



Subject 61058-1

Date: June 1, 2009

TO: Subscribers to UL’s Recognition Service for Appliance Switches – WKKY2

SUBJECT: Request for Comments - Proposed Revisions to Follow-Up Inspection Instructions (FUII) for Appliance Switches (WKKY2)

UL is seeking comments on proposed revisions to the Follow Up Inspection Instructions (FUII) for the category Appliance Switches (WKKY2).

The proposed revisions address the test sequence, conditions and equipment used for testing at the manufacturing location under UL’s Follow Up Program (Part III B of the FUII). The intention is to simplify the required test sequences and allow the use of the actuation equipment and test conditions consistent with and as permitted in the present Special Use Switches FUII (WOYR2).

Attached is a complete copy of the revised FUII. With the exception of Part III, it is the same as the existing FUII (minor editorial changes). Part III has been completely reformatted. The following are the significant changes to Part III for which comments are being sought (page and clause references are to this part of the FUII):

Page 24, Table 7 – Test Sequence: The test sequence has been simplified and includes required testing for both mechanical and electronic switches.

Table 7 – Test Sequence

Reference	Switch ratings except hp and TV	TV	Hp & Specific Motor
B3a	Oven Preconditioning	Oven Preconditioning	Oven Preconditioning
B3c.i	Overload	Overload	-x-
B3c.ii	-x-	-x-	Overcurrent/Overload
B3d	Endurance	Endurance	Endurance
B3e	Temperature Rise	Temperature Rise	Temperature Rise
B3f	Dielectric Strength	Dielectric Strength	Dielectric Strength
B3g	-x-	Continued Endurance	-x-
B3h	-x-	Repeat Dielectric	-x-
B3i	Visual Examination	Visual Examination	Visual Examination

Page 24, III.B3a. Oven Preconditioning – Thermal Stress: Switches with (T ratings) ambient temperature ratings above 55C will be preconditioned instead of cycling testing at the specified ambient. The preconditioning enables subsequent testing to be completed at room ambient and with existing actuation equipment. A heating cabinet (oven), capable of continuously holding the T-rating temperature (+/- 5C tolerance), is required.

Page 24, III.B3bi. Cycling Ambient Conditions: Cycling tests (overload or overcurrent and endurance) are conducted at room ambient of 25C (+/-10C).

Page 25, III.B3bii. Cycling On and Off Times: Cycling times are clarified (on / off periods described) and are based on the standard according to the maximum amp value. There are a few exceptions for Horsepower (hp) and lamp loads and specific conditions. This may require adjustment of cycling rates of actuation equipment.

Page 25, B3biii. Cycling Frequency Representation: This allows laboratories that do not have 50 Hz supplies to complete follow-up testing using 60 Hz with the current increased by 120 percent.

Page 25, III.B3c.i Overload (Increased Voltage): The overload test method is described. This test requires the voltage supply to be adjusted to either 115% or 110%, depending on the switch construction. The method represents present practice.

Page 25, III.B3c.ii Overcurrent/Overload (Hp or Specific Motor Testing only): The overcurrent test method is described and is applicable only for horsepower or Specific Motor ratings. The test is similar to the present Hp “overload.” The method represents present practice.

Page 25, III.B3d. Endurance: The method has been simplified such that cycling is completed for the total number of cycles indicated without the need to change to speed of actuation, voltage or temperature (see III.B3bi). The open circuit voltage should not be greater than 10% of the closed circuit voltage. The closed circuit voltage shall not be less than the rated voltage and not exceed 105% of the rating when under load (current not lower than the ampere rating and power factor not higher than required by the rating).

Page 26, B3e. Temperature Rise: The temperature rise test method has not changed. However compliance will reflect the proposed change to the standard allowing either a 30K or 55K temperature rise. The manufacturer determines whether the switch will be rated for North American standards (30K rise) or IEC standards (55K rise) or both (30K rise). This decision is documented as part of the Recognition (Appendix FS).

Page 26, B3f. Dielectric Strength: The required dielectric strength test voltage has been relocated to Appendix FS.

Page 27, C1. Annual Testing for Hp Ratings: Manufacturers that do not have the equipment necessary to test Hp ratings have the option of testing at UL. This is present practice, however, the test sequence for annual testing was changed to be consistent with Table 7.

IMPACT OF PROPOSAL

The anticipated impact of the proposal is that manufacturers will be able to revert to substantially using their present actuation equipment for factory Follow-Up testing for both WKKY2 and WOYR2 (UL1054 and UL61058-1, respectively). However, this proposal may require manufacturers to acquire an oven for preconditioning of samples.

These changes affect Follow-Up testing only. They reflect the goal of counter-checking continuing compliance using established factory testing equipment. For this purpose, the changes are expected to establish and correlate continuing compliance with the original compliance determination during Recognition type-testing. However, the revisions to the FUII do not change

the methods or required equipment for type-testing conducted at UL laboratories or those of others under Witness Testing or other Data Acceptance Programs.

PROPOSED EFFECTIVE DATE

UL proposes that the revised Follow-up Inspection Instructions become effective upon publication.

REQUEST FOR COMMENTS ON PROPOSAL

Please provide the following:

1. Your comments concerning the proposed FUII for WKKY2
2. Your comments concerning the proposed Effective Date schedule, should the proposal be adopted.

For ease of review, please note that the attached proposal uses standardized wording and format that applies consistently among many product categories that UL encounters. UL requests that your comments focus only on the proposed new or revised requirements and not on the document formatting.

Your written comments should be sent to the attention of Ian McDonald at UL's San Jose Office by July 1, 2009. Comments may be sent by mail, fax or e-mail (see signature block below). Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with this proposal.

Thank you for your time in reviewing this proposal.

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SWITCHES FOR APPLIANCES UL61058-1

(WKKY2, WKKY3, WKKY8, WKKY9)

FOLLOW-UP AND INSPECTION INSTRUCTIONS (FUII)

TABLE OF CONTENTS

	Page
General	2
Scope	2
Glossary	2
Foreword	2
I. Manufacturer's Follow-Up Program	3
I.DD -LL General Responsibility of Manufacturer	3
I.A. Responsibility (sampling, testing, measurements, cycling equipment, inspection equipment, calibration)	5
I.B. Establishing Switch Families (families, switch constructions, ratings, contacts, visual aids)	6
I.C. Establishing Production "Groups" (Group I, Group II, Group III, Sampling periods, Annual production)	8
TABLE 1 Group I Production	8
TABLE 2 Manufacturer's Testing Schedule	9
I.D. Sampling (Initiation of Inspection, Reduced, Normal, and Tightened Inspection, Changing Sampling program, Corrective action, Special Investigation, multiple rated switches)	10
TABLE 3 - MANUFACTURER'S SAMPLING PROGRAM	11
TABLE 4 - MANUFACTURER'S NORMAL SAMPLING FREQUENCY+	12
I.E. Record Keeping Requirements (Test records, Families and Production Groups, Calibration)	15
II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (General, Removal of markings, Special instructions, Visit schedule, Counter check visit, Audit Visit, Records and Documentation, Lot control, Factory Production, horse power ratings, Sampling, witnessing, non-conforming test results)	16
11.A (MM-00) Examination of specimens, records and test schedules.	16
11.PP VN reporting guidelines	16
11.B Scheduling of inspections and Countercheck visit	18
II.C. Sampling of switch specimens from production	20
II.L1 - L7 Examination of specimens and visits	22
III. TEST PROGRAM MANUFACTURER'S AND REEPRESENTATIVE'S RESPONSIBILITIES (Detailed examination, Follow-up tests)	23
III.B. Follow-Up Tests	23
III.B1. General Instructions	23
Table 7 Follow-up Test Sequence	24
III.B2. General Test Methods	24
III.B3. SPECIFIC TEST METHODS (Oven Preconditioning, Overload / Overcurrent, Endurance, Temperature Rise, Dielectric Strength, Visual Examination)	24
ANNUAL TESTING (Horsepower ratings, Sealing compound)	26
Flow Chart	28

Scope

A. These instructions cover (mechanical or electronic) switches for appliances actuated by human contact. The standard reference (UL61058-1) may at times be abbreviated and referred to as UL61058.

1. Voltage - direct current or alternating current (or both).
2. Electrical ratings - Load rating maximums 63A, 600V (if applicable up to 2 hp motor rating).
3. Factory wiring - Unless specifically described in the procedure switches are intended for factory (not field wiring) other than replacement of original equipment.

General

B. As a part of Underwriters Laboratories Inc. (UL's) follow-up inspection, it is required that a Field Representative periodically visit the factory and select, for test or examination or both, samples of production made since the last inspection visit of the products covered.

C. 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.

D. Glossary

For the purpose of this document the following definitions apply.

ACTUATING MEMBER - The part of the operating mechanism that extends outside the body of the switch and is intended to be exposed to contact by the operator.

ACTUATOR - The part of the operating mechanism that is inside the body of the switch and which, in most cases, is not intended to be exposed to contact by the operator.

BASE CONFIGURATION - Structure of internal contacts, number of position, base and actuator.

FAMILY - A collection of switches produced at the same location which are similar in construction such that the construction and performance of one is representative of the remaining members of the collection.

LOT - The quantity of switches manufactured at the same assembly location with identical production variables (such as switches made with the same equipment, materials and in the same work shift). Smaller LOTS may be designated by the manufacturer.

PRODUCTION GROUP - A collection of families grouped together into one of three groups based on relative production for sampling purposes.

TELEVISION SWITCH - A switch intended for use as a supply-circuit control switch in appliances with high inrush loads such as audiovisual appliances.

FOREWORD

It is anticipated that the majority of switch manufacturers will have a program of production control containing at least the elements described herein and that the concepts of families and groups will be applicable. However, in the event that a manufacturer operates his program of tests and examination in a different manner, the program may be submitted to determine its equivalency to the following required program. A program found to be equivalent will be described in the Procedure.

I. MANUFACTURER'S FOLLOW-UP PROGRAM

DD. Restrict the use of markings that reference UL (either directly by use of the name, an abbreviation of it, or the UL symbol, 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. The use of such markings is further limited by the agreements that have been executed by the subscriber and UL.

EE. Confine the markings referencing UL as indicated in Paragraph DD, to the location or locations authorized in these instructions or the Follow-Up Service Procedure.

FF. During hours in which the factory is in operation, permit 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 as indicated in Paragraph DD. 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.

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

HH. 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.

II. Conduct any tests as specified in these Follow-Up and Inspection Instructions under Manufacturer's Test Program.

JJ. Record Keeping - See Paragraph I.E1

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

KK. Determine that all test and measuring instruments required as part of the Follow-Up Services Procedure or used by UL Field Representatives in the conduct of inspection activity at the factory are calibrated in accordance with UL's published calibration requirements for manufacturers. The published document is titled, "UL Calibration Requirements: Equipment Used for UL/C-UL/ULC Mark Follow-Up Services", and is available on UL's website at the following address, "www.ul.com/fieldservices/requirements.html". Manufacturers that do not have internet access may obtain the current version from their local UL Customer Service representative in the same manner as other requests for requirements.

LL. Where so specified by these Follow-Up and Inspection Instructions, forward samples selected by the Field Representative to the specified UL Test Office(s) for Follow-Up Tests, within five working days of the Field Representative's inspection visit. Packaging and shipment of the samples are the responsibility of the manufacturer.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

A. Responsibility

A1. The manufacturer shall perform all follow-up tests and provide test equipment suitable for the tests described. If the test equipment is not located at the manufacturing site, an alternate program may be submitted for review by Conformity Assessment Services to determine its equivalency to the program described in these Instructions. An alternate program for testing at a remote location shall include these minimum requirements:

- A1a) Sampling and testing of each switch family shall proceed as described in these instructions.
- A1b) Shipment of switches of each family shall be held until acceptable test results of sampled switches representing those families are verified by the Field Representative.
- A1c) Selection of switch samples from each family shall represent production lot based on the time frame of production and the previous tests.
- A1d) Testing of switches shall be completed and the results communicated to the location where the switches are shipped from no later than 3 weeks from the date the switches were selected. Detailed description of any alternate testing program will be included in the Follow-up Service Procedure for each manufacturing site.

A2. Measurements - For the measurement of voltage, current and wattage, any standard instrument of reasonable accuracy ($\pm 2\%$) may be used. Current readings need be made only at the beginning and the end of tests. It is recommended that a shorting switch be installed to protect ammeters in case any switch malfunctions under test. It is preferable that voltmeters remain connected during the tests.

A3. Cycling Equipment - Automatic equipment shall be used for all cycling unless specifically instructed to use "high speed" manual actuation. The automatic cycling equipment shall comply with the test methods in this FUII, for speed of actuation, operations per minute and thermal conditions. The automatic test equipment shall have provision for testing at least three samples simultaneously unless specifically authorized in the procedure. The number of cycles completed shall be indicated using automatic counters actuated by monitoring electrical connection of the switch to the load. Equipment interaction with the switch actuator will attempt to replicate normal use and minimize distorting forces.

A4. Inspection - The condition and function of equipment, meters, calibration, documentation, and witnessing test methods shall be rechecked by the Field Representative at intervals not exceeding 12 months. The manufacturer shall maintain records as required by this document, and shall make them available upon request, to the Field Representative. It will be necessary to retain records from the preceding 12 months (see subsection II.A.1).

A5. Calibration - see paragraph KK.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

B. Establishing Switch Families

B1. Switches are to be collected into families as defined in the glossary. All switches within a family must employ the same electrical rating, similar base configuration and number of poles. The base configuration includes the internal contacts, number of positions, base and actuator. Base configurations are determined, during the new work investigation, and documented in the procedure Appendix FS. External parts, such as terminals and actuating members may differ within a family.

Exception No. 1: Poles - Single-, double-, and multiple-pole switches may be included in the same family provided the switches have the same rating and base configuration.

Exception No. 2: Cycles - Switches that are the same except for their Recognized endurance ratings may be placed in the same family.

Exception No. 3: Contact Construction - Switches that employ the same basic contact construction, except for the diameter, thickness or material of the contacts, and/or the electrical rating, may be included in the same family provided the switches have the same base configuration and number of poles. See item 2.e. below.

B2. The following guidelines are to be followed to select switches representative of all others in the family. Variations from the following are acceptable to allow sampling of all production lines and/or in cases when the most critical construction is not available.

B2a. Single/Double-Throw; Normally Open/Closed - If both single throw and double throw switches or normally open and normally closed switches are included in the same family, the tests are to be conducted on an as available basis.

B2b. Different Number of Poles - If single-pole, two-pole, and multiple-pole switches are covered in the same family, each is to be sampled in the approximate proportion of its production to the overall production of the family. See sampling guideline discussed in item e below.

B2c. Different Endurance Ratings - If switches having different endurance ratings are included in the same family, each is to be sampled in the approximate proportion of their production to overall production of the family. See sampling guideline discussed in item e below.

B2d. Same Contacts but Different Electrical Rating - If the family includes similar ratings, any switch can be tested for the maximum rating of the family.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

B2e. Different Contacts and Different Ratings - If the family includes different contacts and different ratings, each different contact is to be sampled each quarter in approximate proportion of its production to the production of the family. Each contact construction is to be tested at its maximum eligible rating.

Example:

Consider a switch family that includes three sizes of contacts and four ratings, as follows:

Contact Size 1 - May be rated 1 ampere, 125 volt ac or 2 amperes, 125 volt ac.

Contact Size 2 - Rated 3 amperes, 125-250 volt ac.

Contact Size 3 - Rated 5 amperes, 125-250 volt ac.

Assume production for the family in the period is estimated to be:

Contact Size 1 -	50,000
Contact Size 2 -	20,000
Contact Size 3 -	<u>30,000</u>
Total=	100,000

The required sampling for a Group I or II family, (see section I. C. "Establishing Production Groups"), is to be determined in accordance with Table 3, Normal Sampling Level. In this case, 12 samples are to be selected from the family based on the 100,000 production quantity. These twelve are to be subjected to the complete test sequence. The contacts are to be sampled in the approximate proportion, as indicated below.

<u>Contact Size</u>	<u>Production Quantity</u>	<u>Number of Complete Tests</u>
1	50,000	6
2	20,000	3
3	<u>30,000</u>	<u>3</u>
Totals	100,000	12

Each contact is to be tested at its marked rating, except Contact Size 1 is always to be tested at 2 amperes, 125 volt ac (rather than at its alternate lower rating of 1 ampere, 125 volt ac).

The required sampling for a Group III family is to consist of three (3) samples of each size contact, with each sample being subjected to complete tests. Contact Size 1 is always to be tested at 2 amperes, 125 volt ac.

B3. UL's Conformity Assessment Services shall assign switches to families based on the examination of the switches and their meeting the above criteria. The family breakdown will be included in the manufacturer's Follow-Up Procedure.

B4. Unless otherwise specified, the manufacturer shall subject all families of switches to the appropriate sequence of tests as outlined in Section III.

B5. Where a family is composed of different actuating members, the manufacturer shall maintain visual aids so that the Field Representative can readily determine which switch actuating members have been tested in the past.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

C. Establishing Production "Groups"

C1. For sampling purposes, the manufacturer shall distribute his families into one, two, or three "Groups" in accordance with Table 1 and the following criteria:

C1a. Group I - Regularly Sampled Families - All high volume switches for appliances families shall be placed into this group. The percentage of total production represented by Group I shall not be less than 75%, except when the manufacturer has Groups I and III only, in which case it shall not be less than 90% (see Table 1). Any family, which individually represents 5% or more of the total annual production, must be placed in Group I. Each family in Group I shall be sampled during each sampling period it is manufactured in accordance with Table 3 (see subsection I.D. -- Manufacturer's Sampling).

TABLE 1
GROUP I PRODUCTION

Families Distributed Into: (Group Combinations)	Minimum Percent of Total Production Group I Families
I	100%
I and II	75%
I, II, and III	75%
I and III	90%

C1b. Group II - Rotationally Sampled Families - Where a manufacturer feels that the low production of some families does not warrant their inclusion in Group I, these families may be tested on a rotational basis and included in Group II. For example, if a manufacturer produces several high volume families, each individually representing 5% or more of total production, these would appear in Group I. If he also produces several other families whose production is below 5% of total production, these families may be placed into Group II. The percentage of total production represented by Group II shall never be more than 25%. A family, which individually represents 0.5% or more of the total annual production, must be placed in Group I or II; if the production of any Group II family rises above 5% of total annual production, it shall be placed into Group I.

Each Group II family shall be sampled at least one period per year in accordance with Table 3, provided it is manufactured during that year. If a manufacturer desires to spread the testing throughout the year, samples may be selected from 1/4 of the Group II families in production during each sampling period (quarter).

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

C1c. Group III - Periodically Sampled Families - Where the production of certain families is so low that the manufacturer feels they do not fit into either Group I or II, these families may be placed into Group III and subjected to periodic testing and examination. For example, if the manufacturer discussed under Group II also produces several low running families, each representing less than 0.5% of total production, these families may be placed in Group III. The percentage of total production represented by Group III shall never be more than 10%. If the production of any Group III family rises above 0.5% of total annual production, it shall immediately be placed into Group I or II, depending upon how high production has risen.

Three (3) switches from each Group III family being sampled shall undergo the complete test sequence. Each Group III family shall be sampled at least one time per year, provided it is manufactured that year. If the manufacturer desires to spread the testing throughout the year, samples may be selected from 1/4 of the Group III families in production during each sampling period (quarter).

C1d. Table 2 is an example of a manufacturer's testing schedule utilizing the group concept.

TABLE 2 MANUFACTURER'S TESTING SCHEDULE

	Portion of Group Tested Per 3-Month Sampling Period			
	January- February- March	April- May- June	July- August- September	October- November- December
#GROUP I - High-Volume Families	All	All	All	All
#GROUP II -Moderate- Volume Families	1/4 *	1/4 *	1/4 *	1/4 *
##GROUP III - Low-Volume Families	1/4 *	1/4 *	1/4 *	1/4 *
#	Samples selected from each family being tested in accordance with Manufacturer's Sampling Program (see Table 3).			
##	Three (3) switches chosen from each family being tested and subjected to complete test sequence.			
*	This is a suggested distribution.			

C1d.1. The manufacturer shall submit to the Field Representative the annual production for each family. It will be the responsibility of the manufacturer to keep the grouping up to date with respect to new families and changes in annual production levels at least twice a year.

During each sampling period, the manufacturer would test all the families in the groups or portions of groups as indicated in Table 2. For example, during the January-February-March period, all of the families in Group I, approximately 1/4 of the families in Group II, and approximately 1/4 of the families in Group III would be tested. The Group I and II families would be sampled in accordance with the Manufacturer's Sampling Program (Table 3). The Group III family would be tested in accordance with the instructions appearing in subsection [I.D.2.](#)

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

D. Sampling

D1. Group I and II families only shall be sampled in accordance with the following criteria:

(Note: The manufacturer's sampling program for Group I and II families is summarized in Table 4.)

D1a. Initiation of Inspection - Normal inspection will be used at the start of inspection, except that a Group I family can begin on the reduced level if the manufacturer can show records that indicate that 24 consecutive switches of the family have been successfully tested within the last 2 years, 15 of which have been witnessed by a Field Representative.

D1b. Reduced, Normal, and Tightened Inspection - (See Manufacturer's Sampling Program, Table 3) - Samples selected under each inspection are to be subjected to the complete test sequence as indicated in Table 3.

D1b.(1) Testing - Table 3 indicates the total number of switches that are to be selected for each sample during a sampling period for testing. UL may, upon review of a manufacturer's quality history, authorize a reduction or increase, as warranted, of the proportion of the total which are to be subjected to the complete sequence for individual manufacturers.

The samples are selected in sets of three. In the selection of sample sets, consideration shall be given to their distribution in such a way as to represent the entire output for the sampling period. An approximate selection sequence is given in Table 4. This sequence is presented here as an aid to guide the manufacturer in uniformly distributing his sampling whenever production for a family is uniform throughout much or all of the lot period. A sampling period shall be 3 months.

In the event that the sampling for the period has not yet been completed and a switch under test does not pass, unless corrective action is required, another set of three switches, or that number of switches less than three required to complete the sampling for the period, shall be immediately selected for test. These switches shall be included as part of the total required by the manufacturer. Should the number of non-conforming test results indicate that a second sample is required, the testing schedule for that family shall be accelerated to accommodate the additional sampling required.

TABLE 3

MANUFACTURER'S SAMPLING PROGRAM									
-- Reduced-- -- Reduced--- Reduced-- -- Reduced--- Reduced-- -- Reduced--- Reduced-- -- Reduced--- Reduced-- -- Reduced---									
No. of Switches made per family per quarter	Switches to be sent for testing 1 st sample	Test Results – No. of Failures (1 st Sample)			Switches to be sent for testing 2 nd sample	Total No. of Switches to be sent for testing (1 st & 2 nd sample)	Test Results - Total No. of Failures (1 st and 2 nd Sample)		
		Action: Continue production, reduced inspection	Action: Select and send 2 nd sample	Action: Take Corrective action, reinstate normal inspection			Action: Continue production, reduced inspection	Action: Continue production, reinstate normal inspection	Action: Take corrective action, reinstate normal inspection
0–10,000	3	0	-	1	3	6	0	1	2
10,001-150,000	6	0	1	2	6	12	0	2	3
150,001-500,000	9	0	1, 2	3	9	18	0	1, 2, 3	4
500,001 & over	12	0	1, 2, 3	4	12	24	1	2, 3, 4	5
-- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal-- -- Normal---									
No. of Switches made per family per quarter	Switches to be sent for testing 1 st sample	Test Results – No. of Failures (1 st Sample)			Switches to be sent for testing 2 nd sample	Total No. of Switches to be sent for testing (1 st & 2 nd sample)	Test Results - Total No. of Failures (1 st and 2 nd Sample)		
		Action: Continue production,	Action: Select and send 2 nd sample	Action: Take corrective action			Action: Continue production	Action: Take corrective action	
0–10,000	6	0	1	2	6	12	1	2	
10,001-150,000	12	0	1	3	12	24	1	2	
150,001-500,000	18	0	1, 2	3	18	36	1, 2	4	
500,001 & over	24	1	2, 3	4	24	48	1, 2, 3, 4	5	
-- Tightened-- -- Tightened-- -- Tightened-- -- Tightened-- -- Tightened-- -- Tightened-- -- Tightened-- -- Tightened-- -- Tightened-- -- Tightened--									
No. of Switches made per family per quarter	Switches to be sent for testing 1 st sample	Test Results – No. of Failures (1 st Sample)			Switches to be sent for testing 2 nd sample	Total No. of Switches to be sent for testing (1 st & 2 nd sample)	Test Results - Total No. of Failures (1 st and 2 nd Sample)		
		Action: Continue production,	Action: Select and send 2 nd sample	Action: Initiate special investigation			Action: Continue production	Action: Initiate special investigation	
0–10,000	9	0	1	1	6	12	1	2	
10,001-150,000	18	0	1	2	12	24	1	2	
150,001-500,000	21	0	1	2	18	36	1	2	
500,001 & over	24	0	1, 2	3	24	48	1,2,3	4	

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

TABLE 4 MANUFACTURER'S NORMAL SAMPLING FREQUENCY+
(Suggested Selection Sequence)

Production Rate (3-Month Period)	Total Initial Sample	Week												
		1 st	2 ⁿ	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	11 th	12 th	13 th
0 - 10 000	6	3					3							
10 001-150 000	12	3			3				3				3	
150 001-50 0000	18	3			3			3			3			3
500 001 & over	24	3		3		3	3		3	3		3		3

+ - Sampling in accordance with Table 3.

Dlc. Continuation of Inspection - Normal, tightened, or reduced inspection shall continue unchanged for each family except where the instructions given below require a change in inspection. Each family shall be considered independently with respect to the inspection program in effect.

Dld. Switching (Change in Sampling) Procedures - The switching procedures shall be implemented as required below.

Dld.(1) Normal to Tightened - When normal inspection is in effect, tightened inspection shall be instituted when the following conditions occur:

(a) Corrective action has been required on two out of five consecutive sampling periods[#] as determined by the manufacturer's testing.

(b) Other conditions such as the lack of correlation of test data, input from field failure analysis, etc., may warrant that a change in inspection be instituted in conjunction with Conformity Assessment Services.

[#] (Note: For Group II family, "consecutive sampling periods" is defined as the sampling periods during which a particular family under consideration for switching has been tested.)

Dld.(2) Tightened to Normal - When tightened inspection is in effect, normal inspection shall be instituted when three consecutive sampling periods have been considered acceptable by the manufacturer on original inspection.

Dld.(3) Normal to Reduced - When normal inspection is in effect, reduced inspection may be instituted providing that all of the following conditions are satisfied.

(a) Follow-up has been active under normal inspection for at least 4 consecutive quarters; and

(b) There have been no non-conformance findings or corrective action in the last 4 consecutive quarters; and

(c) There have been no Variation Notices (VN) issued for the last 2 consecutive quarters.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

D1d.(4) Reduced to Normal - When reduced inspection is in effect, normal inspection shall be instituted if any of the following occur on original inspection by either the manufacturer or the Field Representative:

(a) Any test resulting in corrective action, see Table 3, continue production by reinstate normal inspection schedule.

(b) Other conditions warrant that normal inspection shall be instituted at the discretion of Field Operations management and/or after discussion with the manufacturer.

D1e. Corrective Action - In case that corrective action is needed, due to a non-conforming test, as indicated in the table, the manufacturer shall investigate the causal factors for the rejection. The manufacturer shall determine the portion of completed production represented by the non-conforming switches and identify this as the "rejected lot". The manufacturer shall prepare a written analysis, which shall be available for review by the Field Representative, outlining the causal factors for the rejection and giving the corrective action taken.

A rejected lot of switches may be resampled only after it has been examined by the manufacturer and the non-conformances corrected. Three samples are to be subjected to the appropriate test sequence. These samples are not to be included as part of the manufacturer's sampling requirements. If any sample does not pass, the entire lot shall be rejected again. A similar procedure shall apply in the event of a subsequent resampling of the lot. However, a rejected lot which has been resampled twice may not be resubmitted for inspection a third time.

In order to evaluate the effectiveness of the corrective action on subsequent production once production resumes, three switches shall be immediately subjected to the complete sequence of tests. These switches are not to be included as part of the regular sampling plan required by the manufacturer. If any switch does not pass, the lot is to be rejected, another analysis of the causal factors made and corrective action taken.

If corrective action is required on subsequent production more than two consecutive times, the use of the UL mark is to be discontinued and the manufacturer is to resubmit the switch to UL's Conformity Assessment Services.

If effective corrective action is demonstrated, inspection of production shall continue in accordance with the established schedule for the remainder of the sampling period. However, reference should also be made to the Switching Procedures to determine if the corrective action necessitates a change in inspection level (reduced to normal or normal to tightened). If so, and there are two or more weeks remaining in the sampling period, production during the remaining weeks shall be sampled as a new sampling period.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

D1f. Special Investigation - In the event that a family does not pass testing while on a tightened inspection as per Table 3, shipment of Recognized Component switches shall be held until such time as a special investigation can be performed by the manufacturer. UL's Conformity Assessment Services shall immediately be notified and kept informed on the progress of the special investigation. This notification may come from either the Field Representative or the manufacturer. Immediate notification is of prime importance in this matter.

The special investigation shall be concluded only when it is agreed that the conditions responsible for the special investigation have been corrected.

D2. Group III families shall be sampled in accordance with the following criteria:

D2a. Three switches, from one catalog number, from each family being sampled shall be subjected to the complete test sequence.

(1) If a non-conforming test result occurs on a sample, the manufacturer shall investigate the causal factors for the rejection. He shall determine the portion of completed production represented by the non-conforming switches, and identify this as the rejected lot. The manufacturer shall prepare a written analysis, which shall be available for review by the Field Representative, outlining the causal factors for the rejections and giving the corrective action taken. The rejected lot and effectiveness of the corrective action is to be evaluated as discussed in paragraph I.D.1.e. (Corrective Action).

D3. MULTIPLE RATED SWITCHES - Where a switch has several distinct ratings, which are not mutually representative of one another, the following procedures shall be followed for testing: (This does not apply to horsepower ratings. The manufacturer can elect not to conduct horsepower tests. These tests will be conducted once per year as part of the UL testing of Section III.C.

D3a. Group I and Group II Families - For a multiple rated switch from a Group I or II family, at the start of the sampling period, the manufacturer shall begin the testing by selecting a group of three switches and subjecting them to the required tests at a single rating. Subsequent groups of three switches shall be tested at a single different rating each time, until all the ratings are covered (refer to Table 4). Then, if the sampling period has not been completed, repeat the above procedure until the sampling for the period has been completed.

If all of the ratings cannot be covered by the end of the sampling period, the untested ratings shall be tested during the subsequent testing period.

D3b. Group III Family - Multiple rated switches from Group III family are to be tested at one rating per sampling period. All ratings are to be tested in turn.

I. MANUFACTURER'S FOLLOW-UP PROGRAM (continued)

Should a manufacturer feel that he has a special problem with respect to the testing of multiple rated switches, he may bring the matter to the attention of UL's Conformity Assessment Services. Upon review of the matter, if warranted, special consideration will be given and described in the manufacturer's Follow-Up Service Procedure.

E. Record Keeping Requirements

E1. Maintain records of test performance. Unless indicated otherwise in the Procedure, the information to be recorded shall 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 in place to confirm that production is always subjected to the required tests. Instead, exception reports indicating noncompliance and corrective action should be retained.

E1a. Test Records - The manufacturer shall maintain sampling and testing data. All non-conforming test data shall be recorded on a family basis. The information shall include the catalog number tested, the number of switches tested, the number of non-conforming switches, the dates of the tests, the non-conforming test/s, a failure analysis, and any corrective action taken.

E1b. Families and Production Groups - The manufacturer shall maintain a list of his switch families and their distribution into family groups along with the action production figures for each family. This list should be updated at least twice per year to reflect the addition of new switches or changes in annual production.

(Note: If family production figures are not available to the Field Representative, the manufacturer can provide this information to UL's Conformity Assessment Services.)

E1c. Calibration - Certification of calibration of all instruments involved in the documented performance of the required tests by comparison with a standard traceable to the national standard of the manufacturer's country shall be maintained by the manufacturer for the current and previous year.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE

MM. Examine samples of production bearing, or intended to bear, the UL Mark or Marking to determine compliance with the provisions of the Follow-Up Service Procedure, the applicable UL Standard(s) and these Follow-Up and Inspection Instructions.

NN. Where so specified by these Follow-Up and Inspection Instructions, select samples to be forwarded to the appropriate UL Test Office(s) for Follow-Up Tests.

OO. Review the Manufacturer's Test Program, system, and records to assure that:

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

PP. Report to the manufacturer and the UL Reviewing 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 test 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.).
- 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 effect 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.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (continued)

QQ. 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 to the Procedure has been encountered. Also explain that it is the manufacturer's responsibility to forward a copy of the Variation Notice to the Applicant.

RR. A product, that is found to have features that make it unacceptable to bear a marking referencing UL, shall be acceptably corrected if the marking is to be retained. Carefully check subsequent production for such features until conditions are again considered acceptable.

SS. A product that does not comply with the requirements of the Follow-Up Service Procedure and these Follow-Up and Inspection Instructions shall have each UL referencing Mark removed from the product, or obliterated from the product where the marking is imprinted, die-stamped, molded, or the like. 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 and Applicant have 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. The manufacturer shall demonstrate that all Marks referencing UL are removed from the rejected material. Those Marks referencing UL not destroyed during their removal from the product shall be retrieved from the manufacturer's control 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.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (continued)

A. General

A1. The role of the Field Representative under this program shall be to countercheck and audit the sampling and testing conducted by the manufacturer in accordance with Section I.

To accomplish this the Field Representative will select samples, witness tests, review records and examine construction.

Under normal circumstances, the samples selected for test by the Field Representative should be from a family scheduled for testing under the manufacturer's program. All samples selected for test by the Field Representative will be counted as part of the manufacturer's sampling program.

A2. If the product is found to have features, which make it unacceptable to bear the Recognized Component Mark of Underwriters Laboratories Inc., the Field Representative shall require that acceptable corrections be made if the product is to be so marked. The Field Representative shall check subsequent production carefully for recurrence of such features until conditions again appear to be normal.

A3. The Field Representative shall require that the manufacturer remove markings referencing Underwriters Laboratories Inc. from all products which do not comply with the Follow-Up Service Procedure except that, in the event of disagreement between the manufacturer and Field Representative as to whether the product is acceptable, the manufacturer may hold the material at the factory pending an appeal. All discrepancies between the product and the provisions of the Procedure shall be called immediately to the attention of the manufacturer and confirmed in writing.

A4. A report shall be made out for each completed inspection and forwarded promptly to the appropriate UL office for review. The Field Representative shall indicate on the Report Form the results of the examination and tests witnessed.

B. Special Instructions

B1. The Field Representative and Manufacturer shall meet and agree upon a schedule of inspections. This schedule will be determined on the basis of the anticipated rate of production of switches and will be adjusted from time-to-time as the rate of production changes.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (continued)

B2. The Field Representative's visits are to be divided between 2 separate inspection functions. These are each to be performed on different visits, referred to as countercheck visits and audit visits. See B2a and B2b below.

Number of Total Visits Per Quarter		Number of Audit Visits Per Year
12 or more		4
6 to 11		2
3 to 5		1
0 to 2		None +
+ - It appears that with such a low inspection frequency, the resulting time necessary for review of records and family groupings will not be excessive. Accordingly, such review can be done as necessary during one or more of the countercheck visits.		

B2a. Countercheck Visit - The procedure to be used by the Field Representative during countercheck visits shall include:

B2a.i) selecting samples for tests,
 B2a.ii) witnessing tests on the samples, and
 B2a.iii) performing a visual examination of the samples to determine compliance with the construction requirements of the descriptive report. Visual examinations are to be conducted at the rate of no more than one per countercheck visit and such that all families manufactured during the year are inspected within that year. An exception may be made where a manufacturer has so many different families that it would be impossible to conduct a visual inspection of each family within a year. In such a case, a complete visual inspection of all families is to be completed within a 2 year period.

B2b. Audit Visit - The procedure to be used by the Field Representative during an audit visit shall include a review of the following items:

B2b.i) the manufacturer's records and documentation,
 B2b.ii) the manufacturer's testing procedures,
 B2b.iii) the manufacturer's lot control procedures and,
 B2b.iv) the manufacturer's factory production.

These reviews shall be conducted as described below.

B3. RECORDS AND DOCUMENTATION - During an audit visit, the Field Representative shall review the following records and documentation maintained by the manufacturer:

B3a. Test and Calibration Records - The Field Representative shall verify Manufacturer testing per Table 3 and when applicable the failure analysis and corrective actions. See paragraph 00.

B3b. Documentation - The Field Representative shall review the manufacturer's switch family set-up, and the production figures for each family to verify that the manufacturer is sampling correctly as specified in Table 3.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (continued)

In addition, the Field Representative shall review the manufacturer's production group distribution to verify that the families are correctly distributed into groups according to the criteria given and that the manufacturer is testing at the correct frequency as specified in Table 2.

If family production figures are not available in the factory, the reviewing office shall be notified. In this case, the reviewing office will coordinate the verification of proper sampling frequencies and distribution of families into groups.

B3c. Production Inspection - The Field Representative and Manufacturer shall work together, so that, when possible, visits can be made during production.

B4. MANUFACTURER'S TESTS - The Field Representative to verify testing is performed, see Table 3 and paragraph 00.

B5. LOT CONTROL - The Field Representative shall verify that the manufacturer has an adequate system for the identification and segregation of rejected lots.

B6. FACTORY PRODUCTION - The Field Representative shall review the manufacturer's factory output by selecting random samples from the production area and subjecting them to a physical examination to determine compliance with the construction requirements of the descriptive report.

B7. If any discrepancy is found in any of the above items, with respect to the applicable requirements, it should be immediately called to the attention of the manufacturer. If necessary by recording the discrepancy on a Variation Notice.

B8. New switches shall be selected for complete review from the first production run after they have been Recognized by UL. The sample, consisting of three switches, shall be subjected to the complete test sequence. These tests shall be included as part of the manufacturer's sampling requirements for the family to which the switch is assigned. As new Recognitions are selected and subjected to complete test, the Field Representative shall ascertain that the catalog number is placed into the manufacturer's family records and included in the manufacturer's testing program.

B9. Once each year, per section III, the Field Representative shall select representative samples from all horsepower rated switches and subject them to the horsepower tests as indicated in the testing section.

B10. Since a family may be comprised of many types of actuating members, the Field Representative shall attempt to sample from different types at subsequent inspections.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (continued)

C. Sampling

C1. At each countercheck visit, the Field Representative shall select three switches from a family, which is scheduled complete testing program under the manufacturer's program. These samples shall be selected from switches, which have passed the manufacturer's final inspection, and shall be included as part of the regular sampling plan required by the manufacturer.

C2. The governing factor in determining which families to sample during countercheck visits shall be the manufacturer's testing schedule. However, the Field Representative shall refer to the manufacturer's list detailing "Groups" of families to maintain his sampling schedule in accordance with the following ratios:

C2.a. Where a manufacturer has both Group I and Group II families, the representative shall attempt to select samples from a Group II family during approximately one out of every three countercheck visits.

C2.b. Where a manufacturer also has Group III family, the representative shall attempt to select samples from Group III family during approximately one out of every nine countercheck visits.

The Field Representative shall maintain a record of the catalog number, family and group selected on each inspection in order to maintain the above ratios. If these ratios are difficult or impossible to maintain, the matter shall be brought to the attention of the responsible office.

C3. The Field Representative shall verify the Oven Precondition test (when applicable) and witness the overload or overcurrent (when applicable) and the start of the endurance test on the samples selects during countercheck inspection. The manufacturer may complete the test sequence prior to the Field Representative's next visit in order to obtain timely test results. However, the tested samples shall be retained until his/her next visit so that the Field Representative may repeat the final tests (Temperature Rise and Dielectric Strength Test) and conduct the required physical examination of the switches.

Exception: If the Field Representative's inspection frequency is once per week or higher, and this results in witnessing all facets of testing from time-to-time, samples selected by the Field Representative need only be retained at his/her request.

C4. If a non-conforming test result occurs on a sample selected by the Field Representative, the manufacturer shall take appropriate action for the family in accordance with Section I. D. e. In addition, the Field Representative shall resample from the same family (three specimens) as soon as possible after the non-conforming test result occurs. These samples shall also be included as part of the manufacturers sampling requirement for the family. If any additional non-conforming test results occur on the samples selected by the Field Representative, shipments shall be held and the Conformity Assessment Services of the responsible office shall immediately be notified. The Conformity Assessment Services will then consult with the manufacturer and representative to determine appropriate action to be taken with respect to the family.

II. RESPONSIBILITY OF THE FIELD REPRESENTATIVE (continued)

GENERAL INSPECTION GUIDELINES APPLICATION OF THE LISTING MARK TO THE PRODUCT

L1 The Field Representative shall examine at least one sample of the products to verify that the application of the label to the product is in compliance with the requirements of Underwriters Laboratories Inc.

L2 Appliance Switches are covered under UL's Type R Listing Service. For specific details regarding the application and elements of the Listing Mark, refer to the Listing Mark Data Page in the Procedure. Additional information, such as camera ready art work and proportional dimensions for the Marks/Markings, may be found by visiting UL's website at "http://www.ul.com/marks_labels/".

L3 The Listee's name, trade name, trademark or UL File Number (if authorized in the Follow-Up Service Procedure) that identifies the Listee, must appear on the label, unless the subscriber chooses to purchase standard labels from UL's Label Centers, in which case the Listee's identification is not on the UL Label but is placed elsewhere on the product.

DATA SHEET

L4 The Field Representative shall record Appliance Switch inspection data on Data Sheet 300-XXX. A copy of the completed data sheets shall be retained at the manufacturer's location or the IC until the next inspection visit or 90 days, whichever is longer.

FIELD REPRESENTATIVE'S COUNTERCHECK PROGRAM

L5 At each visit to the factory the Field Representative shall see the entire lot of Appliance Switches that bears or is intended to bear the Listing Mark, and shall then select samples.

L6 The Field Representative shall check the construction details of Appliance Switches with the requirements. The Field Representative shall examine labeled production for all of the construction details, dimensions, ratings and markings specified in the Follow-Up Service Procedure description, and these Follow-Up and Inspection Instructions.

L7 The Field Representative is required to inspect and report on randomly selected samples. These samples shall not be taken from a lot which other samples have been taken during a previous inspection, unless the lot was previously rejected, has been culled (sorted) and reworked, and is resubmitted for re-inspection. The actual number of Appliance Switches to be taken in individual cases may necessarily vary somewhat according to conditions, but the Field Representative shall follow as closely as possible the outline given in Table L1 and the instructions in the paragraphs that follow the table.

III. TEST PROGRAM - MANUFACTURER'S and FIELD REPRESENTATIVE'S RESPONSIBILITIES**A. DETAILED EXAMINATION**

A1. The UL Field Representative shall select switches and perform a detailed examination. This examination includes a review of the device to determine that the details of construction, ratings, and markings are as given in applicable paragraphs of the standard and/or Procedure. Particular attention should be paid to the following items:

- a. Materials used
- b. Adequacy of enclosure and means for mounting
- c. Sealing and spacings
- d. Suitability of all current-carrying parts
- e. Type of switching mechanism
- f. Wire leads
- g. General assembly
- h. Ratings and markings

B. FOLLOW-UP TESTS

B1. General instructions for conducting each test, and equipment suitable for the purpose of conducting the tests, as well as method of operation and making connections, are verified by the Factory Test Load Evaluation. Loads and equipment are indicated in the Volume Section General. The manufacturer shall provide knowledgeable staff to conduct the required testing.

In verifying compliance to the basic certification performance requirements, test conditions may be more severe (such as a lower power factor, a lower frequency, and a greater rate of operation than those specified in the applicable sections of the standard) may be employed if agreeable, both the manufacturer and UL. In order not to reduce the severity of the tests, the Field Representative shall see that the prescribed conditions are adhered to unless UL's Conformity Assessment Services Procedure makes provision for altering these conditions.

Table 7 shows the test sequence to be employed for each switch according to its rating (complete electronic switch testing only). One (1) set of 3 specimens and contacts are used for the complete test sequence. The Procedure Appendix specifies the test sequence and parameters for each switch.

The UL Field Representative shall, when applicable, verify Manufacturer's record that the Oven Preconditioning (Thermal Stress) test was completed. This is normally a record of 72h monitored oven conditioning. The UL Field Representative shall witness the test set up, conditions and cycling of the Overload or Overcurrent test and set up and start of the Endurance test. The Field Representative shall witness the Temperature Rise and Dielectric Strength Tests.

III. TEST PROGRAM - MANUFACTURER'S and FIELD REPRESENTATIVE'S
RESPONSIBILITIES (continued)

Table 7 -Test Sequence

Ref.	Switch ratings except hp and TV	TV	Hp & Specific Motor
B3a	Oven Preconditioning	Oven Preconditioning	Oven Preconditioning
B3c.i	Overload	Overload	-x-
B3c.ii	-x-	-x-	Overcurrent/Overload
B3d	Endurance	Endurance	Endurance
B3e	Temperature Rise	Temperature Rise	Temperature Rise
B3f	Dielectric Strength	Dielectric Strength	Dielectric Strength
B3g	-x-	Continued Endurance	-x-
B3h	-x-	Repeat Dielectric	-x-
B3i	Visual Examination	Visual Examination	Visual Examination

B2. GENERAL TEST METHODS - Compliance is demonstrated by the test sequence described in Table 7. Each test is completed in the declared order and with the conditions indicated in Appendix FS. If any test specimen yields noncompliant results the entire sample set (3 specimens) is not to be subjected to the remaining test sequence. However, an additional sample set (3 specimens) may be selected (see the flow chart) and subjected to the complete test sequence described in Table 7 (starting from the beginning).

B2a. Grease: Switches shall be tested in the same condition (with or without grease) in which they are regularly shipped from the factory. No grease will be applied during any portion of the test sequence.

B2b. Fuse for grounding arc: During the overload and endurance tests, the fuse to detect arc-over to ground shall be a Listed or Recognized fuse rated less than the power supply output current rating but no more than 15 ampere. It shall be a non-time delay type.

B3. Testing

B3a. Oven Preconditioning - Thermal Stress:
Switches with an ambient temperature rated over 55C shall be placed in a heating chamber (oven) at the maximum rated temperature of the switch (tolerance +/-5C) for 72h before the test sequence.

All other Switches are not thermally stressed and continue to the next test in the test sequence. Testing is completed at room ambient 25 +/-10C.

B3b. Cycling conditions

B3bi. Cycling ambient conditions:
Switches are tested in an draft free, indoor controlled environment including a steady ambient temperature between 25+/-10C.

III. TEST PROGRAM - MANUFACTURER'S and FIELD REPRESENTATIVE'S
RESPONSIBILITIES (continued)

B3bii. Cycling On and OFF Times:

0 to 10A = 1 second ON ... and 3 seconds Off
10.1 to 25A = 2 second ON ... and 6 seconds Off
25A to 63A = 4 second ON ... and 12 seconds Off

-Complex sequences may be defined differently in Appendix FS.

-Hp and Lamp loads shall use the B3bii cycling rate or 1 second ON and 6 to 9 seconds OFF.

-Tungsten Lamp loads in addition shall be permitted to cool at least 55 seconds. Synthetic loads shall demonstrate adequate recovery time.

-Compliance - The approximate On and Off times allow tolerance of +/-10%, as determined using an un-calibrated watch.

B3biii. Cycling Frequency Representation:

A 50 Hz rating may be tested using a 60 Hz supply with the cycling testing and endurance testing current increased 120 percent of the 50Hz amp rating.

B3c.i Overload (Increased Voltage):

Switches are tested for 100 cycles using the electrical conditions indicated for Endurance but the voltage is increased as indicated in the Appendix FS. Overload testing is followed by Endurance.

Compliance - The specimens shall control the load (on and off) during cycling and operating as intended after cycling.

B3c.ii Overcurrent/Overload (hp horse power or Specific Motor Testing only):

Switches rated for horse Power (hp) or Specific Motor only are tested for 50 cycles using the voltage and frequency from the Endurance test. The current and Power Factor (PF) are increased as indicated in the Appendix FS. Overcurrent testing is followed by Endurance.

Compliance - The specimens shall control the load (on and off) during cycling and operating as intended after cycling.

B3d. Endurance:

Switches are tested for the number of cycles and electrical conditions indicated in the Appendix FS.

The specimen shall not be operated more than 5 times between endurance and Temperature Rise testing.

Cycling is completed for the total number of cycles indicated without the need to change to speed of actuation, voltage or temperature. The Open Circuit Voltage should not be greater than 10% of the closed circuit voltage. The closed circuit voltage shall not be less than the rated voltage, and not greater than +5% of the rating with a current reading not lower than the rating, and a power factor not higher than required by the rating.

The manufacturer shall record on each tag the data pertaining to the performance of the sample. All such samples shall be held by the manufacturer for review by the Field Representative including Temperature Rise and Dielectric Strength Testing.

Compliance - The specimens shall control the load (on and off) during cycling and operating as intended after cycling.

III. TEST PROGRAM - MANUFACTURER'S and FIELD REPRESENTATIVE'S
RESPONSIBILITIES (continued)

B3e. Temperature Rise:

Switches are tested using the same contacts for Overload/Overcurrent and Endurance. The current shall be as specified in Appendix FS, regardless of the switch electrical marking. Testing shall be completed in a draft free environment, 25+/-10C, at maximum test current for 60 minutes unless 3 readings taken 5 minutes apart show no change greater than +/- 2C. Testing shall use fine wire thermocouples 0.08 to 0.3 mm² type J, K or T.

-Electronic switches may require the rated voltage and Hz.

-Mechanical switches shall use any convenient power source to obtain the maximum test current.

Compliance - The specimens shall demonstrate a temperature rise of 30C or 55K or less, as described in the Appendix FS.

B3f. Dielectric Strength testing:

Switches shall be subjected to the Dielectric Strength test, at the test potential described in Appendix FS, immediately after the temperature rise test. The test voltage shall be applied and held for 60 seconds between:

- Live parts and enclosure (including actuator), wrapped in tight fitting metal foil if non-metallic.
- Live parts of opposite polarity and between circuits.
- Across the disconnect.

The test equipment is to include a visible indication of application of the test potential and an audible and/or visible indication of breakdown. A 500-volt-ampere or larger-capacity transformer need not be used in tests by the manufacturer if the transformer is provided with a suitable voltmeter to directly measure the applied output potential.

Compliance - The specimens shall indicate no breakdown during the 60 seconds at the test voltage indicated in the Appendix FS.

B3g. TV Rated Switches ONLY - Continued Endurance:

TV rated switches are subjected to an additional 15,000 cycles of endurance testing on the same contacts used for overload and endurance, at the same electrical ratings used for Endurance testing. AT the completion of these cycles the switch shall control the load and operated as intended.

Compliance - The specimens shall control the load (on and off) during cycling and operating as intended after cycling.

B3h. TV Rated Switches ONLY - Repeat Dielectric Strength:

TV rated switches at the end of the Continued Endurance test are subjected to the Dielectric Strength test as described above.

Compliance - The specimens shall indicate no breakdown during the 60 seconds at the test voltage indicated in the Appendix FS.

B3i. Visual Examination:

All specimens are examined at the end of the test sequence.

Compliance - The specimens shall operate as intended, without damage or parts loosened or broken, no warping from heat or leakage or sealing. In addition the ground indicator fuse shall not be open.

III. TEST PROGRAM - MANUFACTURER'S and FIELD REPRESENTATIVE'S
RESPONSIBILITIES (continued)

C ANNUAL TESTING

C1. SWITCHES WITH HORSEPOWER RATINGS - Once each year, the Field Representative shall select an additional set of three specimens from each family, which shall be tested for the horsepower rating. If a manufacturer does not have the necessary equipment for conducting the horsepower rating including Overcurrent and Endurance, the Field Representative shall select nine (9) representative specimens of each family for each voltage rating to be tested and forward them to the indicated UL test laboratory. If any of the first three specimens does not pass the horsepower test, production shall be further examined. This is done as follows:

C1a. A second sample of three of the same catalog number shall be subjected to test. If all three switches pass, production of Recognized switches may continue. If any switch does not pass the test, the catalog number is not to be shipped with UL's Recognized Component Mark, and the procedure outlined below (part b.) shall be followed.

C1b. The Field Representative shall select a validation sample of three switches from another catalog number in the family. If any of the validation samples does not pass the horsepower test, Recognized Component switches of the entire family shall be held pending investigation corrective action. Subsequent production of Recognized Component switches of the family shall be placed on tightened inspection. That is, the family in question is to be sampled as indicated above for two consecutive sampling periods.

If all three switches of the second catalog number selected pass, then only the initial catalog number shall not be shipped with UL's Recognized Component Mark. Production of Recognized Component switches of that catalog number may resume only after corrective action has been taken and three additional switches from that catalog number show compliance.

C1c. If production of Recognized Component switches for the entire family is being held, production may resume only after it has been reviewed by the manufacturer and the noncompliance to be corrected. When production resumes, the Field Representative shall select nine switches for review. Of the nine switches tested, three must be from the initial catalog number tested and three must be from the second catalog number tested. If any samples do not pass the test, use of UL's Recognized Component Mark shall again be held. The procedure described above shall apply in the event of a subsequent re-submittal of production.

C2. SEALING COMPOUND - Once a year, if specified in the Follow-Up Service Procedure, the Field Representative shall secure samples of the sealing compounds used and forward them to the applicable UL test laboratory for testing. Such samples should be taken while hot directly from the machines used in applying the material to switches.

FLOW CHART

