

EMI TESTING REPORT

EUT : KEYBOARD SWITCH

MODEL: KFK-E**YY

FCCID: CMYKFK7935

PREPARED FOR:

MITSUMI ELECTRIC CO., LTD.

8-8-2 KOKURYO-CHU, CHOFU-SHI,

TOKYO 182, JAPAN

PREPARED BY:

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1. TEST REPORT CERTIFICATION

APPLICANT : MITSUMI ELECTRIC CO., LTD.

ADDRESS : 8-8-2 KOKURYO-CHO, CHOFU-SHI,
TOKYO 182, JAPAN

EUT DESCRIPTION : KEYBOARD SWITCH

(A) POWER SUPPLY : FROM PC

(B) MODEL : KFK-E**YY

(C) FCC ID : CMYKFK7935

FINAL TEST DATE : 09/14/1998

MEASUREMENT PROCEDURE USED :

PART 15 SUB PART B OF FCC RULES AND

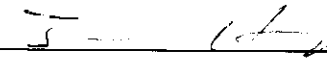
REGULATIONS (47 CFR PART 15)

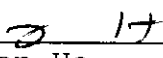
FCC / ANSI C63.4 - 1992

WE HEREBY SHOW THAT:

THE MEASUREMENTS SHOWN IN THE ATTACHMENT WERE
MADE IN ACCORDANCE WITH THE PROCEDURES INDICATED,
AND THE ENERGY EMITTED BY THE EQUIPMENT WAS
FOUND TO BE WITHIN THE LIMITS APPLICABLE.

TESTING ENGINEER :  DATE 
Tom Chuang

SUPERVISOR :  DATE 9/14/98
Jesse Ho

APPROVED BY :  DATE 9/14/98
Johnson Ho

2. TEST STATEMENT

2.1 TEST STATEMENT

TO whom it may concern,
THIS LETTER IS TO EXPLAIN.

CPU : PENTIUM - 166MHz Clock Chip : 66MHz

The data shown in this report reflects the worst-case data for the condition as listed above.

2. TEST STATEMENT

2.2 DEPARTURE FROM DOCUMENT POLICIES, PROCEDURE OR SPECIFICATIONS

DID HAVE
ANY DEPARTURE FROM DOCUMENT POLICIES
& PROCEDURES OR FROM SPECIFICATIONS.

YES _____ , NO N/A .

IF YES, THE DESCRIPTION AS BELOW.

2.3 TEST STATEMENT

1. THE CERTIFICATE OR REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.
2. THE REPORT MUST NOT BE USED BY THE CLIENT TO CLAIM PRODUCT ENDORSEMENT BY NVLAP OR ANY AGENCY OF THE U.S. GOVERNMENT.

3. EUT MODIFICATIONS

THE FOLLOWING ACCESSORIES WERE ADDED TO THE EUT
DURING TESTING:

NO MODIFICATION BY SRT LAB.

4. MODIFICATION LETTER

THIS SECTION CONTAINS THE FOLLOWING DOCUMENTS:

A. LETTER OF MODIFICATIONS

N/A

5. CONDUCTED POWER LINE TEST

5.1 TEST EQUIPMENT

THE FOLLOWING TEST EQUIPMENT WAS USED DURING THE CONDUCTED POWER LINE TEST :

EQUIPMENT/ FACILITIES	SPECIFICAT - IONS	MANUFACTURER	MODEL#/ SERIAL#	DATE OF CAL. & CAL.CENTER	DUE DATE
SPECTRUM ANALZER	9 KHz TO 1 GHz	HP	8590L/ 3624A01317	OCT, 1997 ETC	1Y
EMI TEST RECEIVER	9 KHz TO 30 MHz	ROHDE & SCHWARZ	ESHS30/ 893517/013	OCT, 1997 ETC	1Y
LISN	50 uH, 50 ohm	SOLAR ELECTRONICS	9252-50- R24-BNC/ 951315	AUGUST, 1997 ETC	1Y
LISN	50 uH, 50 ohm	SOLAR ELECTRONICS	9252-50- R24-BNC/ 951318	AUGUST, 1997 ETC	1Y
SIGNAL GENERATOR	9 KHz TO 1080 MHz	ROHDE & SCHWARZ	SMY01/ 841104/019	APRIL, 1998 ITRI	1Y
POWER CONVERTER	0 TO 300 VAC 47 - 500 Hz	AFC	AFC-1KW/ 850510	APRIL, 1998 SRT	1Y

5.2 CONFIGURATION OF THE EUT

THE EUT WAS CONFIGURED ACCORDING TO ANSI C63.4 - 1992. ALL INTERFACE PORTS WERE CONNECTED TO THE APPROPRIATE PERIPHERALS. ALL PERIPHERALS AND CABLES ARE LISTED BELOW.

-EUT

DEVICE	MANUFACTURER	MODEL #	FCCID
KEYBOARD SWITCH	MITSUMI ELECTRIC CO., LTD.	KFK-E**YY	CMYKFK7935

-REMARK

-INTERNAL DEVICES

DEVICE MANUFACTURER MODEL # FCCID/DoC

-PERIPHERALS

DEVICE	MANUFAC-TURER	MODEL# / SERIAL#	FCCID	CABLE
MONITOR	PHILIPS	14B1320W	A3KM064	POWER-UNS DATA-S
PRINTER	HP	2225C	BS46XU2225C	POWER-UNS DATA-S
MODEM	SMARTEAM	103/212A	EF56A5103/212A	POWER-UNS DATA-S
MOUSE	HP	M-S34	DZL211029	DATA-UNS
PC	COMPAQ	3431	EUN3431	POWER-UNS

-REMARK

- (1). CABLE - UNS : UNSHIELDED CABLE
S : SHIELDED CABLE
- (2). CABLES - ALL 1m OR GREATER IN LENGTH-
BUNDLED ACCORDING TO ANSI C63.4 - 1992.

5.3 EUT OPERATING CONDITION

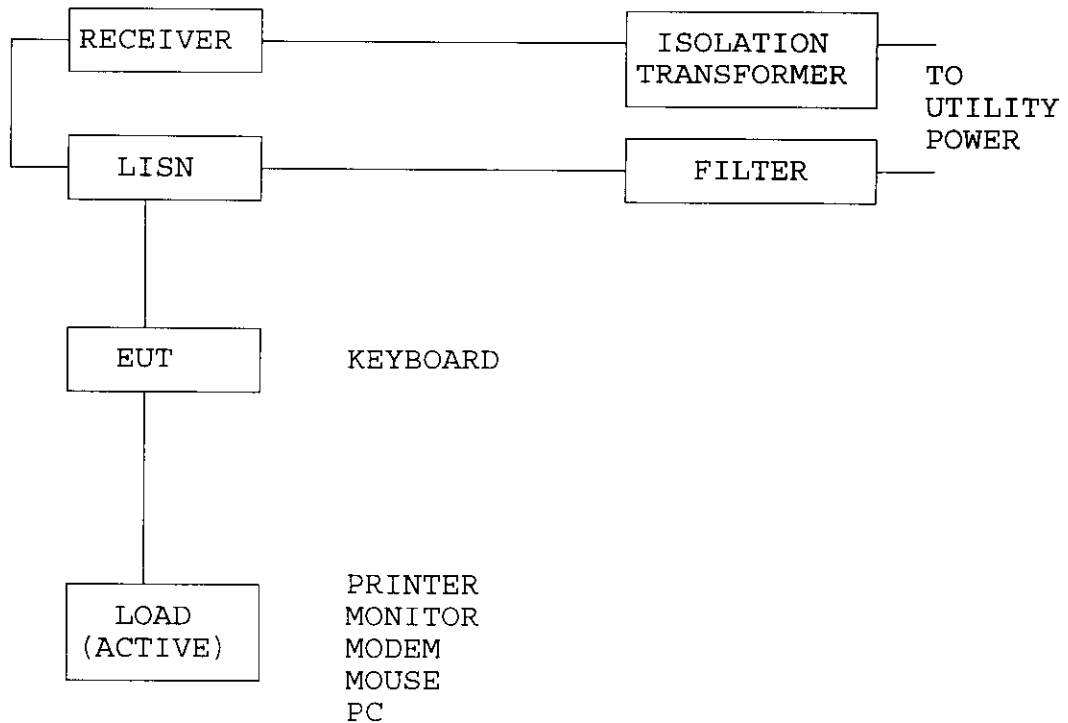
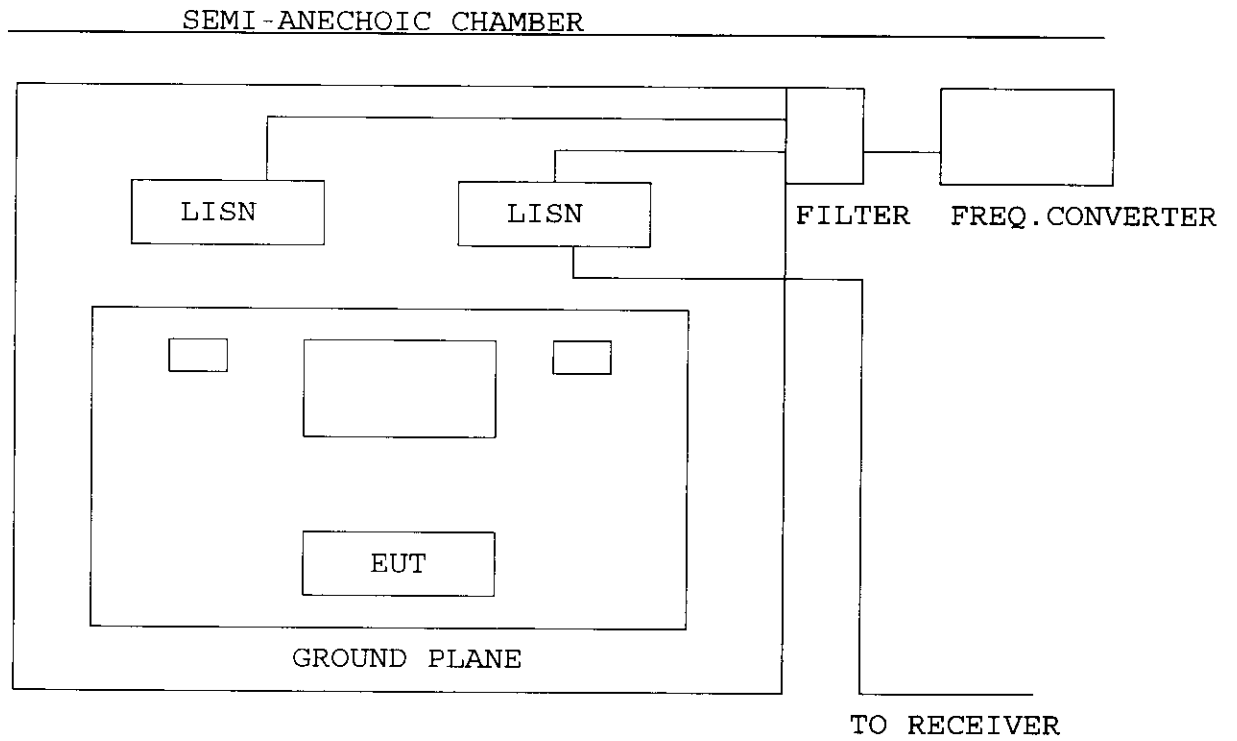
OPERATING CONDITION IS ACCORDING TO ANSI C63.4 - 1992.

1. EUT POWER ON.
2. "H" PATTERN SENT TO THE FOLLOWING PERIPHERALS:
 - PRINTER
 - MONITOR
 - MODEM
3. CPU : PENTIUM - 166MHz
CLOCK CHIP : 66MHz

5.4 TEST PROCEDURE

THE EUT WAS TESTED ACCORDING TO ANSI C63.4 - 1992. THE CONDUCTED TEST WAS PERFORMED ACCORDING TO ANSI C63.4 7.2 TEST PROCEDURES. THE FREQUENCY SPECTRUM FROM 0.45 MHz TO 30 MHz WAS INVESTIGATED. THE LISN USED WAS 50 ohm / 50 uHenry AS SPECIFIED BY SECTION 5.1 OF ANSI C63.4 - 1992. CABLES AND PERIPHERALS WERE MOVED TO FIND THE MAXIMUM EMISSION LEVELS FOR EACH FREQUENCY.

5.5 TEST SETUP



5.6 CONDUCTED POWER LINE EMISSION LIMIT

FREQUENCY RANGE (MHz)	CLASS A	CLASS B
0.045 - 1.705	1000 uV	250 uV
1.705 - 30	3000 uV	250 uV

NOTE : IN THE ABOVE TABLE, THE TIGHTER LIMIT APPLIES AT THE BAND EDGES.

5.7 CONDUCTED POWER LINE TEST RESULT

THE FREQUENCY SPECTRUM FROM 0.45 MHz TO 30 MHz WAS INVESTIGATED. ALL READINGS ARE QUASI-PEAK VALUES WITH A RESOLUTION BANDWIDTH OF 9 KHZ.

TEMPERATURE : 28 C

HUMIDITY : 78 %RH

FREQUENCY(MHz)	LINE 1 (uv)	LINE 2 (uv)	LIMIT (uv)
0.96	43.65	64.57	250
3.64	87.10	138.0	250
3.98	131.8	156.7	250
6.57	*	142.9	250
11.4	51.29	*	250

- REMARKS : (1) .* = MEMENT DOES NOT APPLY FOR THIS FREQUENCY
 (2) .UNCERTAINTY IN CONDUCTED EMISSION MEASURED IS <+/-2dB
 (3) .CPU: PENTIUM - 166MHz CLOCK CHIP : 66MHz
 (4) .TEST CONFIGURATION PLEASE SEE 4.2
 (5) .TEST EQUIPMENT PLEASE SEE 4.1
 (6) .ANY DEPARTURE FROM SPECIFICATION : N/A

SIGNED BY TESTING ENGINEER :  _____

6. RADIATED EMISSION TEST

6.1 TEST EQUIPMENT

THE FOLLOWING TEST EQUIPMENT WAS USED DURING THE RADIATED EMISSION TEST :

EQUIPMENT / FACILITIES	SPECIFICAT - IONS	MANUFACTUR - ER	MODEL#/ SERIAL#	DATE OF CAL. & CAL. CENTER	DUE DATE
RECEIVER	20 MHz TO 1000 MHz	R & S	ESVS 30/ 841977/003	APRIL, 1998 ITRI	1Y
SPECTRUM ANALYZER	100 Hz TO 1500 MHz	HP	8568B/ 3019A05294	OCT , 1997 ETC	1Y
SPECTRUM ANALYZER	9 KHz TO 22 GHz	HP	8593E/ 3322A00670	APRIL, 1998 ITRI	1Y
SPECTRUM ANALYZER	100 Hz TO 1000 MHz	IFR	A-7550/ 2684/1248	JULY, 1998 ETC	1Y
SIGNAL GENERATOR	9 KHz TO 1080 MHz	ROHDE & SCHWARZ	SMY01/ 841104/019	APRIL, 1998 ITRI	1Y
DIPOLE ANTENNA	28 MHz TO 1000 MHz	EMCO	3121C/ 9003-535	DEC, 1997 SRT	1Y
DIPOLE ANTENNA	28 MHz TO 1000 MHz	EMCO	3121C/ 9611-1239	DEC, 1997 SRT	1Y
BI-LOG ANTENNA	26 MHz TO 2000 MHz	EMCO	3142/ 96081-1073	DEC, 1997 SRT	1Y
BI-LOG ANTENNA	26 MHz TO 1100 MHz	EMCO	3143/ 9509-1152	DEC, 1997 SRT	1Y
PRE-AMPLIFIER	0.1 MHz TO 1300 MHz	HP	8447D/ 2944A08402	APRIL, 1998 ITRI	1Y
PRE-AMPLIFIER	0.1 MHz TO 1300 MHz	HP	8447D/ 2944A06412	OCT, 1997 ETC	1Y
HORN ANTENNA	1 GHz TO 18 GHz	EMCO	3115/ 9012-3619	DEC, 1997 SRT	1Y

6.2 CONFIGURATION OF THE EUT

SAME AS SECTION 5.4 OF THIS REPORT.

6.3 EUT OPERATING CONDITION

SAME AS SECTION 5.3 OF THIS REPORT.

6.4 TEST PROCEDURE

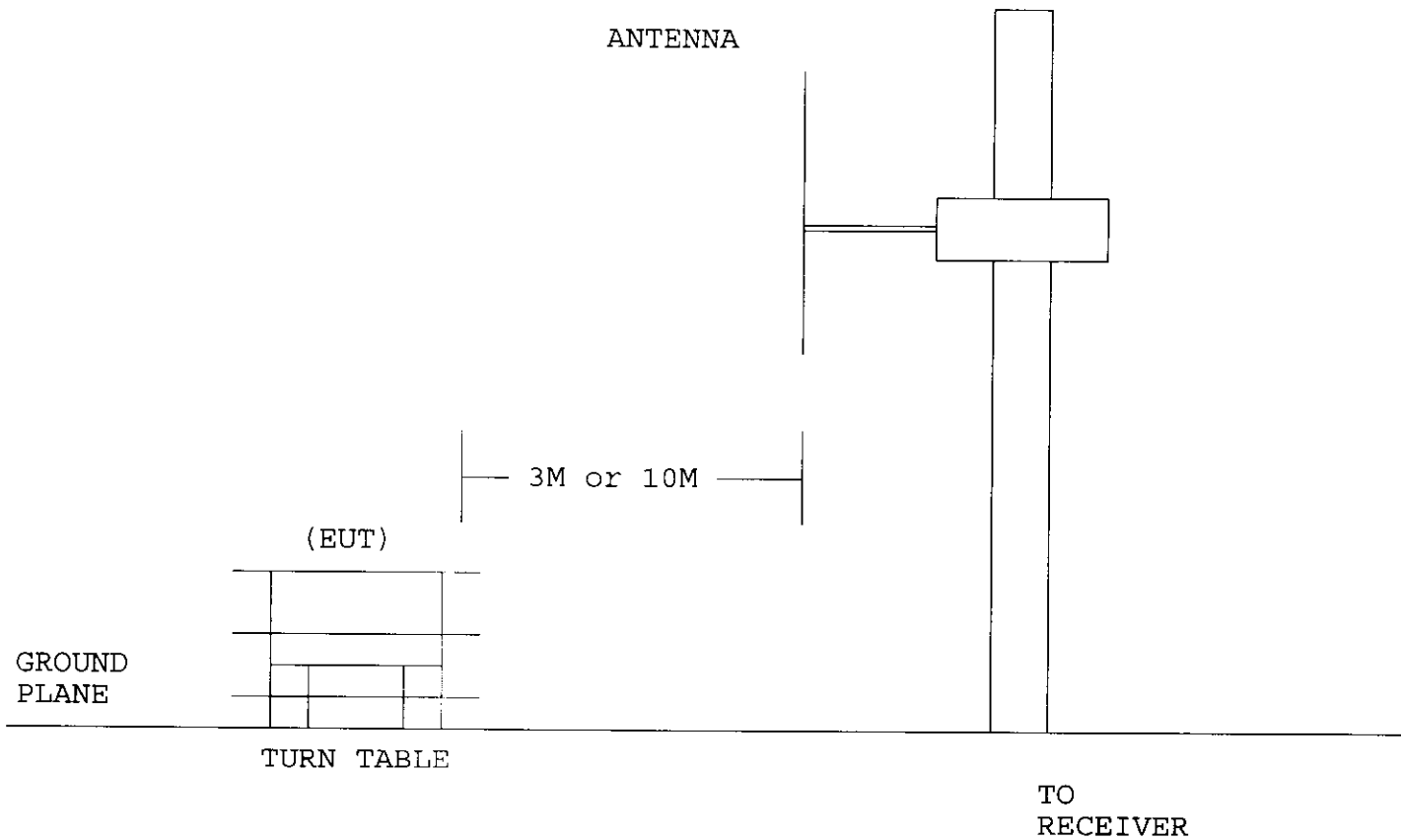
THE EUT WAS TESTED ACCORDING TO ANSI C63.4 - 1992. THE RADIATED TEST WAS PERFORMED AT SRT LAB'S OPEN SITE. THIS SITE IS ON FILE WITH THE FCC LABORATORY DIVISION, REFERENCE 31040/SIT.

THE FREQUENCY SPECTRUM FROM 30 MHz TO 1 GHz WAS INVESTIGATED. MEASUREMENTS WERE MADE AT THREE METERS WITH ANTENNA. PERIPHERALS, CABLES, EUT ORIENTATION, AND ANTENNA HEIGHT WERE VARIED TO FIND THE MAXIMUM EMISSION FOR EACH FREQUENCY.

THE FREQUENCY SPECTRUM FROM 30 MHz TO 2 GHz WAS INVESTIGATED. THE MEASUREMENTS UNDER 1 GHz WITH RESOLUTION BANDWIDTH OF 120 KHz ARE QUASI-PEAK READING MADE AT THREE METERS PERIPHERALS, CABLES, EUT ORIENTATION, AND ANTENNA HEIGHT WERE VARIED TO FIND THE MAXIMUM EMISSION FOR EACH FREQUENCY.

THE MEASUREMENTS ABOVE 1 GHz WITH A RESOLUTION BANDWIDTH OF 1 MHz ARE PEAK READING AT A DISTANCE OF THREE METERS WITH A HORN ANTENNA.

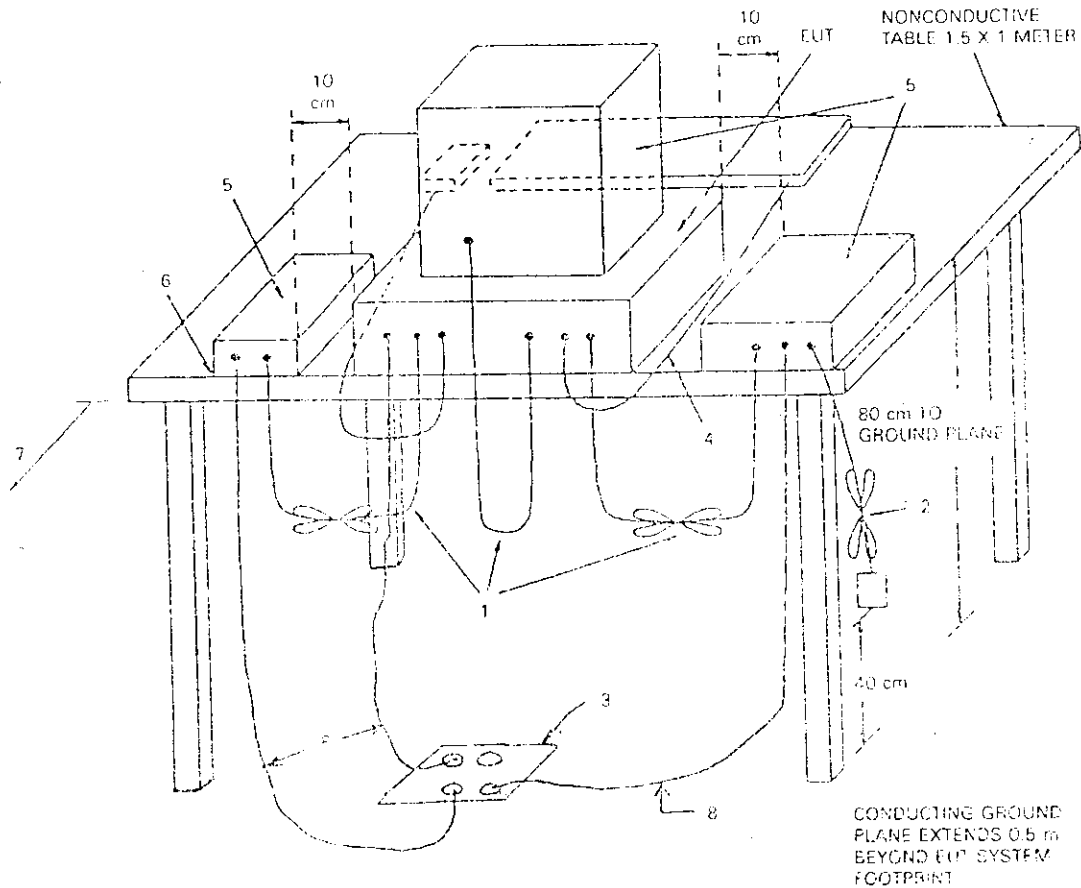
6.5 RADIATED TEST SETUP



6.5 RADIATED TEST SETUP

ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9 KHz TO 40 GHz

ANSI
C63.4-1992



LEGEND:

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 3 m.
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mice, etc., have to be placed as close as possible to the controller.
5. Non-EUT components of EUT system being tested.
6. The rear of all components of the system, under test shall be located flush with the rear of the table.
7. No vertical conducting wall used.
8. Power cords drape to the floor and are routed over to receptacle.

6.6 RADIATED EMISSION LIMIT

ALL EMISSION FROM A DIGITAL DEVICE, INCLUDING ANY NETWORK OF CONDUCTORS AND APPARATUS CONNECTED THERETO, SHALL NOT EXCEED THE LEVEL OF FIELD STRENGTH SPECIFIED BELOW :

CLASS B

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (uV/m)
30 - 88	3	100
88 - 216	3	150
216 - 960	3	200
ABOVE 960	3	500

CLASS B (OPEN CASE)

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (uV/m)
30 - 88	3	199.5
88 - 216	3	298.5
216 - 960	3	398.1

CLASS A

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (uV/m)
30 - 88	3	316.3
88 - 216	3	473.2
216 - 960	3	613.0
ABOVE 960	3	1000.0

- NOTE :
1. IN THE EMISSION TABLES ABOVE, THE TIGHTER LIMIT APPLIES AT THE BAND EDGES.
 2. DISTANCE REFERS TO THE DISTANCE BETWEEN MEASURING INSTRUMENT, ANTENNA, AND THE CLOSEST POINT OF ANY PART OF THE DEVICE OR SYSTEM.

6.7 RADIATED EMISSION TEST RESULT

THE FREQUENCY SPECTRUM FROM 30 MHz TO 1 GHz WAS INVESTIGATED. ALL READINGS UNDER 1 GHz ARE QUASI-PEAK VALUES WITH A RESOLUTION BANDWIDTH OF 120 KHZ. MEASUREMENTS WERE MADE AT 3 METERS.

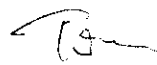
THE MEASUREMENTS ABOVE 1 GHz WITH A RESOLUTION BANDWIDTH OF 1 MHz ARE PEAK READING AT A DISTANCE OF 3 METERS.

TEMPERATURE : 28 C

HUMIDITY : 78 %RH

FREQ. (MHz)	CABLE LOSS (dB)	ANT. FACTOR (dB)	READING (dBuV)		EMISSION (uV)		LMTS (uV)
			HORIZ	VERT	HORIZ	VERT	
237.6	1.80	10.7	12.96	*	18.75	*	200
465.5	2.60	17.0	*	12.42	*	39.90	200
600.4	3.00	19.0	13.49	*	59.50	*	200
634.3	3.00	19.4	*	10.04	*	41.88	200
811.8	3.50	20.6	10.63	*	54.51	*	200

- REMARKS :
- (1). MEASUREMENT DOES NOT APPLY FOR THIS FREQUENCY.
 - (2). THE MAXIMUM CONDITION WAS WITH THE MONITOR POWER CORD CONNECTED TO THE PERSONAL COMPUTER.
 - (3). CPU : PENTIUM - 166MHz CLOCK CHIP : 66MHz
 - (4). SAMPLE CALCULATION
 $20 \text{ LOG}(\text{EMISSION}) \text{ uV/m} = \text{CABLE LOSS (dB)} + \text{FACTOR (dB)} + \text{READING (dBuV/m)}$
 - (5). TEST EQUIPMENT PLEASE SEE 5.1
 - (6). UNCERTAINTY IN RADIATED EMISSION MEASURED IS $\pm 4\text{dB}$
 - (7). ANY DEPARTURE FROM SPECIFICATION : N/A



SIGNED BY TESTING ENGINEER : _____



キーボード製品規格書
 SPECIFICATION OF
 KEYBOARD SWITCH
 KFK type

Approved 	Checked 	Drawn
--------------	-------------	-----------

AUG.06.1997 enact

1. Scope : This specification covers MITSUMI keyboard switch KFK series.

2. Electrical Specifications :

2-1. Maximum Rating : D.C. 12V (with pulse width of 200 μ sec., duty ratio 1/50), 1mA.

2-2. Contact Bounce : 5msec. Max ... Initial
 10msec. Max ... Over life
 (at normal pushing)

2-3. Contact Resistance : 1.5KΩ Max (resistance value of membrane circuit board is included.)

2-4. Insulation Resistance : 50MΩ Max (at D.C. 200V)

2-5. Withstand voltage : A.C.250V , 1 minute.

2-6. Circuit : Make Contact , 1 circuit.

3. Mechanical Specifications :

3-1. Force :

(1) Operating Force : 30g typical

(2) Maximum Force : 50 ± 20g

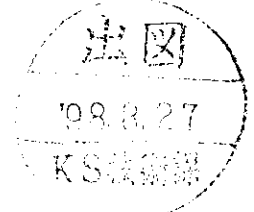
(3) Click Rate : 45 ± 20%

(Decline of Clicking Force after 10 millions operation : within 30%)

3-2. Operating point : 2.2~3.5mm stroke

3-3. Full Travel : 4.2 ± 0.5mm (at 200g)

3-4. Key Touch Feeling : Keytop must be operated without squeaking , catching , locking with normal pushing.



R E V		CODE	DRAWING NO.
		S 5 6	0214

4. Endurance Specifications :

4-1. Operating Life : After 10 millions pushing , the switch must be satisfied with electrical and mechanical specifications shown on item 2&3.

4-2. Operating Temperature Range : $-5^{\circ}\text{C} \sim +50^{\circ}\text{C}$

4-3. Storage Temperature Range : $-20^{\circ}\text{C} \sim +65^{\circ}\text{C}$ (1000H)

4-4. Shock Proof : 20G in 3 Axis

5. Test Condition :

5-1. Measuring Conditions :

Measuring conditions :

Measuring conditions must be at temperature $23 \pm 1^{\circ}\text{C}$ humidity $50 \pm 2\% \text{RH}$.

However the measurement may be conducted under condition of normal temperature ($15 \sim 35^{\circ}\text{C}$) and normal humidity ($45 \sim 75\% \text{RH}$) unless such conditions affect test results.

5-2. Contact Bounce :

Test shall be made by normal pushing at a speed of 3~5 times per second with D.C 3V, $50 \mu \text{A}$ resistance load. Contact bounce range will be measured at 80% level as shown below.

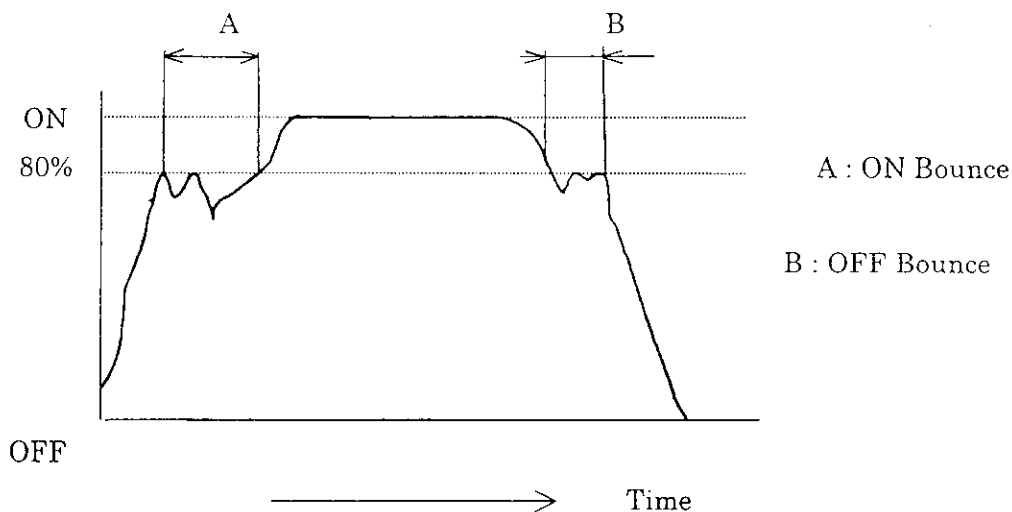


Fig.1.

5-3. Contact Resistance :

Contact resistance included resistance value of membrane circuit board shall be measured at D.C.24V , 0.1mA (voltage drop method) , applying static load of the keytop.

5-4. Insulation Resistance :

Measure , applying D.C.250V between the terminals.

5-5. Withstand Voltage :

After A.C.250V is applied between the terminals for 1 minute , any change and damage will not be appeared.

5-6. Force :

(1) Operating force :

Measure the operating force when switch makes contact by pushing the center of the keytop.

(2) Maximum Force :

Measure the maximum Force among the full travel except the full travel force.

(3) Minimum Force :

Measure the minimum Force among the travel after the maximum force.

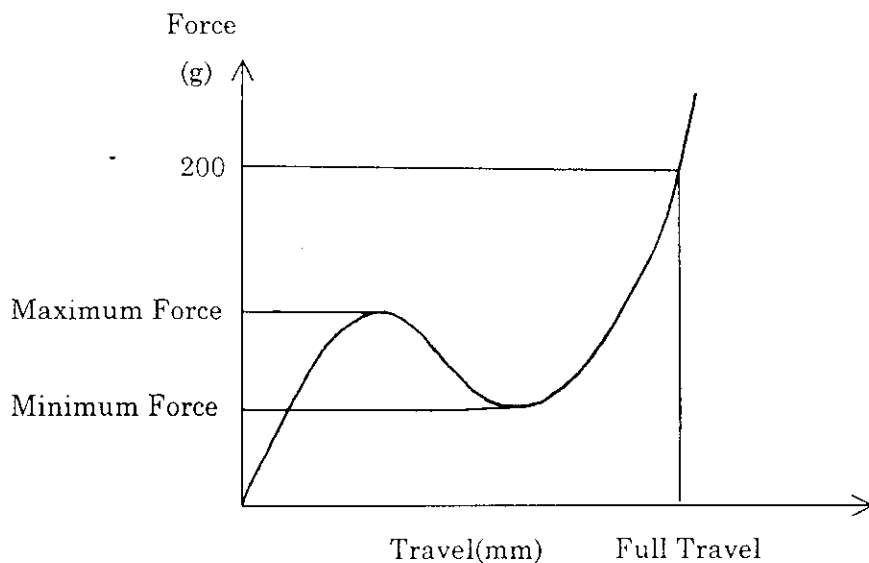


Fig.2.

0214



5-7. Operating Point :

Measure the distance when switch makes contact by pushing the center of the keytop.

5-8. Full Travel :

Measure the distance when static load of 200g is to be applied onto the center of the keytop.

5-9. Key touch feeling :

Keytop must be operated , without squeaking , catching , locking with normal pushing of full travel at a speed of 3~5 times per second.

5-10. Operating Life :

As illustrated in Fig.3 , operating life test shall be made at a speed of 3~7 meter per second pushing the center of the keytop with a plunger of cam life tester.

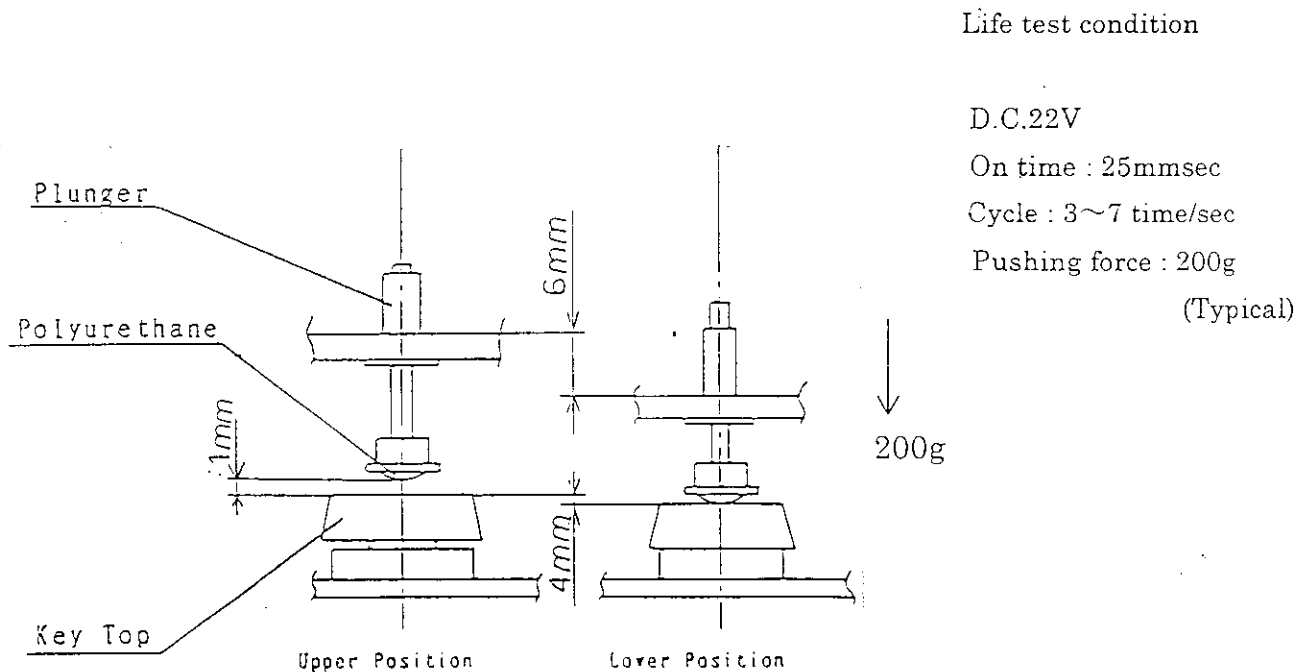


Fig.3.

6. Test Form :

6-1. Humidity Test :

After unit is kept for 96 hours in a chamber of temperature $+40 \pm 2^\circ\text{C}$, and relative humidity 90~95% and then is left in ambient condition for 1 hour , electrical & mechanical specifications item 2&3 shall be satisfied.

6-2. Low Temperature Test :

After unit is kept for 96 hours in a chamber of temperature $-20 \pm 2^\circ\text{C}$, then is left in ambient condition for 1 hour , electrical & mechanical specifications item 2&3 shall be satisfied.

6-3. High Temperature Test :

After unit is kept for 96 hours in a chamber of temperature $+70 \pm 2^\circ\text{C}$, then is left in ambient condition for 1 hour , electrical & mechanical specifications item 2&3 shall be satisfied.

6-4. Thermal Shock Test :

After unit is kept for 5 cycles (one cycle consists of $-20 \pm 2^\circ\text{C}$, 1 hour and $+60 \pm 2^\circ\text{C}$, 1 hour) and then is left in ambient condition for 1 hour , electrical & mechanical specifications item 2&3 shall be satisfied.

6-5. Vibration Proof Test :

Unit shall satisfy electrical & mechanical specifications item 2&3 after the following vibration is applied.

Fréquency : 10~55 Hz (cycle : 1 minute)

Full amplitude : 1.5mm

Duration : 2 hours each in 3 directions

6-6. Shock Proof Test :

After 20 G (half-sine wave) is applied to unit 3 times each in 3 directions , electrical & mechanical specifications item 2&3 shall be satisfied.

cf) The test (6-1~6-6) must be done under the open-circuit condition.

7. Appearance of keytop :

7-1. Disposition of keytop :

Disposition of the keytop shall be within the limit of 0.5mm as illustrated in Fig.4 in both vertical and horizontal lines.

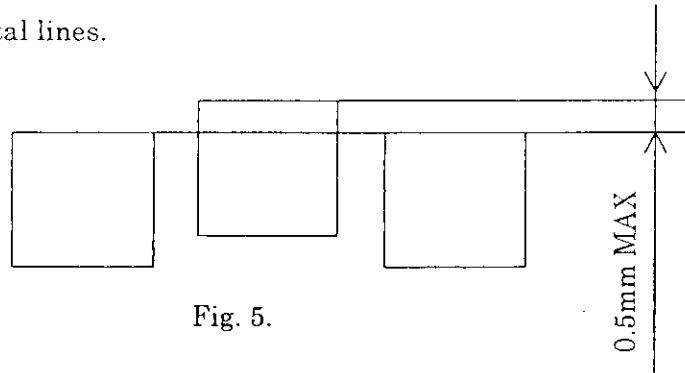


Fig. 5.

7-2. Tilt of keytop :

Tilt of keytop shall be within the limit of 0.5mm as illustrated in Fig.5.

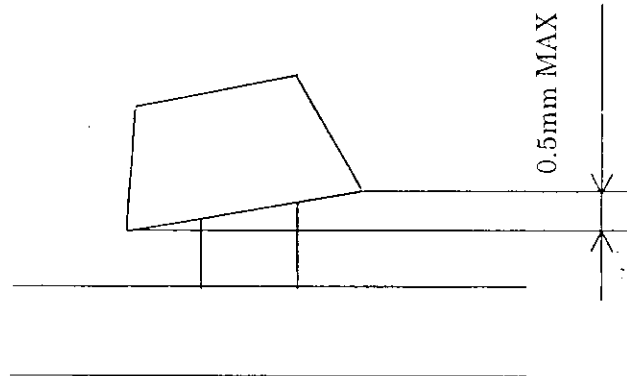


Fig. 6.

7-3. Angular deviation of keytop

Angular deviation of keytop shall be within the limit of 0.5mm as illustrated in Fig 6.

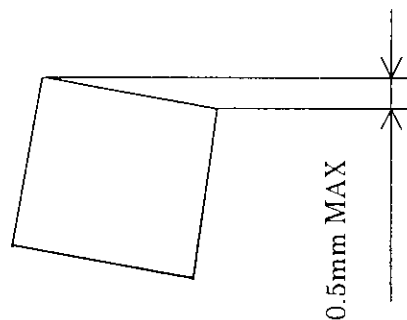


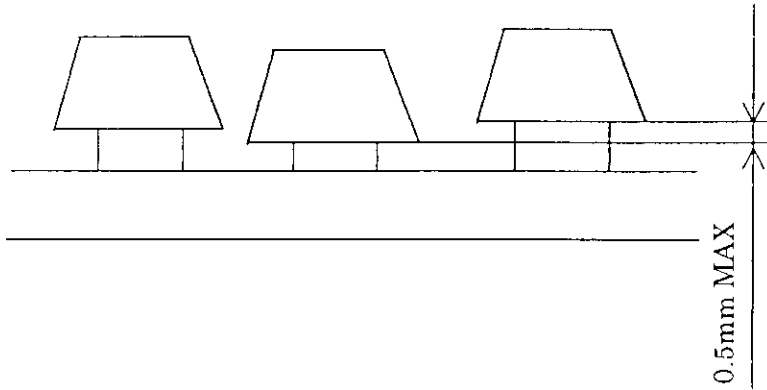
Fig. 7.



7-4. Uneven level of keytop :

Uneven level of keytop shall be within the limit of 0.5mm as illustrated in Fig.7.

However , exclude the bend of the frame.



MITSUMI

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Authorization and Evaluation Division
7435 Oakland Mills Road
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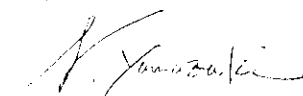
Dear Commission

This is serve as proper written authorization that Spectrum Research and Testing Laboratory Inc., No.101-10 Ling 8, Shan-Tong Li, Chungli City, Taoyuan, Taiwan R.O.C., will act as our representative in all matters relating to FCC applications for equipment approval. This includes the signing of all related documents, the transmitting of required fees, and receiving correspondence and notifications from the FCC. All acts performed by Spectrum Research and Testing Laboratory, Inc., especially modifications to our equipment under testing, will be carried out on our behalf.

Meantime, By checking yes for FCC Form 731, the applicant certifies that, in case of an individual applicant, he or she is not subject to a denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse act of 1988, 21 U.S.C. 862, or in the case of a non-individual applicant (e.g., corporation, partnership or other unincorporated association), no party to the application is subject to a denial of federal benefits, that includes FCC benefits, pursuant to that section. For a definition of a "party" for these purposes see 47 C.F.R. 1.2002(b).

If you have any questions regarding our applications for equipment approval, please contact Spectrum Research and Testing Laboratory, Inc., by calling +886-3-498-7684.

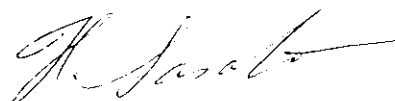
Written by :



Naoki Yamazaki

Issued : September 3, 1998

Approved:



General Manager, Fumitoshi Sasaki