



**CERTIFICATION TEST REPORT**  
**FOR THE**  
**CORDLESS KEY BOARD, Y-RB7**  
**FCC PART 15 SUBPART C**  
**COMPLIANCE**

**DATE OF ISSUE: JUNE 10, 1999**

**PREPARED FOR:**

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Fremont, CA 94555

P.O. No:  
W.O. No: 71742

**Report No: FC99-022**

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### ADMINISTRATIVE INFORMATION

|                                |                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>DATE OF TEST:</b>           | May 26, 1999                                                                                                             |
| <b>PURPOSE OF TEST:</b>        | To demonstrate the compliance of the Cordless Key Board, Y-RB7, with the requirements for FCC Part 15 Subpart C devices. |
| <b>MANUFACTURER:</b>           | Logitech Inc.<br>6505 Kaiser Drive<br>Fremont, CA 94555                                                                  |
| <b>REPRESENTATIVE:</b>         | Bharat Shah                                                                                                              |
| <b>TEST LOCATION:</b>          | CKC Laboratories, Inc.<br>1653 Los Viboras Road<br>Hollister, CA 95023                                                   |
| <b>TEST PERSONNEL:</b>         | Wes Norris                                                                                                               |
| <b>TEST METHOD:</b>            | ANSI C63.4 1992                                                                                                          |
| <b>FREQUENCY RANGE TESTED:</b> | 27 MHz - 1000 MHz                                                                                                        |
| <b>EQUIPMENT UNDER TEST:</b>   | <u>Cordless Key Board</u><br>Manuf: Logitech, Inc.<br>Model: Y-RB7<br>Serial: SLA-2<br>FCC ID: DZL211255 (pending)       |

## **SUMMARY OF RESULTS**

The Logitech Inc. Cordless Key Board, Y-RB7, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C. The results in this report apply only to the items tested, as identified herein.

### **EQUIPMENT UNDER TEST (EUT) DESCRIPTION**

Cordless keyboard.

### **MEASUREMENT UNCERTAINTY**

Associated with data in this report is a  $\pm 4$ dB measurement uncertainty.

### **EUT OPERATING FREQUENCY**

The EUT was operating at 27.145 MHz.

### **TEMPERATURE AND HUMIDITY DURING TESTING**

The temperature during testing was within  $+15^{\circ}\text{C}$  and  $+35^{\circ}\text{C}$ .  
The relative humidity was between 20% and 75%.

## PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

### Cordless Desktop Transceiver

Manuf: Logitech  
Model: C-RC3-KBD  
Serial: DVT 103  
FCC ID: DZLXXXXX

### Printer

Manuf: HP  
Model: DeskJet 340  
Serial:  
FCC ID:

### Modem

Manuf: Cardinal  
Model: 020-0470  
Serial:  
FCC ID:

### Monitor

Manuf: HP  
Model: D5258A  
Serial: DK73795774  
FCC ID: C5F7NFCMC1516X

### PC

Manuf: HP  
Model: 8180  
Serial: US73553464  
FCC ID:

### AC Adaptor

Manuf: HP  
Model: 0950-2435  
Serial:  
FCC ID:

### AC Adaptor

Manuf: AMIGO  
Model: AM-9300  
Serial:  
FCC ID:

## REPORT OF MEASUREMENTS

The following tables report the six highest worst case levels recorded during the tests performed on the Cordless Key Board, Y-RB7. All readings taken are peak readings unless otherwise noted by a "Q" or "A". The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Six Highest Fundamental Emission Levels

| FREQUENCY<br>MHz | METER<br>READING<br>dB $\mu$ V | CORRECTION FACTORS |           |             |            | CORRECTED<br>READING<br>DB $\mu$ V/m | SPEC<br>LIMIT<br>dB $\mu$ V/m | MARGIN<br>dB | NOTES |
|------------------|--------------------------------|--------------------|-----------|-------------|------------|--------------------------------------|-------------------------------|--------------|-------|
|                  |                                | maglp<br>dB        | Amp<br>dB | Cable<br>dB | Dist<br>dB |                                      |                               |              |       |
| 27.018           | 30.8                           | 7.5                |           |             |            | 38.3                                 | 80.0                          | -41.7        | V     |
| 27.180           | 58.3                           | 7.5                |           |             |            | 65.8                                 | 80.0                          | -14.2        | V     |
| 27.234           | 58.8                           | 7.5                |           |             |            | 66.3                                 | 80.0                          | -13.7        | V     |
| 27.320           | 36.9                           | 7.5                |           |             |            | 44.4                                 | 50.0                          | -5.6         | V     |
| 27.364           | 30.9                           | 7.5                |           |             |            | 38.4                                 | 50.0                          | -11.6        | V     |
| 27.434           | 28.0                           | 7.4                |           |             |            | 35.4                                 | 50.0                          | -14.6        | V     |

Test Method: ANSI C63.4 1992  
Spec Limit : FCC 15.209/FCC 15.227  
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization  
V = Vertical Polarization  
N = No Polarization  
D = Dipole Reading  
Q = Quasi Peak Reading  
A = Average Reading

COMMENTS: This test is to FCC C, Paragraph 15.227, and 15.209, IAW ANSI C63.4. The EUT is a cordless Keyboard and communicates with the PC by means of a transmitted RF signal. The fundamental frequency of this signal is 27.145MHz. The PC is fitted with a Cordless Desktop Receiver to detect and decode the signal. The PC is running a special 'Test Software' which causes the EUT to transmit a continuous stream of the letter I, in lower-case. A monitor is connected to the PC and displays status information. A modem, printer, and mouse are connected to the PC, but are not operating in this 'Keyboard Test' Mode.

**Table 2: Six Highest Spurious Emission Levels**

| FREQUENCY<br>MHz | METER<br>READING<br>dB $\mu$ V | CORRECTION FACTORS |           |            |            | CORRECTED<br>READING<br>DB $\mu$ V/m | SPEC<br>LIMIT<br>dB $\mu$ V/m | MARGIN<br>dB | NOTES |
|------------------|--------------------------------|--------------------|-----------|------------|------------|--------------------------------------|-------------------------------|--------------|-------|
|                  |                                | Ant<br>dB          | Amp<br>dB | Cab3<br>dB | Dist<br>dB |                                      |                               |              |       |
| 54.340           | 47.2                           | 9.5                | -26.6     | 1.1        |            | 31.2                                 | 40.0                          | -8.8         | V     |
| 54.325           | 46.9                           | 9.5                | -26.6     | 1.1        |            | 30.9                                 | 40.0                          | -9.1         | H     |
| 72.741           | 48.2                           | 6.9                | -26.6     | 1.4        |            | 29.9                                 | 40.0                          | -10.1        | V     |
| 81.512           | 47.5                           | 6.7                | -26.6     | 1.8        |            | 29.4                                 | 40.0                          | -10.6        | H     |
| 162.930          | 35.9                           | 15.7               | -26.3     | 1.8        |            | 27.1                                 | 43.5                          | -16.4        | H     |
| 135.780          | 33.0                           | 14.5               | -26.4     | 1.6        |            | 22.7                                 | 43.5                          | -20.8        | V     |

Test Method:  
Spec Limit :  
Test Distance:

ANSI C63.4 1992  
FCC 15.209/FCC 15.227  
3 Meters

NOTES: H = Horizontal Polarization  
V = Vertical Polarization  
N = No Polarization  
D = Dipole Reading  
Q = Quasi Peak Reading  
A = Average Reading

COMMENTS: This test is to FCC C, Paragraph 15.227, and 15.209, IAW ANSI C63.4. The EUT is a cordless Keyboard and communicates with the PC by means of a transmitted RF signal. The fundamental frequency of this signal is 27.145MHz. The PC is fitted with a Cordless Desktop Receiver to detect and decode the signal. The PC is running a special 'Test Software' which causes the EUT to transmit a continuous stream of the letter I, in lower-case. A monitor is connected to the PC and displays status information. A modem, printer, and mouse are connected to the PC, but are not operating in this 'Keyboard Test' Mode.

**TABLE A**  
**LIST OF TEST EQUIPMENT**

**Hollister Lab**

1. Spectrum Analyzer, Hewlett Packard, Model No. 8568B, S/N 2601A02378 (rf Unit).  
Calibration date: September 18, 1998. Calibration due date: September 18, 1999
2. Preamp, Hewlett Packard, Model No. 8447D, S/N 2944A06739. Calibration date: June 8, 1998. Calibration due date: June 8, 1999.
3. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01065. Calibration date: September 18, 1998. Calibration due date: September 18, 1999
4. Biconical Antenna, EMCO, Model No. 3104, S/N 2683. Calibration date: April 22, 1999. Calibration due date: April 22, 2000.
5. Log Periodic Antenna, A & H Systems, Model No. SAS 200/512, S/N 288. Calibration date: April 23, 1999. Calibration due date: April 23, 2000.
6. Magnetic Loop Antenna, EMCO, Model No. 6502, S/N 2078. Calibration date: June 1, 1998. Calibration due date: June 1, 1999
7. Hollister site B. Calibration date: June 12, 1998. Calibration due date: June 12, 1999.
8. Test software, EMI Test 2.91.



## EUT SETUP

The equipment under test (EUT) and the peripheral(s) listed were set up in a manner that represented their normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for fundamental radiated emissions, and Table 2 for spurious emissions. Additionally, a complete description of all the ports and I/O cables is included on the information sheets contained in Appendix A.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

I/O cables were connected to the EUT and peripherals in the manner required for normal operation of the system. Excess cabling was bundled in the center in a serpentine fashion using 30-40 centimeter lengths.

## TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect the radiated emissions data for the Cordless Key Board, Y-RB7. For radiated measurements below 30 MHz the magnetic loop antenna was used. For frequencies of 30 - 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB $\mu$ V, and a vertical scale of 10 dB per division.

**TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE**

| TEST               | BEGINNING FREQUENCY | ENDING FREQUENCY | BANDWIDTH SETTING |
|--------------------|---------------------|------------------|-------------------|
| RADIATED EMISSIONS | 150 kHz             | 30 MHz           | 9kHz              |
| RADIATED EMISSIONS | 30 MHz              | 1000 MHz         | 120 kHz           |

## SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 & 2 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Cordless Key Board, Y-RB7.

### Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

### Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

### Average

When the frequencies are below 30 MHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

## TEST METHODS

The radiated emissions data of the Cordless Key Board, Y-RB7, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15, Subpart C emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

### Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode with the I/O cables and line cords facing the antenna. The frequencies below 30 MHz were scanned using the magnetic loop antenna. The frequency range of 30 MHz - 88 MHz was then scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks which were at or near the limit were recorded. The frequency range of 100 - 300 MHz was scanned with the biconical antenna in the same manner, and the peaks recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned with its I/O and power cables facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation, antenna height and configuration of the peripherals and cables. Maximizing of the cables was achieved by monitoring the spectrum analyzer on a closed circuit television monitor while the EUT cables were being moved and rearranged on the EUT table for maximum emissions. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

## FCC Part 15.215(c) - Occupied Bandwidth Measurements

In accordance with Part 15.215(c), the fundamental frequency was kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

### SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the emissions readings in Tables 1 & 2. For radiated emissions in dB $\mu$ V/m, the spectrum analyzer reading in dB $\mu$ V was corrected by using the following formula:

$$\begin{aligned}
 &\text{Meter reading (dB}\mu\text{V)} \\
 &+ \text{Antenna Factor (dB)} \\
 &+ \text{Cable Loss (dB)} \\
 &- \text{Distance Correction (dB)} \\
 &- \text{Pre-amplifier Gain (dB)} \\
 &= \text{Corrected Reading (dB}\mu\text{V/m)}
 \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

| # | Freq<br>MHz | Rdng<br>dBuV | Cab3 | Amp. | Ant | Maglp | Dist | Corr<br>dBuV/m | Spec | Margin | Polar |
|---|-------------|--------------|------|------|-----|-------|------|----------------|------|--------|-------|
|---|-------------|--------------|------|------|-----|-------|------|----------------|------|--------|-------|

# means reading number

**Freq MHz** is the frequency in MHz of the obtained reading.

**Rdng dBuV** is the reading obtained on the spectrum analyzer in dB $\mu$ V.

**Amp.** is short for the preamplifier factor or gain in dB.

**Ant** is either the biconical or log periodic antenna factor in dB.

**maglp** is the magnetic loop antenna factor in dB.

**Cab3** is the cable loss in dB of the coaxial cable on the OATS.

**Dist** is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.

**Corr dB $\mu$ V/m** is the corrected reading which is now in dB $\mu$ V/m (field strength).

**Spec** is the specification limit (dB) stated in the agency's regulations.

**Margin** is the closeness to the specified limit in dB; + is over and - is under the limit.

**Polar** is the Polarity of the antenna with respect to earth.

**APPENDIX A**  
**INFORMATION ABOUT THE EQUIPMENT UNDER TEST**

### INFORMATION ABOUT THE EQUIPMENT UNDER TEST

|                                   |                                        |
|-----------------------------------|----------------------------------------|
| Test Software/Firmware:           | Key board is constantly emitting " I " |
| CRT was displaying:               | A series of " I " are on CRT           |
| Power Supply Manufacturer:        | N/A                                    |
| Power Supply Part Number:         | N/A                                    |
| AC Line Filter Manufacturer:      | N/A                                    |
| AC Line Filter Part Number:       | N/A                                    |
| Line voltage used during testing: | 2 AA Batteries                         |

### I/O PORTS

| Type | # |
|------|---|
|      | 1 |

### CRYSTAL OSCILLATORS

| Type    | Freq In MHz |
|---------|-------------|
| Crystal | 13.5725 MHz |

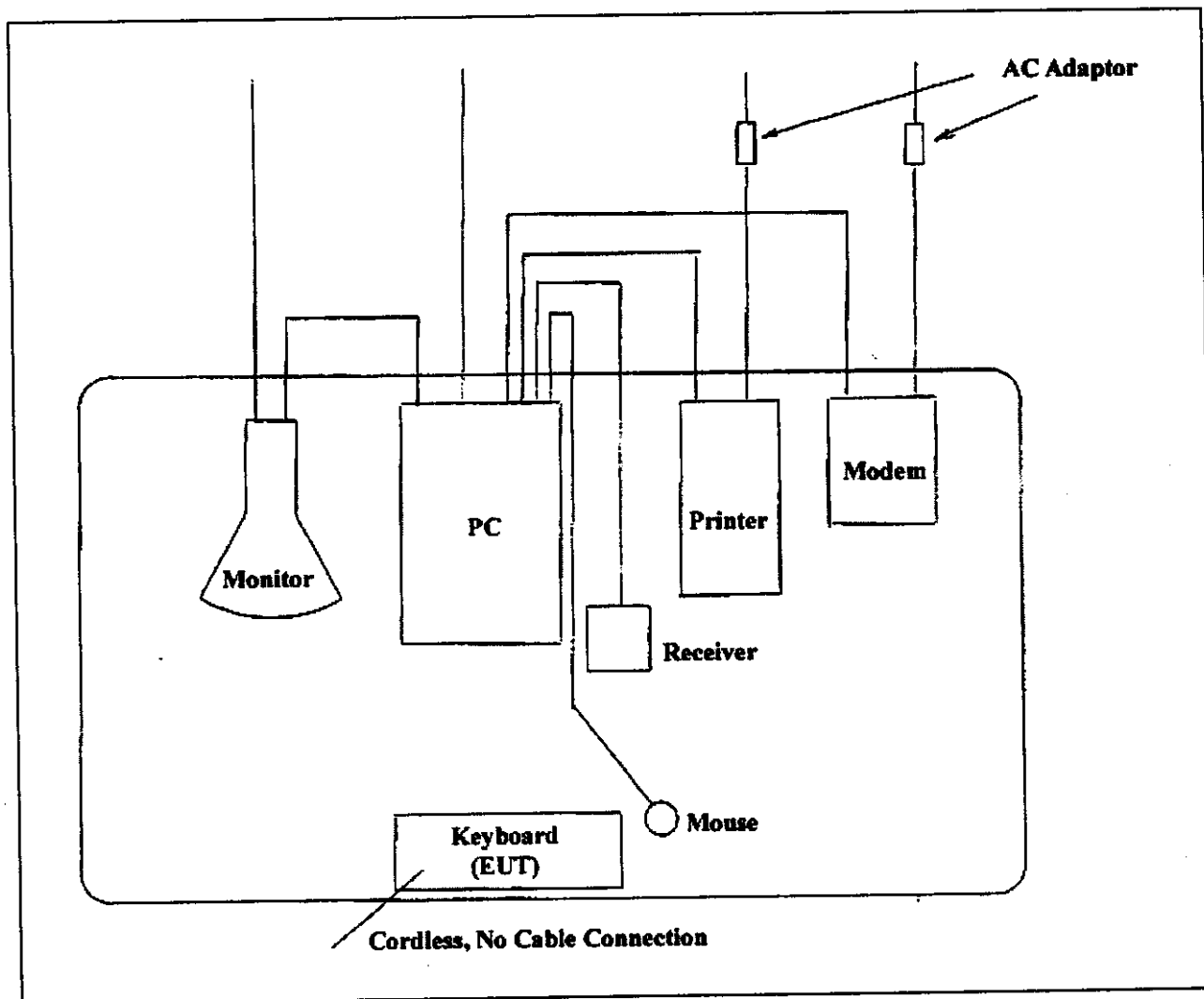
### PRINTED CIRCUIT BOARDS

| Function | Model & Rev | Clocks, MHz | Layers | Location |
|----------|-------------|-------------|--------|----------|
|          |             | 13.5725 MHz | 2      |          |

### REQUIRED EUT CHANGES TO COMPLY:

None.

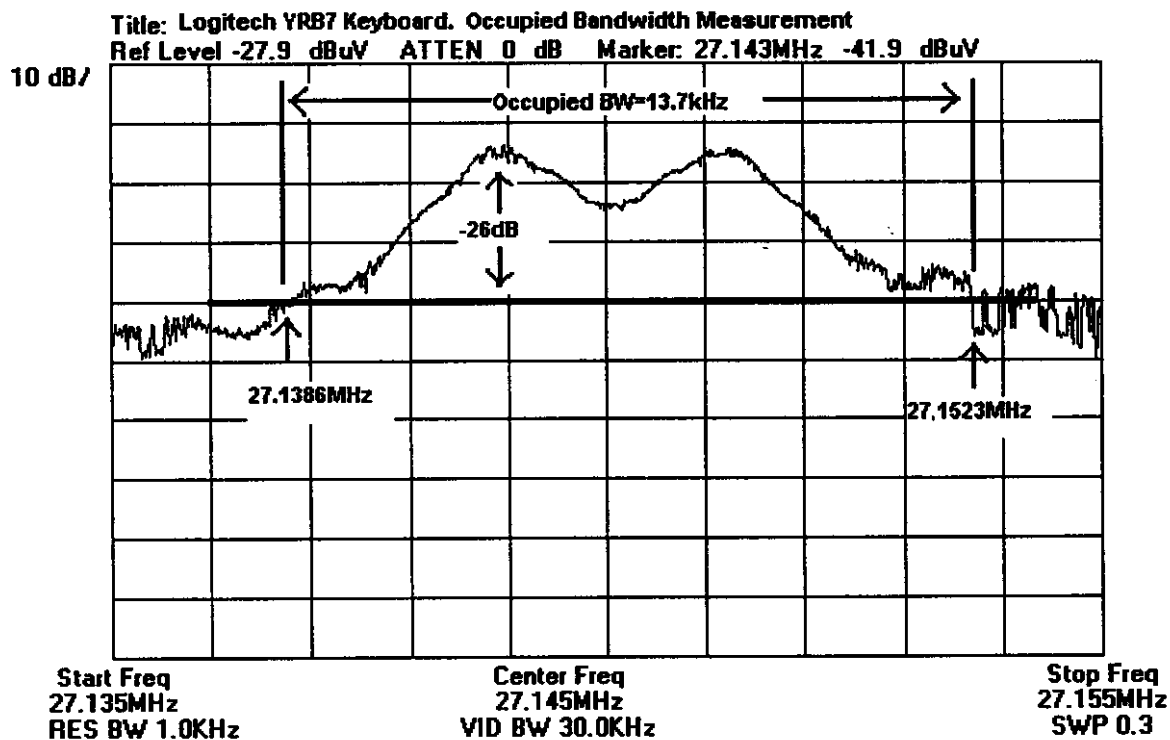
## EQUIPMENT CONFIGURATION BLOCK DIAGRAM



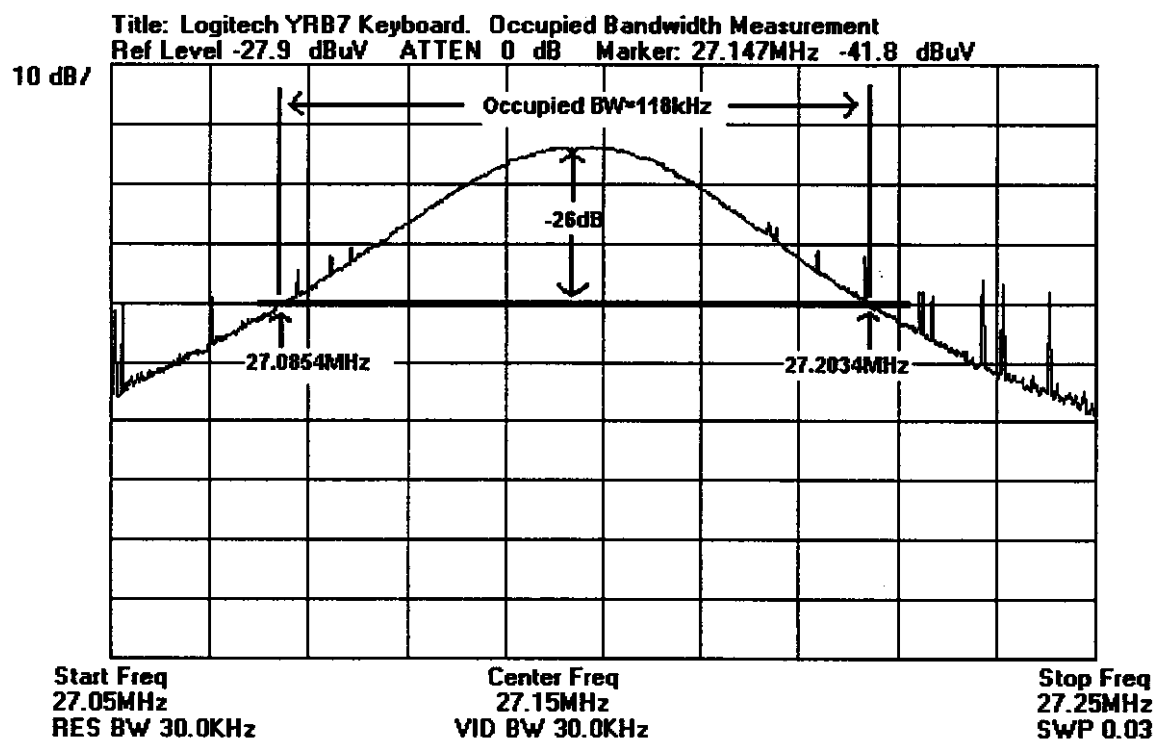
**APPENDIX B**  
**MEASUREMENT DATA SHEETS**



## Occupied Bandwidth Plot



## Occupied Bandwidth Plot



Test Location: CKC Laboratories, Inc. • 1653 Los Viboras Rd., Site A • Hollister, Ca 95023 • (831) 637-0485

Customer: Logitech, Inc.  
Specification: FCC 15.227 RADIATED  
Test Type: Maximized Emissions  
Equipment: Keyboard, Wireless  
Manufacturer: Logitech, Inc.  
Model: Y-RB7  
S/N: SLA-2

Date: May-26-99  
Time: 16:32  
Sequence#: 4  
Tested By: Wes Norris

**Equipment Under Test (\* = EUT):**

| Function            | Manufacturer   | Model # | S/N   |
|---------------------|----------------|---------|-------|
| Keyboard, Wireless* | Logitech, Inc. | Y-RB7   | SLA-2 |

**Support Devices:**

| Function                     | Manufacturer | Model #     | S/N        |
|------------------------------|--------------|-------------|------------|
| Cordless Desktop Transceiver | Logitech     | C-RC3-KBD   | DVT 103    |
| PC                           | HP           | 8180        | US73553464 |
| Printer                      | HP           | DeskJet 340 |            |
| AC Adaptor                   | HP           | 0950-2435   |            |
| Modem                        | Cardinal     | 020-0470    |            |
| AC Adaptor                   | AMIGO        | AM-9300     |            |
| Monitor                      | HP           | D5258A      | DK73795774 |

**Test Conditions / Notes:**

COMMENTS: This test is to FCC C, Paragraph 15.227, and 15.209, IAW ANSI C63.4. The EUT is a cordless Keyboard and communicates with the PC by means of a transmitted RF signal. The fundamental frequency of this signal is 27.145MHz. The PC is fitted with a Cordless Desktop Receiver to detect and decode the signal. The PC is running a special 'Test Software' which causes the EUT to transmit a continuous stream of the letter I, in lower-case. A monitor is connected to the PC and displays status information. A modem, printer, and mouse are connected to the PC, but are not operating in this 'Keyboard Test' Mode.

**Measurement Data:**

Sorted by Margin

Test Distance: 3 Meters

| # | Freq<br>MHz | Rdng<br>dBμV | Amp.<br>dB    | cab3<br>dB | maglp<br>dB  | Dist<br>dB | Corr<br>dBμV/m | Spec<br>dBμV/m | Margin<br>dB | Polar |
|---|-------------|--------------|---------------|------------|--------------|------------|----------------|----------------|--------------|-------|
| 1 | 27.320      | 36.9         | +0.0<br>+0.0  |            | +0.0<br>+7.5 | +0.0       | 44.4           | 50.0           | -5.6         | Vert  |
| 2 | 54.340      | 47.2         | -26.6<br>+9.5 | +1.1       | +0.0         | +0.0       | 31.2           | 40.0           | -8.8         | Vert  |
| 3 | 54.325      | 46.9         | -26.6<br>+9.5 | +1.1       | +0.0         | +0.0       | 30.9           | 40.0           | -9.1         | Horiz |
| 4 | 72.741      | 48.2         | -26.6<br>+6.9 | +1.4       | +0.0         | +0.0       | 29.9           | 40.0           | -10.1        | Vert  |
| 5 | 81.512      | 47.5         | -26.6<br>+6.7 | +1.8       | +0.0         | +0.0       | 29.4           | 40.0           | -10.6        | Horiz |



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|    |         |      |                |      |      |      |      |      |       |       |
|----|---------|------|----------------|------|------|------|------|------|-------|-------|
| 6  | 27.364  | 30.9 | +0.0<br>+0.0   | +0.0 | +7.5 | +0.0 | 38.4 | 50.0 | -11.6 | Vert  |
| 7  | 27.234  | 58.8 | +0.0<br>+0.0   | +0.0 | +7.5 | +0.0 | 66.3 | 80.0 | -13.7 | Vert  |
| 8  | 27.180  | 58.3 | +0.0<br>+0.0   | +0.0 | +7.5 | +0.0 | 65.8 | 80.0 | -14.2 | Vert  |
| 9  | 27.434  | 28.0 | +0.0<br>+0.0   | +0.0 | +7.4 | +0.0 | 35.4 | 50.0 | -14.6 | Vert  |
| 10 | 27.592  | 26.8 | +0.0<br>+0.0   | +0.0 | +7.4 | +0.0 | 34.2 | 50.0 | -15.8 | Vert  |
| 11 | 27.882  | 26.8 | +0.0<br>+0.0   | +0.0 | +7.4 | +0.0 | 34.2 | 50.0 | -15.8 | Vert  |
| 12 | 162.930 | 35.9 | -26.3<br>+15.7 | +1.8 | +0.0 | +0.0 | 27.1 | 43.5 | -16.4 | Horiz |
| 13 | 29.886  | 25.4 | +0.0<br>+0.0   | +0.0 | +7.0 | +0.0 | 32.4 | 50.0 | -17.6 | Vert  |
| 14 | 81.500  | 39.7 | -26.6<br>+6.7  | +1.8 | +0.0 | +0.0 | 21.6 | 40.0 | -18.4 | Vert  |
| 15 | 135.780 | 33.0 | -26.4<br>+14.5 | +1.6 | +0.0 | +0.0 | 22.7 | 43.5 | -20.8 | Vert  |
| 16 | 27.018  | 30.8 | +0.0<br>+0.0   | +0.0 | +7.5 | +0.0 | 38.3 | 80.0 | -41.7 | Vert  |