


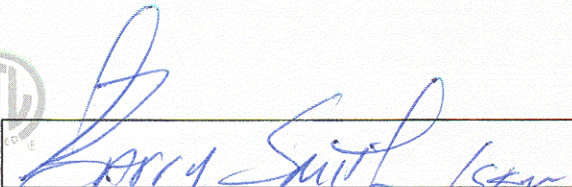


FCC Part 15, Class B (DoC) Emissions Test Report
 for
Symbol Technologies
 on the
Spectrum Wireless LAN
Model: LA-4111

Test Report #: J99022686f
 Date of Report: September 30, 1999

Job #: J99022686
 Date of Test: September 24-27, 1999

Total No. of Pages Contained in this Report: 19 + data pages



| | |
|--|---|
|   | Barry Smith, Test Engineer |
|   | David Chernomordik, Ph.D., EMC Site Manager |

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Part 15 Class B (DoC) and ANSI C63.4-1992, Rev. 8/99



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VERIFICATION OF COMPLIANCE
Report No. J99022686f

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment tested hereon for use under the rules and regulations listed below

| | |
|-------------------------------|---|
| Equipment Under Test: | Spectrum Wireless LAN |
| Trade Name: | Symbol Technologies |
| Model No.: | LA-4111 |
| Serial No.: | Not Labeled |
| Applicant: | Symbol Technologies |
| Contact: | Mr.Norm Nelson |
| Address: | 2145 Hamilton Ave. San Jose CA 95125 USA |
| Tel. number: | 408/369-2649 |
| Fax number: | 408/369-2740 |
| Applicable Regulation: | FCC Part 15, Subpart B, and Industry Canada ICES-003 issue 2 |
| Equipment Class: | Class B |
| Test Site Location: | ITS - Site 1 1365 Adams Drive Menlo Park, CA 94025 |
| Date of Test: | September 24-27, 1999 |



We attest to the accuracy of this report:



Barry Smith
Barry Smith
Test Engineer

David Chernomordik
David Chernomordik, Ph.D.
EMC Site Manager



Intertek Testing Services NA Inc.

1365 Adams Court, Menlo Park, CA 94025

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1.0 Introduction

This report is designed to show compliance with the FCC Part 15, Subpart B Rules for an unintentional radiator. The test procedures, as described in American National Standards Institute C63.4-1992, were employed. A description of the product and operating configuration, the various provisions of the rules, the methods for determining compliance, and a detailed summary of the results are included within this test report.

2.0 Description of Equipment

The Spectrum Wireless LAN is a radio in PCMCIA format that allows a laptop to remotely hook up to a LAN.

A pre-production version of the sample was received on September 24, 1999 in good condition.

3.0 Test Summary

Test results are given in full in section 5 and 6.

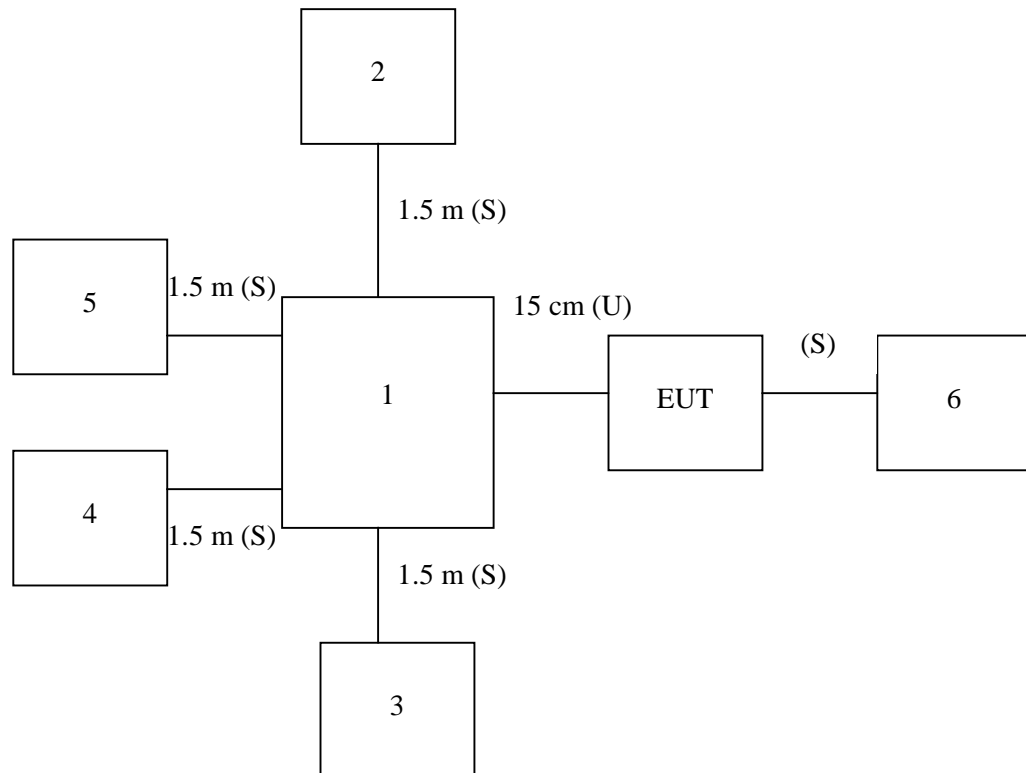
| FCC Part 15 Subpart B Summary of Test Results | | | |
|--|--------------------|--------------|--------------------------|
| Test Condition | Description | Class | Compliance Status |
| Conducted Emission (AC main) | 0.45 MHz - 30 MHz | B | Pass |
| Radiated Emission | 30 MHz - 1000 MHz | B | Pass |

4.0 System Test Configuration

4.1 Support Equipment

| Item # | Description | Model No. | Serial No. | FCC ID |
|--------|-------------------|---------------|--------------|--------------|
| 1 | Compaq Computer | Contura 400CX | 2800A | CNT75MB2CA |
| 2 | ViewSonic Monitor | 7034T | 3732285769 | FV17034T |
| 3 | Compaq Mouse | M-S28 | ID768AN56891 | DZL210472 |
| 4 | HP Printer | 2225C+ | 2921S45711 | DSI6XU2225 |
| 5 | Datronics Modem | 1200CK | 017-247336 | E2050V1200CK |
| 6 | Antennas | - | - | - |

4.2 Block Diagram of Test Setup



| | | |
|---------------------------------|----------------|------------------|
| * = EUT | S = Shielded; | F = With Ferrite |
| ** = No ferrites on video cable | U = Unshielded | |

4.3 Justification

The EUT was configured as a customer would normally use it.

4.4 Software Exercise Program

The software provided by Symbol was used to exercise the EUT.

4.5 Mode of Operation During Test

The EUT was set to continuously transmit.

4.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Symbol Technologies prior to compliance testing):

No modifications were installed by Intertek Testing Services.

4.7 Additions, deviations and exclusions from standards

No additions, exclusions, or deviations were made to the standard.

5.0 Radiated Emissions

5.1 Radiated Emission Limits

The following radiated emission limits apply to Class B unintentional radiators:

Radiated Emissions Limits, Section 15.109(a)

| Frequency MHz | Class B at 3m $\mu\text{V}/\text{m}$ | Class B at 3m $\text{dB}(\mu\text{V}/\text{m})$ |
|------------------|---|--|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt, $\text{dB}(\mu\text{V})$, and microvolts (μV). To convert between them, use the following formulas: $20 \text{ LOG}_{10}(\mu\text{V}) = \text{dB}(\mu\text{V})$, $\text{dB}(m) = \text{dB}(\mu\text{V}) - 107$.



5.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

where FS = Field Strength in dB(μV/m)

RA = Receiver Amplitude (including preamplifier) in dB(μV)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB/m

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in dB(μV/m)

RR = RA - AG in dB(μV)

LF = CF + AF in dB/m

Assume a receiver reading of 52.0 dB(μV) is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 23 dB(μV). This value in dBμV/m was converted to its corresponding level in μV/m.

$$RA = 52.0 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}(\mu\text{V/m})$$

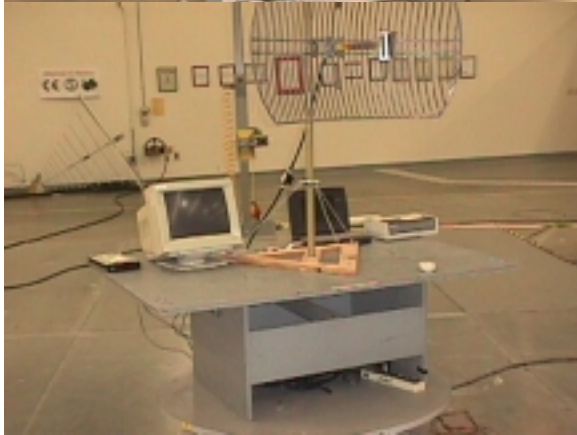
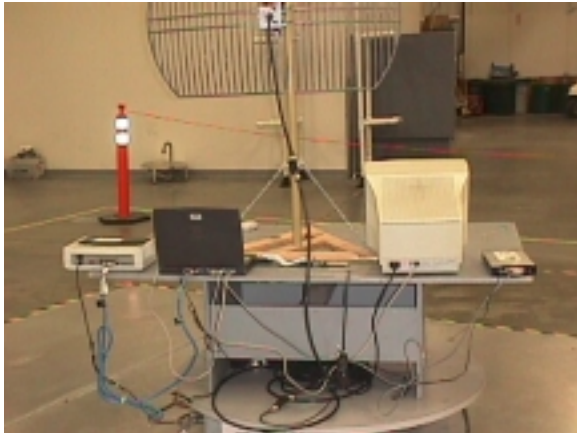
$$RR = 23.0 \text{ dB}(\mu\text{V})$$

$$LF = 9.0 \text{ dB}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } \{[32 \text{ dB}(\mu\text{V/m})]/20\} = 39.8 \mu\text{V/m}$$

5.3 Configuration Photographs

Worst-Case Radiated Emission at 110 MHz



5.4 Test Data

The results on the following page(s) were obtained when the device was tested in the condition described in section 4.

| |
|--|
| Results: Passed by 3.6 dB at 110 MHz |
|--|

- Note:
- a) A complete scan from 30-1000 MHz was made with antenna oriented horizontally and vertically.
 - b) All emissions not reported are at least 20 dB below the limits
 - c) Analyzer setting: RBW \geq 100 kHz, VBW \geq 100 kHz
 Detector mode: Peak unless otherwise specified in the data page

6.0 AC Mains Line-Conducted Emissions

6.1 Line Conducted Emission Limits

The following AC line conducted emission limits apply to Class B unintentional radiators:

Conducted Emissions Limits, Section 15.107(a)

| Frequency MHz | Class B μV | Class B dB(μV) |
|--------------------------|--------------------------------------|--|
| 0.45 - 1.705 | 250 | 48 |
| 1.705 to 30.000 | 250 | 48 |

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt, dB(μ V), and microvolts (μ V). To convert between them, use the following formulas: $20 \text{ LOG}_{10}(\mu\text{V}) = \text{dB}(\mu\text{V})$, $\text{dB}(m) = \text{dB}(\mu\text{V}) - 107$.

6.2 Configuration Photographs

Worst-Case Line-Conducted Emission at 25.2 MHz



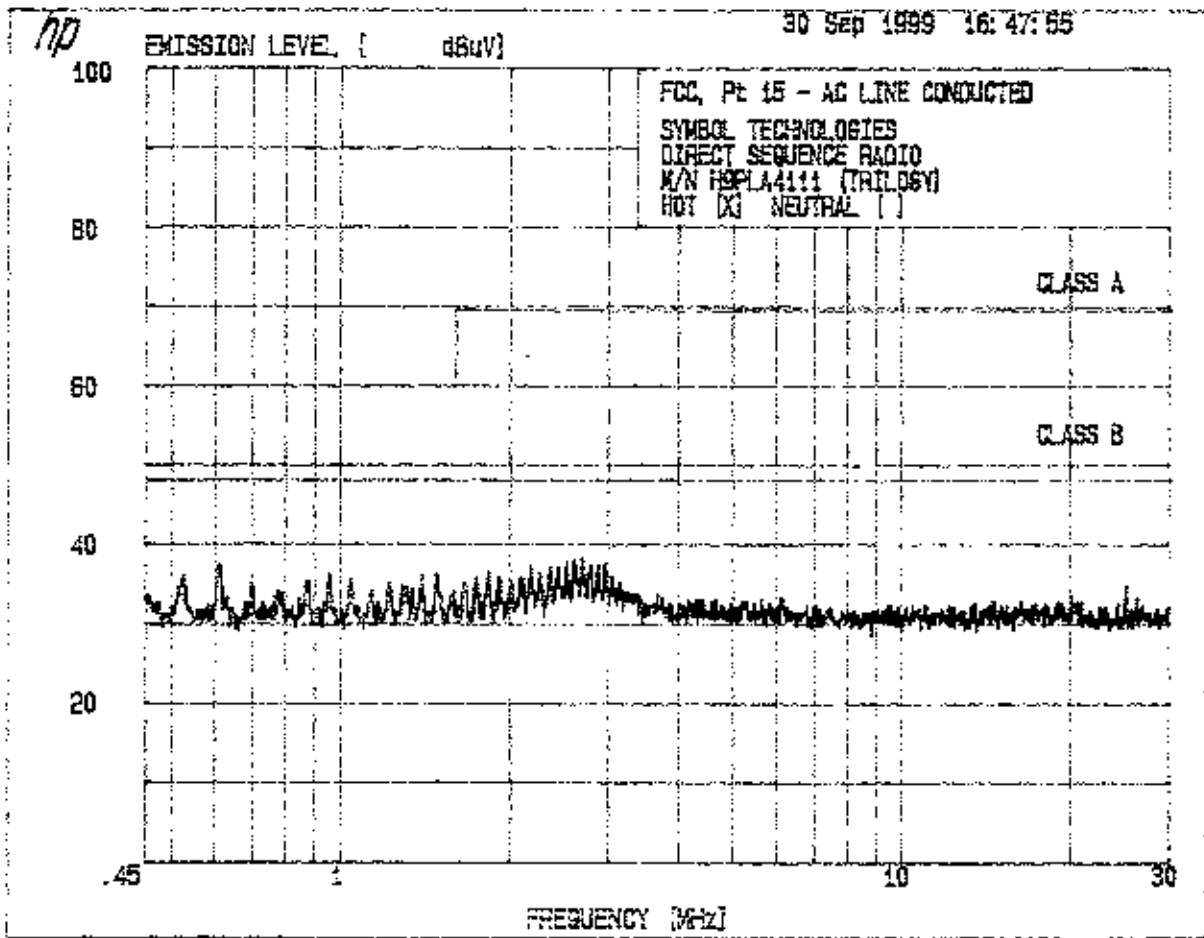
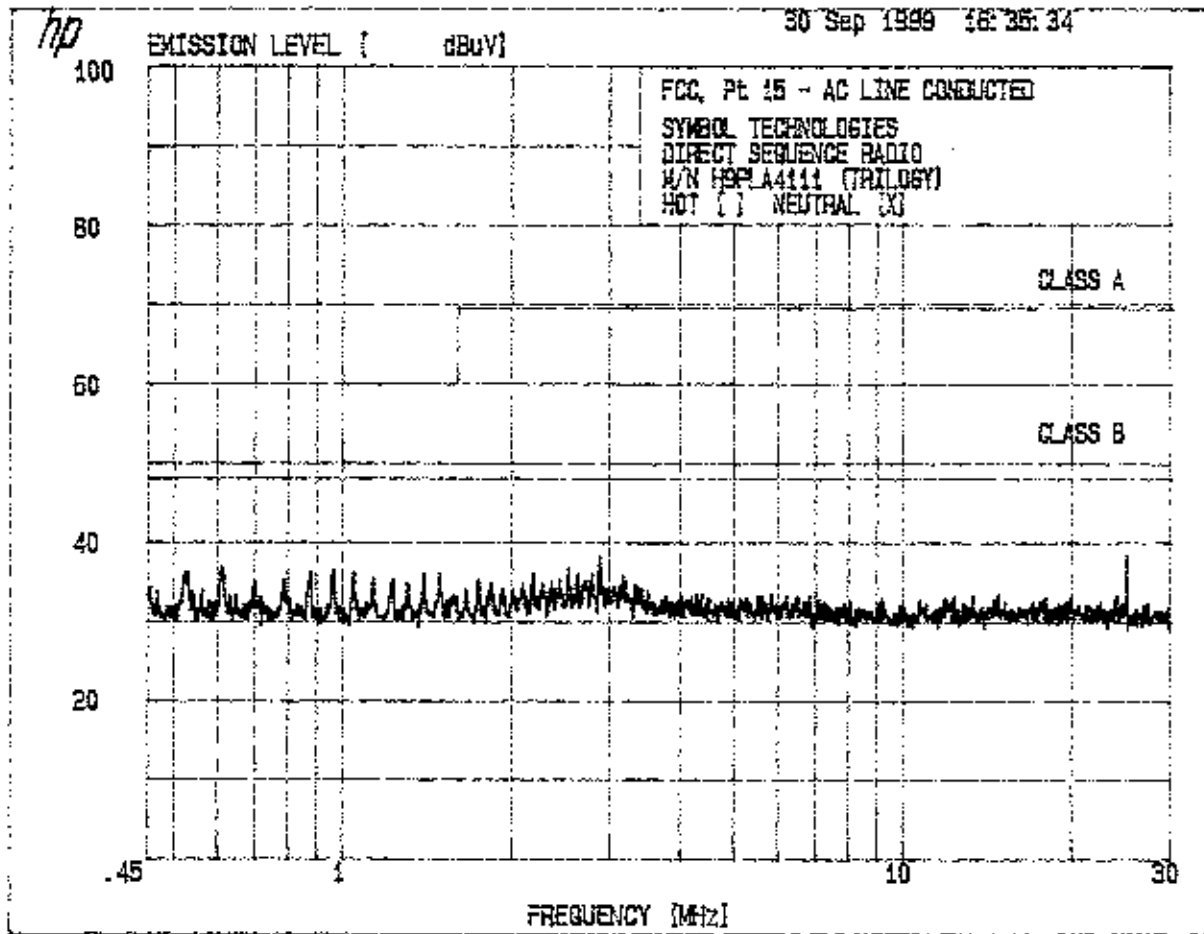
6.3 Test Data

The results on the following page(s) were obtained when the device was tested in the condition described in section 4.

| |
|---|
| Results: Passed by 9.5 dB at 25.2 MHz |
|---|

- Note:
- a) A complete scan from 0.45 - 30 MHz was made.

 - b) Analyzer setting: RBW \geq 9 kHz, VBW \geq 9 kHz
 Detector mode: Peak unless otherwise specified in the data page



=====

30 Sep 1999 16:35:34

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3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

=====

SYMBOL TECHNOLOGIES
DIRECT SEQUENCE RADIO
M/N H9PLA4111 (TRILOGY)
HOT [] NEUTRAL [X]

PEAKS FOUND ABOVE 36 dBuV

| PEAK# | FREQ (MHz) | AMPL(dBuV) |
|-------|------------|------------|
| 1 | .5300 | 36.2 |
| 2 | .6138 | 36.8 |
| 3 | .8842 | 36.0 |
| 4 | .9697 | 36.4 |
| 5 | 1.055 | 36.2 |
| 6 | 1.403 | 36.1 |
| 7 | 1.494 | 36.1 |
| 8 | 2.198 | 36.0 |
| 9 | 2.545 | 36.9 |
| 10 | 2.643 | 36.0 |
| 11 | 2.803 | 36.0 |
| 12 | 2.887 | 38.2 |
| 13 | 25.15 | 38.5 |

=====

30 Sep 1999 16:47:55

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3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

=====

SYMBOL TECHNOLOGIES
DIRECT SEQUENCE RADIO
M/N H9PLA4111 (TRILOGY)
HOT [X] NEUTRAL []

PEAKS FOUND ABOVE 36 dBuV

| PEAK# | FREQ (MHz) | AMPL(dBuV) |
|-------|------------|------------|
| 1 | .5138 | 37.3 |
| 2 | .9616 | 36.1 |
| 3 | 1.403 | 36.0 |
| 4 | 1.488 | 36.1 |
| 5 | 1.843 | 36.4 |
| 6 | 2.188 | 37.2 |
| 7 | 2.273 | 36.2 |
| 8 | 2.370 | 37.0 |
| 9 | 2.451 | 37.0 |
| 10 | 2.535 | 37.7 |
| 11 | 2.621 | 38.0 |
| 12 | 2.711 | 38.1 |
| 13 | 2.803 | 37.2 |
| 14 | 2.887 | 37.2 |



Symbol Technologies, LA-4111

Date of Test: September 24-27, 1999

7.0 Test Equipment

7.1 Equipment List

All test sites are FCC listed, IC accepted, and NVLAP accredited.

| | |
|-----------------------------------|-----------------|
| Industry Canada identifier number | IC 2059 |
| NVLAP Lab Code | 200201-0 |

Instruments used for emission compliance tests described in this report are listed below:

| TEST EQUIPMENT FOR EMISSION TESTING | | | | | | |
|--------------------------------------|-------------------|---------------|--------------------------|------------------------|-----------------------|------|
| EQUIPMENT | MFG. | MODEL | SERIAL NUMBER | CAL. INTERVAL (Months) | CAL. DUE DATE (m/d/y) | USED |
| Bi-Log Antenna | EMCO | 3143 | 9509-1164 | 12 | 3/20/00 | X |
| Pre-Amplifier | Hewlett Packard | 8447D | 2648A04700 | 12 | 12/4/99 | X |
| Spectrum Analyzer w/85650 QP Adaptor | Hewlett Packard | 8566B | 2416A00317 2043A00251 | 12 | 12/30/99 | X |
| Spectrum Analyzer w/85650 QP Adaptor | Hewlett Packard | 8568B | 1912A00553 2521A01021 | 12 | 2/12/00 | X |
| LISN | Solar Electronics | 8028-50-TS-24 | ETL344 | 12 | 12/7/99 | X |
| LISN | Solar Electronics | 8028-50-TS-24 | ETL343 | 12 | 12/7/99 | X |
| Pulse limiter | Hewlett Packard | 11947A | 2820A00184 | 12 | 6/28/00 | X |

7.2 Measurement Uncertainty

7.2.1 Radiated Emission - 3m Open Site Test Distance

The uncertainty in the measured field strength is estimated as follows, for a minimum confidence probability of 95 %

| Freq. Range | Detection Mode | Uncertainty |
|---------------------|----------------|------------------|
| 30 MHz to 200 MHz | Quasi-peak | ± 4.4 dB |
| 200 MHz to 1000 MHz | Quasi-peak | + 5.0 / - 3.6 dB |

7.2.2 Conducted Emission - AC Supply

The uncertainty in the measured voltage is estimated as follows, for a minimum confidence probability of 95 %

| Freq. Range | Detection Mode | Uncertainty |
|-------------------|----------------|--------------|
| 9 kHz to 150 kHz | Average | ± 2.1 dB |
| | Quasi-peak | ± 2.5 dB |
| 150 kHz to 30 MHz | Average | ± 2.4 dB |
| | Quasi-peak | ± 2.6 dB |

7.3 Measurement Traceability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards.

A

1365 Adams Court, Menlo Park, CA 94025

Symbol Technologies, LA-4111

Date of Test: September 24-27, 1999

8.0 Miscellaneous Information or Other Comments


None.

8.1 Labeling - USA


Products subject to Declaration of Conformity (DoC) shall be labeled as shown below. The label shall be located in a conspicuous location on the device and shall contain the unique identification described in FCC Section 2.1074.

The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in FCC Section 2.925(d). "Permanently affixed" means that the label is etched, engraved, stamped, silkscreened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or a permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

- (i) If the product is authorized based on testing of the product or system

| Trade Name | Model Number |
|---|--|
|  | Tested To Comply With FCC Standards |
| OR OFFICE USE | |

- (ii) If the product is authorized based on assembly using separately authorized components and the resulting product is not separately tested:

| Trade Name | Model Number |
|---|---|
|  | Assembled From Tested Components (Complete System Not |
| Tested | |
| FOR HOME OR OFFICE USE | |

8.2 Labeling - Canada

Canadian Emissions and Labeling Requirements

The Canadian Government has announced an amendment of the radio act which will require computing equipment to comply with EMI Specifications in Canada. The effective date for products imported into Canada is January 31, 1989.

The intent of the amendment is to establish Canadian Regulations which are harmonized with the existing FCC Regulations. As such, no retesting is required and devices which have been tested and comply with the FCC Specifications (Class A or B) also comply with the Canadian Specification (Class A or B).

A record of the measurements and results shall be retained by the manufacturer or importer for a period of at least five years and made available for examination on the request of the Canadian Government.

A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other restrictions it is not feasible to affix a label to the apparatus, the notice may be in form of a statement included in the user's manual.

A suggested text for the notice, in English and French, is as follows:

This Class [*] digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe [*] respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

*Insert either "A" or "B" but not both as appropriate for the equipment requirements.

8.3 Compliance Information - USA

If a product must be tested and authorized under a Declaration of Conformity, a compliance information statement shall be supplied with the product at the time of marketing or importation, containing the following information:

- (a) Identification of the product, e.g., name and model number.
- (b) A statement that the product complies with Part 15 of the regulations:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- (c) The identification, by name, address and telephone number, of the responsible party. The responsible party for a Declaration of Conformity must be located within the United States.

The compliance information statement shall be included in the user's manual or as a separate sheet.

The users manual or instruction manual shall also caution the user that:

Changes or modifications not expressly approved the party responsible for compliance could void the user's authority to operate this equipment.



8.4 Manufacturer's Certification

Declaration of Conformity

Standard to which conformity is declared: _____

Manufacturer/Importer s Information

Name: _____

Address: _____

Telephone Number: _____

Equipment Information

Type of Equipment: _____

Trade Name: _____

Model Number: _____

Test Report Reference: _____

I, the undersigned, hereby declare that the equipment specified above conforms to Part 15 of the FCC Rules.

(Signature)

(Name & Title)

(Date)



9.0 Document History

| Revision/Job Number | Date | Change |
|----------------------------|-------------|-------------------|
| 1.0 / | | Original document |
| | | |
| | | |
| | | |
| | | |
| | | |