



Focus No. AUM 524 (Box 1)



### **SUMMARY OF TEST RESULTS**

FCC ID: RV849915570995

The sample (49 MHz controller) submitted COMPLIES with the tested requirements of the applicable sections of the Rules and Regulations detailed in 47 C.F.R., Part 15 of the Federal Communication Commission (FCC) of United States of America.

The Equipment-under-test (EUT) is a RF remote control transmitter.

#### **Tests Required for Intentional Radiator:**

<b>Test Executed</b>	<b>Test Requirement</b>	<b>Test Standard</b>	<b>Limit</b>	<b>Result</b>
Measurement of Radiated Emissions	Section 15.235, 15.215 47 CFR FCC Part 15	Section 15.31, 47 CFR, FCC Part 15 ANSI C63.4 - 2003	See Section 15.235, 15. 215	Meet
Measurement of Conducted Emissions on AC Mains	Section 15. 207, CFR47, FCC Part 15	Section 15.31, 47 CFR, FCC Part 15 ANSI C63.4 - 2003	See Section 15.207	N. A.

N. A. = Not Applicable



**Test Results:**

**Measurement of Radiated Emissions:**

**Requirements:** FCC PART 15, SECTION 15.235 / 15.215

**Limit:** Section 15.235 / 15.215

**Port under test:** Enclosure

**Test equipment:**

Description	Equipment No.	Brand Name	Model No.
EMI Test Receiver	M 054 001 L	Rohde & Schwarz	ESCS 30
Biconical Antenna	T 025 001 L	Rohde & Schwarz	HK 116
Log-Periodic Antenna	T 025 002 L	Rohde & Schwarz	HL 223
Open Area Test Site (range = 3m)	T 027 001 L	None	None
Full Anechoic Chamber (7m x 3m x 3m)	M 053 001 L	Albatross Projects	M-CDC
Automatic Antenna Mast	T 025 003 L	Rainer Schäfer	RSM 010
Automatic Turntable	T 028 001 L	Rainer Schäfer	RST 020
Antenna Mast / Turntable Controller	T 026 001 L	Rainer Schäfer	RSC
Coaxial Cable No. 2	T 029 002 L	Uniradio	None
Coaxial Cable No. 6	T 029 006 L	Unknown	None
Coaxial Cable No. 3	T 029 003 L	Suhner	None
Coaxial Cable No. 4	T 029 004 L	Suhner	None
LOOP Antenna	M 056 001L	Schaffner	HLA 6120

**Test method:**

**Location of test facilities:**

The EMC laboratory is located at the following address:

No. 911, 9/F., Po Hing Centre, 18 Wang Chiu Road, Kowloon Bay, Kowloon, Hong Kong

The test facility has been found in compliance with the requirement of Section 2.948 of the FCC rules. The information has been placed on file and listed by FCC with Registration No. 507882.

**The operational mode(s) under test:**

The operational modes under test are determined according to the typical use of the Equipment-Under-Test (EUT) with respect to the expected highest level of emission. During the test, various parts of the EUT system are exercised in a manner permitting detection of all system disturbances.



**Test method:**

The frequency range of radiated measurements:

The frequency range of radiated measurements is determined pursuant to Section 15.33.

For an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower, if the intentional radiator operates below 10 GHz.

For an unintentional radiator, unless otherwise specified, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below 9 kHz, up to the frequency list in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.707 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, which ever is lower.

Limits of radiated Emissions:

The limits of radiated emissions are specified in the appropriate Sections of the FCC rules that the EUT is subject to, and the provisions in Section 15.35.

Unless otherwise specified in the Rules, on any frequency or frequencies below or equal to 1000 MHz, the limits are based on measuring equipment employing a CISPR quasi-peak detector. For frequencies above 1000 MHz the radiated limits are based upon the use of measurement instrument employing an average detector, with a minimum resolution bandwidth of 1MHz.

When average radiated emission measurements are specified in Part 15, including emission measurements below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit, unless a different peak emission limit is otherwise specified.



**Test method:**

Measurement method of radiated emissions:

Pursuant to Section 15.31(e), for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

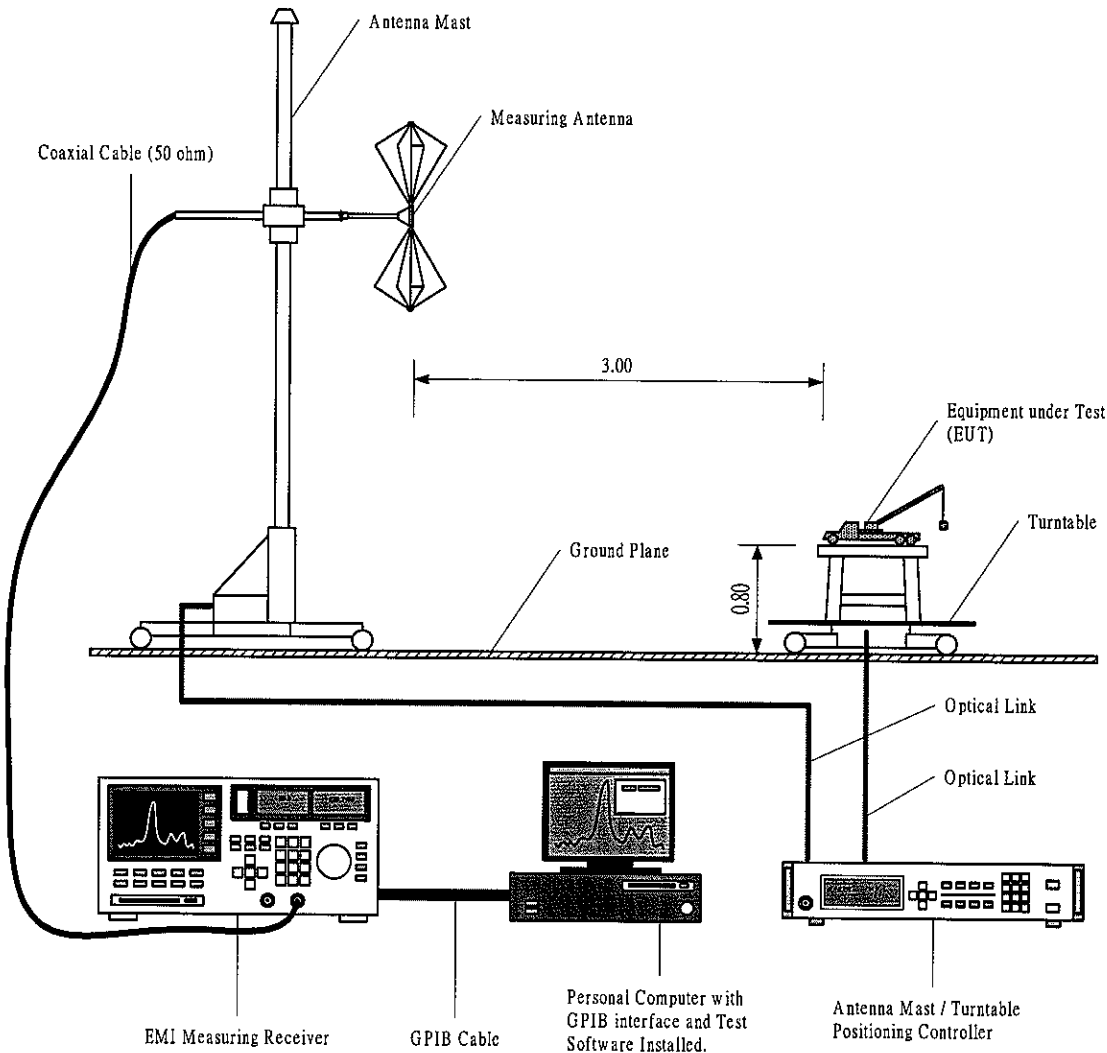
Measurements are carried out on the open area test site (OATS) located on the roof of the EMC laboratory, in accordance with CISPR 22 as a basic standard at a measurement range of 3 meters. The test site has, by verification measurements, satisfied the normalized site attenuation (NSA) requirements specified in the standard CISPR 22. For measurement at each test frequency, the antenna-to-EUT azimuth is varied through 360°. The antenna is also scanned between 1 m to 4 m in height above the ground plane to maximize the level of radiated disturbances. The reading on the measuring receiver is observed for about 15 s for each final measurement; the highest readings shall be recorded with the exception of any isolated spike which shall be ignored.

For measurements of undesired spurious emissions, if the measurement results are 20 dB lower than the corresponding permissible limit levels, they can be confidently regarded as having satisfied the limit requirement applied. No records of these measurement results are required (see Section 15.31(o) of FCC Part 15).

For the measurements at frequencies with high ambient disturbance signals existing, verification tests may be carried out in the Fully Anechoic Chamber (FAC) as an auxiliary method to confirm whether there is any emission of radiated disturbances from the EUT. If there is no maximum disturbance level from the EUT other than the corresponding intrinsic noise floor of measuring system (which is at least 20 dB below the limit level), then it can be stated confidently that the measurement result obtained at OATS is due to the signal levels of ambient signal sources, not from the EUT.



**Test Set-up:**



With hand-held or portable EUT exploratory radiated emission test shall be carried out, including rotation of the EUT through three orthogonal axes to determine the attitude that highest emission relative to the limit. The so found attitude and equipment arrangement shall be used in the final measurement.

In frequency range of 9kHz to 30MHz, a calibrated Loop antenna shall be applied for measuring radiated emissions. The Loop antenna shall be positioned with its plane vertical. The centre of the loop shall be 1m above ground plane and 3m apart from the EUT placed on the turntable. The Loop antenna shall be rotated about its vertical axis to maximize the radiated emission measured.



**Results:**

**Operational mode under test:** Transmission mode (Max Speed)

EUT operating condition:

(a) System Configuration

The EUT system is regarded as a portable apparatus and tested as a desktop.

The EUT is configured and tested as a stand-alone unit.

(b) Antenna (if applicable):

The dedicated or integral antenna of the intentional radiator is fully extended.

For handheld or portable intentional radiator:

Vertical Polarization: The EUT antenna should be initially erected and held perpendicular to the horizontal ground plane of the test site for measurement.

Horizontal Polarization: The EUT antenna should initially be held in parallel to both the horizontal ground plane and the measurement antenna.

(c) Special means of activating, maintaining or repeating the desired functioning state of EUT:

The following triggers, buttons or control sticks of control panel are held pressed with plastic cable ties or plastic tapes, or any other means with insulation materials:

Trigger (Max speed)



**Radiated Emissions of the Peak Fundamental Frequency Component of Intentional Radiator within the Operation Band:**

- Pursuant to SECTION 15.235.
- Modulation of signal generated by EUT = modulated
- Resolution Bandwidth (RBW) = 120 kHz

Frequency	Antenna Polarization	Detector	Measurement Result @ 3m	Limit @ 3m	Correction (Note 1)	Margin (Note 2)	Comment
MHz	Vertical / Horizontal	Peak / Quasi-Peak / Average	dBμV/m	dBμV/m	dB	dB	Meets / Does not Meet
49.85958	Vertical	Average	47.5	80	0.8	-31.7	Meet
		Peak	51.1	100	0.8	-48.1	Meet
49.85958	Horizontal	Average	41.5	80	0.8	-37.7	Meet
		Peak	45.6	100	0.8	-53.6	Meet

Remarks: None





Verification of frequency of the fundamental emission and its 20 dB bandwidth:

Pursuant to SECTION 15.215(c), the intentional radiators subject to the provisions of this specific section of the Rules must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from

- frequency sweeping,
- frequency hopping, and
- other modulation techniques that may be employed, and
- the frequency stability of the transmitter over expected variations in temperature and supply voltage; OR, if the frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

The 20 dB Bandwidth =  $f_{upper} - f_{lower}$ .

The measuring equipment shall be set with:

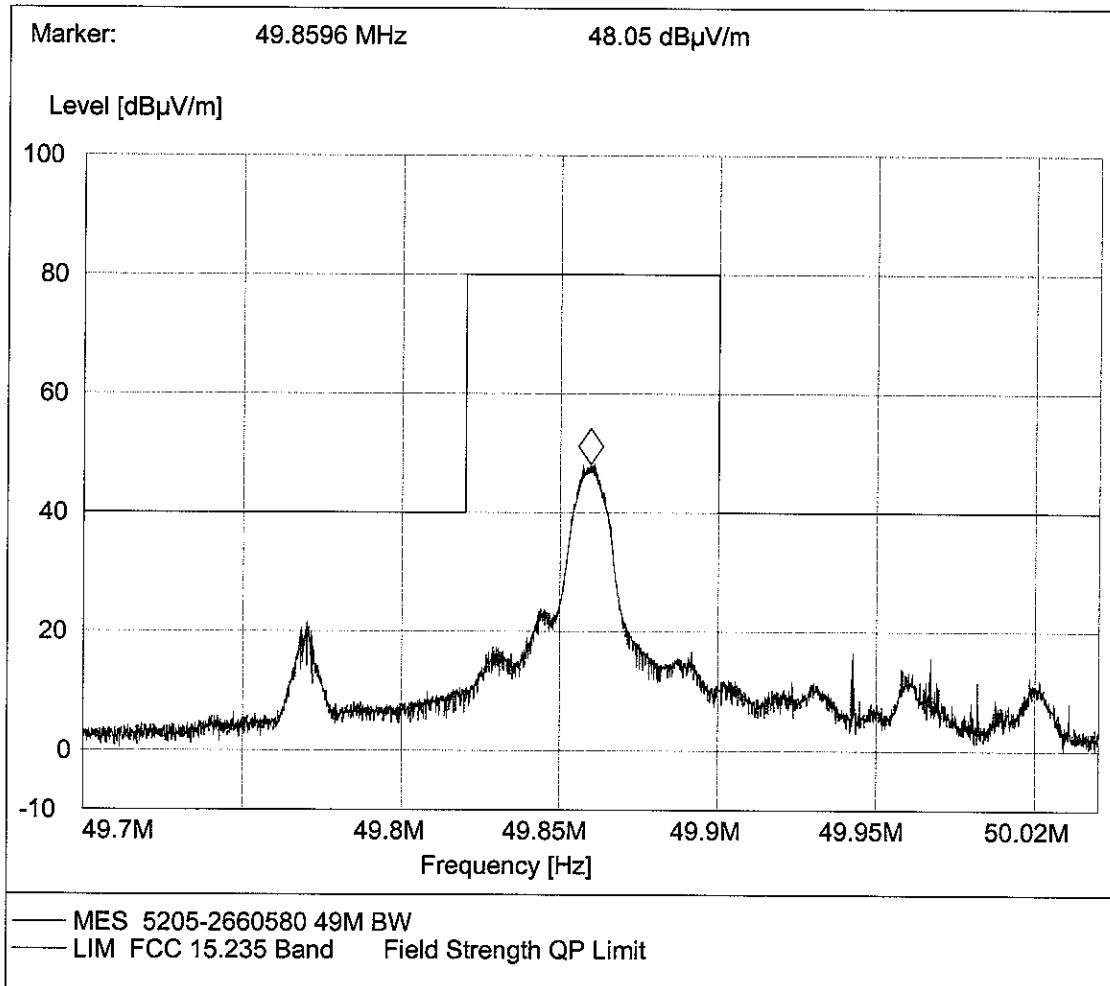
- Resolution Bandwidth (RBW) = 200 Hz
- Detector employed = Average
- Antenna Polarization = Vertical

Parameters	Measurement Results		Permitted Operation Band (MHz)		Comment
	Signal Level (dBμV)	Frequency (MHz)	From	To	
$f_{lower}$ (Max. Level - 20 dB)	26.5	49.85846	49.82	49.90	Meets
$f_0$ (Max. Level)	46.8	49.85945	49.82	49.90	Meets
$f_{upper}$ (Max. Level - 20 dB)	25.6	49.85995	49.82	49.90	Meets

Remarks:



- The spectrum occupied by the fundamental frequency and its 20dB bandwidth is illustrated as shown below:





**Spurious Emissions of Intentional Radiator:**

- Pursuant to SECTION 15.235

The maximum radiated electromagnetic emissions measured are recorded as shown below:

Frequency	Antenna Polarization	Detector	Measurement Result @ 3m	Limit @ 3m	Correction (Note 1)	Margin (Note 2)	Comment
MHz	Vertical / Horizontal	Peak / Quasi-Peak / Average	dBμV/m	dBμV/m	dB	dB	Meets / Does not Meet
49.91	Vertical	Quasi-Peak	36.2	40.0	0.8	-3.0	Meets
49.81	Vertical	Quasi-Peak	34.6	40.0	0.8	-4.6	Meets
149.5788	Vertical	Quasi-Peak	20.0	43.5	0.8	-22.7	Meets
199.4384	Vertical	Quasi-Peak	21.6	43.5	0.8	-21.1	Meets
398.8765	Vertical	Quasi-Peak	24.2	46.0	1.2	-20.6	Meets
349.0166	Vertical	Quasi-Peak	23.0	46.0	1.2	-21.8	Meets

**Remarks:**

RBW = 120kHz

- The equipment pursuant section 15.235 shall have the field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section 15.209, whichever permits the higher emission levels. The field strength of any emissions removed by more than 10 kHz from the band edges shall not exceed the general radiated emission limits in Section 15.209. All signals exceeding 20 microvolts / meter at 3 meters shall be reported in the application for certification.

AND

- Since the equipment under test cannot generate unmodulated carrier, the general limits in Section 15.209 applies to all the spurious emissions.



Expanded Measurement Uncertainty  $U_{lab}$  ( $k = 2$  for level of confidence being 95%):

A). Measurement with Loop or Biconical Antenna:

For Frequency Range of  $25 \text{ MHz} \leq f < 200 \text{ MHz}$ :  $U_{lab} = 6.0 \text{ dB}$

B). Measurement with Log-Periodic Antenna:

For Frequency Range of  $200 \text{ MHz} \leq f < 1000 \text{ MHz}$   $U_{lab} = 6.4 \text{ dB}$

Note 1:

Correction by Expanded Measurement Uncertainty following CISPR 16-4:

Measurement Uncertainty Budget specified in CISPR 16-4:  $U_{cisp} = 5.2 \text{ dB}$

Per Section 4 of CISPR 16-4, If  $U_{lab} \leq U_{cisp}$ , then: *Correction = 0 dB.*

If  $U_{lab} > U_{cisp}$ , then: *Correction =  $(U_{lab} - U_{cisp}) \text{ dB}$ .*

Note 2:

- The term margin is defined as the difference between the measurement result (corrected by taking the measurement uncertainty into consideration as illustrated in Note 1 above), and the disturbance limit specified in the standard applied, i.e.,

$$\text{Margin} = (\text{Measurement Result} + \text{Correction}) - \text{Limit}.$$

- If  $\text{Margin} \leq 0$ , then compliance is deemed to occur and hence the EUT does meet the requirement of the standard applied.
- If  $\text{Margin} > 0$ , then non-compliance is deemed to occur and hence the EUT does NOT meet the requirement of the standard applied.



**Conducted Emissions on AC mains port (150 kHz – 30 MHz)**

**Standard:** FCC PART 15, SECTION 15.207

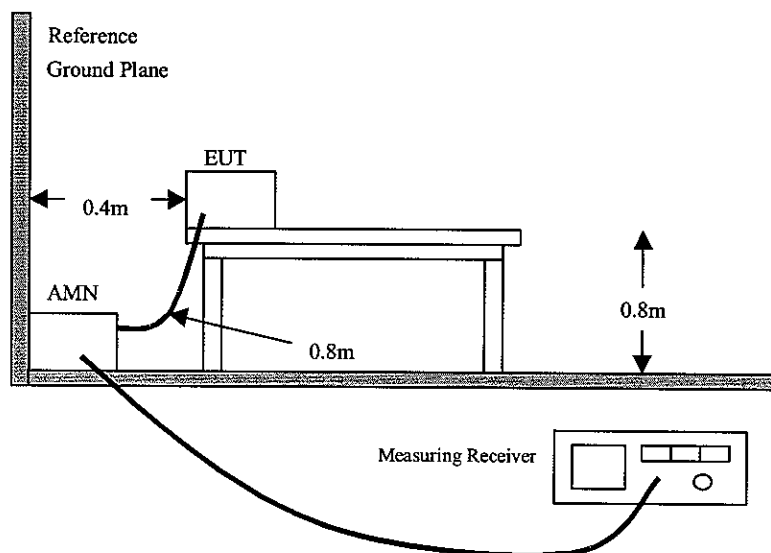
**Limit applicable:** Section Section 15.207

**Port under test:** AC input

**Test equipment:**

Description	Brand Name	Model No.
EMI Test Receiver	Rohde & Schwarz	ESCS 30
Artificial Mains Network (AMN)	Rohde & Schwarz	ESH3-Z5
Pulse Limiter	Rohde & Schwarz	ESH3-Z2
Reference Ground Plane	None	None
Digital Multi-meter	Fluke	Fluke 26 III
Variable transformer	Suzhou	TD2(2)-3kVA
Isolation transformer	Suzhou	ITM – 5000

**Test Set-up:**



**Test method:**

Select the AC mains supply voltage by varying the AC mains voltage over the range of 0.9 to 1.1 times the rated voltage to maximize the level of disturbance voltage measured at about 160 kHz.



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**Test method:**

Perform an initial measurement on each line with peak detectors to identify the frequencies where the maximum disturbances may occur. Then measure and record the maximum disturbances with quasi-peak and average detectors. The reading on the measuring receiver is observed for about 15 s for each measurement; the highest readings shall be recorded with the exception of any isolated spike which shall be ignored.

The final measurements shall be carried out at least at all frequencies at which there is a maximum.

The operational modes under test are determined according to the typical use of the EUT with respect to the expected highest level of emission. During the test, various parts of the EUT system are exercised in a manner permitting detection of all system disturbances

**Results:**

The test is not applicable to the product because it has no AC mains power port (See Section 15.207(c)).

**END of Test Data**



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**The General FCC Requirements  
in Labeling and Instruction Manual  
for Part 15 Devices Subject to  
Verification  
(Informative)**

The following paragraphs provide general information of labeling on most of the devices subjected to verification authorization and requirements of FCC Part 15. The responsible party (i.e. the manufacturer or the importer within the United States) shall refer to the original and updated Rules (e.g. FCC Part 2, and Part 15, etc.) for acquiring information of updated or additional specific requirement for each individual device.

**Device Identification:**

All devices subject to verification are required to have an identification label pursuant to Section 2.954 of the Rules. Additional labeling requirements may be specified in the particular sections of the FCC rules governing the specific class of equipment. The label showing the equipment identification data may be combined with a label showing other information (serial numbers, other governments requirements, etc.), if desired. This unique identifier must be displayed on the device.

**Under NO circumstances shall verified equipment be labeled with a FCC Identifier (FCC ID), or in any manner which implies that such equipment has been approved by the FCC.**

The suggested identification label format for equipment subject to verification is illustrated as shown below:

**Model No. 123  
Company's name or trade name  
Country of origin #**

# Country of origin - U.S. Customs and the Federal Trade Commission regulations require all equipment produced in foreign countries to be marked with the country of origin.



**Label of Compliance Statement:**

Devices subject to FCC Part 15, Subpart B verification must be labeled with the statement(s) pursuant to Section 15.19 (a) of the Rules.

FM broadcast radio receivers or the other receivers associated with the operation of a licensed radio service shall bear the following statement in a conspicuous location on the device:

**This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.**

A stand-alone cable input selector switch for cable TV shall bear the following statement in a conspicuous location on the device:

**This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.**

All other devices shall bear the following statement in a conspicuous location on the device:

**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.**

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 Section 2.925(d) of the FCC Part 2.

**Note:**

"*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.

"*Readily visible*" means that the nameplate or nameplate data must be visible from the outside of the equipment enclosure





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### Information to User

Pursuant to Section 15.21 of the Rules, the users manual or instruction manual shall include the following *or similar* statement to caution the user:

**Caution: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**

Pursuant to Section 15.105 of the Rules, the users manual or instruction manual of **Class A digital devices** shall include the following or similar statement, placed in a prominent location in the text of the manual:

**NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.**

For a **Class B digital device or peripheral**, the user manuals or instructions shall include the following *or similar* statement, placed in a prominent location in the text of the manual:

**NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:**

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The user manual may also be required to include other information for users if the device is subject to the provisions of any specific sections of the Rules. For example:

- TV interface devices marketed as a kit, information for users pursuant to Section 15.25 shall be provided.
- If special accessories, e.g. shielded cables and / or special connectors, are required for enabling the compliance to FCC Rules, they shall be explicitly specified in the user manuals or instructions pursuant to the Section 15.27.

In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.



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**The General FCC Requirements  
in Labeling and Instruction Manual  
for Part 15 Devices Subject to  
Certification  
(Informative)**

The following paragraphs provide general information of labeling on most of the devices subjected to certification authorization and requirements of FCC Part 15. The responsible party (i.e. the manufacturer or the importer within the United States) shall refer to the original and updated Rules (e.g. FCC Part 2, and Part 15, etc.) for acquiring information of updated or additional specific requirement for each individual device.

**Label of Device Identification and Compliance Statement:**

All Part 15 devices subject to certification are required to have a label pursuant to Section 2.925 of the Rules. It shall consist of its FCC Identifier (FCC ID), and also any other statements or labeling requirements imposed by the rules governing the operation of the specific class of equipment, e.g. the compliance statement pursuant to Section 15.19(a). This unique identifier must be displayed on the device. The label format may usually appear as shown below:

**FCC ID XXX123  
Country of origin #**

**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.**

# Country of origin - U.S. Customs and the Federal Trade Commission regulations require all equipment produced in foreign countries to be marked with the country of origin.

Additional labeling requirements may be specified in the particular sections of the FCC rules governing the specific class of equipment. The label showing the equipment identification data may be combined with a label showing other information (serial numbers, other governments requirements, etc.), if desired. This unique identifier must be displayed on the device.

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 Section 2.925(d) of the FCC Part 2.

**Note:**

"*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.

"*Readily visible*" means that the nameplate or nameplate data must be visible from the outside of the equipment enclosure



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## Information to User

Pursuant to Section 15.21 of the Rules, the users manual or instruction manual shall include the following *or similar* statement to caution the user:

**Caution: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**

Pursuant to Section 15.105 of the Rules, the users manual or instruction manual of **Class A digital devices** shall include the following or similar statement, placed in a prominent location in the text of the manual:

**NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.**

For a **Class B digital device or peripheral**, the user manuals or instructions shall include the following *or similar* statement, placed in a prominent location in the text of the manual:

**NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:**

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The user manual may also be required to include other information for users if the device is subject to the provisions of any specific sections of the Rules. For example:

- TV interface devices marketed as a kit, information for users pursuant to Section 15.25 shall be provided.
- If special accessories, e.g. shielded cables and / or special connectors, are required for enabling the compliance to FCC Rules, they shall be explicitly specified in the user manuals or instructions pursuant to the Section 15.27.

In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

**END**