

**Polk's Model Craft Hobbies, Inc.**

Application  
For  
Certification  
**(FCC ID: TGL-ART-84100-RX)**

Superheterodyne Receiver

Sample Description : Live Steam 282 Loco  
Model : ART-84100

0511672  
WL/at  
October 19, 2005

- The test results reported in this report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
- This report shall not be reproduced except in full without prior authorization from Intertek Testing Services Hong Kong Limited
- The evaluation data of the report will be kept for 3 years from the date of issuance.

FCC ID : TGL-ART-84100-RX

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## INTERTEK TESTING SERVICES

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### LIST OF EXHIBITS

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**October 19, 2005**

Report prepared by:	Wilbur Ng Intertek Testing Services 2/F., Garment Center, 576, Castle Peak Road, HONG KONG Phone: 852-2173-8502 Fax: 852-2742-9149
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### List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.pdf
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated photos.doc
Test Setup Photo	Conducted Emission	conducted photos.doc
Test Report	Conducted Emission Test Result	conducted.pdf
External Photo	External Photo	external photos.doc
Internal Photo	Internal Photo	internal photos.doc
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf

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## **EXHIBIT 1**

### **GENERAL DESCRIPTION**

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### 1.0 **General Description**

#### 1.1 Product Description

The equipment under test (EUT) is a receiver for a RC Locomotive operating at 49.860 MHz which is controlled by a crystal. The EUT is powered by a 7.2V rechargeable battery pack. The EUT has a charge-operation-ignition switch, a remote-manual switch, an encoder switch and 9 buttons. Before to start up the locomotive, the user requires to charge up the battery inside the locomotive. To charge up the battery, switch the charge-operation-ignition switch to charge position and connect with the corresponding battery charger (input 120V AC to output 12V DC 1200mA). The LED indicator will light up in orange color and goes out after charging complete. After charging, the user can test the function of the locomotive manually. To do the manual mode testing, the user requires to switch the charge-operation-ignition switch to operation position and the remote-manual switch to manual position. The user can press the whistle, bell and sound buttons to hear the sound effect, press the front light button to switch ON and OFF the headlights, and press the slow, fast, forward and reverse buttons to test the direction arms and speed control levers on the locomotive. When the functional test is complete, the user can fill water and fuel into the locomotive. To ignite the boiler in the locomotive, switch the charge-operation-ignition position and press the ignition button. After that the user can switch the charge-operation-ignition switch to operation position and the remote-manual switch to remote position. The locomotive is ready to run. The user can use the controller to control the motion of the locomotive and generate sound effect when running. The encoder switch is used to select the communication code with the controller. Totally 64 different code settings are available for the user. The locomotive can only be controlled by the controller when the setting of both of the encoder switches on the locomotive and controller are the same.

The brief circuit description is saved with filename: descri.pdf

#### 1.2 Related Submittal(s) Grants

This is a single application for certification of a receiver. The transmitter for this receiver is authorized by Certification procedure with FCC ID: TGL-ART-84100-TX.

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### 1.3 Test Methodology

The radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the emission data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.



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## **EXHIBIT 2**

### **SYSTEM TEST CONFIGURATION**

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### 2.0 **System Test Configuration**

#### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The EUT was powered by a fully charged 7.2V rechargeable batter pack during test.

This battery was charged when the EUT connected with the battery charger (input 120V AC to output 12V DC 1200mA) and plugged in the AC mains.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on the turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

#### 2.2 EUT Exercising Software

There was no special software to exercise the device.

#### 2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

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### 2.4 Equipment Modification

Any modifications installed previous to testing by Polk's Model Craft Hobbies, Inc. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

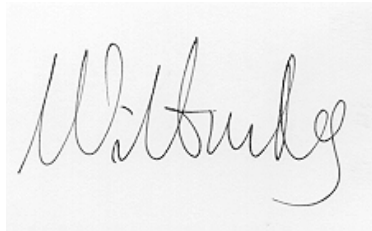
### 2.5 Support Equipment List and Description

This product was tested in a standalone configuration.

All the items listed under section 2.0 of this report are

*Confirmed by:*

*Wilbur Ng  
Manager  
Intertek Testing Services  
Agent for Polk's Model Craft Hobbies, Inc.*



\_\_\_\_\_  
Signature

October 19, 2005 \_\_\_\_\_  
Date

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**EXHIBIT 3**

**EMISSION RESULTS**

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### 3.0 **Emission Results**

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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### 3.1 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 $\mu$ V/m

RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

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 $\mu$ V/m

RR = RA - AG in dB $\mu$ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

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

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

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

$$FS = RR + LF$$

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

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

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

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

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### 3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

49.405 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos.doc

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### 3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 6.0 dB

#### **TEST PERSONNEL:**



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*Signature*

Gary K. M. Li, Compliance Engineer  
*Typed/Printed Name*

October 19, 2005  
*Date*



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## INTERTEK TESTING SERVICES

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Company: Polk's Model Craft Hobbies, Inc.

Date of Test: June 13, 2005

Model: ART-84100

Mode: RX

Sample: 1/1

Table 1

### Radiated Emissions

Polarization	Frequency (MHz)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	49.405	34.0	40.0	-6.0
H	98.823	29.7	43.5	-13.8
H	148.239	28.8	43.5	-14.7
H	197.652	27.6	43.5	-15.9
H	247.065	27.0	46.0	-19.0
H	296.478	26.5	46.0	-19.5

Notes: 1. Negative sign in the column shows value below limit.

2. Peak Detector Data unless otherwise stated.

3. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

Test Engineer: Gary K. M. Li

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## INTERTEK TESTING SERVICES

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Company: Polk's Model Craft Hobbies, Inc.

Date of Test: June 13, 2005

Model: ART-84100

Mode: Charging Battery

Sample: 1/1

Table 2

### Radiated Emissions

Polarization	Frequency (MHz)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	34.175	26.6	40.0	-13.4
V	36.103	27.4	40.0	-12.6
V	43.115	27.8	40.0	-12.2
V	45.506	28.0	40.0	-12.0
V	52.017	26.7	40.0	-13.3
V	57.032	26.0	40.0	-14.0

- Notes:
1. Negative sign in the column shows value below limit.
  2. Peak Detector Data unless otherwise stated.
  3. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

Test Engineer: Gary K. M. Li

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## INTERTEK TESTING SERVICES

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Company: Polk's Model Craft Hobbies, Inc.

Date of Test: June 13, 2005

Model: ART-84100

Mode: Sound

Sample: 1/1

Table 3

### Radiated Emissions

Polarization	Frequency (MHz)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	32.165	26.8	40.0	-13.2
V	35.930	27.3	40.0	-12.7
V	43.037	26.9	40.0	-13.1
V	45.805	27.5	40.0	-12.5
V	56.037	26.3	40.0	-13.7
V	58.020	26.0	40.0	-14.0
V	70.110	26.1	40.0	-13.9

- Notes:
1. Negative sign in the column shows value below limit.
  2. Peak Detector Data unless otherwise stated.
  3. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

Test Engineer: Gary K. M. Li

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### 3.4 Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration  
at  
0.15 MHz (QP)

For electronic filing, the worst case line-conducted configuration photograph are saved with filename: conducted photos.doc.

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### 3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgement: Passed by 20.8 dB (QP)

#### **TEST PERSONNEL:**



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*Signature*

Gary K. M. Li, Compliance Engineer  
*Typed/Printed Name*

October 19, 2005  
*Date*

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**EXHIBIT 4**

**EQUIPMENT PHOTOGRAPHS**

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### 4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename:  
external photos.doc and internal photos.doc

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## **EXHIBIT 5**

### **PRODUCT LABELLING**



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### 5.0 **Product Labelling**

For electronic filing, the FCC ID label artwork and the label location are saved with filename: label.pdf

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**EXHIBIT 6**

**TECHNICAL SPECIFICATIONS**

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### 6.0 **Technical Specifications**

For electronic filing, the block diagram and schematics are saved with filename: block.pdf and circuit.pdf respectively.

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**EXHIBIT 7**

**INSTRUCTION MANUAL**

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### 7.0 **Instruction Manual**

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf

This manual will be provided to the end-user with each unit sold/leased in the United States.

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**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

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### 8.0 Miscellaneous Information

This miscellaneous information includes details of the test procedure.

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### 8.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of superheterodyne receivers operating under the Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003. The local oscillator of the superheterodyne receiver is stabilized prior to measurement by generating a typical or an unmodulated CW Signal at the operating frequency of the receiver. The signal is usually generated as CW with a Marconi 2022D signal generator and a short whip antenna and is at a level of several hundred to several thousand mV/m. If a modulated signal is used, it will be noted.

The equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the groundplane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings.

The frequency range scanned is from 30 MHz to 1000 MHz.



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### **8.1 Emissions Test Procedures (cont)**

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Measurements are normally conducted at a measurement distance of three meters. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

1. When determining the test result, the Measurement Uncertainty of the test has been considered.
2. This test report is issued to the Company indicated based on the request of the Applicant of the product mentioned in this report.