

**Bondrich Development Limited**

Application  
For  
Certification  
**(FCC ID: OVWXH9-RX)**

Superheterodyne Receiver

WO# 0102206  
WL/at Ann Choy  
March 13, 2001

- The test results reported in this test 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.
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# INTERTEK TESTING SERVICES

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## LIST OF EXHIBITS

### *INTRODUCTION*

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## MEASUREMENT/TECHNICAL REPORT

**Bondrich Development Limited**  
**MODEL: Xh Remote Controller Xh<sup>9</sup> 9 Station Indoor Model**  
**FCC ID: OVWXH9-RX**

This report concerns (check one):      Original Grant       Class II Change

Equipment Type: Superregenerative Receiver (example: computer, printer, modem, etc.)

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grant requested per 47 CFR 0.457(d)(1)(ii)?      Yes       No       Deferred

If yes, defer until: \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

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Transition Rules Request per 15.37?      Yes       No

If no, assumed Part 15, Subpart B for unintentional radiator - the new 47 CFR [10-1-96 Edition] provision.

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Report prepared by:

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## List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.doc
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated1.jpg to radiated2.jpg
External Photo	External Photo	ophoto1.jpg to ophoto2.jpg
Internal Photo	Internal Photo	iphoto1.jpg to iphoto6.jpg
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
Test Report	Conducted Emission	conduct.pdf
Test Setup Photo	Conducted Emission	conduct1.jpg to conduct3.jpg

**EXHIBIT 1**

**GENERAL DESCRIPTION**

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## 1.0 General Description 1.0 General Description

### 1.1 Product Description 1.1 Product Description

The Equipment Under Test (EUT) is a receiver operating at 315MHz. The EUT is powered by AC 120V 60Hz input, 24VAC 750mA output adaptor. It is a base unit of the RF Water Timer. In order for the transmitter and receiver to recognize each other, the base unit must be addressed before use. After programming, it can control the valves open and close on the specific timing. It can operate the valves from the remote controller with the station selection matched. The number of the stations is 9.

For electronic filing, the brief circuit description is saved with filename: descri.pdf

### 1.2 Related Submittal(s) Grants 1.2 Related Submittal(s) Grants

This is an application for Certification of a receiver.

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### 1.3 Test Methodology 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. 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 1.4 Test Facility

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

**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

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### 2.0 System Test Configuration 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 (1992).

The device was powered from AC 120V 60Hz input, 24VAC 750mA output adaptor.

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. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

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

#### 2.2 EUT Exercising 2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it receives continuously.

#### 2.3 Special Accessories

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

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### 2.4 Equipment Modification 2.4 Equipment Modification

Any modifications installed previous to testing by Bondrich Development Limited 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 standalone configuration.

All the items listed under section 2.0 of this report are

*Confirmed by:*

*Wilson Loke  
Manager  
Intertek Testing Services Hong Kong Ltd.  
Agent for Bondrich Development Limited*



Signature

March 13, 2001 Date

**EXHIBIT 3**

**EMISSION RESULTS**

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### 3.0 Emission Results 3.0 Emission Results

Data is included of the 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 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.

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

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

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

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

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

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

$$FS = RR + LF$$

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

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

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3.2 Radiated Emission Configuration Photograph  
3.2 Radiated Emission Configuration Photograph  
Worst Case Radiated Emission  
at  
293.600 MHz

For electronic filing, the front view and back view of the test configuration photographs are saved with filename: radiated1.jpg and radiated2.jpg respectively.

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### 3.3 Radiated Emission Data 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 3.0 dB

#### **TEST PERSONNEL:**



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*Signature*

Ben W. K. Ho, Compliance Engineer  
*Typed/Printed Name*

March 13, 2001  
Date

# INTERTEK TESTING SERVICES

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Company: Bondrich Development Limited  
 Model: Xh Remote Controller Xh<sup>9</sup> 9 Station Indoor Model

Date of Test: March 7, 2001

**Table 1**

## FCC Class B Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB $\mu$ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	73.400	38.6	7.1	16	29.7	40.0	-10.3
H	146.800	34.2	11.6	16	29.8	43.5	-13.7
H	220.200	44.4	11.8	16	40.2	46.0	-5.8
V	293.600	45.7	13.3	16	43.0	46.0	-3.0
H	367.001	41.6	14.9	16	40.5	46.0	-5.5
V	440.400	33.1	16.3	16	33.4	46.0	-12.6
V	513.800	29.9	18.0	16	31.9	46.0	-14.1
V	587.200	26.7	18.6	16	29.3	46.0	-16.7
H	660.600	25.0	19.6	16	28.6	46.0	-17.4
H	734.001	29.3	21.6	16	34.9	46.0	-11.1
H	807.400	22.3	21.3	16	27.6	46.0	-18.4
H	880.800	23.0	22.4	16	29.4	46.0	-16.6
H	954.200	23.5	23.2	16	30.7	46.0	-15.3
V	1174.426	44.0	24.2	34	34.2	54.0	-19.8
H	1247.826	42.1	24.2	34	32.3	54.0	-21.7
H	1541.426	42.2	26.5	34	34.7	54.0	-19.3

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances 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.

3. Negative sign in the column shows value below limit.

4. Horn antenna and average detector are used for the emission over 1000MHz.

\* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: Ben W. K. Ho

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### **3.4 Line Conducted Configuration Photograph**

#### **Worst Case Line-Conducted Configuration**

For electronic filing, the worst case line-conducted configuration photograph are saved with filename: conduct1.jpg , conduct 2.jpg and conduct3.jpg respectively.

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### 3.5 Line Conducted Emission Configuration Data

Passed by more than 20 dB margin

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

#### **TEST PERSONNEL:**



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*Signature*

Ben W. K. Ho, Compliance Engineer  
*Typed/Printed Name*

March 13, 2001

*Date*

**EXHIBIT 4**

**EQUIPMENT PHOTOGRAPHS**

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### 4.0 Equipment Photographs 4.0 Equipment Photographs

For electronic filing, photographs of the tested EUT are saved with filename: ophoto1.jpg, ophoto2.jpg for external photo, and iphoto1.jpg to iphoto6.jpg for internal photo.

**EXHIBIT 5**

**PRODUCT LABELLING**

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### 5.0 **Product Labelling**

### 5.0 **Product Labelling**

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

**EXHIBIT 6**

**TECHNICAL SPECIFICATIONS**

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### 6.0 Technical Specifications 6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

**EXHIBIT 7**

**INSTRUCTION MANUAL**

## INTERTEK TESTING SERVICES

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### 7.0 Instruction Manual 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.

**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

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### 8.0 Miscellaneous Information 8.0 Miscellaneous Information

This miscellaneous information includes the test procedure and calculation of factors such as pulse desensitization and averaging factor.

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### 8.1 Discussion of Pulse Desensitization 8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

This device is a superheterodyne receiver. The stabilized signals are continuous, and no desensitization of the measurement equipment occurs.

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### 8.2 Calculation of Average Factor 8.3 Calculation of Average Factor

The emission limits are specified using spectrum analyzers or receivers which incorporate quasi-peak detectors. Typical measurements are made using peak detectors, however, emissions which approach the respective emission limit are measured using a quasi-peak detector.

For measurements above 1 GHz, spectrum analyzers or receivers using average detectors are employed, or the appropriate average factor can be applied.

Measurements using spectrum analyzers with filters other than peak detectors are recorded in the data table section of this report.

This device is a superheterodyne receiver.

It is not necessary to apply average factor to the measurement results.

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### 8.3 Emissions Test Procedures 8.4 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 - 1992. Superheterodyne receivers are stabilized prior to measurement by generating a signal well above the receiver threshold whose frequency is tuned until the emissions stabilize into a line spectrum. 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. Plots of the stabilized signal will be shown. 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 EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. 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. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 kHz to 30 MHz.

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### 8.3 Emissions Test Procedures (cont'd)

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 - 1992.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). 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.