

Techcorp Ltd.

Application
For
Certification

RF Wireless Controller (Controller Unit)

(FCC ID: SGFJS110BT1)

04073821
TL/ Sandy Lee
October 13, 2004

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LIST OF EXHIBITS

INTRODUCTION

<i>EXHIBIT 1:</i>	Summary of Tests
<i>EXHIBIT 2:</i>	General Description
<i>EXHIBIT 3:</i>	System Test Configuration
<i>EXHIBIT 4:</i>	Measurement Results
<i>EXHIBIT 5:</i>	Equipment Photographs
<i>EXHIBIT 6:</i>	Product Labelling
<i>EXHIBIT 7:</i>	Technical Specifications
<i>EXHIBIT 8:</i>	Instruction Manual

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MEASUREMENT/TECHNICAL REPORT

Techcorp Ltd. - MODEL: JOYTECH JS110BT1

FCC ID: SGFJS110BT1

October 13, 2004

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

Equipment Type: DSS, Part 15 Spread Spectrum Transmitter

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

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.

Transition Rules Request per 15.37? Yes _____ No ☒

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [12-08-03
Edition] provision.

Report prepared by:

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Table of Contents

1.0	<u>Summary of test results</u>	2
2.0	<u>General Description</u>	4
2.1	Product Description	4
2.2	Related Submittal(s) Grants	5
2.3	Test Methodology	5
2.4	Test Facility	5
3.0	<u>System Test Configuration</u>	7
3.1	Justification	7
3.2	EUT Exercising Software	7
3.3	Support Equipment List and Description	8
3.4	Equipment Modification	9
4.0	<u>Measurement Results</u>	11
4.1	Maximum Conducted Output Power at Antenna Terminals	11
4.2	Minimum 6dB RF Bandwidth	12
4.3	Maximum Power Density	13
4.4	Out of Band Conducted Emissions	14
4.5	Out of Band Radiated Emissions	15
4.6	Transmitter Radiated Emissions in Restricted Bands	15
4.7	Field Strength Calculation	16
4.8	Radiated Emission Configuration Photograph	17
4.9	Radiated Emission Data	18
4.10	AC Line Conducted Emission	20
4.11	Radiated Emission from Digital Section of Transceiver	21
4.12	Transmitter Duty Cycle Calculation and Measurements	23
5.0	<u>Equipment Photographs</u>	25
6.0	<u>Product Labelling</u>	27
7.0	<u>Technical Specifications</u>	29
8.0	<u>Instruction Manual</u>	31

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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 Report	6 dB Bandwidth Plot	h6dB.pdf
Test Report	Maximum Power Density Plot	hpowden.pdf
Test Report	Out Band Antenna Conducted Emission Plot	hobantcon.pdf
Test Report	Duty Cycle Calculation and Measurement	hdcc.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
RF Exposure Info	RF Safety	RF exposure info.pdf

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EXHIBIT 1

SUMMARY OF TEST RESULTS

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1.0 Summary of Test

Techcorp Ltd. - MODEL: JOYTECH JS110BT1
FCC ID: SGFJS110BT1

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(d)	Pass
Out of Band Antenna Conducted Emission	15.247(c)	Pass
Radiated Emission in Restricted Bands	15.247(c)	Pass
AC Conducted Emission	15.207	Not Applicable
Radiated Emission from Digital Part	15.109	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses a permanently attached antenna, which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

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EXHIBIT 2

GENERAL DESCRIPTION

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2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a 2.4GHz Direct Sequence Spread Spectrum Transmitter operating at 2440.480MHz. The EUT is powered by 4.5V d.c. (3 x 1.5V "AAA" battery). It is a hand-held unit (so called controller unit) which is part of the RF wireless controller system for Xbox. It works with the base unit (so called receiver module) to perform wireless keypad function when the ID setting of both units is the same.

During normal use, it transmits "connect data" to the base unit so as to establish connection with the base unit. In return, it will receive "ACK data" to confirm connection. Also, it transmits "key data" to the base unit and the game activities will be according to the key commands. If it receives "motor data" from the base unit, the motor inside the EUT will run and the EUT will vibrate.

Antenna type: Internal, Integral

The circuit description is saved with filename: descri.pdf

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2.2 Related Submittal(s) Grants

This is an application for Certification of a DSS-Part 15 Spread Spectrum Transmitter. The receiver portion associated with this transmitter is exempted from technical requirement of this Part.

The base unit associated with this EUT has FCC ID: SGFJS110BR1 and will be filed at the same time.

2.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2001). 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 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 fully placed on file with the FCC.

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EXHIBIT 3

SYSTEM TEST CONFIGURATION

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3.0 System Test Configuration

3.1 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). It was powered by 3 x new 1.5V "AAA" battery. To set the EUT for continuous transmission, 500kbit/s signal, which was generated from the functional generator, was fed into the data pin of the RF module.

For the measurements, the EUT is attached to a plastic stand if necessary and placed on the wooden turntable. The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1MHz or greater for frequencies above 1000MHz.

Radiated emission measurement was performed from the lowest radio frequency signal generated in the device which is greater than 9kHz to 25GHz.

3.2 EUT Exercising Software

There was no special software to exercise the device. Once the button is depressed, the unit transmits the typical signal. For simplicity of testing, the unit was set to transmit continuously.

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3.3 Support Equipment List and Description

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system (included inserted cards, which have grants) are:

HARDWARE:

The unit was operated standalone.

CABLES:

- (1) Signal Cable with BNC connector and crocodile clips (1.0m, unshielded)

OTHERS:

- (1) Functional generator

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3.4 Equipment Modification

Any modifications installed previous to testing by Techcorp Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by ETL SEMKO Division, Intertek Testing Services Hong Kong Ltd.

All the items listed under section 3.0 of this report are confirmed by:

Confirmed by:

*Tommy Leung
Supervisor
Intertek Testing Services Hong Kong Ltd.
Agent for Techcorp Ltd.*



Signature

October 13, 2004 Date

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EXHIBIT 4

MEASUREMENT RESULTS

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b) :

- ☒ The antenna port of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.
- ☐ The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW >6dB bandwidth and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).

For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6) dBm.

Max. Antenna Gain = -15.9 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
2440.480	5.0	3.2

Cable loss : 0.5 dB External Attenuation : 0 dB

Cable loss, external attenuation: ☐ included in OFFSET function
☒ added to power meter raw reading

EUT Transmit Antenna Gain (dBi) + dBm max. output level = -10.9 dBm (30 dBm or less)

For RF safety, the information is saved with filename: RF exposure info.pdf.

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	6 dB Bandwidth (MHz)
2440.480	12.24

Refer to the following plots for 6 dB bandwidth data:

Plot H2: 6 dB RF Bandwidth

Limit: at least 500kHz

For electronic filing, the above plots are saved with filename: h6dB.pdf.

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.3 Maximum Power Density Reading, FCC Rule 15.247(d) :

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth.

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Frequency (MHz)	Power Density (dBm)
2440.480	-16.22

Frequency Span = 2.4 MHz

Sweep Time = Frequency Span/ 3 kHz = 800 seconds

Cable Loss: 0.5 dB

Limit: 8 dBm

Refer to the following plots for power density data :

Plot H3: Power density

For electronic filing, the above plots are saved with filename: hpowden.pdf.

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(c):

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the following plots for out of band conducted emissions data:

Plot H4a.1 - H4a.3: Modulation Products Emissions
Plot H4d.1 - H4d.2: Out of Band Emissions

The plots showed the 2nd harmonic and modulation products at the band edges of 2400 MHz and 2483.5 MHz. In addition, all spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

For the electronic filing, the above plots are saved with filename: hobantcon.pdf.

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 26dB below carrier), FCC Rule 15.247(c):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

- ☐ Not required
- ☒ See attached data sheet

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

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. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

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4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

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

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

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

Example

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

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

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

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

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

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

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4.8 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
at
976.372 MHz

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

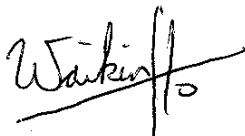
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4.9 Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Judgment: Passed by 8.5 dB

TEST PERSONNEL:



Tester Signature

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

October 13, 2004
Date

INTERTEK TESTING SERVICES

Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Average Factor (-dB)	Peak at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
H	976.372	29.6	16	23.9	37.5	0	37.5	46.0	-8.5
H	1464.558	48.2	34	24.2	38.4	0	38.4	74.0	-35.6
H	3905.488	54.7	34	33.3	54.0	0	54.0	74.0	-20.0
H	4393.612	52.7	34	34.8	53.5	0	53.5	74.0	-20.5
H	4881.860	63.1	34	34.0	63.1	0	63.1	74.0	-10.9
H	5370.050	54.1	34	35.2	55.3	0	55.3	74.0	-18.7
H	7322.790	40.0	34	37.0	43.0	0	43.0	74.0	-31.0

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Average Factor (-dB)	Average at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
H	976.372	29.6	16	23.9	37.5	28.6	8.9	46.0	-37.1
H	1464.558	48.2	34	24.2	38.4	28.6	9.8	54.0	-44.2
H	3905.488	54.7	34	33.3	54.0	28.6	25.4	54.0	-28.6
H	4393.612	52.7	34	34.8	53.5	28.6	24.9	54.0	-29.1
H	4881.860	63.1	34	34.0	63.1	28.6	34.5	54.0	-19.5
H	5370.050	54.1	34	35.2	55.3	28.6	26.7	54.0	-27.3
H	7322.790	40.0	34	37.0	43.0	28.6	14.4	54.0	-39.6

- NOTES
1. All measurements were made at 3 meters. 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.
 2. Negative value in the margin column shows emission below limit.
 3. Horn antenna was used for the emissions over 1000MHz.

Test Engineer: Ben W. K. Ho

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.10 AC Line Conducted Emission, FCC Rule 15.207:

☒ Not required; battery operation only

☐ Test data attached

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.11 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Ref:
15.109

☐ Not required - No digital part

☒ Test results are attached

☐ Included in the separated DOC report.

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Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

Table 2

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	32.874	28.2	16	11.6	23.8	40.0	-16.2
V	37.137	29.1	16	11.2	24.3	40.0	-15.7
V	43.509	29.1	16	11.7	24.8	40.0	-15.2
V	46.124	29.5	16	11.9	25.4	40.0	-14.6
V	54.812	30.6	16	11.7	26.3	40.0	-13.7
V	57.338	31.0	16	11.0	26.0	40.0	-14.0

- NOTES: 1. Quasi-peak detector is used for the emission below or equal to 1000MHz.
2. All measurements were made at 3 meters. 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.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna and average detector are used for the emission over 1000MHz.

Test Engineer: Ben W. K. Ho

INTERTEK TESTING SERVICES

Applicant: Techcorp Ltd.
Model: JOYTECH JS110BT1

Date of Test: September 14, 2004

4.12 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

$$\begin{aligned}\text{Duty Cycle} &= \text{Maximum ON time} / \text{duration} \\ &= 0.588\text{ms} / 16\text{ms}\end{aligned}$$

$$\begin{aligned}\text{Duty Cycle correction, dB} &= 20 \cdot \log (\text{Duty Cycle}) \\ &= 20 \cdot \log (0.037) \\ &= -28.6 \text{ dB}\end{aligned}$$

	See attached spectrum analyzer chart (s) for transmitter timing Plot H5a.1-H5a.3
X	See transmitter timing diagram provided by manufacturer
	Not applicable, duty cycle was not used.

For electronic filing, the above plots are saved with filename: hdcc.pdf

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EXHIBIT 5

EQUIPMENT PHOTOGRAPHS

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5.0 Equipment Photographs

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

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EXHIBIT 6

PRODUCT LABELLING

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6.0 **Product Labelling**

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

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EXHIBIT 7

TECHNICAL SPECIFICATIONS

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7.0 Technical Specifications

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

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EXHIBIT 8

INSTRUCTION MANUAL

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8.0 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.