

TEST REPORT

Report Number: 100468650DAL-005a

Project Number: G100468650

Report Issue Date: 7/30/12

Product Designation: 433.92 MHz Keyfob Remote Control
Model: 125A00-2

Standards: 47 CFR Part 15, Subpart C (15.231 - Periodic operation in the band
40.66-40.70 MHz and above 70 MHz)
RSS-210, Issue 8, 2010

Tested by:
Intertek Testing Services NA, Inc.
1809 10th St.
Plano TX 75074

Client:
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New Orleans, LA 70129

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TABLE OF CONTENTS (OPTIONAL)

1	<i>Introduction and Conclusion.....</i>	3
2	<i>Test Summary</i>	3
3	<i>Description of Equipment Under Test</i>	4
4	<i>System setup including cable interconnection details, support equipment and simplified block diagram</i>	5
5	<i>Duty Cycle Determination (FCC 15A - 15.35(c)).....</i>	6
6	<i>Radiated emissions (E-field) for low power intentional radiators.....</i>	10
7	<i>Bandwidth Requirements (FCC 15C - 15.231(c)).....</i>	17
8	<i>Conducted emissions on AC power lines</i>	19
9	<i>Restrictions (FCC 15C - 15.231(a))</i>	19
10	<i>Revision History.....</i>	22

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard indicated. The results obtained in this test report pertain only to the item tested.

2 Test Summary

Section	Test full name	Test date	Result
3	Description of Equipment Under Test		
4	System setup including cable interconnection details, support equipment and simplified block diagram		
5	Duty Cycle Determination (FCC 15A - 15.35(c))	07/11/12	Pass
6	Radiated emissions (E-field) for low power intentional radiators	05/16/12	Pass
7	Bandwidth Requirements (FCC 15C - 15.231(c))	07/11/12	Pass
8	Conducted Emissions testing is not required as EUT is battery powered.	N/A	N/A
9	Restrictions (FCC 15C - 15.231(a))	05/16/12	Pass
10	10 Revision History	---	---

3 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Keyfob Remote Control	Home Automation Inc	125A00-2	06006404

Receive Date:	4/25/12
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)

EUT is a Low Power Wireless transceiver that transmits a 433.92 MHz signal to the Omni-Bus Control system and allows a home owner to adjust various applications around their home (i.e. lights, security system, etc.)

Transmitter Overview:

FCC Identifier	HHC-125A00-2
IC Identifier	1516A-125A002
Frequency Range	433.92MHz
Modulation	ASK - OOK
Antenna type (15.203)	integrated

Equipment Under Test Power Configuration

Rated Voltage	Rated Current	Rated Frequency	Number of Phases
12V Battery-powered	N/A	N/A	N/A

Operating modes of the EUT:

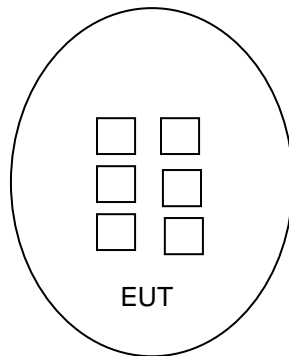
No.	Descriptions of EUT Exercising
1	For Radiated emissions testing, EUT was Transmitting continuously @ 433.9MHz. The EUT was pretested on all 3 axis. The axis used in final test was determined by pretesting to be the worst-case.
2	For Bandwidth testing, EUT was Transmitting @ 433.9MHz every 10 seconds.

4 System setup including cable interconnection details, support equipment and simplified block diagram

4.1 Method:

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

4.2 EUT Block Diagram:



4.3 Data:

ID	Description	Length	Shielding	Ferrites
	None			

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5 Duty Cycle Determination (FCC 15A - 15.35(c))

5.1 Method:

From 47 CFR Part 15, Subpart A (15.35(c)) and RSS-GEN Section 4.5

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Determine the period of the pulse train, T, in mSec and record the results. T is defined as the time from the beginning of one pulse train to the beginning of the next pulse train.

Count the number of different types of pulses, N and record the results.

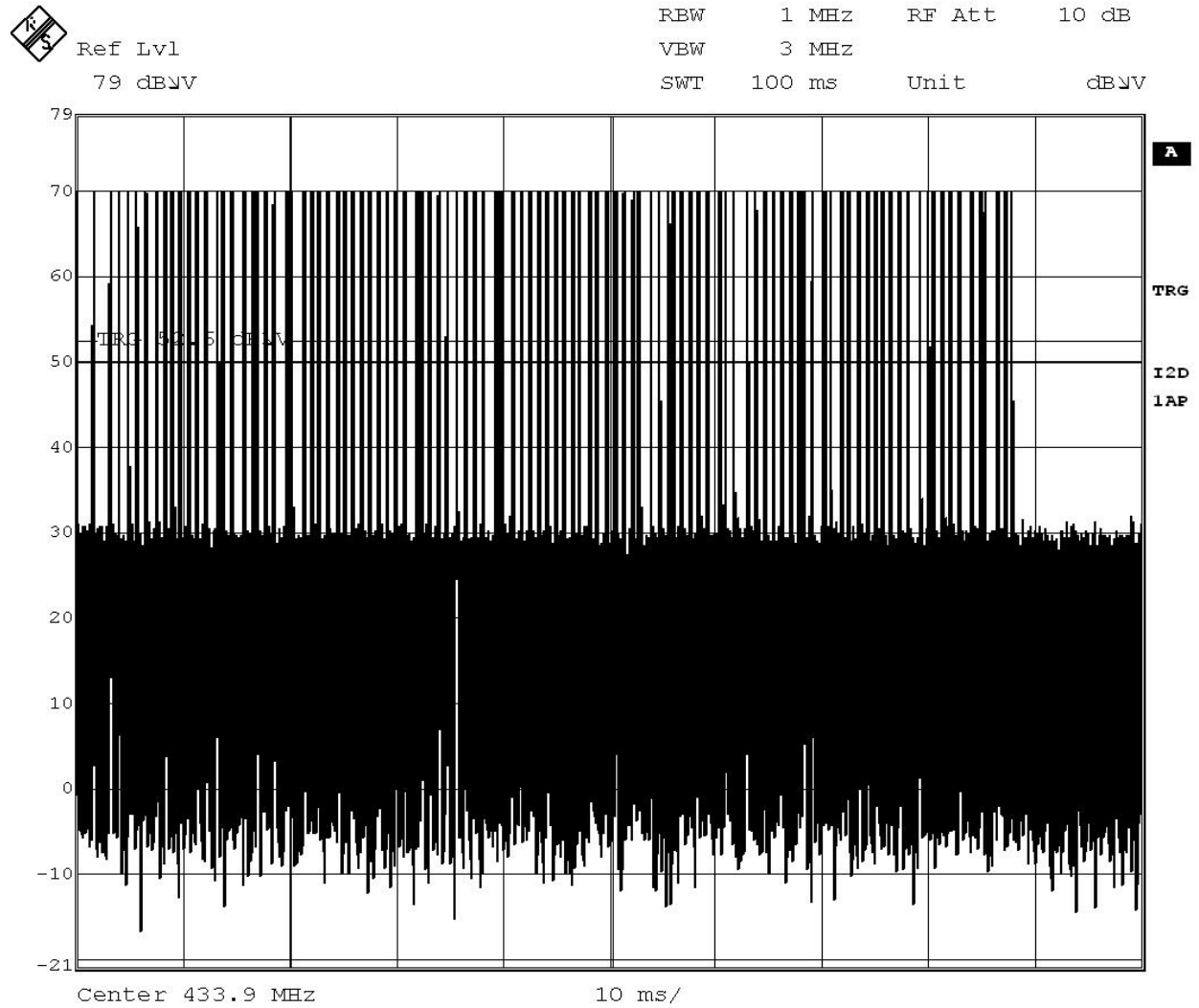
For each of the different types of pulses, count the number of occurrences within one pulse train.

Use the Duty Cycle Correction Factor, DCCF, from the results table and use it to adjust the field strength measurements recorded for radiated emissions.

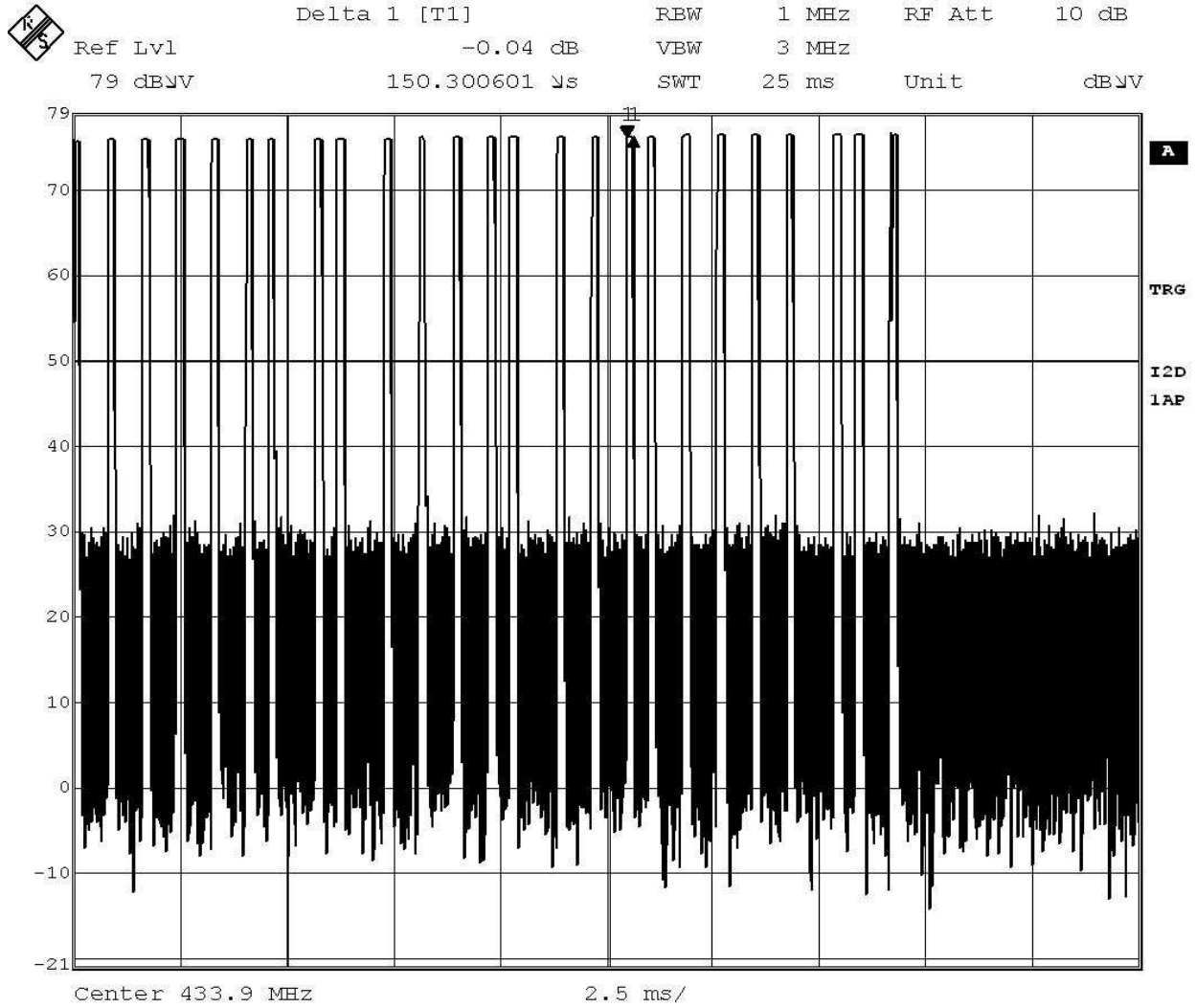
5.2 Test Equipment Used:

Asset ID	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due
77	EMI Reciever	R & S	ESI	100044	04/05/12	04/05/13
974	RF Cable	MegaPhase	Custom	11111301001	09/14/12	09/14/13
975	RF Cable	MegaPhase	Custom	11111301002	09/14/12	09/14/13

5.3 Plots:



88 ms Pulse Train



0.15ms Pulse Width

5.4 Data:

Duration of Pulse Train, T (mSec): 88
 Averaging Interval, A_I (mSec): 88
 Number of different Pulses, N: 1

	Number (#P _x)	Pulse Width, mSec (PW _x)	Product (#P _x)*(PW _x)
Pulse Width 1	107	0.15	16.05
Pulse Width 2			
Pulse Width 3			
Pulse Width 4			
Pulse Width 5			
Pulse Width 6			
Pulse Width 7			
Pulse Width 8			
Pulse Width 9			
Pulse Width 10			

Duty Cycle: 0.182386364
 Duty Cycle Correction Factor, dB: -14.8

$$T_{on} = (PW_1 * \#P_1) + (PW_2 * \#P_2) + \dots + (PW_n * \#P_n)$$

$$DutyCycle = T_{on} \div A_I$$

$$DCCF = 20 * \log_{10}(DutyCycle)$$

6 Radiated emissions (E-field) for low power intentional radiators

6.1 Method

The test method and equipment setup for radiated emissions tests shall follow the guidelines of ANSI C63.4:2003.

Measurements below 1 GHz shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

Bandwidths:

30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW

Above 1000 MHz: 1 MHz RBW and 3 MHz VBW

Detectors:

Equal to or less than 1000 MHz: CISPR quasi-peak detector (alternative: peak detector)

Above 1000 MHz: Average detector (applies to average limit)

Above 1000 MHz: Peak detector (applies to peak limit)

Limits:

Equal to or less than 1000 MHz, the limits are specified as quasi-peak. If a peak detector is used, the limit does not change. Above 1000 MHz, the limits are specified as average. The peak limit is 20 dB above the average limit. Both peak and average measurements are required to be reported.

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequency range of radiated measurements

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 frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

Measurement antenna requirements:

Below 30 MHz - Loop antenna

30 to 1000 MHz - Biconical, Log Periodic, or equivalent

Above 1000 MHz - Horn or equivalent

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission levels. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency. The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is handheld, it shall be oriented in each of its orthogonal axes.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of nonconductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

TEST SITE

The test site for radiated emissions consists of a 3 meter semi-anechoic chamber and is located at Intertek 1809 10th St. Plano TX 75075

6.2 Test Equipment Used:

Asset ID	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due
77	EMI Reciever	R & S	ESI	100044	04/05/12	04/05/13
82	Bilog Antenna	Chase	CBL6112A	2228	08/10/11	08/10/12
271	Horn Antenna	AH Systems	SAS-571	787	04/12/12	04/12/13
222	PreAmp	Miteq	AMF-4D	1020106	10/06/11	10/06/12
974	RF Cable	MegaPhase	Custom	11111301001	09/14/12	09/14/13
975	RF Cable	MegaPhase	Custom	11111301002	09/14/12	09/14/13

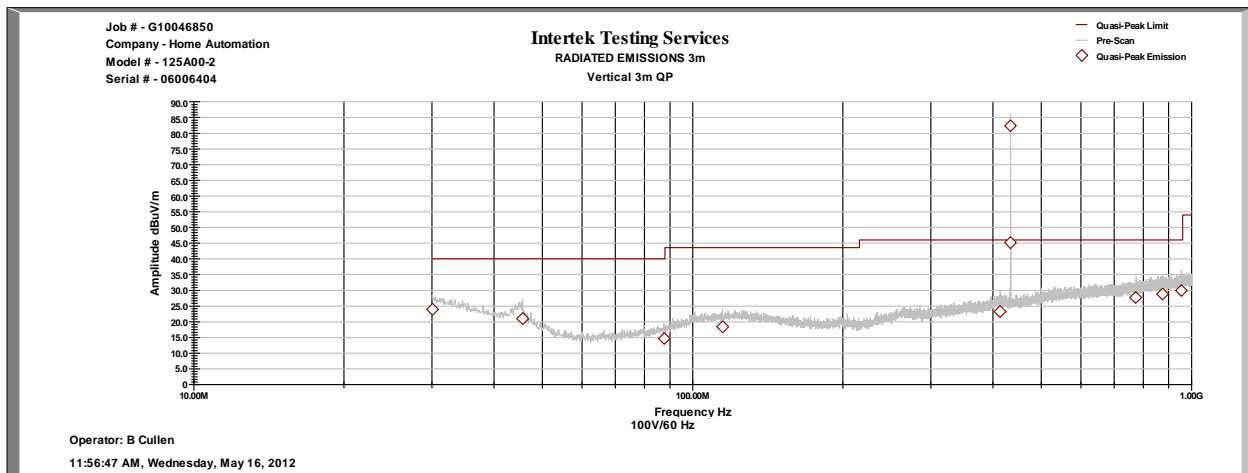
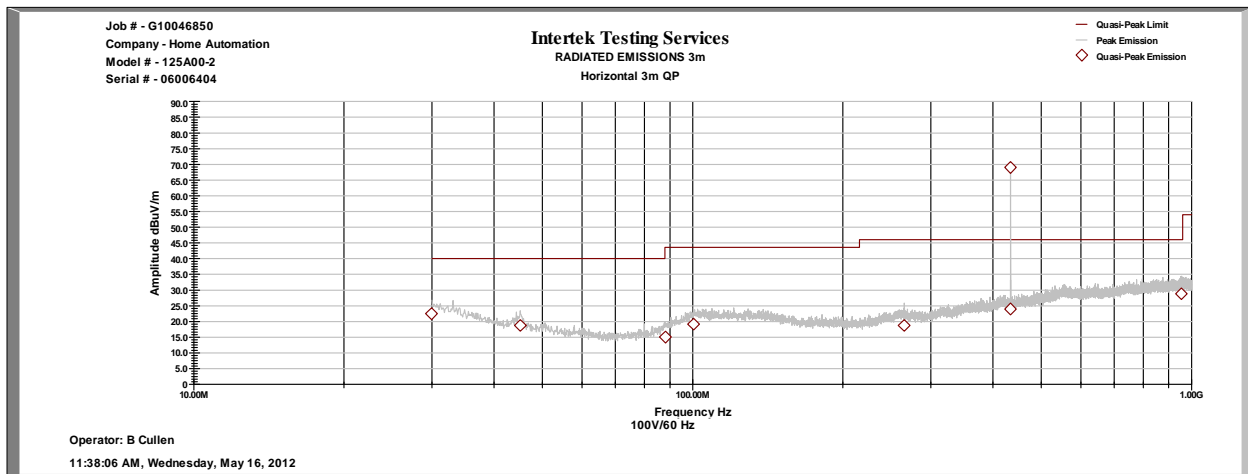
6.3 Results:

The sample tested was found to Comply

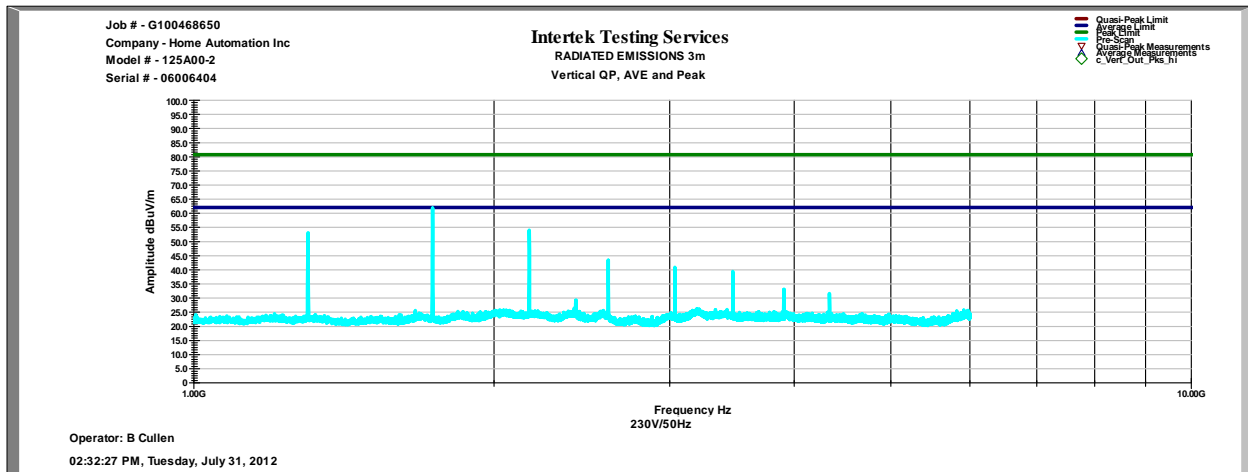
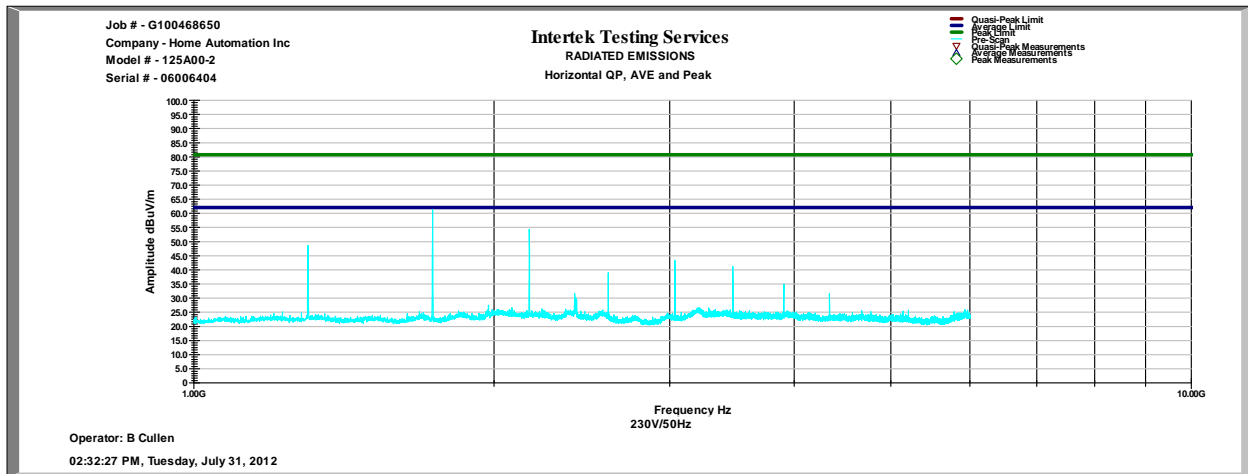
6.4 Setup Photographs:

Test setup

6.5 Plots:



Spurious Emissions plots: 30 to 1000 MHz



Spurious Emissions plots: Above 1 GHz

6.6 Test Data:**Spurious Emissions Data 30 to 1000MHz to Class B limit:**

Frequency	Polarity	Height	Azimuth	QP	Ant	CF	QP Level	Limit	Margin
MHz		cm	degrees	(dBuV/m)	dB	dB	(dBuV/m)	(dBuV/m)	(dB)
45.09	H	224	148	8.014	10.446	0.259	18.719	40	-21.281
87.98	H	186	127	5.496	9.196	0.377	15.07	40	-24.93
100.25	H	335	267	5.724	12.95	0.462	19.135	43.522	-24.387
265.77	H	356	308	4.691	13.538	0.688	18.918	46.021	-27.102
433.57	H	305	45	6.511	16.7	0.896	24.106	46.021	-21.914
954.98	H	283	36	6.303	21	1.385	28.688	46.021	-17.333

30.12	V	295	104	4.858	19.028	0.21	24.097	40	-15.903
45.57	V	334	104	7.48	13.13	0.259	20.869	40	-19.131
87.63	V	182	281	5.419	8.763	0.367	14.549	40	-25.451
114.85	V	172	40	5.263	12.515	0.495	18.272	43.522	-25.249
413.41	V	278	88	4.858	17.568	0.863	23.29	46.021	-22.731
774.71	V	160	262	5.724	20.6	1.192	27.516	46.021	-18.504
874.88	V	320	45	5.872	21.498	1.288	28.658	46.021	-17.362
954.04	V	191	112	6.373	22.262	1.378	30.013	46.021	-16.008

* No peak spurious emissions above 1GHz within 20dB of the Average limit.

Fundamental Frequency:

A	B	C	D	E	F	G	H	I	J	K
Antenna Polarity (H/V)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Duty Cycle Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Axis / Detector
H	433.890	56.8	17.2	4.7	0.0		78.7	100.8	-22.1	X/Pk
H	433.890	56.8	17.2	4.7	0.0	14.8	63.9	80.8	-16.9	X/Av
V	433.890	68.6	17.2	4.7	0.0		90.5	100.8	-10.3	X/Pk
V	433.890	68.6	17.2	4.7	0.0	14.8	75.7	80.8	-5.1	X/Av
H	433.890	67.6	17.2	4.7	0.0		89.5	100.8	-11.3	Y/Pk
H	433.890	67.6	17.2	4.7	0.0	14.8	74.7	80.8	-6.1	Y/Av
V	433.890	63.5	17.2	4.7	0.0		85.4	100.8	-15.4	Y/Pk
V	433.890	63.5	17.2	4.7	0.0	14.8	70.6	80.8	-10.2	Y/Av
H	433.890	67.9	17.2	4.7	0.0		89.8	100.8	-11.0	Z/Pk
H	433.890	67.9	17.2	4.7	0.0	14.8	75.0	80.8	-5.8	Z/Av
V	433.890	59.6	17.2	4.7	0.0		81.5	100.8	-19.3	Z/Pk
V	433.890	59.6	17.2	4.7	0.0	14.8	66.7	80.8	-14.1	Z/Av
Calculations		G=C+D+E+F		I = G - H						

Harmonic Frequencies:

A	B	C	D	E	F	G	H	I	J	K
Antenna Polarity (H/V)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Duty Cycle Factor dB	Net dB(uV/m)	3m Limit dB(uv/m)	Margin dB	Axis / Detector
H	867.780	27.8	21.4	2.7	0.0		51.9	80.8	-28.9	Y/Pk
H	867.780	27.8	21.4	2.7	0.0	14.8	37.1	60.8	-23.7	Y/Av
V	867.780	30.2	20.6	2.7	0.0		53.5	80.8	-27.3	Y/Pk
V	867.780	30.2	20.6	2.7	0.0	14.8	38.7	60.8	-22.1	Y/Av
H	1301.710	56.8	24.8	3.4	32.0		53.0	74.0	-21.0	Z/Pk
H	1301.710	56.8	24.8	3.4	32.0	14.8	38.2	54.0	-15.8	Z/Av
V	1301.710	63.1	25.3	3.4	32.0		59.8	74.0	-14.2	Z/Pk
V	1301.710	63.1	25.3	3.4	32.0	14.8	45.0	54.0	-9.0	Z/Av
H	1735.640	62.7	26.2	3.9	32.5		60.3	80.8	-20.5	Z/Pk
H	1735.640	62.7	26.2	3.9	32.5	14.8	45.5	60.8	-15.3	Z/Av
V	1735.640	65.2	26.2	3.9	32.5		62.8	80.8	-18.0	Z/Pk
V	1735.640	65.2	26.2	3.9	32.5	14.8	48.0	60.8	-12.8	Z/Av
H	2169.570	55.3	28.1	4.5	32.6		55.3	80.8	-25.5	Z/Pk
H	2169.570	55.3	28.1	4.5	32.6	14.8	40.5	60.8	-20.3	Z/Av
V	2169.570	54.7	28.3	4.5	32.6		54.9	80.8	-25.9	Z/Pk
V	2169.570	54.7	28.3	4.5	32.6	14.8	40.1	60.8	-20.7	Z/Av
H	2603.500	48.0	30.0	5.0	33.0		50.0	80.8	-30.8	Z/Pk
H	2603.500	48.0	30.0	5.0	33.0	14.8	35.2	60.8	-25.6	Z/Av
V	2603.500	47.9	30.3	5.0	33.0		50.2	80.8	-30.6	Z/Pk
V	2603.500	47.9	30.3	5.0	33.0	14.8	35.4	60.8	-25.4	Z/Av
H	3037.430	42.6	31.0	5.5	33.0		46.1	80.8	-34.7	Z/Pk
H	3037.430	42.6	31.0	5.5	33.0	14.8	31.3	60.8	-29.5	Z/Av
V	3037.430	41.2	31.2	5.5	33.0		44.9	80.8	-35.9	Z/Pk
V	3037.430	41.2	31.2	5.5	33.0	14.8	30.1	60.8	-30.7	Z/Av
H	3471.360	42.5	31.0	5.9	33.2		46.2	80.8	-34.6	Z/Pk
H	3471.360	42.5	31.0	5.9	33.2	14.8	31.4	60.8	-29.4	Z/Av
V	3471.360	43.8	31.4	5.9	33.2		47.9	80.8	-32.9	Z/Pk
V	3471.360	43.8	31.4	5.9	33.2	14.8	33.1	60.8	-27.7	Z/Av
H	3905.290	30.4	32.0	6.4	33.3		35.5	74.0	-38.5	Z/Pk
H	3905.290	30.4	32.0	6.4	33.3	14.8	20.7	54.0	-33.3	Z/Av
V	3905.290	31.5	32.4	6.4	33.3		37.0	74.0	-37.0	Z/Pk
V	3905.290	31.5	32.4	6.4	33.3	14.8	22.2	54.0	-31.8	Z/Av
H	4339.220	31.6	31.6	6.7	33.3		36.6	80.8	-44.2	Z/Pk
H	4339.220	31.6	31.6	6.7	33.3	14.8	21.8	60.8	-39.0	Z/Av
V	4339.220	36.8	31.8	6.7	33.3		42.0	80.8	-38.8	Z/Pk
V	4339.220	36.8	31.8	6.7	33.3	14.8	27.2	60.8	-33.6	Z/Av
Calculations		G=C+D+E+F								

The worst case axis was selected and measured at each frequency.

The green highlighted frequencies fall into the restricted bands and therefore must meet the restricted band limits.

7 Bandwidth Requirements (FCC 15C - 15.231(c))

7.1 Method

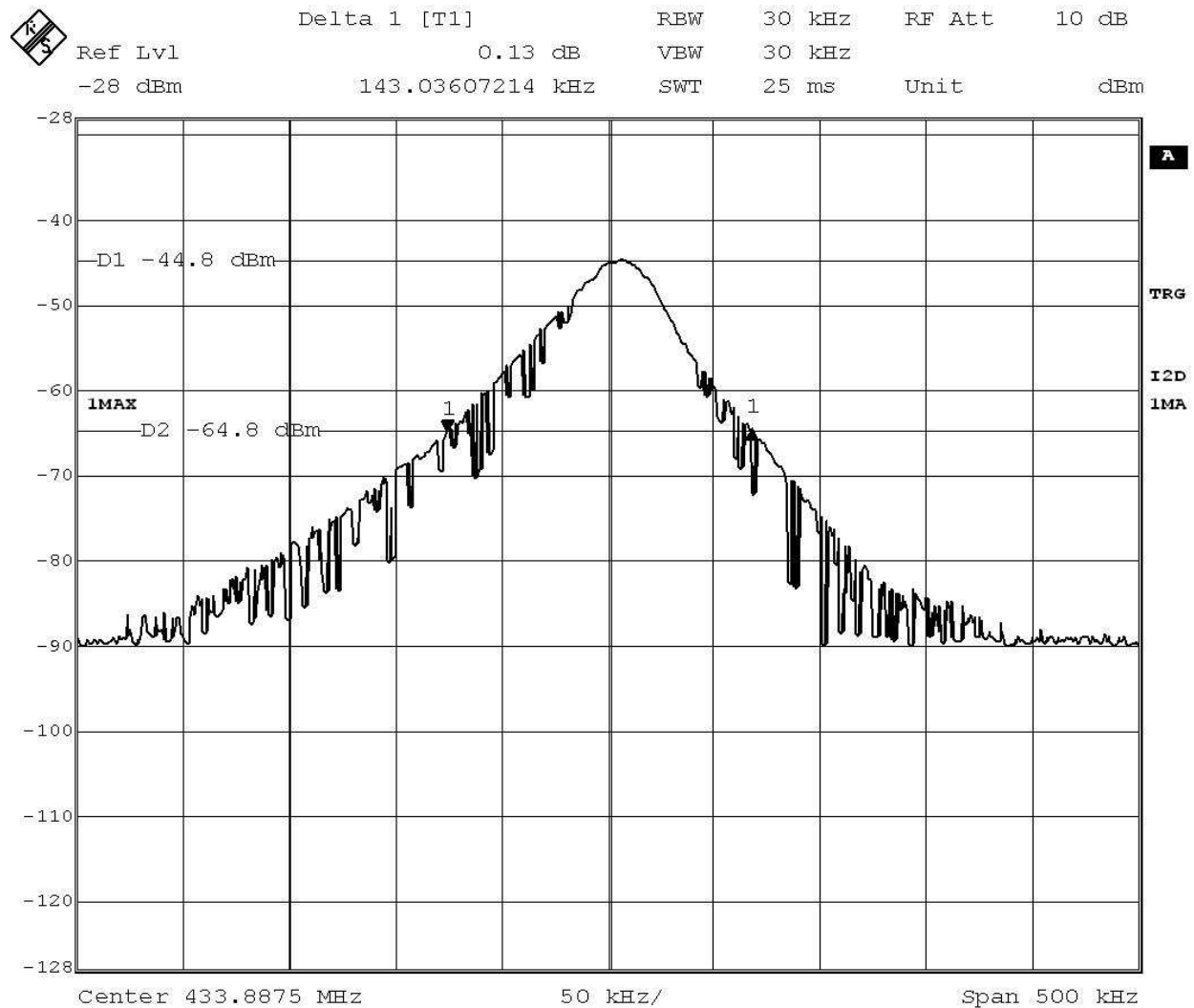
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

- Center Frequency is set to the fundamental of transmitter.
- Resolution Bandwidth is set to approximately 1% of the emission bandwidth.
- Video Bandwidth is set greater than or equal to the Resolution Bandwidth.

7.2 Test Equipment Used:

Asset ID	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due
77	EMI Reciever	R & S	ESI	100044	04/05/12	04/05/13
82	Bilog Antenna	Chase	CBL6112A	2228	08/10/11	08/10/12
271	Horn Antenna	AH Systems	SAS-571	787	04/12/12	04/12/13
222	PreAmp	Miteq	AMF-4D	1020106	10/06/11	10/06/12
974	RF Cable	MegaPhase	Custom	11111301001	09/14/12	09/14/13
975	RF Cable	MegaPhase	Custom	11111301002	09/14/12	09/14/13

7.3 Plot:



20dB Bandwidth...measured bandwidth= 143.04 KHz
Bandwidth limit=1084.75 KHz-Pass

7.4 Results:

The sample tested was found to Comply.

Deviations, Additions, or Exclusions: None

8 Conducted emissions on AC power lines

Not applicable, EUT is Battery Powered.

9 Restrictions (FCC 15C - 15.231(a))

9.1 Method:

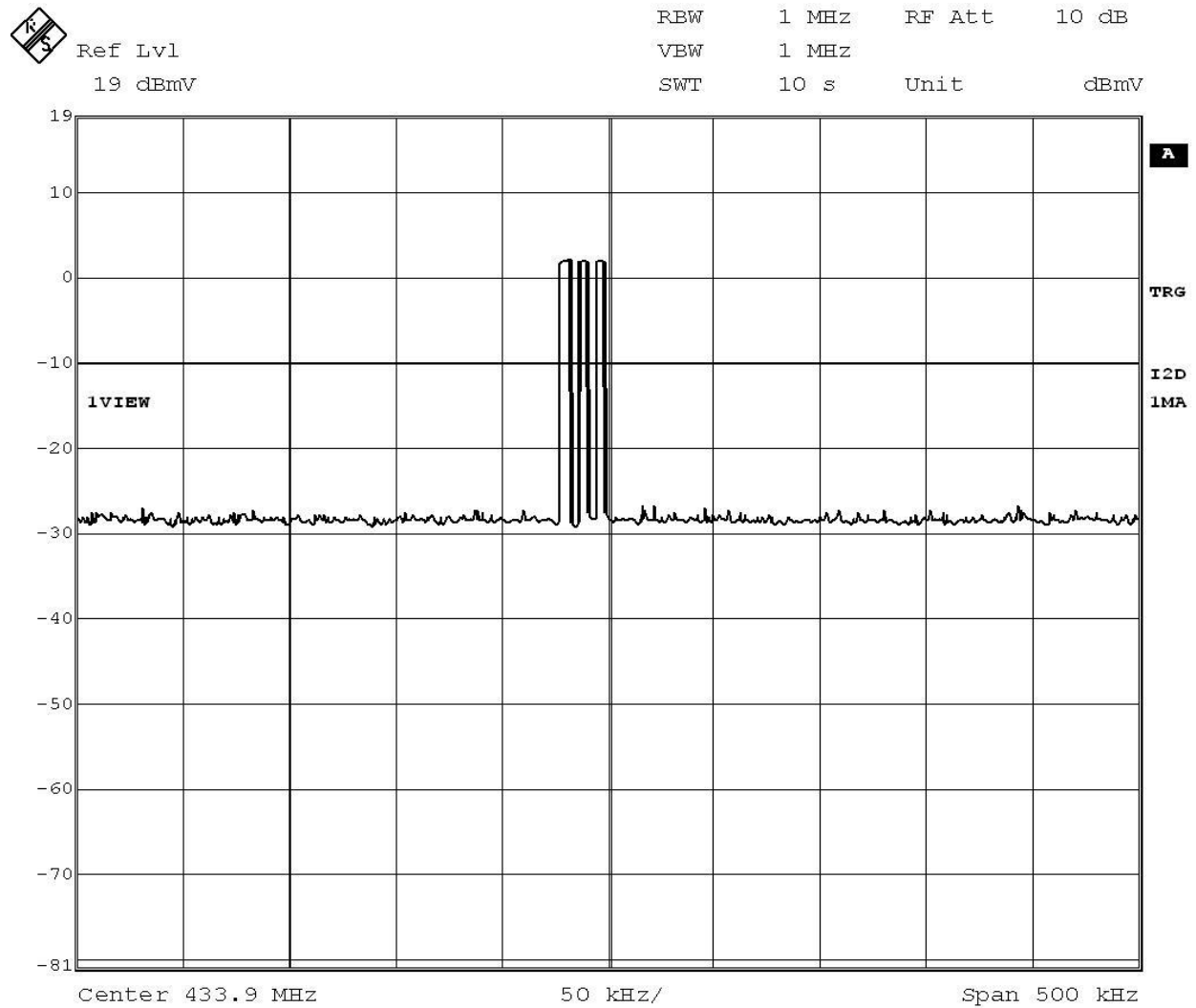
15.231(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data

9.2 Test Equipment Used:

Asset ID	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due
77	EMI Reciever	R & S	ESI	100044	04/05/12	04/05/13
82	Bilog Antenna	Chase	CBL6112A	2228	08/10/11	08/10/12
271	Horn Antenna	AH Systems	SAS-571	787	04/12/12	04/12/13
222	PreAmp	Miteq	AMF-4D	1020106	10/06/11	10/06/12
974	RF Cable	MegaPhase	Custom	11111301001	09/14/12	09/14/13
975	RF Cable	MegaPhase	Custom	11111301002	09/14/12	09/14/13

9.3 Plot



9.4 Data**15.231(a)**

	Response	Requirement
Frequency Range (Mhz, max)	433.9 Mhz	40.66-40.70 MHz and > 70MHz
Frequency Range (MHz, min)	433.9 Mhz	40.66-40.70 MHz and > 70MHz
Transmit only control signal?	Yes	Only control signal allowed
Continuous transmission?	No	No
Voice transmission?	No	No
Video transmission?	No	No
Radio control of toy?	No	No

15.231(a)(1)

Manually operated?	Yes	
Deactivates within 5 seconds?	Yes	Yes
Show plot (10 second sweep)	Yes	

15.231(a)(2)

Automatically operated?	No	
Deactivates within 5 seconds?	N/A	

15.231(a)(3)

Periodically transmits at predetermined intervals?	No	Allowed, with restrictions
Polling signals?	No	Allowed, with restrictions
Polling rate and timing	No	< 2 seconds per hour

15.231(a)(4)

For Emergency Use?	No	Allowed
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15.231(a)(5)

Exceed 15.231(a)(1) or (a)(2) requirements?	No	Allowed for professional install
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10 Revision History:

Revision Level	Date	Report Number	Notes
0	07/30/12	100468650DAL-005a	Original Issue