



HONEYWELL INTERNATIONAL INC. TEST REPORT

FOR THE

**KMH 820 MULTI-HAZARD AWARENESS UNIT AND
KTA 810 TRAFFIC ADVISORY UNIT**

FCC PART 87 SUBPART D

COMPLIANCE

DATE OF ISSUE: MARCH 12, 2001

PREPARED FOR:

Honeywell International Inc.
23500 West 105th St – MS #56
Olathe, KS 66061-6615

P.O. No: A00007055
W.O. No: 75294

PREPARED BY:

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Date of test: March 5-7, 2001

Report No.: FC01-023

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CKC Laboratories, Inc. has received Certificates of Accreditation from the following agencies:
A2LA (USA); DATech (Germany); BSMI (Taiwan); Nemko (Norway); and GOST (Russia).
CKC Laboratories, Inc. has received test site Registration Acceptance from the following agencies:
FCC (USA); VCCI (Japan); and Industry Canada.
CKC Laboratories, Inc. has received Letters of Acceptance through an MRA for the following agencies:
ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); Radio Communications Agency (RA); HOKLAS (Hong Kong); Bakom (Swiss); BIPT (Belgium); Denmark Telestyrelsen; RvA (Netherlands); SEE (Luxembourg) SITTEL (Bolivia); and UKAS (UK).

ADMINISTRATIVE INFORMATION

DATE OF TEST: March 5-7, 2001

DATE OF RECEIPT: March 5, 2001

PURPOSE OF TEST: To demonstrate the compliance of the KMH 820 Multi-Hazard Awareness Unit and KTA 810 Traffic Advisory Unit with the requirements for FCC Part 87 Subpart D.

TEST METHOD: FCC Part 87

MANUFACTURER: Honeywell International Inc.
23500 West 105th St – MS #56
Olathe, KS 66061-6615

REPRESENTATIVE: Larry Haddix

TEST LOCATION: CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

SUMMARY OF RESULTS

As received, the Honeywell International Inc. KMH 820 Multi-Hazard Awareness Unit and KTA 810 Traffic Advisory Unit was found to be fully compliant with the following standards and specifications:

United States

➤ FCC Part 87 Subpart D

The results in this report apply only to the items tested, as identified herein.

FREQUENCY RANGE TESTED

Radiated: 24 MHz – 11 GHz.

EUT OPERATING FREQUENCY

1030 MHz

REQUIRED EUT CHANGES TO COMPLY

None.

APPROVALS

QUALITY ASSURANCE:



Dennis Ward, Quality Manager



Chuck Kendall, EMC/Lab Manager

TEST PERSONNEL:



Randy Clark, EMC Engineer

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The EUT tested by CKC Laboratories was a production unit.

Multi-hazard awareness and traffic advisory unit. Models being certified:

KMH 820 - Part No. 066-01175-2101

KMH 820 - Part No. 066-01175-0101 (same as 066-01175-2101 except without GPS card)

KTA 810 - Part No. 066-01152-0101 (same as 066-01175-2101 except without EGPWS module)

The KMH 820 with the GPS card, represents the most complete unit and therefore, was the model used for testing. All three models are being submitted to the FCC for certification under the same FCC ID: ASYKMH820.

EQUIPMENT UNDER TEST

Multi-Hazard Awareness Unit and KTA 810 Traffic Advisory Unit

Manuf: Honeywell International Inc.

Model: KMH 820

Serial: Y365

FCC ID: ASYKMH820 (pending)

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Breakout Box

Manuf: Honeywell
International Inc.

Model: N/A

Serial: 003

FCC ID: DoC

400Hz Synchro

Manuf: Honeywell
International Inc.

Model: N/A

Serial: 001

FCC ID: DoC

Configuration Module

Manuf: Honeywell
International Inc.

Model: KCM805

Serial: Y379

FCC ID: DoC

Variable Power Supply

Manuf: Pacific
Model: 303AT-E-T1

Serial: 152

FCC ID: N/A

DC Power Supply

Manuf: Sorensen
Model: 60-50B

Serial: 0176

FCC ID: N/A

2.1033(c)(4) – Type of Emissions

The emission designator is 18M0V1D.

2.1033(c)(5) – Frequency Range

1030 MHz

2.1033(c)(6) – Operating Power

53 dBm $\pm$ 2dB (200 watts)

2.1033(c)(7) – Maximum Power Rating

55 dBm (316 watts)

2.1033(c)(14)/87.131 - RF POWER OUTPUT

Honeywell Test Data:

***** CUSTOM ***** FINAL (TSO-Top) REPORT

Thu Mar 29 11:05:51 2001

=====

PROCEDURE PART NUMBER: 968-0220-51 Rev E3 (FINAL (TSO-Top))

EXE. PROG. PART NUMBER: 968-0138-00 Rev E4.2

=====

UNIT PART NUMBER: 066-09999-0101

REFERENCE PART NUMBER: (CUSTOM)

UNIT TYPE: KTA810-0101

UNIT SERIAL NUMBER: Y36521

OPERATOR: no name

TEST CATEGORY: New

Tests PASSED: 1

Tests FAILED: 0

Tests SKIPPED: 0

Total Test Time: 25 sec

Warm up period: 1 min 3 sec

Test ran to completion.

Passed system self tests. 11:01:31 03/29/1901

2.2.3.2 (DO197A) --> PASSED (PKPWR_C) (00:00:24)

Transmitter Output Power per Port Mode-C

Total Power, Lower limit: 51.00 dBm, Upper limit: 55.00 dBm

PASS Total Power, Top Antenna: 54.20 dBm

PASS Total Power, Bottom Antenna: 54.26 dBm

End of Test Results

Cal Factors:

ATE System number = A1 Calfactor File Date = 02/08/01

1030 Receiver Factor = -2 dB 1030 Receiver Hi Power = -2 dB

1090 Receiver Factor = -2.2 dB

RGS Bearing 1030 = 30 deg

Top Antenna 1 = -2.1 dB Bottom Antenna 1 = -2.1 dB

Top Antenna 2 = -2.1 dB Bottom Antenna 2 = -2.1 dB

Top Antenna 3 = -2.1 dB Bottom Antenna 3 = -2.1 dB

Top Antenna 4 = -2.2 dB Bottom Antenna 4 = -2.2 dB

Suppress Recovery Delay = 52600 ns

UUT Communication Information:

Unit Communication Wrap-Up

RS232 Comm Status Counts : overrun=0, break=0, parity=0, framing=0.

KPN SW # : 125-00931-0E03

Engr SW Ver# : KTA 810 Ver

Test SW code date : Feb 14,2001

Test SW Number : 968-0141-00 ver 2.3

Network Log Information:

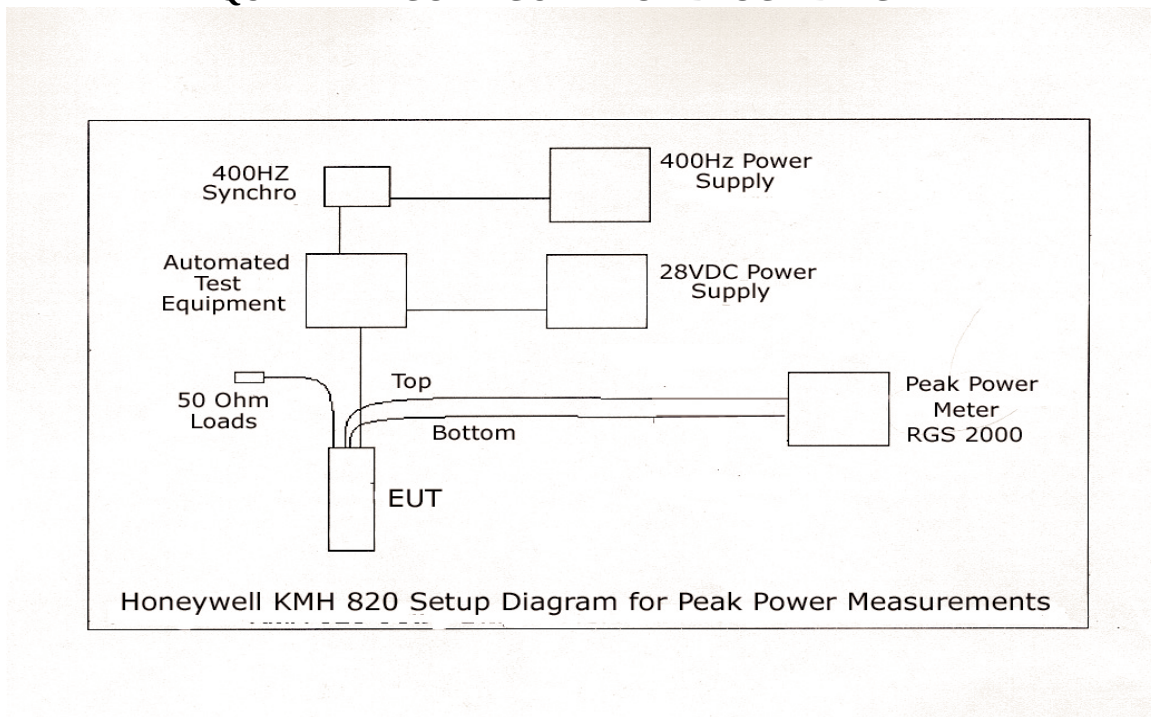
ATENET.LOG file not found.

Pre-Test System Error Log Information:

During-Test System Error Log Information:

End of Results

EQUIPMENT CONFIGURATION BLOCK DIAGRAM



2.1033(c)(14)/2.1047(a) MODULATION CHARACTERISTICS – Audio Frequency Response

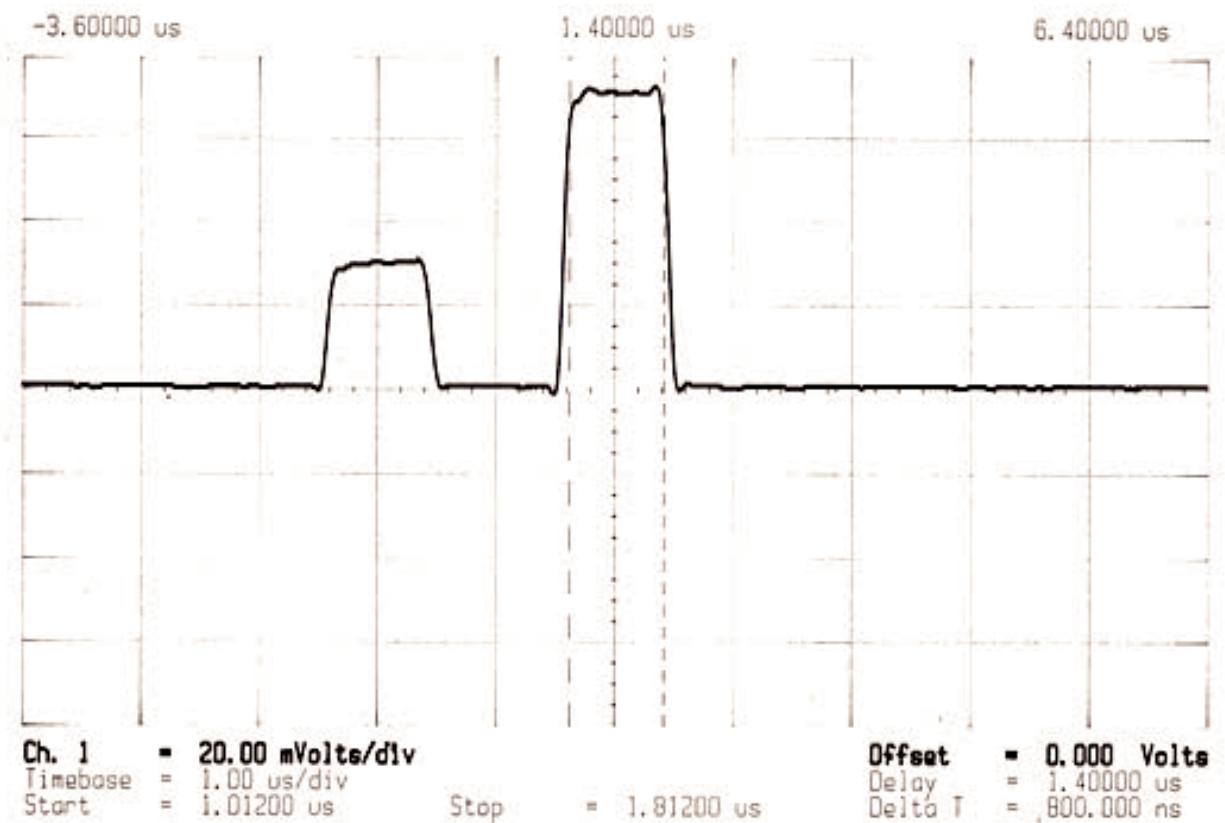
Not applicable.

2.1033(c)(14)/2.1047(b)/ 87.141 MODULATION CHARACTERISTICS – Modulation Limiting Response

A verification test was performed using an Oscope. The pulse duration = 0.801 usec.

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP Digital Oscscope w/ HP 432B Crystal Detector	1822A36169	10/18/2000	10/18/2001	N/A



2.1033(c)(14)/87.135 - OCCUPIED BANDWIDTH

TEST CONDITIONS:

OBW Limit derived by the frequency span occupied by 0.5% of the peak emissions thus:

$$10\text{LOG}(0.5/100) = -23\text{dB}$$

OBW must not be closer than 1.5/T to the upper and lower limits thus:

$$1.5/T \mid T=\text{pulse duration in usec} = 0.80 \text{ usec, therefore}$$

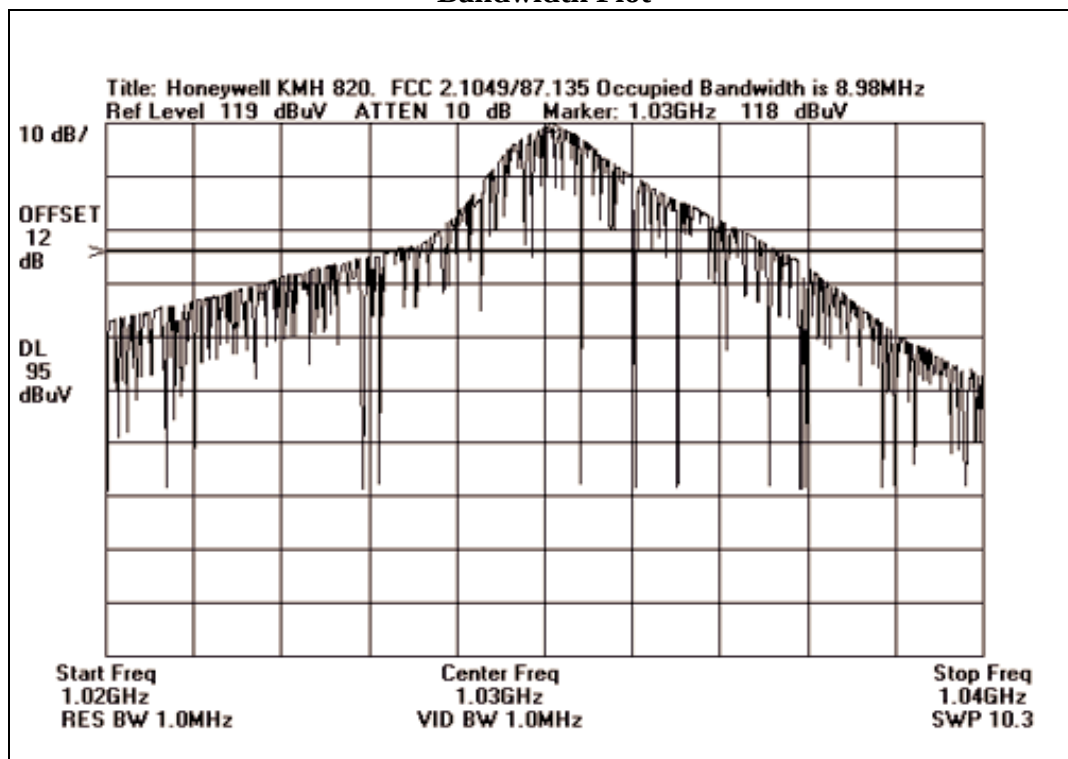
$$1.5/0.8 = 1.875 \text{ MHz}$$

Therefore: OBW must meet 961.875 – 1213.125 MHz.

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer RF Section	2209A0140	11/03/2000	11/03/2001	490
Spectrum Analyzer Display	2403A0824	11/03/2000	11/03/2001	489
QP Adapter	2811A0126	11/03/2000	11/03/2001	478
HF Cable, Andrew	FSJ1-50A	05/10/00	05/10/01	N/A
HP 11636A Power Divider	06927	03/02/01	03/02/02	N/A
HP Agilent 8491A (30 dB pad)	102-0993-00	03/02/01	03/02/02	N/A

Bandwidth Plot



2.1033(c)(14)/2.1051/87.139 - SPURIOUS EMISSIONS AT ANTENNA TERMINAL

Specification: **2.1051/87.139**
Work Order #: **75294**
Test Type: **Maximized Emissions**
Equipment: **Multi-Hazard Awareness Unit**
Manufacturer: Honeywell
Model: KMH 820
S/N: Y365

Date: 03/05/2001
Time: 14:50:52
Sequence#: 2
Tested By: Randal Clark

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer RF Section	2209A0140	11/03/2000	11/03/2001	490
Spectrum Analyzer Display	2403A0824	11/03/2000	11/03/2001	489
QP Adapter	2811A0126	11/03/2000	11/03/2001	478
HF Cable, Andrew	FSJ1-50A	05/10/00	05/10/01	N/A
HP 11636A Power Divider	06927	03/02/01	03/02/02	N/A
HP Agilent 8491A (30 dB pad)	102-0993-00	03/02/01	03/02/02	N/A

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Multi-Hazard Awareness Unit*	Honeywell	KMH 820	Y365

Support Devices:

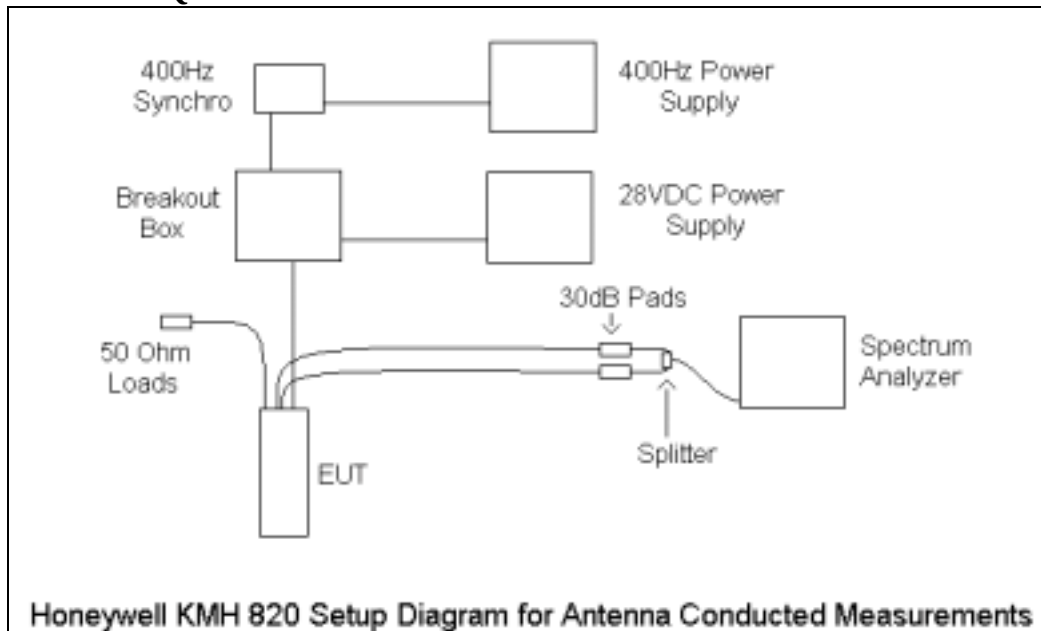
Function	Manufacturer	Model #	S/N
Breakout Box	Honeywell	N/A	003
400Hz Synchro	Honeywell	N/A	001
Configuration Module	Honeywell	KCM805	Y379
Variable Power Supply	Pacific	303AT-E-T1	152
DC Power Supply	Sorensen	60-50B	0176

Test Conditions / Notes:

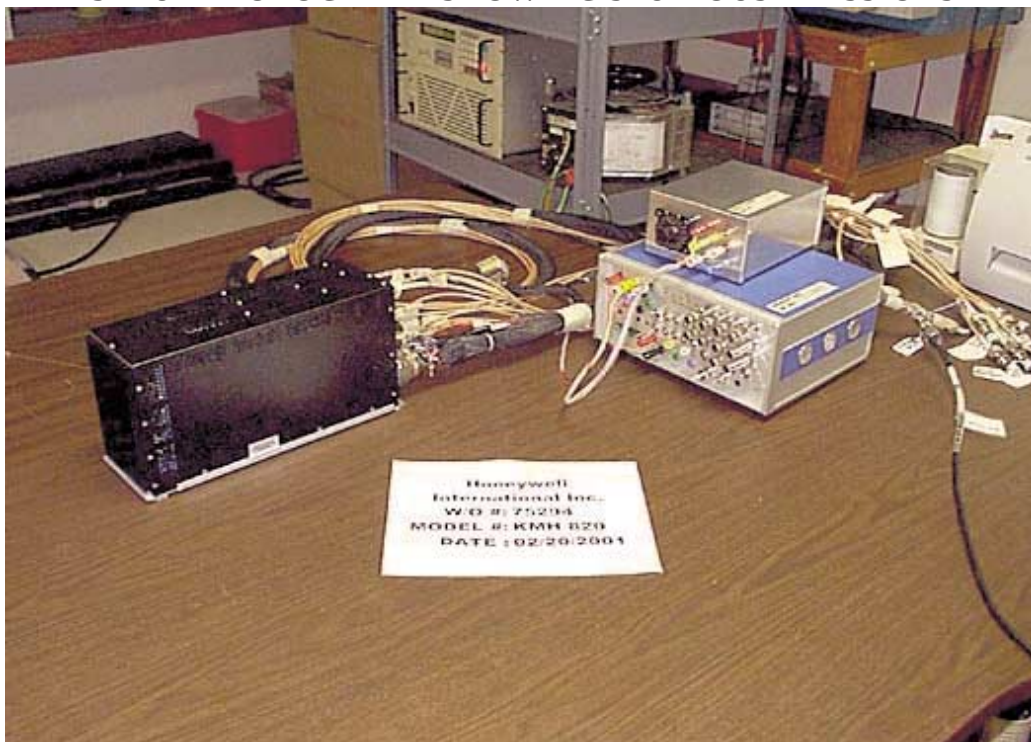
EUT is a Multi-Hazard Awareness Unit operating on 1030MHz powered by 28VDC. EUT is connected to a breakout box to simulate normal installation. Cable length is approximately 15 feet. All cables are terminated with their characteristic impedance. Frequency range tested: 24MHz-11GHz.

Measurement Data:			Reading listed by margin.				Test Distance: None				
#	Freq MHz	Rdng dBμV	30dB Filte dB	Split dB	Cable dB	Cable dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	2060.200M	62.0	+29.6 +0.0	+5.8	+4.8	+0.5	+0.0	102.7	116.7	-14.0	None
2	5150.060M	31.2	+29.3 +1.9	+6.3	+6.3	+1.0	+0.0	76.0	116.7	-40.7	None
3	3089.935M	31.8	+29.6 +1.3	+5.7	+6.0	+0.5	+0.0	74.9	116.7	-41.8	None
4	515.000M	38.1	+30.0 +0.0	+6.0	+1.6	+0.0	+0.0	75.7	121.7 Ambient Noise Level.	-46.0	None
5	1006.010M	62.6	+29.7 +0.0	+6.1	+2.4	+0.4	+0.0	101.2	156.7	-55.5	None
6	1053.830M	61.9	+29.7 +0.0	+6.1	+2.6	+0.4	+0.0	100.7	156.7	-56.0	None

EQUIPMENT CONFIGURATION BLOCK DIAGRAM



SETUP PHOTOGRAPH SHOWING SPURIOUS EMISSIONS



At Antenna Terminal

VIDEO BANDWIDTH AND RESOLUTION BANDWIDTH SETTINGS:

Frequency Range	Bandwidth Settings
150KHz – 30MHz	9kHz
30MHz – 1MHz	120 kHz
1GHz – 11GHz	1MHz

2.1033(c)(14)/2.1053/87.139 - FIELD STRENGTH OF SPURIOUS RADIATION

Specification: **2.1053/87.139**
Work Order #: **75294**
Test Type: **Maximized Emissions**
Equipment: **Multi-Hazard Awareness Unit**
Manufacturer: **Honeywell**
Model: **KMH 820**
S/N: **Y365**

Date: 03/06/2001
Time: 13:28:51
Sequence#: 4
Tested By: Randal Clark

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer RF Section	2209A0140	11/03/2000	11/03/2001	490
Spectrum Analyzer Display	2403A0824	11/03/2000	11/03/2001	489
QP Adapter	2811A0126	11/03/2000	11/03/2001	478
Pre-Amp	1937A02604	04/03/2000	04/03/2001	099
Log Periodic Antenna	154	05/08/2000	05/02/2001	1330
Biconical Antenna	06/04/1900	05/08/2000	05/08/2001	225
Magnetic Loop Antenna	6502	06/16/2000	06/16/2001	226

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Multi-Hazard Awareness Unit*	Honeywell	KMH 820	Y365

Support Devices:

Function	Manufacturer	Model #	S/N
Breakout Box	Honeywell	N/A	003
400Hz Synchro	Honeywell	N/A	001
Configuration Module	Honeywell	KCM805	Y379
Variable Power Supply	Pacific	303AT-E-T1	152
DC Power Supply	Sorensen	60-50B	0176

Test Conditions / Notes:

EUT is a Multi-Hazard Awareness Unit operating on 1030MHz powered by 28VDC. EUT is connected to a breakout box to simulate normal installation. Cable length is approximately 15 feet. All cables are terminated with their characteristic impedance. Derivation of 87.139 limit: Assuming the minimum power output of 51dBm or 125W (the transmitter's declared power output rating is 53dBm $\pm$ 2dB), the field strength at 3 meters is 148dBuV/m calculated using $P=(E*d)^2/(30*G)$ assuming the gain of a half wave dipole antenna. Note: the EUT cannot transmit a CW signal; the pulse modulation characteristics cannot be modified. Frequency range tested: 24-1000 MHz

Calculation:

$125\text{ W} = (E * 3)^2 / (30*1.6)$, assuming the gain of a half wave dipole antenna.

Solving for E;

$E(\text{dBuV/m}) = 20*\text{LOG}(1000000*(\text{SQRT}(30*1.6*125))/3)$

$E(\text{dBuV/m}) = 148.2$

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	Amp dB	Bicon dB	Log 1 dB	Cable dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	772.270M	41.8	-26.1	+0.0	+21.4	+6.1	+0.0	43.2	113.0	-69.8	Vert
2	480.000M	39.6	-25.8	+0.0	+17.3	+4.7	+0.0	35.8	113.0	-77.2	Horiz
									Ambient Noise Level		
3	240.000M	32.7	-24.6	+16.3	+0.0	+3.1	+0.0	27.5	108.0	-80.5	Vert
									Ambient Noise Level		
4	480.000M	33.5	-25.8	+0.0	+17.3	+4.7	+0.0	29.7	113.0	-83.3	Vert
									Ambient Noise Level		
5	240.000M	26.8	-24.6	+16.3	+0.0	+3.1	+0.0	21.6	108.0	-86.4	Horiz
									Ambient Noise Level		
6	48.000M	34.0	-24.9	+10.4	+0.0	+1.3	+0.0	20.8	108.0	-87.2	Vert
									Ambient Noise Level		
7	48.000M	30.3	-24.9	+10.4	+0.0	+1.3	+0.0	17.1	108.0	-90.9	Horiz
									Ambient Noise Level		

Specification: **2.1053/87.139**

Work Order #: **75294**

Test Type: **Maximized Emissions**

Equipment: **Multi-Hazard Awareness Unit**

Manufacturer: Honeywell

Model: KMH 820

S/N: Y365

Date: 03/06/2001

Time: 11:48:10

Sequence#: 3

Tested By: Randal Clark

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer RF Section	2209A0140	11/03/2000	11/03/2001	490
Spectrum Analyzer Display	2403A0824	11/03/2000	11/03/2001	489
QP Adapter	2811A0126	11/03/2000	11/03/2001	478
Pre-Amp	3008A00301	10/27/1999	10/27/2001	2010
Coax cable #2 (2') Andrew	N/A	5/10/2000	5/10/2001	N/A
50" semi rigid coax	Cable #4	5/10/2000	5/10/2001	N/A
25" semi rigid coax	Cable #7	5/10/2000	5/10/2001	N/A
Horn Antenna, EMC Test Sys	9602-4660	11/10/2000	11/10/2001	2113

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Multi-Hazard Awareness Unit*	Honeywell	KMH 820	Y365

Support Devices:

Function	Manufacturer	Model #	S/N
Breakout Box	Honeywell	N/A	003
400Hz Synchro	Honeywell	N/A	001
Configuration Module	Honeywell	KCM805	Y379
Variable Power Supply	Pacific	303AT-E-T1	152
DC Power Supply	Sorensen	60-50B	0176

Test Conditions / Notes:

EUT is a Multi-Hazard Awareness Unit operating on 1030MHz powered by 28VDC. EUT is connected to a breakout box to simulate normal installation. Cable length is approximately 15 feet. All cables are terminated with their characteristic impedance. Derivation of 87.139 limit: Assuming the minimum power output of 51dBm or 125W (the transmitter's declared power output rating is 53dBm $\pm$ 2dB), the field strength at 3 meters is 148dBuV/m calculated using $P=(E*d)^2/(30*G)$ assuming the gain of a half wave dipole antenna. Frequency range tested: 1-11 GHz.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

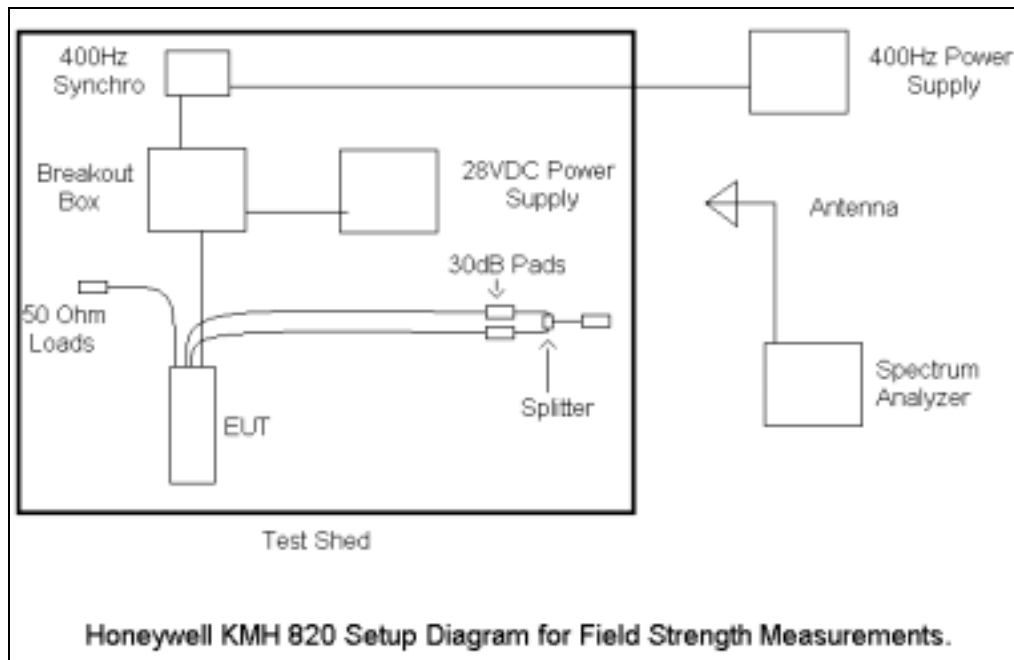
#	Freq MHz	Rdng dB μ V	Amp GHz C dB	Horn Filte dB	GHz C dB	GHz C dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	9269.000M	49.9	-35.8 +4.3	+35.7 +2.6	+11.0	+5.9	+0.0	73.6	108.0	-34.4	Horiz
2	3089.530M	58.1	-35.6 +3.3	+33.3 +1.3	+7.1	+5.7	+0.0	73.2	108.0	-34.8	Vert
3	4119.440M	54.2	-35.9 +1.5	+38.4 +2.1	+7.1	+5.2	+0.0	72.6	108.0	-35.4	Vert
4	2060.140M	70.9	-35.2 +0.7	+26.9 +0.0	+4.7	+2.7	+0.0	70.7	108.0	-37.3	Vert

5	2059.640M	69.7	-35.2 +0.6	+26.9 +0.0	+4.7	+2.7	+0.0	69.4	108.0	-38.6	Horiz
6	9268.610M	45.2	-35.8 +4.3	+35.7 +0.0	+11.0	+5.9	+0.0	66.3	108.0	-41.7	Vert
7	3089.900M	49.0	-35.6 +3.3	+33.3 +1.3	+7.1	+5.7	+0.0	64.1	108.0	-43.9	Horiz
8	4120.088M	43.3	-35.8 +1.5	+38.4 +2.1	+7.2	+5.2	+0.0	61.9	108.0	-46.1	Horiz
9	2574.880M	47.8	-34.6 +3.6	+30.2 +0.0	+8.1	+5.8	+0.0	60.9	108.0	-47.1	Vert
10	5149.616M	41.1	-36.0 +2.3	+36.0 +1.9	+8.5	+4.7	+0.0	58.5	108.0	-49.5	Horiz
11	1545.300M	52.0	-35.7 +0.2	+25.5 +0.0	+3.7	+1.9	+0.0	47.6	113.0	-65.4	Vert
12	1545.420M	50.4	-35.7 +0.2	+25.5 +0.0	+3.7	+1.9	+0.0	46.0	113.0	-67.0	Horiz

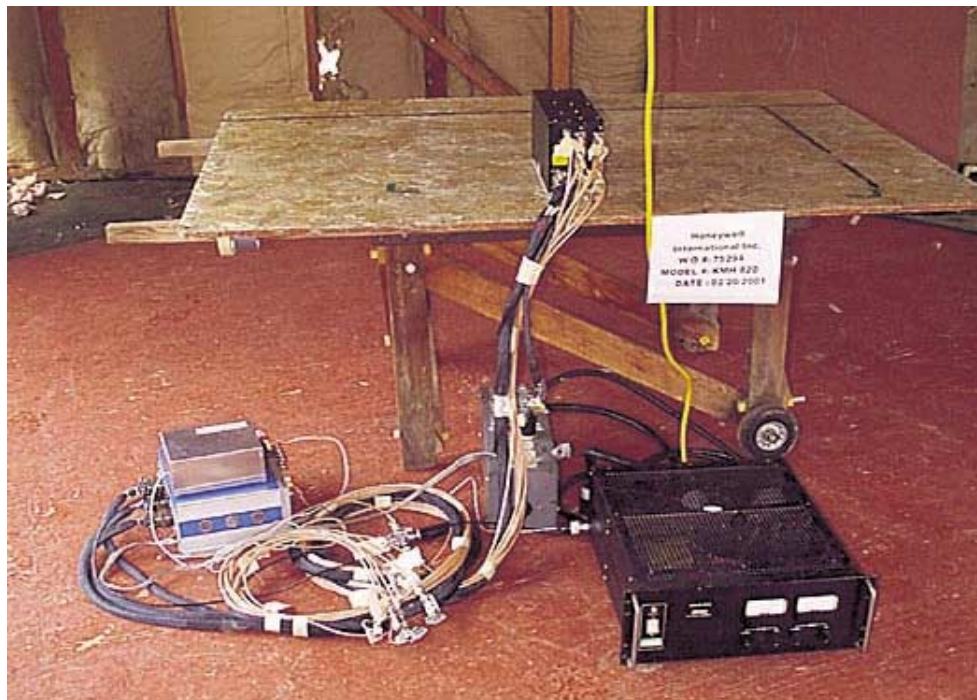
VIDEO BANDWIDTH AND RESOLUTION BANDWIDTH SETTINGS:

Frequency Range	Bandwidth Settings
150KHz – 30MHz	9kHz
30MHz – 1MHz	120 kHz
1GHz – 11GHz	1MHz

EQUIPMENT CONFIGURATION BLOCK DIAGRAM

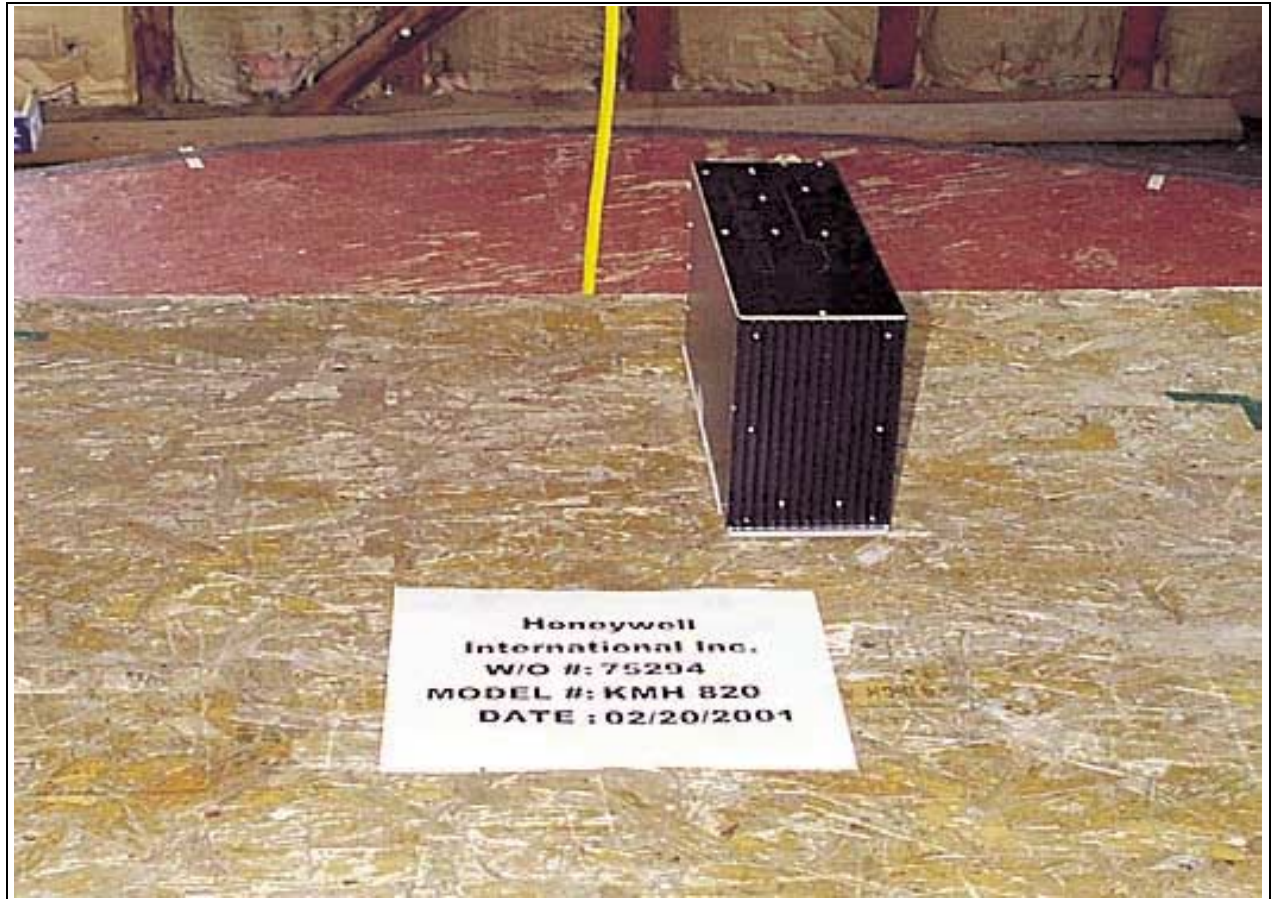


PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Back View

2.1033(c)(14)/2.1055/87.133 - FREQUENCY STABILITY

TEST CONDITIONS:

The EUT has all ports other than antenna terminated at EUT. Antenna ports were fed outside of the temperature chamber to the spectrum analyzer through the splitter. The breakout box and the synchro are located outside of the temperature chamber.

TEST EQUIPMENT USED:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer RF Section	2209A0140	11/03/2000	11/03/2001	490
Spectrum Analyzer Display	2209A01404	07/07/2000	07/07/2001	489
QP Adapter	2811A01267	07/07/2000	07/07/2001	478
Digital Multimeter	22-183	08/30/2000	08/30/2001	1241
Temperature Chamber	11899	04/03/2000	04/03/2001	1879

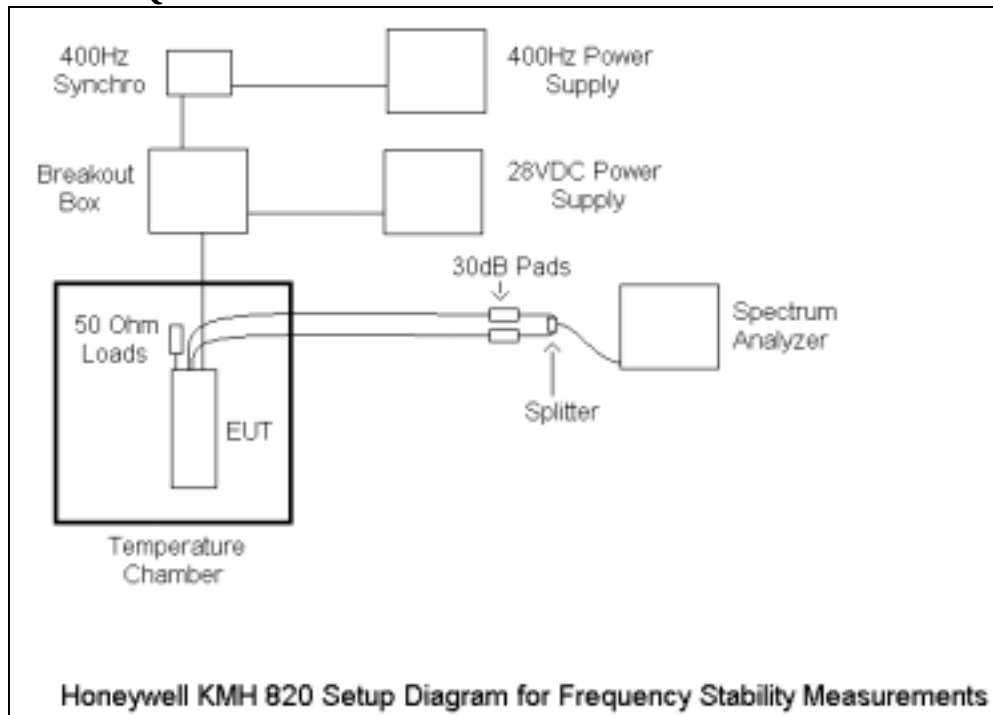
VIDEO BANDWIDTH AND RESOLUTION BANDWIDTH SETTINGS:

Frequency Range	Bandwidth Settings
150KHz – 30MHz	9kHz
30MHz – 1MHz	120 kHz
1GHz – 11GHz	1MHz

TEMPERATURE TESTING DATA:

Operating Frequency in MHz:		1030
Frequency Limit in Hz:		200000
Nominal Operating Voltage:		28.00 VDC
85% of Nominal (V-)		23.80
115% of Nominal (V+)		32.20
Temp	-30°C	Frequency Error Hz
V-	1029.971	-29000
V	1029.937	-63000
V+	1029.97	-30000
Temp	-20°C	
V-	1029.996	-4000
V	1029.992	-8000
V+	1029.985	-15000
Temp	-10°C	
V-	1030.0045	4500
V	1030.002	2000
V+	1029.988	-12000
Temp	0°C	
V-	1030.0325	32500
V	1030.0315	31500
V+	1030.06	60000
Temp	10°C	
V-	1030.007	7000
V	1030.046	46000
V+	1030.058	58000
Temp	20°C	
V-	1030.0535	53500
V	1030.038	38000
V+	1030.0345	34500
Temp	30°C	
V-	1030.115	115000
V	1030.071	71000
V+	1030.113	113000
Temp	40°C	
V-	1030.0815	81500
V	1030.06	60000
V+	1030.0915	91500
Temp	50°C	
V-	1030.0605	60500
V	1030.069	69000
V+	1030.07	70000

EQUIPMENT CONFIGURATION BLOCK DIAGRAM



PHOTOGRAPH SHOWING TEMPERATURE TESTING



APPENDIX A

INFORMATION ABOUT TEST DATA SHEET HEADERS

**A TYPICAL DATA SHEET WILL DISPLAY THE FOLLOWING
IN COLUMN FORMAT:**

#	Freq MHz	Rdng dBuV	GHz C	Amp	Bicon	Horn	30 dB	Corr dBuV/m	Spec	Margin	Polar
			Cable	Log 1	Split	Filte					

means reading number

Freq MHz is the frequency in MHz of the obtained reading.

Rdng dBuV is the reading obtained on the spectrum analyzer in dBuV.

Amp is short for the preamplifier factor or gain in dB.

Bicon is the biconical antenna factor in dB.

Log 1 is the log periodic antenna factor in dB.

Horn is the horn antenna factor in dB.

GHz C is the cable loss in dB of the coaxial cable on the OATS.

Filte is the high pass filter.

Corr dBuV/m is the corrected reading which is now in dBuV/m (field strength).

Spec is the specification limit (dB) stated in the regulations.

Margin is the closeness to the specified limit in dB; + is over and - is under the limit.

Polar is the Polarity of the antenna with respect to earth.

30 dB is a 30 dB attenuator.

Split is a 6 dB power divider.

Cable is the cable loss in dB of the coaxial cable on the OATS.