TEST PROCEDURES AND DATA: TEST NO: 4A

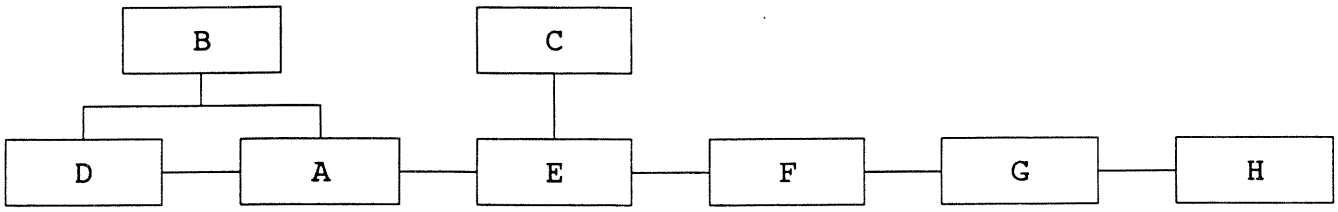
1.0 DESCRIPTION OF TEST: Spurious Emissions (Conducted)
0 - 700 MHz

2.0 SPECIFICATIONS: 47 CFR 2.991
47 CFR 2.993
47 CFR 87.139

3.0 EQUIPMENT REQUIRED:

	TYPE	MANUFACTURER	MODEL	SER. NO
A	Transponder	Honeywell	RCZ-851B	E2
B	Power Supply	Kepco	ATE36-30M	63529
C	RF Generator	IFR	ATC-1400	1104
D	Radio Mgmt Unit	Honeywell	RM-850	88030142
E	Directional Coupler	HP	778D	826-1243
F	Attenuator (6dB)	Narda	765-6	AV05803
G	Low Pass Filter	MicroLab	LA07N	None
H	Spectrum Analyzer	HP	8568B	AV55900
I				
J				
K				
L				
M				
N				

4.0 BLOCK DIAGRAM OF TEST SETUP:



TEST PERFORMED BY: [signature] DATE: 20 Dec 1991

DATA REFERENCE: SHEET: 29

5.0 PROCEDURE

1. Connect equipment as shown.

2. Adjust spectrum analyzer so that no signal exceeds the analyzer's dynamic range.

3. Measure and record all spurious emissions below 700 MHz (corrected for pad/filter/cable losses).

Mean Transmitter Power Calculation:

P_o = 400 Watts
$P_y = P_o * T_w * N * R$
P_y = (400 W)(0.45 µS)(14)(450 Hz) = 1.13 Watts

Where:
P_y = Mean output power (Watts)
P_o = Peak output power (Watts)
T_w = Pulse width (Seconds)
N = Number of pulses
R = Reply rate (Hz)

Therefore:

$$\begin{aligned} \text{Limit} &= 43 + 10\log_{10}(P_y) \\ &= 43 + 10\log_{10}(1.13\ W) \\ &= 43 + 0.5 \\ &= 43.5\text{dB} \end{aligned}$$

Spurious outputs must be at attenuated at least 43.5dB.

Peak Spurious Output Power Calculation:

$$\begin{aligned} P_o(\text{dBm}) &= 10\log_{10}(P_o\ W * 1000\ mW/W) \\ &= 10\log_{10}(400\ W * 1000\ mW/W) \\ &= 56\text{dBm} \end{aligned}$$

$$\begin{aligned} P_s &= P_o(\text{dBm}) - \text{Limit(dBm)} \\ &= 56\text{dBm} - 43.5\text{dBm} \\ &= 12.5\text{dBm} \end{aligned}$$

Where:

P_s = Peak Spurious Output Power

Therefore:
The peak output power of any spurious outputs must be lower than 12.5 dBm

TEST PERFORMED BY: Robert S Dyl DATE: 20 Dec 1991

DATA REFERENCE: _____ SHEET: 30

6.0 DATA:

Frequency	Top Antenna Spurious Output Level (Corrected for Pad etc)	Bottom Antenna Spurious Output Level (Corrected for Pad etc)	Spurious Output Limit
50 MHz	-29.4 dBm	-28.6 dBm	+12.5 dBm
90 MHz	-22.3 dBm	-28.3 dBm	+12.5 dBm
113 MHz	-18.1 dBm	-20.8 dBm	+12.5 dBm
153 MHz	-39.4 dBm	-43.6 dBm	+12.5 dBm
205 MHz	-42.4 dBm	Not Observed	+12.5 dBm
260 MHz	-37.0 dBm	-36.1 dBm	+12.5 dBm
320 MHz	-50.4 dBm	-47.8 dBm	+12.5 dBm
475 MHz	-56.9 dBm	-50.1 dBm	+12.5 dBm
650 MHz	Not Observed	-58.6 dBm	+12.5 dBm

TEST PROCEDURES AND DATA: TEST NO: 4B

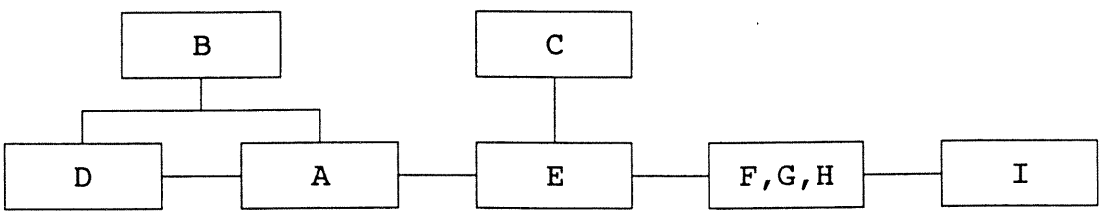
1.0 DESCRIPTION OF TEST: Spurious Emissions (Conducted)
700 MHz - 2000 MHz

2.0 SPECIFICATIONS: 47 CFR 2.991
47 CFR 2.993
47 CFR 87.139

3.0 EQUIPMENT REQUIRED:

	TYPE	MANUFACTURER	MODEL	SER. NO
A	Transponder	Honeywell	RCZ-851B	E2
B	Power Supply	Kepco	ATE36-30M	63529
C	RF Generator	IFR	ATC-1400	1104
D	Radio Mgmt Unit	Honeywell	RM-850	88030142
E	Directional Coupler	HP	778D	826-1248
F	Attenuator (20dB)	Tenuline	8340-200	1149
G	Attenuator (20dB)	Tenuline	8340-200	1155
H	Attenuator (20dB)	Narda	757C	32114
I	Spectrum Analyzer	HP	8568B	AV55900
J				
K				
L				
M				
N				

4.0 BLOCK DIAGRAM OF TEST SETUP:



TEST PERFORMED BY: Robert S Dyer DATE: 20 Dec 1991

DATA REFERENCE: SHEET: 32

5.0 PROCEDURE

1. Connect equipment as shown.

2. Adjust spectrum analyzer so that no signal exceeds the analyzer's dynamic range.

3. Measure and record all spurious emissions between 700 MHz and 2000 MHz (corrected for pads and cable losses).

6.0 DATA:

Frequency	Top Antenna Spurious Output Level (Corrected for Pad etc)	Bottom Antenna Spurious Output Level (Corrected for Pad etc)	Spurious Output Limit
1090 MHz *	-80 dBm	-80 dBm	+12.5 dBm

* Transmitter in standby to measure Local Oscillator leakage.

TEST PERFORMED BY: Robert S Dyl DATE: 20 Dec 1991

DATA REFERENCE: _____ SHEET: 33

TEST PROCEDURES AND DATA: TEST NO: 4C

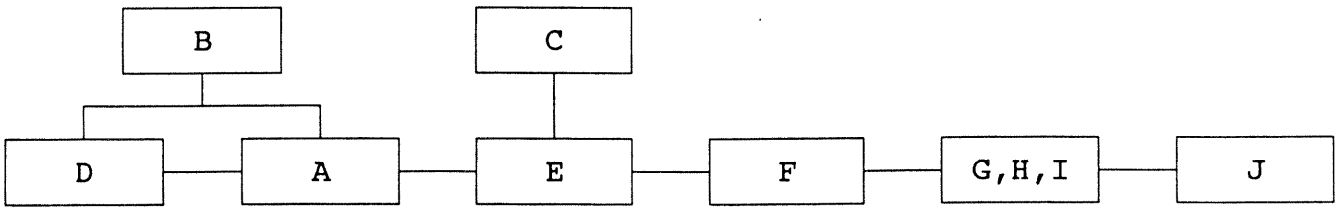
1.0 DESCRIPTION OF TEST: Spurious Emissions (Conducted)
2000 MHz - 11500 MHz

2.0 SPECIFICATIONS: 47 CFR 2.991
47 CFR 2.993
47 CFR 87.139

3.0 EQUIPMENT REQUIRED:

	TYPE	MANUFACTURER	MODEL	SER. NO
A	Transponder	Honeywell	RCZ-851B	E2
B	Power Supply	Kepco	ATE36-30M	63529
C	RF Generator	IFR	ATC-1400	1104
D	Radio Mgmt Unit	Honeywell	RM-850	88030142
E	Directional Coupler	HP	778D	826-1243
F	Attenuator (6dB)	Narda	765-6	AV05803
G	Hi Pass Filter(2GHz)	Microlab	HD-20N	None
H	Hi Pass Filter(4GHz)	Microlab	HD-40N	None
I	Hi Pass Filter(6GHz)	Microlab	HD-60N	None
J	Spectrum Analyzer	HP	8566B	AV58397
K				
L				
M				
N				

4.0 BLOCK DIAGRAM OF TEST SETUP:



TEST PERFORMED BY: Robert S Dyl DATE: 20 Dec 1991

DATA REFERENCE: SHEET: 34

5.0 PROCEDURE

1. Connect equipment as shown.

2. Adjust spectrum analyzer so that no signal exceeds the analyzer's dynamic range. Resolution bandwidth should be set to 3 MHz.

3. Measure and record all spurious emissions between 2 GHz and 4 GHz using the 2 GHz High Pass filter.

4. Measure and record all spurious emissions between 4 GHz and 6 GHz using the 4 GHz High Pass filter.

5. Measure and record all spurious emissions between 6 GHz and 11 GHz using the 6 GHz High Pass filter.

6. Measure and record Pad/Filter/Cable losses for all spurious emissions.

6.0 CALIBRATION DATA:

Frequency	Applicable Filter Type	Calibration Factor (Pad/Filter/Cable)
2180 MHz	2000 MHz	7.5 dB
3270 MHz	2000 MHz	7.5 dB
4360 MHz	4000 MHz	8.0 dB
5450 MHz	4000 MHz	8.0 dB
6540 MHz	6000 MHz	8.0 dB
7630 MHz	6000 MHz	8.0 dB
8720 MHz	6000 MHz	10.0 dB
9810 MHz	6000 MHz	10.0 dB
10900 MHz	6000 MHz	10.0 dB
11990 MHz	6000 MHz	10.0 dB
13080 MHz	6000 MHz	10.0 dB

6.0 MEASUREMENT DATA (Cont.)

Frequency	Top Antenna Spurious Output Level (Corrected for Pad etc)	Bottom Antenna Spurious Output Level (Corrected for Pad etc)	Spurious Output Limit
2180 MHz	-43 dBm	-42 dBm	+12.5 dBm
3270 MHz	-46 dBm	-51 dBm	+12.5 dBm
4360 MHz	-62 dBm	Not Observed	+12.5 dBm
5450 MHz	-55 dBm	-54 dBm	+12.5 dBm
6540 MHz	Not Observed	-54 dBm	+12.5 dBm
7630 MHz	Not Observed	-52 dBm	+12.5 dBm
8720 MHz	Not Observed	Not Observed	+12.5 dBm
8910 MHz	-54 dBm	Not Observed	+12.5 dBm
10900 MHz	Not Observed	-56 dBm	+12.5 dBm
11990 MHz	Not Observed	-55 dBm	+12.5 dBm
13080 MHz	Not Observed	Not Observed	+12.5 dBm

TEST PROCEDURES AND DATA: TEST NO: 5

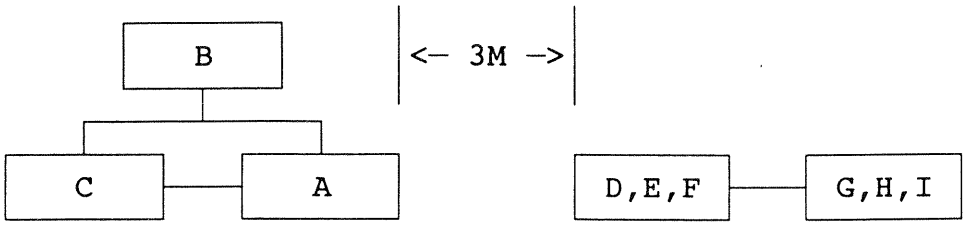
1.0 DESCRIPTION OF TEST: Spurious Emissions (Radiated)

2.0 SPECIFICATIONS: 47 CFR 2.991
47 CFR 2.993
47 CFR 87.139

3.0 EQUIPMENT REQUIRED:

	TYPE	MANUFACTURER	MODEL	SER. NO
A	Transponder	Honeywell	RCZ-851B	E2
B	Power Supply	Kepco	ATE36-30M	63529
C	Radio Mgmt Unit	Honeywell	RM-850	88030142
D	Antenna, Biconical	Emco	3109	
E	Antenna, Log Per.	Aprel	AL-2001	
F	Antenna, Horn	Aprel	AH-118	
G	Spectrun Analyzer	HP	8566B	
H	Preselector	HP	85685A	
I	Quasi-Peak Detector	HP	85650A	
J				
K				
L				
M				
N				

4.0 BLOCK DIAGRAM OF TEST SETUP:



TEST PERFORMED BY: Robert S Doyle DATE: 22 Jan 1992

DATA REFERENCE: SHEET: 37

5.0 PROCEDURE:

1. Connect equipment as shown in an open area.

2. Measure and record all spurious emissions using the appropriate antenna at a distance of 3 meters.

3. Calculate field strength using the recorded power measurement, antenna factor, and cable losses for each frequency.

6.0 DATA:

Transmitter field strength calculation:
(The transmitter field strength is calculated rather than measured for safety reasons)

$$p_{3m} = \frac{P_o G_t}{4\pi r^2} = \frac{(400)\ (1.66)}{4\pi (3)^2} = 5.87 \qquad \frac{Watts}{meter^2}$$

$$e_{3m} = \sqrt{p_3 z_o} = \sqrt{(5.87)\ (377)} = 47.0 \qquad \frac{Volts}{meter}$$

$$e_{3m} = 20 \log_{10}\left[e_3 \frac{v}{m}\ 10^6\right] = 20 \log_{10}\left[(47.0)(10^6)\right] = 153.4 \qquad \frac{dB\mu V}{meter}$$

Where:

e_{3m}	=	Field strength a 3 meters
G_t	=	Transmitter Antenna Gain = 2.2 dB for monopole over ground plane = 1.66 multiplication factor.
P_o	=	Peak Output Power = 400 Watts for this unit
p_{3m}	=	Power density at 3 meters
z_o	=	Characteristic impedance of free space = 377 Ohms

In the previous section, we determined that spurious outputs must be attenuated by at least 43.5 dB.

Therefore the field strength of transmitted spurious shall be 153.4dBμV - 43.5dB = 109.9dBμV

TEST PERFORMED BY: Robert S Dyl DATE: 22 Jan 1992

DATA REFERENCE: _____ SHEET: 38

6.0 DATA (Cont.)

Frequency (MHz)	Level (dBμV)	Antenna (dB)	Cable (dB)	Calc'd dBμV	Limit dBμV
32.0	9.0	14.2	1.2	24.4	109.9
40.0	8.4	12.9	1.3	22.6	109.9
48.0	9.2	11.2	1.4	21.8	109.9
56.0	7.7	9.8	1.6	19.1	109.9
88.0	2.9	8.4	2.1	13.4	109.9
112.0	16.5	11.6	2.2	30.3	109.9
120.0	17.3	12.2	2.3	31.8	109.9
128.0	19.8	12.4	2.3	34.5	109.9
136.0	21.2	12.8	2.4	36.4	109.9
140.0	18.6	13.0	2.5	34.1	109.9
180.0	12.2	12.4	2.9	27.5	109.9
200.0	8.2	14.2	3.0	25.4	109.9
204.0	13.6	14.5	3.0	31.2	109.9
220.0	11.4	14.1	3.1	28.7	109.9
236.2	12.3	14.6	3.3	30.2	109.9
268.4	13.0	15.3	3.5	31.8	109.9
272.0	13.9	15.4	3.5	32.8	109.9
304.0	9.9	15.9	3.8	29.5	109.9
320.0	8.8	16.1	3.9	28.7	109.9
400.0	5.0	17.0	4.4	26.4	109.9
408.0	4.8	17.2	4.4	26.4	109.9
416.0	10.4	17.4	4.5	32.2	109.9
432.0	5.6	17.7	4.6	27.8	109.9
440.0	3.8	17.9	4.6	26.3	109.9
448.0	5.5	18.0	4.6	28.2	109.9
1090 (1)	12.8	24.4	7.8	45.0	109.9
1090 (2)	69.0	24.4	7.8	101.2	None
2180 (2)	37.0	28.2	11.5	76.7	109.9

(1) LO leakage (Transmitter in Standby with dummy load)
(2) Transmitter Transmitting into dummy load

TEST PERFORMED BY: [signature] DATE: 22 Jan 1992

DATA REFERENCE: _____ SHEET: 39

TEST PROCEDURES AND DATA: TEST NO: 6

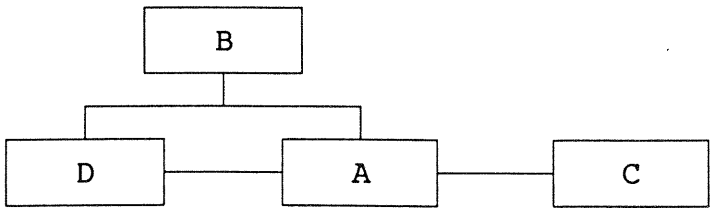
1.0 DESCRIPTION OF TEST: Frequency Stability (Temperature Variation)

2.0 SPECIFICATIONS: 47 CFR 2.995a
47 CFR 87.133

3.0 EQUIPMENT REQUIRED:

	TYPE	MANUFACTURER	MODEL	SER. NO
A	Transponder	Honeywell	RCZ-851B	E2
B	Power Supply	Kepco	ATE36-30M	63529
C	RF Generator	IFR	ATC-1400	1104
D	Radio Mgmt Unit	Honeywell	RM-850	88030142
E	Temperature Chamber	Std Env Sys	TK/5	2594
F	Temperature Probe	Keithley	871	AV05125
G				
H				
I				
J				
K				
L				
M				
N				

4.0 BLOCK DIAGRAM OF TEST SETUP:



TEST PERFORMED BY: Robert S Doyle DATE: 17 Dec 1991

DATA REFERENCE: SHEET: 40

5.0 PROCEDURE:

1. Connect the equipment as shown in the block diagram in section 4.0 of this document.

2. Set the temperature chamber to -20°C and allow the transmitter (non-operating) temperature to stabilize.

3. Record the transmission frequency for both the top and bottom antennas.

4. Repeat steps 2 and 3 at -10°C, 0°C, +10°C, +20°C, +30°C, and +40°C, and +50°C.

6.0 DATA

Temperature	Measured Frequency (Top Ant)	Measured Frequency (Bot Ant)	Frequency Limit
-20°C	1089.98 MHz	1089.99 MHz	1090 ± 1 MHz
-10°C	1089.99 MHz	1090.02 MHz	1090 ± 1 MHz
0°C	1090.01 MHz	1090.01 MHz	1090 ± 1 MHz
+10°C	1090.00 MHz	1089.99 MHz	1090 ± 1 MHz
+20°C	1089.99 MHz	1090.00 MHz	1090 ± 1 MHz
+30°C	1089.99 MHz	1090.00 MHz	1090 ± 1 MHz
+40°C	1089.01 MHz	1090.02 MHz	1090 ± 1 MHz
+50°C	1089.02 MHz	1090.01 MHz	1090 ± 1 MHz

TEST PERFORMED BY: Robert S Doyle DATE: 17Dec1991

DATA REFERENCE: _____ SHEET: 41

TEST PROCEDURES AND DATA: TEST NO: 7

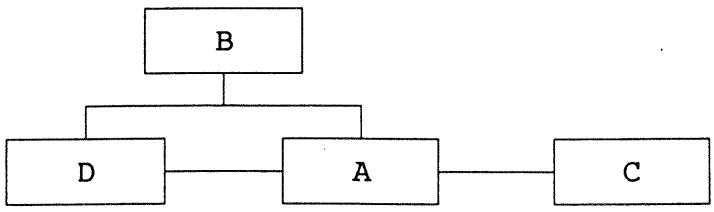
1.0 DESCRIPTION OF TEST: Frequency Stability (Primary Power Variation)

2.0 SPECIFICATIONS: 47 CFR 2.995d
47 CFR 87.133

3.0 EQUIPMENT REQUIRED:

	TYPE	MANUFACTURER	MODEL	SER. NO
A	Transponder	Honeywell	RCZ-851B	E2
B	Power Supply	Kepco	ATE36-30M	63529
C	RF Generator	IFR	ATC-1400	1104
D	Radio Mgmt Unit	Honeywell	RM-850	88030142
E				
F				
G				
H				
I				
J				
K				
L				
M				
N				

4.0 BLOCK DIAGRAM OF TEST SETUP:



TEST PERFORMED BY: Robert S Doyle DATE: 16 Dec 1991

DATA REFERENCE: SHEET: 42

5.0 PROCEDURE:

1. Connect the equipment as shown in the block diagram in section 4.0 of this document.

2. Vary the power supply voltage from -15% to + 15% of the nominal 27.5 VDC and record the transmitted frequency.

6.0 DATA

Power Supply Voltage	Measured Frequency (Top Ant)	Measured Frequency (Bot Ant)	Frequency Limit
23.375 V	1090.04 MHz	1090.04 MHz	1090 ± 1 MHz
24.750 V	1090.04 MHz	1090.04 MHz	1090 ± 1 MHz
26.125 V	1090.04 MHz	1090.04 MHz	1090 ± 1 MHz
27.500 V	1090.04 MHz	1090.04 MHz	1090 ± 1 MHz
28.875 V	1090.05 MHz	1090.05 MHz	1090 ± 1 MHz
30.250 V	1090.05 MHz	1090.05 MHz	1090 ± 1 MHz
31.625 V	1090.05 MHz	1090.05 MHz	1090 ± 1 MHz

TEST PERFORMED BY: Robert S Doyle DATE: 16 Dec 1991

DATA REFERENCE: _____ SHEET: 43