NATIONAL RADIO SYSTEMS COMMITTEE

NRSC-R37 FM Receiver Interference Tests -Laboratory Test Report July 27, 1999

Part II – Receiver Test Reports



REPORT

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NRSC-R37

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Published by CONSUMER ELECTRONICS ASSOCIATION Technology & Standards Department 1919 S. Eads St. Arlington, VA 22202

NATIONAL ASSOCIATION OF BROADCASTERS Science and Technology Department 1771 N Street, NW Washington, DC 20036

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NRSC-R37

FOREWORD

NRSC-R37, FM Receiver Interference Tests - Laboratory Test Report, presents the results of a technical study conducted for National Public Radio, the Consumer Electronics Manufacturers Association (CEMA, precursor to CEA), and the Corporation for Public Broadcasting to document the sensitivity of consumer FM receivers to interference from other FM band signals. This report was filed with the FCC on August 2, 1999 in MM Docket No. 99-25, In the Matter of Creation of a Low Power Radio Service.

The NRSC is jointly sponsored by the Consumer Electronics Association and the National Association of Broadcasters. It serves as an industry-wide standards-setting body for technical aspects of terrestrial over-the-air radio broadcasting systems in the United States.

Appendix

RECEIVER

Receiver

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Certification Procedure

Date	:	
Engineers	:	
Project	FM Receiver Test A	Ī
Receiver Test No.		
		-
Radio Mfg		-
Model		-
501141		-
Antenna Network		_FM -
Audio load:	Ohms	
Initial Set Up:	Fader controls center Any other control set Left channel shall be 15kHz Low Pass filte	Il have tone controls set to flat detent position, Loudness control off, Balance red (set to mid position), Volume set to Standard Output tings unique to the radio under test shall be noted in the Comments section. s used for all Signal (and S/N ratio) measurements. er shall be used on the output of the left channel for all measurements. be used for Noise measurements - Stereo Separation test only. atts are rms
Comments:		
Commonition.		
	· · · · · · · · · · · · · · · · · · ·	
Standard I	RF Levels	Standard FM Test Frequencies
Strong:	-45 dBm	Low: 94.1 MHz
Medium:		
Weak:	-65 dBm	
	Fest Set Ups	- 4
1	Strong Signal Overloa Single RF Tone Tests	
2 3	Two RF Tone Tests	1
3 4	Measurement Set up	
4	measurement Set up	
Standard 7	ſests	
1	Local Oscillator Frequ	uency (Tuning Error)
		ut (Audio level and distortion)
3	RF Input Overload ()	RF level required for 5% THD)
	AM Rejection	
	Image Rejection	
		RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separa
	Capture Ratio	
		ent (30dB noise figure)
		ent (30dB noise figure)
		ent (50dB noise figure)
		cent (50dB noise figure)
		ent (50dB noise figure)
	Additional 10.7MHz	
10-10		

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Single RF Tone Tests

Set Ur Adjust	illator Frequency (Tuning Error) : Connect Spectrum Analyzer to Radio Antenna input : Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2 : .O. Freq 1 MHz L.O. Freq 2 MHz
Set Up	Audio Output Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD
Measurement	Left ChRight ChLevelVrms= 0dBLevelVrmsTHD%THD%
	Overload Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level
Measurement	RF Lev dBm (@ 5% THD) EOC:
	tion Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD
Measurement:	$\frac{\text{THD}}{\text{THD}} \frac{\%}{\%} = \frac{\text{dB}}{\text{dB}} (\text{FM Only})$ (FM + AM 30\%)
AM	Rejection:dB
	ection Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2
Measurement: Image	RF Lev1 dBm (S/N Ratio = 30dB) RF Lev2 dBm (21.4MHz + 94.1MHz = 115.5MHz) Rejection: 0.00 dB (RF Lev1 - RF Lev2)

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6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono (L)	Sierco (L)	Separation L>R	
RF Level	Signal Noise	Signal lift Nois Noise		RF Level
dBm	dB dB	dB dB dB	dB dB	dBm
-130				-130
-125				-125
-120				-120
-115 -110				-115
				-110
-105				-105
-100				-100
-95				-95
-90	i i			-90
-85				-85
-80				-80
-75				-75
-70				-70
-65				-65
-60				-60
-55				-55
-50				-50
-45				-45

Two	RF	Tone	Tests

-1

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<u>Two RF Tone Tests</u>	
7 Capture Ratio	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono	
Undesired: Test Freq. 1, -130dBm, CW	
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1	
Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2	
Measurement: RF Lev 1 dBm	
RF Lev 2 dBm	
Capture Ratio: 0.00 dB (RF Lev 1 - RF Lev 2)/2	
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower)	
Upper 1st	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono	
Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Designal to CW	
Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Uppe	
Lower 1st	
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono	
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Low	
Mono 30dB Storeo 30dB	
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev 55.00 55.00	
Undesired Lower Lev 55.00 55.00 Selectivity, 1st Adj.: 55.00 (RF D/U Up + RF D/U Lo)/2	
Selectivity, 1st Adj.: 55.00 (RF D/U Up + RF D/U Lo)/2	
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower)	
Upper 2nd	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono	
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Uppe	
Lower 2nd	
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Low	
Mono 30dB Stereo 30dB	
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev	
Undesired Lower Lev 53.00 55.00	
Selectivity, 2nd Adj.: 55.00 (RF D/U Up + RF D/U Lo)/2	

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FM Receiver Test Laboratory
10 Selectivity - 1st Adjacent 50dB S/N (Upper and Lower)
Upper 1st
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Uppe Lower 1st
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Low
Mono 50dB Stereo 50dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00 Undesired Upper Lev 55.00 -55.00
Undesired Upper Lev 55.00 55.00 Undesired Lower Lev 55.00 55.00
Selectivity, 1st Adj.: 55.00 (RF D/U Up + RF D/U Lo)/2
11 Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)
Upper 2nd
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Uppe
Lower 2nd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Low
Mono 50dB Stereo 50dB dBm D/U dBm D/U
Desired Lev -55.00
Undesired Upper Lev 55.00 -55.00
Undesired Lower Lev -55.00 -55.00
Selectivity, 2nd Adj.: 55.00 (RF D/U Up + RF D/U Lo)/2
· · · · · · · · · · · · · · · · · · ·
12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)
Upper 3rd Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Uppe
Lower 3rd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Padia audia to Std. Paf Level (0dB)
Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Low
Mono 50dB Stereo 50dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev 55.00 55.00
Undesired Lower Lev 55.00 55.00
Selectivity, 3rd Adj.: 55.00 (RF D/U Up + RF D/U Lo)/2

55.00 (RF D/U Up + RF D/U Lo)/2

Additional Tests

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13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

 RF Lev 1
 dBm

 RF Lev 2
 dBm
 EOC

 D/U
 0.00
 dB
 EOC

14 10.7 IM Test

Using the three generator set up, set generators as follows;

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust: Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz

		southern and the second	
-45.00		-45.00	
	-45.00		-45.00

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1 MHz, -45dBm, Pilot only

- Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev
- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6M

b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/A	dBm	Đ /E
-45.00		-45.00	
	-45.00		-45.00

EOC:

	Deta	. 1/0/00					
,	Engineers	: <u>1/0/00</u>	_				
	-	FM Receiv	ver Test Al				
Re	ceiver Test No.:	0					
	Class:	0					
	Radio Mfg.:	0					
	Model:	stations and second second second	0				
	Serial:	0					
An	tenna Network:	0		FM			
	Audio load:	0	Ohms				
:	Initial Set Up:	Fader contr Any other of Left channel 15kHz Low Right channel	ols centered (control setting shall be use v Pass filter sl	(set to mid positi rs unique to the r rd for all Signal (hall be used on the sed for Noise me	on), Volume se radio under test (and S/N ratio) he output of the	et to Sta t shall b measu e left ch	e noted in the Comments section.
	Comments:	0					
		0					
		0					
		0					
	•						
Standard	RF Levels				St	andard	FM Test Frequencies
Strong	: -45	dBm					94.1MHz
Medium	: -55	dBm					
Weak	: -65	dBm					
Standard	Test Set Ups						
1	Strong Signal	Overload					
2	Single RF Tor						
3	Two RF Tone						
4	Measurement	Set up					
	Standard Tes	ts					-
1	Local Oscillat	or Frequenc	y (Tuning En	ror)		13	10.7MHz Rejection
2	Standard Audi					14	10.7MHz Intermodulation
3	RF Input Over	load (RF le	vel required t	for 5% THD)		15	10.7MHz Spurious (Local Osc. Interference)
4	AM Rejection						
5	Image Rejection			.			
6	Curve Tests (p	iots of RF L	evel Vs Audi	o Output)			
7 8	Capture Ratio	Adiacant (
8 9	Selectivity; 1st Selectivity; 2nd						
10	Selectivity, 216			• '			

- 11
- Selectivity; 1st Adjacent (50dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) 12

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Test Results:

1 Local Oscillator Frequency: 0.000 MHz

2	Standard Audio Output: Left Channel 0 Vrms	THD %	Right Channel	THD %
3	RF Input Overload: 0.00 dBm	0		
4	AM Rejection: dB			
5	Image Rejection: 0.00 dB			
6	Curve Tests: (See Plots)			
7	Capture Ratio: 0.00 dB			
8	Selectivity, First Adjacent, -55.00 dB Mono -55.00 dB Stereo	30dB Noise Floor (A	vve. D/U)	
9	Selectivity, Second Adjacen 	t, 30dB Noise Floor	(Ave. D/U)	
10	Selectivity, First Adjacent, 5 	OdB Noise Floor (A	ve D/U)	
1	Selectivity, Second Adjacent -55.00 dB Mono -55.00 dB Stereo	, 50dB Noise Floor ((Ave. D/U)	
12	Selectivity, Third Adjacent, -55.00 dB Mono -55.00 dB Stereo	50dB Noise Floor (A	we. D/U)	
3	<u>55.00</u> dB Stereo 10.7MHz Rejection <u>0.00</u> dB	0		
4				

 14
 10.7MHz IM

 -45.00
 dB (10.6)
 Max RF
 0

 -45.00
 dB (10.7)
 Max RF
 0

 15
 10.7MHz Spurious (Local Osc. Interference)

	_dB (10.6)	Max RF	0
45.00	_dB(10.7)	Max RF	0

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SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

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1st and 2nd ADJACENT CHANNEL SELECTIVITY (30dB Noise Floor)

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1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

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IM & L.O. Rejection

File Name: !c_temp

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Receiver #1

Delco

Auto

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	e: <u>2/28/99</u>
Engineer	
Projec	t: FM Receiver Test A1
eceiver Test No	1
	s: Automotive
Radio Mfg	
	1: 16192463
	1: 1000499
ntenna Network	E: Delco FM AM
Audio load	l: Ohms
Initial Set Un	: Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and
hudan Set Op	Fader controls centered (set to mid position), Volume set to Standard Output
	Any other control settings unique to the radio under test shall be noted in the Comments section.
	Left channel shall be used for all Signal (and S/N ratio) measurements.
	15kHz Low Pass filter shall be used on the output of the left channel for all measurements.
	Right channel shall be used for Noise measurements - Stereo Separation test only.
	All level measurements are rms
Commente	
Comments:	Craphic equalizer set to flat
	· · · · · · · · · · · · · · · · · · ·
Standard R	
Strong:	
Medium:	-55 dBm
Weak:	-65 dBm
64 J J T	
Standard Te	st Set Ups
1	Strong Signal Overload
2	Single RF Tone Tests
3	Two RF Tone Tests
	Measurement Set up
Standard Te	sts
1	Local Oscillator Frequency (Tuning Error)
	Standard Audio Output (Audio level and distortion)
	RF Input Overload (RF level required for 5% THD)
	AM Rejection
	Image Rejection
	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation
	Capture Ratio
	Selectivity; 1st Adjacent (30dB noise figure)
	Selectivity; 2nd Adjacent (30dB noise figure)
	Selectivity; 1st Adjacent (50dB noise figure)
	Selectivity; 1st Adjacent (50dB noise figure)
	Selectivity; 3rd Adjacent (50dB noise figure)
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Single RF Tone Tests

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Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	104.800 MHz
	L.O. Freq 2	MHz

Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	Le	ft Ch			Ri	ght Ch				
	Level	2	Vrms	= 0 dB	Level	2	Vrms			
		.64	%		THD	.45	_%			

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22 dBm (@ 5% THD) Max Test Bed RF level - no change in level or THD

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.64	_%	=	43.88 dB	(FM Only)
	THD	0.64	%	=	-43.88 dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-106	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-62	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
Image	Rejection:	-44.0	dB	(RF Lev1 - RF Lev2)

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Curve Tests

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- Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.
- Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separatio	n L->R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-23.00	-23.00	-23.00	-23.00		-23.00	-23.00	-130
-125	-23.00	-23.00	-23.00	-23.00		-23.00	-23.00	+125
*120	-21.00	-24.00	-22.00	-23.50	000000000000000000000000000000000000000	-22.50	-22.50	-120
-115	-16.00	-25.00	-17.00	-24.50		-20.50	-20.50	+115
-110	-8.00	-27.00	-9.00	-26.50		-14.00	-14.00	-110
+105	-2.50	-35.50	-3.20	-34.00		-9.00	-9.00	-105
-100	-0.50	-50.00	-0.80	-47.00		-7.00	-6.50	-100
-95	0.00	-58.00	-0.50	-54.50		-6.00	-7.00	-95
-90	0.00	-62.00	-0.40	-55.00		-5.00	-8.00	-90
+85	0.00	-62.00	-0.30	-55.00		-4.00	-9.50	•85
-80	0.00	-62.00	0.00	-55.00		-2.00	-13.00	+80
•75	0.00	-62.00	0.00	-57.00		-1.20	-17.00	+75
-70	0.00	-62.00	0.00	-58.50		-0.50	-32.50	-70
-65	0.00	-62.00	0.00	-60.00		0.00	-38.00	+65
-60	0.00	-62.00	0.00	-61.00		0.00	-38.00	-60
-55	0.00	-62.00	0.00	-61.00		0.00	-38.00	+55
-50	0.00	-62.00	0.00	-61.00		0.00	-38.00	-50
-45	0.00	-62.00	0.00	-61.00	-52.50	0.00	-38.00	-45

Two RF Tone Tests

Two RF Ton	<u>e Tests</u>
7 Capture Rat	
Set Up:	Test Set Up 3
	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
A	Undesired: Test Freq. 1, -130dBm, CW
-	Set Radio audio to Std. Ref. Level (0dB)
	Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
	Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement:	RF Lev 1 -60.00 dBm
	RF Lev 2 dBm
Caj	pture Ratio: <u>-5.00</u> dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1 Upper 1st	st Adjacent 30dB S/N (Upper and Lower)
	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: S	Set Radio audio to Std. Ref. Level (0dB)
•	Set the modulation of the Desired signal to CW
	ncrease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: S	et Radio audio to Std. Ref. Level (0dB)
5	et the modulation of the Desired signal to CW
I	ncrease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	-36.42 -36.92 -36.92 -36.92
Undesired Lower Lev	-35.32 -19.68 -35.92 -19.08
Selectivity, 1st Adj.:	-19.13 -18.58 (RF D/U Up + RF D/U Lo)/2
9 Selectivity - 21	nd Adjacent 30dB S/N (Upper and Lower)
Upper 2nd	
Set Up: T	est Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: S	et Radio audio to Std. Ref. Level (0dB)
	et the modulation of the Desired signal to CW
	crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	et Radio audio to Std. Ref. Level (0dB)
	t the modulation of the Desired signal to CW
In	crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	8.00 -63.00 8.00 -63.00
Undesired Lower Lev	8.00 -63:00 8.00 -63:00
Selectivity, 2nd Adj.:	-63.00 [http://www.sef

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	FM Receiver Test Laboratory
10 Selectivity	- 1st Adjacent 50dB S/N (Upper and Lower)
Upper 1st	
	y: Test Set Up 3
,	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	
Set Up	: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
-	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	-59.12 4.12 -60.92 5.92
Undesired Lower Lev	
Selectivity, 1st Adj.:	5.97 7.42 (RF D/U Up + RF D/U Lo)/2
U pper 2nd Set Up:	Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust.	Set Radio audio to Std. Ref. Level (0dB)
Tigust.	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
-	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
Desired Lev	dBm D/U dBm D/U -55.00 -55.00
Undesired Upper Lev	0.08 -55.08 -1.92 -53.08
Undesired Lower Lev	-0.92 -54.08 -2.92 52.08
Selectivity, 2nd Adj.:	-54.58 (RF D/U Up + RF D/U Lo)/2
,	
12 Selectivity - 3	Brd Adjacent 50dB S/N (Upper and Lower)
Upper 3rd	
Set Up: 1	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Hadada d. Tast Frank I. (COMIL 100 ID 11 II. COURT D. 14

Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 3rd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

					,	
	Mono	50dB	Stereo	50dB		
	dBm	D/U	dBm	D/U		
Desired Lev	-55.00		-55.00			
Undesired Upper Lev	3.08	-58.08	1.08	-56.08		
Undesired Lower Lev	0.08	-55.08	-1.92	-53.08		
Selectivity, 3rd Adj.:		-56.58		-54.58	(RF D/U Up + RF D/	'U Lo)/2

Additional Tests

1

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

RF Lev 1	-105.00	dBm
RF Lov 2		dBm
D/U	105.00	dB

EOC Could not attain a reading for this test

14 10.7 IM Test

Using the three generator set up, set generators as follows;

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

dBm	10U	dBm	D/U
-45.00		-45.00	
-13.07	-31.93	-13.07	-31.93

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

10.6MHz S	***************************	10.7MHz S	pacing
dBm	D/U	dBm	D/U
-45.00		-45.00	
-13.07	-31.93	-13.07	-31.93
Aax RP	-31.93	MarRF	-31.93

EOC: There was enough interference to raise the noise floor to -54dB - beat note type noise

	Date	2/28/99				
	Engineers				,	
•	Project	FM Recei	ver Test Al	-		
Rec	ceiver Test No.:			-		
		Automotiv	/e	_		
	Radio Mfg.:	-		-		
		16192463	·	-		
	Senai	1000499		-		
Ant	tenna Network:	Delco		FM		
	Audio load:	4	Ohms	-		
1	Initial Set IIn:	Radio und	er test shall have	e tone controls se	t to flat detent nos	tion, Loudness control off, Balance and
-	unum set op.				i), Volume set to Si	
			•	•		be noted in the Comments section.
					nd S/N ratio) meas	
						hannel for all measurements.
		Right chan	nel shall be used	d for Noise meas	urements - Stereo S	Separation test only.
		All level m	easurements are	e rms		
	Comments:		ualizer set to fla	ut		
		Loudness c				
		0			· · · .	
		0				
	•					
Standard	RF Levels				Standar	d FM Test Frequencies
	RF Levels	dBm			Standar	d FM Test Frequencies 94 1MHz
Standard Strong Medium	: -45	dBm dBm			Standar	d FM Test Frequencies 94.1MHz
Strong	-45 -55				Standar	-
Strong: Medium:	-45 -55	dBm			Standar	-
Strong Medium Weak	-45 -55	dBm			Standar	-
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups	dBm dBm			Standar	-
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups Strong Signal	dBm dBm Overload			Standar	-
Strong Medium Weak Standard 1 2	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Too	dBm dBm Overload ne Tests			Standar	-
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups Strong Signal	dBm dBm Overload ne Tests Tests			Standar	-
Strong Medium Weak Standard 1 2 3	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Tone Two RF Tone	dBm dBm Overload ne Tests Tests Set up			Standar	-
Strong Medium Weak Standard 1 2 3 4	- 45 -55 -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes	dBm dBm Overload ne Tests Tests Set up sts	zy (Tuning Error	r)		94.1MHz
Strong Medium Weak Standard 1 2 3 4	- 45 -55 -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat	dBm dBm Overload ne Tests Tests Set up sts or Frequence	ry (Tuning Erro Audio level and		13	94.1MHz 10.7MHz Rejection
Strong Medium Weak Standard 1 2 3 4	- 45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up sts or Frequence to Output (2	zy (Tuning Erro Audio level and evel required for	distortion)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4	- 45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up sts or Frequence to Output (2 cload (RF h	Audio level and	distortion)	13	94.1MHz 10.7MHz Rejection
Strong Medium Weak Standard 1 2 3 4 1 2 3 3	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over	dBm dBm overload ne Tests Tests Set up sts or Frequence to Output (2 cload (RF le	Audio level and	distortion)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection	dBm dBm dBm Tests Tests Set up sts or Frequence to Output (4 cload (RF la on	Audio level and	distortion) r 5% THD)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection	dBm dBm dBm Tests Tests Set up sts or Frequence to Output (4 cload (RF la on	Audio level and evel required for	distortion) r 5% THD)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7 8	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st	dBm dBm dBm overload ne Tests Tests Set up sts or Frequence to Output (A cload (RF la cload (RF la cload of RF l cload of RF l	Audio level and evel required for Level Vs Audio 30dB noise figu	distortion) r 5% THD) Output) re)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7 8 9	-45 -55 -55 -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 2n	dBm dBm dBm overload ne Tests Tests Set up sts or Frequence to Output (A cload (RF le on lots of RF I cload of RF I cload (d Adjacent (Audio level and evel required for Level Vs Audio 30dB noise figu (30dB noise figu	distortion) r 5% THD) Output) rre) ure)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7 8 9 10	-45 -55 -55 -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 1st	dBm dBm dBm overload ne Tests Tests Set up sts or Frequence to Output (A cload (RF la cload (RF la cload (RF la cload (RF la cload (Adjacent (d Adjacent (cloacent (Audio level and evel required for Level Vs Audio 30dB noise figu	distortion) r 5% THD) Output) rre) ure) rre)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation

12 Selectivity; 3rd Adjacent (50dB noise figure)

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1 Local Oscillator Frequency: 104.800 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
Vrms	.64%	2 Vrms	.45 %

3 RF Input Overload: 22.00 dBm

Max Test Bed RF level - no change in level or THD

4 AM Rejection: 0.00 dB

- 5 Image Rejection: _____dB
- 6 Curve Tests: (See Plots)
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -19.13 dB Mono -18.58 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.00 dB Mono Max RF -63.00 dB Stereo Max RF
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) 5.97 dB Mono 7.42 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -54.58 dB Mono -52.58 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -56.58 dB Mono -54.58 dB Stereo
- 13
 10.7MHz Rejection

 ______105.00
 dB

 Could not attain a reading for this test
- 14
 10.7MHz IM (D/U)

 -31.93
 dB (10.6)
 Max RF
 0

 -31.93
 dB (10.7)
 Max RF
 0

15 10.7MHz Spurious - Local Osc. Interference (D/U) -31.93 dB (10.6) Max RF There was enough

-31.93 dB (10.6) Max RF There was enough interference to raise the noise floor to -54dB - beat note type noise -31.93 dB (10.7) Max RF 0

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SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

File Name: C_delco

Done 10 of 15



SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

Delco 16192463





1st and 2nd ADJACENT CHANNEL SELECTIVITY

File Name: C_delco

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Delco 16192463

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1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY (50dB Noise Floor)

Delco 16192463

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IM & L.O. Rejection (50dB Noise Floor)

Delco 16192463

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Receiver #2

1

Denon

Home HiFi

Date Engineers	: <u>2/28/99</u>						
-	: FM Receiv	ver Test Al					
Receiver Test No.	: 2						
	: Home Hi I	Fi Tuner					
Radio Mfg.							
	: TU-380RI						
Serial	: <u>40563011</u> 4	49	_				
Antenna Network	: 50/75 Ohn	1 Trans	FM				
			AM				
Audio load	10K	Ohms					
Total Deve The	D ¹¹ 1						
Initial Set Up:	Fadar cont	er test shall ha	ave tone control	s set to flat de	tent posi	ition, Loudness control off, Balance and	
			(set to mid posi				
	Left channe	el chall be uc	ed for all Signal	radio under i		be noted in the Comments section.	
						hannel for all measurements.	
	Right chan	nel shall be u	sed for Noise m	easurements .	Stereo S	Separation test only.	
		easurements a			0101001	separation test only.	
Comments:	RF Atten; C	Dff					
			anual for Mono				
	Auto/Manu	al switch; Au	to for Stereo tes	sts			
			~				-
Standard R	F I evels			Standard FM	Test Fr	remencies	
Standard R Strong:	F Levels -45	dBm	ŝ	Standard FM		-	
Standard R Strong: Medium:		dBm dBm	\$	Standard FM Low:	Test Fr 94.1	requencies MHz	
Strong:	-45		Ş			-	
Strong: Medium:	-45 -55	dBm	5			-	
Strong: Medium: Weak:	-45 -55 -65	dBm	5			-	
Strong: Medium:	-45 -55 -65	dBm	8			-	
Strong: Medium: Weak: Standard Te	-45 -55 -65 st Set Ups	dBm dBm	8			-	
Strong: Medium: Weak: Standard Te 1	-45 -55 -65 st Set Ups Strong Signa	dBm dBm al Overload	8			-	
Strong: Medium: Weak: Standard Te 1 2	-45 -55 -65 st Set Ups	dBm dBm al Overload one Tests	8			-	
Strong: Medium: Weak: Standard Te 1 2 3	-45 -55 -65 st Set Ups Strong Sign: Single RF T	dBm dBm al Overload one Tests ne Tests	8			-	
Strong: Medium: Weak: Standard Te 1 2 3	-45 -55 -65 st Set Ups Strong Sign. Single RF To Two RF Tor	dBm dBm al Overload one Tests ne Tests	5			-	
Strong: Medium: Weak: Standard Te 1 2 3	-45 -55 -65 st Set Ups Strong Sign: Single RF To Two RF Tor Measurement	dBm dBm al Overload one Tests ne Tests	8			-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te	-45 -55 -65 st Set Ups Strong Sign: Single RF To Two RF Tor Measurements	dBm dBm al Overload one Tests te Tests te Tests th Set up		Low:		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te: 1	-45 -55 -65 st Set Ups Strong Sign: Single RF To Two RF Tor Measurement sts Local Oscilla	dBm dBm al Overload one Tests te Tests at Set up ator Frequence	y (Tuning Erro	Low: r)		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te: 1	-45 -55 -65 st Set Ups Strong Signa Single RF To Two RF Tor Measuremen sts Local Oscilla Standard Au	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (2	y (Tuning Erro Audio level and	r) distortion)		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te: 1 2 3 3	-45 -55 -55 -65 st Set Ups Strong Signa Single RF Tr Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (A erload (RF la	y (Tuning Erro	r) distortion)		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 2 3 4 2 3 1 4 2 3 2 3 4	-45 -55 -55 -65 st Set Ups Strong Sign: Single RF Tr Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov AM Rejectio	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (<i>A</i> erload (RF le n	y (Tuning Erro Audio level and	r) distortion)		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te: 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 3 1 2 3 3 1 2 3 5 1 2 3 3 4 2 3 5 1 2 3 5 4 1 2 3 5 5 1 1 2 5 5 1 1 1 2 5 5 1 1 1 1 1 1 1	-45 -55 -55 -65 st Set Ups Strong Signa Single RF Tr Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov AM Rejectio image Reject	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (A erload (RF la n tion	y (Tuning Erro Audio level and evel required for	r) distortion) r 5% THD)	94.1	MHz	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 1 2 3 4 3 1 4 5 1 6	-45 -55 -55 -55 st Set Ups Strong Sign: Single RF To Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov AM Rejectio Image Reject Curve Tests	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (<i>J</i> erload (RF la n tion (plots of RF]	y (Tuning Erro Audio level and evel required for	r) distortion) r 5% THD)	94.1	-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 2 3 1 4 2 5 1 5 1 6 0 7	-45 -55 -55 -55 st Set Ups Strong Sign: Single RF To Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov AM Rejectio image Reject Curve Tests Capture Rati	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (<i>A</i> erload (RF la n tion (plots of RF 1 o	y (Tuning Erro Audio level and evel required for Level Vs Signal	r) distortion) r 5% THD) - Mono & Sta	94.1	MHz	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 1 2 3 4 5 5 1 6 6 6 7 6 8 8 5	-45 -55 -55 -65 st Set Ups Strong Signa Single RF To Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov AM Rejectio Image Reject Curve Tests Capture Rati Selectivity; 1	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence idio Output (<i>J</i> erload (RF lo n tion (plots of RF I) o st Adjacent (:	ey (Tuning Erro Audio level and evel required for Level Vs Signal 30dB noise figu	r) distortion) r 5% THD) - Mono & Sta ure)	94.1	MHz	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 1 2 3 4 5 1 6 6 6 7 6 8 5 9 5	-45 -55 -55 -55 st Set Ups Strong Signs Single RF To Two RF Tor Measuremen sts Local Oscilla Standard Au RF Input Ov AM Rejectio Image Reject Curve Tests Capture Rati Selectivity; 1 Selectivity; 2	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence dio Output (<i>J</i> erload (RF I n (plots of RF I o st Adjacent (nd Adjacent (y (Tuning Erro Audio level and evel required for Level Vs Signal	r) distortion) r 5% THD) - Mono & Sta ure) ure)	94.1	MHz	

12 Selectivity; 3rd Adjacent (50dB noise figure)

Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

```
Measurement: L.O. Freq 1 104.794 MHz
L.O. Freq 2 MHz
```

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	eft Ch			F	light Ch	
	Level	0.775	Vrms	= 0 dB	Level	0.780	Vrms
	THD_	0.16	_%		THD	0.16	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22.00 dBm (@ 5% THD) Max Test Bed RF level - slight increase in THD (0.36%)

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD_	0.16	_%	=	<u>-55.92</u> dB	(FM Only)
	THD_	0.16	_%	=	<u>-55.92</u> dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-106.0	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-53.0	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
Image 1	Rejection:	-53.00	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separation	n L⊧≫R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-14.50	-14.50	-77.00	-77.00		-77.00	-77.00	-130
-125	-14.50	-14.50	-77.00	-77.00		-77.00	-77.00	-125
-120	-14.50	-15.00	-77.00	-77.00		-77.00	-77.00	-120
-115	-12.00	-16.50	-77.00	-77.00		-77.00	-77.00	-115
-110	-6.50	-21.00	-77.00	-77.00		-77.00	-77.00	-110
+105	-2.00	-35.50	-77.00	-77.00		-77.00	-77.00	-105
-100	-0.25	-49.00	-77.00	-77.00		-77.00	-77.00	+100
+95	0.00	-54.50	-77.00	-77.00		-77.00	-77.00	•95
-90	0.00	-60.00	0.00	-36.00		0.00	-31.50	-90
-85	0.00	-65.50	0.00	-41.00		0.00	-34.00	-85
-80	0.00	-71.00	0.00	-46.00		0.00	-35.00	-80
-75	0.00	-76.00	0.00	-51.00		0.00	-35.50	-75
-70	0.00	-78.00	0.00	-55.50		0.00	-35.50	-70
-65	0.00	-78.00	0.00	-60.50		0.00	-36.00	-65
-60	0.00	-78.00	0.00	-65.00		0.00	-36.00	-60
-55	0.00	-78.00	0.00	-69.00		0.00	-36.00	-55
-50	0.00	-78.00	0.00	-71.50		0.00	-37.00	-50
-45	0.00	-78.00	0.00	-72.50	-70.50	0.00	-37.50	-45

Two RF Tone Tests

1WO KF 10	<u>ne rests</u>
7 Capture Ra	atio
	: Test Set Up 3
	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
	Undesired: Test Freq. 1, -130dBm, CW
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
-	Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
	Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement:	
	RF Lev 2 dBm
C	apture Ratio:dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity -	1st Adjacent 30dB S/N (Upper and Lower)
Upper 1st	
Set Up:	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	increase ondesired signal unu noise noor is -soub, record ondesired Kr level as ondesired opper Lev.
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
500 SP	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
2	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	
Undesired Upper Lev	
Undesired Lower Lev	-50.52 -4.48 -50.82 -4.18
Selectivity, 1st Adj.:	-9.63 (RF D/U Up + RF D/U Lo)/2
9 Selectivity - 2	2nd Adjacent 30dB S/N (Upper and Lower)
Upper 2nd	and Aufacent South SAT (Opper and Lower)
	Test Set Up 3
•	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
A 31	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	8.08 -63.08 7.70 -62.70
Undesired Lower Lev	8.08 -63.08 8.08 -63.08
Selectivity, 2nd Adj.:	
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	FM Receiver Test Laboratory
10 Selectivity	- 1st Adjacent 50dB S/N (Upper and Lower)
Upper 1st	- 15t Adjucint Soup 1314 (opper and Lower)
	: Test Set Up 3
500 O J	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
A dinot	: Set Radio audio to Std. Ref. Level (0dB)
Aujusi	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
T	increase Undesired signal until noise noor is -Joub, record Undesired Kr level as Undesired Opper Lev.
Lower 1st	Desired Test Days 1 Madium 11-12 Wills Day Man
Set Up	• • • • •
	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	
Undesired Upper Lev	
Undesired Lower Lev	
Selectivity, 1st Adj.:	-8.08 9.42 (RF D/U Up + RF D/U Lo)/2
11 Selectivity -	2nd Adjacent 50dB S/N (Upper and Lower)
Upper 2nd	
Set Up:	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
•	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
-	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	
Undesired Upper Lev	
Undesired Lower Lev	8.08 -63.08 8.08 -63.08
Selectivity, 2nd Adj.:	
Selectivity, 2nd Player	
12 Selectivity -	3rd Adjacent 50dB S/N (Upper and Lower)
Upper 3rd	
	Test Set Up 3
bu op.	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 3rd	increase ondesned signal and noise noor is sould, record ondesned Kr level as ondesned opper Lev.
Set Up:	Desired Test Freq 1 Medium 1kHz 75kHz Dev Mana
Set Op:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
-	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
r	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	7.90 -62:90 -9.92 -45:08
Undesired Lower Lev	8.08 -12.92 -42.08

 Undesired Lower Lev
 8.08
 -63.08
 -12.92
 -42.08

 Selectivity, 3rd Adj.:
 -62.99
 -43.58
 (RF D/U Up + RF D/U Lo)/2

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175

Additional Tests

13

10.7MHz Rejection Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

			D/U
-45.00		-45.00	
-24.37	20.63	-25.37	-19.63

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz) Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-13.37	-31.63	-26.37	-18.63

EOC: Objectionable beat notes

	Date	: 2/28/99			
	Engineers	RMc			
		FM Receiver Test A1	-		
	•		-		
Rec	eiver Test No.:	: 2			
		Home Hi Fi Tuner	-		
	Radio Mfg.:	· · · · · · · · · · · · · · · · · · ·	-		
	-	TU-380RD	-		
		4056301149	-		
	bonan.	4050501145	-		
۸+	onno Notrionici	50/75 Ohm Tana	ÊM		
An	eillia Network.	50/75 Ohm Trans.	_FM		
		• · · · · · · · · · · · · · · · · · · ·	-		
	A				
	Audio load:	<u> </u>			
-					
I	nitial Set Up:			-	on, Loudness control off, Balance and
		Fader controls centered (se			
					noted in the Comments section.
		Left channel shall be used i			
		15kHz Low Pass filter shall	ll be used on the output	of the left cha	nnel for all measurements.
		Right channel shall be used	d for Noise measuremen	its - Stereo Sej	paration test only.
		All level measurements are	erms		
	Comments:	RF Atten; Off			
		Auto/Manual switch; Manual	ual for Mono tests		
		Auto/Manual switch; Auto	for Stereo tests		
		0			
Standard	RF Levels			Standard 1	FM Test Frequencies
Strong	-45	dBm			94.1MHz
Medium		dBm			
Weak:		dBm			
W CHILL	-05				
Standard	Test Set Ups				
Station	rest set ops				
-	Steana Signal	Ormiand			
1	Strong Signal				
2	Single RF To				
3	Two RF Tone				
4	Measurement	Set up			
					•
	Standard Te	sts			
1		tor Frequency (Tuning Error		13	10.7MHz Rejection
2		io Output (Audio level and	•	14	10.7MHz Intermodulation
3	RF Input Over	rload (RF level required for	r 5% THD)	15	10.7MHz Spurious (Local Osc. Interference)
4	AM Rejection				
5	Image Rejecti	on			
6	Curve Tests (p	plots of RF Level Vs Audio	Output)		
7	Capture Ratio				
8	Selectivity; 1s	t Adjacent (30dB noise figu	ire)		
9		d Adjacent (30dB noise fig			
10		t Adjacent (50dB noise figu			
11		d Adjacent (50dB noise fig			
		d Adjacent (50dB noise figu			
14	Solocuvity, 51	a majacon (2001) noise ligi			

Test Results:

- 1 Local Oscillator Frequency: 104.794 MHz
- 2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
0.775Vrms	0.16 %	0.78 Vrms	0.16 %

3 RF Input Overload: 22.00 dBm Max

Max Test Bed RF level - slight increase in THD (0.36%)

- 5 Image Rejection: -53.00 dB
- 6 Curve Tests: (See Plots)
- 7 Capture Ratio: _-0.55 dB
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -9.63 dB Mono -9.48 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.08 dB Mono Max RF -62.89 dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -8.08 dB Mono 9.42 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -55.58 dB Mono -48.08 dB Stereo

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- 13 10.7MHz Rejection _-87.70 dB
- 14
 10.7MHz IM

 -20.63
 dB (10.6)
 0

 -19.63
 dB (10.7)
 0
- 15
 10.7MHz Spurious (Local Osc. Interference)

 __31.63
 dB (10.6)
 Max RF
 Objectionable beat notes

 __18.63
 dB (10.7)
 0

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SIGNAL/NOISE VS RF LEVEL

Denon TU-380RD

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1.110



SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

Denon TU-380RD

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SIGNAL/NOISE VS RF LEVEL

Denon TU-380RD

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1st and 2nd ADJACENT CHANNEL SELECTIVITY

(30dB Noise Floor)

Denon TU-380RD

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1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

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IM & L.O. Rejection (50dB Noise Floor)

Denon TU-380RD

Receiver #3

Panasonic

Portable

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Engineers	
Project	FM Receiver Test A1
Radio Mfg.: Model:	AM/FM/Cass Portable
Antenna Network:	<u>50/75 Ohm Trans.</u> FM AM .
Audio load:	Ohms
Initial Set Up:	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and Fader controls centered (set to mid position), Volume set to Standard Output Any other control settings unique to the radio under test shall be noted in the Comments section. Left channel shall be used for all Signal (and S/N ratio) measurements. 15kHz Low Pass filter shall be used on the output of the left channel for all measurements. Right channel shall be used for Noise measurements - Stereo Separation test only. All level measurements are rms
Comments:	Tone control full clockwise
	Band switch in FM Stereo
Standard RJ	
Strong: Medium:	-45 dBm Low: 94.1 MHz -55 dBm
Weak:	-55 dBm -65 dBm
weak.	-05 dBm
Standard Te	st Set Ups
1	Strong Signal Overload
2	Single RF Tone Tests
3	Two RF Tone Tests
4	Measurement Set up
Standard Tes	sts
1	Local Oscillator Frequency (Tuning Error)
	Standard Audio Output (Audio level and distortion)
	RF Input Overload (RF level required for 5% THD)
	AM Rejection
	mage Rejection
	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation
7 (Capture Ratio
	Selectivity; 1st Adjacent (30dB noise figure)
	Selectivity; 2nd Adjacent (30dB noise figure)
	Selectivity, 1st Adjacent (50dB noise figure)
	Selectivity; 2nd Adjacent (50dB noise figure)
	electivity; 3rd Adjacent (50dB noise figure)
	Additional 10.7MHz Tests
13-13 1	

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Single RF Tone Tests

: 1

Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	104.898	MHz
	L.O. Freq 2		MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	eft Ch			F	light Ch	
	Level_	1.000	Vrms	= 0 dB	Level	0.950	Vrms
	THD_	0.56	_%		THD_	0.54	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 19.50 dBm (@ 5% THD)

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.55	%	=	-45.19	B	(FM Only)
	THD	0.6	_%	=	-44.44	iВ	(FM + AM 30%)

AM Rejection: -0.76 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-101.0	dBm	(S/N Ratio = 30dB)
	RF Lev2	-65.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image	Rejection:	-36.00	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

Mono (L)			Stereo (L)		Separatio	Separation L->R		
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-30.00	-30.00	-29.50	-29.50		-29.50	-29.50	-130
-125	-30.00	-30.00	-29.50	-29.50		-29.50	-29.50	-125
-120	-30.00	-30.00	-29.00	-29.50		-29.00	-29.50	-120
-115	-26.50	-30.00	-26.00	-29.00		-28.00	-28.50	-115
-110	-18.50	-30.00	-18.00	-29.00		-23.00	-24.00	-110
-105	-10.00	-31.00	-10.00	-29.50		-15.50	-16.00	-105
-100	-3.50	-36.00	-3.25	-27.00		-3.50	-26.00	-100
.95	-0.75	-47.00	-0.50	-32.50		-0.50	-29.50	-95
-90	0.00	-58.00	0.00	-38.00		0.00	-32.00	-90
-85	0.00	-64.00	0.00	-43.00		0.00	-33.50	+85
-80	0.00	-68.50	0.00	-48.00		0.00	-34.50	-80
•75	0.00	-70.50	0.00	-53.00		0.00	-34.50	•75
-70	0.00	-71.00	0.00	-57.50		0.00	-35.00	-70
+65	0.00	-71.50	0.00	-62.00		0.00	-35.00	+65
-60	0.00	-71.80	0.00	-65.00		0.00	-35.00	-60
+55	0.00	-72.00	0.00	-67.20		0.00	-35.00	+55
-50	0.00	-72.00	0.00	-68.00		0.00	-35.50	-50
-45	0.00	-72.00	0.00	-68.50	-36.20	0.00	-37.00	-45

Two RF Tone Tests

Two RF Tone Tests
7 Capture Ratio
Set Up: Test Set Up 3
Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
Undesired: Test Freq. 1, -130dBm, CW
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement: RF Lev 1 -53.78 dBm
RF Lev 2 dBm
Capture Ratio:dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -50.92 -4.08 -51.92 -3.08
Undesired Lower Lev -50.52 -4.48 -50.92 -4.08
Selectivity, 1st Adj.:
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower)
Upper 2nd
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -35.12 -19.88 -35.12 -19.88
Undesired Lower Lev -20.42 34.58 -20.92 34.08
Selectivity, 2nd Adj.:

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	FM Receiver Test Laboratory
10 Selectivity -	1st Adjacent 50dB S/N (Upper and Lower)
Upper 1st	
	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
P	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	-53.52 -1.48 -72.42 17.42
Undesired Lower Lev	-54.92 -0.08 -66.92 11.92
Selectivity, 1st Adj.:	
Upper 2nd	2nd Adjacent 50dB S/N (Upper and Lower) Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
 	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
Dutat	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	<u>-38.32</u> <u>-16.68</u> <u>-44.92</u> <u>-10.08</u>
Undesired Lower Lev Selectivity, 2nd Adj.:	<u>-33.92</u> <u>-21.08</u> <u>-33.92</u> <u>21.08</u>
Selectivity, 2nd Adj.:	-18:88 -15:58 (RF D/U Up + RF D/U Lo)/2
12 Selectivity - 3	rd Adjacent 50dB S/N (Upper and Lower)
Upper 3rd	a release come out (offer and rough)
	Test Set Up 3
500 Sp. 1	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev. Mono

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 3rd

ł

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

		SOdB D/U			
Desired Lev	-55.00		-55.00		
Undesired Upper Lev	-30.92	-24.08	-30.92	-24.08	
Undesired Lower Lev		-37 08	-21.92	-33.08	
Selectivity, 3rd Adj.:		-30.58		-28.58	(RF D/U Up + RF D/U Lo)/2

Additional Tests

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

$$\begin{array}{c} \text{RF Lev 1} & -100.00 & \text{dBm} \\ \text{RF Lev 2} & -32.00 & \text{dBm} \\ D/U & -68.00 & \text{dB} \end{array} \quad \text{EOC}$$

10.7 IM Test 14

> Using the three generator set up, set generators as follows; Set Up:

Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

10.6MHz S	pacing	10.7MHz 3	Spacing
dBm	D/U	dBm	D/U
-45.00		-45.00	
-24.37	-20.63	-29.37	-15.63
	-20.63		-15.63

EOC: Objectionable beat notes

15 10.7MHz (10.6MHz) Local Osc Interference Test

Desired: 94.1MHz, -45dBm, Pilot only Set Up:

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-29.37	-15.63	-51.37	6.37

EOC: Objectionable beat notes

		2/28/99			
	Engineers:				
	Project:	FM Receiver Test A	1		
Pag	eiver Test No.:	2			
Ret			1.		
		AM/FM/Cass Portab	le		
	Radio Mfg.:				
		RX-FS430			
	Serial:	GR3JA01184			
Ant	enna Network:	50/75 Ohm Trans.	FM		
	Audio load:	Ohms			
1	Initial Set Up:	Radio under test shall	have tone controls set	to flat detent positi	ion, Loudness control off, Balance and
		Fader controls centered	ed (set to mid position),	Volume set to Sta	indard Output
		Any other control sett	tings unique to the radio	o under test shall b	e noted in the Comments section.
		Left channel shall be	used for all Signal (and	l S/N ratio) measur	rements.
					annel for all measurements.
			e used for Noise measure	-	
		All level measuremen			epmanoli toot Viliy.
	_	<u> </u>			
		Tone control full cloc			
	-	Band switch in FM St	ereo		
	-	0			
	-	0			
G4	DE Lassie			<i></i>	
	RF Levels	4D		Standard	FM Test Frequencies
Strong		dBm			94.1MHz
Medium		dBm			
Weak:	-65	dBm			
Standard	Test Set Ups				
	_				
1	Strong Signal				
2	Single RF Tor				
3	Two RF Tone	Tests			
4	Measurement	Set up			
	Standard Tes	its			-
1	Local Oscillat	or Frequency (Tuning	Emor)	13	10.7MHz Rejection
1		o Output (Audio level			
2				14	10.7MHz Intermodulation
3		load (RF level require	eu 107 5% (HD)	15	10.7MHz Spurious (Local Osc. Interference
4	AM Rejection				
5	Image Rejectio				
6		lots of RF Level Vs A	udio Output)		
7	Capture Ratio				
8	Selectivity; 1st	Adjacent (30dB noise	e figure)		
9		d Adjacent (30dB nois			
10		Adjacent (50dB noise			
11		d Adjacent (50dB nois			
12		Adjacent (50dB nois			
14	Science vity, SIC	a Aujaveni (JUUD 1101S	e ugure)		

THD

0.54

%

Test Results:

1 Local Oscillator Frequency: 104.898 MHz

2 Standard Audio Output: Left Channel THD Right Channel 1 Vrms 0.56 % 0.95 Vrms 3 RF Input Overload: 19.50 0 0 0

- 4 AM Rejection: _-0.76 dB
- 5 Image Rejection: -36.00 dB
- 6 Curve Tests: (See Plots)
- Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U)
 -4.28 dB Mono
 -3.58 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -27.23 dB Mono -26.98 dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -0.78 dB Mono 14.67 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -18.88 dB Mono -15.58 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -30.58 dB Mono -28.58 dB Stereo
- 14
 10.7MHz IM
 Objectionable beat notes

 -20.63
 dB (10.6)
 Objectionable beat notes

 -15.63
 dB (10.7)
 0

0

15 **10.7MHz Spurious (Local Osc. Interference)** <u>-15.63</u> dB (10.6) Objectionable beat notes <u>6.37</u> dB (10.7) 0



SIGNAL/NOISE VS RF LEVEL

File Name: C_pana

SG1



SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

Panasonic RX-FS430

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FM Receiver Test Laboratory



SIGNAL/NOISE VS RF LEVEL

Panasonic RX-FS430



1st and 2nd ADJACENT CHANNEL SELECTIVITY

Panasonic RX-FS430

661

* 1



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

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IM & L.O. Rejection (50dB Noise Floor)

Panasonic RX-FS430

201

1.1.10

Receiver #4

Pioneer

Home HiFi

Date	e: 2/28/99
Engineers	s: RMc
Project	t: FM Receiver Test Al
Receiver Test No.	
	: Home Hi Fi Receiver
Radio Mfg.	: Pioneer
Model	: <u>SX-201</u>
Serial	: OA3965843C
Antenna Network	: 50/75 Ohm Trans FM
Audio load	: <u>10K</u> Ohms
Initial Set Up:	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and Fader controls centered (set to mid position), Volume set to Standard Output
	Any other control settings unique to the radio under test shall be used in the Control settings unique to the radio under test shall be used in the Control settings unique to the radio under test shall be used in the Control settings unique to the radio under test shall be used in the Control settings unique to the radio under test shall be used in the Control settings unique to the radio under test shall be used in the control settings unique to the radio under test shall be used in the Control settings unique to the radio under test shall be used in the control settings under test settings under t
	Any other control settings unique to the radio under test shall be noted in the Comments section.
	Left channel shall be used for all Signal (and S/N ratio) measurements.
	15kHz Low Pass filter shall be used on the output of the left channel for all measurements.
	Right channel shall be used for Noise measurements - Stereo Separation test only. All level measurements are rms
	V W YALAN THATPATATINIP OF LITTE
Comments:	FM Mode Switch: Auto/Stereo
	FM Tuning Switch: Manual
	Buffered line outputs used for audio measurements
Standard RI	F Levels Standard FM Test Frequencies
Strong:	
Medium:	-55 dBm
Weak:	-65 dBm
Standard Te	st Set Ups
	Strong Signal Overload
	Single RF Tone Tests
	Two RF Tone Tests
4	Measurement Set up
Standard Tes	its
1 1	Local Oscillator Frequency (Tuning Error)
	Standard Audio Output (Audio level and distortion)
	RF Input Overload (RF level required for 5% THD)
	AM Rejection
	mage Rejection
7 0	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio
	•
	electivity; 1st Adjacent (30dB noise figure)
	electivity; 2nd Adjacent (30dB noise figure)
10 S	electivity; 1st Adjacent (50dB noise figure)
11 S	electivity; 2nd Adjacent (50dB noise figure)
12 S	electivity; 3rd Adjacent (50dB noise figure)
13 - 15 A	dditional 10.7MHz Tests
15-15 A	aditional 10.7MHz Tests

203

Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement: L.O. Freq 1 104.806 MHz L.O. Freq 2 MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	Left Ch				Right Ch			
	Level_	0.710	Vrms	= 0 dB	Level	0.710	Vrms	
	THD	0.95	_%		THD_	0.90	_%	

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22.00 dBm (@ 5% THD) Max Test Bed RF level - slight increase in THD (1.3%)

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.95	%	=	-40.45	dB	(FM Only)
	THD_	0.95	_%	=	-40.45	dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-86.0	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-55.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image	Rejection:	-31.00	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono (L)			Stereo (L)		Separation L->R		
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Lefi	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-16.00	-16.00	-15.00	-15.00		-15.00	-15.00	+130
-125	-16.00	-16.00	-15.00	-15.00		-15.00	-15.00	-125
-120	-14.50	-16.50	-14.00	-15.50		-15.00	-15.00	-120
-115	-9.50	-18.00	-9.00	-17.00		-15.00	-15.00	-115
-110	-3.00	-24.00	-3.00	-23.00		-10.00	-10.00	-110
-105	-0.50	-45.50	-0.50	-44.00		-6.00	-6.00	-105
-100	0.00	-52.50	0.00	-51.50		-6.00	-6.00	-100
+95	0.00	-58.00	0.00	-57.00		-6.00	-6.00	-95
-90	0.00	-63.00	0.00	-62.00		-6.00	-6.00	-90
-85	0.00	-68.00	0.00	-67.00		-6.00	-6.00	-85
-80	0.00	+73.00	0.00	-50.00		0.00	-34.50	-80
-75	0.00	-75.00	0.00	-55.00		0.00	-35.00	-75
-70	0.00	-75.00	0.00	-60.00		0.00	-35.00	-70
-65	0.00	-75.00	0.00	-64.50		0.00	-35.50	+65
-60	0.00	-75.00	0.00	-68.00		0.00	-35.50	-60
-55	0.00	-75.00	0.00	-70.00		0.00	-36.00	-55
-50	0.00	+75.00	0.00	-72.00		0.00	-36.00	-50
-45	0.00	-75.00	0.00	-72.00	-33.00	0.00	-36.00	-45
Two RF Tone Tests

Two AT TOR TESTS
7 Capture Ratio
Set Up: Test Set Up 3
Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
Undesired: Test Freq. 1, -130dBm, CW
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement: RF Lev 1dBm
RF Lev 2 -50.00 dBm
Capture Ratio:dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower)
Upper 1st
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undepired: Test Freq. 1, 200kHz, 120dPm, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -46.72 -8.28 -47.72 -7.28
Undesired Lower Lev -53.22 -1.78 -57.22 2.22
Selectivity, 1st Adj.:
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
dBm D/U dBm D/U
Desired Lev
Undesired Upper Lev -7.62 47.38 -7.62 47.38
Undesired Lower Lev -9.22 -45.78 -9.52 -45.48
Selectivity, 2nd Adj.: 46.58 (RF D/U Up + RF D/U Lo)/2

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	FM Receiver Test Laboratory
10 Selectivity	- 1st Adjacent 50dB S/N (Upper and Lower)
Upper 1st	
	p: Test Set Up 3
-	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjus	t: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	
Set U	
	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjus	t: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
Desired La	dBm D/U dBm D/U
Desired Le Undesired Upper Le	
Undesired Lower Le	
Selectivity, 1st Adj.	
5010001110, 150 11 0 ,	
11 Selectivity	- 2nd Adjacent 50dB S/N (Upper and Lower)
Upper 2nd	
	: Test Set Up 3
-	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up	
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev. Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	
Undesired Upper Lev	
Undesired Lower Lev	
Selectivity, 2nd Adj.:	
••••••	
12 Selectivity -	3rd Adjacent 50dB S/N (Upper and Lower)
Upper 3rd	
Set Up:	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
T	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 3rd	Derived Test Free 1 Medium 1111 78111 Der Mann
Set Up:	
A dipet.	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono Set Radio audio to Std. Ref. Level (0dB)
Aujust.	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	3.08 -58.08 3.08 -58.08
Undesired Lower Lev	-24.92 -30.08 -24.92 -30.08
Selectivity, 3rd Adj.:	-44.08 (RF D/U Up + RF D/U Lo)/2
•••••	

Additional Tests

10.7MHz Rejection 13

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

> Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust:

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

dBm	D/U	dBm	D/U
-45.00	I	-45.00	
-33.37	-11.63	-35.37	-9.63

EOC: Hiss

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

10.6MHz Sp dBm	nat.	10.7MHz S dBm	
	9/U		D/II
-45.00		-45.00	
-29.14	-15.86	-38.14	-6.86
		000000000000000000000000000000000000000	

EOC: Objectionable beat noise

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

,	Date	2/28/99		
2	Engineers			
-	-	FM Receiver Test Al		
	-			
Rea	ceiver Test No.:	4		
	Class:	Home Hi Fi Receiver		
	Radio Mfg.:			
	Model:	SX-201		
	Serial:	OA3965843C		
Ant	tenna Network:	50/75 Ohm Trans. FM		
	Audio load:	10K Ohms		
	Initial Set Un-	Radio under test shall have tone controls	set to flat datant nosi	tion Loudness control of Polones and
	mana set op.	Fader controls centered (set to mid positi		
		Any other control settings unique to the		
		Left channel shall be used for all Signal		
		15kHz Low Pass filter shall be used on t		
		Right channel shall be used for Noise me		
		All level measurements are rms	asurements - Stereo S	eparation test only.
	a .			
		FM Mode Switch: Auto/Stereo		
		FM Tuning Switch: Manual		
		Buffered line outputs used for audio mea	surements	
	•	0		
Standard	RF Levels		Stan J	
Standaru	Kr Levels		Standard	I FM Test Frequencies
	45	4Dee		-
Strong	,	dBm dBm		94.1MHz
Strong Medium	, .: -55	dBm		-
Strong	.: -55			-
Strong Medium Weak	.: -55 :: -65	dBm		-
Strong Medium Weak	, .: -55	dBm		-
Strong Medium Weak: Standard	.: -55 :: -65 Test Set Ups	dBm dBm		-
Strong Medium Weak: tandard	2: -55 2: -65 Test Set Ups Strong Signal	dBm dBm Overload		-
Strong Medium Weak: itandard 1 2	i: -55 :: -65 Test Set Ups Strong Signal Single RF Ton	dBm dBm Overload ne Tests		-
Strong Medium Weak: tandard	:: -55 :: -65 Test Set Ups Strong Signal Single RF Tone Two RF Tone	dBm dBm Overload ne Tests Tests		-
Strong Medium Weak: tandard 1 2 3	i: -55 :: -65 Test Set Ups Strong Signal Single RF Ton	dBm dBm Overload ne Tests Tests		-
Strong Medium Weak: tandard 1 2 3	:: -55 :: -65 Test Set Ups Strong Signal Single RF Tone Two RF Tone	dBm dBm Overload ne Tests Tests Set up		-
Strong Medium Weak: Standard 1 2 3	2: -55 2: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes	dBm dBm Overload ne Tests Tests Set up	13	-
Strong Medium Weak: Standard 1 2 3 4	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat	dBm dBm Overload ne Tests Tests Set up ts		94.1MHz
Strong Medium Weak: itandard 1 2 3 4 1	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up ts or Frequency (Tuning Error)	13 14 15	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: tandard 1 2 3 4 1 2	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion)	14	94.1MHz 10.7MHz Rejection
Strong Medium Weak: (tandard 1 2 3 4 1 2 3	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over	dBm dBm Overload ne Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD)	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: (tandard 1 2 3 4 1 2 3 4	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio	dBm dBm Overload ne Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD) on	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: itandard 1 2 3 4 1 2 3 4 5	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio	dBm dBm Overload ne Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD)	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio	dBm dBm Overload ne Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD) on	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7 8	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st	dBm dBm dBm Overload he Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD) on lots of RF Level Vs Audio Output) Adjacent (30dB noise figure)	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7 8 9	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 2m	dBm dBm Overload he Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD) on lots of RF Level Vs Audio Output)	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak: Standard 1 2 3 4 1 2 3 4 5 6 7 8 9 10	.: -55 .: -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 1st Selectivity; 1st	dBm dBm dBm Overload he Tests Tests Set up ts or Frequency (Tuning Error) o Output (Audio level and distortion) load (RF level required for 5% THD) on lots of RF Level Vs Audio Output) Adjacent (30dB noise figure) d Adjacent (30dB noise figure)	14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation

Test Results:

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1 Local Oscillator Frequency: 104.806 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
0.71 Vrms	0.95 %	0.71Vrms	0.90 %

3 RF Input Overload: <u>22.00</u> dBm Max Test Bed RF level - slight increase in THD (1.3%)

- 4 AM Rejection: 0.00 dB
- 5 Image Rejection: -31.00 dB
- 6 Curve Tests: (See Plots)
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -5.03 dB Mono -2.53 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) <u>-46.58</u> dB Mono <u>-46.43</u> dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -1.68 dB Mono 17.02 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -29.58 dB Mono -27.58 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) <u>-44.08</u> dB Mono <u>-44.08</u> dB Stereo
- 13 10.7MHz Rejection -88.30 dB
- 0
- 10.7MHz IM

 -11.63
 dB (10.6)
 Hiss

 -9.63
 dB (10.7)
 0
- 15
 10.7MHz Spurious (Local Osc. Interference)

 -15.86
 dB (10.6)
 Objectionable beat noise

 -6.86
 dB (10.7)
 0



SIGNAL/NOISE VS RF LEVEL

Pioneer SX-201



SIGNAL/NOISE VS RF LEVEL

1.1.18



SIGNAL/NOISE VS RF LEVEL

Pioneer SX-201

213



SIGNAL/NOISE VS RF LEVEL

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214

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1st and 2nd ADJACENT CHANNEL SELECTIVITY

Pioneer SX-201



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Pioneer SX-201

••••



IM & L.O. Rejection

Pioneer SX-201

Receiver #5

Ford

Auto

Engineers: Project: Receiver Test No.:	FM Recei	ver Test Al	
Radio Mfg.:	Ford	·····	
•	F4XF-19E	132-CB	—
Serial:			
Antenna Network:	Ford		FM AM
Audio load:	4	Ohms	
-	Fader cont Any other Left chann 15kHz Lov Right chan	rols centered control settin el shall be us v Pass filter s	ave tone controls set to flat detent position, Loudness control off, Balance and (set to mid position), Volume set to Standard Output gs unique to the radio under test shall be noted in the Comments section. ed for all Signal (and S/N ratio) measurements. shall be used on the output of the left channel for all measurements. used for Noise measurements - Stereo Separation test only. are rms
Comments:			
-			
Standard RF	Levels		Standard FM Test Frequencies
Strong:	-45	dBm	Low: 94.1 MHz
Medium:	-55	dBm	
Weak:	-65	dBm	

Standard Test Set Ups

- 1 Strong Signal Overload
- 2 Single RF Tone Tests
- 3 Two RF Tone Tests
- 4 Measurement Set up

Standard Tests

- 1 Local Oscillator Frequency (Tuning Error)
- 2 Standard Audio Output (Audio level and distortion)
- 3 RF Input Overload (RF level required for 5% THD)
- 4 AM Rejection
- 5 Image Rejection
- 6 Curve Tests (plots of RF Level Vs Signal Mono & Stereo, Noise Mono & Stereo, Stereo Separation
- 7 Capture Ratio
- 8 Selectivity; 1st Adjacent (30dB noise figure)
- 9 Selectivity; 2nd Adjacent (30dB noise figure)
- 10 Selectivity; 1st Adjacent (50dB noise figure)
- 11 Selectivity; 2nd Adjacent (50dB noise figure)

Single RF Tone Tests

1

Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	104.800 MHz
	L.O. Freq 2	MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	eft Ch			R	ight Ch	
	Level_	1.70	Vrms	= 0 dB	Level	1.70	Vrms
	THD	1.00	_%		THD	1.00	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22 dBm (@ 5% THD) Max Test Bed RF level - no change in level or THD

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	1	%	=	-40.00 d	iΒ	(FM Only)
	THD	1	%	=	<u>-40.00</u> d	iB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-102.0	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-55.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image 1	Rejection:	-47.0	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

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Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separation	n L≠≥R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-36.00	-36.00	-35.00	-35.00		-35.00	-35.00	-130
-125	-36.00	-36.00	-35.00	-35.00		-35.00	-35.00	-125
-120	-35.50	-36.00	-34.50	-35.00		-34.50	-34.50	-120
-115	-34.00	-36.00	-33.00	-35.00		-34.00	-34.00	-115
-110	-27.80	-37.00	-28.50	-36.50		-30.50	-30.50	-110
-105	-20.00	-40.00	-19.50	-39.00		-23.80	-23.80	-105
-100	-11.00	-47.00	-11.00	-45.50		-14.00	-14.00	-100
-95	-2.50	-54.50	-2.50	-54.00		-8.00	-8.00	-95
-90	-1.75	-58.50	-1.80	-58.00		-7.00	-7.00	-90
•85	-1.25	-62.50	-1.30	-61.00		-6.80	-7.00	+85
-80	-1.00	-65.50	-1.00	-64.00		-6.00	-6.50	-80
+75	-0.60	-67.00	-0.80	-65.00		-6.00	-6.50	-75
-70	-0.30	-68.50	-0.50	-66.00		-5.30	-6.50	-70
-65	0.00	-69.00	-0.25	-66.00		-4.50	-7.00	+65
-60	0.00	-69.00	0.00	-66.00		-3.30	-9.00	-60
+55	0.00	-69.00	0.00	-66.00		-2.00	-12.00	+55
-50	0.00	-69.00	0.00	-66.00		-0.80	-17.50	-50
-45	0.00	-69.00	0.00	-66.00	-41.50	0.00	-23.00	-45

Two RF Tone Tests

	THU III TORC TOSIS
7	Capture Ratio
NDY	Set Up: Test Set Up 3
	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
	Undesired: Test Freq. 1, -130dBm, CW
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
	Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
	easurement: RF Lev 1 <u>-56.92</u> dBm
	RF Lev 2 dBm
	Capture Ratio: -3.50 dB (RF Lev 1 - RF Lev 2)/2
8	Selectivity - 1st Adjacent 30dB S/N (Upper and Lower)
Ū	Joper 1st
	Set Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
	ower 1st
	Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB
	Mono 30dB Stereo 30dB dBm D/U dBm D/U
	Desired Lev -55.00
Undesi	Upper Lev -30.92 -24.08 -30.92 -24.08
	Lower Lev -38.02 +16.98 -38.02 -16.98
	, 1st Adj.: 20.53 -20.53 (RF D/U Up + RF D/U Lo)/2
9	electivity - 2nd Adjacent 30dB S/N (Upper and Lower)
	pper 2nd
	Set Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
	ower 2nd
	Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
	esired Lev -55.00 -55.00
Undesir	Upper Lev 8.08 -63.08 8.08 -63.08
	Lower Lev 8.08 -63.08 8.08 -63.08
	2nd Adj.: 246 RF

	10	Selectivity - Upper 1st	1st Adjacent 50dB S/N (Upper and Lower)
		Set Up:	Test Set Up 3
		•	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
			Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust:	Set Radio audio to Std. Ref. Level (0dB)
			Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
		Lower 1st	
		Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		bbi op.	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		A dinet.	Set Radio audio to Std. Ref. Level (0dB)
		Aujust.	Set Radio addition of the Desired signal to CW
			-
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev. Mono 50dB Stereo 50dB
		D	dBm D/U dBm D/U
		Desired Lev	
		d Upper Lev	
		l Lower Lev	
	Selectivi	ty, 1st Adj.:	-18.28 (RF D/U Up + RF D/U Lo)/2
		•	2nd Adjacent 50dB S/N (Upper and Lower)
	1	U pper 2nd	
		Set Up:	Test Set Up 3
			Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
			Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust:	Set Radio audio to Std. Ref. Level (0dB)
			Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
]	lower 2nd	
		Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
			Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
1		Adjust:	Set Radio audio to Std. Ref. Level (0dB)
			Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
		[Mono 50dB Stereo 50dB
			dBm D/U dBm D/U
	J	Desired Lev	-55.00 -55.00
	Undesired	Upper Lev	-27.92 27.08 -27.92 -27.08
	Undesired	Lower Lev	-26.92 28.08 -26.92 -28.08
	Selectivity	, 2nd Adj.:	-27.58 (RF D/U Up + RF D/U Lo)/2
	12 S	electivity - 3	Brd Adjacent 50dB S/N (Upper and Lower)
		pper 3rd	
		Set Up: 7	Test Set Up 3
		-	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
			Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust: S	Set Radio audio to Std. Ref. Level (0dB)
		-	Set the modulation of the Desired signal to CW
			increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	T.	ower 3rd	
	-	Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		out op.	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust S	Set Radio audio to Std. Ref. Level (0dB)
		-	Set the modulation of the Desired signal to CW
			· · · · · · · · · · · · · · · · · · ·
		10 10	ncrease Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
			Mono 50dB Stereo 50dB
			dBm D/U dBm D/U
		esired Lev	-55.00 -55.00
		Upper Lev	<u>-25.92</u> <u>-29.08</u> <u>-25.92</u> <u>-29.08</u>
ſ	Undesired		-20.92 -34.08 -20.92 -34.08
÷	selectivity,	3rd Adj.: 💹	-31.58 (RF D/U Up + RF D/U Lo)/2

Additional Tests

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13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

$$\begin{array}{c} \text{RF Lev 1} & -103.70 & \text{dBm} \\ \text{RF Lev 2} & -26.00 & \text{dBm} \\ \text{D/U} & -77.70 & \text{dB} \end{array} \quad \text{EOC}$$

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

abm	D /U	aBm	
-45.00		-45.00	
-13.07	-31.93	-13.07	-31.93

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1 MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

D/11	dRm	рлт
2.5	-45.00	200
-28.93	-30.07	-14.93

EOC:

Adjust: Undes

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

	Engineers	2/28/99 RMc FM Receiver Te	st Al				
Rec	eiver Test No.:						
		Automotive					
	Radio Mfg.: Model	Ford F4XF-19B132-0	<u></u>				
		9411					
Anto	enna Network:	Ford		FM			
	Audio load:	40	hms				
ſ	nitial Set Un-	Radio under test	shall have	tone controls	set to flat deter	nt nositi	ion, Loudness control off, Balance and
-	mua sec op.	Fader controls co				-	
							e noted in the Comments section.
		Left channel shal					
							annel for all measurements.
		•			asurements - S	tereo Se	eparation test only.
		All level measure	ements are	rms			
	C	0					
	Comments:	0					
		0					
		0	······				
							·····
Standard 3	RF Levels				Sta	andard	FM Test Frequencies
Strong:		dBm					94.1MHz
Medium:	-55	dBm					94.1MHz
•	-55						94.1MHz
Medium:	-55	dBm					94.1MHz
Medium: Weak:	-55	dBm					94.1MHz
Medium: Weak:	-55 -65	dBm dBm					94.1MHz
Medium: Weak: Standard	-55 -65 Test Set Ups	dBm dBm Overload					94.1MHz
Medium: Weak: Standard 7	-55 -65 Test Set Ups Strong Signal	dBm dBm Overload ne Tests					94.1MHz
Medium: Weak: Standard 7 1 2	-55 -65 Test Set Ups Strong Signal Single RF To	dBm dBm Overload ne Tests Tests					94.1MHz
Medium: Weak: Standard 7 1 2 3	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tond	dBm dBm Overload ne Tests Tests Set up					94.1MHz
Medium: Weak: Standard 7 1 2 3 4	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te	dBm dBm Overload ne Tests Tests Set up sts	uning Error)		13	
Medium: Weak: Standard 7 1 2 3 4 1	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat	dBm dBm Overload ne Tests Tests Set up sts or Frequency (Tu				13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud	dBm dBm Overload ne Tests Tests Set up sts	level and o	distortion)		13 14 15	10.7MHz Rejection
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection	dBm dBm overload ne Tests Tests Set up sts for Frequency (Tu io Output (Audio rload (RF level re	level and o	distortion)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti	dBm dBm dBm overload ne Tests Tests Set up sts for Frequency (Tu io Output (Audio rload (RF level re on	equired for	distortion) 5% THD)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5 6	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (j	dBm dBm dBm overload ne Tests Tests Set up sts or Frequency (Tu io Output (Audio rload (RF level r on blots of RF Level	equired for	distortion) 5% THD)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5 6 7	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (j Capture Ratio	dBm dBm dBm overload ne Tests Tests Set up sts for Frequency (Tu io Output (Audio rload (RF level r on blots of RF Level	equired for Vs Audio	distortion) 5% THD) Output)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5 6 7 8	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (j Capture Ratio Selectivity; 1s	dBm dBm dBm Overload ne Tests Fests Set up sts for Frequency (Tu io Output (Audio rload (RF level r on blots of RF Level t Adjacent (30dB	vequired for Vs Audio	distortion) 5% THD) Output) re)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5 6 7 8 9	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tom Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (j Capture Ratio Selectivity; 1s Selectivity; 2r	dBm dBm dBm Overload ne Tests Fests Set up sts for Frequency (Tu io Output (Audio rload (RF level r on blots of RF Level t Adjacent (30dB d Adjacent (30dB	v level and o equired for Vs Audio o noise figures noise figures	distortion) 5% THD) Output) re) ure)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5 6 7 8 9 10	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tom Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (j Capture Ratio Selectivity; 1s Selectivity; 1s	dBm dBm dBm Overload ne Tests Fests Set up sts for Frequency (Tu io Output (Audio rload (RF level r on blots of RF Level t Adjacent (30dB d Adjacent (30dB t Adjacent (50dB	level and d equired for Vs Audio (noise figures noise figures noise figures	distortion) 5% THD) Output) re) ure) re)		14	10.7MHz Rejection 10.7MHz Intermodulation
Medium: Weak: Standard 7 1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	-55 -65 Test Set Ups Strong Signal Single RF To Two RF Tom Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (j Capture Ratio Selectivity; 1s Selectivity; 2n Selectivity; 2n	dBm dBm dBm Overload ne Tests Fests Set up sts for Frequency (Tu io Output (Audio rload (RF level r on blots of RF Level t Adjacent (30dB d Adjacent (30dB	level and d equired for Vs Audio (noise figures noise figures noise figures noise figures noise figures	distortion) 5% THD) Output) re) ure) re) re) ure)		14	10.7MHz Rejection 10.7MHz Intermodulation

16:

Test Results:

1 Local Oscillator Frequency: 104.800 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
1.7 Vrms	1.00 %	1.7 Vrms	1.00 %

3 RF Input Overload: 22.00 dBm

Max Test Bed RF level - no change in level or THD

- 4 AM Rejection: 0.00 dB
- 5 Image Rejection: -47.00 dB
- 6 Curve Tests: (See Plots)
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -20.53 dB Mono -20.53 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.08 dB Mono Max RF -63.08 dB Stereo Max RF
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -18.28 dB Mono -18.28 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -27.58 dB Mono -27.58 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -31.58 dB Mono -31.58 dB Stereo

- 14
 10.7MHz IM

 -31.93
 dB (10.6)
 Max RF
 0

 -31.93
 dB (10.7)
 Max RF
 0
- 15
 10.7MHz Spurious (Local Osc. Interference)

 -28.93
 dB (10.6)
 0

 -14.93
 dB (10.7)
 0



Ford F4XF-19B132-CB

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1 the second

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SIGNAL/NOISE VS RF LEVEL

File Name: C_ford

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SIGNAL/NOISE VS RF LEVEL

Ford F4XF-19B132-CB

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SIGNAL/NOISE VS RF LEVEL

Ford F4XF-19B132-CB

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فنرظ



1st and 2nd ADJACENT CHANNEL SELECTIVITY

(30dB Noise Floor)

Ford F4XF-19B132-CB

231

1.1.998



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Ford F4XF-19B132-CB

* 1



IM & L.O. Rejection

(50dB Noise Floor)

Ford F4XF-19B132-CB

Receiver #6

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Denon

Home HiFi

	: 2/28/99							
Engineers								
Project	FM Receive	er Test Al						
Receiver Test No.	. 6							
	Home Hi F	Tunor	<u> </u>					
Radio Mfg.	· · · · · · · · · · · · · · · · · · ·							
-	TU-680NA	P						
	209240010							
Senai.	209240010	5						
Antenna Network:	50/75 Ohm	Trans.	FM					
			AM					
Audio load:	10K	Ohms						
Initial Set Un:	Radio unde	r test shall h	ave tone controls set to flat dete	ent nositi	on, Loudness control off, Balance and			
indui set op.			(set to mid position), Volume s					
					e noted in the Comments section.			
			ed for all Signal (and S/N ratio)					
			hall be used on the output of the					
			sed for Noise measurements - !					
		asurements a		510100 50	paradon lest only.			
	1 III IOVOI IIIO	4541011151						
Comments:	Auto Mute/	Man switch s	set to Auto for Stereo tests					
	Auto Mute/	Man switch s	set to Man for Mono tests					
	Bandwidth	switch set to	Wide		<u> </u>			
		tch set to Off			· · · · · · · · · · · · · · · · · · ·			
Standard R	F Levels		Standard FM	Test Fre	quencies			
Strong:	-45	dBm	Low:	94.1	MHz			
Medium:	-55	dBm	High:		MHz			
Weak:	-65	dBm	-					
0/ 1 1m	· C · T							
Standard Te	st Set Ups							
1	Strong Signa	al Overload						
	Single RF To							
3	Two RF Tor							
-								
4	Measuremer	it Set up						
Standard Te	sts							
1	Local Oscill	ator Frequence	cy (Tuning Error)					
			Audio level and distortion)					
	RF Input Overload (RF level required for 5% THD) AM Rejection							
	Image Reject							
			Level Ve Signal - Mono & Stor	neo Main	e - Mono & Starson Starson Samaration			
	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation							
	Capture Rati		(20dD mains farme)					
			(30dB noise figure)					
			(30dB noise figure)					
			(50dB noise figure)					
11	Selectivity; 2	nd Adjacent	(50dB noise figure)					

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Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement: L.O. Freq 1 104.800 MHz L.O. Freq 2 MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	eft Ch			F	light Ch	
	Level	0.58	_Vrms	= 0 dB	Level	0.56	Vrms
	THD	0.047	_%		THD	0.055	_%

3 **RF Input Overload**

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22 dBm (@ 5% THD) EOC Worst case THD: 0.13%

4 **AM Rejection**

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD_	0.06	_%	=	<u>-64.44</u> dB	(FM Only)
	THD	0.06	_%	=	<u>-64.44</u> dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 **Image Rejection**

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-108	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-26.68	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
Image Rejection:		-81.3	dB	(RF Lev1 - RF Lev2)
	ax test bed RF level)			

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo

Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separatio	n L+≥R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-14.00	-14.00	-74.00	-74.00		-74.00	-74.00	-130
-125	-14.00	-14.00	-74.00	-74.00		-74.00	-74.00	-125
-120	-13.00	-15.00	-74.00	-74.00		-74.00	-74.00	-120
-115	-9.00	-17.00	-74.00	-74.00		-74.00	-74.00	-115
-110	-3.50	-24.00	-74.00	-74.00		-74.00	-74.00	-110
-105	-1.00	-43.50	-74.00	-74.00		-74.00	-74.00	+105
-100	0.00	-53.50	-74.00	-74.00		-74.00	-74.00	-100
-95	0.00	-59.00	-74.00	-74.00		-74.00	-74.00	-95
+90	0.00	-64.50	0.00	-41.50		0.00	-38.50	-90
-85	0.00	-70.00	0.00	-46.50		0.00	-40.00	-85
-80	0.00	-74.00	0.00	-51.50		0.00	-40.50	-80
-75	0.00	-74.00	0.00	-56.00		0.00	-40.50	-75
-70	0.00	-74.00	0.00	-61.50		0.00	-40.50	•70
-65	0.00	-74.00	0.00	-66.00		0.00	-40.50	-65
+60	0.00	-74.00	0.00	-69.00		0.00	-40.50	+60
-55	0.00	-74.00	0.00	-71.00		0.00	-40.50	-55
+50	0.00	-74.00	0.00	-71.00		0.00	-40.50	+50
-45	0.00	-74.00	0.00	-71.00	-71.00	0.00	-40.50	-45

Two RF Tone Tests

, <u>Two RF Tone Tests</u>	
7 Conturo Botio	
7 Capture Ratio Set Up: Test Set Up 3	
Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono	
Undesired: Test Freq. 1, -130dBm, CW	
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Increase Undesired signal until audio level drops 1dB, record Undesired	RF level as RF Lev 1
Increase Undesired signal until audio level drops 30dB, record Undesired	
Measurement: RF Lev 1 dBm	
RF Lev 2 dBm	
Capture Ratio: -1.15 dB (RF Lev 1 - RF Lev 2)/2	
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono	D
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Undesired RI	F level as Undesired Upper Lev.
Lower 1st	
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono	
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	Flored on The desired Lorenze Lore
Increase Undesired signal until noise floor is -30dB, record Undesired RI Mono 30dB Stereo 30dB	Plever as Olidesifed Lower Lev.
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev -42.22 -12.78 -42.42 -12.58	
Undesired Lower Lev -54.22 -0.78 -54.42 -0.58	
Selectivity, 1st Adj.:6.786.58 (RF D/U Up + RF D/	/U Lo)/2
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower)	
Upper 2nd	
Set Up: Test Set Up 3	-
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB)	•
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Undesired RF	level as Undesired Upper Lev
Lower 2nd	inter as chatching opportizer.
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono	
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Undesired RF	level as Undesired Lower Lev.
Mono 30dB Stereo 30dB	
dBm D/U dBm D/U	
Desired Lev	
Undesired Upper Lev 2.68 -57.68 2.68 -57.68	
Undesired Lower Lev -9.52 45:48 -9.52 45:48	
Selectivity, 2nd Adj.:	U L0)/2

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FM Receiver Test Labor	atory
10 Selectivity - 1st Adjacent 50dB S/N (Upper and Lower)	
Upper 1st	
set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, M	000
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -50dB, record Undesired	RF level as Undesired Upper Lev
Lower 1st	IN INVERSION OPPORTON.
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mo	200
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -50dB, record Undesired	RF level as Undesired Lower Lev
Mono 50dB Stereo 50dB	Id forei as chaeshed hower hor.
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev -46.42 -8.58 -46.42 -8.58	
Undesired Lower Lev -58.52 3.52 -58.92 3.92	
Selectivity, 1st Adj.: 2.53 2.33 (RF D/U Up + RF	D/ULo)/2
	2.0 20,2
11 Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)	
Upper 2nd	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mo	000
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -50dB, record Undesired	RF level as Undesired Upper Lev.
Lower 2nd	
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mo.	no
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -50dB, record Undesired	RF level as Undesired Lower Lev.
Mono 50dB Stereo 50dB	
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev -16.92 -38.08 -17.32 -37.68	
Undesired Lower Lev -12.52 -42.48 -16.92 -38.08	
Selectivity, 2nd Adj.:	D/U Lo)/2
12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)	
Upper 3rd	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mo	no
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -50dB, record Undesired I	RF level as Undesired Upper Lev.
Lower 3rd	
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mon	ю
Adjust: Set Radio audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -50dB, record Undesired F	RF level as Undesired Lower Lev.
Mono 50dB Stereo 50dB	
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev -14.42 40.58 -14.42 40.58	
Undesired Lower Lev -19.92 35.08 -19.92 35.08	

Additional Tests

1

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

Adjust:

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

10.6MHz Sp dBm	D/U	dBm	Spacing D/U
-45.00		-45.00	
-13.37	-31.63	-13.37	-31.63
4	-31.63	1.400 E C	1

EOC: No impact on noise floor

No impact on noise floor

15 10.7MHz (10.6MHz) Local Osc Interference Test

- Set Up: Desired: 94.1MHz, -45dBm, Pilot only Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev
 - a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
 - b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-13.37	-31.63	-15.37	-29.63

EOC: Objectionable beat notes

	Daic.	2/28/99						
	Engineers							
		FM Receive	er Test Al	-				
	1 Toject.	T M ROOT	CI ICSUAI	-				
n .	·							
Rec	eiver Test No.:	A REAL PROPERTY AND A REAL		-				
		Home Hi Fi	1 Tuner	-	•			
	Radio Mfg.:	Denon		_				
	Model:	TU-680NA	В	-				
	Serial:	209240010	3	•				
			-	-				
Ant	enna Network:	50/75 Ohm	Tenne	FM				
7110	cilla retwork.	<u> </u>	11415.					
				•				
	Audio load:	10K	Ohms					
I	initial Set Up:	Radio under	r test shall have	tone controls s	et to flat detent	positi	on, Loudness control off, Balance and	
	-	Fader control	ols centered (se	t to mid position	1). Volume set	to Star	ndard Output	
					•		e noted in the Comments section.	
		•	-	for all Signal (a				
							annel for all measurements.	
		-			surements - Ste	reo Se	paration test only.	
		All level me	asurements are	rms				
	Comments:	Auto Mute/I	Man switch set	to Auto for Ster	eo tests			
		Auto Mute/I	Man switch set	to Man for Mon	10 tests		· · · · · · · · · · · · · · · · · · ·	
	•		witch set to W					
	•		tch set to Off	140			· · · · · · · · · · · · · · · · · · ·	
		11101112 5000						
Standard	RF Levels				Stor	heate	EM Test Engranging	
		JD			Stal	iuaru	FM Test Frequencies	
Strong:		dBm					94.1MHz	
Medium:		dBm						
Weak:	-65	dBm						
Standard '	Test Set Uns							
Standard '	Test Set Ups							
	-	Quality						
1	Strong Signal							
1 2	Strong Signal Single RF To	ne Tests						
1	Strong Signal	ne Tests						
1 2	Strong Signal Single RF To	ne Tests Tests						
1 2 3	Strong Signal Single RF Tor Two RF Tone	ne Tests Tests					-	
1 2 3	Strong Signal Single RF Tor Two RF Tone	ne Tests Tests Set up						
1 2 3	Strong Signal Single RF Tor Two RF Tone Measurement	ne Tests Tests Set up						
1 2 3 4	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes	ne Tests Tests Set up s ts	v (Tunino Fero	n		13	10 7MHz Rejection	
1 2 3 4	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat	ne Tests Tests Set up sts or Frequency				13	10.7MHz Rejection	
1 2 3 4 1 2	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud	ne Tests Tests Set up its or Frequency io Output (A	udio level and	distortion)		14	10.7MHz Intermodulation	
1 2 3 4 1 2 3	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over	ne Tests Tests Set up or Frequency io Output (A cload (RF let	udio level and	distortion)			-	e)
1 2 3 4 1 2 3 4	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection	ne Tests Tests Set up or Frequency to Output (A cload (RF let	udio level and	distortion)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection	ne Tests Tests Set up or Frequency io Output (A rload (RF let	udio level and vel required for	distortion) r 5% THD)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection	ne Tests Tests Set up or Frequency io Output (A rload (RF let	udio level and vel required for	distortion) r 5% THD)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p	ne Tests Tests Set up or Frequency io Output (A cload (RF let on plots of RF L	udio level and vel required for	distortion) r 5% THD)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio	ne Tests Tests Set up or Frequency io Output (A cload (RF let on olots of RF L	udio level and vel required for evel Vs Audio	distortion) r 5% THD) Output)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s	ne Tests Tests Set up or Frequency io Output (A cload (RF le on olots of RF L t Adjacent (3	udio level and vel required for evel Vs Audio 00B noise figu	distortion) r 5% THD) Output) re)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (1	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu	distortion) r 5% THD) Output) re) ure)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s	ne Tests Tests Set up or Frequency io Output (A cload (RF le on blots of RF L t Adjacent (3 d Adjacent (5	udio level and vel required for evel Vs Audio 00B noise figu 30dB noise figu 0dB noise figu	distortion) r 5% THD) Output) re) ure) re)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	ю)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	¢)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	¢)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	e)
1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	Strong Signal Single RF Ton Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1s Selectivity; 1s Selectivity; 1s Selectivity; 2n	ne Tests Tests Set up or Frequency to Output (A cload (RF let on blots of RF L t Adjacent (3 d Adjacent (5 d Adjacent (5	udio level and vel required for evel Vs Audio 0dB noise figu 30dB noise figu 50dB noise figu	distortion) r 5% THD) Output) re) ure) re) ure)		14	10.7MHz Intermodulation	æ)

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	Test Results:
1	Local Oscillator Frequency: 104.800 MHz
2	Standard Audio Output: Left Channel THD Right Channel THD 0.58 Vrms 0.047 % 0.56 Vrms 0.055 %
3	RF Input Overload: 22.00 dBm Worst case THD: 0.13%
4	AM Rejection: 0.00 dB
5	Image Rejection: 81.32 dB
6	Curve Tests: (See Plots)
7	Capture Ratio: dB
8	Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) <u>-6.78</u> dB Mono <u>-6.58</u> dB Stereo
9	Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -51.58 dB Mono -51.58 dB Stereo
10	Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) dB Mono dB Stereo
11	Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) dB Mono 37.88 dB Stereo
12	Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) dB Mono dB Stereo
13	10.7MHz Rejection <u>128.50</u> dB 0
14	10.7MHz IM -31.63 dB (10.6) Max RF No impact on noise floor -31.63 dB (10.7) Max RF No impact on noise floor
15	10.7MHz Spurious (Local Osc. Interference)-31.63dB (10.6)Max RFObjectionable beat notes-29.63dB (10.7)0



SIGNAL/NOISE VS RF LEVEL



SIGNAL/NOISE VS RF LEVEL

2,



SIGNAL/NOISE VS RF LEVEL



SIGNAL/NOISE VS RF LEVEL

Denon TU-680NAB

ZAA

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1st and 2nd ADJACENT CHANNEL SELECTIVITY

(30dB Noise Floor)

Denon TU-680NAB



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

(50dB Noise Floor)

Denon TU-680NAB

File Name: C_den680



IM & L.O. Rejection (50dB Noise Floor)

Frequency (MHz)

Denon TU-680NAB

Receiver #7

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Audiovox

Auto

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Da				
- ·	ate: 2/28/99			
	ers: <u>RMc</u>	·	<u></u>	
Proje	ext: FM Rece	aver Test Al		
Receiver Test N	ío.: 7			
	ss: Automoti			
Radio Mf	g.: Audiovox	ς		
Mod	el: AV-220			
Seri	al: 3090180	7N		
Antenna Networ	t IFW SOM	INI_001	FM	
	R. <u><u><u></u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u>	<u>11-001</u>	AM	
Audio loa	d:4	Ohms		
Initial Set U	p: Radio und	ler test shall l	have tone controls set to flat detent position, Loudness control off, Balance and	4
	rader con	trois centered	(set to mid position), Volume set to Standard Output	•
	Any other	control settir	gs unique to the radio under test shall be noted in the Comments section	
	Left chann	iel shall be us	ed for all Signal (and S/N ratio) measurements.	
	15kHz Lo	w Pass filter :	shall be used on the output of the left channel for all measurements	
	Right char	nnel shall be i	used for Noise measurements - Stereo Separation test only	
	All level m	leasurements	are rms	
Comments	: Tone contr	rol at detent r	orition	
			t for test 2, re-adjusted for proper balance for subsequent tests	
			to a subsequent tests	
				-
<i>a</i>				-
Standard F	CF Levels		Standard FM Test Frequencies	
Strong		dBm	Low: 94.1 MHz	
Medium	: -55	dBm	Low: 94.1 MHz	
Ų	: -55		Low: 94.1 MHz	
Medium Weak	: -55 : -65	dBm	Low: 94.1 MHz	
Medium	: -55 : -65	dBm	Low: 94.1 MHz	
Medium Weak Standard T	: -55 : -65 est Set Ups	dBm dBm	Low: 94.1 MHz	
Medium Weak Standard T 1	: -55 : -65 est Set Ups Strong Sign	dBm dBm al Overload	Low: 94.1 MHz	
Medium Weak Standard T	: -55 : -65 est Set Ups Strong Sign Single RF T	dBm dBm al Overload fone Tests	Low: 94.1 MHz	
Medium Weak Standard T 1 2	: -55 : -65 est Set Ups Strong Sign	dBm dBm al Overload fone Tests ne Tests	Low: 94.1 MHz	
Medium Weak Standard T 1 2 3	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF To Measurement	dBm dBm al Overload fone Tests ne Tests	Low: 94.1 MHz	
Medium Weak Standard T 1 2 3 4 Standard Te	: -55 : -65 Strong Sign Single RF T Two RF Ton Measurement ests	dBm dBm al Overload Tone Tests ne Tests nt Set up		
Medium Weak Standard T 1 2 3 4 Standard Te 1	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF To Measurement ests Local Oscilla	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence	y (Tuning Error)	
Medium Weak Standard T 1 2 3 4 Standard Te 1 2	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF To Measureme ests Local Oscilla Standard Au	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence adio Output (2000)	y (Tuning Error) Audio level and distortion)	
Medium Weak Standard T 1 2 3 4 Standard Te 1 2 3 3	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF To Measurement ests Local Oscilla Standard Au RF Input Ov	dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence adio Output (A rerload (RF h	y (Tuning Error)	
Medium Weak Standard T 1 2 3 4 Standard Te 1 2 3 4	: -55 : -65 Strong Sign Single RF T Two RF Ton Measurement ests Local Oscilla Standard Au RF Input Ow AM Rejection	dBm dBm dBm Cone Tests ne Tests nt Set up ator Frequence adio Output (A rerload (RF la on	y (Tuning Error) Audio level and distortion)	
Medium Weak Standard T 1 2 3 4 Standard Te 1 2 3 4 5	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF Tor Measurement ests Local Oscilla Standard Au RF Input Ow AM Rejectio Image Reject	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence adio Output (A rerload (RF la on tion	y (Tuning Error) Audio level and distortion) evel required for 5% THD)	
Medium Weak Standard T 2 3 4 Standard Te 1 2 3 4 5 6	: -55 : -65 Strong Sign Single RF T Two RF Ton Measurement ests Local Oscilla Standard Au RF Input Ow AM Rejection Image Reject Curve Tests	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence adio Output (A rerload (RF la on tion (plots of RF)	y (Tuning Error) Audio level and distortion)	
Medium Weak Standard T 2 3 4 Standard Te 1 2 3 4 5 6 7	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF Ton Measurement ests Local Oscilla Standard Au RF Input Ov AM Rejection Image Reject Curve Tests Capture Rati	dBm dBm dBm al Overload one Tests ne Tests nt Set up ator Frequence adio Output (A rerload (RF la on tion (plots of RF)	y (Tuning Error) Audio level and distortion) evel required for 5% THD) Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation	
Medium Weak Standard T 2 3 4 Standard Te 1 2 3 4 5 6 7 8	: -55 : -65 Strong Sign Single RF T Two RF Ton Measurement ests Local Oscilla Standard Au RF Input Ov AM Rejection Image Reject Curve Tests Capture Rati Selectivity; 1	dBm dBm dBm al Overload fone Tests ne Tests nt Set up ator Frequence adio Output (A verload (RF 1 vn tion (plots of RF 1) io st Adjacent (2)	y (Tuning Error) Audio level and distortion) evel required for 5% THD) Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation 30dB noise figure)	
Medium Weak Standard T 2 3 4 Standard Te 1 2 3 4 5 6 7 8 8 9	: -55 : -65 Strong Sign Single RF T Two RF Ton Measurement ests Local Oscilla Standard Au RF Input Ov AM Rejection Image Reject Curve Tests Capture Rati Selectivity; 1 Selectivity; 2	dBm dBm dBm al Overload fone Tests ne Tests nt Set up ator Frequence idio Output (A verload (RF 1 vn tion (plots of RF 1 io st Adjacent (and Adjacent (y (Tuning Error) Audio level and distortion) evel required for 5% THD) Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation 30dB noise figure) 30dB noise figure)	
Medium Weak Standard T 1 2 3 4 Standard Te 1 2 3 4 5 6 7 8 9 10	: -55 : -65 est Set Ups Strong Sign Single RF T Two RF Ton Measurement ests Local Oscilla Standard Au RF Input Ov AM Rejection Image Reject Curve Tests Capture Rati Selectivity; 1 Selectivity; 1	dBm dBm dBm al Overload fone Tests ne Tests nt Set up ator Frequence idio Output (A verload (RF 1 on (plots of RF 1) io st Adjacent (st Adjacent (y (Tuning Error) Audio level and distortion) evel required for 5% THD) Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation 30dB noise figure)	

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Single RF Tone Tests

	 Local Oscillator Frequency (Tuning Error) Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2
	Measurement: L.O. Freq 1 104.800 MHz L.O. Freq 2 MHz
2	Standard Audio Output Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD
	Measurement: Left Ch Biskt Ch
	Level 10 Verse = 0.1D
	$\frac{1.9}{\text{THD}} = 0.74 \text{ %} \qquad $
	Note: Due to L/R imbalance, Balance control adjusted to L=R for subsequent tests
3	
3	RF Input Overload
	Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level
	Increase RF Level until 5% THD at Radio output, record RF Level
	Measurement: RF Lev. 22 dBm (@ 5% THD)
	Max Test Bed RF level - no change in level or THD
4	AM Rejection
	Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level, record THD
	Set modulation mode to FM (75kHz), AM (30%), record THD
	Measurement: THD 0.74 % = -42.62 dB (EM Only)
	HD 0.74 % = 42.62 dB (FM + AM 30%)
	AM Rejection: 0.00 dB
5	Image Rejection
2	Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Decrease RF Level until S/N Ratio = 30dB, record RF Lev1
	Tune RF Gen to; Desired Freq. +/- 2 X IF Freq.
	Adjust RF Level until S/N Ratio = 30dB, record RF Lev2
	Measurement: RF Lev1 dBm (S/N Ratio = 30dB)
	RF Lev2 -52 dBm (21.4MHz + 94.1MHz = 115.5MHz)
	Image Rejection: -55.0 dB (RF Lev1 - RF Lev2)

2

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mone	5(L)		Stereo (L)		Separatio	n li-SR	3 2000000000000000000000000000000000000
RF Level	Signat	Noise	Signal	Filt Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-28.00	-28.00	-27.00	-27.00		-26.50	-27.00	-130
-125	-28.00	-28.00	-27.00	-27.00		-26.50	-27.00	-125
-120	-26.50	-29.00	-25.50	-28.00		-26.00	-26.50	-120
-115	-22.50	-30.00	-22.00	-28.50		-23.50	-24.00	-115
-110	-15.50	-35.00	-15.00	-33.00		-17.80	-18.00	-110
-105	-9.00	-49.00	-8.50	-46.50		-12.00	-12.50	-105
-100	-4.50	-57.00	-4.00	-56.00		-9.00	-9.00	-100
-95	-2.20	-62.00	-2.00	-57.50		-7.80	-8.00	-95
-90	-1.80	-64.00	-1.80	-51.00		-6.00	-9.50	-90
-85	-1.50	-65.00	-1.50	-51.00		-4.50	-11.00	-85
-80	-0.60	-65.50	-0.50	-51.00		-2.00	-14.00	-80
-75	-0.20	-66.50	0.00	-53.00		-0.80	-19.50	-75
-70	0.00	-67.00	0.00	-56.00		-0.50	-23.00	-70
-65	0.00	-67.00	0.00	-58.00		0.00	-24.50	-65
-60	0.00	-67.00	0.00	-59.00		0.00	-25.50	-60
-55	0.00	-67.00	0.00	-59.50		0.00	-26.00	+55
-50	0.00	-67.00	0.00	-59.50		0.00	-26.50	-50
-45	0.00	-67.00	0.00	-59.50	-54.00	0.00	-26.50	-30

Two RF Tone Tests

7 Capture Ratio Set Up: Test Set Up 3 Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement: RF Lev 1 -59.91 dBm RF Lev 2 -55.41 dBm Capture Ratio: -2.25 dB (RF Lev 1 - RF Lev 2)/2 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) **Upper 1st** Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U dBm D/U Desired Lev -55.00 -55.00 Undesired Upper Lev -27.12 -27.88 -33.92 -21.08Undesired Lower Lev -46.22 -8.78 -46.62 -8,38 Selectivity, 1st Adj .: -18.33 -14.73 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U dBm D/U Desired Lev -55.00 -55.00 Undesired Upper Lev 8.08 -63.08 8.08 -63.08 Undesired Lower Lev 8.08

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Selectivity, 2nd Adj .: Market

-63.08

-63.08

8.08

- DE

-63.08

-63.08

(RF D/U Up + RF D/U Lo)/2

	FM Receiver Test Laboratory
10	Selectivity - 1st Adjacent 50dB S/N (Upper and Lower)
	Upper 1st
	Set Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	Lower 1st
	Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev. Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
	Desired Lev -55.00 -55.00
	ed Upper Lev -27.92 -27.08 -54.92 -0.08
	ed Lower Lev -51.82 -59.42 4.42
Selectiv	ity, 1st Adj.:
11	Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)
	Upper 2nd
	Set Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd
	Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB dBm D/U dBm D/U
	dBm D/U dBm D/U Desired Lev -55.00
	d Upper Lev 1.08 -56.08 -7.92 47.08
Undesired	Lower Lev 6.38 -61.38 6.08 -61.08
Selectivity	7, 2nd Adj.:
10 0	
	Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower) Upper 3rd
,	Set Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
т	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev. ower 3rd
L	Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
n	dBm D/U dBm D/U lesired Lev -55.00
Undesired	
Undesired	
	3rd Adj.:

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Additional Tests

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

RF Lev 1	-105.50	dBm	
RF Lev 2	-15.50	dBm	EOC
D/U	90.00	dB	

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

10.6MHz S	pacing D/II		pacing
-45.00	Dre	<u>dBm</u> -45.00	D/U
-18.37	-26.63	-20.37	24.63
	-26.63		-24.63

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

- Set Up: Desired: 94.1MHz, -45dBm, Pilot only
 - Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev
 - a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
 - b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	10.7MHz Sp dBm	D/U
-45.00		-45.00	
-14.37	-30.63	-14.37	-30.63

EOC: These figures represent RF levels at 83.4MHz

	Date:	2/28/99	
•	Engineers:	the second se	
	Project:	FM Receiver Test A1	-
Recei	ver Test No.:	7	
	Class:	Automotive	-
	Radio Mfg.:	Audiovox	-
	Model:	AV-220	-
	Serial:	30901807N	-
Anter	na Network:	JFW 50MN-001	_FM
	Audio load:	4 Ohms	
Ini			e tone controls set to flat detent position, Loudness control off, Balance and
			et to mid position), Volume set to Standard Output
			unique to the radio under test shall be noted in the Comments section.
			for all Signal (and S/N ratio) measurements.
			Il be used on the output of the left channel for all measurements.
			d for Noise measurements - Stereo Separation test only.
		All level measurements are	e ms
	Comments:	Tone control at detent posi	tion
	-		or test 2, re-adjusted for proper balance for subsequent tests
	-	0	
		0	
Standard R	F I evels		Standard EM Test Program day
Standard K.		iBm	Standard FM Test Frequencies 94.1MHz
Medium:		iBm	94.1MHZ
Weak:		iBm	

Standard Test Set Ups

- 1 Strong Signal Overload
- 2 Single RF Tone Tests
- 3 Two RF Tone Tests
- 4 Measurement Set up

Standard Tests

- 1 Local Oscillator Frequency (Tuning Error)
- 2 Standard Audio Output (Audio level and distortion)
- 3 RF Input Overload (RF level required for 5% THD)
- 4 AM Rejection
- 5 Image Rejection
- 6 Curve Tests (plots of RF Level Vs Audio Output)
- 7 Capture Ratio
- 8 Selectivity; 1st Adjacent (30dB noise figure)
- 9 Selectivity; 2nd Adjacent (30dB noise figure)
- 10 Selectivity; 1st Adjacent (50dB noise figure)
- 11 Selectivity; 2nd Adjacent (50dB noise figure)
- 12 Selectivity; 3rd Adjacent (50dB noise figure)

- 13 10.7MHz Rejection
- 14 10.7MHz Intermodulation
- 15 10.7MHz Spurious (Local Osc. Interference)

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Test Results:

1 Local Oscillator Frequency: 104.800 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
<u> </u>	<u> 0.74 </u> %	1.2 Vrms	0.73 %

3 RF Input Overload:

_____dBm

Max Test Bed RF level - no change in level or THD

- 4 AM Rejection: 0.00 dB
- 5 Image Rejection: -55.00 dB
- 6 Curve Tests: (See Plots)
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -18.33 dB Mono -14.73 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.08 dB Mono Max RF -63.08 dB Stereo Max RF
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -15.13 dB Mono 2.17 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -58.73 dB Mono -54.08 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) <u>-61.58</u> dB Mono <u>-54.08</u> dB Stereo
- **13 10.7MHz Rejection** <u>90.00</u> dB
- 14 10.7MHz IM (D/U) <u>-26.63</u> dB (10.6) <u>-24.63</u> dB (10.7)

15 10.7MHz Spurious - Local Osc. Interference (D/U) -30.63 dB (10.6) These figures represent RF

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SIGNAL/NOISE VS RF LEVEL

Audiovox AV-220

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SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

Audiovox AV-220

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1st and 2nd ADJACENT CHANNEL SELECTIVITY

Audiovox AV-220



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Audiovox AV-220

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IM & L.O. Rejection (50dB Noise Floor)

Audiovox AV-220

Receiver #8

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Sony

Home HiFi

Da	te: 2/28/99
Enginee	
	ct: FM Receiver Test Al
110,0	THE RECEIVED TEST AT
Receiver Test N	A • 0
	ss: Home Hi Fi Receiver
Radio Mf	
	el: STR-AV21
Seria	al: 802086
Antenna Networ	k: <u>50/75 Ohm Trans.</u> FM
A	
Audio loa	d: <u>10K</u> Ohms
Initial Set U	: Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and
	Fader controls centered (set to mid position), Volume set to Standard Output
	Any other control settings unique to the radio under test shall be noted in the Comments section.
	Left channel shall be used for all Signal (and S/N ratio) measurements.
	15kHz Low Pass filter shall be used on the output of the left channel for all measurements.
	Right channel shall be used for Noise measurements - Stereo Separation test only.
	All level measurements are rms
Comments	: Audio Output: Tape Rec line output
Standard H	RF Levels Standard FM Test Frequencies
Strong	: -45 dBm Low: 94.1 MHz
Medium	: -55 dBm
Weak	: -65 dBm
Standard T	est Set Ups
	•
1	Strong Signal Overload
2	Single RF Tone Tests
3	Two RF Tone Tests
4	Measurement Set up
-	weasurement set up
Standard T	
Stanuaru 1	
1	
1	Local Oscillator Frequency (Tuning Error)
2	Standard Audio Output (Audio level and distortion)
3	RF Input Overload (RF level required for 5% THD)
4	AM Rejection
5	Image Rejection
6	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation
7	Capture Ratio
8	Selectivity; 1st Adjacent (30dB noise figure)
9	Selectivity; 2nd Adjacent (30dB noise figure)
10	Selectivity; 1st Adjacent (50dB noise figure)
11	Selectivity, 2nd Adjacent (50dB noise figure)
11	Serveriny, and Aujaveni (Joud noise agure)

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Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	104.800	MHz
	L.O. Freq 2		MHz

Standard Audio Output

2

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	Left Ch				F	light Ch	
	Level	0.325	Vrms	= 0dB	Level	0.330	Vrms
	THD	0.22	%		THD	0.22	~%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22.00 dBm (@ 5% THD) Max Test Bed RF level - slight increase in THD (0.26%)

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75 Hz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.22	%	=	-53.15	dB	(FM Only)
	THD_	0.22	_%	=	-53.15	dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-109.0	dBm	(S/N Ratio = 30dB)
	RF Lev2	-63.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image	Rejection:	-46.00	dB	(RF Lev1 - RF Lev2)

Curve Tests

6

2

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono (L)			Stereo (L)		Separatio	Separation L->R		
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level	
dBm	đB	dB	dB	dB	dB		dB	dBm	
-130	-19.00	-19.00	-18.50	-18.50		-18.50	-18.50	-130	
-125	-18.50	-19.50	-18.00	-19.00		-18.50	-18.50	-125	
-120	-16.00	-20.00	-16.00	-19.50		-18.00	-18.00	-120	
-115	-10.00	-22.50	-10.00	-22.00		-14.50	-14.50	-115	
-110	-4.00	-30.00	-4.00	-29.00		-9.50	-9.50	-110	
-105	-0.50	-44.00	-0.50	-43.00		-6.50	-6.50	-105	
-100	0.00	-51.50	0.00	-50.50		-6.00	-6.00	-100	
-95	0.00	-58.00	0.00	-57.00		-6.00	-6.00	+95	
-90	0.00	-64.00	0.00	-63.00		-6.00	-6.00	-90	
-85	0.00	-69.00	0.00	-45.00		0.00	-37.00	-85	
-80	0.00	-70.00	0.00	-50.00		0.00	-37.50	+80	
-75	0.00	-70.00	0.00	-55.00		0.00	-38.00	-75	
-70	0.00	-70.00	0.00	-60.00		0.00	-38.00	-70	
-65	0.00	-70.00	0.00	-64.50		0.00	-38.00	-65	
-60	0.00	-70.00	0.00	-68.00		0.00	-38.00	-60	
+55	0.00	-70.00	0.00	-70.00		0.00	-38.00	-55	
-50	0.00	-70.00	0.00	-70.00		0.00	-38.00	-50	
-45	0.00	-70.00	0.00	-70.00	-36.00	0.00	-38.00	-45	

<u>Two RF Tone Tests</u>

<u>two KF Tone Tests</u>
7 Capture Ratio
Set Up: Test Set Up 3
Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
Undesired: Test Freq. 1, -130dBm, CW
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement: RF Lev 1 -56.20 dBm
$\frac{1}{10000000000000000000000000000000000$
Capture Ratio:dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower)
Upper 1st
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -41.72 +13.28 -41.82 -13.18
Undesired Lower Lev -49.62 -538 -51.22 -3.78
Selectivity, 1st Adj.:
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower)
Upper 2nd
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
Desired Law 55.00 D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev 8.08 -63.08 8.08 -63.08 Undesired Lower Lev 8.08 -63.08 8.08 -63.08
Selectivity, 2nd Adj.: 2000 8 0 -63.08 Nax 8: 63.08 (RF D/U Up + RF D/U Lo)/2

	FM Receiver Test Laboratory
10 Selec	tivity - 1st Adjacent 50dB S/N (Upper and Lower)
Uppe	
5	Set Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
1	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
Lowe	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
-	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
I	Adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
. .	dBm D/U dBm D/U
	ed Lev -55.00 -55.00
Undesired Upp Undesired Low	
Selectivity, 1st	
Sciecuvity, 13t	(NI D/O Op + NI D/O L0/2
11 Select	ivity - 2nd Adjacent 50dB S/N (Upper and Lower)
Upper	
S	et Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
A	adjust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
Lower	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	et Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
А	djust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
Desire	dBm D/U dBm D/U
Undesired Uppe	
Undesired Lowe	
Selectivity, 2nd	
• • • • • • • • • • • • • • • • • • • •	
12 Selectiv	vity - 3rd Adjacent 50dB S/N (Upper and Lower)
Upper :	
Se	t Up: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
٨	Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono ijust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower	
Set	t Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Ad	ljust: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB dBm D/U dBm D/U
Desired	
Undesired Upper	
Undesired Lower	
Selectivity, 3rd A	

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Additional Tests

10.7MHz Rejection 13 Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

RF Lev 1	-109.00	dBm	
RF Lev 2	22.00	_ dBm	
D/U	-131.00	dB	

EOC Could not attain 30dB S/N - only slight impact of 10.7MHz at 22dBm

14 10.7 IM Test

Using the three generator set up, set generators as follows;

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust: Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

dBm	D/U	dBm	D/U
-45.00		-45.00	
-20.37	-24.63	-22.37	-22.63

EOC:

10.7MHz (10.6MHz) Local Osc Interference Test 15

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

-22.63

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz) Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

0.6MHz Sj	pacing	10.7MHz S	pacing
dBm	D/U	dBm	D/U
-45.00	1	-45.00	
-14.37	-30.63	-22.37	-22.63
	-30.63		.77 63

EOC: Slight tone at 10.6MHz, objectionable beat noise at 10.7MHz

	Date	2/28/99			
	Engineers	RMc			
	-	FM Receiver Test Al			
	,				
Re	ceiver Test No.:	8			
		Home Hi Fi Receiver			
	Radio Mfg.:				
		STR-AV21			
	Serial:	802086			
Ar	itenna Network:	50/75 Ohm Trans. FM	1		
	Audio load:	<u> </u>			
	Initial Set Up:	Radio under test shall have ton	ne controls set to flat deten	t positio	on, Loudness control off, Balance and
		Fader controls centered (set to :			
					noted in the Comments section.
		Left channel shall be used for a	all Signal (and S/N ratio)	neasure	ments
		15kHz Low Pass filter shall be	e used on the output of the	left cha	nnel for all measurements
		Right channel shall be used for			
		All level measurements are rms			pur univer that only.
		·	2		
	Commonter	Audio Output: Tana Das line -	autout		
		Audio Output: Tape Rec line o	Juiput		
		0			
		0			
	-	0			
Standard	l RF Levels		Sta	ndard l	FM Test Frequencies
Strong	g: -45	dBm			94.1MHz
Medium	1: -55	dBm			
Weak	c: -65	dBm			
Standard	Test Set Ups				
1	Strong Signal	Overload			
2	Single RF Tor				
3	Two RF Tone				
4	Measurement	Set up			
	~				2
	Standard Tes	ts			
1	Local Oscillate	or Frequency (Tuning Error)		13	10.7MHz Rejection
2	Standard Audi	o Output (Audio level and disto	ortion)	14	10.7MHz Intermodulation
3		load (RF level required for 5%	-	15	10.7MHz Spurious (Local Osc. Interference)
4	AM Rejection	· •	•		······································
5	Image Rejectio	n			
6		 lots of RF Level Vs Audio Out	mut)		
7	Capture Ratio		Part)		
8		Adjacent (30dB noise figure)			
9		Adjacent (30dB noise figure)			
10		Adjacent (50dB noise figure)			
11		Adjacent (50dB noise figure)			
12	Selectivity; 3rd	Adjacent (50dB noise figure)			

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Test Results:

1 Local Oscillator Frequency: 104.800 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
0.325 Vrms	0.22 %	0.33 Vrms	0.22 %

3 RF Input Overload: 22.00 dBm Max Test Bed RF level - slight increase in THD (0.26%)

- 5 Image Rejection: -46.00 dB
- 6 Curve Tests: (See Plots)
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -9.33 dB Mono -8.48 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.08 dB Mono Max RF -63.08 dB Stereo Max RF
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -7.08 dB Mono 11.22 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -30.78 dB Mono -30.78 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) <u>-47.93</u> dB Mono <u>-47.93</u> dB Stereo
- 13
 10.7MHz Rejection

 __131.00
 dB

 Could not attain 30dB S/N only slight impact of 10.7MHz at 22dBm

14 10.7MHz IM -24.63 dB (10.6) 0 -22.63 dB (10.7) 0

15 10.7MHz Spurious (Local Osc. Interference) -30.63 dB (10.6) Slight tone at 10.6MHz, objectionable beat noise at 10.7MHz -22.63 dB (10.7) 0



SIGNAL/NOISE VS RF LEVEL

Sony STR-AV21

A 273



SIGNAL/NOISE VS RF LEVEL

Sony STR-AV21



SIGNAL/NOISE VS RF LEVEL

Sony STR-AV21

275


SIGNAL/NOISE VS RF LEVEL



1st and 2nd ADJACENT CHANNEL SELECTIVITY

Sony STR-AV21



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Sony STR-AV21

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IM & L.O. Rejection

279

,

Receiver #9

2

Sony

Portable

Data	. 0/00/00						
Engineers	: <u>2/28/99</u>	<u> </u>					
	: FM Receiv	rer Test Al					
110,000	. 1111100011	01 1031 111	—				
Receiver Test No.	: 9						
	Walkman	Гуре					
Radio Mfg.		-JE					
	SRF-M40V	v	—				
	194352		—				
			—				
Antenna Network	33pf (see	diagram)	FM				
			AM				
Andia taad	16	01			`		
Audio load:	16	Ohms			;		
Initial Set Up:	Radio unde	r test shall ha	ave tone controls set to	flat detent posit	tion. Loudness o	control off, Balance and	i
			(set to mid position), V				
			gs unique to the radio			Comments section.	
			ed for all Signal (and S				
			shall be used on the out			asurements.	
			used for Noise measure				
		easurements a			•	•	
Comments:	Function sv	vitch set to Fl	M Stereo				<u></u>
			•·····				<u> </u>
	<u>,</u>						
						· · · · · · · · · · · · · · · · · · ·	-
Standard R	F Levels		Stand?	rd FM Test Fr	equencies		
Strong:	-45	dBm		Low: 94.1	MHz		
Medium:	-55	dBm	ł	High: 103.5	MHz		
Weak:	-65	dBm		-			
Standard Te	st Set Ups						
1	Strong Sign						
	Single RF T						
3	Two RF To						
	Measuremen						
-	1410d3d10ill0i	n oot up					
Standard Te	sts						
			cy (Tuning Error)				
			Audio level and distor				
3	RF Input Ov	erload (RF le	level required for 5% T	HD)			
4	AM Rejectio	n	-				
	Image Rejec						
	Curve Tests	(plots of RF)	Level Vs Signal - Mor	o & Stereo, Nois	se - Mono & Ste	reo, Stereo Separation	
	Capture Rati		Ũ				
			(30dB noise figure)				
			(30dB noise figure)				
			(50dB noise figure)				
			(50dB noise figure)				
			(HOIDO HEALO)				

.42

1.7

Vrms

%

Single RF Tone Tests

1

2

3

4

5

Local Oscillator Frequency (Tuning Error) Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2 Measurement: L.O. Freq 1 104.850 MHz L.O. Freq 2 MHz **Standard Audio Output** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD Measurement: Left Ch **Right Ch** Level 46 Vrms = 0 dBLevel THD 1.7 % THD **RF Input Overload** Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level Measurement: RF Lev. 15.7 dBm (@ 5% THD) (Sudden threshold, THD greater than 10%) **AM Rejection** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD Measurement: THD 17 % -35.39 (FM Only) dB THD 17 <u>%</u> -35.39 dB (FM + AM 30%) AM Rejection: 0.00 d₿ **Image Rejection** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-104	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-66	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image	Rejection:	-38.0	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Мопо	(L)		Stereo (L)		Separatio	a L+≥R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
•130	-20.50	-20.50	-19.50	-19.50		-19.50	-20.50	-130
-125	-20.50	-20.50	-19.50	-19.50		-19.50	-20.50	-125
-120	-20.00	-21.00	-19.00	-19.50		-19.50	-20.50	-120
-115	-18.00	-21.50	-17.00	-20.50		-19.50	-20.00	-115
+110	-11.50	-24.00	-11.00	-22.50		-16.00	-16.50	-110
-105	-5.00	-30.00	-4.50	-28.50		-10.00	-11.00	-105
-100	-1.50	-49.00	-1.50	-48.00		-7.50	-8.50	-100
-95	-1.00	-60.00	-1.00	-59.00		-7.50	-8.50	-95
-90	0.00	-59.50	0.00	-35.00		0.00	-22.50	-90
-85	0.00	-61.00	0.00	-40.00		0.00	-23.00	-85
-80	0.00	-62.00	0.00	-45.00		0.00	-23.00	-80
-75	0.00	-62.00	0.00	-49.50		0.00	-23.00	-75
+70	0.00	-62.00	0.00	-53.50		0.00	-23.00	-70
-65	0.00	-62.00	0.00	-57.00		0.00	-23.00	-65
-60	0.00	-62.00	0.00	-59.00		0.00	-23.00	-60
-55	0.00	-62.00	0.00	-60.50		0.00	-23.00	-55
+50	0.00	-62.00	0.00	-61.00		0.00	-23.00	+50
	0.00	-62.00	0.00	-61.00	-49.00	0.00	-23.00	-45

Two RF Tone Tests

<u>1wo RF 10</u>	ne lests
7 Capture Ra	atio
-	: Test Set Up 3
	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
	Undesired: Test Freq. 1, -130dBm, CW
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
	Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement:	
	$RF Lev 2 \underline{-47.91} dBm$
Ca	apture Ratio: dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity -	1st Adjacent 30dB S/N (Upper and Lower)
Upper 1st	
Set Up:	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
.	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	Desired Test Port 1 M 1 11 11 11 11 11 11 11 11 11 11 11
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Adjust	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	-54.92 -0.08 -53.92 -1.098
Undesired Lower Lev	-51.72 -3.28 -51.72 -3.28
Selectivity, 1st Adj.:	-1.68 (RF D/U Up + RF D/U Lo)/2
9 Selectivity - 2	
Upper 2nd	2nd Adjacent 30dB S/N (Upper and Lower)
	Test Set Up 3
bet op.	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: S	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
I	increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	ncrease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB
	Mono 30dB Stereo 30dB dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	-18.22 -36.78 -18.22 -36.78
Undesired Lower Lev	-27.12 -27.88 -27.12 -27.88
Selectivity, 2nd Adj.:	-32.33 (RF D/U Up + RF D/U Lo)/2

FM Receiver Test Laboratory
10 Selectivity - 1st Adjacent 50dB S/N (Upper and Lower)
Upper 1st
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Bedia and is to Std. Bef. Level (AB)
Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
Mono S0dB Stereo 50dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -64.92 9.92 -69.92 14.92
Undesired Lower Lev -60.52 5.52 -68.52 13.52
Selectivity, 1st Adj.: 7.72 (RF D/U Up + RF D/U Lo)/2
11 Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)
Upper 2nd
Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
Mono 50dB Stereo 50dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00 Undesired Upper Lev -25.12 -29.88 -28.22 -26.78
Undesired Upper Lev -25.12 29.88 -28.22 -26.78 Undesired Lower Lev -28.02 -26.98 -30.92 -24.08
Selectivity, 2nd Adj.: 28.43 (RF D/U Up + RF D/U Lo)/2
12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)
Upper 3rd
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev. Lower 3rd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
Mono 50dB Stereo 50dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev <u>-22.92</u> <u>-32.08</u> <u>-22.92</u> <u>-32.08</u>
Undesired Lower Lev -19.32 -35.68 -19.92 -35.08
Selectivity, 3rd Adj.: 33.88 33.88 (RF D/U Up + RF D/U Lo)/2

Additional Tests

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

Adjust:

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

45.00	1	45.00	D/U
-45.00		-45.00	
-35.37	-9.63	-40.37	-4.63

EOC: Objectionable beat notes

15 10.7MHz (10.6MHz) Local Osc Interference Test

- Set Up: Desired: 94.1MHz, -45dBm, Pilot only
 - Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev
 - a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

0.6MHz Sp dBm	Б /Л1	10.7MHz Sp dBm	DAT
-45.00		-45.00	2/10
-18.37	-26.63	-39.70	-5.50

EOC: Objectionable beat notes

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	Dete							
		: <u>2/28/99</u>						
*	Engineers		aver Text A1					
	mojaa	. TM Rece	iver Test Al					
Re	ceiver Test No.	: 9						
		Walkman	Type					
	Radio Mfg.			_				
	-	SRF-M40	W					
		194352						
An	tenna Network:	33pf (see	e diagram)	FM			·	
	Audio load:	16	Ohms	_				
	Initial Set Up:	Radio und	ler test shall ha	ve tone controls	set to flat detent pos	ition, Loudnes	s control off, Balance and	
					m), Volume set to S			
		Any other	control setting	s unique to the ra	adio under test shall	be noted in the	Comments section.	
		Left chann	el shall be used	d for all Signal (a	and S/N ratio) meas	surements.		
		15kHz Lo	w Pass filter sh	all be used on th	e output of the left	channel for all	measurements.	
					surements - Stereo	Separation test	only.	
		All level n	neasurements a	re rms				
	Commentes	Exaction of	witch set to FM	1 Sharan				
	Comments.	0	when set to FM	A Stereo				
		0					······	
		<u> </u>				· · · · · · ·		
Standard	RF Levels				Standa	rd FM Test Fr	equencies	
	RF Levels	dBm			Standa	rd FM Test Fr 94.1MHz	-	
Standard Strong Medium	: -45	dBm dBm			Standa	r d FM Test Fr 94.1MHz	-	
Strong	: -45 : -55				Standa		-	
Strong Medium	: -45 : -55	dBm			Standar		-	
Strong Medium Weak	: -45 : -55	dBm			Standa		-	
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups	dBm dBm			Standa		-	
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups Strong Signal	dBm dBm Overload			Standa		-	
Strong Medium Weak Standard 1 2	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Tor	dBm dBm Overload ne Tests			Standa		-	
Strong Medium Weak Standard 1 2 3	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone	dBm dBm Overload ne Tests Tests			Standa		-	
Strong Medium Weak Standard 1 2	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Tor	dBm dBm Overload ne Tests Tests			Standa		-	
Strong Medium Weak Standard 1 2 3	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone	dBm dBm Overload ne Tests Tests Set up			Standa		-	
Strong Medium Weak Standard 1 2 3	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes	dBm dBm Overload ne Tests Tests Set up sts	ry (Tuning Fre			94.1MHz	-	
Strong Medium Weak Standard 1 2 3 4	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat	dBm dBm Overload ne Tests Tests Set up sts or Frequence	cy (Tuning Err Audio level and		13	94.1MHz 10.7MHz 1	Rejection	
Strong Medium Weak Standard 1 2 3 4 1 2	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up sts or Frequence to Output (A	Audio level and	d distortion)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	
Strong Medium Weak Standard 1 2 3 4 1 2 3	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over	dBm dBm Overload me Tests Tests Set up sts or Frequence to Output (cload (RF 1		d distortion)	13	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	æ)
Strong Medium Weak Standard 1 2 3 4 1 2 3 4	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection	dBm dBm Overload me Tests Tests Set up or Frequence to Output (cload (RF 1	Audio level and	d distortion)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	æ)
Strong Medium Weak Standard 1 2 3 4 1 2 3	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection	dBm dBm Overload ne Tests Tests Set up or Frequence to Output (cload (RF 1 on	Audio level and evel required fo	d distortion) For 5% THD)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	æ)
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection	dBm dBm Overload ne Tests Tests Set up or Frequence to Output (cload (RF 1 on	Audio level and	d distortion) For 5% THD)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	e)
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio	dBm dBm Overload ne Tests Tests Set up or Frequence to Output (load (RF 1 on lots of RF 1	Audio level and evel required fo Level Vs Audio	d distortion) For 5% THD) o Output)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	œ)
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6 7	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p	dBm dBm overload ne Tests Tests Set up or Frequence to Output (load (RF 1 on lots of RF 1 Adjacent (Audio level and evel required for Level Vs Audio 30dB noise fig	d distortion) For 5% THD) o Output) gure)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	æ)
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6 7 8 9	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1st	dBm dBm overload ne Tests Tests Set up or Frequence to Output (cload (RF 1 on lots of RF 1 c Adjacent (d Adjacent	Audio level and evel required f Level Vs Audio 30dB noise fig (30dB noise fig	d distortion) for 5% THD) o Output) gure) gure)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	æ)
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6 7 8 9 10	: -45 : -55 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 2m	dBm dBm overload ne Tests Tests Set up ats or Frequence io Output (cload (RF 1 on blots of RF 1 c Adjacent (d Adjacent (Audio level and evel required for Level Vs Audio 30dB noise fig (30dB noise fig 50dB noise fig	d distortion) for 5% THD) o Output) gure) gure) gure)	13 14	94.1MHz 10.7MHz 1 10.7MHz 1	Rejection	æ)

Test Results:

1 Local Oscillator Frequency: 104.850 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
46Vrms	<u> 1.7 </u> %	42 Vrms	1.7 %

- 3 RF Input Overload: <u>15.70</u> dBm (Sudden threshold, THD greater than 10%)
- 4 AM Rejection: 0.00 dB
- 5 Image Rejection: -38.00 dB
- 6 Curve Tests: (See Plots)
- 7 **Capture Ratio:** ______dB
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -1.68 dB Mono -2.18 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -32.33 dB Mono -32.33 dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) 7.72 dB Mono 14.22 dB Stereo
- 11
 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U)

 -28.43
 dB Mono

 -25.43
 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -33.88 dB Mono -33.58 dB Stereo
- 13 10.7MHz Rejection ______dB
- 14
 10.7MHz IM
 Objectionable beat notes

 -9.63
 dB (10.6)
 Objectionable beat notes

 -4.63
 dB (10.7)
 0

0

 15
 10.7MHz
 Spurious (Local Osc. Interference)

 -26.63
 dB (10.6)
 Objectionable beat notes

 -5.30
 dB (10.7)
 0

-



SIGNAL/NOISE VS RF LEVEL

File Name: C_sonywm

2 & S

1.10



SIGNAL/NOISE VS RF LEVEL

Sony SRF-M40W

 $\mathbf{w}^{(1)}$



SIGNAL/NOISE VS RF LEVEL

File Name: C_sonywm

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SIGNAL/NOISE VS RF LEVEL

Sony SRF-M40W

- 1 **10)**



1st and 2nd ADJACENT CHANNEL SELECTIVITY

Sony SRF-M40W

662



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

(50dB Noise Floor)

Sony SRF-M40W

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IM & L.O. Rejection (50dB Noise Floor)

Sony SRF-M40W

Receiver #10

Technics

Home HiFi

Date:	2/28/99
Engineers:	RMc
Project:	FM Receiver Test A1
Receiver Test No.:	
Class:	Home Hi Fi Receiver
Radio Mfg.:	Technics
Model:	SA-EX110
Serial:	GY8JA38798
Antenna Network:	50/75 Ohm Trans. FM
	AM
Audio load:	10K Ohms
Initial Set Up:	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and
	Fader controls centered (set to mid position), Volume set to Standard Output
	Any other control settings unique to the radio under test shall be noted in the Comments section.
,	Left channel shall be used for all Signal (and S/N ratio) measurements.
	15kHz Low Pass filter shall be used on the output of the left channel for all measurements.
	Right channel shall be used for Noise measurements - Stereo Separation test only.
	All level measurements are rms

Comments: FM Auto/Mono switch in FM Auto mode

Audio output, Tape Rec Out

Standard RF Levels

1

Strong:	-45	dBm
Medium:	-55	dBm
Weak:	-65	dBm

Standard FM Test Frequencies Low: 94.1 MHz

Standard Test Set Ups

- 1 Strong Signal Overload
- 2 Single RF Tone Tests
- 3 Two RF Tone Tests
- 4 Measurement Set up

Standard Tests

- 1 Local Oscillator Frequency (Tuning Error)
- 2 Standard Audio Output (Audio level and distortion)
- 3 RF Input Overload (RF level required for 5% THD)
- 4 AM Rejection
- 5 Image Rejection
- 6 Curve Tests (plots of RF Level Vs Signal Mono & Stereo, Noise Mono & Stereo, Stereo Separation

7 Capture Ratio

- 8 Selectivity; 1st Adjacent (30dB noise figure)
- 9 Selectivity; 2nd Adjacent (30dB noise figure)
- 10 Selectivity, 1st Adjacent (50dB noise figure)
- 11 Selectivity; 2nd Adjacent (50dB noise figure)

0.4

Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	104.756	MHz
	L.O. Freq 2		MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	Left Ch				Right Ch		
	Level_	0.315	Vrms	= 0 dB	Level	0.310	Vrms
	THD_	0.26	_%		THD	0.26	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22.00 dBm (@ 5% THD) Max Test Bed RF level - slight increase in THD

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.26	%	=	-51.70	dB	(FM Only)
	THD	0.32	%	=	-49.90	dB	(FM + AM 30%)

AM Rejection: -1.80 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-110.0	_dBm	(S/N Ratio = 30dB)
	RF Lev2	-66.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image 1	Rejection:	-44.00	dB	(RF Lev1 - RF Lev2)

Curve Tests

6

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separatio	n L⊷R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-20.00	-20.00	-19.00	-19.50		-19.00	-19.50	-130
+125	-19.50	-20.50	-19.00	-19.50		-19.00	-19.50	-125
-120	-17.00	-21.50	-17.00	-20.50		-18.00	-18.50	-120
-115	-11.00	-25.00	-11.00	-23.00		-14.00	-14.50	-115
+110	-4.00	-34.00	-4.00	-31.50		-8.50	-9.00	-110
+105	0.00	-47.00	0.00	-45.50		-6.00	-6.00	-105
-100	0.00	-53.00	0.00	-52.00		-6.00	-6.00	-100
-95	0.00	-58.00	0.00	-57.00		-6.00	-6.00	-95
-90	0.00	-64.00	0.00	-40.50		0.00	-35.00	-90
+85	0.00	-68.00	0.00	-45.50		0.00	-35.00	-85
-80	0.00	-68.00	0.00	-50.50		0.00	-35.00	-80
-75	0.00	-68.00	0.00	-55.00		0.00	-35.00	-75
-70	0.00	-68.00	0.00	-60.00		0.00	-35.50	-70
-65	0.00	-68.00	0.00	-65.00		0.00	-36.00	-65
-60	0.00	-68.00	0.00	-67.00		0.00	-36.00	-60
-55	0.00	-68.00	0.00	-68.00		0.00	-36.00	-55
-50	0.00	-68.00	0.00	-68.00		0.00	-36.00	-50
-45	0.00	-68.00	0.00	-68.00	-36.50	0.00	-36.00	-45

Two RF To	ne Tests
7 Capture Ra	<u></u>
-	
Set Op	: Test Set Up 3
	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
A	Undesired: Test Freq. 1, -130dBm, CW
Adjust	Set Radio audio to Std. Ref. Level (0dB)
	Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement:	RF Lev 1 -55.60 dBm
	$\frac{1}{RF Lev 2} - \frac{1}{-52.00} dBm$
Ca	apture Ratio: dB (RF Lev 1 - RF Lev 2)/2
	1st Adjacent 30dB S/N (Upper and Lower)
Upper 1st	
Set Up:	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	-50.32 -4.68 -50.32 -4.68
Undesired Lower Lev	-47.92 -7.08 -47.92 -7.08
Selectivity, 1st Adj.:	
_	
	nd Adjacent 30dB S/N (Upper and Lower)
Upper 2nd	
Set Up: 7	Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Set Radio audio to Std. Ref. Level (0dB)
5	Set the modulation of the Desired signal to CW
I	ncrease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: S	et Radio audio to Std. Ref. Level (0dB)
S	et the modulation of the Desired signal to CW
	ncrease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
Desired Lev	-55.00 -55.00
Undesired Upper Lev	8.08 -63.08 7.08 -62.08
Undesired Lower Lev	8.08 -63.08 5.08 -60.08
Selectivity, 2nd Adj.:	

	FM Receiver Test Laboratory
10 Selectivit Upper 1s	y - 1st Adjacent 50dB S/N (Upper and Lower) t
	Jp: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adju	st: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st	
Set U	
Adim	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono st: Set Radio audio to Std. Ref. Level (0dB)
rsaju	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired L	
Undesired Upper L	
Undesired Lower La	
Selectivity, 1st Adj	8.42 (RF D/U Up + RF D/U Lo)/2
11 Selectivity	- 2nd Adjacent 50dB S/N (Upper and Lower)
Upper 2nd	
	p: Test Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjus	t: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	
Set Up	
A	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjus	t: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Le	
Undesired Upper Lev	v 3.38 -58.38 -7.92 -47.08
Undesired Lower Lev	
Selectivity, 2nd Adj.	:
12 Solootinity	
12 Selectivity - Upper 3rd	- 3rd Adjacent 50dB S/N (Upper and Lower)
	: Test Set Up 3
500 0 0	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust	: Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW
	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
Lower 3rd	
Set Up:	1, , , , , , , , , , , , , , , , , , ,
A 3* .	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust:	Set Radio audio to Std. Ref. Level (0dB)
	Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Mono 50dB Stereo 50dB
	dBm D/U dBm D/U
Desired Lev	
Undesired Upper Lev	
Undesired Lower Lev	

 Undesired Lower Lev
 -5.62
 49.38
 -8.92
 46.08

 electivity, 3rd Adj.:
 56.23
 46.58
 (RF D/U Up + RF D/U Lo)/2

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Additional Tests

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

$$\begin{array}{c} \text{RF Lev 1} & -109.00 & \text{dBm} \\ \text{RF Lev 2} & -25.50 & \text{dBm} \\ \text{D/U} & -83.50 & \text{dB} \end{array} \quad \text{EOC}$$

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

-45.00		-45.00	
-27.37	17 67	-27.37	17 60
-21.31		-21.31	-11.03

EOC: Raspy noise

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz) Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-30.37	-14.63	-34.37	-10.63
Ī			

EOC:

Adjust: Und

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

		: 2/28/99			
	Engineers	: <u>RMc</u> : FM Receiver Test A1	-		
	Project	FINI RECEIVET TEST AI	-		
Re	ceiver Test No.	: 10			
	Class	Home Hi Fi Receiver	_		
	Radio Mfg.	Technics	_		
	Model	SA-EX110	-		
	Serial	GY8JA38798	-		
Ar	itenna Network:	50/75 Ohm Trans.	_FM		
	Audio load:	<u>10K</u> Ohms			
	Initial Set Up:	Fader controls centered (se	et to mid position), Volume unique to the radio under t for all Signal (and S/N rat Il be used on the output of d for Noise measurements	e set to Star test shall be io) measure the left cha	e noted in the Comments section. ements. unnel for all measurements.
	Comments:	FM Auto/Mono switch in F	FM Auto mode		
		Audio output; Tape Rec On			
		0			
		0			
~ .					
	RF Levels	dBm		Standard .	FM Test Frequencies
Strong Medium	•	dBm			94.1MHz
Weak		dBm			
	-05	olom -			
Standard	Test Set Ups				
1	Strong Signal	Overload			
2	Single RF To				
3	Two RF Tone	Tests			
4	Measurement	Set up			
	Standard Tes	its			- -
1	Local Oscillat	or Frequency (Tuning Error	m)	12	10 7MHz Dejection
2		io Output (Audio level and		13 14	10.7MHz Rejection 10.7MHz Intermodulation
3		load (RF level required for		14	10.7MHz Spurious (Local Osc. Interference)
4	AM Rejection		·,		openious (Loom Goe, MacAlelonov)
5	Image Rejection	on			
6		lots of RF Level Vs Audio	Output)		
7	Capture Ratio				
8		Adjacent (30dB noise figur			
9 10		d Adjacent (30dB noise figu Adjacent (50dB noise figu			
11		d Adjacent (50dB noise figu			
11		a Adjacent (50dB noise figu			
		Jacone (a care moree like			

Test Results:

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- 1 Local Oscillator Frequency: 104.756 MHz
- 2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
0.315 Vrms	0.26 %	0.31 Vrms	0.26 %

3 RF Input Overload: 22.00 dBm

Max Test Bed RF level - slight increase in THD

- 4 AM Rejection: -1.80 dB
- 5 Image Rejection: _____dB
- 6 Curve Tests: (See Plots)
- 7 Capture Ratio: ______dB
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -5.88 dB Mono -5.88 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) <u>-63.08</u> dB Mono Max RF <u>-61.08</u> dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -3.98 dB Mono 8.42 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -58.23 dB Mono -46.58 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -56.23 dB Mono -46.58 dB Stereo

- 14
 10.7MHz IM

 -17.63
 dB (10.6)
 Raspy noise

 -17.63
 dB (10.7)
 0
- 15
 10.7MHz Spurious (Local Osc. Interference)

 -14.63
 dB (10.6)
 0

 -10.63
 dB (10.7)
 0



SIGNAL/NOISE VS RF LEVEL

Technics SA-EX110

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SIGNAL/NOISE VS RF LEVEL

Technics SA-EX110

File Name: C_tech

Page 10 of 15



SIGNAL/NOISE VS RF LEVEL

Technics SA-EX110

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SIGNAL/NOISE VS RF LEVEL

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Technics SA-EX110



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Technics SA-EX110

1 1 1



IM & L.O. Rejection

(50dB Noise Floor)

Technics SA-EX110

2 5

1.1.50
Receiver #11

Sanyo

Portable

Date	: 2/28/99
Engineers	
	FM Receiver Test Al
110,000.	
Receiver Test No.:	11
Class:	Bookshelf/Port. All-in-One
Radio Mfg.:	
	MCD-S736
	8701316
Antenna Network:	50/75 Ohm Trans. FM AM
Audio load:	8 Ohms
Initial Set Up:	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and Fader controls centered (set to mid position), Volume set to Standard Output Any other control settings unique to the radio under test shall be noted in the Comments section. Left channel shall be used for all Signal (and S/N ratio) measurements. 15kHz Low Pass filter shall be used on the output of the left channel for all measurements. Right channel shall be used for Noise measurements - Stereo Separation test only.
	All level measurements are rms
C -i	
Comments:	Modified with F connector antenna input
	Tone control full right (high) BASSXPANDER control off
	BASSAPANDER control ou
Standard RI	F Levels Standard FM Test Frequencies
Standari di Re	-45 dBm Low: 94.1 MHz
Medium:	-55 dBm
Weak:	-65 dBm
WCak.	-05 000
	•
Standard Te	st Set Ups
1	Strong Signal Overload
	Single RF Tone Tests
	Two RF Tone Tests
-	Measurement Set up
-	Measurement Set up
Standard Te	sts
1	Local Oscillator Ergguangy (Tuning Ergs)
	Local Oscillator Frequency (Tuning Error)
	Standard Audio Output (Audio level and distortion)
	RF Input Overload (RF level required for 5% THD)
	AM Rejection
	Image Rejection
	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation
	Capture Ratio
8	Selectivity; 1st Adjacent (30dB noise figure)
	Selectivity, 2nd Adjacent (30dB noise figure)
	Selectivity; 1st Adjacent (50dB noise figure)
	Selectivity; 2nd Adjacent (50dB noise figure)
	Selectivity; 3rd Adjacent (50dB noise figure)
	Additional 10.7MHz Tests
13-15 /	200111011a1 10.7191112 16515

Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement: L.O. Freq 1 104.821 MHz L.O. Freq 2 MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	eft Ch			R	ight Ch	
	Level	0.84	Vrms	= 0 dB	Level	0.84	Vrms
	THD_	0.4	_%		THD	0.35	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22 dBm (@ 5% THD) Max Test Bed RF level - increase in THD: (2%)

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.4	%	=	-47.96 dB	(FM Only)
	THD	0.4	_%	=	<u>-47.96</u> dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Levi	-95	dBm	(S/N Ratio = 30dB)
	RF Lev2	-75	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
Image	Rejection:	-20.0	dB	(RF Lev1 - RF Lev2)

Curve Tests

6

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separation	n L->R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	đB	dB	dB	đB	dB	dBm
-130	-29.50	-29.50	-29.00	-29.00		-28.50	-28.50	-130
-125	-29.50	-29.50	-29.00	-29.00		-28.50	-28.50	-125
-120	-29.50	-29.50	-28.50	-29.00		-28.50	-28.50	-120
-115	-28.00	-28.00	-27.50	-28.00		-27.50	-27.50	-115
-110	-24.00	-27.00	-23.50	-26.50		-25.00	-25.50	-110
-105	-16.00	-25.50	-16.00	-24.50		-20.00	-20.00	+105
-100	-8.00	-26.00	-8.00	-25.00		-13.00	-13.00	-100
-95	-2.00	-33.00	-2.00	-32.00		-7.50	-8.00	-95
-90	-0.25	-47.50	-0.25	-30.50		0.00	-29.00	-90
+85	0.00	-55.00	0.00	-35.50		0.00	-34.00	-85
-80	0.00	-58.50	0.00	-40.50		0.00	-37.00	-80
-75	0.00	-60.00	0.00	-45.50		0.00	-39.00	-75
-70	0.00	-61.50	0.00	-50.00		0.00	-39.50	-70
-65	0.00	-62.00	0.00	-54.00		0.00	-40.00	-65
-60	0.00	-62.00	0.00	-57.50		0.00	-40.00	+60
-55	0.00	-62.00	0.00	-59.00		0.00	-40.00	-55
-50	0.00	-62.00	0.00	-60.00		0.00	-40.00	-50
-45	0.00	-61.00	0.00	-59.50	-33.00	0.00	-40.00	-45

Two RF Tone Tests

	I WO KE TONE	
7	Capture Ratio	· ·
'	-	, lest Set Up 3
	Set Op. 1	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
		Undesired: Test Freq. 1, -130dBm, CW
	Adjust S	et Radio audio to Std. Ref. Level (0dB)
	Aujust. of	ncrease Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
	II Ir	ncrease Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
	11	
	Measurement:	RF Lev 1 -55.94 dBm
	wiedsarement.	RF Lev 2 - 42.94 dBm
	Capt	ture Ratio:dB (RF Lev 1 - RF Lev 2)/2
8	Selectivity - 1s	t Adjacent 30dB S/N (Upper and Lower)
	Upper 1st	
		est Set Up 3
	•	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		et Radio audio to Std. Ref. Level (0dB)
	•	et the modulation of the Desired signal to CW
		crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
	Lower 1st	
	Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Se	et Radio audio to Std. Ref. Level (0dB)
		et the modulation of the Desired signal to CW
	In	crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
		Mono 30dB Stereo 30dB
		dBm D/U dBm D/U
	Desired Lev	-55.00 -55.00
Undesi	ired Upper Lev	-54.92 -0.08 -55.92 0.92
	red Lower Lev	-46.92 -8.08 -47.92 -7.08
	ivity, 1st Adj.:	-4.08 (RF D/U Up + RF D/U Lo)/2
9	Selectivity - 2n	d Adjacent 30dB S/N (Upper and Lower)
	Upper 2nd	•
		est Set Up 3
	-	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	1	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust: Se	t Radio audio to Std. Ref. Level (0dB)
		t the modulation of the Desired signal to CW
		crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
	Lower 2nd	-
	Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		t Radio audio to Std. Ref. Level (0dB)
		t the modulation of the Desired signal to CW
		crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
		Mono 30dB Stereo 30dB
		dBm D/U dBm D/U
	Desired Lev	-55.00 -55.00
Undesi	red Upper Lev	-30.12 -24.88 -30.12 -24.88
	red Lower Lev	-25.92 -29.08 -25.92 -29.08
	ity, 2nd Adj.:	-26.98 (RF D/U Up + RF D/U Lo)/2
SUCCUY		

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	10	Selectivity - Upper 1st	1st Adjacent 50dB S/N (Upper and Lower)
			: Test Set Up 3
	2	Bet Op	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
			Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		A direct	s Set Radio audio to Std. Ref. Level (0dB)
		Aujusi	Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
		Lower 1st	increase Undesired signal unit noise noor is -5000, record Undesired for rover as Ondesired Oppor Dev.
		Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		Set Op.	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		A diameter	
		Adjust	Set Radio audio to Std. Ref. Level (0dB)
			Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
			Mono 50dB Stereo 50dB
		D 11	dBm D/U dBm D/U
	TT 1	Desired Lev	
		red Upper Lev	
		ed Lower Lev	
	Selectiv	vity, 1st Adj.:	-2.28 [(RF D/U Up + RF D/U Lo)/2
	14	G-]	2nd Adjacent 50dB S/N (Upper and Lower)
	11	•	2nd Adjacent Sodd S/N (Opper and Lower)
		Upper 2nd	
		Set Op:	Test Set Up 3
			Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		A 1	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust:	Set Radio audio to Std. Ref. Level (0dB)
			Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
		Lower 2nd	Increase Ondesired signal unul noise noor is -Jourb, record Ondesned Kr level as Ondesned Opper Lev.
			Desired Test Free 1 Medium 11/117 75/117 Day Mono
100		Set Up:	•
1		A	Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust:	Set Radio audio to Std. Ref. Level (0dB)
			Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
			Mono S0dB Stereo S0dB
		Desired Lev	
	T Tu dania	ed Upper Lev	
		ed Upper Lev	<u>31.42</u> <u>-20.34</u> <u>-43.32</u> <u>-30.08</u> <u>-33.02</u> <u>-21.98</u> <u>-33.32</u> <u>-21.68</u>
	Selectivi	ty, 2nd Adj.:	-22.78 [
	10	Sala attrates	3rd Adjacent 50dB S/N (Upper and Lower)
	12	Upper 3rd	Siu Aujacent Soub Sin (Opper and Lower)
		**	Test Set Up 3
		Set Op.	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
			Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		A divert	Set Radio audio to Std. Ref. Level (0dB)
		•	Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
		Lower 3rd	
		Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
		Bet Op.	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Adjust	Set Radio audio to Std. Ref. Level (0dB)
		•	Set the modulation of the Desired signal to CW
			Increase Undesired signal until noise floor is <u>50dB</u> , record Undesired RF level as Undesired Lower Lev.
		f	Mono 50dB Stereo 50dB
			dBm D/U dBm D/U
		Desired Lev	-55.00 -55.00
	Undersite	d Upper Lev	-25.82 -29.18 -26.22 -28.78
period.		d Lower Lev	<u>-23.32</u> <u>-25.48</u> <u>-29.42</u> <u>-25.58</u>
(y, 3rd Adj.:	-27.43 -27.18 (RF D/U Up + RF D/U Lo)/2
×.	Selecuvi	y, Jru Auj.:	

Additional Tests

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

Adjust:

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

10.6MHz Sp	pacing	10.7MHz S	vacing
dBm	D/U	dBm	D/U
-45.00		-45.00	
-25.37	-19.63	-27.37	-17.63
	-19.63		-17.63

EOC: Hiss

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1 MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing

b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

0.6MHz Sj dBm	D/U	dBm	D/U
-45.00		-45.00	
-58.14	13.14	-62.14	17.14

Desired: -55.00 RF Lev 1 -58.14

Desired:

RF Lev 1

RF Lev 2

-55.00

-29.37

-30.37

EOC: Objectionable beat notes

	Engineers:	: 2/28/99 : RMc : FM Receiver Test Al				
Rece	Radio Mfg.: Model:	Bookshelf/Port. All-in				
Ante		50/75 Ohm Trans.	FM			
	Audio load:	: <u>8</u> Ohms				
I	nitial Set Up:	Fader controls centered Any other control settin Left channel shall be u	d (set to mid position ngs unique to the rad used for all Signal (an shall be used on the used for Noise measure), Volume set to lio under test sha ad S/N ratio) mea output of the left	Sta 11 b asur t ch	e noted in the Comments section. ements. annel for all measurements.
	Comments:	Modified with F conne Tone control full right BASSXPANDER cont 0	(high)			
Standard	DF L anala			Stand	~~ 3	FM Test Encoursion
Standard . Strong:		dBm		Scantos	aru	FM Test Frequencies 94.1MHz
Medium:		dBm				J-1.1.041.04
Weak:		dBm				
Standard	Fest Set Ups					
1	Strong Signal	l Overload				
2	Single RF To	one Tests				
3	Two RF Tone					
4	Measurement	t Set up				
	Standard Te	sts				- -
1	Local Oscillat	tor Frequency (Tuning	Error)	13	3	10.7MHz Rejection
2		lio Output (Audio level		14	L I	10.7MHz Intermodulation
3	RF Input Ove	rload (RF level require	ed for 5% THD)	15	5	10.7MHz Spurious (Local Osc. Interference)
4	AM Rejection	1				
5	Image Rejecti					
6	-	plots of RF Level Vs Ai	udio Output)			
7	Capture Ratio		. .	-		
		st Adjacent (30dB noise				
	• ·	nd Adjacent (30dB nois				
		st Adjacent (50dB noise nd Adjacent (50dB noise				
		rd Adjacent (50dB noise				

	Test Results:			
1	Local Oscillator Frequent	ncy:		
2	Standard Audio Output: Left Channel 	THD %	Right Channel 0.84 Vrms	THD %
3	RF Input Overload: 22.00 dBm	Max Test Bed RF le	vel - increase in THD: (2%)	
4	AM Rejection: 0.00dB			
5	Image Rejection: dB			
6	Curve Tests: (See Plots)			
7	Capture Ratio: dB			
8	Selectivity, First Adjacen dB Mono dB Stereo	t, 30dB Noise Floor	(Ave. D/U)	
9	Selectivity, Second Adjace -26.98 dB Mono -26.98 dB Stereo	ent, 30dB Noise Floo	or (Ave. D/U)	
10	Selectivity, First Adjacent -2.28 dB Mono 18.42 dB Stereo	t, 50dB Noise Floor ((Ave D/U)	
11	Selectivity, Second Adjace -22.78 dB Mono -15.38 dB Stereo	ent, 50dB Noise Floo	or (Ave. D/U)	
12	Selectivity, Third Adjacen -27.43 dB Mono -27.18 dB Stereo	t, 50dB Noise Floor	(Ave. D/U)	
13	10.7MHz Rejection dB	0		
14	10.7MHz IM -19.63 dB (10.6) -17.63 dB (10.7)	Hiss	0	
15	10.7MHz Spurious (Local 13.14 dB (10.6) 17.14 dB (10.7)		nable beat notes 0	

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SIGNAL/NOISE VS RF LEVEL

Sanyo MCD-S736



SIGNAL/NOISE VS RF LEVEL

Sanyo MCD-S736



SIGNAL/NOISE VS RF LEVEL

Sanyo MCD-S736

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SIGNAL/NOISE VS RF LEVEL

Sanyo MCD-S736

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1st and 2nd ADJACENT CHANNEL SELECTIVITY

Sanyo MCD-S736

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1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Sanyo MCD-S736



IM & L.O. Rejection

Sanyo MCD-S736

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Receiver #12

Sony

Portable

Engineers	e: 2/28/99 s: RMc d: FM Receiver Test A1	
Receiver Test No.	: 12	
	s: Bookshelf/Port. All-in-One	
Radio Mfg.		
-	1: CFD-S33	
Serial	1: 1132161	
Antenna Network	c: <u>50/75 Ohm Trans.</u> FM AM	
Audio load	l:10KOhms	
Initial Set Up:	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance an Fader controls centered (set to mid position), Volume set to Standard Output Any other control settings unique to the radio under test shall be noted in the Comments section. Left channel shall be used for all Signal (and S/N ratio) measurements. 15kHz Low Pass filter shall be used on the output of the left channel for all measurements.	1
	Right channel shall be used for Noise measurements - Stereo Separation test only. All level measurements are rms	
Comments:	Modified with F connector antenna input	
	Mono/Stereo switch in Stereo	
	Audio output; Headphone output	<u> </u>
Standard R	F Levels Standard FM Test Frequencies	
Strong:	······································	
Medium:		
Weak:		
Standard Te	est Set Ups	
1	Strong Signal Overload	
2	Single RF Tone Tests	
3	Two RF Tone Tests	
	Measurement Set up	
Standard Te	ests	
1	Local Oscillator Frequency (Tuning Error)	
	Standard Audio Output (Audio level and distortion)	
	RF Input Overload (RF level required for 5% THD)	
	AM Rejection	
	Image Rejection	
	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation	
	Capture Ratio	
	Selectivity; 1st Adjacent (30dB noise figure)	
	Selectivity; 2nd Adjacent (30dB noise figure)	
	Selectivity; 1st Adjacent (50dB noise figure)	
	Selectivity; 2nd Adjacent (50dB noise figure)	
	Selectivity, 3rd Adjacent (50dB noise figure)	
13 - 15	Additional 10.7MHz Tests	

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Single RF Tone Tests

1

Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	104.800	MHz
	L.O. Freq 2		MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	æft Ch			F	light Ch	
	Level_	0.745	Vrms	= 0 dB	Level	0.765	Vrms
	THD_	3.40	_%		THD_	3.60	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 17.00 dBm (@ 5% THD)

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	3.6	%	=	-28.87 dE	(FM Only)
	THD	3.6	%	=	-28.87 dE	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-99.0	dBm	(S/N Ratio = 30dB)
	RF Lev2	-74.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image	Rejection:	-25.00	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

... 1 Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separatio	n L->R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-36.00	-36.00	-35.00	-35.00		-35.00	-34.50	-130
-125	-36.00	-36.00	-35.00	-35.00		-35.00	-34.50	-125
+120	-35.00	-36.00	-34.00	-35.00		-35.00	-34.50	-120
-115	-31.00	-35.50	-30.50	-34.50		-33.00	-32.50	-115
-110	-23.00	-35.00	-22.50	-34.00		-27.00	-26.50	-110
-105	-14.00	-34.50	-13.50	-33.50		-19.00	-18.50	-105
-100	-6.50	-35.50	-6.00	-34.50		-12.00	-11.50	-100
-95	-2.00	-42.00	-1.50	-41.50		-7.50	-7.00	-95
-90	-0.30	-54.00	-0.20	-36.00		-0.20	-32.50	-90
+85	0.00	-59.00	0.00	-40.50		0.00	-33.00	+85
-80	0.00	-61.00	0.00	-45.50		0.00	-34.00	-80
-75	0.00	-61.50	0.00	-50.00		0.00	-34.20	-75
-70	0.00	-61.50	0.00	-54.00		0.00	-34.50	-70
-65	0.00	-61.50	0.00	-57.00		0.00	-35.00	-65
-60	0.00	-61.50	0.00	-59.00		0.00	-35.00	-60
-55	0.00	-61.50	0.00	-59.50		0.00	-35.00	-55
-50	0.00	-61.50	0.00	-59.50		0.00	-35.00	-50
-45	0.00	-61.00	0.00	-59.50	-34.00	0.00	-35.00	-45

Two RF Tone Tests

Two RF Tone	<u>e Tests</u>
7 Contract Dat	
7 Capture Rati	o Test Set Up 3
Set Op.	Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono
	Undesired: Test Freq. 1, -130dBm, CW
Adiust: S	Set Radio audio to Std. Ref. Level (0dB)
	ncrease Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
I	ncrease Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Measurement:	RF Lev 1 dBm RF Lev 2 dBm
Cap	ture Ratio: dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1s Upper 1st	st Adjacent 30dB S/N (Upper and Lower)
Set Up: T	'est Set Up 3
	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	et Radio audio to Std. Ref. Level (0dB)
	et the modulation of the Desired signal to CW
Lower 1st	ncrease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
•	Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	et Radio audio to Std. Ref. Level (0dB)
	et the modulation of the Desired signal to CW
In	crease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
	dBm D/U dBm D/U
	-55.00 -55.00
Undesired Upper Lev Undesired Lower Lev	<u>-58.32</u> <u>3.32</u> <u>-58.92</u> <u>3.92</u> <u>-54.72</u> <u>0.28</u> <u>-54.92</u> <u>-0.08</u>
Selectivity, 1st Adj.:	-54.72 -0.28 -54.92 -0.08 1.52 1.92 (RF D/U Up + RF D/U Lo)/2
	(A D/O D/) Z
9 Selectivity - 2nd	d Adjacent 30dB S/N (Upper and Lower)
Upper 2nd	
Set Up: Te	*
_	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	t Radio audio to Std. Ref. Level (OdB)
	t the modulation of the Desired signal to CW rease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd	wase Undesired signal and hoise hoor is -500b, record Undesired RF level as Undesired Upper Lev.
Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
	Jndesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Radio audio to Std. Ref. Level (0dB)
Set	the modulation of the Desired signal to CW
Inc	rease Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
	Mono 30dB Stereo 30dB
Dealer 1 7	dBm D/U dBm D/U
	-55.00 -55.00
	-15.92 -39.08 -16.92 -38.08 -15.52 -39.48 -16.12 -38.88
Selectivity, 2nd Adj.:	-15.52 39.48 -16.12 -38.88 -39.28 -38.48 (RF D/U Up + RF D/U Lo)/2
· · · · · · · · · · · · · · · · · · ·	$(\mathbf{v}_1, \mathbf{p}_1) \cap \mathbf{p}_1 \neq \mathbf{v}_2 $

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10 Selectivity - Upper 1st	1st Adjacen	t 50dB S/N ((Jpper and L	ower)	
	Test Set Up	3			
ou op.	-	: Test Freq. 1,	Medium 11	Hz 75kHz	Dev Mono
		-			Hz, 75kHz Dev, Mono
Adjust		dio to Std. Re		•	
7 Кајчон.		lation of the l		,	
			•		, record Undesired RF level as Undesired Upper Lev.
Lower 1st	merease one	icsircu signai	unui noise n	001 13 -50015	, record Ondesired Ki lever as Ondesired Opper Lev.
Set Up:	Desired	Test Freq. 1,	Madium 11	U. 751-U.	Day Mono
Set Op.				•	•
		-		,	iz, 75kHz Dev, Mono
Adjust:		dio to Std. Re	•		
		lation of the I	•		
		······································			record Undesired RF level as Undesired Lower Lev.
	Mono	50dB	Stereo :	50dB	
	d Bm	D/U	dBm	D/U	
Desired Lev	-55.00		-55.00		
Undesired Upper Lev	-66.72	11.72	-75.92	20.92	
Undesired Lower Lev	-66.22	11.22	-73.92	18.92	
Selectivity, 1st Adj.:		11.47		19.92	(RF D/U Up + RF D/U Lo)/2
11 Selectivity -	2nd Adjacen	t 50dB S/N (1	Upper and L	.ower)	
Upper 2nd	-			-	
	Test Set I In 2	1			

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 2nd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

	Mono : dBm	50dB D/U		SOdB D/U	
Desired Lev	-55.00		-55.00		
Undesired Upper Lev	-24.92	-30.08	-30.92	-24.08	
Undesired Lower Lev	-20.92	-34.08	-31.92	-23.08	
Selectivity, 2nd Adj.:		-32-08		-23.58	(RF D/U Up + RF D/U Lo)/2

12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)

Upper 3rd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 3rd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

		Mono	SOdB	Stereo	50dB	
		dBm	D/U	dBm	D/U	
	Desired Lev	-55.00		-55.00		
	Undesired Upper Lev	-11.22	-43.78	-22.42	-32.58	
• ••	Undesired Lower Lev	-19.62	-35.38	-27.92	-27.08	8
	Selectivity, 3rd Adj.:		-39.58		-29.83	(RF D/U Up + RF D/U Lo)/2

Additional Tests

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13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Jp: Desired: 94.1MHz, -45dBm, Pilot only Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

10.6MHz Sj	bacing	10.7MHz	Spacing
dBm -45.00	0/0	-45.00	D/U
-32.37	-12.63	-35.37	-9.63
	-12.63		-9.63

EOC: Hiss

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-52.37	7.37	-54.37	9.37
	7.37		9.37

EOC:

Adjust:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

	Date	: 2/28/99	_						
	Engineers	: RMc	_	_					
	Project	: FM Receiver	r Test Al	_					
				_					
Rea	ceiver Test No.	: 12		_					
	Class	Bookshelf/Po	ort. All-in-On	ne					
	Radio Mfg.	Sony		-					
	Model	CFD-S33		-					
	Serial	1132161		_					
An	tenna Network:	50/75 Ohm 7	Frans.	FM					
		<u> </u>		-					
	Audio load:	10K	Ohms						
	initial Set Up:					tion, Loudness control off, Balance and			
			-	-), Volume set to St	•			
		•	-	-		be noted in the Comments section.			
				• •	d S/N ratio) measu				
						hannel for all measurements.			
		-			urements - Stereo S	Separation test only.			
		All level mea	surements are	e rms					
	German	16 - 1:6 - 1:4	. 17	· · · · · · · · · · · · · · · · · · ·					
	Comments:			antenna input					
		Mono/Stereo switch in Stereo Audio output; Headphone output							
			; Headphone	output					
		0							
Standard	RF Levels				Stondon	I The Tool Francisco			
Stanuaru		dBm			Standar	d FM Test Frequencies			
Medium		dBm				94.1MHz			
Weak		dBm							
weak	05	ubm							
Standard	Test Set Iins								
Standard	Test Set Ups								
	-	Overload							
1	- Strong Signal								
1 2	Strong Signal Single RF To	ne Tests							
1 2 3	Strong Signal Single RF To Two RF Tone	ne Tests Tests							
1 2	Strong Signal Single RF To	ne Tests Tests							
1 2 3	Strong Signal Single RF To Two RF Tone	ne Tests e Tests Set up							
1 2 3	Strong Signal Single RF To Two RF Tone Measurement	ne Tests e Tests Set up				×			
1 2 3	Strong Signal Single RF To Two RF Tone Measurement Standard Te	ne Tests e Tests Set up	(Tuning Erro	я)	13	10.7MHz Rejection			
1 2 3 4	Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat	ne Tests : Tests Set up sts			13 14	10.7MHz Rejection 10.7MHz Intermodulation			
1 2 3 4	Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud	ne Tests Tests Set up sts	dio level and	distortion)		10.7MHz Intermodulation	;)		
1 2 3 4 1 2	Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud	ne Tests Tests Set up sts for Frequency io Output (Au rload (RF leva	dio level and	distortion)	14		<i>•</i>		
1 2 3 4 1 2 3	Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove	ne Tests Tests Set up sts or Frequency io Output (Au rload (RF leve	dio level and	distortion)	14	10.7MHz Intermodulation	•		
1 2 3 4 1 2 3 4	Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti	ne Tests Tests Set up sts for Frequency io Output (Au rload (RF leve on	dio level and el required fo	distortion) r 5% THD)	14	10.7MHz Intermodulation	;)		
1 2 3 4 1 2 3 4 5	Strong Signal Single RF To Two RF Tone Measurement Standard Te Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti	ne Tests Tests Set up sts for Frequency io Output (Au rload (RF leve on blots of RF Leve	dio level and el required fo	distortion) r 5% THD)	14	10.7MHz Intermodulation	•)		
1 2 3 4 1 2 3 4 5 6	Strong Signal Single RF To Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (J Capture Ratio	ne Tests Tests Set up sts for Frequency io Output (Au rload (RF leve on blots of RF Leve	dio level and el required fo vel Vs Audio	distortion) r 5% THD) Output)	14	10.7MHz Intermodulation			
1 2 3 4 1 2 3 4 5 6 7	Strong Signal Single RF To Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (I Capture Ratio Selectivity; 1s	ne Tests Tests Set up sts for Frequency io Output (Au rload (RF leve on blots of RF Leve	dio level and el required fo vel Vs Audio dB noise figu	distortion) r 5% THD) Output) are)	14	10.7MHz Intermodulation	9		
1 2 3 4 1 2 3 4 5 6 7 8	Strong Signal Single RF To Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (I Capture Ratio Selectivity; 1s Selectivity; 2n	ne Tests 2 Tests Set up sts for Frequency io Output (Au- rload (RF leve on blots of RF Leve t Adjacent (30	dio level and el required fo vel Vs Audio dB noise figu 0dB noise figu	distortion) r 5% THD) Output) ure) ure)	14	10.7MHz Intermodulation			
1 2 3 4 1 2 3 4 5 6 7 8 9	Strong Signal Single RF To Two RF Tone Measurement Standard Tee Local Oscillat Standard Aud RF Input Ove AM Rejection Image Rejecti Curve Tests (I Capture Ratio Selectivity; 1s Selectivity; 1s	ne Tests 2 Tests Set up sts for Frequency io Output (Au- rload (RF leve on blots of RF Leve t Adjacent (30 d Adjacent (30	dio level and el required fo vel Vs Audio dB noise figu 0dB noise figu dB noise figu	distortion) r 5% THD) Output) ure) ure) ure)	14	10.7MHz Intermodulation	()		

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Test Results:

- 1 Local Oscillator Frequency: 104.800 MHz
- 2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
0.745Vrms	3.40 %	<u>0.765</u> Vrms	3.60

- **3 RF Input Overload:** 17.00 dBm 0
- 4 AM Rejection: 0.00 dB
- 5 Image Rejection: -25.00 dB
- 6 Curve Tests: (See Plots)
- 7 **Capture Ratio:** ______dB
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) <u>1.52</u> dB Mono <u>1.92</u> dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -39.28 dB Mono -38.48 dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) <u>11.47</u> dB Mono <u>19.92</u> dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -32.08 dB Mono -23.58 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -39.58 dB Mono -29.83 dB Stereo

- 14
 10.7MHz IM

 -12.63
 dB (10.6)
 Hiss

 -9.63
 dB (10.7)
 0
- 15
 10.7MHz Spurious (Local Osc. Interference)

 7.37
 dB (10.6)
 0

 9.37
 dB (10.7)
 0



SIGNAL/NOISE VS RF LEVEL

Sony CFD-S33

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SIGNAL/NOISE VS RF LEVEL

File Name: C_sonytr



SIGNAL/NOISE VS RF LEVEL

ພ ອ File Name: C_sonytr

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SIGNAL/NOISE VS RF LEVEL

Sony CFD-S33

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1st and 2nd ADJACENT CHANNEL SELECTIVITY (30dB Noise Floor)

Sony CFD-S33

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1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Sony CFD-S33

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IM & L.O. Rejection (50dB Noise Floor)

Sony CFD-S33

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Receiver #13

Koss

Auto

Date	: 2/28/99		
Engineers		-	
	: FM Receiver	Test Al	
Receiver Test No.	: 13		
Class	: Automobile		
Radio Mfg.	: Koss		
Model	: MS-457		
Serial	: 3805003200		
Antenna Network	: JFW50MN-00	01FM	
	·····		
Audio load	: <u>10K</u>	Ohms	
Initial Set Up		test shall have tone controls set to flat detent position, Loudness control off, Balance and	
		s centered (set to mid position), Volume set to Standard Output	
		ntrol settings unique to the radio under test shall be noted in the Comments section.	
		shall be used for all Signal (and S/N ratio) measurements.	
		Pass filter shall be used on the output of the left channel for all measurements.	
	-	I shall be used for Noise measurements - Stereo Separation test only.	
	All level measure	surements are rms	
Comments	Audio output	; Line Out connectors	
comments.		switch in Stereo	
		switch in Distant	
	·		
Standard R		Standard FM Test Frequencies	
Strong:		dBm Low: 94.1 MHz	
Medium:		dBm	
Weak:	-65 c	dBm	
Standard To	et Set Une		
Standard 1	st bet ops		
1	Strong Signal (Overload	
2	Single RF Tone		
3	Two RF Tone		
4	Measurement S		
		•	
Standard Te	sts		
1	Local Oscillato	or Frequency (Tuning Error)	
		io Output (Audio level and distortion)	
		load (RF level required for 5% THD)	
	AM Rejection		
	Image Rejection		
		lots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation	
	Capture Ratio		
8	Selectivity; 1 st .	Adjacent (30dB noise figure)	
9	Selectivity; 2nd	d Adjacent (30dB noise figure)	
10	Selectivity; 1 st .	Adjacent (50dB noise figure)	
		d Adjacent (50dB noise figure)	
		Adjacent (50dB noise figure)	
13 - 15	Additional 107	7MHz Tests	
	Additional 10.7	///////////////////////////////////////	
	Additional 10.7		
	Additional 10.7		

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Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement:	L.O. Freq 1	MHz
	L.O. Freq 2	MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	I	left Ch			F	light Ch	
	Level	0.500	Vrms	= 0 dB	Level	0.520	Vrms
	THD	0.95	%		THD	0.80	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22.00 dBm (@ 5% THD) Max Test Bed RF level - no increase in THD

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD	0.95	_%	=	_40.45 dB	(FM Only)
	THD	0.95	_%	=	-40.45 dB	(FM + AM 30%)

AM Rejection: 0.00 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-97.0	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-51.0	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
Image	Rejection:	-46.00	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

. 2. Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)			Separation L>>R	
RF Level	Signal	Noise	Signal	Filt Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-46.50	-46.50	-46.00	-46.00		-46.00	-46.00	-130
-125	-46.50	-46.50	-46.00	-46.00		-46.00	-46.00	-125
-120	-46.50	-46.50	-46.00	-46.00		-46.00	-46.00	-120
-115	-45.00	-45.50	-45.00	-45.00		-45.00	-45.00	+115
-110	-40.50	-43.50	-40.50	-43.00		-42.50	-42.00	-110
-105	-31.50	-40.50	-31.00	-40.00		-35.50	-35.00	-105
-100	-17.50	-38.00	-17.00	-36.50		-23.00	-22.50	-100
•95	-4.50	-43.50	-3.00	-29.00		-4.00	-27.50	-95
-90	0.00	-59.00	0.00	-33.50		0.00	-31.50	+90
+85	0.00	-64.50	0.00	-38.50		0.00	-36.00	-85
-80	0.00	-69.00	0.00	-43.50		0.00	-38.00	+80
.75	0.00	-71.00	0.00	-48.00		0.00	-39.00	-75
-70	0.00	-72.00	0.00	-53.00		0.00	-39.50	-70
-65	0.00	-72.00	0.00	-57.00		0.00	-40.00	-65
-60	0.00	-72.00	0.00	-61.00		0.00	-40.00	-60
+55	0.00	-72.00	0.00	-63.00		0.00	-40.00	-55
-50	0.00	-72.00	0.00	-63.50		0.00	-40.00	-50
-45	0.00	-72.00	0.00	-64.00	-45.00	0.00	-40.00	-45
Two RF Tone Tests

7 Capture Ratio Undesired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio and/to 5xH Ref Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement: RF Lev 1 RF Lev 2 -55.98 Measurement: RF Lev 1 RF Lev 2 -55.98 Opper 1st Capture Ratio: Selectivity - 1st Adjacent 30dB SN (Upper and Lower) Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floot is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set Up: Desired: Test Freq. 1, 400kHz, 130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired Signal until noise floot is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo	Two RF Tor	<u>ie Tests</u>
Set Up: Test Set Up 3 Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undasired: Test Freq. 1, -65dBm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal unit audio level drops 30dB, record Undesired RF level as RF Lev 1 Increase Undesired signal unit audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement: RF Lev 1	7 Canture Da	tio
Desired: Test Freq. 1, -553Bm, 1Hž, 22, SHž dev, Mono Undesired: Test Freq. 1, -1304Bm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 10B, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 304B, record Undesired RF level as RF Lev 2 Measurement: RF Lev 1 _ <u>-55.98</u> dBm RF Lev 2 _ <u>-50.98</u> dBm Capture Ratio: _ <u>-2.50</u> dB (RF Lev 1 - RF Lev 2)/2 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lover) Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHž, 75kHž Dev, Mono Undesired Size Strate 1 - 200 dB, 1kHž, 75kHž Dev, Mono Adjust: Set Radio audio to Std. Ref Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1 st Set Up: Desired: Test Freq. 1, Medium, 1kHž, 75kHž Dev, Mono/Stereo Undesired Upper Lev. Addition of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Meno30dB DB Set the modulation of the Desired signal to CW Increase Undesired Signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Meno30dB DB DB DB DB DB DB DB DB DE DB	-	
Undesired: Test Freq. 1, -130dBm, CW Adjust: ScR Radio audio to Sk Ref. Level (OB) Increase Undesired signal until audio level drops 10B, record Undesired RF level as RF Lev 2 Measurement: RF Lev 1 <u>-55.98</u> dBm RF Lev 2 <u>-50.98</u> dBm Capture Ratio: <u>-2.50</u> dB (RF Lev 1 - RF Lev 2)2 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lover) Upper 1st Set Up 7 Ist Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired itsel rest Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Skt. Ref. Level (OB) Set the modulation of the Desired signal to CW Increase Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Skt. Ref. Level (OB) Set the modulation to the Desired signal to CW Increase Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Skt. Ref. Level (OB) Set the modulation to the Desired signal to CW Increase Undesired in the Desired signal to CW Increase Undesired in the Desired signal to CW Increase Undesired into the Desired signal to CW Increase Undesired Upper Leve <u>Minio 30407</u> <u>447.38</u> <u>7.62</u> <u>47.738</u> <u>7.62</u> 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lover) Upper 2nd Set Up 7 Desired Izev <u>Minio 30408</u> Set the modulation of the Desired signal to CW Increase Undesired into Ket Level (04B) Set the modulation of the Desired signal to CW Increase Undesired Set IP 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired Upper Leve <u>Minio 30408</u> Set Ref. Level (04B) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -304B, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired Upper I. 400	bu op.	-
Adjust: Set Radio audio to Sd. Ref. Level (0dB) Increase Undesired signal until audio level drops 10dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement: RF Lev 155.98dBm Capture Ratio:2.50dB (RF Lev 1 - RF Lev 2)/2 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lover) Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, 30dBm, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, 30dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 200kHz, -130dBm, 1kHz, 75kHz Dev, Mono/Stereo Undesired isgaal until noise floor is -30dB, record Undesired RF level as Undesired Lover Lev. Lover 1st Set Up: Desired: Test Freq. 1, 200kHz, -130dBm, 1kHz, 75kHz Dev, Mono/Stereo Undesired isgaal until noise floor is -30dB, record Undesired RF level as Undesired Lover Lev. Memo 30dB Set Up: Test 5:00 D// 3 Set Derive: <u>-3528 199.72 -3538 19.62</u> Undesired Upper Lev Undesired Upper Lev Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Stere Addio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired		• • • • •
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement: RF Lev 155.98 _dBm RF Lev 250.98 _dBm Capture Ratio:2.50 _dB _ (RF Lev 1 - RF Lev 2)2 3 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st Set Up 3	Adjust:	-
Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement: RF Lev 2 $\frac{-55.98}{-50.98}$ dBm RF Lev 2 $\frac{-55.98}{-50.98}$ dBm Capture Ratio: $\frac{-2.50}{-6.08}$ (RF Lev 1 - RF Lev 2)/2 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 + 200kHz, 130dBn, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, 4200kHz, 130dBn, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, 4200kHz, 130dBn, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set Up: Desired: Test Freq. 1, 200kHz, 130dBn, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set Up: Desired: Test Freq. 1, 200kHz, 130dBn, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set Up: Desired: Test Freq. 1, 200kHz, 130dBn, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set Up: Test Set Up: 3 Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired Lever Lev Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kH		
Measurement: $FE Lev 1 = \frac{-55.98}{-30.98} = dBm$ $FE Lev 2 = \frac{-50.98}{-30.98} = dBm$ Capture Ratio: $-2.50 = dB$ $(FE Lev 1 - FF Lev 2)2$ 8Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st Bet Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 + 200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.Cower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired isignal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.Mono 30dD Undesired Upper Lev. Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Set Radio audio to Std. Ref Level (0dB) Set Radio audio to Std. Ref Level (0dB) Set Radio audio to Std. Ref Level (0dB) Set Pierel as Undesired Jone DVU $\frac{-55.00}{-35.28} - \frac{19.72}{-35.28} - \frac{13.62}{-35.28} - \frac{19.72}{-35.28} - 19.7$		· · ·
$RF Lev 2 \frac{-50.98}{-50.98} dBm$ $Capture Ratio: -2.50 dB (RF Lev 1 - RF Lev 2)2$ 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 + 200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Majust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired Signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mains: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired Signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mains: 30dB Undesired Upper Lev -55:00 Undesired Upper Lev -55:00 100 Undesired RF level as Undesired Lower Lev. Mains: 30dB MBM DUV Undesired Upper Lev -55:00 100 Upper Le		
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Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 + 200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 200kHz, 130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Mono 30dB Stereo 30dB Stereo 30dB Undesired Upper Lev -55.00 -55.00 Undesired Upper Lev -55.00 -7.62 Selectivity. 1st Adj.: -13.67 -33.62 Undesired Upper Lev -35.28 -19.62 Jost Up Fat Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired Lower Lev -33.62 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/S	Ca	pture Ratio:dB (RF Lev 1 - RF Lev 2)/2
Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1, +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Undesired Low Vundesired Lower Lev -55:00 -55:00 Undesired Lower Lev -47:38 -7:62 Selectivity. 1st Adj.: Undesired Upper Lev Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower Znd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo	8 Selectivity - 1	1st Adjacent 30dB S/N (Upper and Lower)
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Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to 5td. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to 5td. Ref. Level (0dB) Set the modulation of the Desired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 3ddB Undesired Signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 3ddB Undesired Lower Lev -55.00 Undesired Lower Lev -55.00 Undesired Lower Lev -47.38 -7.62 -47.38 -7.62 -47.38 -7.62 -55.00 Upper 2nd Set Up: Test Set Up 3 Desired Iser Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Modium, 1kHz, 75kHz Dev	Set Up:	
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Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 3/dB Juncesired Upper Lev Undesired Upper Lev Undesired Upper Lev Undesired Upper Lev Undesired Ive -35.28 -13.67 -47.38 -7.62 Selectivity, 1st Adj.: -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.67 -13.62 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired isgnal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd	Bet Op.	-
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Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono. 30dB dBm D/U Desired Lev Undesired Upper Lev -55.00 Undesired Lower Lev -35.28 -19.72 -35.38 -19.62 Undesired Lower Lev -47.38 7.62 Selectivity, 1st Adj.: -13.67 Selectivity, 1st Adj.: -13.67 (RF D/U Up + RF D/U Lo)/2 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Hedium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB MBm D/U Desired Level Undesired Level Mono 30dB Stereo 30dB MBm D/U MBm D/U MBm D/U MBm J/U MBm J/U M	-	, ,
Mono 30dB dBmStereo 30dB dBmDesired Lev-55.00-55.00Undesired Upper Lev-35.28-19.72-35.28-19.72-35.3819.62Undesired Lower Lev-47.38-7.6247.38Selectivity, 1st Adj.:-13.67-13.62(RF D/U Up + RF D/U Lo)/29Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, MonoAdjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.Lower 2nd Set Up:Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired isgnal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.Lower 2nd Set Up:Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono/Stereo Undesired isgnal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.Lower 2nd Set Up:Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, MonoSet Up:Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, MonoAdjust:Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.Mono 30dB dBmMdBmD/UdBmDesired Lev Undesired Lower-55.00Stereo 30dB dBmD/UdBmD/UdBmD/U<		
dBm D/U dBm D/U Desired Lev -55.00 -55.00 -55.00 Undesired Upper Lev -35.28 +19.72 -35.38 +19.62 Undesired Lower Lev -47.38 -7.62 -47.38 -7.62 Selectivity, 1st Adj.: -13.67 -13.62 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) -13.67 -13.62 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) -13.67 -13.62 (RF D/U Up + RF D/U Lo)/2 9 Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired Signal until noise floor is -30dB, record Undesired RF level as Undesired Lower	l.	
Desired Lev -55.00 -55.00 Undesired Upper Lev -35.28 19.72 -35.38 19.62 Undesired Lower Lev -47.38 -7.62 -47.38 -7.62 Selectivity, 1st Adj.:		
Undesired Lower Lev 47.38 27.62 47.38 7.62 Selectivity, 1st Adj.: 13.67 13.62 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Lower 2nd Set Up: Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Set tup: Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Monn 30dB Steree 30dB dBm D/U Undesired Lev 55.00 -55.00 Undesired Upper Lev 8.02 63.02 <	Desired Lev	
Selectivity, 1st Adj.: 13.67 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Desired: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Steree 30dB dBm D/U Desired Lev -55.00 0 -55.00 0 -55.00 0 -55.00 0 -55.00		-35.28 -49.72 -35.38 -19.62
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Set Up: Desired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm Undesired Lev -55.00 Undesired Upper Lev 8.02 8.02 63.02	Undesired Lower Lev	-47.38 -7.62 -47.38 -7.62
Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U Desired Lev -55.00 Undesired Upper Lev 8.02 63.02 8.02	Selectivity, 1st Adj.:	-13.67 (RF D/U Up + RF D/U Lo)/2
Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U Desired Lev -55.00 Undesired Upper Lev 8.02 63.02 8.02		
Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U dBm D/U Undesired Lev -55.00 Windesired Upper Lev 8.02 63.02 8.02	•	nd Adjacent 30dB S/N (Upper and Lower)
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo Jobs dBm D/U Desired Lev -55.00 -55.00 Undesired Upper Lev 8.02 63.02 State 8.02 63.02		
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB dBm D/U Desired Lev Undesired Lev Undesired Upper Lev 8.02 -63.02 8.02 63.02	Set Up: 1	•
Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1, 400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U Desired Lev -55.00 Undesired Upper Lev 8.02 63.02 8.02		-
Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm Desired Lev -55.00 Undesired Upper Lev 8.02 63.02 8.02	A dimete S	• • • • •
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB BMU Desired Lev Content Desired Lev Streep 30dB Content Desired Lev Streep 30dB Content Desired Lev Streep 30dB Content Desired Lev Content Desired Le		
Lower 2nd Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U Desired Lev -55.00 Undesired Upper Lev 8.02 -63.02		u u u u u u u u u u u u u u u u u u u
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mone 30dB Stereo 30dB dBm D/U Desired Lev -55.00 Undesired Upper Lev 8.02 63.02 8.02		norease ondesned signal and hoise noor is -sound, record ondesned for level as ondesned opper Lev.
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB dBm D/U Desired Lev Undesired Upper Lev 8.02 -63.02 8.02 -63.02		Desired: Test Freq 1 Medium 1kHz 75kHz Dev Mono/Stereo
Adjust: Set Radio audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm Desired Lev -55.00 Undesired Upper Lev 8.02 -63.02 8.02		
Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Mono 30dB dBm D/U Desired Lev One Undesired Upper Lev 8.02 63.02	Adjust: S	
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U Desired Lev -55.00 Undesired Upper Lev 8.02 63.02 63.02	-	
Mono 30dB Stereo 30dB dBm D/U dBm D/U Desired Lev -55.00 -55.00 -55.00 Undesired Upper Lev 8.02 -63.02 8.02 -63.02		
dBm D/U dBm D/U Desired Lev -55.00 -55.00 -55.00 Undesired Upper Lev 8.02 -63.02 -63.02		
Undesired Upper Lev 8.02 63.02 8.02 63.02		dBm D/U dBm D/U
	Desired Lev	-55.00 -55.00
	Undesired Lower Lev	8.02 -63.02 8.02 -63.02
Selectivity, 2nd Adj.: 348.83 -63.02 Rep. 84 -63.02 (RF D/U Up + RF D/U Lo)/2	Selectivity, 2nd Adj.:	-63.02 Mm 87 -63.02 (RF D/U Up + RF D/U Lo)/2

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		FM Receiver Test Laboratory
10	Selectivity - Upper 1st	- 1st Adjacent 50dB S/N (Upper and Lower)
7		: Test Set Up 3
-		Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo
		Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust	: Set Radio audio to Std. Ref. Level (0dB)
		Set the modulation of the Desired signal to CW
		Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	Lower 1st	
	Set Up:	
		Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust:	Set Radio audio to Std. Ref. Level (0dB)
		Set the modulation of the Desired signal to CW
		Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
		Mono 50dB Stereo 50dB dBm D/U dBm D/U
	Desired Lev	
Undesir	red Upper Lev	
	ed Lower Lev	
	ity, 1st Adj.:	
11	Selectivity -	2nd Adjacent 50dB S/N (Upper and Lower)
	Upper 2nd	•
	Set Up:	Test Set Up 3
		Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo
		Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	Adjust:	Set Radio audio to Std. Ref. Level (0dB)
		Set the modulation of the Desired signal to CW
		Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	Lower 2nd	
	Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo
		Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
	-	Set Radio audio to Std. Ref. Level (0dB)
		Set the modulation of the Desired signal to CW
	1	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev. Mono 50dB Stereo 50dB
		dBm D/U dBm D/U
	Desired Lev	-55.00 -55.00
Undesire	d Upper Lev	8.02 -63.02 -11.98 -43.02
	d Lower Lev	0.98 -55.98 -15.98 -39.02
		-59.50 -41.02 (RF D/U Up + RF D/U Lo)/2
	- 1	
12	Selectivity - 3	Brd Adjacent 50dB S/N (Upper and Lower)
	Upper 3rd	
	Set Up:	Test Set Up 3
		Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo
		Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono
		Set Radio audio to Std. Ref. Level (0dB)
		Set the modulation of the Desired signal to CW
	Lower 3rd	Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.
	Set Up:	Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo
	ber op.	Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono/Stereo
	Adinet 9	Set Radio audio to Std. Ref. Level (0dB)
	-	Set the modulation of the Desired signal to CW
		Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.
	Ī	Mono 50dB Stereo 50dB
		dBm D/U dBm D/U
	Desired Lev	-55.00 -55.00
	1 Unner Lev	8.02 -63.02 -11.98 43.02

Additional Tests

i.

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Desned. 94.1MHz, -450Bill, Filot on

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust:

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

0.6MHz Sp		10.7MHz S	
<u>dBm</u> -45.00	D/U	dBm -45.00	D/U
-13.07	-31.93	-13.07	-31.93

EOC: Noise floor at Max RF: -55dB

Noise floor at Max RF: -52dB

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-23.98	-21.02	-28.98	-16.02

EOC:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

	Date	: 2/28/99			
	Engineers	RMc			
	Project	: FM Receiver Test A1			
			<u></u>		
Rec	eiver Test No.:	: 13			
		Automobile	-		
	Radio Mfg.:		-		
		MS-457	-		
			-		
	Serial.	3805003200	-		
	NT / 1		-		
Ant	enna Network:	JFW50MN-001	_FM		
			-		
	Audio load:	<u> </u>			
]	initial Set Up:	Radio under test shall have	e tone controls set to flat	detent positio	on, Loudness control off, Balance and
		Fader controls centered (se	et to mid position), Volu	me set to Star	ndard Output
					noted in the Comments section.
		Left channel shall be used	for all Signal (and S/N r	atio) measure	ements.
		15kHz Low Pass filter sha			
		Right channel shall be use	•		
		All level measurements are			paration cost onny.
	Comments:	Audio output; Line Out co	meator		
	Comments.	Mono/Stereo switch in Ste			
		Local/Distant switch in Di	stant		
		0		• • • • • • • • • • • • • • • • • • • •	
~					
	RF Levels			Standard 1	FM Test Frequencies
Strong		dBm			94.1MHz
Medium:	: -55	dBm			
Weak:	-65	dBm			
Standard '	Test Set Ups				
1	Strong Signal	Overload			
2	Single RF Tor	ne Tests			
3	Two RF Tone				
4	Measurement				
-	initial different	bet up			
	Standard Tes	***			, e
	Stanuaru res				
1		or Fromone (Trains France	m)	40	10 71 (II- D. '
1		or Frequency (Tuning Erro		13	10.7MHz Rejection
2		io Output (Audio level and		14	10.7MHz Intermodulation
3		load (RF level required for	r 5% THD)	15	10.7MHz Spurious (Local Osc. Interference)
4	AM Rejection				
	Image Rejection				
		lots of RF Level Vs Audio	Output)		
	Capture Ratio				
8	Selectivity; 1st	Adjacent (30dB noise figu	ure)		
		d Adjacent (30dB noise fig			
		Adjacent (50dB noise figu			
		d Adjacent (50dB noise fig			
		Adjacent (50dB noise figu			
	, 10, , 510				

Local Oscillator Frequer	icy:			
0.000 MHz				
Standard Audio Output:				
Left Channel	THD		Right Channel	THD
<u>0.5</u> Vrms	0.95	%	<u>0.52</u> Vrms	0.80
RF Input Overload:				
dBm	Max Test	Bed RF le	vel - no increase in THD	
AM Rejection:				
<u>0.00</u> dB				
Image Rejection:				
<u>-46.00</u> dB				
Curve Tests:				
(See Plots)				
Contras Data				
Capture Ratio: -2.50 dB				
<u></u> ub				
Selectivity, First Adjacent	, 30dB Noi	ise Floor ((Ave. D/U)	
<u>-13.67</u> dB Mono -13.62 dB Stereo				
<u>-13.02</u> db Steleo				
	nt, 30dB N	loise Floo	or (Ave. D/U)	
Selectivity, Second Adjace	nt, 30dB N Max RF	loise Floo	r (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1	-	loise Floo	r (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent,	Max RF Max RF			
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1	Max RF Max RF			
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo	Max RF Max RF 50dB Noi	se Floor (Ave D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono	Max RF Max RF 50dB Noi	se Floor (Ave D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent	Max RF Max RF 50dB Noi	se Floor (Ave D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent -59.50 dB Mono -41.02 dB Stereo Selectivity, Third Adjacent	Max RF Max RF 50dB Noi nt, 50dB N , 50dB No	se Floor (oise Floo	Ave D/U) r (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent -59.50 dB Mono -41.02 dB Stereo Selectivity, Third Adjacent	Max RF Max RF 50dB Noi nt, 50dB N	se Floor (oise Floo	Ave D/U) r (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono -63.02 dB Stereo Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent -59.50 dB Mono -41.02 dB Stereo Selectivity, Third Adjacent -63.02 dB Mono -63.02 dB Mono Mono Mono	Max RF Max RF 50dB Noi nt, 50dB N , 50dB No	se Floor (oise Floo	Ave D/U) r (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono -63.02 dB Stereo Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent -59.50 dB Mono -41.02 dB Stereo Selectivity, Third Adjacent -63.02 dB Mono	Max RF Max RF 50dB Noi nt, 50dB N , 50dB No	se Floor (oise Floo	Ave D/U) r (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent -59.50 dB Mono -41.02 dB Stereo Selectivity, Third Adjacent -63.02 dB Mono 1 -63.02 dB Mono 1 -63.02 dB Stereo 10.7MHz Rejection -100.50 dB 10.7MHz IM	Max RF Max RF 50dB Noi at, 50dB No 50dB No fax RF	se Floor ('oise Floo ise Floor	Ave D/U) r (Ave. D/U) (Ave. D/U)	
Selectivity, Second Adjace -63.02 dB Mono 1 -63.02 dB Stereo 1 Selectivity, First Adjacent, -10.72 dB Mono 1.48 dB Stereo Selectivity, Second Adjacent -59.50 dB Mono -41.02 dB Stereo Selectivity, Third Adjacent -63.02 dB Mono 1 -63.02 dB Mono 1 -63.02 dB Stereo 10.7MHz Rejection -100.50 dB 10.7MHz IM -31.93 dB (10.6) 10	Max RF Max RF 50dB Noi nt, 50dB No , 50dB No fax RF	se Floor (oise Floo ise Floor Noise floo	Ave D/U) r (Ave. D/U)	

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SIGNAL/NOISE VS RF LEVEL

Koss MS-457

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SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL



SIGNAL/NOISE VS RF LEVEL

Koss MS-457



1st and 2nd ADJACENT CHANNEL SELECTIVITY

Koss MS-457

357

s.



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Koss MS-457



IM & L.O. Rejection (50dB Noise Floor)

Frequency (MHz)

Koss MS-457

1 S.

Receiver #14

Philips/Magnavox

Portable

Date	: 2/28/99						
Engineers	s: RMc						
-	t: FM Receiver 7	Test A1					
110,000		Itst AI					
Receiver Test No.	. 14						
		4 411 1 0					
	Bookshelf/Por		;				
	: Philips/Magna	ivox					
	: <u>AZ2700/17</u>						
Serial	: <u>KT019841120</u>)616					
Antenna Network	: 50/75 Ohm Tr	ans.	FM				
Audio load	: 8 (Ohms					
	<u></u>						
Initial Set Un	Radio under te	st shall have	tone controls set	to flat det	ent nositi	ion, Loudness control o	ff Balance and
bildin Set Op.	Fader controls	se shan have	t to mid position)	Volume	ent postu	a dand Output	in, Dalance and
						e noted in the Commen	ts section.
			for all Signal (and				
						annel for all measurem	ents.
	Right channel s	shall be used	for Noise measu	rements -	Stereo Se	paration test only.	
	All level measu	rements are	rms				
Comments:	Dynamic bass l	boost switch	Off				
	Tone control Fu						
						•••••••••••••••••••••••••••••••••••••••	· · · · · · · · · · · · · · · · · · ·
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				·····			
Standard D	F I avala		Stor	Jand FM	T		
Standard R		Du	Stan	dard FM		-	
Strong:	-45 d	Bm	Stan	dard FM Low:	Test Fre 94.1	equencies MHz	
Strong: Medium:	-45 d -55 d	Bm	Stan			-	
Strong:	-45 d -55 d		Stan			-	
Strong: Medium:	-45 d -55 d	Bm	Stan			-	
Strong: Medium:	-45 d -55 d	Bm	Stan			-	
Strong: Medium:	-45 di -55 di -65 di	Bm	Stan			-	
Strong: Medium: Weak:	-45 di -55 di -65 di	Bm	Stan			-	
Strong: Medium: Weak: Standard Te	-45 di -55 di -65 di	Bm Bm	Stan			-	
Strong: Medium: Weak: Standard Te 1	-45 di -55 di -65 di est Set Ups Strong Signal O	Bm Bm Dverload	Stan			-	
Strong: Medium: Weak: Standard Te 1 2	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone	Bm Bm Overload Tests	Stan			-	
Strong: Medium: Weak: Standard Te 1 2 3	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Two RF Tone T	Bm Bm Overload Tests 'ests	Stan			-	
Strong: Medium: Weak: Standard Te 1 2 3	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone	Bm Bm Overload Tests 'ests	Stan			-	
Strong: Medium: Weak: Standard Te 1 2 3 4	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Two RF Tone T Measurement Se	Bm Bm Overload Tests 'ests	Stan			-	
Strong: Medium: Weak: Standard Te 1 2 3	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Two RF Tone T Measurement Se	Bm Bm Overload Tests 'ests	Stan			-	• •
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Two RF Tone T Measurement Se sts	Bm Bm Overload Tests Sests et up				-	• •
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Two RF Tone T Measurement So sts Local Oscillator	Bm Bm Overload Tests Sests et up Frequency (Tuning Error)	Low:		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Two RF Tone T Measurement So sts Local Oscillator Standard Audio	Bm Bm Overload Tests Sests et up Frequency (Output (Auc	Tuning Error) dio level and dista	Low: ortion)		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 3	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement So sts Local Oscillator Standard Audio RF Input Overlo	Bm Bm Overload Tests Sests et up Frequency (Output (Auc	Tuning Error)	Low: ortion)		-	
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Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 Standard Te 1 2 3 4	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement Se sts Local Oscillator Standard Audio RF Input Overlo AM Rejection	Bm Bm Tests Yests et up Frequency (Output (Auc wad (RF level	Tuning Error) dio level and dista	Low: ortion)		-	
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement So sts Local Oscillator Standard Audio RF Input Overlo AM Rejection Image Rejection	Bm Bm Dverload Tests Sests et up Frequency (Output (Auc oad (RF level	Tuning Error) dio level and disto l required for 5%	Dortion) THD)	94.1	MHz	reo Senaration
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Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 4 5 6 7	-45 di -55 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone T Weasurement Se sts Local Oscillator Standard Audio RF Input Overlo AM Rejection Image Rejection Curve Tests (plo Capture Ratio	Bm Bm Tests 'ests et up Frequency (Output (Auc ad (RF level ots of RF Lev	Tuning Error) dio level and dista l required for 5% rel Vs Signal - Ma	Dortion) THD)	94.1	MHz	reo Separation
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 6 7 8	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement Se sts Local Oscillator Standard Audio RF Input Overlo AM Rejection Image Rejection Curve Tests (plo Capture Ratio Selectivity; 1st A	Bm Bm Bm Tests èsts et up Frequency (Output (Auc ead (RF level ots of RF Lev adjacent (30c	Tuning Error) dio level and dista l required for 5% rel Vs Signal - Ma dB noise figure)	Dortion) THD)	94.1	MHz	reo Separation
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 6 7 8 8 9	-45 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement Se sts Local Oscillator Standard Audio RF Input Overlo AM Rejection Image Rejection Image Rejection Curve Tests (plo Capture Ratio Selectivity; 1st A Selectivity; 2nd A	Bm Bm Bm Tests ests et up Frequency (Output (Auc ad (RF level ots of RF Lev Adjacent (300 Adjacent (300	Tuning Error) dio level and dista l required for 5% rel Vs Signal - Ma dB noise figure) dB noise figure)	Dortion) THD)	94.1	MHz	reo Separation
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Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 6 7 8 9 5 6 7 8 9 5 10 5 11 5	-45 di -55 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement Se sts Local Oscillator Standard Audio RF Input Overlo AM Rejection Image Rejection Curve Tests (plo Capture Ratio Selectivity; 1st A Selectivity; 1st A Selectivity; 2nd A	Bm Bm Bm Tests Sests et up Frequency (Output (Auc ad (RF level ots of RF Lev Adjacent (300 Adjacent (500 Adjacent (500 Adjacent (500	Tuning Error) dio level and dista l required for 5% vel Vs Signal - Ma dB noise figure) dB noise figure) dB noise figure) dB noise figure)	Dortion) THD)	94.1	MHz	reo Separation
Strong: Medium: Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 6 7 8 9 5 6 7 8 9 5 10 5 11 5	-45 di -55 di -55 di -65 di est Set Ups Strong Signal O Single RF Tone Two RF Tone T Measurement Se sts Local Oscillator Standard Audio RF Input Overlo AM Rejection Image Rejection Curve Tests (plo Capture Ratio Selectivity; 1st A Selectivity; 1st A Selectivity; 2nd A	Bm Bm Bm Tests Sests et up Frequency (Output (Auc ad (RF level ots of RF Lev Adjacent (300 Adjacent (500 Adjacent (500 Adjacent (500	Tuning Error) dio level and dista l required for 5% vel Vs Signal - Ma dB noise figure) dB noise figure) dB noise figure) dB noise figure)	Dortion) THD)	94.1	MHz	reo Separation

-1

Vrms

%

Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error) Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2 Measurement: L.O. Freq 1 MHz L.O. Freq 2 MHz 2 Standard Audio Output Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD Measurement: Left Ch **Right Ch** 1.000 = 0 dBLevel Vrms Level 1.200 THD 0.90 % 0.90 THD 3 **RF Input Overload** Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Increase RF Level until 5% THD at Radio output, record RF Level Measurement: RF Lev. 22.00 dBm (@ 5% THD) Max Test Bed RF level - increase in THD to: 2%) **AM Rejection** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Set modulation mode to FM (75kHz), AM (30%), record THD Measurement: THD 0.96 % = -40.35 dB (FM Only) THD 0.96 % = -40.35 dB (FM + AM 30%) AM Rejection: 0.00 dB **Image Rejection** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2 Measurement: REL evi 00.0 d D m (CAL Dette - 20JD)

measarement.	ICI. LEAT	-77.0	abiii	(5/N Ratio = 30 dB)
	RF Lev2	-58.0	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
•	Rejection:	-		(RF Lev1 - RF Lev2)
Ve	ry "mercuri	al" in natur	e. The recieve	er's AFC tends to make this measurement very slippery to find.

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6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separation	n L⊷R	
RF Level	Signal	Noise	Signal	Filt Noise	Noise	Left	Right	RF Level
dBm	đB	dB	dB	dB	dB	dB	dB	dBm
-130	-25.50	-25.50	-24.50	-24.50		-24.50	-24.50	-130
-125	-25.50	-25.50	-24.50	-24.50		-24.50	-24.50	-125
+120	-25.50	-25.50	-24.50	-24.50		-24.50	-24.50	-120
-115	-25.00	-25.50	-24.50	-24.50		-24.50	-24.50	-115
-110	-24.00	-25.50	-23.00	-25.00		-24.00	-24.00	-110
+105	-17.00	-28.00	-16.50	-27.00		-19.50	-19.50	-105
-100	-9.50	-36.00	-9.00	-35.00		-13.50	-13.50	-100
-95	-5.50	-47.00	-5.50	-46.00		-11.50	-11.50	-95
-90	-2.00	-49.50	-1.50	-48.50		-7.50	-7.00	-90
+85	0.50	-53.50	-0.50	-52.00		-6.00	-7.00	-85
-80	-0.25	-58.00	-0.25	-48.00		-4.00	-10.00	-80
-75	0.00	-62.50	0.00	-48.00		-2.00	-14.50	-75
-70	0.00	-66.00	0.00	-49.50		-0.50	-26.50	-70
-65	0.00	-68.00	0.00	-54.00		0.00	-33.50	-65
-60	0.00	-69.00	0.00	-57.50		0.00	-33.00	-60
+55	0.00	-69.00	0.00	-60.50		0.00	-33.00	+55
-50	0.00	-69.00	0.00	-62.00		0.00	-33.00	-50
-45	0.00	-69.00	0.00	-63.00	-24.00	0.00	-33.00	-45

Two RF Tone Tests

7 **Capture Ratio** Set Up: Test Set Up 3 Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2 Measurement RF Lev 1 -56.00 dBm RF Lev 2 -41.00 dBm Capture Ratio: -7.50 dB (RF Lev 1 - RF Lev 2)/2 8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 1st Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U dBm D/U Desired Lev -55.00 -55.00 Undesired Upper Lev -43.00 -12.00 -44.00 -11.00 Undesired Lower Lev -47.20 -7.80 -48.00 -7.00 Selectivity, 1st Adj.: -9.90 -9.00 (RF D/U Up + RF D/U Lo)/2 9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower) Upper 2nd Set Up: Test Set Up 3 Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev. Lower 2nd Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Up: Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev. Mono 30dB Stereo 30dB dBm D/U dBm D/U Desired Lev -55.00 -55.00 Undesired Upper Lev 8.00 -63.00 8.00 -63.00 Undesired Lower Lev 8.00 -63.00 8.00 -63.00 Selectivity, 2nd Adj .: See -63.00 (RF D/U Up + RF D/U Lo)/2 RF -63.00 R and R P.

Worst case noise floor, -35dB

Upper 1st

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 1st

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

	Mono : dBm		Stereo dBm		
Desired Lev	-55.00		-55.00		
Undesired Upper Lev	-45.20	-9.80	-65.00	10.00	
Undesired Lower Lev	-48.60	-6.40	-67.00	12.00	
Selectivity, 1st Adj.:		-8.10		11.00	(RF D/U Up + RF D/U Lo)/2

11 Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)

Upper 2nd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 2nd

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Up:

Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

	************************	50dB D/U		50dB D/I	
Desired Lev			-55.00	-	
Undesired Upper Lev	-13.00	-42.00	-19.00	-36.00	
Undesired Lower Lev		-52.00		-34.00	
Selectivity, 2nd Adj.:		-47.00		-35.00	(RF D/U Up + RF D/U Lo)/2

12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)

Upper 3rd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 3rd

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Set Up:

Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

	Mono dBm	***************************************	Stereo dBm	50dB D/U	
Desired Lev	-55.00		-55.00	T	
Undesired Upper Lev	0.00	-55.00	-18.00	-37.00	
Undesired Lower Lev	0.00	-55.00	-21.00	-34.00	
electivity, 3rd Adj.:		-55.00		-35.50	(RF D/U

Up + RF D/U Lo)/2

Additional Tests

13 10.7MHz Rejection

Using Test Set Up 1 at the desired frequency of 94.1MHz; Set generator to 1kHz, 75kHz dev. / CW Reduce RF level to obtain 30dB S/N ratio. Record RF Level as RF Lev 1 Set RF generator to 10.7MHz Adjust RF level to obtain 30dB S/N ratio Record RF Level as RF Lev 2 Calculate the difference between the two RF levels

$$\begin{array}{c} \text{RF Lev 1} & -97.00 & \text{dBm} \\ \text{RF Lev 2} & -25.00 & \text{dBm} \\ \text{D/U} & -72.00 & \text{dB} \end{array} \quad \text{EOC}$$

14 10.7 IM Test

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Adjust: U

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing) 10.6MHz Spacing 10.7MHz Spacing

-45.00		-45.00	
-27.07	-17.93	-29.07	-15.93

EOC: Hiss

15 10.7MHz (10.6MHz) Local Osc Interference Test

- Set Up: Desired: 94.1MHz, -45dBm, Pilot only
 - Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev
 - a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
 - b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-54.07	9.07	-56.07	11.07

EOC: Objectionable beat notes

,		bate: 2/28/99		
	-	ers: RMc		
	Ргој	ect: FM Receiver Test A1		
Re	eceiver Test N	No.: 14		
	Cl	ass: Bookshelf/Port. All-in-One		
		fg.: Philips/Magnavox		
		del: AZ2700/17		
		ial: KT019841120616		
Aı	ntenna Netwo	ork: 50/75 Ohm Trans. FM		
	Audio lo	ad: <u>8</u> Ohms		
	Initial Set U	Jp: Radio under test shall have tone controls set	to flat detent posi	tion, Loudness control off. Balance and
		Fader controls centered (set to mid position),	Volume set to St	andard Output
		Any other control settings unique to the radio	o under test shall	be noted in the Comments section.
		Left channel shall be used for all Signal (and		
		15kHz Low Pass filter shall be used on the o	utput of the left c	hannel for all measurements.
		Right channel shall be used for Noise measur		
		All level measurements are rms		
	Commen	ts: Dynamic bass boost switch Off		
		Tone control Full Clockwise		
		0		
		0		
Standard	I RF Levels		Standar	d FM Test Frequencies
Strong	g: -45	dBm		94.1MHz
Mediun	n: -55	dBm		
Weal	c: -65	dBm		
Standard	l Test Set Uj	18		
1	Strong Sig	nal Overload		
2	Single RF	Tone Tests		
3	Two RF T	one Tests		
4	Measureme	ent Set up		
	Standard '	Tests		
1	Local Osci	llator Frequency (Tuning Error)	13	10.7MHz Rejection
2		udio Output (Audio level and distortion)	14	10.7MHz Intermodulation
3		verload (RF level required for 5% THD)	15	10.7MHz Spurious (Local Osc. Interference
4	AM Rejecti	ion		
5	Image Reje	ction		
6	Curve Tests	s (plots of RF Level Vs Audio Output)		
7	Capture Ra	tio		
•	-	1st Adjacent (30dB noise figure)		
8		2nd Adjacent (30dB noise figure)		
	Selectivity.			
8		1st Adjacent (50dB noise figure)		
- 8 9	Selectivity;	1st Adjacent (50dB noise figure) 2nd Adjacent (50dB noise figure)		

Test Results:

1 Local Oscillator Frequency: 0.000 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
Vrms	0.90 %	<u> </u>	<u>0.90</u> %

- 3 RF Input Overload: <u>22.00</u> dBm Max Test Bed RF level - increase in THD to: 2%)
- 4 AM Rejection: 0.00 dB
- 5 Image Rejection: -41.00 dB
- 6 Curve Tests: (See Plots)
- 7 Capture Ratio: ______dB
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -9.90 dB Mono -9.00 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.00 dB Mono Max RF -63.00 dB Stereo Max RF
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -8.10 dB Mono 11.00 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) <u>-47.00</u> dB Mono <u>-35.00</u> dB Stereo

0

- 14
 10.7MHz IM

 -17.93
 dB (10.6)
 Hiss

 -15.93
 dB (10.7)
 0
- 15
 10.7MHz
 Spurious (Local Osc. Interference)

 9.07
 dB (10.6)
 Objectionable beat notes

 11.07
 dB (10.7)
 0

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SIGNAL/NOISE VS RF LEVEL

Philips/Magnavox AZ2700/17

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SIGNAL/NOISE VS RF LEVEL

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SIGNAL/NOISE VS RF LEVEL

Philips/Magnavox AZ2700/17

37

1.110



SIGNAL/NOISE VS RF LEVEL

Philips/Magnavox AZ2700/17

* 1



1st and 2nd ADJACENT CHANNEL SELECTIVITY

Philips/Magnavox AZ2700/17



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY (50dB Noise Floor)

1.1.10

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IM & L.O. Rejection (50dB Noise Floor)

Philips/Magnavox AZ2700/17

•

Receiver #15

Ford

Auto

Date	: 5/14/99
Engineers	s: RMc
	t: FM Receiver Test A1
р ^с т (),	16
Receiver Test No.	
	: Automotive
Radio Mfg.	: Ford
	: XF3F
	: WANM000067
Donia	. ••••••••••••••
Antenna Network	: Ford FM
Audio load	4 Ohms
Initial Set Un-	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and
Difficial Set Op.	Factor finder test shan have tone controls set to hat detent position, fourness control off, Balance and
	Fader controls centered (set to mid position), Volume set to Standard Output
	Any other control settings unique to the radio under test shall be noted in the Comments section.
	Left channel shall be used for all Signal (and S/N ratio) measurements.
	15kHz Low Pass filter shall be used on the output of the left channel for all measurements.
	Right channel shall be used for Noise measurements - Stereo Separation test only.
	All level measurements are rms
	A in love measurements are mis
0	
Comments:	Bass, Treble, Balance, Fader are default power up detent position
Standard R	F Levels Standard FM Test Frequencies
Strong:	
Ŷ	
Medium	.55 dDm
Medium:	
Medium: Weak:	
Weak:	-65 dBm
	-65 dBm
Weak:	-65 dBm
Weak: Standard Te	-65 dBm st Set Ups
Weak: Standard Te 1	-65 dBm st Set Ups Strong Signal Overload
Weak: Standard Te 1 2	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests
Weak: Standard Te 1 2 3	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests
Weak: Standard Te 1 2 3	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests
Weak: Standard Te 1 2 3	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests
Weak: Standard Te 1 2 3	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up
Weak: Standard Te 1 2 3 4	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up
Weak: Standard Te 1 2 3 4 Standard Te:	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts
Weak: Standard Te 1 2 3 4 Standard Te: 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error)
Weak: Standard Te 1 2 3 4 Standard Te: 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 3 1 2 3 1 2 3 1 2 3 1 2 3 4 3 1 3 4 3 3 3 4 3 3 4 3 3 3 3 3 3 3 3 3 3 3 3 3	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 3 1 4 2 3 1 2 3 1 2 3 4 2 3 4 3 4 3 4 3 4 5 5 5 6 6 6 7 6 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 3 1 4 2 3 1 2 3 1 2 3 4 2 3 4 3 4 3 4 3 4 5 5 5 6 6 6 7 6 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 1 2 3 1 4 2 3 1 2 3 1 2 3 4 5 1 4 5 1 2 3 4 5 1 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 1 2 3 1 4 2 3 1 4 2 5 1 6 0 0 0 0 0 0 0 0 0 0 0 0 0	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 1 2 3 1 4 2 3 1 4 2 3 1 4 2 3 4 5 1 6 0 7 0 0 7 0 0 0 0 0 0 0 0 0 0 0 0 0	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 1 2 3 1 4 2 3 1 4 2 3 1 4 5 1 6 0 7 0 8 5 5 5 6 6 7 0 8 5 5 5 6 6 7 6 7 6 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1 st Adjacent (30dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 2 3 4 4 5 1 6 0 7 0 8 5 9 5	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 2 3 4 4 5 1 6 0 7 0 8 5 9 5	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1 st Adjacent (30dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 2 3 4 4 5 1 6 0 7 0 8 5 9 5 10 5 9 5 10 5 1 5 5 1 5 5 1 5 5 1 5 1 5 1 5 1 5 1 5 1 5	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 1 6 0 7 0 8 5 9 5 1 5 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 5 5 5 5 5 5 5 5 5 5 5 5	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 1st Adjacent (50dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 10 5 10 5 1 5 5 5 5 5 5 5 5 5 5 5 5 5	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 1st Adjacent (50dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 1st Adjacent (50dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)
Weak: Standard Te 1 2 3 4 Standard Te 1 2 3 4 5 1 6 0 7 0 8 5 9 5 10 5 11 5 12 5 10 5 11 5 1 6 0 7 0 8 5 1 5 1 6 0 7 0 8 5 1 1 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1	-65 dBm st Set Ups Strong Signal Overload Single RF Tone Tests Two RF Tone Tests Measurement Set up sts Local Oscillator Frequency (Tuning Error) Standard Audio Output (Audio level and distortion) RF Input Overload (RF level required for 5% THD) AM Rejection Image Rejection Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation Capture Ratio Selectivity; 1st Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (30dB noise figure) Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure)

Right Ch

2.060

1.60

(FM Only)

Vrms

%

Single RF Tone Tests

1

2

3

4

5

Local Oscillator Frequency (Tuning Error) Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2 Measurement: L.O. Freq 1 MHz L.O. Freq 2 MHz **Standard Audio Output** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD Measurement: Left Ch 1.980 Vrms = 0 dBLevel Level THD 1.60 % THD **RF Input Overload** Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Increase RF Level until 5% THD at Radio output, record RF Level Measurement: **RF** Lev. 22.00 dBm (@,5% THD) Max limit of test bed - no change in THD **AM Rejection** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) Set modulation mode to FM (75kHz), AM (30%), record THD Measurement: THD % -35.92 1.6 dB THD 1.6 % -35.92 dB (FM + AM 30%) AM Rejection: 0.00 dB **Image Rejection** Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Levi	-100.0	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-55.0	dBm	(21.4MHz + 94.1MHz = 115.5MHz)
Image	Rejection:	-45.00	₫B	(RF Lev1 - RF Lev2)

6 Curve Tests

2

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Storeo (L)		Separatio	n L-≫R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	dB	dB	dBm
-130	-20.20	-20.10	-19.10	-19.10		-19.10	-19.10	-130
-125	-20.20	-20.10	-19.10	-19.10		-19.00	-19.10	-125
+120	-20.00	-20.10	-18.80	-19.00		-18.80	-19.00	+120
-115	-19.20	-20.10	-17.80	-18.70		-18.00	-18.50	-115
-110	-16.50	-20.20	-15.20	-18.70		-16.40	-16.70	-110
-105	-10.00	-22.40	-9.30	-21.00		-12.20	-12.40	-105
-100	-3.80	-32.00	-3.40	-30.50		-7.80	-8.10	-100
.95	-1.00	-48.00	-0.86	-46.50		-6.40	-6.70	-95
-90	-0.32	-52.80	-0.32	-51.40		-6.17	-6.46	-90
-85	-0.25	-57.00	-0.22	-55.40		-6.11	-6.40	+85
-80	0.00	-59.50	0.00	-53.50		-5.55	-6.90	-80
-75	0.00	-60.00	0.00	-52.00		-4.30	-8.30	-75
-70	0.00	-61.00	0.00	-53.20		-3.40	-9.70	-70
+65	0.00	-62.00	0.00	-55.00		-2.74	-11.10	+65
-60	0.00	-62.00	0.00	-56.50		-2.10	-12.90	-60
+55	0.00	-62.00	0.00	-57.75		-1.58	-15.00	+55
-50	0.00	-62.00	0.00	-57.75		-1.00	-17.80	-50
-45	0.00	-62.00	0.00	-57.50	-57.00	-0.57	-22.10	-45

Two RF Tone Tests

Two RF Tone Tests	·
7 Capture Ratio	
Set Up: Test Set Up 3 Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mo	
Undesired: Test Freq. 1, -130dBm, CW	
Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)	
Increase Undesired signal until audio level drops 1dB, record	Undesired RF level as RF Lev 1
Increase Undesired signal until audio level drops 30dB, reco	
Measurement: RF Lev 1 dBm	
RF Lev 2 dBm	
Capture Ratio: dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mon	0
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz	
Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record U	ndesired RF level as Undesired Upper Lev.
Lower 1st	
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mon	
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz	Dev, Mono
Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record U	ndesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev -34.00 -21.00 -34.00 -21.00	
Undesired Lower Lev -28.00 -27.00 -28.00 -27.00	
	Up + RF D/U Lo)/2
	- ,
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower)	
Upper 2nd	
Set Up: Test Set Up 3	
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz	Dev, Mono
Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW Increase Undesired signal until noise floor is -30dB, record Ur	
Lower 2nd	idesired RF level as Undesired Upper Lev.
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono	
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz J	
Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)	
Set the modulation of the Desired signal to CW	
Increase Undesired signal until noise floor is -30dB, record Un	desired RF level as Undesired Lower Lev.
Mona 30dB Stereo 30dB	
dBm D/U dBm D/U	
Desired Lev -55.00 -55.00	
Undesired Upper Lev 8.00 -63.00 8.00 -63.00	
Undesired Lower Lev 8.00 -63.00 8.00 -63.00	
Selectivity, 2nd Adj.: 348. RF -63.00 Nar. RF -63.00 (RF D/U U	Jp + RF D/U Lo)/2

	tivity - 1st Adjacen er 1st	t 50dB S/N (Upper and 1	Lower)					
	Set Up: Test Set Up	Text Set I in 3							
·		Desired: Test Freq. 1. Medium, 1kHz, 75kHz Dev, Mono							
		Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono Set Radio/Analyzer audio to Std. Ref. Level (0dB)							
•	•	•							
		ulation of the	•						
	Increase Un	desired signal	until noise f	loor is -50dB	, record Undesired RF level as Undesired Upper Lev.				
Lowe	r 1st								
1	Set Up: Desired	: Test Freq. 1	, Medium, 1	kHz, 75kHz l	Dev, Mono				
	Undesired	: Test Freq. 1	-200kHz, -1	30dBm, 1kH	z, 75kHz Dev, Mono				
	Adjust: Set Radio/A	nalyzer audio	to Std. Ref.	Level (0dB)					
		ulation of the							
					record Undesired RF level as Undesired Lower Lev.				
	Mono		Stereo						
	dBm	D/U	dBm	D/U					
Desir	ed Lev -55.00	T	-55.00						
Undesired Upp	er Lev -34.00	-21.00	-34.00	-21.00					
Undesired Low	er Lev -30.00	-25.00	-30.00	-25.00					
Selectivity, 1st	Adj.:	-23.00		-23.00	(RF D/U Up + RF D/U Lo)/2				

11 Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)

Upper 2nd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

- Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)
 - Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 2nd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

	Mono ! dBm	50dB D/U	Stereo dBm	50dB D/U	
Desired Lev	-55.00		-55.00		
Undesired Upper Lev	8.00	-63.00	8.00	-63.00	
Undesired Lower Lev		-63.00	8.00	-63.00	
Selectivity, 2nd Adj.:	Mex RF	-63.00	65 X X	-63.00	(RF D/U Up + RF D/U Lo)/2

12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)

Upper 3rd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 3rd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio/Analyzer audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

					,	
	Mono :		Stereo	50dB		
	abm	D/U	abm			
Desired Lev	-55.00		-55.00			
Undesired Upper Lev	8.00	-63.00	8.00	-63.00		
 Undesired Lower Lev	8.00	-63.00	8.00	-63.00		
Selectivity, 3rd Adj.:	Max R9	-63.00	las BP	-63.00	(RF D/U Up + RF D/U	J Lo)/2

1

Additional Tests

10.7MHz Rejection
 Using Test Set Up 1 at the desired frequency of 94.1MHz;
 Set generator to 1kHz, 75kHz dev. / CW
 Reduce RF level to obtain 30dB S/N ratio.
 Record RF Level as RF Lev 1
 Set RF generator to 10.7MHz
 Adjust RF level to obtain 30dB S/N ratio
 Record RF Level as RF Lev 2
 Calculate the difference between the two RF levels

RF Lev 1	-100.00	dBm	
RF Lev 2	22.00	dBm	EOC
D/U	-122.00	dB	

Radio is insensitive to 10.7MHz

14 10.7 IM Test

Adjust:

Using the three generator set up, set generators as follows;

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev

Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

dBm	D/U	dBm	D/U
-45.00		-45.00	
-1.00	-44.00	-6.00	-39.00
		1	
	14 00		20.0

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

- Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev
- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz) Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

0.6MHz Sj dBm	D/U	10.7MHz S dBm	D⁄ti
-45.00		-45.00	
-33.00	-12.00	-34.00	-11.00

EOC:

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

		5/14/99					
	Engineers			-			
	Project	FM Receiv	er Test Al				
Re	ceiver Test No.:	15					
	Class: Automotive			-			
	Radio Mfg.: Ford			•			
	Model:	XF3F		•			
	Serial:	WANM000	067				
An	tenna Network:	Ford	, "	FM			
	Audio load:	4	Ohms				
				_			
	Initial Set Up:						on, Loudness control off, Balance and
				-	n), Volume set to		▲
							noted in the Comments section.
					and S/N ratio) me		
							unnel for all measurements.
					surements - Stere	eo Sej	paration test only.
		All level me	asurements are	rms			
	Commentes	Deen Trable	Dalama E.J				
			, Balance, Fad	er are delault p	ower up detent p	ositio	n
		0					
	•	0					
	-	0	·····				
Standard	RF Levels				Store	الحما	FM Test Frequencies
Strong		dBm			Stant	iaru .	FM Test Frequencies 94.1MHz
Medium	•	dBm					94.1MHZ
Weak		dBm					
TT OUL	05						
Standard	Test Set Ups						
	_						
1	Strong Signal						
2	Single RF Tor						
3	Two RF Tone Tests						
4	Measurement	Set up					
	Standard Tes	its					r.
1	Local Oscillat	or Frequency	(Tuning Error)	1	3	10.7MHz Rejection
2			udio level and		14		10.7MHz Intermodulation
3			vel required for		1:		10.7MHz Spurious (Local Osc. Interferen
4							
5	Image Rejectio	n					
6			evel Vs Audio	Output)			
7	Capture Ratio						
8		Adjacent (3	0dB noise figu	re)			
9			30dB noise figu				
10			0dB noise figu				

- 11
- Selectivity; 2nd Adjacent (50dB noise figure) Selectivity; 3rd Adjacent (50dB noise figure) 12

nce)

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%

Test Results:

Local Oscillator Frequency: 1 0.000 MHz 2 **Standard Audio Output:** Left Channel THD **Right Channel** THD 1.98 Vrms 1.60 % 2.06 Vrms 1.60 . 3 **RF Input Overload:** 22.00 dBm Max limit of test bed - no change in THD AM Rejection: 4 0.00 dB 5 **Image Rejection:** -45.00 dB 6 **Curve Tests:** (See Plots) 7 **Capture Ratio:** -8.50 dB 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -24.00 dB Mono -24.00 dB Stereo 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -63.00 dB Mono Max RF -63.00 dB Stereo Max RF 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -23.00 dB Mono -23.00 dB Stereo Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) 11 -63.00 dB Mono Max RF dB Stereo -63.00 Max RF 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -63.00 dB Mono -63.00 dB Stereo Max RF Max RF 13 **10.7MHz Rejection** -122.00 dB 0 14 **10.7MHz IM** -44.00 dB(10.6) 0 0 -39.00 dB (10.7) 0 0 15 10.7MHz Spurious (Local Osc. Interference) -12.00 dB (10.6) 0 -11.00 dB (10.7) 0



SIGNAL/NOISE VS RF LEVEL

Ford XF3F



SIGNAL/NOISE VS RF LEVEL

9 0 C



SIGNAL/NOISE VS RF LEVEL

Ford XF3F



SIGNAL/NOISE VS RF LEVEL

Ford XF3F

File Name: C_xf3f_1

Dana 10 -010



1st and 2nd ADJACENT CHANNEL SELECTIVITY (30dB Noise Floor)

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A. .



1st, 2nd and 3rd ADJACENT CHANNEL SELECTIVITY

Ford XF3F

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IM & L.O. Rejection (50dB Noise Floor)

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Receiver #16

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Radio Shack

Portable

Det	
	e: <u>6/12/99</u>
Engineer	
Projec	t: FM Receiver Test A1
Panairian Tant Ma	. 16
Receiver Test No	
	s: AM/FM/Cass Portable
	: Radio Shack
	I: SCR-64 14-704
Seria	1: <u>12A98</u>
Antenna Network	:: <u>50/75 Ohm Trans.</u> FM AM
Audio load	
initial Set Up	Radio under test shall have tone controls set to flat detent position, Loudness control off, Balance and
	Fader controls centered (set to mid position), Volume set to Standard Output
	Any other control settings unique to the radio under test shall be noted in the Comments section.
	Left channel shall be used for all Signal (and S/N ratio) measurements.
	15kHz Low Pass filter shall be used on the output of the left channel for all measurements.
	Right channel shall be used for Noise measurements - Stereo Separation test only.
	All level measurements are rms
Comments	: Tone control full clockwise
	Band switch in FM Stereo
Standard R	
Strong	
Medium	
Weak:	-65 dBm
Standard T	est Set Ups
1	Strong Signal Overload
2	Single RF Tone Tests
3	Two RF Tone Tests
4	Measurement Set up
Standard To	
Stanuaru 14	20
1	Local Oscillator Frequency (Tuning Error)
2	Standard Audio Output (Audio level and distortion)
3	RF Input Overload (RF level required for 5% THD)
4	AM Rejection
5	Image Rejection
6	Curve Tests (plots of RF Level Vs Signal - Mono & Stereo, Noise - Mono & Stereo, Stereo Separation
7	Capture Ratio
	Selectivity; 1st Adjacent (30dB noise figure)
	Selectivity; 2nd Adjacent (30dB noise figure)
	Selectivity; 1st Adjacent (50dB noise figure)
	Selectivity; 2nd Adjacent (50dB noise figure)
	Selectivity; 3rd Adjacent (50dB noise figure)
	Additional 10.7MHz Tests
AU 10	

Single RF Tone Tests

1 Local Oscillator Frequency (Tuning Error)

Set Up: Connect Spectrum Analyzer to Radio Antenna input Adjust: Tune radio to Test Freq. 1, measure L.O. Freq 1 Tune radio to Test Freq. 2, measure L.O. Freq 2

Measurement: L.O. Freq 1 MHz L.O. Freq 2 MHz

2 Standard Audio Output

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio Volume to Std. Ref. Level, record Left and Right channel audio level and THD

Measurement:	L	.eft Ch			F	light Ch	
	Level_	0.502	Vrms	= 0 dB	Level	0.479	Vrms
	THD	0.34	_%		THD	0.33	_%

3 RF Input Overload

Set Up: Test Set Up 1, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level Increase RF Level until 5% THD at Radio output, record RF Level

Measurement: RF Lev. 22.00 dBm (@ 5% THD) THD increased to 0.0.6%

4 AM Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level, record THD Set modulation mode to FM (75kHz), AM (30%), record THD

Measurement:	THD_	0.33	_%	=	-49.63 dB	(FM Only)
	THD_	0.396	_%	=	-48.05 dB	(FM + AM 30%)

AM Rejection: -1.58 dB

5 Image Rejection

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono Adjust: Set Radio audio to Std. Ref. Level (0dB) Decrease RF Level until S/N Ratio = 30dB, record RF Lev1 Tune RF Gen to; Desired Freq. +/- 2 X IF Freq. Adjust RF Level until S/N Ratio = 30dB, record RF Lev2

Measurement:	RF Lev1	-101.0	dBm	(S/N Ratio = 30 dB)
	RF Lev2	-23.0	dBm	(21.4 MHz + 94.1 MHz = 115.5 MHz)
Image]	Rejection:	-78.00	dB	(RF Lev1 - RF Lev2)

6 Curve Tests

Set Up: Test Set Up 2, Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono/Stereo Adjust: Set Radio audio to Std. Ref. Level (0dB) for both Mono and Stereo set ups.

Plot: Signal, Noise Vs RF Level (Mono) Signal, Noise Vs RF Level (L+R, Stereo) Stereo Separation Vs RF Level (L only, Stereo) Record: Noise floor at -45dBm without Low Pass Filter as a measure of pilot rejection

CURVE DATA

SIGNAL, NOISE & SEPARATION VS RF LEVEL

	Mono	(L)		Stereo (L)		Separatio	n L⊷R	
RF Level	Signal	Noise	Signal	Filt. Noise	Noise	Left	Right	RF Level
dBm	dB	dB	dB	dB	dB	đB	dB	dBm
-130	-29.00	-29.00	-28.30	-27.90		-27.50	-27.50	-130
+125	-29.00	-29.00	-28.30	-27.90		-27.50	-27.50	-125
-120	-29.00	-28.80	-28.30	-27.90		-27.50	-27.50	-120
-115	-28.80	-28.40	-28.00	-27.50		-27.30	-27.50	-115
-110	-27.30	-28.70	-26.70	-27.90		-26.20	-26.50	-110
+105	-18.00	-31.40	-17.00	-30.40		-19.80	-20.20	-105
-100	-5.00	-40.80	-4.00	-39.50		-8.20	-8.50	-100
-95	-0.30	-50.00	-0.32	-37.60		-3.00	-9.60	-95
-90	-0.22	-56.00	-0.20	-36.30		-0.20	-27.10	-90
-85	-0.13	-60.20	-0.15	-41.40		0.00	-27.70	-85
-80	0.00	-61.80	0.00	-46.50		0.00	-27.80	-80
-75	0.00	-62.40	0.00	-51.10		0.00	-27.80	-75
-70	0.00	-62.50	0.00	-55.10		0.00	-27.80	-70
+6S	0.00	-62.60	0.00	-58.10		0.00	-27.90	+65
-60	0.00	-62.70	0.00	-59.60		0.00	-28.00	-60
+55	0.00	-62.80	0.00	-60.30		0.00	-28.30	-55
-50	0.00	-63.00	0.00	-60.40		0.00	-29.00	-50
-45	0.00	-63.00	0.00	-60.40	-34.60	0.00	-29.70	-45

 7 Capture Ratio Set Up: Test Set Up 3 Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
Set Up: Test Set Up 3 Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Desired: Test Freq. 1, -55dBm, 1kHz, 22.5kHz dev, Mono Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Undesired: Test Freq. 1, -130dBm, CW Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Adjust: Set Radio audio to Std. Ref. Level (0dB) Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1
Increase Undesired signal until audio level drops 1dB, record Undesired RF level as RF Lev 1 Increase Undesired signal until audio level drops 30dB, record Undesired RF level as RF Lev 2
increase Ondesned signal until audio level drops 30dB, record Undestred RF level as RF Lev 2
Measurement: RF Lev 1 -52.00 dBm
RF Lev 2 -45.00 dBm
Capture Ratio:dB (RF Lev 1 - RF Lev 2)/2
8 Selectivity - 1st Adjacent 30dB S/N (Upper and Lower) Upper 1st
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 1st
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -200kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
dBm D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -43.00 12.00 -46.00 -9.00 Undesired Lower Lev -55.00 0.06 -60.00 5.00
Selectivity, 1st Adj.:
9 Selectivity - 2nd Adjacent 30dB S/N (Upper and Lower)
Upper 2nd
Set Up: Test Set Up 3
Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Upper Lev.
Lower 2nd
Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono
Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono
Adjust: Set Radio audio to Std. Ref. Level (0dB)
Set the modulation of the Desired signal to CW
Increase Undesired signal until noise floor is -30dB, record Undesired RF level as Undesired Lower Lev.
Mono 30dB Stereo 30dB
Desired Lev 55.00 D/U dBm D/U
Desired Lev -55.00 -55.00
Undesired Upper Lev -23.00 32.00 -27.00 28.00 Undesired Lower Lev -33.00 -22.00 -34.00 21.00
Selectivity, 2nd Adj.: 27.0024.50 (RF D/U Up + RF D/U Lo)/2

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10 Selectivity Upper 1st	- 1st Adjacent	50dB S/N (U	J pper and I	Lower)	
**	p: Test Set Up 3	1			
;	• •	Test Freq. 1,	Medium, 1	kHz. 75kHz	Dev. Mono
·				-	Hz, 75kHz Dev, Mono
Adju	st: Set Radio aud	lio to Std. Re	f. Level (0d	B)	
	Set the modu	lation of the I	Desired sign	al to CW	
	Increase Und	esired signal	until noise f	loor is -50dB	, record Undesired RF level as Undesired Upper Lev.
Lower 1st					
Set U	p: Desired:	Test Freq. 1,	Medium, 1	kHz, 75kHz	Dev, Mono
	Undesired:	Test Freq. 1	-200kHz, -1	30dBm, 1kH	Iz, 75kHz Dev, Mono
Adju	t: Set Radio auc	lio to Std. Re	f. Level (0dl	B)	
	Set the modul		•		
	Increase Unde	esired signal u	until noise fl	oor is -50dB	, record Undesired RF level as Undesired Lower Lev.
	Mono 5	0dB	Stereo	50dB	
	dBm	D/U	dBm	D⁄U	
Desired Le			-55.00		
Undesired Upper Le		-11.00	-65.00	10.00	
Undesired Lower Le		6.00	-80.00	25.00	
Selectivity, 1st Adj	.:	-2.50		17.50	(RF D/U Up + RF D/U Lo)/2

11 Selectivity - 2nd Adjacent 50dB S/N (Upper and Lower)

Upper 2nd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 2nd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -400kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

		50dB D/U		50dB D/U	•
Desired Lev	-55.00		-55.00		
Undesired Upper Lev	-30.00	-25.00	-45.00	-10.00	
Undesired Lower Lev	-39.00	-16.00	-46.00	-9.00	
Selectivity, 2nd Adj.:		-20.50		-9.50	(RF D/U Up + RF D/U Lo)/2

12 Selectivity - 3rd Adjacent 50dB S/N (Upper and Lower)

Upper 3rd

Set Up: Test Set Up 3

Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 +600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Upper Lev.

Lower 3rd

Set Up: Desired: Test Freq. 1, Medium, 1kHz, 75kHz Dev, Mono

Undesired: Test Freq. 1 -600kHz, -130dBm, 1kHz, 75kHz Dev, Mono

Adjust: Set Radio audio to Std. Ref. Level (0dB)

Set the modulation of the Desired signal to CW

Increase Undesired signal until noise floor is -50dB, record Undesired RF level as Undesired Lower Lev.

					,	
		50dB		50dB		
	dBm	D/U	dBm	D⁄U		
Desired Lev	-55.00		-55.00			
Undesired Upper Lev	-35.00	-20.00	-38.00	-17.00		
Undesired Lower Lev	-33.00	-22.00	-34.00	-21.00		
Selectivity, 3rd Adj.:		-21.00		-19.00	(RF D/U Up + RF	D/U Lo)/2

Additional Tests

13

10.7 MHz Rejection
Using Test Set Up 1 at the desired frequency of 94.1 MHz;
Set generator to 1kHz, 75kHz dev. / CW
Reduce RF level to obtain 30dB S/N ratio.
Record RF Level as RF Lev 1
Set RF generator to 10.7 MHz
Adjust RF level to obtain 30dB S/N ratio
Record RF Level as RF Lev 2
Calculate the difference between the two RF levels

$$\begin{array}{c} \text{RF Lev 1} & -101.00 & \text{dBm} \\ \text{RF Lev 2} & 14.50 & \text{dBm} \\ \text{D/U} & -115.50 & \text{dB} \end{array} \qquad \text{EOC}$$

14 10.7 IM Test

Adjust:

Using the three generator set up, set generators as follows; Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Lower Undesired: 88.7MHz, 1kHz, 75kHz dev Upper Undesired: 99.3MHz, 400Hz, 75kHz dev

Undesired RF level to obtain -50dB noise floor, record RF lev 10.6MHz Spacing

Set upper undesired generator to 99.4MHz. Adjust RF lev for -50dB noise floor. (RF lev 10.7MHz Spacing)

dBm	D/U	dBm	D/U
-45.00		-45.00	
-43.00	-2.00	-45.00	0.00

EOC:

15 10.7MHz (10.6MHz) Local Osc Interference Test

Set Up: Desired: 94.1MHz, -45dBm, Pilot only

Set upper interferer generator to 104.7MHz (94.1MHz + 10.6MHz), 400Hz, 75kHz dev

- a) Increase level of undesired signals until noise floor is -50dB (+/- 2dB). Record RF Lev for 10.6MHz Spacing
- b) Re-adjust upper interfering generator to 104.8MHz (94.1MHz + 10.7MHz)

Re-adjust RF level for -50dB and record RF lev for 10.7MHz spacing

dBm	D/U	dBm	D/U
-45.00		-45.00	
-71.00	26:00	-71.00	26.00

EOC:

	Dete	6/10/00			
		: <u>6/12/99</u>			
*	Engineers	and the second s			
	Froject	FM Receiver Test A1			
Pa	eiver Test No.:	0			
KG		AM/FM/Cass Portable			
					
	-	Radio Shack			
		SCR-64 14-704 12A98			
	Serial.	12A30			
An	tenna Network:	50/75 Ohm Trans.	FM		
	Audio load:	<u> </u>			
	Initial Set Up:	Radio under test shall have	ave tone controls set	t to flat detent posit	ion, Loudness control off, Balance and
	-	Fader controls centered			
					e noted in the Comments section.
		Left channel shall be use			
				•	annel for all measurements.
		Right channel shall be u	sed for Noise measu	urements - Stereo S	eparation test only.
		All level measurements	are rms		
	Comments:	Tone control full clocky	vise		
		Band switch in FM Stere			
	•	0			<u></u>
	•	0			
	-				
Standard	RF Levels			Standard	FM Test Frequencies
Standard Strong		dBm		Standard	I FM Test Frequencies 94.1MHz
	: -45	dBm dBm		Standard	-
Strong	: -45 : -55			Standard	-
Strong Medium Weak	-45 -55 -65	dBm		Standard	-
Strong Medium Weak	: -45 : -55	dBm		Standard	-
Strong Medium Weak	-45 -55 -65	dBm dBm		Standard	-
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups	dBm dBm Overload		Standard	-
Strong Medium Weak Standard	: -45 : -55 : -65 Test Set Ups Strong Signal	dBm dBm Overload ne Tests		Standard	-
Strong Medium Weak Standard 1 2	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Top	dBm dBm Overload ne Tests Tests		Standard	-
Strong Medium Weak Standard 1 2 3	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone	dBm dBm Overload ne Tests Tests Set up		Standari	-
Strong Medium Weak Standard 1 2 3	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes	dBm dBm Overload ne Tests Tests Set up sts	TOT)		94.1MHz
Strong Medium Weak Standard 1 2 3 4	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat	dBm dBm Overload ne Tests Tests Set up		13	-
Strong Medium Weak Standard 1 2 3 4 4	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up sts or Frequency (Tuning Er	nd distortion)		94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4	: -45 : -55 : -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi	dBm dBm Overload ne Tests Tests Set up sts or Frequency (Tuning Er to Output (Audio level au cload (RF level required	nd distortion)	13 14	94.1MHz 10.7MHz Rejection
Strong Medium Weak Standard 1 2 3 4 1 2 3	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio	dBm dBm overload ne Tests Tests Set up ats or Frequency (Tuning Er to Output (Audio level ar cload (RF level required on	nd distortion) for 5% THD)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio	dBm dBm Overload ne Tests Tests Set up ets or Frequency (Tuning Er to Output (Audio level ar cload (RF level required	nd distortion) for 5% THD)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio	dBm dBm overload ne Tests Tests Set up ets or Frequency (Tuning Er to Output (Audio level an cload (RF level required on on	nd distortion) for 5% THD)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio	dBm dBm overload ne Tests Tests Set up ets or Frequency (Tuning Er to Output (Audio level an cload (RF level required on on	nd distortion) for 5% THD) io Output)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6 7 8 9	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st	dBm dBm overload ne Tests Tests Set up ets or Frequency (Tuning Er to Output (Audio level ar cload (RF level required on olots of RF Level Vs Aud	nd distortion) for 5% THD) io Output) gure)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6 7 8 9 10	-45 -55 -55 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejectio Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 2m	dBm dBm Overload ne Tests Tests Set up sts or Frequency (Tuning Er to Output (Audio level an cload (RF level required on slots of RF Level Vs Aud Adjacent (30dB noise fi	nd distortion) for 5% THD) io Output) gure) ñgure)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation
Strong Medium Weak Standard 1 2 3 4 1 2 3 4 5 6 7 8 9 10 11	 -45 -55 -55 -65 Test Set Ups Strong Signal Single RF Ton Two RF Tone Measurement Standard Tes Local Oscillat Standard Audi RF Input Over AM Rejection Image Rejection Curve Tests (p Capture Ratio Selectivity; 1st Selectivity; 1st Selectivity; 1st Selectivity; 2m 	dBm dBm Overload ne Tests Tests Set up sts or Frequency (Tuning Er to Output (Audio level ar cload (RF level required on slots of RF Level Vs Aud Adjacent (30dB noise fi d Adjacent (30dB noise fi	nd distortion) for 5% THD) io Output) gure) gure) gure) gure) igure)	13 14	94.1MHz 10.7MHz Rejection 10.7MHz Intermodulation

Test Results:

1 Local Oscillator Frequency: 0.000 MHz

2 Standard Audio Output:

Left Channel	THD	Right Channel	THD
0.502Vrms	0.34 %	0.479 Vrms	0.33 %

- 3 RF Input Overload: 22.00 dBm THD increased to 0.0.6%
- 4 AM Rejection: ______dB
- 5 Image Rejection: ______dB
- 6 Curve Tests: (See Plots)
- 7 Capture Ratio: ______dB
- 8 Selectivity, First Adjacent, 30dB Noise Floor (Ave. D/U) -6.00 dB Mono -2.00 dB Stereo
- 9 Selectivity, Second Adjacent, 30dB Noise Floor (Ave. D/U) -27.00 dB Mono -24.50 dB Stereo
- 10 Selectivity, First Adjacent, 50dB Noise Floor (Ave D/U) -2.50 dB Mono 17.50 dB Stereo
- 11 Selectivity, Second Adjacent, 50dB Noise Floor (Ave. D/U) -20.50 dB Mono -9.50 dB Stereo
- 12 Selectivity, Third Adjacent, 50dB Noise Floor (Ave. D/U) -21.00 dB Mono -19.00 dB Stereo

0

- **13 10.7MHz Rejection** ______dB
- 14
 10.7MHz IM

 -2.00
 dB (10.6)
 0

 0.00
 dB (10.7)
 0
- 15
 10.7MHz Spurious (Local Osc. Interference)

 26.00
 dB (10.6)
 0

 26.00
 dB (10.7)
 0

400



SIGNAL/NOISE VS RF LEVEL

Radio Shack SCR-64 14-704

1.1.14



SIGNAL/NOISE VS RF LEVEL

Radio Shack SCR-64 14-704

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Radio Shack SCR-64 14-704

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Chick SU



IM & L.O. Rejection (50dB Noise Floor)

Frequency (MHz)

Radio Shack SCR-64 14-704

NRSC-R37

NRSC Document Improvement Proposal

If in the review or use of this document a potential change appears needed for safety, health or technical reasons, please fill in the appropriate information below and email, mail or fax to:

National Radio Systems Committee c/o Consumer Electronics Association Technology & Standards Department 1919 S. Eads St. Arlington, VA 22202 FAX: 703-907-4190 Email: standards@ce.org

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b. Recommended Changes:				
c. Reason/Rationale for Recommendation:				
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