NATIONAL RADIO SYSTEMS COMMITTEE

NRSC-R33 High-speed Subcarrier (Digital) HSSC Laboratory Test Report May 1997

Part I - Report



REPORT

NAB: 1771 N Street, N.W. Washington, DC 20036 Tel: (202) 429-5356 Fax: (202) 775-4981



CEA: 1919 South Eads Street Arlington, VA 22202 Tel: (703) 907-7660 Fax: (703) 907-8113

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NRSC-R33

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NRSC-R33

FOREWORD

NRSC-R33, High-speed Subcarrier (Digital) HSSC Laboratory Test Report, is the first of three test reports submitted to the NRSC's High-Speed FM Subcarrier (HSSC) Subcommittee. Three digital FM subcarrier systems were evaluated during these tests—DARC (submitted by Digital DJ, Inc.), STIC (submitted by Mitre Corporation), and HSDS (submitted by Seiko, Inc.). The co-chairmen of the HSSC Subcommittee at the time of the submission of NRSC-R33 were Michael Rau and David Kelly. The NRSC Chairman at the time of the submission of NRSC-R33 was Charles Morgan.

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.

NRSC HIGH-SPEED FM SUBCARRIER SUBCOMMITTEE

High-Speed Subcarrier

(Digital)

HSSC

Laboratory Test Report

Published by: Consumer Electronics Manufacturers Association

Thomas B. Keller, Consultant David M. Londa, RF Test Manager Robert W. McCutcheon, Systems Test Engineer

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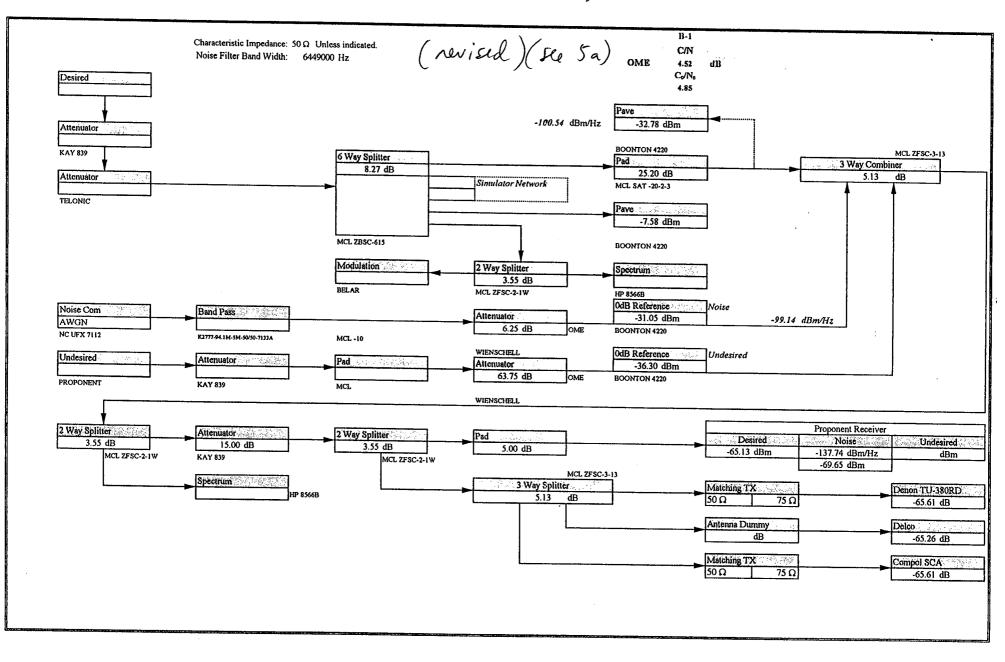
- A HSSC SYSTEM DESCRIPTIONS
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- N SYSTEM PLOTS (handed out at tutorial)
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- P Co/No ADJUSTMENTS

LABORATORY TEST RESULTS

DIGITAL DJ

TESTS

B, C, & E-2



S

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Digital Radio Test Laboratory (revised) (see (m)

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1

5-Band Medium Processed ORBAN #2

COMP OUT 1: Not Used

COMP OUT 2: Not Used

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Proponent Only Error Meas. Duration: 5 Min.

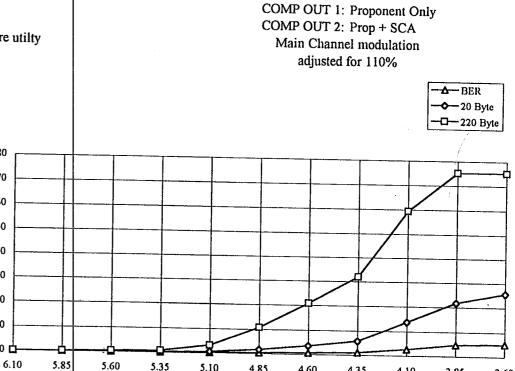
SIGNAL

Analog Receivers: Delco RX 1 Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility

B1.1 **Noise Failure Characterization**

Basic Test Parameters:

	Noise Level	Er	ror Level (%)	
C₀/N₀	Attn	BER	20 Byte	220 Byte	
62.35	63.75	0	0	0	
6.10	7.50	0	0	0	
5.85	7.25	0.004	0.026	0.143	OME
5.60	7.00	0.016	0.078	0.429	0
5.35	6.75	0.017	0.117	0.714	
5.10	6.50	0.101	0.508	3.143	
4.85	6.25	0.345	1.721	10.857	
4.60	6.00	0.662	3.467	20.857	
4.35	5.75	1.071	5.696	32.00	
4.10	5.50	2.666	13.74	59.29	
3.85	5.25	4.667	21.74	75.14	
3.60	5.00	5.022	25.600	75.143	



4.85

Co/No (dB)

4.60

4.35

4.10

5.10

B-1

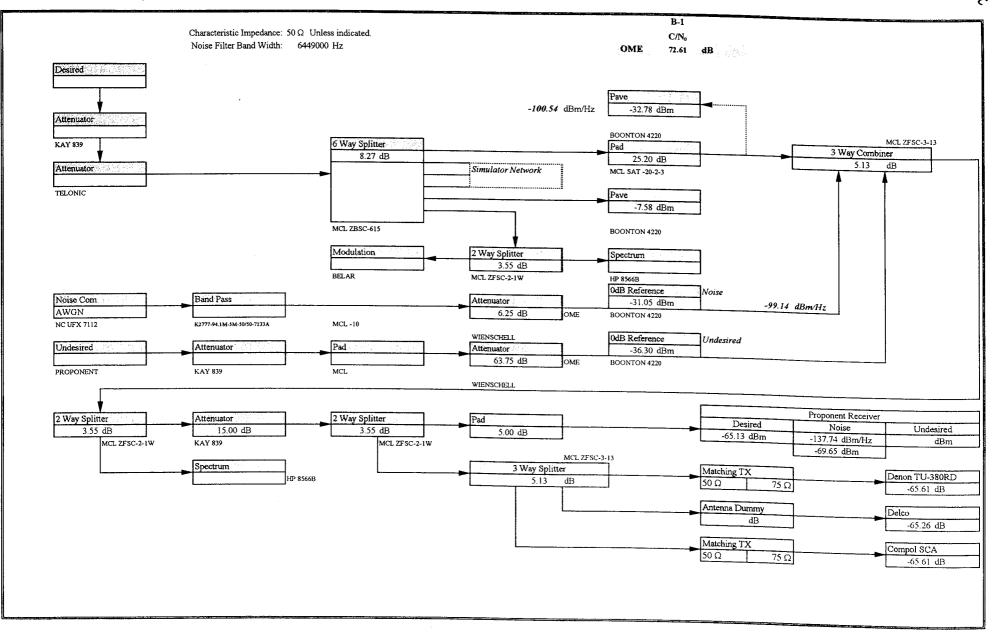
80 70 60

ERROR RATE (%)

Page 2 of 21

3.85

3.60



B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Proponent Only Error Meas. Duration: 5 Min.

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

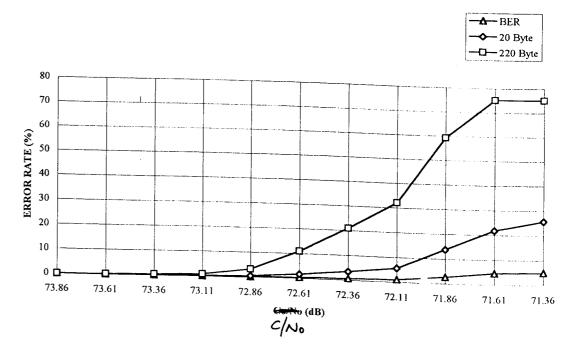
COMPOSITE SIGNAL

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ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

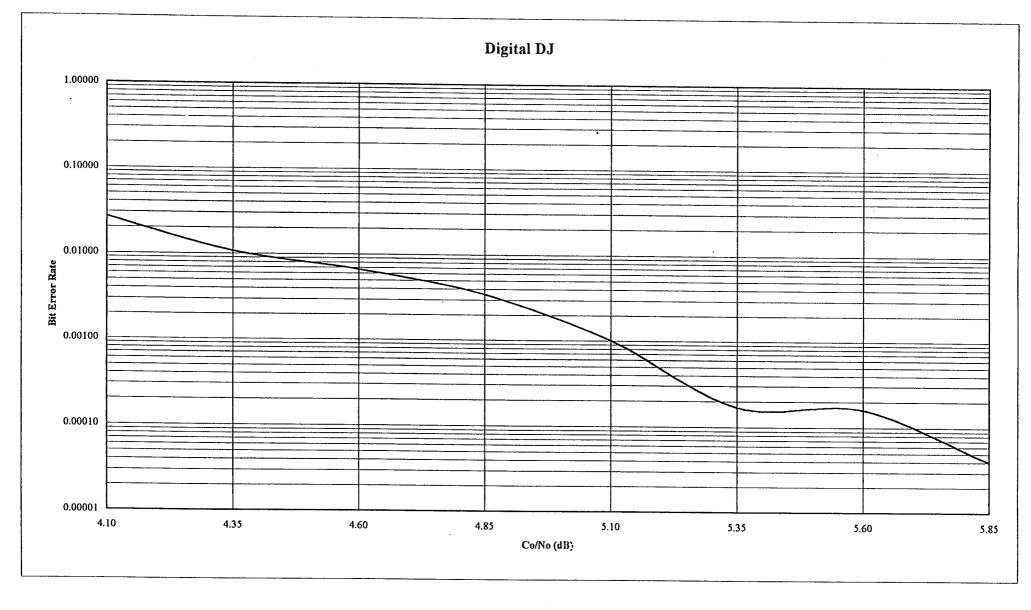
B1.1 Noise Failure Characterization

	Noise Level	1	Error Level ((%)	
C/N _o	Attn	BER	20 Byte	220 Byte	
130.11	63.75	0	0	0	
73.86	7.50	0	0	0	
73.61	7.25	0.004	0.026	0.143	OME
73.36	7.00	0.016	0.078	0.429	
73.11	6.75	0.017	0.117	0.714	
72.86	6.50	0.101	0.508	3.143	
72.61	6.25	0.345	1.721	10.857	
72.36	6.00	0.662	3.467	20.857	
72.11	5.75	1.071	5.696	32.00	
71.86	5.50	2.666	13.74	59.29	
71.61	5.25	4.667	21.74	75.14	
71.36	5.00	5.022	25.600	75.143	



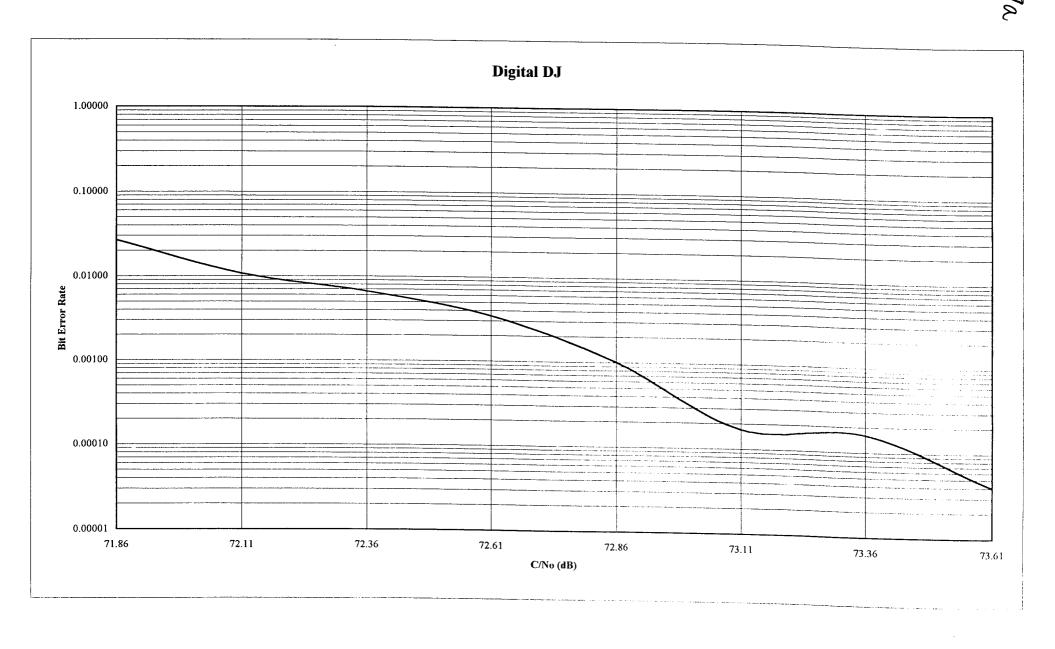
B-1

(revised)(su 7a)



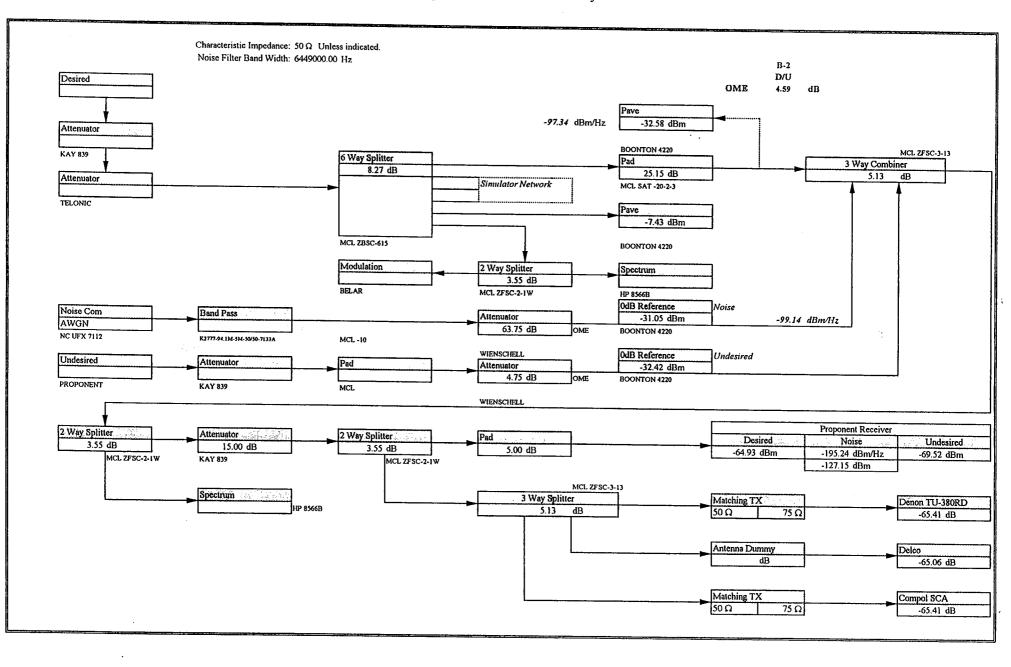
B1.2	Onset of Error with other SCAs	10/2/	96	(revised) (see 8a)
	Main Ch. Mod: CPN SCA Group: A	Noise Level Atten. Set 7.75 dB 7.50 dB	Error Lev BER 20by 0 0 0.003 0.020	cl (%) e 220byte 0 (c to Clathe heat of the
	Main Ch. Mod: CPN SCA Group: B	Noise Level Atten. Set 8.00 dB 7.75 dB	Error Lev BER 20by 0 0 0.003 0.026	e 220byte $(6.35 \text{ GN}_{\circ} \text{ galance})$
B1.3a	92KHz S/N ratio SCA Group: A Best Case RBDS & 92 kHz Or With Duranget G		Rec.)	EO&C Rushing noise heard from SCA receiver
	With Proponent Group at OM			Without other SCA
B1.3b	Main ch. S/N ratio SCA Group: A With Grp A and B1.1 noise lev	(Denon RX 2) 59 dB el: 35.3 dB	RMS No Filter	0dB taken with 1 kHz Mod Souce
B1.4 a	RBDS Block Error Level Co/No 6.60		OME Target Meas	Noise Level for $5\% \pm 2\%$ maximum block errors per 100 blocks (measured for a period of 5 minutes)
B1.4b	RBDS error measurement at MAX error measurement		Without Proponent	
	File Name: DDJ.XLS		B-1	Page 4 of 21

α



	B1.2	Onset of Error with other SCAs	10/2/9	96			
		Main Ch. Mod: CPN	Noise Level	E	ror Level	(%)	
		SCA Group: A	Atten. Set	BER	20byte	220byte	
			7.75 dB	0	0	0	
			7.50 dB	0.003	0.026	0.143	OME
		Main Ch. Mod: CPN					
		SCA Group: B	Noise Level	Eı	ror Level	(%)	
		•	Atten. Set	BER	20byte	220byte	
			8.00 dB	0	0	0	
			7.75 dB	0.003	0.026	0.143	OME
	B1.3a	92KHz S/N ratio (C SCA Group: A	ompol 92 kHz SCA I S/N	Rec.)			
		SCA Oroup. A	(dB)			FORC	
		Best Case RBDS & 92 kHz Only	48.5			EO&C	
		With Proponent Group A	42.7			Without of	oise heard from SCA receiver
		at OME	16			without of	ther SCA
	B1.3 b		(Denon RX 2)				
		SCA Group: A	59 dB	RMS No F	ilter	0dB taken	with 1 kHz Mod Souce
		With Grp A and B1.1 noise level:	35.3 dB	OME			
	B1.4a	RBDS Block Error Level				Noise Lev	el for $5\% \pm 2\%$ maximum block errors per 100 blocks
		C/N₀ 74.36	Attn 8.00 dB	Target 5	Meas 5	(measured	for a period of 5 minutes)
					ر.		
,	B1.4b	RBDS error measurement at B1 . MAX error measurement:	.4 noise level 5 %	Without Pr	roponent		

4



2.

B-2 Co-Channel

Characterization of HS Digital Subcarrier Signal Failure

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Prop + SCA COMP OUT 2: Proponent Only

B2.1 Ma	Co-Channnel Analog Re Desired Signa RF Key Point Meas.: RX RF Level: in Channel Modulation: Modulation Level: SCA Group: No	Il Parameters -32.58 dBm -65 dBm 1 kHz 100 % 0 ne	dB Reference	Main Chanı Mo		Bm	ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%
B2.2a	Reference:	dB S/N ratio target on Delco RX 1 Best Case S/N: S/N: Atten:	main analog chai 55.70 dB 45.00 dB 26.00 dB	nnel receiver d/u 25:84 dB	(Measurement is rms w/) Denon RX 2 Best Case S/N: S/N: Atten:	-	d/u 30.84 dB
<i>D2.2</i> a	Co-Channnel HSD Interf Desire RF Level: -6: Modulation Type: No: Modulation Level: No: SCA Group: No:	ed Signal Parameters 5dBm ne ne			Undesired Signal Modulation Type: Cl Modulation Level: 11 SCA Group: Gr	Parameters PN 0%	50.04 01
	Group A:	Deico R S/N: Atten:	X 1 45.00 dB 26.00 dB	d/u 25:84∵dB	Denon R S/N: Atten:	X 2 45.00 dB 31.00 dB	d/u 30.84 dB
Fi	le Name: DDJ.XLS			B-2			Page 6 of 21

B2.2b	Co-Channnel HSD Interfere	nce					Ĩ
	Desired Signal Pa	rameters		**	1 1 1 00		
	RF Level: -65dB	m		Ur	idesired Signal Para	neters	
	Modulation Type: None			Modulatio	Trinos CDNI		
	Modulation Level: None				on Type: CPN n Level: 110%		
	SCA Group: None				Group: Group B		
	Measurement: Target	Signal-to-Noise F	Ratio				
		Delco F	X 1	d/u	Denon 1	RX 2	d/u
		S/N:	45.00 dB		S/N:	45.00 dB	u/u
	Group B:	Atten:	26.00 dB	25.84 dB	Atten:	31.00 dB	30.84 dB
B2.2c	Co-Channnel HSD -> Analog	Interference					
	Desired Signal Pa	rameters		IIn	desired Stand Day		
	RF Level: -65dBr	n		UI	desired Signal Parar	neters	
	Modulation Type: None			Modulatio	n Type: CPN		
	Modulation Level: None				1 Level: 110%		
	SCA Group: None				Group: Proponent Or	nly	
	Measurement: Target S	Signal-to-Noise R	atio				
		Delco R	X 1	d/u	Denon F	NY a	.,
		S/N:	45.00 dB	W/ W	S/N:	45.00 dB	d/u
		Atten:	25.75 dB	25.59 dB	Atten:	30.50 dB	20.24 40
					i moll,	10.30 LT	30.34 dB

1

;

B2.3	Modula Modula	cl Analog Desired Sig RF Level: ation Type: ation Level: CA Group:	gnal Parai -65 CPN 110	neters 5 dBm 1 9 %				/lodulatior lodulation	а Туре:	CPN 110	rameters N) % kHz		
	Co-Char D/U 4.84 4.59 4.34 4.09 3.84 3.59 3.34 3.09 2.84	n. Level Attn 5.00 4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.00	Cu BER 0 0.014 0.082 0.168 0.520 1.278 2.623 4.797 8.425	 im. Error L 20 Byte 0 0.052 0.391 0.834 2.633 6.52 13.67 23.88 39.42 	220 Byte 0	OME	90 80 70 60 50 40 30 20 10						-X-BER -∆-20 Byte -◇-220 Byte

0 📩 –

4.59

4.34

4.09

3.84

D/U (dB)

3.59

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3.34

3.09

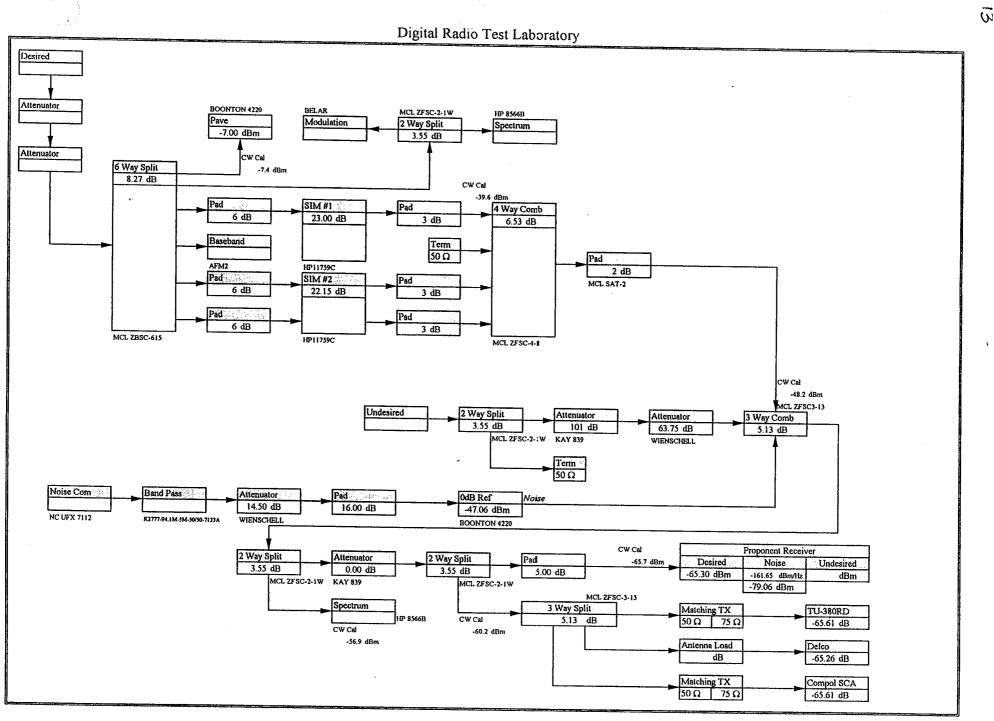
2.84

File Name: DDJ.XLS

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B-3 Multipath

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(revised)

D-5 Multipath						(100/864)
Characterization of	f HS Digital	Subcarrier	Signal Fai	luro		
Basic Test Parameter	'S:		NAL		νρονο	
					PROPU	NENT SPECIFIC COMPOSITE SIGNAL
One Pa	th Zero Phase	e Reference	: -65dBm			
ł.		nnel Mod:				ORBAN #1
		SCA Group				COMP OUT 1: Not Used
Error	Measuremen	t Duration:	5 Min			COMP OUT 2: Not Used
						5-Band Medium Processed
Analog Receiver	s: Delco RX	1				ORBAN #2
		KHz SCA	Receiver			COMP OUT 1: Proponent Only
	Denon RX	2 RBDS R	eceiver W/R	DS Check	software utilty	COMP OUT 2: Prop + SCA
					soliware utility	Main Channel modulation
						adjusted for 110%
	Noisc	Level	E	rror Level (%)	EO&C
	C ₀ /N ₀	Attn	BER	20 Byte		LUAC
Urban Slow	63.34	63.75	0.1450	0.6000	2.1430	Performance immeined with a state to the
	-				2.1130	Performance impaired without added noise. MAX RBDS Block Error= 11 %
						MAX RBDS Block Error= 11 %
						• •
···						
Urban Fast	63.34	63.75	1.2230	6.595	33.57	Performance impaired without added noise.
						MAX RBDS Block Error= 14 %
						14 /0
Dural East						
Rural Fast	63.34	63.75	0.5030	2.815	17.00	Performance impaired without added noise.
						MAX RBDS Block Error= 16 %
Obstructed	62.24	<				
Obstructed	63.34	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently.
						MAX RBDS Block Error= 98 %
File Name: DDJ.XLS					D 4	
					B-3	Page 10 of 21
~~						

B-3 Multipath

Characterization of HS Digital Subcarrier Signal Failure Basic Test Parameters: SIGNAL

One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 Min.

Analog Receivers: Delco RX 1

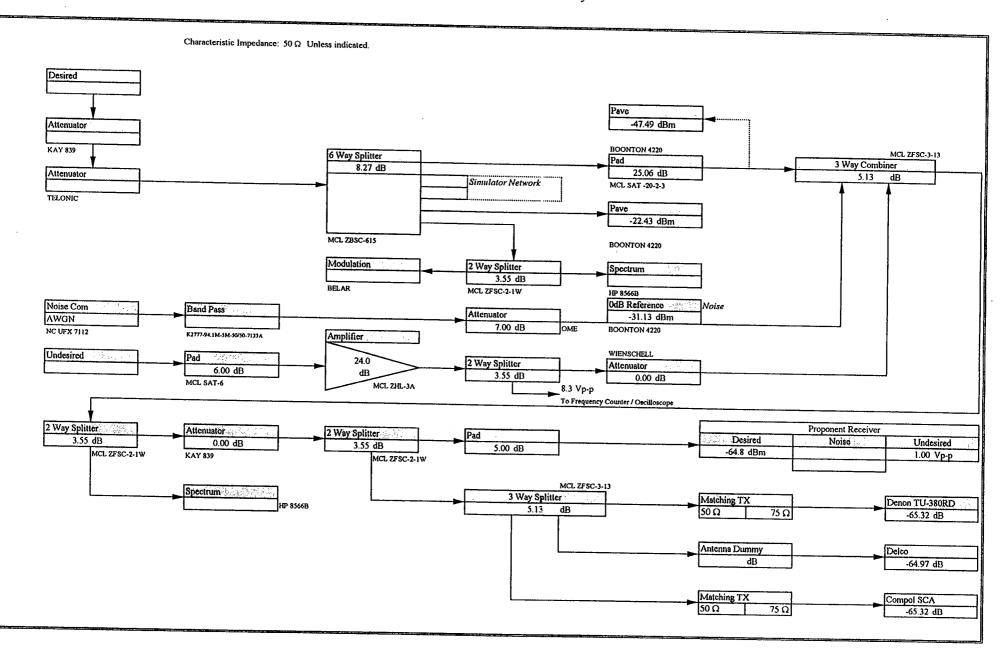
Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

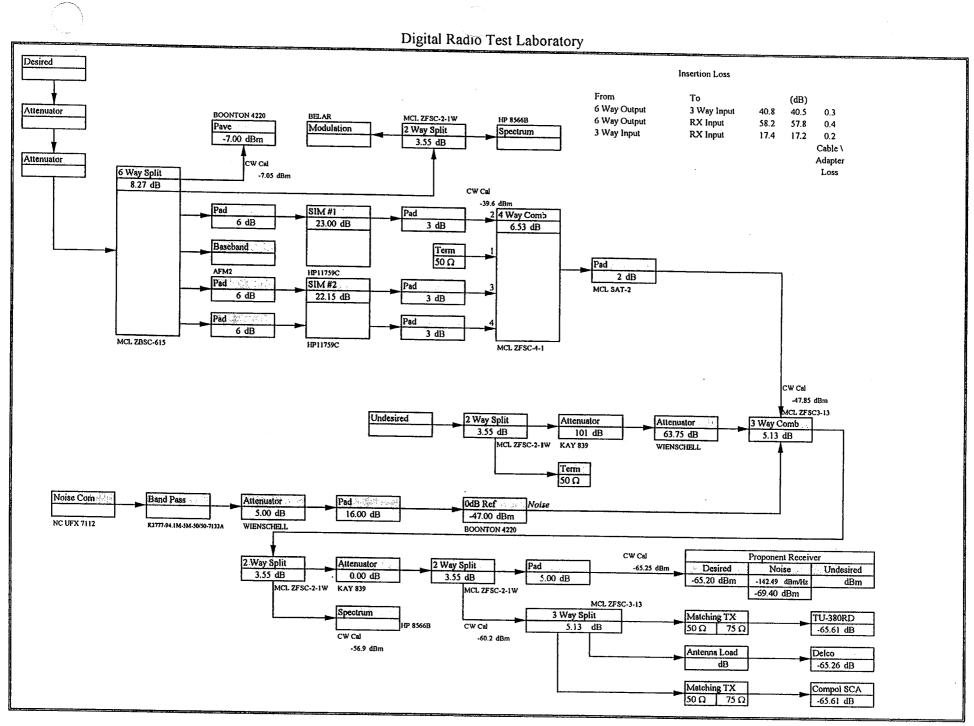
	Noise	Level	Er	ror Level ((%)	EO&C
	C/N _e	Attn	BER	20 Byte	220 Byte	
Urban Slow	131.10	63.75	0.1450	0.6000	2.1430	Performance impaired without added noise. MAX RBDS Block Error= 11 %
Urban Fast	131.10	63.75	1.2230	6.595	33.57	Performance impaired without added noise. MAX RBDS Block Error= 14 %
Rural Fast	131.10	63.75	0.5030	2.815	17.00	Performance impaired without added noise. MAX RBDS Block Error= 16 %
Obstructed	131.10	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently. MAX RBDS Block Error= 98 %



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B-4 Impulse N	oisc	11/6/96	,			
Desired Signal -65	dBm at receiver	input.			Undesired Signal	p pulse at receiver input
Group	A subcarriers	- S.			Repetition Rate Va	riable
Results accumu measurement pe	lated over 5 minut eriod.	e				
Denstit D	_			Pilot O	nly	
Repetition Rate	BER	20 Byte	220 Byte		Attenuator Setting	Voltage
(Hz)					(dB)	(Vp-p)
100	0.0000	0.0000	0.0000		0	1.0000
200	0.0000	0.0000	0.0000		0	1.0000
300	0.0000	0.0000	0.0000		0	1.0000
600	0.0000	0.0000	0.0000		0	1.0000
1000	0.1780	0.9120	6.286		0	1.0000
1000	0.0060	0.0260	0.1430		10	0.3162
1000	0.0000	0.0000	0.0000		15	0.1778
		Clipped	Pink Noise	(Stereo)		
Repetition Rate	BER	20 Byte	220 Byte	•		** •
(Hz)		20 2910	220 Dyte	4	Attenuator Setting	Voltage
100	0.0000	0.0000	0.0000		(dB)	(Vp-p)
200	0.0000	0.0000	0.0000		0	1.000
300	0.0000	0.0000	0.0000		0	1.000
600	0.0000	0.0000	0.0000		0	1.000
1000	0.1320	0.6520	4.286		0	1.000
1000	0.0070	0.0320	4.280 0.1430		0	1.000
1000	0.0060	0.0260	0.1430		10	0.3162
1000	0.0000	0.0200	0.1430		15	0.1778
	0.0000	0.0000	0.0000		20	0.1000

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EIA Digital Audio Radio Laboratory

Scenario	Reflected Path		CPN	Medium Si	gnal Streng	lh Pilot Only		
41	400 km/h Doppler 27.5 μs Delay 8.00 dB	BER 100.00 System doe System per	20 Byte 100.00 s not acquir forms error	220Byte 100.00 re signal wi free with p	0.00 th CPN on n	20 Byte 0.00 nain channel.	220Byte 0.00	%
#2	200 km/h Doppler 13.7 μs Delay 6.00 dB	BER 12.29 System perf	20 Byte 54.47	220Byte 99.00	BER 0.00	20 Byte 0.00	220Byte 0.00	%
13	100 km/h Doppler 6.8 μs Delay 4.00 dB	BER 2.76 System perf	20 Byte 14.89	220Byte 66.00	BER 0.00	20 Byte 0.00	220Byte 0.00	%

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Filename: DDJ.XLS B-5

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B-6 Weak Signal
Characterization of HS Digital Subcarrier Signal Failure

pilot: proponent: 57 kHz: 92 kHz: Total Injection:	9 % 10 % % 19 %	9 % 10 % 3 % 7 % 29 %	9 % 10 % 10 % % 29 %	
Group	Proponent Only	Α	В	
Signal Level:	-92 ≤ome< -91 dBm	-92 ≤ome< -91 dBm	-92 ≤ome< -91 dBm	

File Name: DDJ.XLS

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C-1 Re-Acquisition

11/4/96

	POF-2dB	Re-Acquisitior POF-40	1	POF-6dB			
	2.2	2.8		2.6			
	2.4	1.5		2.1			
	2.8	2.8		1.9			
	3.8	2.6		1.2			
	1.1	2.4		2.0			
Average	2.5	2.4		2.0			
Point Of Failure Atten			3.00				
Desired Signal Referen	ice Level		1989 C 19 S 10 C	-47.83 dBm			
Noise 0 dB Reference				-47.1 dBm			
Desired Signal Level a	t Receiver			dBm			
POF Noise Level is det	fined as the lev	el which causes					
220 byte Packet Error	Rate of $95\% \pm$	5%.					
ABBA Used as Modulation Source on Main Channel							
Connection is broken f							

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•	līsim (s)	POF-2	Rc-Acquisition Time (s) POF-4	POF-6
	5	2.9	1.3	2.2
	10	2.7	1.8	2.3
	15	2.5	1.9	3.0
	20	1.9	3.0	1.9
A	verage	2.5	2.0	2.4
РС	OF Attenuator	Setting:	12 dB	
с	Poi 220	nt of Failure (POF) 9 Byte Message Erro	defined as: or Rate ≥ 50 9	/0

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EIA Digital Audio Radio Test Laboratory

Fest C-2 Ro Ur	Acquisition with Mult ban Fast Rayleigh	ipath		
Tsim (s)	POF-2	Re-Acquisition Time (s)		
		POF-4	POF-6	
5	2.1	2.1	1.2	
10	2.1	2.5	1.8	
15	4.8	4.7	3.1	
20	3.6	2.3	2.5	
	;			
Average		2.9	2.2	
	POF Attenuator	Setting: 18 dB		
EO&C			<u> </u>	
Test Date: 24-Oct-96	,			
ngineer(s): DML				

File Name: DDJ.XLS C-2 UFR

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Tsim (s)	Re POF-2	-Acquisition Time (POF-4	s) POF-6	
5	3.0	3.1	2.1	
10	1.7	2.7	5.2	
15	1.8	3.0	2.2	
20	4.2	3.1	1.8	
Average	2.7	3.0	2.8	
	POF Attenuator Se	tting: 20 dB		
	<u></u>		<u></u>	
24-Oct-96				
	5 10 15 20 <u>Average</u>	Tsim (s) POF-2 5 3.0 10 1.7 15 1.8 20 4.2 Average 2.7 POF Attenuator Set	Tsim (s) POF-2 POF-4 5 3.0 3.1 10 1.7 2.7 15 1.8 3.0 20 4.2 3.1 Average POF Attenuator Setting: 20 dB	5 3.0 3.1 2.1 10 1.7 2.7 5.2 15 1.8 3.0 2.2 20 4.2 3.1 1.8 Average 2.7 POF Attenuator Setting: 20 dB

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EIA Digital Audio Radio Test Laboratory

Test	C-2	Re-Acquisition with Multipath Obstructed Rayleigh		
	Tsim (s)	Rc-A	equisition Tin	ic (s)
	13111 (3)		POF	
	5			
	10			_
	15			_
	20			~~
	Avcrage	<u>.</u>	0.0	
EO&C	System only determine r	y re-acquires for short bursts whi e-acquisition time accurately.	ich are not lon	g enough to
Test Date: ngineer(s):	24-Oct-96 DML			

File Name: DDJ.XLS C-2 OR

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Page 20 of 21

(revised)

E-2Host Analog Program -> HSDS with MultipathEngineer(s):DMLDMLDate:24-Oct-96Basic Test Parameters:SIGNAL

PROPONENT SPECIFIC

COMPOSITE SIGNAL

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One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 minutes 92 kHz: Track 48 on EBU SQAM Disk

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

				Er	ror Level (%)	
		Noise	Level			/	EO&C
		C ₀ /N ₀	Attn	BER	20 Byte	220 Byte	
	CPN	63.28	63.75	0.8300	2.646	4.571	
Urban Slow	Pilot Only	63.28	63.75	0.00	0.00	0.00	Pilot only on main channel produces error free operation.
Urban Fast	CPN	63.28	63.75	1.247	6.348	34.29	
	Pilot Only	63.28	63.75	0.0510	0.2740	1.857	Improvement without main channel modulation.
Dunal East	CPN	63.28	63.75	0.4980	2.685	16.43	
Rural Fast	Pilot Only	63.28	63.75	0.0670	0.3130	2.429	Improvement without main channel modulation.
Obstructed	CPN	63.28	63.75	17.36	65.51	98.00	4 out of 28 possible iterations of file transfers made it. Statistics listed are based on the 4 files that made it
	Pilot Only	63.28	63.75	3.182	15.56	63.86	Improvement without main channel modulation.

E-2Host Analog Program -> HSDS with MultipathEngineer(s):DMLDate:24-Oct-96Basic Test Parameters:SIGNAL

One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 minutes 92 kHz: Track 48 on EBU SQAM Disk

Emmory Lowel (0/)

PROPONENT SPE	CIFIC
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COMPOSITE SIGNAL

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

				Er	ror Level (%)
		Noise	Level			-
		C/N _o	Attn	BER	20 Byte	220 Byte
Linker Clean	CPN	131.04	63.75	0.8300	2.646	4.571
Urban Slow	Pilot Only	131.04	63.75	0.00	0.00	0.00
Urban Fast	CPN	131.04	63.75	1.247	6.348	34.29
Ulball Fast	Pilot Only	131.04	63.75	0.0510	0.2740	1.857
Rural Fast	CPN	131.04	63.75	0.4980	2.685	16.43
Kulai I ast	Pilot Only	131.04	63.75	0.0670	0.3130	2.429
Obstructed	CPN	131.04	63.75	17.36	65.51	98.00
Obstructed	Pilot Only	131.04	63.75	3.182	15.56	63.86

EO&C

Pilot only on main channel produces error free operation.

Improvement without main channel modulation.

Improvement without main channel modulation.

4 out of 28 possible iterations of file transfers made it Statistics listed are based on the 4 files that made it Improvement without main channel modulation.

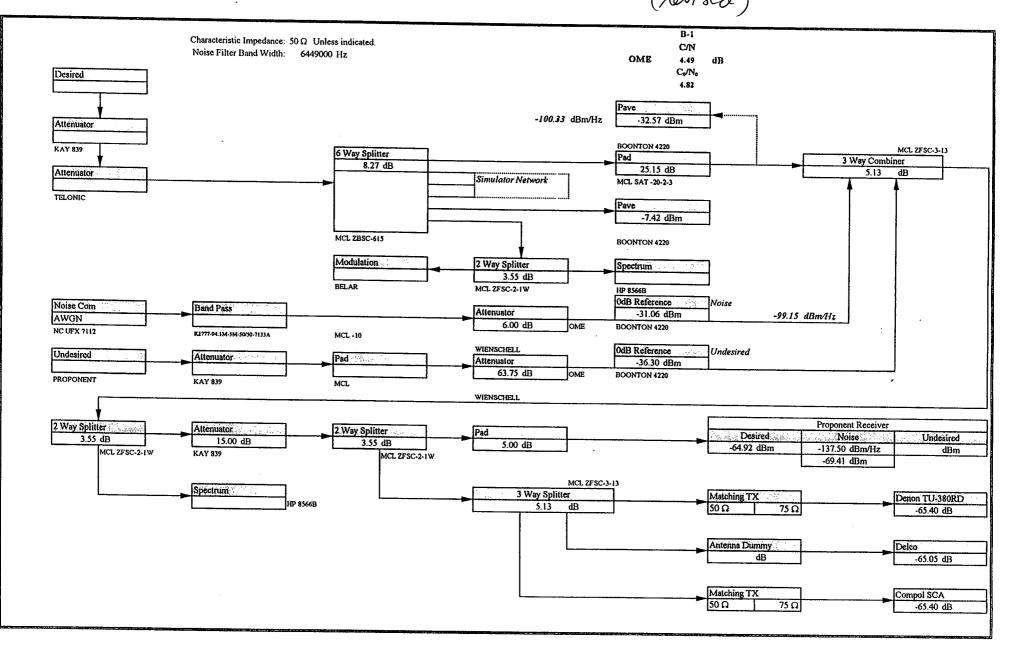
MITRE

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TESTS

B, C, & E-2

(revised)



B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

(revised)

Test Date 11/5/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

Interleaver Level 2

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Prop. Only Error Meas. Duration: 5 Min.

Analog Receivers: Delco RX 1

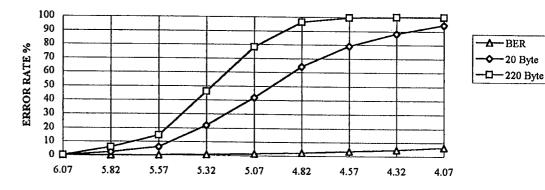
Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

COMPOSITE SIGNAL

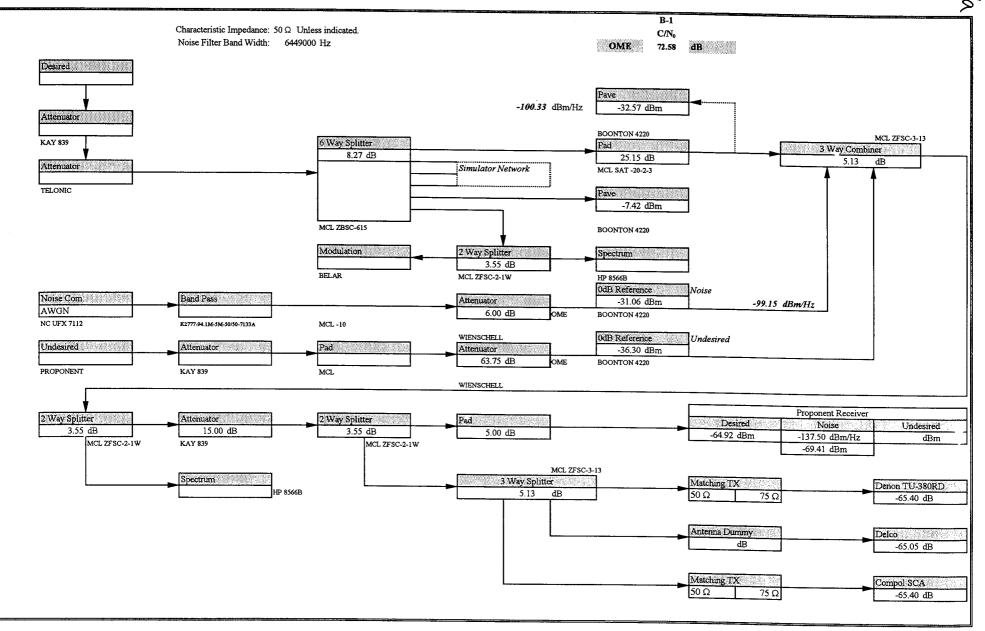
5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

B1.1 Noise Failure Characterization

	Noise Level	E	rror Level (%)
C ₀ /N ₀	Attn	BER	20 Byte	220 Byte
62.57	63.75	0	0	0
6.07	7.25	0	0	0
5.82	7.00	0.064	2.345	6.000 OME
5.57	6.75	0.164	6.103	14.741
5.32	6.50	0.646	22.01	46.07
5.07	6.25	1.307	41.72	78.15
4.82	6.00	2.304	64.19	96.44
4.57	5.75	3.468	79.01	99.48
4.32	5.50	4.649	88.02	100.0
4.07	5.25	6.407	94.56	100.0



File Name: MITRE.XLS



B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Test Date 11/5/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

Interleaver Level 2

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Prop. Only Error Meas. Duration: 5 Min.

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA

COMPOSITE SIGNAL

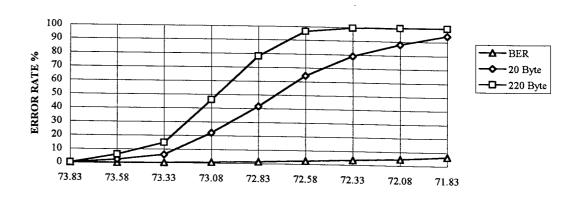
Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1

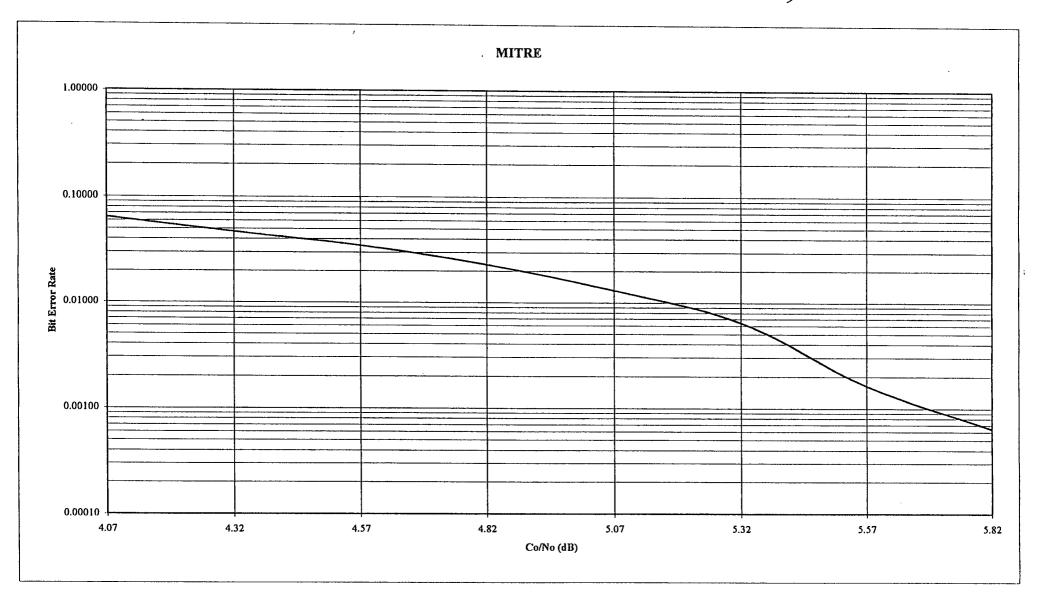
Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1Noise Failure Characterization
Noise LevelError Level (%)C/N₀AttnBER20 Byte220 Byte130.3363.75000

130.33	63.75	0	0	0	
73.83	7.25	0	0	0	
73.58	7.00	0.064	2.345	6.000	OME
73.33	6.75	0.164	6.103	14.741	
73.08	6.50	0.646	22.01	46.07	
72.83	6.25	1.307	41.72	78.15	
7 2.58	6.00	2.304	64.19	96.44	
72.33 ·	5.75	3.468	79.01	99.48	
72.08	5.50	4.649	88.02	100.0	
71.83	5.25	6.407	94.56	100.0	



(revised)



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BER

0

Error Level (%)

0

20byte

220byte

0

Noise Level

Attn

7.25 dB

(revised) (c/No = 5,82 dB - 54 19.28)

		7.00 dB	0.00051	0.03379	0.14815 [%]		ý
	Main Ch. Mod: CPN SCA Group: B	Noise Level Atten. Set 7.50 dB 7.25 dB	Err BER 0 0.00165	or Level 20byte 0 .0.05407	(%) 220byte 0 0.14815	(C/No = 6.07 d	\$ - 5er pg. 28)
B1.3a	92KHz S/N ratio (Compo	ol 92 kHz SCA Rec	eiver)				
	SCA Group: A	S/N					
		(dB)			EO&C		
	Best Case RBDS & 92 kHz Only With Provenant Comment	49					624 mV into SCA Modulator
	With Proponent Group A at OME	49 17				ence at 317 mV RMS at OME. CPN On main	channel has no effect.
B1.3b	Main ch. S/N ratio (De	enon RX 2)					
	SCA Group: A		RMS No Fil	ter	0dB taken v	vith 1 kHz Mod Souce	
	With Grp A and B1.1 noise level:	35.6 dB	OME				
B1.4 a	RBDS Block Error Level						
	C₀/N₀ 5.82	Attn 7.00 dB	Target 5	Meas 5		for $5\% \pm 2\%$ maximum for a period of 5 minutes	block errors per 100 blocks
B1.4b	RBDS error measurement at B1.4 n MAX error measurement:	oise level 5 %	Without Pro	nonent			
		5 /0	minout 110	ponent			

File Name: MITRE.XLS

B1.2

Onset of Error with other SCAs

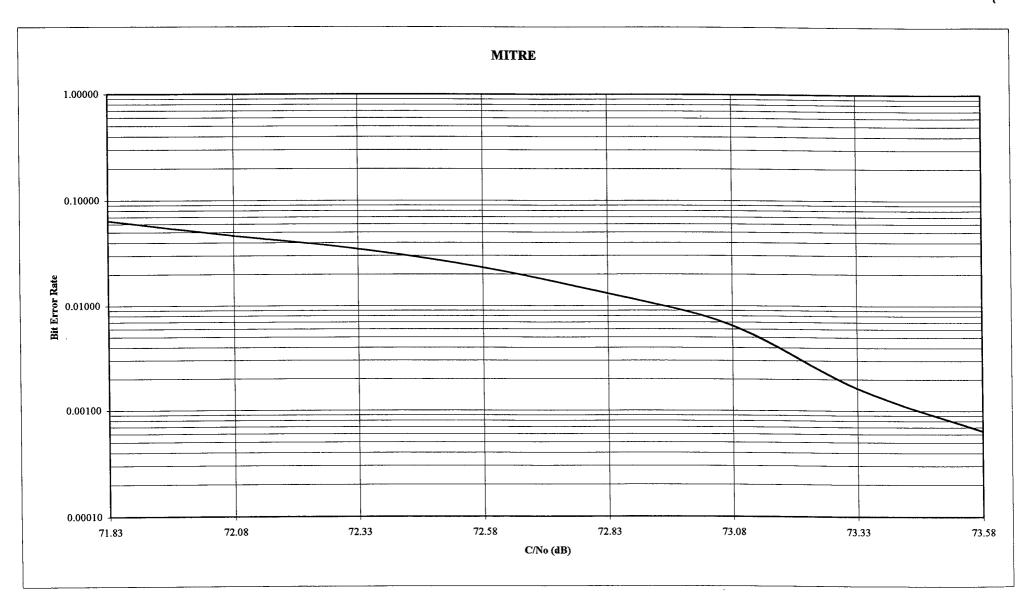
Main Ch. Mod: CPN

SCA Group: A

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File Name: MITRE_B.XLS

B-1

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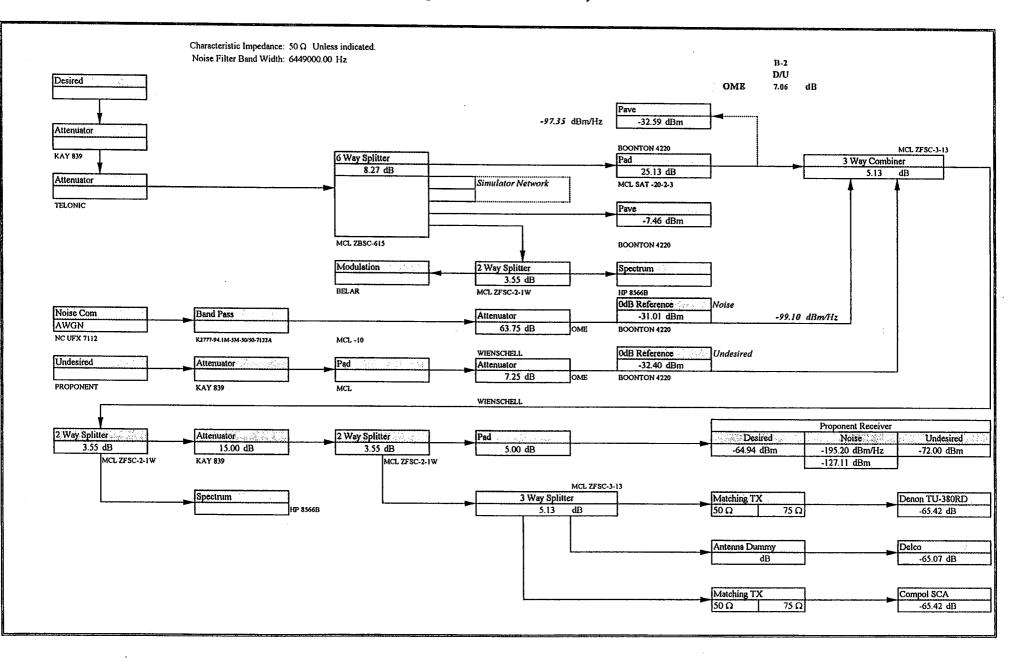
B1.2 Onset of Error with other SCAs

Main Ch. Mod: CPN	Noise Level	Error Level (%)			
SCA Group: A	Attn	BER	20byte	220byte	
	7.25 dB	0	0	0	
	7.00 dB	0.00051	0.03379	0.14815	

Main Ch. Mod: CPN						
SCA Group: B	Noise Level	Error Level (%)				
	Atten. Set	BER	20byte	220byte		
	7.50 dB	0	0	0		
	7.25 dB	0.00165	0.05407	0.14815		

B1.3a	92KHz S/N ratio (Com	pol 92 kHz SCA R	eceiver)	
	SCA Group: A	S/N		
		(dB)		EO&C
	Best Case RBDS & 92 kHz Only	49		Deviation = 5.5 kHz: Fmod=1 kHz: 624 mV into SCA Modulator
	With Proponent Group A	49		0 dB Reference at 317 mV RMS
	at OME	17		Static noise at OME. CPN On main channel has no effect.
B1.3b	Main ch. S/N ratio	(Denon RX 2)		
	SCA Group: A	57.8 dB	RMS No Filter	0dB taken with 1 kHz Mod Souce
	With Grp A and B1.1 noise level:	35.6 dB	OME	
B1.4a	RBDS Block Error Level			
	C/N _o	Attn	Target Meas	Noise Level for $5\% \pm 2\%$ maximum block errors per 100 blocks
	73.58	7.00 dB	5 5	(measured for a period of 5 minutes)
B1.4b	RBDS error measurement at B1 .	4 noise level		
	MAX error measurement:	5 %	Without Proponent	

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File Name:MITRE.XLS

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B-2 Co-Channel

PROPONENT SPECIFIC

COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Prop + SCA COMP OUT 2: Proponent Only

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Interleaver Level 2

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B2.1	Co-Channnel Analog	Reference					ORBAN #2
		gnal Parameters			Undesired Signal Parameter	0	
	RF Key Point Meas.:			BE K	ey Point Meas.: -32.40 dE		COMP OUT 1: Proponent Only
	RX RF Level:				nel Modulation: CPN	111	COMP OUT 2: Prop + SCA
	Main Channel Modulation:						
	Modulation Level:		dD Defenses	MC	dulation Level: 110 %		Main Channel modulation
			dB Reference		SCA Group: 67 & 92 kH	ĺz	adjusted for 110%
	SCA Group:				CA Modulation: 0.4 & 1 kH	ĺz	:
	Measurement:	45dB S/N ratio target on		nnel receiver	(Measurement is rms w/1)	5 kHz LPF)	
		N	o Filter		Fil	ter	
		Delco RX 1		d/u	Denon RX 2		d/u
		Best Case S/N:	56.30 dB		Best Case S/N:	60.30 dB	
		S/N: .	45.00 dB		S/N:	45.00 dB	
	Reference:	Atten:	26.00 dB	25.81 dB	Atten:	31.00 dB	30.81 dB
B2.2 a	Co-Channnel HSD In	terference			Titton.	51.00 015	30:01 (H)
	De	esired Signal Parameters	2		Underived Signal	Danamatana	
	RF Level:		5		Undesired Signal	rarameters	
	Modulation Type:						
	Modulation Level:				Modulation Type: CF		
					Modulation Level: 11		
	SCA Group:	None			SCA Group: Gr	oup A	
		Delco R	X 1	d/u	Denon R	X 2	d/u
		S/N:	45.00 dB		S/N:	45.00 dB	
	·Group A:	Atten:	26.00 dB	25.81 dB	Atten:	31.00 dB	30.81 dB

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B2.2 b	Co-Channnel HSD Interferen	ce					
	Desired Signal Par	ameters		IIn	desired Signal Paran	notore	
	RF Level: -65dBn				dean eu orginar i ar an	neter s	
	Modulation Type: None			Modulatio	n Type: CPN		
	Modulation Level: None				n Level: 110%		
	SCA Group: None				Group: Group B		
	-			0011	Group: Group D		
	Mcasurement: Target S	Signal-to-Noise R	atio				
		Delco R	X 1	d/u	Denon F	XX 2	d/u
	- 1. S	S/N:	45.00 dB		S/N:	45.00 dB	
	Group B:	Atten:	² 26.00 dB	25.81 dB	Atten:	31.00 dB	30.81 dB
B2.2c	Co-Channnel HSD -> Analog	Interference					:
	Desired Signal Par			Un	desired Signal Paran	neters	
	RF Level: -65dBn	ı					
	Modulation Type: None			Modulatio	n Type: CPN		
	Modulation Level: None				n Level: 110%		
	SCA Group: None			SCA	Group: Proponent Or	ıly	•
	Measurement: Target S	Signal-to-Noise R	atio				
		Delco R	X 1	d/u	Denon F	X 1	d/u
		S/N:	45.00 dB		S/N:	45.00 dB	u/ u
		Atten:	26.00 dB	25.81 dB	Atten:	30.75 dB	30.56 dB
				100 L ^m			

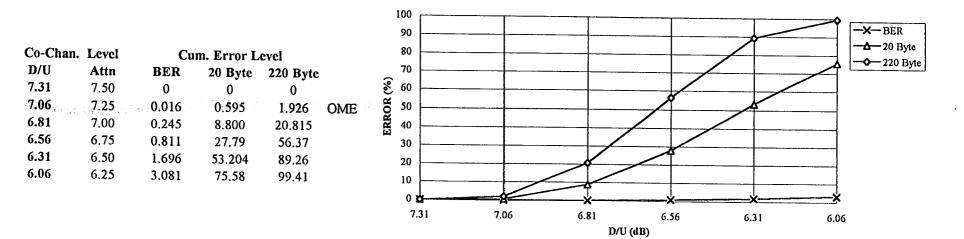
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B2.3 Co-Channel Analog -> HSD interference

Desired Signal ParametersRF Level:-65 dBmModulation Type:CPNModulation Level:110 %SCA Group:Proponent Only

Undesired Signal Parameters

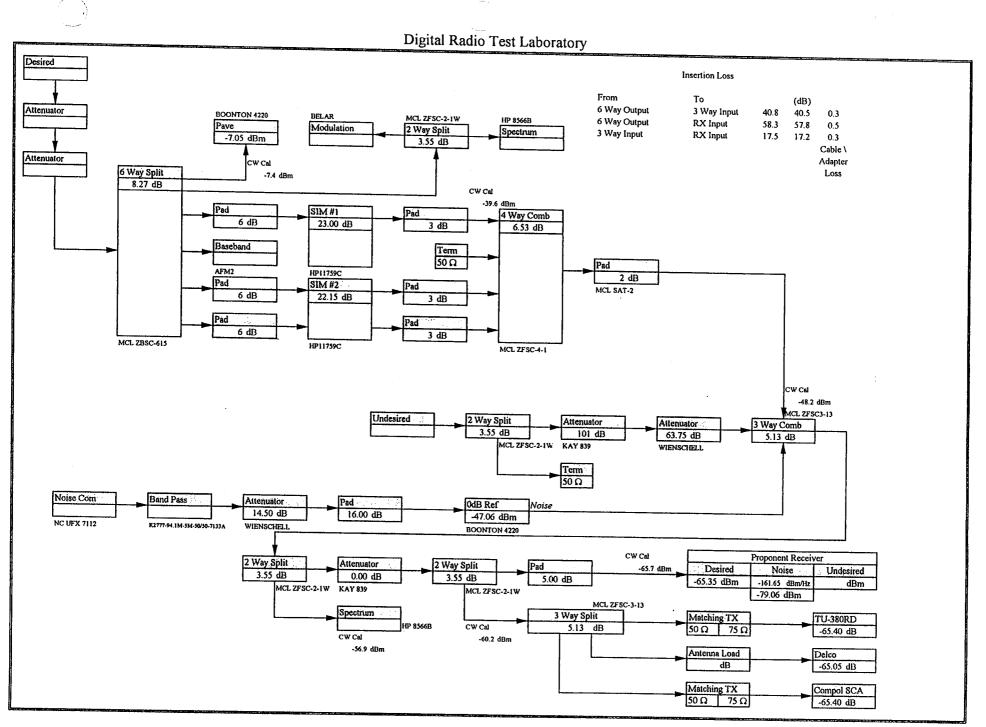
Modulation Type: CPN Modulation Level: 110 % SCA Group: 67 &92 kHz



File Name: MITRE.XLS

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PROPONENT SPECIFIC

B-3 Multipath Characterization of HS Digital Subcarrier Signal Failure Basic Test Parameters: SIGNAL

One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 minutes

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty

(revised)

COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

	c/No	Noise	Level	Eı	ror Level ((%)		EO&C		
	CINO	C ₀ /N ₀	Attn	BER	20 Byte	220 Byte				
Urban Slow	131,05	63.29	63.75	0.0000	0.0000	0.0000		Error Free performance without added noise		
	83.8	16.04	16.50	0.0000	0.0000	0.0000			4 %	at OME.
	83,3	15.54	16.00	0.0024	0.1014	0.2963			T 70	
Urban Fast	131,05	63.29	63.75	0.0000	0.0000	0.0000	(-2 18)	Error Free performance without added noise		
	81.8	14.04	14.50	0.0000	0.0000	0.0000	(-2 ")			
	81,3	13.54	14.00	0.0294	1.1287	3.2593			6 %	at OME.
Rural Fast	131.15 85.3 84.8	63.29 17.54 17.04	63.75 18.00 17.50	0.0000 0.0000 0.0222	0.0000 0.0000 0.8043	0.0000 0.0000 2.7407	(+ <u> </u> 5 18)	Error Free performance without added noise MAX RBDS Block Error= 4	0 %	at OME.
Obstructed	131.05	63.29	63.75	49.72	100.0	100.0		Performance impaired without added noise. MAX RBDS Block Error= 9 Does not remain synchronized throughout 5 measurement period.	7 % minute	at OME.

File Name: MITRE XLS

File Name: MITRE_B.XLS

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Digital Radio Test Laboratory

B-3 Multipath Characterization of HS Digital Subcarrier Signal Failure **Basic Test Parameters:** SIGNAL

> One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 minutes

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty

PROPONENT SPECIFIC

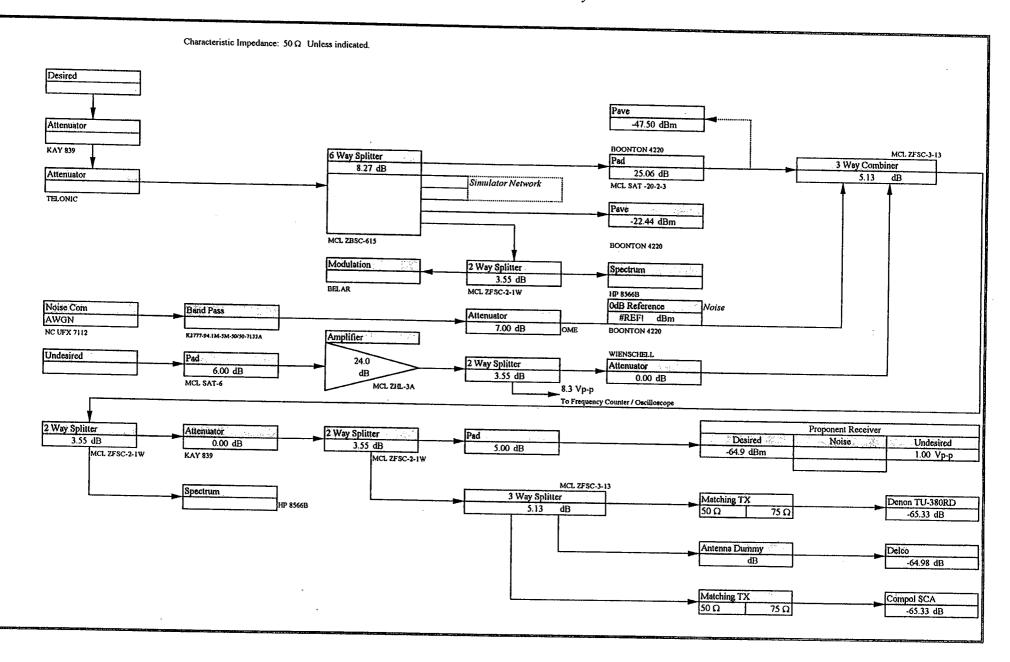
COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

	Noise	Level	Er	ror Level ((%)	EO&C	
	C/N₀	Attn	BER	20 Byte	220 Byte		
Urban Slow	131.05	63.75	0.0000	0.0000	0.0000	Error Free performance without added noise.	
	83.80	16.50	0.0000	0.0000	0.0000	MAX RBDS Block Error= 54 %	at OME.
	83.30	16.00	0.0024	0.1014	0.2963		at Olvie.
Urban Fast	131.05	63.75	0.0000	0.0000	0.0000	Error Free performance without added noise.	
	81.80	14.50	0.0000	0.0000	0.0000	MAX RBDS Block Error= 36 %	
	81.30	14.00	0.0294	1.1287	3.2593	50 /0	at OME.
Rural Fast	131.05	63.75	0.0000	0.0000	0.0000	Error Free performance without added noise.	
	85.30	18.00	0.0000	0.0000	0.0000	MAX RBDS Block Error= 40 %	at OME.
	84.80	17.50	0.0222	0.8043	2.7407		at OIVIL.
Obstructed	131.05	63.75	49.72	100.0	100.0	Performance impaired without added noise. MAX RBDS Block Error= 97 % Does not remain synchronized throughout 5 minute measurement period.	at OME.

B-3





B-4 Impulse Noise

11/6/96

see also supplemental data.

Desired Signal

-65 dBm and Group A S

at Receiver Input Subcarriers Undesired Signal 10 ns wide 1.0 Vp-p pulse at receiver input Repetition Rate Variable

Results accumulated over 5 minute measurement period.

				Pilot Only		
Repetition Rate	BER	20 Byte	220 Byte	Attenuator Setting	Voltage	
(Hz)				(dB)	(Vp-p)	
100	0.0000	0.0000	0.0000	0	1.0000	
200	0.0000	0.0000	0.0000	0	1.0000	
300	0.2338	8.915	20.07	0	1.0000	
300	0.0815	3.177	7.704	10	0.3162 see Plot	
300	0.0000	0.0000	0.0000	15	0.1778	
600	0.0000	0.0000	0.0000	0	1.0000	
1000	0.0000	0.0000	0.0000	0	1.0000	

	Clipped Pink Noise (Stereo)							
Repetition Rate	BER	20 Byte	220 Byte	Attenuator Setting	Voltage			
(Hz)				(dB)	(Vp-p)			
100	0.0000	0.0000	0.0000	0	1.0000			
200	0.0086	0.3244	0.5926	0	1.0000			
200	0.0000	0.0000	0.0000	5	0.5623			
300	0.3131	11.87	26.67	0	1.0000			
300	0.0387	1.345	3.333	10	0.3162			
300	0.0000	0.0000	0.0000	15	0.1778			
600	0.0000	0.0000	0.0000	0	1.0000			
1000	0.0000	0.0000	0.0000	0	1.0000			

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SUPPLEMENTAL DATA

B-4 Impulse Noise

Ammended: 3/11/97

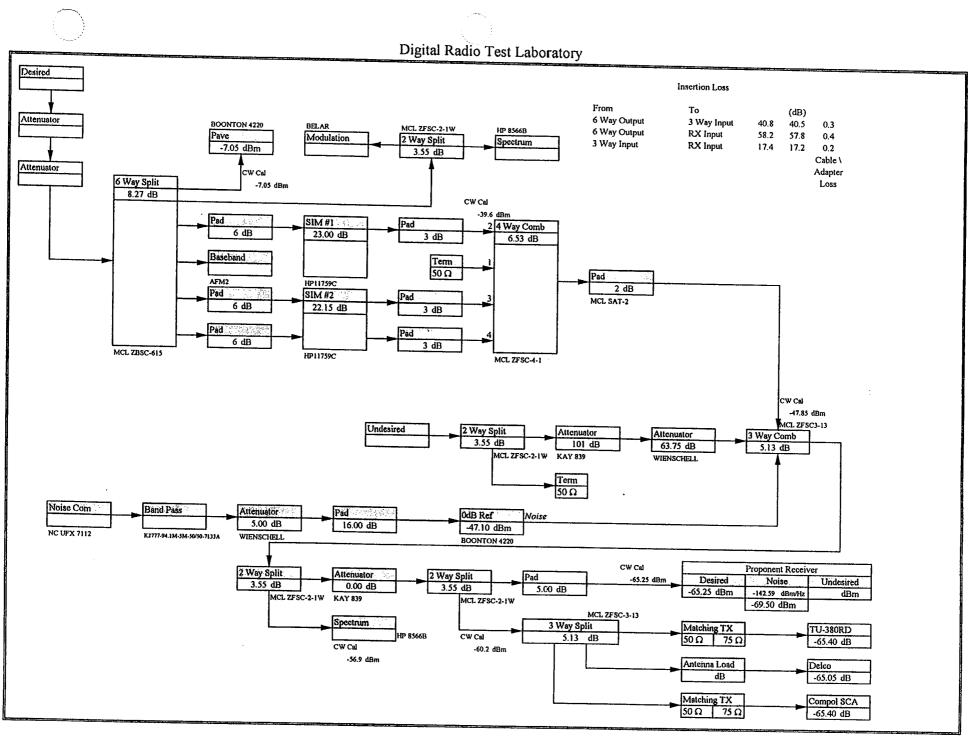
Desired	Signal	
-1	65 dBm	at
Group	А	Su

5 dBm at Receiver Input A Subcarriers Undesired Signal 1C ns wide 1.0 Vp-p pulse at receiver input Repetition Rate Variable

Results accumulated over 5 minute

measurement period.

Repetition Rate (Hz)	BER	20 Byte	220 Byte	Attenuator Setting (dB)	Voltage (Vp-p)	
198	0.000	0.000	0.000	0	1.0000	
202	0.000	0.000	0.000	0	1.0000	
297	0.000	0.000	0.000	0	1.0000	
303	0.000	0.000	0.000	0	1.0000	
625	0.000	0.000	0.000	0	1.0000	



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Scenario	Reflected Path		CPN	Medium Sig	nal Strengt	h Pilot Only		
#1	400 km/h Doppler 27.5 μs Delay	BER 100.0	20 Byte 100.0	220Byte 100.0	BER 0.000	20 Byte 0.000	220Byte 0.000	%
	8.00 dB	Not trackir	ng STIC with	CPN on ma	in channel.			
#2	200 km/h Doppler 13.7 μs Delay 6.00 dB	BER 32.22	20 Byte 100.0	220Byte 100.0	BER 0.000	20 Byte 0.000	220Byte 0.000	%
#3	100 km/h Doppler 6.8 μs Delay 4.00 dB	BER 21.21	20 Byte 99.97	220Byte 100.0	BER 0.000	20 Byte 0.000	220Byte 0.000	%

Filename: MITRE.XLS B-5

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B-6 Weak Signal
Characterization of HS Digital Subcarrier Signal Failure

pilot: proponent: 57 kHz: 92 kHz: Total Injection:	9 % 10 % % 19 % Proponent Only		9 % 10 % 3 % 7 % 29 % A		9 % 10 % 10 % % 29 % B	
Signal Level:	-93 ≤ome< -92	dBm	-93 ≤ome< -92	dBm	-93 ≤ome< -92	dBm

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C-1 Re-Acquisition		8/14/96		
	POF-2dB	Re-Acquisition Time (s) POF-4dB	POF-6dB	
	18.8	20.6	22.7	
	23.5	15.3	18.0	
	14.9	18.0	. 17.1	
	14.4	17.6	15.4	
	23.4	16.3	18.8	
Average	19.0	17.6	18.4	
Point Of Failure Atter Desired Signal Refere Noise 0 dB Reference		3.75 dB -32.77 dBm -31.0 dBm		
Desired Signal Level a	at Receiver		55 dBm	

POF Noise Level is defined as the level which causes 20 and 220 byte Packet Error Rates of $95\% \pm 5\%$.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

File Name: MITRE.XLS

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د:		Urban Slow Rayleigh		<u> </u>
	Tsim (s)	POF-2	Re-Acquisition Time (3) POF-4	POF-6
	5	18.7	18.4	17.1
	10	19.7	22.8	17.5
	15	23.8	22.3	16.4
	20	17.1	21.3	16.6
	Average	19.8	21.2	16.9
	POF Atten	uator Setting:	12 dB	
C	<u></u>	Point of Failure (POF) d 220 Byte Message Error		1 %

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Tsim (s)	FOF-2	e-Acquisition Time (s) POF-4	POF-6
5	23.3	23.7	18.7
10	24.9	13.6	13.3
15	15.4	15.0	14.0
20	15.8	18.1	21.9
Average	19.9	17.6	17.0
	POF Attenuator S	etting: 12 dB	
		<u> </u>	

File Name: MITRE.XLS C-2 UFR

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fest	C-2 Re- Rui	Acquisition with Muli al Fast Rayleigh	tipath		
	Tsim (s)		Rc-Acquisition Time (s		
		POF-2	POF-4	POF-6	
	5	24.6	15.4	16.1	
	10	18.7	14.5	18.6	
	15	16.8	22.0	24.0	
	20	22.7	18.0		
			;"	S	
	Average	20.7	17.5	18.3	
	- 141 - T	POF Attenuator	Setting: 16 dB		
0&C					
	te: 25-Oct-96				
gineer(s	s): DML				

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Test	C-2 R O	Re-Acquisition with Multipath Dbstructed Rayleigh
	Tsim (s)	Re-Acquisition Time (s) POF
	5	
	10	
	15	
	20	
	Average	0.0
50&C	System did no	ot re-acquire 5 minutes into this simulation.
Test Date: ngineer(s):	25-Oct-96 DML	

File Name: MITRE.XLS C-2 OR

Page 20 of 22

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(revised)

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E	E-2 Host Analo ngineer(s): DML		24-Oct-96	5	oath			
Da	asic Test Parameters:		SIG	NAL		PROF	PONENT SPECIFIC	COMPOSITE SIGNAL
		Main Cha	CA Group	CPN (Unb A 5 minutes Track 48 c	alanced) on EBU SQ4 rror Level (5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Or COMP OUT 2: Prop + SCA
		Noise C₀/N₀	Level Attn	BER	20 Byte	220 Byte	EO&C	
Urban Slow	CPN	63.29 15.04 14.54	63.75 15.50 15.00	0.0000 0.0000 0.0007	0.0000 0.0000 0.0270	0.0000 0.0000 0.1482		
	Pilot Only	63.29 13.04 12.54	63.75 13.50 13.00	0.0000 0.0000 0.0044	0.0000 0.0000 0.1825	0.0000 0.0000 0.5185		
Urban Fast	CPN	63.29 13.54 13.04	63.75 14.00 13.50	0.0000 0.0000 0.0158	0.0000 0.0000 0.6517	0.0000 0.0000 1.643		
Urban Fast	Pilot Only	63.29 11.54 11.04	63.75 12.00 11.50	0.0000 0.0000 0.0314	0.0000 0.0000 1.190	0.0000 0.0000 3.407		

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(revised)

	Error Level (%)						
		Noise	Level				
		C₀/N₀	Attn	BER	20 Byte	220 Byte	EO&C
		63.29	63.75	0.0000	0.0000	0.0000	
	CPN	17.54	18.00	0.0000	0.0000	0.0000	
Rural Fast		17.04	17.50	0.0030	0.1014	0.2963	
		63.29	63.75	0.0000	0.0000	0.0000	
	Pilot Only	16.04	16.50	0.0000	0.0000	0.0000	
		15.54	16.00	0.0009	0.0406	0.1482	
Obstructed Fast	CPN	63.29	63.75	100.00	100.0	100.0	System would not re-acquire
		63.29	63.75	0.0000	0.0000	0.0000	
	Pilot Only	17.54	18.00	0.0000	0.0000	0.0000	
		17.04	17.50	0.0009	0.0473	0.7404	

File Name: MITRE.XLS

1. 0.

E-2 Host Analog Program -> HSSC with Multipath

Engineer(s): DML Date: 24-Oct-96 **Basic Test Parameters:**

SIGNAL

PROPONENT SPECIFIC

EO&C

C	One Path 2	Zero Phase	Reference:	-65dBm		
		Main Char	nnel Mod:	CPN (Unba	alanced)	
		S	CA Group:	Α	,	
	Error Me	easurement	Duration:	5 minutes		
			92 kHz:	Track 48 o	n EBU SQA	M Disk
				Er	ror Level (%)
		Noise	Level			
		C/N _e	Attn	BER	20 Byte	220 Byte
		131.05	63.75	0.0000	0.0000	0.0000
	CPN	82.80	15.50	0.0000	0.0000	0.0000
		82.30	15.00	0.0007	0.0270	0.1482
Urban Slow						
		131.05	63.75	0.0000	0.0000	0.0000
Pi	lot Only	80.80	13.50	0.0000	0.0000	0.0000
		80.30	13.00	0.0044	0.1825	0.5185
		131.05	63.75	0.0000	0.0000	0.0000
	CPN	81.30	14.00	0.0000	0.0000	0.0000
		80.80	13.50	0.0158	0.6517	1.643
Urban Fast						
		131.05	63.75	0.0000	0.0000	0.0000
Pi	lot Only	79.30	12.00	0.0000	0.0000	0.0000
		78.80	11.50	0.0314	1.190	3.407

COMPOSITE SIGNAL

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA

				Er	ror Level (%)	
		Noise Level					
		C/N _o	Attn	BER	20 Byte	220 Byte	EO&C
		131.05	63.75	0.0000	0.0000	0.0000	
	CPN	85.30	18.00	0.0000	0.0000	0.0000	
		84.80	17.50	0.0030	0.1014	0.2963	
Rural Fast							
		131.05	63.75	0.0000	0.0000	0.0000	
	Pilot Only	83.80	16.50	0.0000	0.0000	0.0000	
		83.30	16.00	0.0009	0.0406	0.1482	
Obstructed Fast	CPN	131.05	63.75	100.00	100.0	100.0	System would not re-acquire
Costructed 1 ast		131.05	63.75	0.0000	0.0000	0.0000	
	Pilot Only	85.30	18.00	0.0000	0.0000	0.0000	
		84.80	17.50	0.0009	0.0473	0.7404	

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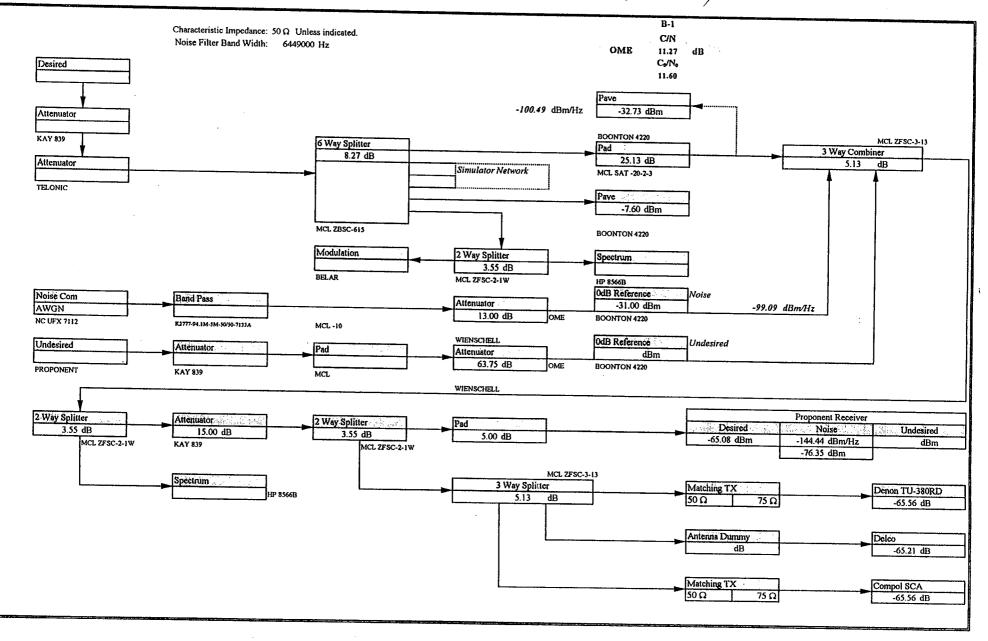
SEIKO

TESTS

B, C, & E-2

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(revised)



 $\overline{\Omega}_{1}$

B-1 Additive White Gaussian Noise Digital Characterization of HS Digital Subcarrier Signal Failure

Digital Radio Test Laboratory

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Prop. Only Error Meas. Duration: 5 Min.

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PROPONENT SPECIFIC PCR average weighting 4096 PCR averaged over 5 minute period.

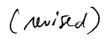
BCR averaged over 5 minute period.

Analog Receivers: Delco RX 1

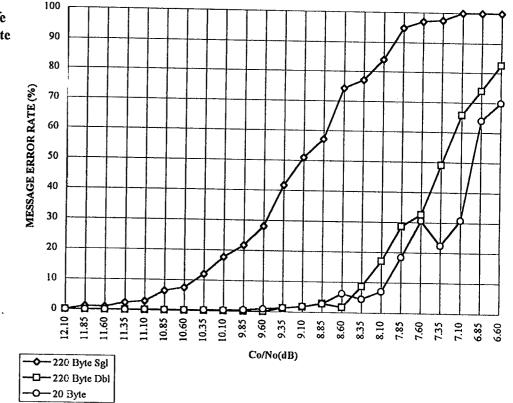
Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility

B1.1 Noise Failure Characterization

		Х	Error (%)	d d	Co	ompletion (%)
.		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Single	Double		Single	Double
C _o /N _o	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte
12.10	13.50	0.000	0.000	0.000	100.0	100.0	100
11.85	13.25	0.000	1.140	0.000	100.0	98.86	100
11.60	13.00	0.000	1.000	0.000	100.0	99.00	100
11.35	12.75	0.000	2.290	0.000	100.0	97.71	100
11.10	12.50	0.100	2.860	0.000	99.90	97.14	100
10.85	12.25	0.100	6.400	0.000	99,90	93.60	100
10.60	12.00	0.100	7.430	0.000	99.90	92.57	100
10.35	11.75	0.200	12.00	0.000	99.80	88.00	100
10.10	11.50	0.200	17.71	0.000	99.80	82.29	100
9.85	11.25	0.400	21.71	0.000	99.60	78.29	100
9.60	11.00	0.800	28.00	0.000	99.20	72.00	100
9.35	10.75	1.300	41.71	1.140	98.70	58.29	98.86
9.10	10.50	1.800	50.86	1.710	98.20	49.14	98.80 98.29
8.85	10.25	2.800	57.14	2.860	97.20	42.86	98.29 97.14
8.60	10.00	6.100	74.29	1.710	93.90	25.71	97.14 98.29
8.35	9.75	4.40	77.14	8.570	95.60	22.86	98.29 91.43 ·
8.10	9.50	7.00	84.00	17.00	93.00	16.00	
7.85	9.25	18.30	94.86	28.57	81.70	5.140	83.00
7.60	9.00	30.50	97.00	32.50	69.50	3.000	71.43
7.35	8.75	22.30	97.50	49.00	77.70		67.50
7.10	8.50	30.7	100.0	65.71	69.30	2.500	51.00
6.85	8.25	63.9	100.0	74.00		0.000	34.29
6.60	8.00	69.8	100.0		36.10	0.000	26.00
2000	0.00	0,0	100,0	82.50	30.20	0.000	17.50



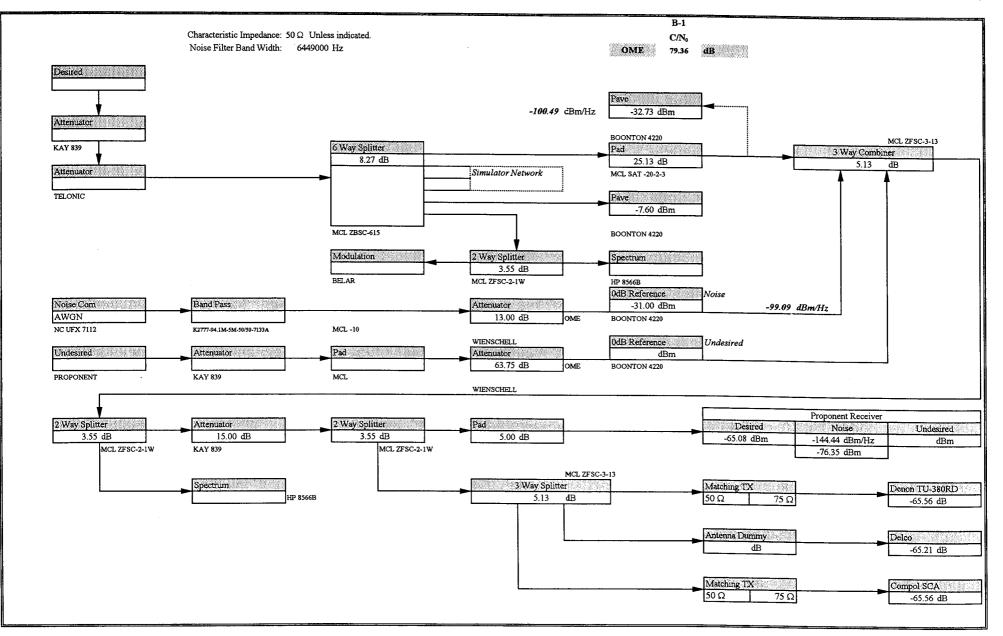
COMPOSITE SIGNAL ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%



Little confidence in 20 byte due to visual hits not included in average: even though instantaneous PCR goes to 92.3% average stays at 100%.

File Name: SEIKO.XLS

B-1



Characterization of HS Digital Subcarrier Signal Failure 9/17/96 DML SIGNAL

Basic Test Parameters:

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Prop. Only Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

PCR average weighting 4096 PCR averaged over 5 minute period. BCR averaged over 5 minute period.

COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed **ORBAN #2** COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

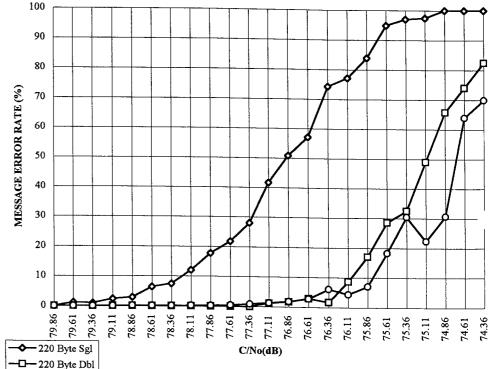
Analog Receivers: Delco RX 1

B-1 Additive White Gaussian Noise

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

			Error (%)		Completion (%)			
			Single	Double		Single	Double	
C/N₀	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte	
7 9.86	13.50	0.000	0.000	0.000	100.0	100.0	100	
79.61	13.25	0.000	1.140	0.000	100.0	98.86	100	
79.36	13.00	0.000	1.000	0.000	100.0	99.00	100	
79.11	12.75	0.000	2.290	0.000	100.0	97.71	100	
78.86	12.50	0.100	2.860	0.000	99.90	97.14	100	
78.61	12.25	0.100	6.400	0.000	99.90	93.60	100	
78.36	12.00	0.100	7.430	0.000	99.90	92.57	100	
78.11	11.75	0.200	12.00	0.000	99.80	88.00	100	
77 .8 6	11.50	0.200	17.71	0.000	99.80	82.29	100	
77 .61	11.25	0.400	21.71	0.000	99.60	78.29	100	
77.36	11.00	0.800	28.00	0.000	99.20	72.00	100	
77.11	10.75	1.300	41.71	1.140	98.70	58.29	98.86	
76.86	10.50	1.800	50.86	1.710	98.20	49.14	98.29	
76.61	10.25	2.800	57.14	2.860	97.20	42.86	97.14	
76.36	10.00	6.100	74.29	1.710	93.90	25.71	98.29	
76.11	9.75	4.40	77.14	8.570	95.60	22.86	91.43	
75.86	9.50	7.00	84.00	17.00	93.00	16.00	83.00	
75.61	9.25	18.30	94.86	28.57	81.70	5.140	71.43	ſ
75.36	9.00	30.50	97.00	32.50	69.50	3.000	67.50	
75.11	8.75	22.30	97.50	49.00	77.70	2.500	51.00	
7 4.86	8.50	30.7	100.0	65.71	69.30	0.000	34.29	
74.61	8.25	63.9	100.0	74.00	36.10	0.000	26.00	
74.36	8.00	69.8	100.0	82.50	30.20	0.000	17.50	



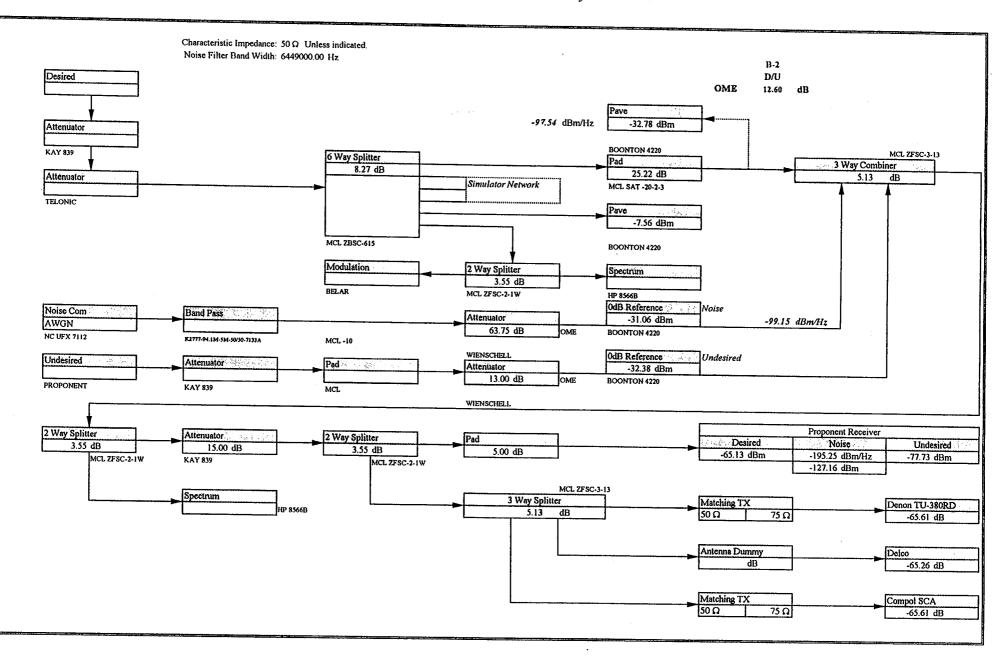
-**O**-20 Byte

	\bigcirc	Digita	l Radio Test Lat	boratory (verised) (also see suppermembel data)
B1.2	Onset of Error with other SCAs	9/17/90	6	(also see suppermulted later)
	Main Ch. Mod: CPN SCA Group: A SCA Mod: 1kHz	C₀/N₀ Attn 13.10 14.50 12.85 14.25	Error (%) Single 20 Byte 220 Byte 0.000 0.500) Completion (%) Double Single Double
	Main Ch. Mod: CPN SCA Group: B	C ₀ /N ₀ Attn 62.35 63.75 Errors occur without a 57 kHz uneffected.	Error (%) Single 20 Byte 220 Byte 7.50 significant noise added.	DoubleSingleDouble220 Byte20 Byte220 Byte220 Byte7.0092 5093 00
B1.3a	92KHz S/N ratio SCA Group: A Best case RBDS & 92kHz Only With Proponent Group A: at OME;	(Compol 92KHz SCA S/N (dB) 49 49 23.7	A Rec.)	EO&C Rushing noise heard from SCA receiver
B1.3 b	Main ch. S/N ratio SCA Group: A With Grp A and B1.1 noise level:	(Denon RX 2) 57.9 dB 38.7 dB	RMS No Filter	0dB taken with 1 kHz Mod Souce
B1.4a	RBDS Block Error Level C _o /N _o 6.10	Attn 7.50 dB	Target Meas 5 5	Noise Level for $5\% \pm 2\%$ maximum block errors per 100 blocks (measured for a period of 5 minutes)
B1.4b	RBDS error measurement at B1 MAX error measurement:	.4 noise level 5 %	Without Proponent	

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B1.2	Onset of Error with other SCAs		9/17/96		Amended 2	2/26/97			
	Main Ch. Mod: CPN				Error (%)		Co	mpletion (•
	SCA Group: A SCA Mod: 1kHz	C/N₀ 77.61 77.36	Attn 11.25 11.00	20 Byte	Single 220 Byte 0.000 25.14	Double 220 Byte 0.000 1.710	20 Byte	100.0	100
		//.50	11.00		23.14	1.710		74.86	98.29
	Main Ch. Mod: CPN								
	SCA Group: B				Error (%)		Co	ompletion (-
			A 44 .	3 0 D (Single	Double		Single	Double
		C/N ₀ 82.36	Attn 16.00	20 Byte	•	•	20 Byte	220 Byte	220 Byte
		82.30 82.11	15.75		0.000 32.57	0.000 1.710		100.0 67.43	100 98
			20.70		52.57	1.710		07.45	20
B1.3 a	92KHz S/N ratio	(Compol 92	KHz SCA	Rec.)					
	SCA Group: A	S/N	(dB)						
						EO&C			
	Best case RBDS & 92kHz Only	49				Rushing no	oise heard fi	rom SCA re	ceiver
	With Proponent Group A:	49							
	at OME:	23.7							
B1.3b	Main ch. S/N ratio	(Denon RX	(2)						
	SCA Group: A	57.9		RMS No F	Filter	0dB taken	with 1 kHz	Mod Souce	
	With Grp A and B1.1 noise level:	38.7	dB	OME					
B1.4a	RBDS Block Error Level C/N ₀ 73.86	Attn 7.50	dB	Target 5	Meas 5			2% maximu l of 5 minute	um block errors per 100 blocks es)
B1.4b	RBDS error measurement at B1 MAX error measurement:	.4 noise leve		Without P	-				

			Digital	Radio 7	fest Lab	oratory	(with	RDS	phasing	conectly)
B1.2	Onset of Error with other SCAs		9/17/96	;	Ammended	1 2/26/97				conectly)
	Main Ch. Mod: CPN SCA Group: A SCA Mod: 1kHz	C₀/N₀ 9.85 9.60	Attn 11.25 11.00	20 Byte	Error (%) Single 220 Byte 0.000 25.14	Double 220 Byte 0.000 1.710	Co 20 Byte	Single 220 Byte 100.0 74.86	%) Double	
	Main Ch. Mod: CPN SCA Group: B	C₀/N₀ 14.60 14.35	Attn 16.00 15.75	20 Byte	Error (%) Single 220 Byte 0.000 32.57	Double	Co 20 Byte	ompletion (Single 220 Byte 100.0 67.43	Double	
B1.3a	92KHz S/N ratio SCA Group: A	(Compol 92 S/N	2KHz SCA (dB)	Rec.)						
ł	Best case RBDS & 92kHz Only With Proponent Group A: at OME:	49 49 23.7				EO&C Rushing no	oise heard f	rom SCA re	eceiver	
B1.3b	Main ch. S/N ratio SCA Group: A	(Denon RX 57.9		RMS No I	Filter	0dB taken	with 1 kHz	Mod Souce	2	
	, With Grp A and B1.1 noise level:	38.7	dB	OME						
B1.4a	RBDS Block Error Level C ₀ /N ₀ 6.10	Attn 7.50	dB	Target 5	Meas 5			2% maxim d of 5 minu		ors per 100 blocks
B1.4b	RBDS error measurement at B1 MAX error measurement:		vel %	Without F	Proponent	•				

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(17 (Tacm/men)

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B-2 Co-Channel

Co-Channel Analog Reference

RX RF Level:

SCA Group: None

RF Key Point Meas .:

Modulation Level:

Main Channel Modulation:

Characterization of HS Digital Subcarrier Signal Failure

Date	
9/18/96	

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B2.1

Engineer(s): DML

Desired Signal Parameters

-32.78 dBm

100 %

-65 dBm

l kHz

Measurement: 45dB S/N ratio target on main analog channel receiver

0 dB Reference

PROPONENT SPECIFIC

Undesired Signal Parameters

SCA Group: 67 & 92

SCA Modulation: 0.4 & 1

-32.38 dBm

110 %

(Measurement is rms w/15 kHz LPF)

kHz

kHz

RF Key Point Meas .:

Main Channel Modulation: CPN

Modulation Level:

COMPOSITE SIGNAL

01 (7)

ORBAN #1 COMP OUT 1: Prop + SCA COMP OUT 2: Proponent Only

ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%

						-	
		Delco RX 1		d/u	Denon RX 2		d/u
		Best Case S/N:	57.30 dB		Best Case S/N:	60.00 dB	uru
	Reference:	S/N: Atten:	45.00 dB 25.50 dB	25 10 JD	S/N:	45.00 dB	
B2.2a	Co-Channnel HSD Interfer		23.30 UD	25.10 dB	Atten:	30.00 dB	29.60 dB
	Desired RF Level: -65d	Signal Parameters Bm			Undesired Signal	l Parameters	
	Modulation Type: None Modulation Level: None SCA Group: None				Modulation Type: Cl Modulation Level: 11 SCA Group: G	10%	

 Delco RX 1
 d/u
 Denon RX 2
 d/u

 S/N:
 45.00 dB
 S/N:
 45.00 dB
 S/N:
 45.00 dB

 Group A:
 Atten:
 25.50 dB
 25.10 dB
 Atten:
 30.00 dB
 29.60 dB

B2.2b	Co-Channnel HSD Interference Desired Signal Para RF Level: -65dBm	ameters		Un	desired Signal Parar	neters	
	Modulation Type: None Modulation Level: None SCA Group: None			Modulation	n Type: CPN n Level: 110% Group: Group B		
	Measurement: Target Si	gnal-to-Noise R	atio				
		Delco R S/N:	X 1 45.00 dB	d/u	Denon I		d/u
	Group B:	Atten:	25.50 dB	25.10 dB	S/N: Atten:	45.00 dB 30.00 dB	29.60 dB
B2.2c	Co-Channnel HSD -> Analog J Desired Signal Para RF Level: -65dBm Modulation Type: None Modulation Level: None SCA Group: None Measurement: Target Si	imeters	atio	Modulation Modulation	desired Signal Paran n Type: CPN 1 Level: 110% Group: Proponent Or		:
		Delco R S/N:	45.00 dB	d/u	Denon R S/N:	XX 2 45.00 dB	d/u
		Atten:	25.50 dB	25.10 dB	Atten:	29.75 dB	29.35 dB

File Name: SEIKO.XLS

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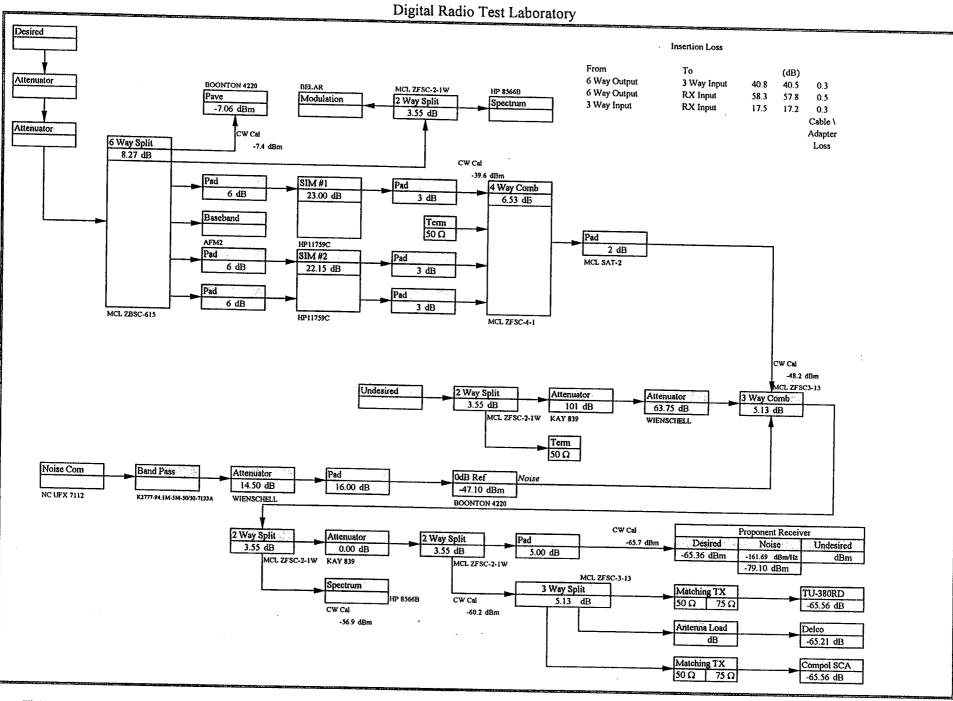
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B2.3	Desired Signal Parameters RF Level: -65 dBm Modulation Type: CPN Modulation Level: 110 % SCA Group: Proponent Only						Modu	Undesi Ilation Ty Iation Lev SCA Gro	vpe: vel:	CF 1							·				
<u> </u>			Error (%)		Co	mpletion (%)						-								
-Chan. Lo			Single	Double		Single	Double			<u> </u>	- 22 0 E	uto Col									
D/U	Attn	20 Byte	220 Byte	220 Byte	20 Byte	220 Byte	220 Byte				-220 E										
13.85 13.60	14.25		0.000	0.000		100.0	100.0	100.000			220 2	J 10 D 01									
13.35	14.00 13.75		1.140	0.000		98.86	100.0								1	TT		1	<u> </u>	·	- <u></u>
13.10	13.75		2.290	0.000		97.71	100.0	90.000				┥╌┦				+-+			┝──┼	-+	4
12.85	13.30		4.000	0.000		96.00	100.0	80.000									1_			_Å_	
12.60	13.00		6.500 8.000	0.000 0.000		93.50	100.0	70.000													
12.35	12.75		17.50	0.000		92.00	100.0									K			1		-1
12.10	12.50		24.00	1.140		82.50	100.0	60.000 ج							-/-				┟─┤		
11.85	12.25		41.71	0.570		76.00 58.29	98.86 00.42	8 50.000	<u>├</u>	+					<u>/</u>			<u>↓</u> _/			
11.60	12.00		48.00	5.710		52.00	99.43 94.20	10.000							Τ						
11.35	11.75		66.29	6.860		33.71	94.29 93.14							Λ				\$			7
11.10	11.50		81.71	13.710		18.29	86.29	30.000							1		17	4			
10.85	11.25		87.50	19.500		12.50	80.50	20.000		┼╴┼╴			$ \land $				×				_
10.60	11.00		96.00	34.290		4.000	65.71	10.000							· · ·	X		_			_
10.35	10.75		97.71	57.710		2.290	42.29	0.000		4-4	1	T			ϕ						
10.10	10.50		100.00	73.140		0.000	26.86			2 O	85	03 20 20	0	- <u>-</u>	0 4	<u> </u>			<u>بالم</u>		
9.85	10.25		100.00	84.500		0.000	15.50	:	13.60	13.35 13.10	12.85	12.60 12.35	12.10	D/U (4	11.6	دد.11 10.11	10.85	10.60	دد.01 10.10	9.85	9.60
9.60	10.00		100.00	96.000		0.000	4.000							D/U ((1B)						

This data amended-refe to amended data

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File Name:SEIKO.XLS

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SUPPLEMENTAL PATA V

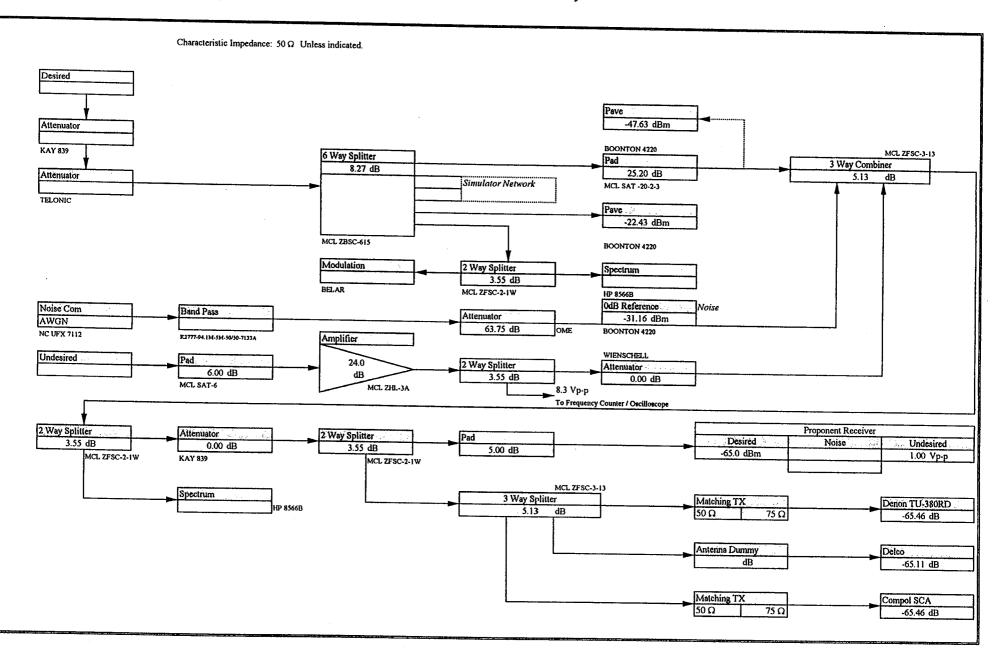
	: ن_													
						Digital	Radio T	est La	bora	atory	7	Ĩ	SUPPLEMENTAL PATA	S
													PATA	7 A
B2.3	Co-Chann	el Analog -	> HSD inte	rference			Ammended							-+-
			gnal Paran	ieters			3/7/97		Un	desire	d Signa	l Paramet	ters	
		RF Level:	-65	dBm	Weighting									
		lation Type:			512			Mo	dulatio	n Type	e:	CPN		
		ation Level:						Mod	lulation	n Level	l:	110 %		
	5	SCA Group:	Proponent						SCA	Group	o: 67 &	2 kHz		
			Error (%)		Co	mpletion (
-Chan. I			Single	Double		Single	Double						••-20	
D/U	Attn	20 Byte	220 Byte	220 Byte	-	220 Byte	•				•		O 220 Sgl 220 Dbl	
13.85	14.25	0.0	0.000	0.000	100.0	100.0	100.0	100			<u></u>			-00
13.60	14.00	0.0	1.140	0.000	100.0	98.86	100.0	90						
13.35	13.75	0.0	2.290	0.000	100.0	97.71	100.0	⁹⁰						
13.10	13.50	0.1	4.000	0.000	99.9	96.00	100.0	80 -			<u> </u>		+	A
12.85	13.25	0.1	6.500	0.000	99.9	93.50	100.0	70						F .
12.60	13.00	0.1	8.000	0.000	99.9	92.00	100.0							
12.35	12.75 12.50	0.2 0.4	17.50 24.00	0.000 1.140	99.8 99.6	82.50	100.0	ર્ટ ⁶⁰ ∣		-				
12.10 11.85	12.50	0.4	24.00 41.71	0.570	99.0	76.00 58.29	98.86 99.43	8 50					+	
11.60	12.25	0.9	41.71	5.710	99.1 99.2	52.00	99.43 94.29	60 050 050 050						
11.35	11.75	1.2	66.29	6.860	98.8	33.71	93.14	щ 4 0						
11.35	11.50	1.2	81.71	13.71	98.3	18.29	86.29	30 -						
10.85	11.25	6.0	87.50	19.50	94.0	12.50	80.50	20						
10.60	11.20	10.5	96.00	34.29	89.5	4.000	65.71							-4
10.35	10.75	15.2	97.71	57.71	84.8	2.290	42.29	10				-0		
10.10	10.50	16.2	100.0	73.14	83.8	0.000	26.86	ᅆᇥ	-0-		5 <u> </u>	-dd		
9.85	10.25	25.6	100.0	84.50	74.4	0.000	15.50	13.8	5 1	13.35	12.85	12.35	11.85 11.35 10.85 10.35 D/U (dB)	9.85
9,60	' 10.00	33.5	100.0	96.00	66.5	0.000	4.000							

Page 7 of 20

Digital Radio Test Laboratory (revised) **B-3** Multipath Characterization of HS Digital Subcarrier Signal Failure **Basic Test Parameters:** SIGNAL **PROPONENT SPECIFIC COMPOSITE SIGNAL** One Path Zero Phase Reference: -65dBm ORBAN #1 Main Channel Mod: CPN COMP OUT 1: Not Used SCA Group: A COMP OUT 2: Not Used Error Measurement Duration: 5 minutes 5-Band Medium Processed **ORBAN #2** Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utility COMP OUT 1: Proponent Only This data amended - upen to amended data COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110% Error Level (%) Noise Level Single Double EO&C C_o/N_o Attn 220 Byte 220 Byte 20 Byte Urban Slow 63.32 63,75 10.86 10.29 Performance impaired without added noise. MAX RBDS Block Error= 10 % at OME. Urban Fast 63.32 63.75 94.86 93.71 Performance impaired without added noise. MAX RBDS Block Error= 17 % at OME. **Rural Fast** 63.32 63.75 80.00 54.86 Performance impaired without added noise. MAX RBDS Block Error= 14 % at OME. Obstructed 63.32 63.75 100.0 100.0 Only briefly re-acquired signal. MAX RBDS Block Error= 97 % at OME. No difference with pilot only on Main Channel.

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Page 10 of 20

Error N	Aeasurement	nel Mod: CA Group: Duration:	CPN A 5 minutes	er W/RDS C	heck software utilty	COM 5-E COM COM	ORBAN #1 P OUT 1: Not Us P OUT 2: Not Us Sand Medium Proc ORBAN #2 P OUT 1: Propon P OUT 2: Prop + in Channel modu	ed cessed ent Only SCA lation
	Noise			rror Level (Single	Double	EO&C	adjusted for 1109	<i>/</i> 0
Urban Slow	C/N ₀ 131.08	Attn 63.75	20 Byte 1.300 1.040	10.86 ▼	220 Byte 10.29	Performance impaired without adde MAX RBDS Block Error=	d noise. 10 %	at OME.
Urban Fast	131.08	63.75	23.20 23.60	94.86 ♥ ◀─ Calc	93.71	Performance impaired without adde MAX RBDS Block Error=	d noise. 17 %	at OME.
Rural Fast	131.08	63.75	14.60 13.60	80.00 ▼ ← Calc	54.86	Performance impaired without adde MAX RBDS Block Error=	d noise. 14 %	at OME.
Obstructed	131.08	63.75	100.0 100.0	100.0 ♥ ← Calc	100.0	Only briefly re-acquired signal. MAX RBDS Block Error= No difference with pilot only on Ma	97 % in Channel.	at OME.

PROPONENT SPECIFIC

Digital Radio Test Laboratory

File Name: SEIKO_B.XLS

B-3 Multipath

Basic Test Parameters:

Characterization of HS Digital Subcarrier Signal Failure

SIGNAL

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COMPOSITE SIGNAL

B-3 Multipath Characterization of HS Digital Subcarrier Signal Failure Basic Test Parameters: SIGNAL

3/10/97

Ammended:

One Path Zero Phase Reference: -65dBm

Main Channel Mod: CPN

Error Measurement Duration: 5 minutes

SCA Group: A

Analog Receivers: Denon TU-380RD RBDS Receiver W/RDS Check software utilty

PROPONENT SPECIFIC

SUPPLEMENTAL PATA

COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

		Noise	Level	Eı	rror Level (' Single	%) Double	EO&C
Urban Slow	C/N 131,08	C ₀ /N ₀ 63.32	Attn 63.75	20 Byte 1.300 1.040	220 Byte 10.86 ▼ ← Calc	220 Byte 10.29	Performance impaired without added noise. MAX RBDS Block Error= 10 % at OME.
Urban Fast	131,08	63.32	63.75	23.20 23.60	94.86 ♥ ◀- Calc	93.71	Performance impaired without added noise. MAX RBDS Block Error= 17 % at OME.
Rural Fast	131,08	63.32	63.75	14.60 13.60	80.00 V Calc	54.86	Performance impaired without added noise. MAX RBDS Block Error= 14 % at OME.
Obstructed	131.08	63.32	63.75	100.0 100.0	100.0 ♥ ◀- Calc	100.0	Only briefly re-acquired signal. MAX RBDS Block Error= 97 % at OME. No difference with pilot only on Main Channel.

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B-4 Impulse Noise

11/6/96

Desired Signal

-65 dBm at receiver input. Group A subcarriers.

Undesired Signal

10 ns wide 1.0 Vp-p pulse at receiver input Repetition Rate Variable

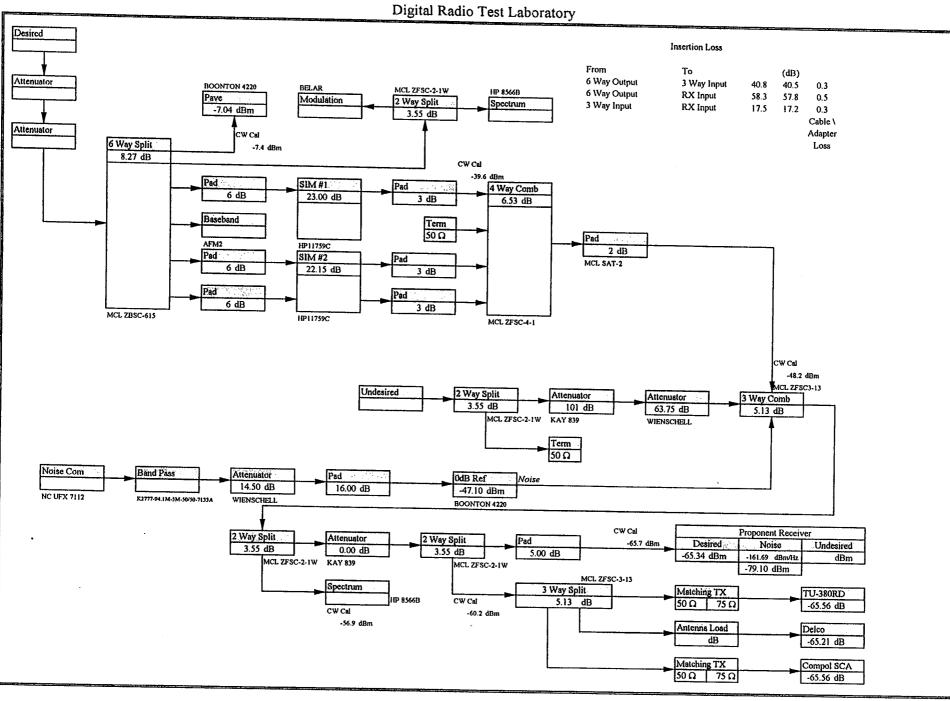
Results accumulated over 5 minute measurement period.

			Pilot Only	
Repetition Rate	220 Byte	220 Byte	Attenuator Setting	Voltage
(Hz)	Sgl	Dbl	(dB)	(Vp-p)
100	0.0000	0.0000	0	1.0000
200	0.0000	0.0000	0	1.0000
300	0.0000	0.0000	0	1.0000
600	0.0000	0.0000	0	1.0000
1000	8.000	0.0000	0	1.0000
1000	0.5700	0.0000	10	0.3162
1000	0.0000	0.0000	15	0.1778

· · · · · ·	Clipped Pink Noise (Stereo)								
Repetition Rate	220 Byte	220 Byte	Attenuator Setting	Voltage					
(Hz)	Sgl	Dbl	(dB)	(Vp-p)					
100	0.0000	0.0000	0 Ú	1.000					
200	0.0000	0.0000	0	1.000					
300	0.0000	0.0000	0	1.000					
600	0.0000	0.0000	0	1.000					
1000	8.000	0.5700	0	1.0000					
1000	2.860	0.0000	10	0.3162					
1000	0.5700	0.0000	15	0,1778					
1000	0.0000	0.0000	20	0.1000					

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File Name:SEIKO.XLS

Level B-5

Page 12 of 20

B-4 Impulse Noise

1/21/97

Desired Signal

-65 dBm at receiver input. Group A subcarriers. **Undesired Signal**

10 ns wide 1.0 Vp-p pulse at receiver input Repetition Rate Variable

Results accumulated over 5 minute measurement period.

	Error R	late (%)		
	Sgl	Dbl		
Repetition Rate	220 Byte	220 Byte	Attenuator Setting	Voltage
(kHz)			(dB)	(Vp-p)
1,3	98.40	47.20	0	1.0000
1.3	88.57	24.00	15	0.1778
1.3	9,330	0.4400	20	0.1000
1.3	0.000	0.000	25	0.0562
1.6	96.80	26,00	0	1.0000
1.6	70,86	3.430	15	0.1778
1.6	1,500	0.0000	20	0.1000

FROM 215 433 8705 CTD (Handed out at tutorial

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PAGE.004/005

EIA Digital Audio Radio Laboratory

Scenario	Reflected Path	Me CPN	dium Signal Str	rength Pilot Only		
#1	400 km/h Doppler	220 S	220 D	220 S	220 D	·
	27.5 μs Delay	99.25	99.25	0	0	%
	8.00 dB	Without main error free. Wit error rates are	h Clipped Pink	ition the system per Noise on the main	rforms channel	
¥2	200 km/h Doppler	220 S	220 D	220 S	220 D	
	13.7 µs Delay	100.00	100.00	0	0	%
	6.00 dB		h Clipped Pink	ition the system per Noise on the main		
#3	100 km/h Doppler		220 D	220 S	220 D	·····
	6.8 µs Delay		100.00	0	0	%
	4.00 dB		out main channe are listed above	el modulation	V	70

Page 13 of 20

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(see also supplemental data)

B-6 Weak Sig	ynal		•	
Characteriza	tion of HS Digital Subcar	rier Signal Failt	ire	
pilot:	9 %		9 %	9 %
proponent:	10 %		10 %	10 %
57 kHz:	%		3 %	10 %
92 kHz:	%		7 %	10 % %
Total Injection:	19 %		29 %	% 29 %
	Proponent Onl	ly	Α	В
Signal Level:	-83 ≤ome< -82	dBm	-83 ≤ome< -82 dBm	Can not achieve error free performance.

File Name: SEIKO.XLS

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SUPPLEMENTAL PATA

B-6 Weak Sig	nal			Ammended 2/26/97					
Characterizat	ion of HS Digital	Subcari	rier Signal Failu	re					
pilot:		9 %			9 %			9 %	
proponent:	1	0 %		1	0 %		10	0 %	
57 kHz:		%			3 %		10	0 %	
92 kHz:		%			7%			%	
Total Injection:	1	9 %		2	9 %		2	9 %	
-	Propo	nent Onl	у		Α			В	
Signal Level:	-83 ≤ome<	-82	dBm	-83 ≤ome<	-82	dBm	-79 ≤ome<	-78	dBm

A

64A

		Re-Acquisition Time (s)	
	POF-2dB	POF-4dB	POF-6dB
	42.7	28.9	26.5
	27.7	· 27.5	27.5
	0 4 0	· · · · ·	
	24.9	25.2	26.7
	6.8	29.5	23.6
	26.9	24.5	26.1
Average	25,8	27.1	26.1
Point Of Failure Att	tenuator Setting	6.5	0 dB
Desired Signal Refe	erence Level	-47.8	4 dBm
Noise 0 dB Referen	се	-47	0 dBm
Desired Signal Leve	el at Receiver		5 dBm

10/22/96

POF Noise Level is defined as the level which causes 220 byte Packet Error Rate of $95\% \pm 5\%$.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

C-1 Re-Acquisition

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			Rc-Acquisition Time (s)	
	Tsim (s)	POF-2	POF-4	POF-6
	5	11.7	13.1	20.1
	10	46.7	16.2	30.3
	15	35.8	53.7	15.1
	20	17.5	7.8	10.5
	Average	27.9	22.7	19.0
	POF Attenuator	r Setting:	12 dB	
:0&C			<u> </u>	
	220	nt of Failure (POF) def Byte Message Error F	tined as: Rate ≥ g	50 %

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File Name: SEIKO.XLS C-2 USR

Page 16 of 20

n (s) 5 0 5 0	Re-Acquisition Time (s) POF 	
0 5	21.9	
5	22.4	
0	27.2	
ge	21.0	
POF A	Attenuator Setting: 63.75 dB	
out added noise the per	rformance is beyond point of failure.	n - Ord Mar - X 92 - 28 - 20 - 20 - 20 - 20 - 20 - 20 - 2
ct-96		
		ut added noise the performance is beyond point of failure. st-96

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Test	C-2	Re-Acquisition with Multipath Rural Fast Rayleigh
	Tsim (s)	Re-Acquisition Time (s) POF
	5	13.5
	10	35.0
	15	30.9
	20	43.8
4	Average	
		POF Attenuator Setting: 63.75 dB
EO&C	Without ad	ided noise the performance is at or beyond point of failure.
Test Date: 1gincer(s): I		
	<u> </u>	

File Name: SEIKO.XLS C-2 RFR

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Test C-2	Re-Acquisition with Multipath Obstructed Rayleigh
Tsim (s) POF
5	
10	
15	
20	•
Average	0.0
EO&C System (does not re-acquire after 5 minutes of this multipath scenario.
Test Date: 23-Oct-	96
ngineer(s): DML	

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PROPONENT SPECIFIC

E-2 Host Analog Program → HSDS with Multipath Engineer(s): DML Date: 10/23/96 Basic Test Parameters: SIGNAL

> One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 minutes 92 kHz: Track 48 on EBU SQAM Disk

(revised)

COMPOSITE SIGNAL

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

					Eı	ror Level ((%)	
			Noise	Level		Single	Double	EO&C
			C _o /N _o	Attn	20 Byte	220 Byte	220 Byte	
	<u>.</u>	CPN	63.32	63.75	-	12.00	10.29	
Urban	Slow	Pilot Only	63.32	63.75		3.43	0.00	Improvement without main channel modulation.
Urban	Fast	CPN	63.32	63.75	-	94.29	93.71	-
orbui	Urban Fast	Pilot Only	63.32	63.75		82.86	77.71	Improvement without main channel modulation.
Rural	Fast	CPN	63.32	63.75	-	85.71	62.29	
Kurui	1 451	Pilot Only	63.32	63.75		75.43	58.29	Improvement without main channel modulation.
Obstru	icted	CPN	63.32	63.75	-	100.0	100.0	No difference.
		Pilot Only	63.32	63.75		100.0	100.0	No unicience.

File Name: SEIKO.XLS

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E-2 Host Analog Program -> HSDS with Multipath

Engineer(s): DML Date: 10/23/96

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

COMPOSITE SIGNAL

One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 minutes 92 kHz: Track 48 on EBU SQAM Disk

Free Lovel (04)

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

				Er	ror Level (%)	
		Noise	Level		Single	Double	
		C/N _o	Attn	20 Byte	220 Byte	220 Byte	
Urban Slow	CPN	131.08	63.75	-	12.00	10.29	
Cibali Slow	Pilot Only	131.08	63.75		3.43	0.00	
	CPN	131.08	63.75	-	94.29	93.71	
Urban Fast	Pilot Only	131.08	63.75		82.86	77.71	
	CPN	131.08	63.75	-	85.71	62.29	
Rural Fast	Pilot Only	131.08	63.75		75.43	58.29	
Obstructed	CPN	131.08	63.75	-	100.0	100.0	
Obstructed	Pilot Only	131.08	63.75		100.0	100.0	

EO&C

Improvement without main channel modulation.

Improvement without main channel modulation.

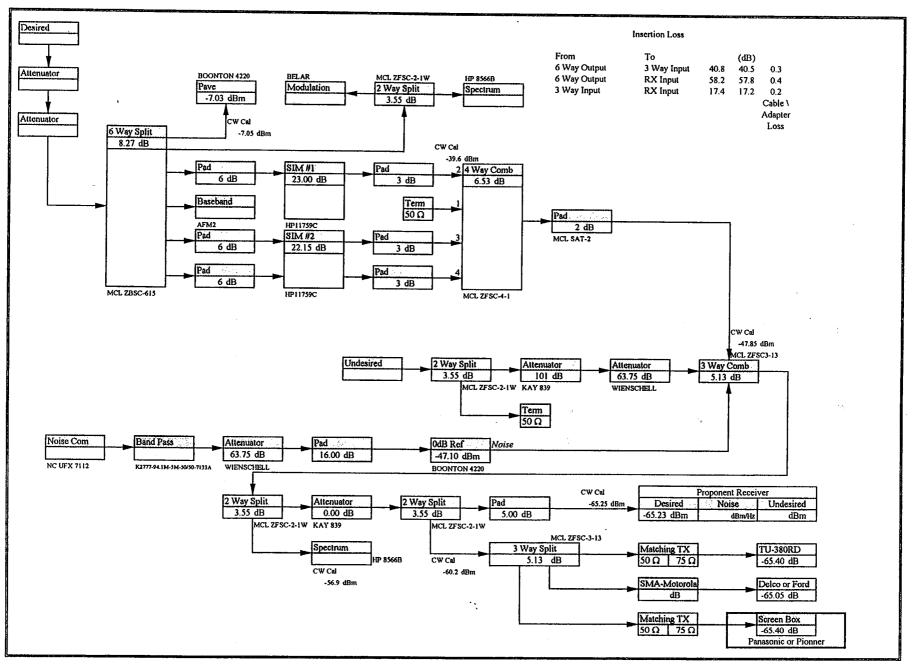
Improvement without main channel modulation.

No difference.

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TESTS

D



File Name: HS_D.XLS Index: D Levels

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Main Channel:	91 %			91	%		81	%		81	%
Pilot:	9 %			9	%		9	%		9	%
92 kHz:	0 %			0	%		7	%		0	%
57 kHz:	0 %			0	%		3	%		10	%
Proponent:	0 %			10	%		10	%		10	%
Total:	100 %			110	%		110	%		110	%
	0 dB= 2.40	V				0 dB=	2.25	V			
	Pilot Only			Proponent + Pilot			Group A			Group B	
RF Level			MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO
dBm	S/N Units		S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)
-65	50.8 dB		50.7	50.7	50.7	50.0	50.0	50.0	49.8	49.8	49.8
-75	47.6 dB		47.5	47.5	47.5	46.8	46.8	46.8	46.7	46.7	46.7

D-1 HSSC -> Host Analog

Measurements made psophometrically (Q-Peak detected with CCIR weighting and 15 kHz low pass filters).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements made on Left Channel.

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Unit Not in Screen Box

Clipped Pink Noise on 92 kHz SCA.

Engineer(s): DML, TBK

Tests Conducted: 11/13/1996, 11/18/96, 11/22/96

File Name: HS_D.XLS

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DAT File Number	Time Start	Code Stop		ID	Description	Grade
HS40100.DAT	11/13/96	<u>ətup</u>		T T		
11010100.0731	11/13/90		·	·{}-		
	0:00	0:30	1		Delco Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
	0.000	0.50	1	++-	2.4 Vrms=-14 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2	·	Noise Reference No SCA	
				1		
	1:05	3:06	3		Reference	
	3:12	5:12	4	1	MITRE D-1	0
			1	1		
	5:19	7:20	5	1	Reference	
	7:27	9:27	5	1	DDJ D-1	0
			I	I		······
	9:34	11:35			Reference	
	11:42	13:41	8		SEIKO D-1	0
	13:45	15:46	9	ļļ.	Reference	
	15:52	17:52	10	 	SEIKO Group A	0
	10.00			ļļ.		
	17:58	20:00	11	 	Reference	
	20:06	22:07	12	ļļ.	DDJ Group A	0
	22.12	04.12		ļļ.		
	22:13 24:19	24:13 26:20	13	ļļ	Reference	
	24:19	20:20	14	ļļ	MITRE Group A	0
	26:26	20.26	15		Reference	
	28:32	28:26 30:32	16		MITRE Group B	
		50.52				0
	30:38	32:39	17		Reference	
	32:45	34:45	18		DDJ Group B	
			···			0
	34:50	36:52	19		Reference	
	36:58	38:58	20		SEIKO Group B	0
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File Name: HS_D.XLS Index: Delco DAT -

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Number	Start	Stop						
HS40101.DAT	11/18/96					Proponent Only		••••
	0:06	2:06	1			Urban Slow Reference		
	2:12	4.12	2	•	-	Urban Slow SEIKO		0
	4:18		3		-	Urban Slow DDJ		0
	6:24	8:24		•	-	Urban Slow MITRE		0
			1	1		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		••••••
	8:30		5	1	1	Urban Fast Reference		
	10:36					Urban Fast MITRE		0
	12:42	14:42				Urban Fast DDJ		0
	14:48	16:48	8			Urban Fast SEIKO		0
		10	ļ	. 				
	16:54 19:00	18:54 21:00	9			Rural Fast Reference		
	19:00 21:06	21:00	10	·		Rural Fast SEIKO Rural Fast DDJ	***	0
	21:00		11			Rural Fast DDJ Rural Fast MITRE		0
	23.12	23.12	12		-			0
	25:18	27:24	13	+		Obstructed Reference		
	27:30	29:30	14	+	1	Obstructed MITRE		0
	29:36	31:36	15	1	-	Obstructed DDJ		0
	31:42	33:42	16	1	1	Obstructed SEIKO		0
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DAT File Number	Time Start	Code Stop		ID		Description	Grade
HS40102.DAT	11/18/96		T	T	T	Group A	
]	1		-		
	0:05			Ι]	Urban Slow Reference	
	2:11	4:12	2	I		Urban Slow SEIKO	0
	4:18		3	I	Ι	Urban Slow DDJ	0
	6:24	8:25	4			Urban Slow MITRE	0
			1				
	8:30		5	<u> </u>		Urban Fast Reference	-
	10:36		6			Urban Fast MITRE	0
	12:42	14:43	7			Urban Fast DDJ	Ŏ
	14:48	16:49	8			Urban Fast SEIKO	Ŏ
	16:54	18:55	9			Rural Fast Reference	
	19:00		10			Rural Fast SEIKO	0
	21:06	23:07	11			Rural Fast DDJ	0
	23:12	25:13	12			Rural Fast MITRE	0
			 	ļ			
	25:19	27:19	13	<u> </u>		Obstructed Reference	
	27:24	29:27	14	_		Obstructed MITRE	0
	29:32	31:34	15			Obstructed DDJ	0
	31:39	33:41	16	.		Obstructed SEIKO	0
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DAT File	Time	Code		ID		Description	Grade
Number	Start	Stop					
HS40103.DAT	11/18/96					Group B	
	0:05	2:05				Urban Slow Reference	
	2:10					Urban Slow SEIKO	0
	4:15	6:17				Urban Slow DDJ	0
	6:22	8:23	4			Urban Slow MITRE	0
	8:28	10:29		·		Urban Fast Reference	
	10:34	12:34		·	·	Urban Fast MITRE	0
	12:41	12:54	7		·	Urban Fast DDJ	Ö
	14:46				+	Urban Fast SEIKO	- Ö
		10,17	1	••••••	•		- j
	16:55	18:54	9		1	Rural Fast Reference	
	18:59	18:54 21:00	10		•	Rural Fast SEIKO	0
	21:06	23:06	11		1	Rural Fast DDJ	Ō
	23:12	25:13	12		1	Rural Fast MITRE	0
			T	T	1		
	25:18	27:18	13	T	1	Obstructed Reference	
	27:24	29:25	14	I	I	Obstructed MITRE: Multipath more pronounced.	-1.5
	29:30	31:31	15		I	Obstructed DDJ: Multipath more pronounced.	-1.5
	31:36	33:37	16			Obstructed SEIKO: Multipath more pronounced.	-1.5
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File Name: HS_D.XLS Index: Delco SIM

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D-1 HSSC -> Ho	ost Analog					C	see su	of lenent	tel data	~)	
Main Channel:	91 %			91	%		81	%		81	%
Pilot:	9 %			9	%		9	%		9	%
92 kHz:	0 %			0	%		7	%		0	%
57 kHz:	0 %			0	%		3	%		10	%
Proponent:	0 %			10	%		10	%		10	%
Total:	100 %			110	%		110	%		110	%
	0 dB= 2.26	<u>v</u>				0 dB=	2.02	V			
	Pilot Only			Proponent + Pilot			Group A			Group B	
RF Level dBm	S/N Units		MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)	MITRE S/N (dB)	DDJ S/N (dB)	SEIKO S/N (dB)
-65	55.4 dB		53.4	55.2	51.9	53.3	54.2	51.8	52.0	53.0	50.0
-75	54.6 dB		53.6	54.4	52.7	53.3	53.7	52.4	52.9	53.4	51.5

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Unit Not in Screen Box

Engineer(s): DML Tests Conducted: 11/21/96 Ì

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DAT Filo	Time	Code		ID		Description	Grad
Number	Start	Stop					
HS40800.DAT	11/21/96						
	0:00	0:30				Ford Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
	0.00	0.50	<u>†</u>	·	+	2.25 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2	+		Noise Reference No SCA	
			1	•		Proponent Only	
	1:05	3:05	3		1	Reference	
	3:10	5:11	4	I	1	MITRE: Slight increase in noise floor or change in noise character.	-0.5
	5:16	7:17	5	I		DDJ	0
	7:22	9:23	6			SEIKO: Slight increase in noise floor or change in noise character.	-0.5
						Group A	
	9:28	11:28	7			Reference	
	11:34	13:34	8			SEIKO Group A: Slight increase in noise floor or change in noise character.	-0.5
	13:40	15:40	9			DDJ Group A: Slight increase in noise floor.	-0.1
	15:46	17:46	10			MITRE Group A: Slight increase in noise floor.	-0.3
	17:51	19:52				Group B	
	17:51	21:58				Reference MITRE Group B: Low level tone.	
	22:03	24:03	12		·	DDJ Group B: Low level tone.	-1
	22:03	24:05	14		·	SEIKO Group B: Low level tone and increase in noise floor.	-1
	21.07	20.07	+ 17	•	•		-1.5
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File Name: HS_D.XLS Index: Ford DAT

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(supplemental Data)

D-1 HSSC -> Host Analog

Main Channel: Pilot: 92 kHz: 57 kHz: Proponent: Total:	91 % 9 % 0 % 0 % 100 % 0 dB= 1.90	v		91 9 0 10 110	% % % % %	0 dB=	81 9 7 3 10 110 1.73	% % % % % %		81 9 0 10 10 10	% % % % %
	Pilot Only			Proponent + Pilot	-		Group A			Group B	
RF Level dBm -50	S/N Units 56.7 dB		MITRE S/N (dB) 54.1	DDJ S/N (dB) 56.5	SEIKO S/N (dB) 51.6	MITRE S/N (dB) 53.5	DDJ S/N (dB) 54.3	SEIKO S/N (dB) 51.2	MITRE S/N (dB) 50.8	DDJ S/N (dB) 51.5	SEIKO S/N (dB) 48.5
-65	55.7 dB		53.6 53.5	55.5 54.3	52.1 52.6	53.2 53.2	53.8 53.6	51.7 52.4	51.6 52.7	52.6 53.3	49.6 51.3
-75	54.7 dB	l		DDJ Variable			DDJ Variable		it Proponent	51.7 52.0 Variable	
-50 -65 -75			:	56.7 55.6 54.0			54.0 53.5 53.0			51.0 52.0 52.4	

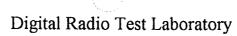
Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

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DAT File Number	Time Start	Code Stop		ID		Description	Grade
HS40801.DAT	11/21/96			Ι	Γ	Proponent Only	1
				.			
	0:05	2:05 4:13	1	ļ	ļ	Urban Slow Reference	
	2:11 4:18	4:13		ł		Urban Slow SEIKO: Slight increase in noise floor. Urban Slow DDJ	-1
	6:25	8:25				Urban Slow DDJ Urban Slow MITRE: Slight increase in noise floor.	0
	0.23	0.23	1				-1
******	8:31	10:31	5	1	1	Urban Fast Reference	
	10:35	12:36	6	1	1	Urban Fast MITRE: Slight increase in noise floor.	-1
	12:42	14:42 16:48	7	I	I	Urban Fast DDJ	0
	14:47	16:48	8	I	[Urban Fast SEIKO: Slight increase in noise floor.	-1
				ļ	ļ		
	16:53	18:54	9]	.	Rural Fast Reference	
	19:00 21:06	21:00	110	ļ	.	Rural Fast SEIKO: Slight increase in noise floor. Rural Fast DDJ	-1
*****	21:06	23:06 25:12				Rural Fast DDJ Rural Fast MITRE: Slight increase in noise floor.	0 -0.5
	23.11	23:12	12			Kurai rasi wili KC: Signi increase in noise lioor.	-0.5
	25:17	27:17	13			Obstructed Reference	
	27:23	29:23	14	•••••	1	Obstructed MITRE	0
	29:28	31:30	15			Obstructed DDJ	Ō
	31:35	33:35	16		1	Obstructed SEIKO	0
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DAT File	Time	Code		ID	Description	Grad
Number	Start	Stop				
HS40802.DAT	11/21/96				Group A	
			1			
	0:05	2:05	1		Urban Slow Reference	
	2:10	4:11	2 3		Urban Slow SEIKO: Slight increase in noise floor.	-0.5
	4:16	6:16	3		Urban Slow DDJ	0
	6:21	8:21	4	I	Urban Slow MITRE: Slight increase in noise floor.	-0.5
	8:27	10:27			Urban Fast Reference	-0.
	10:33	12:33	6		Urban Fast MITRE: Slight increase in noise floor.	-0.
	12:38	14:38			Urban Fast DDJ	-1
	14:44	16:44	8		Urban Fast SEIKO: Slight increase in noise floor.	-1
	16:50	18:50 20:56	9		Rural Fast Reference	-1
	18:56	20:56	10	ļļ	Rural Fast SEIKO: Slight increase in noise floor.	0
	21:02	23:02	11	ļ	Rural Fast DDJ	-0.
	23:07	25:07	12	ļļ	Rural Fast MITRE: Slight increase in noise floor.	
				ļ		
	25:13	27:13	13	ļ	Obstructed Reference	0
	27:19	29:19 31:25	14		Obstructed MITRE Obstructed DDJ	0
	29:25	31:25	112	<u></u>	Obstructed DD3 Obstructed SEIKO	ō
	31:31	33:31	10	[Ubstructed SEINO	
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File Name: HS_D.XLS Index: Ford SIM

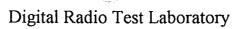
f_s=44.1kHz

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DAT File Number	Time Start	Code Stop		ID		Description	Grade
HS40803.DAT	11/21/96	Stop	1 T	T	1	C	
11540003.DA1	11/21/90	•••••••••	 			Group B	
	0:06	· 2:06	1			Urban Slow Reference	
***************************************	2:12	4:12	2			Urban Slow SEIKO: Low level tone.	-1
	4:18	6:18			†	Urban Slow DDJ: Low level tone.	-1
	6:23	8:23			†	Urban Slow MITRE: Low level tone.	-1
			1	†			
	8:29	10:29	5		1	Urban Fast Reference	1
	10:35	12:35	6	†	1	Urban Fast MITRE: Low level tone.	-1
	12:40	14:40	7	1	1	Urban Fast DDJ: Low level tone.	-1
	14:46	16:46	8	1	1	Urban Fast SEIKO: Low level tone.	-1
		**********************************	İ		1		
	16:52	18:52	9	1	1	Rural Fast Reference	
	18:57	20:57	10	1		Rural Fast SEIKO: Low level tone and slight increase in noise floor.	-1.5
	21:03	23:03	11	I	I	Rural Fast DDJ: Low level tone.	-1
	23:09	25:09	12	Ι		Rural Fast MITRE: Low level tone and slight increase in noise floor.	-1.5
			I	I	[
	25:15	27:15		1	Ι	Obstructed Reference	
	27:21	29:21				Obstructed MITRE: Low level tone.	-1
	29:27	31:27	15		1	Obstructed DDJ: Low level tone.	-1
	31:33	33:33	16	1	1	Obstructed SEIKO: Low level tone.	-1
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(see supplemental data)

D-1 HSSC -> Ho	st Analog						·		//			
Main Channel:	9	1 %			91	%		81	%		81	%
Pilot:	9	9%			9	%		9	%		9	%
92 kHz:	() %			0	%		7	%		0	%
57 kHz:		0 %			0	%		3	%		10	%
Proponent:		0 %			10	%		10	%		10	%
Total:		0 %			110	%		110	%		110	%
	0 dB=	755.0	mV				0 dB=	699.0	mV			
	Pilo	ot Only			Proponent + Pilot			Group A			Group B	
RF Level			-1	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO
dBm	S/N	Units		S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)
-65	49.3	dB	-1	49.1	49.1	49.1	48.0	47.9	47.8	48.4	48.4	48.2
							1					
-75	39.3	dB		39.4	39.4	39.4	38.5	38.5	38.5	38.7	38.7	38.7
			•			the second second second		1. a.				and the second

Measurements made Q-Peak detected with CCIR weighting filter (psophometric). 0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation Orban #2 Composite output #2 Set for 81% Main Channel Modulation Unit Not in Screen Box

Engineer(s): DML,TBK Tests Conducted: 11/19/96

File Name: HS_D.XLS

Denon TU-380RD

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DAT File Number	Time Start	Code Stop		ID	Description	Grado
HS40200.DAT	11/19/96		T	TT		
				·		
	0:00	0:30	1		Denon Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
			I	I I	755 mVrms=-24 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2	I	Noise Reference No SCA	
					Proponent Only	
	1:05	3:06			Reference	*******
	3:11	5:11	4		MITRE	0
	5:17	7:17		ļļ	DDJ	0
	7:23	9:22	6	ļļ	SEIKO	0
			ļ	ļ	Group A	
	9:28	11:28	7	 	Reference	
•••••••	11:34	13:34	8	ļļ	SEIKO Group A	0
******	13:40	15:40			DDJ Group A	0
	15:45	17:46	10	ļļ	MITRE Group A	0
	17:52	10.61		.	Group B	
•••••••••••••••••••••••••••••••••••••••	17:52	19:51 21:57		 	Reference	
	22:03	21:57	12	ļ	MITRE Group B: Change in the characteristic of noise.	-0.1
	22:03	24:03 26:09			DDJ Group B: Change in the characteristic of noise.	-0.1
	24:09	20:09	14		SEIKO Group B: Change in the characteristic of noise.	-0.1
		•••••••••••••••••••••••••••••••••••	 	<u> </u>		
	26:14	28:15	15	 	Proponent Only Urban Slow Reference	
	28:20	30:21			Urban Slow SEIKO	
	30:26	32:27	17		Urban Slow DDJ	
	32:32	34:33			Urban Slow MITRE	0
						0
		••••••••••••••••••••••••••••••••••			Group A	
	34:38	36:38	19	-	Urban Slow Reference	
	36:43	38:43	20		Urban Slow SEIKO	0
	38:48	40:48	21		Urban Slow DDJ	ŏ
	40:54	42:54	22		Urban Slow MITRE	ŏ
	1		t			······
			1		Group B	
	43:00	45:00	23		Urban Slow Reference	
	45:06	47:06	24		Urban Slow SEIKO: Change in the characteristic of noise.	-0.1
	47:11	49:11	25		Urban Slow DDJ: Change in the characteristic of noise.	-0.1
	49:17	51:17	26	ĺ	Urban Slow MITRE: Change in the characteristic of noise.	-0.1
	1					
			.			

File Name: HS_D.XLS Index: Denon DAT

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D-1 HSSC -> He	ost Analog						C					
Main Channel:	91 %)			91	%		81	%		81	%
Pilot:	9 %)			9	%		9	%		9	%
92 kHz:	0 %)			0	%		7	%		0	%
57 kHz:	0 %)			0	%		3	%		10	%
Proponent:	0 %)			10	%		10	%		10	%
Total:	100 %)			110	%		110	%		110	%
	0 dB= 65	54.0	mV				0 dB=	604.0	mV			
					Proponent							
	Pilot O	nly			+ Pilot			Group A			Group B	
RF Level				MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO
dBm	S/N U	nits		S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)
-65	52.1 dI	В	1	51.8	51.8	51.1	50.1	50.1	49.4	50.6	50.6	49.6
-75	42.9 dI	B		42.9	42.9	42.8	42.0	42.1	41.8	42.1	42.1	42.0
	and a star and a star		•				•					

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK Tests Conducted: 11/19/96

File Name: HS_D.XLS

Pioneer SX-201

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(Supplemental data)

D-1 HSSC -> Host Analog

Main Channel:		91 %			91	%		81	%		81	%
Pilot:		9 %			9	%		9	%		9	%
92 kHz :		0%			0	%		7	%		0	%
57 kHz:		0%			0	%		3	%		10	%
Proponent:		0 %			10	%		10	%		10	%
Total:	10	00 %			110	%		110	%		110	%
	0 dB =	655.00	mV		······		0 dB =	605.00	mV			
				1	Proponent				·····			
	Pi	lot Only			+ Pilot			Group A			Group B	
											•	
RF Level			-	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO
dBm	S/N	Units		S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)
-50	60.9			59.5	<u>59.4</u>	56.4	55.8	55.8	54.0	54.5	54.6	52.6
				37.5	39.4		1 99.0					
	52.7	dB		52.4	52.4	51.5	50.7	50.7	50.0	50.1	50.1	49.4
-65	52.7			Company and the second second	52.4 Mini () ()		50.7	30.1				
	43.1	dB	100	43.0	43.0	42.9	42.0	42.0	42.0	42.0	42.0	41.9
-75	43.1			45.0	43.0	42.3	42.0	42.0	12.0	12.0	50.2	
									Withou	it Proponent	******	
					DDJ			DDJ		it i roponom	42.0	1
								Variable	L		Variable	
					Variable	T			ר		54.8	7
-50					60.4	-		56.2				<u> i</u>
								E O 8			50.2	ž.
-65					52.6	1		50.8	ę		50.2	2
									e		41.8	4
-75					43.0]	(42.0	1		41.0	_1

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric). 0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

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Digital Radio Test Laboratory

DAT File	Time	Code		ID	Description	Grade
Number	Start	Stop				
HS40400.DAT	11/19/96		I			1
			1	[[
	0:00	0:30	1	Ī	Pioncer Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
					680 mVrms=-26 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2		Noise Reference No SCA	
					Proponent Only	
	1:06	3:07			Reference	
	3:12	5:12			 MITRE	0
	5:18	7:20		[].	DDJ	0
	7:25	9:25	6	.	 SEIKO .	0
		*****	.		 Group A	
	9:31	11:31 13:37	7		Reference	
	11:37	13:37	8	ļļ.	 SEIKO Group A : Slight increase in noise floor. Tone when Program on 92 kHz SCA back tracks. Mod Peaks detected.	-0.1
	13:42	15:43	9	 .	 DDJ Group A : Slight increase in noise floor. Tone when Program on 92 kHz SCA back tracks. Mod Peaks detected.	-0.1
	15:48	17:49	10	 	 MITRE Group A : Slight increase in noise floor. Tone when Program on 92 kHz SCA back tracks. Mod Peaks detected.	-0.1
		****	.	.	 Group B	
	17:54	19:56	11		Reference	
	20:01	22:02	12		 MITRE Group B :Small increase in noise floor.	-0.2
	22:08	24:08		ļļ.	 DDJ Group B :Small increase in noise floor.	-0.2
	24:14	26:14	14		 SEIKO Group B :Small increase in noise floor.	-0.2
					 Proponent Only	
	26:20	28:22		ļļ.	Urban Slow Reference	
	28:27	30:27			Urban Slow SEIKO	0
	30:32	32:33			Urban Slow DDJ	0
	32:41	34:41	18		 Urban Slow MITRE	
	34:46	36:47	10		 Group A Urban Slow Reference	
					Urban Slow Reference Urban Slow MITRE	0
	36:52 38:58	38:52 40:58	20		Urban Slow DDJ	0
	41:04	40:38	21		Urban Slow DD3 Urban Slow SEIKO	0
	41:04	43:04			 OLDAU 2010A	·····
					 Group B	
	43:10	45:10		 .	 Urban Slow Reference	
	43:10	45:10 47:15	23	∤	Urban Slow SEIKO	0
	45:15	47:15	24	<u> </u>	Urban Slow DDJ	0
	47:21	49:21 51:26	22	<u>├</u>	Urban Slow DD3 Urban Slow MITRE	0
	49:20	J1:20	1. <u>20</u>	<u></u>		
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					 Digital Radio Test Laboratory	
		Code		ID	Description	Grade
Number	Start	Stop				
HS40401.DAT	11/19/96			.	 Strong Signal Level	
				ļļ.		
			ļ		 Proponent Only	
	0:00	2:05			 Reference	0
	2:12	4:12	2	ļļ.	 MITRE	0
	4:18	6:18		ļļ	 DDJ SEIKO	- ŭ
	6:23	8:24	4	ļ		×
	0.20	10:30	ļ	 	 Group A SEIKO :Hear modulation peaks on 92kHz SCA and low level tone when CD back tracks.	-0.4
	8:30 10:38	10:30		 	 SELKO : Hear modulation peaks on 92kH2 SCA and low level tone when CD back tracks.	-0.4
		12:38			 DDJ :Hear modulation peaks on 92kHz SCA and low level tone when CD back tracks. MITRE :Hear modulation peaks on 92kHz SCA and low level tone when CD back tracks.	-0.4
	12:44	14:43	ļ	 	 Group B	
	14.50	16.50		 	 MITRE : Increase in noise floor.	-0.4
	14:50	16:50 18:55	1 ×	 	 DDJ :Increase in noise floor.	-0.4
	16:55 19:01	18:55	1 3	 	 SEIKO :Increase in noise floor.	-0.4
	19:01	21:01	1.10		 SEIKU Increase in noise floor.	-0.4
				ļļ		
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				I		
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File Name: HS_D.XLS Index: Pioneer DAT

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Main Channel:		91 %			91	%		01	07		0.1	
Pilot:		9%			9	%		81	%		81	%
92 kHz:		0%			•			9	%		9	%
					0	%		7	%		0	%
_ 57 kHz:		0%			0	%		3	%		10	%
Proponent:		0%			10	%		10	%		10	%
Total:		00 %			110	%		110	%		110	%
	0 dB=	2.03	V				0 dB=	1.88	V			
	Pi	ilot Only	-		Proponent + Pilot			Group A			Group B	
RF Level				MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO	MITRE	DDJ	SEIKO
dBm	S/N	Units		S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)	S/N (dB)
-65	51.4	dB		51.4	51.4	51.2	50.4	50.4	50.2	50.7	50.6	50.4
-75	42.1	dB		42.1	42.1	42.1	41.3	41.3	41.3	41.3	41.3	41.3

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK Tests Conducted: 11/20/96

D-1 HSSC -> Host Analog

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DAT File Number	Time Start	Code Stop		ID	Description	Gra
HS40300.DAT	11/20/96					
	0:00	0:30	1		Panasonic Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
	0.00	0:50	ļ		2 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00			Noise Reference No SCA	
	0.50	1.00	<u> </u>		Proponent Only	
	1:06	3:06	3		Reference	
	3:11	5:12			MITRE	0
	5:18	7:18			DDJ	Ö
	7:24	9:24			SEIKO	0
•••••••••••••••••••••••••••••••••••••••					Group A	· · · · · · ·
	9:30	11:30	7		Reference	
	11:36	11:30 13:36	8		SEIKO Group A	0
	13:41	15:42	9		DDJ Group A	Ö
	15:48	17:48	10		MITRE Group A	Ö
			1		Group B	
	17:53	19:53	111		Reference	
	19:59	21:59	12		MITRE Group B	0
	22:05	24:05			DDJ Group B	- O
	24:10	26:11	14		SEIKO Group B	0
			1			V
		******	t		Proponent Only	
	26:17	28:17	15		Urban Slow Reference	
	28:22	30:22	16	1	Urban Slow SEIKO	0
	30:27	32:28		Ī	Urban Slow DDJ	Ō
	32:34	34:35	18		Urban Slow MITRE	ŏ
			I			
			I	I	Group A	
	34:40	36:41			Urban Slow Reference	
	36:47	38:47	20		Urban Slow SEIKO	0
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	38:53	40:53	21		Urban Slow DDJ	Ő
	40:59	42:59	22		Urban Slow MITRE	0
			I	I	Group B	
	43:04	45:06		I	Urban Slow Reference	
	45:11	47:11		I	Urban Slow SEIKO	0
	47:16	49:16	25	I	Urban Slow DDJ	- Ŭ
	49:22	51:23	26	I	Urban Slow MITRE	- Ö
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File Name: HS_D.XLS Index: Panasonic DAT

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TESTS

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E-1

(revised)

E-1 Analog Program -> HSSC

		Group /		L	Group I		Group A 92 kHz Off	Group A 57 kHz Off	57	kHz Rec	luced
n Channel:			1 %		8	1 %	81 %	81 %	1		1 %
Pilot:			9%	1	9	9 %	9 %	9 %			9%
92 kHz:			7%			%	0%	7 %			%
57 kHz:			3%		10)%	3 %	0 %			5 %
Proponent:		10)%	1	10)%	10, %	10 %			0 %
Deviation:	110 %				110) %	103 %	107 %			5%
									1		
	ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units					
DDJ:	7.00	5.75	dB	7.50	6.25	dB	NA	NA		NA	
	ATTN	C ₀ /N ₀	Units	ATTN	C₀/N₀	Units					
MITRE:	6.75	5.50	dB	7.00	5.75	dB	NA	NA		NA	ʻ:
	ATTN	C₀/N₀	Units	220 S	220 D	Units			ATTN	C₀/N₀	Uni
SEIKO:	13.25	12.88	dB	82.86	82.86	%	NA	NA	14.75	14.38	dB

Main Channel: Clipped Pink Noise

HSSC Performance Monitored for 5 minute period.

(see supplemental data)

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(revised)

E-1 Analog Program -> HSSC

		Group A			Group E	3	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced		
Channel:			%		81	%	81 %	81 %		81	%
Pilot:		9	%		9	%	9 %	9 %		9	%
92 kHz:		7	%			%	0 %	7 %			%
57 kHz:		3	%		10	%	3 %	0 %		6	%
Proponent:		10	%		10	%	10 %	10 %		10	%
Deviation:	110 %			110 %			103 %	107 %		106	%
······································	ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units					
DDJ:	6.75	5.50	dB	7.00	5.75	dB	NA	NA		NA	
	ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units					
MITRE:	6.50	5.25	dB	7.00	5.75	dB	NA	NA		NA	
	ATTN	C₀/N₀	Units	220 S	220 D	Units			ATTN	C₀/N₀	Units
SEIKO:	13.75	13.38	dB	74.86	74.86	%	NA	NA	14.75	14.38	dB

Main Channel: ABBA 5-Band Medium Fast Processing

(see supplementel date)

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E-1 Analog Program -> HSSC

	Group A		Group B		Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	%	81	%	81 %	81 %	81 %
Pilot:	9 %	%	9	%	9 %	9 %	9 %
92 kHz:	7 9			%	0 %	7 %	%
57 kHz:	3 %	%	10	%	3 %	0 %	6 %
Proponent:	10 %		10		10 %	10 %	10 %
Total Deviation:	110 %	%	110	%	103 %	107 %	106 %
	ATTN C/N ₀	Units ATT	N C/N₀	Units			· · · · · · · · · · · · · · · · · · ·
10/17/96							
DDJ:	7.00 73.51 d	dB 7.50	74.01	dB	NA	NA	NA
		TT. M. ATT		T.T 14-			
	ATTN C/N₀	Units ATT	N C/N₀	Units		· · · · · · · · · · · · · · · · · · ·	
10/18/96				15			
MITRE:	6.75 73.26 d	dB 7.00	73.51	dВ	NA	NA	NA
	ATTN C/N₀	Units ATT	N C/N ₀	Units			
10/21/96							
SEIKO:	11.50 78.11 d	dB 15.2	5 81.86	dB	NA	NA	NA

Main Channel: Clipped Pink Noise

Revision:3/6/97 OME consistent definition.Revision:11/10/97 Changed Co/No to C/No.

91a

E-1 Analog Program -> HSSC

			Group A			Group B		Group A 92 kHz Off	Group A 57 kHz C	
Main C	Channel:			%	81 %		%	81 %	81 %	81 %
	Pilot:		9	%	9 % ·			9 %	9 %	9 %
	92 kHz:		7	%			%	0 %	7 %	%
	57 kHz:		3	%			%	3 %	0 %	6 %
Pro	oponent:		10	%			%	10 %	10 %	10 %
	eviation:		110	%		110	%	103 %	107 %	106 %
									•	
	·····	ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units			
	DDJ:	7.00	5.75	dB	7.50	6.25	dB	NA	NA	NA
		ATTN	C _o /N _o	Units	ATTN	C _o /N _o	Units			
	MITRE:	6.75	5.50	dB	7.00	5.75	dB	NA	NA	NA
		ATTN	C _o /N _o	Units	ATTN	C₀/N₀	Units			
	SEIKO:	11.50	11.22	dB	15.25	14.97	dB	NA	NA	NA

Main Channel: Clipped Pink Noise

Ammended: 3/6/97

SUPPLEMENTAL PATA

(with ros phasing set conectly for seites)

91 A

E-1 Analog Program -> HSSC

	Group A	Group B	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:	81 %	81 %	81 %	81 %	81 %
Pilot:	9 %	9 %	9 %	9 %	9%
92 kHz:	7 %	%	0 %	7 %	%
57 kHz:	. 3 %	10 %	3 %	0 %	6 %
Proponent:	10 %	10 %	10 %	10 %	10 %
Total Deviation:	110 %	110 %	103 %	107 %	106 %
	ATTN C/N ₀ Uni	ts ATTN C/N ₀ Units			
10/17/96					· · · · ·
DDJ:	6.75 73.26 dB	7.00 73.51 dB	NA	NA	NA
	ATTN C/N ₀ Uni	s ATTN C/N₀ Units			
10/18/96					
MITRE:	6.50 73.01 dB	7.00 73.51 dB	NA	NA	NA
	ATTN C/N ₀ Uni	ts ATTN C/N ₀ Units		· · · · · · · · · · · · · · · · · · ·	
10/21/96					
SEIKO:	11.50 78.11 dB	15.25 81.86 dB	NA	NA	NA

Main Channel: ABBA 5-Band Medium Fast Processing

Revision:3/6/97 OME consistent definition.Revision:11/10/97 Changed Co/No to C/No.

E-1 Analog Program -> HSSC

		·····	Group A		(Group B		Group A 92 kHz Off	Group A 57 k	Hz Off	57 kHz Reduced
Main C	Channel:			%			%	81 %		%	81 %
	Pilot:		9	%		9	%	9 %		%	9 %
	92 kHz:		7	%			%	0 %		%	%
	57 kHz:		3	%			%	3 %)%	6 %
Pro	oponent:		10	%			%	10 %)%	10 %
	eviation:		110	%		110	%	103 %	107	1 %	106 %
		ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units	· <u>····································</u>			
	DDJ:	6.75	5.50	dB	7.00	5.75	dB	NA	NA		NA
		ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units				
	MITRE:	6.50	5.25	dB	7.00	5.75	dB	NA	NA		NA
		ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units				
	SEIKO:	11.50	11.22	dB	15.25	14.97	dB	NA	NA		NA

Main Channel: ABBA 5-Band Medium Fast Processing Ammended: 3/6/97

SUPPLEMENTAL DATA

(with pos phasing at correctly for sciles)

2012

Digital Radio Test Laboratory (revised)

E-1 Analog Program -> HSSC

		Group /			Group I		Group A 92 kHz Off	Group A 57 kHz Off	57	kHz Red	duced
n Channel:			1 %		81	1 %	81 %	81 %	1		1 %
Pilot:			9%	1	9)%	9 %	9 %			9%
92 kHz:			7%			%	0 %	7 %			%
57 kHz:			3%)%	3 %	0 %			6 %
Proponent:)%		10)%	10 %	10 %			0 %
Deviation:		110) %		110) %	103 %	107 %			6 %
									1		
	ATTN	C₀⁄N₀	Units	ATTN	C₀/N₀	Units		······			
DDJ:	7.25	6.00	dB	6.75	5.50	dB ·	NA	NA		NA	
	ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units				-	·····
MITRE:	6.25	5.00	dB	6.50	5.25	dB	NA	NA		NA	:
	ATTN	C₀/N₀	Units	220 S	220 D	Units			ATTN	C₀/N₀	Uni
SEIKO:	13.50	13.13	dB	74.86	74.86	%	NA	NA	14.75	14.38	dB

Main Channel: Unbalanced Clipped Pink Noise

(see supplemental data)

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E-1 Analog Program -> HSSC

	Group			Group E	the second s	Group A 92 kHz Off	Group A 57 kHz Off	57 kHz Reduced
Main Channel:		1 %		81	l %	81 %	81 %	81 %
Pilot:		9 %		9)%	9 %	9 %	9 %
92 kHz:		7 %			%	0 %	7 %	%
57 kHz:		3 %		10) %	3 %	0 %	6 %
Proponent:	1	0%		10) %	10 %	10 %	10 %
Total Deviation:	11	0 %		110) %	103 %	107 %	106 %
							· · · · · · · · · · · · · · · · · · ·	
	ATTN C/No	Units	ATTN	C/N₀	Units			
10/17/96								
DDJ:	7.25 73.76	dB	6.75	73.26	₫B	NA	NA	NA
	ATTN C/N _o	Units	ATTN	C/N₀	Units			······································
10/18/96								
MITRE:	6.25 72.76	dB	6.50	73.01	₫B	NA	NA	NA
	ATTN C/No	Units	ATTN	C/N₀	Units			······
10/21/96								
SEIKO:	11.50 78.11	dB	15.00	81.61	dB	NA	NA	NA

Main Channel: Unbalanced Clipped Pink Noise

Revision:3/6/97 OME consistent definition.Revision:11/10/97 Changed Co/No to C/No.

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E-1 Analog Program -> HSSC

			Group A			Group E		Group A 92 kHz Off	Group A 57 kHz Of	
Main (Channel:			%			%	81 %	81 %	81 %
	Pilot:		9	%		9	%	9 %	9 %	9 %
	92 kHz:		7	%			%	0 %	7 %	%
	57 kHz:		3	%			%	3 %	0 %	6 %
Pr	oponent:		10	%			%	10 %	10 %	10 %
Total D	eviation:		110	%		110	%	103 %	107 %	106 %
		ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units		, , , , , , , , , , , , , , , ,	
	DDJ:	7.25	6.00	dB	6.75	5.50	dB	NA	NA	NA
		ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units			
	MITRE:	6.25	5.00	dB	6.50	5.25	dB	NA	NA	NA
		ATTN	C₀/N₀	Units	ATTN	C₀/N₀	Units			
	SEIKO:	11.50	11.22	dB	15.00	14.72	dB	NA	NA	NA

Main Channel: Unbalanced Clipped Pink Noise Ammended: 3/6/97

SUPPLEMENTAL DATA

(with 1.05 phasing set conectly for seike)

93A

TESTS

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F-1 HSSC ->	Analog SCA		Test Date:	10/16/96	•	Engineer(s)	: DML		
Main Chanr	nel·	Grou	ир А %			S Off]		S Off
	lot:	1	%		1	%			% %
92 ki			%		1	%			%
57 kH Propone			% %			% %		1	% %
Total Modulatio		110			100			10	
		92 kH (dl				Iz S/N			Iz S/N
		Medium	Weak		Medium	B) Weak	-	Medium	B) Weak
SEIK	0:	48.7	41.2		-			48.8	41.3
DI	DJ:	43.1	39.5		49.0	41.5		43.1	39.6
MITR	E:	48.7	41.3					48.8	41.3

Main Channel: Clipped Pink Noise

92 kHz: 1 kHz THD+Noise: 2.4 %

S/N measurements made RMS detected with out filter.

THD+Noise measurement made RMS without filter.

43

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DAT File Number	Time Code Start Stop			Program ID Description Number					Signal (dBm)	CCIR
HS40110.DAT 16-Oct-96						***				
	0:00	00:30	1					0 dB 1 kHz Reference: M=5.5: fmod=1 kHz:	-65	
	00:30	01:00	2			·····		Group A Noise Reference without Proponent: S/N=38.5 dB	-65	
	01:00	01:57	3					Group A with MITRE Gated ON - OFF	-65	0
	02:00	02:58	4					Group A with DDJ Gated ON - OFF	-65	-2
	03:00	03:58	5					Group A with SEIKO Gated ON - OFF	-65	0
	04:00	04:58	6					SEIKO Group A with RBDS Gated ON - OFF	-65	0
	05:00	05:54	7					DDJ Group A with RBDS Gated ON - OFF	-65	0
	06:00	06:55	8					MITRE Group A with RBDS Gated ON - OFF	-65	
								CCIR Grade used as a comparison of the Gated On Signal		
								as compared to the Gated Off Signal		
					•••••			Track 48 of the EBU SQAM Disk used for program material.		······
								Peak Deviation set for 5.5 kHz.		
					·····					
						••••••	••••••			
					••••••					
								·		••••••

File Name: HS_F.XLS F-1 DAT

96

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	Gro	up A]	HSD	S Off]	92 kF	Iz Off	
Main Channel:	81	%		81	%	1	81 %		
Pilot:	9	%		9	%			%	
92 kHz:	7	%		7	%		1	%	
57 kHz:	3	%		3	%			%	
Proponent:	10	%		0	%		1	%	
otal Deviation:	110	%		100			103		
		Ma	aximum Bloo	k Error Inde	ependent of I	Error Correct			
	RBDS BI	ock Error			lock Error	1	RBDS BI	ock Erro	
	(%	6)			%)			6) 6)	
	Medium	Weak		Medium	Weak	1	Medium	Weak	
DDJ:	5	7					4	6	
MITRE:	4	6		5	5		5	5	
SEIKO:	6	6		-			6	7	
Main Channel: Clipped	l Pink Noise 8.00 dB			ise Ref	<u>1</u>	Signal R 7 in	eference 6W		

Errors accumulated over a 5 minute measurement period. EBU SQAM Disk Track 48 used to exercise the 92 kHz SCA. - Area

F-3 HSSC -> 57 kHz Paging	F-3	HSSC	->	57	kHz	Paging
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		Test Date	: 10/16/96	J	Engineer(s):	DML
		Gro	oup B		HSD	S Off
Ma	in Channel:	81	%		81	%
	Pilot:	9)%		9	%
	57 kHz:	10)%		10	%
	Proponent:	10)%		0	%
Tota	l Deviation:	110) %		100	%
			Maximum	Uncorrected	Block Error	
		Block	k Error		Block	Error
		(<u>%)</u>		(?	6)
		Medium	Weak		Medium	Weak
	DDJ:	1	2			
	MITRE:	1	2		1	2
	SEIKO:	2	2			

Main Channel: Clipped Pink Noise Noise Attenuator: 0.00 dB

Errors accumulated over a 5 minute measurement period.

File Name: HS_F.XLS

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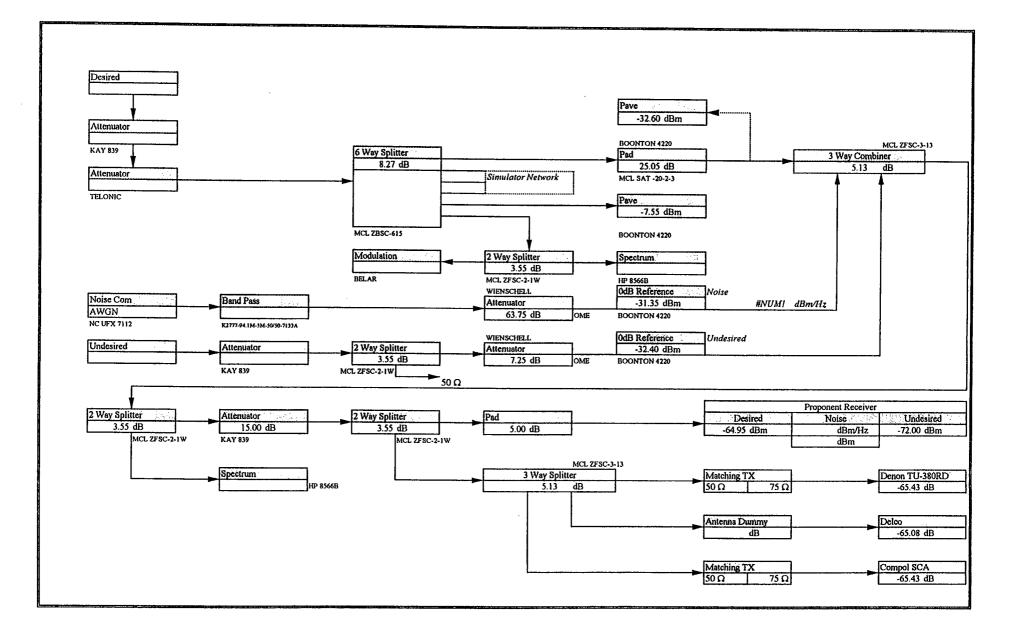
TESTS

G

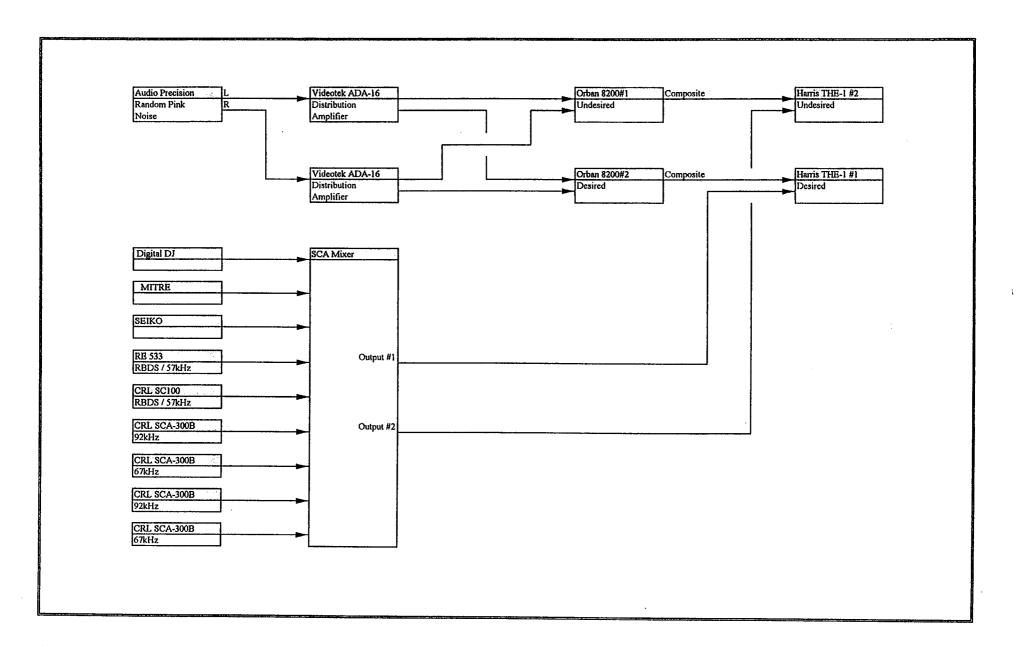
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File Name:HS_G.XLS Index: COMP

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Page 2 of 10

G-1 Lower Firs	t Adjacent		
Analog -> H		93.9 MHz	
	Desired	Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%
		ATTN	OME
		(dB)	D/U (dB)
MITRE:		12.00	-8.20
SEIKO:		18.00	-2.15
DDJ:		9.50	-10.65

G-1 Upper First	Adjacent		
Analog -> HS	SC	94.3 MHz	
	Desired	Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%
·		ATTN	OME
		(dB)	D/U (dB)
MITRE:		5.00	-15.20
SEIKO:		16.50	-3.65
DDJ:		12.00	-8.15

EO&C

File Name: HS_G.XLS

C.

G-2 Low	er Secor	nd Adjacer	nt	
Anal	og -> HS	SSC	93.7 MHz	
		Desired	Undesired	
Main Ch	annel:	81	81	%
1	Pilot:	9	9	%
6	7 kHz:	0	10	%
9	2 kHz:	7	10	%
5	7 kHz:	3	0	%
Prop	onent:	10	0	%
Total Dev	iation:	110	110	%
			ATTN	OME
			(dB)	D/U (dB)
M	IITRE:		0.00	-50.20
S	EIKO:		6.50	-43.65
	DDJ:		12.00	-38.15

G-1 Upper Seco	nd Adiacer	nt	
Analog -> HS	•	94.5 MHz	
-	Desired	Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	7	10	%
57 kHz:	3	0	%
Proponent:	10	0	%
Total Deviation:	110	110	%
		ATTN	OME
		(dB)	D/U (dB)
MITRE:		0.00	-50.20
SEIKO:		4.50	-45.65
DDJ:		13.50	-36.65

EO&C

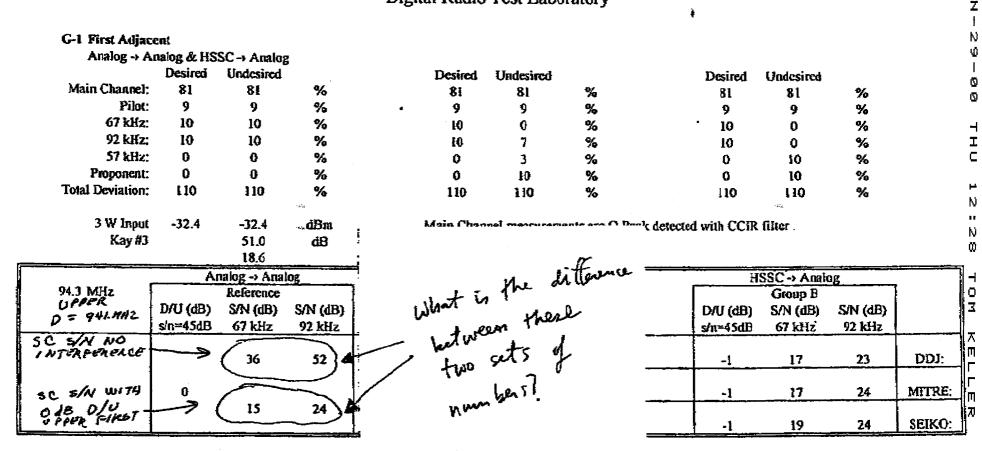
Could not achieve OME .

-37.65 dB Upper 2nd without modulation on 92kHz SCA.

File Name: HS_G.XLS

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	An	alog -> Anal	log			=	H	SSC -> Anale	og	
93.9 MHz LOWER D= 94.1 MHZ	D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	S/N (dB) 92 kHz	
SHONO FURST -	>	36	53	5	17	34	5	18	32	IDD:
IN WITH FIRST	5			5	17	34	5	18	32	MITRE:
		17	33	5	18	34	5	19	33	SEIKO:

File Name: HS_G.XLS

Delco 1st Adj

Page 5 of 10 N

G-1 First Adjac Analog -> A	ent malog & HS	SC -> Analog	2									
	Desired	Undesired	,		Desired	Undesired			Desired	Undesired		
Main Channel:	81	81	%		81	81	%		81	81	%	
Pilot:	9	9	%	•	9	9	%		9	9	%	
67 kHz:	10	10	%		10	0	%		10	0	%	
92 kHz:	10	10	%		10	7	%		10	0 0	%	
57 kHz:	0	0	%		0	3	%		0	10	%	
Proponent:	0	0	%		0	10	%		0	10	%	
Total Deviation:	110	110	%		110	110	%		110	110	%	
3 W Input	-32.4	-32.4	dBm		Main Chan	nel measurer	nents are Q-	Peak detecte	d with CCIR	filter .		
Kay #3		51.0	dB			rements are						
		18.6			Measureme	nts are unsta	ble and vary	•				
	Aı	nalog -> Anal	og		H	SSC -> Anal	og		H	SSC -> Anal	og	
94.3 MHz		Reference				Group A]	[Group B	<u> </u>	
	D/U (dB)	S/N (dB)	S/N (dB)		D/U (dB)	S/N (dB)	S/N (dB)		D/U (dB)	S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz		s/n=45dB	67 kHz	92 kHz		s/n=45dB	67 kHz	92 kHz	
		36	52		-1	15	25		-1	17	23	DDJ:
	0				-1	16	25		1	17	24	MITDE.
	, v	15	24		<u> </u>	10	2.3		-1	1/	24	MITRE:
		* <i>~</i>	21		-1	18	26		-1	19	24	SEIKO:

· · · · ·	A	nalog -> Ana	log	H	SSC -> Anal	og	 HSSC -> Analog			
93.9 MHz		Reference			Group A			Group B		
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	
		36	53	5	17	34	 5	18	32	DDJ:
	5			5	17	34	5	18	32	MITRE:
		17	33							
				 5	18	34	 5	19	33	SEIKO:

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G-2 Second Adjacent

Analog -> A	nalog & HS	SC -> Analog	g									
	Desired	Undesired			Desired	Undesired			Desired	Undesired		
Main Channel:		81	%		81	81	%		81	81	%	
Pilot:		9	%		9	9	%		9	9	%	
67 kHz:	10	10	%		10	0	%		10	0	%	
92 kHz:	10	10	%		10	7	%		10	0	%	
57 kHz:	0	0	%		0	3	%		0	10	%	
Proponent:	0	0	%		0	10	%		0	10	%	
Total Deviation:	110	110	%		110	110	%		110	110	%	
3 W Input		-32.4	dBm	M	ain Chanr	el measuren	nents are Q-	Peak detecte	d with CCIR	filter .		
Kay #3		51.0	dB			rements are						
		18.6		-4	0 dB D/U	produces a S	/N of appro	ximately 47	dB.			
	Aı	nalog -> Anal	og			SSC -> Analo				SSC -> Analo	ງຊ	
94.5 MHz		Reference				Group A	-]	[Group B	<u> </u>	
	D/U (dB)	S/N (dB)	S/N (dB)	L	/U (dB)	S/N (dB)	S/N (dB)		D/U (dB)	S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/	n=45dB	67 kHz	92 kHz		s/n=45dB	67 kHz	92 kHz	
		•										
		36	52		-40	24	7		-40	24	4	DDJ:
	-40				-40	24	8		-40	24	4	MITRE:
		24	10			•				_ •		
					-40	24	9		-40	24	3	SEIKO:

	A	nalog -> Ana			H	SSC -> Anal	og	Н	SSC -> Anal	ດ <u>ຍ</u>	
93.7 MHz	D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	S/N (dB) 92 kHz		D/U (dB) s/n=45dB	Group A S/N (dB) 67 kHz	S/N (dB) 92 kHz	 D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	S/N (dB) 92 kHz	
		36	52		-40	13	6	 -40	16	4	DDJ:
	40	10	7	•	-40	14	6	 -40	18	4	MITRE:
L					-40	16	7	 -40	20	4	SEIKO:

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G-1 First Adjac	ent								
Analog -> A	nalog & HS	SC -> Analog	1						
	Desircd	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm	Main Chan	nel measuren	nents are O-Peak	detected with CCIR	filter .	
Kay #3		51.0	dB		irements are	•			
		18.6							
	A	nalog -> Anal	og	Н	SSC -> Analo	og	H	SSC -> Anal	og
94.3 MHz		Reference			Group A			Group B	
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)
	1 10 100								/

 s/n=45dB	[•] 67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	
	37	52	21	34	46	21	34	45	DDJ:
21	24		21	34	47	21	35	46	MITRE:
	34	46	21	35	47	21	35	46	SEIKO:

	Aı	nalog -> Ana	og	Н	SSC -> Anal	og	H	SSC -> Anal	og	-
93.9 MHz		Reference			Group A			Group B		
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	
		37	52	32.5	36	52	32.5	36	52	DDJ:
	32.5			32.5	36	52	32.5	36	52	MITRE:
		36	52	32.5	36	52	32.5	36	52	SEIKO:

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G-2 Second Adjacent

Kay #3

51.0

18.6

dB

	Desired	Undesired		Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%	10	0	%
92 kHz:	10	10	%	10	7	%	10	0	%
57 kHz:	0	0	%	0	3	%	0	10	%
Proponent:	0	0	%	0	10	%	0	10	%
Total Deviation:	110	110	%	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm	Main Chan	nel measuren	nents are O-Peak	detected with CCIF	t filter	

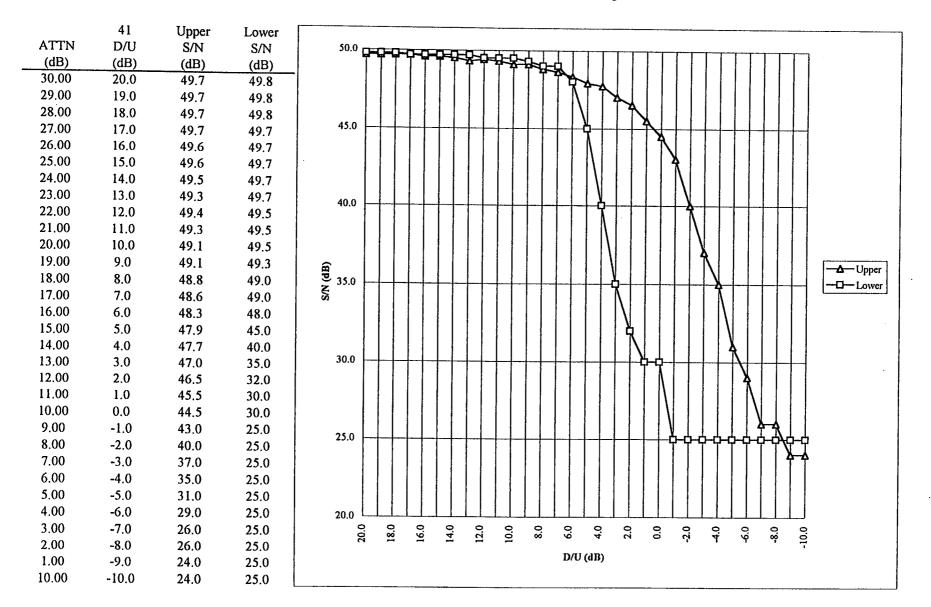
Main Channel measurements are Q-Peak detected with CCIR filter. SCA Measurements are RMS.

Analog -> Analog				 HSSC -> Analog			Н	HSSC -> Analog			
94.5 MHz	D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	Group A S/N (dB) 67 kHz	S/N (dB) 92 kHz	D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	S/N (dB) 92 kHz		
		37	52	-14	37	41	-14	37	43	DDJ:	
	-14	37	39	-14	37	41	-14	37	43	MITRE:	
		· ·		-14	37	41	-14	37	43	SEIKO:	

	Analog -> Analog				HSSC -> Analog			 HSSC -> Analog			
93.7 MHz	D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	S/N (dB) 92 kHz		D/U (dB) s/n=45dB	Group A S/N (dB) 67 kHz	S/N (dB) 92 kHz	 D/U (dB) s/n=45dB	Group B S/N (dB) 67 kHz	S/N (dB) 92 kHz	
		37	52		-13	37	48	 -16	37	48	DDJ:
	-13	37	48		-14	37	48	 -15	37	48	MITRE:
					-15	37	· 48	-18	37	48	SEIKO:

File Name: HS_G.XLS

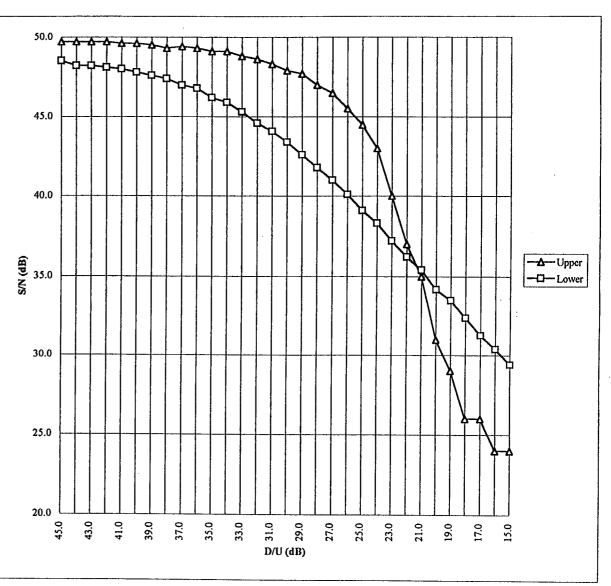
67



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	51	Upper	Lower
ATTN	D/U	S/N	S/N
(dB)	(dB)	(dB)	(dB)
45.0	45.0	49.7	48.5
44.0	44.0	49.7	48.2
43.0	43.0	49.7	48.2
42.0	42.0	49.7	48.1
41.0	41.0	49.6	48.0
40.0	40.0	49.6	47.8
39.0	39.0	49.5	47.6
38.0	38.0	49.3	47.4
37.0	37.0	49.4	47.0
36.0	36.0	49.3	46.8
35.0	35.0	49.1	46.2
34.0	34.0	49.1	45.9
33.0	33.0	48.8	45.3
32.0	32.0	48.6	44.6
31.0	31.0	48.3	44.1
30.0	30.0	47.9	43.4
29.0	29.0	47.7	42.6
28.0	28.0	47.0	41.8
27.0	27.0	46.5	41.0
26.0	26.0	45.5	40.1
25.0	25.0	44.5	39.1
24.0	24.0	43.0	38.3
23.0	23.0	40.0	37.2
22.0	22.0	37.0	36.2
21.0	21.0	35.0	35.4
20.0	20.0	31.0	34.2
19.0	19.0	29.0	33.5
18.0	18.0	26.0	32.4
17.0	17.0	26.0	31.3
16.0	16.0	24.0	30.4
15.0	15.0	24.0	29.4



File Name: HS_G.XLS

DIGITAL DJ

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SYSTEM SPECIFIC

H-1 & H-3

Characterization of HS Digital Subcarrier Signal Failure

4.39E+00

2.28E+01

(revised)

-A-BER

Test Date 1/9/97

Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: A Error Meas. Duration: 5 Min. Pilot: Not Locked

Analog Receivers: Delco RX 1

B-1 Additive White Gaussian Noise

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

PROPONENT SPECIFIC

COMPOSITE SIGNA

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5-Band Medium Process ORBAN #2 COMP OUT 1: Proponent COMP OUT 2: Prop + SC Main Channel modulati adjusted for 110%

B1.1	Noise Failure Cha	racterization								- \$ 201			
	Noise Level	Er	ror Level (%)							Byte		
C₀/N₀	Attn	BER	20 Byte	220 Byte									
62.46	63.75	0	0	0	80		-T		1	T		T	I
6.71	8.00	0	0	. 0	70								
6.46	7.75	8.00E-03	5.20E-02	2.86E-01	70								
6.21	7.50	2.60E-02	1.30E-01	8.57E-01	60						<u> </u>		
5.96	7.25	9.90E-02	5.21E-01	3.57E+00	*								
5.71	7.00	2.76E-01	1.32E+00	8.71E+00	Э 50 Н			1	†				·
5.46	6.75	5.40E-01	2.71E+00	1.61E+01	- C			<u> </u>	<u> </u>	<u> </u>			
5.21	6.50	9.51E-01	5.25E+00	2.97E+01	2 40 2 30 30								
4.96	6.25	1.87E+00	9.74E+00	4.84E+01	ER 30							/	
4.71	6.00	2.98E+00	1.60E+01	6.64E+01	20				L				

7.86E+01

5.75

4.46

10

0 년--6.71

6.46

6.21

5.96

5.71

5.46

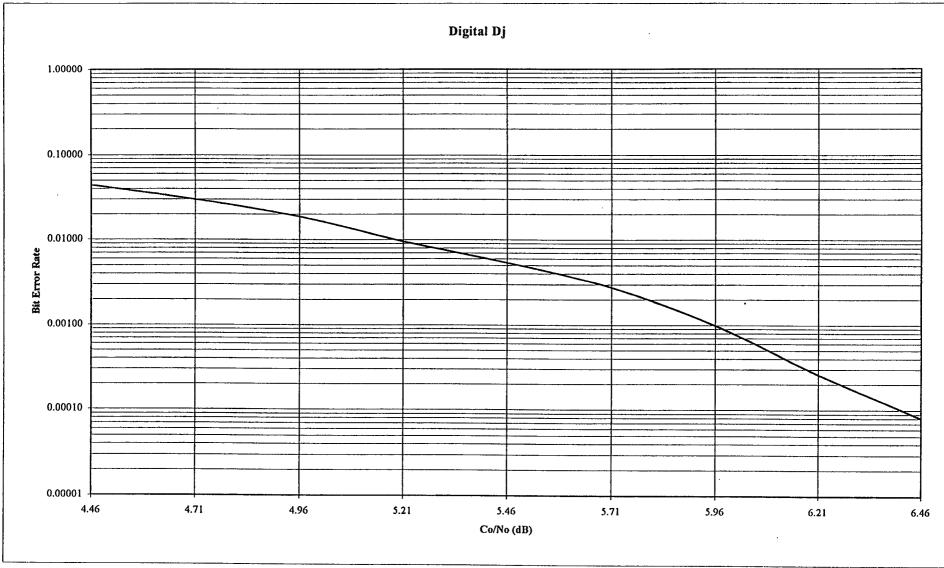
5.21

4.96

4.71

4.46

(verised)



File Name: H1_DDJ.XLS

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B-1 Additive White Gaussian Noise Digital Characterization of HS Digital Subcarrier Signal Failure

Test Date 1/9/97 Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

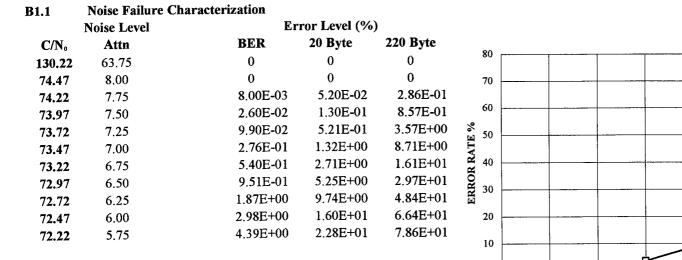
CC MPOSITE SIGNA

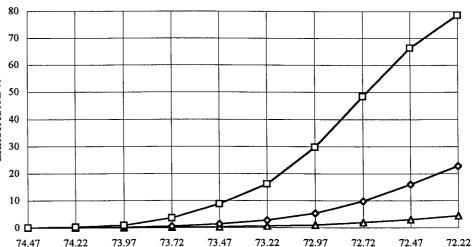
5-Band Medium Process ORBAN #2 COMP OUT 1: Proponent COMP OUT 2: Prop + SC Main Channel modulati adjusted for 110%

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: A Error Meas. Duration: 5 Min. Pilot: Not Locked

Analog Receivers: Delco RX 1

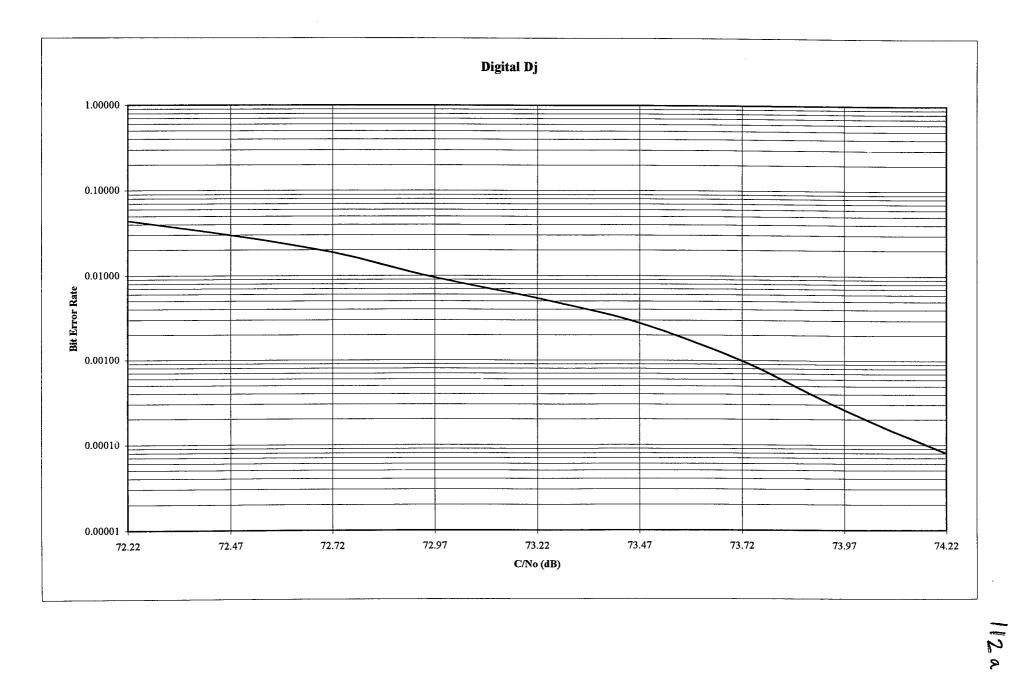
Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

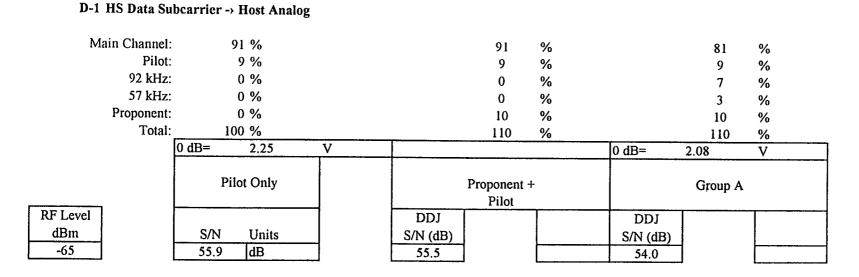




→ BER → 20 Byte

-D- 220 Byte





Pilot Frequency (kHz) Transmitter 18.99993

Lock 19.00003

Slight increase in noise floor with group A.

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H1_DDJ.XLS

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DDJ

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D-1 HS Data Subcarrier -> Host Analog

Main Channel:	91 %			91	%		81	%
Pilot:	9 %			9	%		. 9	%
92 kHz:	0 %			0	%		7	%
57 kHz:	0 %			0	%		3	%
Proponent:	0 %			10	%		10	%
Total:	100 %			110	%		110	%
	0 dB= 642.0	mV		·		0 dB=	604.0	mV
	Pilot Only]	Proponent Pilot	ŧ		Group A	
RF Level			DDJ			DDJ	1	
dBm	S/N Units		S/N (dB)			S/N (dB)		
-65	52.7 dB		52.4			50.7]	

Pilot Frequency (kHz)

Transmitter 18.99993 Lock 19.00003

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H1_DDJ.XLS

Pioneer SX-201

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D-1 HS Data Subcarrier -> Host Analog

Main Channel:	91 %		9	I	%		81	%
Pilot:	9 %		9		%		9	%
92 kHz:	0 %		0		%		7	%
57 kHz:	0 %		0		%		3	%
Proponent:	0 %		10)	%		10	%
Total:	100 %		11	0	%		110	%
	0 dB= 755.0	mV				0 dB=	699.0	mV
	Pilot Only		Propor Pil		+		Group A	
RF Level			DDJ			DDJ		
dBm	S/N Units		S/N (dB)			S/N (dB)		
-65	50.3 dB		50.3			49.0	7	

Pilot Frequency (kHz)

Transmitter 18.99993

Lock 19.00003

Engineer(s): DML, TBK Tests Conducted: 12/17/96

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

(revised)

Test Date 12/20/96

Engincer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

Variable Injection

Sig. Lev: -65dBm Main Ch. Mod: ABBA Ma SCA Group: Group A Error Meas. Duration: 5 Min.

Medium CHR

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

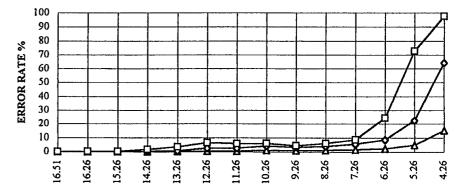
COMPOSITE SIGNAL

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility

B1.1	Noise	Failure	Characterization
D1.1	110130	ranuic	Characterization

D111	Noise Fanare Characterization									
	Noise Level	Er	ror Level (%)						
C₀/N₀	Attn	BER	20 Byte	220 Byte						
62.51	63.75	• 0	0	0						
16.51	17.75	0	0	0						
16.26	17.50	7.00E-03	1.30E-02	1.43E-01 OME						
15.26	16.50	3.00E-03	2.60E-02	1.43E-01						
14.26	15.50	5.60E-02	3.13E-01	1.71E+00						
13.26	14.50	1.48E-01	7.95E-01	3.57E+00						
12.26	13.50	4.00E-01	2.61E+00	6.43E+00						
11.26	12.50	5.50E-01	2.61E+00	5.71E+00						
10.26	11.50	1.09E+00	4.09E+00	6.00E+00						
9.26	10.50	1.00E+00	3.29E+00	4.43E+00						
8.26	9.50	1.26E+00	3.96E+00	6.00E+00						
7.26	8.50	1.70E+00	5.50E+00	8.57E+00						
6.26	7.50	2.33E+00	8.58E+00	2.41E+01						
5.26	6.50	4.83E+00	2.22E+01	7.29E+01						
4.26	5.50	1.52E+01	6.42E+01	9.73E+01						



File Name: H3.XLS

B-1

Medium CHR

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Test Date	Engineer(s):
12/20/96	DML

Basic Test Parameters:

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SIGNAL

Sig. Lev: -65dBm

SCA Group: Group A

Main Ch. Mod: ABBA

Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

Variable Injection

COMPOSITE SIGNAL

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

	Noise Level	Er	Error Level (%)							
C/N _o	Attn	BER	20 Byte	220 Byte						
130.27	63.75	0	0	0						
84.2 7	17.75	0	0	0						
84.02	17.50	7.00E-03	1.30E-02	1.43E-01 OME						
83.02	16.50	3.00E-03	2.60E-02	1.43E-01						
82.02	15.50	5.60E-02	3.13E-01	1.71E+00						
81.02	14.50	1.48E-01	7.95E-01	3.57E+00						
80.02	13.50	4.00E-01	2.61E+00	6.43E+00						
79.02	12.50	5.50E-01	2.61E+00	5.71E+00						
78.02	11.50	1.09E+00	4.09E+00	6.00E+00						
77.02	10.50	1.00E+00	3.29E+00	4.43E+00						
76.02	9.50	1.26E+00	3.96E+00	6.00E+00						
75.02	8.50	1.70E+00	5.50E+00	8.57E+00						
74.02	7.50	2.33E+00	8.58E+00	2.41E+01						
73.02	6.50	4.83E+00	2.22E+01	7.29E+01						
72.02	5,50	1.52E+01	6.42E+01	9.73E+01						

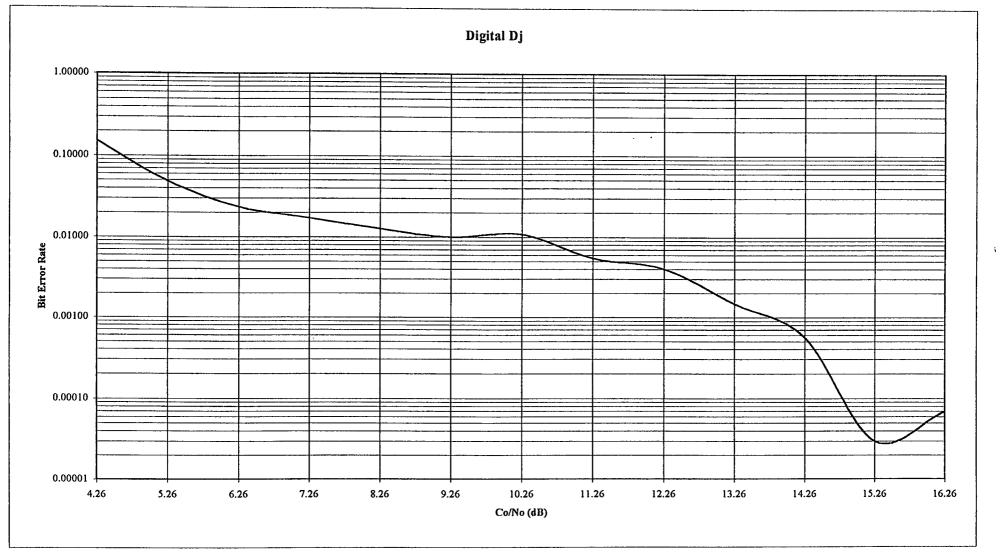


-A-BER

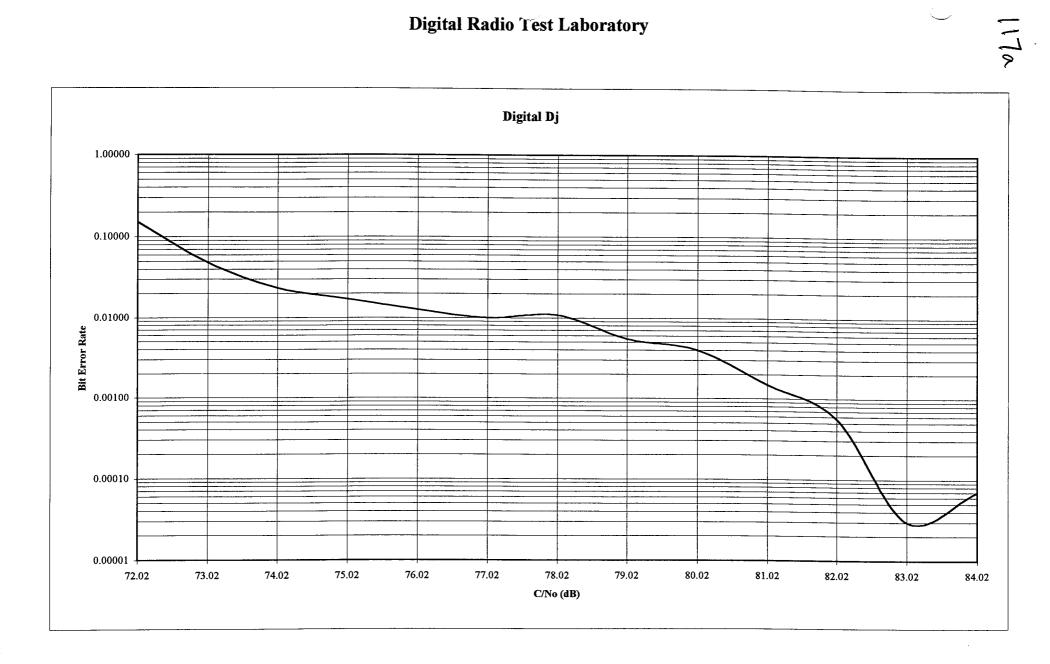
-**0**-20 Byte

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B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

(reviced)

Test Date 2/5/97

Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

COMPOSITE SIGNAL

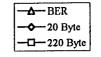
Sig. Lev: -65dBm Main Ch. Mod: ABBA Medium CHR SCA Group: Proponent Only Error Meas. Duration: 5 Min. Variable Injection

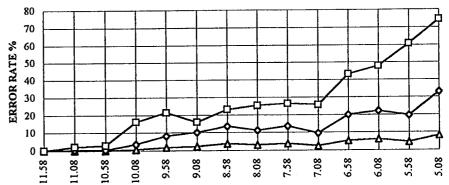
5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility

B1.1	Noise Failure Ch	aracterization						
	Noise Level	Error Level (%)						
C _o /N _o	Attn	BER	20 Byte	220 Byte				
63.33	63.75	0	0	0				
11.58	12.00	0	0	0				
11.08	11.50	4.23E-02	2.74E-01	2.00E+00 OME				
10.58	11.00	8.80E-02	4.17E-01	2.71E+00				
10.08	10.50	6.15E-01	3.42E+00	1.61E+01				
9.58	10.00	1.62E+00	7.98E+00	2.13E+01				
9.08	9.50	2.28E+00	9.98E+00	1.59E+01				
8.58	9.00	3.63E+00	1.35E+01	2.30E+01				
8.08	8.50	2.88E+00	1.11E+01	2.51E+01				
7.58	8.00	3.68E+00	1.36E+01	2.63E+01				
7.08	7.50	2.33E+00	9.57E+00	2.56E+01				
6.58	7.00	5.14E+00	1.99E+01	4.31E+01				
6.08	6,50	6.08E+00	2.21E+01	4.79E+01				
5.58	6.00	4.34E+00	1.96E+01	6.07E+01				
5.08	5.50	8.05E+00	3.28E+01	7.44E+01				





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Medium CHR

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Test Date 2/5/97

Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm

SCA Group: Proponent Only

Main Ch. Mod: ABBA

Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

Variable Injection

COMPOSITE SIGNAL

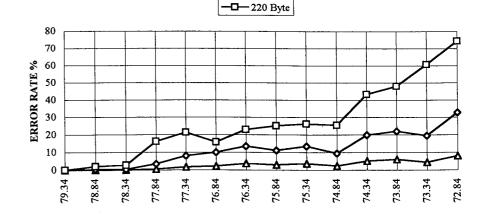
5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

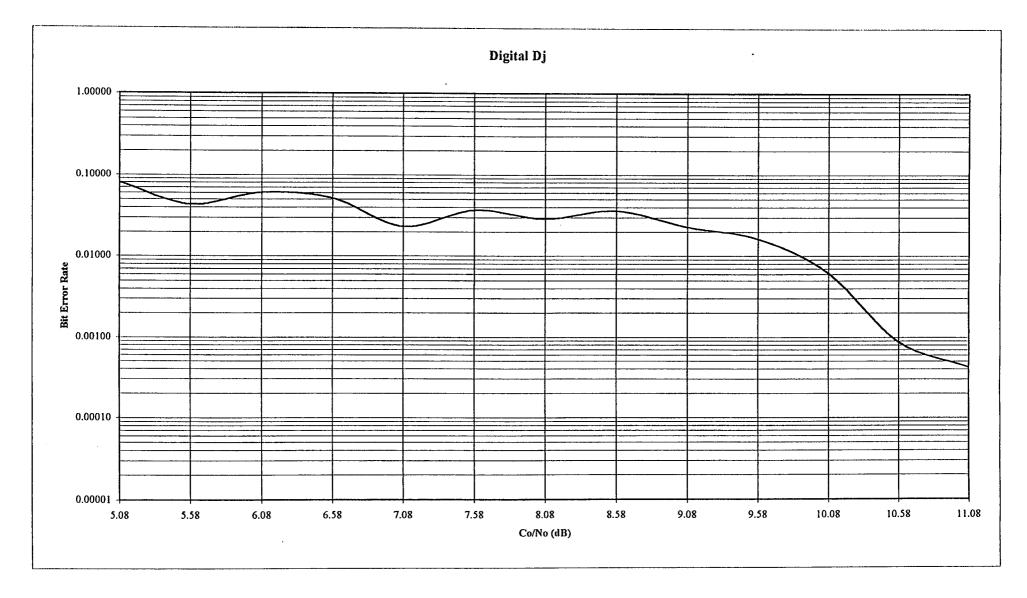
D1.1	Hoise Fanure Ci			
	Noise Level	Eri	ror Level (%)
C/N₀	Attn	BER	20 Byte	220 Byte
131.09	63.75	0	0	0
79.34	12.00	0	0	0
78.84	11.50	4.23E-02	2.74E-01	2.00E+00 OME
78.34	11.00	8.80E-02	4.17E-01	2.71E+00
77.84	10.50	6.15E-01	3.42E+00	1.61E+01
77.34	10.00	1.62E+00	7.98E+00	2.13E+01
76.84	9.50	2.28E+00	9.98E+00	1.59E+01
76.34	9.00	3.63E+00	1.35E+01	2.30E+01
75.84	8.50	2.88E+00	1.11E+01	2.51E+01
75.34	8.00	3.68E+00	1.36E+01	2.63E+01
74.84	7,50	2.33E+00	9.57E+00	2.56E+01
74.34	7.00	5.14E+00	1.99E+01	4.31E+01
73.84	6.50	6.08E+00	2.21E+01	4.79E+01
73.34	6.00	4.34E+00	1.96E+01	6.07E+01
72.84	5.50	8.05E+00	3.28E+01	7.44E+01



------BER

-**\$**-- 20 Byte

(revised)



B-2 Co-Channel

B2.3

PROPONENT SPECIFIC Variable Injection

Undesired Signal Parameters

SCA Group: 67 & 92 kHz

RF Key Point Meas .:

Modulation Level:

Main Channel Modulation:

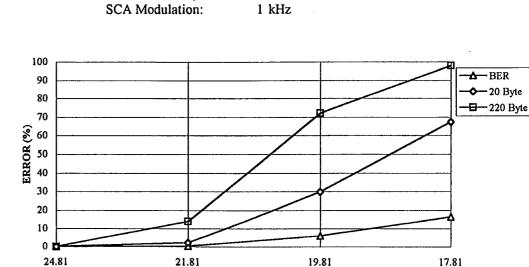
COMPOSITE SIGNAL

ORBAN #1 COMP OUT 1: Prop + SCA COMP OUT 2: Proponent Only

ORBAN #2 COMP OUT 1: Proponent Only

COMP OUT 2: Prop + SCA

Main Channel modulation adjusted for 110%



D/U (dB)

-32.43 dBm

110 %

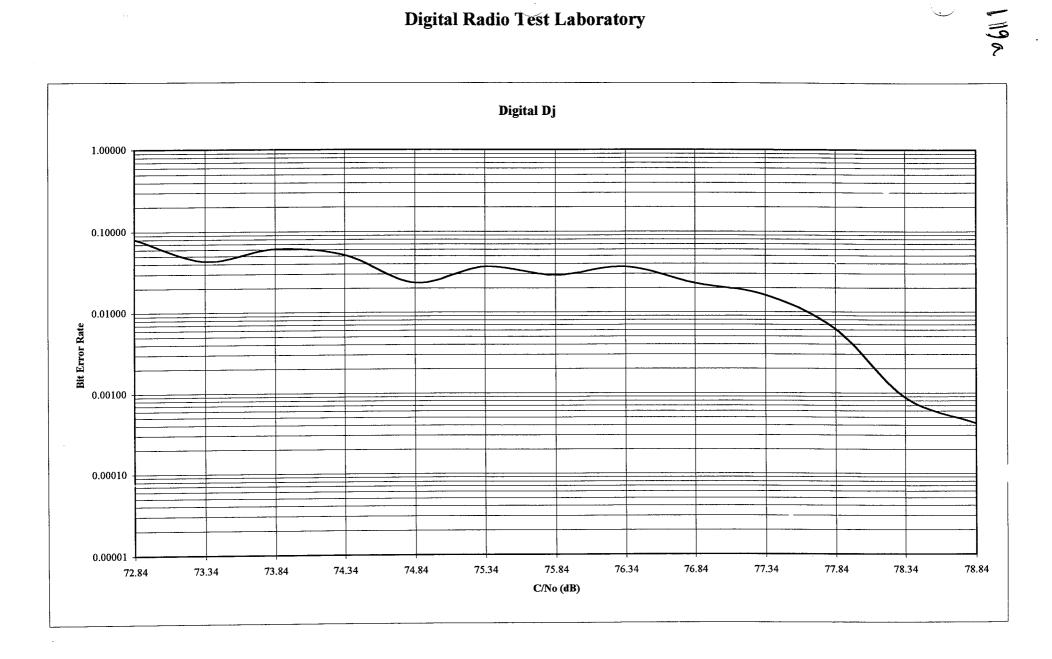
CPN

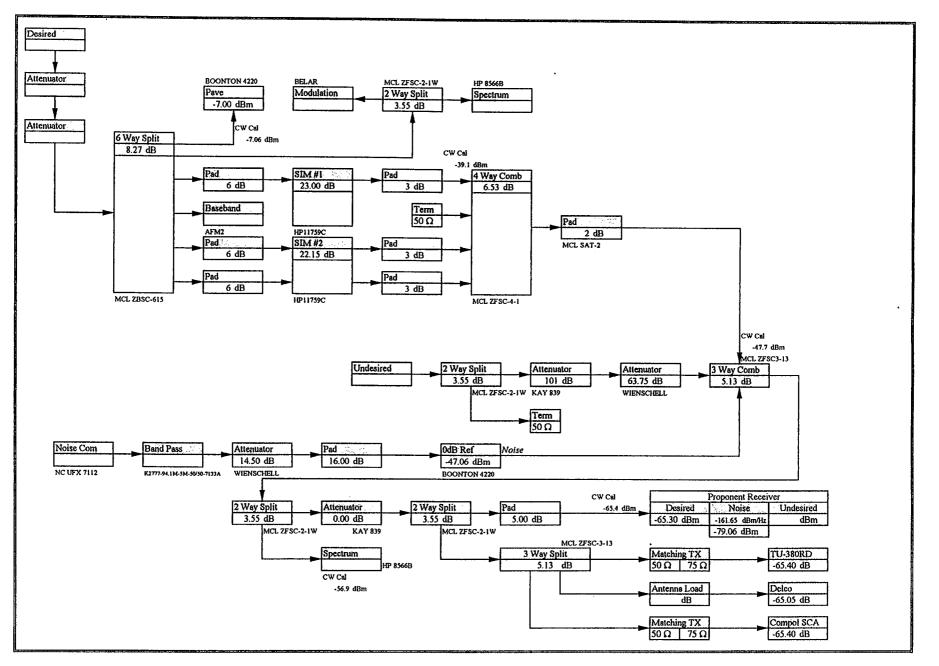
Desired Signal Parameters RF Key Point Meas.: -32.62 dBm RX RF Level: -65 dBm Main Channel Modulation: ABBA kHz Modulation Level: 110 % SCA Group: Group A

Co-Channnel Analog Reference

Co-Chan	. Level	Cum. Error Level					
D/U	Attn	BER	20 Byte	220 Byte			
24.81	25.00	0	0	0			
21.81	22.00	0.382	2.203	14.00			
19.81	20.00	6,159	29.81	72.00			
17.81	18.00	16.467	67.34	98.00			

File Name: H3.XLS





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(nevised)

D 2 Multinath						l	
B-3 Multipath	A HC Dialdal	Cubern	or Signal I				
Characterization	•		er signal r NAL	anure	וססמ	PONENT SPECIFIC	COMPOSITE SIGNAL
Basic Test Parameter	'S:	51G	NAL		PROF	FUNENT SPECIFIC	COMI OSITE SIGNAD
One Dati	n Zero Phase I	Deference:	-65dBm		L.	/ariable Injection	ORBAN #1
Olle Fall	Main Chan				•		COMP OUT 1: Not Used
		CA Group:					COMP OUT 2: Not Used
Error	Measurement	•					5-Band Medium Processed
EIIOIIN	vicasurement	Duration.	J IVIIII.				ORBAN #2
Analog Receiver	s: Delco RX	1					COMP OUT 1: Proponent Only
Annuog Receiver	Compol 92		Receiver				COMP OUT 2: Prop + SCA
	•				ck software util	ltv	Main Channel modulation
	Denon ICA						adjusted for 110%
	Noise	Level	Er	ror Level	(%)	EO&C	
	C₀/N₀	Attn	BER	20 Byte	220 Byte		
Urban Slow	58.00	63.75	0.7470	2.294	3.571	Performance impaire	d without added noise.
						-	
,							
Urban Fast	58.00	63.75	0.6450	3.193	18.71	Performance impaire	d without added noise.
	-						
Rural Fast	58.00	63.75	0.3800	2.112	12.00	Dorformonoo immoire	d without added poins
Rural Past	38.00	03.75	0.3800	2.112	12.00	Performance impaire	d without added noise.
							1
Obstructed	58.00	63,75	100.0	100.0	100.0	Receiver does not acc	uire signal consistently.
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~							ed on completed files and not all
						files are completely t	-

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B-3 Multipath Characterization Basic Test Paramet	÷		er Signal F NAL	ailure	PRO	DPONENT SPECIFIC	COMPOSITE SIGNAL
One Path Zero Phase Reference: -65dBm Main Channel Mod: CPN SCA Group: A Error Measurement Duration: 5 Min.					Variable Injection	ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2	
Analog Receiv	Compol 92	KHz SCA		/RDS Chec	ck software u	tilty	COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%
	Noise 2	Level	Er	ror Level	(%)	EO&C	
Urban Slow	C/N₀ 125.76	Attn 63.75	BER 0.7470	20 Byte 2.294	220 Byte 3.571	Performance impaire	ed without added noise.
Urban Fast	125.76	63.75	0.6450	3.193	18.71	Performance impaire	ed without added noise.
Rural Fast	125.76	63.75	0.3800	2.112	12.00	Performance impaire	ed without added noise.
Obstructed	125.76	63.75	100.0	100.0	100.0		quire signal consistently. ted on completed files and not all transfered.

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(revised)

B-3 Multipath Characterization of HS Digital Subcarrier Signal Failure Basic Test Parameters: SIGNAL

PROPONENT SPECIFIC

Variable Injection

One Path Zero Phase Reference: -65dBm Main Channel Mod: ABBA Medium CHR SCA Group: Group A and Proponent Only Error Measurement Duration: 5 Min.

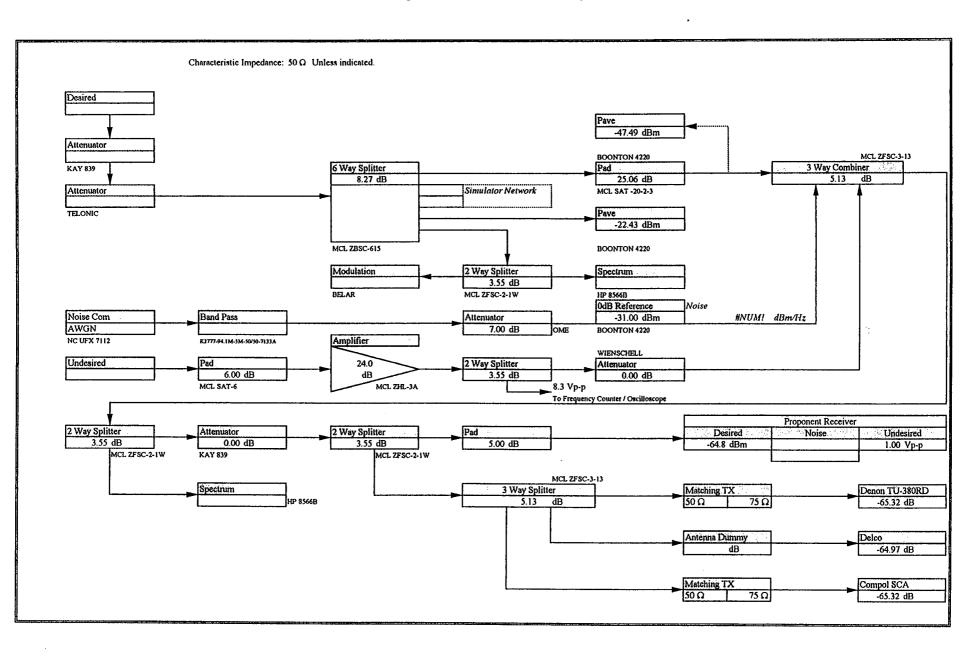
Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty **COMPOSITE SIGNAL**

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ORBAN #1 COMP OUT 1: Not Used COMP OUT 2: Not Used 5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

		Noise	Level	Er	ror Level ((%)	EO&C
		C ₀ /N ₀	Attn	BER	20 Byte	220 Byte	
Urban Slow	Grp A	63.34	63.75	0.7470	2.294	3.571	Performance impaired without added noise.
I ·	ODJ Only			0.3350	1.095	3.000	
Urban Fast	Grp A	63.34	63.75	0.6450	3.193	18.71	Performance impaired without added noise.
	ODJ Only			0.5650	2.815	15.57	
Rural Fast	Grp A	63.34	63.75	0.3800	2.112	12.00	Performance impaired without added noise.
	DDJ Only			0.2480	1.290	8.857	
Obstructed	Grp A	63.34	63.75	100.0	100.0	100.0	Receiver does not acquire signal consistently. Statistics are calculated on completed files and not all
	DJ Only			100.0	100.0	100.0	files are completely transfered.



Page 9 of 22

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Characterization of Basic Test Parameters:			NAL		PROP	ONENT SPECIFIC	COMPOSITE SIGNAL
One Path Z	ero Phase	Reference:	-65dBm		v	ariable Injection	ORBAN #1
1	Main Chan			Medium (COMP OUT 1: Not Used
		-	Group A a	and Propon	ent Only		COMP OUT 2: Not Used
Error Me	asurement	Duration:	5 Min.				5-Band Medium Processed ORBAN #2
Analog Receivers:	Delco RX	1					COMP OUT 1: Proponent Onl
	Compol 92						COMP OUT 2: Prop + SCA
	Denon RX	2 RBDS I	Receiver W	/RDS Chec	k software utilt	ty	Main Channel modulation adjusted for 110%
	Noise	Level		ror Level		EO&C	
	C/N ₀	Attn	BER	•	220 Byte		
-	131.10	63.75	0.7470	2.294	3.571	Performance impaire	ed without added noise.
Urban Slow DDJ Only			0.3350	1.095	3.000		
DD3 Only			0.5550	1.095	5,000		
-	131.10	63.75	0.6450	3.193	18.71	Performance impaire	ed without added noise.
Urban Fast			0.5650	2.815	15.57		
DDJ Only			0.3030	2.015	13.57		
Grp A	131.10	63.75	0.3800	2.112	12.00	Performance impaire	ed without added noise.
Rural Fast				1 000			
DDJ Only			0.2480	1.290	8.857		
Grp A	131.10	63.75	100.0	100.0	100.0	Receiver does not ac	quire signal consistently.
Obstructed							ted on completed files and not all
DDJ Only			100.0	100.0	100.0	files are completely	transfered.

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B-4 Impulse Noise 12/23/96 Variable Injection Desired Signal -65 dBm at receiver input. Group A subcarriers.

Undesired Signal

10 ns wide 1.0 Vp-p pulse at receiver input Repetition Rate Variable

Results accumulated over 5 minute measurement period.

•			ABBA		
Repetition Rate	BER	20 Byte	220 Byte	Attenuator Setting	Voltage
(Hz)				(dB)	(Vp-p)
100	0.0000	0.0000	0.0000	0	1.000
200	0.0000	0.0000	0.0000	0	1.000
300	0.0000	0.0000	0.0000	0	1.000
600	0.0000	0.0000	0.0000	0	1.000
1000	0.0970	0.6520	3.857	0	1.000
1000	0.0650	0.3520	2.286	10	0.3162
1000	0.0310	0.1960	1.571	15	0.1778
1000	0.0000	0.0000	0.0000	20	0.1000

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(revised)

Analog	Noise	Level	Er	ror Level (%)	Main Channel	SCA	Weak Signal	
Out	Attn	C ₀ /N ₀	BER	20 Byte	220 Byte	Modulation Medium CHR	Injection	Performance	
	7.50	6.26	0.0E+00	0.0E+00	0.0E+00			42 dB	
	7.25	6.01	3.00E-05	3.90E-04	2.86E-03	ABBA	10%	-92 ≤OME< -91	dBm
p-c	18.25	17.01	4.00E-05	1.30E-04	1.43E-03	ABBA	Variable	31 dB -81 ≤OME< -80	dBm
	28.75	27.51	9.00E-05	3.90E-04	2.86E-03	ABBA	4%	20 dB -70 ≤OME< -69	dBm
flat	18.25	17.01	3.00E-05	1.30E-04	1.43E-03	ABBA	Variable	30 dB -80 ≤OME< -79	dBm

File Name: H3.XLS

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Analog	Noise	Level	Er	ror Level (%)	Main Channel	SCA	Weak Signal	
Out	Attn	C/N ₀	BER	20 Byte	220 Byte	Modulation	Injection	Performance	
						Medium CHR			
	7.50	74.02	0.0E+00	0.0E+00	0.0E+00			42 dB	
	7.25	73.77	3.00E-05	3.90E-04	2.86E-03	ABBA	10%	-92 ≤OME< -91	dBm
								31 dB	
р-е	18.25	84.77	4.00E-05	1.30E-04	1.43E-03	ABBA	Variable	-81 ≤OME< -80	dBm
								20 dB	
	28.75	95.27	9.00E-05	3.90E-04	2.86E-03	ABBA	4%	-70 ≤OME< -69	dBm
								30 dB	
flat	18.25	84. 77	3.00E-05	1.30E-04	1.43E-03	ABBA	Variable	-80 ≤OME< -79	dBm

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C-1 Re-Acquisition Variable Injection		12/23/96			
j 	POF-2dB	Re-Acquisition Time (s) POF-4dB	POF-6dB		
	1.0	2.6	1.4		
	1.6	1.0	3.1		
	1.9	1.6	1.3		
	6.3	1.3	1.0		
	1.5	2.8	1.0		
Average	2.4	1.9	1.5		
Point Of Failure Atte		÷			
Desired Signal Refer		-32.62 -31.0			
Desired Signal Level	-		dBm		

POF Noise Level is defined as the level which causes 220 byte Packet Error Rate of $95\% \pm 5\%$.

ABBA Used as Modulation Source on Main Channel

Connection is broken for at least 30 seconds.

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			Re-Acquisition Time (s		
	Tsim (s)	POF-2	POF-4	POF-6	
	5	2.2	2.5	1.5	
	10	2.0	2.7	3.2	
•	15	1.8	1.5	2.1	
	20	1.8	1.8	3.1	
	Average	1.9	2.2	2.5	
	POF Attenuator	Setting:	12 dB		
0&C	Poi	nt of Failure (POF) d	efined as:		<u> </u>
		Byte Message Error		50 %	

File Name: H3.XLS C-2 USR

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	Tains (a)	DOF 0	Re-Acquisition Time (s		
	Tsim (s)	POF-2	POF-4	POF-6	
	5	3.1	2.1	2.4	
	10	3.2	4.8	5.7	
	15	1.5	2.9	1.3	
	20	3.1	1.7	2.6	
	Average	2.7	2.9	3.0	
		POF Attenuator	Setting: 18 dB		
D&C			<u></u>		
ect Dat	e: 23-Dec-96				

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		Re-Acquisition Time (s	
Tsim (s)	POF-2	POF-4	POF-6
5	3.8	3.0	4.0
10	1.9	2.7	4.3
15	3.0	3.1	2.0
20	2.0	1.6	2.2
Average	2.6	2.6	3.1
	POF Attenuator	Setting: 20 dB	
)&C		<u> </u>	

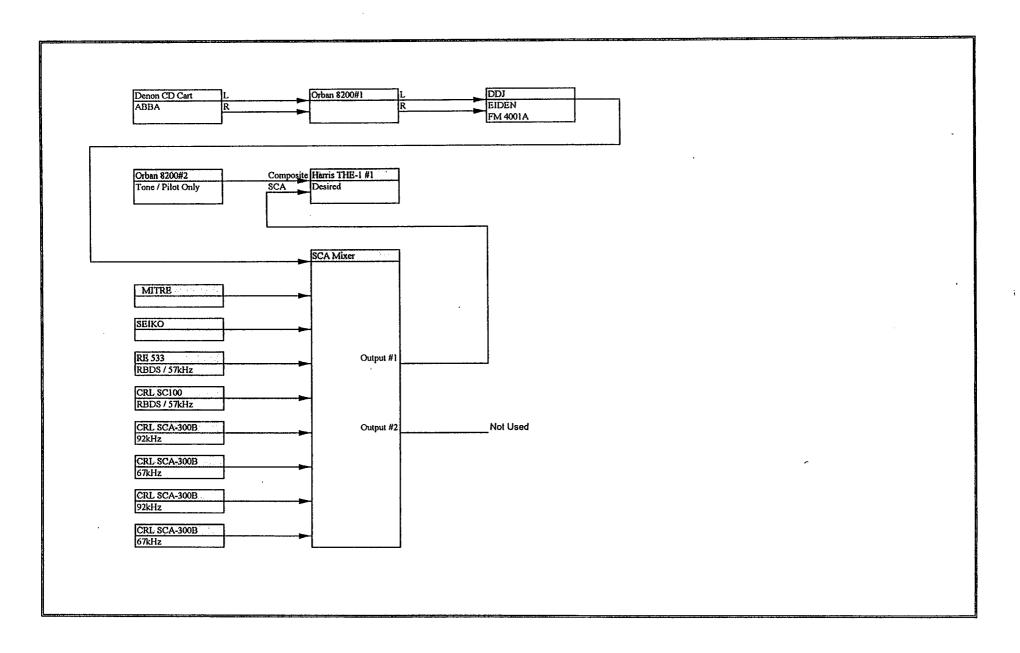
File Name: H3.XLS C-2 RFR

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Test	C-2	Re-Acquisition with Multipath Obstructed Rayleigh				
	Tsim (s)	Rc-Acquisition Time (s) POF				
	5					
	10					
	15					
	20					
	Average	0.0				
EO&C	System only re-acquires for short bursts which are not long enough to determine re-acquisition time accurately.					
Test Date: ngineer(s):	23-Dec-96 DML	<u>, an </u>				



File Name:H3.XLS Index: COMP

Page 17 of 22

Main Channel:	91 %	91 %	91 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	0 %
57 kHz:	0 %	0 %	0 %
Proponent:	0 %	4 %	4-10 %
Total:	100 %	104 %	104-110 %
-	·····		
	Pilot Only	Proponent + Pilot	Proponent Variable + Pilot
RF Level		DDJ	DDJ
dBm	S/N Units	S/N (dB)	S/N (dB)
-50	57.3 dB	57.0	55.4
-65	55.6 dB	55.4	54.2

D-1 HS Data Subcarrier -> Host Analog

At strong and medium signal levels noise floor modulates to ABBA beat with variable injection.

Engineer(s): DML, TBK Tests Conducted: 12/17/96

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Main Channel:	91 %	91 %	91 %
Pilot:	9 %	9 %	9 %
92 kHz:	0 %	0 %	0 %
57 kHz:	0 %	0 %	0 %
Proponent:	0 %	4 %	4-10 %
Total:	100 %	104 %	104-110 %
	Pilot Only	Proponent + Pilot	Proponent Variable + Pilot
RF Level		DDJ	DDJ
dBm	S/N Units	S/N (dB)	S/N (dB)
-50	60.5 dB	60.2	59.4
-65	52.6 dB	52.6	52.4

D-1 HS Data Subcarrier -> Host Analog

Could not detect variable injection effect on noise floor at strong and medium signal levels.

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H3.XLS

Pioneer SX-201

Main Channel:	91 %	91 %	91 %	
Pilot:	9 %	9 %	9 %	
92 kHz:	0 %	. 0 %	0 %	
57 kHz:	0 %	0 %	0 %	
Proponent:	0 %	4 %	4-10 %	
Total: 100 %		104 %	104-110 %	
	Pilot Only	Proponent + Pilot	Proponent Variable + Pilot	
RF Level		DDJ	DDJ	
dBm	S/N Units	S/N (dB)	S/N (dB)	
-50	61.2 dB	61.0	60.5	
-65	50.4 dB	50.2	50.1	

Slight increase in noise floor at strong signal level.

Could not detect variable injection effect on noise floor at medium signal level.

Engineer(s): DML, TBK Tests Conducted: 12/17/96

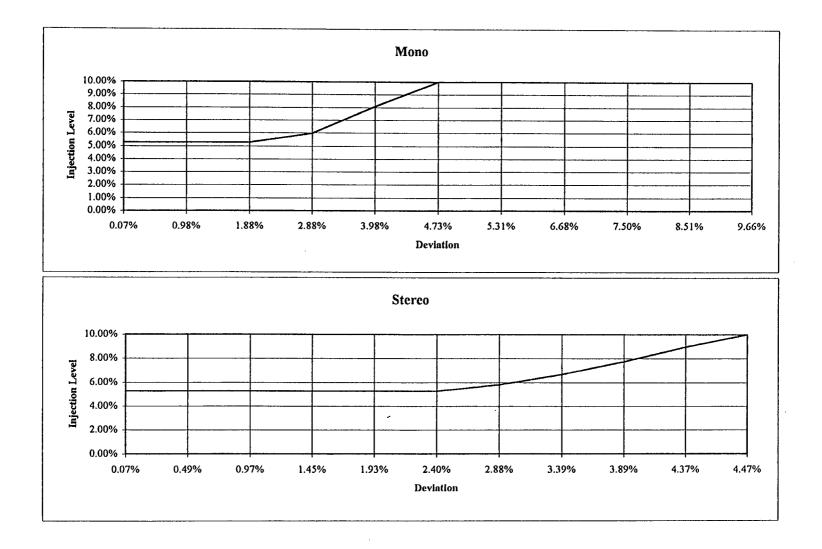
Mono	SCA		Stereo	SCA	
Deviation	Injection	Vp-p	Deviation	Injection	Vp-p
0.07%	5.26%	0.15	0.07%	5.26%	0.15
0.98%	5.26%	0.15	0.49%	5.26%	0.15
1.88%	5.26%	0.15	0.97%	5.26%	0.15
2.88%	5.96%	0.17	1.45%	5.26%	0.15
3.98%	8.07%	0.23	1.93%	5.26%	0.15
4.73%	10.00%	0.29	2.40%	5.26%	0.15
5.31%	10.00%	0.29	2.88%	5.79%	0.17
6.68%	10.00%	0.29	3.39%	6.67%	0.19
7.50%	10.00%	0.29	3.89%	7.72%	0.22
8.51%	10.00%	0.29	4.37%	8.95%	0.26
9.66%	10.00%	0.29	4.47%	10.00%	0.29

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H3.XLS







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SYSTEM SPECIFIC

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H-1 & H-2

Characterization of HS Digital Subcarrier Signal Failure

Test Date 1/9/97

Engineer(s): DML

B-1 Additive White Gaussian Noise

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

(wird)

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: A Error Meas. Duration: 5 Min. Pilot: Not Locked

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

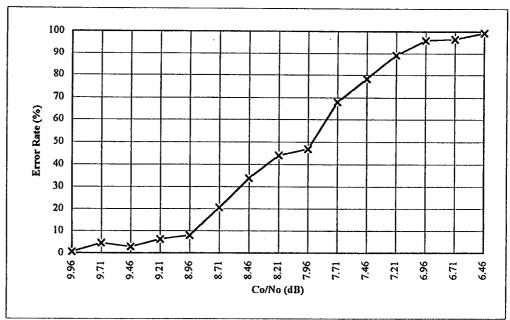
COMPOSITE SIGNAL

8

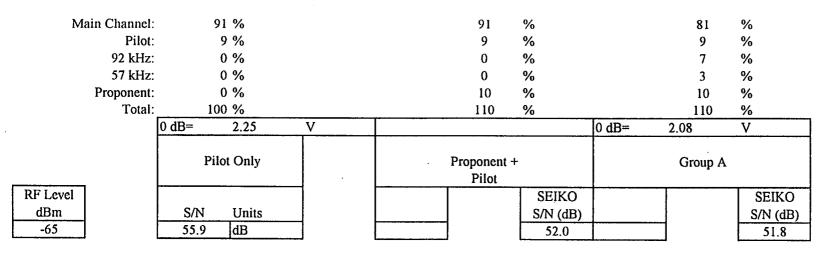
5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

B1.1 Noise Failure Characterization

noise ranare en	ai acter ization			
Noise Level	E	rror Level ((%)	
Attn	BER	20 Byte	220 Byte	Γ
63.75			0	
11.50			0.000	
11.25			0.570	
11.00			4.570	Ì
10.75			2.860	
10.50			6.290	
10.25			8.000	l
10.00			20.570	
9.75			33.710	
9.50			44.00	
9.25			46.86	
9.00			68.00	
8.75			78.29	
8.50			89.14	
8.25			96.00	
8.00			96.57	
7.75			99.43	
	Noise Level Attn 63.75 11.50 11.25 11.00 10.75 10.50 10.25 10.00 9.75 9.50 9.25 9.00 8.75 8.50 8.25 8.00	Noise Level En Attn BER 63.75 11.50 11.25 11.00 10.75 10.50 10.25 10.00 9.75 9.50 9.25 9.00 8.75 8.50 8.25 8.00	Attn BER 20 Byte 63.75 11.50 11.25 11.00 10.75 10.50 10.25 10.00 9.75 9.50 9.25 9.00 8.75 8.50 8.25 8.00	Noise LevelError Level (%)AttnBER20 Byte220 Byte63.750011.500.00011.250.57011.004.57010.752.86010.506.29010.258.00010.0020.5709.7533.7109.5044.009.2568.008.7578.298.5089.148.2596.008.0096.57



File Name: H1_SEI.XLS



D-1 HS Data Subcarrier -> Host Analog

Pilot Frequency (kHz) Transmitter 18.99993

Perceptable increase in noise floor proponent only and with group A.

SEIKO

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H1_SEI.XLS

Lock

19.00003

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Characterization of HS Digital Subcarrier Signal Failure

Test Date	
1/9/97	

1

Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: A Error Meas. Duration: 5 Min. Pilot: Not Locked

Analog Receivers: Delco RX 1

B-1 Additive White Gaussian Noise

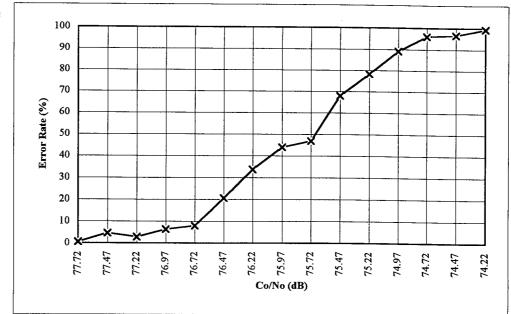
Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility **COMPOSITE SIGNAL**

1550

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

B1.1 Noise Failure Characterization

D1+1	roise ranure	Character ization	
	Noise Level	Error Lev	vel (%)
C/N _o	Attn	BER 20 By	te 220 Byte
130.22	63.75		0
77 .9 7	11.50		0.000
77.72	11.25		0.570
77.47	11.00		4.570
77.22	10.75		2.860
76.97	10.50		6.290
76.72	10.25		8.000
76.47	10.00		20.570
76.22	9.75		33.710
75.97	9.50		44.00
75.72	9.25		46.86
75.47	9.00		68.00
75.22	8.75		78.29
7 4.9 7	8.50		89.14
74.72	8.25		96.00
74.47	8.00		96.57
74.22	7.75		99.43



File Name: H1_SEI_A.XLS

D-1 HS Data Subcarrier -> Host Analog

Main Channel:	91	%		91	%		81	%
Pilot:	9	%		9	%		9	%
92 kHz:	0	%		0	%		7	%
57 kHz:	0	%		0	%		3	%
Proponent:	0			10	%		10	%
Total:				 110	%		110	%
	0 dB=	642.0	mV			0 dB=	604.0	mV
	Pilot	Only		Proponent - Pilot	+		Group A	
RF Level dBm		Units			SEIKO S/N (dB)			SEIKO S/N (dB)
-65	52.7	dB			51.5			49.9

Pilot Frequency (kHz) Transmitter 18.99993

Lock 19.00003

Engineer(s): DML, TBK Tests Conducted: 12/17/96

D-1 HS Data Subcarrier -> Host Analog

Main Channel:	91 %		91	%		81	%
Pilot:	9 %		9	%		9	%
92 kHz:	0 %		0	%		7	%
57 kHz:	0 %		0	%		3	%
Proponent:	0 %		10	%		10	%
Total:	100 %		110	%		110	%
	0 dB= 755.0	mV			0 dB=	699.0	mV
	Pilot Only		Proponent Pilot	+		Group A	
RF Level				SEIKO			SEIKO
dBm	S/N Units			S/N (dB)			S/N (dB)
-65	50.3 dB			50.1			49.0

Pilot Frequency (kHz)

Transmitter 18.99993 Lock 19.00003

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H1_SEI.XLS

Denon TU-380RD

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(revised)

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Test Date 12/11/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

COMPOSITE SIGNAL

adjusted for 110%

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Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Proponent @17% + RBDS Error Meas. Duration: 5 Min.

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1	Noise Failure Ch	aracterization				100	[]	— r				· · · · ·	····					·					>0
	Noise Level	E	ror Level (%)		90															户	4	
C _o /N _o	Attn	BER	20 Byte	220 Byte		80														X			
62.73	63.75		•	0	%	70								-									
6.23	7.25			0.000	ATE	60														·			_
5.98	7.00			0.570	22	50						-				_		4		_			
5.73	6.75			0.240	ERROR RATE %	40							_	<u> </u>			4						
5.48	6.50			1.140	ERI	30										\checkmark					\square		
5.23	6.25			1.140		20	 						_	+	A								
4.98	6.00			3.430		10								фф	\square								
4.73	5.75			4.570		0 [5d	⊢b		d-	<u></u>	Q	-lp										
4.48	5.50			6.000		5	0.23 5.98	5.73	5.48	5.23	4.98	4.73	4.48	4.23 3.98	3.73	3.48	3.23	2.98	2.73	2.48	2.23	1.98	1.73
4.23	5.25			11.43			o v	Ś	ŝ	ŝ	4	4	4	4 M	μ.	ŝ	'n	1	6	3	6	i	
3.98	5.00			12.57																			
3.73	4.75			25.71																			
3.48	4.50			35.08																			
3.23	4.25			46.00																			
2.98	4.00			60.00																			
2.73	3.75			72.00																			
2.48	3.50			84.31																			
2.23	3.25			93.09																			
1.98	3.00			96.69																			
1.73	2.75			99.60																			

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation

File Name: H2_SEI.XLS

]	B-2 Co-Channel			PRO	PONENT SPECIFIC	C	COMPOSITE SIGNAL
							ORBAN #1 COMP OUT 1: Prop + SCA COMP OUT 2: Proponent Only
B2.1	Co-Channnel Analog H	Reference					ORBAN #2
		al Parameters		Undes	ired Signal Paramete	226	
	RF Key Point Meas.: RX RF Level:	-32.67 dBm -65 dBm		RF Key Poin Main Channel Mod	t Meas.: -32.53 dl		COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA
Main C	Channel Modulation: Modulation Level: SCA Group: No		dB Reference	Modulatio SCA SCA Mod	Group: 67 & 92 kl	Hz	Main Channel modulation adjusted for 110%
		dB S/N ratio target o	n main analog cl		lulation: 1 kl Aeasurement is rms w		w noon filter)
			o Filter			ilter	. ,
		Delco RX 1		d/u	Denon RX 2		d/u
		Best Case S/N:	56.60 dB		Best Case S/N:	, 61.00 dB	u/u
		S/N:	45.00 dB		S/N:	45.00 dB	
	Reference:	Atten:	26.25 dB	26.11 dB	Atten:	30.25 dB	30.11 dB
		al Parameters		Ui	ndesired Signal Para	meters	
	RF Level: -6						
	Modulation Type: No Modulation Level: No				n Type: CPN		
	SCA Group: No				n Level: 110%		
	SCA Oldup. N	ne -		SCA	Group: Non-Standar	d Injection	
	Measurement: Ta	rget Signal-to-Noise	Ratio				
		Delco R		d/u	Denon R	X 2	d/u
		S/N:	45.00 dB		S/N:	45.00 dB	
		Atten:	26.25 dB	26.11 dB	Atten:	30.25 dB	30.11 dB

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File Name: H2_SEI_A.XLS

B-1

71.99 71.74 71.24 71.24 70.99

Page 1 of 14

592

Digital Radio Test Laboratory

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure Test Date 12/11/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm

Main Ch. Mod: CPN

Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

COMPOSITE SIGNAL

5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

> 70.74 70.49 69.99 69.74

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility

SCA Group: Proponent @17% + RBDS

B1.1	Noise Failure Char	acterization				¹⁰⁰ [1 1	T	
	Noise Level	E	rror Level (%)		90 -				+		
C/N _o	Attn	BER	20 Byte	220 Byte		80 -						
130.49	63,75			0	ERROR RATE %	70 -						
73.99	7.25			0.000	LΑΤ	60 -						
73.74	7.00			0.570	RF	50 -		-				
73.49	6.75			0.240	ВQ	40 -						
73.24	6.50			1.140	ER	30 -						
72.99	6.25			1.140		20						
72.74	6.00			3.430		10					0	
72.49	5.75			4.570		00-	D -	- D- -	4 4.)====	0 4	6	_
72.24	5.50			6.000		73.99	73.74	73.49	73.24	72.99 72.74	72.49	
71.99	5.25			11.43						(* (*	(-	
71.74	5.00			12.57								
71.49	4.75			25.71								
71.24	4.50			35.08								
70.99	4.25			46.00								
70.74	4.00			60.00								
70.49	3.75			72.00								
70.24	3.50			84.31								
69.99	3.25			93.09								
69.74	3.00			96.69								
69.49	2.75			99.60								

rs:

B2.3 Co-Channel Analog -> HSD interference Desired Signal Parameters RF Level: -65 dBm

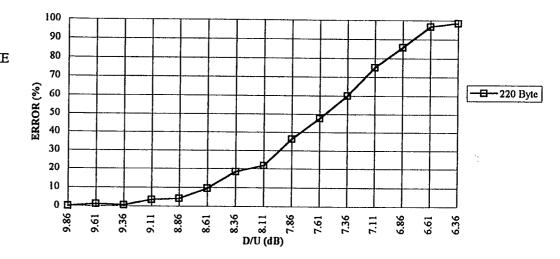
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Modulation Type: CPN Modulation Level: 110 % SCA Group: Non-Standard Injection

Co-Chan.	Level	Cu	m. Error L	ævel	
D/U	Attn	BER	20 Byte	220 Byte	
9.86	10.00		·	0	
9.61	9.75			1.140	OME
9.36	9.50			0.570	
9.11	9.25			3.430	
8.86	9.00			4.000	
8.61	8.75			9.500	
8.36	8.50			18,29	
8.11	8.25			21.71	
7.86	8.00			36.40	
7.61	7.75			47.60	
7.36	7.50			60.00	
7.11	7.25			75.00	
6.86	7.00			85.71	
6.61	6.75			96.57	
6.36	6.50			98.40	

Undesired Signal Parameters

Modulation Type:CPNModulation Level:110 %SCA Group:67 & 92 kHz



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Weak Signal Performance

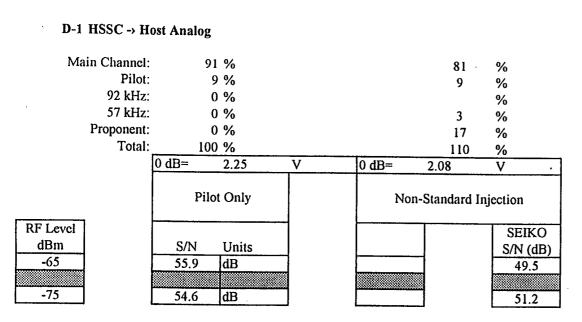
SCA Group: A

39 dB -89 ≤OME< -88 dBm

File Name: H2_SEI.XLS

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Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation Orban #2 Composite output #2 Set for 81% Main Channel Modulation Unit Not in Screen Box

Engineer(s): DML, TBK Tests Conducted: 12/17/96 5

81 Main Channel: 91 % % Pilot: 9 % % 9 92 kHz: 0 % % 57 kHz: 0 % % 3 % Proponent: 0 % 17 110 % Total: 100 % 0 dB= $0 \, dB =$ 604.0 654.0 mV mV **Pilot Only** Non-Standard Injection **RF** Level SEIKO dBm S/N S/N (dB) Units 52.9 dB -65 49.5 -75 43.4 dB 42.2

D-1 HSSC -> Host Analog

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric). 0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK Tests Conducted: 12/17/96

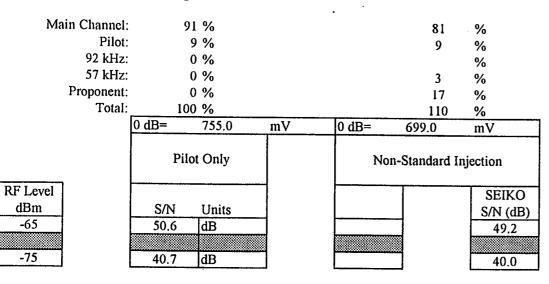
File Name: H2_SEI.XLS

Pioneer SX-201



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D-1 HSSC -> Host Analog



Measurements made Q-Peak detected with CCIR weighting filter (psophometric). 0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R. Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation Orban #2 Composite output #2 Set for 81% Main Channel Modulation Unit Not in Screen Box

Engineer(s): DML, TBK Tests Conducted: 12/17/96 ŝ

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DAT File	Time	Code		ID		Description	Grade
Number	Start	Stop					
HS50800.DAT	12/17/96						
	0:00	0:30	1			Ford Radio 0 dB Reference Track 1kHz@91% Pilot@9%	
	0.00	0.30	[·	2.25 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2	•		Noise Reference No SCA	
			1	1	1	Non-Standard Injection FORD	
	1:05	3:05	3			Reference	
			<u> </u>		I		
	5:16	5:11	4		.		
		- 13	ļ				
	5:16	7:17	<u> </u>			SEIKO: Increase in noise floor and change in noise character (digital peaks detected).	-1.5
		*****		·		Non-Standard Injection PIONEER	
	7:22	9:23	6	+	ł	Reference	
			T	1	1		
	9:29	11:29	7	1	t		-
				I	I		
	11:35	13:35	8			SEIKO:	-0.1
			ļ				
	13:41	15:41				Non-Standard Injection DENON	
	15:41	15:41	9		•	Reference	
	15:46	17:46	10		+		
	12110		Ι	1			
	17:51	19:52	11	1	1	SEIKO:	0
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		*******	!	1	†		

File Name: H2_SELXLS Index: DAT

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G-1 Lower First Analog -> HS	•	02 0 MII~		G-1 Upper First			
Allalog -> Al	Desired	93.9 MHz Undesired		Analog -> HS	SSC Desired	94.3 MHz Undesired	
Main Channel:	81	81	%	Main Channel:	81	81	%
Pilot:	9	9	%	Pilot:	9	9	%
67 kHz:	0	10	%	67 kHz;	0	10	%
92 kHz:	0	10	%	92 kHz:	0	10	%
57 kHz:	3	0	%	57 kHz:	3	0	%
Proponent:	17	0	%	Proponent:	17	0	%
Total Deviation:	110	110	%	Total Deviation:	110	110	%
		ATTN	OME			ATTN	OME
		(dB)	D/U (dB)			(dB)	D/U (dB)
		· · · · · ·					
SEIKO:		17.00	-2.95	SEIKO:		16.00	-3.95

EO&C

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G-2 Lower Seco	nd Adjacer	nt	
Analog -> H	SSC	93.7 MHz	
	Desired	Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%
		ATTN	OME
	·	(dB)	D/U (dB)
SEIKO:		2.50	-47.45

Upper Seco	nd Adjacer	nt	
Analog -> HS	SSC	94.5 MHz	
	Desired	Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%
		ATTN	OME
		(dB)	D/U (dB)
SEIKO:		2.50	-47.45

EO&C

File Name: H2_SEI.XLS

600

G-1 First Adjac		SC -> Analog			
	Desired	Undesired	5	Desired Undesired	
Main Channel:	81	81	%	81 81 %	
Pilot:	9	9	%	9 9 %	
67 kHz:	10	10	%	10 0 %	
. 92 kHz:	10	10	%	10 0 %	
57 kHz:	0	0	%	0 3 %	
Proponent:	0	.0	%	0 17 %	
Total Deviation:	110	110	%	110 110 %	
3 W Input	-32.4	-32.4	dBm	Main Channel measurements are Q-Peak de	tected with CCIR
Kay #3		51.0	dB	SCA Measurements are RMS.	
		18.6		·	
	Ai	nalog -> Anal	og	HSSC -> Analog	······
94.3 MHz		Reference		Non -Standard Injection	
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB) S/N (dB) S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB 67 kHz 92 kHz	1
Best Case		36	52		
	0	48			
. 5. //					
at D/U		15	24	-1 29 12	SEIKO:

	A1	alog -> Ana	log	H	ISSC -> Ana			
93.9 MHz		Reference		Non	Non -Standard Injection			
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)		
	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz		
Best Case		36	53					
	5	48						
at D/U		17	33	5	29	33		SEIKO:

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G-2 Second Adj								
Analog -> An	Desired	Undesired	5	Desired	Undesired	l		
Main Channel:	81	81	%	81	81	%		
Pilot:	9	9	%	9	9	%		
67 kHz:	10	10	%	10	0	%		
92 kHz:	10	10	%	10	0	%		
57 kHz;	0	0	%	0	3	%		
Proponent:	0	0	%	0	17	%		
Total Deviation:	110	110	%	110	110	%		
3 W Input	-32.4	-32.4	dBm	Main Cha	nnel measure	ements are Q-	Peak detecte	d with CCIR
Kay #3		51.0	dB		surements are			
		18.6		-40 dB D/	U produces a	S/N of appro	ximately 47	dB.
	AI	nalog -> Anal	log		HSSC -> Ana	log		
94.5 MHz		Reference			-Standard In	M]	•
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)		•		
	s/n=45dB	67 kHz	92 kHz	s/n=45dE		92 kHz		
Best Case		36	52					
	-40	48						
at D/U		24	10	-40	43	5		SEIKO:

	Analog -> Analog			H	SSC -> Anal	··········	
93.7 MHz		Reference		Non -	Standard Inj	ection	
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	
Best Case		36	52				
	-40	48					
at D/U		10	7	 -40	28	4	SEIKO:





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G-1 First Adjac	ent					
Analog -> A	nalog & HS	SC -> Analog	3			
	Desired	Undesired		Desired Undesired		
Main Channel:		81	%	81 81	%	
Pilot:		9	%	9 9	%	
67 kHz:		10	%	10 0	%	
92 kHz:		10	%	10 0	%	
57 kHz:	-	0	%	0 3	%	
Proponent:		0	%	0 17	%	
Total Deviation:	110	110	%	110 110	%	
3 W Input	-32.4	-32.4	dBm	Main Channel measureme	ents are O_P	eak detected with CCID
Kay #3		51.0	dB	SCA Measurements are R	MS.	
		18.6				
	Ai	nalog -> Anal	og	HSSC -> Analog	g	
94.3 MHz	u	Reference		Non -Standard Injec	ction	
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB) S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB 67 kHz	92 kHz	
Best Case		37	52			
	21	48		·····		
at D/U		34	46	21 46	46	SEIKO:

	Ar	nalog -> Anal	log	HSSC -> Analog	
93.9 MHz		Reference		Non -Standard Injection	
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB) S/N (dB) S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB 67 kHz 92 kHz	
Best Case		37	52		
	32.5	48			
at D/U		36	52	32.5 47 52	SEIKO:

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G-2 Second Adjacent

Kay #3

Analog -> Ar	halog & HS	SSC -> Analog				
	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm	Main Chan	nel measureme	ents are

dB

51.0

Main Channel measurements are Q-Peak detected with CCIR SCA Measurements are RMS.

		18.6		
· · · · · · · · · · · · · · · · · · ·	Aı	nalog -> Ana	log	HSSC -> Analog
94.5 MHz		Reference		Non -Standard Injection
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB) S/N (dB) S/N (dB)
	s/n=45dB	67 kHz	92 kHz	s/n=45dB 67 kHz 92 kHz
Best Case		37	52	
	-14	48		
at D/U		37	39	-15 48 43 SEIKO:

	Analog -> Analog				Н				
93.7 MHz	Reference			Reference Non			ection]	
	D/U (dB)	S/N (dB)	S/N (dB)		D/U (dB)	S/N (dB)	S/N (dB)		
	s/n=45dB	67 kHz	92 kHz		s/n=45dB	67 kHz	92 kHz		
Best Case		37	52						
	-13	48							
at D/U		37	48		-17	48	48		SEIKO:

File Name: H2_SEI.XLS

Pioneer 2nd Adj

MITRE

B

SYSTEM SPECIFIC

H-2

(revised)

B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Test Date 12/10/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

Sig. Lev: -65dBm

Main Ch. Mod: CPN

Error Meas. Duration: 5 Min.

PROPONENT SPECIFIC

Interleaver Level 2

COMPOSITE SIGNAL

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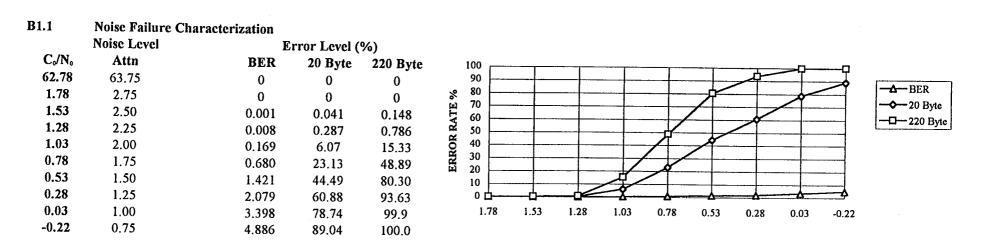
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5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utility

SCA Group: Proponent @ 17% + RBDS



(revised) MITRE 1.00000 0.10000 0.01000 **Bit Error Rate** 0.00100 0.00010 0.00001 -0.22 0.03 0.28 0.53 0.78 1.03 1.28 Co/No (dB)

File Name: H2_MIT.XLS



B-1 Additive White Gaussian Noise Characterization of HS Digital Subcarrier Signal Failure

Test Date 12/10/96

Engineer(s): DML

Basic Test Parameters:

SIGNAL

PROPONENT SPECIFIC

COMPOSITE SIGNAL

Sig. Lev: -65dBm Main Ch. Mod: CPN SCA Group: Proponent @ 17% + RBDS Error Meas. Duration: 5 Min.

Interleaver Level 2

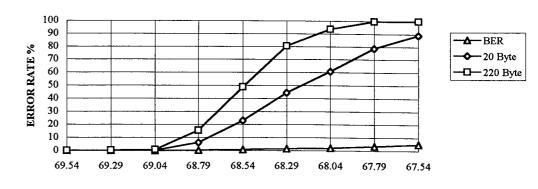
5-Band Medium Processed ORBAN #2 COMP OUT 1: Proponent Only COMP OUT 2: Prop + SCA Main Channel modulation adjusted for 110%

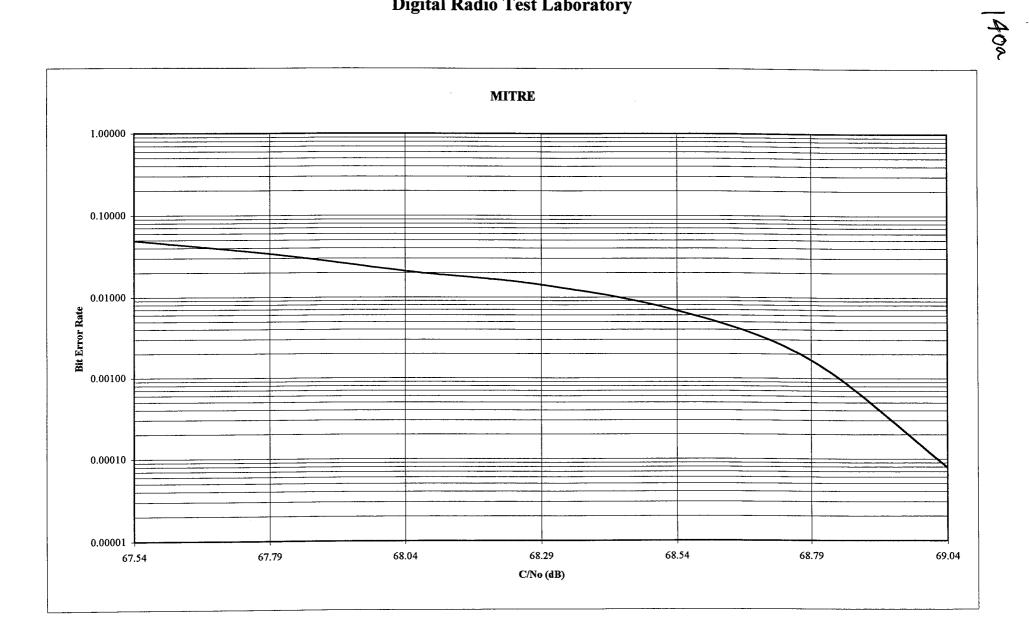
Analog Receivers: Delco RX 1

Compol 92KHz SCA Receiver Denon RX 2 RBDS Receiver W/RDS Check software utilty

B1.1 Noise Failure Characterization

	Noise Level	E	Error Level (%)						
C/N _o	Attn	BER	20 Byte	220 Byte					
130.54	63.75	0	0	0					
69.54	2.75	0	0	0					
69.29	2.50	0.001	0.041	0.148					
69.04	2.25	0.008	0.287	0.786					
68.79	2.00	0.169	6.07	15.33					
68.54	1.75	0.680	23.13	48.89					
68.29	1.50	1.421	44.49	80.30					
68.04	1.25	2.079	60.88	93.63					
67.79	1.00	3.398	78.74	99.9					
67.54	0.75	4.886	89.04	100.0					





B-2 Co-Channel

PROPONENT SPECIFIC

COMPOSITE SIGNAL

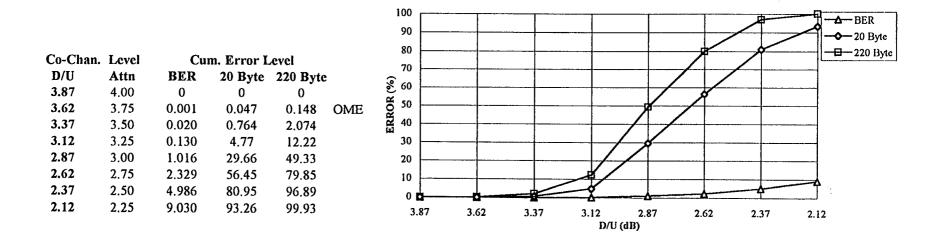
1

Interleaver Level 2

ORBAN #1 COMP OUT 1: Prop + SCA COMP OUT 2: Proponent Only

B2.1	Co-Channnel Analog	Reference					ORBAN #2
	Desired Sig	gnal Parameters		Unde	sired Signal Paramete	ers	COMP OUT 1: Proponent Only
	RF Key Point Meas .:	-32.67 dBm		RF Key Poi	6		COMP OUT 2: Prop + SCA
	RX RF Level:	-65 dBm		Main Channel Mo			
Mai	n Channel Modulation:	1 kHz		Modulati	on Level: 110 %	, a	Main Channel modulation
	Modulation Level:	100 % 0	dB Reference		A Group: 67 & 92 kl		adjusted for 110%
	SCA Group: 1	None			dulation: 1 kl		
	Measurement: 4	5dB S/N ratio target of	n main analog cl		Measurement is rms w		w pass filter)
			lo Filter			ilter	, p ,
		Delco RX 1		d/u	Denon RX 2		d/u
		Best Case S/N:	56.50 dB		Best Case S/N:	59.30 dB	
		S/N:	45.00 dB		S/N:	45.00 dB	
	Reference:	Atten:	26.50 dB	26.37 dB	Atten:	30.25 dB	30.12 dB
	Desired Sig RF Level:	gnal Parameters -65dBm		ı	Undesired Signal Para	meters	
	Modulation Type: 1			Modulati	ion Type: CPN		
	Modulation Level: 1				on Level: 110%		
	SCA Group: 1	None			A Group: Non-Standar	d Injection	
	N				-	-	
	measurement:	Farget Signal-to-Noise	Ratio				
		Delco F		d/u	Denon F		d/u
		S/N:	45.00 dB		S/N:	45.00 dB	
		Atten:	26.50 dB	26.37 dB	Atten:	30.25 dB	30.12 dB
B2.3	Co-Channel Analog -						
		nal Parameters		1	Undesired Signal Para	meters	
	RF Level:	-65 dBm					
	Modulation Type:	CPN			ion Type: CPN		
	Modulation Level:	110 %		Modulati			
	SCA Group: 1	Non-Standard Injectior	l	SC	A Group: 67 &92 kl	Hz	

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Weak Signal Performance

SCA Group: A

48 dB -98 ≤OME< -97 dBm - 10 (N

Main Channel: 91 % 81 % Pilot: 9 % % 9 92 kHz: 0 % % 0 % % 57 kHz: 3 0 % % Proponent: 17 100 % Total: 110 % $0 \, dB =$ 2.25 0 dB= v V 2.08 **Pilot Only** Non-Standard Injection **RF** Level MITRE dBm Units S/N (dB) S/N 55.9 dB -65 54.0 -75 54.6 dB 54.2

D-1 HSSC -> Host Analog

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Orban #2 Composite output #2 Set for 81% Main Channel Modulation Unit Not in Screen Box

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H2_MIT.XLS

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D-1 HSSC -> Host Analog

Main Channel	:	91 %			81	%
Pilot		9%			9	%
92 kHz		0 %				%
57 kHz	:	0 %			3	%
Proponent		0 %			17	%
Total	1(00 %			110	%
	0 dB=	654.0	mV	0 dB=	604.0	mV
	Pi	lot Only		No	n-Standard I	njection
RF Level			-1	MITRE		- <u></u>
dBm	S/N	Units		S/N (dB)		
-65	52.9	dB		51.4	-	
-75	43.4	dB		42.5		

Measurements made Q-Peak detected with CCIR weighting and 15 kHz low pass filters (psophometric).

0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R.

Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation

Orban #2 Composite output #2 Set for 81% Main Channel Modulation

Engineer(s): DML, TBK Tests Conducted: 12/17/96 л. U

D-1 HSSC -> Host Analog

Main Channel: Pilot:		91 % 9 %			81 9	% %
92 kHz:		0 %				%
57 kHz:		0 %			3	%
Proponent:		0 %			17	%
Total:	1	00 %			110	%
	0 dB=	755.0	mV	0 dB=	699.0	mV
	Р	ilot Only		Non	-Standard I	njcction
RF Level				MITRE		
dBm	S/N	Units		S/N (dB)		
-65	50.6	dB		49.6	1	
-75	40.7	dB		40.0		

Measurements made Q-Peak detected with CCIR weighting filter (psophometric). 0 dB Reference Measurements made with 1 kHz Mod Source on Main Channel L+R. Measurements on Left Channel

Orban #2 Composite output #1 Set for 91% Main Channel Modulation Orban #2 Composite output #2 Set for 81% Main Channel Modulation Unit Not in Screen Box

Engineer(s): DML, TBK Tests Conducted: 12/17/96

File Name: H2_MIT.XLS

DAT Füe Number	Time Start	Code Stop	-	<u>ar</u>		Description	Grad
HS50800.DAT	12/17/96	1		Ī	T		
	0:00						
	0.00	0:30	<u>' 1</u>			Ford Radio 0 dB Reference Track 1kHz@91% Pilot@9% 2.25 Vrms=-15 dB on DAT Input Monitor Level Meters	
	0:30	1:00	2			Noise Reference No SCA	
	1:05	3:05	3			Non-Standard Injection FORD Reference	
			1	·	-	KCIEFEIRCE	
	5:16	5:11	4			MITRE: Slight increase in noise floor.	-0.1
	5:16	7:17	5				
	7:22	9:23	6	ļ	l	Non-Standard Injection PIONEER Reference	-
			[Relefence	
	9:29	11:29	7	_		MITRE:	0
	11:35	13:35	8				
	13:41	15:41	9			Non-Standard Injection DENON Reference	
		15.41				Kelerence	
	15:46	17:46	10			MITRE:	0
	17:51	19:52	11				
							·····
			·····				

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	Analog -> HS n Channel: Pilot:	Desired 81	93.9 MHz Undesired 81	%
Main				0/
Maiı		81	81	0/
	Pilot:			/0
		9	9	%
	67 kHz:	0	10	%
	92 kHz:	0	10	%
	57 kHz:	3	3 0	
J	Proponent:	17	0	%
Total	Deviation:	110	110	%
		,	ATTN	OME
r-			(dB)	D/U (dB)
	MITRE:		11.50	-8.45

SSC	94.3 MHz			
Desired	Undesired			
81	81	%		
9	9	%		
0	10	%		
0	10	%		
3	0	%		
17	0	%		
110	110	%		
	ATTN	OME		
	(dB)	D/U (dB)		
	5.00	-14.95		
	Desired 81 9 0 0 3 17	Desired Undesired 81 81 9 9 0 10 0 10 3 0 17 0 110 110 ATTN (dB)		

EO&C

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File Name: H2_MIT.XLS

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G-2 I	lower Secon	nd Adjacer	nt	
F	Analog -> HS	SSC	93.7 MHz	
		Desired	Undesired	
Mair	n Channel:	81	· 81	%
	Pilot:	9.	9	%
	67 kHz:	0	10	%
	92 kHz:	0	10	%
	57 kHz:	3	0	%
I	Proponent:	17	0	%
Total	Deviation:	110	110	%
			ATTN	OME
Г			(dB)	D/U (dB)
	MITRE:		0.00	-49.95
Γ				
L				

Upper Seco	nd Adjacer	nt	
Analog -> HS	SSC	94.5 MHz	
	Desired	Undesired	
Main Channel:	81	81	%
Pilot:	9	9	%
67 kHz:	0	10	%
92 kHz:	0	10	%
57 kHz:	3	0	%
Proponent:	17	0	%
Total Deviation:	110	110	%
		ATTN	OME
		(dB)	D/U (dB)
MITRE:		0.00	-49.95
		· · · · · · · · · · · · · · · · · · ·	
L			

EO&C

Could not achieve OME .

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G-1 First Adjacent

Analog -> A	nalog & HS	SC -> Analog	g						
	Desired	Undesired		Desired	Undesired				
Main Channel:	81	81	%	81	81	%			
Pilot:	9	9	%	9	9	%			
67 kHz:	10	10	%	10	0	%			
92 kHz:	10	10	%	10	0	%			
57 kHz:	0	0	%	0	3	%			
Proponent:	0	0	%	0	17	%			
Total Deviation:	110	110	%	110	110	%			
3 W Input -32.4		-32.4	dBm	Main Channel measurements are Q-Peak detected with CCIR					
Kay #3		51.0	dB	SCA Measu	urements are	re RMS.			
		18.6							
	A1	nalog -> Anal	log	F	ISSC -> Analo	og			
94.3 MHz		Reference		Non	-Standard Inj	ection			
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)			
	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz			
Best Case		36	52						
	0	48		-1	26	12		MITRE:	
at D/U		15	24						

	A1	nalog -> Anal	log		HSSC -→ Analog				
93.9 MHz		Reference		N	lon -S				
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (d	iB)	S/N (dB)	S/N (dB)		
	s/n=45dB	67 kHz	92 kHz	_s/n=45	dB	67 kHz	92 kHz		
Best Case		36	53						
	5	48		5		28	32		MITRE:
at D/U		17	33						

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G-2 Second Adj	acent			
Analog -> A	nalog & HS	SC -> Analog	3	
	Desired	Undesired		Desired Undesired
Main Channel:		81	%	81 81 %
Pilot:		9	%	9 9 %
67 kHz:		10	%	10 0 %
92 kHz:		10	%	10 0 %
57 kHz:		0	%	0 3 %
Proponent:		0	%	0 17 %
Total Deviation:	110	110	%	110 110 %
3 W Input	-32.4	-32.4	dBm	Main Channel measurements are Q-Peak detected with CCIR
Kay #3		51.0	dB	SCA Measurements are RMS.
		18.6		-40 dB D/U produces a S/N of approximately 47 dB.
	Ar	nalog -> Anal	og	HSSC -→ Analog
94.5 MHz		Reference		Non -Standard Injection
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB) S/N (dB) S/N (dB)
	s/n=45dB	67 kHz	92 kHz	s/n=45dB 67 kHz 92 kHz
Best Case		36	52	
	-40	48		-40 43 5 MITRE:
1 D/U		24	10	

	Ar	alog -> Ana	log	Н	SSC -> Anal	og	
93.7 MHz		Reference		Non -Standard Injection			
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)	
	s/n=45dB	67 kHz	92 kHz	s/n=45dB	67 kHz	92 kHz	
Best Case		36	52				
	-40	48		-40	23	4	 MITRE:
at D/U		10	7				

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G-1 First Adjacent

Kay #3

Analog -> An	nalog & HS	SC -> Analog				
	Desired	Undesired		Desired	Undesired	
Main Channel:	81	81	%	81	81	%
Pilot:	9	9	%	9	9	%
67 kHz:	10	10	%	10	0	%
92 kHz:	10	10	%	10	0	%
57 kHz:	0	0	%	0	3	%
Proponent:	0	0	%	0	17	%
Total Deviation:	110	110	%	110	110	%
3 W Input	-32.4	-32.4	dBm	Main Chan	nel measureme	nts are

dB

51.0

Main Channel measurements are Q-Peak detected with CCIR SCA Measurements are RMS.

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		18.6		
	Aı	nalog -> Anal	log	HSSC -> Analog
94.3 MHz		Reference		Non -Standard Injection
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB) S/N (dB) S/N (dB)
	s/n=45dB	67 kHz	92 kHz	s/n=45dB 67 kHz 92 kHz
Best Case		37	52	
	21	48		21 45 46 MITRE
at D/U		34	46	

Analog -> Analog				HSSC -> Analog					·
93.9 MHz	D/U (dB) s/n=45dB	Reference S/N (dB) 67 kHz	S/N (dB) 92 kHz		Non - D/U (dB) s/n=45dB	Standard Inj S/N (dB) 67 kHz	S/N (dB)	ţ	
Best Case	32.5	37 48	52		32.5	47	92 kHz 52		MITRE:
at D/U		36	52						

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G-2 Second Adj	jacent								
Analog -> A	nalog & HS	SC -> Analog	5						
	Desired	Undesired			Desired	Undesired			
Main Channel:	81	81	%		81	81	%		
Pilot:	9	9	%		9	9	%		
67 kHz:	10	10	%		10	. 0	%		
92 kHz:		10	%		10	0	%		
57 kHz:	0	0	%		0	3	%		
Proponent:		0	%		0	17	%		
Total Deviation:	110	110	%		110	110	%		
3 W Input	-32.4	-32.4	dBm		Main Chan	nel measuren	nents are O-	Peak detecte	d with CCIR
Kay #3		51.0	dB			irements are			
		18.6							
	A1	nalog -> Anal	og	_	H	SSC -> Analo	og		
94.5 MHz		Reference			Non -	Standard Inj	ection		
	D/U (dB)	S/N (dB)	S/N (dB)		D/U (dB)	S/N (dB)	S/N (dB)		
	s/n=45dB	67 kHz	92 kHz		s/n=45dB	67 kHz	92 kHz		
Best Case		37	52						
	-14	48			-15	48	43		MITRE:

37

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		HSSC -> Anal						
93.7 MHz	93.7 MHz			Nor	Non -Standard Injection			
	D/U (dB)	S/N (dB)	S/N (dB)	D/U (dB)	S/N (dB)	S/N (dB)		
	s/n=45dB	67 kHz	92 kHz	s/n=45dE	67 kHz	92 kHz		
Best Case		37	52					
	-13	48		-14	48	48		MITRE:
					·			
at D/U		37	48					

0 0 0

at D/U

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NRSC-R33

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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PROBLEM AREA (ATTACH ADDI	TIONAL SHEETS IF NECESSARY)	:					
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b. Recommended Chang	es:						
c. Reason/Rationale for I	c. Reason/Rationale for Recommendation:						
ADDITIONAL REMARKS:							
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