Using Sage Instruments 960B for End-to-End Wireless Phone Testing [Samsung Galaxy S21,5G]

Assumptions: The 960B UI app software has been successfully installed on controller PC/Laptop.

Recommended Tests:

SMOS Director & Responder SMOS One-way (MOS Tx & MOS Rx) One-Way Delay (One-Way Delay Rx & Tx)

General Test Configuration Setup:

Cellphones

- 1) Using two cellphones, establish a 2-way audio call (reference here is for Samsung S21 phones). Note1: Set the volume level on both phones to 50% or lower.
- 2) Connect each cellphone to a USB-C audio adapter module (Sage PN 7905-0000-01).
 - Note1: The audio adapter module switch should be set to the cellphone icon (not 'MIC').
- 3) Connect each audio adapter module to one of the 960B front panel analog 4W ports with a 3.5mm-to-RJ-22 interconnect cable (Sage PN 9400-0072-01), in the following manner:
 - Connect the 3.5mm ends of the cables marked '960B Receive' to the audio adapter module jacks marked with the headphone icon.
 - Connect the 3.5mm ends of the cables marked '960B Transmit' to the audio adapter module jacks marked with the microphone icon.
 - Connect each RJ-22 end of the cables to one of the 960B front panel analog 4W (RJ-22) ports.

960B Interface Setup

1) From the Home screen, highlight the initial port line item (i.e. New Analog) and then click the 'Configure Span' button.

🖉 Sage Instruments 960 C:\Program Files\Sage Instruments\960\cfg\DS0Tests.cfg						
File Tools View Help	1				1	
<= Back Home Save	Cancel Dialpo	ad+HF Turn Au	dio On	Enable Log S	ave PCM	
	Configure /	Analog Interface	2			
Input: New Analog2 (A 2) - Status: No Errors						
	View Purchased Options					
		DSP Version #:	58.2	Unit Serial #:	701	
Name: N	ew Analog2	JSB Version #:	1.6	Board Serial #:	1330021011	
Mode: 4-	Wire, Normal			•		
Min Ring Voltage (V): 20	Min Ring Voltage (V): 20 Longitudinal balance test mode					
Min Ring Duration (ms): 50	v 00	✓ Attenuate TX signal by 30 dB in 4-wire mode				
Max Ring Duration (ms): 80	8000					
• Test to another product or the IP/DS1 interface of this 960B						
C Test to analog port 1 of this 960B C Test to analog port 2 of this 960B						
© Test to analog port 3 of this 960B © Test to analog port 4 of this 960B						
「 16 kHz Wideband Audio Mode (Changes all Analog interfaces; deletes tests)						
Unit #701 Front Panel Speaker Jack Available						

Fig. 1 – Analog Interface Configuration Display

2) Recommended: Rename the port to something better suited for your application (or 'Port 1').

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- 3) In the 'Mode' drop-down list, select '4-Wire Normal'.
- 4) Click the check box next to 'Attenuate TX signal by 30 dB in 4-wire mode' to turn on the attenuation.
- 5) Recommended: Click the radio button next to 'Test to analog port 4 of this 960B' to direct the tests to that port.
- 6) Click the 'Save' button.
- 7) In the 'Input' drop-down list, select the second port and repeat steps 1 thru 6, with an exception in Step 5 (select "Test to analog port 2 of this 960B" to direct the tests to that port) – Don't forget to click the 'Save' button when finished.

960B Test Channel/Port Setup (using SMOS Director and Responder as example)

1) From the 'Home' screen, double-click port 1 to get Span View and then double-click channel 1 to get Channel View – This is where you can setup your test.

🖉 Sage Instruments 960 C: \Program Files\Sage Instruments\960\cfg\DSOTests.cfg						
Eile Tools Yiew Help						
<= Back Home Save Cancel [Dialpad+H	IF Tu	rn Audio On	Enable Log 3	Save PCM	
Interface: New Analog2			Run	6	$\begin{array}{c c} \hline \\ \hline $	
IF Status: No Errors	Manua	l Off	Stop		Rx 0	
Test Type: SMOS Director	Config	jure	Test Statu	s: Running(Call c	onnected)	
Call Setup: No Destination # Specified!	Config	jure				
Load Type: Fixed Delay	Config	jure	· ·	l Calls: 288 Calls: 2	of: infinite	
Log To: C:\Program Files\Sage Instru	Config	jure	T difec			
Stats VF Test						
Duration(s): 9 Xmit Reverse Arti	ficial		.00		NF FN	
Delay (ms): 472 Near to Far Far	to Near	MOS Score	.00 ********** ***********			
MOS: 4.15 4	4.15	MOS	.00			
Noise (dBrnC): 6.8	7.8		.00			
+Frame Slips (msec): 0	40		500			
	60	3		մաստուսեսններ	hanad balada da balan	
2	3.90	Delay, ms	400			
· · ····	6.40	Del	200			
Codec: VCD8K VC	D8K		0			
			l	Jnit #701 Front Panel Sp	aker Jack Available	

Fig. 2 – SMOS Director Test

Set up the SMOS Director (near-end side):

2) Click on the 'Test Type' drop-down list and select 'SMOS Director' and then click the 'Save' button.

Note1: Default test is 9 seconds of artificial speech in both directions.

Note2: The 'Tx' and 'Rx' gain settings in the upper right corner are set to unity (0 dB). These settings are useful when the 30 dB attenuator is not switched in – They will work to some degree in boosting or attenuating audio, but are not calibrated. The setup has been optimized for the test configuration using Galaxy S21 phones.

Set up the SMOS Responder (far-end side):

- 3) Click on the 'Interface' drop-down list and select the second interface.
- 4) Click on the 'Test Type' drop-down list and select 'SMOS Responder' and then click the 'Save' button.

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Run the test:

- 5) Click the 'Run' button to start the test.
- 6) Switch back to port one on the 'Director' side via the 'Interface' drop-down list and then click the 'Run' button.

Note1: If the test call setup field was set to run '0' times, the test will continue to run until the user stops the test.

Note2: By clicking on the 'Turn Audio On' button while in Channel View, users can listen to the test. But beware, depending on PC speed and power, the audio may be buffered. For real-time audio monitoring, plug an amplified speaker into the 'SPKR' port on the 960B front panel.

Misc Screen shots of different tests

Ø Sage Instruments 960 C:\Program Files\Sage Instruments\960\cfg\DS0Tests.cfg						
<= Back Home Save Cancel	Dialpad+HF Tu	rn Audio On 🛛 En	able Log Save PCM			
Interface: New Analog2]	Run	Gain Tx 0			
IF Status: No Errors	Manual Off	Stop	Gain Tx 0 Rx 0			
Test Type: One-Way Delay RX	Configure	Test Status: Ri	unning(Call connected)			
Call Setup: No Destination # Specified!	Configure					
Load Type: Fixed Delay	Configure	Attempted Cal Failed Cal				
Log To: C:\Program Files\Sage Instru	Configure	Falled Cal				
Stats VF Test						
Ref: Acquired On	e-Way Delay (ms): 247 One	-Way Gain (dB): -15			
	20 20 20 20		0 Front Panel Speaker Jack Blocked			

Fig. 3 – One Way Delay

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Fig. 4 – One-way MOS

🖉 Sage Instruments 960 C:\Program Files\Sage Instruments\960\cfg\DS0Tests.cfg						
Eile Tools <u>View H</u> elp <= Back Home Save	e Cancel C	Dialpad+HF Tu	rn Audio On Enable	Log Save PCM		
Interface: New Analog2	•		Run	Gain Tx 0		
IF Status: New Analog2 New Analog4		Manual	Stop	Gain Tx 0 Rx 0		
Test Type: Send/Measure	2 Tone 🔄	Configure	Test Status: Runni	ng(Call connected)		
Call Setup: No Destinatio	n # Specified!	Configure				
Load Type: Fixed Delay	-	Configure	Attempted Calls:			
Log To: C:\Program Files\Sage Instru Configure						
Stats VF Test						
609Hz -27.38dBm	^{20.00} Send: 10	20Hz -10dBm				
Noise Power	0.00					
RL: 13.01dB	-20.00	0				
3Knoise: 67.00dBr_n	3Knoise: 67.00dBr n -40.00					
Cmsg: 62.98dBr nC	Cmsg 62.98dBr nC -60.00					
Cnotch: 62.22dBr nC						
	AV 1	- " " VA	M	WW WWW		
PSOPH: -24.64dBmP	-100.00	800	1600 2000 2400	3600		
SNR: 0.40dB	1	~ 1	5 5 1	7 % % 7		
			Unit #701 Fr	ont Panel Speaker Jack Available		

Fig. 5 – Send & Measure Tone