## 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:**

## <u>Cellphones</u>

- 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							
<pre>&lt;= Back Home Save</pre>	Cancel Dialpa	id+HF   Turn Au	dio On	Enable Log S	ave PCM		
	Configure Analog Interface						
Input: New Analog2 (A 2) - Status: No Errors							
	View Purchased Options						
_	t	SP Version #:	58.2	Unit Serial #:	701		
Name: Ne	w Analog2 L	JSB Version #:	1.6	Board Serial #:	1330021011		
Mode: 4-1	Wire, Normal			•			
Min Ring Voltage (V): 20	Min Ring Voltage (V): 20						
Min Ring Duration (ms): 50	 ✓ Attenuate TX signal by 30 dB in 4-wire mode						
Max Ring Duration (ms): 80	g Duration (ms): 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\DS0Tests.cfg						
Elle Tools View Help	Dialpad+	не Гт	Irn Audio On	Enable Loa Save	PCAL	
Intertace: New Analog2	• 		Run	Gain		
IF Status: No Errors	Manue	al Off	Stop		Rx 0 -	
Test Type: SMOS Director	Confi	gure	Test Statu	s: Running(Call conne	ected)	
Call Setup: No Destination # Specified	! Confi	gure				
Load Type: Fixed Delay	• Confi	gure	Attempted	Calls: 288 of	intinite	
Log To: C:\Program Files\Sage Inst	ru Confi	gure	Failed	calls: 2		
Stats VF Test						
Duration(s): 9 Xmit Reverse A	•tificial	e 5	5.00		NF FN	
Delay (ms): 472 Near to Far Fa	ır to Near	2200	1.00	. bitan	ttt	
MOS: 4.15	4.15	OM C	8.00			
Noise (dBrnc): 6.8	/.8	2	2.00			
-Frame Slips (msec): 20	60		600			
Bandwidth Usage(%): 63.00	63.90	y, me	400			
Gain (dB): -4.20	-6.40	Dela	200			
Codec: VCD8K	VCD8K		0			
			[L	Init #701 Front Panel Speaker .	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.

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

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 <b>Tu</b>	rn Audio On Ei	nable Log Save PCA			
Interface: New Analog2		Run	Gain Tx 0			
IF Status: No Errors	Manual Off	Stop	Rx 0 -			
Test Type: One-Way Delay RX	Configure	Test Status: R	unning(Call connected)			
Call Setup: No Destination # Specified!	Configure					
Load Type: Fixed Delay	Configure	Attempted Ca	lls: 1 of: infinite			
Log To: C:\Program Files\Sage Instru	Configure	Falled Ca				
Stats VF Test						
Ref: Acquired One	-Way Delay (ms	): 247 One	-Way Gain (dB): -15			
	230 200 230 200	8 8 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Image: Second			

Fig. 3 – One Way Delay

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Fig. 4 – One-way MOS

💋 Sage Instruments 960 C:\Program Files\Sage Instruments\960\cfg辺S0Tests.cfg					
Here Roos Mew Here     <= Back   Home   Save	e Cancel D	Dialpad+HF <b>Tu</b>	rn Audio On   Enable	Log Save PCM	
Interface: New Analog2	•		Run	Gain Tx 0	
IF Status: New Analog2 New Analog4		Manual	Stop	Rx 0	
Test Type: Send/Measure	: Tone 🔄	Configure	Test Status: Runni	ng(Call connected)	
Call Setup: No Destinatio	n # Specified!	Configure	Attempted Celler	c infinite	
Load Type: Fixed Delay	~	Configure	Failed Calls:		
Log To: C:\Program Files\Sage Instru Configure					
Stats VF Test					
609Hz -27.38dBm	<sup>20.00</sup> Send: 10	20Hz -10dBm			
Noise Power	0.00				
RL: 13.01dB	-20.00	0			
3Knoise: 67.00dBr_n -40.0040.00					
Cmsg: 62.98dBr nC	Cmsg 62.98dBr nC				
Chotch: 62 22dBr, pC	80 00 L AV	' W W VA	h h h h h	a martine	
	-80.00	−∵ r vγ	MANNIM V	WW WWW	
PSOPH: -24.64dBmP	-100.00	50 00	400 000		
SNR: 0.40dB		- 1	5 5 5	ч н н <del>4</del>	
			Unit #701 Fr	ont Panel Speaker Jack Available	

Fig. 5 – Send & Measure Tone