Sage 925VST Application Note
Testing Through WiFi and VoIP Phones

Introduction

This document describes how to interface a Sage 925VST Handheld VoIP Service Tester to a WiFi phone or VoIP phone. It also includes a complete example of how to conduct an SMOS test.

Background

On classic analog telephone circuits, test equipment can be connected directly to the pair of telephone wires that extend from the telephone central office to the customer's premises. The test equipment directly substitutes the telephone set. This 2-wire interface is expected to have a known fixed test impedance of about 600 ohms, no matter what phone line you connect to, and no matter what phone was being used. There are also industry-wide expectations about the required transmit level (0 dBm). And with the fixed interface impedance, it is very straightforward to accurately measure the receive level (nominally -10 dBm)

Telephone circuits employing WiFi or VoIP phones, however, don't have this "standard" 2-wire interface. Instead, the connection from phone to the "telephone central office" can employ 2 or more wires and any of a number of transport protocols and modulation schemes. So, the most practical method of testing through such phones is to connect to the "coil-cord" handset interface of a VoIP phone or the headset interface of a WiFi phone.

These interfaces are inherently 4-wire (two wires for the microphone, and two wires for the earphone). In WiFi phones, though, you may find the physical connections consist of only three wires. On such connections, one lead of the microphone and one lead of the earphone have been joined as a "common" lead.

Unfortunately, none of these interfaces are "standardized" with respect to impedance, transmit level, or receive sensitivity. So, this document will also describe how to adjust the 925VST transmit level and receive sensitivity as a method to cope with these variances.
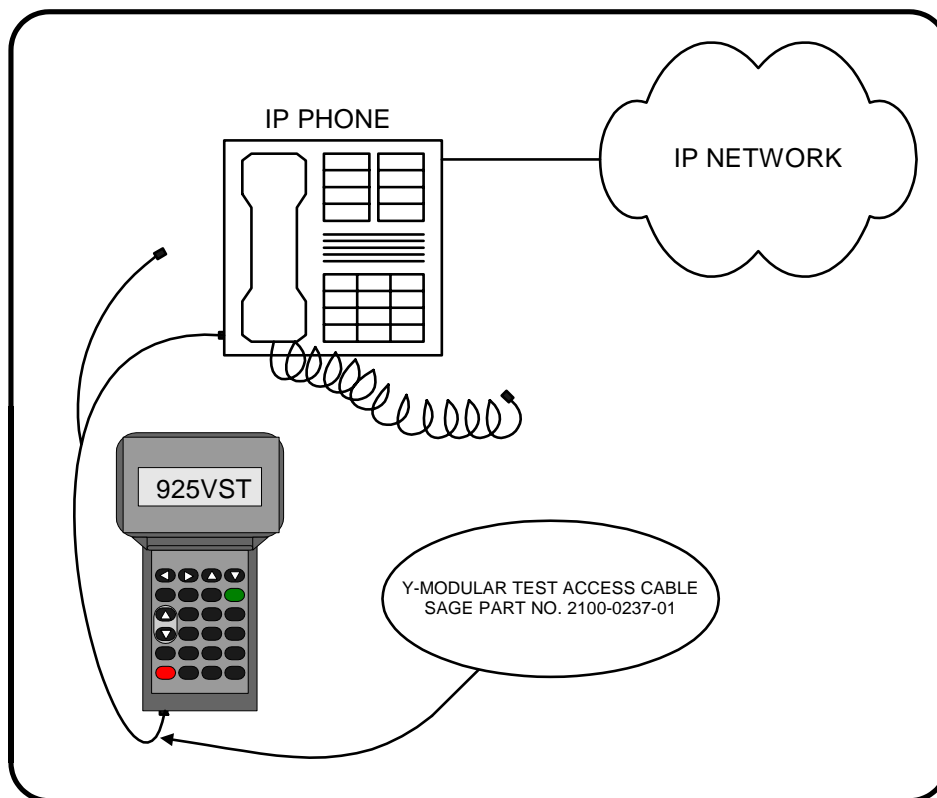
Figure 1 — Connecting the 925VST to an IP Phone

Connecting to a VoIP Phone

The recommended method of connecting a 925VST to a VoIP phone is via the phone's modular "coil-cord" handset interface. You can use the Sage Instruments Y-modular test access cable, Part No. 2100-0237-01, as illustrated in *Figure 1*.

Note that each leg of the "Y" cable has a different type of modular connector. The thicker one is terminated in a standard modular RJ11 telephone plug, and labeled "2W" (2-wire). The other is terminated in a modular RJ22 plug, which is identical to the small modular connector at the end of a telephone handset coil-cord. This leg is a thinner, flat cable and is labeled "4W" (4-wire).

Procedure:
1. Unplug the existing handset coil-cord cable from the VoIP telephone base unit
2. In its place, plug the "4W" RJ22 end of the "Y" cable
3. Plug the other end of the "Y" cable (a fat, wide RJ45 plug) into the matching jack at the bottom end of the 925VST
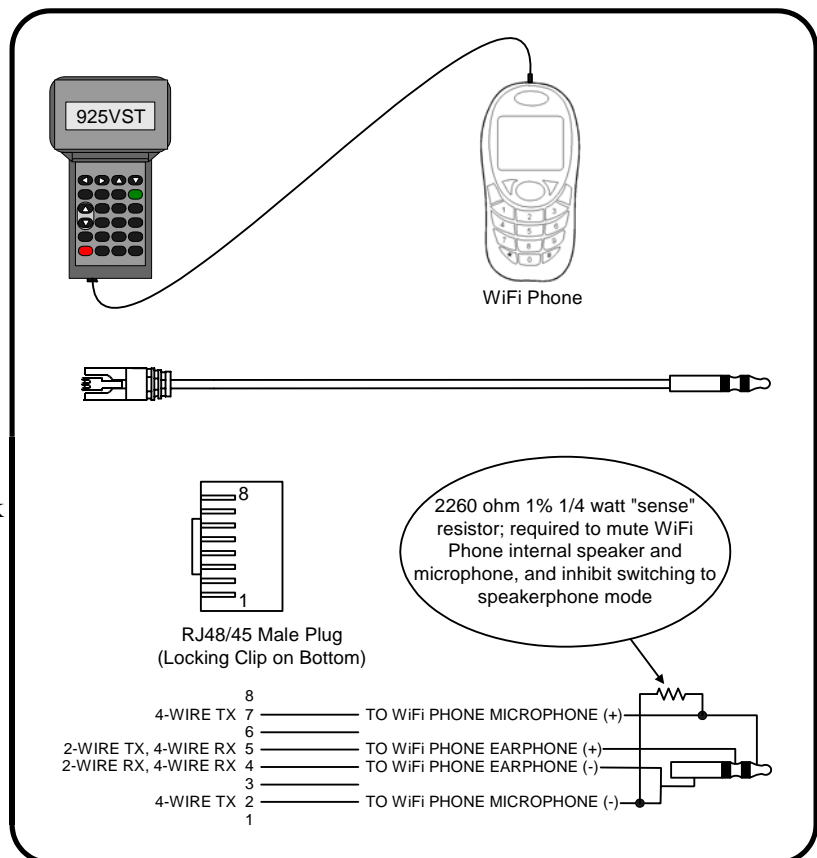
Connecting to a WiFi Phone

The recommended method of connecting to a WiFi phone is through its headset jack.

Unfortunately, Sage does not offer a custom cable for making this connection, so you will have to assemble one yourself. *Figure 2* provides sufficient information to construct an appropriate cable.

Procedure:
1. Plug the RJ45 end of the test cable into the matching RJ45 jack at the bottom of the 925VST
2. Plug the mini plug end of the test cable into the matching jack on the WiFi phone

925VST

WiFi Phone

8

1

RJ48/45 Male Plug
(Locking Clip on Bottom)

2260 ohm 1% 1/4 watt "sense" resistor; required to mute WiFi Phone internal speaker and microphone, and inhibit switching to speakerphone mode

	8	
4-WIRE TX	7	TO WiFi PHONE MICROPHONE (+)
	6	
2-WIRE TX, 4-WIRE RX	5	TO WiFi PHONE EARPHONE (+)
2-WIRE RX, 4-WIRE RX	4	TO WiFi PHONE EARPHONE (-)
	3	
4-WIRE TX	2	TO WiFi PHONE MICROPHONE (-)
	1	

Figure 2 — Connecting the 925VST to a WiFi Phone

Configure for 4-Wire Dry Circuit Operation

1. Power up the 925VST. You should see a screen like the illustration at the right

```
   Sage Instruments
    925VST 2.9001
     2 Wire Mode
 Hit Next to Continue
```

2. Press the **NEXT** key to see the Main Menu

```
Main Menu          1 ↓
1:<Test>
2:Setup
3:View Results
```

3. Using the numeric keypad, press the "**2**" key to enter the Setup area

```
1:<Interfaces>
2:Environment
3:Phone Lists
4:Responder Mode
```

4. Using the numeric keypad, press the "**1**" key to select the Interfaces screen

```
Interfaces
1:<Test Interface>
2:Serial Port
```

5. Using the numeric keypad, press the "**1**" key to select Test Interface

```
Select Interface  1 ↓
1:<2W Loop 600>
2:2W Loop 900
3:2W Gnd-Start 600
```

6. Press the down-arrow button to see additional choices

```
Select Interface   2↑
1:2W Gnd-Start 900
2:4 Wire Dry
```

7. Using the numeric keypad, press the "**2**" key to select 4 Wire Dry, which is the test interface necessary to connect to the handset jack of an IP Phone, or headset jack of a WiFi phone. You will see briefly displayed "Interface is 4W, Dry Mode"

```
Interface is 4W,
Dry mode
```

   Then, the display will return to the Select Interface screen, with line 2 enclosed by "greater than" and "less than" symbols.

```
Select Interface   2↑
1:2W Gnd-Start 900
2:<4 Wire Dry>
```

8. Press the **BACK** key three times to return to the Main Menu

Configure the SMOS Director Function

1. Using the **BACK** and **NEXT** keys, navigate to the Main menu

```
Main Menu          1 ↓
1:<Test>
2:Setup
3:View Results
```

2. Using the numeric keypad, press the "**1**" key to select Test

```
Test Select        1 ↓
1:<SMOS Director>
2:Echo Sounder
3:PVIT Send/Meas
```

3. Using the numeric keypad, press the "**1**" key to select SMOS Director

```
Phone # Under Test,


            <SETUP>
```

4. Using the numeric keypad, enter the phone number of the telephone this 925VST is connected to. This information will be included in the test result logs saved by the 925VST.

   Note: The following steps 5 through 13 are optional, but are included to acquaint you with the available user-adjustable parameters

```
Phone # Under Test,
8315551212


            <SETUP>
```

5. Press the F2 key to display additional setup options

```
1:<Voice Duration>
2:TX TLP
3:RX TLP
4:Set to Default
```

6. Use the numeric keypad to enter **1, 2, 3,** or **4**. Pressing **4** sets all three parameters to factory default values. Let's assume you want to view or modify each of these parameters. Press the "**1**" key to select Voice Duration.

   This parameter defines how long the SMOS artificial voice signal will last in each test direction. Default is 9 seconds. On poor quality circuits (i.e. with significant frame slips, and frame losses), a longer artificial voice duration will yield more accurate results. In such cases, Sage recommends setting the artificial voice duration to 30 seconds or more.

```
SMOS Artificial
Voice Duration
9  Seconds
Enter 3 to 60
```

7. After you have made any desired adjustment, press the **NEXT** key to "enter" your input and return to the previous setup screen

```
1:<Voice Duration>
2:TX TLP
3:RX TLP
4:Set to Default
```

8. Using the numeric keypad, press the "**2**" key to select TX TLP. Use the numeric keypad to modify the displayed value.

   You can use the transmit (TX) TLP to adjust the 925VSTs test signal level up or down. Handset and headset interfaces are often too sensitive for the "0 dB" transmit level setting, so Sage suggests starting with a setting of -10 dB to -20 dB.

```
SMOS TX Level Point
0    dB
Enter -30 to 10
Next to continue
```

9. After you have made any desired adjustment, press the **NEXT** key to "enter" your input and return to the previous setup screen

```
1:Voice Duration
2:<TX TLP>
3:RX TLP
4:Set to Default
```

10. Using the numeric keypad, press the "**3**" key to select RX TLP. You can use the receive (RX) TLP to adjust the 925VSTs receive sensitivity. Default is 0 dB. To increase sensitivity, LOWER the RX TLP.

```
SMOS RX Level Point
0    dB
Enter -30 to 10
Next to continue
```

11. After you have made any desired adjustment, press the **NEXT** key to "enter" your input and return to the previous setup screen

```
1:Voice Duration
2:TX TLP
3:<RX TLP>
4:Set to Default
```

12. Let's assume you've changed your mind, and want to reset all three parameters to factory defaults: Using the numeric keypad, press the "**4**" key to select Set to Default

```
Voice Duration: 9s
TX TLP: 0dB
RX TLP: 0dB
NEXT to continue
```

13. Press the **NEXT** key to "enter" your input and return to the previous setup screen

```
1:Voice Duration
2:TX TLP
3:RX TLP
4:<Set to Default>
```

14. Press the **BACK** key to continue the main series of SMOS setup screens. This will take you back to the last main setup screen you saw

```
Phone # Under Test,
8315551212

            <SETUP>
```

15. Press the **NEXT** key to move to the next SMOS setup screen

```
Enter Your ID


 Numeric      <Alpha>
```

16. The intent of the ID field is to identify the tester who ran the tests. This information will be included in the test result logs saved by the 925VST.

    If your ID consists of strictly numbers, press the **F1** (Numeric) key and use the numeric keypad to enter them.

    If your ID consists of letters, or a combination of numbers and letters, press the **F2** (Alpha) key, and use the numeric keypad to enter them. Notice that each numeric key also has two or three letters. Repeatedly pressing a key will cycle through each letter and the number on the key. Then, the cursor will advance on space to be ready for the next character you input.

```
Enter Your ID
JSMITH3416

 Numeric      <Alpha>
```

17. After you have input your ID, press the **NEXT** key to move to the next SMOS setup screen

```
Enter Order #


 Numeric      <Alpha>
```

18. The intent of the Order field is to identify the work order, sales order, repair order, or any other desired tracking number. Such a number, for instance, could be used to relate the test results with a circuit installation or repair job.

```
Enter Order #
112301BA

 Numeric      <Alpha>
```

19. After you have input your Order number, press the **NEXT** key to move to the next SMOS setup screen

```
Manual # Entry    0 ↓
#:

            <Dig Setup>
```

20. With IP and WiFi phones, you need to dial the destination phone number by using the phone's dial pad, so do not enter any digits in this window. Instead, press the **NEXT** key to advance to the next screen. This screen will prompt you with the message "Go off hook and Dial, The Press Next."

```
Go off hook and Dial


Then Press Next
```

21. Using the IP or WiFi phone, make the call as you normally would if the 925VST was not connected to it. Then, press the **NEXT** key. The 925VST will then briefly display a "connecting" message, which changes to a "Test in Progress" message.

```
SMOS Director      4W
Test In Progress
Please wait...
```

22. At completion of the test, use the IP or WiFi phone to hang up and terminate the call.

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