Agilent Technologies

Connecting and Configuring the Agilent Technologies Signaling Advisor

Product Note

Introduction

The Agilent Technologies Signaling Advisor is a flexible, easy to use protocol analyzer that can help make a significant difference to your test methods. It can help you when installing new network equipment, connecting to other networks or rolling out new services.

The Signaling Advisor is not only capable of monitoring it also has emulation capabilities available. The emulation capability called EmuLite is a fully graphical environment that makes the development of tests and scripts much easier with no programming required. This allows you to focus on generating the correct tests, not debugging code.

This note will help you get started quickly and explain both the connection and configuration of your Signaling Advisor using the Auto Configure facility.

Connecting the Signaling Advisor to Your Network Equipment

Cabling

Supplied with every instrument is cabling to connect your Signaling Advisor to the network equipment. This is accomplished by connecting the Line Interface Module (LIM) supplied with the Signaling Advisor to the network equipment's monitor ports.

Please contact your local Agilent sales representative for guidance on choosing appropriate cabling to connect to your network equipment.

Getting Started

The following steps are the basic procedures when connecting to live network equipment:

1. Establish your monitor point on the network equipment.

2. Connect to the link on the switch that carries the signaling data.

Cabling can be inserted or removed when the Signaling Advisor is powered up and running. Removing cables when configured will cause a small window to 'pop-up' on-screen, indicating a loss of signal alarm. This is simply a facility to ensure that the user is aware of any alarms that occur.

Helpful Hints When Connecting

Ensure you know what you are connecting to i.e. check if there is equipment behind a patch panel or if there are 'hidden' cables of more than 30 meters. The Signaling Advisor will run correctly with cabling up to 30 meters to the actual network switch. Very long cable lengths may affect the operation of the Signaling Advisor.

Never connect directly to an unprotected monitor point when the instrument is set to low impedance mode, as this may affect the signaling network. The Signaling Advisor is set to high impedance mode as default to ensure no accidental interruption occurs.

If you have to connect directly to the 'bare' wires connected to the monitor point, ensure you select 'Bridged Monitor' mode from the Operating Mode option in Configuration screen.

Operating Mode — Bridged Monitor

Bridged Monitor mode is used when you connect to an active bearer. The high input impedance allows connection without affecting the signal. Total cable length from the Signaling Advisor to the link being monitored should be a maximum of 3 meters. Longer cables are prone to reflections and may cause signal alarms.

```
   ┌──────┐                              ┌──────┐
   │  SP  │━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━│  SP  │
   └──────┘        │                     └──────┘
                   │    High impendence (Z)
                   ▼
             ┌───────────┐
             │ Signaling │
             │  Advisor  │
             └───────────┘
```
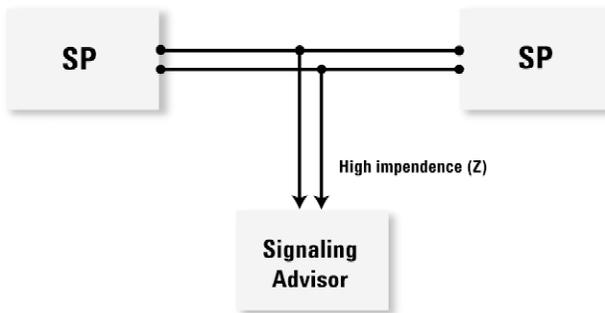
Operating Mode — 20 -> 30dB Terminated Monitor/ 0dB Terminated Monitor

20 -> 30dB Terminated Monitor mode is used when you are connected to a monitor point that attenuates the signal by 20 to 30 decibels (dB). Maximum cable length depends on cable quality and could be more than 100 meters.

0dB Terminated Monitor mode is used when you need to terminate the link being monitored. Maximum cable length depends on cable quality and may be up to several hundred meters.

```
  ┌──────┐      ┌─────────┐      ┌──────┐
  │  SP  │━━━━━│ Monitor │━━━━━│  SP  │
  └──────┘      │  Point  │      └──────┘
               └─────────┘
                    │   Low impendence (Z)
                    ▼
              ┌───────────┐
              │ Signaling │
              │  Advisor  │
              └───────────┘
```

4
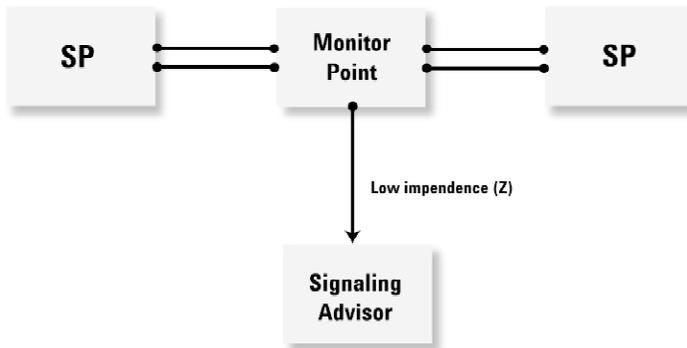
Operating Mode — End Emulate

End Emulate mode is used when you need to use a link for emulation. This sets the termination impedance on the receive connector (RXa) to low (75/120/100 for E1 unbal/E1 bal/T1) and generates G.703 compatible outputs on the transmit connector (TX). The maximum cable length also depends on cable quality and may be up to several hundred meters.

Configuring the Signaling Advisor

Configure the Links

Once the physical connection is made to the network equipment, the second stage in the process is to configure the links to read the signaling traffic. This couldn't be easier using the Auto Configure facility but you also have the option to configure manually.

Auto Configure is of particular benefit if you are unsure which timeslot or protocol is being used for the signaling on the network.

Auto Configure

The following steps should be followed when using Auto Configure:

1. Start up Signaling Advisor in Real Time mode
2. Click on the Configuration icon

The following Bearer View window will appear.

See section *Multi-Frame Type* on page 11 for information on Multi-Frame Type options.

See section *Emulate Clock* on page 11 for information on Emulate Clock.

See section *Line Encoding* on page 11 for information on Line Encoding.
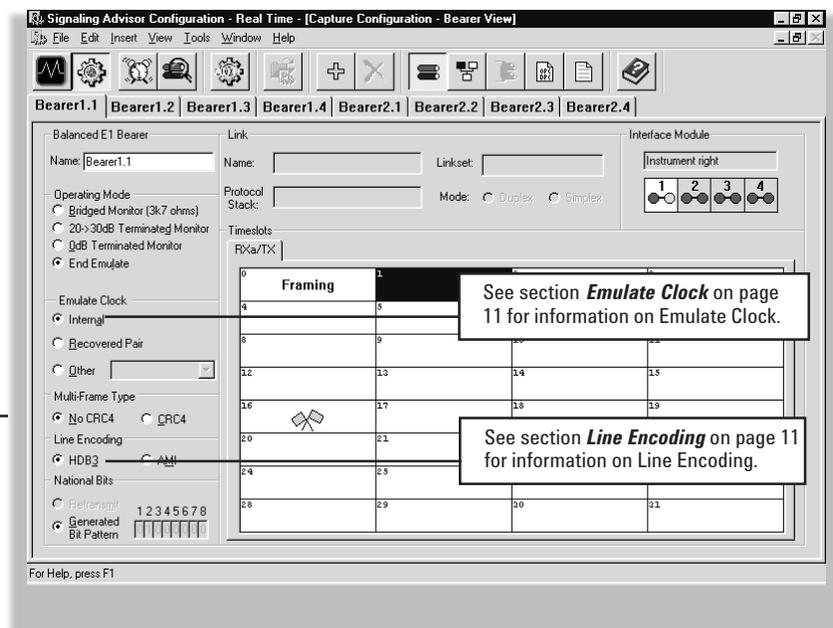
3. Click on the Auto-Configuration icon .

The following Auto Configure window will appear.

4. Select the Bearer(s) you want to automatically configure on

5. Click on the Options button. You will be given the opportunity to set the Data Rates, Protocol Stack, etc to be used in the Auto Configuration search. This can reduce the time taken to complete the Auto Configuration. Default settings will be adopted on the basis of the chosen Network Type.
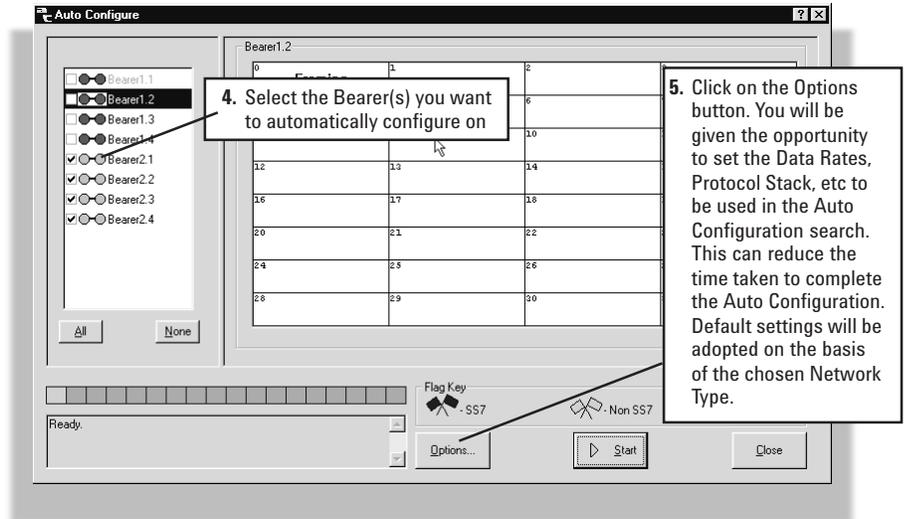
Note: When correctly connected to network equipment and a good signal is being received, the bearer lights should be green.

The following Options window will appear with the Auto Configure window tabbed.
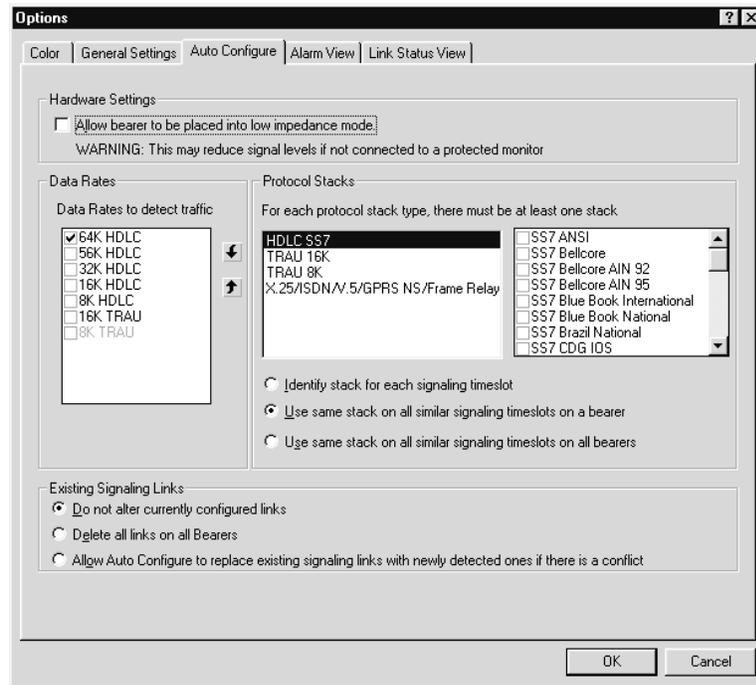
See section Explanation of Options window on page 10 for more information.

6. Click 'OK' after you have made the appropriate selections.

7. Click 'Start' to begin the Auto Configure process.

See section 'Auto Configure process' on page 14 for a detailed step by step description of each stage of the configuration process.

The Auto Configure process takes a few moments to complete. Once complete, the Bearer View will show the resultant hardware settings. These settings may be manually adjusted by double-clicking if necessary.

Automatic configuration of your bearers has now been established. You are now ready to begin capture of your signaling traffic.

Manual Configuration

Although Auto-Configure is always recommended, the Signaling Advisor may also be manually configured. Manual configuration requires each timeslot and protocol stack to be assigned by the user.

Helpful Hints When Configuring

- The first time the instrument is booted up, you are prompted to choose the Network Type. This sets up the appropriate data rate and protocol stack options that Auto Configure will check. These settings can be viewed and edited in the Auto Configure Options dialog.

- Auto Configure will not work on the GPRS Gb interface, where multiple timeslots will be aggregated. Gb must be configured manually. Links must also be manually configured when emulating.

- If you are running test equipment in parallel, there is a possibility that attenuation may occur. To ensure the Signaling Advisor runs correctly without alarms, you should remove any other devices from the link whilst the Signaling Advisor is connected.

- If you see no traffic when connected to a live link, there are two common causes of this:

  - **There is simply no traffic on the link.** (For instance, this can happen on a new piece of network such as GPRS, where the usage is still very low).

  - **You are not connected to a link that carries signaling traffic.** SOLUTION: Run Auto Configure over all links in order to find signaling data.

If you have manually configured and you are unsure there is traffic on the link, then you should select "No Filtering or Collapsing" of short messages from the Signaling Link Properties window. You must then alter the message display levels to show the level 2 messages. This can be done as follows:

1. Select the Traffic menu
2. Select Display Levels.
3. Uncheck Hide in the MTP2 layer level bar and ensure it is set to Max.

Now when you monitor traffic, you will see all the layer 2 messages being sent over the network. If at this stage there is still no traffic within a 30 second period, then it is most likely that you are not connected to the correct link.

Summary

Through the use of Auto Configure, you are able to quickly and automatically configure your Signaling Advisor to your network's signaling traffic.

Reference Section

Overview

This reference section has been included for additional information on configuration of the Signaling Advisor.

Explanation of "Options" Window

- **Hardware Settings** — "Allow bearer to be placed into low impedance mode". This option is disabled by default to prevent accidental net work disruption which could be caused by connecting with a low impedance. You should only select this if you know you are connecting to a protected monitor point.

- **Data Rates** — Auto Configure checks for signaling data at only these selected data rates and in the order specified from top to bottom. Reducing the number of data rates to examine, improves the speed of the configuration process.

  Select those rates that match your network, then promote or demote the priority of the rates so that the most likely data rate is at the top of the list.

- **Protocol Stacks** — This field selects the protocol stack(s) that Auto Configure will verify data against, reducing the number will speed up the process. Select the Protocol Stack Type, then the protocol stack itself. Note: Use the "same stack..." option if you know that the same protocol stack exists on each bearer.

- **Existing Signaling Links** — This determines whether or not you preserve previously configured links.

Bearer View Functions

Emulate Clock

- **Internal:** Select this clock when you wish to transmit messages using the interface module's internal clock.

- **Recovered Pair:** Select this clock when you wish to take the clock data from the input source.

- **Other:** Select this clock when you wish to take the clock data from a selected source i.e., another interface module or an external clock de vice.

Multi-Frame Type

This is only applicable to E1. The Multi-Frame Type option is in relation to the information transmitted on timeslot 0 on an E1 bearer.

Line Encoding (for E1 interface)

- **HDB3:** High Density Bipolar Order 3 Encoding

  The HDB3 code is a bipolar signaling technique (i.e. relies on the transmission of both positive and negative pulses). It is based on Alternate Mark Inversion (AMI), but extends this by inserting violation codes whenever there is a run of 4 or more 0's. This and similar (more complex) codes have replaced AMI in modern distribution networks. Most commonly this form of line encoding shall be used.

- **AMI:** AMI (Alternate Mark Inversion)

  AMI is a synchronous clock encoding technique which uses bipolar pulses to represent logical 1 values. It is therefore a three level system. A logical 0 is represented by no symbol, and a logical 1 by pulses of alternating polarity. The alternating coding prevents the build-up of a d.c. voltage level down the cable. This is considered an advantage since the cable may be used to carry a small d.c. current to power intermediate equipment such as line repeaters.

  AMI coding was used extensively in first generation PCM networks, but nowadays has been replaced by HDB3.

Alarms

Alarm View

Alarm view identifies any hardware alarms found on the selected bearers.
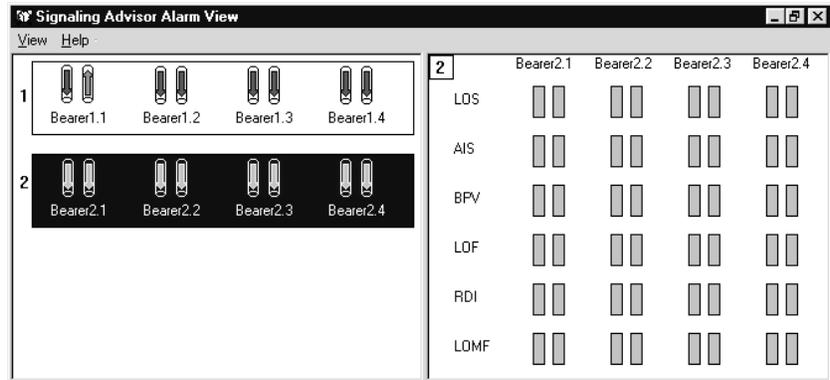
How to Identify and Clear Hardware Alarms

If any hardware alarms have been detected on any of the bearers, they will be shown in the alarm color (default red).

The bearers are listed across the top and the alarm type down the left of the alarm view window. The alarm color identifies the bearers where particular hardware alarms have been detected.

The following table shows all the possible alarm types and possible actions to clear the alarms.

E1 Alarms	Possible Actions
LOS – Loss of Signal	Check connection, Change Operating Mode to Terminated Monitor (20dB or 0dB) Change Line Encoding
AIS – Alarm Indication Signal	Clear problem at remote end
LOF – Loss of Framing	Change Line Encoding Change Multi-Frame Type
BPV – Bi-Polar Violation	Change Line Encoding Change Operating Mode to Terminated Monitor (20dB or 0dB)
LOMF – Loss of Multiframe	Change Multi-Frame Type
RDI – Remote Defect Indication	Clear problem at remote end
BPV & LOF together	Change Operating Mode

T1 Alarms	Possible Actions
LOS – Loss of Signal	Check connection, Change Operating Mode to Terminated Monitor (20dB or 0dB) Change Line Encoding
AIS – Alarm Indication Signal	Clear problem at remote end
LOF – Loss of Framing	Change Line Encoding Change Multi-Frame Type
BPV – Bi-Polar Violation	Change Line Encoding
RDI – Remote Defect Indication	Clear problem at remote end
SEF – Severely Errored Frame	Change Multi-Frame Type

DS0 Alarms	Possible Actions
LOS – Loss of Signal	Check connections, Change clock source
LOBC – Loss of Byte Clock	Check connections, Change clock source
LOC – Loss of Bit Clock	Check connections, Change clock source

Datacom Alarms	Possible Actions
LOS – Loss of Signal	Check connection
LOC – Loss of Clock	Check connection

Auto Configure Process

Stage 1 – Clear Hardware Alarms – The line encoding and framing type are changed until all hardware alarms have been cleared. Impedance is only changed if the option is enabled in the Auto Configure Options. As hardware alarms clear, the individual alarm status color will change. Only the selected bearers are adjusted.

Stage 2 – Detect Signaling – The Signaling Advisor looks for signaling on each alarm free bearer. Only the selected data rates will be checked. When signaling is detected, the appropriate symbols will appear in the timeslot.

- Blue Flags represent SS7 signaling.
- Green Flags represent Non-SS7 signaling (either X.25/ISDN/V.5/NS GPRS/ Frame Relay).
- 'TRAU' represents GSM TRAU 8K or 16K data.
- A yellow flag represents the repeated patterns that separate signaling units (flags).

Note: On T1 interface, a yellow flag may be displayed where empty timeslots are idling the same pattern as these flags.

Stage 3 – Capture Sample Data – A sample of data is captured from all the detected bearers. This data is used to validate against the selected Protocol Stacks. If only one stack is selected for each stack type then Stage 3 is not carried out and the selected stack is used.

Stage 4 – Validate Protocol Stacks – The captured data sample is validated against the selected Protocol Stacks. The stack that gives the best validation statistics is taken as the correct stack. The first stack that verifies 100% will be used without further checks. If only one stack is selected for each stack type then Stage 4 is not carried out and the selected stack is used.

Stage 5 – Creates Links – When the Auto Configure dialog is closed, all the detected links are automatically created. Links are not created on timeslots which have a yellow flag, because full signaling has not been detected in these timeslots. You can now capture network traffic on the created links.

Glossary

AMI	Alternate Mark Inversion
CRC4	Cyclic Redundancy Check 4
FISU	Fill In Signal Unit
GPRS	General Packet Radio Services
GSM	Global System for Mobile Communications
HDB3	High Density Bipolar Order 3 Encoding
LIM	Line Interface Module
MTP2	Message Transport Part 2
NSAlive	Network Service Alive
NSAliveAck	Network Service Alive Acknowledgment
Rx	Receive
SP	Signaling Point
SS7	Signaling System No. 7
TRAU	Transcoder Rate Adaption Unit
Tx	Transmit

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