Agilent Technologies

3G UMTS W-CDMA Test Software

Getting Started

Agilent Technologies

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Introduction to 3G UMTS W-CDMA

Getting Started

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Introduction to 3G UMTS W-CDMA

Introduction to 3G UMTS W-CDMA

The Agilent Advisor J5458A 3G UMTS W-CDMA Test Software is a tool for field service network managers, engineers, and technicians in deploying, troubleshooting, and optimizing advanced 3G (third generation) Radio Access Networks.

This guide introduces you to the characteristics of 3G mobile services, then describes how to configure and use the Advisor 3G UMTS W-CDMA protocol decodes to troubleshoot and test 3G wireless communications systems.

The term “3G UMTS W-CDMA” stands for:

- 3G — Third Generation
- UMTS — Universal Mobile Telecommunications System
- W-CDMA — Wideband Code Division Multiple Access

What is 3G?

The Agilent Advisor protocol decodes help you test and troubleshoot 3G networks. “3G” is the third-generation of mobile communication services, which provide high quality, efficient, and easy-to-use mobile, wireless, hand-held multimedia devices. Third-generation devices offer:

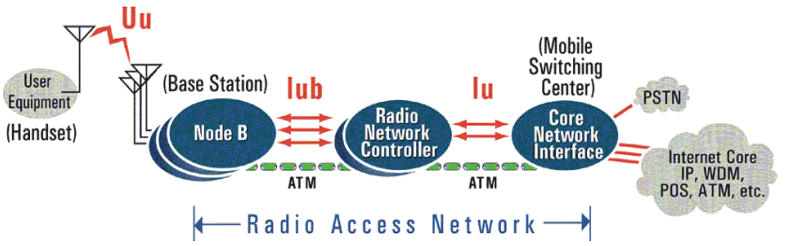
- Very high bit rate
- Enhanced communications
- Multimedia (voice, data, music, interactive data)

3G Test Software Protocol Decodes

The 3G UMTS W-CDMA Test Software enables you to test and deploy 3G Radio Access Networks. This test software is the most powerful and comprehensive tool available for installing, maintaining, and troubleshooting these networks.

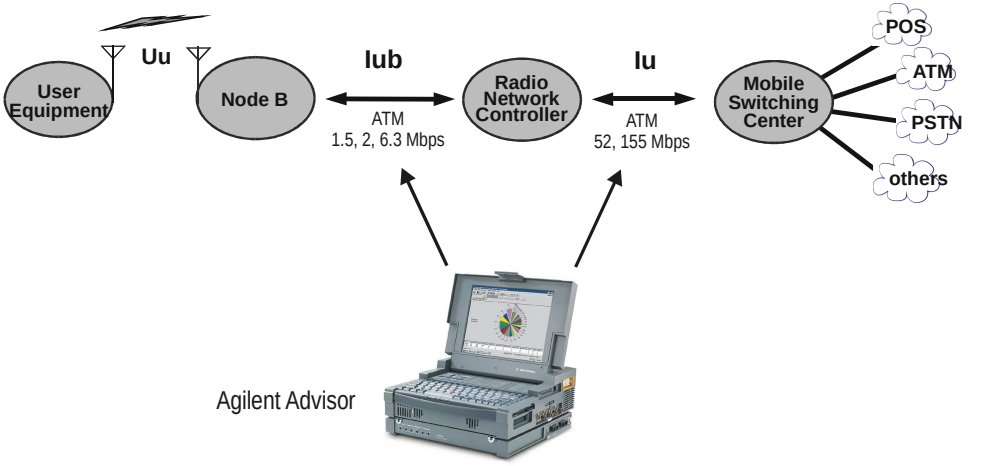
The Advisor 3G protocol decodes add extensive capabilities for testing, including analysis of the ATM transport network layer, and decoding and searching of the Iu, Iub, and Iur protocol layers.

The Radio Access Network (RAN) resembles:



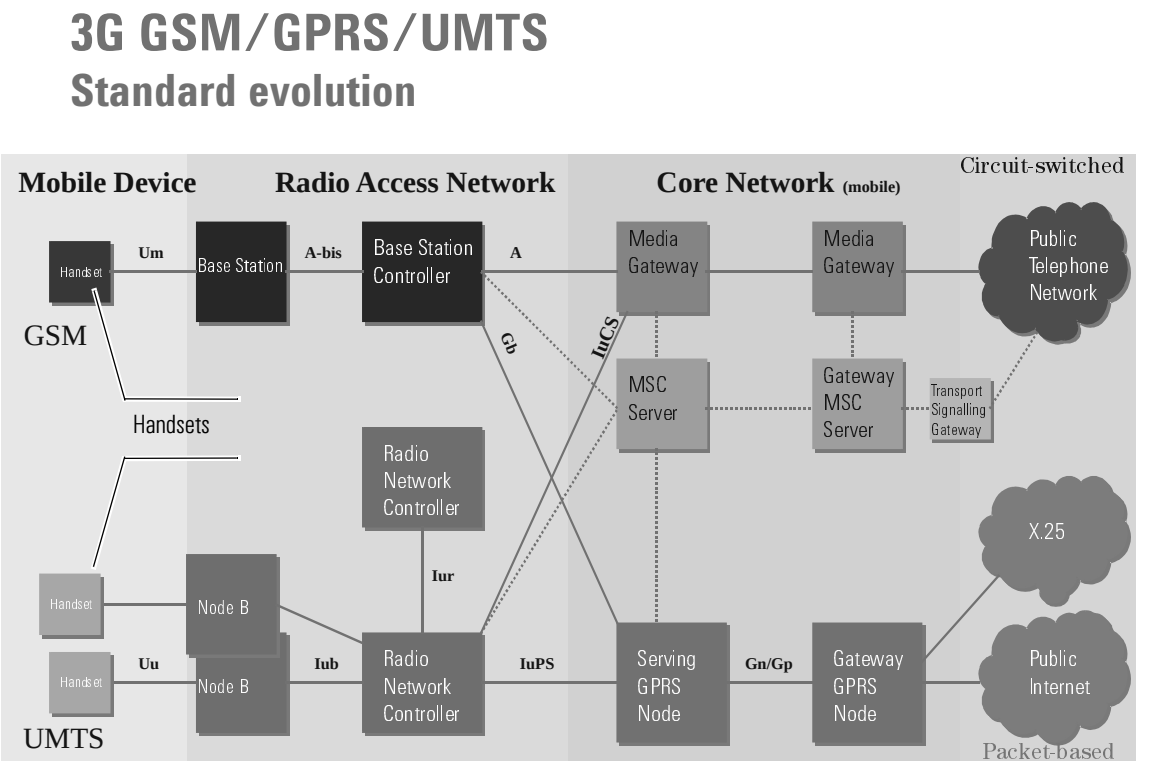
Sample Test Scenario

A sample test case displaying the Iu and Iub interfaces is shown here:



Overview of GSM, GPRS, and UMTS

An overview of the GSM (Global System for Mobile Communications), GPRS (General Packet Radio System), and UMTS (Universal Mobile Telecommunication Services) is shown here:



Advisor Decodes for 3G UMTS W-CDMA

The Advisor decodes for 3G UMTS W-CDMA include:

Iub User Plane

AAL-2 / FP / MAC / RLC/PDCP
AAL-2 / FP / MAC / RLC/BMC

Iub Control Plane

AAL-5 / SSCOP / SSCF-UNI / ALCAP (AAL2SIG)
AAL-5 / SSCOP / SSCF-UNI / NBAP
AAL-2 / FP / MAC / RLC / RRC / NAS

Iu User Plane

AAL-2 / IuUP / RLP
AAL-5 / IP / UDP / GTP-u/IuUP

Iu Control Plane

AAL-5 / SSCOP / SSCF / MTP3-b / ALCAP (AAL2SIG)
AAL-5 / SSCOP / SSCF / MTP3-b / SCCP / RANAP / NAS
AAL-5 / SSCOP / SSCF / MTP3-b / SCCP / RNSAP
AAL-5 / IP / SCTP

For Further Information

For details about IMT-2000 services, see the ITU's Recommendation ITU-R M.816-1, or contact the International Telecommunication Union (ITU) for more information about the recommendation.

3G Abbreviations and Definitions

A summary of the abbreviations and definitions in this manual include:

AAL-2 — ATM Adaptation Layer type 2
AAL-5 — ATM Adaptation Layer type 5
ALCAP — Access Link Control Application Part
ATM —Asynchronous Transfer Mode
CDMA — Code Division Multiplex Access
FP — Framing Protocol
GPRS — General Packet Radio System
GTP-u — User plan part of GPRS (General Packet Radio System) Tunnelling Protocol
IP — Internet Protocol
ITU — International Telecommunications Union
Iu — Interface unit
Iub — Interface unit b
MAC — Medium Access Control
MTP3-b — Message Transfer Part level 3 (Broadband)
NAS — Non-Access Stratum
NBAP — Node B Application Part
RAN — Radio Access Network
RANAP — Radio Access Network Application Part
RLC — Radio Link Control
RLP — Radio Link Protocol
RNSAP — Radio Network Subsystem Application Part
RRC —Radio Resource Control
SAAL-NNI — Signalling ATM Adaption Layer for Network-to-Network Interfaces
SAAL-UNI — Signalling ATM Adaption Layer for User-to-Network Interfaces
SCTP — Simple Control Transmission Protocol
SSCF — Service-Specific Coordination Function
SSCOP — Service-Specific Connection-Oriented Protocol
SCCP — Signalling Connection Control Part
TTC — Telecommunication Technology Commission (Japan)
UMTS — Universal Mobile Telecommunication System
W-CDMA — Wideband CDMA (Code Division Multiple Access)

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Getting Started

Getting Started

This chapter shows you how to use the J5458A 3G UMTS W-CDMA Test Software to configure and use the Advisor 3G UMTS W-CDMA protocol decodes to troubleshoot and test 3G wireless communications systems.

The basic steps for getting started and using the test software to test 3G networks include:

1 Enable the software.

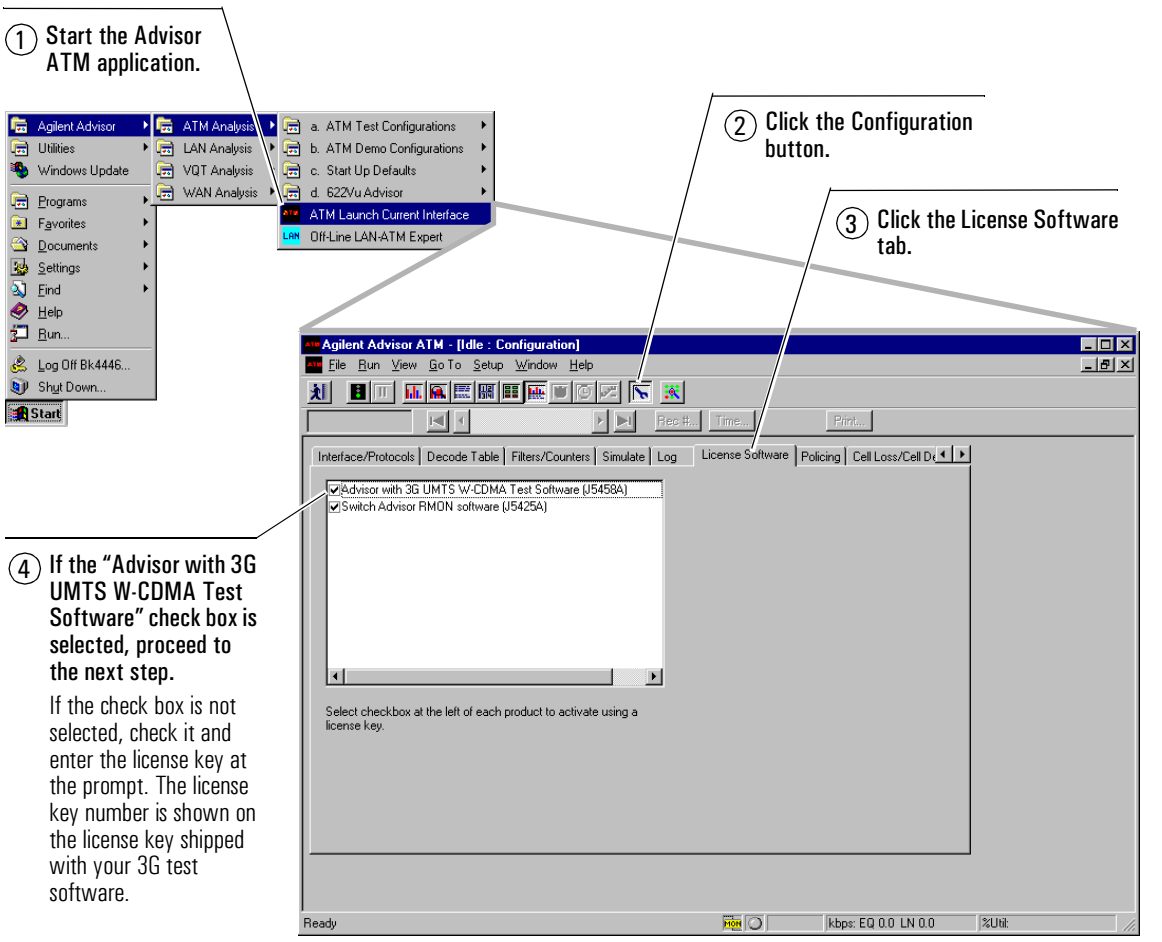
2 Choose the protocol stack routing direction of 3G data.

3 Set display filtering on 3G decodes.

These steps are described in detail in this chapter.

Step 1. Enable the 3G Test Software

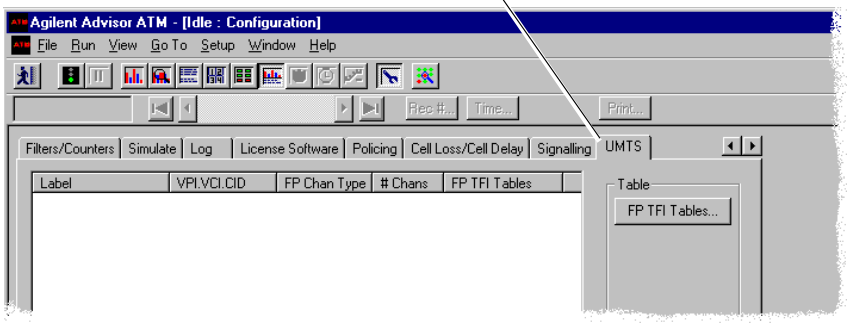
To enable the 3G Test Software, follow these steps:



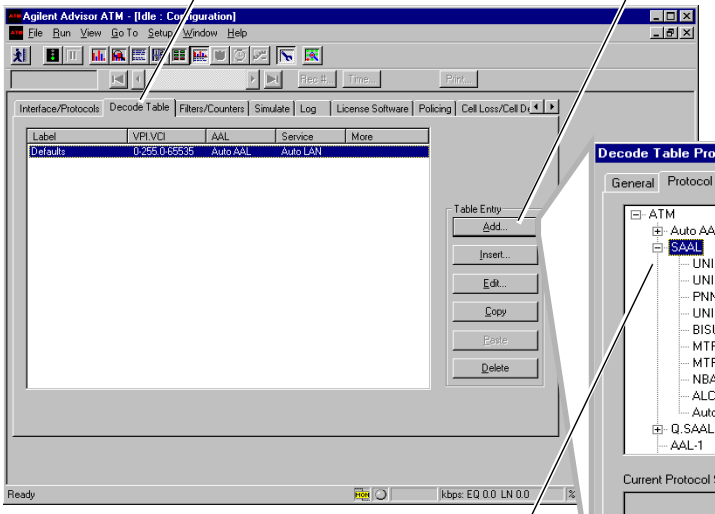
4 **If the "Advisor with 3G UMTS W-CDMA Test Software" check box is selected, proceed to the next step.**

If the check box is not selected, check it and enter the license key at the prompt. The license key number is shown on the license key shipped with your 3G test software.

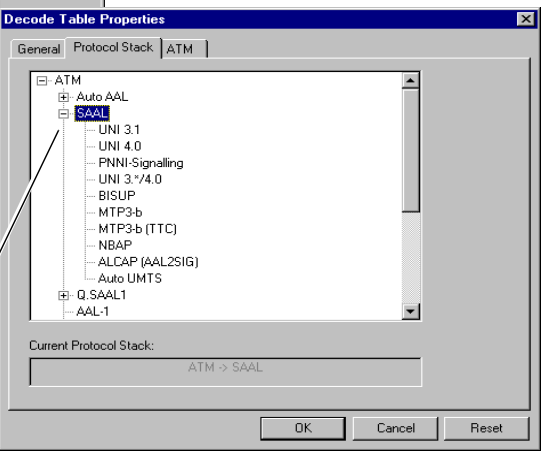
⑤ After you enter the license key number, 3G analysis and protocols are enabled, and you can access the UMTS tab.



⑥ Click the Decode Table tab.



⑦ In the Decode Table, when you add or edit an entry and then view the protocol stack, the 3G protocol decode stacks will appear.



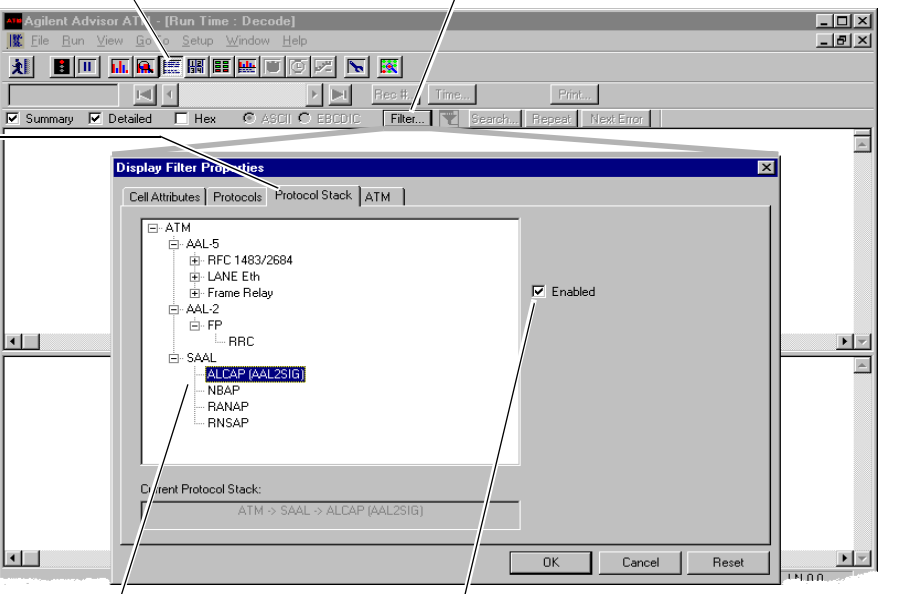
⑧ **Expand and examine the protocol stacks.**

AAL-2 will have Iub, IuUP, and Iur stacks. SAAL will have the MTP3-b, MTP3-b TTC, NBAP, ALCAP (AAL2SIG), and AutoUMTS.

You may need to select the appropriate stack based on your monitor point in the 3G UMTS network.

⑨ Display the Decode view to access the display filters.

⑩ Click the Filter button, and the Display Filter Properties dialog box appears.



⑪ Click the Protocol Stack tab to display the 3G filters.

⑫ **Enable the display filters protocol stack.**

The AAL-2 branch is accessible, and contains the FP and RRC filters. The SAAL branch includes ALCAP (AAL2SIG), NBAP, RANAP, and RNSAP.

⑬ **Select the protocol you want to use.**

By selecting any one of the protocols that you are interested in, you can filter and view that particular protocol stack of data only. When you select a display filter, other types of data will be filtered out, and will not be displayed.

Step 2. Choose the Protocol Stack Routing Direction of 3G Data

In the next several steps, you will direct the 3G data on ATM to the appropriate route. The appropriate route will be to any of these decode stacks:

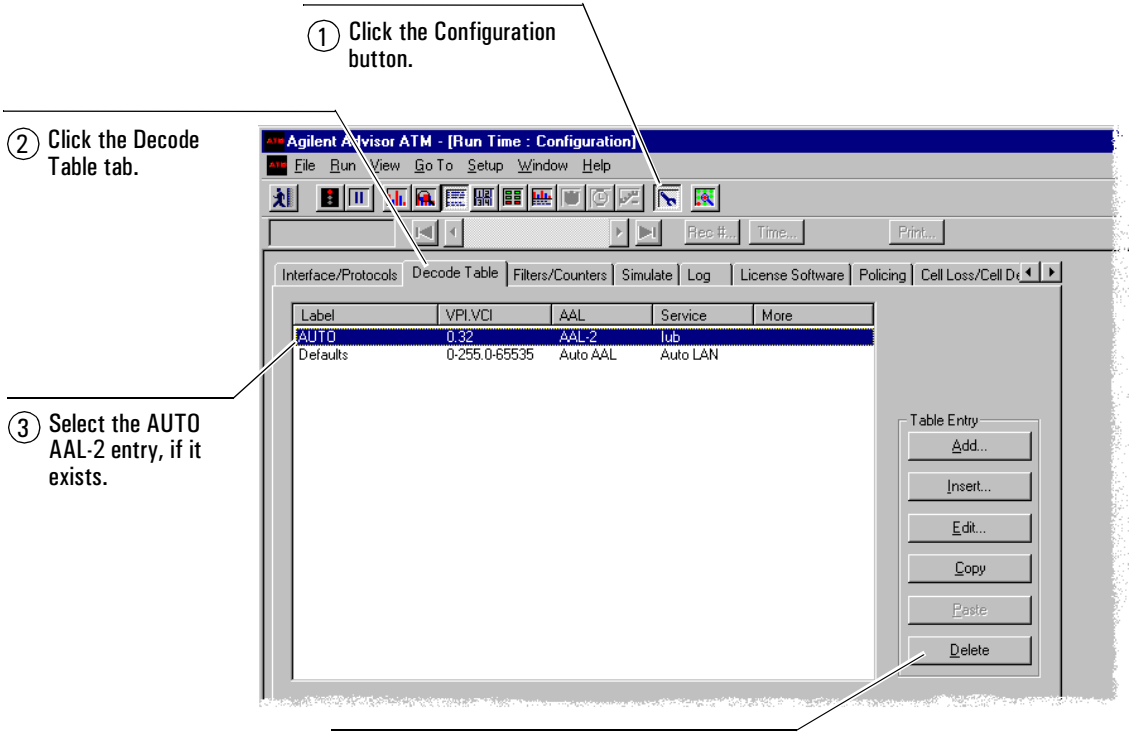
- 3G SAAL
- 3G IuUP
- 3G Iub
- 3G Iur

If the data is over SAAL or over IuUP on AAL-2, no further configuration is needed.

Step 2a. Direct Data to 3G SAAL Decodes

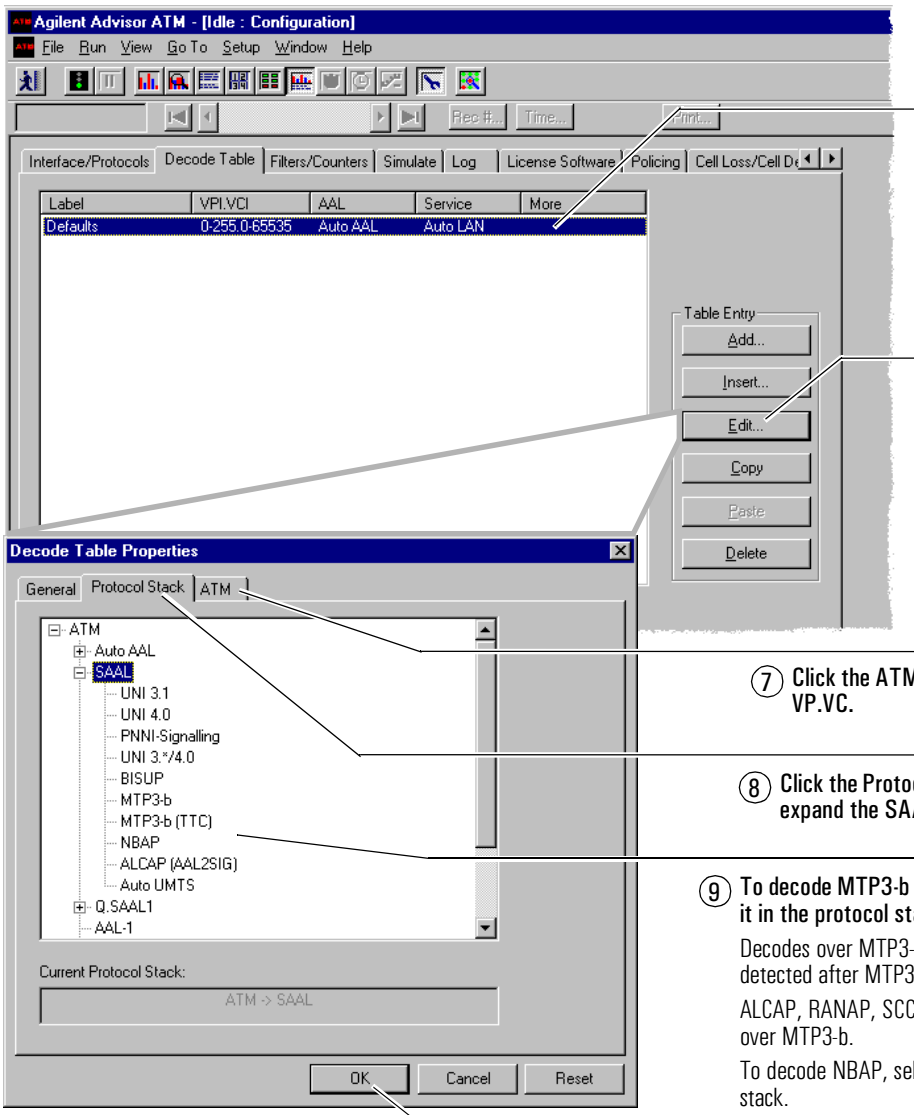
The data you will be directing may include MTP3-b, SCCP, RANAP, RNSAP, NBAP, and ALCAP.

You will first check the Decode Table to see if the AUTO entry exists. Then, you will direct the data to 3G SAAL decodes. To do this, follow these steps:



4 **Delete the AUTO AAL-2 entry.**

Because there are not enough fixed field values to detect a pattern of data automatically, you cannot use the AUTO entry, and therefore must force the decodes into the correct path.



5 Select the Defaults entry so that you can edit it.

6 Edit the Defaults entry.

7 Click the ATM tab to change the VP.VC.

8 Click the Protocol Stack tab, then expand the SAAL protocol stack.

9 **To decode MTP3-b or MTP3-b (TTC), select it in the protocol stack.**

Decodes over MTP3-b will be automatically detected after MTP3-b is decoded.

ALCAP, RANAP, SCCP, and RNSAP may occur over MTP3-b.

To decode NBAP, select NBAP in the protocol stack.

To decode ALCAP (AAL2SIG) over SAAL, select ALCAP (AAL2SIG) in the protocol stack.

10 When you are finished, click OK.

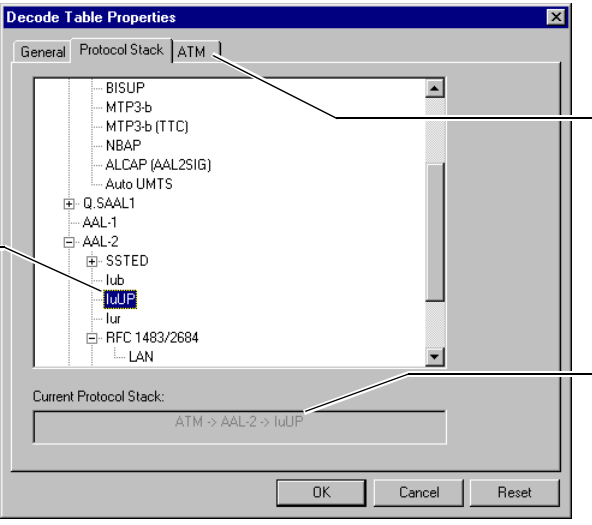
Step 2b. Direct Data to 3G IuUP Decodes

Note that the IuUP stack does not have any user configuration.

To direct the data to 3G IuUP decodes, follow these steps:

1. Click the Configuration  button.

2. Check the Decode Table, and delete the AUTO AAL-2 entry if it exists, as described in "Step 2a. Direct Data to 3G SAAL Decodes, page 2-7."



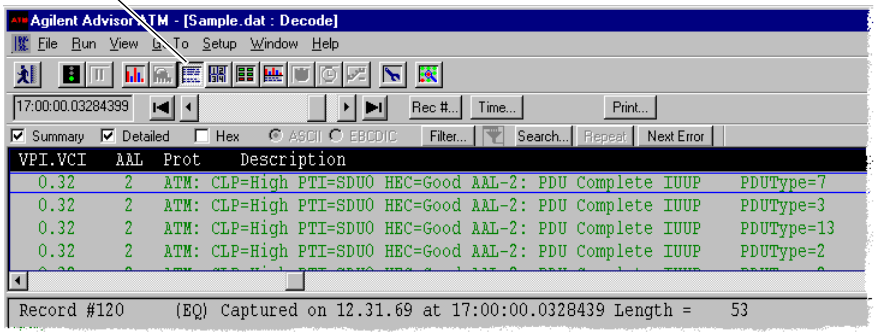
3. Click the ATM tab to change the VP.VC.

4. Edit the Defaults entry in the Decode Table to change the Protocol Stack to AAL-2 –> IuUP. Then click OK.

This area displays the currently selected protocol stack.

5. View the Decode Table tab, and notice that AAL changes to AAL-2, and the service changes from Auto LAN to IuUP.

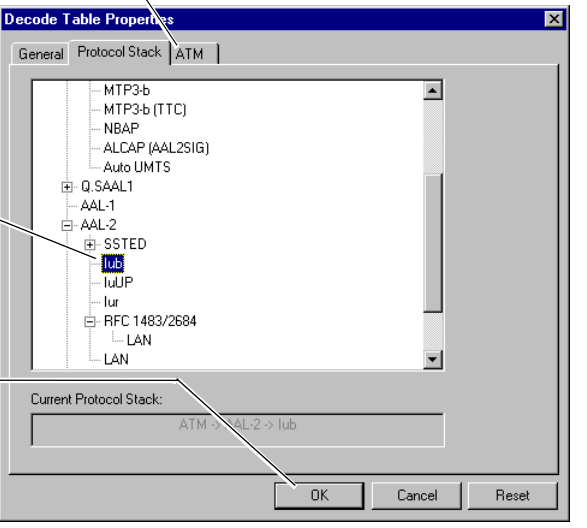
6. Display the Decode view to examine the IuUP frames. RLP frames may occur over IuUP.



Step 2c. Direct Data to 3G Iub or Iur Decodes

The Iub and Iur protocol stacks are almost identical, except for slight differences in the FP header. The user settings are the same. To direct the data to 3G Iub or Iur decodes, follow these steps:

1. Click the Configuration  button.
2. Check the Decode Table, and delete the AUTO AAL-2 entry if it exists, as described in "Step 2a. Direct Data to 3G SAAL Decodes, page 2-7."
3. Click the ATM tab to change the VP.VC.
4. Edit the Defaults entry in the Decode Table to change the Protocol Stack to AAL-2 -> Iub.
5. Click OK.
6. On the Decode Table tab, AAL changes to AAL-2, and the service changes from Auto LAN to Iub or Iur.



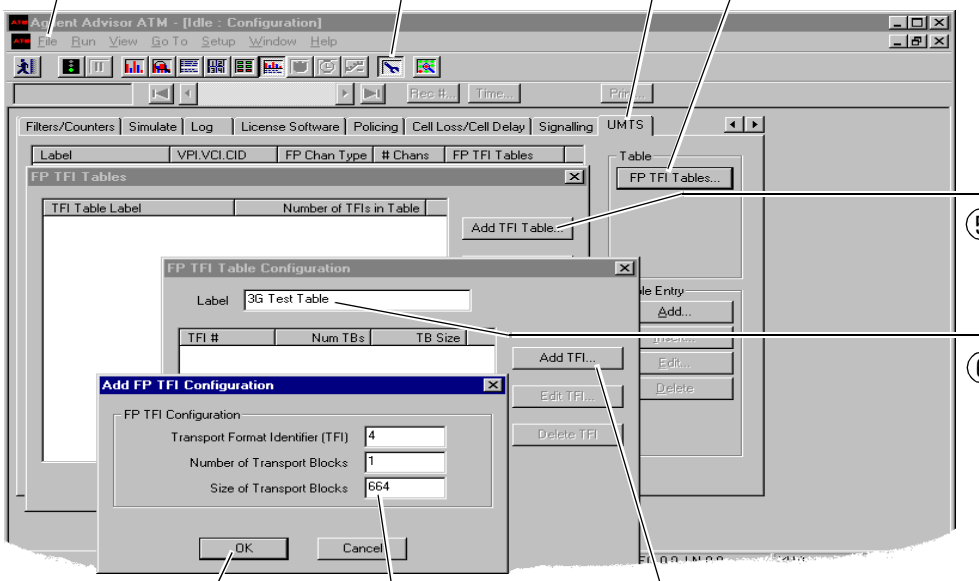
Changing the Iub or Iur Data Framing

To change the UMTS settings for the Iub or Iur data framing, you will update the TFI (Transport Format Identifier) tables. You can either load an existing TFI table using the File, Open (Load Data) menu selections, or create a new TFI table.

The data is carried over the radio waves using transport channels, which are mapped in the physical layer to different physical channels. The TFI tables map the transport channels to the physical channels, and provide an identifier

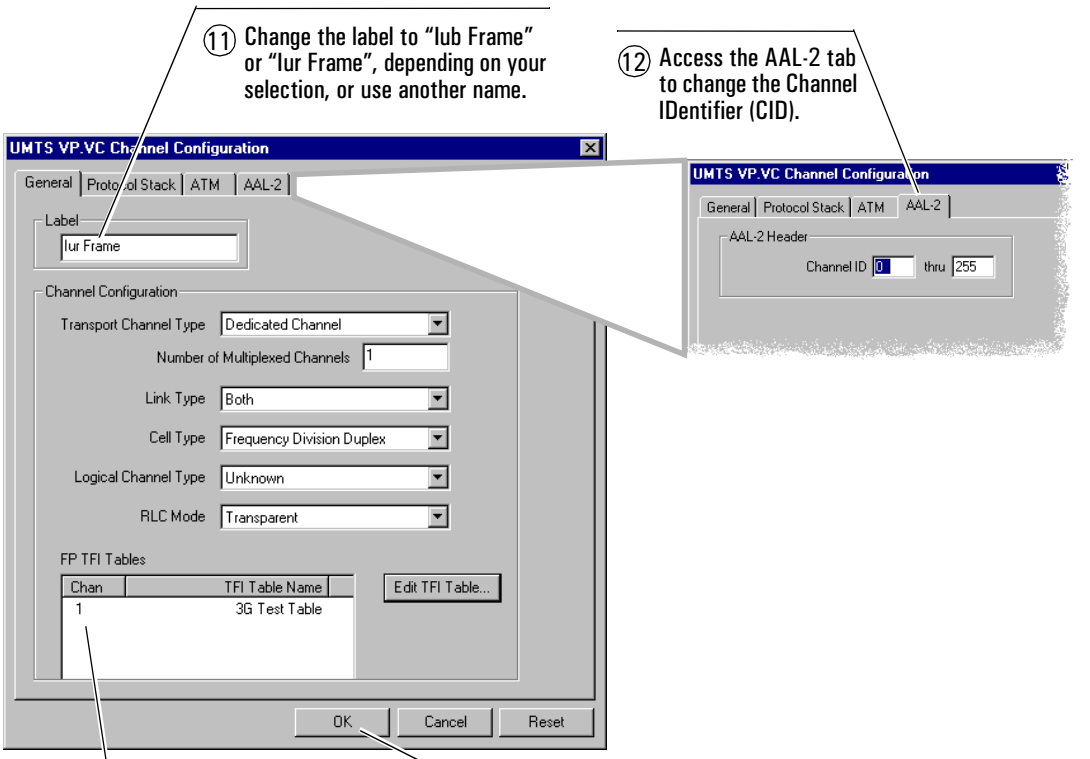
at each time event to indicate when data is expected to arrive for the transport channel from the higher layers.

To change the Iub or Iur data framing, follow these steps:



1. To load an existing TFI table, click File, then Open, and load the TFI table. Otherwise, you can create a new TFI table, as described in the following steps.
2. Click the Configuration button.
3. Click the UMTS tab.
4. To create a new TFI table, click "FP TFI Tables...".
5. In the FP TFI Tables dialog box, click "Add TFI Table...".
6. In the FP TFI Table Configuration dialog box, change the Label to "3G Test Table", or use another name.
7. Click "Add TFI...". The Add FP TFI Configuration dialog box appears.
8. Enter values for the TFI, the number of transport blocks, and the bit size of the transport blocks for each TFI number.
9. Click OK until you return to the UMTS tab.

⑩ **In the UMTS window, click "Add..." to add an entry to the list.**
The UMTS VP.VC Channel Configuration dialog box appears.



⑬ **In the lower part of the dialog box, look at the FP TFI Tables list and make sure that Channel 1 is assigned to the TFI Table Name that you assigned.**

⑭ **Click OK.**
When you click OK, the UMTS window appears with this information:
1) a table entry named "Iub Frame" or "Iur Frame" that has all VPI.VCI.CIDs assigned to it,
2) the type of channel used by this VPI.VCI (the FP channel type),
3) the number of channels multiplexed on this VP.VC.CID, and
4) the assigned FP TFI Table named "3G Test Table" for each of the multiplexed channels.

Changing the ATM VP.VC and the AAL-2 CID

On the AAL-2 tab, the AAL-2 Channel ID (CID) specifies a channel within a VP.VC address. Channels on UMTS are designated as 0 through 255.

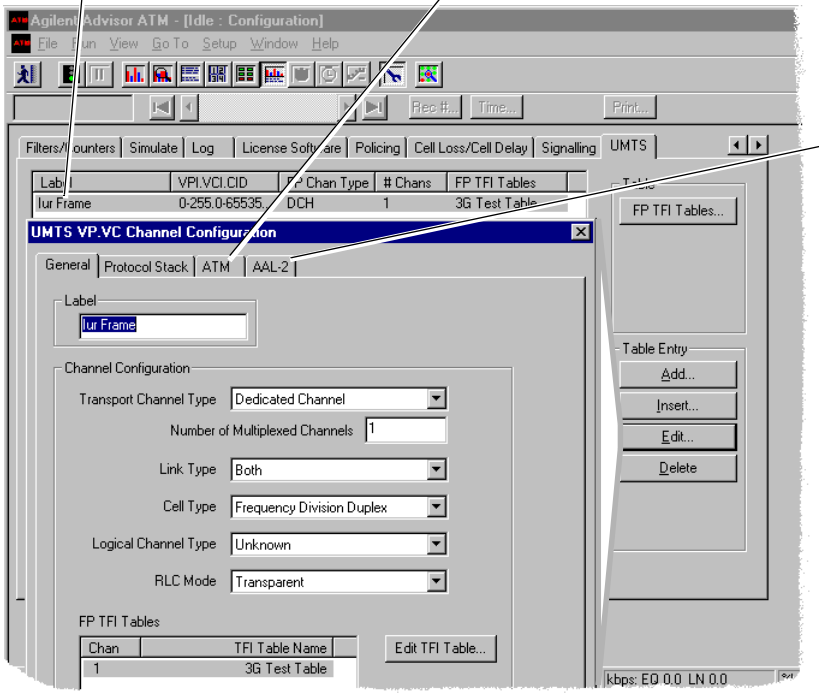
AAL-2 cell payloads carry mini-cells. An 8-bit CID field in the mini-cell header is used to identify the channel to which a mini-cell belongs. The CID in an AAL-2 mini-cell is similar to the VPI.VCI in an ATM cell.

To change the ATM VP.VC address and the AAL-2 CID, follow these steps:

1. **Edit the entry you specified earlier.**
   The UMTS VP.VC Channel Configuration dialog box appears and displays the ATM and AAL-2 tabs.

2. **Click the ATM tab and change the default values for VP and VC.**
   The VP.VC must match, or it must be included in the range of VP.VCs that you set in the Decode Table in order to direct the data to the Iub or Iur decodes.

3. **Click the AAL-2 tab and change the CID value. Then click OK and return to the UMTS window.**



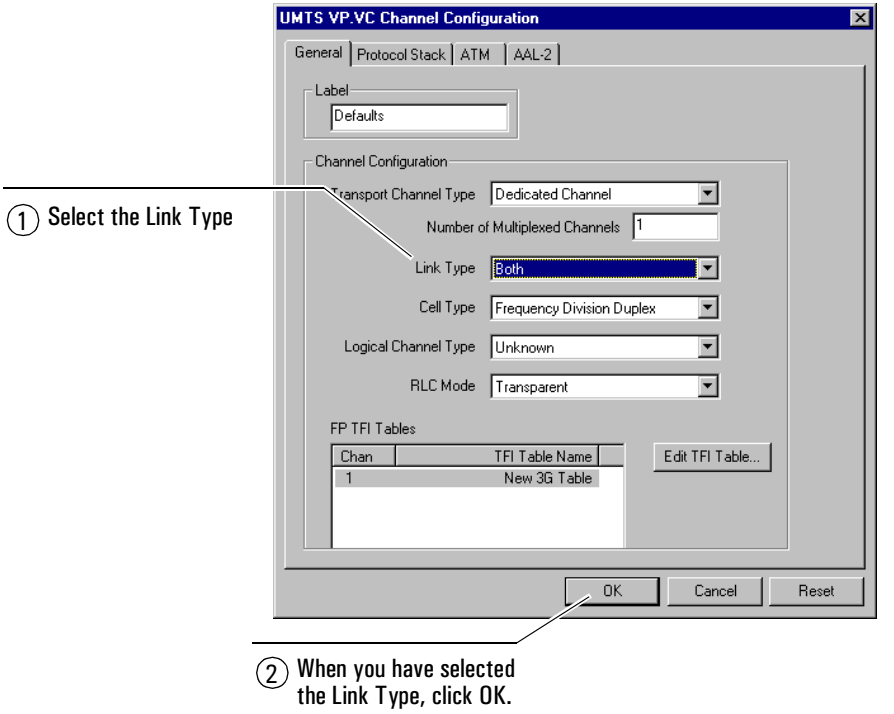
Changing the UMTS Iub or Iur FP Type Settings

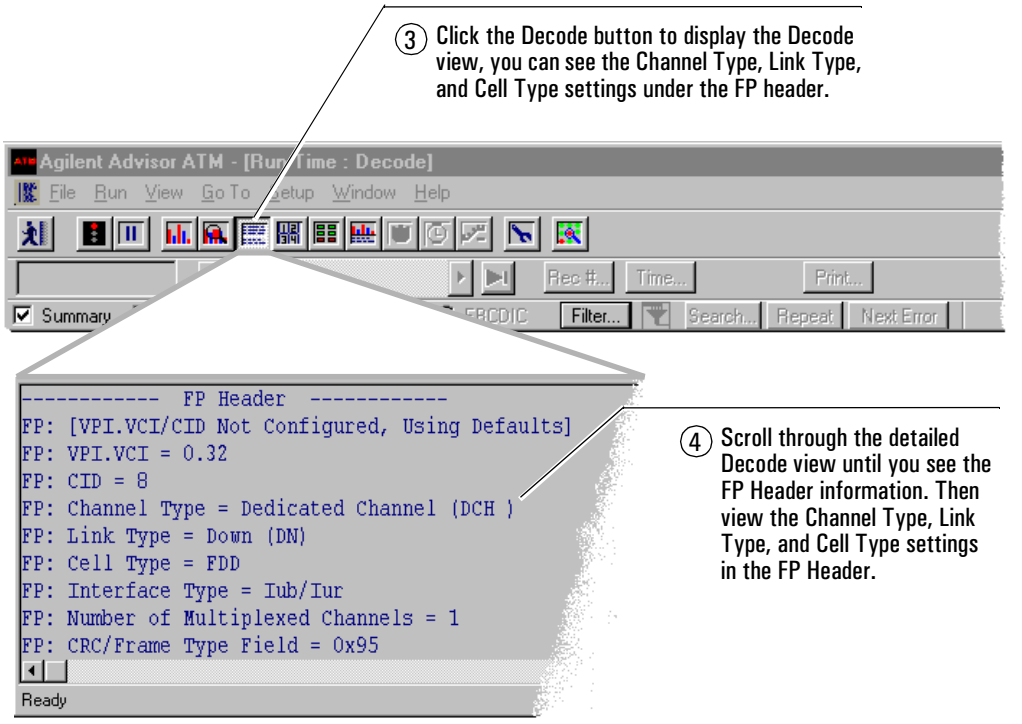
You can change these Iub or Iur channel configuration Framing Protocol (FP) parameters:

- Channel Types (Transport Channel and Logical Channel types)
- Link Type (Downlink, Uplink, or Both)
- Cell Type (Time Division Duplex or Frequency Division Duplex)

When you select Both for the Link Type, you must connect the Uplink side to Port 1 (or EQPT) on the interface card in the Advisor, and the Downlink side to Port 2 (or Line) on the interface card. The labels on the interface card will indicate either Port 1 and Port 2, or EQPT and Line.

To change the UMTS Iub or Iur FP Type settings, follow these steps:

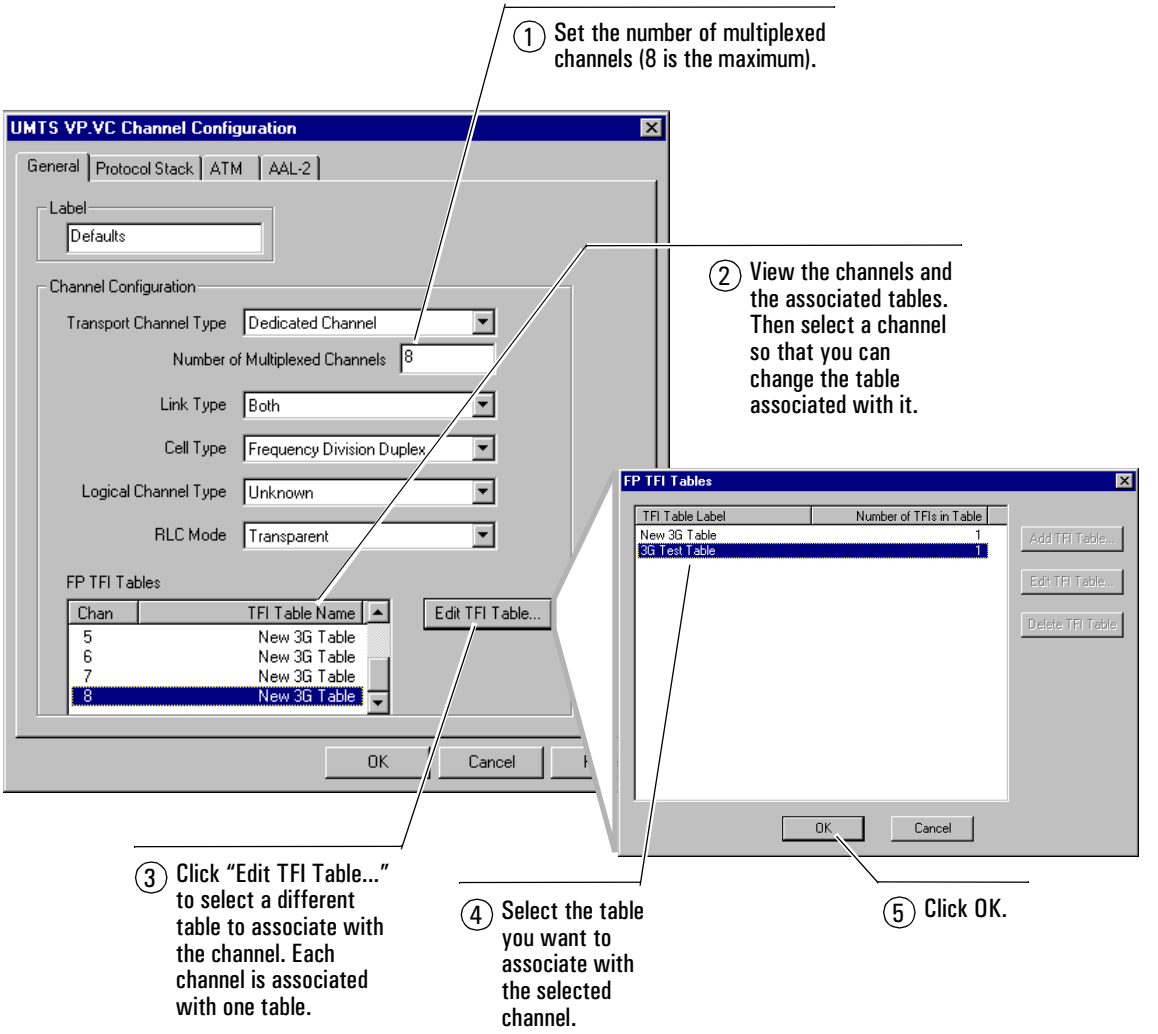




Changing the UMTS Iub or Iur FP Multiplex Channels

When you add an FP entry, and the Transport Channel Type is set to "Dedicated Channel", you can set the Number of Multiplexed Channels. Setting the Framing Protocol (FP) parameter for the Number of Multiplexed Channels can be complicated, because when you use a multiplexed channel setting other than "1", you are requesting that the protocol decode look for more than one payload in the frame.

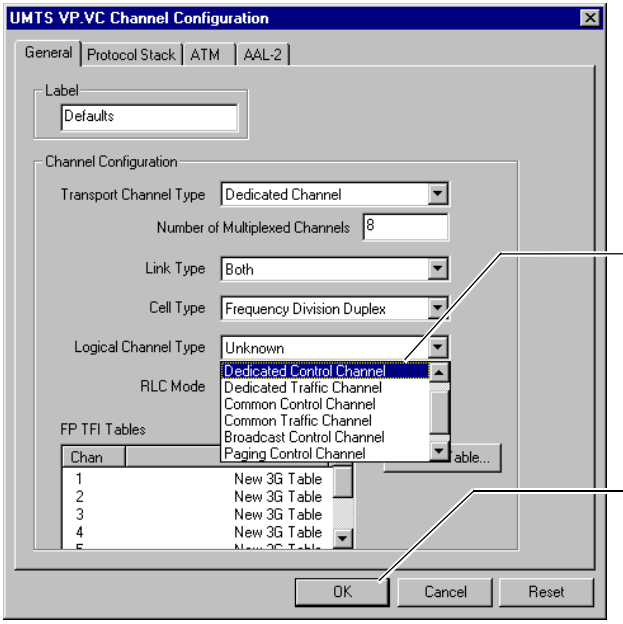
To change the UMTS Iub or Iur FP multiplex channels, follow these steps:



Changing the UMTS Iub or Iur MAC Logical Channel Type

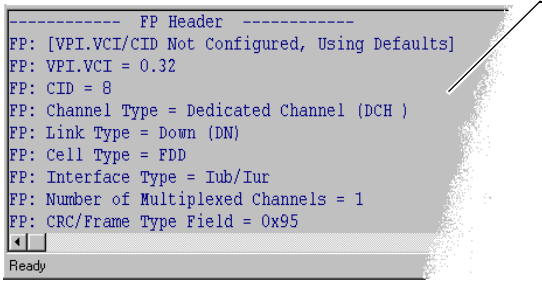
The MAC protocol may be contained in each multiplexed channel payload in a Framing Protocol frame. If you do not configure this protocol, the logical channel type will be shown as the default, which is "Unknown" in the detailed Decode view of the MAC Header.

To change the UMTS Iub or Iur MAC logical channel type, follow these steps:



1. Change the Logical Channel Type from Unknown to one of the other available settings.

2. When you are finished, click OK.

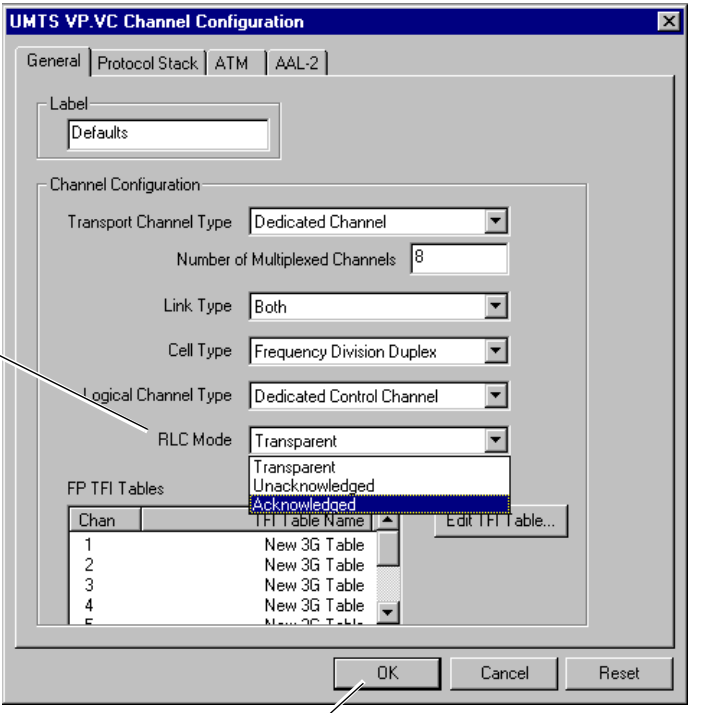


3. Display the Decode view, then scroll through the detailed view until you see the Logical Channel Type in the FP Header.

Changing the UMTS Iub or Iur RLC Mode

The RLC protocol may be contained in each multiplexed channel payload in a Framing Protocol frame. If you do not configure the RLC mode, it will be shown as the default, which is "Unknown", in the detailed Decode view.

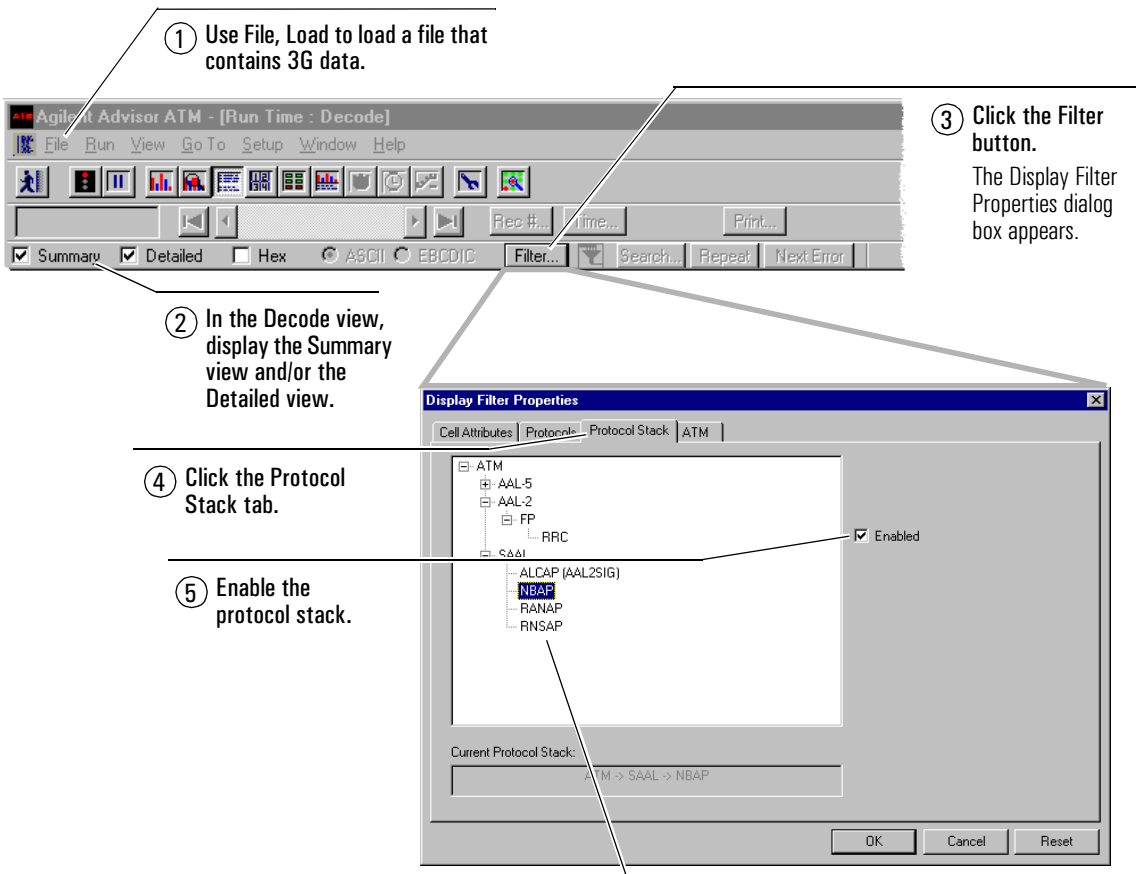
To change the UMTS Iub or Iur RLC mode, follow these steps:



1. Select the RLC mode.
2. When you have finished, click OK.
3. Click the Decode view button, and look at the RLC header to see that the RLC mode changed.

Step 3. Set Display Filtering on 3G Decodes

To filter a file that contains 3G data, follow these steps:

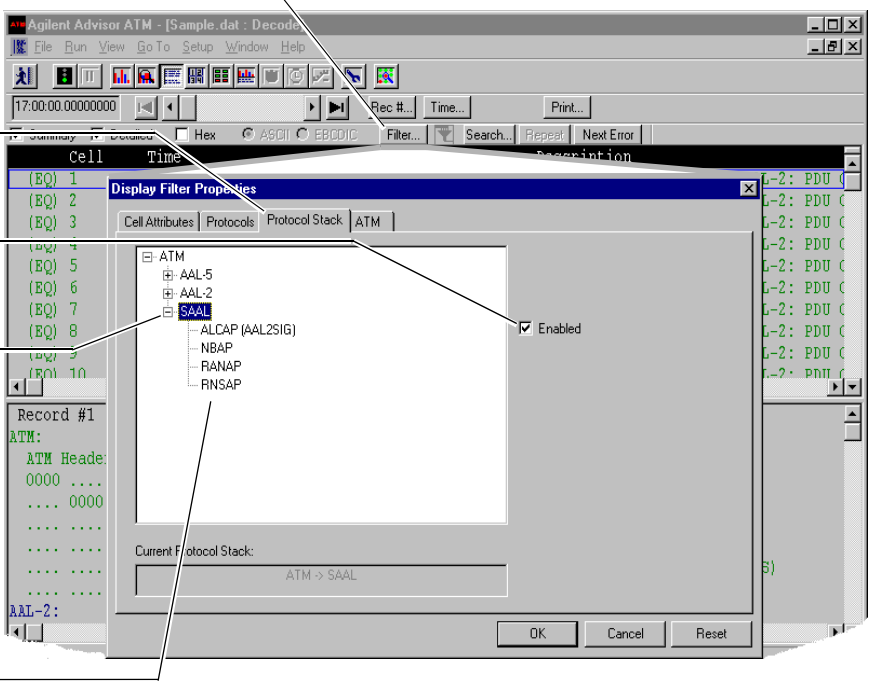


For AAL-5, the ALCAP display filters match both:
AAL-5 -> SSCOP -> SSCF-UNI -> ALCAP (Iub)
AAL-5 -> SSCOP -> SSCF-NNI -> MTP3-b -> ALCAP (Iu)

To Filter SAAL Stacks

To filter SAAL stacks, follow these steps:

1. In the Decode view, click the Filter button to view the display filters properties.
2. Click the Protocol Stack tab.
3. Enable the Protocol Stack.
4. To filter SAAL stacks, expand the SAAL branch.



5. To filter on ALCAP (AAL2SIG), select the ALCAP (AAL2SIG) filter.

   To filter on NBAP, select the NBAP filter.

   To filter on RANAP, select the RANAP filter.

   To filter on RNSAP, select the RNSAP filter.

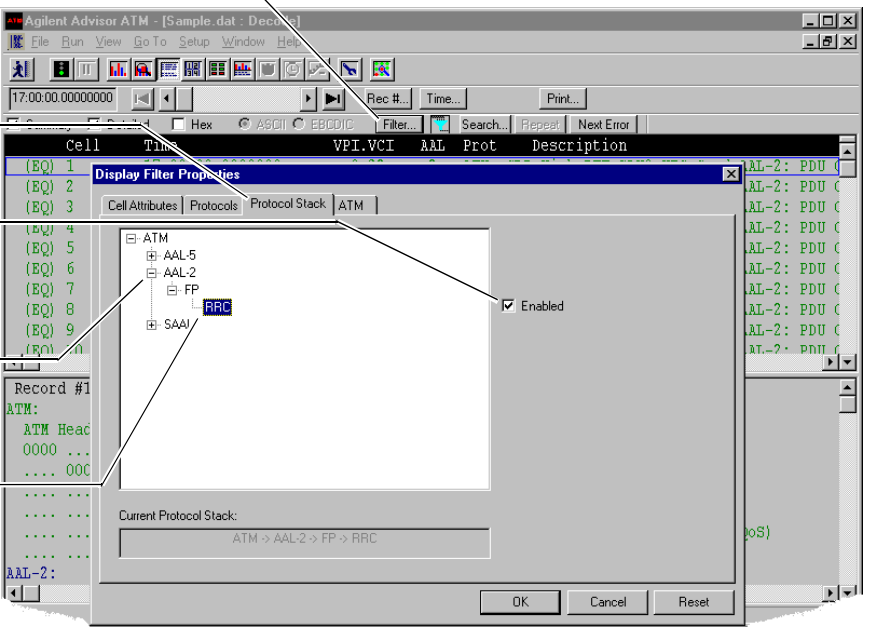
6. After you select a display filter, click the Decode view  button, and only the frames that have the protocol display filter you selected are displayed.

If the file you are using does not contain frames that have these protocols, a message box appears to indicate this.

To Filter AAL-2 Stacks

To filter AAL-2 stacks, follow these steps:

1. In the Decode view, click the Filter button to view the display filters
2. Click the Protocol Stack tab.
3. Enable the Protocol Stack.
4. To filter AAL-2 stacks, expand the AAL-2 branch.
5. Select either the FP filter or the RRC filter.



6. After you select a display filter, click the Decode view  button, and only the frames that have FP or RRC decoded are displayed.

If your file does not contain frames that have these protocols, a message box appears to indicate this.