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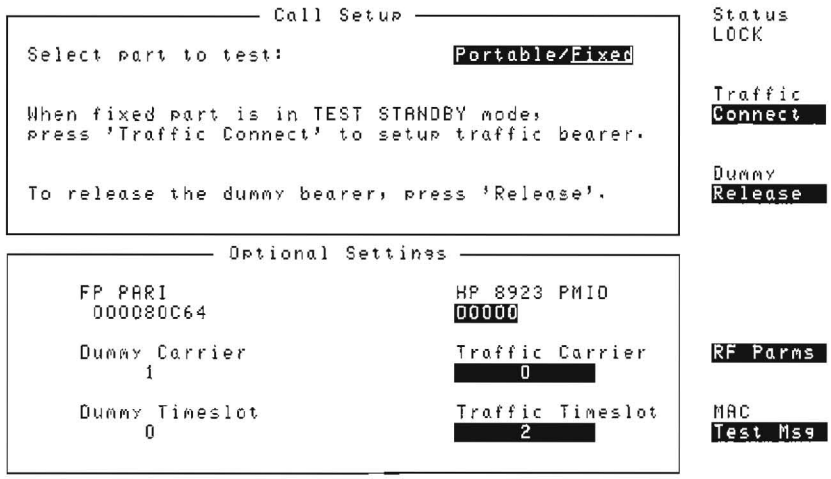
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LOCK and the following screen is displayed.



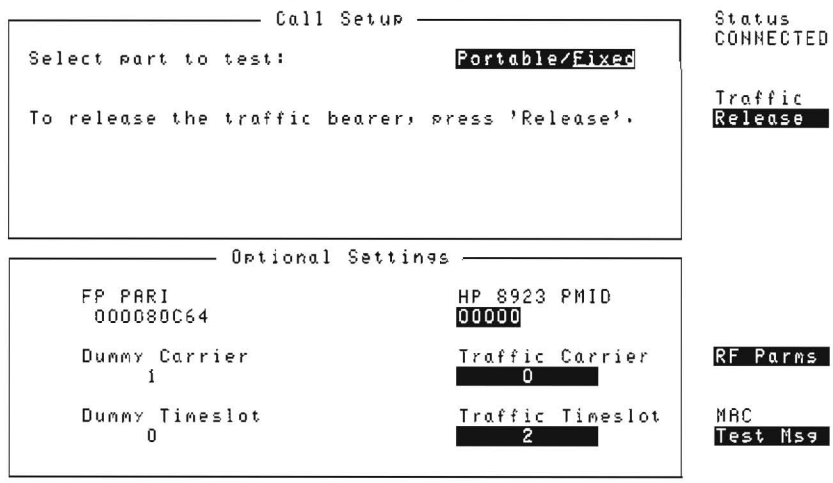
Note The PARI of the Fixed Part is returned in the FP PARI field. The Dummy Carrier and Dummy Timeslot fields report where, in the DECT spectrum, the FP is transmitting the Dummy Bearer.

Status CALLING

7. Select Traffic Connect . The status is set to CALLING until a traffic bearer has been established.

Status CONNECTED

8. If the connection is successfully made, the status changes to CONNECTED and the following screen is displayed.



The PARI of the Fixed Part is displayed in the FP PARI field.

Note The HP 8923B is now ready to make measurements on the traffic bearer. You may now proceed to Chapter 4, "Making Measurements" or terminate the communication link by following the termination procedure in this chapter.

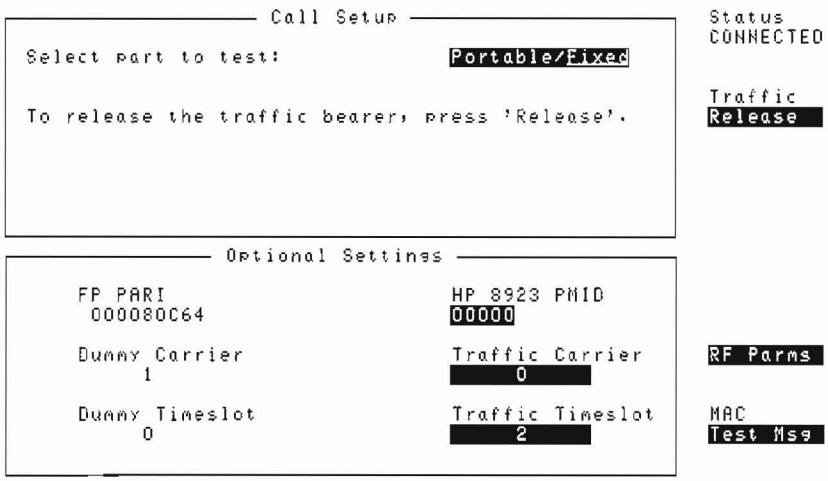
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Terminating a Communication Link To A FP

The current Status of the communication link is indicated in the top right hand corner of the screen.

Status
CONNECTED

1. Press (CALL SETUP) on the front panel. The following screen is displayed. The Status indicator is set to CONNECTED.

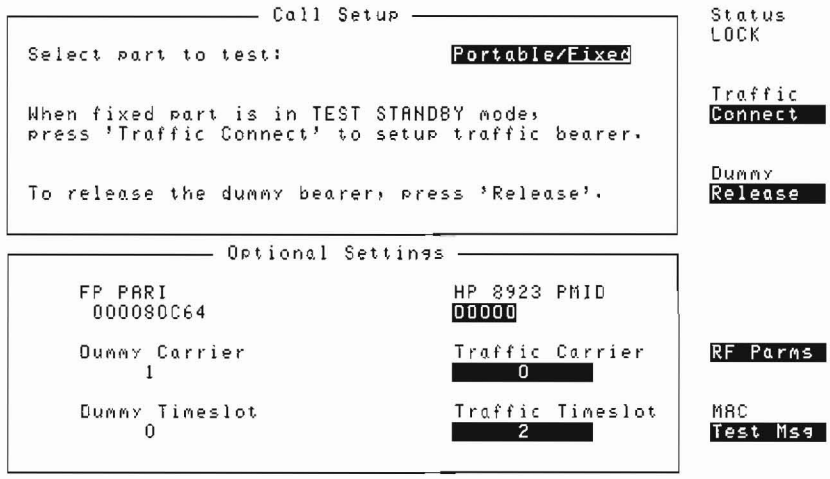


Status
RELEASING

2. Select Traffic Release. The Status changes to RELEASING until the traffic bearer has been released.

Status
LOCK

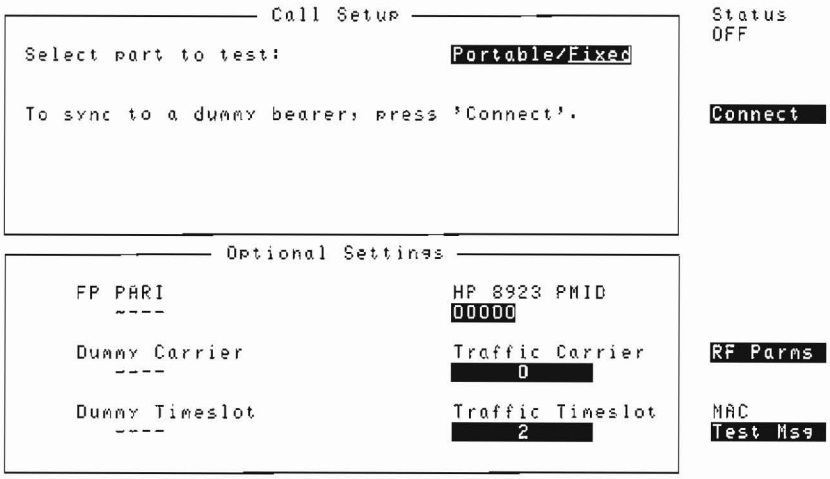
3. If the connection is released successfully the status changes to LOCK and the following screen is displayed.



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Status
OFF

4. Select Dummy Release. The status changes to OFF and the following screen is displayed.



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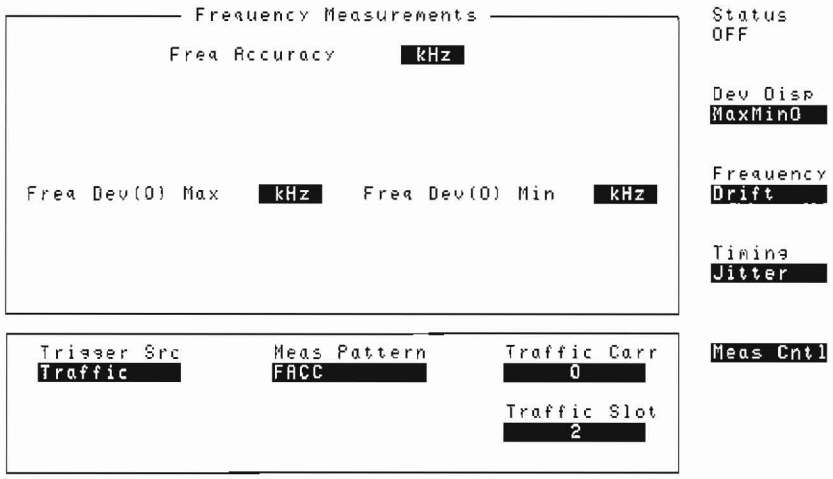
Changing Measurement Control Parameters

Before making any measurements, ensure that the following measurement control parameters have been set accordingly:

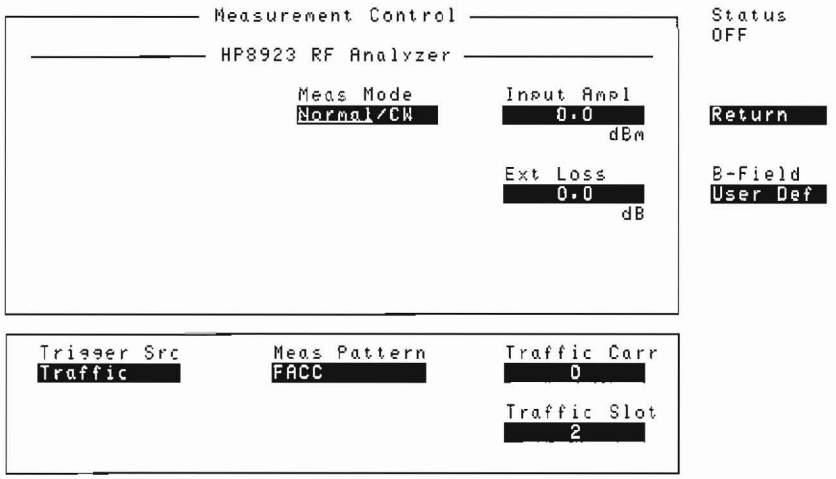
- Input Amplitude
- External Loss

To do this:

1. Select (FREQ), (PWR) or (BER), to gain access to one of the Measurement Screens.



2. Press `Meas Cntl` to gain access to the Measurement Control Screen, where the control parameters can be modified.



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Input Amplitude

a. Use the knob to select the `Input Ampl` field.

b. Set the input amplitude field to within 6 dBm of the power transmitted by the EUT.

c. Press the knob or (ENTER).

External Loss

a. Use the knob to select the `External Loss` field.

b. Set the external loss field to allow for any attenuation in the connecting cables attaching the module to the HP 8923B. A typical "over-the-air" connection has a loss of approximately 20 dB.

c. Press the knob or (ENTER).

Note For more detail on the Measurement Control Screen functions, see Measurement Control Screen (softkey accessed).

The HP 8923B DECT Test Set is now ready to make measurements on the full DECT protocol, see Chapter 4, "Making Measurements".

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Examples of Testing When MAC Layer Test Messages are Supported by the EUT

RF Module With Digital Interface

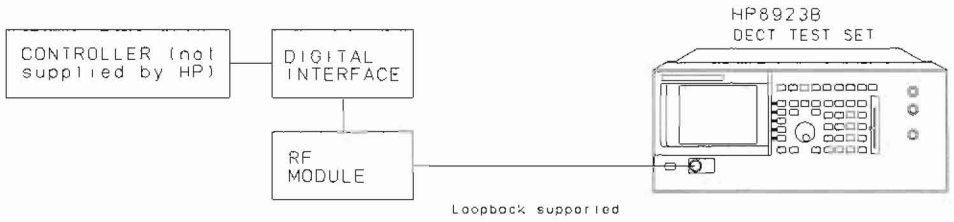


Figure 3.1-3. Example of RF Module Test.

Fully Assembled Fixed Part

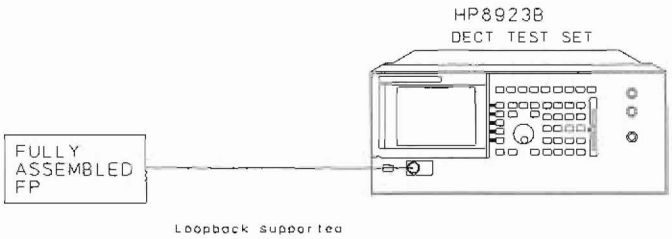


Figure 3.1-4. Example of Testing a Fully Assembled Fixed Part

In Figure 3.1-3, a controller/digital interface provides the MAC Layer Test Messages to support the communication link.
In Figure 3.1-4, a fully assembled fixed part is being tested. In both cases, the HP 8923B triggers to bit p0 in the preamble of the measured bearer. No external triggers are needed in this case.

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3.1-14 EUT with MAC Layer Test Messages

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3.2

EUT without MAC Layer Test Messages

What You'll Learn In This Section

- How to setup the HP 8923B for making measurements on an EUT which does not support MAC Layer Test Messages.

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Introduction

When no MAC Layer test messages are supported by the EUT, the HP 8923B must be provided with an alternative method of triggering. The possible ways of triggering the HP 8923B are:

- RF Rise
- Ext
- Immediate

Measurement Triggers

Normal Measuring Mode

When testing an EUT which produces a pulse modulated signal (without MAC layer test messages), the HP 8923B allows two types of Measurement Triggers. These triggers are:

1. RF Rise triggering
2. External triggering

1. RF Rise triggering (`RF Rise`)

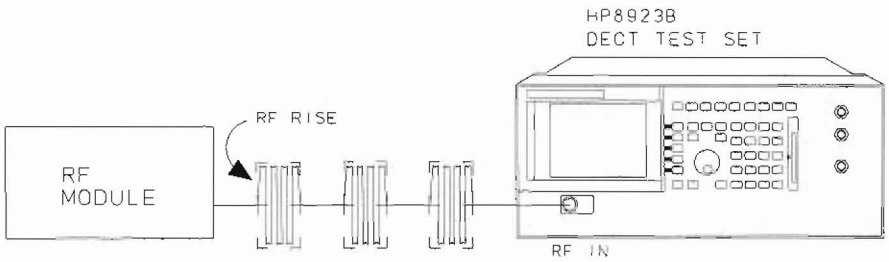


Figure 3.2-1. Example of RF Rise Trigger

In Figure 3.2-1 the HP 8923B measurements are triggered from the rising edge of the RF bursts from the EUT. No additional TTL triggers are required in this case.

2. External triggering (`Ext`)

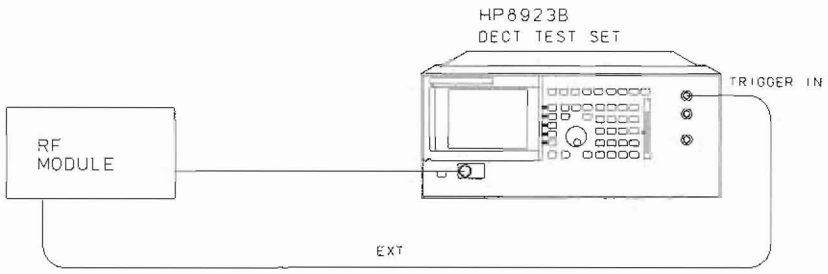


Figure 2-1. Example of Ext Trigger

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In Figure 3.2-2-1 an external positive edge TTL trigger signal is applied to the Trigger Input. This signal is used to trigger the HP 8923B measurements. The trigger signal is of the form:



Figure 2-2. Example of Ext Trigger Type

CW Measuring Mode

The HP 8923B can perform measurements on CW (non-pulsed) RF transmissions from the EUT.

1. Immediate Triggering (`Immed`)

When measuring an EUT which transmits a CW (non-pulsed) signal, the HP 8923B can generate an internal repetition trigger to initiate measurements.

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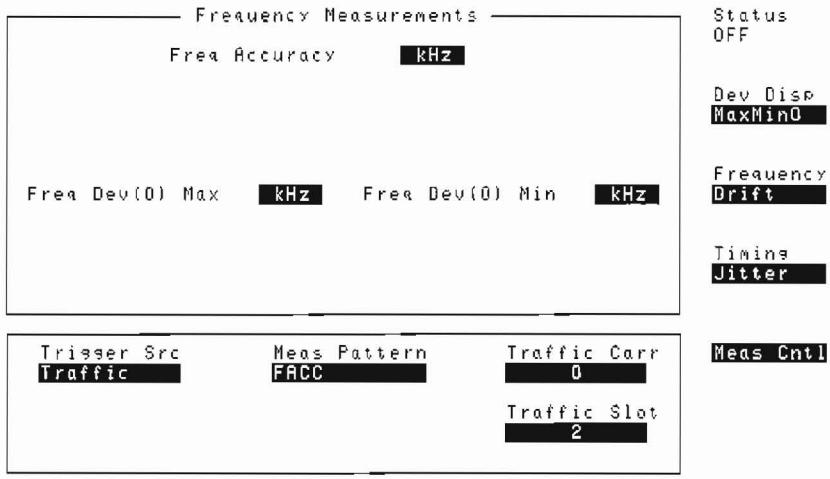
Changing Measurement Control Parameters

Before making any measurements, ensure that the following measurement control parameters have been set correctly:

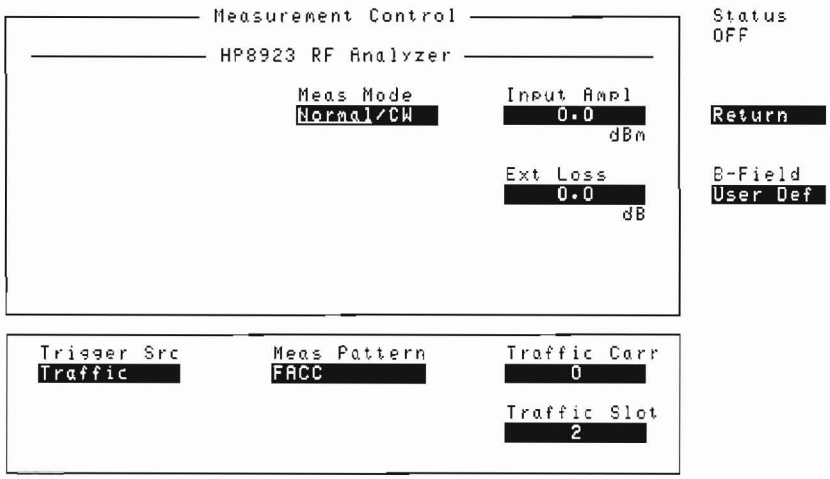
- Input Amplitude
- External Loss
- Measuring Mode
- Trigger Source

To do this:

1. Select (FREQ) or (PWR) to gain access to one of the Measurement Screens.



2. Press `Meas Cntl` to gain access to the Measurement Control Screen, where the control parameters can be modified.



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Input Amplitude

a. Use the knob to select the `Input Ampl` field.

b. Set the input amplitude field to within 6 dBm of the power transmitted by the EUT.

c. Press the knob or (ENTER).

External Loss

a. Use the knob to select the `External Loss` field.

b. Set the external loss field to allow for any attenuation in the connecting cables attaching the module to the HP 8923B. A typical "over-the-air" connection has a loss of approximately 20 dB.

c. Press the knob or (ENTER).

Measuring Mode

a. Use the knob to select the `Meas Mode` field.

b. The measuring mode will be set depending on the RF module capabilities, see "Normal Measuring Mode" or "CW Measuring Mode" in this section.

c. Press the knob or (ENTER).

Trigger Source

a. Use the knob to select the `Trig Src` field.

b. The trigger source is dependant on the capabilities of the RF module and on the measuring mode selected, see "Normal Measuring Mode" or "CW Measuring Mode" in this section.

c. Press the knob or (ENTER).

Note For more detail on the Measurement Control Screen functions, see "Measurement Control Screen (softkey accessed)", on page 5-35.

The HP 8923B DECT Test Set is now ready to make power, frequency and audio measurements, see Chapter 4, "Making Measurements".

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Examples of Testing With No MAC Layer Test Messages Supported

RF Module Test

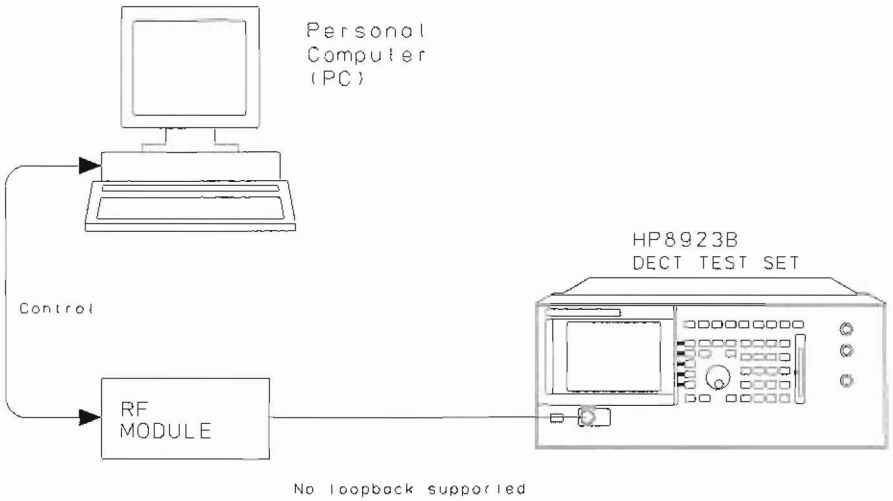


Figure 2-3. Example of RF Module Test

In this example, the PC controls the RF module, but does not support the MAC Layer Test Messages. The HP 8923B uses RF rise triggering to start measurements.

RF Module Test (Module controlled via a digital interface board)

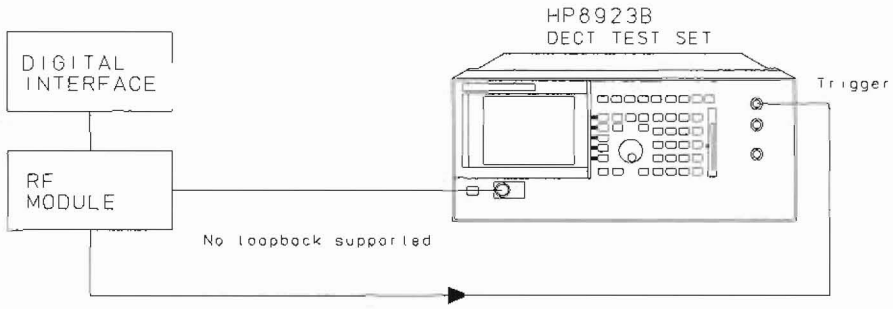


Figure 2-4. Example of RF Module Test with external triggering

In Figure 3.2-2-4 the digital interface has the capability to control the RF module. An external trigger is supplied by the RF module to start measurements.

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3.3

MAC Layer Test Messages

What You'll Learn In This Section

- The MAC layer test messages supported by the HP 8923B.
- The functionality of each MAC layer test message.

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MAC Layer Test Messages

The DECT burst can be split up into three fields, the synchronization field (S-Field), data field (D-Field) and a collision detection field (Z-Field). These are shown in the diagram below.

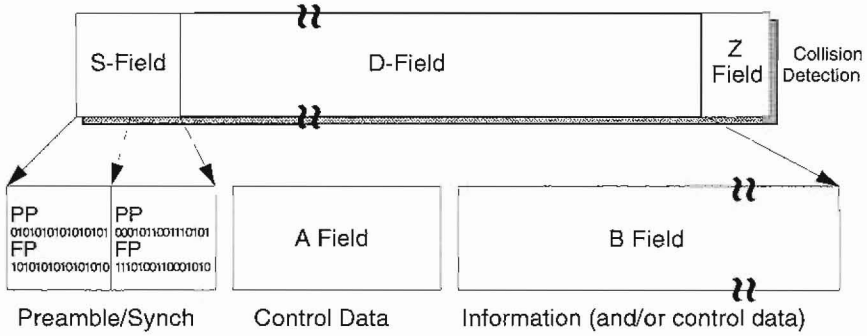


Figure 3.3-1. Fields in the DECT Burst

Test messages are transmitted in the B-Field.

The basic format of the test message is shown below:

$a_8 ... a_{11}$ $a_{12} ... a_{15}$ a_{16} ... ... a_{47}

0010 Test Data Field

The test messages given on the following pages are supported by the HP 8923B:

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FORCE_TRANSMIT

This message forces the EUT to transmit on a specific slot and channel. Handover is prohibited by setting the "Handover disable" bit. The EUT transmission slot is indicated in the slot number (SN) field of the test message. The destination RF channel is encoded in the channel number (CN) field of the test message.

$a_8...a_{11}$	$a_{12}...a_{15}$	$a_{16}...a_{21}$	a_{23}	a_{24}	$a_{25}...a_{27}$	$a_{28}...a_{31}$	$a_{32}...a_{33}$	$a_{34}...a_{39}$	$a_{40}...a_{47}$
0010	0000	010100	KP	HD	000	SN	SP	CN	00001111
		spare			spare				spare

If the KP bit (a_{23}) is set to "1" it prevents the release of existing bearers, and if set to "0" it will initiate the release of existing bearers. The HP 8923B sets this bit to "0".

If the HD bit (a_{24}) is set to "1" it disables handover. The HP 8923B sets this bit to "1".

The Start Position (SP) bits ($a_{32}...a_{33}$) define the bit in the full slot pair where the transmission begins. The HP 8923B sets these bits to "00".

LOOPBACK_DATA

This message instructs the EUT to loopback the data in the B-field. The data pattern sent to the EUT, by the HP 8923B, is returned in the next transmission.

$a_8...a_{11}$	$a_{12}...a_{15}$	a_{16}	...	...	...	...	...	...	a_{47}
0010	0001	0000	1111	0000	1111	0000	1111	0000	1111
		Spare							

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ESCAPE

This message allows the user to transmit a Proprietary Test Message of thirty two bits.

a_8...a_{11}	a_{12}...a_{15}	a_{16}	...	...	...	...	...	...	a_{47}
0010	0100	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
					Proprietary Test Message				

The HP 8923B DECT Test Set supports both transmission and reception of proprietary Escape test messages.

DEFEAT_ANTENNA_DIVERSITY

This message inhibits antenna diversity operation in the EUT and selects an antenna. The antennas should be numbered 0 to N where (N+1) is the number of antennas employed in the antenna diversity operation. The format of the Defeat Antenna Diversity test message is shown below.

a_8...a_{11}	a_{12}...a_{15}	a_{16}	a_{17}...a_{19}	a_{20}	...	...	...	...	a_{47}
0010	0010	DP Bit	ANT Field	1111	0000	1111	0000	1111	0000

The Defeat Proprietary (DP) bit is a_{16}. If it is set to "1" it indicates that an antenna switch is required (for example if the antenna being used is not receiving the signal or the signal is too weak), and if set to "0" it indicates that no action is required. It will over-ride any proprietary diversity algorithm (the coding which the EUT uses to determine which antenna to use) which the EUT has installed. The HP 8923B sets this bit to "0".

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The encoding of the ANT field is shown below.

ANT Field a_{17}, a_{18}, a_{19}	Antenna Number
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

Note

An EUT with no antenna diversity ignores this message.

If an EUT receives this message with the ANT field set to a number greater than the number of antennas available the message is ignored.

The EUT remains on the selected antenna until the test message "Clear Test Modes" is received or until a new antenna is selected.

CLEAR_TEST_MODES

The receipt of this message clears all current test modes (including proprietary) and returns the EUT to the test standby mode within 16 frames.

a_8...a_{11}	a_{12}...a_{15}	a_{16}	...	...	...	...	...	...	a_{47}
0010	1111	0000	1111	0000	1111	0000	1111	0000	1111
		spare							

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Entering Test Message Data

Two of the test messages outlined may be controlled by the user. These are DEFEAT_ANTENNA_DIVERSITY and ESCAPE. The user also has indirect control of the FORCE_TRANSMIT test message by entering the slot and channel number on the Call Setup screen.

Antenna

Test Message Data can only be transmitted once a communication link has been established. When testing a FP, you can force the FP to transmit/receive on a fixed antenna. Usually, an FP will transmit/receive on the antenna with the strongest signal. Entering a number from 0 to 7 in the DEFEAT_ANTENNA_DIVERSITY Test message forces the FP to transmit/receive on the specified antenna.

This data is entered as follows:

1. Press (CALL SETUP).
2. Select MAC `Test Msg` from the screen.
3. Select `Antenna`.
4. Enter `Antenna` Test Message data. (0-7)
5. Select `Send`.

Escape Test Messages

Information, such as calibration data and serial number for the EUT, can be transmitted on the Escape Test Message.

The data is entered as follows:

1. Press (CALL SETUP).
2. Select MAC `Test Msg` from the screen.
3. Select `Escape`.
4. Enter `Escape` Test Message data. (Maximum of 8 Hex characters)
5. Select `Send`.

If the EUT can return or acknowledge the transmitted EscapeTest Messages, the HP 8923B displays the contents in the appropriate section of the screen.

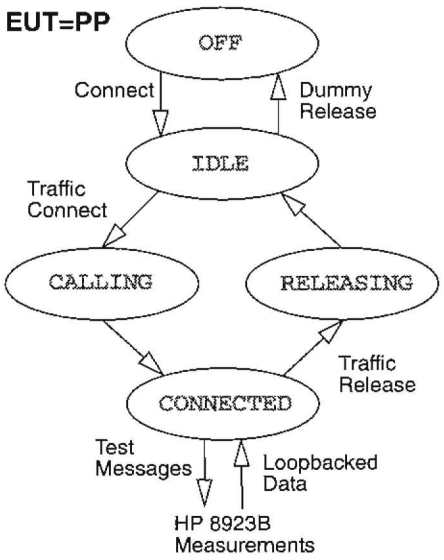
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Transmitted Messages when Testing a PP

The HP 8923B DECT Test Set uses Medium Access Control (MAC) layer test messages[1] to establish and maintain the link to the equipment under test (EUT). The example shows the MAC Layer test messages transmitted and received during a communication link setup with a PP as the EUT. Only relevant messages are shown.

Communication Status Changes...

The communication status of the HP 8923B, while setting up and releasing a call to a PP, is shown below.



...when performing a Call Setup...

1. In the Call Setup screen you can enter:

- The HP 8923B PARI.
- The dummy bearer slot and carrier number.
- The traffic bearer slot and carrier number.

2. Select `Connect`, to transmit a dummy bearer from the HP 8923B. Place the PP in Test Stand-by Mode. Static Information is transmitted to the PP which synchronises to the dummy bearer.

3. Select `Traffic Connect`, to send a FORCE_TRANSMIT message on the dummy bearer from the HP 8923B .

   a. The PP sends an access_request message to the HP 8923B and initiates a bearer on the Carrier number and Slot number indicated by the FORCE_TRANSMIT message.

1. Compliant to ETS 300 175-3 section 7.2.5.4 and section 12.1.

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b. The HP 8923B confirms the bearer from the PP by sending a bearer_confirm message. The PP does not attempt to communicate any higher level information, such as Network Layer Messages.

c. The HP 8923B requests loopback of data by sending the LOOPBACK_DATA message on the traffic bearer.
The PP loops back the data in B-Field bits b_0 - b_{319}.

4. In the MAC Test Message screen you can enter:

- The antenna number.
- The `Send` command to defeat antenna diversity.
  a. This command causes the HP 8923B to disable antenna diversity by sending the DEFEAT_ANTENNA_DIVERSITY test message on the traffic bearer.

  b. The PP transmits from the antenna indicated in the test message.

You can now select HP 8923B measurements to be made on the PP.

...and Call Release

1. Select `Traffic Release` from the Call Setup screen. The CLEAR_TEST_MODES message is sent.
This message instructs the PP to clear loopback data and the traffic bearer.
The PP releases the traffic bearer and places itself in test stand-by mode.

2. Select `Dummy Release` which causes the HP 8923B to cease transmission of the dummy bearer. The PP is no longer synchronised to the HP 8923B.

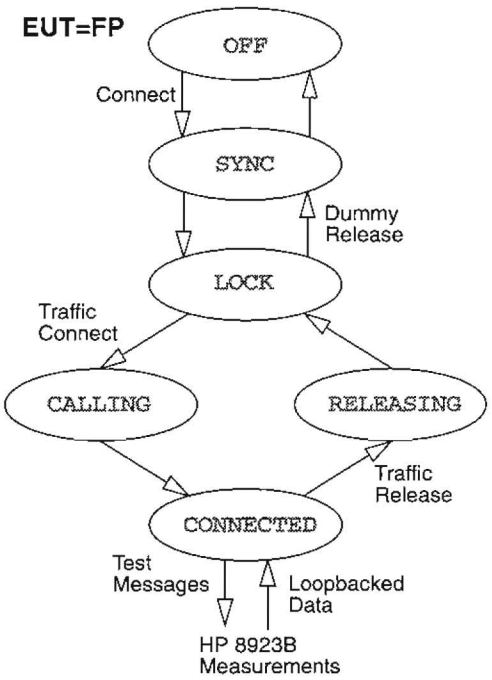
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Transmitted Messages when Testing a FP

The HP 8923B DECT Test Set uses Medium Access Control (MAC) layer test messages[1] to establish and maintain the link to the equipment under test (EUT). The example shows the MAC Layer test messages transmitted and received during a communication link setup with an FP as the EUT. Only relevant messages are shown.

Communication Status Changes...

The communication status of the HP 8923B, while setting up and releasing a call to a FP, is shown below.



...when performing a Call Setup...

Before attempting to set up a communication link between the HP 8923B and the FP, the FP should be placed in test stand-by mode and should be transmitting a dummy bearer.

1. In the Call Setup screen you can enter:

- The HP 8923B PMID.
- The traffic bearers slot and carrier number.

Note

The position of the dummy bearer is fixed by the FP.

2. Select `Connect` to synchronize the HP 8923B with the dummy bearer.

1. Compliant to ETS 300 175-3 section 7.2.5.4 and section 12.1.

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Static Information is transmitted by the FP, allowing the HP 8923B to display the dummy bearer location and identity of the FP.

3. Select `Traffic Connect` to initiate a traffic bearer from the HP 8923B. This sends an access request to the FP, on the Carrier number and Slot number set by the user.

   a. The FP returns a message which confirms the bearer has been received, and will not attempt to communicate any higher level information, for example, Network Layer Messages.

   b. The HP 8923B forces loopback of data by sending the test message, LOOPBACK_DATA, on the traffic bearer. The PP loops back the data in B-Field bits b_0 - b_{319}.

4. In the MAC Test Message screen you can enter:

- The antenna number.
- The Send command to defeat antenna diversity.
  a. This command causes the HP 8923B to disable antenna diversity by sending the DEFEAT_ANTENNA_DIVERSITY test message on the traffic bearer.

  b. The FP transmits from the antenna indicated in the test message.

You can now select HP 8923B measurements to be made on the FP.

...and Call Release

1. Select `Traffic Release` from the Call Setup screen to send the CLEAR_TEST_MODES message from the HP 8923B. The FP initiates the release of the traffic bearer and places itself in test stand-by mode.

2. The HP 8923B will release the traffic bearer if the FP fails to do so.

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4

Making Measurements

What You'll Learn In This Chapter

In this chapter you will learn to:

- Make Frequency, Power, Power Versus Time Template, BER/WER and Audio Measurements using the HP 8923B.

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Introduction

Chapter 3 outlined the various ways to prepare the EUT for making measurements. The HP 8923B and the EUT are now ready to make measurements.

Note

All measurements are fully compliant with the methods and measurement specified in the ETSI type approval test document CTR 06.

Before making any measurements, ensure that the measurement control parameters have been set correctly for the communication link between the HP 8923B and the EUT.

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With MAC Layer Test Messages

- The Input Amplitude has been set to ± 6 dB of the expected input amplitude presented at the **RF IN/OUT** connector.
- The Status of the call setup is CONNECTED.
- The Measuring Mode is Normal.

Note To change the input amplitude or measuring mode see either Section 3.1, "Changing Measurement Control Parameters" or Chapter 5, "Measurement Control Screen (softkey accessed)" on page 5-35.

When MAC Layer Test Messages are supported by the EUT, then the following table provides the appropriate measurement pattern, and trigger needed, for each possible measurement scenario.

		Measurements					
		BER	**Freq Acc.**[1]	**Freq Dev.**[1]	**Freq Drift**[1]	**NTP**	**Power Time**
Traffic Bearer	**Trigger**	N/A[2]	Ext RF Rise Traffic	Ext RF Rise Traffic	Ext RF Rise Traffic	Ext RF Rise Traffic	Ext RF Rise Traffic
	Measurement Pattern	DM2	FACC	FACC FDEV1_FS FDEV2_FS	FDEV2_FS	Any	Any
Dummy Bearer[3]	**Trigger**	BER Unavailable	Ext RF Rise Dummy	Ext RF Rise Dummy	Ext RF Rise Dummy	Ext RF Rise Dummy	Ext RF Rise Dummy
	Measurement Pattern	BER Unavailable	FACC	FACC FDEV1_FS FDEV2_FS	FDEV2_FS	Any	Any

Table 2-2. Patterns/Triggers For Making Valid Measurements

1. The accuracy of the reading when triggering from the dummy bearer can only be guaranteed if the FP fills the A-field loopback field with the appropriate measurement pattern. The HP 8923B cannot directly control this as the Dummy Bearer is a simplex transmission.
2. No Trigger required for measurement.
3. Dummy Bearer Testing Only Available When Testing A Fixed Part.

Note The selected measurement pattern must be present in the B-field.

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Measurement Patterns

The HP 8923B has the following measurement patterns available for transmission in the B-field:

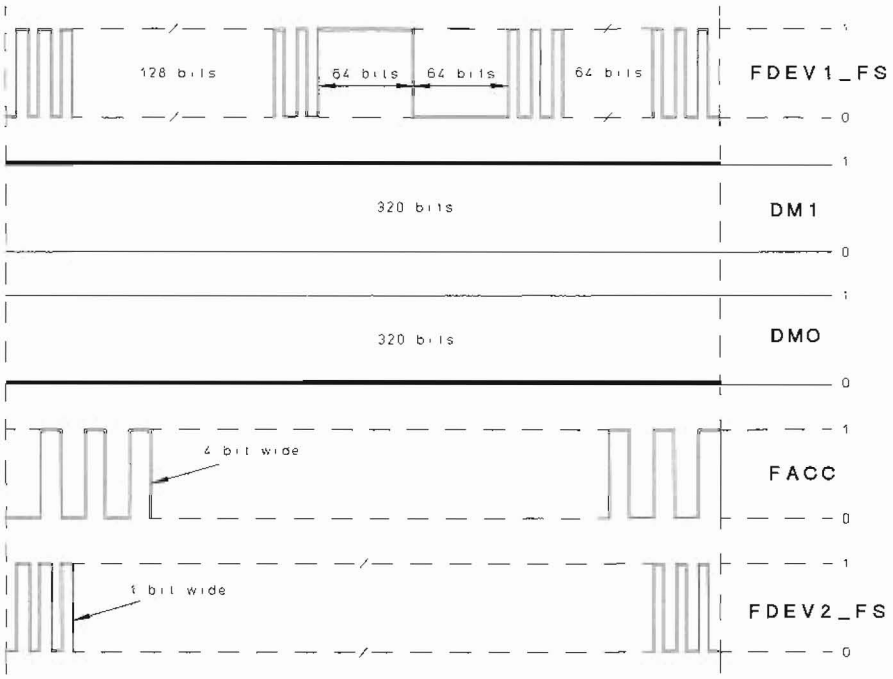


Figure 2-1. Measurement Patterns Supported By the HP 8923B

DM2, which is not shown in Figure 2-1, is a PRBS conforming to CCITT O.153 standard. It consists of 512 bits. These measurement patterns are explained in more detail in put in Chapter 5, "Fields, Screens, Keys And Softkeys".

A **User Defined B-Field**, not shown in Figure 2-1, can be created. See "User Defined B-Field Screen (Softkey Accessed)", on page 5-54 for more information on this feature.

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Without MAC Layer Test Messages

- The Input Amplitude has been set to ±6 dB of the expected input amplitude presented at the RF IN/OUT connector.
- The Measurement Mode is correct.
  - For CW measuring the Measuring Mode is CW.
  - For Bursted RF measuring the Measuring Mode is Normal.
- The Trigger Source is set to an appropriate choice.
- The Measurement Pattern is correct for the measurement.
- The Frequency Coupling of the Analyzer is Manual.
- The manual entry is the carrier number or an actual frequency.
- The Packet Type has been selected.

Note

To change these parameters see either Section 3.1, "Changing Measurement Control Parameters" or Chapter 5, "Measurement Control Screen (softkey accessed)" on page 5-35.

When MAC Layer test messages are not supported by the EUT, then the following table provides the appropriate measurement patterns and trigger needed for each possible measurement scenario.

		Measurements					
		BER	**Freq Acc.**	**Freq Dev.**	**Freq Drift**	**NTP**	**Power Time**
Bursted RF	**Trigger**	Unavailable	Ext RF Rise	Ext RF Rise	Ext RF Rise	Ext RF Rise	Ext RF Rise
	Measurement Pattern	Unavailable	FACC	FACC FDEV1_FS FDEV2_FS	FDEV2_FS	Any	Any
CW RF	**Trigger**	Unavailable	Ext Immed	Ext Immed	Ext Immed	Ext Immed	Ext Immed
	Measurement Pattern	Unavailable	FACC	FACC FDEV1_FS FDEV2_FS	FDEV2_FS	Any	Any

Table 2-2. Patterns/Triggers for making Valid Measurements

Note

To ensure measurement accuracy, bursted RF transmissions must contain valid S and B field data patterns.

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Frequency Measurements

Frequency Accuracy

To display this measurement:

- Select (FREQ).

The following screen is displayed:

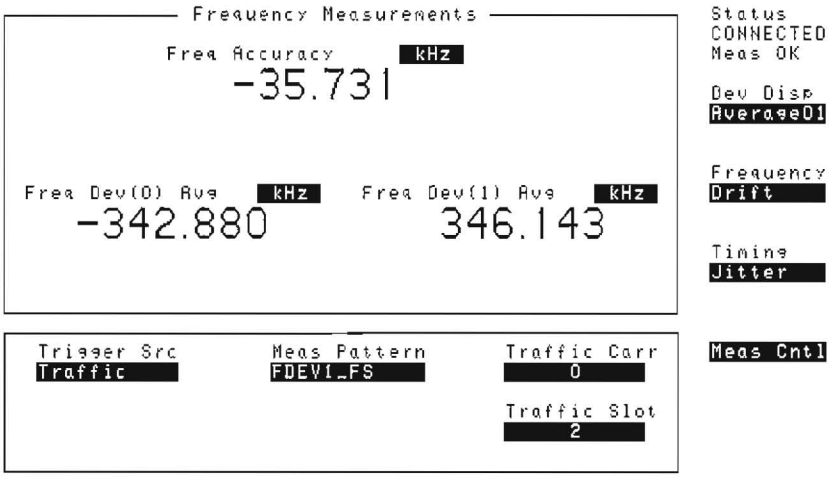


Figure 2-2. Frequency Measurement Screen

HP 8923B measurement control parameters are displayed in the lower section of the screen. They are explained in Chapter 5, "Fields, Screens, Keys And Softkeys".

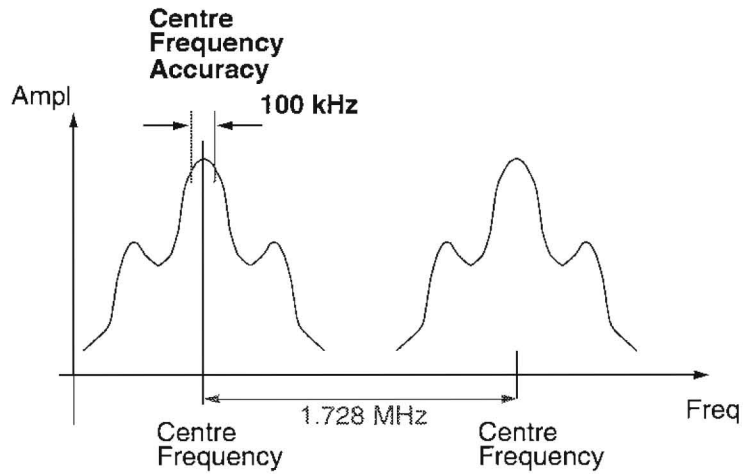
Note The frequency measurements will only be valid when testing the dummy bearer if the appropriate measurement pattern is transmitted by the EUT in the dummy bearer's A-field loopback field.

Note If a Measurement Synchronization error appears (shown below the communication status) then see Chapter 10, "Error Messages" for more information.

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Measurement Theory

The Frequency Accuracy measurement is made to verify that the transmission from the EUT is within 50 kHz of the specified DECT channel frequency (Traffic Carrier).



The HP 8923B calculates the centre frequency by demodulating the B-field and averaging the signal over the burst.

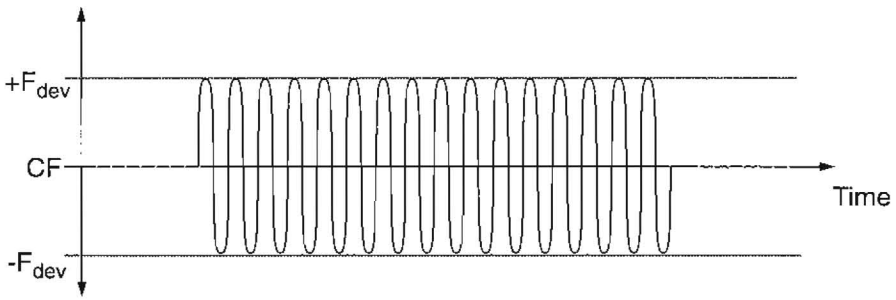


Figure 2-3. B-Field Data Across the Burst (using FACC)

The measurement pattern used for this is FACC, which contains an even number of ones and zeroes in the transmission, and gives an accurate reading for the centre frequency.

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The values of the ten possible centre frequencies are given in Table 2-2. They are each separated from the adjacent channel by 1.728 MHz.

Channel Number	Frequency (GHz)
0	1.881792
1	1.88352
2	1.885248
3	1.886976
4	1.888704
5	1.890432
6	1.89216
7	1.893888
8	1.895616
9	1.897344

Table 2-2. Centre Frequencies of the DECT Channels

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Frequency Deviation

To display these measurements:

- Select (FREQ).

The following screen is displayed:

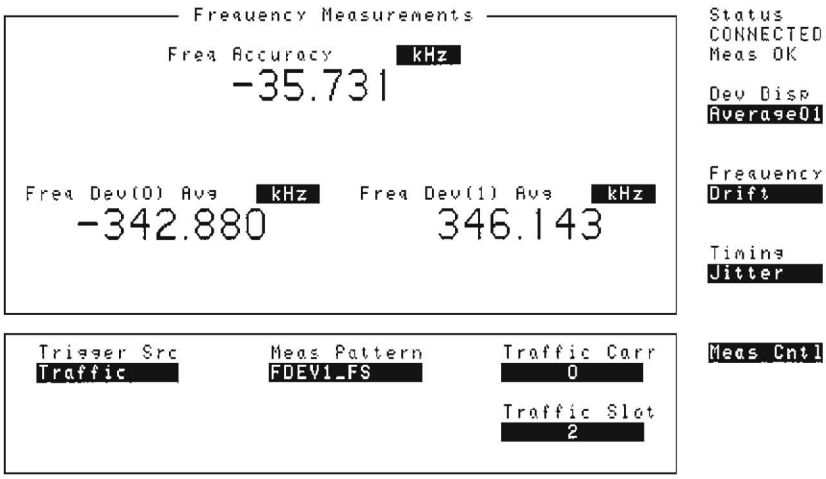


Figure 2-4. Frequency Measurement Screen

HP 8923B measurement control parameters are displayed in the lower section of the screen. They are explained in Chapter 5, "Fields, Screens, Keys And Softkeys".

Note The frequency measurements will only be valid when testing the dummy bearer if the appropriate measurement pattern is transmitted by the EUT in the dummy bearer's A-field loopback field.

Note If a Measurement Synchronization error appears (shown below the communication status) then see Chapter 10, "Error Messages" for more information.

The values of the Frequency Deviation are given beneath the Frequency Accuracy measurement. By selecting the `Dev Disp` softkey the following measurements can be made:

- Maximum and minimum values of transmitted "ones".
- Maximum and minimum values of transmitted "zeroes".
- Average values of transmitted "ones" and "zeroes".

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Measurement Theory

In a DECT system the transmission of a binary "1" is achieved by modulating a frequency of +288 kHz onto the centre frequency, and a binary "0" by a frequency of -288 kHz. To stop the sharp changes in frequency, between transmitted ones and zeroes affecting the DECT spectrum the modulated signal is passed through a Gaussian filter. The Frequency Deviation measurement is performed to verify the quality of the GFSK transmission from the EUT.

The measurement parameters are;

Deviation for binary "1"

F_1 is the nominal frequency deviation of a binary "1" and is;

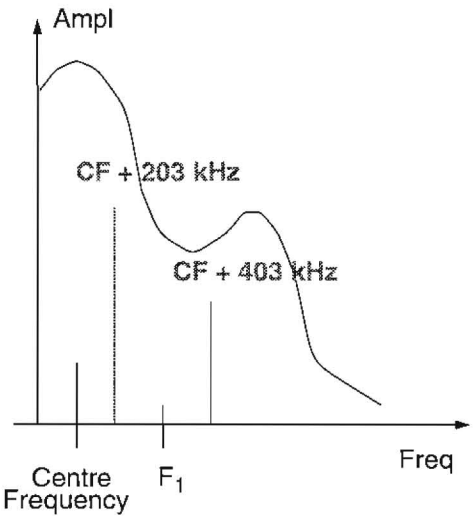
$$CenterFrequency + 288kHz$$

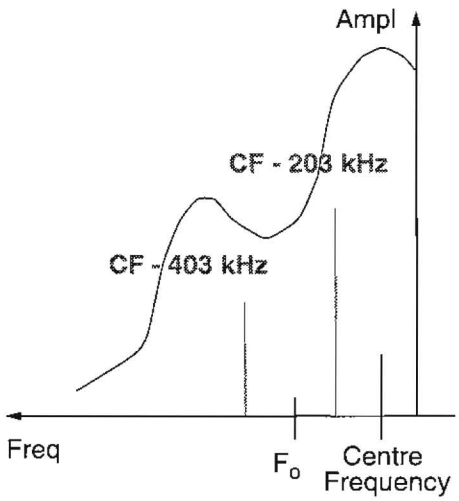
The lower limit is;

$$CenterFrequency + 203kHz$$

The upper limit is;

$$CenterFrequency + 403kHz$$





Deviation for binary "0"

F_0 is the nominal frequency deviation of a binary "0" and is;

$$CenterFrequency - 288kHz$$

The upper limit is;

$$CenterFrequency - 203kHz$$

The lower limit is;

$$CenterFrequency - 403kHz$$

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Frequency Drift

To display this measurement:

- Press FREQ.
- Change `Meas Pattern` to `FDEV2_FS`.
- Select `Frequency Drift`.

The following screen is displayed:

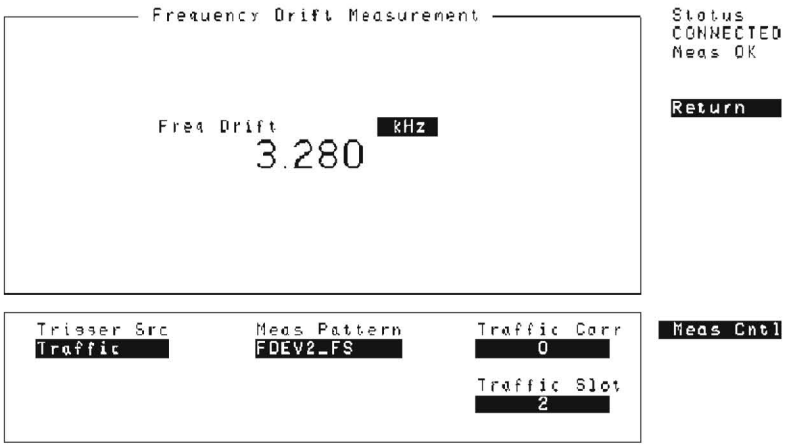


Figure 2-5. Frequency Drift Measurement Screen

This screen displays the drift of the frequency across the DECT timeslot, measured in kHz. The lower section displays the measurement control parameters.

Note

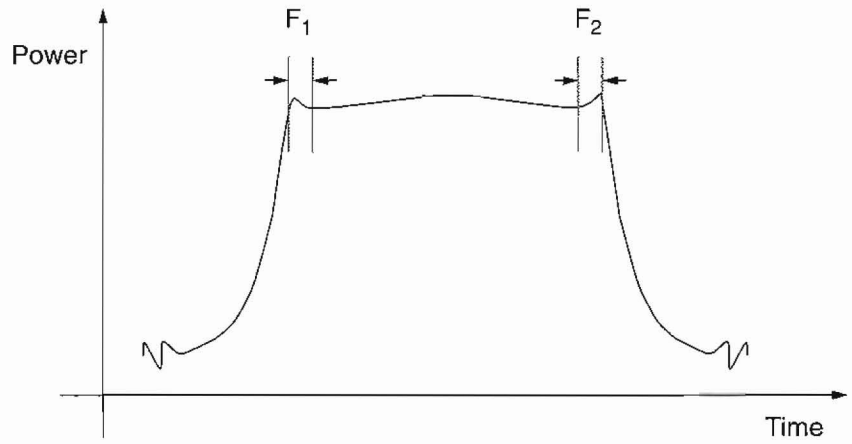
For a frequency drift measurement, the `Meas Pattern` must be set according to that defined in Table 2-2 on page 4-3 and Table 2-2 on page 4-5.

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Measurement Theory

The center frequency is calculated twice from different points of the same DECT timeslot. The first sixteen bits of the signal, and the last sixteen bits of the loopback field are examined, and the centre frequency is calculated at both points.
The measurement pattern FDEV2_FS is used for this test. This pattern has the last sixteen bits as alternating ones and zeroes, which gives an accurate reading for the center frequency.

The difference between the two frequency readings give the Frequency Drift across the burst. The drift should not be greater than 15 kHz.



Field Descriptions

`Freq Drift`	Displays how much the frequency has drifted across the burst.
`Return`	Returns to the previous screen.
`Meas Cntl`	Accesses the measurement control screen.

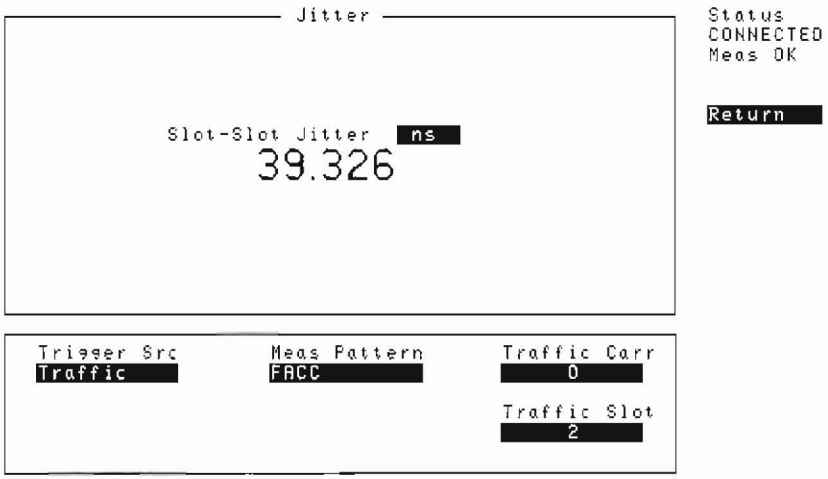
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Jitter Measurement

To display the jitter measurement:

- Press FREQ.
- Select Timing Jitter .

The following screen is displayed:

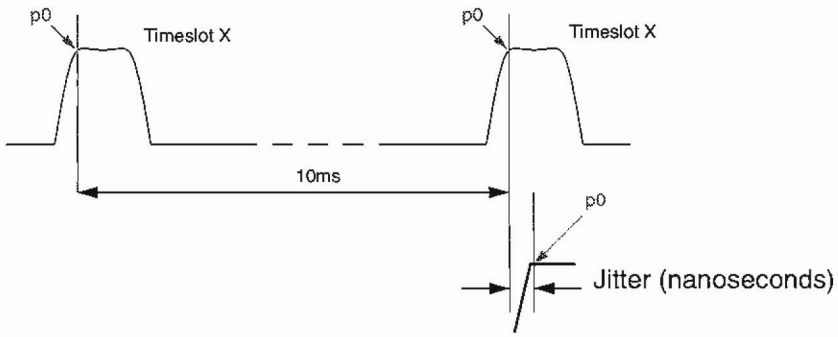


This screen displays the slot to slot timing jitter between a timeslot in consecutive frames. The measurement is displayed in nanoseconds.

HP 8923B measurement control parameters are displayed in the lower section of the screen. They are explained in Chapter 5, "Fields, Screens, Keys And Softkeys".

Measurement Theory

The measurement is carried out by finding the p0 bit of the same timelsot in two consecutive time frames. The jitter is the time difference between the two slots compared with the expected value of ten milliseconds, the length of a timeframe.



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Power Measurements

Normal Transmitted Power (NTP)

To display the NTP of the RF burst presented at the **RF IN/OUT** connector:

- Select PWR

The following screen is displayed:

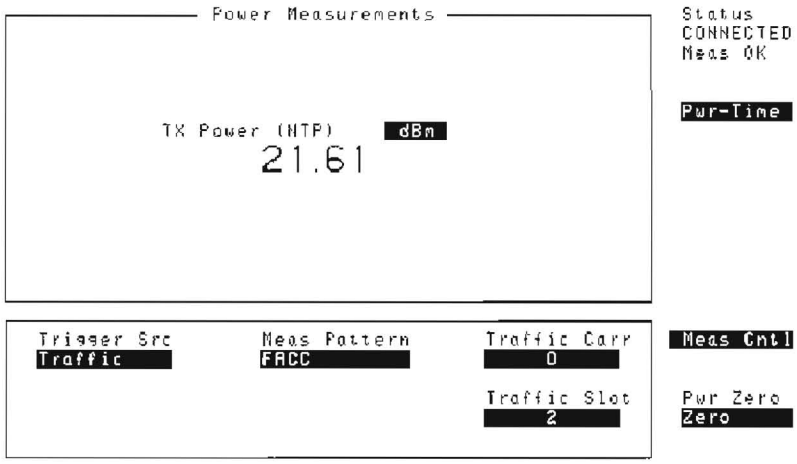


Figure 2-6. Power Measurement Screen

The Power screen displays the Normal Transmitted Power (NTP) of the RF signal. There are also measurement control parameters displayed in the lower section of the screen.

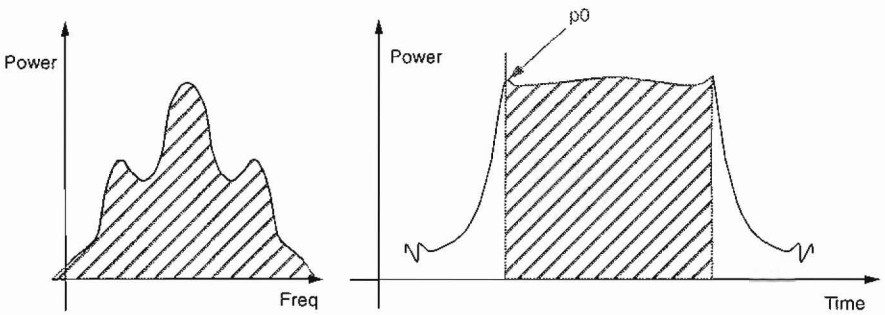
Note

If a Measurement Synchronization error appears (shown below the communication status) then see Chapter 10, "Error Messages" for more information.

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Measurement Theory

The output power from a DECT FP or PP is fixed at 24 dBm. The NTP is the average transmitted power, from the start of bit p0 to the end of the burst.



Field Descriptions

`Tx Power (NTP)`	This displays the NTP reading of the signal applied to the RF In/Out.
`Pwr-Time`	Switches to the power versus time template measurements. A graphical display of the middle of the RF signal is shown when this softkey is selected.
`Power Zero Zero`	Zeroes the power reading when no RF input is present. To zero the power, follow the procedure below.

Zeroing Power Reading

This should be performed before setting up a call or making any measurements.

1. Remove any connection to the **RF IN/OUT** connector.
2. Select (PWR).
3. Select `Pwr Zero Zero` .
4. Replace the connection to the **RF IN/OUT** connector.

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Power Versus Time Template Measurements

The RF burst can be displayed graphically by:

- Selecting `Pwr-Time` from the (PWR) screen.

The following screen is displayed:

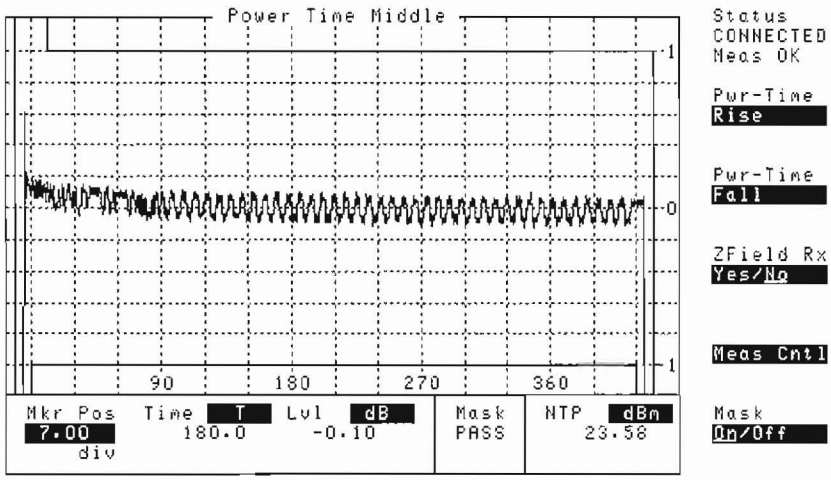


Figure 2-7. Power Time Middle Screen

This screen graphically displays the power level across the length of the burst.

To examine the fall characteristics of the RF burst:

- Select `Pwr-Time` `Fall` softkey from the screen shown in Figure 2-7.

The following screen is displayed:

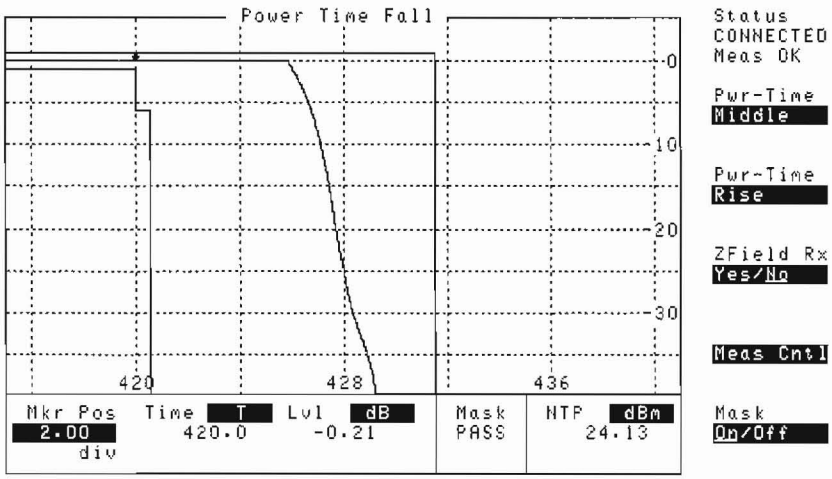


Figure 2-8. Power Time Fall Screen

This screen graphically displays the falling edge of the RF burst.

To examine the rise characteristics of the RF burst:

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- Select `Pwr-Time Rise` softkey from the screen shown in Figure 2-7.
- Or Select `Pwr-Time Rise` softkey from the screen shown in Figure 2-8.

The following screen is displayed:

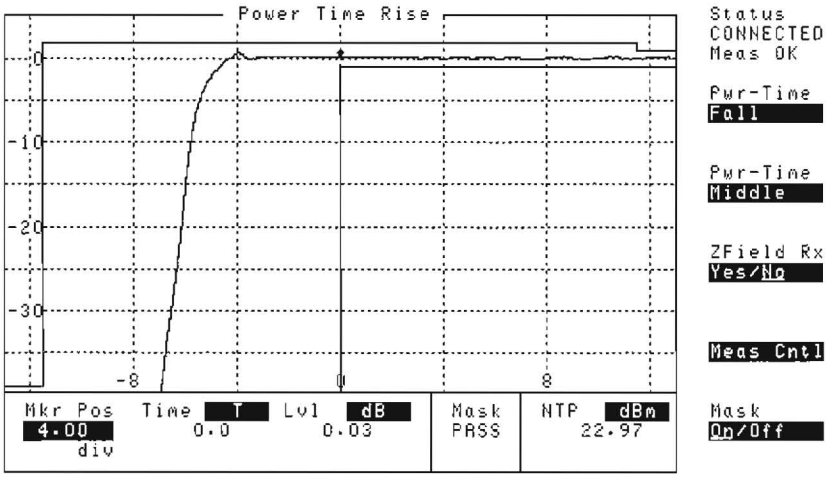


Figure 2-9. Power Time Rise Screen

This screen graphically displays the rising edge of the RF burst.

Measurement Theory

The Power Time screens show the power in the DECT burst over the period of the burst. The power should not exceed the boundaries specified in the power time template laid out in the ETSI type approval document CTR-06.

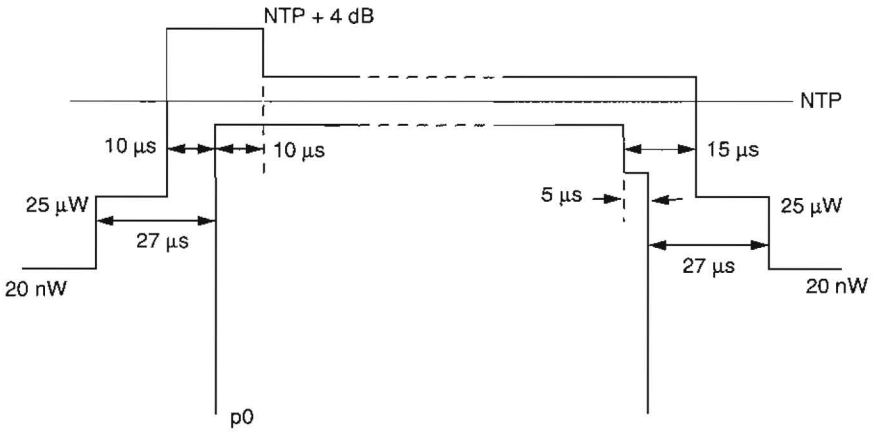


Figure 2-10. DECT Power Template

The frame is time synchronised to bit p0 and the maximum power level is given with respect to the normally transmitted power of the burst.

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Field Descriptions

`Mkr Pos`	The field displays the position of the marker on the screen. The range of the marker positions are: ■Power Time Middle `0.4` to `16` divisions. ■Power Time Rise `0.75` to `7.25` divisions. ■Power Time Fall `0.75` to `7.25` divisions.
`Time`	This displays the time position of the marker in bit periods (T). The scale is displayed across the bottom of each screen.
`Lvl`	This displays the level at the marker in dB relative to the NTP reading.
`Mask`	Displays a `Pass` if the burst characteristics fit the template. Displays a `Fail` if the burst characteristics do not fit the template.
`NTP`	This is the same NTP reading as on the (PWR) screen.
`Z-Field Rx` `Yes/No`	Adapts the length of the template to allow for Z-field transmissions.
`Mask` `On/Off`	Switches the measurement template ON or OFF. The HP 8923B will still indicate if the burst is passing or failing the template test.
`Meas Cntl`	Accesses the measurement control screen.

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BER/WER Measurements

BER Measurement

To access the BER screen:

- Select BER

The following screen is displayed:

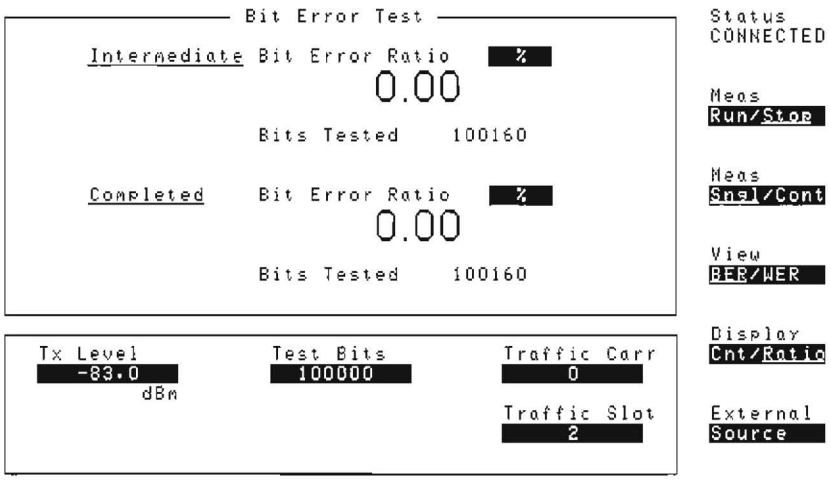


Figure 2-11. BER Measurement

Note

BER testing can only be performed when MAC layer test messages are supported by the EUT. BER measurements cannot be performed when testing a Dummy Bearer.

In the `Run` state, the intermediate reading is constantly being updated while the HP 8923B tests the alloted number of bits to test. When the HP 8923B has completed the measurement, the intermediate reading is transferred to the `Completed Bit Error Ratio` measurement. Another intermediate measurement is started automatically if continuous measuring has been chosen.

Measurement Theory

The bit error ratio test verifies the performance of the EUT under ideal operating conditions. The HP 8923B sends the DM2 test pattern, see "Measurement Patterns" on page 4-4, to the EUT. The EUT is forced into loopback and the HP 8923B compares this with the data which was sent. The RF Level from the HP 8923B should be reduced to -73 dB and the BER should not exceed 0.00001.

The receiver sensitivity can also be checked using the Bit Error Test Screen. While the EUT is in loopback mode the RF level from the HP 8923B should be reduced to -83 dB and the BER should not exceed 0.001.

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Field Descriptions

`Intermediate Bit Error Ratio`	This area displays the intermediate BER measurement result.
`Completed Bit Error Ratio`	This area displays the completed BER result.
`Tx Level`	Allows you to test the sensitivity/BER of the EUT by reducing the amplitude of the signal provided by the HP 8923B.
`Test Bits`	Allows you to set the number of bits used in the BER test. The default is 100,000 bits.
`Traffic Carr`	Allows you to set the carrier for the traffic bearer. The carrier is an integer from 0-9.
`Traffic Slot`	Allows you to set the timeslot for the traffic bearer. The timeslot is an integer from 0-11.
`Meas Run/Stop`	Allows the measurement to be started or stopped.
`Meas Sngl/Cont`	Allows single or continuous measurement control.
`View BER/WER`	Allows choice of bit errors or word errors to be displayed.
`Display Cnt/Ratio`	Allows measurement to be displayed as an absolute error count or a ratio.
`External Source`	Switches to the External Source Control Screen.

Note

The `COMPLETED` area is initially blank, but will update every time the HP 8923B has cycled through the number of bits defined in `Bits to Test`.
If you are in `Sngl` mode then both readings report the same value after one complete measurement.

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WER Measurement

To access the WER measurement:

- Select `View BER/WER` until WER is underlined.

The following screen is displayed:

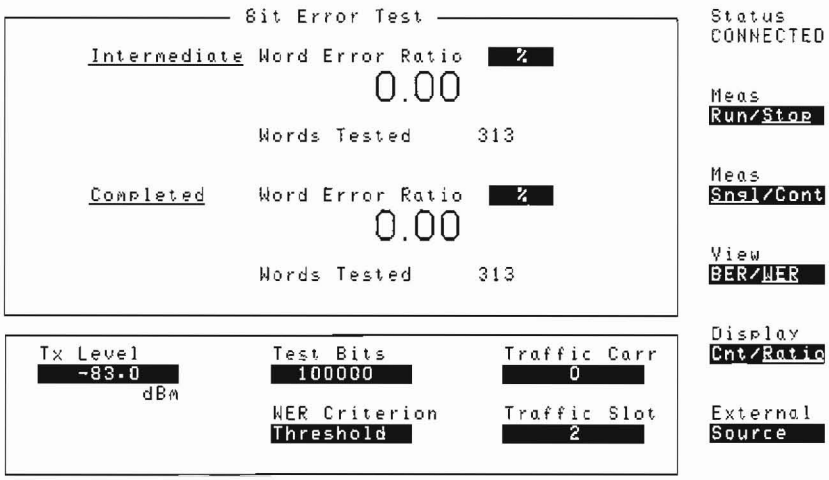


Figure 2-12. WER Measurement

Note

WER testing can only be performed when MAC layer test messages are supported by the EUT. WER measurements cannot be performed when testing a Dummy Bearer.

On this screen, a WER reading is being constantly updated while the HP 8923B tests the allocated number of bits. This is the `Intermediate Word Error Ratio`. A word error is reported if the number of bits failing exceeds the criterion set in the WER Criterion Field. When the HP 8923B has completed the measurement, the intermediate reading is transferred to the `Completed Word Error Ratio` measurement and another intermediate measurement is started, if continuous measuring has been chosen.

Field Descriptions

`WER Criterion`

`Threshold`

Sets the criterion for a word error. The choices are:

1.Threshold

A word error is detected when > 25 % of the bits in a frame are in error.

2.No B-field

A word error is detected when a B-field is not received from the EUT.

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Audio Testing

To access the audio screen press the following keys:

- SHIFT then PWR.

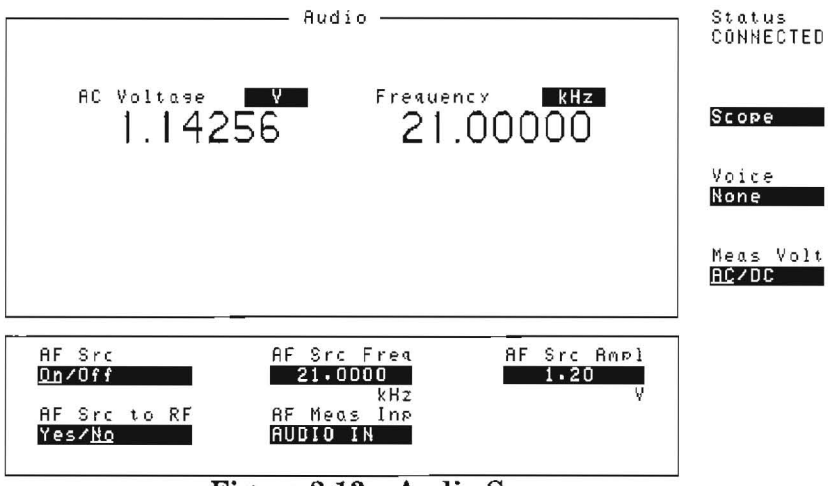


Figure 2-13. Audio Screen (with the Audio Output Connected to the Audio Input)

This screen provides access to audio measurements, the audio source controls and the speech controls.

Field Descriptions

`AC/DC Voltage` — The field displays the a.c. or d.c. voltage of the audio signal.

`Frequency` — This field displays the frequency of the audio signal.

Audio Source

`AF Src` — A toggle field, which switches the audio source on or off.

`AF Src Freq` — Allows you to set the frequency of the internal audio source.

`AF Src Ampl` — Allows you to set the amplitude of the internal audio source.

`AF Src to RF` — This field connects the Audio Source output to the internal CODEC. The choices are;

- No (source connected only to front panel)
- Yes (source connected to CODEC and front panel)

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Audio Analyzer `AF Meas Inp`

This field toggles the Audio Analyzer input between the front panel **Audio In** connector and the internal CODEC. The choices are;

- AUDIO IN
  The signal is measured at **Audio In**.
- Rx Audio
  The signal is measured at the internal CODEC output, from the RF carrier.

Speech Destination `Voice`

Allows you to select where to send the received voice signal from the RF carrier. The choices are;

- None
- Rear Panel
- Echo

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Audio Testing Of a DECT PP

Full Audio Loopback Testing

The continuity of the audio circuits of a DECT PP can be checked by setting up the following connections. See Figure 4-14.

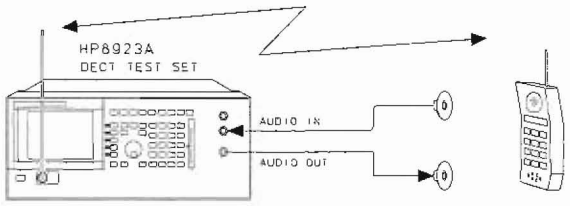


Figure 4-14. Audio Testing Of A DECT Portable

If using the setup as in Figure 4-14 then the EUT must have the capability to:

- Route the audio after a MAC layer test message FORCE_TRANSMIT has been sent and received by the EUT.

The Audio source is used to drive a speaker which stimulates the microphone of the EUT. If using the setup as in Figure 4-14 then the HP 8923B must have:

1. The Audio `Source` set to `On` .
2. The `Speech Destination` set to `None` .

The built in oscilloscope can measure signals applied to the audio input connector on the front panel.

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Speaker Testing

The speaker output section of the DECT PP can be checked separately from the microphone pickup.

The equipment should be setup as follows:

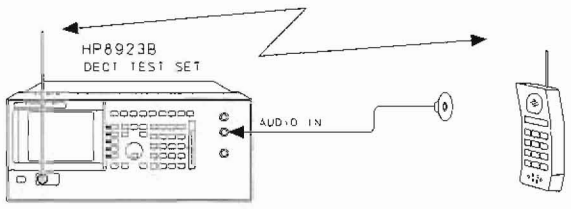
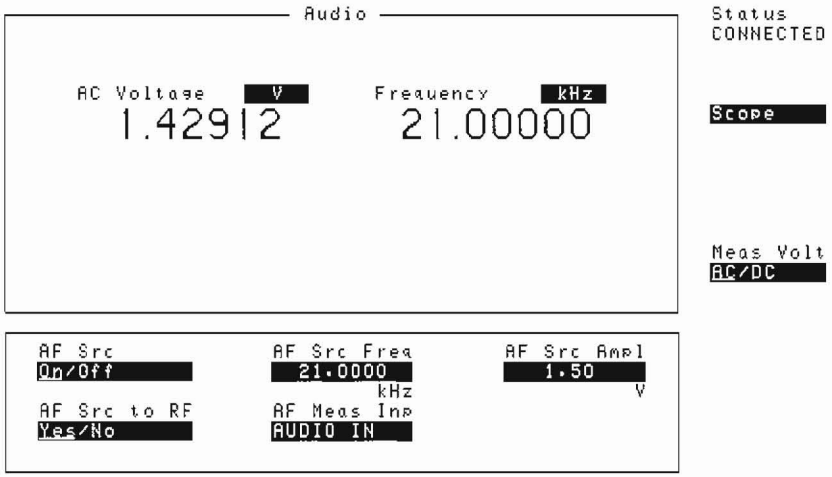


Figure 4-15. Audio Testing of the PP Speaker

A microphone is connected to the audio input on the HP 8923B, and a DECT signal is transmitted to the PP. The PP deccodes this information and transmits it to the earpiece where it is picked up by the microphone.

The HP 8923B can display the measured signal on the audio screen or on the oscilloscope screen.

A communication should be established between the DECT PP and the HP 8923B.



- The `AF Src` field should have `On` underlined.
- The `AF Src to RF` field should have `Yes` underlined.
- The `AF Meas Inp` should be set to `AUDIO IN`.

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Microphone Testing

The speaker input of the DECT PP (or microphone) can be tested separately from the earpiece.

The equipment should be setup as follows:

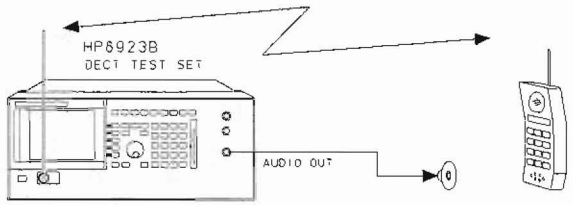
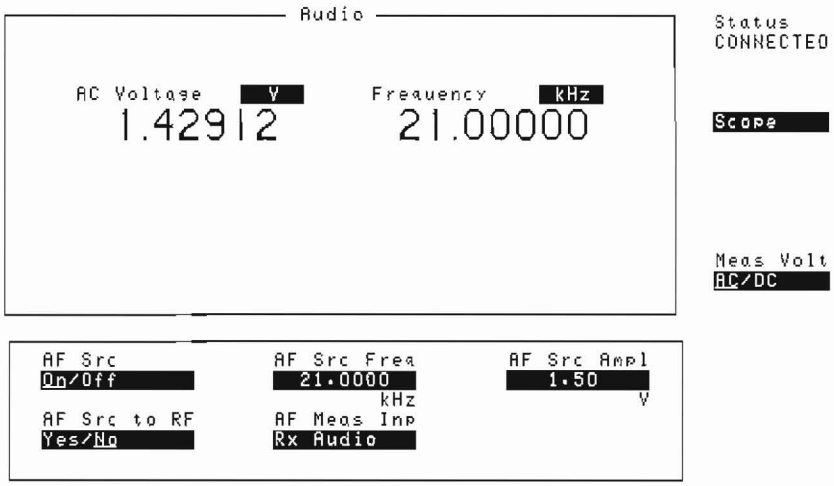


Figure 4-16. Audio Testing of the PP Microphone

A speaker is connected to the audio source from the HP 8923B, and an audio signal is transmitted to the mouthpiece of the PP. The PP then codes this information and transmits it to the HP 8923B which is acting as a Fixed Part.

The HP 8923B can decode this information and display the result on the audio screen or on the built in oscilloscope.
An external signal generator could also be used to supply the audio signal.

To perform this test the HP 8923B should be set up as follows:



- The `AF Src` field should have `On` underlined.
- The `AF Src to RF` field should have `No` underlined.
- The `AF Meas Inp` field should be set to `Rx Audio`.

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Rear Panel Handset

The continuity of the audio circuits can also be checked through the handset interface on the rear of the instrument using the setup in Figure 2-17.

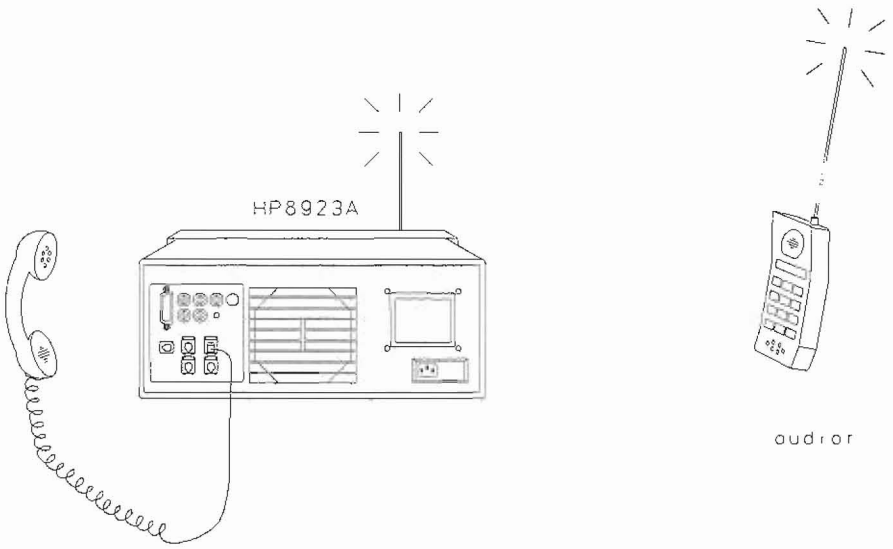


Figure 2-17. Audio Testing Using A Handset.

Connecting a handset to the rear panel handset port enables you to verify the operation of the audio circuits in the portable part. If using the setup as in Figure 2-17 then the HP 8923B must have:

- The `Speech Destination` set to `Rear Panel`.

The speech is now routed to the rear panel and you can speak and listen through the handset.

More comprehensive audio testing can be performed using an external audio analyzer and generator. The internal connections of the handset connector are shown in Chapter 2, "Preparing Your HP 8923B For Use". This will enable you to construct an appropriate interface to the external audio analyzer and generator.

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Oscilloscope

This can be accessed by selecting SHIFT, PWR (Audio) then `Scope`. Figure 2-18 shows a typical display. The oscilloscope can display the signal applied to the **AUDIO IN** connector on the front panel, or the voice signal received "over-the-air" from the EUT.

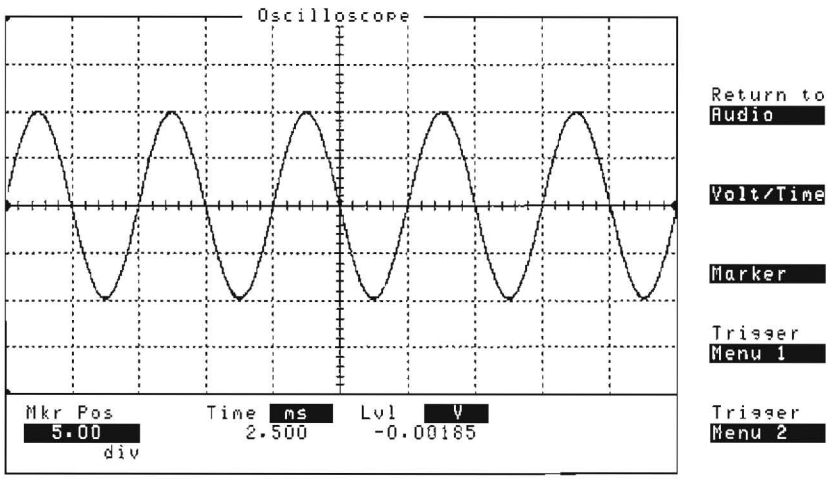


Figure 2-18. Example of Audio Signal on screen

On this screen there are three main measurements displayed at the bottom:

- `Mkr Pos` - horizontal position of the marker.
- `Time` -time position of marker relative to left of screen (0 ms).
- `Lvl` - amplitude readout.

`Time` and `Lvl` readings are those of the current marker position. Using the softkeys on the right hand side of the screen, you can alter the scale of the screen, set triggers and offsets, set voltage offsets and return to the main audio screen.

Field Descriptions

`Return To Audio` — Switches to the audio screen.

`Volt/Time` — Allows you to choose from a list of choices for the horizontal and vertical axes scaling on the oscilloscope.

`Time/div`

This softkey allows you to choose from a list of choices for the timebase on the oscilloscope.

`Vert/div`

This softkey allows you to choose from a list of choices for the vertical scale on the oscilloscope.

`Vert/Offs`

This softkey allows you to choose a vertical offset for the trace.

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Marker	Accesses marker position softkeys.
	Marker to Peak+
	Sets marker to positive peak of the on screen trace.
	Marker to Peak-
	Sets marker to negative peak of the on screen trace.
Trigger Menu 1	Accesses trigger features.
	Trig Src Int/Ext
	Allows you to toggle between Internal and External trigger sources.
	Sense Pos/Neg
	Changes the sense of the trigger from positive to negative edge and vice-versa.
	Delay Value
	Allows you to enter a delay value for the trigger (in milliseconds).
Trigger Menu 2	Accesses trigger features.
	Type Auto/Normal
	Selects automatic or normal triggering.
	Trig Mode Cont/Sngl
	Selects single or continuous triggering.
	Trigger Reset
	Resets the trigger, allowing a new measurement to be made. Most useful when in single triggering mode.
	Lvl (div) Value
	Allows you to set the trigger level in divisions.

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5

Fields, Screens, Keys And Softkeys

What You'll Find in this Chapter

- What keys are on the front panel and an example of their use.
- What type of fields are displayed on the screen and a description of each field application.
- What screens are displayed and a brief description of the softkeys displayed on each screen.

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5.1 Key Descriptions

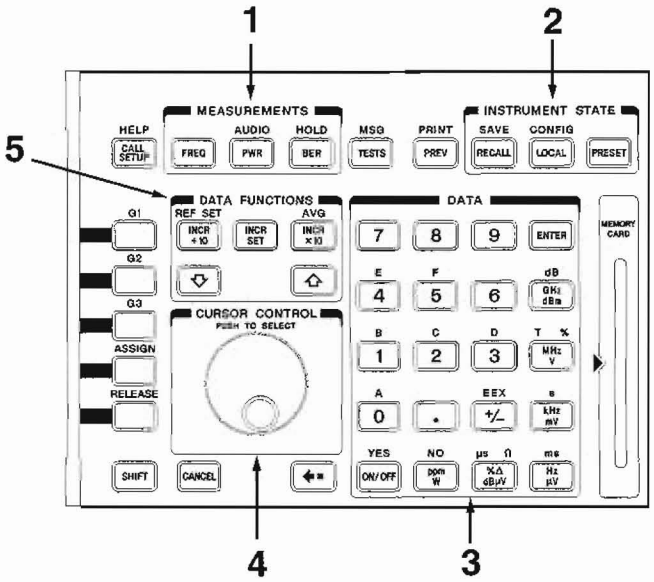


Figure 5-1. Front Panel Keys of the HP 8923B

The front panel is split into sections. These sections are:

1. Measurement Keys.
2. Instrument State Keys.
3. Data Keys.
4. Cursor Control Knob.
5. Data Function Keys.

Each section is surrounded by a box with a heading in **UPPERCASE**. The keys in each box (numbered 1-5) are the main keys used for the heading.

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