Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Agilent Technologies

Printed in USA March 2000

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-1 Contacting Agilent

Online assistance: www.agilent.com/find/assist

United States
(tel) 1 800 452 4844

Latin America
(tel) (305) 269 7500
(fax) (305) 269 7599

Canada
(tel) 1 877 894 4414
(fax) (905) 282-6495

Europe
(tel) (+31) 20 547 2323
(fax) (+31) 20 547 2390

New Zealand
(tel) 0 800 738 378
(fax) (+64) 4 495 8950

Japan
(tel) (+81) 426 56 7832
(fax) (+81) 426 56 7840

Australia
(tel) 1 800 629 485
(fax) (+61) 3 9210 5947

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

User's, Calibration and Service Guide

85723A
DECT Measurement Personality
including
8590 E-Series Option 012
(DECT Source)

Agilent Technologies

Part No. 08594-90030
Printed in USA May 1993

Certification

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Hewlett-Packard Software Product License Agreement and Limited Warranty

Important Please carefully read this License Agreement before opening and operating the equipment. Rights in the software are offered only on the condition that the Customer agrees to all terms and conditions of the License Agreement. Opening the media envelope or operating the equipment indicates your acceptance of these terms and conditions. If you do not agree to the License Agreement, you may return the unopened package for a full refund.

License Agreement

In return for payment of the applicable fee, Hewlett-Packard grants the Customer a license in the software, until terminated, subject to the following:

Use.

- Customer may use the software on one spectrum analyzer instrument.
- Customer may not reverse assemble or decompile the software.

Copies and Adaptations.

- Customer may not make copies or adaptations of the software:
  - For archival purposes, or
  - When copying or adaptation is an essential step in the use of the software with a computer so long as the copies and adaptations are used in no other manner.
- Customer has no other rights to copy unless they acquire an appropriate license to reproduce which is available from Hewlett-Packard for some software.
- Customer agrees that no warranty, free installation, or free training is provided by Hewlett-Packard for any copies or adaptations made by Customer.
- All copies and adaptations of the software must bear the copyright notices contained in or on the original.

Ownership.

- Customer agrees that they do not have any title or ownership of the software, other than ownership of the physical media.
- Customer acknowledges and agrees that the software is copyrighted and protected under the copyright laws.
- Customer acknowledges and agrees that the software may have been developed by a third party software supplier named in the copyright notice(s) included with the software, who shall be authorized to hold the Customer responsible for any copyright infringement or violation of this License Agreement.

Transfer of Rights in Software.

- Customer may transfer rights in the software to a third party only as part of the transfer of all their rights and only if Customer obtains the prior agreement of the third party to be bound by the terms of this License Agreement.

- Upon such a transfer, Customer agrees that their rights in the software are terminated and that they will either destroy their copies and adaptations or deliver them to the third party.
- Transfer to a U.S. government department or agency or to a prime or lower tier contractor in connection with a U.S. government contract shall be made only upon their prior written agreement to terms required by Hewlett-Packard.

Sublicensing and Distribution.

- Customer may not sublicense the software or distribute copies or adaptations of the software to the public in physical media or by telecommunication without the prior written consent of Hewlett-Packard.

Termination.

- Hewlett-Packard may terminate this software license for failure to comply with any of these terms provided Hewlett-Packard has requested Customer to cure the failure and Customer has failed to do so within thirty (30) days of such notice.

Updates and Upgrades.

- Customer agrees that the software may include future updates and upgrades which may be available from HP under a separate support agreement.

Export.

- Customer agrees not to export or re export the software or any copy or adaptation in violation of the U.S. Export Administration regulations or other applicable regulations.

Limited Warranty

Software.
Hewlett-Packard warrants for a period of 1 year from the date of purchase that the software product will execute its programming instructions when properly installed on the spectrum analyzer instrument indicated on this package. Hewlett-Packard does not warrant that the operation of the software will be uninterrupted or error free. In the event that this software product fails to execute its programming instructions during the warranty period, customer's remedy shall be to return the measurement card ("media") to Hewlett-Packard for replacement. Should Hewlett-Packard be unable to replace the media within a reasonable amount of time, Customer's alternate remedy shall be a refund of the purchase price upon return of the product and all copies.

Media.
Hewlett-Packard warrants the media upon which this product is recorded to be free from defects in materials and workmanship under normal use for a period of 1 year from the date of purchase. In the event any media prove to be defective during the warranty period, Customer's remedy shall be to return the media to Hewlett-Packard for replacement. Should Hewlett-Packard be unable to replace the media within a reasonable amount of time, Customer's alternate remedy shall be a refund of the purchase price upon return of the product and all copies.

Notice of Warranty Claims.
Customer must notify Hewlett-Packard in writing of any warranty claim not later than thirty (30) days after the expiration of the warranty period.

Limitation of Warranty.
Hewlett-Packard makes no other express warranty, whether written or oral, with respect to this product. Any implied warranty of merchantability or fitness is limited to the 1 year duration of this written warranty. This warranty gives specific legal rights, and Customer may also have other rights which vary from state to state, or province to province.

Exclusive Remedies.
The remedies provided above are Customer's sole and exclusive remedies. In no event shall Hewlett-Packard be liable for any direct, indirect, spel, incidental, or consequential damages (including lost profit) whether based on warranty, contract, tort, or any other legal theory.

Warranty Service.
Warranty service may be obtained from the nearest Hewlett-Packard sales office or other location indicated in the owner's manual or service booklet.

Safety Symbols

The following safety symbols are used throughout this guide. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Caution

The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a *caution* sign until the indicated conditions are fully understood and met.

Warning

The *warning* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a *warning* sign until the indicated conditions are fully understood and met.

General Safety Considerations

Warning

Before the spectrum analyzer is switched on, **make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.**

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

Warning

There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

Caution

Before the spectrum analyzer is switched on, make sure its primary power circuitry has been adapted to the voltage of the ac power source.

Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

HP 8590 Series Spectrum Analyzer Documentation Description

Manuals Shipped with Your Spectrum Analyzer

HP 8590 Series Spectrum Analyzer User's Guide

Describes how to prepare the analyzer for use.
Describes analyzer features.
Describes common applications.
Tells how to make measurements with your spectrum analyzer.
Includes error messages.

HP 8590 E-Series Spectrum Analyzer Calibration Guide

Provides analyzer specifications and characteristics.
Provides manual procedures to verify specifications.
Indicates the test equipment required for verification.

HP 8590 D-Series and E-Series Spectrum Analyzer Quick Reference Guide

Describes how to make a simple measurement with your spectrum analyzer.
Briefly describes the spectrum analyzer functions.
Lists all the programming commands.

HP 8590 E-Series Option 012 User's, Calibration and Service Guide

This guide provides all the information needed to install and operate the HP 85723A DECT measurements personality and Option 012 DECT Source. This will allow you to make DECTmeasurements and generate a DECT signal. This guide also provides calibration and service information for the HP 8590 E-Series Option 012, DECT Source. This includes the performance verification tests required to determine if the DECT Source meets its specifications and the information required to adjust and repair the DECT Source to assembly level.

To use this guide:

1. Perform the procedures in Chapter 1. The procedures in Chapter 1 explain how to prepare the spectrum analyzer to make a DECT measurement and how to prepare the DECT Source to generate a DECT signal.
2. Once you have completed Chapter 1, you can proceed to Chapter 2. Chapter 2 contains the procedures for making measurements with the DECT measurements personality. It also contains procedures on how to use the HP 8590 E-Series Option 012 DECT Source.

The rest of the guide contains reference information that you may want to refer to.

- Chapter 3 contains the verification tests for the HP 85723A DECT measurements personality. The verification tests should be performed at least once a year.
- Chapter 4 contains information about how to use a computer to operate the HP 85723A DECT measurements personality.
- Chapter 5 contains information about what to do if you have a problem with the HP 85723A DECT measurements personality.
- Chapter 6 contains reference information about the HP 85723A DECT measurements personality's functions.
- Chapter 7 contains general reference information about the HP 85723A DECT measurements personality.
- Chapter 8 contains reference information about the HP 85723A DECT measurements personality's programming commands.
- Chapter 9 contains calibration information for the HP 8590 E-Series Option 012, DECT Source.
- Chapter 10 contains service information for the HP 8590 E-Series Option 012, DECT Source.

What is the DECT Mobile Communication System?

The Digital European Cordless Telecommunications (DECT) system is a means of communication without the transmission lines that traditionally link a telecommunications system. With DECT, the transmission occurs between for example a telephone handset (also called a portable part or PP) and a base station (also called a fixed part or FP). The frequency for the portable part and fixed part transmission is called the carrier frequency, and every carrier frequency is assigned a channel number. Because a portable part and a fixed part use the same carrier frequency, they must share the carrier frequency by using a time division duplexing (TDD) scheme. Time division means that either the portable part or the fixed part can only transmit during its assigned time period (so the time period is divided). Duplexing means that the transmissions from the portable part and the fixed part appear to occur simultaneously to the telephone user.

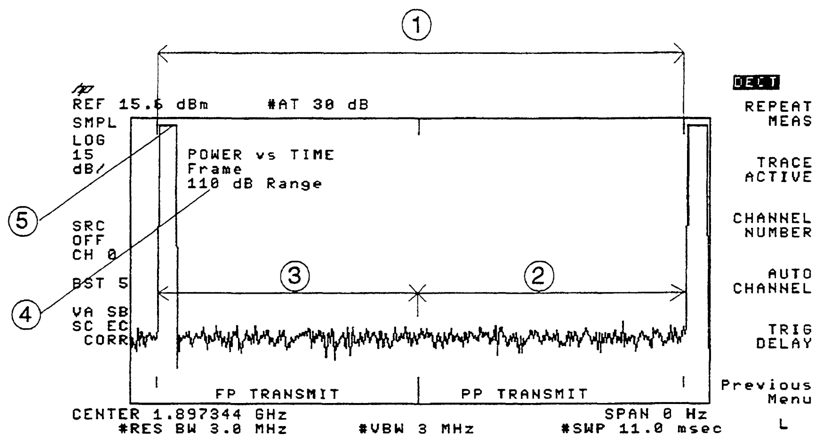


Figure 0-1. Timing for Handset (PP) and Base Station (FP) Transmission

Table 0-1.

Number	Description
1	The time period in which the fixed part and portable part transmissions occur. This time period is called a frame. Each frame is 10 ms long and contains 11520 bits.
2	The time period in which the portable part transmission occurs.
3	The time period in which the fixed part transmission occurs.
4	The selected display range (70 dB or 110 dB).
5	The fixed part burst or timeslot.

The basic technical characteristics are defined by the European Telecommunications Standards Institute Radio Equipment and Systems DECT/(ETSI RES DECT) approval test specification.

The frequency band for a DECT transceiver is defined as 1.88 GHz to 1.9 GHz. Each DECT transceiver is allocated 10 channels which are spaced 1.728 MHz apart.

The TDMA frame structure has 24 timeslots, allowing each carrier to be switched on up to 24 times in the 10 ms frame. For normal conversation the DECT portable part will only use two of these timeslots, (one for receiving and one for transmitting).

What does the HP 85723A DECT measurements personality do?

The HP 85723A DECT measurements personality can help determine if a DECT transmitter is working correctly. The HP 85723A controls HP 8590 Series spectrum analyzer hardware for the testing of a DECT transmitter according to most of the specifications in the ETSI RES DECT approval test specification. This test specification defines complex, multi part measurements used to maintain an interference free environment. For example, the test specification includes searching for spurious emissions and for measuring intermodulation products. The HP 85723A automatically makes these measurements using the algorithms defined by this test specification. The detailed results displayed by the measurements allow you analyze DECT system performance, and also allow you to alter measurement parameters for further analysis.

The HP 85723A DECT measurements personality also allows you to control the HP 8590 E-Series Option 012, DECT Source. The DECT Source provides a built in DECT stimulus allowing you to generate a signal to perform receiver sensitivity testing or provide a stimulus for RF sub-assemblies.

Key Conventions

The following key conventions are used in this guide:

(Front panel key)	Text shown like this represents a key physically located on the spectrum analyzer.
`Softkey` or `SOFTKEY`	Text shown like this represents a softkey. (The softkeys are located next to the softkey labels, and the softkey labels are the annotation on the right side of the spectrum analyzer display.)
`Screen Text`	Text printed in this typeface indicates text displayed on the spectrum analyzer.

Spectrum Analyzer Operation

If you are not familiar with your spectrum analyzer, refer to the *HP 8590 Series Spectrum Analyzer User's Guide* and the *HP 8590 D-Series and E-Series Spectrum Analyzer Programmer's Guide*. These manuals describe spectrum analyzer preparation and verification, and tell you what to do if something goes wrong. Also, they describe spectrum analyzer features and tell you how to make spectrum analyzer measurements. Consult these manuals whenever you have a question about standard spectrum analyzer use.

Contents

Figures

Tables

1

Getting Started

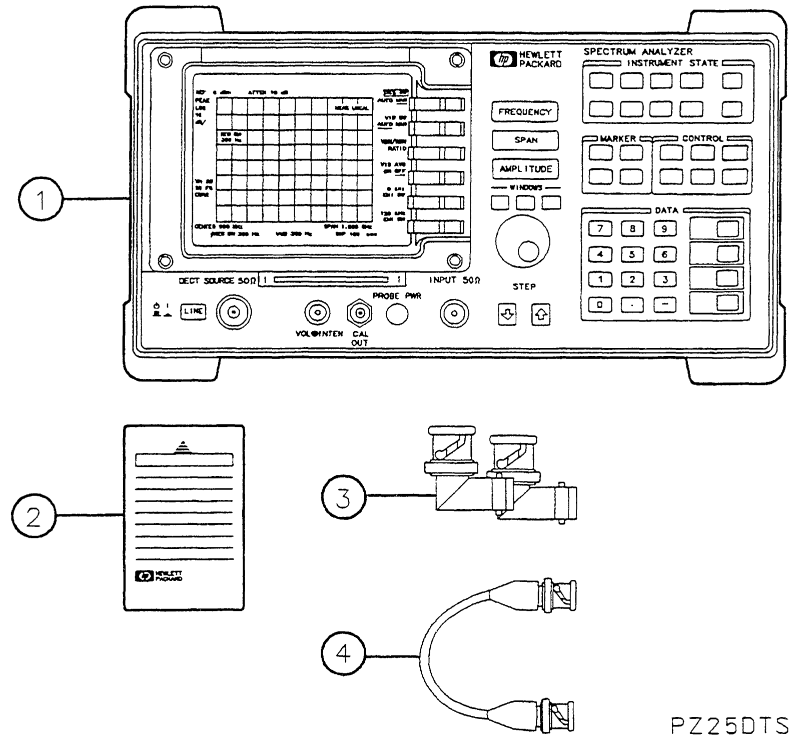
The procedures in this chapter describe how to prepare the spectrum analyzer to measure a DECT transmission and how to prepare the DECT Source to generate a DECT signal. This chapter contains the following information:

- Descriptions of the equipment that you will need.
- Descriptions of the HP 8590 Series spectrum analyzer front-panel features that you will be using.
- Procedures for preparing to make a measurement.
- Procedures for preparing the DECT Source.
- Procedures for accessing the spectrum analyzer functions (performing the procedures in this section is optional).

You should do all the procedures in "Preparing to Make a Measurement" before proceeding to Chapter 2.

The Equipment that You Will Need

To prepare the spectrum analyzer to measure a signal from a DECT transmitter, you need the following equipment.



PZ25DTS

1 An HP 8593E, HP 8594E, HP 8595E, or HP 8596E spectrum analyzer with the required options installed in the spectrum analyzer. The required options, and any substitute for a required option, are listed in the following table.

Required Option	Substitute for the Required Option	Description
Option 004, the precision frequency reference	A 10 MHz, −2 to +10 dBm signal from an external precision frequency reference.	Increases the frequency accuracy of the spectrum analyzer.
Option 012, the DECT Source	HP 8665A Opt H10	Provides a DECT signal generated from a data stream and TDMA pulse.
Option 101, the fast time-domain sweeps option card	None	Provides the 20 ms to 20 μs sweep times in zero span.
Option 105, the time-gated spectrum analyzer option card	None	Provides the time gating needed in the power versus time and frequency and modulation measurements. (If you are retrofitting an older spectrum analyzer, the Option 105 card must have a serial number prefix of 3121K or higher.)
Option 112, the DECT demodulator option card	An HP 53310A modulation domain analyzer with option 031. When real time demodulated data is required, there is no substitute	Performs the frequency and deviation measurements. When used in conjunction with Opt 012 provides real time data demodulation.

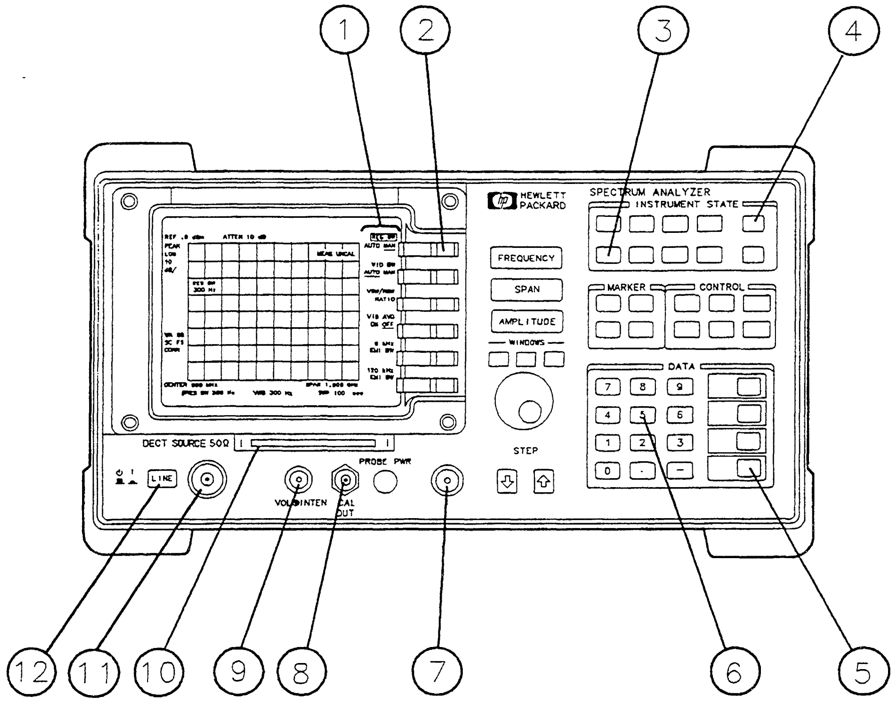
2 The HP 85723A DECT measurements personality read-only memory (ROM) card. The DECT measurements personality is a program that resides on this ROM card.

3 Two BNC-male to BNC-female right-angle adapters. The HP part number for the adapters is 1250-0076.

4 A short BNC cable, HP part number 8120-2682.

The HP 8590 Series Spectrum Analyzer Front-Panel Features

To use the DECT measurements personality, you need to be familiar with the following features of an HP 8590 Series spectrum analyzer.



PZ26DTS

1 The annotation on the right side of the spectrum analyzer display shows the softkey labels. The softkey labels display the different functions that can be selected. In this guide, the softkey labels are shown in text as shaded boxes (for example, DECT ANALYZER).

2 The dark grey keys next to the spectrum analyzer display are softkeys. To select the function shown by the softkey label, press the softkey that is next to the softkey label.

3 (MODE) can be used to access the spectrum analyzer mode of operation or the DECT measurements personality. In this guide, the front-panel keys are shown in text as boxes (for example, (MODE)).

4 (COPY) is used to print the screen display on a printer or plot the screen display on a plotter.

5 (ENTER) is used to terminate entries made with the data keys.

6 The data keys are used to enter numbers.

7 The INPUT 50Ω connector is where the signal to be measured is applied.

8 The CAL OUT connector provides a 300 MHz, −10 dBm calibration signal. The calibration signal is used by the spectrum analyzer to perform the spectrum analyzer amplitude and frequency self-calibration routines.

9 The volume and intensity knobs control the volume of the speaker and the intensity of the spectrum analyzer display respectively. The inner knob controls the intensity, the outer knob controls the volume.

10 The memory card reader is where a random-access memory (RAM) or read-only memory (ROM) card is inserted.

11 The DECT SOURCE 50Ω connector.

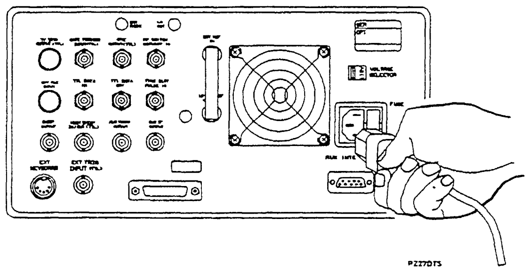
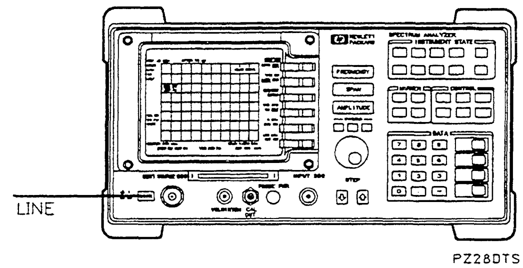
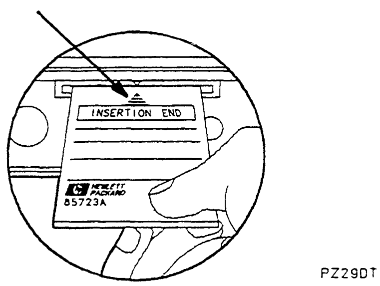
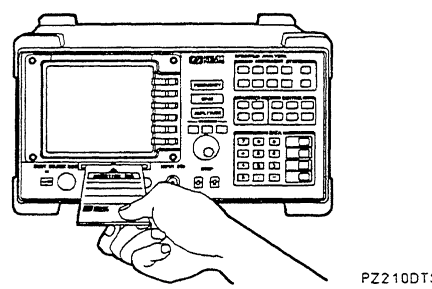
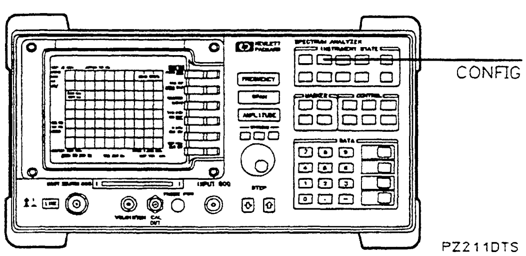
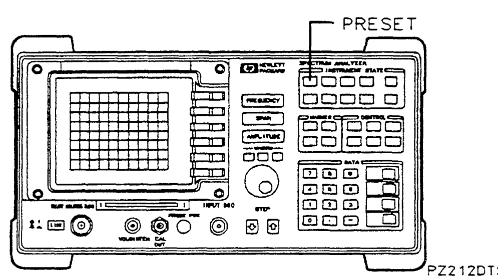
12 (LINE) turns the spectrum analyzer on or off.

Preparing to Make a Measurement

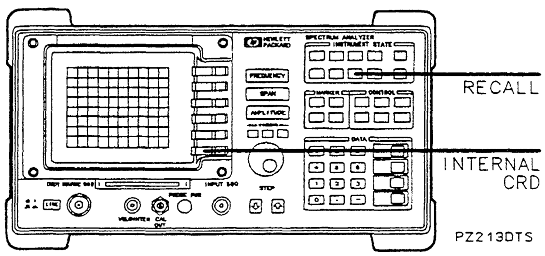
This section explains the steps that are necessary to prepare the spectrum analyzer for making DECT measurements. The steps are as follows:

1. Load the DECT measurements personality into the spectrum analyzer's memory.
2. Perform the spectrum analyzer's self-calibration routines.
3. Connect the cables to the spectrum analyzer's rear panel.
4. Access the DECT measurements personality.
5. Configure the personality for your test equipment.
6. Select a channel to test.

Step 1. Load the DECT measurements personality

<table>
<tr><td>1 Plug the spectrum analyzer into an ac power supply.</td><td>2 Press the (LINE) key.</td></tr>
<tr><td></td><td>
</td></tr>
<tr><td>3 Locate the arrow printed on the DECT measurements personality's card label.</td><td>4 Insert the card into the spectrum analyzer with the card's arrow matching the raised arrow on the bezel around the card-insertion slot.</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>5 Press (CONFIG), More 1 of 3, Dispose User Mem, ERASE DLP MEM then ERASE DLP MEM once more.</td><td>6 Press (PRESET) once the ERASE DLP MEM key is no longer highlighted.</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

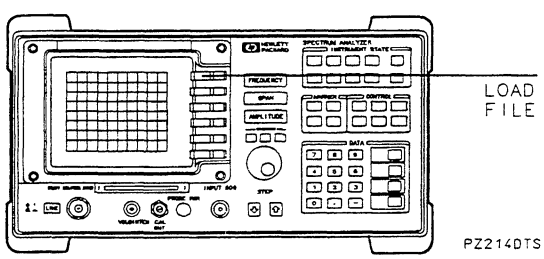
7 Press (RECALL). Press the INTERNAL CARD softkey so that CARD is underlined.



8 Press Catalog Card, CATALOG ALL. Ensure that "dDECT" is highlighted on the spectrum analyzer screen. If dDECT is not highlighted, turn the large knob on the spectrum analyzer's front panel until "dDECT" is highlighted.

```
DECT
dDECT        DLP
dINTSPUR     DLP
dTGK         DLP
dPTIMEFM     DLP
dCID         DLP
```

9 Press LOAD FILE. It takes about a minute to load the DECT measurements personality.



When the spectrum analyzer has finished loading the DECT measurements personality, the catalog entries will be blanked from the spectrum analyzer display.

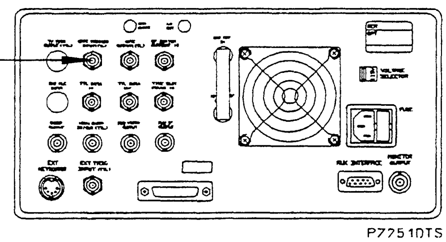
After completing this procedure, the DECT measurements personality will remain in the spectrum analyzer memory until it is deleted with ERASE DLP MEM.

Step 2. Perform the spectrum analyzer's self-calibration routines

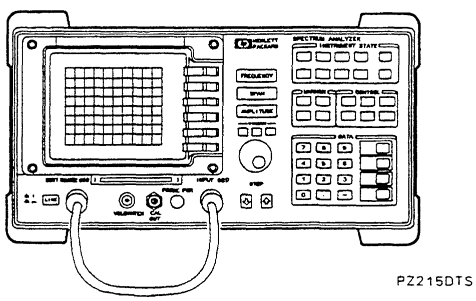
For the spectrum analyzer to meet its specifications and characteristics, the self calibration routines should be performed periodically or whenever the ambient temperature changes. Refer to the *HP 8590 Series User's Guide* for details on how often the self-calibration routines should be performed.

To meet the specifications and characteristics, the spectrum analyzer must be allowed to warm up for at least 30 minutes before performing these self-calibration routines.

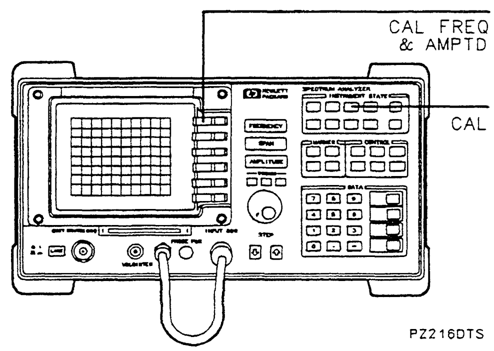
1 Ensure that there is nothing connected to the GATE TRIGGER INPUT connector on the spectrum analyzer's rear panel.



2 Attach the calibration cable from the CAL OUT connector to the INPUT connector with the appropriate adapters.

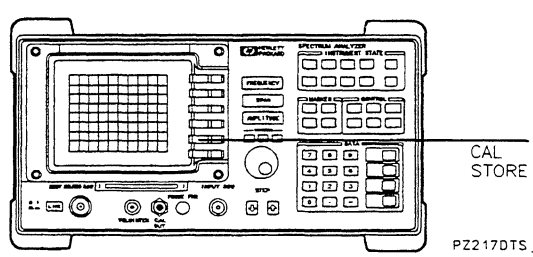


3 Press (CAL), then `CAL FREQ & AMPTD`.



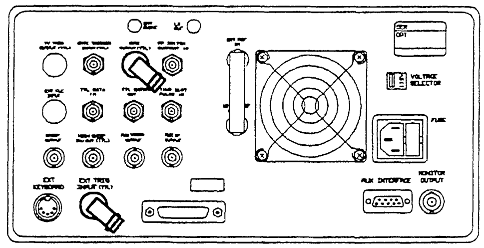
The spectrum analyzer's frequency and amplitude self-calibration routines take about 9 minutes to complete. `CAL:DONE` is displayed when the self-calibration routines are finished. If an error message is displayed, refer to the *HP 8590 Series Spectrum Analyzer User's Guide.*

4 Press `CAL STORE`.



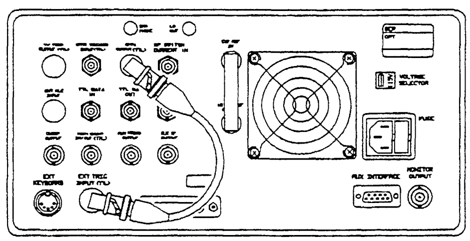
Step 3. Connect the cables to the spectrum analyzer's rear panel

1 Attach the two right-angle BNC adapters to the GATE OUTPUT and the EXT TRIG INPUT connectors located on the rear panel of the spectrum analyzer.



PZ220DTS

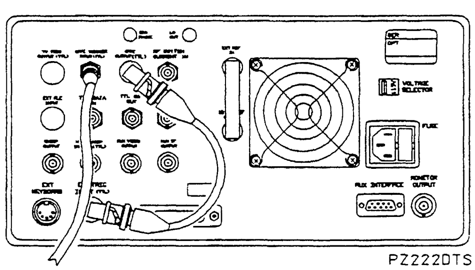
2 Connect a short BNC cable between the two adapters.



PZ221DTS

It is not necessary to remove the BNC cable after you have connected it to the right-angle adapters. This cable can remain attached to the spectrum analyzer for all of the DECT measurements and all of the self-calibration routines. If you need to move the spectrum analyzer, the right-angle adapters prevent the BNC cable from being damaged when the spectrum analyzer is set onto its rear feet.

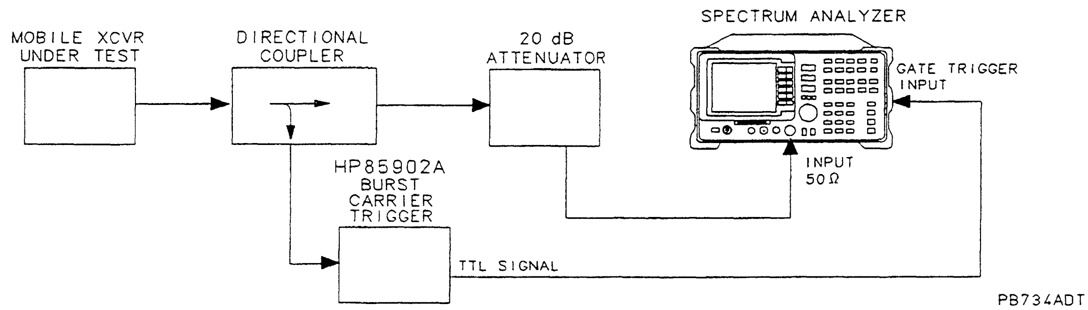
3 Connect a TTL trigger signal to the GATE TRIGGER INPUT connector on the rear panel of the spectrum analyzer.



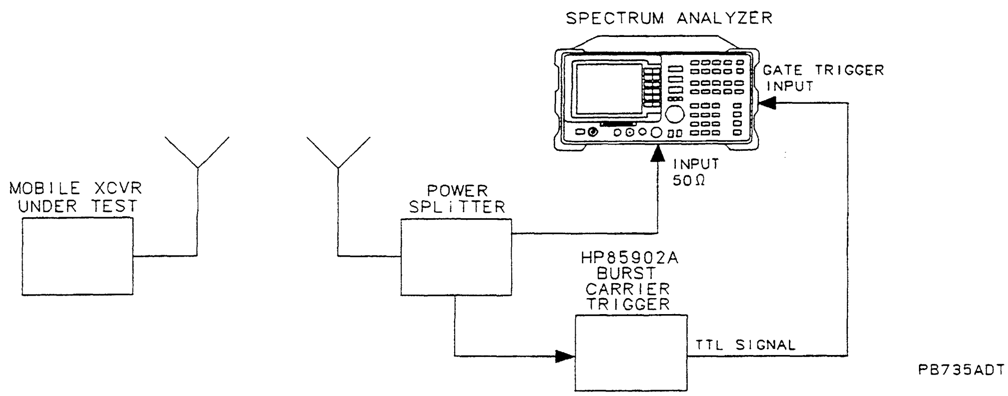
PZ222DTS

This TTL trigger signal provides an external trigger for the spectrum analyzer. The trigger signal needs to be a transistor-transistor logic (TTL) signal that generates a trigger signal edge for every DECT frame. The external trigger signal can be supplied by the unit under test, or by an associated piece of test equipment. The HP 85902A, Burst Carrier Trigger can be used for this conversion.

Two examples of using the HP 85902A, Burst Carrier Trigger are shown below.

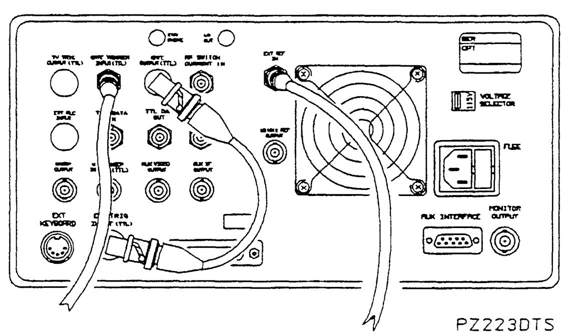


Mobile Station in Self-Test Mode, Using a Directional Coupler



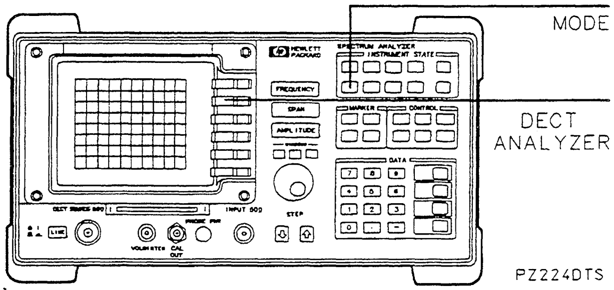
Mobile Station in Self-Test Mode, Using a Power Splitter

4 *If you do not have Option 004:* Disconnect the connector from the 10 MHz REF OUTPUT and EXT REF IN connectors on the rear panel. Connect the 10 MHz signal from a precision external frequency reference to the EXT REF IN connector.



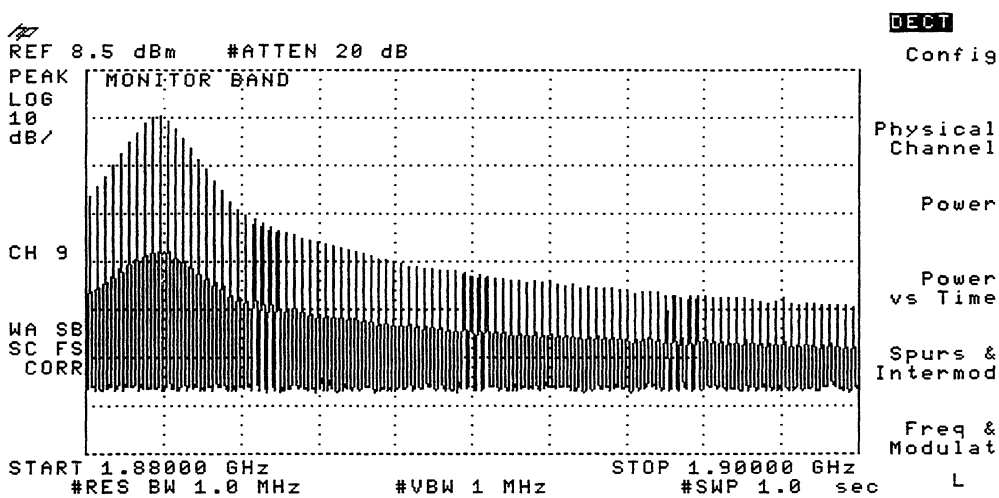
Step 4. Access the DECT measurements personality

1 Press (MODE), DECT ANALYZER to access the DECT measurements personality.



2 You will see the copyright message for the HP 85723A. This message is only displayed the first time you access the DECT analyzer mode. After reading the copyright message, press (DISPLAY) to erase the message.

Notice that when the spectrum analyzer is using the DECT measurements personality, DECT is displayed in the upper right corner of the spectrum analyzer display.



Pressing DECT ANALYZER also accesses the main menu for the DECT measurements personality.

If your spectrum analyzer does not have Option 004 installed in it, the message EXT PRECISION FREQ REFERENCE REQUIRED will be displayed. This message is a reminder that you must use an external frequency reference when using the DECT measurements personality. See the previous procedure, "Step 3. Connect the cables to the spectrum analyzer's rear panel" for information about connecting an external frequency reference to the spectrum analyzer.

If any other messages are displayed, refer to Chapter 5, "If You Have a Problem."

Step 5. Configure the personality for your test equipment

1 Press Config.

2 If you plan to use an external piece of equipment (for example, a directional coupler, fixed attenuator, or test fixture) to connect the transmitter's output to the spectrum analyzer's input, you need to enter the insertion loss of that equipment into the EXT LOSS function. To enter the insertion loss, press EXT LOSS, use the data keys to enter the insertion loss of the external equipment, then press (+dBm) or (ENTER).

3 Select the trigger polarity for the external trigger (the external trigger is the TTL trigger signal that is connected to the GATE TRIGGER INPUT connector on the rear panel of the spectrum analyzer). If you want the spectrum analyzer to trigger on the positive edge of the external trigger signal, press TRIG POL NEG POS so that POS is underlined. If you want the spectrum analyzer to trigger on the negative edge of the external trigger signal, press TRIG POL NEG POS so that NEG is underlined.

4 Enter the trigger delay time value. If you selected positive edge triggering, this is the time from the positive edge of the trigger pulse to the start of the FP burst (see Figure 1-1). If you selected negative edge triggering, this is the time from the end of the FP period to the negative edge of the trigger pulse (see Figure 1-1). To enter the trigger delay time, press TRIG DELAY, enter the trigger delay time (in microseconds) by using the data keys, then press (μs).

   If you do not know the trigger delay time, you can use P vs T BURST to adjust the trigger delay time. You should complete the rest of the procedures in this section and then refer to "To view the FP or PP burst" in Chapter 2 for more information.

5 Press More 1 of 2.

6 If the input signal is a burst carrier, ensure that BURST is underlined in the BURST CONT softkey label. If necessary, press BURST CONT so that BURST is underlined. If the input signal is a continuous carrier, press BURST CONT so that CONT is underlined.

Pressing Config accesses the configuration softkeys. The DECT measurements personality uses the settings of the configuration softkeys when performing the measurements, you therefore need to set the configuration softkeys whenever you initially test a transmitter or change your test equipment. The settings for the configuration softkeys are retained until you change them; pressing (PRESET) or turning the spectrum analyzer off does not change the settings of the configuration softkeys.

Some measurements may not work if a configuration function is set incorrectly. For example, you need to set the trigger delay time and the trigger polarity to perform the power versus time measurements, the frequency and modulation measurements, or use time-gating (GATE ON OFF) with the adjacent channel power due to modulation measurement.

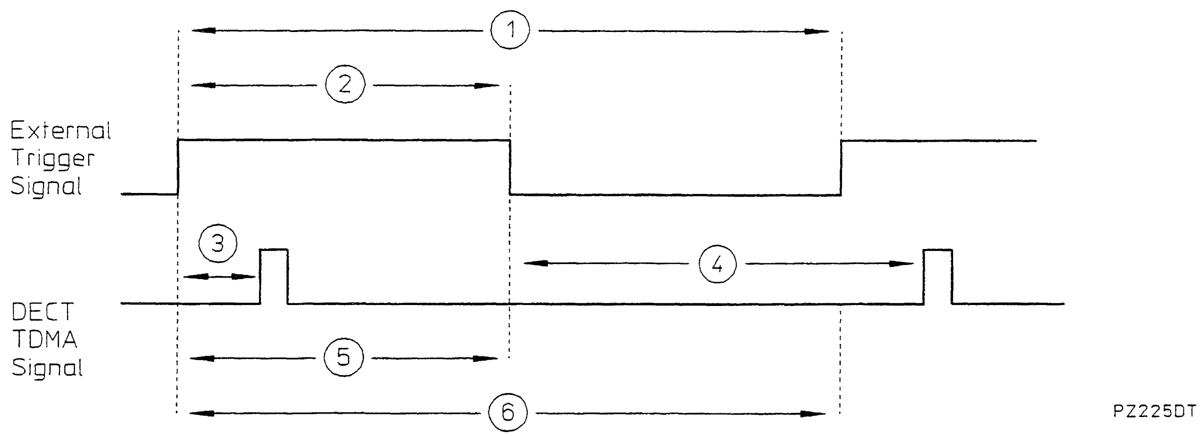


Figure 1-1. Relationship Between the External Trigger and the DECT Frame

Table 1-1.

Number	Description
1	The measurements personality assumes a 100 Hz 1:1 mark space ratio frame trigger, where the rising edge of the frame trigger corresponds with the turn on of time slot zero.
2	The external trigger signal.
3	The trigger delay time if TRIG POL POS NEG is set to POS.
4	The trigger delay time if TRIG POL POS NEG is set to NEG.
5	The fixed part transmission time.
6	A DECT frame. A frame is 10 ms long.

Step 6. Select a channel to test

1 Connect the RF signal from the transmitter to the spectrum analyzer input.

2 If `Physical Channel` is not displayed, you need to access the main menu of the DECT measurements personality by pressing (MODE), `DECT ANALYZER`.

3 Press `Physical Channel`.

4 Select whether the fixed part (FP) or portable part (PP) is to be tested. If you are testing a FP, press `TRANSMIT FP PP` so that FP is underlined. If you are testing a PP, press `TRANSMIT FP PP` so that PP is underlined.

5 Select the channel to test.

- If you know the channel number, press `CHANNEL NUMBER`, enter the channel number using the data keys, then press (ENTER).
- If you want the spectrum analyzer to find and select the channel with the highest signal level, press `AUTO CHANNEL`.
- If you wish to tune to a specific frequency, press `CH X CTR FREQ`, enter the frequency (in MHz), then press (MHz). The channel number will be set to X automatically.

6 Press `Main Menu`. You are ready to perform the measurements that are described in Chapter 2.

The functions accessed by `Physical Channel` allow you to select the source of transmission (FP or PP), and the channel or frequency that you want tested.

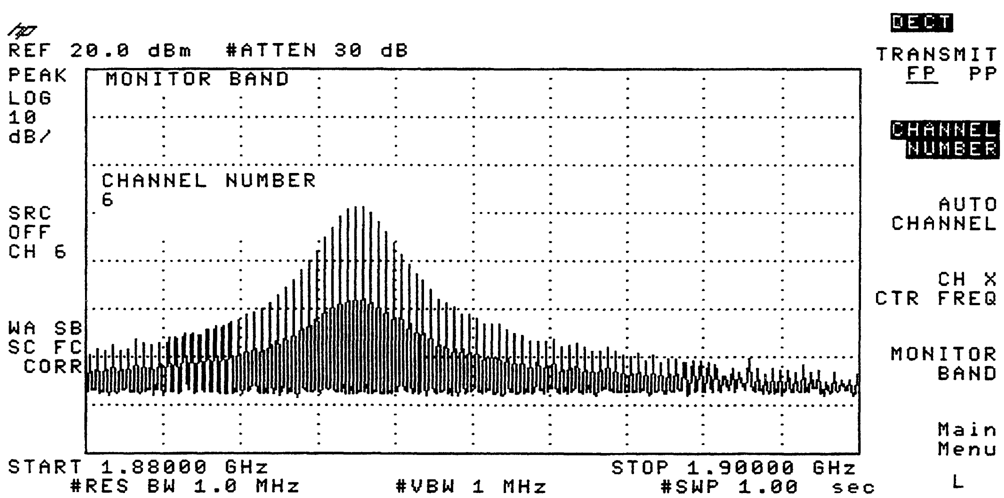


Figure 1-2. Selecting Channel 1

Notice that the channel number is displayed on the left side of the spectrum analyzer display.

Preparing to Use the DECT Source

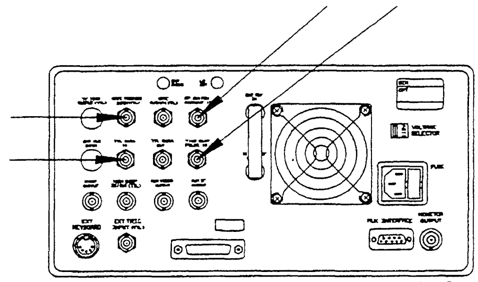
This section explains the steps that are necessary to prepare the DECT Source as a stimulus for sub-assembly testing or for the testing of fixed parts (FP) or portable parts (PP). The steps are as follows:

1. Complete steps 1 through 4 in the previous section, "Preparing to make a measurement".
2. Perform the DECT Source self-calibration routine.
3. Configuring the DECT Source for stand-alone applications.

Step 2. Perform the DECT Source self-calibration routine

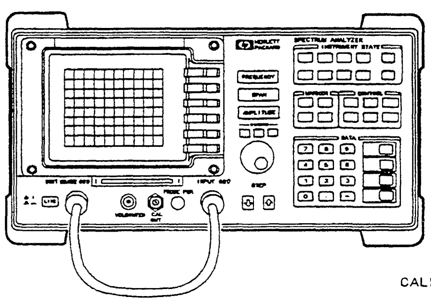
To meet the specifications and characteristics, the spectrum analyzer must be allowed to warm up for at least 30 minutes before performing this self-calibration routine. The spectrum analyzer self-calibration routine must also be carried out prior to this routine. (Refer to “Step 2. Perform the spectrum analyzers self-calibration routines” within this chapter.)

1 Ensure that there is nothing connected to the GATE TRIGGER INPUT, TTL DATA IN, TIMESLOT PULSE IN and RF SWITCH CURRENT IN connectors on the spectrum analyzer rear panel.



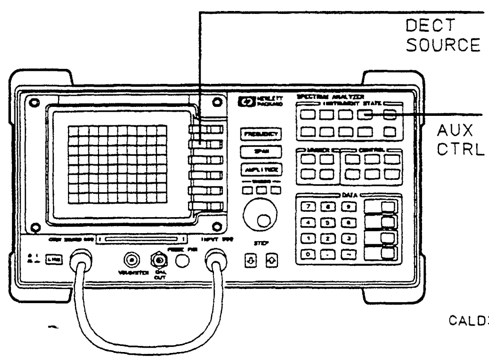
CALD1

2 Attach the calibration cable from the DECT SOURCE 50 Ω connector to the INPUT 50 Ω connector.



CALD2

3 Press (AUX CTRL), DECT SOURCE to access the DECT Source menu.



CALD3

4 Press More 1 of 2 then DECT SRC CAL. Once you have verified that the rear panel connectors have been removed press CONTINUE CAL.

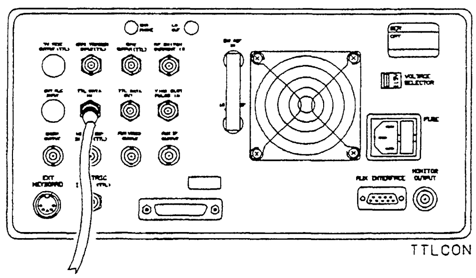
5 The DECT Source calibration routine takes approximately 1.5 minutes to complete. `DECT Source cal done` is displayed when the calibration routine is finished.

Step 3. Configuring the DECT Source for standalone applications

1 Connect a TTL data signal to the TTL DATA IN connector on the rear panel of the spectrum analyzer. This data is filtered using a 0.5 GFSK filter in the DECT Source.

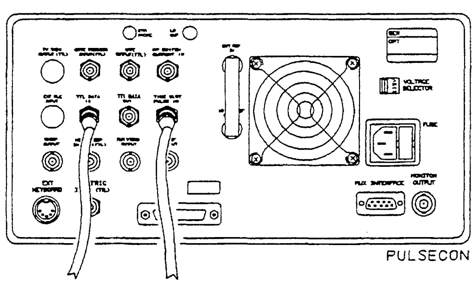
If you apply a logic level of one to this connector it causes a positive frequency deviation of the DECT carrier. A logic level of zero causes a negative frequency deviation of the DECT carrier. The maximum frequency deviation is set internally to 288 kHz.

The TTL signal can be either continuous or bursted data. For bursted data the number of ones and zeroes entered should be approximately equal and for continuous entry, the ones and zeroes must be approximately equal for similar time periods, of 0.5ms for example. For both bursted and continuous data you should avoid applying an input of more than 16 continuous ones or zeros.


TTLCON

2 Connect a TTL signal to the TIMESLOT PULSE IN connector on the rear panel of the spectrum analyzer.

If you apply a logic level of one to this connector it will turn the DECT Source RF switch on, a logic level of zero will turn the DECT Source RF switch off. If no connections are made to this input the RF switch defaults to the on state.


PULSECON

If the TTL IN connector is being supplied with continuous data a timeslot pulse is optional.

If the TTL IN connector is being supplied with bursted data you *must* provide a timeslot pulse.

Note If you do not provide a timeslot pulse erroneous frequency modulation results. Refer to Figure 1-3 for the recommended timing relationship between the bursted data and the timeslot pulse.

3 The spectrum analyzer TTL DATA OUT connector supplies demodulated data from the spectrum analyzer receiver path. This line can drive a standard TTL/CMOS load as well as driving a 75 Ω load with a 2 V p-p signal. This data is available regardless of the measurement being made assuming the spectrum analyzer is tuned to a DECT signal in zero span. Noise is present on the TTL DATA OUT connector between data bursts, therefore care should be taken when using the demodulated data.

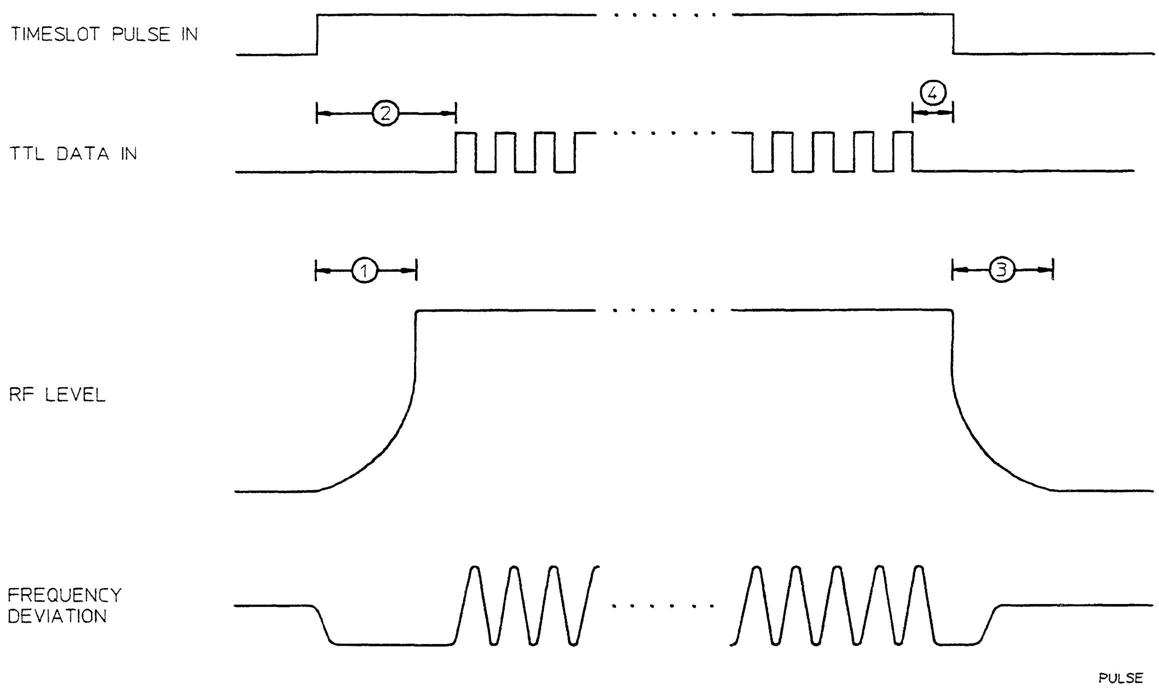


Figure 1-3.
Relationship Between TIMESLOT PULSE IN, TTL DATA IN, the RF Output Level and the Frequency Deviation

Table 1-2.

Number	Description
1	RF Output Level Risetime. Typically 5 μs.
2	Timeslot pulse timing advance. The TIMESLOT PULSE IN line should be taken high between 5 μs and 10 μs before the data burst.
3	RF Output Level Falltime. Typically 5 μs.
4	Timeslot pulse timing delay. The TIMESLOT PULSE IN line should be taken low after the data burst is complete. Typically this delay should be between 1 μs and 5 μs.

Accessing the Spectrum Analyzer Functions (Optional)

The menus of the DECT measurements personality provide the softkeys that are normally needed for making DECT measurements. You may want to use some spectrum analyzer functions without leaving the DECT measurements personality, or you may want to exit the personality. This section contains the procedures for the following:

- Access the spectrum analyzer functions while you are using the DECT measurements personality.
- Access the spectrum analyzer mode.

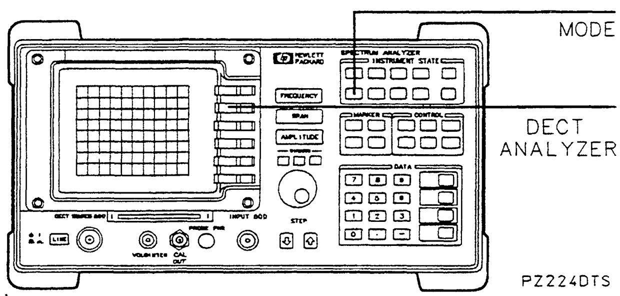
To access the spectrum analyzer functions while using the DECT measurements personality mode

1 To use a spectrum analyzer function without leaving the DECT measurements personality, just press the front-panel key, and then the softkey. For example, to use the marker normal function, press (MKR), then press MARKER NORMAL.

2 To return to a DECT measurements personality menu, you can do either of the following:

- To return to the DECT measurements personality menu that was displayed before the spectrum analyzer front-panel key was pressed, press (MODE), (MODE) (press the (MODE) key twice).
- To return to the main menu of the DECT measurements personality, press (MODE), DECT ANALYZER.

Some spectrum analyzer front-panel keys can provide useful, supplemental functions for DECT measurements, and most spectrum analyzer functions can be used while using the DECT measurements personality. Refer to "Changes to the Spectrum Analyzer Functions During DECT Operation" in Chapter 7 for the list of the functions that cannot be used while in the DECT measurements personality.



To access the spectrum analyzer mode

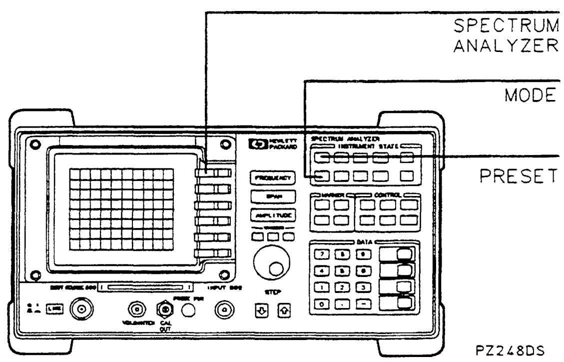
- Press (PRESET). (PRESET) changes all of the DECT measurements personality functions back to their default values, except for the functions in the configuration menu, TRANSMIT FP PP and Demod .

or,

- Press (MODE), then SPECTRUM ANALYZER . Unlike (PRESET), selecting SPECTRUM ANALYZER does not change any of the DECT measurements personality softkey settings.

When you press SPECTRUM ANALYZER or (PRESET), the spectrum analyzer will exit the DECT measurements personality and use the spectrum analyzer mode instead. When the spectrum analyzer is in the spectrum analyzer mode, DECT is no longer displayed in the upper right corner of the spectrum analyzer display.

The DECT measurements personality can be reaccessed by pressing (MODE), then DECT ANALYZER .



2

Making a Measurement and Using the DECT Source

This chapter demonstrates how to make measurements with the DECT measurements personality. It also contains procedures on how to use the HP 8590E Option 012, DECT Source. This chapter contains procedures for performing the following:

- Measuring carrier power, and the adjacent channel power.
- Measuring the amplitude and timing of a FP or PP transmission.
- Measuring the frequency error and frequency deviation of a carrier.
- Measuring the spurious emissions from a transmitter and measuring the intermodulation products produced by two transmitters.
- Using the DECT Source.

Note

1. Before you begin any of the measurements, you need to do the following:
   a. Perform the procedures in "Preparing to Make a Measurement" in Chapter 1.
   b. Connect the RF signal from the transmitter to the spectrum analyzer input.
2. Before you begin to use the DECT Source you must perform the necessary procedures in "Preparing to Use the DECT Source" in Chapter 1.

Once a measurement has been completed, many of the measurements access the "post-measurement" menu. The post-measurement menu contains functions that allow you to repeat the previous measurement or change various testing parameters. For more information about the post-measurement softkeys, refer to "The Post-Measurement Menu" in Chapter 6.

Measuring Power

To make a power measurement, you use the functions that are accessed by pressing Power. This section contains the procedures for performing the following measurements:

- Carrier power.
- Adjacent channel power due to switching transients.
- Adjacent channel power due to modulation.

Note

Except for using time-gating (GATE ON OFF is set to ON) during the adjacent channel power due to modulation measurement, an external trigger is not required for any of the power measurements. Refer to "To measure the adjacent channel power due to modulation" for more information about time-gating.

To measure the carrier power

1 Ensure that the channel number selection agrees with the transmitter's RF output. Refer to "Step 6. Select a channel to test" in Chapter 1 for more information.

2 Press Power. (If Power is not displayed, press (MODE), DECT ANALYZER to access Power).

3 Ensure that the transmitter's RF output power on the unit under test is set to the normal power setting.

4 Press CARRIER POWER. The personality will measure the mean carrier power, compare the result against the normal power level limits for a carrier, and then display the results.

5 If you want to measure the power again for a carrier then press REPEAT MEAS. The personality will remeasure the mean carrier power level.

6 If you want to select the number of sweeps the spectrum analyzer measures, from the main menu press Config, More 1 of 2, NUMBER BURSTS. Using the data keys, enter the number of bursts to be measured, and then press (ENTER). After the measurement has been completed, the number of bursts used for the measurement is displayed on the left side of the spectrum analyzer display.

CARRIER POWER measures the mean carrier power, compares it to the limits for a normal power carrier, and then displays the results.

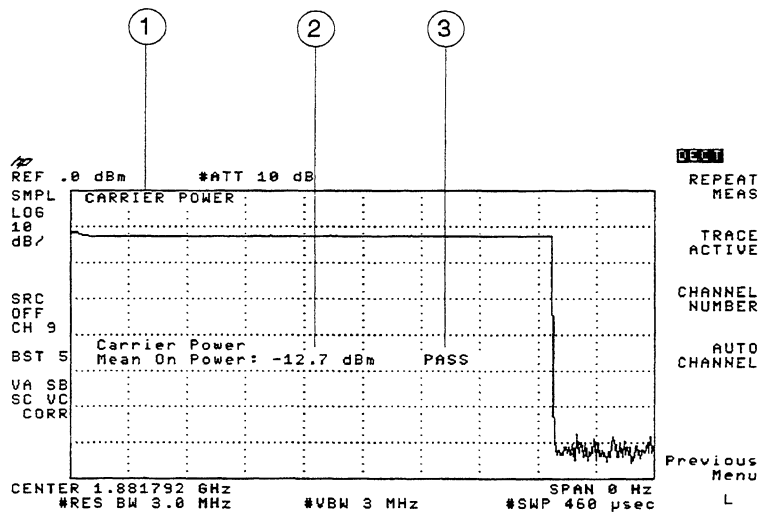


Figure 2-1. Carrier Power Measurement

① Indicates carrier power test.

② Indicates the mean carrier power. The mean carrier power level is measured between the −3 dB points referenced from the peak of the carrier signal. The mean carrier power is measured over several bursts.

③ Indicates if the transmitter's power level is within the power level limits. If the carrier power is less than 24 dBm, PASS is displayed on the analyzer screen. If the carrier power is outwith the level limits, FAIL is displayed on the analyzer screen.

To measure the adjacent channel power due to switching transients

1. Ensure that the channel number selection agrees with the transmitter's RF output. Refer to "Step 6. Select a channel to test" in Chapter 1 for more information.
2. If ADJ CHAN TRNS PWR is not displayed, press Power. (If Power is not displayed, press (MODE), DECT ANALYZER to access Power).
3. Press ADJ CHAN TRNS PWR. The personality will measure the power in the adjacent channels and display the results.

ADJ CHAN TRNS PWR measures the power that "leaks" from the transmitted channel due to the effect of all modulation products (including AM components due to the switching on or off of the modulated RF carrier). This uses a peak search to measure the power on each channel with a 1 MHz span and a 100 kHz bandwidth. The power of the transmit channel is not measured. The peak detector is used to ensure that the RF spectrum is captured during the burst.

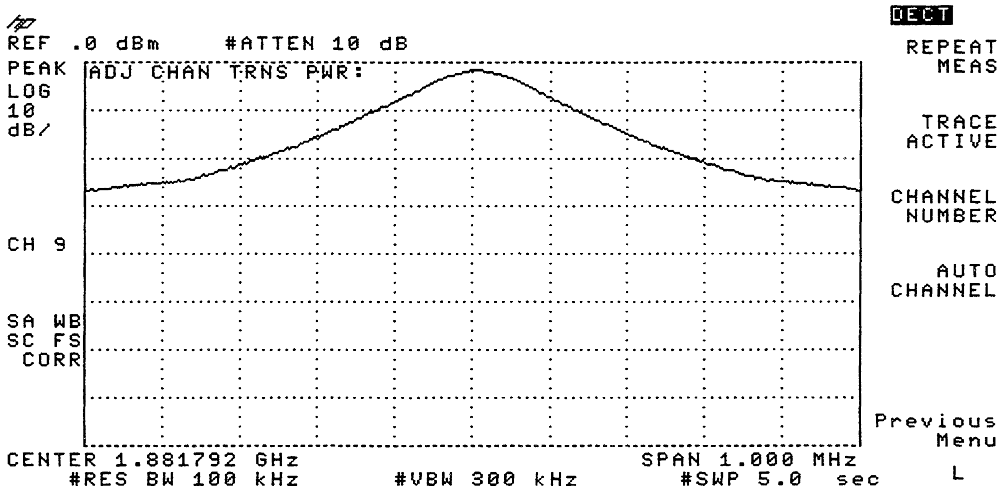


Figure 2-2. A DECT Carrier with Switching Transients

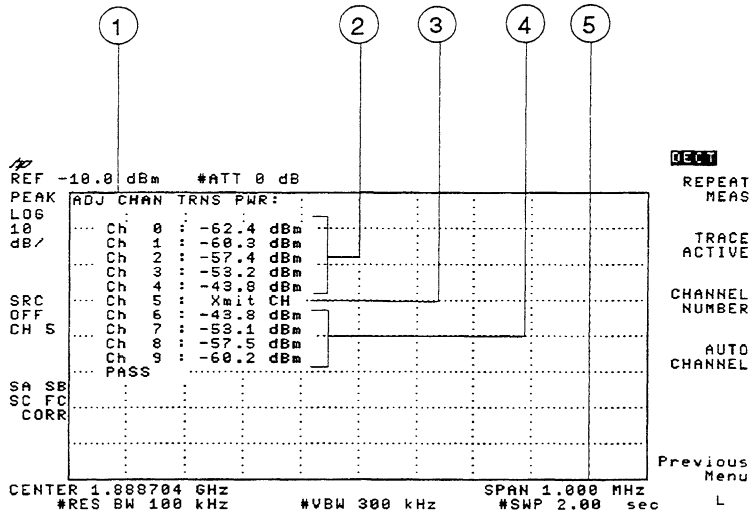


Figure 2-3.
The Adjacent Channel Power due to Switching Transients Measurement Results

① Indicates that it is the adjacent channel power due to switching transients test.
② Indicates the measured power level in the lower adjacent channels.
③ Indicates the transmit channel.
④ Indicates the measured power level in the upper adjacent channels.
⑤ Indicates the region (the 1 MHz span) where the adjacent channel power due to switching transients is measured.

Table 2-1 lists the limits for the adjacent channel power due to switching transients measurement. Where TC is the equipment under test transmit channel and X is a legal DECT channel other than the transmit channel of the equipment under test.

Table 2-1.

Emissions on RF channel "X"	maximum peak power level
X=TC ± 1	−6 dBm
X=TC ± 2	−14 dBm
X=TC ± 3	−24 dBm
X=any other DECT channel	−30 dBm

To measure the adjacent channel power due to modulation

1 Ensure that the channel number selection agrees with the transmitter's RF output. Refer to "Step 6. Select a channel to test" in Chapter 1 for more information.

2 If ADJ CHAN MOD PWR is not displayed, press Power. (If Power is not displayed, press (MODE), DECT ANALYZER to access Power).

3 Press ADJ CHAN MOD PWR. The personality will measure the power in the adjacent channels and display the results.

4 You can use time-gating if you want to exclude switching transients and measure only the adjacent channel power due to modulation. The adjacent channel power due to modulation softkey automatically selects the time gate. (Because you need to use external triggering to use time-gating, ensure that the selection for TRANSMIT FP PP, TRIG POL NEG POS, and TRIG DELAY are correct. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.)

When you no longer want time-gating, in the post measurement menu press GATE ON OFF until OFF is underlined and then press REPEAT MEAS.

5 Press Previous Menu if you are finished with the adjacent channel power measurement, or use one of the post-measurement functions.

ADJ CHAN MOD PWR measures the power that "leaks" from the transmitted channel due to the effect of modulation. The personality uses the spectrum analyzer's positive peak detector and a 1 MHz integration bandwidth to measure the power in the adjacent channels relative to the transmitting channel. The peak detector is used to ensure that the RF spectrum is captured during the burst. The increased amplitude that results from using the positive-peak detector (versus a sample detector) is automatically subtracted out of the displayed result.

Refer to Figure 2-5 and Figure 2-6 for examples of a time gated signal.

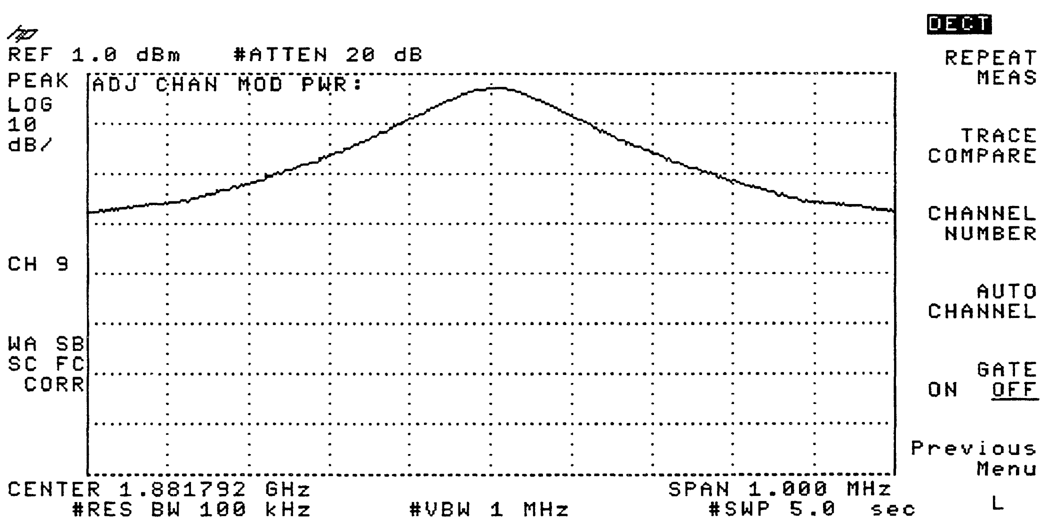


Figure 2-4. A DECT Carrier with Switching Transients (Time-Gating is Not Used)

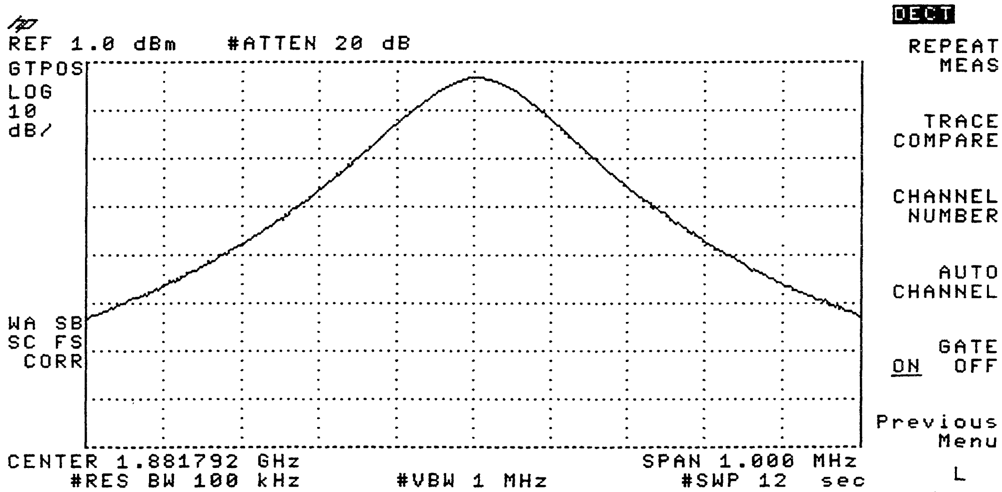


Figure 2-5. A DECT Carrier without Switching Transients (Time-Gating is Used)

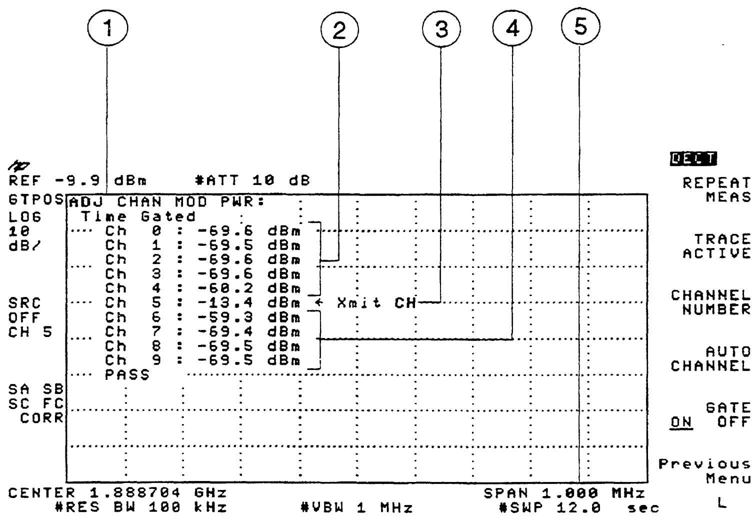


Figure 2-6. The Adjacent Channel Power Measurement Results (Time-Gating is Used)

① Indicates that it is the adjacent channel power due to modulation test and time gating was used.
② Indicates the measured power level in the lower adjacent channels.
③ Indicates the transmit channel.
④ Indicates the measured power level in the upper adjacent channels.
⑤ Indicates the region (the 1MHz bandwidth) where the adjacent channel power due to modulation is measured.

Note

The adjacent channel power measurement due to modulation is a summation of the total power in the band. Switching the time-gating off in the adjacent channel power due to modulation test will sum the power in the band due to all modulation products (including AM components due to the switching on or off of the modulated RF carrier).

Table 2-2 lists the limits for the adjacent channel power due to modulation measurement. Where TC is the equipment under test transmit channel and X is a legal DECT channel other than the transmit channel of the equipment under test.

Table 2-2.

Emissions on RF channel "X"	maximum peak power level
X=TC ± 1	−8 dBm
X=TC ± 2	−30 dBm
X=any other DECT channel	−47 dBm

Measuring the Amplitude and Timing of a FP or PP Transmission

The power versus time measurement analyzes the amplitude profile and timing of the burst FP or PP transmission. The personality uses the setting of TRANSMIT FP PP to determine which transmission (FP or PP) to measure.

This section contains the following procedures:

- Setup a power versus time measurement.
- View a frame.
- View the FP or PP burst.
- Measure the rising edge, falling edge and on time of a burst.

Note

An external frame trigger signal is required for all the power versus time measurements. If you have trouble performing any of the power versus time measurements, you should ensure that the selection for TRANSMIT FP PP, TRIG POL NEG POS, and TRIG DELAY are correct. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.

To setup a power versus time measurement

1 Ensure that the channel number selection agrees with the transmitter's RF output. Refer to "Step 6. Select a channel to test" in Chapter 1 for more information.

2 Press Power vs Time. (If Power vs Time is not displayed, press (MODE), DECT ANALYZER to access Power vs Time).

3 If you want to obtain a trace that is an average of the trace data over the number of bursts, press More 1 of 2, then MEASURE AVG PKS until AVG is underlined. If you want to obtain a trace containing the maximum trace peaks and a trace containing the minimum trace peaks (over the number of bursts), press MEASURE AVG PKS until PKS is underlined.

Averaging (MEASURE AVG PKS is set to AVG) applies only if the number of bursts is set to more than 1.

4 If you want to select the total amplitude range that is displayed, press RANGE dB 70 110. To select an amplitude range of 10 dB per division press RANGE dB 70 110 until 70 is underlined. To select an amplitude range of 15 dB per division press RANGE dB 70 110 until 110 is underlined.

5 If you want to select the number of sweeps the spectrum analyzer measures, from the main menu press Config, More 1 of 2, NUMBER BURSTS. Using the data keys, enter the number of measurement sweeps (each sweep measures a burst) to be measured, and then press (ENTER). After the measurement has been completed, the number of bursts used for the measurement is displayed on the left side of the spectrum analyzer display.

Refer to Figure 2-7 for an example of the trace results of averaging five bursts. Refer to Figure 2-8 for an example of the trace results of the maximum and minimum peaks of five bursts.

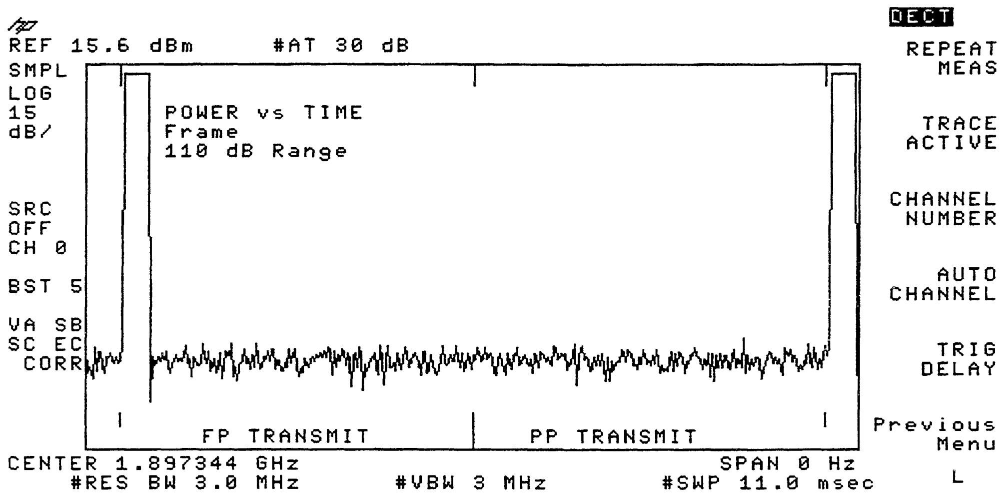


Figure 2-7. Measuring the Average of Five Bursts

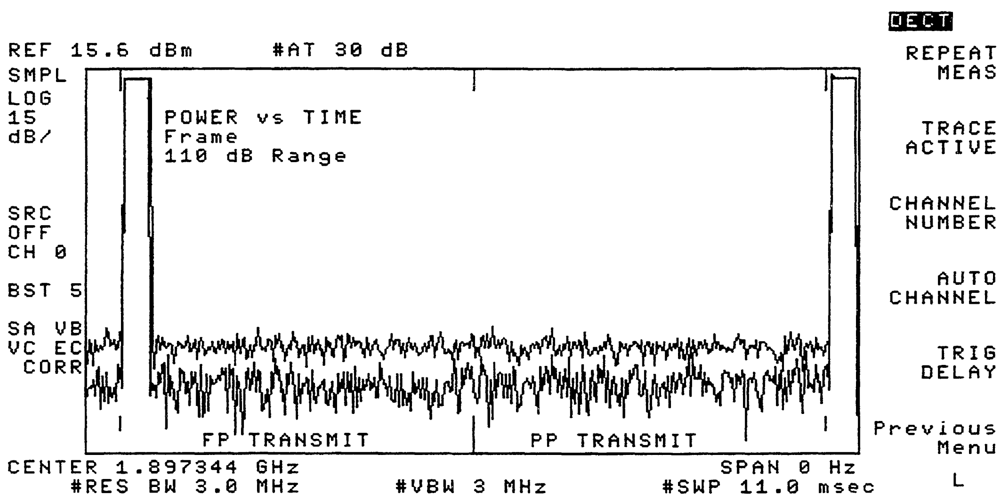


Figure 2-8. Measuring the Maximum and Minimum Peaks of Five Bursts

To view the frame

1 Ensure that the channel number selection agrees with the transmitter's RF output. Refer to "Step 6. Select a channel to test" in Chapter 1 for more information.

2 If P vs T FRAME is not displayed, press Power vs Time. (If Power vs Time is not displayed, press (MODE), DECT ANALYZER to access Power vs Time).

3 Press P vs T FRAME. If a trace is not displayed on the screen, the spectrum analyzer may not be triggering correctly. Refer to "Step 5. Configure the personality for your test setup" in Chapter 1 for more information about setting the trigger time delay and trigger polarity.

4 If the edges of the burst are not where you should expect them (see number 1 in Figure 2-9 for an example of the start of the frame), press TRIG DELAY, then use the large knob on the spectrum analyzer's front panel to adjust the trigger delay until the start of the burst is aligned with the small vertical line on the spectrum analyzer display.

5 Press Previous Menu if you are finished with the P vs T FRAME measurement, or use one of the post-measurement functions.

P vs T FRAME displays one time frame (one time frame is the time period in which both the FP and PP transmissions occur). The results from P vs T FRAME can help you to check your test setup for problems, but for more accurate measurements you should use P vs T RISING, P vs T FALLING or P vs T BST ON. Refer to Figure 2-9 for an example of viewing a frame.

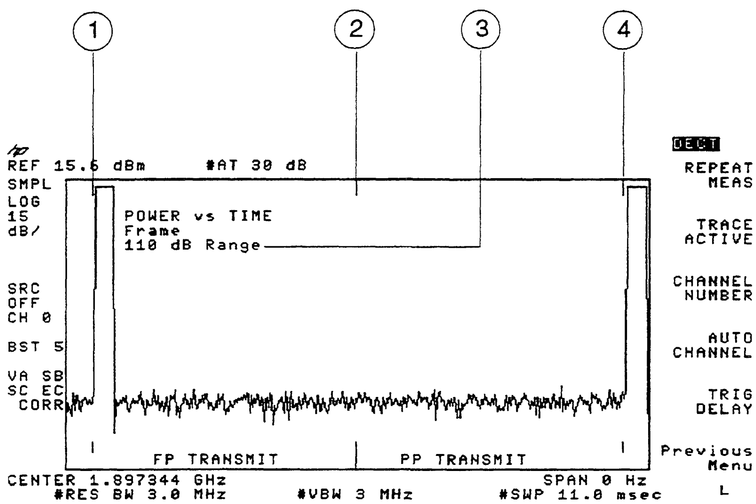


Figure 2-9. Viewing a Frame

① Indicates the start and the transmit part of the frame.
② Indicates the start of the receive portion of the time frame. You must use TRANSMIT FP PP to select the correct timing for the power versus time measurements.
③ The selected display range (either 70 dB or 110 dB).
④ Indicates where the start of the next frame should occur.

To view the FP or PP burst

1 If P vs T BURST is not displayed, press Power vs Time. (If Power vs Time is not displayed, press (MODE), DECT ANALYZER to access Power vs Time).

2 Press P vs T BURST to display the FP or PP transmission burst.

3 If the burst is not symmetrical with respect to the limit lines, press TRIG DELAY, then use the large knob on the spectrum analyzer's front panel to adjust the trigger delay until the burst is symmetrical with the limit lines. Or, if you know the actual trigger time delay, you can enter the time delay by pressing TRIG DELAY, entering the number with the data keys, and then pressing (μs). (The trigger delay time is usually a negative number.)

4 Press Previous Menu if you are finished with the P vs T BURST measurement, or use one of the post-measurement functions.

P vs T BURST measures the burst and compares it with the minimum and maximum limit lines for a burst. The results from P vs T Burst can help you check your test setup, but for more accurate measurements of the burst transitions, you should use P vs T RISING, P vs T FALLING or P vs T BST ON. Refer to Figure 2-10 for an example of measuring a burst.

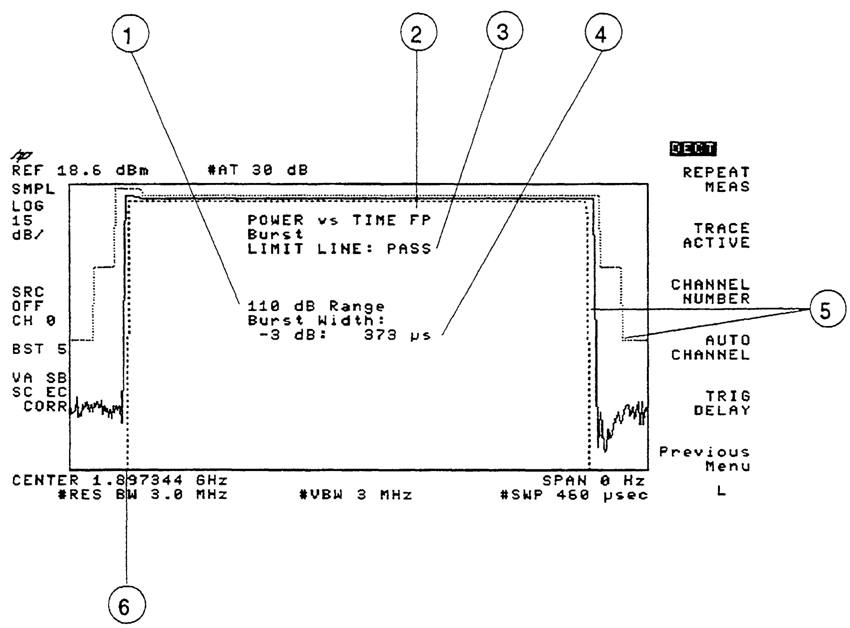


Figure 2-10. Measure a Burst

① The selected display range (70 dB or 110 dB).
② Indicates which transmission (FP or PP) is displayed.
③ Indicates if the burst crossed the limit lines. If the burst is within the limit lines, PASS is displayed on the analyzer screen. If the burst is outwith the limit lines, FAIL is displayed on the analyzer screen.
④ Indicates the width of the burst waveform. The burst width is measured −3 dB from the burst peak.

⑤ The limit lines. The limit lines indicate the power vs time template as defined in the ETSI RES DECT approval test specification. These limit lines are the minimum and maximum limit lines for a burst.

⑥ Indicates where the start for a FP transmission should occur. This position is also the reference position for external triggering when the trigger polarity is positive and the trigger delay is equal to 0.

To measure the rising edge, falling edge and on time of a burst

1 Press Power vs Time . (If Power vs Time is not displayed, press (MODE), DECT ANALYZER to access Power vs Time).

2 If necessary, use P vs T BURST to ensure that the burst is symmetrical with respect to the limit lines. Refer to the previous procedure "To view the FP or PP burst" for more information.

3 Measure the rising edge, falling edge or on time of a burst. To measure the rising edge, press P vs T RISING . To measure the falling edge, press P vs T FALLING . To measure the on time of a burst, press More 1 of 2 , P vs T BST ON . The personality will measure the rise time, fall time or on time and settling time, and then display the result. The waveform will also be compared to the minimum and maximum burst limit lines.

4 Press Previous Menu if you are finished with the measurement, or use one of the post-measurement functions.

P vs T RISING allows you to view the rising edge of a burst. Refer to Figure 2-11 for an example of measuring the rising edge of a burst.

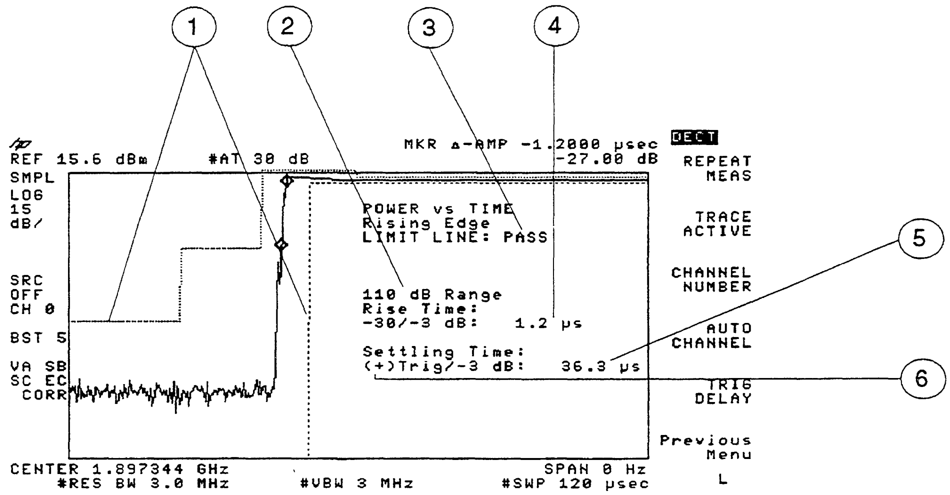


Figure 2-11. Measuring the Rising Edge of a Burst

① The limit lines. The limit lines indicate the minimum and maximum rising edge for the burst.
② The selected display range (70 dB or 110 dB).
③ Indicates if the rising edge of the burst crossed the limit lines. If the burst is within the limit lines, PASS is displayed on the analyzer screen. If the burst is outwith the limit lines, FAIL is displayed on the analyzer screen.
④ Indicates the rise time. Rise time is the time it takes for the signal's amplitude to transition from −30 dB to −3 dB (referenced to the mean carrier power).
⑤ Indicates the settling time. Settling time is the time it takes for the signal's amplitude to reach −3 dB *after* the trigger.
⑥ Indicates the triggering polarity. A " + " indicates positive triggering, a "-" indicates negative triggering. The triggering polarity is determined by TRIG POL NEG POS .

P vs T FALLING allows you to view the falling edge of a burst. Refer to Figure 2-12 for an example of measuring the falling edge of a burst.

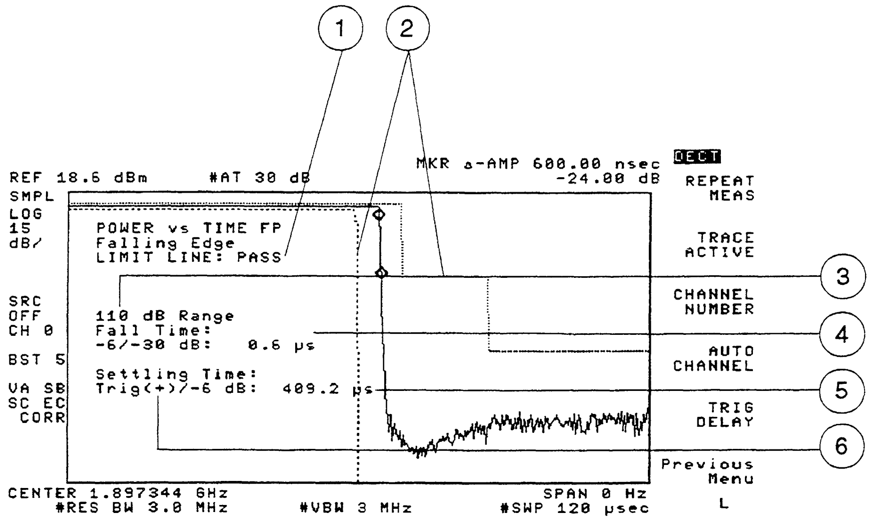


Figure 2-12. Measuring the Falling Edge of a Burst

① Indicates if the falling edge of the burst crossed the limit lines. If the burst is within the limit lines, PASS is displayed on the analyzer screen. If the burst falls outwith the limit lines, FAIL is displayed on the analyzer screen.
② The limit lines. The limit lines indicate the minimum and maximum falling edge for the burst.
③ The selected display range (70 dB or 110 dB).
④ Indicates the fall time. Fall time is the time it takes for the signal's amplitude to transition from −6 dB to −30 dB (referenced to the mean carrier power).
⑤ Indicates the settling time. Settling time is the time it takes for the signal's amplitude to reach −6 dB *after* the trigger.
⑥ Indicates the triggering polarity. A "+" indicates positive triggering, a "-" indicates negative triggering. The triggering polarity is determined by TRIG POL NEG POS .

P vs T BST ON allows you to view the on time of a burst. Refer to Figure 2-13 for an example of measuring the on time of a burst.

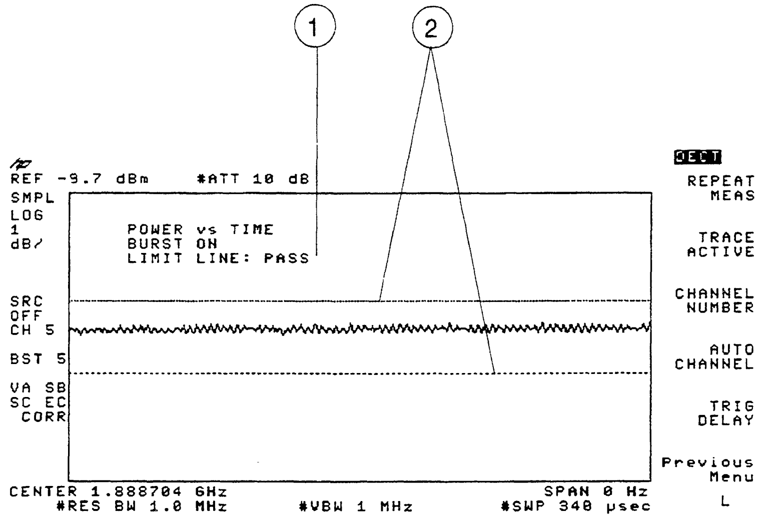


Figure 2-13. Measuring the On Time of a Burst

① Indicates if the on time of the burst crossed the limit lines. If the burst is within the limit lines, PASS is displayed on the analyzer screen. If the burst falls outwith the limit lines, FAIL is displayed on the analyzer screen.

② The limit lines. The limit lines indicate the minimum and maximum amplitude for the on time of the burst.

Measuring the Frequency Error and Frequency Deviation

To measure the frequency error and the frequency deviation of a carrier, you use the functions that are accessed by pressing Freq & Modulat .

This section contains the following procedures for performing the frequency and deviation measurement with Option 112 (the DECT demodulator card):

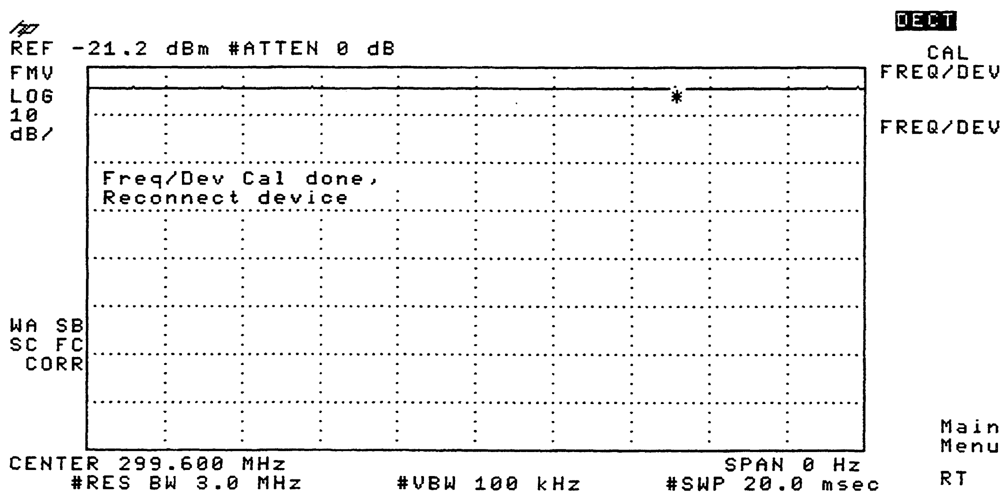
- Perform the frequency and modulation calibration.
- Measure the frequency deviation. An external frame trigger signal is required when using Option 112 to measure the frequency deviation of a burst carrier. (Remember that for a burst carrier, BURST CONT should be set to BURST.)

To perform the frequency and deviation calibration Option 112 only

1. Press Freq & Modulat . (If Freq & Modulat is not displayed, press (MODE), DECT ANALYZER to access Freq & Modulat .)
2. Press CAL FREQ/DEV .
3. Connect a cable between the spectrum analyzer CAL OUT connector and the spectrum analyzer INPUT connector with the appropriate adapters.
4. Press CONTINUE CAL .
5. When the calibration routine is finished, reconnect the carrier signal to the spectrum analyzer input.

CAL FREQ/DEV performs the calibration routines that are specific to Option 112. When using FREQ/DEV , you should perform this calibration routine every 30 minutes or with a change in ambient temperature for best accuracy. You can perform this calibration every 24 hours if less accuracy is acceptable.

When the calibration routine has finished, `Freq/Dev Cal done, Reconnect device` is displayed.



To measure the frequency and deviation with an Option 112

1 Ensure that the channel number selection and the FP or PP selection (TRANSMIT FP PP) agree with the transmitter's RF output. Refer to "Step 6. Select a channel to test" in Chapter 1 for more information.

2 If FREQ/DEV is not displayed, press Freq & Modulat. (If Freq & Modulat is not displayed, press (MODE), DECT ANALYZER to access Freq & Modulat.)

3 Perform the frequency and deviation calibration routine, if necessary. Refer to the previous procedure, "To perform the frequency and deviation calibration" for more information.

4 Press FREQ/DEV. The personality measures and displays the results of the median frequency error, and peak frequency deviation. If a trace is not displayed on the screen, the spectrum analyzer may not be triggering correctly. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information about setting the trigger time delay and trigger polarity.

FREQ/DEV uses Option 112 to demodulate the carrier and display the carrier in the frequency modulation (FM) detection mode. Because the spectrum analyzer is in the FM detection mode (denoted by "FMV" in the upper left corner of the spectrum analyzer display) the horizontal center line of the spectrum analyzer display indicates the nominal carrier frequency (zero deviation). Excursions above the line indicate positive deviations. Excursions below the line indicate negative deviations.

FREQ/DEV performs the median frequency error and peak frequency deviation measurements as follows:

- The median frequency error is the difference between the zero deviation line and the mid point between the maximum and minimum frequency deviation. The median frequency error measurement is an average of several measurements made across a burst. The number of measurements made is dependent on the packet type selected.
- The peak deviation is one-half the total difference between the maximum and minimum deviation. The peak deviation measurement is an average of several measurements made across a burst. The number of measurements made is dependent on the packet type selected.

Note If you inspect the start and end of a burst using TRACE ACTIVE and TRIG DELAY you will see noise. This is due to Option 112 DECT demodulator, and is not part of the DECT signal.

Refer to Figure 2-14 for an example of a frequency and deviation measurement.

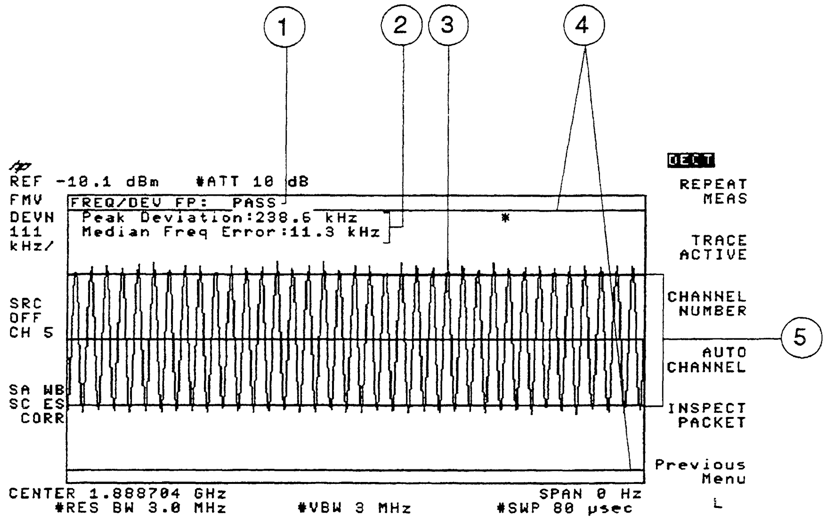


Figure 2-14. Results of FREQ/DEV, with VIEW PKS LAST Set to LAST

① Indicates if the frequency and deviation measurements were within the limits.
② The measurement results.
③ The waveform of the first 80 μs of the demodulated signal.
④ The upper frequency deviation limit lines. These will be at 403 kHz.
⑤ The lower frequency deviation limit lines. These will be at either 202 kHz or 259 kHz depending on what you selected in the frequency and modulation menu.

Measuring the Spurious Emissions and Intermodulation Attenuation

Spurs & Intermod accesses the functions that allow you to measure any spurious emissions from the transmitter as well as measure the intermodulation attenuation of the transmitter. The spurious emissions measurement determines if the transmitter is producing signals at frequencies other than the carrier frequency. The intermodulation attenuation measurement measures the level of intermodulation products generated by the transmitter. Intermodulation products are caused by the interaction of the carrier and an interfering signal in the nonlinear elements of the transmitter.

To measure the spurious emissions or intermodulation attenuation, you use the functions that are accessed by pressing Spurs & Intermod.

This section contains the following procedures:

- Setup the spurious emission testing parameters.
- Measure for spurious emissions.
- Measure a specific spurious emission.
- Measure the intermodulation attenuation.

Note

An external trigger signal is not required when measuring the spurious emissions.

An external trigger signal is required when measuring the intermodulation attenuation.

To setup the testing parameters for a spurious emissions measurement

1. Press Spurs & Intermod . (If Spurs & Intermod is not displayed, press (MODE), DECT ANALYZER to access Spurs & Intermod .)
2. Press Spurious Setup to access the setup menu for the spurious measurements.
3. If you want to change the frequency range over which spurious emissions will be measured:
   - Press MINIMUM FREQ , enter the start frequency using the data keys, then press the key for the appropriate frequency unit (for example, press (MHz) for the MHz frequency unit).
   - Press MAXIMUM FREQ , enter the stop frequency using the data keys, then press the key for the appropriate frequency unit (for example, press (MHz) for the MHz frequency unit).

   If you do not specify the frequency range, a default frequency range is used.
4. To test a transmitter in the active state (the active state is when the transmitter is transmitting a carrier), press XCVR IDLE ACT until ACT is underlined. To test a transmitter in the idle state (the transmitter is not transmitting a carrier), press XCVR IDLE ACT until IDLE is underlined.
5. Press Previous Menu when you are finished with the spurious emissions setup functions.

To measure for spurious emissions

1. Ensure the state of the transmitter agrees with the setting for XCVR IDLE ACT. Refer to the previous procedure, "To setup the testing parameters for a spurious emissions measurement" for more information.
2. If SPURIOUS is not displayed, press Spurs & Intermod. (If Spurs & Intermod is not displayed, press (MODE), DECT ANALYZER to access Spurs & Intermod.)
3. Press SPURIOUS. The personality will begin the spurious emissions measurement. If there were spurious emissions detected, the spurious emissions will be listed in a tabular format. If no spurious emissions were detected, the message <No spurs> is displayed.
4. If spurious emissions were detected, press Inspect Spur to view a spurious emission (see the following procedure "To measure a specific spurious emission" for more information). Otherwise, press Previous Menu.

The spurious emissions test measures the power level of emissions over the frequency range set by MINIMUM FREQ and MAXIMUM FREQ.

If spurious emissions were detected, you will see a table like the one in Figure 2-15.

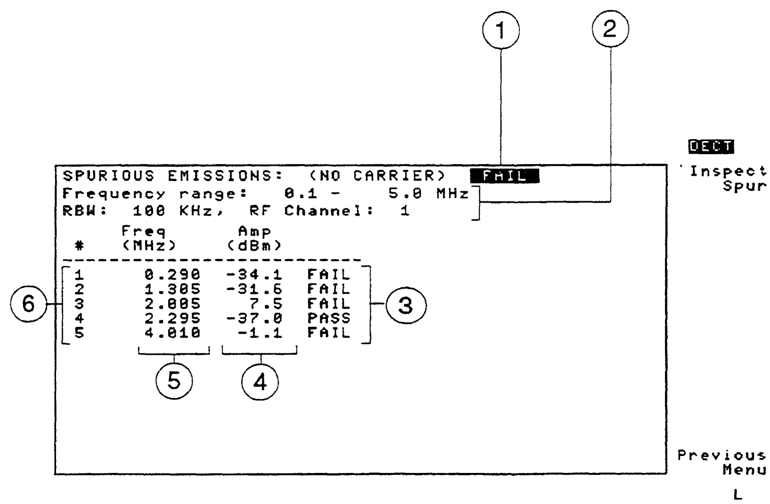


Figure 2-15. Viewing the Table of Spurious Emissions

① Indicates if the spurious emission test passed or failed. The spurious emissions test will fail if one of the measured spurious emissions exceeds the spurious emissions limit.
② Indicates the resolution bandwidth, the current channel number, and frequency range used for the spurious emission test.
③ Indicates if the spurious emission exceeded the limit for spurious emissions. If the spurious emission was above the limit for a spurious emission, FAIL is displayed. If the spurious emission did not exceed the limit but was within 6 dB of the limit, PASS is displayed.
④ Amplitude of the spurious emission.
⑤ Frequency of the spurious emission.
⑥ Number of the spurious emission. Use this number when specifying a specific spur with ENTER SPUR # (see the following procedure "To measure a specific spurious emission" for more information about ENTER SPUR #). An asterisk (*) next to a table entry indicates that the spectrum analyzer noise floor may be too high to measure the spur. If the table entry has an asterisk by it, you can examine the spectrum analyzer noise floor by removing the

input signal while measuring the specific spurious emission. If the trace does not change, the spur is actually spectrum analyzer noise floor and *not* a spurious emission. Refer to "CHECK NOISE FLOOR" in Chapter 5 for information about reducing the noise floor level.

Table 2-3 lists the limits for the spurious emissions measurement.

Table 2-3.

Frequency	maximum power level
Transmit mode:	
Frequency < 1 GHz	−36 dBm
Frequency > 1 GHz	−30 dBm
except for:	
47 MHz to 74 MHz	−46 dBm
87.5 MHz to 108 MHz	
108 MHz to 118 MHz	
174 MHz to 230 MHz	
470 MHz to 862 MHz	
Idle mode:	
30 MHz to 1 GHz	−57 dBm
1 GHz to 12.75 GHz	−47 dBm
except for:	
1.88 Ghz to 1.9 GHz	−57 dBm

To measure a specific spurious emission

1 Use the previous procedure to make a spurious emissions measurement. If a list of spurious emissions is displayed after the measurement has finished, press Inspect Spur. The first spurious signal (spur number 1) will be displayed.

2 You can view another spur by pressing ENTER SPUR #, entering the number of the spur that you want to view, and then pressing (ENTER). You can also use the up key (▲) to view the next spur, or use the down key (▼) to view the previous spur.

3 If you want to place a marker on the signal peak, press MARKER PEAK.

4 If you want to use a marker, press MARKER NORMAL, then use the large knob on the spectrum analyzer to move the marker.

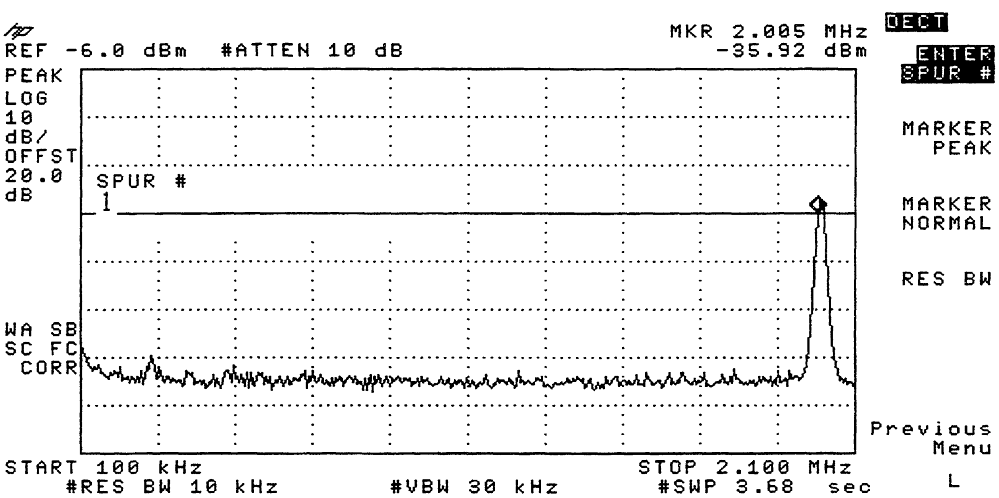
5 If you want to change the resolution bandwidth, press RES BW. You may want to decrease the resolution bandwidth for any spurious emissions in the table with an asterisk. (Decreasing the resolution bandwidth decreases the noise floor and increases the sensitivity of the spectrum analyzer.)

6 Press Previous Menu to redisplay the list of spurious emissions.

or,

Press Previous Menu, Previous Menu to exit the spurious emissions menu.

Inspect Spur allows you to view and measure each spurious emission that was detected. Inspect Spur also accesses several useful functions for measuring a spurious signal.



Measuring Spur Number 1

To measure the intermodulation attenuation

1 The intermodulation attenuation measurement measures the intermodulation products caused by two carriers, you must therefore ensure that there are two carriers present. Connect the equipment as shown in Figure 2-16. (Refer to Figure 2-17 for an example of the spectrum analyzer display of two carriers.)

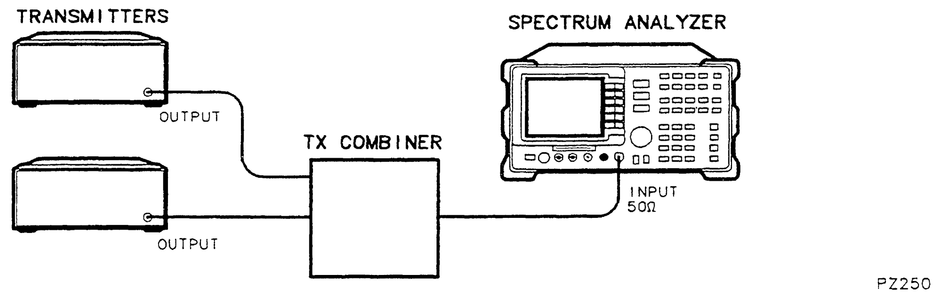


Figure 2-16. Equipment Setup for the Intermodulation Attenuation Measurement

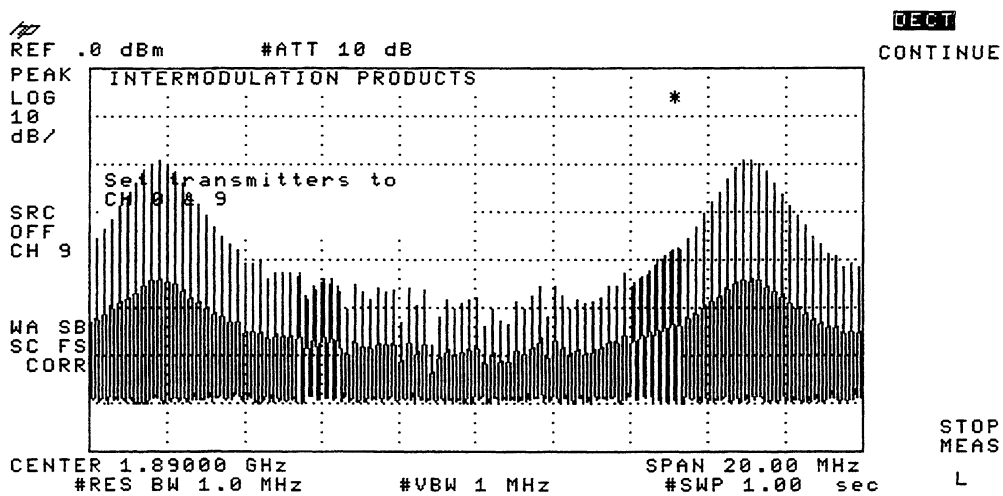


Figure 2-17. Screen Display of the Two Carriers

2 If INTERMOD is not displayed, press Spurs & Intermod. (If Spurs & Intermod is not displayed, press (MODE), DECT ANALYZER to access Spurs & Intermod.)

3 Press INTERMOD. The personality will measure the intermodulation products, compare the results against the limit for intermodulation products, and then display the result. The final trace display will be the intermodulation product with the highest amplitude.

4 If you want to repeat the measurement, press REPEAT MEAS.

5 Press Previous Menu when you are finished with the intermodulation attenuation measurement.

INTERMOD measures the normal transmitted power, NTP, of channels 0 and 9 when the DECT transceiver is tuned to these channels. (These measurements are used as a reference.) The DECT transceiver is then tuned to channels 3 and 6 and the power of the intermodulation products are measured relative to the reference powers. Refer to Figure 2-18 and Figure 2-19 for examples of measuring intermodulation attenuation. Figure 2-18 shows the intermodulation attenuation measurement with time gating on. Figure 2-19 shows what the signal would look like if time gating was not used.

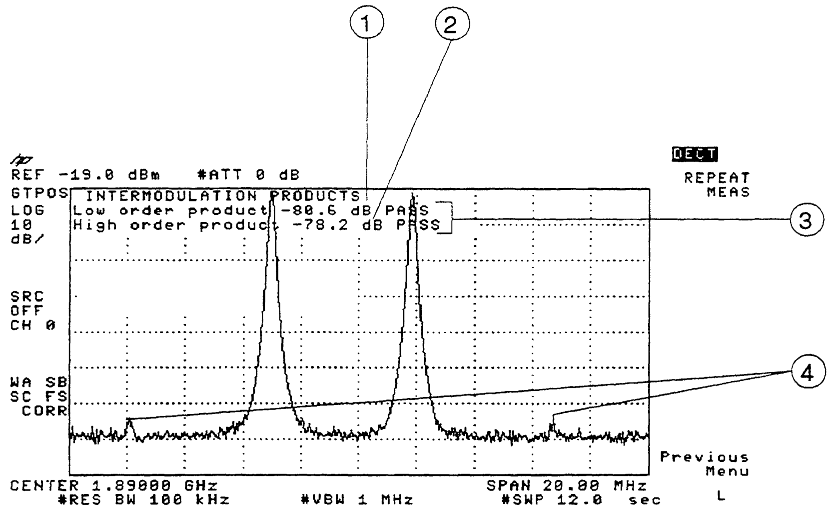


Figure 2-18. Measuring Intermodulation Attenuation (Time-gating on)

① The amplitude level of the lower product. The lower product is the intermodulation product that is lower in frequency than the lower carrier.
② The amplitude level of the upper product. The upper product is the intermodulation product that is higher in frequency than the upper carrier.
③ Indicates if the intermodulation attenuation measurements passed or failed. To pass, the intermodulation products must be below −30 dB.
④ Indicates the intermodulation products.

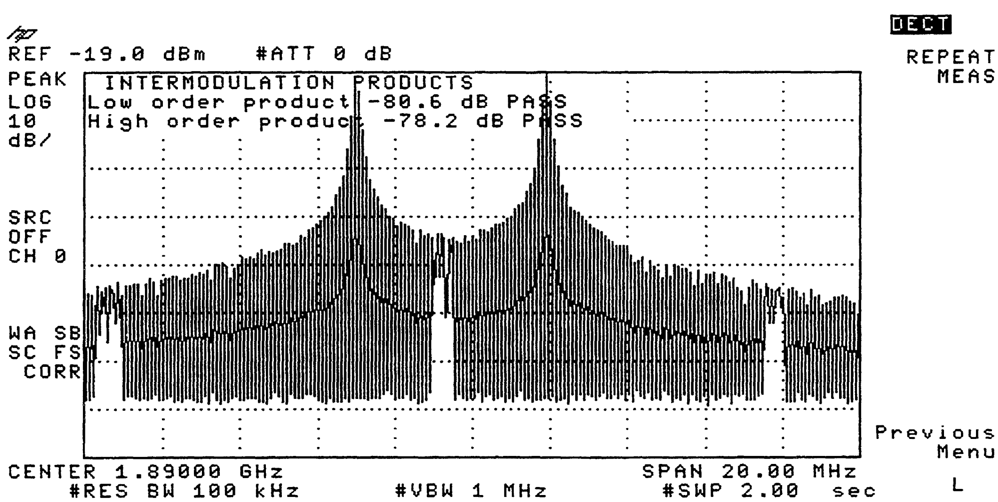


Figure 2-19. Measuring Intermodulation Attenuation (Time-gating off)

Using the DECT Source

To use the HP 8590E Option 012 DECT Source, the HP 85723A DECT measurements personality must first be loaded into the spectrum analyzer memory. (Refer to "Step 1. Load the DECT measurements personality" in chapter 1.) The DECT Source menu can then be accessed by pressing (AUX CTRL) DECT SOURCE. This section contains the following procedures on how to use the DECT Source:

- for standalone applications.
- pulse modulator.
- as a DECT transceiver.

The HP 8590E Option 012 DECT Source can also be used as a tracking generator. It can be used in the same method as described for the HP 8590E Option 010 Tracking Generator in the *HP 8590 Series Spectrum Analyzer User's Guide.* However, the following features differ from the Option 010 Tracking Generator:

- The frequency range is limited to 70 MHz through 2.9 GHz.
- The output power range is 20 dB lower than the Option 010 Tracking Generator.
- When you are using external levelling with ALC set to EXT an external amplifier is required to compensate for an extra 20 dB loss that is internal to the spectrum analyzer. Without this amplifier the dynamic range is significantly restricted.

Note Before you set any of the DECT Source parameters you must first switch the DECT Source on.

Using the DECT Source for standalone applications

1. To access the DECT Source menu press (AUX CTRL) then DECT SOURCE. (If DECT SOURCE is not displayed, press (MODE), DECT ANALYZER, then press (AUX CTRL) and DECT SOURCE.)
2. If necessary, perform the self calibration routine for the DECT Source described in "Step 1. Perform the DECT Source self-calibration routine" in chapter 1. The DECT Source calibration routine should be carried out if the spectrum analyzer has been powered down.
3. If necessary, perform the DECT Source frequency calibration routine. This routine should be carried out once a day or if there is a change in the operating temperature. To perform this calibration press DECT FRQ CAL. You are prompted on the spectrum analyzer screen to connect the DECT SOURCE 50 Ω to the spectrum analyzer INPUT 50 Ω, and to ensure that the TIMESLOT PULSE IN, RF SWITCH CURRENT IN and TTL DATA IN rear panel connections are disconnected. Press CONTINUE CAL to execute the calibration routine.
4. Press SRC PWR ON OFF such that ON is underlined to turn the DECT Source on. The frequency defaults to the current center frequency of the spectrum analyzer. The frequency span is zero.
5. Press CHANNEL NUMBER to set the DECT Source to a particular DECT frequency channel. The default channel number is 9. To select any other channel number use the data keys then press (ENTER).

   If you require a frequency other than one of the ten preselected frequencies press CH X CTR FREQ, enter the frequency using the data keys then press (ENTER).

Note

The DECT Source cannot be used to generate a continuous wave (CW) signal while the spectrum analyzer is making a swept measurement.

---

6. Press SRC PWR ON OFF to adjust the DECT Source power. Enter the output power you require using the data keys, then press (dBm).

   You can also use the spectrum analyzer knob, or the (▲) and (▼) keys to adjust the DECT Source output power. The (▲) and (▼) keys change the DECT Source output power in fixed 10 dB steps.
7. If you are using external equipment (for example, an amplifier, power splitter, fixed attenuator or test fixture) to connect the DECT Source output to the device under test (DUT), enter the insertion loss or gain of this equipment into the spectrum analyzer using the source power offset function. Press SRC PWR OFFSET, enter the insertion loss or gain using the data keys, then press (dBm).
8. You can modify the amplitude calibration factor determined in the DECT Source calibration routine using LVL CAL FACTOR. Set the LVL CAL FACTOR to 0dB. Connect a power meter to the spectrum analyzer DECT SOURCE 50 Ω connector. Using CH X CTR FREQ set the DECT Source frequency to 1.89 GHz. Using SRC PWR ON OFF set the DECT Source amplitude to −40 dBm.
   The value for the LVL CAL FACTOR is calculated from the expression,

   LVL CAL FACTOR = Power Meter Reading − Displayed Power

   Press LVL CAL FACTOR and enter the value calculated using the data keys then press (dB).

Controlling the DECT Source Pulse Modulator

There are two methods of controlling the pulse modulator of the DECT Source. They are either through the TIMESLOT PULSE IN or the RF SWITCH CURRENT IN connectors on the spectrum analyzer rear panel.

The TIMESLOT PULSE IN connector only accepts a TTL signal and has a fixed response time of 5 μs. Use this connector in most applications where the DECT Source is used to stimulate DECT equipment.

The RF SWITCH CURRENT IN connector accepts a current input. Use this connector when you require control over the rise time and fall time of the RF burst. The DECT Source pulse modulator is a current driven device. Figure 2-20 shows the non-linear relationship between current and attenuation. You must provide a linearizing circuit and voltage to current translator, if you require to control the attenuation in a linear manner with a voltage ramp.

Caution To prevent damage to the spectrum analyzer the maximum input current of 200 mA on the RF SWITCH CURRENT IN connector must not be exceeded.

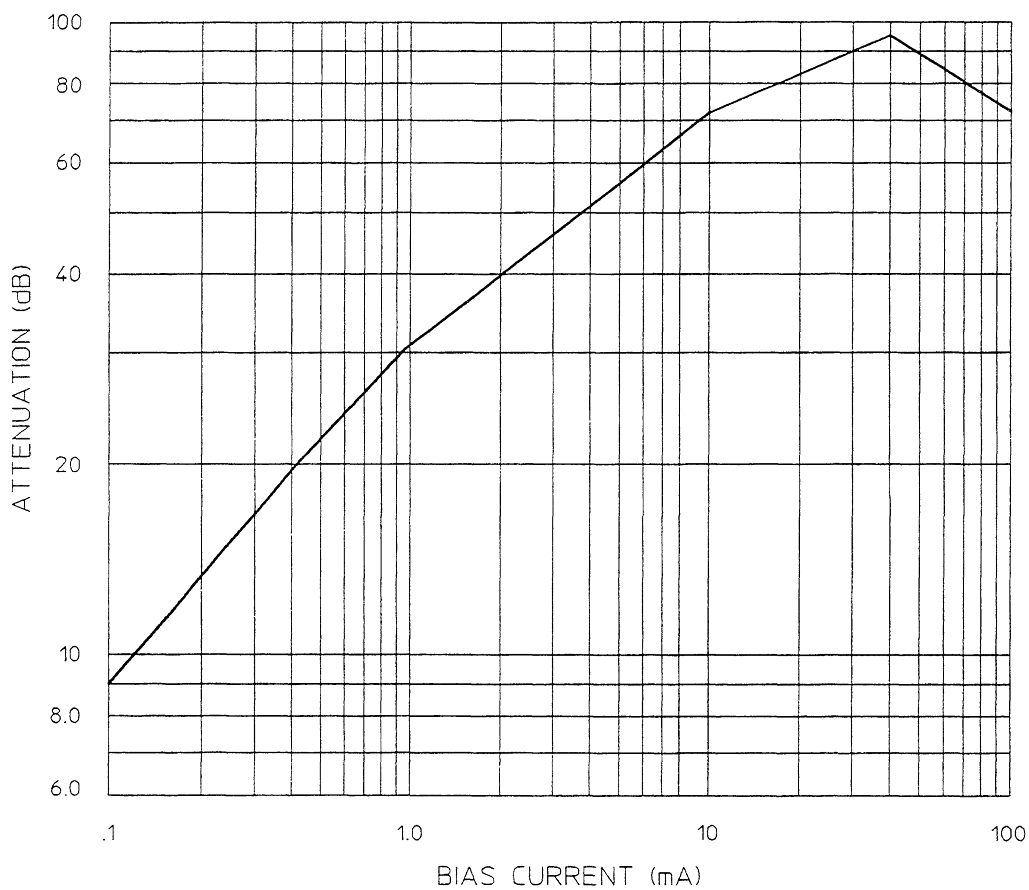


Figure 2-20. Pulse Modulator Attenuation as a Function of Bias Current

3

Verifying Operation

This chapter contains test procedures that verify the electrical performance of the DECT demodulator card (Option 112), and the time-gated spectrum analyzer card (Option 105). These tests verify that the DECT measurements personality performs within all specifications listed in "Specifications and Characteristics for the HP 85723A" in Chapter 7. This chapter contains the following sections:

- Preparing for the verification tests.
- The following verification procedures:
  1. Frequency deviation accuracy (Option 112 only).
  2. Gate delay accuracy and gate length accuracy.
  3. Gate card insertion loss.
- The performance verification test record.
- What to do if a verification test fails.

Note The HP 8590 E-Series Option 012, DECT Source verification tests are described in Chapter 9, along with the DECT Source specifications and characteristics.

Preparing for the Verification Tests

Do these four things before beginning a verification test:

1. Turn on the spectrum analyzer and allow the spectrum analyzer to warm up for at least 30 minutes.
2. Read "Making Basic Measurements", Chapter 3 of the *HP 8590 Series Spectrum Analyzer User's Guide* to familiarize yourself with basic HP 8590 Series spectrum analyzer operation.
3. Perform the spectrum analyzer's self-calibration routines. Refer to "Improving Accuracy with Self-Calibration Routines" in Chapter 2 of the *HP 8590 Series Spectrum Analyzer User's Guide* for instructions. (Before performing the self-calibration routines, ensure that nothing is connected to the GATE INPUT connector. Otherwise, the self-calibration routine's results may not be valid.)
4. Read the rest of this section before you start any of the tests, and make a copy of the Performance Verification Test Record as described in "To record the test results."

The test equipment you will need

Table 3-1 lists the recommended test equipment for the performance tests. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model or models.

To record the test results

Within the verification procedure, there are places to enter the test results. In addition, the Performance Verification Test Record (Table 3-2) has been provided at the end of the chapter. We recommend that you make a copy of the table, record the test results on the copy, and keep the copy for your calibration test records. This record could prove valuable in tracking gradual changes in test results over long periods of time.

Periodically verifying operation

The spectrum analyzer requires periodic verification of operation. Under most conditions of use, you should perform these verification tests once a year to ensure that the spectrum analyzer meets its specifications.

If the spectrum analyzer does not meet its specifications

1. Ensure that there is nothing connected to the spectrum analyzer's GATE TRIGGER INPUT connector.
2. Ensure that the external preamplifier gain (EXT PREAMP) is set to 0.
3. Rerun the spectrum analyzer's frequency and amplitude self-calibration routines. Refer to "Step 2. Perform the spectrum analyzer's self-calibration routines" in Chapter 1 for more information.
4. Repeat the verification test.

If the spectrum analyzer continues to fail one or more of its specifications, complete any remaining tests and record the results on a copy of the performance verification test record, then return the spectrum analyzer with a copy of the completed test record to a Hewlett-Packard Sales and Service Office. Refer to the *HP 8590 Series Spectrum Analyzer User's Guide* for addresses and shipping instructions.

Recommended test equipment

Table 3-1 lists the recommended test equipment for performing the verification tests.

Table 3-1. Recommended Test Equipment

Instrument	Critical Specifications for Equipment Substitution	Recommended Model	Use*
Synthesized Sweeper	Frequency Range: 1.88 GHz to 1.9 GHz Frequency Accuracy (CW): ±0.02% Power Level Required: −10 dBm	HP 83630A *or* HP 8340A/B	P,A,T
Synthesizer/ Level Generator	Frequency Range: 50 MHz Amplitude Range: −5 to 0 dBm Flatness: ±0.15 dB Attenuator Accuracy: ±0.09 dB Resolution: 0.01 dB	HP 3335A	P,A,T
Oscilloscope	No Substitute	HP 54501A	P
Universal Counter	Time Interval: 100 ns to 100 ms	HP 5316A	P
Pulse/Function Generator	Frequency: 100 Hz Duty Cycle: 50% Output: TTL Square Wave	HP 8116A	P
* P = Performance Test, A = Adjustment, T = Troubleshooting			

1. Verifying Frequency Deviation Accuracy (Option 112 Only)

Characteristic

Frequency Accuracy:

±20 kHz + (carrier frequency × frequency reference accuracy)*

Frequency Deviation Accuracy (DC):

±22 kHz *

*After the frequency and deviation calibration when the measurement ambient temperature is the same as the calibration temperature.

Related Adjustments

The self-calibration routines for the spectrum analyzer.
The frequency deviation calibration routine (CAL FREQ/DEV).

Description

This procedure measures the frequency accuracy and frequency deviation accuracy for Option 112, the DECT demodulator card.

Option 112 is a modified version of Option 102, the AM/FM demod and TV sync trigger circuitry card. (Option 112 has been modified to enhance the FM frequency response of an Option 102. The AM and TV sync trigger, however, operates normally.) Option 112 is meant to be used with the DECT measurements personality.

To determine the frequency accuracy of the Option 112, a signal of a known frequency is input into the spectrum analyzer, and the spectrum analyzer's center frequency is then set to the same frequency. The FREQ/DEV function is used to demodulate the signal, measure the median frequency error, and display the results. The measurement result is compared to the frequency accuracy specification.

To determine the frequency deviation accuracy of the Option 112, the frequency of the input signal is changed by 288 kHz. The frequency deviation is then measured by the DECT measurements personality, and the result is displayed on the spectrum analyzer's screen. The median frequency error is then subtracted from the frequency deviation and the result is compared to the frequency deviation specification.

To eliminate any frequency error caused by the external frequency reference, the same external frequency reference is used for both the spectrum analyzer and the synthesized sweeper.

Equipment

Synthesized Sweeper .... HP 8340A/B or HP 83630A

Adapters
Type N (f) to APC 3.5 (m) 1250-1750
APC 3.5 (f) to APC 3.5 (f) 5061-5311
Cables
Type N, 183 cm (72 in) .... HP 11500A
BNC, 122 cm (48 in) .... HP 10503A

To determine the frequency accuracy

1. Ensure the DECT measurements personality is loaded into the spectrum analyzer's memory. Refer to "Step 1. Load the DECT measurements personality" in Chapter 1 for more information.
2. Use the BNC cable to connect the spectrum analyzer's CAL OUT connector to the INPUT 50Ω connector.
3. Press (PRESET) on the spectrum analyzer and wait for the preset to finish.
4. Press DECT ANALYZER and wait for the DECT measurements personality to initialize.
5. Press Freq & Modulat.
6. Press CAL FREQ/DEV.
7. Press CONTINUE CAL. Wait for the frequency and deviation calibration routine to finish.
8. On the spectrum analyzer press the following keys:

   Main Menu
   Config
   TOTAL TX POWER 0 (dBm)
   More 1 of 2
   BURST CONT such that CONT is underlined.
   More 2 of 2
   Main Menu

9. Press (INSTR PRESET) on the Synthesized Sweeper and set the controls as follows:

   CW .... 1.888704 GHz
   POWER LEVEL .... −10 dBm

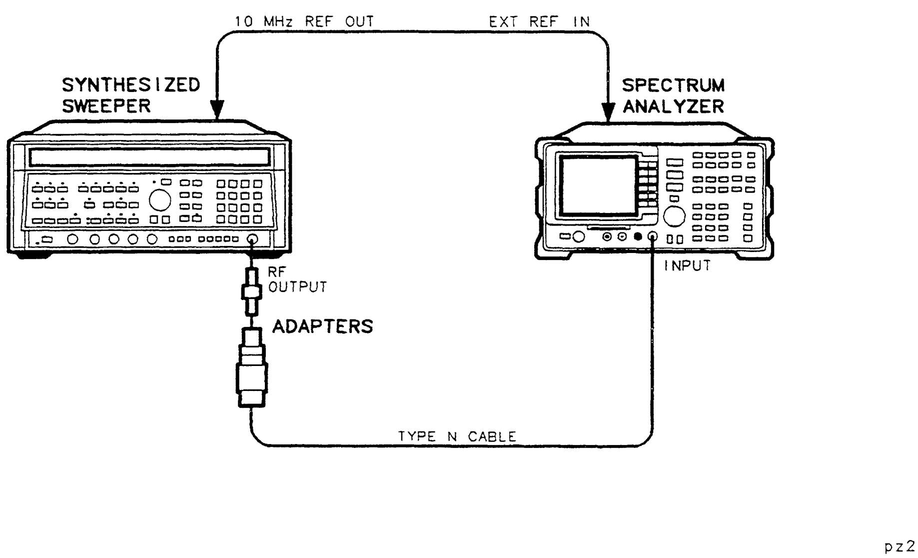


Figure 3-1. Frequency Readout Accuracy Test Setup

10. Connect the equipment as shown in Figure 3-1. Connect the Synthesized Sweeper 10MHz REF OUT connector to the spectrum analyzer's EXT REF IN connector with a cable.
11. On the spectrum analyzer press the following keys:

    Physical Channel 5 (ENTER)

    Main Menu

    Freq & Modulat

    FREQ/DEV This causes a measurement to be made.
12. Wait for the spectrum analyzer to finish its measurement and then press the following spectrum analyzer keys:

    (TRIG)

    FREE RUN

    (MODE) (MODE)
13. Press REPEAT MEAS. Wait for the measurement to complete.

Note

Ignore the FREQ/DEV: FAIL message that appears throughout this test. This message will appear because this performance test uses the function FREQ/DEV to obtain the results for a signal with no modulation. (This is not the way FREQ/DEV is usually used.)

14. Read the median frequency error (MEDIAN FREQ ERROR), and record it as the Frequency Accuracy.

    Frequency Accuracy ________________ kHz

    The results should be within ±20 kHz.

To determine the frequency deviation accuracy

15. On the Synthesized Sweeper set the frequency step size to 288 kHz.
16. On the Synthesized Sweeper press CW and the STEP (▲) key.
17. Repeat the measurement by pressing REPEAT MEAS on the spectrum analyzer. After the test is complete record the MEDIAN FREQ ERROR (median frequency error) for Deviation Reading at 288 kHz.

    Deviation Reading 288 kHz ________________ kHz
18. Subtract the Frequency Accuracy reading recorded in step 14 from the Deviation Reading 288 kHz in step 17. Record the result here as the Frequency Deviation Accuracy 288 kHz.

    Frequency Deviation Accuracy 288 kHz ________________ kHz

    The results should be 288 kHz ±22 kHz.
19. On the spectrum analyzer press the following keys:

    Main Menu

    Config

    TOTAL TX POWER 26 (dBm)

2. Verifying Gate Delay Accuracy and Gate Length Accuracy

Specifications

Gate Delay Refer to "Specifications and Characteristics for the HP 85723A" in Chapter 7 for specific values.

Gate Length Refer to "Specifications and Characteristics for the HP 85723A" in Chapter 7 for specific values.

Description

The method used for measuring the gate length times is determined by the length of the gate. Shorter gate-length times are measured with an oscilloscope, and longer gate-length times are measured with a counter.

For shorter gate-length times, the output signal of a pulse generator is used to trigger the gate circuitry. To measure the gate delay, Δt markers are used. There is often up to 1 μs of jitter due to the 1 μs resolution of the gate delay clock. The "define measure" feature of the oscilloscope is used to measure and calculate the average length of the gate output automatically.

For longer gate-length times, a counter is used to measure the time period from the rising edge of the gate output to its falling edge. Because the gate-length time is equivalent to the clock accuracy of the spectrum analyzer, the gate-length time is compared to the specification for clock accuracy.

Equipment

Universal Counter .... HP 5316A
Pulse/Function Generator .... HP 8116A
Digitizing Oscilloscope .... HP 54501A

Cables
BNC, 120 cm (48 in) (four required) .... HP 10503A

Adapters
BNC tee (m) (f) (f) (two required) 1250-0781

To determine small gate delay and gate length (jitter-term)

1. Connect the equipment as shown in Figure 3-2.

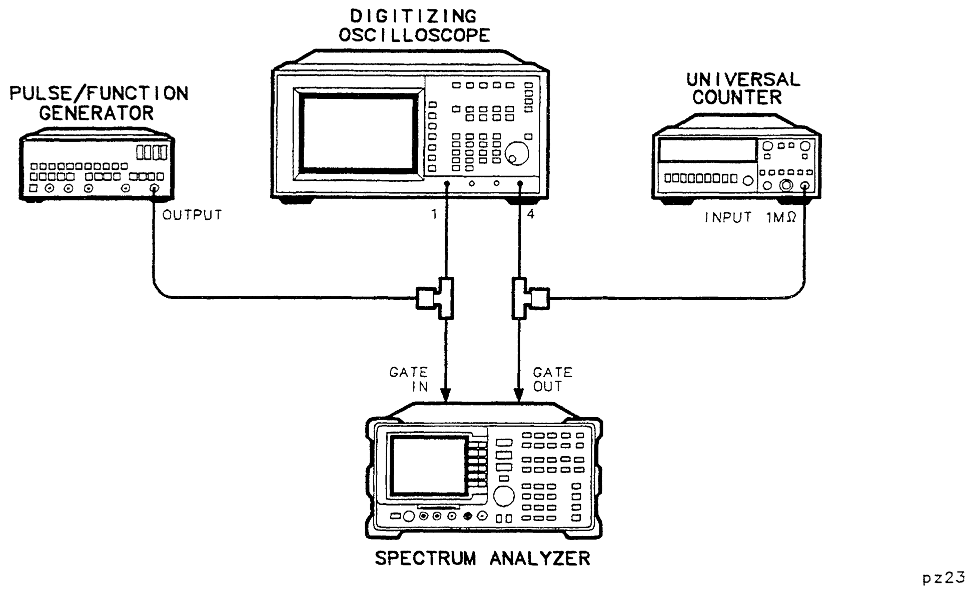


Figure 3-2. Gate Delay and Gate Length Test Setup

2. Press the following spectrum analyzer keys:

   (PRESET) (wait for preset to complete)
   (SPAN) ZERO SPAN
   (SWEEP) 20 (ms) GATE ON OFF (underline ON) GATE MENU GATE DELAY 1 (μs)
   GATE LENGTH 1 (μs)

3. Activate the square wave output on the function generator.
4. Set the pulse/function generator controls as follows:

   MODE .... NORM
   FRQ .... 100 Hz
   DTY 50%
   HIL .... 2.5 V
   LOL .... 0.0 V

5. Press the following keys on the oscilloscope:

   (RECALL)
   (CLEAR)
   (DISPLAY)
   off frame axes grid .... highlight grid
   connect dots off on .... highlight on
   (TRIG)
   source 1 2 3 4 .... highlight 4
   level .... 2 V
   (TIMEBASE) .... 500 ηs/div

(CHAN)

CHANNEL 1 2 3 4 off on

highlight CHANNEL 1 on

set V/div to 1 V and offset to 2 V

highlight CHANNEL 4 on

set V/div to 1 V and offset to 3 V

(DISPLAY)

DISPLAY norm avg env .... highlight env

6. Press (CLEAR DISPLAY) on the oscilloscope. Wait for the trace to fill in, then press the following keys:

(Δt ΔV)

Δt markers off on .... highlight on

stop marker .... 0 μs

To record the minimum and maximum gate delay values

7. On the oscilloscope, press start marker . Use the knob to position the start marker on the upper trace on the right side of the oscilloscope display. Refer to Figure 3-3.

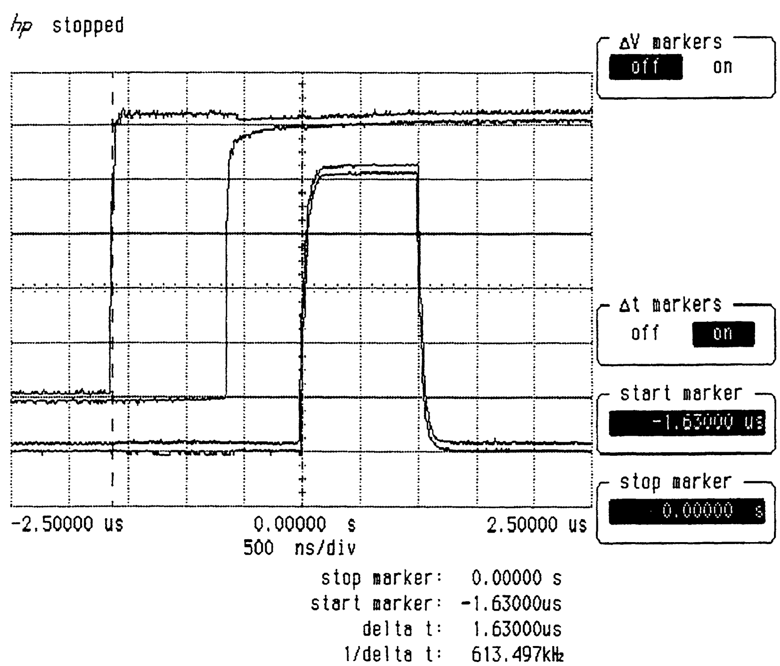


Figure 3-3. Oscilloscope Display of Minimum and Maximum Gate Delay Values

8. Record the Δt value of the start marker reading as the MIN Gate Delay.

   MIN Gate Delay ____________________

   (the expected value is greater than 0.0 μs, but less than 2.0 μs)

9. Use the oscilloscope knob to position the start marker on the edge of the left side of the upper trace.

10. Record the Δt value of the start marker reading as the MAX Gate Delay.

MAX Gate Delay ________________

(the expected value is greater than 0.0 μs, but less than 2.0 μs)

To determine small gate length

11. Press the following keys on the oscilloscope:

    (BLUE) (+WIDTH) 4

    (DEFINE MEAS)

    statistics off on .... highlight ON

12. Read the average +width (4) displayed on the oscilloscope in the bottom right-hand annotation area.
13. Record this value as the 1 μs Gate Length value.

    1 μs Gate Length ________________

    (the 1μs gate length minimum width should be greater than 800 ηs and maximum width should be less than 1200 ηs.

To determine large gate length (clock accuracy term)

14. Press the following spectrum analyzer keys:

    (SWEEP) 150 (ms) GATE MENU GATE DELAY 10 (ms) GATE LENGTH 65 (ms)

15. Set the universal counter controls as follows:

    TI .... A → B
    GATE TIME delay .... mid-range
    CHANNEL A .... rising edge, dc couple, SENSITIVITY mode
    CHANNEL B .... falling edge, dc couple, SENSITIVITY mode
    COM A

16. Adjust LEVEL/SENS on the universal counter for best triggering.
17. Record the universal counter readout value as the 65 ms Gate Length.

    65 ms Gate Length ________________

    (minimum gate length width should be greater than 64.99 ms)

    (maximum width should be less than 65.01 ms)

3. Verifying Gate Card Insertion Loss

Specifications Measured

- Additional Amplitude Error Due to Gate-On Enabled

Log Scale	Refer to "Specifications and Characteristics for the HP 85723A" in Chapter 7 for specific values.
Linear Scale	Refer to "Specifications and Characteristics for the HP 85723A" in Chapter 7 for specific values.

Description

Use this procedure to verify that the insertion loss for the Option 105 card is within the specifications. Refer to the specifications in Chapter 7 for the log and linear scale additional amplitude error due to Gate-On enabled. The insertion loss is measured as follows:

1. HIGH SWEEP output on the spectrum analyzer is connected to GATE INPUT to provide a trigger signal for the gate circuitry.
2. The gate is turned off and a marker reading is taken.
3. The gate is then turned on and the synthesizer/level generator amplitude is adjusted to match the marker reading taken while the gate was off.

The difference between the two synthesizer/level generator readings is the measured insertion loss of the gate card.

Equipment

Synthesizer/Level Generator .... HP 3335A

Cables
BNC, 122 cm (48 in) (two required) .... HP 10503A

Additional Equipment for Option 001 Spectrum Analyzer
BNC cable, 75Ω, 120 cm (48 in) .... HP part number 15525-80010

To determine the card insertion loss

1. Connect the equipment as shown in Figure 3-4. (For Option 001 spectrum analyzers, attach the 75Ω cable to the spectrum analyzer's RF input connector rather than the 50Ω cable.)

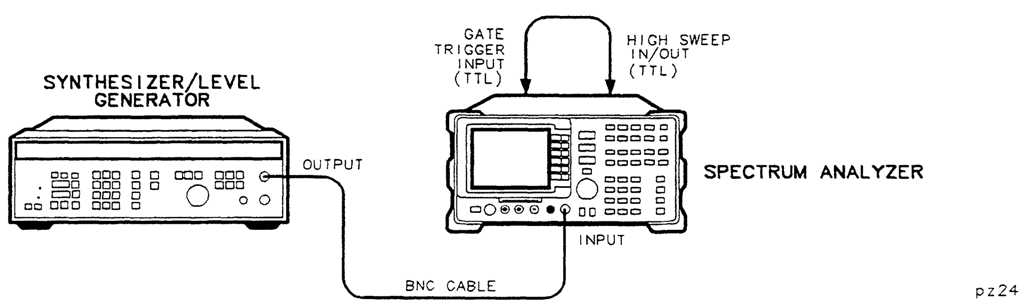


Figure 3-4. Gate Delay and Gate Length Test Setup

2. Set the synthesizer/level generator controls as follows:

   FREQUENCY .... 50 MHz
   AMPTD INCR .... 0.01 dB
   AMPLITUDE .... −5 dBm

3. On the spectrum analyzer, press (PRESET). Wait for preset to complete.

4. Press the following spectrum analyzer keys:

   (FREQUENCY) 50 (MHz)
   (SPAN) 1 (MHz)
   (BW) 100 (kHz)
   (SWEEP) 100 (ms) GATE ON OFF (underline OFF) GATE MENU GATE DELAY 20 (ms)
   GATE LENGTH 65 (ms)
   (PEAK SEARCH) MARKER DELTA
   (SWEEP) GATE ON OFF (underline ON)
   (PEAK SEARCH)

5. Use the step INCR (▲) or (▼) key on the synthesizer/level generator to adjust the output amplitude for a spectrum analyzer MKR Δ reading of 0.0 ±0.05 dB.

6. Record the amplitude displayed on the synthesizer/level generator as the Synthesizer/Level Generator Reading.

   Synthesizer/Level Generator Reading ____________

7. Subtract the synthesizer/level generator reading you just recorded from −5.0 dBm. Record the result as the Gate Card Insertion loss.

   For example, if the synthesizer/level generator reading is −4.96 dBm, then the result is −0.04 dBm as shown below:

   −5.0 dB minus the synthesizer reading is equal to the Gate Card Insertion Loss

   (−5.0) − (−4.96) = −0.04 dBm

   Gate Card Insertion Loss ____________

   (the insertion loss should be between −0.3 dB and +0.3 dB)

Performance Verification Test Record

The Performance Verification Test Record lists test specifications and acceptable limits. We recommend that you make a copy of this table, record the complete test results on the copy of the performance verification test record, and keep the copy for your calibration test records. You may find that keeping a record of the calibration test records helpful for tracking gradual changes in test results over long periods of time.

Table 3-2. Performance Verification Test Record (Page 1 of 2)

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 2 APRIL 1993)

Model HP 8590 Series Spectrum Analyzer with HP 85723A

Serial No. ______________________

Options ______________________

Firmware Revision ______________

Customer ______________________ Tested by ______________________

Ambient temperature ______________ °C Relative humidity ______________ %

Power mains line frequency ______________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Counter	________	________	________
Oscilloscope	________	________	________
Synthesizer/Function Generator	________	________	________
Synthesizer/Level Generator	________	________	________
Synthesized Sweeper	________	________	________

Performance Verification Test Record (Page 2 of 2)

Hewlett-Packard Company
Model HP 8590 Series Spectrum Analyzer with HP 85723A Report No. ______________

Serial No. ______________ Date ______________

Test No.	Test Description	Results Min	Results Measured	Results Max	Measurement Uncertainty
1.	**Frequency Accuracy**				
	Frequency Deviation				
	Freq Accuracy	−20 kHz	______	20 kHz	±1.85 kHz
	Freq Deviation at 288 kHz	−266 kHz	______	310 kHz	±1.85 kHz
2.	**Gate Delay Accuracy**				
	Gate Length Accuracy				
	MIN Gate Delay	0.0 μs	______	2.0 μs	±0.011 μs
	MAX Gate Delay	0.0 μs	______	2.0 μs	±0.011 μs
	65 ms Gate Length	64.99 ms	______	65.01 ms	±0.434 μs
3.	**Gate Card Insertion Loss**				
		−0.3 dB	______	+0.3 dB	±0.092 dB

4

Programming the HP 85723A

This chapter explains how the DECT measurements personality's functions can be executed by using programming commands. When you use programming commands to operate the DECT measurements personality, you send instructions to the spectrum analyzer instead of pressing the softkeys. The instructions (also called programming commands) are sent to the spectrum analyzer with a computer.

This chapter contains the following sections:

- Accessing the DECT measurements personality for remote operation.
- Programming basics for DECT remote operation.
- Programming examples for DECT remote operation.

Before you can program the spectrum analyzer, you must connect the spectrum analyzer to the computer. Refer to Chapter 1 in the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for more information.

All the examples in this chapter are written in HPBASIC.

Accessing the DECT Measurements Personality for Remote Operation

To use the DECT programming commands, the DECT measurements personality must be loaded into spectrum analyzer memory, and DECT mode must be selected. This section contains the following procedures:

- Load the DECT measurements personality remotely.
- Select the DECT mode remotely.

To load the DECT measurements personality remotely

1 If necessary, insert the HP 85723A DECT measurements personality memory card into the analyzer's front-panel memory card reader.

2 Prepare the spectrum analyzer for the DONE command by doing an instrument preset and placing the spectrum analyzer into a single sweep mode. Press (PRESET), (SWEEP) then SINGLE.

3 Dispose any personalities from the spectrum analyzer memory by executing the DISPOSE ALL command.

4 Perform a take sweep. You must do a take sweep before executing the DONE command.

5 Execute the DONE command.

6 Wait until the DONE command returns a "1."

7 Use the spectrum analyzer's LOAD command to load the file called "dDECT" into spectrum analyzer memory.

8 Perform a take sweep. You must do a take sweep before executing the DONE command.

9 Execute the DONE command.

10 Wait until the DONE command returns a "1."

This procedure describes how to use programming commands to load the DECT measurement personality into spectrum analyzer memory. You may find it more convenient to use the spectrum analyzer's front-panel keys to load the DECT measurements personality into spectrum analyzer memory.

Example

`OUTPUT 718;"IP;SNGLS;"`	*Does an instrument preset and places the spectrum analyzer in the single sweep mode.*
`OUTPUT 718;"DISPOSE ALL;"`	*Removes any personalities from spectrum analyzer memory.*
`OUTPUT 718;"TS;"`	*Performs a take sweep.*
`OUTPUT 718;"DONE?;"`	*Queries the spectrum analyzer to return a "1" when the MODE and the take sweep commands are completed.*
`ENTER 718;Done`	*Waits until a "1" is returned.*
`OUTPUT 718;"LOAD/dDECT/;"`	*Loads the DECT measurements personality into spectrum analyzer memory. "dDECT" is the file name for the DECT measurements personality program.*
`OUTPUT 718;"TS;"`	*Performs a take sweep.*
`OUTPUT 718;"DONE?;"`	*DONE? returns a "1" when the MODE command and the take sweep command are completed.*
`ENTER 718;Done`	*Waits until a "1" is returned.*

To change to the DECT mode remotely

1 Prepare the spectrum analyzer for the DONE command by doing an instrument preset and placing the spectrum analyzer into a single sweep mode. Press (PRESET), (SWEEP) then SINGLE.

2 Change to the DECT mode by setting the value of the MODE command to 10.

3 Perform a take sweep. You must do a take sweep before executing the DONE command.

4 Execute the DONE command.

5 Wait until the DONE command returns a "1."

The spectrum analyzer must be using the DECT mode before you can send any DECT programming commands to the spectrum analyzer. You need to execute the DONE command to ensure that the spectrum analyzer has finished executing the MODE command.

Example

`OUTPUT 718;"IP;SNGLS;"`	*Does an instrument preset and places the spectrum analyzer in the single sweep mode.*
`OUTPUT 718;"MODE 10;"`	*Changes to the DECT mode.*
`OUTPUT 718;"TS;"`	*Performs a take sweep.*
`OUTPUT 718;"DONE?;"`	*DONE? returns a "1" when the MODE command and the take sweep command are completed.*
`ENTER 718;Done`	*Waits until a "1" is returned.*

Programming Basics for DECT Remote Operation

This section contains information about how to use the DECT programming commands. Refer to the descriptions for the individual programming commands in Chapter 8 for more information about a specific programming command.

This section contains the following procedures:

- Use the MOV command.
- Use the DECT setup and measurement commands.
- Change the value of a limit variable.
- Change the value of a parameter variable.
- Use the repeat command.
- Determine when a measurement is done.
- Use an external keyboard to enter programming commands.
- Create a limit line function.

Note

You can distinguish the DECT programming commands and variables from the spectrum analyzer programming commands because the DECT programming commands and variables begin with an underscore (_), and spectrum analyzer programming commands do not. For example, _CHN is a DECT programming command, and MOV is a spectrum analyzer programming command.

This guide contains information about the DECT programming commands. Refer to the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for information about the spectrum analyzer programming commands.

To use the spectrum analyzer's MOV command

- Use the MOV command to move a value into a DECT command that can accept a value.

You are encouraged to use the MOV command when you need to move a value into a DECT programming command. Using MOV allows the spectrum analyzer to process the command faster because no text is displayed in the active function area during command execution.

Example

This example shows how to move a number into the _CHN command. The _CHN command allows you to enter the channel number to be measured.

`OUTPUT 718;"MOV _CHN,4;"`	*Changes the channel number to 4.*

To use the DECT setup and measurement commands

1 Execute the measurement's setup command.

2 Change the spectrum analyzer setting, as desired.

3 Execute the measurement's "measure" command.

Most of the DECT measurements can be done two ways:

Method 1: By executing the command that automatically performs both the setup and measurement. For example, _CPWR sets up the measurement and also performs the carrier power measurement.

or,

Method 2: By executing the command that sets up the measurement, a command that changes a spectrum analyzer setting, and then the command that actually performs the measurement. This method allows you to change parameters (for example, resolution bandwidth) for a measurement. For example, the two commands needed to perform the carrier power measurement are _CPS (sets up the measurement) and _CPM (actually performs the measurement).

This procedure demonstrates how you can perform a measurement by the second method.

Example

`OUTPUT 718;"_CPS;"`	*Sets up the spectrum analyzer settings for the carrier power measurement. After _CPS is executed, the resolution bandwidth is set to 300 kHz.*
`OUTPUT 718;"RB 10KHZ;"`	*Changes the resolution bandwidth to 10 kHz.*
`OUTPUT 718;"_CPM;"`	*Performs the carrier power measurement.*

To change the value of a limit variable

- Use the MOV command to move the new value for a limit into the variable for the limit.

or,

- Use the VARDEF command to move the new value for a limit into the variable for the limit.

The DECT measurements personality uses a "limit" to decide if the measurement results failed or passed. For example, if a signal is above the intermodulation attenuation limit, the unit under test will fail the intermodulation attenuation measurement. You can change a limit by changing the value of the limit variable. Refer to Table 8-2 in Chapter 8 for a list of all the limit variables.

There are two ways to move a value to a limit variable: with the MOV command or with the VARDEF command.

If you use the MOV command:

The limit variable will be reset to the default value for the limit variable if an instrument preset (IP) is executed or the spectrum analyzer is turned off.

Example of the MOV command

`OUTPUT 718;"MOV _SPXL,-50;"`	*Changes the limit for spurious emissions in the broadcast bands from the default value of −47 dBm to −50 dBm.*

If you use VARDEF command:

The value for the limit variable is retained by the limit variable even if an instrument preset (IP) is executed or the spectrum analyzer is turned off.

Example for the VARDEF command

`OUTPUT 718;"VARDEF _SPXL,-50;"`	*Changes the limit for spurious emissions in the broadcast bands from the default value of −47 dBm to −50 dBm.*

The VARDEF command changes the DECT measurements personality that is currently in spectrum analyzer memory; the VARDEF command does not change the program on the HP 85723A memory card. If you reload the DECT measurements personality from the HP 85723A memory card, all the limit variables are set to their default values.

To change the value of a parameter variable

- Use the MOV command to move the new value for a parameter into the variable for the parameter.

  or,

- Use the VARDEF command to move the new value for a parameter into the variable for the parameter.

Many of the DECT programming commands use one or more parameters when making a measurement. A parameter is a variable that specifies a spectrum analyzer setting. For example, the spurious emissions measurement uses the parameter _MAXST to determine the sweep time for the spurious emissions measurement. You can change the parameter for a measurement by moving the new value into the parameter variable. Refer to Table 8-2 in Chapter 8 for a list of all the parameters variables.

There are two ways to move a value into a parameter variable: with the MOV command or with the VARDEF command.

If you use the MOV command:

The parameter variable will be reset to the default value for the parameter variable if an instrument preset (IP) is executed or the spectrum analyzer is turned off.

Example of the MOV command

`OUTPUT 718;"MOV _PNB,100;"`	*Sets the number of bursts for the power versus time measurements to 100. _PNB is the variable for the number of bursts for a power versus time measurement.*

If you use VARDEF command:

The value for the parameter variable is retained by the parameter variable even if an instrument preset (IP) is executed or the spectrum analyzer is turned off.

Example for the VARDEF command

`OUTPUT 718;"VARDEF _PNB,100;"`	*Sets the number of bursts for the power versus time measurements to 100. _PNB is the variable for the number of bursts for a power versus time measurement.*

The VARDEF command changes the DECT measurements personality that is currently in spectrum analyzer memory; the VARDEF command does not change the program on the HP 85723A memory card. If you reload the DECT measurements personality from the HP 85723A memory card, all the parameter variables are set to their default values.

To use the repeat command

- Execute the _RPT command to repeat a measurement.

You can use the _RPT command if you want to repeat a power measurement, power versus time measurement, or frequency and deviation measurement (Option 112 only). Some DECT parameters such as channel number and trace status can be changed prior to executing _RPT.

Example

`OUTPUT 718;"MOV _CHN,1;"`	*Changes the channel number to channel 1. _CHN is the command for the channel number.*
`OUTPUT 718;"_RPT;"`	*Repeats the previous measurement.*

To determine when a measurement is done

1 Execute the DECT measurement command.

When the measurement is finished, the command will return a number. This number is called the measurement state.

2 Use a REPEAT UNTIL loop to enter the numbers from the spectrum analyzer's output buffer into the computer.

Because there may be other numbers in the spectrum analyzer's output buffer, you need to use a loop to determine if the measurement state has been received. Refer to the command description in Chapter 8 to determine what numbers are valid measurement state values.

3 Examine the value of the measurement state.

If the number is 1, the spectrum analyzer has successfully completed the command. If the number is greater than 1, an error has occurred. Refer to the description for the measurement command in Chapter 8 for more about error conditions and measurement state values.

It is necessary to check the measurement state to ensure that the results of a measurement are not queried before the measurement is completed. The measurement state is also useful for checking for error conditions, for example, if the carrier level is too low to make the measurement.

Example

`OUTPUT 718;"_MBAND;"`	*Performs the monitor band measurement.*
`REPEAT`	*Repeats the ENTER statement until a valid number for the measurement state is found.*
`  ENTER 718;Meas_state`	*Enters the values from the analyzer buffer.*
`UNTIL Meas_state>0 AND Meas_state<2`	*Ignores numbers that are not valid numbers for the _MBAND measurement state. For _MBAND, the only valid measurement state value is a 1.*

Use an external keyboard to enter commands

You can enter the programming commands into the spectrum analyzer by using a keyboard that is connected to the spectrum analyzer's external keyboard connector. The external keyboard connector is included with an Option 021 or Option 023 spectrum analyzer. Refer to the *HP 8590 Series Spectrum Analyzer User's Guide* for more information about the different external keyboard functions.

1 Turn off the spectrum analyzer.

Caution Do not connect the keyboard to the spectrum analyzer while the spectrum analyzer is turned on.

---

2 Connect an HP C1405 Option 002 cable from the spectrum analyzer's rear panel connection (marked EXT KEYBOARD) to the HP C1405 Option ABA keyboard.

3 Press (LINE) to turn on the spectrum analyzer, then press DECT ANALYZER.

4 Press (F8) on the external keyboard.

5 Type in the command syntax. The characters that you type are shown at the top of the spectrum analyzer display.

6 Press (ENTER).

Because you are not using an external computer, the DECT and spectrum analyzer commands are entered without an OUTPUT or PRINT statement preceding them.

Example

Type in following programming line. Press (ENTER) after the programming line has been entered.

`MOV _CHN,2;` *Changes the channel number to 2. _CHN is the command for the channel number.*

To create a limit line function

1 Use the FUNCDEF command to create a limit line function.

The power versus time burst, power versus time rising edge, and power versus time falling edge measurements each have a specific limit line function assigned to the measurement. (Refer to Table 8-3 for a list of the limit line function names.) When you use the FUNCDEF command to create a limit line function, you are actually redefining the existing limit line function that was created by the DECT measurements personality.

2 Use the LIMIDEL command to delete any current limit line functions.

Refer to the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for more information about the LIMIDEL command.

3 Enter the values for the new limit line into a trace.

The values must be in display units. There are 0 to 8000 display units for the spectrum analyzer display, with 0 representing the bottom graticule and 8000 representing the top graticule. A display unit is equal to 0.01 dB.

4 Move the contents of the trace into the lower limit line with the LIMILO command.

Refer to the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for more information about the LIMILO command.

5 Turn on limit line testing with the LIMITEST command.

Refer to the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for more information about the LIMITEST command.

6 End the FUNCDEF declaration.

Some measurements (power versus time burst, power versus time rising edge, and power versus time falling edge measurements) use and display a limit line as part of the measurement. You can change each of these limit lines by creating a limit line function.

Once you have created a limit line function, your limit line function remains in use unless you reload the DECT measurements personality into spectrum analyzer memory.

Example

The following example shows you how you can create a limit line function for changing the limit line that is used in the power versus time burst measurement.

3242	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
3243	`!`	
3244	`OUTPUT @Sa;"FUNCDEF _PBLIM,@";`	*Use the spectrum analyzer FUNCDEF command to redefine the limit line function for power versus time burst (_PBLIM).*
3245	`!`	
3246	`OUTPUT @Sa;"LIMIDEL;";`	*Deletes any previous limit line functions.*
3247	`OUTPUT @Sa;"MOV TRA[1,33],0;";`	*Enters 0 display units in trace elements 1 through 33.*
3248	`OUTPUT @Sa;"MOV TRA[34,349],7400;";`	*Enters 7400 display units in trace elements 34 through 349.*
3249	`OUTPUT @Sa;"MOV TRA[350,351],7100;";`	*Enters 7100 display units in trace elements 350 through 351.*

`3250 OUTPUT @Sa;"MOV TRA[352,401],0;";`	*Enters 0 display units in trace elements 352 through 401.*
`3251 !`	
`3252 OUTPUT @Sa;"LIMILO TRA;";`	*Moves trace A into LIMILO. LIMILO represents the lower limit line.*
`3253 OUTPUT @Sa;"LIMITEST1;";`	*Turns on limit line testing.*
`3254 !`	
`3255 OUTPUT @Sa;"@;";`	*Ends the FUNCDEF declaration.*
`3256 !`	
`3257 END`	

Programming Examples

This section contains programming examples that show you how to make the following measurements remotely:

- Carrier power.
- Adjacent channel power due to modulation.
- Adjacent channel power due to switching transients.
- Monitor band.
- Power versus time frame.
- Power versus time burst.
- Power versus time rising edge.
- Power versus time falling edge.
- Power versus time burst on.
- Frequency and deviation.
- Spurious emissions.
- Intermodulation attenuation.

To measure the carrier power

This example shows how you can use the DECT programming commands to measure the carrier power and get the value for mean carrier power.

Example

`10 !re-store "CPWR_EX"`	
`20 !Shows how to use the _CPWR command`	
`30 !`	
`40 INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 REAL Mean_pwr`	*Declares a variable that will hold the mean carrier power variable.*
`80 !`	
`90 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`100 !`	
`110 !`	
`120 OUTPUT @Sa;"_CPWR;"`	*Performs the carrier power measurement.*
`130 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _CPWR measurement state.*
`140   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`150 UNTIL Meas_state>0 AND Meas_state<6`	*Checks for a valid measurement state value. For _CPWR, the only valid measurement state values are 1 through 5.*
`160 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`170   PRINT "CARRIER POWER: ";`	
`180   OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the carrier power measurement passed, or a 1 if the measurement failed.*
`190   ENTER @Sa;Fail_flag`	*Enters the value of _F into Fail_flag.*
`200   IF Fail_flag=0 THEN`	
`210     PRINT "PASSED"`	
`220   ELSE`	
`230     PRINT "FAILED"`	
`240   END IF`	
`250   OUTPUT @Sa;"_CPA?;"`	*Queries _CPA. _CPA contains the result of the mean carrier power.*
`260   ENTER @Sa;Mean_pwr`	*Enters the mean carrier power into Mean_pwr.*

```
270     PRINT
280     PRINT "Mean On Power= ";Mean_pwr;" dBm"
290   ELSE
300     DISP "Measurement aborted"
310   END IF
320   !
330   END
```

If Meas_state did not equal 1.

To measure the adjacent channel power due to modulation

This example shows how you can use the DECT programming commands to measure the adjacent channel power due to modulation.

`10 !re-store "ACP_MOD"`	
`20 !shows how to use the _ACPMOD command`	
`30 !`	
`40 INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	*Declares a variable that will hold the measurement state value.*
`60 REAL Meas_state`	
`70 DIM Acp_mod_res(1:10)`	*Declares an array.*
`80 !`	
`90 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`100 !`	
`110 !`	
`120 OUTPUT @Sa;"_ACPMOD;"`	*Performs the adjacent channel power due to modulation measurement.*
`130 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _ACPMOD measurement state.*
`140 ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`150 UNTIL Meas_state>0 AND Meas_state<6`	*Checks for a valid measurement state value. For _ACPMOD, the only valid measurement state values are 1 through 5.*
`160 IF Meas_state=1 THEN`	*If the measurement state value is 1,the measurement was successfully completed.*
`170   PRINT "Adjacent Channel Power Due to Modulation";`	
`180   OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the adjacent channel power measurement passed, or a 1 if the measurement failed.*
`190   ENTER @Sa;Fail_flag`	*Enters the value of _F into Fail_flag.*
`200   IF Fail_flag=0 THEN`	
`210     PRINT "PASSED"`	
`220   ELSE`	

```
230       PRINT "FAILED"
240     END IF
250     PRINT
260     OUTPUT @Sa;"TDF M;AUNITS DBM;_ACPMR?;"
```

Queries _ACPMR. _ACPMR contains the result of the adjacent channel power due to modulation.

```
270     ENTER @Sa;Acp_mod_res(*)
```

Sets the spectrum analyzer trace data format to measurement units and enters the adjacent channel power due to modulation into Acp_mod_res.

```
280     FOR A=0 TO 9
290     PRINT "CH ";A;" : ";Acp_mod_res(A+1)/10;" dBm"
```

The results are stored in the Acp_mod_res array a factor of 10 greater than the measured results. To redisplay the results they must be divided by 10.

```
300     NEXT A
310   ELSE
```

If Meas_state did not equal 1.

```
320     DISP "Measurement aborted"
330   END IF
340   !
350   END
```

To measure the adjacent channel power due to switching transients

This example shows how you can use the DECT programming commands to measure the adjacent channel power due to switching transients.

`10 !re-store "ACP_TRANS"`	
`20 !shows how to use the _ACPT command`	
`30 !`	
`40 INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 DIM Acp_trans_res(1:10)`	*Declares an array.*
`80 !`	
`90 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`100 !`	
`110 !`	
`120 OUTPUT @Sa;"_ACPT;"`	*Performs the adjacent channel power due to switching transients measurement.*
`130 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _ACPT measurement state.*
`140 ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`150 UNTIL Meas_state>0 AND Meas_state<6`	*Checks for a valid measurement state value. For _ACPT, the only valid measurement state values are 1 through 5.*
`160 If Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`170   PRINT "Adjacent Channel Power Due to Transients";`	
`180   OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the adjacent channel power measurement passed, or a 1 if the measurement failed.*
`190   ENTER @Sa;Fail_flag`	*Enters the value of _F into Fail_flag.*
`200   IF Fail_flag=0 THEN`	
`210     PRINT "PASSED"`	

`220     ELSE`	
`230       PRINT "FAILED"`	
`240     END IF`	
`250     PRINT`	
`260     OUTPUT @Sa;"TDF M;AUNITS DBM;_ACPTR?;"`	*Queries _ACPTR. _ACPTR contains the result of the adjacent channel power due to switching transients.*
`270     ENTER @Sa;Acp_trans_res(*)`	*Sets the spectrum analyzer trace data format to measurement units and enters the adjacent channel power due to switching transients into Acp_trans_res.*
`280     FOR A=0 TO 9`	
`290     PRINT "CH ";A;" : ";Acp_trans_res(A+1)/10;" dBm"`	*The results are stored in the Acp_trans_res array a factor of 10 greater than the measured results. To redisplay the results they must be divided by 10.*
`300     NEXT A`	
`310   ELSE`	*If Meas_state did not equal 1.*
`320     DISP "Measurement Aborted"`	
`330   END IF`	
`340   !`	
`350   END`	

To measure the monitor band

This example shows how you can use the DECT programming commands to view the monitor band and find the maximum amplitude of the trace.

`10 !re-store "MBAND_EX"`	
`20 !Shows how to use the _MBAND command`	
`30 !`	
`40 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`50 !`	
`60 REAL Trace_array(1:401)`	*Declares an array that will be used to hold the analyzer trace data.*
`70 !`	
`80 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`90 !`	
`100 !`	
`110 OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
`120 OUTPUT @Sa;"_MBAND;"`	*Performs the monitor band measurement.*
`130 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _MBAND measurement state.*
`140   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`150 UNTIL Meas_state>0 AND Meas_state<2`	*Checks for a valid measurement state value. For _MBAND, the only valid measurement state value is a 1.*
`160 OUTPUT @Sa;"TRA?;"`	*Queries trace A.*
`170 ENTER @Sa;Trace_array(*)`	*Enters the trace data from trace a into Trace_array.*
`180 PRINT`	
`190 PRINT "Maximum value of trace A= "; MAX(Trace_array(*));"dBm"`	
`200 !`	
`210 END`	

To measure the power versus time frame

This example shows how you can use the DECT programming commands to make a power versus time frame measurement and display the amplitude level of a trace element.

`10 !re-store "PFRAME_EX"`	
`20 !Shows how to use the _PFRAME command`	
`30 !`	
`40 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`50 REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
`60 !`	
`70 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`80 !`	
`90 !`	
`100 OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
`110 !`	
`120 OUTPUT @Sa;"_PFRAME;"`	*Performs the power versus time frame measurement.*
`130 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PFRAME measurement state.*
`140   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`150 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PFRAME, the only valid measurement state values are 1 and 2.*
`160 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`170   PRINT "POWER vs TIME"`	
`180   OUTPUT @Sa;"TRA?;"`	*Queries trace A.*
`190   ENTER @Sa;Trace_array(*)`	*Enters the trace data from trace a into Trace_array.*
`200   PRINT`	
`210   PRINT "Amplitude value for 300th element of trace A=";Trace_array(300);" dBm"`	*You can examine each trace element by examining the data in the trace array. In this example, the 300th trace element is examined.*
`220 ELSE`	*If Meas_state did not equal 1.*
`230   DISP "Measurement aborted"`	
`240 END IF`	
`250 !`	
`260 END`	

To measure the power versus time burst

This example shows how you can use the DECT programming commands to make a power versus time burst measurement and display the results.

10	`!re-store "PBURST_EX"`	
20	`!Shows how to use the _PBURST command`	
30	`!`	
40	`INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
50	`!`	
60	`REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
70	`REAL Burst_width`	*Declares a variable that will hold the value of the burst width.*
80	`REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
90	`!`	
100	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
110	`!`	
120	`!`	
130	`OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
140	`!`	
150	`OUTPUT @Sa;"_PBURST;"`	*Performs the power versus time burst measurement.*
160	`REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PBURST measurement state.*
170	`  ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
180	`UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PBURST, the only valid measurement state values are 1 and 2.*
190	`IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
200	`  PRINT "POWER vs TIME"`	
210	`  PRINT "BURST WIDTH: ";`	
220	`  OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the power versus time burst measurement passed, or a 1 if the measurement failed.*

`230     ENTER @Sa;Fail_flag`	*Enters the value of _F into Fail_flag.*
`240     IF Fail_flag=0 THEN`	
`250       PRINT "PASSED"`	
`260         ELSE`	
`270       PRINT "FAILED"`	
`280     END IF`	
`290     OUTPUT @Sa;"_PBT?;"`	*Queries the carrier burst width value.*
`300     ENTER @Sa;Burst_width`	*Enters the value.*
`310     OUTPUT @Sa;"TRA?;"`	*Queries trace A.*
`320     ENTER @Sa;Trace_array(*)`	*Enters the trace data from trace a into Trace_array.*
`330     PRINT`	
`340     PRINT "Burst width= ";Burst_width;" usec"`	
`350     PRINT "Amplitude value for 200th element of trace A=";Trace_array(200);" dBm"`	*You can examine each trace element by examining the data in the trace array. In this example, the 200th trace element is examined.*
`360   ELSE`	*If Meas_state did not equal 1.*
`370     DISP "Measurement aborted"`	
`380   END IF`	
`390   !`	
`400   END`	

To measure the power versus time rising edge

This example shows how you can use the DECT programming commands to measure the rising edge of a burst and display the results.

This example also demonstrates how you can change the limit variables _PRXL and _PRXH for the power versus time rising edge measurement.

`10 !re-store "PRISE_EX"`	
`20 !Shows how to use the _PRISE command`	
`30 !`	
`40 INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 REAL Rise_time`	*Declares a variable that will hold the burst rise time value.*
`80 REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
`90 !`	
`100 ASSIGN @Sa TO 718`	*Declares an array that will hold analyzer trace data.*
`110 !`	
`120 !`	
`130 OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
`140 !`	
`150 OUTPUT @Sa;"_PRISE;"`	*Performs the power versus time rising measurement.*
`160 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PRISE measurement state.*
`170   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`180 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PRISE, the only valid measurement state values are 1 and 2.*
`190 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`200   PRINT "POWER vs TIME"`	
`210   PRINT "RISE TIME: ";`	
`220   OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the power versus time rising edge measurement passed, or a 1 if the measurement failed.*
`230   ENTER @Sa;Fail_flag`	*Enters the value of _F into Fail_flag.*
`240   IF Fail_flag=0 THEN`	

```
250       PRINT "PASSED"
260         ELSE
270       PRINT "FAILED"
280     END IF
290     OUTPUT @Sa;"_PRT?;"                      Queries the rise time value.
300     ENTER @Sa;Rise_time                      Enters the value.
310     OUTPUT @Sa;"TRA?;"                       Queries trace A.
320     ENTER @Sa;Trace_array(*)                 Enters the trace A data into
                                                 Trace_array.
330     PRINT
340     PRINT "Rise time= ";Rise_time;" usec"
350     PRINT "Amplitude value for 100th         You can examine each trace element
element of trace A=";Trace_array(100);" dBm"     by examining the data in the trace
                                                 array. In this example, the 100th
                                                 trace element is examined.
360   ELSE                                       If Meas_state did not equal 1.
370     DISP "Measurement aborted"
380   END IF
390   !
400   END
```

To measure the power versus time falling edge

This example shows how you can use the DECT programming commands to measure the falling edge of a burst and display the results.

This example also demonstrates how you can change the limit variables _PFXL and _PFXH for the power versus time falling edge measurement.

`10 !re-store "PFALL_EX"`	
`20 !Shows how to use the _PFALL command`	
`30 !`	
`40 INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 REAL Fall_time`	*Declares a variable that will hold the value of the fall time of the burst.*
`80 REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
`90 !`	
`100 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`110 !`	
`120 !`	
`130 OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
`140 !`	
`150 OUTPUT @Sa;"_PFALL;"`	*Performs the power versus time falling edge measurement.*
`160 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PFALL measurement state.*
`170   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`180 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PFALL, the only valid measurement state values are 1 and 2.*
`190 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`200   PRINT "POWER vs TIME"`	
`210   PRINT "FALL TIME: ";`	
`220   OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the power versus time falling edge measurement passed, or a 1 if the measurement failed.*
`230   ENTER @Sa;Fail_flag`	*Enters the value.*

```
240      IF Fail_flag=0 THEN
250        PRINT "PASSED"
260          ELSE
270        PRINT "FAILED"
280      END IF
290      OUTPUT @Sa;"_PFT?;"
300      ENTER @Sa;Fall_time
310      OUTPUT @Sa;"TRA?;"
320      ENTER @Sa;Trace_array(*)
330      PRINT
340      PRINT "Fall time= ";Fall_time;" usec"
350      PRINT "Amplitude value for 300th
element of trace A=";Trace_array(300);" dBm"
360    ELSE
370      DISP "Measurement aborted"
380    END IF
390    !
400    END
```

- 290: *Queries the fall time value.*
- 300: *Enters the value.*
- 310: *Queries trace A.*
- 320: *Enters the trace A data into Trace_array.*
- 350: *You can examine each trace element by examining the data in the trace array. In this example, the 300th trace element is examined.*
- 360: *If Meas_state did not equal 1.*

To measure the power versus time burst on

This example shows how you can use the DECT programming commands to measure the amplitude of a burst during the on time and display the results.

`10 !re-store "PON_EX"`	
`20 !Shows how to use the _PON command`	
`30 !`	
`40 INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 !`	
`80 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
`90 !`	
`100 !`	
`110 !`	
`120 OUTPUT @Sa;"_PON;"`	*Performs the power versus time falling edge measurement.*
`130 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PON measurement state.*
`140   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`150 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PON, the only valid measurement state values are 1 and 2.*
`160 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`170   PRINT "POWER vs TIME"`	
`180   PRINT "BURST ON: ";`	
`190   OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the power versus time falling edge measurement passed, or a 1 if the measurement failed.*
`200   ENTER @Sa;Fail_flag`	*Enters the value.*
`210   IF Fail_flag=0 THEN`	
`220     PRINT "PASSED"`	
`230      ELSE`	
`240     PRINT "FAILED"`	
`250   END IF`	
`260 ELSE`	*If Meas_state did not equal 1.*
`270   DISP "Measurement aborted"`	
`280 END IF`	
`290 !`	
`300 END`	

To measure the frequency and deviation with an Option 112

This example shows how you can use the DECT programming commands to measure the frequency and deviation measurements and display the results.

10	`!re-store "FRQDEV_EX"`	
20	`!Shows how to use the _FREQDEV command`	
30	`!`	
40	`INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
50	`!`	
60	`REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
70	`REAL Freq_dev`	*Declares a variable that will hold the peak carrier frequency deviation.*
80	`REAL Freq_err_median`	*Declares a variable that will hold the median carrier frequency error.*
90	`!`	
100	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
110	`!`	
120	`!`	
130	`PRINT "Connect the 300 MHz CAL output on the Spectrum Analyzer to the 50 ohm input"`	
140	`PRINT "Then press return"`	
150	`INPUT Temp$`	
160	`OUTPUT @Sa;"_CALFRQDEV;"`	*Performs the calibration routine.*
170	`REAT`	
180	`  ENTER @Sa;Meas_state`	
190	`UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state. For _CALFRQDEV, the only valid measurement state values are 1 and 2.*
200	`IF Meas_state=2 THEN`	
210	`  PRINT "CAL FAILED - CAL SIGNAL NOT FOUND"`	
220	`ELSE`	
230	`  PRINT "CAL COMPLETED, RE-CONNECT SIGNAL, THEN PRESS RETURN"`	
240	`  INPUT Temp$`	
250	`  OUTPUT @Sa;"_FRQDEV;"`	*Performs the frequency and deviation measurement.*
260	`  REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _FRQDEV measurement state.*

`270      ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`280    UNTIL Meas_state>0 AND Meas_state<6`	*Checks for a valid measurement state value. For _FRQDEV, the only valid measurement state values are a 1 through 5.*
`290    PRINT "FREQUENCY & DEVIATION: ";`	
`300    OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the frequency and deviation measurement passed, or a 1 if the measurement failed.*
`310    ENTER @Sa;Fail_flag`	*Enters the value.*
`320    IF Fail_flag=0 THEN`	
`330      PRINT "PASSED"`	
`340    ELSE`	
`350      PRINT "FAILED"`	
`360    END IF`	
`370    OUTPUT @Sa;"_FDEV?;"`	*Queries the peak carrier frequency deviation value.*
`380    ENTER @Sa;Freq_dev`	*Enters the value.*
`390    OUTPUT @Sa;"_FER?;"`	*Queries the median carrier frequency error value.*
`400    ENTER @Sa;Freq_err_median`	*Enters the value.*
`410    PRINT`	
`420    PRINT "Peak carrier frequency deviation= ";Freq_dev;"kHz"`	
`430    PRINT "Median carrier frequency error= ";Freq_err_median;"kHz"`	
`440  END IF`	
`450  !`	
`460  END`	

To measure the spurious emissions

This example shows how you can use the DECT programming commands to make a spurious emissions measurement and display the results.

10	`!re-store "SPUR_EX"`	
20	`!`	
30	`INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
40	`INTEGER Num_spurs`	*Declares a variable that will be used to hold the number of spurs found.*
50	`INTEGER Sp_fail`	*Declares a variable that will be used to determine if a spurious emission passed or failed.*
60	`INTEGER Sp_ok`	*Declares a variable that will be used to determine if the spectrum analyzer noise floor was too high.*
70	`INTEGER I`	*Declares the loop variable.*
80	`!`	
90	`REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
100	`REAL Spur_frq_m`	*Declares a variable that will hold the MHz portion of the frequency of the spurious emission.*
110	`REAL Spur_frq_k`	*Declares a variable that will hold the kHz portion of the frequency of the spurious emission.*
120	`REAL Sp_amp`	*Declares a variable that will hold the amplitude of the spurious emission.*
130	`!`	
140	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
150	`!`	
160	`OUTPUT @Sa;"MOV _SPMAXF,2E9;"!`	*Limits the maximum frequency range for the spurious emissions measurement to 2 GHz.*
170	`OUTPUT @Sa;"_SPUR;"`	*Performs the spurious emissions measurement.*
180	`REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _SPUR measurement state.*

190 ENTER @Sa;Meas_state	*Enters the measurement state into Meas_state.*
200 UNTIL Meas_state>0 AND Meas_state<3	*Checks for a valid measurement state value. For _SPUR, the only valid measurement state values are 1 and 2.*
210 IF Meas_state=1 THEN	*If the measurement state value is 1, the measurement was successfully completed.*
220 PRINT "SPURIOUS EMISSIONS: ";	
230 OUTPUT @Sa;"_F?;"	*Queries _F. _F is a variable that contains a 0 if the spurious emissions measurement passed, or a 1 if it failed.*
240 ENTER @Sa;Fail_flag	*Enters the value.*
250 IF Fail_flag=0 THEN	
260 PRINT "PASSED"	
270 ELSE	
280 PRINT "FAILED"	
290 END IF	
300 PRINT "# Freq (MHz) Amp (dBm)"	
310 PRINT "-------------------------------"	
320 OUTPUT @Sa;"_SPN?;"	*Queries the number of spurs found.*
330 ENTER @Sa;Num_spurs	*Enters the value.*
340 IF Num_spurs<1 THEN	*If the number of spurs is less than 1, then no spurs were detected.*
350 PRINT "No spurs found"	
360 ELSE	*Else the number of spurs is greater than 0.*
370 FOR I=1 TO Num_spurs	*Loops through each spur found.*
380 OUTPUT @Sa;"_SPFM[";I;"]?;"	*Queries the MHz portion.*
390 ENTER @Sa;Spur_frq_m	*Enters the value.*
400 OUTPUT @Sa;"_SPFK[";I;"]?;"	*Queries the kHz portion.*
410 ENTER @Sa;Spur_frq_k	*Enters the value.*
420 OUTPUT @Sa;"_SPAMP[";I;"]?;"	*Queries the amplitude.*
430 ENTER @Sa;Sp_amp	*Enters the value.*
440 Sp_amp=Sp_amp/10	*Converts the amplitude to dBm.*
450 OUTPUT @Sa;"_SPFAIL[";I;"]?;"	*Queries the pass or fail flag.*
460 ENTER @Sa;Sp_fail	*Enters the value.*
470 OUTPUT @Sa;"_SPOK[";I;"]?;"	*Queries the spectrum analyzer noise floor indicator.*
480 ENTER @Sa;Sp_ok	*Enters the value.*
490 PRINT I,Spur_frq_m+(Spur_frq_k/1000),Sp_amp;	*Prints each spur.*

```
500        IF Sp_fail=1 THEN
```

If a spur's amplitude is greater than the limit, print "FAIL" by the spur.

```
510          PRINT "   FAIL";
520        ELSE
```

If the spur's amplitude is less than the limit, print "PASS" by the spur.

```
530          PRINT "   PASS";
540        END IF
550        IF Sp_ok=0 THEN
560          PRINT " * (CHECK NOISE FLOOR)"
```

Prints asterisk (*), (CHECK NOISE FLOOR), a carriage return, and a line feed.

```
570        ELSE
580          PRINT
```

Prints a carriage return and a line feed.

```
590        END IF
600      NEXT I
610    END IF
620  ELSE
```

If Meas_state did not equal 1.

```
630    DISP "Measurement aborted"
640  END IF
650  END
```

To measure the intermodulation attenuation

This example shows how you can use the DECT programming commands to make an intermodulation attenuation measurement and display the results.

10	`!re-store "INT_MOD_ATN"`	
20	`!shows how to use the _IMTADN command`	
30	`!`	
40	`INTEGER Fail_flag`	*Declares a variable that will be used to determine if the measurement failed.*
50	`!`	
60	`REAL Meas_state`	*Declares a variable to hold the measurement state.*
70	`REAL Int_low_res`	*Holds the lower intermodulation product value.*
80	`REAL Int_high_res`	*Holds the upper intermodulation product value.*
90	`!`	
100	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer.*
110	`!`	
120	`!`	
130	`OUTPUT @Sa; "_IMDATN;"`	*Performs the intermodulation attenuation measurement.*
140	`REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _IMDATN measurement state.*
150	`  ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
160	`UNTIL Meas_state=1`	*Checks for a valid measurement state value. A measurement state value of 1 is returned if the measurement is completed.*
170	`PRINT "INTERMODULATION ATTENUATION: ";`	
180	`PRINT "Set transmitters to CH 0 & 9 then press RETURN"`	
190	`INPUT Temp$`	
200	`OUTPUT @Sa; "_zINTMREF;"`	*Measures the normal transmitted power and the gated power integral of the carriers.*
210	`REPEAT`	
220	`ENTER @Sa;Meas_state`	
230	`UNTIL Meas_state=2`	*A measurement state value of 2 is returned if the setup was successful.*
240	`PRINT "Set transmitters to CH 3 & 6 then press RETURN"`	
250	`INPUT Temp$`	
260	`REPEAT`	

`270 OUTPUT @Sa; "_zINTMEAS;"`	*Measures the gated power integral of the intermodulation products.*
`280 ENTER @Sa;Meas_state`	
`290 UNTIL Meas_state=3`	*A measurement state value of 3 is returned if the measurement is successfully completed.*
`300 OUTPUT @Sa;"_F?;"`	*Queries _F. _F is a variable that contains a 0 if the intermodulation attenuation measurement passed, or a 1 if it failed.*
`310 ENTER @Sa;Fail_flag`	*Enters the value of _F into Fail_flag.*

```
320   IF Fail_flag=0 THEN
330    PRINT "PASSED"
340     ELSE
350       PRINT "FAILED"
360   END IF
370   PRINT
```

`380 OUTPUT @Sa;"_IMDL?;"`	*Queries the lower intermodulation product value.*
`390 ENTER @Sa;Int_low_res`	*Enters the value.*
`400 OUTPUT @Sa;"_IMDU?;"`	*Queries the higher intermodulation product value.*
`410 ENTER @Sa;Int_high_res`	*Enters the value.*

```
420   PRINT "Lower Product = ";Int_low_res;" dB"
430   PRINT "Upper Product = ";Int_high_res;" dB"
440   !
450   END
```

5

If You Have a Problem

The purpose of this chapter is to help you if you have a problem operating the DECT measurements personality. If the problem is related to the spectrum analyzer and not the DECT measurements personality, consult the documentation for the spectrum analyzer.

This chapter is divided into the following sections:

- Problems that are indicated by error messages that appear on the spectrum analyzer display.
- Other types of problems (problems that are not indicated by error messages).
- How to contact Hewlett-Packard.

Error Messages

The error messages are listed alphabetically by the first word in the message.

CAL SIGNAL NOT FOUND, CAL STOPPED

Indicates that the spectrum analyzer could not find the 300 MHz calibration signal because the signal was not present or because the signal power was too low (less than −30 dBm).

To solve this problem:

- □ Check that the spectrum analyzer's CAL OUT connector is connected to the INPUT connector with a cable.

CARRIER NOT BURST, MEAS STOPPED

Indicates that the carrier does not seem to have the characteristics of a burst carrier (for example, the difference between the carrier's maximum and minimum power levels is less than 25 dB), and the measurement has been stopped.

To solve this problem:

- □ If the carrier to be measured is a continuous carrier, check that BURST CONT is set to CONT.
- □ If the carrier to be measured is a burst carrier, check that the transmitter is in the burst mode.

CARRIER NOT CONT, MEAS STOPPED

Indicates that the carrier does not seem to have the characteristics of a continuous carrier (for example, the difference between the carrier's maximum and minimum power levels is greater than 10 dB), and the measurement has been stopped.

To solve this problem:

- □ If the carrier to be measured is a burst carrier, check that BURST CONT is set to BURST.
- □ If the carrier to be measured is a continuous carrier, check that the transmitter is in the continuous mode.

CARRIER POWER TOO HIGH, MEAS STOPPED

Indicates that the measured level of the carrier is too high to make a valid measurement and the measurement has been stopped. (The carrier level cannot be greater than 1 dB above the top graticule line.)

To solve this problem:

- □ Check that the transmitter output is connected to the spectrum analyzer input correctly.
- □ Check that the EXT LOSS function has been set correctly. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.

CARRIER POWER TOO LOW, AUTO CH STOPPED

Indicates that a carrier could not be found, and the AUTO CHANNEL function has been stopped. To be considered a carrier, the amplitude level of the carrier must be greater than −30 dBm.

To solve this problem:

- ☐ Check that the transmitter output is connected to the spectrum analyzer's input correctly.
- ☐ Check that the EXT LOSS function has been set correctly. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.
- ☐ If you want the DECT measurements personality to use an amplitude level other than −30 dBm when searching for carriers, you can change the minimum amplitude level by using the remote variable _CMIN.

CARRIER POWER TOO LOW, MEAS STOPPED

Indicates that the measured level of the carrier is too low to make a valid measurement and the measurement has been stopped. The carrier level must be greater than the minimum level of −30 dBm.

To solve this problem:

- ☐ Check that the transmitter output is connected to the spectrum analyzer input.
- ☐ Check that the EXT LOSS function has been set correctly. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.
- ☐ If you want the DECT measurements personality to use an amplitude level other than −30 dBm when searching for carriers, you can change the minimum amplitude level by using the remote variable _CMIN.

CARRIER PRESENT, MEAS STOPPED

Indicates that although the XCVR IDLE ACT function is set to IDLE, the DECT measurements personality has detected a carrier with a power level greater than −30 dBm.

To solve this problem:

- ☐ Check that the DECT transmitter is idle. When a transmitter is idle, it is not transmitting a signal.

CHECK NOISE FLOOR

Indicates that the noise floor of the spectrum analyzer may be too high to measure any spurious emissions or intermodulation products down to the measurement limits.

If you are testing for spurious emissions:

1. Use `Inspect Spur` to view the spurious emission.
2. While viewing the spurious emission, temporarily remove the signal from the analyzer input. If the spurious emission remains, the spurious emission is caused by the spectrum analyzer's noise floor.

3 If the spur is caused by the spectrum analyzer noise floor:

- □ If the carrier level is greater or equal to +10 dBm, verify that there is at least 3 dB of EXT LOSS. If there is not, add enough external attenuation to bring EXT LOSS to least 3 dB (but not more than is necessary to reach this). The power calibration must be rerun if this is done. This technique will work for carriers with carrier levels of up to +13 dBm.
- □ Decrease the resolution bandwidth (RES BW) when testing for spurious emissions. Decreasing the test resolution bandwidth will increase the test time for the spurious emissions measurement, however.

If you are testing intermodulation attenuation:

- □ If you are making an intermodulation attenuation measurement and the carrier levels are greater than +7 dBm, verify that there is at least 3 dB of EXT LOSS. If there is not, add enough external attenuation to bring EXT LOSS to at least 3 dB (but not more than is necessary to reach this). The power calibration must be rerun if this is done. This technique will work for carriers with carrier levels of up to +10 dBm.

DECT DEMOD CARD REQUIRED

Indicates that the spectrum analyzer does not have Option 112, the DECT demodulator card, installed in it. (Option 112 is required for making a frequency deviation measurement with FREQ/DEV.)

To solve this problem:

- □ If there is an Option 112 installed in the spectrum analyzer, it could be malfunctioning. Refer to the *HP 8590 Series Spectrum Analyzer User's Guide* for more information about returning the spectrum analyzer for repair.

Note If you use SHOW OPTIONS to list the options installed in your spectrum analyzer, you should be aware that Option 112 is incorrectly displayed as Option 102. To check if your spectrum analyzer has an Option 112 installed in it, look at the serial number label on the spectrum analyzer's rear panel. The "OPT" section of the serial number label lists the options that are installed in the spectrum analyzer.

- □ If Option 112 is not installed in the spectrum analyzer, you can have an Option 112 installed in your spectrum analyzer. Contact your local HP sales and service office for more information.

EXT PRECISION FREQ REFERENCE REQUIRED

Indicates that the spectrum analyzer does not have Option 004, the precision frequency reference, installed in it. This message is a reminder that because the spectrum analyzer does not have Option 004 installed in it, and that you must use an external precision frequency reference to use the DECT measurements personality.

To use an external precision frequency reference:

- □ Disconnect the connector from the 10 MHz REF OUTPUT and EXT REF IN connectors on the rear panel, then connect the 10 MHz signal from a precision external frequency reference to the EXT REF IN connector.

FAST ADC CARD REQUIRED

Indicates that the spectrum analyzer does not have Option 101, the the fast time-domain sweeps card, installed in it.

To solve this problem:

- □ If there is an Option 101 installed in the spectrum analyzer, it could be malfunctioning. Refer to the *HP 8590 Series Spectrum Analyzer User's Guide* for more information about returning the spectrum analyzer for repair.
- □ If Option 101 is not installed in the spectrum analyzer, you can have an Option 101 installed in your spectrum analyzer. Contact your local HP sales and service office for more information.

GATE CARD REQUIRED

Indicates that the spectrum analyzer does not have Option 105, the time-gated spectrum analysis card, installed in it. You need to have Option 105 installed in the spectrum analyzer to make power versus time and frequency and modulation measurements.

To solve this problem:

- □ If there is an Option 105 installed in the spectrum analyzer, it could be malfunctioning. Refer to the *HP 8590 Series Spectrum Analyzer User's Guide* for more information about returning the spectrum analyzer for repair.
- □ If Option 105 is not installed in the spectrum analyzer, you can have an Option 105 installed in your spectrum analyzer. Contact your local HP sales and service office for more information.

INVALID SYMTAB ENTRY: SYMTAB OVERFLOW

Indicates that there was not enough available spectrum analyzer memory to load the DECT measurements personality.

To solve this problem, you must delete the other programs in the spectrum analyzer memory as follows:

1 Press (PRESET).

2 Press (CONFIG), MORE 1 of 3, Dispose User Mem, ERASE DLP MEM, ERASE DLP MEM, (PRESET).

3 Reload the DECT measurements personality using the procedure "Step 1. Load the DECT measurements personality" in Chapter 1.

NEWER FIRMWARE REQUIRED: REV 930302 OR LATER

This message indicates that the spectrum analyzer's firmware must be updated before the DECT measurements personality can be used.

To solve this problem:

- □ Contact your HP sales office for more information about updating the firmware in your spectrum analyzer.

REMOVE GATE TRIGGER INPUT BEFORE AMPTD CAL

This message appears whenever (CAL) is pressed. The purpose of this message is to remind you that nothing should be connected to the spectrum analyzer's GATE TRIGGER INPUT connector when the spectrum analyzer's amplitude self-calibration routine is performed.

PLEASE INSERT HP 85723A CARD AND TRY AGAIN

Indicates that the wrong memory card is located in the spectrum analyzer memory card reader.

To solve this problem, you must insert the HP 85723A memory card into the spectrum analyzer and load the DECT measurements personality.

PLEASE CHECK HP 85723A CARD IS IN SLOT AND TRY AGAIN

Indicates that the HP 85723A memory card is not located in the spectrum analyzer memory card reader. To solve this problem insert the memory card into the spectrum analyzer memory card reader and try again.

This error may occur if you try to run a menu that isn't loaded in the spectrum analyzer memory. You must have the memory card inserted into the spectrum analyzer memory card reader the first time you access the spurious and intermodulation menu.

Other Problems

This section lists problems that are not indicated by an error message.

If the DECT measurements personality does not make a measurement

If you press one of the measurement functions and the DECT measurements personality does not make the measurement, it could be caused by one of the following:

- □ Check that the channel number is correct.

  Make sure that the channel number corresponds to the transmitted carrier frequency. (Remember that AUTO CHANNEL can be used to find the carrier with the highest signal level.) Refer to "Step 7. Select a channel to test" in Chapter 1 for more information.

- □ Check that BURST CONT is set correctly.

  If you are testing a continuous carrier, ensure that CONT is underlined in the BURST CONT softkey. If you are testing a burst carrier, ensure that BURST is underlined in the BURST CONT softkey. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.

- □ Check that if a burst carrier is selected, the external triggering is correct.

  Ensure that an external trigger is input to the spectrum analyzer. Refer to "Step 3. Connect the cables to the spectrum analyzer's rear panel" in Chapter 1 for more information.

If the test results are not what you expected

If the test results are incorrect or not what you expected, it could be caused by one of the following conditions:

- □ Check that BURST CONT is set correctly.

  If you are testing a continuous carrier, ensure that CONT is underlined in the BURST CONT softkey. If you are testing a burst carrier, ensure that BURST is underlined in the BURST CONT softkey. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.

- □ Check that the external trigger settings are correct.

  Ensure that the correct trigger delay and trigger polarity have been selected. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information about TRIG DELAY and TRIG POL NEG POS.

- □ Check that TRANSMIT FP PP is set correctly.

  Ensure that if you are testing a fixed part (FP), FP is underlined in the TRANSMIT FP PP softkey. If you are testing a portable part (PP), ensure that PP is underlined in the TRANSMIT FP PP softkey. Refer to "Step 7. Select a channel to test" in Chapter 1 for more information.

- □ Check that the value for external insertion loss is set correctly.

  Ensure that the EXT LOSS function has been set correctly. Refer to "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.

How to Contact Hewlett-Packard

In the event something goes wrong with your spectrum analyzer, refer to the documentation for the spectrum analyzer about returning it for service. If you need to contact Hewlett-Packard about a problem with the DECT measurements personality, you can call your nearest Hewlett-Packard Sales and Service office that is listed in the following table.

Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS HEADQUARTERS Hewlett-Packard Company 19320 Pruneridge Avenue Cupertino, CA 95014, USA (408) 973-1919	**EUROPEAN OPERATION HEADQUARTERS** Hewlett-Packard S.A. 150, Route du Nant-d'Avril 1217 Meyrin 2/Geneva Switzerland (41 22) 780.8111	**INTERCON OPERATIONS HEADQUARTERS** Hewlett-Packard Company 3495 Deer Creek Rd. Palo Alto, California 94304-1316 (415) 857-5027
California Hewlett-Packard Co. 1421 South Manhattan Ave. Fullerton, CA 92631 (714) 999-6700 Hewlett-Packard Co. 301 E. Evelyn Mountain View, CA 94041 (415) 694-2000	**France** Hewlett-Packard France 1 Avenue Du Canada Zone D'Activite De Courtaboeuf F-91947 Les Ulis Cedex France (33 1) 69 82 60 60	**Australia** Hewlett-Packard Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 (61 3) 895-2895 **Canada** Hewlett-Packard (Canada) Ltd. 17500 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 Canada (514) 697-4232
Colorado Hewlett-Packard Co. 24 Inverness Place, East Englewood, CO 80112 (303) 649-5000	**Germany** Hewlett-Packard GmbH Berner Strasse 117 6000 Frankfurt 56 West Germany (49 69) 500006-0	**Japan** Yokogawa-Hewlett-Packard Ltd. 1-27-15 Yabe, Sagamihara Kanagawa 229, Japan (81 427) 59-1311
Georgia Hewlett-Packard Co. 2000 South Park Place Atlanta, GA 30339 (404) 955-1500	**Great Britain** Hewlett-Packard Ltd. Eskdale Road, Winnersh Triangle Wokingham, Berkshire RG11 5DZ England (44 734) 696622	**People's Republic of China** China Hewlett-Packard, Ltd. 38 Bei San Huan X1 Road Shuang Yu Shu Hai Dian District Beijing, China (86 1) 256-6888
Illinois Hewlett-Packard Co. 5201 Tollview Drive Rolling Meadows, IL 60008 (708) 255-9800		**Singapore** Hewlett-Packard Singapore Pte. Ltd. 1150 Depot Road Singapore 0410 (65) 273 7388
New Jersey Hewlett-Packard Co. 120 W. Century Road Paramus, NJ 07653 (201) 599-5000		**Taiwan** Hewlett-Packard Taiwan 8th Floor, H-P Building 337 Fu Hsing North Road Taipei, Taiwan (886 2) 712-0404
Texas Hewlett-Packard Co. 930 E. Campbell Rd. Richardson, TX 75081 (214) 231-6101		

6

Softkey Descriptions

This chapter contains the following:

- A menu map of the DECT measurements personality softkeys.
- Definitions of the DECT measurements personality softkeys. The softkeys are listed as they appear within a menu, and the DECT menus are presented as follows:

Configuration menu	Pressing Config accesses the configuration menu.
Physical Channel menu	Pressing Physical Channel accesses the physical channel menu.
Power menu	Pressing Power accesses the power menu.
Power versus Time menu	Pressing Power vs Time accesses the power versus time menu.
Spurious and Intermodulation menu	Pressing Spurs & Intermod accesses the spurious and intermodulation menu.
Frequency and Modulation menu	Pressing Freq & Modulat accesses the frequency and modulation menu.
Post-Measurement menu	Pressing a power measurement softkey, a power versus time measurement softkey, or FREQ/DEV accesses the post-measurement menu.

DECT Measurements Personality Menu Map

The following menu map is a graphic representation of how the DECT measurements personality's softkeys are accessed.

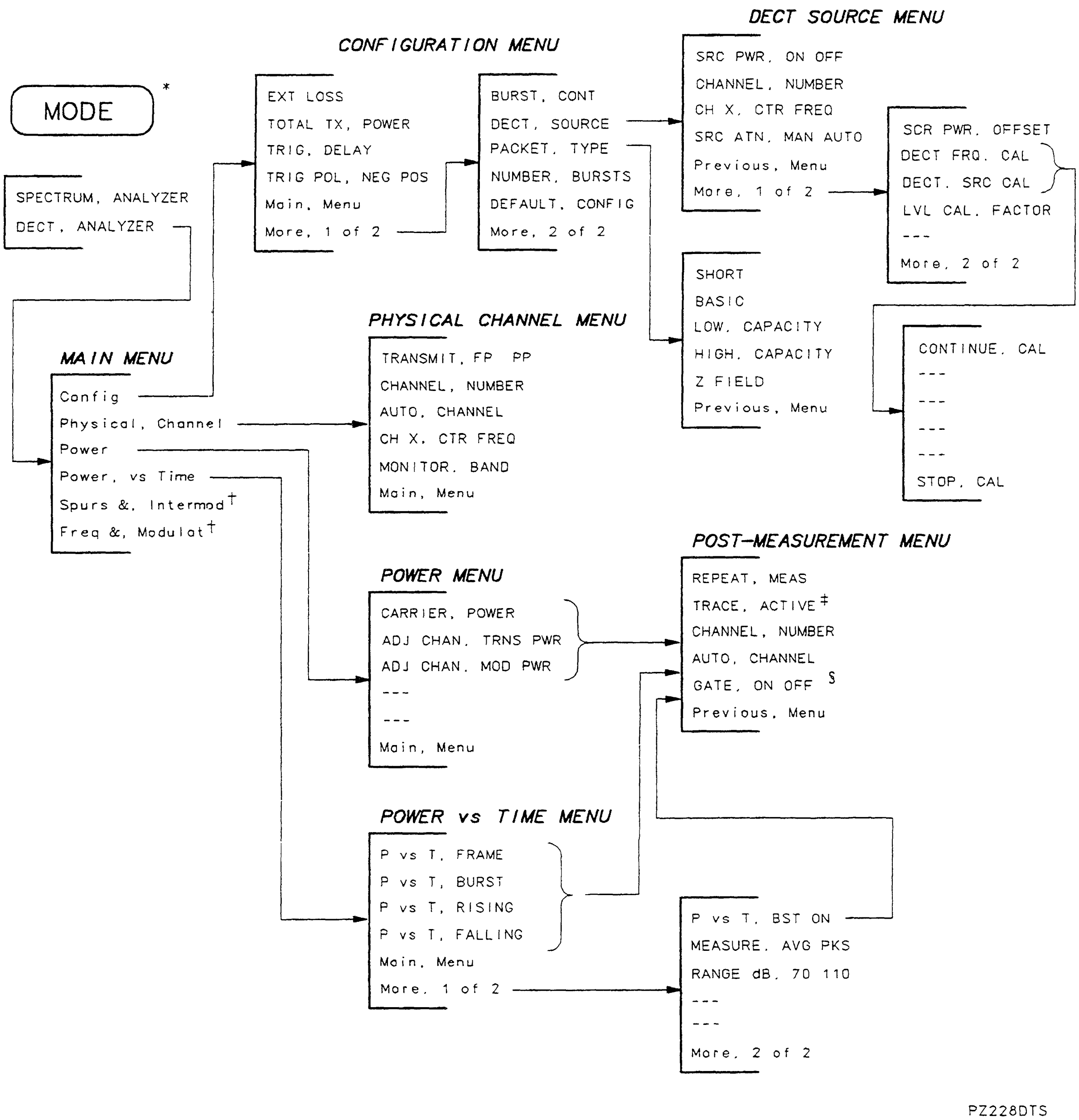


Figure 6-1. Overall Menu Map

* The first time you press (MODE), you access the MODE menu. If you press (MODE) again, you will access the current DECT menu.

† Refer to the following page for the Spurs & Intermod and Freq & Modulat menus.

§ The softkey that is shown in this position varies according to the measurement function as follows: GATE ON OFF is only available only for ADJ CHAN MOD PWR, TRIG DELAY is available only for the Power vs Time measurement functions, and INSPECT PACKET is available only for FREQ/DEV.

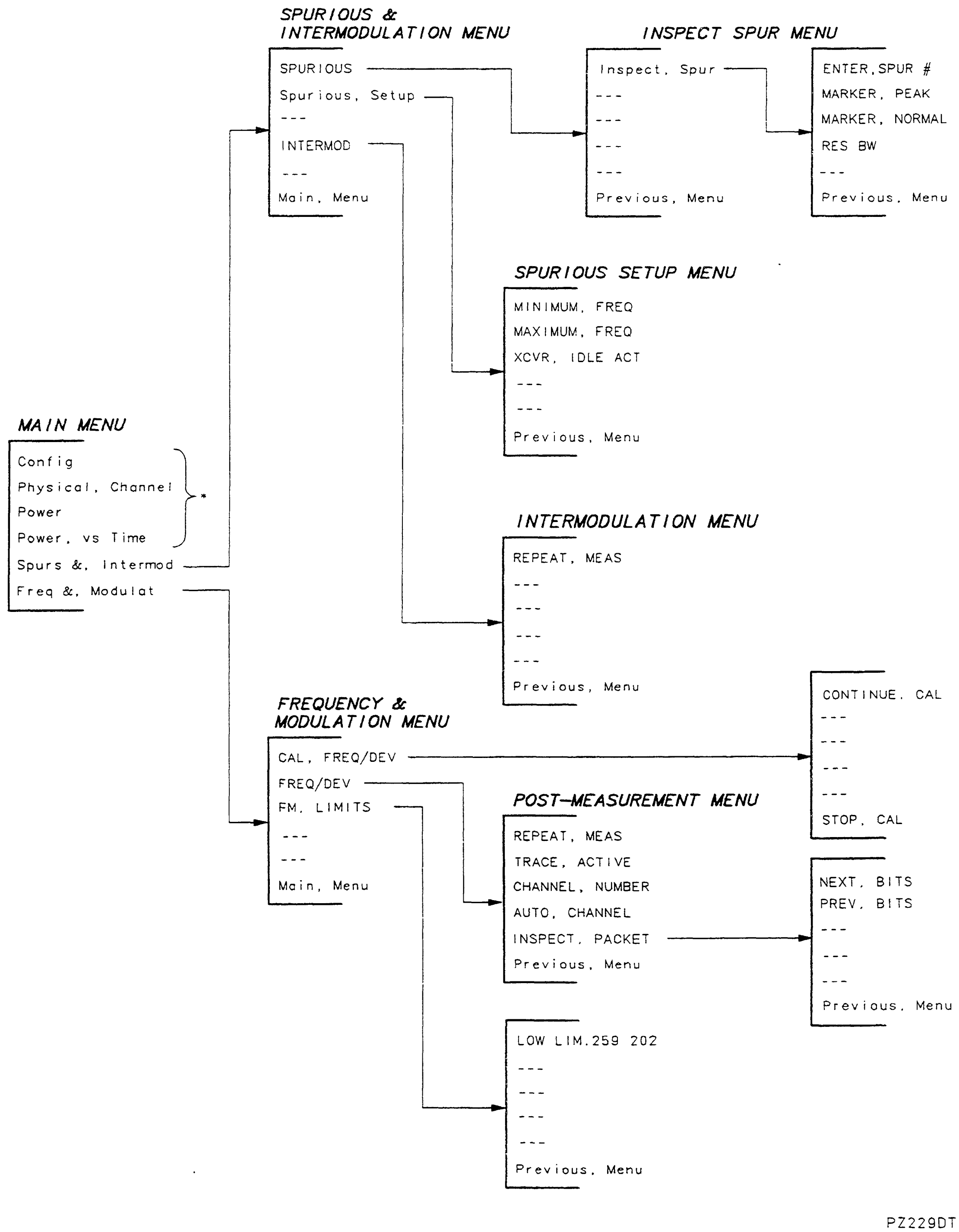
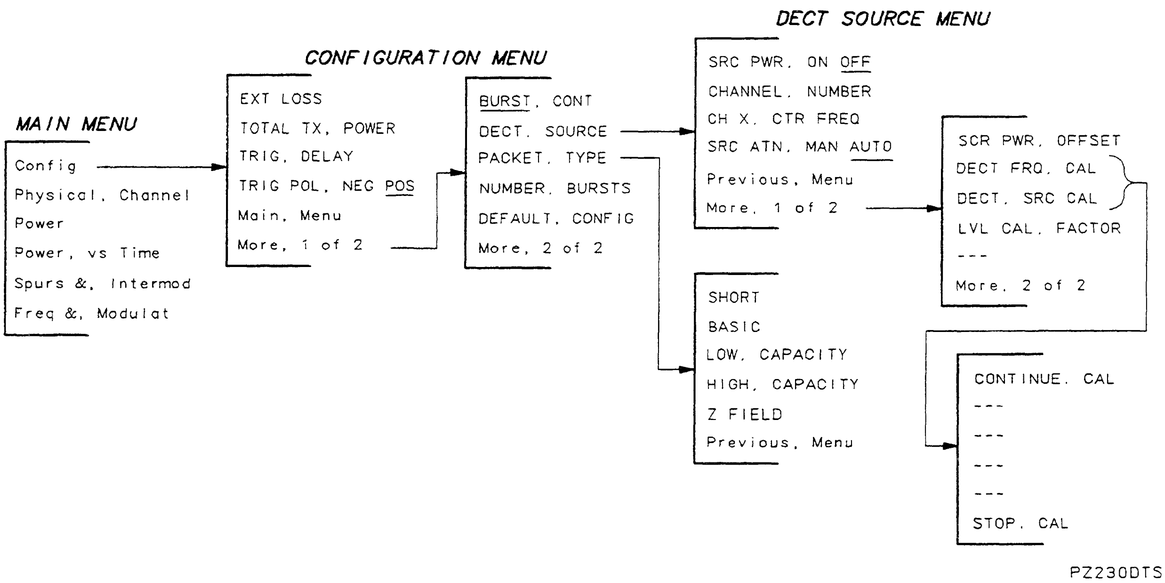


Figure 6-1. Overall Menu Map (continued)

* Refer to the previous page for the Config, Physical Channel, Power, and Power vs Time menus.

The Configuration Menu

Pressing **Config** accesses the softkeys that allow you to configure the DECT measurements personality and the DECT Source for your test setup.



The Configuration Menu Map

Most of the configuration functions allow you to enter a value into the function or make a selection with the function. The values that you enter, or the selections that you make, are retained even if (PRESET) is pressed or the spectrum analyzer is turned off.

You can reset the configuration functions to their default values with **DEFAULT CONFIG**. For example, if you enter 3 dB of external loss with **EXT LOSS**, the value for **EXT LOSS** will be 3 dB until you change it (by using **EXT LOSS**), or use **DEFAULT CONFIG**.

The Configuration Menu Softkeys

EXT LOSS	Allows you to enter the insertion loss of any external equipment that is used to connect the transmitter output to the spectrum analyzer input. The external loss is used when calculating the amplitude readouts so that the readouts indicate the true power level at the transmitter output. You can enter an external loss from 0 dB to 50 dB in 0.01 dB increments. If an external loss is not entered, a default value of 0 dB is used.
TOTAL TX POWER	Allows you to enter the total RF output power of the transmitter. The entered value allows the spectrum analyzer to adjust the input attenuation so that the spectrum analyzer is not driven into signal compression for signals with power levels less than the entered value. You can enter a value from −10 dBm to 30 dBm (depending on the transmitter output) in 1 dB increments. If the total transmission power is not entered, a default value of +26 dBm is used.
TRIG DELAY	Allows you to enter the delay time from the external trigger signal to the reference point of the burst. For a positive edge trigger, the reference point is either the rising edge of the burst or the rising edge of the frame trigger. For a negative edge trigger, the reference point is either the falling edge of the burst or the falling edge of the frame trigger. You can enter a trigger delay from −2200 μs to +1800 μs in 1 μs increments. If you do not enter a trigger delay, a default value of 0 μs is used.
TRIG POL NEG POS	Allows you to select the edge trigger polarity for the external transistor-transistor logic (TTL) trigger signal. If you select negative polarity, the spectrum analyzer will trigger on the negative (falling) edge of the trigger signal. Selecting positive polarity results in the spectrum analyzer triggering on the positive (rising) edge of the trigger signal. The default for this function is POS.
Main Menu	Allows you to return to the main menu.
More 1 of 2	Accesses the second page of the configuration menu.
BURST CONT	Allows you to specify if the carrier is a burst or a continuous (nonburst) carrier. This selection affects the spectrum analyzer trigger mode and sweep time. The sweep time used in the measurements will be slower if BURST is selected, to ensure that the peak signal values are captured. The default for this function is BURST.
DECT SOURCE	Allows you to access the softkey functions which enable you to use the DECT Source. This key can also be accessed through the front panel key (AUX CTRL).
PACKET TYPE	Pressing PACKET TYPE accesses the softkeys that allow you to select the type of packet used for burst timing measurements. This allows the analyzer to select the correct sweep time for zero span measurements. These softkeys are:

SHORT	Allows you to select a short physical packet. This type of packet is used as a dummy bearer and also for short slot connectionless data, for example paging.
BASIC	Allows you to select a basic physical packet. This type of packet is generally used for telephony in DECT transmissions.
LOW CAPACITY	Allows you to select a low capacity physical packet. This type of packet function is subject to future standardization.

HIGH CAPACITY — Allows you to select a high capacity physical packet. This type of packet is generally used for low overhead data transmissions.

Z FIELD — Allows you to set an optional error detection field. This will increase the length of each physical packet by 3.5 μs. Press Z FIELD until it is underlined to setup an optional error detection field. The Z field cannot be selected for short physical packets.

Previous Menu — Returns to the configuration menu.

NUMBER BURSTS — Allows you to change the number of bursts that are used in calculating the trace values. (The trace values can be calculated two different ways—refer to the description for MEASURE AVG PKS for more information.) You can change the number of bursts from 1 to 99,999 with the data keys. After the measurement is performed, the number of bursts used to make the measurement is shown on the left side of the spectrum analyzer screen.

DEFAULT CONFIG — Replaces the entered values for the configuration functions with their default values. The default values are as follows: EXT LOSS is set to 0 dB, TOTAL TX POWER is set to +26 dBm, TRIG DELAY is set to 0 μs, TRIG POL NEG POS is set to POS, BURST CONT is set to BURST, TRANSMIT FP PP is set to FP.

More 2 of 2 — Returns to the first page of the configuration menu.

The DECT Source Menu Softkeys

SRC PWR ON OFF — Allows you to activate (ON underlined) or deactivate (OFF underlined) the output power of the DECT Source (SRC). The power level can be adjusted using the data keys, step keys, or spectrum analyzer knob. You can enter a power level from −17.25 dBm to −83 dBm. The default power level is −17.25 dBm. (The default level can be modified by the level calibration factor if the frequency is in the DECT frequency band.) The center frequency defaults to the current channel number or the channel X center frequency channel if it is selected. Changing the resolution bandwidth of the spectrum analyzer from a value of 100KHz or greater to a value of 30KHz or less (or vice versa) can result in a change in DECT source carrier frequency. Cycling the SRC PWR will restore the correct carrier frequency.

CHANNEL NUMBER — Allows you to select the RF frequency by selecting a channel number. You can enter a channel number from 0 to 9 inclusive. The default channel number is 9.

CH X CTR FREQ — Allows you to enter the frequency of any arbitrary channel that you want to measure. CH X CTR FREQ can be helpful if you know the channel's frequency but not the channel number, or if you want to measure a frequency that does not correspond to a standard channel number. If you do not enter a frequency, the default frequency of 300 MHz will be used. Entering a frequency for channel X automatically changes the channel number to X.

SRC ATN MAN AUTO — Allows you to select between manual (select MAN underlined) and automatic (select AUTO underlined) adjustment of the DECT Source's switching attenuator. The DECT Source attenuation can be manually adjusted from 0 dB to 56 dB in 8 dB steps. When autocoupled, the source attenuation function automatically adjusts the attenuator to yield the source amplitude level specified by the SRC PWR ON OFF softkey function.

Previous Menu — Returns to the second page of the configuration menu.

More 1 of 2 — Accesses the second page of the DECT Source menu.

SRC PWR OFFSET — Allows you to offset the displayed power of the DECT Source. Using this capability you can take system losses or gains into account, thereby displaying the actual power delivered to the device under test. You can enter an offset value of −100 dB to +100 dB.

DECT FRQ CAL — Allows you to activate a routine that automatically calibrates the DECT Source output frequency to an accuracy of 1 kHz with respect to the spectrum analyzer's frequency reference.

For the DECT frequency calibration to function properly:

a. the spectrum analyzer frequency and amplitude calibration routines must be executed after the spectrum analyzer has warmed up for at least 30 minutes. Refer to chapter 2, "Getting Started" in the *HP 8590 Series Spectrum Analyzer User's Guide* for information regarding calibration of the spectrum analyzer.

b. the DECT SOURCE 50 Ω output must be connected to the INPUT 50 Ω connector.

c. the rear panel inputs TIMESLOT PULSE IN, RF SWITCH CURRENT IN and TTL DATA IN must also be disconnected.

DECT SRC CAL Allows you to activate a routine that automatically calibrates the frequency and amplitude of the DECT Source. During the amplitude calibration a value is stored as the level calibration factor. This value improves the amplitude accuracy in the DECT frequency band.

For the DECT Source calibration to function properly:

a. the spectrum analyzer frequency and amplitude calibration routines must be executed after the spectrum analyzer has warmed up for at least 30 minutes. Refer to chapter 2, "Getting Started" in the *HP 8590 Series Spectrum Analyzer User's Guide* for information regarding calibration of the spectrum analyzer.

b. the DECT SOURCE 50 Ω output must be connected to the INPUT 50 Ω connector.

c. the rear panel inputs TIMESLOT PULSE IN, RF SWITCH CURRENT IN and TTL DATA IN must also be disconnected.

LVL CAL FACTOR Allows you to modify the absolute amplitude calibration factor at 1.89 GHz. This allows you to calibrate the DECT Source using a power meter. This is a narrow band calibration factor and should only be used for the DECT frequency band.

To make a power meter calibration routine select LVL CAL FACTOR and set it to zero using the data keys. Connect the power meter to the DECT SOURCE 50 Ω output. A power level of −40 dBm is applied to the DECT SOURCE 50 Ω output and measured by the power meter.

The value for the LVL CAL FACTOR is calculated from the expression,

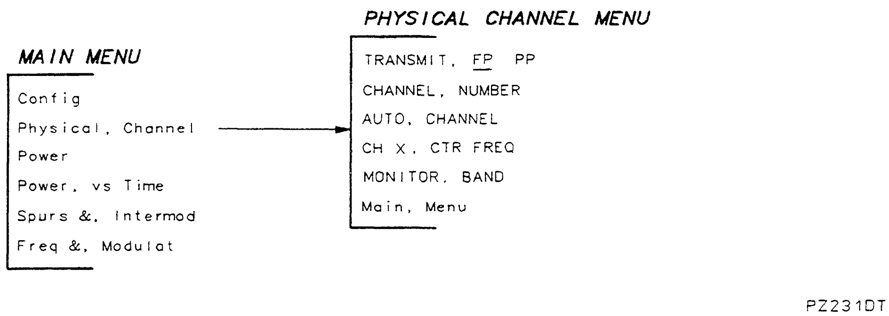
LVL CAL FACTOR = Power meter reading − Displayed Power

The difference in power is stored by reselecting LVL CAL FACTOR and entering the value using the data keys.

More 2 of 2 Returns to the first page of the DECT Source menu.

The Physical Channel Menu

Pressing Physical Channel accesses the softkey functions that allow you to select the timing reference (FP or PP), the channel to be tested, and the length of the burst.



The Physical Channel Menu Map

The Physical Channel Menu Softkeys

TRANSMIT FP PP Allows you to examine either the fixed part (FP) transmission or the portable part (PP) transmission in the power versus time and the frequency and modulation measurements. If FP is underlined, the timing of the measurements is set to examine the fixed part (also called the base station) transmission burst. When PP is underlined, the timing of the measurements is set to examine the portable part (also called the handset) transmission burst. The default for this function is FP. The selection for FP or PP is retained even if (PRESET) is pressed or the spectrum analyzer is turned off.

CHANNEL NUMBER Allows you to enter the channel number for the DECT channel you want to measure. The DECT measurements personality uses the channel number to set the center frequency to the correct value when one of the "channel" measurements is performed. The channel measurements are as follows: carrier power, carrier off power, adjacent channel power, out of band power, a power versus time measurement, and a frequency and modulation measurement. You can enter a channel number from 0 to 9, inclusive. If you do not enter a channel number, or if you press (PRESET), the channel selection defaults to channel 9.

AUTO CHANNEL Automatically tunes to the channel having the highest carrier power level, and then displays the full frequency band of the DECT radio by setting the start frequency of the spectrum analyzer to 1880 MHz and the stop frequency to 1900 MHz.

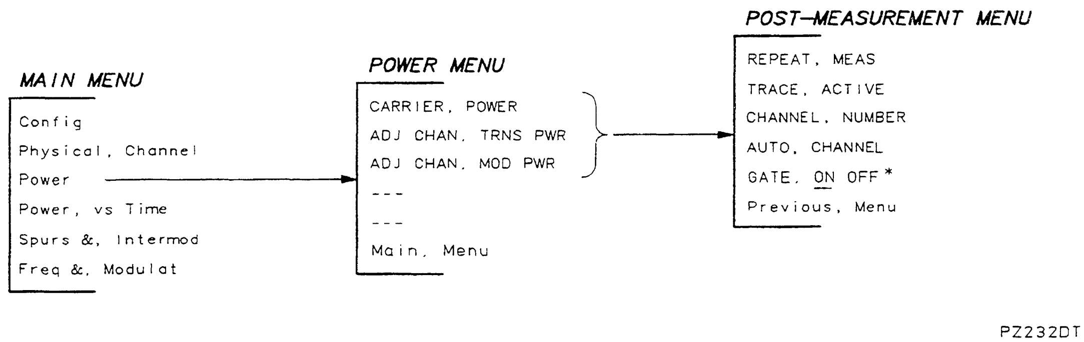
CH X CTR FREQ Allows you to enter the frequency of any arbitrary channel that you want to measure. CH X CTR FREQ can be helpful if you know the channel's frequency but not the channel number, or if you want to measure a frequency that does not correspond to a standard channel number. If you do not enter a frequency, the default frequency of 300 MHz will be used. Entering a frequency for channel X automatically changes the channel number to X.

MONITOR BAND Displays the full frequency band of the DECT band by setting the start frequency of the spectrum analyzer to 1880 MHz and the stop frequency to 1900 MHz.

Main Menu Returns to the main menu.

The Power Menu

Pressing Power accesses the softkeys that allow you to measure the transmitter's carrier power and the adjacent channel power due to modulation and transients. The power menu functions not only make a measurement, but they also access additional softkeys. Refer to "The Post-Measurement Menu" for more information about the softkeys that the power menu softkeys access.



The Power Measurement Menu Map

* The softkey that is shown in this position is only available for ADJ CHAN MOD PWR.

None of the power measurements require an external trigger signal, with the exception of the adjacent channel power due to modulation measurement when time-gating is used (GATE ON OFF is set to ON).

Table 6-1 shows the spectrum analyzer settings for each of the power measurements. The DECT measurements personality automatically sets the spectrum analyzer settings for each measurement.

Table 6-1. Spectrum Analyzer Settings

Spectrum Analyzer Setting	CARRIER POWER	ADJ CHAN TRNS PWR	ADJ CHAN MOD PWR
Span	0 Hz	1 MHz	1 MHz
Resolution bandwidth	3 MHz	100 kHz	100 kHz
Video bandwidth	3 MHz	300 kHz	1 MHz
Sweep time	†	5.0 s	12.0 s
Detector	Sample	Peak	Peak
Trigger mode	Video*	Free run	External

* The trigger mode for a burst carrier is video. The trigger mode for a continuous carrier is free run.
† The sweep time for the carrier power depends on the packet type selected. Refer to Table 6-2.

Table 6-2. Carrier Power Sweep Time Settings

Packet Type	Sweep Time
Short	180 μs
Basic	460 μs
Low Capacity	240 μs
High Capacity	800 μs

The limits and parameters for the power measurements can be changed remotely. Refer to "Programming Basics for DECT Remote Operation" in Chapter 4 for more information.

The Power Menu Softkeys

CARRIER POWER Measures the mean power of the transmitter carrier envelope during the on part of the burst. This measurement determines the mean carrier power between the −3 dB points referenced from the peak of the carrier signal. The average power of several bursts are used in calculating the carrier power level. The default number of bursts is 5.

To determine whether the carrier power was within normal power limits, the measured carrier power is compared to the normal power limits, and then the pass or fail message is displayed.

ADJ CHAN TRNS PWR Measures the power that "leaks" from the transmitted channel due to the effect of switching transients. This uses a peak detector to measure the power on each channel with a 1 MHz span and 100 kHz resolution bandwidth. The power of the transmit channel is not measured. The peak detector is used to ensure that the RF spectrum is captured during the burst.

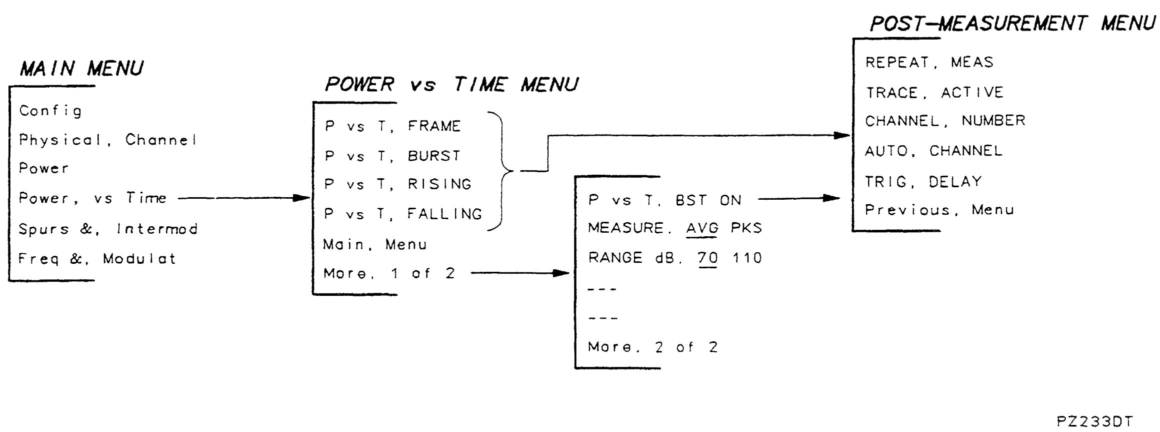
ADJ CHAN MOD PWR Measures the power that "leaks" from the transmitted channel due to the effect of modulation. The personality uses the spectrum analyzer's positive peak detector and an 1 MHz integration bandwidth to measure the power in the adjacent channels relative to the transmitting channel. The peak detector is used to ensure that the RF spectrum is captured during the burst. The increased amplitude that results from using the positive-peak detector (versus a sample detector) is automatically subtracted out of the displayed result.

Main Menu Returns to the main menu.

The Power versus Time Menu

Pressing **Power vs Time** accesses the softkeys that allow you to measure or examine the DECT timing parameters. The power versus time functions allow you to view the full DECT frame, the burst waveform, the rising edge of the burst, the falling edge of the burst, or the on time of the burst. All of the power versus time measurements automatically position the mean power of the on-part of the burst 3 dB below the reference level (the reference level is the top graticule).

The result of any of the power versus time measurements is both the graphical display of the DECT burst and numerical results.



The Power versus Time Measurement Menu Map

All power versus time measurements require an external trigger signal.

Table 6-3 shows the spectrum analyzer settings for the power versus time measurements. The DECT measurements personality automatically sets the spectrum analyzer settings for each measurement. The spectrum analyzer sweep time setting is dependent on the packet type selected, refer to Table 6-4.

Table 6-3. Spectrum Analyzer Settings

Spectrum Analyzer Setting	Value
Span	0 Hz
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Detector	Sample
Trigger mode	External

Table 6-4. Spectrum Analyzer Sweep Time Settings

Packet Type Selected	P vs T FRAME	P vs T BURST	P vs T RISING	P vs T FALLING	P vs T BST ON
Short	11 ms	180 μs	120 μs	120 μs	60 μs
Basic	11 ms	460 μs	120 μs	120 μs	340 μs
Low Capacity	11 ms	240 μs	120 μs	120 μs	140 μs
High Capacity	11 ms	800 μs	120 μs	120 μs	760 μs

The limits and parameters for the power versus time measurements can be changed remotely. Refer to "Programming Basics for DECT Remote Operation" in Chapter 4 for more information.

The Power versus Time Menu Softkeys

P vs T FRAME — Displays the full frame time-division duplexing (TDD) waveform. P vs T FRAME is useful for checking your equipment setup or troubleshooting your equipment, but for more accurate measurements you should use P vs T FALLING, P vs T RISING or P vs T BST ON.

P vs T BURST — Measures the transmit burst waveform and determines if the burst waveform exceeds the specified burst width. The width of the burst at the −3 dB points of the burst is displayed. The burst is also compared to a limit line.

P vs T RISING — Measures the rise time and settling time of the rising edge of the burst. (The rise time is the time it takes the rising edge of the burst to transition from −30 dB to −3 dB. The settling time is the amount of time it takes the burst to reach −3 dB after the edge trigger.) The rising edge is also compared to a limit line.

P vs T FALLING — Measures the fall time and settling time of the falling edge of the burst. (The fall time is the time it takes the falling edge of the burst to transition from −6 dB to −30 dB. The settling time is the amount of time it takes the burst to reach −6 dB after the edge trigger.) The falling edge is also compared to a limit line.

Main Menu — Returns to the main menu.

More 1 of 2 — Accesses the second page of the power versus time menu.

P vs T BST ON — Measures the amplitude of the burst on time waveform and determines if the burst on time amplitude is within the specified limits.

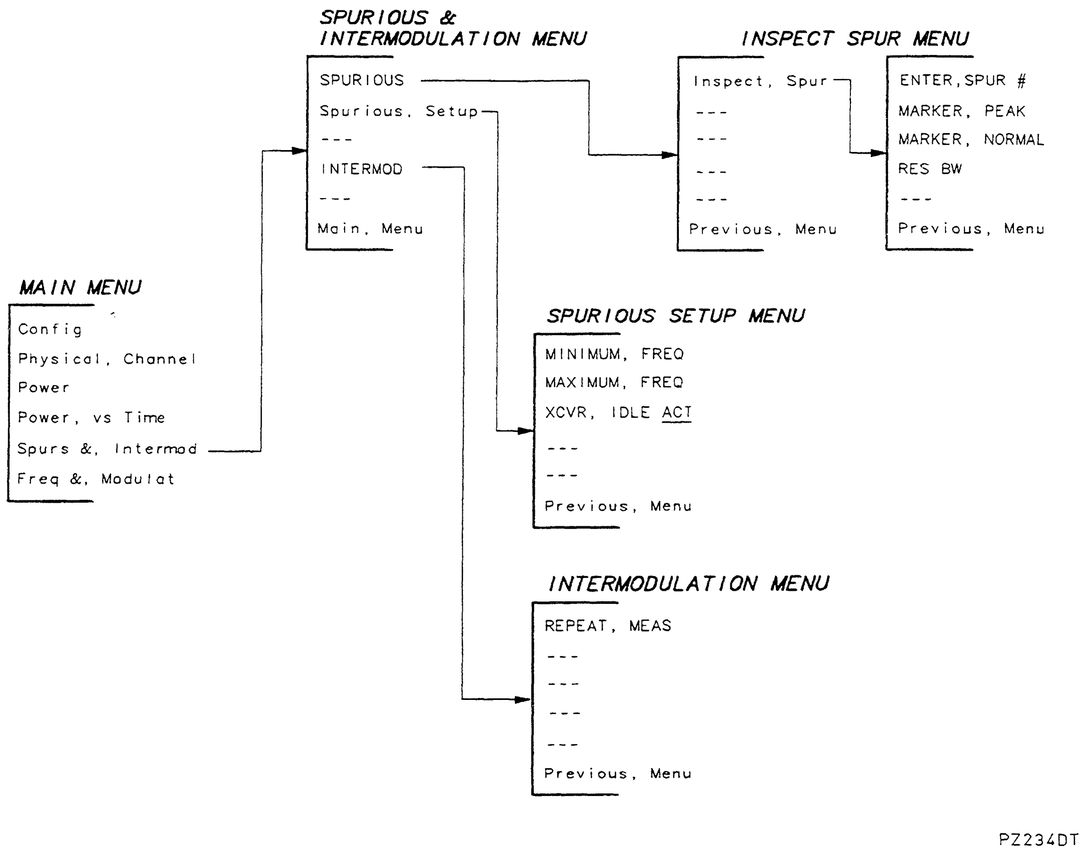
MEASURE AVG PKS — Selects if the trace containing the averaged trace results is displayed, or if the traces containing the maximum and minimum trace results are displayed. If AVG is underlined, the displayed trace is an average of the trace values over multiple sweeps. If PKS is underlined, there are two displayed traces: one of the minimum trace peaks over multiple sweeps and one of the maximum trace peaks over multiple sweeps. Because the value of NUMBER BURSTS determines the number of sweeps, the value of NUMBER BURSTS must be greater than 1 to obtain averaged trace results (MEASURE AVG PKS is set to AVG). The default for this function is AVG.

RANGE dB 70 110 — Allows you to select the total amplitude range that is displayed by a power versus time measurement. If you select 70, a range of 70 dB is displayed, and the amplitude scale is set to 10 dB per division. If you select 110 a range of 110 dB is displayed, and the amplitude scale is set to 15 dB per division. (The personality obtains a display range of 110 dB by combining measurements made at two different reference level settings.)

More 2 of 2 — Accesses the first page of the power versus time menu.

The Spurious and Intermodulation Menu

Pressing Spurs & Intermod access the softkeys that allow you to measure spurious emissions and intermodulation products created by the transmitter.



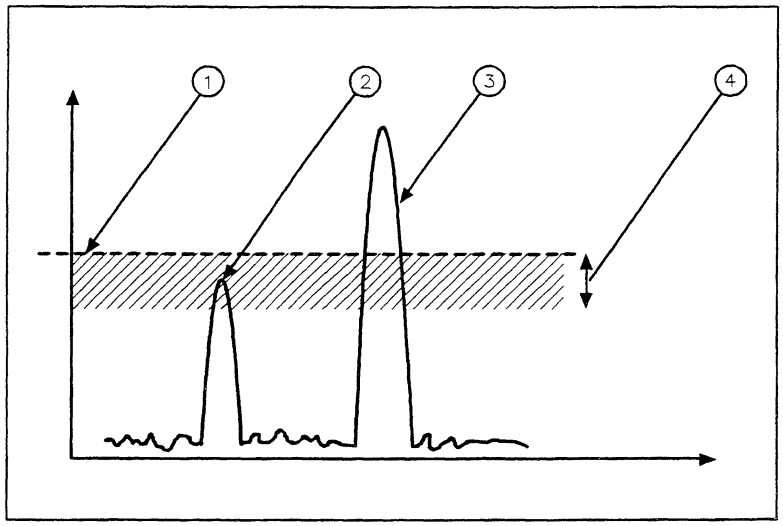
The Spurious and Intermodulation Measurement Menu Map

The spurious emissions measurement does not require an external trigger signal. However, an external trigger signal is required for the intermodulation attenuation measurement.

The limits and parameters for the spurious and intermodulation measurements measurements can be changed remotely. Refer to "Programming Basics for DECT Remote Operation" in Chapter 4 for more information.

The Spurious and Intermodulation Menu Softkeys

SPURIOUS The DECT measurements personality searches the specified frequency range for spurious emissions. If a signal exceeds the limit for spurious emissions or if it is detected within 6 dB below the limit, the signal is entered in the table of spurious emissions. If the spurious signal exceeds the limit, the message FAIL is displayed next the frequency of the spurious signal. If the signal was within 6 dB below the limit, the message PASS is displayed next to the spurious emission. Refer to Figure 6-2 for an example of a spurious emission that passes the spurious emissions limit, and a spurious emission that fails.



PZ235

Figure 6-2. The Spurious Emissions Limit

Table 6-5. Spurious Emissions Limit

Number	Description
1	The limit for spurious emissions.
2	A signal that passes the spurious emissions test. Even if a signal passes the spurious emissions test, it will be listed in the table of spurious emissions if it is within 6 dB below the limit for spurious emissions.
3	A signal that fails the spurious emissions test. Signals that exceed the limit for spurious emissions will be listed in the table of spurious emissions.
4	The 6 dB margin that is used by the spurious emissions measurement.

The frequency range: If you do not specify the frequency range, the frequency range is 100 kHz to the default value for MAXIMUM FREQ (refer to the description for MAXIMUM FREQ for the default values). If the transmitter is in the active state, the DECT measurements personality automatically excludes the DECT frequency band from this search. In addition, if the carrier is set to channel 0 or 9, any frequencies which are less than 2 MHz from the frequency band limits are also excluded from this search.

You can specify the frequency range to be used in the spurious emissions measurement with MAXIMUM FREQ and MINIMUM FREQ . (MAXIMUM FREQ and MINIMUM FREQ are located in the menu accessed by Spurious Setup .)

Frequency Range	Comments	Resolution Bandwidth
Transmitter in the Active State		
100 kHz to 15 MHz	Frequency range near the feedthrough from the spectrum analyzer's local oscillator.	10 kHz
15 MHz to 1850 MHz		3 MHz †
1850 MHz to 1860 MHz 1860 MHz to 1870 MHz 1870 MHz to 1875 MHz 1875 MHz to 1878 MHz	Frequency ranges near the DECT band.	1 MHz 300 kHz 100 kHz 30 kHz
1878 MHz to 1880 MHz	Only if the transmit channel is not 9.	30 kHz
1900 MHz to 1902 MHz	Only if the transmit channel is not 0.	30 kHz
1902 MHz to 1905 MHz 1905 MHz to 1910 MHz 1910 MHz to 1920 MHz 1920 MHz to 1930 MHz	Frequency ranges near the DECT band.	30 kHz 100 kHz 300 kHz 1 MHz
1930 MHz to analyzer maximum		3 MHz
† Except for the following broadcast frequency bands.		
47 MHz to 74 MHz 87.5 MHz to 108 MHz 108 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz		100 kHz 100 kHz 100 kHz 100 kHz 100 kHz
Transmitter in the Idle State		
100 kHz to 15 MHz	Frequency range near the feedthrough from the spectrum analyzer's local oscillator.	10 kHz
15 MHz to 1880 MHz		100 kHz
1880 MHz to 1900 MHz	This is the DECT frequency band.	100 kHz
1900 MHz to analyzer maximum		100 kHz

Spurious Setup Accesses the functions that allow you to change the testing parameters for testing spurious emissions with SPURIOUS. Refer to "The Spurious Setup Menu Softkeys" for more information about the spurious setup softkeys.

INTERMOD Measures the intermodulation products from the transmitter. To measure the intermodulation products, there must be two carriers present. The DECT measurement personality measures the power in channels 0 and 9 when the DECT transceiver is tuned to these channels, and the relative power in channels 0 and 9 when the DECT transceiver is tuned to channels 3 and 6.

Main Menu Returns to the main menu.

The Inspect Spur Menu Softkeys

Pressing Inspect Spur accesses the softkeys that allow you to inspect any signals that are listed in the table of spurious emissions and also displays the first spur in the table. If there were no spurs, pressing Inspect Spur has no effect.

ENTER SPUR # — Allows you to enter the number of the spur that you want to examine (you can determine the number of the spur from the table that is displayed). After you select the spur to be examined, the spectrum analyzer settings change to the same measurement state in which the test was performed, and then positions a marker on the spur. You can also use the up key (▲) or down key (▼) to examine the spurs. Pressing the up key displays the next spur, pressing the down key displays the previous spur.

MARKER PEAK — Positions a marker on the highest level of the displayed trace.

MARKER NORMAL — Allows you to change the position of the marker. You can use the large knob on the spectrum analyzer's front panel to position the marker.

RES BW — Changes the resolution bandwidth. (Video bandwidth and sweep time remain correctly coupled so that the DECT signals are correctly displayed when the resolution bandwidth is changed.)

Previous Menu — Returns to the detected spurious emissions table.

The Spurious Setup Menu Softkeys

Pressing Spurious Setup access the following softkeys that allow you to change the measurement parameters for testing spurious emissions.

MINIMUM FREQ
: Changes the start frequency used during the spurious emissions measurement. The default value is 100 kHz.

MAXIMUM FREQ
: Changes the stop frequency used during the spurious emissions measurement. The default value is 12.75 GHz for the HP 8593E, 2.9 GHz for the HP 8594E, 6.5 GHz for the HP 8595E and 12.8 GHz for the HP 8596E spectrum analyzers.

XCVR IDLE ACT
: Allows you to specify if the handset or base station transceiver is in the idle (IDLE) state or the active (ACT) state. (The measurement limits for the spurious emission test depend upon the setting of this softkey.) If the unit under test is in the active state (there is a carrier present) you must select ACT, otherwise the measurement will stop. The default value for XCVR IDLE ACT is ACT.

Previous Menu
: Returns to the spurious and intermodulation menu.

The Intermodulation Menu Softkeys

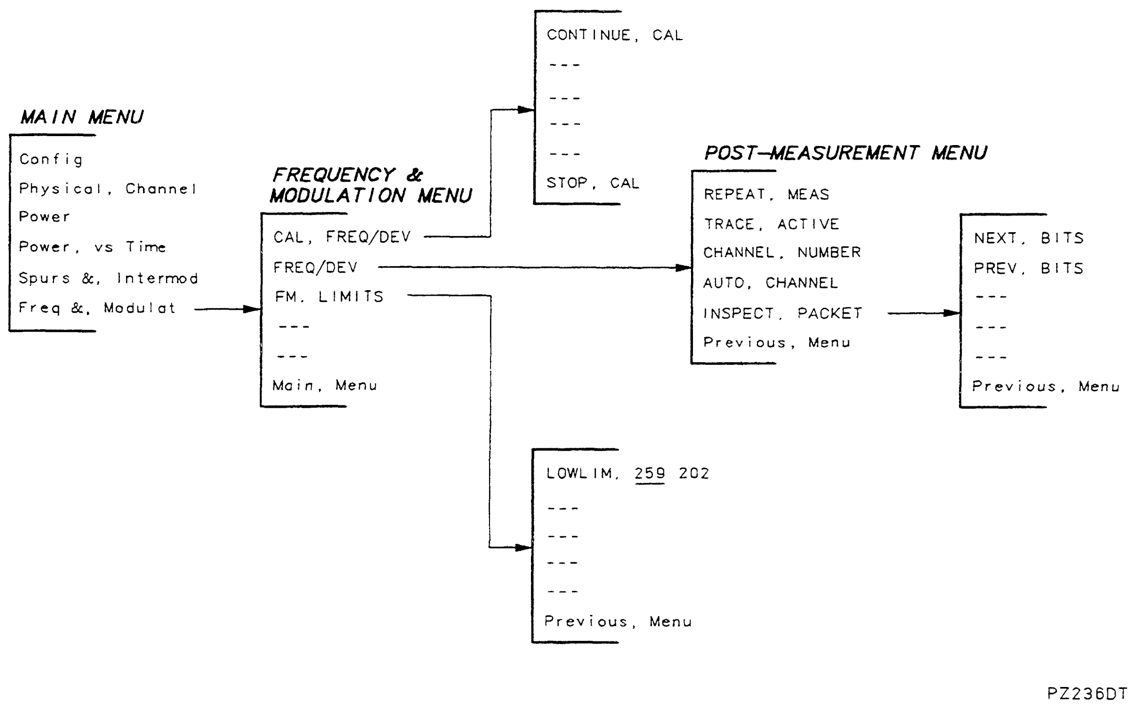
Pressing INTERMOD measures the intermodulation products and accesses the softkeys that allow you to repeat the measurement, or inspect the upper and lower intermodulation products.

REPEAT MEAS — Repeats the measurement again.

Previous Menu — Returns to the spurious and intermodulation menu.

The Frequency and Modulation Menu

Pressing Freq & Modulat accesses the softkeys that measure the carrier frequency error and carrier frequency deviation. To perform the measurements, you must have a DECT demodulator card (Option 112) installed in your spectrum analyzer.



The Frequency and Modulation Measurement Menu Map

The Frequency and Modulation Menu Softkeys

CAL FREQ/DEV *Option 112 Only:* Uses the spectrum analyzer's 300 MHz calibration signal to calibrate the DECT demodulator card (Option 112) for FM offset and FM gain. The message `Connect 300 MHz CAL OUT to INPUT 50 Ω,then press 'CONTINUE CAL'` is displayed. When using FREQ/DEV, you should perform this calibration routine every 30 minutes or with a change in the ambient temperature for best accuracy.

- **CONTINUE CAL** Allows you to continue with the calibration after you have made the connection between the 300 MHz CAL OUT and the INPUT 50 Ω.
- **STOP CAL** Allows you to stop the calibration routine.

FREQ/DEV *Option 112 Only:* Measures both the median frequency error, and the peak deviation of a modulated carrier (either a burst or continuous carrier).

For the frequency deviation measurement, the spectrum analyzer is set to the following settings:

Span	0 Hz	Scale	112 kHz/division†
Sweep time	80 μs	Detector	FMV
Resolution Bandwidth	3 MHz	Trigger Mode	External*
Video bandwidth	3 MHz		

* The trigger mode for a burst carrier is external. The trigger mode for a continuous carrier is free run.

† This is a typical example of the scale setting, however the scale is dependent on the characteristics of option 112.

For the median frequency error measurement: The DECT measurements personality determines the median frequency error of the carrier. The median frequency error is the midpoint between the maximum and minimum frequency deviation. The median frequency error measurement is an average of several measurements made across a burst. The number of measurements made is dependent on the packet type selected.

For the peak frequency deviation measurement: The peak frequency deviation is obtained by measuring the peak-to-peak frequency deviation of the carrier and dividing the result by 2. The peak frequency deviation measurement is an average of several measurements made across a burst. The number of measurements made is dependent on the packet type selected.

FREQ/DEV also accesses the post-measurement softkeys. Refer to "The Post-Measurement Menu" in this chapter for more information about the post-measurement softkeys.

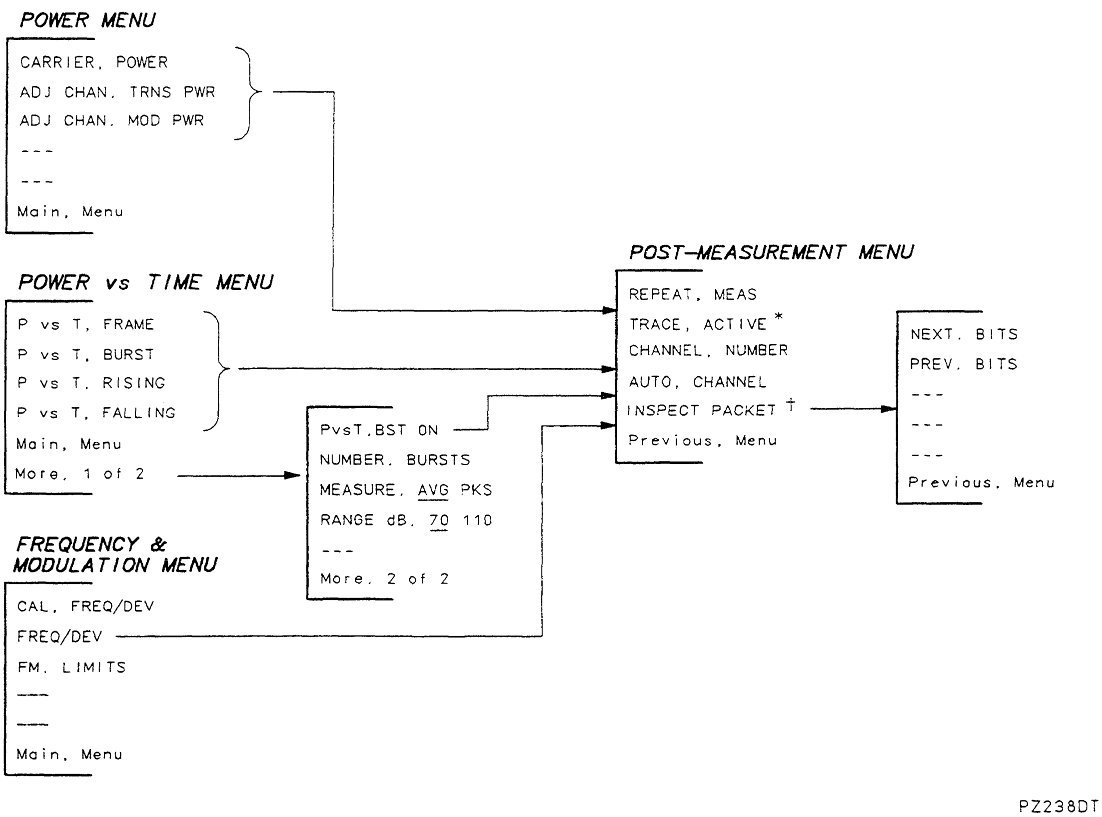
FM LIMITS Allows you to access a menu where you can set the frequency modulation limits.

- **LOW LIM 259 202** Allows you to select the lower frequency modulation limit. Pressing the softkey toggles the frequency modulation between 259 kHz and 202 kHz. Press the softkey so that the frequency modulation you require is underlined.
- **Previous Menu** Returns you to the frequency and modulation menu.

Main Menu Returns to the main menu.

The Post-Measurement Menu

Once the measurement has been completed, many of the DECT measurements access the "post-measurement" menu. The post-measurement menu contains functions that allow you to repeat the previous measurement or change various testing parameters.



The Post-Measurement Menu Map

* When you press TRACE ACTIVE, the softkey label changes to TRACE COMPARE. (Except in FM)

† The softkey that is shown in this position varies according to the measurement function as follows: GATE ON OFF is only available only for ADJ CHAN MOD PWR, TRIG DELAY is available only for the Power vs Time measurement functions, and INSPECT PACKET is available only for FREQ/DEV.

The Post-Measurement Menu Softkeys

REPEAT MEAS	Repeats the measurement again. If desired, you can change parameters such as the channel number, trigger delay, or resolution bandwidth before you press this key.
TRACE ACTIVE	Allows you to view the active trace. When you press TRACE ACTIVE, an active trace (an active trace is a trace of the signal that is being continuously updated) is displayed and the softkey label changes to TRACE COMPARE. Pressing TRACE ACTIVE allows you to change analyzer settings and repeat measurements.
TRACE COMPARE	If you press TRACE COMPARE, the active trace data is copied into trace C, and trace C is placed in the view mode. The active trace (in trace A) is displayed along with the trace in the view mode (the trace in trace C).
CHANNEL NUMBER	Allows you to change the channel number of the channel that is to be measured.
AUTO CHANNEL	Changes the channel by tuning to the channel with the highest carrier power, and then repeats the measurement.
TRIG DELAY	Allows you to enter the delay time from the external trigger signal to the reference point of the burst.
GATE ON OFF	Allows you to exclude switching transients and measure only the adjacent channel power due to modulation. When time-gating is selected (GATE ON OFF is set to ON), the spectrum is measured during the middle portion (between 60 percent to 80 percent) of the burst. Therefore the spectrum due to switching transients at the beginning and end of the burst are excluded.
INSPECT PACKET	Allows you to inspect the bits in a burst by stepping through the last captured packet in 80 μs increments.

NEXT BITS	Allows you to view the next 80 μs of the burst.
PREV BITS	Allows you to view the previous 80 μs of the burst.
Previous Menu	Returns to the previous menu.

Previous Menu	Returns to the previous menu.

7

Operating Reference

This chapter contains general information about the operation of the DECT measurements personality. This chapter contains the following sections:

- Information about the changes to the spectrum analyzer operation caused by the DECT measurements personality.
- The specifications and characteristics for the DECT measurements personality.
- Lists of the recommended accessories and spectrum analyzer options for use with the DECT measurements personality.

Note The HP 8590 E-Series Option 012, DECT Source specifications and characteristics are described in Chapter 9.

Spectrum Analyzer Functions and Annotation

This section contains information about how the DECT measurements personality changes the functions and screen annotation of an HP 8590 Series spectrum analyzer.

Changes to the Spectrum Analyzer Functions During DECT Operation

Most of the spectrum analyzer functions perform the same function regardless of whether the spectrum analyzer is using the DECT measurements personality mode or the spectrum analyzer mode. Some spectrum analyzer functions however, are either not available or are changed when the spectrum analyzer is using the DECT mode.

Note

If you press SHOW OPTIONS and your spectrum analyzer has an Option 112 installed in it, the list of installed options displays Option 102, the AM/FM speaker and TV sync trigger circuitry card, instead of Option 112. Option 112 is displayed as Option 102 because an Option 112 is a modified version of Option 102.

If you need to check if your spectrum analyzer has an Option 112 installed in it, look at the serial number label on the spectrum analyzer's rear panel. The "OPT" section of the serial number label lists the options that are installed in the spectrum analyzer.

The following spectrum analyzer functions are not available when using the DECT mode:

AMPTD UNITS	The DECT measurements personality provides only dBm units.
FREQ OFFSET	The frequency offset function is not available when using DECT mode.
(CAL) functions	
REF LVL OFFSET	The DECT measurement personality offsets the reference level whenever a value is entered into the EXT LOSS function.
VID AVG ON OFF	The averaging function is not available when using the DECT mode.

The following spectrum analyzer functions are changed by the DECT mode:

SCALE LOG/LIN	This softkey becomes SCALE LOG (linear scale is not available in the DECT mode).
(FREQUENCY)	Pressing (FREQUENCY) accesses the spectrum analyzer frequency functions and CH X CTR FREQ replaces CENTRE FREQ .

DECT Measurements Personality Screen Annotation

When using the DECT measurements personality, you may have noticed that there is additional annotation displayed on the spectrum analyzer screen. This additional screen annotation supplies information that is related to the DECT measurements settings. Refer to Figure 7-1 and Table 7-1 for an explanation of the screen annotation that is related to the DECT measurements personality.

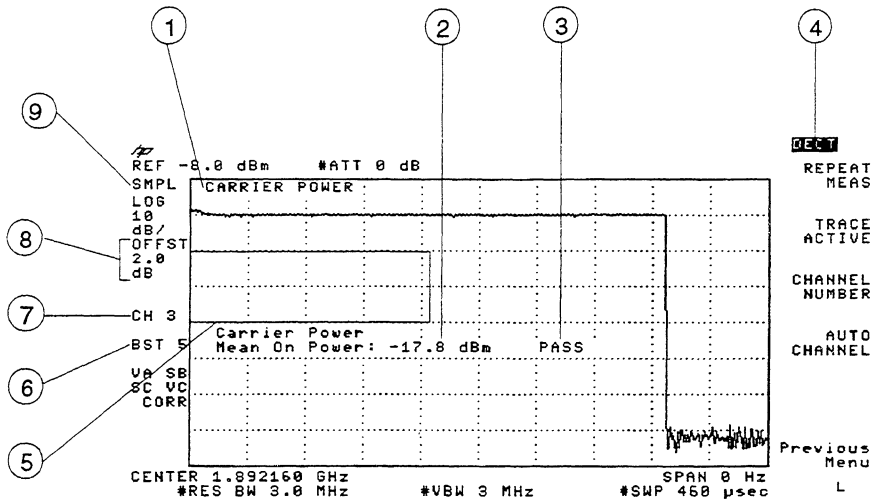


Figure 7-1. DECT Screen Annotation

Table 7-1. DECT Screen Annotation

Item	Display Annotation	Description
1	Measurement	The current DECT measurement.
2	Measurement results	The measurement results.
3	PASS or FAIL messages	Indicates if the measurement results passed or failed the current measurement limits.
4	DECT	Indicates the spectrum analyzer is using the DECT measurements personality (also referred to as the DECT mode).
5	Active function or error message	Indicates either the active function that has been selected or an error message.
6	BST	Displays the number of bursts or sweeps that were used for the measurement.
7	CH	Displays the channel number.
8	OFFST	Displays the reference level offset that is equal to the value entered for the external loss.
9	FMV, GTSMP, GTPOS, SMPL, PEAK	Detector mode for measurement. The detectors are: FM demodulator mode (FMV), gated-sample mode (GTSMP), gated-positive mode (GTPOS), sample mode (SMPL), and peak mode (PEAK).

Specifications and Characteristics for the HP 85723A

This section contains the specifications and characteristics for the HP 85723A DECT measurements personality when it is installed in an HP 8590 Series spectrum analyzer.

The specifications describe warranted performance over the temperature range 0° to +55°C (unless otherwise noted). Characteristics provide useful, but nonwarranted, information about the functions and performance of the instrument.

Specifications and Characteristics Requirements

The specifications and characteristics in Table 7-2 apply if the following conditions are met:

- The DECT measurements personality is used with an HP 8593A/E, HP 8594A/E, HP 8595A/E or HP 8596E spectrum analyzer.
- The necessary options are installed in the spectrum analyzer (refer to "The Equipment that You Will Need" in Chapter 1 for a list of the necessary options and acceptable option substitutions).
- The spectrum analyzer is operated within the temperature range of 0° to +55°C.
- The spectrum analyzer's temperature has been stabilized. The instrument's temperature is considered to be stabilized if the spectrum analyzer has been stored at a constant temperature between 0°C and +55 °C for 2 hours, *and* after the spectrum analyzer has been turned on for at least 30 minutes.
- The measurements are performed on DECT transmitter signals.
- With the following spectrum analyzer settings:

  Total transmitter power (TOTAL TX POWER) of +26 dBm

  External loss (EXT LOSS) of +3 dB

  The other spectrum analyzer settings are set automatically by the DECT measurements personality.
- The maximum safe input level is not exceeded. Total input power must not exceed +30 dBm (1 watt).

Sensitivity Optimization

The best sensitivity is achieved by minimizing the total attenuation of the signal of interest. Total attenuation is the sum of the external attenuation (also called the external loss) and the spectrum analyzer internal input attenuation. The spectrum analyzer internal input attenuation is automatically set, in 10 dB increments, according to the highest amplitude signal displayed on screen or to the setting of the TOTAL TX POWER, depending on the measurement. External attenuation, however, can be adjusted in 1 dB increments. By choosing the proper amount of external attenuation, the internal attenuator can be set one 10 dB step lower, thus reducing the total attenuation.

The value for external loss for best sensitivity can be found by the following equation:

$$External\ Loss = Total\ TX\ Power - (N \times 10\ dB)$$

Where N = 0 or 1.

You must set EXT LOSS to the value of external attenuation that is used. The DECT measurements personality uses the value of EXT LOSS to correct the spectrum analyzer reference level value.

Specifications and Characteristics

Table 7-2 lists all the specifications and characteristics for the DECT measurements personality. Refer to "Specifications and Characteristics Requirements" for the conditions under which the specifications and characteristics apply.

Table Notation

Root-Sum-Squared
Many of the specifications and characteristics have more than one value associated with them. The first value gives the specification or characteristic as the sum of the measurement uncertainties. The second value gives the specification or characteristic as the square root of the sum of the squares of the uncertainties. These values are shown with "RSS" (root-sum-squared) next to them.

Characteristics
Characteristics are identified by the label "(characteristic)."

RBW and VBW Resolution bandwidth has been abbreviated RBW, and video bandwidth has been abbreviated VBW.

Table 7-2. HP 85723A Specifications and Characteristics

Frequency Reference (Option 004 Only)		
Frequency error of Option 004	$\pm 1 \times 10^{-7}$/year (aging only).	
Carrier Power		
Amplitude range	+26 to −35 dBm (with default settings)	
Absolute amplitude accuracy	±4.5 dB	±2.0 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	
Adjacent Channel Power due to Modulation and Intermodulation Attenuation		
Integration bandwidth (RBW 100 kHz)	1 MHz ±3%	
Range of spectrum before integration		
Adjacent Channel Power	+26 to −60 dBm (characteristic)	
Intermodulation Attenuation	+26 to −40 dBm (characteristic)	
Absolute amplitude accuracy	±4.7 dB	±2.0 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	
Adjacent Channel Power due to Switching Transients		
Range of spectrum before integration	+26 to −40 dBm (characteristic)	
Absolute amplitude accuracy	±4.7 dB	±2.0 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	

Table 7-2. HP 85723A Specifications and Characteristics (continued)

Power versus Time		
Displayed range of waveform, log scale	select either 0 to − 70 dB or 0 to − 110 dB	
Vertical scale per division	1 dB to 15 dB in 1 dB steps	
Relative amplitude accuracy:		
for 0 to −70 dB from a fixed ref level	±1.0 dB	
Time resolution:		
Displayed Time Resolution for		
Frame	25 μs for all packet types	
Rising edge	0.3 μs for all packet types	
Falling edge	0.3 μs for all packet types	
Burst (dependent on packet type)	short packet:0.45 μs basic packet:1.15 μs low capacity packet:0.6 μs high capacity packet:2.2 μs	
Burst on (dependent on packet type)	short packet: 0.15μs basic packet:0.85 μs low capacity packet:0.35 μs high capacity packet:1.9 μs	
Time error, absolute with respect to external trigger:		
RBW and VBW set to 3 MHz	±(3 μs + time resolution) (characteristic)	±(1.5 μs + time resolution) RSS (characteristic)
Time error, relative:		
RBW and VBW set to 3 MHz	±(1.3 μs + time resolution) (characteristic)	±(1.0 μs + time resolution) RSS (characteristic)
Sweep time accuracy, for sweep times < 20 ms	±0.02% (characteristic)	
Gate delay:		
Range	1 μs to 65.535 ms	
Resolution	1 μs	
Accuracy (from GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	±(1 μs + (0.01% × GATE DELAY readout)) (there is up to 1 μs jitter due to 1 μs resolution of gate delay clock)	
Gate length:		
Range	1 μs to 65.535 ms	
Resolution	1 μs	
Accuracy (from positive edge to negative edge of GATE OUTPUT)	±(0.2 μs + (0.01% × GATE DELAY readout))	
Gate amplitude (additional error):		
Log scale	±0.3 dB	
Linear scale	±0.4% of reference level	

Table 7-2. HP 85723A Specifications and Characteristics (continued)

Spurious Emissions (Total TX Power = 17 dBm)		
Sensitivity:		
Transmitter active, 30 kHz RBW, Displayed average noise level for the frequency range 1875 to 1880 MHz and 1900 to 1905 MHz	−55 dBm (characteristic)	
Transmitter active, 100 kHz RBW, Displayed average noise level for the frequency range 1870 to 1875 MHz	−50 dBm (characteristic)	
Transmitter active, 300 kHz RBW, Displayed average noise level for the frequency range 1860 to 1870 MHz and 1910 to 1920 MHz	−45 dBm (characteristic)	
Transmitter active, 1 MHz RBW, Displayed average noise level for the frequency range 1850 to 1860 MHz and 1900 to 1902 MHz	−40 dBm (characteristic)	
Transmitter active, 3 MHz RBW, Displayed average noise level for the frequency range* 5 to 1850 MHz† and 1930 MHz to 12.75 GHz	−40 dBm (characteristic)	
‡Transmitter idle, no carrier, 100 kHz RBW, displayed average noise level for the frequency range* 30 to 12.75 GHz	−70 dBm (characteristic)	
Absolute amplitude accuracy:		
Frequency range* 100 kHz to 6.4 GHz	±4.9 dB	±2.3 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	
* Limited by the frequency range of the spectrum analyzer.		
† Except for the frequency bands as follows:		
47 MHz to 74 MHz 87.5 MHz to 108 MHz 108 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	− 55 dBm	

‡ To make the spurious emissions test the ETSI specification requires that two filters are used.

1. For the measurement of spurious emissions below the second harmonic of the carrier frequency the filter used shall be a high 'Q' (notch) filter centered on the transmitter carrier frequency attenuating the signal by at least 30 dB.
2. For the measurement of spurious emissions at and above the second harmonic of the carrier frequency, the filter used shall be a high pass filter with stop band rejection exceeding 40 dB. The cut off frequency of the high pass filter shall be approximately 1.5 times the transmitter carrier frequency.

Table 7-2. HP 85723A Specifications and Characteristics (continued)

Frequency and Deviation Measurement (with Option 112 Only)	
Total range from nominal carrier frequency	−440 kHz to +440 kHz (characteristic)
Level range	+13 to −25 dBm (characteristic)
Resolution	3.7 kHz (characteristic)
Frequency accuracy	±20 kHz + (carrier frequency) × (frequency reference error)*
Frequency temperature drift	±1.0 kHz/°C (characteristic)
FM peak deviation accuracy	±22 kHz* (characteristic)
FM discriminator 3 dB bandwidth at 288 kHz peak deviation	dc to 1 MHz (characteristic)
*After the frequency and deviation calibration when the measurement ambient temperature is the same as the calibration temperature.	

Recommended Accessories and Spectrum Analyzer Options for the DECT Measurements Personality

This section describes additional equipment and spectrum analyzer options that can be used with the spectrum analyzer and with the DECT measurements personality.

Recommended Accessories

This section lists the recommended accessories for use with the DECT measurements personality.

Burst Carrier Trigger

For use with HP 8590 series Option 105. The HP 85902A Burst Carrier Trigger is used to produce off the air trigger signals for TDMA or TDD measurements. The pulsed carrier should be split into two paths via an external power splitter. One path goes to the RF input of the spectrum analyzer. The other is used to extract a positive going trigger pulse that corresponds to the switching on edge of the TDMA/TDD carrier.

External Keyboard

For use with HP 8590 Series Option 021 or 023. Although you can use many models of IBM/AT nonauto switching keyboards as an external keyboard for the spectrum analyzer, the HP C1405A Option ABA keyboard is recommended. The external keyboard can be connected to the external keyboard connector on the rear panel of the spectrum analyzer. Screen titles and remote programming commands can be entered easily with the external keyboard.

External Keyboard Cable

For use with an HP 8590 Series Option 021 or 023. HP C1405A Option 002 or 003 cable is a coiled cable that connects the external keyboard to the rear panel of the spectrum analyzer. Option 002 is a 2 meter cable; Option 003 is a 3 meter cable.

Fixed Attenuator, 20 dB

The HP 8491A/B Option 020 is a 20 dB fixed attenuator. The HP 8491A/B Option 020 provides precision attenuation, a flat frequency response, and a low standing-wave ratio (SWR) over a broad frequency range.

The HP 8491A/B Option 020 fixed attenuator is the recommended fixed attenuator for the DECT measurements personality.

Modulation Domain Analyzer

For more accurate modulation measurements the HP 53310A with Option 031 modulation domain analyzer allows you to view frequency, phase, or time-interval measurements versus time.

Printer

For use with an HP 8590 Series Option 021 or 023. The HP 3630A PaintJet printer provides a high-resolution color print out. The printers can be ordered with HP-IB or RS-232 interfaces to correspond to the interface option installed on your spectrum analyzer. The display on the spectrum analyzer screen can be automatically copied to the printer for a permanent record of the display.

Recommended and Required Spectrum Analyzer Options

This section describes the spectrum analyzer options that are either required or recommended for use with the DECT measurements personality.

Precision Frequency Reference (Option 004)

Option 004 provides increased absolute frequency-reference accuracy by using an ovenized reference oscillator.

You need either an Option 004 installed in your spectrum analyzer or an external 10 MHz precision frequency reference to use the DECT measurements personality.

DECT Source (Option 012)

Option 012 provides a built-in DECT source for the HP 8593E, HP 8594E, HP 8595E and HP 8596E.

The DECT source allows you to generate a signal to perform receiver sensitivity testing or provide a source for RF sub assemblies.

Interface, HP-IB (Option 021)

Option 021 enables you to control your spectrum analyzer from a computer that uses an Hewlett-Packard interface bus (HP-IB). (The HP-IB interface bus is also called IEEE-488.) Such computers include HP 9000 Series 200 and Series 300, and HP Vectra PC. This option also enables the spectrum analyzer to control a printer, plotter, or another instrument with an HP-IB interface. Option 021 includes a connector for an external keyboard, an HP-IB connector, and the *HP 8590 Series Spectrum Analyzer Programmer's Guide*.

Interface, RS-232 (Option 023)

Option 023 enables you to control your spectrum analyzer from a computer that uses an RS-232 interface bus. Such computers include the HP Vectra PC, the IBM PC, the AT, and compatibles. This option also enables the spectrum analyzer to control a printer, plotter or another instrument with an RS-232 interface. Option 023 includes a connector for an external keyboard, an RS-232 connector, and the *HP 8590 Series Spectrum Analyzer Programmer's Guide*.

Impact Cover Assembly (Option 040)

The impact cover assembly snaps onto the front of your spectrum analyzer to protect the front panel during travel and when the unit is not in use.

Fast Time Domain Sweeps (Option 101)

Option 101 allows sweep times down to 20 μs in zero span. In fast sweep times (sweep times less than 20 ms), time domain sweeps are digitized. All trace functions are available for these fast zero-span sweeps.

You must have an Option 101 installed in your spectrum analyzer to use the DECT measurements personality.

Time-Gated Spectrum Analysis (Option 105)

Option 105 allows you to select and measure the spectrum of signals that may overlap in the frequency domain, but be separated in the time domain. By adjusting a time gate based on a external trigger signal, you can significantly increase the diagnostic capability of your spectrum analyzer for time-interleaved signals. When used with the DECT measurements personality, Option 105 also provides the delayed triggering capability for zero span measurements that is used in the power versus time measurements and the frequency and deviation measurement (with Option 112).

You must have an Option 105 installed in your spectrum analyzer to use the DECT measurements personality. The Option 105 board assembly must have a number prefix of 3121K or higher.

DECT Demodulator Card (Option 112)

Option 112 provides the FM demodulation for the DECT measurements personality's frequency and deviation measurement function, FREQ/DEV. Option 112 is very similar to the HP 8590 Series spectrum analyzer Option 102, the AM/FM speaker and TV sync trigger circuitry card. Both Option 112 and 102 enable you to use amplitude or frequency demodulation. Option 112 however has a wider FM bandwidth than an Option 102. Unlike option 102, the FM gain and frequency deviation are not variable with option 112 .

You need either an Option 112 installed in your spectrum analyzer or an HP 53310A modulation domain analyzer configured with option 031 to do the DECT frequency and modulation measurements.

8

Programming Reference

This chapter contains the following programming reference information:

- A table containing a cross reference of the DECT measurements personality softkey to the corresponding programming command.
- A table containing a cross reference of the DECT measurement to the limit and parameter variables.
- A table containing a cross reference of DECT measurements and the corresponding limit line function names.
- The descriptions of all the DECT measurements personality's programming commands.

This chapter contains reference information. Refer to Chapter 4 for information about operating the DECT measurements personality functions remotely.

Note

The *HP 8590 Series Spectrum Analyzer Programmer's Guide* provides useful information on HP 8590 Series programming commands. Refer to the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for descriptions of syntax elements, characters secondary keywords, and HP 8590 Series programming commands.

Functional Index

The following table lists each DECT measurements personality softkey and references the corresponding remote command sequence that performs the same operation remotely.

Table 8-1. Functional Index

DECT Softkey	Corresponding Remote Command Sequence
DECT ANALYZER	MODE 10 (Refer to "To change to the DECT mode remotely" in Chapter 4 for more information.)
Configuration Menu	
BURST CONT	_CC
DEFAULT CONFIG	_DEFAULT
EXT LOSS	_EXTLOSS
NUMBER BURSTS	_PNB
PACKET TYPE	_PTYPE
TOTAL TX POWER	_TOTPWR
TRIG DELAY	_TRIGD
TRIG POL NEG POS	_TRIGP
Z FIELD	_PZF
DECT Source Menu	
CHANNEL NUMBER	_CHN
DECT FRQ CAL	_DFCAL
DECT SRC CAL	_DSRCCALX
LVL CAL FACTOR	_DSRCF
SRC ATN MAN AUTO	SRCAT
SRC PWR OFFSET	_DSRCPOFS
SRC PWR ON OFF	_DSRCON and _DSRCPWR
Frequency and Modulation Menu	
CAL FREQ/DEV	_CALFRQDEV
FM LIMITS	_FDXL
FREQ/DEV	_FRQDEV or _FDS and _FDM
Physical Channel Menu	
AUTO CHANNEL	_ACH
CH X CTR FREQ	_CFX
CHANNEL NUMBER	_CHN
TRANSMIT FP PP	_PP
MONITOR BAND	_MBAND

Table 8-1. Functional Index (continued)

DECT Softkey	Corresponding Remote Command Sequence
Power Menu	
ADJ CHAN TRANS PWR	_ACPT or _ACPST and _ACPMT
ADJ CHAN MOD PWR	_ACPMOD or _ACPS and _ACPM
CARRIER POWER	_CPWR or _CPS and _CPM
Power versus Time Menu	
MEASURE AVG PKS	_AVG
P vs T BURST	_PBURST
P vs T FALLING	_PFALL
P vs T FRAME	_PFRAME
P vs T RISING	_PRISE
P vs T BST ON	_PON
RANGE dB 70 110	_RNG
Spurious and Intermodulation Menu	
INTERMOD	_IMDATN
MAXIMUM FREQ	_SPMAXF
MINIMUM FREQ	_SPMINF
SPURIOUS	_SPUR
XCVR IDLE ACT	_IDLE
Post-Measurement Menus	
AUTO CHANNEL	_ACH
CHANNEL NUMBER	_CHN
GATE ON OFF	_ACPG
REPEAT MEAS	_RPT
TRACE ACTIVE	_TA
TRACE COMPARE	_TC
TRIG DELAY	_TRIGD

Limit and Parameter Variables

Table 8-2 lists all the limit variables and parameter variables available for a DECT measurements personality command. For more information about using limit variables, refer to "To change the value of a limit variable" in Chapter 4. For more information about using parameter variables, refer to "To change the value of a parameter variable" in Chapter 4.

Table 8-2. Limit and Parameter Variables

Measurement	Variable Name	Description	Units	Default Value
Channel Number	_CMAX	Maximum power for a signal to be detected as a carrier.	dBm	26
	_CMIN	Minimum power for a signal to be detected as a carrier.	dBm	−30
		Power Measurements		
Carrier Power	_CPXL	The low limit for normal carrier power.	dBm	0
	_CPXH	The high limit for normal carrier power.	dBm	24
	_VTMAR	The video trigger margin.	dB	−30
Adjacent Channel Power due to Modulation	_ACPMX	Maximum limit for the adjacent channel power due to modulation.	dBm	−8 to −47*
Adjacent Channel Power due to Switching Transients	_ACPTX	Maximum limit for the adjacent channel power due to switching transients	dBm	−6 to −30*
* These default limits are dependent on which channel is the transmit channel.				
		Power versus Time Measurements		
Power versus Time Burst	_PBMAX	Sets how far from the carrier peak the burst width is measured.	dB	−3
Power versus Time Falling	_PFMAX	Sets where on the falling edge of the trace the measurement for the fall time should begin (referenced to the mean carrier power).	dB	−6
	_PFMIN	Sets where on the falling edge of the trace the measurement for the fall time should end (referenced to the mean carrier power).	dB	−30
Power versus Time Rising	_PRMAX	Sets where on the rising edge of the trace the measurement for the rise time should end (referenced to the mean carrier power).	dB	−3
	_PRMIN	Sets where on the rising edge of the trace the measurement for the rise time should begin (referenced to the mean carrier power).	dB	−30

Table 8-2. Limit and Parameter Variables (continued)

Measurement	Variable Name	Description	Units	Default Value
Spurious and Intermodulation Measurements				
Spurious	_MAXST	Sets the maximum sweep time for the spurious emissions measurement.	Second	2
	_SPMAR	Sets the margin between the spurious emissions limit and the minimum amplitude for a signal to be considered a spurious emission.	dB	6
	_SPXL	Specifies the limit for a spurious emission, from an active transmitter, in the following frequency ranges: 47 to 74 MHz, 87.5 to 108 MHz, 108 to 118 MHz, 174 to 230 MHz,and 470 to 862 MHz.	dBm	−47
	_SPXH	Specifies the limit for a spurious emission, from an active transmitter, for frequencies than less than 1 GHz, and *not* within the frequencies covered by _SPXL.	dBm	−36
	_SPXGH	Specifies the limit for a spurious emission, from an active transmitter, for frequencies greater than 1 GHz.	dBm	−30
	_SPXLI	Specifies the limit for a spurious emission, from an idle transmitter, for frequencies from 1880 to 1900 MHz.	dBm	−57
	_SPXHI	Specifies the limit for a spurious emission, from an idle transmitter, for frequencies less than 1 GHz that are not within the frequency ranges listed for _SPXLI.	dBm	−57
	_SPXGHI	Specifies the limit for a spurious emission, from an idle transmitter, for frequencies greater than 1 GHz.	dBm	−47
Intermodulation	_IMDX	Intermodulation attenuation limit.	dBm	−30
Frequency and Deviation				
Frequency and Deviation	_FCALF	Specifies the frequency of the calibration signal for the frequency and deviation calibration routine.	Hz	300E6
	_FDXL	The limit for the minimum deviation of the FM signal.	kHz	202
(with Option 112 Only)	_FDXH	The limit for the maximum deviation of the FM signal.	kHz	403
	_FERX	The limit for the maximum frequency error.	kHz	100

Limit Line Functions

During the power versus time measurements and the out of band power measurement, a limit line is displayed on the spectrum analyzer display. You can change that limit line by creating your own limit line function. Refer to "To create a limit line function" in Chapter 4 for more information about creating your own limit line function. Table 8-3 lists all the names of the limit line functions.

Table 8-3. Limit Line Function Names

Measurement	Limit Line Name
Power versus Time Burst	_PBLIM
Power versus Time Rising Edge	_PRLIM
Power versus Time Falling Edge	_PFLIM
Power versus Time Burst On	_POLIM

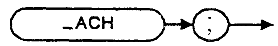
Descriptions of the Programming Commands

This section contains the descriptions of the DECT measurement personality's programming commands. The commands are listed alphabetically.

Refer to the programming examples in Chapter 4 for more information about how to make a measurement remotely, and how to extract the measurement results from a variable, array, or trace.

_ACH
Auto Channel

Syntax



XACH

The _ACH command automatically tunes to the channel having the highest carrier power level. _ACH is similar to AUTO CHANNEL, but unlike AUTO CHANNEL _ACH does not repeat the measurement or make the monitor band measurement.

Note If the DECT Source is on when you execute the _ACH command it is automatically switched off. This is because the DECT Source cannot be on when the spectrum analyzer is in sweep mode.

Example

```
OUTPUT 718;"_ACH;"
```

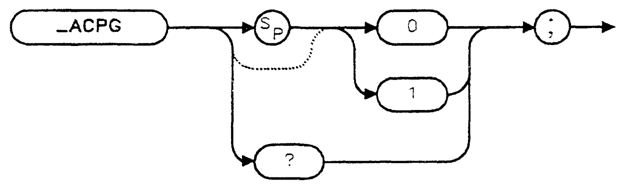
Measurement State Whenever _ACH is executed, it returns a value when the auto channel function is completed.

_ACH Measurement State Results

Value	Description
1	The command was successfully completed.
2	The command was aborted. _ACH is aborted if a carrier could not be found. (To be considered a carrier, the amplitude level of the signal must be greater than _CMIN.)

_ACPG
Adjacent Channel Power Gated

Syntax



XACPG

Allows you to use time-gating to exclude any switching transients from the adjacent channel power due to modulation measurement. _ACPG is equivalent to GATE ON OFF.

If _ACPG is set to 0, time-gating is off. If _ACPG is set to 1, time-gating is on. The default value for _ACPG is 0 for all measurements except the adjacent channel power due to modulation measurement.

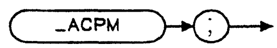
Example

`OUTPUT 718;"MOV _ACPG,1;"`	*Turns on the time-gating for the adjacent channel measurement.*

Related Commands Use the adjacent channel power due to modulation command (_ACPMOD) to perform the adjacent channel power due to modulation measurement.

_ACPM
Adjacent Channel Power due to modulation Measurement

Syntax



XACPM

Performs the adjacent channel power due to modulation measurement.

Example

`OUTPUT 718;"_ACPS;"`	*Sets up the adjacent channel power due to modulation measurement.*
`OUTPUT 718;"ST 4;"`	*Changes the sweep time to 4 seconds.*
`OUTPUT 718;"_ACPM;"`	*Performs the adjacent channel power due to modulation measurement.*

Before using _ACPM, you need to use the _ACPS command to perform the setup for the adjacent channel power due to modulation measurement. The _ACPS and _ACPM commands are useful if you want to change the spectrum analyzer settings before making an adjacent channel power due to modulation measurement. The combination of the _ACPS and _ACPM commands is equivalent to ADJ CHAN MOD PWR.

Refer to the description for _ACPMOD for information about the measurement state and measurement results from an adjacent channel due to modulation measurement.

_ACPMOD
Adjacent Channel Power due to Modulation Measurement

Syntax

XACPMOD

Measures the adjacent channel power due to modulation, of the transmitter. _ACPMOD is equivalent to ADJ CHAN MOD PWR .

Example

```
OUTPUT 718;"_ACPMOD;"
```

Executing _ACPMOD does the following:

1. Performs the adjacent channel power due to modulation measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement was completed, the measurement results are placed in variables and a trace.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_ACPMOD Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted because the carrier power was too low.
3	The measurement was aborted because the carrier power was too high.
4	The measurement was aborted because the carrier was not a burst carrier. If _CC is set to 0 (burst carrier) the carrier must be a burst carrier.
5	The measurement was aborted because the carrier was not a continuous carrier. If _CC is set to 1 (continuous carrier) the carrier must be a continuous carrier.

Measurement Results The results of the _ACPMOD command are stored in the variables or trace in the following table.

_ACPMOD Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the adjacent channel power due to modulation measurement. ■ If the adjacent channel power measurement passed, the value of _F is a 0. ■ If the adjacent channel power measurement failed, the value of _F is a "1."	None
_ACPMR[*n*]	A trace variable that contains the amplitude level found in the adjacent channels. Where $n-1$ is the channel number and $n=1$ through 10. The amplitude value stored is a factor of 10 greater than the measured power.	dBm x 10
_ACPMX[*n*]	A trace variable that contains the maximum limit. Where $n-1$ is the channel number and $n=1$ through 10.	dBm

Limit and Parameter Variables _ACPMOD uses _ACPMX. Refer to Table 8-2 for more information.

Alternate Commands You can also use the _ACPS and _ACPM commands to measure adjacent channel power due to modulation.

See Also

"To measure the adjacent channel power due to modulation" in Chapter 4.

_ACPMT
Adjacent Channel Power due to Switching Transients Measurement

Syntax

XACPMT

Performs the adjacent channel power due to switching transients measurement.

Example

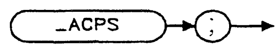
`OUTPUT 718;"_ACPST;"`	*Sets up the adjacent channel power due to switching transients measurement.*
`OUTPUT 718;"ST 4;"`	*Changes the sweep time to 4 seconds.*
`OUTPUT 718;"_ACPMT;"`	*Performs the adjacent channel power due to switching transients measurement.*

Before using _ACPMT, you need to use the _ACPST command to perform the setup for the adjacent channel power measurement. The _ACPST and _ACPMT commands are useful if you want to change the spectrum analyzer settings before making an adjacent channel power due to switching transients measurement. The combination of the _ACPST and _ACPMT commands is equivalent to ADJ CHAN TRANS PWR.

Refer to the description for _ACPT for information about the measurement state and measurement results from an adjacent channel due to switching transients measurement.

_ACPS
Adjacent Channel Power due to Modulation Setup

Syntax



XACPS

Performs the setup for the adjacent channel power due to modulation measurement.

Example

`OUTPUT 718;"_ACPS;"`	*Sets up the adjacent channel power measurement.*
`OUTPUT 718;"ST 4;"`	*Changes the sweep time to 4 seconds.*
`OUTPUT 718;"_ACPM;"`	*Performs the adjacent channel power measurement.*

After using _ACPS, you need to use the _ACPM command to perform the adjacent channel power due to modulation measurement. The _ACPS and _ACPM commands are useful if you want to change the spectrum analyzer settings before making an adjacent channel power due to modulation measurement. The combination of the _ACPS and _ACPM commands is equivalent to ADJ CHAN MOD PWR .

_ACPST
Adjacent Channel Power due to Switching Transients Setup

Syntax

XACPST

Performs the setup for the adjacent channel power due to switching transients measurement.

Example

`OUTPUT 718;"_ACPST;"`	*Sets up the adjacent channel power due to switching transients measurement.*
`OUTPUT 718;"ST 4;"`	*Changes the sweep time to 4 seconds.*
`OUTPUT 718;"_ACPMT;"`	*Performs the adjacent channel power due to switching transients measurement.*

After using _ACPST, you need to use the _ACPMT command to perform the adjacent channel power due to switching transients measurement. The _ACPST and _ACPMT commands are useful if you want to change the spectrum analyzer settings before making an adjacent channel power due to switching transients measurement. The combination of the _ACPST and _ACPMT commands is equivalent to ADJ CHAN TRANS PWR.

_ACPT
Adjacent Channel Power due to Switching Transients

Syntax

XACPT

Measures the adjacent channel power due to switching transients, of the transmitter. _ACPT is equivalent to ADJ CHAN TRANS PWR.

Example

```
OUTPUT 718;"_ACPT;"
```

Executing _ACPT does the following:

1. Performs the adjacent channel power due to switching transients measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement was completed, the measurement results are placed in variables and a trace.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_ACPT Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted because the carrier power was too low.
3	The measurement was aborted because the carrier power was too high.
4	The measurement was aborted because the carrier was not a burst carrier. If _CC is set to 0 (burst carrier) the carrier must be a burst carrier.
5	The measurement was aborted because the carrier was not a continuous carrier. If _CC is set to 1 (continuous carrier) the carrier must be a continuous carrier.

Measurement Results The results of the _ACPT command are stored in the variables or trace in the following table.

_ACPT Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the adjacent channel power due to switching transients measurement. ■ If the adjacent channel power measurement passed, the value of _F is a 0. ■ If the adjacent channel power measurement failed, the value of _F is a "1."	None
_ACPTR[*n*]	A trace variable that contains the amplitude level found in the adjacent channels. Where $n-1$ is the channel number and $n=1$ through 10. The amplitude value stored is a factor of 10 greater than the measured power.	dBm × 10
_ACPTX[*n*]	A trace variable that contains the maximum limit. Where $n-1$ is the channel number and $n=1$ through 10.	dBm

Limit and Parameter Variables _ACPT uses _ACPTX. Refer to Table 8-2 for more information.

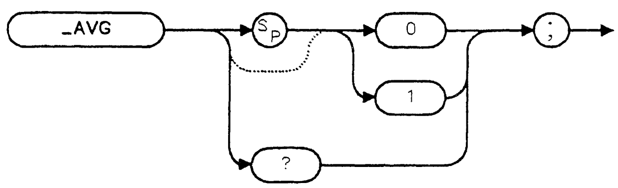
Alternate Commands You can also use the _ACPST and _ACPMT commands to measure adjacent channel power due to switching transients.

See Also

"To measure the adjacent channel power due to switching transients" in Chapter 4.

_AVG
Average or Peaks for Power vs Time

Syntax



XAVG

Selects how the trace data for a power versus time measurement is taken: as a trace that contains an average of the trace data, or as a trace for minimum trace peaks and a trace for the maximum trace peaks. _AVG is equivalent to MEASURE AVG PKS.

If _AVG is set to 0, it is set to measure both the minimum and maximum peaks of the bursts. If _AVG is set to 1, it is set to measure the average of the bursts. The default value for _AVG is 1.

Example

`OUTPUT 718;"MOV _AVG,0;"` *Sets _AVG to measure the minimum and maximum peaks of the burst.*

You should set _AVG prior to executing _PBURST, _PRISE, _PFALL or _PON. If you set _AVG to 1, then the averaged trace results will be placed in trace A. If you set _AVG to 0, the maximum trace peaks will be placed in trace B, and the minimum trace peaks will be placed in trace C.

_CALFRQDEV
Calibrate Frequency Deviation

Syntax

XCALFR

Performs the calibration routine for the frequency and deviation measurement with Option 112. _CALFRQDEV is equivalent to CAL FREQ/DEV.

Example

```
OUTPUT 718;"_CALFRQDEV;"
```

_CALFRQDEV can only be performed if an Option 112 is installed in the spectrum analyzer. You must connect the 300 MHz calibration signal to the spectrum analyzer input before executing _CALFRQDEV. For best accuracy, this calibration routine should be performed every 30 minutes or with a change in the ambient temperature.

Whenever _CALFRQDEV is executed, the voltage on control line A (CNTLA) of the auxiliary interface connector is changed to a transistor-transistor logic (TTL) high level.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

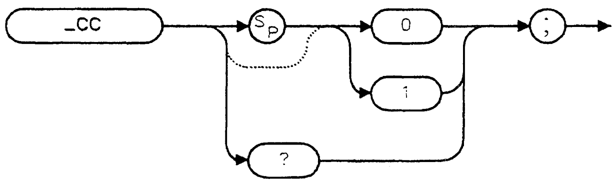
_CALFRQDEV Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the calibration signal is not connected to the spectrum analyzer input or the calibration signal amplitude is too low.

Parameter Variables _CALFRQDEV uses _FCALF. Refer to Table 8-2 for more information.

_CC
Continuous Carrier or Burst Mode

Syntax



XCCMOD

Allows you to specify if the carrier to be measured is continuous or burst. The _CC command is equivalent to BURST CONT.

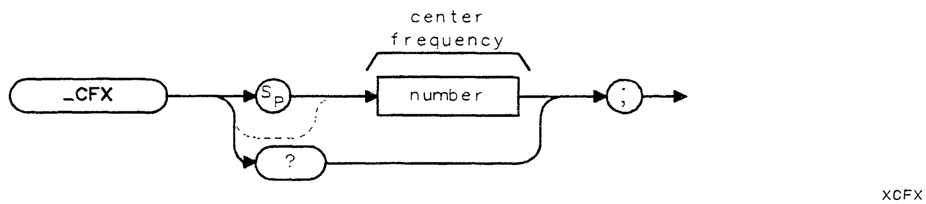
If _CC is set to 0, it is set to a burst carrier. If _CC is set to 1, it is set to a continuous carrier. The default value for _CC is 0.

Example

`OUTPUT 718;"MOV _CC,0;"` *Sets _CC for a burst carrier.*

_CFX
Center Frequency for Channel X

Syntax



Allows you to enter the frequency of the channel that you want to measure. The _CFX variable is equivalent to CH X CTR FREQ .

_CFX can accept a real number. The measurement unit for _CFX is Hz. The default value for _CFX is 300 MHz.

Example

OUTPUT 718;"MOV _CFX,840E6;" *Sets the center frequency of the spectrum analyzer to 840 MHz.*

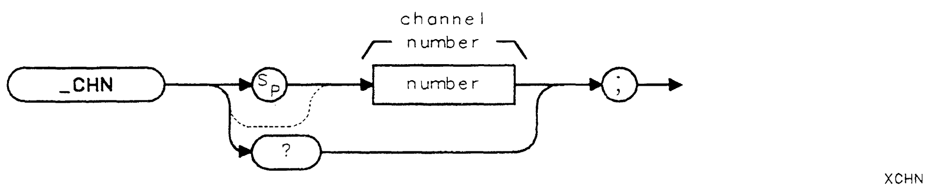
Query Example

```
OUTPUT 718;"_CFX?;"
```

The query response will be the current frequency for channel X.

_CHN
Channel Number

Syntax



Allows you to enter the channel number for the RF channel you want to measure. The _CHN command is equivalent to CHANNEL NUMBER.

_CHN can accept an integer number from 0 to 9. The default for _CHN is 1.

Example

```
OUTPUT 718;"MOV _CHN,2;"
```
Sets the channel number to 2.

Query Example

```
OUTPUT 718;"_CHN?;"
```

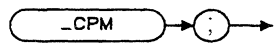
The query response will be a the current channel number.

See Also

"To use the spectrum analyzer's MOV command" in Chapter 4.

_CPM
Carrier Power Measurement

Syntax



XCPM

Performs the carrier power measurement.

Example

`OUTPUT 718;"_CPS;"`	*Sets up the carrier power measurement.*
`OUTPUT 718;"RB 10KHZ;"`	*Changes the resolution bandwidth to 10 kHz.*
`OUTPUT 718;"_CPM;"`	*Performs the carrier power measurement.*

Before using _CPM, you need to use the _CPS command to perform the setup for the carrier power measurement. The _CPS and _CPM commands are useful if you want to change the spectrum analyzer settings before making a carrier power measurement. The combination of the _CPS and _CPM commands is equivalent to CARRIER POWER.

Refer to the description for _CPWR for information about the measurement state and measurement results from a carrier power measurement.

See Also

"To measure the carrier power" in Chapter 4.

_CPS
Carrier Power Setup

Syntax

XCPS

Performs the setup for the carrier power measurement.

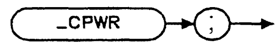
Example

`OUTPUT 718;"_CPS;"`	*Sets up the carrier power measurement.*
`OUTPUT 718;"RB 10KHZ;"`	*Changes the resolution bandwidth to 10 kHz.*
`OUTPUT 718;"_CPM;"`	*Performs the carrier power measurement.*

After using _CPS, you need to use the _CPM command to perform the carrier power measurement. The _CPS and _CPM commands are useful if you want to change the spectrum analyzer settings before making a carrier power measurement. The combination of the _CPS and _CPM commands is equivalent to CARRIER POWER.

_CPWR
Carrier Power

Syntax



XCPWR

Measures the transmitter carrier power. _CPWR is equivalent to CARRIER POWER.

Example

```
OUTPUT 718;"_CPWR;"
```

Measures the mean power of the transmitter carrier envelope during the on part of the burst. This measurement determines the mean carrier power between the −3 dB points referenced from the peak of the carrier signal.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_CPWR Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted because the carrier power was too low.
3	The measurement was aborted because the carrier power was too high.
4	The measurement was aborted because the carrier was not a burst carrier. If _CC is set to 0 (burst carrier) the carrier must be a burst carrier.
5	The measurement was aborted because the carrier was not a continuous carrier. If _CC is set to 1 (continuous carrier) the carrier must be a continuous carrier.

Measurement Results The results of the _CPWR are stored in the variables and trace shown in the following table.

_CPWR Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the carrier power measurement. ■ If the carrier measurement passed, the value of _F is a 0. ■ If the carrier measurement failed, the value of _F is a "1."	None
_CPA	A variable that contains the mean carrier power amplitude.	dBm
TRA	TRA is trace A. Trace A contains the power waveform that was used to test for carrier power.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _CPWR uses _CPXL, _CPXH, and _VTMAR. Refer to Table 8-2 for more information.

Alternate Commands If you want to change the spectrum analyzer settings before making a carrier power measurement, use _CPS and _CPM instead of the _CPWR command.

See Also

"To measure the carrier power" in Chapter 4.

_DEFAULT
Default Configuration

Syntax

XDEFAU

Replaces the values and selections for the configuration functions to their default values. _DEFAULT is equivalent to DEFAULT CONFIG.

Example

```
OUTPUT 718;"_DEFAULT;"
```

The default values are as follows:

EXT LOSS	0 dB
TOTAL TX POWER	+26 dBm
TRIG DELAY	0 μS
TRIG POL NEG POS	POS
BURST CONT	BURST
TRANSMIT FP PP	FP

_DFCAL
DECT Source Frequency Calibration

Syntax

dfcal

Performs the calibration of the DECT Source output frequency to an accuracy of 1 kHz with respect to the spectrum analyzer's frequency reference. The _DFCAL command is equivalent to DECT FRQ CAL.

For _DFCAL to function properly:

a. the spectrum analyzer frequency and amplitude calibration routines must be executed after the spectrum analyzer has warmed up for at least 30 minutes. Refer to the CAL command in "Programming Commands" in the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for information regarding calibration of the spectrum analyzer.

b. the DECT SOURCE 50 Ω output must be connected to the INPUT 50 Ω connector.

c. the rear panel inputs TIMESLOT PULSE IN, RF SWITCH CURRENT IN and TTL DATA IN must also be disconnected.

Example

`OUTPUT 718;"_DFCAL;"` *Calibrates the DECT Source frequency.*

Measurement State A measurement state value of 1 is returned when the calibration is complete.

_DSRCCALX
DECT Source Frequency and Amplitude Calibration

Syntax

dsrccalx

Performs the calibration of the DECT Source output frequency and amplitude. The _DSRCCALX command is equivalent to DECT SOURCE CAL .

For _DSRCCALX to function properly:

a. the spectrum analyzer frequency and amplitude calibration routines must be executed after the spectrum analyzer has warmed up for at least 30 minutes. Refer to the CAL command in "Programming Commands" in the *HP 8590 Series Spectrum Analyzer Programmer's Guide* for information regarding calibration of the spectrum analyzer.

b. the DECT SOURCE 50 Ω output must be connected to the INPUT 50 Ω connector.

c. the rear panel inputs TIMESLOT PULSE IN, RF SWITCH CURRENT IN and TTL DATA IN must also be disconnected.

Example

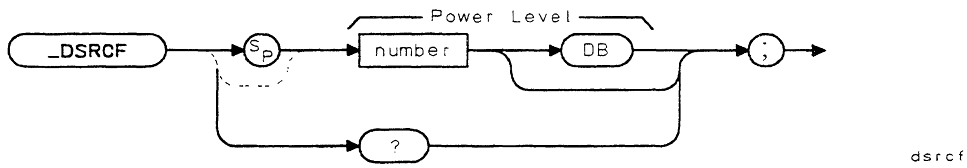
`OUTPUT 718;"_DSRCCALX;"` *Calibrates the DECT Source frequency and amplitude.*

Measurement State A measurement state value of 1 is returned when the calibration is complete.

Related Commands _DFCAL.

_DSRCF
Level Calibration Factor

Syntax



Allows you to modify the absolute calibration factor at 1.89 GHz, enabling you to calibrate the DECT Source using a power meter. The _DSRCF command is equivalent to LVL CAL FACTOR.

_DSRCF can accept any real or integer number. The default value for _DSRCF is 0 dB.

Example

```
OUTPUT 718;"_DSRCF 1DB;"
```
Sets the cal factor to 1 dB.

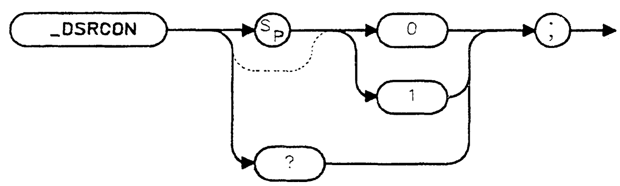
Query Example

```
OUTPUT 718;"_DSRCF?;"
```

The query response will be the current level calibration factor.

_DSRCON
Source Power

Syntax



DSRCON

Allows you to turn the DECT Source off or on. The DECT Source is turned on automatically whenever its value is specified with _DSRCPWR.

Example

`OUTPUT 718;"_DSRCON 1;"`	*Turns the DECT Source power on.*
`OUTPUT 718;"_DSRCON 0;"`	*Turns the DECT Source power off.*

Query Example

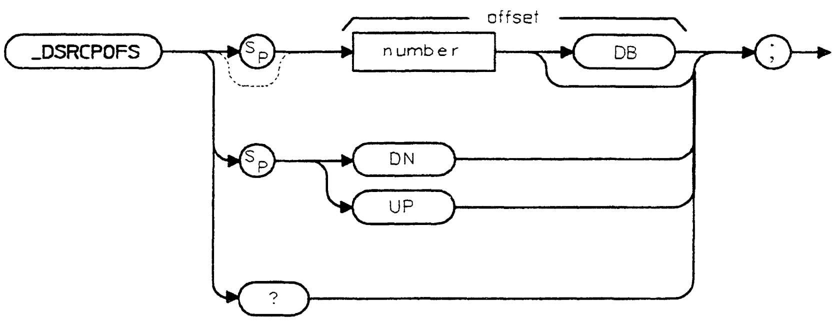
```
OUTPUT 718;"DSRCON?;"
```

The query response allows you to establish whether the DECT Source is on or off.

Related Commands SRCAT, _DSRCPWR and _DSRCPOFS.

_DSRCPOFS
Source Power Offset

Syntax



XDSRCPOFS

Allows you to offset the displayed power of the DECT Source. This function may be used to take into account system losses (for example, cable loss) or gains (for example, preamplifier gain) reflecting the actual power delivered to the device under test. The _DSRCPOFS command is equivalent to SRC PWR OFFSET.

_DSRCPOFS can accept any real or integer number in the range −100 to +100. The default value for _DSRCPOFS is 0 dB.

Example

`OUTPUT 718;"_DSRCPWR -30DB;"`	*Turns on DECT Source output.*
`OUTPUT 718;"_DSRCPOFS 13DB;"`	*Offsets power-level readout for DECT Source by 13 dB.*

Query Example

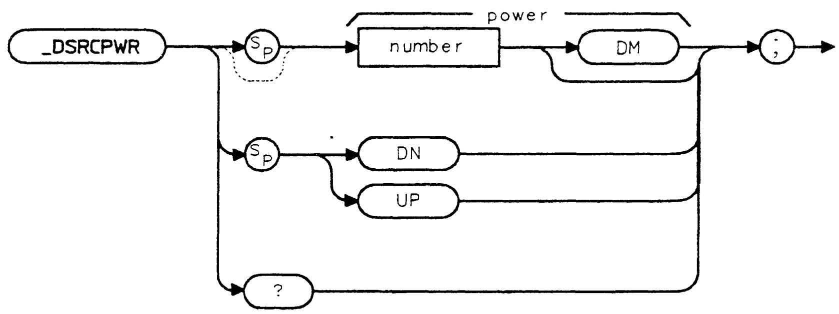
```
OUTPUT 718;"_DSRCPOFS?;"
```

The query response will be the current offset power of the DECT Source.

Related Commands _DSRCPWR.

_DSRCPWR
DECT Source Power Level

Syntax



DSRCPWR

Allows you to set the output level of the DECT Source.

_DSRCPWR can accept any real or integer number. The default value is −17.25 dBm. The default unit is the current amplitude unit.

Example

```
OUTPUT 718;"AUNITS DBM;"
OUTPUT 718;"_DSRCPWR -20;"
```
Changes the DECT Source power level to −20 dBm.

Query Example

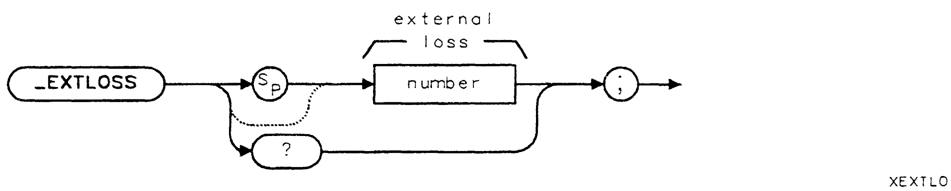
```
OUTPUT 718;"_DSRCPWR?;"
```

The query response will be the current DECT Source output level.

Related Commands SRCAT, _DSRCPOFS, _DSRCF, _DSRCON.

_EXTLOSS
External Loss

Syntax



Allows you to enter the amplitude losses of any external equipment that is used to connect the transmitter output to the spectrum analyzer input. The _EXTLOSS variable is equivalent to EXT LOSS.

_EXTLOSS accepts a real number from 0 to 50. The unit is dB. The default value for _EXTLOSS is 0.

Example

`OUTPUT 718;"MOV _EXTLOSS,3;"` *Sets the external loss to 3 dB.*

Related Commands _DEFAULT sets _EXTLOSS to 0.

Query Example

`OUTPUT 718;"_EXTLOSS?;"`

The query response will be a the current setting for the external loss.

_FDM
Frequency and Deviation Measurement

Syntax

XFDM

Performs the frequency and deviation measurement.

Example

`OUTPUT 718;"_FDS;"`	*Sets up the frequency and deviation measurement.*
`OUTPUT 718;"RB 30KHZ;"`	*Changes the resolution bandwidth to 30 kHz.*
`OUTPUT 718;"_FDM;"`	*Performs the frequency and deviation measurement.*

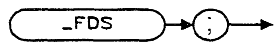
An Option 112 must be installed in the spectrum analyzer to perform the frequency and deviation measurement with _FDM.

Before using _FDM, you need to use the _FDS command to perform the setup for the frequency and deviation measurement. The _FDS and _FDM commands are useful if you want to change the spectrum analyzer settings before making a frequency and deviation measurement. The combination of the _FDS and _FDM commands is equivalent to the _FRQDEV command and FREQ/DEV.

Refer to the description for _FRQDEV for information about the measurement state and measurement results from a frequency and deviation measurement.

_FDS
Frequency and Deviation Setup

Syntax



XFDS

Performs the setup for the frequency and deviation measurement.

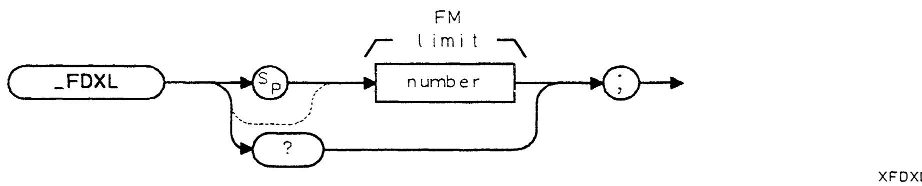
Example

`OUTPUT 718;"_FDS;"`	*Sets up the frequency and deviation measurement.*
`OUTPUT 718;"RB 30KHZ;"`	*Changes the resolution bandwidth to 30 kHz.*
`OUTPUT 718;"_FDM;"`	*Performs the frequency and deviation measurement.*

The _FDS and _FDM commands can be used if you want to change the spectrum analyzer settings before making a frequency and deviation measurement. (An Option 112 must be installed in the spectrum analyzer to perform the frequency and deviation measurement with _FDM, however.) The combination of the _FDS and _FDM commands is equivalent to the _FRQDEV command and FREQ/DEV .

_FDXL
FM Limits

Syntax



Allows you to enter the FM limits for the RF channel you want to measure. The _FDXL command is equivalent to FM LIMITS.

_FDXL can accept the numbers 202 or 259. The default for _FDXL is 202.

Example

`OUTPUT 718;"MOV _FDXL,202;"` *Sets the FM limits to 202 kHz.*

Query Example

`OUTPUT 718;"_FDXL?;"`

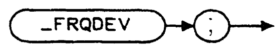
The query response will be a the current FM limit.

See Also

"To use the spectrum analyzer's MOV command" in Chapter 4.

_FRQDEV
Frequency and Deviation

Syntax



XFRQDE

Measures the frequency deviation of the transmitter. _FRQDEV is equivalent to FREQ/DEV .

Example

```
OUTPUT 718;"_FRQDEV;"
```

An Option 112 must be installed in the spectrum analyzer to perform the frequency and deviation measurement with _FRQDEV.

Executing _FRQDEV does the following:

1. Performs the frequency and deviation measurement.
2. Returns the measurement state. If the measurement state is equal to 1, the measurement was completed.
3. If the measurement was completed, the measurement results are placed in variables.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_FRQDEV Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted because the carrier power was too low.
3	The measurement was aborted because the carrier power was too high.
4	The measurement was aborted because the carrier was not a burst carrier. If _CC is set to 0 (burst carrier) the carrier must be a burst carrier.
5	The measurement was aborted because the carrier was not a continuous carrier. If _CC is set to 1 (continuous carrier) the carrier must be a continuous carrier.

Measurement Results The results of the _FRQDEV command are stored in the variables and trace shown in the following table.

_FRQDEV Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the frequency and deviation measurement. ■ If the frequency and deviation measurement passed, the value of _F is 0. ■ If the frequency and deviation measurement failed, the value of _F is 1.	None
_FDEV	A variable that contains the peak frequency deviation of the carrier.	kHz
_FER	A variable that contains the frequency error of the carrier.	kHz

Limit and Parameter Variables _FRQDEV uses _FDXL, _FDXH, and _FERX. Refer to Table 8-2 for more information.

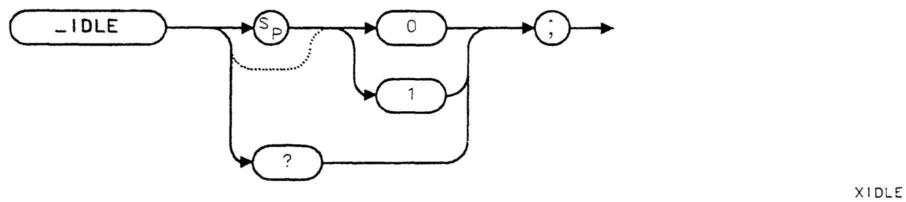
Alternate Commands You can also use the _FDS and _FDM commands to measure frequency and deviation.

See Also

"To measure the frequency and deviation with an Option 112" in Chapter 4.

_IDLE
Idle or Active State

Syntax



Allows you to specify if the transmitter is idle or active. _IDLE is equivalent to XCVR IDLE ACT.

If _IDLE is set to a "0," the spurious emissions measurement will test for spurious emissions from an active transmitter. If _IDLE is set to a "1," the spurious emissions measurement will test for spurious emissions from an idle transmitter. The default for _IDLE is 0.

Example

`OUTPUT 718;"MOV _IDLE,1;"` *Specifies the transmitter state as idle.*

Because the value of _IDLE determines how the spurious emissions measurement is performed, it is important that the value of _IDLE corresponds to the state of the equipment that is being tested.

Related Commands _IDLE is used by _SPUR (the spurious emissions measurement command).

See Also

"To measure the spurious emissions" in Chapter 4.

Note _LDRB must be executed prior to the *first* usage of the _IDLE command.

_IMDATN
Intermodulation Attenuation Measurement

Syntax

XIMDAT

_IMDATN performs the intermodulation attenuation measurement. This measurement requires that the DECT transceiver is set the same channels as the HP 85723A Measurements Personality. _IMDATN is equivalent to INTERMOD.

Example

```
OUTPUT 718;"_IMDATN;"
```

Executing _IMDATN does the following:

1. Sets the spectrum analyzer to perform the intermodulation attenuation measurement.
2. Returns the measurement state indicating that the setup was successfully completed.
3. The _zINTMREF command must then be executed.
4. Returns the measurement state indicating that the normal transmitted power and the gated carrier reference powers have been successfully measured.
5. The _zINTMEAS command must then be executed.
6. Returns the measurement state indicating that the measurement was completed or aborted.
7. If the measurement was completed, the measurement results are placed in variables.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_IMDATN Measurement State Results

Value	Description
1	The measurement setup was successfully completed.
2	The normal transmitted power and the gated carrier reference powers have been successfully measured.
3	The intermodulation measurement was successfully completed.
4	The measurement was aborted.

Measurement Results The results of the _IMDATN command are stored in the variables shown in the following table.

_IMDATN Measurement Results

Value	Description	Units
_IMDL	A variable that contains the value of the lower frequency intermodulation product.	dB
_IMDU	A variable that contains the value of the upper frequency intermodulation product.	dB
_F	A variable that contains the pass or fail results of the intermodulation attenuation measurement. ■ If the intermodulation products pass (the intermodulation products are less than the intermodulation product limit) the value of _F is a 0. ■ If the intermodulation products fail (the intermodulation products are greater than the intermodulation product limit), the value of _F is a 1.	None

Limit and Parameter Variables _IMDATN uses _IMDX. Refer to Table 8-2 for more information.

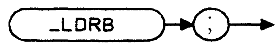
See Also

"To measure the intermodulation attenuation" in Chapter 4.

Note _LDRB must be executed prior to the *first* usage of the _IMDATN command.

_LDRB
Loader B

Syntax



XLDRB

_LDRB loads the spurious and intermodulation menu into the spectrum analyzer memory.

Example

```
OUTPUT 718;"_LDRB;"
```
Loads the spurious and intermodulation menus.

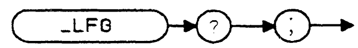
Measurement State The measurement state value is returned to the external controller to indicate when the load is finished.

_LDRB Measurement State Results

Value	Description
1	The load was successfully completed.
2	The load was aborted due to the wrong ROM card being inserted in the spectrum analyzer.
3	The load was aborted as there was no ROM card inserted in the spectrum analyzer.

_LFG
Load Flag

Syntax



XLFG

_LFG allows you to query which menus are loaded in the spectrum analyzer memory.

Query Example

```
OUTPUT 718;"_LFG?;"
```

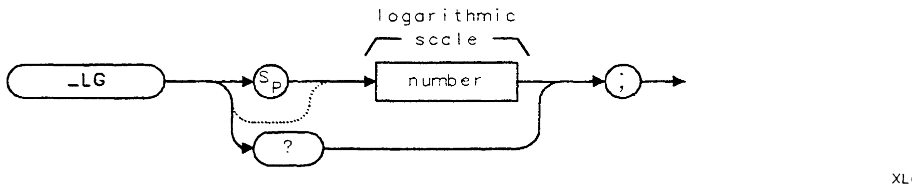
The query response will be the current menu stored in the spectrum analyzer memory.

_LFG Query Values

Value	Description
0	The power versus time, and frequency and modulation menus are loaded into the spectrum analyzer memory.
1	The spurious and intermodulation menu is loaded in the spectrum analyzer memory.

_LG
Logarithmic Scale

Syntax



Allows you to change the number of decibels a division represents on the spectrum analyzer screen. _LG is equivalent to SCALE LOG. _LG is useful for obtaining the proper display of the limits of a power versus time measurement.

_LG can accept an integer number from 1 to 20. The amplitude scale is in dB per division.

Example

`OUTPUT 718;"MOV _LG,20;"`	*Sets the spectrum analyzer's amplitude scale to 20 dB per division.*

Query Example

```
OUTPUT 718;"_LG?;"
```

The query response will be a the current setting for the amplitude scale.

_MBAND
Monitor Band

Syntax

Displays the full frequency band of the DECT radio by setting the start frequency of the spectrum analyzer to 1880 MHz and the stop frequency to 1900 MHz. _MBAND is equivalent to MONITOR BAND.

Example

```
OUTPUT 718;"_MBAND;"
```

Measurement State A "1" is returned to the external controller to indicate when the measurement is finished.

Measurement Results After executing _MBAND, the spectrum of the monitor band is stored in trace A. The measurement units for trace A are determined by the trace data format (TDF) command.

See Also

"To measure the monitor band" in Chapter 4.

_PBURST
Power versus Time Burst

Syntax

XPBURS

_PBURST performs the power versus time burst measurement. _PBURST is equivalent to P vs T BURST.

Example

```
OUTPUT 718;"_PBURST;"
```

Executing _PBURST does the following:

1. Performs the power versus time burst measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement was completed, the measurement results are placed in variables and traces.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_PBURST Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier power is out of range.

Measurement Results The results of the _PBURST command are stored in the variables and traces shown in the following table.

_PBURST Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the power versus time burst width measurement. ■ If the burst width measurement passed, _F is 0. ■ If the burst width measurement failed, _F is 1.	None
_PBT	A variable that contains the measured width of the burst at −3 dB (or the value of _PBMAX) from the peak of the burst.	μs
_PTM	A variable that contains the time between the external trigger and the marker.	μs

_PBURST Measurement Results (continued)

Variable or Trace	Description	Units
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _PBURST uses _PBMAX. Refer to Table 8-2 for more information.

Related Commands _PP determines if the FP or PP transmission burst is measured. _AVG should be set prior the executing _PBURST.

See Also

"To measure the power versus time burst" in Chapter 4.

_PFALL
Power versus Time Falling Edge

Syntax

XPFALL

_PFALL performs the power versus time falling edge measurement. _PFALL is equivalent to P vs T FALLING.

Example

```
OUTPUT 718;"_PFALL;"
```

Executing _PFALL does the following:

1. Performs the power versus time falling edge measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement was completed, the measurement results are placed in variables and traces.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_PFALL Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier power is out of range.

Measurement Results The results of the _PFALL command are stored in the variables and traces shown in the following table.

_PFALL Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the power versus time fall time measurement. ■ If the fall time measurement passed, _F is 0. ■ If the fall time measurement failed, _F is 1.	None
_PFT	A variable that contains the fall time of the burst.	μs
_PTM	A variable that contains the time between the external trigger and the marker.	μs
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command

_PFALL Measurement Results (continued)

Variable or Trace	Description	Units
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _PFALL uses _PFMAX, and _PFMIN. Refer to Table 8-2 for more information.

Related Commands _PP determines if the FP or PP transmission burst is measured. _AVG should be set prior the executing _PFALL.

See Also

"To measure the power versus time falling edge" in Chapter 4.

_PFRAME
Power versus Time Frame

Syntax

XPFRAM

_PFRAME performs the power versus time frame measurement. _PFRAME is equivalent to `P vs T FRAME`.

Example

```
OUTPUT 718;"_PFRAME;"
```

Executing _PFRAME does the following:

1. Performs the power versus time frame measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement was completed, time between the external trigger and the spectrum analyzer's marker is placed in the _PTM variable.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_PFRAME Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier power is out of range.

Measurement Results The results of the _PFRAME command are stored in the _PTM variable.

_PFRAME Measurement Result

Variable or Trace	Description	Units
_PTM	A variable that contains the time between the external trigger and the marker.	μs
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

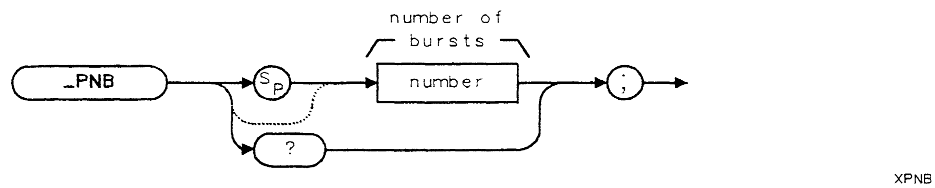
Related Commands _PP determines if the FP or PP transmission burst is measured.

See Also

“To measure the power versus time frame” in Chapter 4.

_PNB
Number of Bursts

Syntax



Allows you to change the number of bursts that are used in calculating the results for a power versus time, carrier power, and frequency and deviation measurements. The _PNB variable is equivalent to NUMBER BURSTS .

You enter an integer value from 1 to 99,999 into _PNB. The default value for _PNB is 5.

Example

`OUTPUT 718;"MOV _PNB,1;"` *Sets the number of bursts for a measurement to 1.*

Related Commands The functions performed by _AVG does not apply if _PNB is equal to 1.

Query Example

```
OUTPUT 718;"_PNB?;"
```

The query response will be a the current setting for the number of bursts.

See Also

"To change the value of a parameter variable" in Chapter 4.

_PON
Power versus Time Burst On

Syntax

XPON

_PON performs the power versus time burst on measurement. _PON is equivalent to P vs T BST ON .

Example

```
OUTPUT 718;"_PON;"
```

Executing _PON does the following:

1. Performs the power versus time burst on measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_PON Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier power is out of range.

Measurement Results The results of the _PON command are stored in the variables and traces shown in the following table.

_PON Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the power versus time burst on measurement. ■ If the burst on measurement passed, _F is 0. ■ If the burst on measurement failed, _F is 1.	None
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command

_PON Measurement Results (continued)

Variable or Trace	Description	Units
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

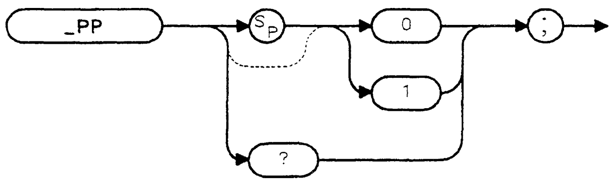
Related Commands _PP determines if the FP or PP transmission burst is measured.

See Also

"To measure the power versus time burst on" in Chapter 4.

_PP
Portable or Fixed Part

Syntax



XPP

Allows you to select the if the portable part (PP) or fixed part (FP) transmission burst is measured in the power versus time measurements, and the frequency and deviation measurements. The _PP variable is equivalent to TRANSMIT FP PP.

If _PP is set to 0, the DECT measurements personality will measure the fixed part transmission. If _PP is set to 1, the portable part transmission will be measured. The default value for _PP is 0.

Example

OUTPUT 718;"MOV _PP,0;" *Sets _PP to the fixed part transmission.*

_PRISE
Power versus Time Rising Edge

Syntax

XPRISE

_PRISE performs the power versus time rising edge measurement. _PRISE is equivalent to P vs T RISING.

Example

```
OUTPUT 718;"_PRISE;"
```

Executing _PRISE does the following:

1. Performs the power versus time rising edge measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement was completed, the measurement results are placed in variables and traces.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_PRISE Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier power is out of range.

Measurement Results The results of the _PRISE command are stored in the variables and traces shown in the following table.

_PRISE Measurement Results

Variable or Trace	Description	Units
_F	A variable that contains the pass or fail results of the power versus time rise time measurement. ■ If the rise time measurement passed, _F is 0. ■ If the rise time measurement failed, _F is 1.	None
_PRT	A variable that contains the rise time of the burst.	μs
_PTM	A variable that contains the time between the external trigger and the marker.	μs
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command

_PRISE Measurement Results (continued)

Variable or Trace	Description	Units
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

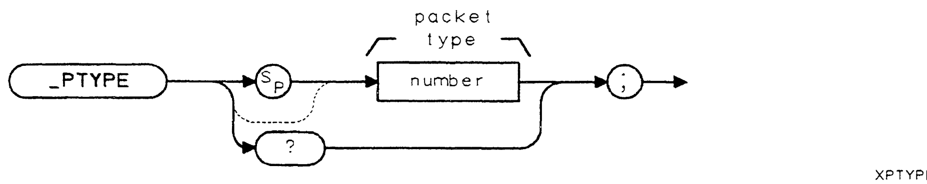
Limit and Parameter Variables _PRISE uses _PRMAX, and _PRMIN. Refer to Table 8-2 for more information.

See Also

"To measure the power versus time rising edge" in Chapter 4.

_PTYPE
Packet Type

Syntax



Allows you to enter the packet type. The _PTYPE command is equivalent to PACKET TYPE.

_PTYPE can accept an integer number from 0 to 3. The default for _PTYPE is 1 (basic physical Packet).

_PTYPE Values

Value	Packet Type
0	Short
1	Basic
2	Low capacity
3	High capacity

Example

`OUTPUT 718;"MOV _PTYPE,2;"` *Sets the packet type to low capacity Packet.*

Query Example

`OUTPUT 718;"_PTYPE?;"`

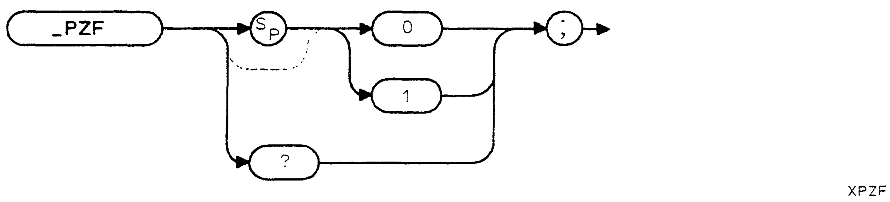
The query response will be a the current packet type.

See Also

"To use the spectrum analyzer's MOV command" in Chapter 4.

_PZF
Z Field

Syntax



Allows you to adjust the time measurements for a physical packet that contains the Z field. The _PZF command is equivalent to `Z Field`.

_PZF can accept the numbers 0 and 1. The default for _PZF is 1.

Note _PZF is set to 0 if _PTYPE is set to 0 (short physical packet).

Example

`OUTPUT 718;"MOV _PZF,0;"` *Sets the Z field to 0.*

Query Example

`OUTPUT 718;"_PZF?;"`

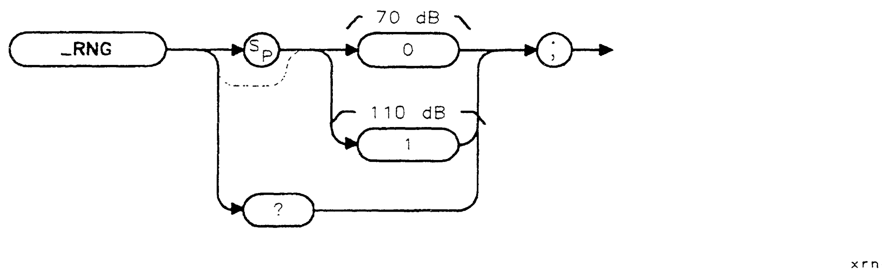
The query response will be a the current Z field.

See Also

"To use the spectrum analyzer's MOV command" in Chapter 4.

_RNG
Amplitude Range for Power vs Time

Syntax



Selects the amplitude range that is displayed for a power versus time measurement; either 70 dB or 110 dB. _RNG is equivalent to RANGE dB 70 110.

If _RNG is set to 0, the amplitude range is set to 70 dB. If _RNG is set to 1, the amplitude range is set to 110 dB. The default value for _RNG is 1.

Example

`OUTPUT 718;"MOV _RNG,0;"` *Sets the amplitude range to 70 dB.*

You should set _RNG prior to executing _PFRAME, _PBURST, _PRISE, _PON, or _PFALL.

Query Example

`OUTPUT 718;"_RNG?;"`

The query response will be the current value of _RNG.

_RPT
Repeat

Syntax

Repeats a power measurement, power versus time measurement, or frequency and deviation measurement (if the frequency and deviation measurement is performed with Option 112). The _RPT command is equivalent to REPEAT MEAS .

Example

```
OUTPUT 718;"_RPT;"
```

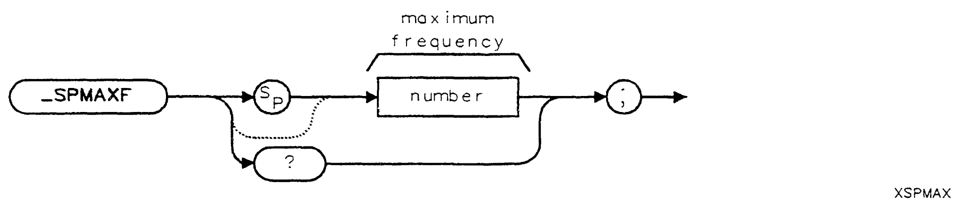
Related Commands _RPT will repeat the following measurements: _CPWR, _ACPT, _ACPMOD, _PFRAME, _PBURST, _PRISE, _PFALL, _PON, _FRQDEV.

See Also

"To use the repeat command" in Chapter 4.

_SPMAXF
Maximum Frequency

Syntax



Determines the maximum frequency of the frequency range that is to be tested for spurious emissions. _SPMAXF is equivalent to MAXIMUM FREQ.

_SPMAX can accept a real number from _SPMINF (the current value for minimum frequency) to 12.75 GHz or the maximum frequency for the spectrum analyzer (whichever is less). The default value for _SPMAX is 12.75 GHz or the maximum frequency for the spectrum analyzer.

Example

`OUTPUT 718;"MOV _SPMAXF,1E9;"` *Sets the maximum frequency to 1 GHz.*

Related Commands _SPMAXF is used by _SPUR (the spurious emissions measurement command).

Query Example

`OUTPUT 718;"_SPMAXF?;"`

The query response will be a real number representing the current setting for the maximum frequency.

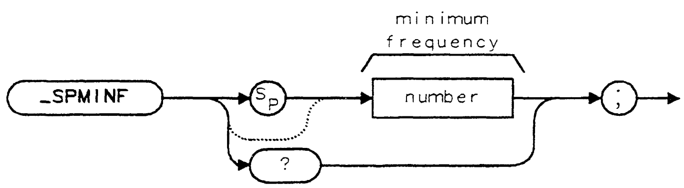
See Also

"To measure the spurious emissions" in Chapter 4.

Note _LDRB must be executed prior to the *first* usage of the _SPMAXF command.

_SPMINF
Minimum Frequency

Syntax



XSPMIN

Determines the minimum frequency of the frequency range that is to be tested for spurious emissions. _SPMINF is equivalent to MINIMUM FREQ.

_SPMINF can accept a real number from 100 kHz to the value of _SPMAXF (the current value for maximum frequency). The default value for _SPMINF is 100 kHz.

Example

```
OUTPUT 718;"MOV _SPMINF,1E6;"
```
Sets the minimum frequency to 1 MHz.

Related Commands _SPMINF is used by _SPUR (the spurious emissions measurement command).

Query Example

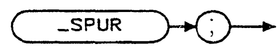
```
OUTPUT 718;"_SPMINF?;"
```

The query response will be a real number representing the current setting for the minimum frequency.

Note _LDRB must be executed prior to the *first* usage of the _SPMINF command.

_SPUR
Spurious Emissions Measurement

Syntax



XSPUR

_SPUR makes the spurious emissions measurement. _SPUR is equivalent to SPURIOUS.

Example

```
OUTPUT 718;"_SPUR;"
```

Executing _SPUR does the following:

1. Performs the spurious emissions measurement.
2. Returns the measurement state. The measurement state indicates if the measurement was completed or aborted.
3. If the measurement is completed, the measurement results are placed in variables and arrays.

Measurement State The measurement state value is returned to the external controller to indicate when the measurement is finished.

_SPUR Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted because a carrier was detected and the transmitter (refer to _IDLE) was set to idle.

Measurement Results The results of the _SPUR command are stored in the variables and arrays shown in the following tables.

_SPUR Measurement Results

Value	Description
_NOCAR	A variable that indicates if a carrier signal with an amplitude level of greater than −30 dBm was detected. ■ If _NOCAR is equal to 0, a carrier with an amplitude value of greater than −30 dBm was detected. ■ If _NOCAR is equal to 1, no carrier with an amplitude value of −30 dBm was detected. (The measurement is still performed even if no carriers were detected.)
_F	A variable that contains the pass or fail results of the spurious emission measurement. ■ If the spurious emissions measurement passed, the value of _F is 0. ■ If the spurious emissions measurement failed, the value of _F is 1.

Unlike the other measurement commands, _SPUR places some of the measurement results into arrays. The following table describes the arrays used by _SPUR.

_SPUR Measurement Results (Array Information)

Array or Variable Name	Description	Units
_SPN	The variable _SPN holds the number of spurs found.	None
_SPAMP	The _SPAMP array elements contain the amplitude level of each spur found.	10 times the actual amplitude level in dBm. To convert to dBm, divide the value by 10.
_SPFM	The _SPFM array elements contain the MHz portion* of the frequency of each spur found.	MHz
_SPFK	The _SPFK array elements contain the kHz portion* of the frequency of each spur found.	kHz. To convert to MHz, divide the value by 1000.
_SPFAIL	The _SPFAIL array elements contain a value that indicates if the spur passed or failed the spurious emission limit. ■ If the _SPFAIL array element is a "0," the spurious emission passed (it was less than the spurious emission limit). ■ If the _SPFAIL array element is a "1," the spurious emission failed (it was greater than the spurious emission limit).	None
_SPOK	The _SPOK array elements contain a value that indicates whether (for that spur) the noise floor of the spectrum analyzer was too high to measure the spurious emission accurately. For more information, refer to "CHECK NOISE FLOOR" in Chapter 5. ■ If the value of the _SPOK array element is a "0," it indicates that the spurious emission could be spectrum analyzer noise.† ■ If the value is a "1," the spurious emission is a valid spurious emission.	None

*The frequency of the spurious emission can be found as follows: Frequency = MHz portion + (kHz portion/1000)

† To be considered spectrum analyzer noise, the spectrum analyzer's calculated displayed average noise level must be greater than the spurious emissions limit minus the value of _SPMAR.

Limit and Parameter Variables _SPUR uses _SPMAR, _SPXL, _SPXH, _SPXGH, _SPXLI, _SPXHI, _SPXGHI, and _MAXST. Refer to Table 8-2 for more information.

Related Commands _IDLE, _MAXST, _SPMAR, _SPMAXF, and _SPMINF.

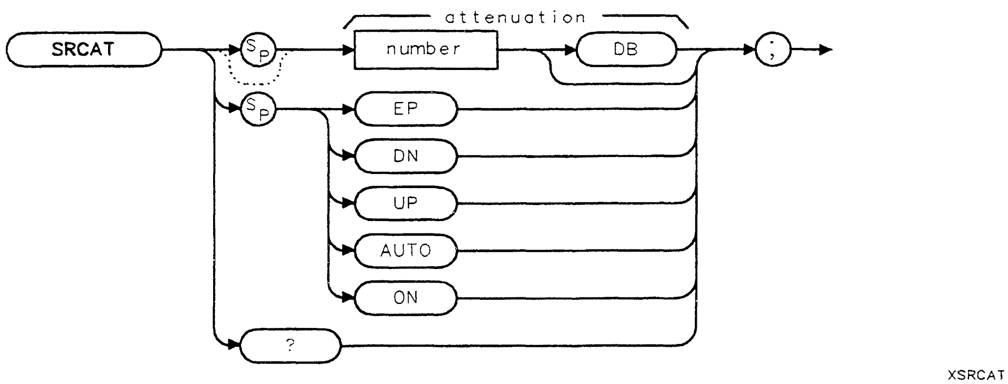
See Also

"To measure the spurious emissions" in Chapter 4.

Note _LDRB must be executed prior to the *first* usage of the _SPUR command.

SRCAT
Source Attenuator

Syntax



Allows you to attenuate the output level of the source. Use SRCAT to attenuate the power level of the source manually, from 0 dB to 56 dB in 8 dB steps. The SRCAT command is equivalent to SRC ATN MAN AUTO.

SRCAT can accept any real or integer number, specified in multiples of 8 dB within the range 0 dB to 56 dB. The default value for SRCAT is SRCAT AUTO. SRCAT AUTO automatically adjusts the attenuator to yield the source amplitude level specified by the SRCPWR command.

Example

`OUTPUT 718;"SRCAT AUTO;"`	*Activates DECT Source-attenuation coupling.*
`OUTPUT 718;"_DSRCPWR -20DB;"`	*Activates DECT Source output.*
`OUTPUT 718;"SRCAT 20DB;"`	*Sets attenuator to 20 dB. This decouples the attenuator from the DECT Source power-level setting.*

Query Example

```
OUTPUT 718;"SRCAT?;"
```

The query response will be the current attenuation level.

_TA
Trace Active

Syntax

XTA

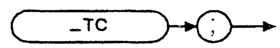
_TA allows you to view an active trace on the spectrum analyzer display after a measurement has been completed. The _TA command is equivalent to TRACE ACTIVE.

Example

```
OUTPUT 718;"_TA;"
```

_TC
Trace Compare

Syntax



XTC

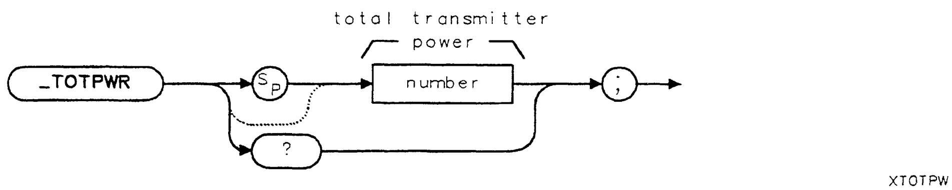
_TC copies the active trace from trace A into trace C. Trace A remains in the active mode, trace C is placed into the view mode (in the view mode, the trace is not updated). The _TC command is equivalent to TRACE COMPARE.

Example

```
OUTPUT 718;"_TC;"
```

_TOTPWR
Total Power

Syntax



Allows you to enter the total RF power of the transmitter. The _TOTPWR variable is equivalent to TOTAL TX POWER.

_TOTPWR can accept an integer number from −10 to 40. The measurement unit is dBm. The default value for _TOTPWR is +26 dBm.

Example

`OUTPUT 718;"MOV _TOTPWR,10;"` *Sets the total power to +10 dBm.*

The entered value allows the spectrum analyzer to adjust the input attenuation automatically so that the spectrum analyzer is not driven into signal compression for signals with power levels less than the entered value.

Related Commands _DEFAULT sets _TOTPWR to 26.

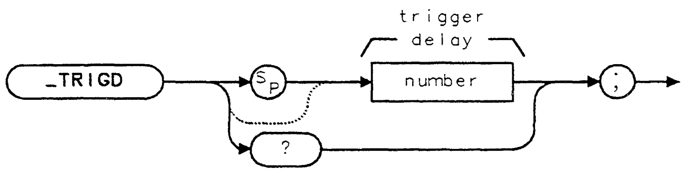
Query Example

`OUTPUT 718;"_TOTPWR?;"`

The query response will be the current setting for the total power.

_TRIGD
Trigger Delay

Syntax



Allows you to enter the delay time from the external trigger signal to the reference point of the burst. The _TRIGD variable is equivalent to TRIG DELAY.

You can enter in an integer number for trigger delay from −2200 μs to +1800 μs in 1 μs increments. The measurement unit for _TRIGD is μs. If you do not enter a trigger delay, a default value of 0 μs is used.

Example

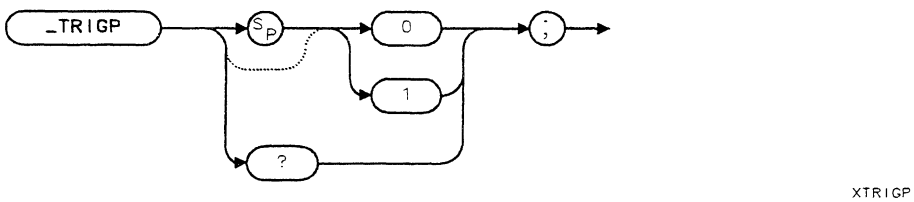
`OUTPUT 718;"MOV _TRIGD,40;"` *Sets the trigger delay to 40 μs.*

For a positive-edge trigger, the reference point is the beginning of a burst. For a negative-edge trigger, the reference point is the end of a burst.

Related Commands _DEFAULT sets _TRIGD to 0. Use _TRIGP to set the trigger polarity.

_TRIGP
Trigger Polarity

Syntax



Allows you to select the edge trigger polarity for the external transistor-transistor logic (TTL) frame trigger signal. The _TRIGP variable is equivalent to TRIG POL NEG POS.

To select triggering on negative polarity, move a "0" into _TRIGP. To select triggering on positive polarity, move a "1" into _TRIGP. The default value for _TRIGP is 1.

Example

```
OUTPUT 718;"MOV _TRIGP,0;"
```

Related Commands _DEFAULT sets _TRIGP to 1. Use _TRIGD to set trigger time delay.

9

Calibration Information for the DECT Source

This chapter lists the specifications and characteristics for the DECT Source (Option 012) when it is performing as a DECT Source and as a Tracking Generator. It also explains how to test your DECT Source to determine if it meets its specifications.

Commands within parenthesis after a softkey, for example (ON), are used throughout this chapter to indicate the part of a softkey that should be underlined when the key is pressed.

Notes

1. To perform these tests the HP 85723A DECT Measurements Personality must be loaded into the spectrum analyzer memory. Refer to "Step 1. Load the DECT measurements personality" in chapter 1, for information on loading the DECT measurements personality into the spectrum analyzer memory.
2. This is not a comprehensive spectrum analyzer calibration guide. Only tests required to verify the performance of the DECT Source are described. Refer to your *HP 8590 E-Series Spectrum Analyzer Calibration Guide* for further information on calibrating your spectrum analyzer.

Specifications and Characteristics

This section contains specifications and characteristics for the DECT Source.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C (unless otherwise noted). The spectrum analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the spectrum analyzer is turned on and after the appropriate calibration routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

Specifications (Option 012)

DECT Source Specifications (Option 012)

All specifications apply over 0 °C to +55 °C. The spectrum analyzer/DECT Source combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum analyzer is turned on and after CAL FREQ, CAL AMPTD, and DECT SRC CAL have been run.

Warm-Up	30 minutes

Carrier Frequency	
Range	1.88 GHz to 1.9 GHz
Frequency Accuracy	±(5 kHz + analyzer frequency error*)
* analyzer frequency error = frequency reference error x carrier frequency + 300MHz where, frequency reference error = (aging rate x period of time since last adjustment + initial achievable accuracy + temperature stability). Refer to your *HP 8590 E-Series Spectrum Analyzer Calibration Guide* for further information.	

Output Power Level	
Range	−21 dBm to −83 dBm
Resolution	0.1 dB
Absolute Accuracy (at 25 °C ±10 °C)	
(−40 dBm at 1.89 GHz)	±1.5 dB
Vernier‡	
Range	9 dB
Accuracy (at 25 °C ±10 °C)	
(−40 dBm at 1.89 GHz, 16 dB attenuation)	
Incremental	±0.20 dB/dB
Cumulative	±0.50 dB total
Output Attenuator	
Range	0 dB to 56 dB in 8 dB steps
‡ Refer to the “DECT Source Output Accuracy” table in “Characteristics”.	

Output Flatness	
(referenced to 1.89 GHz, −40 dBm)	
1.88 GHz to 1.9 GHz	±0.5 dB

Modulation	
Input	TTL compatible signal
Format	frequency shift keying
Premodulation Filter	guassian (BT = 0.5)
Frequency Deviation	288 kHz fixed
	100 kHz squarewave modulation source
Frequency Deviation Accuracy	±5 kHz (characteristic)

TDMA Switch	
Input	TTL compatible signal
On/Off Ratio	>75 dB
Video Feedthrough (0 dB attenuation)	<500 mV pk-pk*
Switching Characteristics	as per ETSI RES DECT approval test specification.
* This value improves by 6 dB for each 6 dB of output attenuation introduced.	

Spurious Output	
Non Harmonic Spurs from 1.88 GHz to 1.9 GHz (>10 KHz offset)	
−21 dBm output	<−40 dBc

Tracking Generator Specifications (Option 012)

All specifications apply over 0 °C to +55 °C. The spectrum analyzer/tracking generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum analyzer is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN and TRACKING PEAK have been run.

Warm-Up	30 minutes

Output Frequency	
Range	70 MHz to 2.9 GHz

Output Power Level	
Range	−21 dBm to −83 dBm
Resolution	0.1 dB
Absolute Accuracy (at 25 °C ±10 °C) (−40 dBm at 300 MHz)	±1.0 dB
Vernier	
Range	9 dB
Accuracy (at 25 °C ±10 °C) (−40 dBm at 300 MHz, 16 dB attenuation)	
Incremental	±0.20 dB/dB
Cumulative	±0.50 dB total
Output Attenuator	
Range	0 dB to 56 dB in 8 dB steps

Output Power Sweep	
Range	(−30 dBm to −21 dBm) − (Source Attenuator Setting)
Resolution	0.1 dB

Output Flatness (referenced to 300 MHz, −40 dBm) 70 MHz to 2.9 GHz	 ±2.5 dB

Spurious Output (−21 dBm output)	
Harmonic Spurs from 70 MHz to 2.9 GHz	
TG Output 70 MHz to 2.9 GHz	≤−25 dBc
Non harmonic Spurs from 70 MHz to 2.9 GHz	
TG Output 70 MHz to 2.0 GHz	≤−27 dBc
TG Output 2.0 GHz to 2.9 GHz	≤−23 dBc
LO Feedthrough	
LO Frequency 3.9217 to 6.8214 GHz	≤−36 dBm

Characteristics (Option 012)

DECT Source Characteristics (Option 012)

Output VSWR	
0 dB Attenuator	<2.0:1
8 dB Attenuator	<1.5:1

DECT SOURCE OUTPUT ACCURACY, Option 012 (after DECT SRC CAL, Frequency 1.88GHz - 1.9GHz, 25°C ± 10°C)			
DECT Source Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 1.89 GHz referred to −40 dBm)**	**Absolute Accuracy**
−21 to −30 dBm	0 dB	1.0 dB	3.0 dB
−30 to −38 dB	8 dB	1.5 dB	3.5 dB
−40 dBm	16 dB	Reference	2.0 dB
−38 to −46 dBm	16 dB	1.0 dB	3.0 dB
−46 to −54 dBm	24 dB	1.5 dB	3.5 dB
−54 to −62 dBm	32 dB	1.6 dB	3.6 dB
−62 to −70 dBm	40 dB	1.8 dB	3.8 dB
−70 to −78 dBm	48 dB	2.0 dB	4.0 dB
−78 to −83 dBm	56 dB	2.1 dB	4.1 dB

Tracking Generator Characteristics (Option 012)

Tracking Drift	
(Usable in a 1 kHz RBW after 5 minute warmup)	1.5 kHz/5 minute

Tracking Generator Feedthrough	<−109 dBm

Output Attenuator Repeatability	
70 MHz to 300 MHz	±0.1 dB
300 MHz to 2.0 GHz	±0.2 dB
2.0 GHz to 2.9 GHz	±0.3 dB

Output VSWR	
0 dB Attenuator	<2.0:1
8 dB Attenuator	<1.5:1

Physical Characteristics (Option 012)

Front Panel Output

DECT SOURCE 50 Ω	
Connector	Type N female
OUTPUT Impedance	50 Ω nominal

Rear Panel Inputs and Outputs

TTL DATA OUT	
Connector	BNC female
OUTPUT Impedance	75 Ω

RF SWITCH CURRENT IN	
Connector	BNC female
INPUT Impedance	100 Ω nominal

TIMESLOT PULSE IN	
Connector	BNC female
INPUT Impedance	1 kΩ

TTL DATA IN	
Connector	BNC female
INPUT Impedance	1 kΩ

Calibrating

This section contains performance verification test procedures which test the electrical performance of the DECT Source.

Allow the spectrum analyzer to warm up in accordance with the Temperature Stability specification described in the "Specifications and Characteristics" section of this chapter before performing the tests.

None of the test procedures involve removing the cover of the spectrum analyzer.

Calibration

Calibration verifies that the DECT source is within all specifications listed in this chapter. It is time consuming and consists of all the performance verification tests in this chapter.

Operation Verification

Operation Verification consists of a subset of the performance verification tests. It only tests the most critical specifications of the DECT Source. These tests are recommended for incoming inspection, troubleshooting, or after repair of the DECT source assembly. If any of the tracking generator assemblies are repaired, the full DECT source calibration is recommended. Operation verification requires less time than the calibration.

The tests recommended for operation verification are : Absolute Amplitude Accuracy; TDMA Switch Delay; Frequency Deviation Accuracy and Demodulator Squaring.

Safety

Familiarize yourself with the safety symbols marked on the spectrum analyzer, and read the general safety instructions and the symbol definitions given in the front of this guide *before* you begin verifying performance of the spectrum analyzer.

Before You Start

There are four things you should do before starting a performance verification test:

- Switch the spectrum analyzer on and let it warm up in accordance with the Temperature Stability specification in Chapter 2.
- Read "Making a Measurement" in Chapter 2 of the *HP 8590 Series Spectrum Analyzer User's Guide.*
- After the spectrum analyzer has warmed up as specified, perform the Self-Calibration Procedure documented in "Improving Accuracy With Self-Calibration Routines" in Chapter 2 of the *HP 8590 Series Spectrum Analyzer User's Guide.* The performance of the spectrum analyzer is only specified after the spectrum analyzer calibration routines have been run and if the spectrum analyzer is autocoupled.
- Load the HP 85723A DECT Measurements Personality into the spectrum analyzer memory. (Refer to "Step 1. Load the DECT measurements personality in chapter 1.")
- Read the rest of this section before you start any of the tests, and make a copy of the Performance Verification Test Record described in "Recording the Test Results."

Test equipment you will need

Tables 9-1 through 9-3 list the recommended test equipment and accessories required for the performance verification tests. The tables also list recommended equipment for the DECT Source adjustment procedures which are located in chapter 10. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

Recording the test results

A performance verification test record is provided at the end of this chapter.

Each test result is identified as a *TR Entry* in the performance tests and on the performance verification test record. We recommend that you make a copy of the performance verification test record, record the test results on the copy, and keep the copy for your calibration test record. This record could prove valuable in tracking gradual changes in test results over long periods of time.

If the DECT Source doesn't meet specifications

If the spectrum analyzer fails a test, rerun the frequency calibration and amplitude calibration routines by pressing CAL FREQ & AMPTD, and DECT SRC CAL, then repeat the verification test. If the spectrum analyzer still fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to "If You Have a Problem," in your *HP 8590 Series Spectrum Analyzer Calibration Guide* for instructions on how to solve the problem.

Table 9-1. Recommended Test Equipment

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
Digital Voltmeter	Input Resistance: $\geq$10 MΩ Accuracy: ±10 mV on 100 V range	HP 3456A	P,A,T
Measuring Receiver	Compatible with Power Sensors dB Relative Mode Resolution: 0.01 dB Reference Accuracy: ±1.2%	HP 8902A	P,A,T
Microwave Frequency Counter	Frequency Range: 9 MHz to 7 GHz Timebase Accy (Aging): <5 x 10^{-10}/day	HP 5343A	P,A,T
Power Sensor, Low-Power	Frequency Range: 70 MHz to 2.9 GHz Amplitude Range: −20 dBm to −70 dBm Maximum SWR: 1.1 (300 MHz) 1.15 (70 MHz to 2.9 GHz)	HP 8484A *or* HP 8481D	P,A,T
Power Sensor	Frequency Range: 50 MHz to 6.5 GHz Maximum SWR: 1.1 (300 MHz) 1.15 (50 MHz to 100 MHz) 1.10 (100 MHz to 2 GHz) 1.15 (2 GHz to 12.4 GHz)	HP 8485A	P,A,T
Pulse Generator	Period Range: 1 ms to 980 ms ±2%, single pulse mode Level −2 V to +2 V Transition Time: 6 ns ±10%, ±1 ns Pulse Width: 150 ns to 3 μs ±1% ±1 ns	HP 8116A	P,T
Spectrum Analyzer, Microwave	Frequency Range: 10 MHz to 7 GHz	HP 8566A/B	P,A,T
Synthesized Sweeper	Frequency Range: 10 MHz to 6.5 GHz Frequency Accuracy (CW): ±0.02% Leveling Modes: Internal and External Modulation Modes: AM Power Level Range: −35 to +16 dBm	HP 8340A/B *or* HP 83630A	P,A,T

1 P = Performance verification test, A = Adjustment, T = Troubleshooting

Table 9-1. Recommended Test Equipment (continued)

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use[1]
Oscilloscope	Bandwidth: dc to 100 MHz Vertical Scale Factor of 0.5 V to 5 V/Div External Trigger Mode	HP 54501A	T
Synthesizer/Function Generator	Frequency Range: 0.1 Hz to 100 kHz Frequency Accuracy: ±0.02% Waveform: Triangle, Square	HP 3325B	P,T
Synthesizer/Level Generator	Frequency Range: 500 Hz to 80 MHz Amplitude Range: +12 to −85 dBm Flatness: ±0.15 dB Attenuator Accuracy: ±0.09 dB	HP 3335A	P,A,T
Universal Counter[2]	Time Interval Range: 25 ms to 100 ms Single Operation Range: +2.5 Vdc to −2.5 Vdc	HP 5316B	P,T

1 P = Performance verification test, A = Adjustment, T = Troubleshooting

2 Option 105 only

Table 9-2. Recommended Accessories

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use[1]
Adapter	APC 3.5 (f) to APC 3.5 (f) *(two required)*	5061-5311	P,A,T
Adapter	BNC tee (m) (f) (f) *(two required)*	1250-0781	T
Adapter	Type N (f) to APC 3.5 (m)	1250-1750	P,A,T
Adapter	Type N (m) to BNC (f) *(four required)*	1250-1476	P,A,T
Adapter	Type N (m) to N (m)	1250-1475	P,A,T
Attenuator, 10 dB	Type N(m to f) Frequency: 300 MHz to 1.89 GHz	HP 8491A Option 010	P,T
Power Splitter	Frequency Range: 50 kHz to 6.5 GHz Insertion Loss: 6 dB (nominal) Output Tracking: <0.25 dB Equivalent Output SWR: <1.22:1	HP 11667B	P,A
Termination, 50 Ω	Impedance: 50 Ω (nominal)	HP 908A	P,T
Termination, 50 Ω	Impedance: 50 Ω (nominal)	HP 909D	P,T
Termination, BNC 50 Ω	Impedance: 50 Ω (nominal)	HP 11593A	P,T
DVM Test Leads	For use with HP 3456A	HP 34118	A,T

1 P = Performance verification test, A = Adjustment, T = Troubleshooting

Table 9-3. Recommended Cables

Equipment	Critical Specifications for Cable Substitution	Recommended Model	Use[1]
Cable	Type N, 183 cm (72 in)	HP 11500A	P,A,T
Cable	Type N, 60 cm (24 in)	HP 11500B/C	P,A,T
Cable	Frequency Range: dc to 1 GHz Length: ≥91 cm (36 in) Connectors: BNC (m) both ends *(four required)*	HP 10503A	P,A,T
Cable	Frequency Range: dc to 310 MHz Length: 23 cm (9 in) Connectors: BNC (m) both ends *(two required)*	HP 10502A	P,A,T

1 P = Performance verification test, A = Adjustment, T = Troubleshooting

1. Absolute Amplitude Accuracy

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 1.89 GHz in the DECT ANALYZER mode. A calibrated power sensor is then connected to the DECT SOURCE 50 Ω output to measure the power level at 1.89 GHz.

A power reading is made at −40 dBm to measure the amplitude accuracy.

The DECT Source is set to −21 dBm and the measuring receiver is then set into RATIO mode so that future power level readings will be in dB relative to the power level at 1.89 GHz. The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between the ideal and actual power levels is calculated at each step. The step-to-step error is also calculated.

The spectrum analyzer is changed to SPECTRUM ANALYZER mode and a tracking generator absolute power reading is made at 300 MHz, −40 dBm.

The related adjustment for this performance verification test is the "BITG Power Level" adjustment.

Equipment Required

Measuring receiver
Power sensor:
  70 MHz to 2.9 GHz
  −70 dBm to −20 dBm
Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*
Attenuator, 10 dB

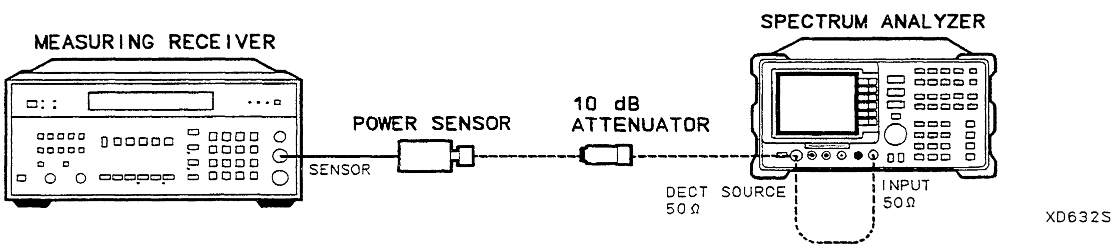


Figure 9-1. Absolute Amplitude Accuracy Test Setup

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-1.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish.
3. Press DECT ANALYZER on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 10 seconds.)
4. Set the spectrum analyzer by pressing the following keys:

   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)
   (AUX CTRL) DECT SOURCE SRC PWR ON OFF (ON) −25 (dBm)
   CH X CTR FREQ 1.89 (GHz)

5. On the spectrum analyzer press More 1 of 2, DECT SRC CAL, then follow the instructions on the screen.
6. Wait for the DECT Source cal done message to be displayed on the spectrum analyzer then press More 2 of 2.
7. Zero and calibrate the measuring-receiver/power-sensor combination in log mode (power levels readout in dBm). Refer to the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.
8. Disconnect the BNC cable and the adapter from the DECT SOURCE 50 Ω output and connect the power sensor to the DECT SOURCE 50 Ω output. Refer to Figure 9-1. (The 10 dB attenuator pad should not be connected at this stage.)
9. On the spectrum analyzer, press SRC PWR ON OFF (ON), −40 (dBm), (SGL SWP).
10. Record the power level displayed on the measuring receiver as the Absolute Amplitude Accuracy in the performance verification test record as TR Entry 1-1.
11. Connect the 10 dB attenuator pad between the power sensor and the DECT SOURCE 50 Ω output. (This is required to eliminate the possibility of overloading the power sensor/measuring receiver when the spectrum analyzer is set to −21 dBm.)
12. On the spectrum analyzer, press SRC PWR ON OFF (ON), −21 (dBm). Allow the reading on the measuring receiver to settle.
13. Press RATIO on the measuring receiver. Power levels will now readout in dB relative to the power level just measured at the −21 dBm output power level setting.
14. Set the SRC POWER on the spectrum analyzer to the settings indicated in Table 9-4. At each setting, record the power level displayed on the measuring receiver.
15. Calculate the Absolute Vernier Accuracy by subtracting the Power change from reference setting from the Measured Power Level for each SRC POWER setting in Table 9-4.

    Absolute Vernier Accuracy = Measured Power Level − Power change from reference
16. Record the Absolute Vernier Accuracy for the −22 dBm SRC POWER setting as the corresponding Step-to-Step Accuracy.
17. Calculate the Step-to-Step Accuracy for the −23 dBm to −30 dBm SRC POWER settings by subtracting the previous Absolute Vernier Accuracy from the current Absolute Vernier Accuracy.
18. Locate the most positive Absolute Vernier Accuracy value in Table 9-4 and record as TR Entry 1-2 of the performance verification test record.
19. Locate the most negative Absolute Vernier Accuracy value in Table 9-4 and record as TR Entry 1-3 of the performance verification test record.
20. Locate the most positive Step-to-Step Accuracy values in Table 9-4 and record as TR Entry 1-4 of the performance verification test record.
21. Locate the most negative Step-to-Step Accuracy values in Table 9-4 and record as TR Entry 1-5 of the performance verification test record.

Table 9-4. Vernier Accuracy

SRC POWER	Power change from reference (dB)	Measured Power Level (dB)	Absolute Vernier Accuracy (dB)	Step-to-Step Accuracy (dB)	Measurement Uncertainty (dB)
−21	0	(Ref)	(Ref)	(Ref)	±0.000
−22	−1	______	______	______	±0.033
−23	−2	______	______	______	±0.033
−24	−3	______	______	______	±0.033
−25	−4	______	______	______	±0.033
−26	−5	______	______	______	±0.033
−27	−6	______	______	______	±0.033
−28	−7	______	______	______	±0.033
−29	−8	______	______	______	±0.033
−30	−9	______	______	______	±0.033

22. Disconnect the power sensor and attenuator pad from the DECT SOURCE 50 Ω output.
23. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-1.
24. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

    SPECTRUM ANALYZER
    (FREQUENCY) 300 (MHz)
    (SPAN) 0 (Hz)
    (BW) RES BW AUTO MAN (MAN) 30 (kHz)
    (MKR)
    (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −25 (dBm)

25. Press TRACKING PEAK on the spectrum analyzer, then wait for the PEAKING message to disappear.
26. Enter the power sensor 300 MHz Cal Factor into the measuring receiver.
27. Disconnect the BNC cable and adapter from the DECT SOURCE 50 Ω output and connect the power sensor to the DECT SOURCE 50 Ω output. Refer to Figure 9-1.
28. On the spectrum analyzer, press SRC POWER ON OFF (ON), −40 (dBm), (SGL SWP).
29. Press RATIO on the measuring receiver to return it to RF POWER measurement mode.
30. Record the power level displayed on the measuring receiver as the Absolute Amplitude Accuracy in the performance verification test record as TR Entry 1-6.

2. Tracking Generator Power Sweep Range

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω through a power splitter and the accuracy is optimized at 300 MHz. The other output of the power splitter is connected to a measuring receiver. The tracking generator is set to do a power sweep from −30 dBm to −18.25 dBm.

The markers are used to measure the displayed amplitude at the beginning and end of the sweep. The power sweep is then turned off and the power level of the tracking generator is adjusted until the displayed amplitude is the same as at the start of the sweep. This power level is measured on the measuring receiver and recorded. The tracking generator is then adjusted until the displayed amplitude is the same as at the end of the sweep. This power level is measured and recorded. The difference between the two measured power levels is calculated and recorded.

The related adjustment for this performance verification test is the "BITG Power Level" adjustment.

Equipment Required

Measuring receiver
Power sensor, 70 MHz to 2.9 GHz
Power splitter
Cable, Type N, 62 cm (24 in)
Adapter, Type N(m) to Type N(m)

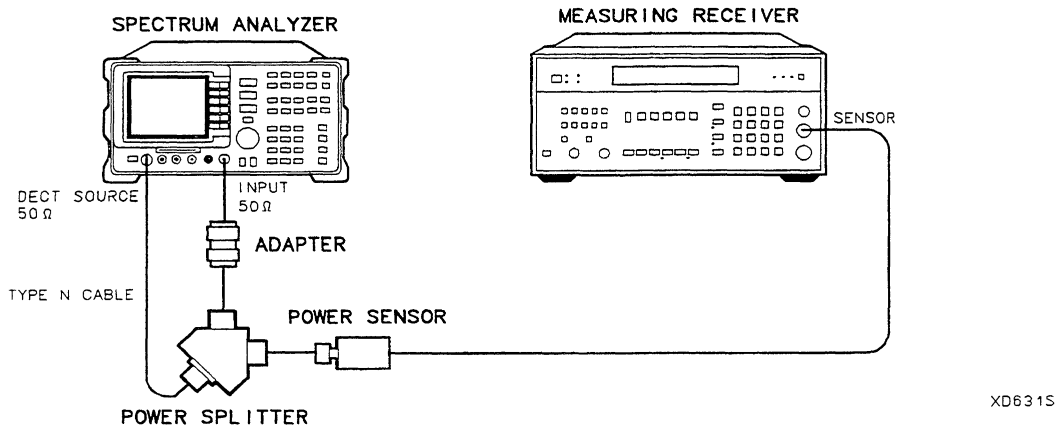


Figure 9-2. Power Sweep Range Test Setup

Procedure

1. Connect the equipment as shown in Figure 9-2. Do not connect the power sensor to the power splitter at this time.
2. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER
   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)

(AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −25 (dBm)

3. On the spectrum analyzer, press TRACKING PEAK, then wait for the PEAKING message to disappear.
4. Zero and calibrate the power-sensor/measuring-receiver in log mode (power levels read out in dBm). Refer to the measuring receiver operation manual. Enter the power sensor 300 MHz Cal Factor into the measuring receiver. Connect the power sensor to the power splitter. Refer to Figure 9-2.
5. On the spectrum analyzer, press the following keys:

   REF LVL −20 (dBm)

   (AUX CTRL) TRACK GEN

   SRC PWR ON OFF (ON) −30 (dBm)

   SRC ATN MAN AUTO (MAN) 0 (dBm)

   PWR SWP ON OFF (ON) 11.75 (dB)

   (AMPLITUDE) SCALE LOG LIN (LOG) 2 (dB)

   Press REF LVL on the spectrum analyzer, then adjust the reference level until the peak of the displayed ramp (along the rightmost graticule) is one-half division down from the reference level.
6. Press (MKR), MARKER NORMAL. Use the knob to place the marker at the leftmost graticule line. The marker should read 0 picosecond. Press MARKER Δ.
7. Press (AUX CTRL), TRACK GEN, PWR SWP ON OFF (OFF) to set power sweep off. The ΔMKR should read 0 dB ±0.1 dB. If it does not, press SRC PWR ON OFF (ON), and adjust the power level until the marker reads 0 dB ±0.1 dB.
8. Record the power level displayed on the measuring receiver as TR Entry 2-1 of the performance verification test record.
9. Press PWR SWP ON OFF (ON) to set power sweep on. Wait for completion of a new sweep.
10. Press (MKR), MARKER NORMAL. Use the knob to place the marker at the rightmost graticule line. Press MARKER Δ.
11. Press (AUX CTRL), TRACK GEN, PWR SWP ON OFF (OFF) to set power sweep off. Press SRC PWR ON OFF (ON) and adjust the SRC POWER level until the ΔMKR reads 1 dB ±0.1 dB.

    Be sure to wait for the completion of a new sweep after each adjustment of the SRC POWER level.
12. Record the power level displayed on the measuring receiver as TR Entry 2-2 of the performance verification test record.
13. Subtract Start Power Level (TR Entry 2-1) from the Stop Power Level (TR Entry 2-2) and record as the Power Sweep Range in the performance verification test record as TR Entry 2-3.

    Power Sweep Range = Stop Power Level − Start Power Level

3a. DECT Source Level Flatness

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 1.89 GHz. A calibrated power sensor is then connected to the DECT SOURCE 50 Ω output to measure the power level at 1.89 GHz. The measuring receiver is set for RATIO mode so that future power level readings are in dB relative to the power level at 1.89 GHz.

The DECT Source is then stepped through the DECT frequency channels. The output power relative to the power level at 1.89 GHz is measured at each frequency channel and recorded.

The related adjustment for this procedure is "BITG Power Level" adjustment.

Equipment Required

Measuring receiver
Power sensor, 70 MHz to 2.9 GHz
Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*

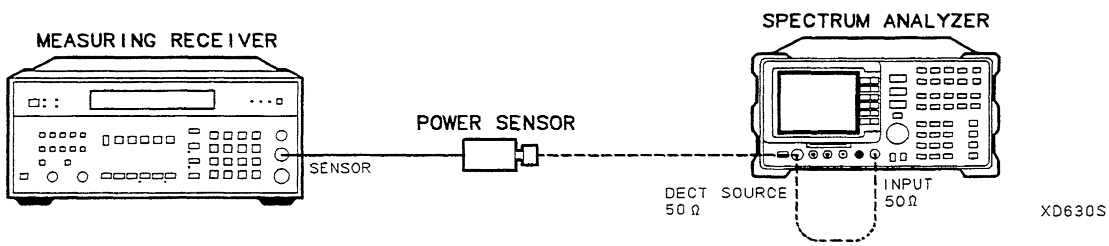


Figure 9-3. DECT Source and Tracking Generator Level Flatness Test Setup

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-3.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish.
3. Press DECT ANALYZER on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 10 seconds.)
4. Set the spectrum analyzer by pressing the following keys:

   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)
   (AUX CTRL) DECT SOURCE SRC PWR ON OFF (ON) −25 (dBm)
   CH X CTR FREQ 1.89 (GHz)

5. On the spectrum analyzer press More 1 of 2, DECT SRC CAL, then follow the instructions on the screen.
6. Wait for the DECT Source cal done message to be displayed on the spectrum analyzer then press More 2 of 2.
7. Zero and calibrate the measuring receiver and power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 2 GHz Cal Factor into the measuring receiver.

8. Disconnect the BNC cable and adapter from the DECT SOURCE 50 Ω output and connect the power sensor to the DECT SOURCE 50 Ω output.
9. On the spectrum analyzer, press SRC PWR ON OFF (ON), −40 (dBm), (SGL SWP).
10. Press RATIO on the measuring receiver. The measuring receiver readout is now in power levels relative to the power level at 1.89 GHz.
11. On the spectrum analyzer, press CHANNEL NUMBER 0 (ENTER).
12. On the spectrum analyzer, press (SGL SWP).
13. Record the power level displayed on the measuring receiver as the Level Flatness in Table 9-5.
14. Repeat steps 11 through 13 to measure the flatness at each frequency channel setting listed in Table 9-5. The (▲) (step-up key) may be used to change the channel number.
15. Locate the most positive Level Flatness reading in Table 9-5 and record this value as TR Entry 3-1 of the performance verification test record.
16. Locate the most negative Level Flatness reading in Table 9-5 and record this value as TR Entry 3-2 of the performance verification test record.

Table 9-5. DECT Source Level Flatness Worksheet

Channel Number	Level Flatness (dB)	Measurement Uncertainty
0	______	+0.21/−0.21
1	______	+0.21/−0.21
2	______	+0.21/−0.21
3	______	+0.21/−0.21
4	______	+0.21/−0.21
5	______	+0.21/−0.21
6	______	+0.21/−0.21
7	______	+0.21/−0.21
8	______	+0.21/−0.21
9	______	+0.21/−0.21

3b. Tracking Generator Level Flatness

The tracking generator level flatness measurements are performed using the same method as the DECT Source level flatness measurements. Flatness measurements are made with respect to a tracking generator frequency of 300 MHz at several frequencies throughout the tracking generator frequency range.

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-3.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER
   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   CF STEP AUTO MAN (MAN) 100 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 30 (kHz)

3. On the spectrum analyzer, press the following keys:

   (MKR)
   (AUX CTRL) Track Gen SRC PWR ON OFF (ON) −25 (dBm)

4. On the spectrum analyzer, press TRACKING PEAK . Wait for the PEAKING message to disappear.
5. Zero and calibrate the measuring receiver and power sensor in log mode (power reads out in dBm), as described in the measuring receiver operation manual. Enter the power sensor 300 MHz Cal Factor into the measuring receiver.
6. Disconnect the BNC cable and adapter from the DECT SOURCE 50 Ω output and connect the power sensor to the DECT SOURCE 50 Ω output.
7. On the spectrum analyzer press SRC PWR ON OFF (ON), −40 (dBm) (SGL SWP).
8. Press RATIO on the measuring receiver. The measuring receiver readout is now in power levels relative to the power level at 300 MHz.
9. Set the spectrum analyzer center frequency to 70 MHz.
10. On the spectrum analyzer press (SGL SWP).
11. Enter the appropriate power sensor Cal Factor into the measuring receiver as indicated in Table 9-6.
12. Record the power level displayed on the measuring receiver as the Level Flatness in Table 9-6.
13. Repeat steps 9 through 12 to measure the flatness at each center frequency setting listed in Table 9-6. The (▲) (step-up key) may be used to tune to center frequencies above 100 MHz.
14. Locate the most positive Level Flatness reading in Table 9-6 and record this value as TR Entry 3-3 of the performance verification test record.
15. Locate the most negative Level Flatness reading in Table 9-6 and record this value as TR Entry 3-4 of the performance verification test record.

Table 9-6. Tracking Generator Level Flatness Worksheet

Center Frequency	Level Flatness (dB)	Cal Factor (GHz)	Measurement Uncertainty
70 MHz	________	0.1	+0.21/−0.21
100 MHz	________	0.1	+0.21/−0.21
200 MHz	________	0.1	+0.21/−0.21
300 MHz	________	0.1	+0.21/−0.21
400 MHz	________	0.1	+0.21/−0.21
500 MHz	________	0.1	+0.21/−0.21
600 MHz	________	0.1	+0.21/−0.21
700 MHz	________	0.1	+0.21/−0.21
800 MHz	________	0.1	+0.21/−0.21
900 MHz	________	0.1	+0.21/−0.21
1000 MHz	________	0.1	+0.21/−0.21
1100 MHz	________	2	+0.21/−0.21
1200 MHz	________	2	+0.21/−0.21
1300 MHz	________	2	+0.21/−0.21
1400 MHz	________	2	+0.21/−0.21
1500 MHz	________	2	+0.21/−0.21
1600 MHz	________	2	+0.21/−0.21
1700 MHz	________	2	+0.21/−0.21
1800 MHz	________	2	+0.21/−0.21
1900 MHz	________	2	+0.21/−0.21
2000 MHz	________	2	+0.21/−0.21
2100 MHz	________	2	+0.21/−0.21
2200 MHz	________	2	+0.21/−0.21
2300 MHz	________	2	+0.21/−0.21
2400 MHz	________	2	+0.21/−0.21
2500 MHz	________	3	+0.21/−0.21
2600 MHz	________	3	+0.21/−0.21
2700 MHz	________	3	+0.21/−0.21
2800 MHz	________	3	+0.21/−0.21
2900 MHz	________	3	+0.21/−0.21

4. Harmonic Spurious Outputs for the Tracking Generator

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 300 MHz. The DECT SOURCE output is then connected to the input of a microwave spectrum analyzer. The tracking generator is tuned to several different frequencies and the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Spectrum analyzer, microwave
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*

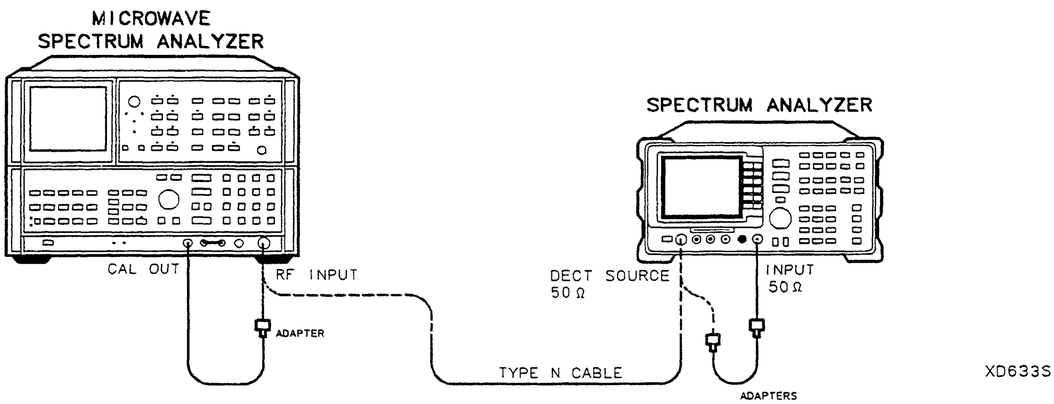


Figure 9-4. Harmonic Spurious Outputs Test Setup

Procedure

It is only necessary to perform the step if more than two hours have elapsed since a front-panel calibration of the microwave spectrum analyzer was performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B Microwave Spectrum Analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between the CAL OUTPUT and the RF INPUT.
   - Press 2 – 22 GHz (INSTR PRESET), RECALL, 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press RECALL, 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.
   - When the `CALIBRATING!` message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-4.
3. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) 30 (kHz)
   (MKR)

   (AUX CTRL) TRACK GEN

   SRC PWR ON OFF (ON) −25 (dBm)

   TRACKING PEAK

   Wait for the PEAKING message to disappear, then press the following keys:

   SRC PWR ON OFF (ON) −21 (dBm)
   (FREQUENCY) 70 (MHz)
   (SGL SWP)
4. Connect the Type N cable from the DECT SOURCE 50 Ω output to the microwave spectrum analyzer RF INPUT as shown in Figure 9-4.
5. Set the microwave spectrum analyzer controls as follows:

CENTER FREQUENCY	70 MHz
SPAN	100 kHz
REFERENCE LEVEL	−10 dBm
RES BW	30 kHz
LOG dB/DIV	10 dB

6. Set up the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   a. Press PEAK SEARCH and SIGNAL TRACK (ON). Wait for the signal to be displayed at center screen.
   b. Press PEAK SEARCH, CF STEP SIZE 10 MHz, CENTER FREQUENCY, then SIGNAL TRACK (OFF).
   c. Press PEAK SEARCH, MKR/Δ →STP SIZE, MARKER Δ.
   d. Press CENTER FREQUENCY and the step-up key to tune to the second harmonic, then press PEAK SEARCH. (If the center frequency is greater than 2.5 GHz, press PRESEL PEAK. Wait for the PEAKING! message to disappear.)
   e. Record the marker amplitude reading in Table 9-7 as the 2nd Harmonic Level for the 70 MHz Tracking Generator Output Frequency.
   f. If the Tracking Generator Output Frequency is less than 1 GHz, press CENTER FREQUENCY and the step-up key to tune to the third harmonic. Press PEAK SEARCH. (If the center frequency is greater than 2.5 GHz, press PRESEL PEAK and wait for the PEAKING message to disappear.)
   g. Record the marker amplitude reading in Table 9-7 as the 3rd Harmonic Level for the 70 MHz Tracking Generator Output Frequency.
   h. Press MARKER (OFF).

7. Change the tracking generator and microwave spectrum analyzer frequency to the next frequency listed in Table 9-7. Repeat step 6. Note that the microwave spectrum analyzer frequency is the same as the Tracking Generator Output Frequency.
8. Locate the most positive 2nd Harmonic Level in Table 9-7 and record as TR Entry 4-1 of the performance verification test record.
9. Locate the 2nd Harmonic Level for 1.4 GHz in Table 9-7 and record this value as TR Entry 4-2 of the performance verification test record.
10. Locate the most positive 3rd Harmonic Level in Table 9-7 and record as TR Entry 4-3 of the performance verification test record.

Table 9-7. Harmonic Spurious Responses Worksheet

Tracking Generator Frequency	2nd Harmonic Level (dBc)	3rd Harmonic Level (dBc)	Measurement Uncertainty (dB)
70 MHz	________	________	+1.63/−1.95
100 MHz	________	________	+1.63/−1.95
300 MHz	________	________	+1.63/−1.95
900 MHz	________	________	+1.63/−1.95
1.4 GHz	________	N/A	+3.49/−4.05

5a. DECT Source Non-Harmonic Spurious Outputs

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 1.89 GHz. The DECT SOURCE 50 Ω output is then connected to the input of a microwave spectrum analyzer.

The DECT Source is tuned to 1.89 GHz and the highest displayed spurious response on the microwave spectrum analyzer is measured within the DECT frequency band. Responses at the fundamental frequency of the DECT Source output are ignored. The amplitude of the highest spurious response is recorded.

There are no related adjustments for this performance verification test.

Equipment Required

Spectrum analyzer, microwave
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*

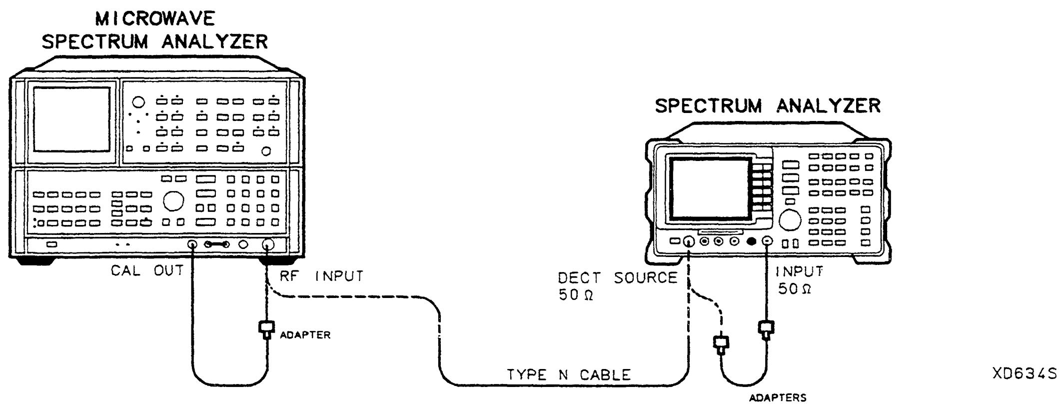


Figure 9-5. Non-Harmonic Spurious Outputs Test Setup

Procedure

It is only necessary to perform step 1 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B Microwave Spectrum Analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between CAL OUTPUT and RF INPUT.
   - Press 2 – 22 GHz band (INSTR PRESET), RECALL, 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press RECALL, 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.
   - When the CALIBRATING! message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-5.
3. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish.
4. Press DECT ANALYZER on the spectrum analyzer to access the main menu from the DECT measurements personality. (This takes approximately 10 seconds.)
5. Set the spectrum analyzer by pressing the following keys:

   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)
   (AUX CTRL) DECT SOURCE SRC PWR ON OFF (ON) −25 (dBm)
   CH X CTR FREQ 1.89 (GHz)

6. On the spectrum analyzer press More 1 of 2, DECT SRC CAL and follow the instructions on the screen.
7. Wait for the DECT Source cal done message to be displayed on the spectrum analyzer, then press the following keys:

   More 2 of 2
   SRC PWR ON OFF (ON) −21 (dBm)
   (SGL SWP)

8. Connect the Type N cable from the DECT SOURCE 50 Ω output to the microwave spectrum analyzer RF INPUT as shown in Figure 9-5.

Measuring Fundamental Amplitude

9. Set the microwave spectrum analyzer controls as follows:

   PRESET
   CENTER .... 1.89 GHz
   SPAN .... 20 MHz
   REFERENCE LEVEL .... −10 dBm
   ATTEN .... 10 dB
   LOG dB/DIV .... 10 dB
   RES BW .... 30 kHz
   VIDEO BW .... 3 kHz

10. On the microwave spectrum analyzer, press PEAK SEARCH. Press MARKER →REF LVL. Wait for another sweep to finish then press SINGLE.
11. Record the microwave spectrum analyzer marker amplitude reading as the Fundamental Amplitude in Table 9-8.

Measuring Non-Harmonic Responses

12. On the microwave spectrum analyzer press SHIFT, PEAK SEARCH to move the marker to the next highest signal. Record this level as the Marker Amplitude in Table 9-8.

13. Calculate the Non-harmonic Amplitude by subtracting the Fundamental Amplitude from the Marker Amplitude in Table 9-8.

    Non-Harmonic Amplitude = Marker Amplitude − Fundamental Amplitude

    For example, if the Fundamental Amplitude for a fundamental frequency of 70 MHz is −21.2 dBm and the marker amplitude is −53.2 dBm, the difference is −32 dBc.

14. Record this difference as the Non-Harmonic Response Amplitude in the performance verification test record as TR Entry 5-1.

Table 9-8. Non-harmonic Amplitude Worksheet

Fundamental Amplitude	Marker Amplitude	Non-harmonic Amplitude

5b. Tracking Generator Non-Harmonic Spurious Outputs

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 300 MHz. The DECT SOURCE 50 Ω output is then connected to the input of a microwave spectrum analyzer. The Tracking Generator is tuned to several different frequencies, and for each output frequency, several sweeps are taken on the microwave spectrum analyzer over different frequency spans. The highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or its harmonics are ignored; they are tested in the "Harmonic Spurious Responses" performance verification test. The amplitude of the highest spurious response relative to the fundamental frequency is recorded.

There are no related adjustments for this performance verification test.

Procedure

It is only necessary to perform step 1 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between CAL OUTPUT and RF INPUT.
   - Press 2 – 22 GHz band (INSTR PRESET), RECALL, 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press RECALL, 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.
   - When the CALIBRATING! message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-5.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER

   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0

   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −25 (dBm)
   TRACKING PEAK

   Wait for the PEAKING message to disappear, then press the following keys:

   SRC PWR ON OFF (ON) −21 (dBm)
   (SGL SWP)

4. Connect the Type N cable from the DECT SOURCE 50 Ω output to the microwave spectrum analyzer RF INPUT as shown in Figure 9-5.

Measuring Fundamental Amplitudes

5. Set the spectrum analyzer center frequency to the Fundamental Frequency listed in Table 9-9, and press (SGL SWP).
6. Set the microwave spectrum analyzer controls as follows:

   SPAN .... 100 kHz
   REFERENCE LEVEL .... −15 dBm
   LOG dB/DIV .... 10 dB

7. Set the microwave spectrum analyzer CENTER FREQUENCY to the Fundamental Frequency listed in Table 9-9.
8. On the microwave spectrum analyzer, press PEAK SEARCH. If the marker frequency is greater than 2.5 GHz, press PRESEL PEAK and wait for the PEAKING! message to disappear. Press MARKER →REF LVL. Wait for another sweep to finish.
9. Record the microwave spectrum analyzer marker amplitude reading in Table 9-9 as the Fundamental Amplitude.
10. Repeat steps 5 through 9 for all Fundamental Frequency settings in Table 9-9.

Table 9-9. Fundamental Response Amplitudes Worksheet

Fundamental Frequency	Fundamental Amplitude (dBm)
70 MHz	____________
1.5 GHz	____________
2.9 GHz	____________

Measuring Non-Harmonic Responses

11. On the spectrum analyzer, set the center frequency to 70 MHz.
12. Set the microwave spectrum analyzer START FREQ, STOP FREQ, and RES BW as indicated in the first row of Table 9-10.
13. Press SINGLE on the microwave spectrum analyzer and wait for the sweep to finish. Press PEAK SEARCH. If the marker frequency is greater than 2.5 GHz, press PRESEL PEAK and wait for the PEAKING! message to disappear.
14. Verify that the marked signal is not the fundamental or a harmonic of the fundamental by performing the following steps:

    Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

    a. Divide the marker frequency by the fundamental frequency (the spectrum analyzer center frequency setting). For example, if the marker frequency is 205 MHz and the fundamental frequency is 70 MHz, dividing 205 MHz by 70 MHz yields 2.929.
    b. Round the number calculated in step a the nearest whole number. In the example above, 2.929 should be rounded to 3.

c. Multiply the fundamental frequency by the number calculated in step b. Following the example, multiplying 70 MHz by 3 yields 210 MHz.

d. Calculate the difference between the marker frequency and the frequency calculated in step c above. Continuing the example, the difference would be 5 MHz.

e. Due to span accuracy uncertainties in the microwave spectrum analyzer, the marker frequency might not equal the actual frequency. Given the marker frequency, check if the difference calculated in step d is within the appropriate tolerance:

For marker frequencies <5 MHz, tolerance = ±200 kHz
For marker frequencies <55 MHz, tolerance = ±750 kHz
For marker frequencies >55 MHz, tolerance = ±10 MHz

f. If the difference in step d is within the indicated tolerance, the signal in question is the fundamental signal (if the number in step b = 1) or a harmonic of the fundamental (if the number in step b >1). This response should be ignored.

15. Verify that the marked signal is a true response and not a random noise peak by pressing SINGLE to trigger a new sweep and press PEAK SEARCH. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.

    If the marked signal is *not* the fundamental or a harmonic of the fundamental (refer to step 14) and is a true response (refer to step 15), proceed with step 17.

16. If the marked signal is either the fundamental or a harmonic of the fundamental (refer to step 14) or a noise peak (refer to step 15), move the marker to the next highest signal by pressing SHIFT, PEAK SEARCH. Repeat step 15. If all the signals on the screen are either fundamental or a harmonic of the fundamental or a noise peak then proceed with step 18.

    The following step is only performed if the marker signal is not the fundamental or harmonic of the fundamental and is a true response.

17. Calculate the difference between the amplitude of marked signal and the Fundamental Amplitude as listed in Table 9-9.

    For example, if the Fundamental Amplitude for a fundamental frequency of 70 MHz is −21.2 dBm and the marker amplitude is −53.2 dBm, the difference is −32 dBc.

    Record this difference as the Non-Harmonic Response Amplitude for the appropriate spectrum analyzer center frequency and microwave spectrum analyzer start and stop frequency settings in Table 9-10.

    Non-Harmonic Amplitude = Marker Amplitude − Fundamental Amplitude

18. If a true non-harmonic spurious response is not found, record "NOISE" as the Non-Harmonic Response Amplitude in Table 9-10 for the appropriate spectrum analyzer center frequency and microwave spectrum analyzer start and stop frequency settings.

19. Repeat steps 14 through 19 for the remaining microwave spectrum analyzer settings for start frequency, stop frequency, and resolution bandwidth; and for the spectrum analyzer center frequency setting of 70 MHz.

20. Repeat steps 13 through 19 with the spectrum analyzer center frequency set to 1.5 GHz.

21. Repeat steps 13 through 19 with the spectrum analyzer center frequency set to 2.9 GHz.

22. Locate in Table 9-10 the most-positive Non-Harmonic Response Amplitude for the microwave spectrum analyzer STOP frequency settings of less than or equal to 2000 MHz. Record this amplitude as the Highest Non-Harmonic Response Amplitude ≤2000 MHz as TR Entry 5-2 of the performance verification test record.

23. Locate in Table 9-10 the most-positive Non-Harmonic Response Amplitude for the microwave spectrum analyzer START frequency settings of greater than or equal to 2000 MHz. Record this amplitude as the Highest Non-Harmonic Response Amplitude ≥2000 MHz as TR Entry 5-3 of the performance verification test record.

Table 9-10. Non-Harmonic Responses Worksheet

Microwave Spectrum Analyzer Settings			Non-Harmonic Response Amplitude (dBc)			
Start Freq (MHz)	**Stop Freq (MHz)**	**Resolution Bandwidth**	**at 70 MHz Center Frequency**	**at 1.5 GHz Center Frequency**	**at 2.9 GHz Center Frequency**	**Measurement Uncertainty (dB)**
0.2	5.0	30 kHz	______	______	______	+1.63/−1.95
5.0	55	100 kHz	______	______	______	+1.63/−1.95
55	1240	1 MHz	______	______	______	+1.63/−1.95
1240	2000	1 MHz	______	______	______	+1.63/−1.95
2000	2900	1 MHz	______	______	______	+3.49/−4.05

6. Tracking Generator Feedthrough

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 300 MHz. The tracking generator output is terminated and set for −21 dBm output power (maximum output power). The spectrum analyzer input is also terminated. The noise level of the spectrum analyzer is then measured at several frequencies.

There are no related adjustments for this performance verification test.

Equipment Required

Termination, 50 Ω *(two required)*
Cable, BNC, 23 cm (9 in)
Cable, Type N(m) to BNC(f) *(two required)*
Adapter, Type N(m) to BNC(f) *(two required)*

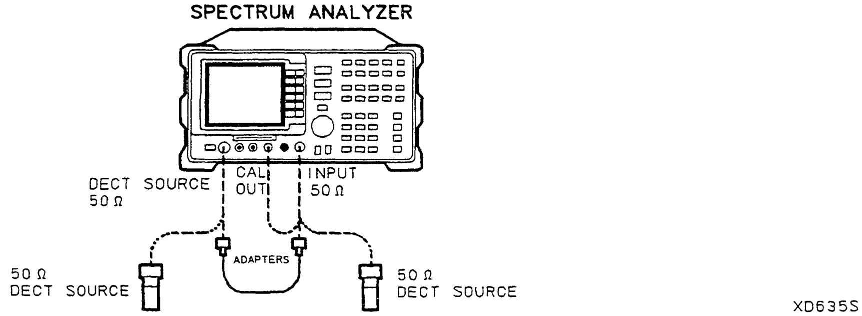


Figure 9-6. Tracking Generator Feedthrough Test Setup

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-6.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER
   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN
   SRC PWR ON OFF (ON) −25 (dBm)

3. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.
4. Connect the CAL OUTPUT to the INPUT 50 Ω.

5. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 10 (MHz)
   (AMPLITUDE) REF LVL −20 (dBm)
   ATTEN AUTO MAN (MAN) 0 (dB)
   (PEAK SEARCH)
   (SPAN) 100 (kHz)
   (BW) VID BW AUTO MAN (MAN) 30 (Hz)

6. Press (SGL SWP), and wait for completion of a new sweep. Press the following spectrum analyzer keys:

   (PEAK SEARCH)
   (AMPLITUDE) More 1 of 3 REF LVL OFFSET (enter value)

   Subtract the MKR amplitude reading from −20 dBm, then enter the result in the spectrum analyzer as the REF LVL OFFSET. For example, if the marker reads −20.21 dBm, enter +0.21 dB.

   −20 dBm − (−20.21 dBm) = +0.21 dB

7. Connect one 50 Ω termination to the spectrum analyzer INPUT 50 Ω and another to the tracking generator RF OUT 50 Ω.

8. Press (AUX CTRL), Track Gen, then SRC PWR ON OFF (OFF).

9. Set the spectrum analyzer by pressing the following keys:

   (SPAN) 50 (kHz)
   (AMPLITUDE) REF LVL −50 (dBm)
   (BW) RES BW AUTO MAN (MAN) 1 (kHz)
   VID BW AUTO MAN 30 (Hz)
   (TRACE) More 1 of 3 DETECTOR PK SP NG (SP)

10. Press (AUX CTRL), TRACK GEN, SRC PWR ON OFF (ON), then enter −21 (dBm).

11. Press (FREQUENCY) 70 (MHz).

12. Press (SGL SWP), then wait for completion of a new sweep. Press (DISPLAY), DSP LINE ON OFF (ON).

13. Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Record the display line amplitude setting in Table 9-11 as the noise level at 70 MHz.

14. Repeat steps 13 through 15 for the remaining Tracking Generator Output Frequencies (spectrum analyzer center frequency) listed in Table 9-11.

15. In Table 9-11, locate the most positive Noise Level Amplitude. Record this amplitude as TR Entry 6-1 of the performance verification test record.

Table 9-11. TG Feedthrough Worksheet

Tracking Generator Output Frequency	Noise Level Amplitude (dBm)	Measurement Uncertainty (dB)
70 MHz	______	+1.59/−1.70
100 MHz	______	+1.59/−1.70
250 MHz	______	+1.59/−1.70
400 MHz	______	+1.59/−1.70
550 MHz	______	+1.59/−1.70
700 MHz	______	+1.59/−1.70
850 MHz	______	+1.59/−1.70
1000 MHz	______	+1.59/−1.70
1150 MHz	______	+1.59/−1.70
1300 MHz	______	+1.59/−1.70
1450 MHz	______	+1.59/−1.70
1600 MHz	______	+1.59/−1.70
1750 MHz	______	+1.59/−1.70
2000 MHz	______	+1.59/−1.70
2300 MHz	______	+1.59/−1.70
2600 MHz	______	+1.59/−1.70
2900 MHz	______	+1.59/−1.70

7. Tracking Generator LO Feedthrough Amplitude

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 300 MHz. The DECT SOURCE 50 Ω output is then connected to the input of a microwave spectrum analyzer. The tracking generator is tuned to several different frequencies and the LO Feedthrough is measured at the frequency extremes of the LO.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Microwave spectrum analyzer
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*

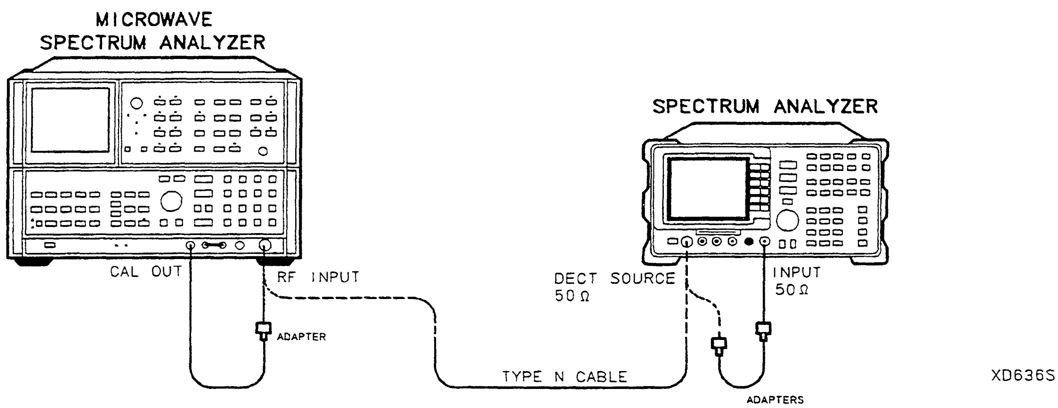


Figure 9-7. LO Feedthrough Amplitude Test Setup

Procedure

It is only necessary to perform step 1 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B Microwave Spectrum Analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   a. Connect a BNC cable between CAL OUTPUT and RF INPUT.

   b. Press 2 - 22 GHz (INSTR PRESET), RECALL, 8. Adjust AMPTD CAL for a marker-amplitude reading of −10 dBm.

   c. Press RECALL, 9. Adjust FREQ ZERO for a maximum amplitude response.

   d. Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.

   e. After the CALIBRATING! message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-7.

3. Press (PRESET) on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER
   (FREQUENCY) Band Lock 0-2.9 Gz BAND 0
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (MKR)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) −25 (dBm)

4. Press TRACKING PEAK, then wait for the PEAKING message to disappear.

5. Press the following spectrum analyzer keys:

   SRC PWR ON OFF (ON) −21 (dBm)
   (FREQUENCY) 70 (MHz)
   (SGL SWP)

6. Connect the Type N cable from the DECT SOURCE 50 Ω output to the microwave spectrum analyzer RF INPUT. Refer to Figure 9-7.

7. Set the microwave spectrum analyzer controls as follows:

   CENTER FREQUENCY .... 3.9914 GHz
   SPAN .... 100 kHz
   REFERENCE LEVEL .... 0 dBm
   RES BW .... 1 kHz
   LOG dB/DIV .... 10 dB

8. On the microwave spectrum analyzer, press PEAK SEARCH and SIGNAL TRACK (ON). Wait for the signal to be displayed at center screen. Press SIGNAL TRACK (OFF).

9. On the microwave spectrum analyzer, press PEAK SEARCH, PRESEL PEAK. Wait for the PEAKING! message to disappear.

10. Record the microwave spectrum analyzer marker amplitude in Table 9-12 as the LO Feedthrough Amplitude for 3.9914 GHz.

11. Repeat steps 8 through 10 for the remaining spectrum analyzer CENTER FREQ and Microwave Spectrum Analyzer CENTER FREQUENCY settings listed in Table 9-12. On the spectrum analyzer press (SGL SWP) each time the frequencies are changed.

12. Locate in Table 9-12 the LO Feedthrough Amplitude with the greatest amplitude, then record the amplitude as TR Entry 7-1 of the performance verification test record.

Table 9-12. LO Feedthrough Amplitude

Spectrum Analyzer CENTER FREQ	Microwave Spectrum Analyzer CENTER FREQUENCY	LO Feedthrough Amplitude (dBm)	Measurement Uncertainty (dB)
70 MHz	3.9914 GHz	______	+3.51/−4.24
150 MHz	4.0714 GHz	______	+3.51/−4.24
1.5 GHz	5.4214 GHz	______	+3.51/−4.24
2.9 GHz	6.8214 GHz	______	+3.51/−4.24

8. TDMA Switch On/Off Ratio

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 1.89 GHz in the DECT ANALYZER mode. The DECT Source power is turned on and the TDMA switch is turned on and off. The DECT Source power is measured on the microwave spectrum analyzer to give the On/Off ratio.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Spectrum Analyzer, microwave
Pulse Generator
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*

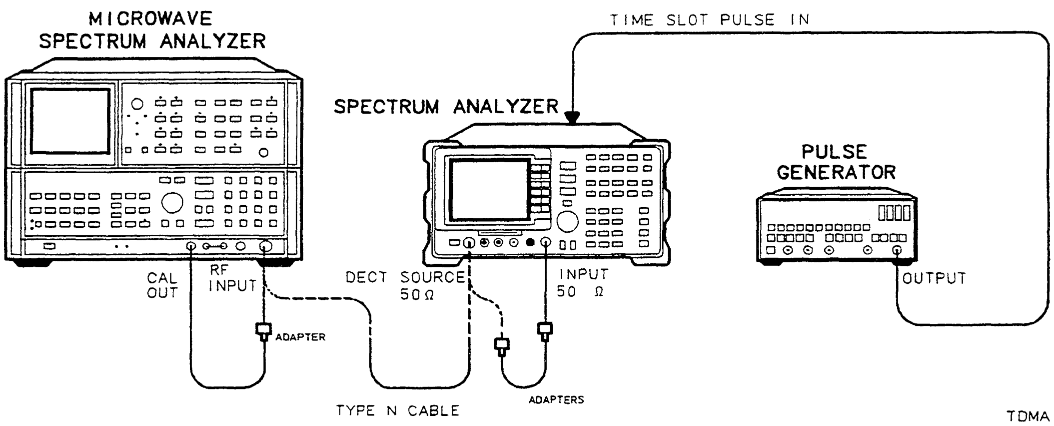


Figure 9-8. TDMA Switch On/Off Ratio Test Setup

Procedure

It is only necessary to perform step 1 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B Microwave Spectrum Analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   a. Connect a BNC cable between CAL OUTPUT and RF INPUT.

   b. Press 2 - 22 GHz (INSTR PRESET), RECALL, 8. Adjust AMPTD CAL for a marker-amplitude reading of −10 dBm.

   c. Press RECALL, 9. Adjust FREQ ZERO for a maximum amplitude response.

   d. Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.

   e. After the `CALIBRATING!` message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.

2. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-8.

3. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish.
4. Press DECT ANALYZER on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 10 seconds.)
5. Set the spectrum analyzer by pressing the following keys:

   (AUX CTRL) DECT SOURCE SRC PWR ON OFF (ON) −25 (dBm)
   CH X CTR FREQ 1.89 (GHz)

6. On the spectrum analyzer press More 1 of 2, DECT SRC CAL, then follow the instructions on the screen.
7. Wait for the DECT Source cal done message to be displayed on the spectrum analyzer then press the following keys:

   More 2 of 2
   SRC PWR ON OFF (ON) −21 (dBm)
   (SGL SWP)

8. Set the microwave spectrum analyzer controls as follows:

   2 - 22 GHz (INSTR PRESET)
   CENTER FREQUENCY .... 1.89 GHz
   SPAN .... 100 kHz
   REFERENCE LEVEL .... −20 dBm

9. Set the pulse generator as follows:

   Ensure that the pulse generator is set for DC operation. (All function keys depressed.)
   MODE .... Normal
   OFS .... 2.5 V

   (Ensure the pulse generator output is enabled.)

10. Connect the Type N cable from the spectrum analyzer DECT SOURCE 50 Ω output to the microwave spectrum analyzer RF INPUT. Also connect the BNC cable from the spectrum analyzer TIME SLOT PULSE IN input to the pulse generator output. Refer to Figure 9-8.
11. Set up the microwave spectrum analyzer by performing the following steps:

    Note that the following steps are for an HP 8566A/B microwave spectrum analyzer, the steps may be different if you are using another microwave spectrum analyzer.

    Press PEAK SEARCH and MKR→CF
    SPAN 10 kHz
    Press PEAK SEARCH and MKR→CF

12. On the microwave spectrum analyzer press PEAK SEARCH and record the marker amplitude reading in Table 9-13 as the TDMA Switch On Level.
13. Set the pulse generator as follows:

    OFS .... 0 V

14. Set the reference level on the microwave spectrum analyzer to −50 dBm.
15. On the microwave spectrum analyzer press PEAK SEARCH and record the marker amplitude reading in Table 9-13 as the TDMA Switch Off Level.

16. Calculate the TDMA Switch On/Off Ratio by subtracting the TDMA switch Off Level from the TDMA switch On Level in Table 9-13.

    TDMA Switch Ratio = TDMA Switch On Level – TDMA Switch Off Level

17. When you have calculated the TDMA Switch Ratio record the result as TR Entry 8-1 in the performance test verification record.

Table 9-13. TDMA Switch Ratio Worksheet

TDMA Switch On Level	TDMA Switch Off Level	TDMA Switch Ratio
______________	______________	______________

9. TDMA Switch Delay

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 1.89GHz in the DECT ANALYZER mode. A pulse is applied to the TIME SLOT PULSE IN and the time for the signal to reach 90% of its final value is measured.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Pulse Generator
Cable, BNC, 23 cm (9 in) *(two required)*
Cable, BNC, 122 cm (48 in)
Adapter, BNC tee (m) (f) (f)
Adapter, Type N(m) to BNC(f) *(two required)*

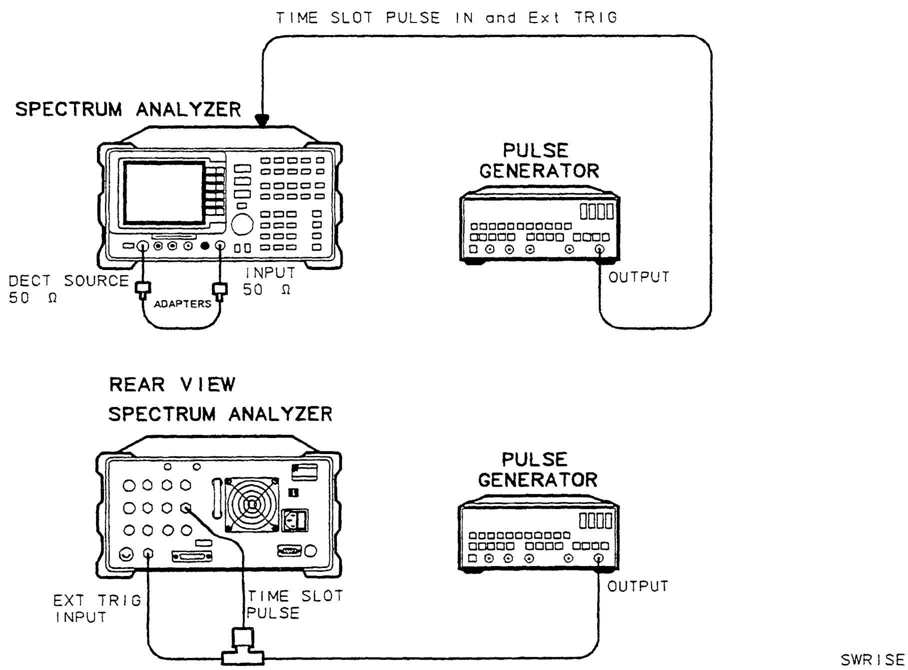


Figure 9-9. TDMA Switch Delay Test Setup

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-9.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER
   (FREQUENCY) 1.89 (GHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 30 (kHz)
   (AUX CTRL) Track Gen SRC PWR ON OFF (ON) −25 (dBm)

3. Press TRACKING PEAK on the spectrum analyzer and wait for the PEAKING message to disappear.

4. On the spectrum analyzer, press the following:

   SRC PWR ON OFF (ON) −21 (dBm)

   (BW) RES BW AUTO MAN (MAN) 1 (MHz)

   VID BW AUTO MAN (MAN) 1 (MHz)

   (TRIG) EXTERNAL

   (SWEEP) SWP TIME AUTO MAN (MAN) 20 (ms)

5. Set up the pulse generator as follows:

   Square wave operation
   MODE .... Normal
   FRQ .... 100 Hz
   DTY 50%
   HIL 2.5V
   LOL 0.0V

   (Ensure the pulse generator output is enabled.)

6. Connect the pulse generator output to the TIME SLOT PULSE IN and EXT TRIG INPUT connectors on the spectrum analyzer rear panel. The 122 cm BNC cable, 23 cm BNC cable and BNC tee are required.

7. Verify that a periodic signal is shown on the spectrum analyzer screen. This should be approximately two cycles of a square wave.

8. On the spectrum analyzer, press the following keys:

   SWP TIME AUTO MAN (MAN) 20 (μs)

   (AMPLITUDE) SCALE LOG LIN (LIN)

   REF LVL 30 (mV)

   (MKR) MARKER NORMAL

   Use the spectrum analyzer knob to position the marker at 20 μs. Then press:

   MARKER Δ

   Use the spectrum analyzer knob to move the marker to give a MARKER Δ reading between .89X and .91X.

9. Record the MARKER Δ time as the Marker Reference Time. (The value expected is between −20 μs and −10 μs.)

   Marker Reference Time______________μs

10. Add the Marker Reference Time to 20 μs and record the TDMA Switch Delay result as TR Entry 9-1 in the performance verification test record.

    For example, if the Marker Reference Time is −15 μs, then the TDMA Switch Delay is 5 μs as shown below:

    (20) + (−15) = 5

10. TDMA Switch Video Feedthrough

A signal is applied to the TIME SLOT PULSE IN connector on the spectrum analyzer rear panel. The video feedthrough signal at the DECT SOURCE 50 Ω output is measured on an oscilloscope.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Digitizing Oscilloscope (HP 54501A)
Pulse Generator
Cable, BNC, 122 cm (48 in) *(three required)*
Adapter, BNC tee (m) (f) (f) *(two required)*
Adapter, Type N(m) to BNC(f)
BNC 50 Ω termination

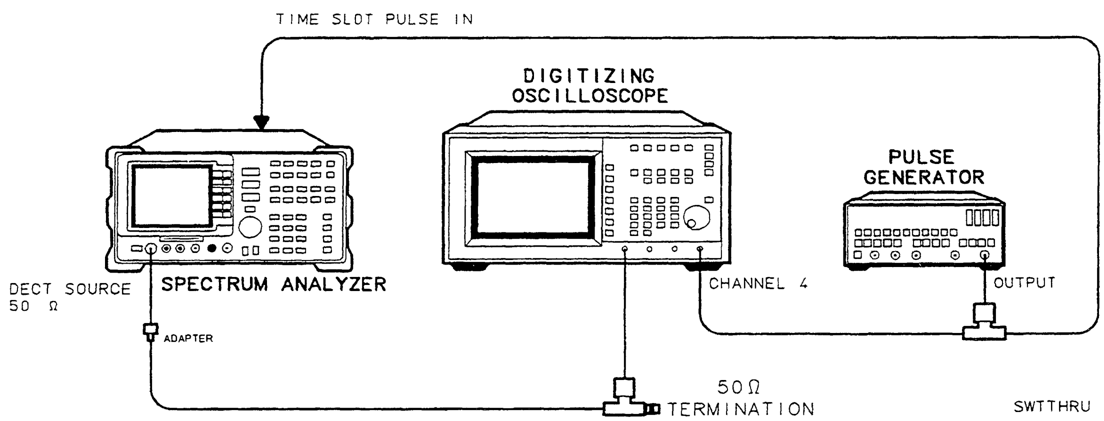


Figure 9-10. TDMA Switch Video Feedthrough Test Setup

Procedure

1. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish.
2. Press DECT ANALYZER on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 10 seconds.)
3. Set the spectrum analyzer by pressing the following keys:

   (AUX CTRL) DECT SOURCE SRC PWR ON OFF (ON) -17.5 (dBm)

   CH X CTR FREQ 1.89 (GHz)

   SRC ATN MAN AUTO (MAN) 0 (dB)

4. Set the pulse generator as follows:

   Square wave output
   MODE .... Normal
   FRQ .... 100 Hz
   DTY 50%
   HIL 2.5V
   LOL 0.0V

   (Ensure the pulse generator output is enabled).

5. Set the digitizing oscilloscope as follows:

   Note that the following instructions are for an HP 54501A oscilloscope, the steps may be different if you are using another oscilloscope.

   Set the oscilloscope to its default state by pressing:

   (RECALL)
   (CLEAR)

   Then press:

   (CHAN)
   Set V/div to 100 mV
   (TIMEBASE)
   Set to 1 μs/div
   (TRIG)
   Set source to 4
   Set level to 2.5V
   Set trigger on leading edge
   Set to trig'd
   (DISPLAY)
   DISPLAY norm avg env .... highlight avg
   (Δt Δv)
   Δ v markers off on .... highlight on

6. Connect the pulse generator output to the TIME SLOT PULSE IN connector on the spectrum analyzer and CHANNEL 4 connector of the oscilloscope using a BNC tee connector and two BNC cables.

7. Connect a BNC tee connector to CHANNEL 1 of the oscilloscope. Connect the BNC 50 Ω termination to one end of the BNC tee connector, and connect the other end of the BNC tee connector to the spectrum analyzer DECT SOURCE 50 Ω using a BNC cable.

8. Rotate the knob on the oscilloscope to move Vmarker1 to the minimum of the displayed signal.

9. Record the Vmarker(1) reading in Table 9-14 as the Minimum Feedthrough Level. (The value expected is between 0 mV and −250 mV.)

10. On the oscilloscope, press the following:

    TRIG
    trigger on falling edge
    Δt Δv
    highlight Vmarker2

11. Rotate the knob on the oscilloscope to move Vmarker2 to the maximum of the displayed signal.

12. Record the Vmarker(2) reading in Table 9-14 as the Maximum Feedthrough Level. (The value expected is between 0 mV and +250 mV.)

13. Calculate the Video Feedthrough by subtracting the Minimum Feedthrough Level from the Maximum Feedthrough Level in Table 9-14.

    $$Video\ Feedthrough = Maximum\ Feedthrough\ Level - Minimum\ Feedthrough\ Level$$

    For example,

    Video Feedthrough = 128 − (−87) = 215 mV

14. When you have calculated the Video Feedthrough, record the result as TR Entry 10-1 of the performance verification test record.

Table 9-14. TDMA Switch Video Feedthrough Worksheet

Maximum Feedthrough Level	Minimum Feedthrough Level	Video Feedthrough

11. Frequency Accuracy

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 300 MHz. The frequency accuracy of the tracking generator is measured using the marker count function of the spectrum analyzer. The frequency reference errors are eliminated because the same errors apply to the tracking generator output frequency and the marker count accuracy.

There are no related adjustment procedures for this performance verification test.

Equipment Required

Cable, BNC, 23 cm (9 in)
Adapter, Type N(m) to BNC(f) *(two required)*

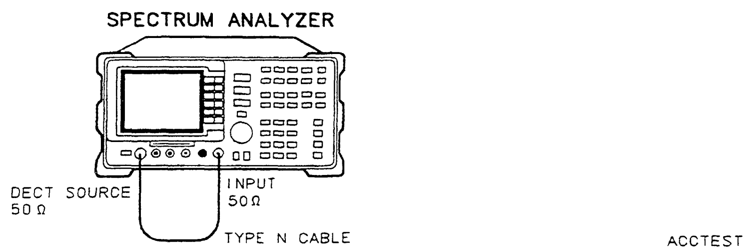


Figure 9-11. Frequency Accuracy Test Setup

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-11.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

   SPECTRUM ANALYZER
   (FREQUENCY) 1.89 (GHz)
   (SPAN) 0 (Hz)
   (BW) RES BW AUTO MAN (MAN) 3 (kHz)
   (AUX CTRL) Track Gen SRC PWR ON OFF (ON) −25 (dBm)

3. Press TRACKING PEAK on the spectrum analyzer and wait for the PEAKING message to disappear.
4. On the spectrum analyzer, press the following:

   SRC PWR ON OFF (ON) -21 (dBm)
   (SPAN) 10 (kHz)
   (MKR)
   Rotate the marker so that it is positioned at the center of the display. Then press:
   (MKR FCTN)
   MK COUNT ON OFF (ON)
   More 1 of 2
   CNT RES AUTO MAN (MAN) 100 (Hz)
   More 2 of 2

5. Wait for a count to be taken, this may take several seconds.
6. Record the CNTR frequency reading as the measured frequency.

   Measured Frequency ____________ GHz

7. Subtract 1.89 GHz from the Measured Frequency to find the frequency accuracy. Record the frequency accuracy as TR Entry 11-1 of the performance verification test record.

12. Frequency Deviation Accuracy

This procedure is only for spectrum analyzers equipped with Option 012 and Option 112.

The DECT SOURCE 50 Ω output is connected to the spectrum analyzer INPUT 50 Ω and the accuracy is optimized at 1.89 GHz in the DECT ANALYZER mode. The DECT Source is modulated by applying a TTL signal to the spectrum analyzer TTL DATA IN connector. The frequency deviation accuracy is then measured.
The related adjustment for this test is "Frequency Deviation".

Equipment Required

Pulse Generator
Cable, BNC, 23 cm (9 in)
Cable, BNC, 122 cm (48 in)
Adapter, Type N(m) to BNC(f) *(two required)*

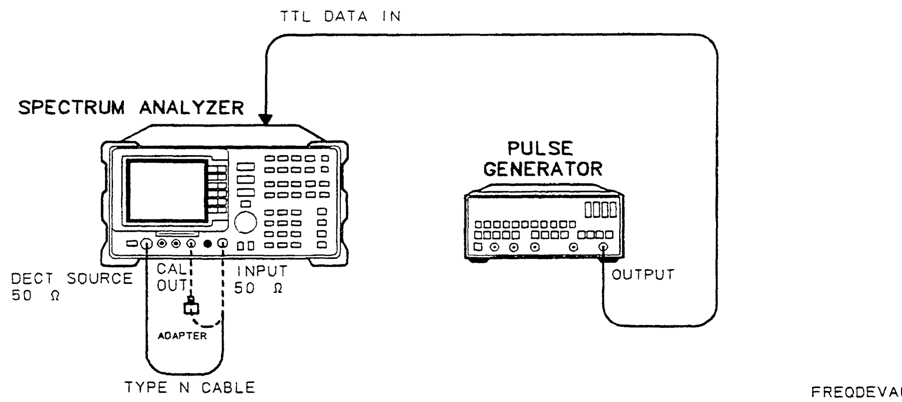


Figure 9-12. Frequency Deviation Accuracy Test Setup

Procedure

1. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-12.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish.
3. Press DECT ANALYZER on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 10 seconds.)
4. Set the spectrum analyzer by pressing the following keys:

   (AUX CTRL) DECT SOURCE SRC PWR ON OFF (ON) −25 (dBm)

   CH X CTR FREQ 1.89 (GHz)

5. On the spectrum analyzer press More 1 of 2, DECT SRC CAL, and follow the instructions on the screen.
6. Wait for the `DECT Source cal done` message to be displayed on the spectrum analyzer then press the following keys:

   More 2 of 2

   SRC POWER ON OFF (ON) −21 (dBm)

7. Connect a BNC cable between the CAL OUT and INPUT 50Ω connectors on the spectrum analyzer. Refer to Figure 9-12.

8. Set the spectrum analyzer by pressing the following keys:

   Prev Menu
   Freq & Modulat
   CAL FREQ/DEV

9. Press CONTINUE CAL and wait for the frequency and deviation calibration routine to finish.

10. On the spectrum analyzer press the following keys:

    Main Menu
    Config
    TOTAL TX POWER −10 (dBm)
    More 1 of 2
    BURST CONT (CONT)
    More 2 of 2
    Main Menu

11. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-12.

12. Set the pulse generator as follows:

    Square wave output
    MODE .... Normal
    FRQ .... 100 kHz
    DTY 50%
    HIL .... 2.5 V
    LOL .... 0.0 V

    (Ensure the pulse generator output signal is enabled.)

13. Connect the pulse generator output to the spectrum analyzer TTL DATA IN connector.

14. On the spectrum analyzer, press the following keys:

    Freq & Modulat
    FREQ/DEV

15. When the measurement is completed record the Peak Frequency Deviation reading as TR Entry 12-1 in the performance test verification record.

16. The total transmission power must be returned to its default state. To do this press the following keys on the spectrum analyzer:

    Previous Menu
    Main Menu
    Config
    TOTAL TX POWER 26 (dBm)

13. Demodulator Squaring

This procedure is only for spectrum analyzers equipped with Option 012 and Option 112.

This test verifies that when a DECT modulated signal is applied to the spectrum analyzer, the analog demodulated signal obtained from the Option 112 demodulator is properly reproduced as a TTL signal at the DATA OUT connector on the spectrum analyzer rear panel.

There are no performance test limits for this test. It is only intended as a functional check for a square wave output.

Equipment Required

Digitizing Oscilloscope
Pulse Generator
Cable, BNC, 23 cm (9 in)
Cable, Type N, 62 cm (24 in)
Cable, BNC, 122 cm (48 in) *(two required)*
Adapter, Type N(m) to BNC(f) *(two required)*

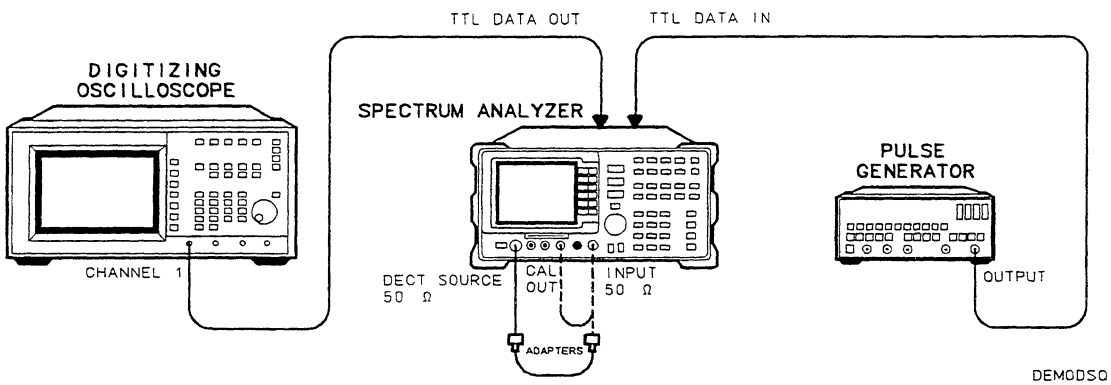


Figure 9-13. Demodulator Squaring Test Setup

Procedure

1. Connect the BNC cable between the CAL OUT and INPUT 50 Ω connectors on the spectrum analyzer.
2. Press (PRESET) on the spectrum analyzer, and wait for the preset routine to finish.
3. Press DECT ANALYZER on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 10 seconds.)
4. Set the spectrum analyzer by pressing the following keys:

   Freq & Modulat
   CAL FREQ/DEV

   Press CONTINUE CAL and wait for the frequency and deviation calibration routine to finish.

5. On the spectrum analyzer press the following keys:

   Main Menu
   Config
   More 1 of 2
   BURST CONT (CONT)
   DECT SOURCE
   SRC PWR ON OFF (ON) −21 (dBm)
   Prev Menu
   More 2 of 2
   Main Menu

6. Connect the 23 cm BNC cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer, using the N(m) to BNC(f) adapters. Refer to Figure 9-13.

7. Set the pulse generator as follows:

   Square wave operation

MODE	Normal
FRQ	100kHz
DTY	50%
HIL	2.5V
LOL	0.0V

8. Connect the spectrum analyzer TTL DATA IN connector to the pulse generator output.

9. On the Spectrum analyzer, press the following keys:

   Freq & Modulat
   FREQ/DEV

   When the measurement is completed press TRACE ACTIVE.

10. Set up the digitizing oscilloscope as follows:

    Note that the following steps are for an HP 54501A oscilloscope, the steps may be different if you are using another oscilloscope.

    Set the oscilloscope to its default state by pressing:

    (RECALL)
    (CLEAR)

    Then press:

    (CHAN)
    set V/div to 1 V and offset to 2.5 V
    (TIMEBASE) .... 5 μs/div

11. Connect the spectrum analyzer rear panel DATA OUT connector to channel 1 of the oscilloscope. Refer to Figure 9-13.

12. Verify that the signal shown on the oscilloscope is a 100 kHz square wave. The frequency can be measured by pressing (BLUE KEY) (9) (FREQ) 1.

    There are no performance test limits for this test, but a 100 kHz square wave is expected with a minimum voltage level of at least 0.5 V and a maximum voltage level greater than 3 V.

Performance Verification Test Record

Table 9-15. Performance Verification Test Record

Hewlett-Packard Company

Address: ______________________ Report No. ______________________

____

______________________ Date ______________________

______________________ (e.g. 10 APRIL 1993)

Model HP 8590 Series Spectrum Analyzer

Serial No. ______________________

Options ______________________

Firmware Revision ______________

Customer ______________________ Tested by ______________________

Ambient temperature ______________ °C Relative humidity ______________ %

Power mains line frequency ______________ Hz (nominal)

Test Equipment Used:

Description	Model No.	Trace No.	Cal Due Date
Measuring Receiver			
Microwave Spectrum Analyzer			
Power Sensor, Low power			
Power Sensor			
Power Splitter			
Pulse Generator			
Synthesizer/Function Generator			
Termination, 50 Ω			
Termination, 50 Ω			
Universal Counter			

Notes/Comments:

____

____

____

____

Performance Verification Test Record

Hewlett-Packard Company Model HP 8590 Series Spectrum Analyzer	Report No. ______________
Serial No. ______________	Date ______________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
1. Absolute Amplitude Accuracy				
Absolute Amplitude Accuracy	−41.5 dBm	(1-1) ______________	−38.5 dBm	+.150/−.152 dB
Positive Vernier Accuracy		(1-2) ______________	+0.50 dB	±0.03 dB
Negative Vernier Accuracy	−0.50 dB	(1-3) ______________		±0.03 dB
Positive Step-to-Step Accuracy		(1-4) ______________	+0.20 dB	±0.03 dB
Negative Step-to-Step Accuracy	−0.20 dB	(1-5) ______________		±0.03 dB
Tracking Generator Absolute Amplitude Accuracy	−41.0 dBm	(1-6) ______________	−39.0 dBm	+.152/−.154 dB
2. Power Sweep Range				
Start Power Level		(2-1) ______________		
Stop Power Level		(2-2) ______________		
Power Sweep Range	9.0 dB	(2-3) ______________		±0.03 dB
3a. DECT Source Level Flatness				
Maximum Flatness				
1.88 GHz to 1.9 GHz		(3-1) ______________	+1.0 dB	+.209/−.212 dB
Minimum Flatness				
1.88 GHz to 1.9 GHz	−1.0 dB	(3-2) ______________		+.209/−.212 dB
3b. Tracking Generator Level Flatness				
Maximum Flatness				
70 MHz to 2.9 GHz		(3-3) ______________	+2.5 dB	+.211/−.214 dB
Minimum Flatness				
70 MHz to 2.9 GHz	−2.5 dB	(3-4) ______________		+.211/−.214 dB
4. Harmonic Spurious Outputs				
2nd Harmonic Level, 70 MHz to 900 MHz		(4-1) ______________	−25 dBc	+1.63/−1.95 dB
2nd Harmonic Level, 1.4 GHz		(4-2) ______________	−25 dBc	+3.49/−4.05 dB
3rd Harmonic Level, 70 MHz to 900 MHz		(4-3) ______________	−25 dBc	+1.63/−1.95 dB
5a. DECT Source Non-Harmonic Spurious Outputs				
Highest Non-Harmonic Response Amplitude		(5-1) ______________	−40 dBc	+1.63/−1.95 dB
5b. Tracking Generator Non-Harmonic Spurious Outputs				
Highest Non-Harmonic Response Amplitude				
70 MHz to 2000 MHz		(5-2) ______________	−27 dBc	+1.63/−1.95 dB
2000 MHz to 2900 MHz		(5-3) ______________	−23 dBc	+3.49/−4.05 dB

Performance Verification Test Record

Hewlett-Packard Company Model HP 8590 Series Spectrum Analyzer	Report No. ______________
Serial No. ______________	Date ______________

Test Description	Results Measured			Measurement
	Min.	(TR Entry)	Max.	Uncertainty
6. Tracking Generator Feedthrough 70 MHz to 2.9 GHz		**(6-1)** ______________	−110 dBm	+1.59/−1.70 dB
7. Tracking Generator LO Feedthrough Amplitude 70 MHz to 2.9 GHz		**(7-1)** ______________	−36 dBm	±3.51/−4.24 dB
8. TDMA Switch On/Off Ratio	75 dB	**(8-1)** ______________		+1.59/−1.96 dB
9. TDMA Switch Delay		**(9-1)** ______________	10 μs	±0.4 μs
10. TDMA Switch Video Feedthrough		**(10-1)** ______________	500 mV	±18.4 mV
11. Frequency Accuracy	−5 kHz	**(11-1)** ______________	+5 kHz	±200 Hz
12. Frequency Deviation Accuracy	−35 kHz	**(12-1)** ______________	+35 kHz	±28.85 kHz

10

Service Information for the DECT Source

This chapter provides the information required to adjust and repair the DECT Source (Option 012) to the assembly level.

This chapter contains:

- The procedures required to adjust the DECT Source electrical performance to the specifications described in chapter 9. Most adjustments require access to the interior of the spectrum analyzer.
- Figures identifying all major assemblies and cables.
- Part numbers for standard value replacement components used in the adjustment procedures.
- A block diagram description of the DECT Source.
- A troubleshooting guide for the DECT Source.

Commands within parenthesis after a softkey, for example (ON), are used throughout this chapter to indicate the part of a softkey that should be underlined when the key is pressed.

Note This is not a comprehensive spectrum analyzer service guide. Refer to the *HP 8590 D-Series and E-Series Spectrum Analyzer Service Guide* for further service information for the spectrum analyzer.

Warning **There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.**

Before You Start

There are four things you should do before starting an adjustment procedure:

- □ Check that you are familiar with the safety symbols marked on the spectrum analyzer, and read the general safety instructions and the symbol definitions given in this guide.
- □ Check that the spectrum analyzer has been turned on and allowed to warm up for at least 30 minutes at room temperature before making any adjustments. The spectrum analyzer *must* be allowed to stand at room temperature at least 2 hours prior to the 30 minute warm-up.
- □ The adjustments in this chapter should be carried out *after* the basic spectrum analyzer adjustments have been made.
- □ To perform the adjustments in this chapter the HP 85723A DECT Measurements Personality must be loaded into the spectrum analyzer memory. Refer to "Step 1. Load the DECT measurements personality" in chapter 1, for information on loading the DECT measurements personality into the spectrum analyzer memory.
- □ Read the rest of this section.

Test equipment you will need

Refer to chapter 9, "Calibration Information for the DECT Source" for a list of recommended equipment for the DECT Source adjustments. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

If there are abnormal indications during adjustment

If the indications received during an adjustment do not agree with the normal conditions given in the adjustment procedures, a fault exists in your spectrum analyzer. The fault should be repaired *before* proceeding with any further adjustments. If you suspect the fault is related to the DECT Source, refer to the troubleshooting section in this chapter. If the fault is a basic spectrum analyzer fault refer to the troubleshooting and repair information in Chapter 4 of the *HP 8590 D-Series and E-Series Spectrum Analyzers Service Guide.*

Periodically verifying calibration

The DECT Source requires periodic verification of operation. Under most conditions of use, you should test the DECT Source at least once a year with the complete set of performance verification tests located in chapter 9.

When test results show proper operation and calibration, no adjustments are necessary. However, if test results indicate that the DECT Source does not meet specifications, the cause should be determined and rectified. If you suspect the fault is related to the DECT Source, refer to the troubleshooting section in this chapter. If the fault is a basic spectrum analyzer fault refer to the troubleshooting and repair information in Chapter 4 of the *HP 8590 D-Series and E-Series Spectrum Analyzers Service Guide.*

If you replace or repair a component of the DECT Source

If one or more DECT Source components has been replaced or repaired, related adjustment procedures should be done prior to verifying operation. Refer to Table 10-1 to determine which adjustment to perform after replacing or repairing a DECT Source component. It is important that adjustments are performed in the order indicated to ensure that the DECT Source meets all of its specifications.

Table 10-1. Adjustments and Tests for Replaced or Repaired Assemblies

Replaced or Repaired Assembly	Related Adjustments and Adjustment Routines	Related Performance Verification Tests
A3A15 Tracking Generator	First LO Distribution Amplifier CAL FREQ CAL AMPTD CAL YTF BITG Power Level	Frequency Readout and Marker Count Accuracy Noise Sidebands System Related Sidebands Residual FM Frequency Span Readout Accuracy Frequency Response Other Input Related Spurious Responses Spurious Response Residual Responses
A10 LODA Control **Tracking Generator Control**	First LO Distribution Amplifier CAL FREQ CAL AMPTD CAL YTF	Frequency Response Absolute Amplitude, Vernier and Power Sweep Accuracy Tracking Generator Level Flatness
A613 DECT Source Assembly	Frequency Deviation CAL FREQ CAL AMPTD CAL YTF DECT SRC CAL	Frequency Response Absolute Amplitude, Vernier and Power Sweep Accuracy Tracking Generator Level Flatness DECT Source Level Flatness Harmonic Spurious Outputs for the Tracking Generator DECT Source Non-Harmonic Spurious Outputs Tracking Generator Non-Harmonic Spurious Outputs Tracking Generator Feedthrough Tracking Generator LO Feedthrough Amplitude TDMA Switch On/Off Ratio TDMA Switch Delay TDMA Switch Video Feedthrough Frequency Accuracy Frequency Deviation Accuracy Demodulator Squaring

1. First LO Distribution Amplifier

The gate bias for the A3A14 LO distribution amplifier assembly is adjusted to the value specified on a label on the RF section. The LO power is adjusted so that the LO SENSE voltage is equal to the value specified on the label. The adjustments are made on the A10 tracking generator control assembly, which is located in the card cage.

Equipment Required

Measuring receiver
Digital multimeter
Power sensor
DMM test leads
Adapter, dual banana plug

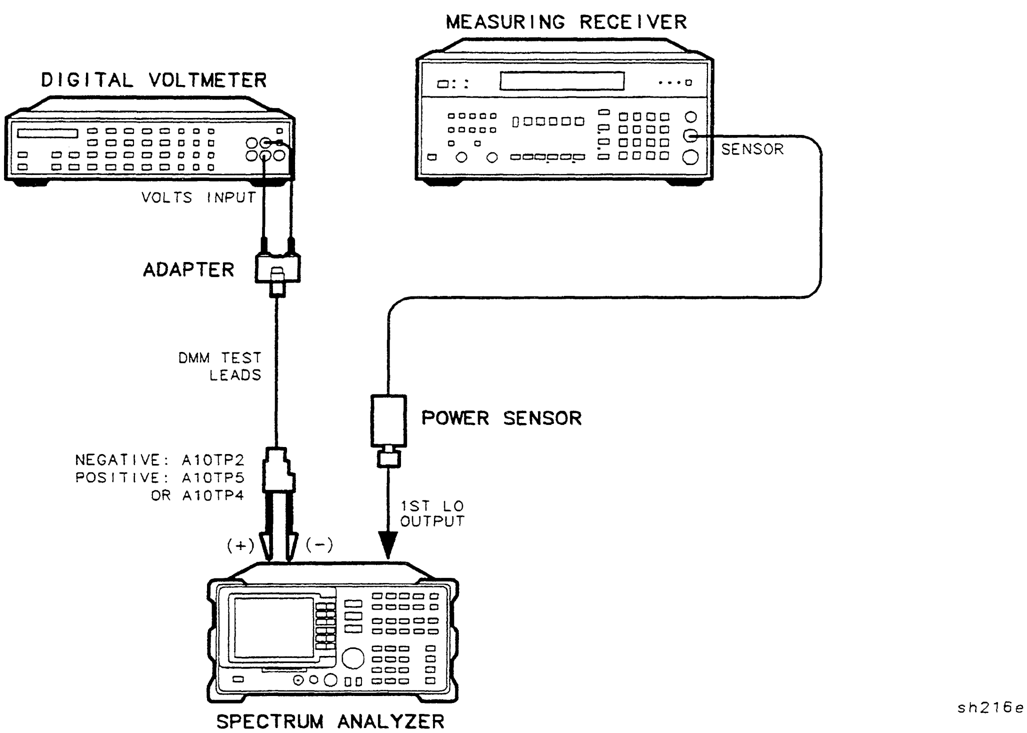


Figure 10-1. First LO Distribution Amplifier Adjustment Setup

Procedure

1. Set the spectrum analyzer (LINE) switch to off, then disconnect the line cord. Remove the cover assembly, then reconnect the line cord.
2. Remove the 50 Ω termination from the spectrum-analyzer rear-panel LO OUTPUT connector.
3. Connect the positive DMM test lead to A10TP5, GB (gate bias). Connect the negative DMM test lead to A10TP2, AGND (analog ground). See Figure 10-1.
4. Set the digital voltmeter controls as follows:

   FUNCTION .... DC VOLTS
   RANGE .... 10 V
   RESOLUTION .... 1 mV

5. Set the spectrum analyzer (LINE) switch to on.
6. Adjust A10R29 (GATE) for a digital voltmeter reading within 5 mV of the GATE (gate bias) voltage printed on the RF section label.
7. Zero and calibrate the measuring receiver and power sensor in LOG mode. (Power levels read in dBm.) Enter the power sensor's 5 GHz cal factor into the measuring receiver.
8. Connect the power sensor to the spectrum analyzer LO OUTPUT.
9. On the spectrum analyzer, press (PRESET), (SPAN), ZERO SPAN, (FREQUENCY), 4.6786, (GHz).
10. Connect the positive DMM test lead to A10TP4, LOS (LO sense).
11. Note the SENS (LO sense) voltage printed on the RF section label. Adjust A10R25, LO AMP (LO power) until the DMM reads equal to the SENS voltage printed on the RF section label.
12. Check that the measuring receiver power level reads greater than +12 dBm.
13. Disconnect the power sensor from LO OUTPUT, then reconnect the 50 Ω termination to LO OUTPUT.
14. Disconnect the DMM leads from A10TP4 and A10TP2.

2. BITG Power Level

The BITG has two adjustments for setting the output power. The – 10 dB ADJ (A3A15R13) sets the power level when the DECT Source power level is set to – 30 dBm. The 0 dB ADJ (A3A15R18) sets the power level when the DECT Source power is set to –20 dBm. The –10 dB ADJ acts as an offset adjustment, while 0 dB ADJ acts as a gain adjustment.

These adjustments are set in the factory for a 10 dB difference in output power between the –30 dBm and –20 dBm DECT Source power level settings. When installing a replacement BITG, it is probable that no adjustments will be required. In some cases it may be necessary to adjust the –10 dB ADJ (the offset adjustment) to account for variations in cable loss from the BITG to the DECT Source 50 Ω connector. This adjustment is done at a –20 dBm DECT Source power level setting. This ensures that the absolute power level with a – 20 dBm power level setting is –20 dBm, with little or no effect on the vernier accuracy.

In some cases, the power level at the –30 dBm DECT Source power level might be out of tolerance. In such cases, the –10 dB ADJ is set at a DECT Source power level of –30 dBm and the 0 dB ADJ is set at a DECT Source power level of –20 dBm. These two adjustments must be repeated until the power level at the two settings are within the given tolerances.

Equipment Required

Measuring receiver
Power sensor, 1 MHz to 350 MHz
Cable, Type N, 62 cm (24 in)

Procedure

1. Before beginning this adjustment, the Absolute Amplitude Accuracy performance test in Chapter 9 should be run. If this test passes, there should be no need to continue with the adjustment. If it fails, proceed with the following steps.
2. Set the spectrum analyzer AOFST to zero by pressing the following keys:

   (PRESET)
   (DISPLAY) Change Title

   Enter the following:

   ZTGAOFST;
   (CAL) More 1 of 4 More 2 of 4
   Service Cal EXECUTE TITLE
   (CAL) More 1 of 4 More 2 of 4
   Service Diag DISPLAY CAL DATA NEXT PAGE

   Verify that AOFST=0 under the tracking generator readouts.
3. Connect the cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer.
4. Press (PRESET) on the spectrum analyzer and set the controls as follows:

   SPECTRUM ANALYZER
   (FREQUENCY) 300 (MHz)
   (SPAN) 0 (Hz)

5. On the spectrum analyzer, press the following keys:

   (BW) 10 (kHz)
   (AUX CTRL) TRACK GEN SRC PWR ON OFF (ON) 25 (−dBm)

6. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.

7. Zero and calibrate the measuring-receiver/power-sensor combination in log mode (power levels readout in dBm). Enter the power sensor 300 MHz cal factor into the measuring receiver.

8. Disconnect the cable from the DECT SOURCE 50 Ω connector. Connect the power sensor to the DECT SOURCE 50 Ω connector. See Figure 10-2.

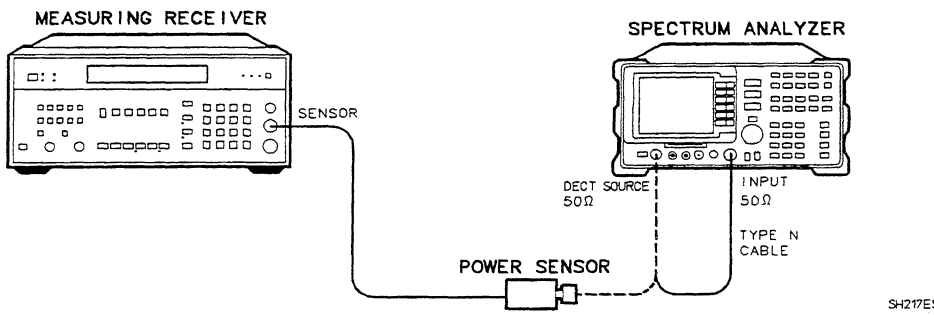


Figure 10-2. BITG Power Level Adjustment Setup

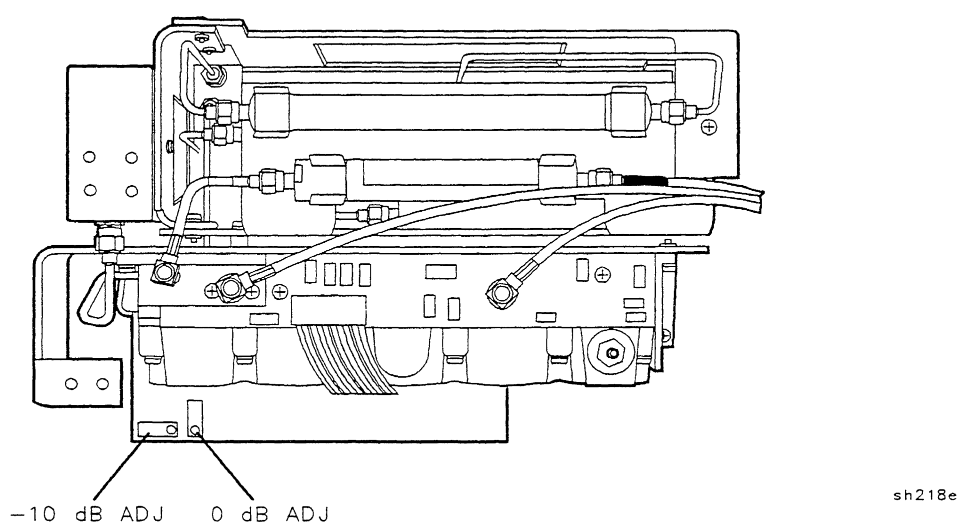


Figure 10-3. BITG Power Level Adjustment Locations

9. On the spectrum analyzer, press SRC PWR ON OFF (ON), − 20, (dBm), (SGL SWP).

   Note that some spectrum analyzers may have sealing compound over A3A15R13 (−10 dB ADJ) and A3A15R18 (0 dB ADJ) adjustments. Remove this compound before making these adjustments.

10. Adjust −10 dB ADJ (A3A15R13) for a −20 dBm ±0.05 dB reading on the measuring receiver. Refer to Figure 10-3 for adjustment location.

11. Set the SRC PWR level to −30 dBm. Note the power displayed on the measuring receiver.

    If the power level is −29.77 dBm to −30.23 dBm, then the adjustment is complete. If the power level is not within the range, continue with step 12.

    Power at −10 dBm Setting ____________ dBm

12. If the power level noted in step 11 was outside the range of −30 dBm ±0.23 dB perform the following:

    - With the SRC PWR level set to −30 dBm, adjust −10 dB ADJ (A3A15R13) for a −30 dBm ±0.1 dB reading on the measuring receiver. Refer to Figure 10-3 for adjustment location.
    - Set the SRC PWR level to −20 dBm. Adjust 0 dB ADJ (A3A15R18) for a −20 dBm ±0.2 dB reading on the measuring receiver. Refer to Figure 10-3 for adjustment location.
    - Repeat this step until the output power level is within the tolerances indicated at both the −30 dBm and −20 dBm SRC PWR level settings. Adjust −10 dB ADJ only with the SRC POWER level set to −30 dBm, and adjust 0 dB ADJ only with the SRC PWR level set to −20 dBm.

3. Tracking Oscillator

This is *not* a routine adjustment. This adjustment should only be performed if the range of either the automatic tracking peak adjustment (TRACKING PEAK) or the manual tracking peak adjustment (MAN TRK ADJUST) is insufficient to peak a signal.

The centering of the tracking oscillator range is adjusted in the factory to ensure that the tracking adjustment will work properly. Over a period of 5 years, however, the center frequency of the tracking oscillator range may drift outside of acceptable limits.

The tracking oscillator range is checked first. A tracking peak test is performed and the output frequency is recorded. The manual tracking adjustment is set to its minimum and maximum values and the output frequency is recorded. The minimum and maximum frequencies are compared to the peaked frequency. If the difference is less than 5 kHz, adjustment is necessary.

The adjustment recenters the tracking oscillator range. The A3 RF assembly is placed in its service position to perform this adjustment. A frequency counter is used to measure the output frequency.

Equipment Required

Microwave frequency counter
Termination, 50 Ω Termination
Alignment tool, non-metallic
Cable, BNC, 122 cm (48 in) (*two required*)
Adapter, Type N(f) to APC-3.5(f)
Adapter, Type N(m) to BNC(f)

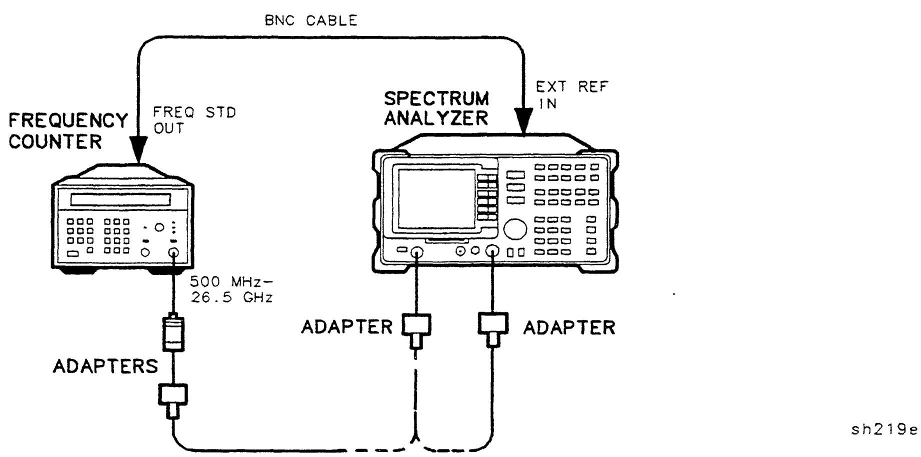


Figure 10-4. Frequency Tracking Range Setup

Procedure

Frequency Tracking Range Check

1. Connect a cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer.
2. Remove the rear-panel jumper between the 10 MHz REF OUTPUT and EXT REF IN jacks. Connect the frequency counter FREQ STD OUT connector to the spectrum analyzer EXT REF IN connector as shown in Figure 10-4.

3. Press PRESET on the spectrum analyzer, then press the following keys:

   FREQUENCY CENTER FREQ 500 MHz
   SPAN 0 Hz

4. On the spectrum analyzer, press the following key:

   BW 10 kHz
   AUX CTRL TRACK GEN SRC PWR ON OFF (ON) 25 −dBm

5. On the spectrum analyzer press TRACKING PEAK. Wait for the PEAKING message to disappear.

6. Set the microwave frequency counter controls as follows:

   SAMPLE RATE .... Midrange
   10 Hz-500 MHz/500 MHz-26.5 GHz Switch .... 500 MHz - 26.5 GHz
   RESOLUTION .... 1 Hz

7. Connect the DECT SOURCE 50 Ω connector to the microwave frequency counter input as shown in Figure 10-4.

8. Wait for the microwave frequency counter to gate two or three times, then record the microwave frequency counter reading below as the peaked frequency:

   Peaked Frequency: ____________ MHz

9. On the spectrum analyzer, press MAN TRK ADJUST, 4095, ENTER. Wait for the microwave frequency counter to gate two or three times, then record the microwave frequency counter reading below as the minimum frequency:

   Minimum Frequency: ____________ MHz

10. On the spectrum analyzer, press MAN TRK ADJUST, 0, ENTER. Wait for the microwave frequency counter to gate two or three times, then record the microwave frequency counter reading below as the maximum frequency:

    Maximum Frequency: ____________ MHz

11. If the absolute value of the difference between either the minimum or maximum frequency and the peaked frequency is less than 5 kHz, proceed with the adjustment procedure below. If the differences are greater than 5 kHz, no adjustment is necessary.

12. Disconnect the cable from the EXT REF IN connector, then replace the rear-panel jumper.

Adjust the Tracking Oscillator

13. Remove the A3 RF Section assembly as described in Chapter 9 of this supplement. With A3 sitting on top of the A2 display assembly, reconnect all cables from A3 to their respective jacks on A7, A9, A25, and A10. Reconnect W40 to A3A15J8. Connect the 50 Ω termination to the end of W42.
14. Connect the equipment as shown in Figure 10-5. The microwave frequency counter provides the frequency reference for the spectrum analyzer.

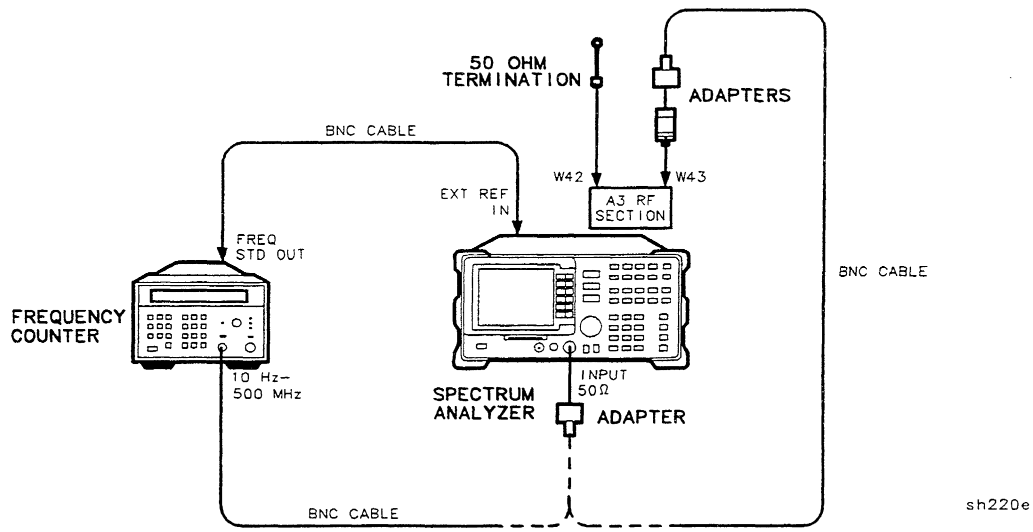


Figure 10-5. Tracking Oscillator Adjustment Setup

15. Set the spectrum analyzer (LINE) switch to on. Press (AUX CTRL), TRACK GEN, SRC PWR ON OFF (ON). Allow the spectrum analyzer to warm up for at least 5 minutes. Set the controls as follows:

    (FREQUENCY) CENTER FREQ 300 (MHz)
    (SPAN) 0 (Hz)

16. Set the microwave frequency counter controls as follows:

    SAMPLE RATE .... Fully CCW
    10 Hz-500 MHz/500 MHz-26.5 GHz Switch .... 10 Hz-500 MHz
    50 Ω - 1 MΩ Switch .... 50 Ω

17. Remove the screw, located on the front of the tracking generator, used to seal the tracking oscillator adjustment.
18. On the spectrum analyzer, press (AUX CTRL), TRACK GEN, MAN TRK ADJUST, 0, (ENTER).
19. Record the microwave frequency counter reading in Table 10-2 as F1.
20. On the spectrum analyzer, press MAN TRK ADJUST, 4095, (ENTER).
21. Record the microwave frequency counter reading in Table 10-2 as F2.
22. Calculate Fcenter as shown below, and record it in Table 10-2.

$$Fcenter = \frac{(F1 + F2)}{2}$$

23. Set SRC TRACK ADJ to 350. This sets the tracking oscillator near the center of its frequency range. (The relationship between the SRC TRACK ADJ DAC number and the output frequency is nonlinear.) Adjust SRC TRACK ADJ until the microwave frequency counter reads Fcenter ±100 Hz.
24. Record the value of SRC TRACK ADJ in Table 10-2.

Caution A3A15C3 (TRK OSC CTR) is rated for a maximum of 10 adjustment cycles. Due to this limitation, adjust TRK OSC CTR only when absolutely necessary.

25. Adjust A3A15C3 (TRK OSC CTR) until the microwave frequency counter reads 300 MHz ±500 Hz.
26. Repeat steps 17 through 24 at least once more until no further adjustment of A3A15C3 is necessary.
27. Set the spectrum analyzer (LINE) switch to off. Replace the screw removed in step 17.
28. Reinstall the A3 RF Section assembly into the spectrum analyzer.
29. Replace the rear-panel jumper between the 10 MHz REF OUTPUT and EXT REF IN connectors.

Table 10-2. Tracking Oscillator Range Centering

N	F1 (MHz)	F2 (MHz)	Fcenter (MHz)	SRC TRACK ADJ Setting
1				
2				
3				
4				
5				
6				

4. Frequency Deviation

To adjust the frequency deviation accuracy of the spectrum analyzer DECT Source, the DECT SOURCE 50 Ω output is connected to a microwave spectrum analyzer. A square wave modulating signal of 95.5 kHz is applied to the spectrum analyzer TTL DATA IN. The fundamental sideband at 95.5 kHz from the DECT Source frequency, is adjusted for a null. This sets the peak frequency deviation to 288 kHz.

The following description explains the theory behind this adjustment.

A sinusoidal FM signal comprises sidebands at multiples of the FM rate, on each side of the carrier signal. Bessel function tables show that the fundamental sideband amplitude passes through a null, when the modulation index, β, is equal to 3.83. For a square wave modulating signal, applying Fourier theory establishes that the amplitude of the fundamental sideband is equal to 1.27 times the amplitude of the whole signal.

Using these principles and the standard equation, $\beta = \frac{\Delta f}{f_m}$, where Δf is the peak frequency deviation and f_m is the modulating frequency, you can calculate the desired modulating frequency, which when nulled, will correspond to a peak frequency deviation of 288 kHz. This is the desired peak frequency deviation for a DECT square wave modulating signal.

Rearranging the equation for β in terms of f_m,

$$f_m = \frac{\Delta f}{\beta}$$

$$= 1.27 \times \frac{288}{3.83} = 95.5\text{kHz}$$

Equipment Required

Synthesized Function Generator
Microwave Spectrum Analyzer
Cable, Type N, 62 cm (24 in)
Cable, BNC, 23 cm (9 in)
Cable, BNC, 122 cm (48 in), *(2 required)*
Adapter, Type N(m) to BNC(f), *(2 required)*

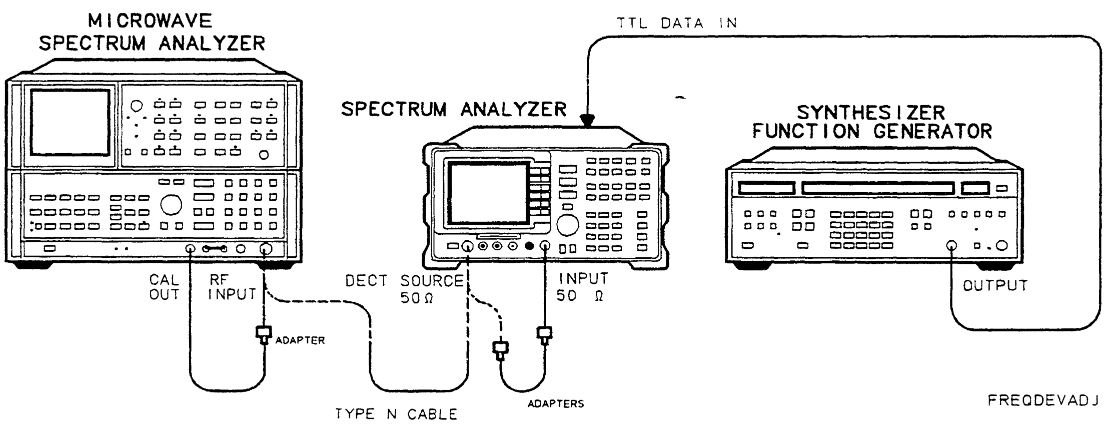


Figure 10-6. Frequency Deviation Adjustment Setup

Procedure

It is only necessary to perform the step if more than two hours have elapsed since a front-panel calibration of the microwave spectrum analyzer was performed.

The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

1. Perform a front-panel calibration of the microwave spectrum analyzer by performing the following steps:

   Note that the following steps are for an HP 8566A/B Microwave Spectrum Analyzer, the steps may be different if you are using another microwave spectrum analyzer.

   - Connect a BNC cable between the CAL OUTPUT and the RF INPUT.
   - Press 2 – 22 GHz (INSTR PRESET), RECALL, 8. Adjust AMPTD CAL for a marker amplitude reading of −10 dBm.
   - Press RECALL, 9. Adjust FREQ ZERO for a maximum amplitude response.
   - Press SHIFT, FREQUENCY SPAN to start the 30 second internal error correction routine.
   - When the `CALIBRATING!` message disappears, press SHIFT, START FREQ to use the error correction factors just calculated.
2. Connect the Type N cable between the DECT SOURCE 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. Refer to Figure 10-6.
3. Press (PRESET) on the spectrum analyzer. Wait for the preset routine to finish.
4. Press `DECT ANALYZER` on the spectrum analyzer to access the main menu for the DECT measurements personality. (This takes approximately 30 seconds.)
5. Set the spectrum analyzer by pressing the following keys:

   `Config`

   `More 1 of 2`

   `DECT SOURCE`

   `SRC PWR ON OFF` (ON) -25(dBm)

   `CH X CTR FREQ` 1.89 (GHz)
6. On the spectrum analyzer press `More 1 of 2`, `DECT SRC CAL`, and follow the instructions on the screen.
7. Wait for the `DECT Source cal done` message to be displayed on the spectrum analyzer then press:

   `More 2 of 2`

   `SRC PWR ON OFF` (ON) -21 (dBm)

   (SGL SWP) (SGL SWP)
8. Set the microwave spectrum analyzer as follows:

   2 - 22 GHz (INST PRESET)
   CENTER FREQUENCY .... 1.89 GHz
   SPAN .... 500 kHz
   RES BW .... 3 kHz
9. Connect the DECT SOURCE 50 Ω output to the microwave spectrum analyzer RF input. Ensure the function generator is not connected at this point.

10. On the microwave spectrum analyzer, press the following keys:

    PEAK SEARCH
    MKR→CF

11. Set the synthesized function generator as follows:

    Set up for square wave operation.
    FREQUENCY .... 95.5 kHz
    AMPLITUDE .... 2.5 V
    OFFSET .... 1.25 V

12. Connect the synthesized function generator to the spectrum analyzer TTL DATA IN connector. Refer to Figure 10-6.

13. Connect the microwave spectrum analyzer 10 MHz output to the synthesized function generator external reference input.

14. On the microwave spectrum analyzer, press the following keys:

    CF STEP SIZE 95.5 kHz
    CENTER FREQUENCY ⇑
    SPAN 100 kHz

    This results in the first sideband of the 1.89GHz carrier being displayed at the centre of the screen.

15. Adjust A612R34 for a minimum signal level on the microwave spectrum analyzer. (Refer to Figure 10-7 for the location of A612R34.)

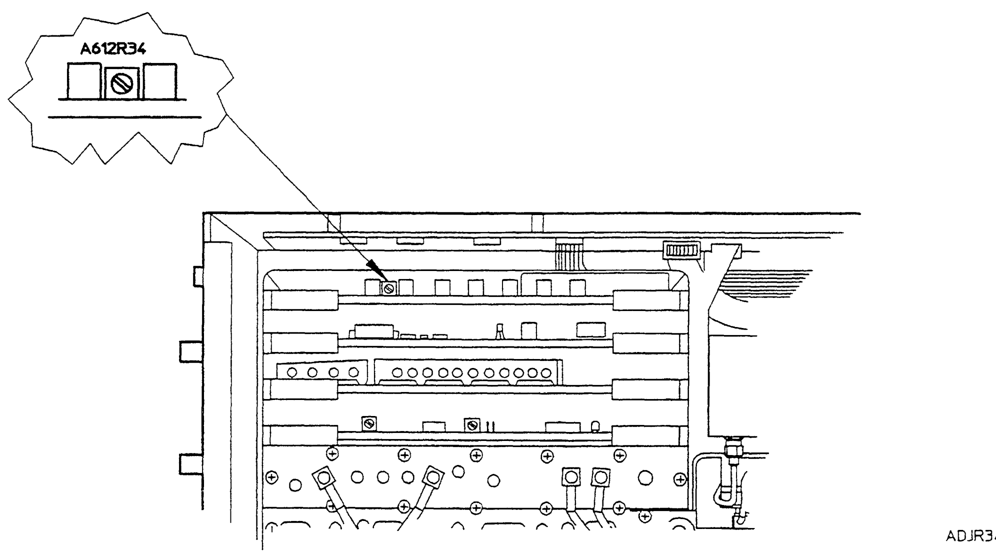


Figure 10-7. Frequency Deviation Adjustment Location

Replaceable Parts

This section contains information for identifying replacement assemblies for the DECT Source.

Table 10-3. Assembly Level Replaceable Parts

Reference Designator	Description	CD	HP Part Number
A3A15	**Tracking Generator**		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E	5	5086-7905
	Tracking Generator Exchange		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E	3	5086-6905
A10	**LO Distribution Amplifier (LODA) Control for Option 009**		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E	3	5062-8232
	Tracking Generator Control for Option 010		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E	2	5062-8231
A101	**Fast ADC Board**		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E (Option 101)	4	5062-7079
A112	**DECT Demodulator Board**		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E (Option 112)	5	5063-0288
A612	**DECT Source Board**		
	HP 8593E, HP 8594E, HP 8595E, and HP 8596E (Option 012)	4	5063-0287

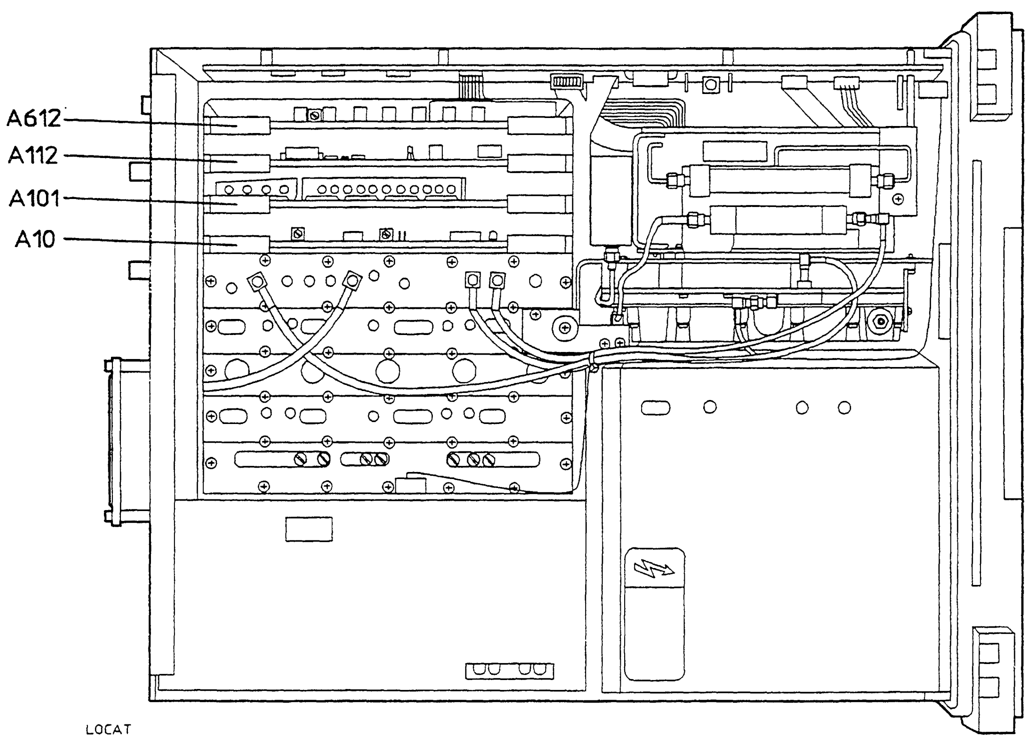


Figure 10-8. Location of Assembly Level Replaceable Parts

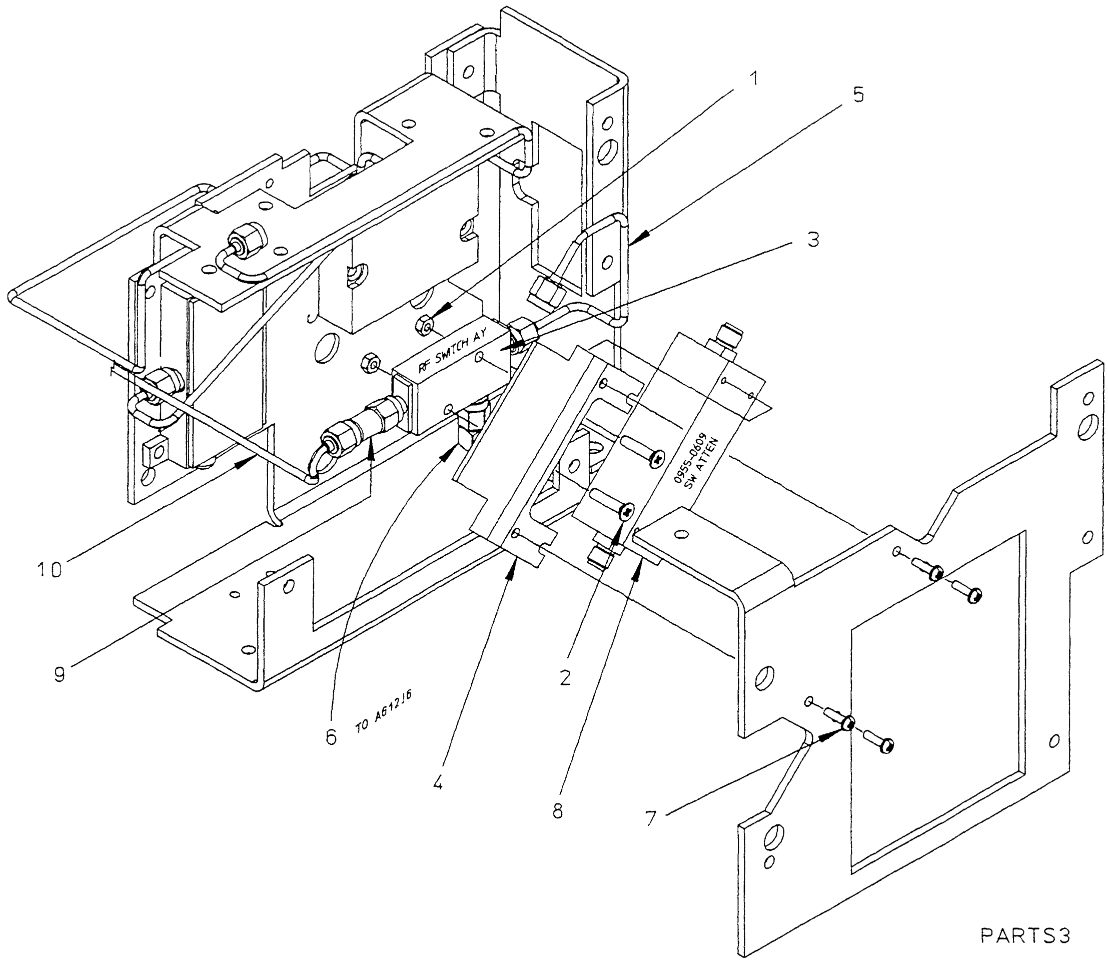


Figure 10-9.
Attenuator and Cable Locations in the Spectrum Analyzer Front End for HP 8594E

Table 10-4. Replaceable Parts

Item	HP Part Number	CD	Description
1	0535-0071	0	HEX NUT, M3
2	0515-1236	9	SCREW-MACH, M3x14MM, CSNK-HD
3	0955-0685	2	RF SWITCH ASSEMBLY, HP 33144A OPT 001
4	08594-00007	6	SWITCH SUPPORT BRACKET
5	08594-20037	4	CABLE ASSY, RF SWITCH TO SWITCHED ATTEN
6	8120-5106	1	CABLE ASSY, RF SWITCH TO DECT SOURCE ASSY
7	0520-0175	5	SCREW-MACH, 2-56 x 0.312
8	0955-0609	0	SWITCHED ATTENUATOR
9	0955-0688	5	20 DB ATTENUATOR PAD
10	08594-20036	4	CABLE ASSY, 20 DB PAD TO TRACKING GENERATOR

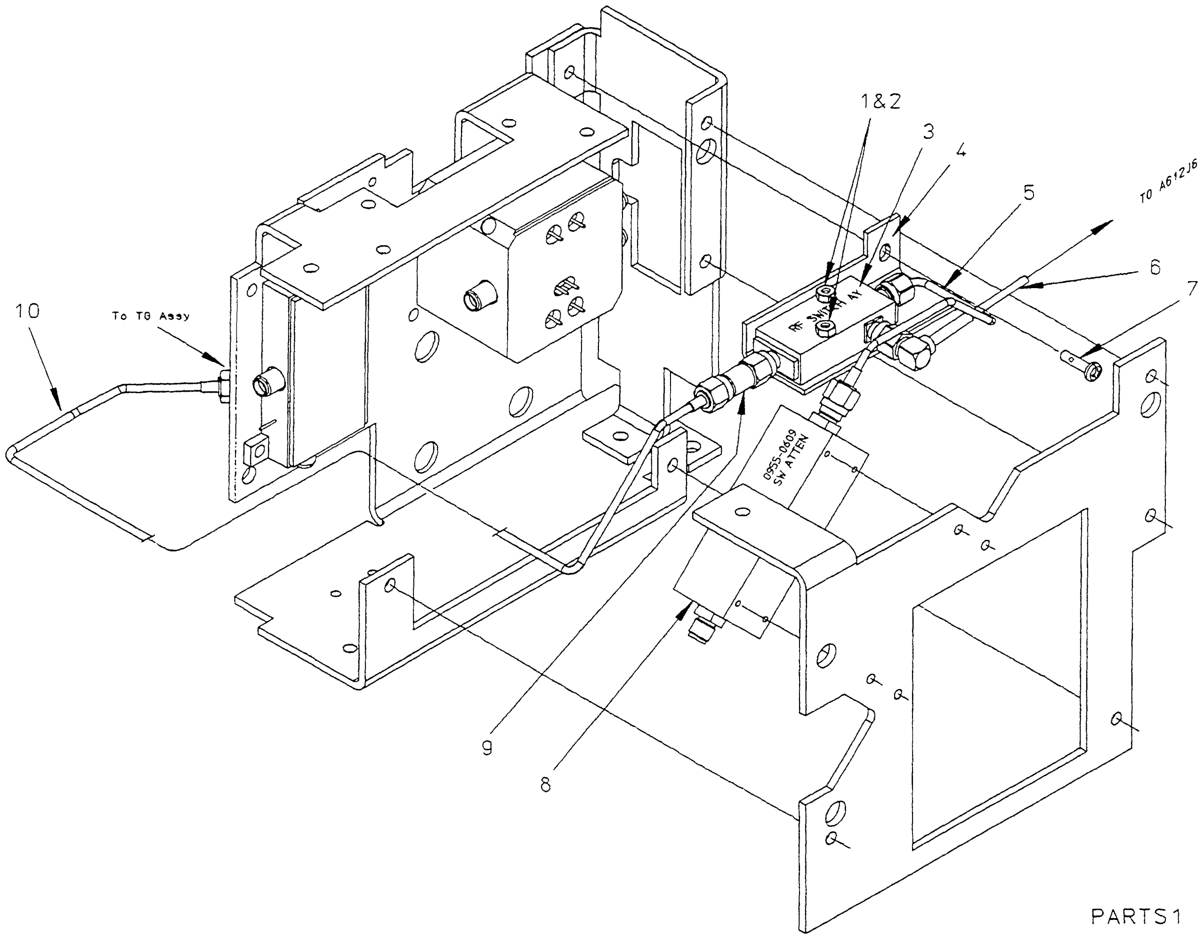


Figure 10-10.
Attenuator and Cable Locations in the Spectrum Analyzer Front End for HP 8593E, HP 8595E and HP 8596E

Table 10-5. Replaceable Parts

Item	HP Part Number	CD	Description
1	0535-0071	0	HEX NUT, M3
2	0515-1236	9	SCREW-MACH, M3x14MM, CSNK-HD
3	0955-0685	2	RF SWITCH ASSEMBLY, HP 33144A OPT 001
4	08594-00006	6	SWITCH SUPPORT BRACKET
5	08594-20030	4	CABLE ASSY, RF SWITCH TO SWITCHED ATTEN
6	8120-5106	1	CABLE ASSY, RF SWITCH TO DECT SOURCE ASSY
7	0515-0372	5	SCREW-MACH, M3x8MM, TORX
8	0955-0609	0	SWITCHED ATTENUATOR
9	0955-0688	5	20 DB ATTENUATOR PAD
10	08594-20029	4	CABLE ASSY, 20 DB PAD TO TRACKING GENERATOR

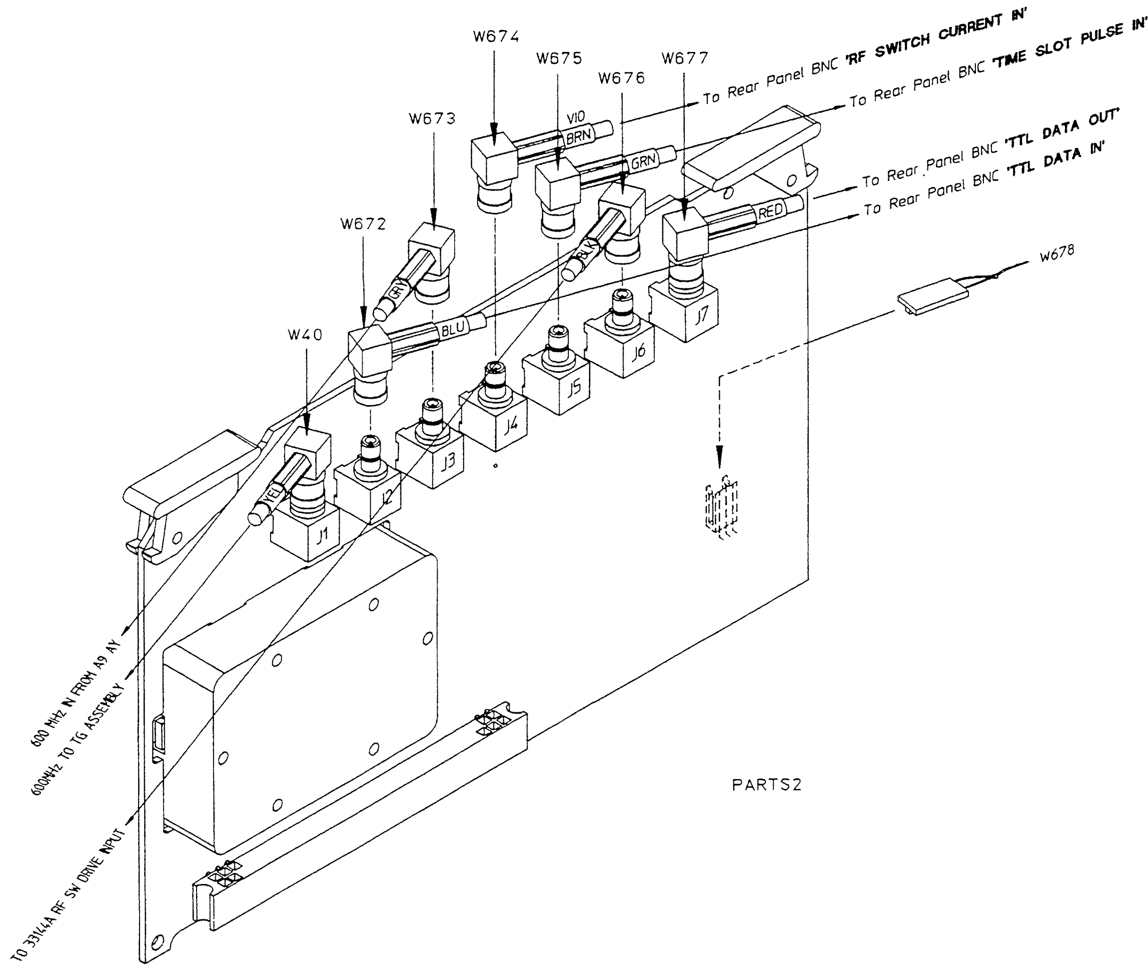


Figure 10-11. Cable connections on A612 DECT Source Assembly

Table 10-6. Replaceable Parts

Item	HP Part Number	CD
W40	8120-5020	8
W672	08753-60118	9
W673	8120-5020	8
W674	8120-5056	0
W675	08625-60029	6
W676	8120-5106	1
W677	08625-60030	9
W678	08594-60036	7

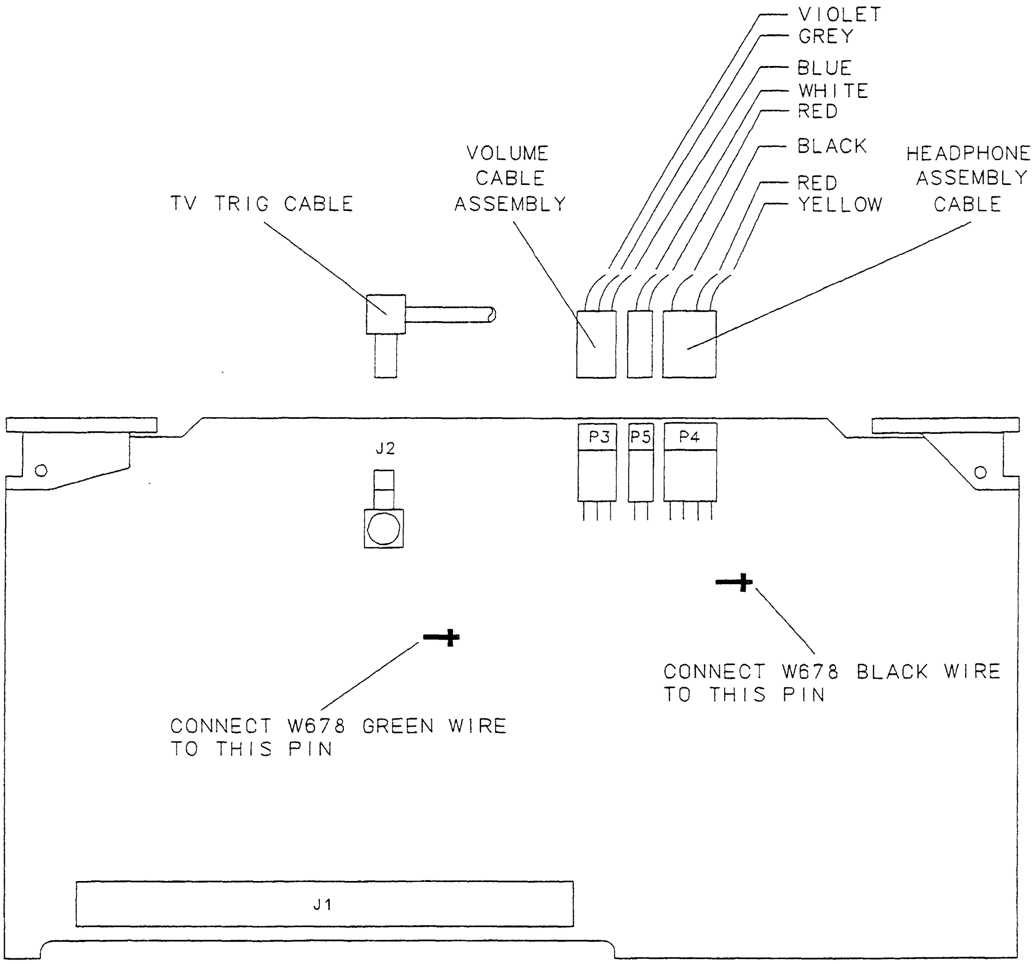


Figure 10-12. Cable connections on A112 DECT Demodulator Assembly

Block Diagram Description

Refer to Figure 10-13, DECT Source Block Diagram, for an overview of the operation of the DECT Source and tracking generator.

A DECT Source must provide:

10 RF carriers in the range 1.88 GHz to 1.9 GHz.

0.5 GFSK modulation for an incoming data stream.

Pulse Modulation.

These requirements are achieved in the DECT Source by adapting the built-in tracking generator of the HP 8590 E-Series spectrum analyzers. The normal frequency range for the tracking generator is 300 kHz to 2.9 GHz. The DECT Source frequency range is 1.88 to 1.9GHz. However the DECT Source can be used over the frequency range of 70 MHz to 2.9 GHz.

The 600 MHz signal from the spectrum analyzer A9 Third Converter Assembly is routed to the DECT Source assembly. It is then divided down and used as the reference for the phase locked loop. The same division is applied to the feedback path from the VCO output and this forces the loop to lock at 600 MHz. The 600 MHz VCO output signal is connected as the tracking generator input signal. Modulation is applied to the 600 MHz signal in the phase locked loop.

Data is fed into the analyzer from a TTL input on the rear panel. The incoming data stream is limited and scaled. The data is filtered by the 0.5 GFSK premodulation filter and the peak frequency deviation is nominally 288 kHz. The filtered signal is coupled into the VCO drive to provide out-of-band FM. The loop forces a highpass action on the modulating signal and this sets the lower frequency limit for modulation. Static frequency offsets are not possible.

Pulse modulation is provided using an RF switch on the tracking generator output. A fixed 20 dB attenuator is placed in between the tracking generator and the RF switch to provide isolation.

The Option 112 DECT Demodulator provides an analog demodulated signal. This signal is routed to the DECT Source assembly where it is converted to TTL data.

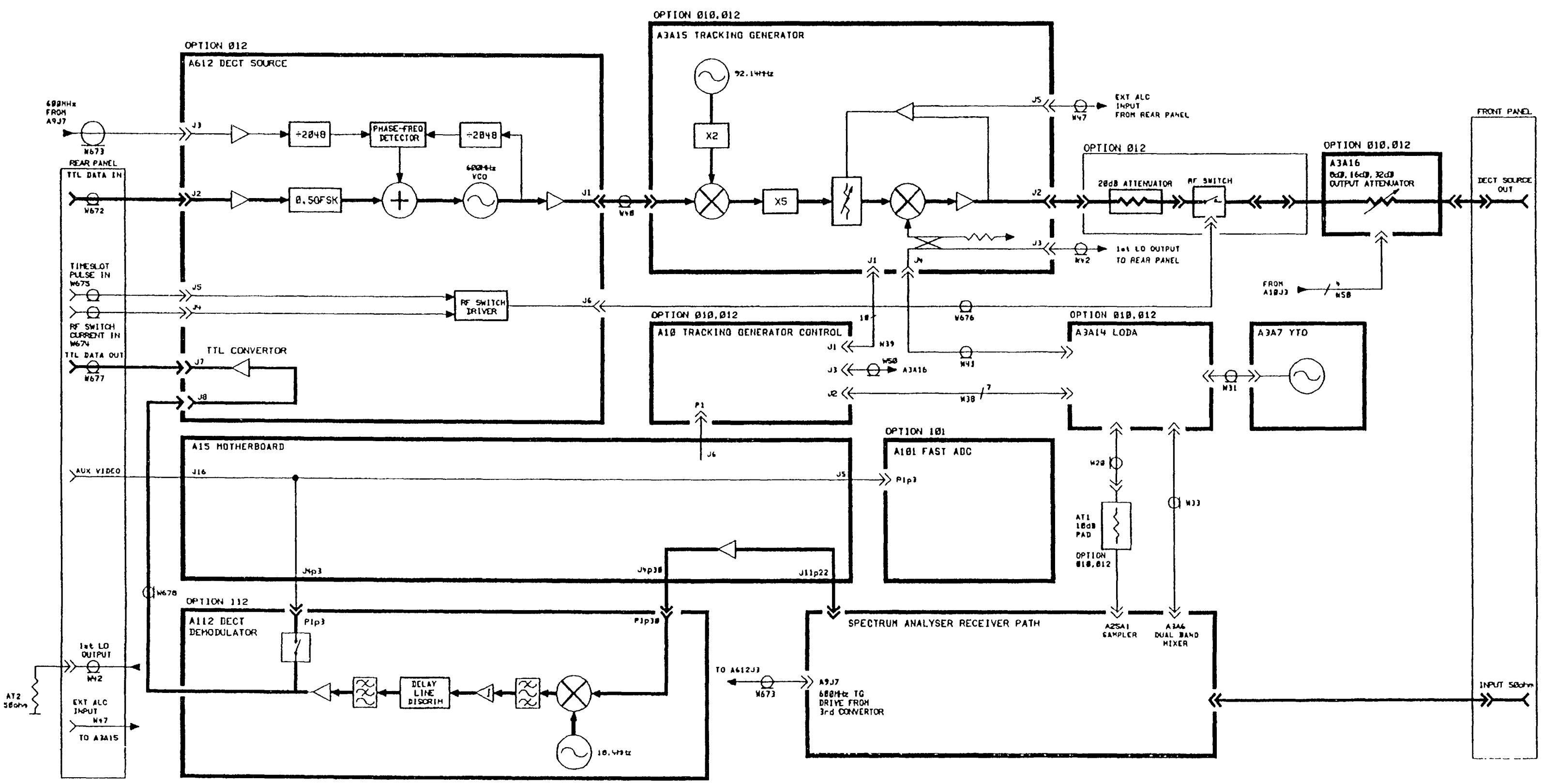


Figure 10-13. DECT Source Block Diagram

Trouleshooting

DECT Source
HP 8593E, 8594E, 8595E, 8596E Option 012

This section provides information that is useful when starting to troubleshoot a DECT Source or tracking generator failure within Option 012.

Troubleshooting the tracking generator is performed in the same manner as for a normal Option 010 tracking generator although the expected power levels and specified frequency range are different.

Troubleshooting is intended to isolate faults to assembly level. There is no component level repair information for the A612 DECT Source assembly.

Troubleshooting the DECT source

The DECT Source assembly can be removed from operation by disconnecting W40 at the A612 DECT Source end and W673 at the 600 MHz 3rd converter end. The cable W40 is connected between A3A15 and A9J7. (Refer to Figure 10-13.) The spectrum analyzer is then returned to the normal Option 010 tracking generator configuration except that there is an RF switch and a 20 dB pad in the output path.

If the fault goes away, suspect the DECT Source assembly.

If a fault persists when the DECT Source assembly has been isolated, suspect the tracking generator and proceed with the following troubleshooting procedure. This troubleshooting procedure is based on the tracking generator (Option 010) troubleshooting procedure.

The following troubleshooting information is aimed at isolating tracking-generator-related faults to either the A3A15 tracking generator assembly or one of the other supporting assemblies, such as A9, A10, or A3A14. The A3A15 tracking generator assembly is not field-repairable; a rebuilt-exchange assembly is available.

If the output goes unleveled (TG UNLVL message displayed)

A window comparator on the A10 tracking generator control assembly is used to monitor the control line ALC_MON (ALC Monitor) from the A3A15 assembly. If ALC_MON is greater than +1.0 Vdc or less than −0.10 Vdc TG UNLVL will be displayed, indicating that the output of the tracking generator (TG) is unleveled. The tracking generator can typically be set for −17.25 dBm output power and remain leveled. In any case, the output should remain leveled for output power settings of −20 dBm or less. It is normal for the tracking generator to be unleveled at frequencies below 300 kHz.

The ALC_MON line is continuously monitored during a sweep, but the TG UNLVL message will only be displayed at the end of the sweep. For this reason, it is possible that the output could be unleveled during a portion of a sweep. Although the output returns to a leveled condition by the end of the sweep, TG UNLVL will be displayed at the end of the sweep.

If TG UNLVL is displayed, proceed as follows:

1. Check at which frequencies the output is unleveled. Set the spectrum analyzer to zero span and step the center frequency in 50 MHz increments. Note at which frequencies the output is unleveled.
2. Check at which power levels the output is unleveled. Connect the DECT SOURCE 50 Ω connector to the INPUT 50 Ω connector. With the spectrum analyzer in zero span, set CENTER FREQ to 300 MHz or one of the frequencies noted in step 1, with the spectrum analyzer in zero span. Press the following keys:

   (AUX CTRL)
   TRACK GEN
   SRC PWR ON OFF (ON underlined)
   TRACKING PEAK

   Wait for the PEAKING message to disappear. Step the SRC POWER setting in 1 dB increments and note at which power levels the output is unleveled. The output should be unleveled only when the power level is greater than −20 dBm.
3. Check maximum power available from the tracking generator. Connect the DECT SOURCE 50 Ω connector to the INPUT 50 Ω connector. Press the following keys:

   (PRESET)
   (AMPLITUDE), 20, (+dBm)
   LOG dB/DIV, 5, (dB)
   (AUX CTRL)
   TRACK GEN
   SRC PWR ON OFF (ON underlined)
   MORE 1 OF 2
   ALC INT EXT (EXT underlined)

   The available power should always be greater than −20 dBm. If the output is unleveled only at specific frequencies, a power hole will usually be visible at those frequencies.

4. Check the LO OUTPUT power level as follows:
   a. Set the spectrum analyzer to zero span at a 0 Hz center frequency.
   b. Zero and calibrate a power-meter/power-sensor combination. Set the power meter to readout power in dBm. Enter the power sensor's 4 GHz cal factor into the power meter.
   c. Connect the power sensor to the LO OUTPUT connector on the spectrum analyzer's rear panel.
   d. Record the power meter reading. The power level should be greater than +12.5 dBm.
   e. Increase the spectrum analyzer's center frequency setting by 100 MHz. The LO OUTPUT frequency will be 3.9214 GHz greater than the center frequency setting.
   f. Enter the appropriate power sensor cal factor into the power meter.
   g. Repeat steps d through f until the center frequency setting is 2.9 GHz.
5. If the LO OUTPUT power-level check fails, note the center frequency setting at which the power level was out of tolerance. If the LO OUTPUT power level check passes, proceed to step 7.
6. Place the A3 front end assembly in its service position. Place the A3A15 tracking generator assembly in its service position. Disconnect W41 from A3A15J4 (LO IN). Connect the power sensor to the free end of W41. Repeat the LO OUTPUT power level check above, noting the center frequency settings at which the power level is out of tolerance. The power level for this check should be +16.5 dBm ±2 dB.
   - If the power level is within tolerance at W41, but out of tolerance at the LO OUTPUT (rear panel), and the center frequency setting of the out-of-tolerance power levels is close to the frequencies at which the output is unleveled, suspect A3A15.
   - If the power level at W41 is also out of tolerance, suspect either the A3A14 LODA assembly, A3A7 YTO assembly, or W41. Refer to the "LO Section Information," in Chapter 7 of the Service Manual.
7. If the output is unleveled only at certain power level settings or certain frequencies, monitor A10J1 pin 8 with a DVM. Connect the negative DVM lead to A7JTP1. Vary the SRC POWER setting or center frequency setting, as appropriate, and plot the voltage variation versus power level or frequency. A discontinuity in the plot near the frequency or power level at which the output is unleveled indicates a problem on the A10 tracking generator control assembly.

To check excessive residual FM

Either the tracking oscillator or the ALC circuitry could be responsible for excessive residual FM. The residual FM should be measured on another spectrum analyzer, such as an HP 8566A/B or HP 8568A/B, using slope detection with the spectrum analyzer under test set to zero span. Proceed as follows to troubleshoot residual FM problems:

1. Perform the Residual FM performance test for the spectrum analyzer (see the *HP 8590 Series Spectrum Analyzer User's Guide*). If this test passes, the 1st LO input and 600 MHz drive signals should be within tolerance. If the test fails, troubleshoot the LO section.
2. Monitor A10J1 pin 5 (TUNE) with an oscilloscope. Connect the oscilloscope probe ground lead to A7TP1. The voltage at this point should be greater than 500 mV.
   - If the voltage is less than 500 mV, perform the "Frequency Tracking Range Check" in the Tracking Oscillator adjustment procedure, in this chapter. If this check fails, perform the "Adjustment Procedure" which follows the "Frequency Tracking Range Check".
   - If the noise on this tune line is greater than 10 mV, troubleshoot the A10 Tracking Generator Control assembly.
3. Monitor the output of the tracking generator with another spectrum analyzer (the spectrum analyzer under test should be in zero span). Check for high-amplitude spurious responses from 100 kHz to at least 3 GHz. If the spurious responses are too high in amplitude, the (broadband) ALC detector may cause the ALC loop to oscillate, generating FM sidebands. If any spurious responses are excessively high, refer to "If harmonic/spurious outputs are too high" in this section.
4. If no spurious responses are present, or if the spurious responses are sufficiently low enough in amplitude to not cause a problem, suspect the tracking oscillator in the A3A15 assembly.

If flatness is out of tolerance

The output level flatness of the tracking generator is specified at a −40 dBm output power setting. In general, most flatness problems will be a result of a failure in the A3A15 Tracking Generator microcircuit. However, the PWR_LVL signal from the A10 Tracking Generator Control assembly and the 1ST LO IN signal from the A3A14 First LO Distribution Amplifier assembly can also contribute to flatness problems.

1. Check the function of the PWR_LVL signal from the A10 Tracking Generator Control assembly. Set the `SRC POWER` setting to a level at which the flatness is out of tolerance. Monitor A10J1 pin 8 with a DVM, step the center frequency setting in 100 MHz increments from 100 MHz to 2.9 GHz, and plot the voltage variation versus frequency. A discontinuity in the plot near the frequency at which the flatness is out of tolerance indicates a problem on the A10 Tracking Generator Control assembly.
2. Check the flatness of the 1ST LO IN signal. Perform the LO OUTPUT amplitude check as described in "If the output goes unleveled (`TG UNLVL` message displayed)," in this section.
   - If the check passes, the fault is most likely in the A3A15 Tracking Generator assembly.
   - If the test fails, note the center frequency setting at which the power level was out of tolerance and compare against the frequencies at which the flatness was out of tolerance. Repeat the check with the power sensor connected to the end of W41 that is nearest the A3A15 assembly, noting the center frequency of any out of tolerance power levels. The power level should be +16.5 dBm ±2 dB.
     - If the power level is within tolerance at W41, but out of tolerance at the LO OUTPUT connector (rear panel), and the center frequency settings of the out-of-tolerance power levels are close to the frequencies at which the flatness is out of tolerance, suspect the A3A15 assembly.
     - If the power level at W41 is also out of tolerance, suspect either the A3A14 First LO Distribution Amplifier or the A3A7 YTO assembly. Refer "LO Section Information," in Chapter 9 of the 8590E Series Service Guide.
3. Check all coax cables, especially semi-rigid cables. A fault in one of these cables can cause a very-high-Q power hole.

If vernier accuracy is out of tolerance

Vernier accuracy is a function of the PWR_LVL drive signal from the A10 tracking generator control assembly and the ALC circuitry on A3A15. The vernier accuracy is specified at 300 MHz. Since vernier accuracy is tested using a broadband power sensor, abnormally high spurious responses could cause the measured vernier accuracy to fail when in fact the accuracy of the 300 MHz signal alone is within specification.

1. Check the PWR_LVL drive signal from A10. Monitor A10J1 pin 8 with a DVM. Change the SRC POWER setting in 1 dB steps and note the voltage at each power level setting. The voltage should change by the same amount for each 1 dB step. If the voltage does not change by the same amount for each 1 dB step, the fault lies on the A10 Tracking Generator Control assembly.
2. Check for abnormally high spurious outputs. Connect the DECT SOURCE 50 Ω connector to the input of another spectrum analyzer (the test analyzer). Set the test spectrum analyzer to sweep from 70 MHz to 2.9 GHz, with a sweeptime of 100 ms or less. Set the spectrum analyzer under test to sweep from 70 MHz to 2.9 GHz with a 50 s sweeptime. Press (SGL SWP) on the spectrum analyzer under test and observe any responses on the test spectrum analyzer, ignoring the desired output signal. If any spurious responses are greater than −20 dBc, the vernier accuracy measurement may fail. Refer to "If harmonic/spurious outputs are too high" in this section.
3. Check for excessive LO feedthrough. Use the LO Feedthrough performance test in the *HP 8590 Series Spectrum Analyzer User's Guide*, but check over a center frequency range of 70 MHz to 100 MHz. The LO Feedthrough will be 3.9214 GHz greater than the center frequency setting.

If harmonic/spurious outputs are too high

Harmonic and spurious outputs may be generated by A3A15 itself or may be present on either the 600 MHz drive or 1st LO drive signal. There is a direct relationship between spurious signals on the 1st LO and spurious signals on the tracking generator output. There is a five-to-one relationship between spurious signals on the 600 MHz drive and the spurious signals on the tracking generator output. For example, if the 600 MHz signal moves 1 MHz, the tracking generator output signal will move 5 MHz. This is due to the multiplication in the pentupler.

1. If the Harmonic Spurious Responses performance test failed, connect another spectrum analyzer, such as an HP 8566A/B, to the spectrum analyzer under test LO OUTPUT connector. Set the spectrum analyzer under test to each frequency as indicated in the performance test, with the SPAN set to 0 Hz. The 1st LO frequency will be 3.9214 GHz greater than the center frequency setting. Use the HP 8566A/B to measure the level of the second and third harmonics of the 1st LO signal.

Note

The 1st LO typically has a higher harmonic content than the tracking generator output. For the purposes of this check, it is the variation in harmonic content versus frequency which is important.

If the variation of the harmonic level of the 1st LO versus frequency tracks the harmonic level variation of the tracking generator output, repeat step 1 while measuring the 1st LO signal at the end of W41 nearest A3A15. If there is little variation in the 1st LO harmonic level between the LO OUTPUT connector and W41, and the relative variation in harmonic level tracks with the tracking generator output harmonic level, suspect either the A3A14 First LO Distribution Amplifier assembly or the A3A7 YTO assembly.

If the harmonic level variation of the 1st LO versus frequency does not track the harmonic level variation of the tracking generator output, suspect A3A15.

2. If sidebands are present at the same frequency offset at every output frequency, use another spectrum analyzer to check the spectral purity of the 1st LO and the 600 MHz drive signals. When checking the 1st LO, the spectrum analyzer under test must be set to zero span. The 1st LO frequency will be 3.9214 GHz greater than the center frequency setting. A 1 MHz sideband on the 1st LO will appear as a 1 MHz sideband on the output signal.

   To verify that the 600 MHz drive or 1st LO signal is responsible for the sidebands, substitute a clean signal for the 600 MHz drive or 1st LO signal. If the sidebands on the output disappear when using the clean signal, the substituted signal was responsible for the sidebands.

Note

The 600 MHz drive signal should be −8 dBm ±3.5 dB. The 1st LO signal should be +16 dBm ±2 dB.

If power sweep is not functioning properly

Power sweep is accomplished by summing an attenuated SWEEP RAMP signal with the PWR_LVL signal. The SWEEP_RAMP is attenuated using the 12-bit power sweep DAC. The power sweep DAC output is then fed to a summing amplifier where it is summed with the power level DAC output to yield the PWR_LVL signal.

1. If some power sweep ranges do not appear to work properly, the fault is probably the power sweep DAC on the A10 Tracking Generator Control assembly. Check the operation of the power sweep DAC as follows:

   a. Monitor A10U9 pin 7 with an oscilloscope. Connect the ground lead of the oscilloscope to A10TP1. (Refer to the schematic for the A10 Tracking Generator Control assembly.) Trigger the oscilloscope using the spectrum analyzer's HIGH SWEEP IN/OUT signal on the rear panel.

   b. Set the spectrum analyzer by pressing the following keys whilst in spectrum analyzer mode:

      (FREQUENCY)
      CENTER FREQ 300 (MHz)
      (SPAN) 0 (Hz)
      BW 300 (kHz)
      (AUX CTRL)
      TRACK GEN
      SRC POWER ON OFF (ON) −30 (dBm)
      PWR SWP ON OFF (ON) 10 (dB)

   c. The amplitude of the positive-going ramp displayed on the oscilloscope should be approximately 7.8V.

   d. Change the SRC PWR SWEEP setting to any value between 1 and 11 dB. The ramp amplitude displayed on the oscilloscope should be 780 mV per dB of the SRC PWR SWEEP setting.

Note

Although the source power sweep may be set to a 12.75 dB sweep width, the power sweep function is only warranted to have a 11 dB sweep width.

2. Perform the Vernier Accuracy performance test. Vernier Accuracy is part of the "Absolute Amplitude Accuracy" performance verification test in chapter 9. If this test fails, refer to "If vernier accuracy is out of tolerance" earlier in this section.

If there is no output power

The A3A15 assembly requires power supplies, a 1st LO signal, and a 600 MHz drive signal in order to provide power output.

1. Check the power supplies on A10J1 and A3A15J1. Refer to the A10 Tracking Generator Control assembly schematic in the *HP 8590 D-Series and E-Series Spectrum Analyzers Service Guide.*
2. Verify that the voltage at A10J1 pin 4 is greater than +14 Vdc when the tracking generator is on. If the voltage is not greater than +14 Vdc, troubleshoot A10.
3. Check that ALC_EXT, measured at A10J1 pin 10, is at a TTL low when the tracking generator is set to ALC INT and at a TTL high when the tracking generator is set to ALC EXT.
4. Check that the 600 MHz drive signal is −8 dBm ±3.5 dB. If the signal is outside of this range, troubleshoot the A9 Third Converter assembly.
5. Check that the 1st LO input signal is +16 dBm ±2 dB. Perform the LO OUTPUT amplitude check described in "If the output goes unleveled (TG UNLVLD message displayed)" earlier in this section, measuring instead at the end of W41 nearest A3A15.
6. Check the tracking adjustment controls. Monitor A10J1 pin 5 with a DVM. On the spectrum analyzer under test, use the step keys and knob to change the MAN TRACK ADJUST value from 0 to 4095. The voltage measured should increase from 0 V to +12 V.

Caution The following step requires adjustment of A3A15C3. The lifetime of A3A15C3 is rated for less than 10 cycles. Do not adjust A3A15C3 unless it is absolutely necessary.

7. If all of the checks above are acceptable, the tracking oscillator might not be functioning. Setup the spectrum analyzer under test as indicated in the Tracking Oscillator adjustment procedure in this chapter, using a spectrum analyzer, such as an HP 8566A/B, in place of the frequency counter. Try to adjust A3A15C3 until a signal is displayed on the HP 8566A/B. If adjusting A3A15C3 does not result in the tracking generator beginning to function, the A3A15 Tracking Generator assembly is suspect.

Glossary

absolute amplitude accuracy
The degree of correctness or uncertainty (expressed in either volts or dB power). It includes relative uncertainties plus calibrator uncertainty. For improved accuracy, some spectrum analyzers specify frequency response relative to the calibrator as well as relative to the midpoint between peak-to-peak extremes. Refer also to **relative amplitude accuracy**.

active function readout
The area of a display screen where the active function and its state are displayed. The active function is the one that was completed by the last key selection or remote-programming command.

active marker
The marker on a trace that can be repositioned by front-panel controls or programming commands.

active trace
The trace (commonly A, B, or C) that is being swept (updated) with incoming signal information.

amplitude accuracy
The general uncertainty of a spectrum analyzer amplitude measurement, whether relative or absolute.

attenuation
A general term used to denote a decrease of signal magnitude in transmission from one point to another. Attenuation may be expressed as a scalar ratio of the input to the output magnitude in decibels.

bandwidth selectivity
This is a measure of the spectrum analyzer's ability to resolve signals unequal in amplitude. It is the ratio of the 60 dB bandwidth to the 3 dB bandwidth for a given resolution filter (IF). Bandwidth selectivity tells us how steep the filter skirts are. Bandwidth selectivity is sometimes called shape factor.

base station
See **fixed part**.

battery-backed RAM
Random access memory (RAM) data retained by a battery. RAM memory cards can contain data that is maintained with a battery. Refer also to **nonvolatile memory**.

burst carrier
A carrier that is periodically turned off and on. A burst carrier may or may not be modulated.

carrier

A signal used to convey information through modulation of signal characteristics. The amplitude of a carrier signal is usually higher than other types of signals.

Conference Europeenne des Postes et Telecommunications (CEPT), has allocated the frequency band 1880 MHz to 1900 MHz throughout Europe for DECT. This allows ten DECT carriers. To calculate the center frequencies f_c of these carriers, use the following equation:

$$f_c = f_o - C \times 1728\ kHz$$

Where:

f_c is the center frequency of the carrier corresponding to the channel number.

C is the channel number and has the value 0 through 9.

$f_o = 1897.344\ MHz$.

channel number

A number assigned to a carrier frequency.

clear-write mode

This is a spectrum analyzer function that clears the specified trace (A, B, or C) from the display, then sweeps (updates) the trace each time trigger conditions are met. When trigger conditions are met, the new input-signal data is displayed, then cleared, and the process begins again.

collision detection

Collision detection is the function of the Z Field within the DECT packet. Its contents are the same as the last four bits of the Data field.

command

A set of instructions that are translated into instrument actions. The actions are usually made up of individual steps that together can execute an operation. Generally, for spectrum analyzers it is a sequence of code that controls some operation of a spectrum analyzer. These codes can be keyed in via a controller, or computer. Refer also to **function**.

continuous carrier

A carrier that is always on. A continuous carrier may or may not be modulated.

continuous sweep mode

The spectrum analyzer condition where traces are automatically updated each time trigger conditions are met.

data field

The Data or D field within the DECT packet contains the data. Its length depends on whether the transmission medium has selected full, half or double slot packet size.

DECT

The abbreviation for Digital European Cordless Telecommunications.

default

The factory-defined conditions, options, or parameters of an instrument. The default state may be changed by choosing key selections or writing programming commands to use other conditions.

display detector mode

The manner in which analog, video information is processed prior to being digitized and stored in memory.

DLP

The abbreviation for downloadable program. A single programming command or a sequence of programming commands used to perform specific operations. DLPs can be made up of several functions, variables, and traces defined by the program creator. The DLP can be downloaded from one electronic storage medium into another and executed without a controller.

drift

The slow (relative to sweep time) change of signal position on the display as a result of a change in local oscillator frequency versus sweep voltage. While spectrum analyzer drift may require periodic retuning, it does not impair frequency resolution.

dynamic range

The power ratio (dB) between the smallest and largest signals simultaneously present at the input of a spectrum analyzer that can be measured with some degree of accuracy. Dynamic range generally refers to measurement of distortion or intermodulation products.

envelope detector

A detector circuit whose output follows the envelope, but not the instantaneous variation of its input signal. This detector is sometimes called a peak detector. In superheterodyne spectrum analyzers, the input to the envelope detector comes from the final IF, and the output is a video signal. When the spectrum analyzer is in zero span, the envelope detector demodulates the input signal, and you can observe the modulating signal as a function of time on the display.

error message

A message, displayed on the spectrum analyzer display, that indicates an error condition. An error condition can be caused by missing or failed hardware, improper user operation, or other conditions that require additional attention. Generally, the requested action or operation cannot be completed until the condition is resolved.

ETSI

The abbreviation for European Telecommunications Standards Institute.

external trigger signal

For the DECT measurements personality, the external trigger signal is a TTL signal that is input to the spectrum analyzer's GATE INPUT connector. The external trigger signal initiates a sweep of the spectrum analyzer, thus the external trigger signal makes the measurements synchronous with the frame rate of the burst RF input signal.

firmware

An assembly made up of hardware and instruction code. The hardware and instruction code is integrated and forms a functional set that cannot be altered during normal operation. The instruction code, permanently installed in the circuitry of the instrument, is classified as ROM (read-only memory). The firmware determines the operating characteristics of the instrument or equipment. Each firmware version is identified by a revision code number, or date code.

fixed part

The fixed part (FP) acts as the main control unit for sending and receiving transmissions from portable parts. Multiple portable parts can be used with a fixed part in a DECT communication system. A FP is also called a base station.

FP
See **fixed part**.

frame
For a DECT signal, a frame represents the time period in which the PP and FP can be transmitting or receiving data. Each frame is equivalent to 11520-bits (11520-bits is the sum of the transmission burst length of the PP, and the transmission burst length of the FP). The time period in which the FP or PP transmission occurs is called a timeslot, and there are 24 timeslots per DECT frame.

frequency accuracy
The uncertainty with which the frequency of a signal or spectral component is indicated, either in an absolute sense or relative to another signal or spectral component. Absolute and relative frequency accuracies are specified independently.

frequency range
The range of frequencies over which the spectrum analyzer performance is specified. The maximum frequency range of many microwave spectrum analyzers can be extended with the application of external mixers.

frequency resolution
The ability of a spectrum analyzer to separate closely spaced spectral components and display them individually. Resolution of equal amplitude components is determined by resolution bandwidth. Resolution of unequal amplitude signals is determined by resolution bandwidth and bandwidth selectivity.

frequency response
The peak-to-peak variation in the displayed signal amplitude over a specified center frequency range. Frequency response is typically specified in terms of ±dB relative to the value midway between the extremes. It also may be specified relative to the calibrator signal.

frequency span
The magnitude of the displayed frequency component. Span is represented by the horizontal axis of the display. Generally, frequency span is given as the total span across the full display. Some spectrum analyzers represent frequency span (scan width) as a per-division value.

frequency stability
The ability of a frequency component to remain unchanged in frequency or amplitude over short- and long-term periods of time. Stability refers to the local oscillator's ability to remain fixed at a particular frequency over time. The sweep ramp that tunes the local oscillator influences where a signal appears on the display. Any long-term variation in local oscillator frequency (drift) with respect to the sweep ramp causes a signal to shift its horizontal position on the display slowly. Shorter-term local oscillator instability can appear as random FM or phase noise on an otherwise stable signal.

front-panel key
Keys, typically labeled, that are located on the front panel of an instrument. The key labels identify the function the key activities. Numeric keys and step keys are two examples of front-panel keys.

function
The action or purpose that a specific item is intended to perform or serve. The spectrum analyzer contains functions that can be executed via front-panel key selections, or through programming commands. The characteristics of these functions are determined by the

firmware in the instrument. In some cases, a DLP (downloadable program) execution of a function allows you to execute the function from front-panel key selections.

GFSK

The abbreviation for Gaussian Frequency Shift Keying. This term represents the digital signal modulation used for the transmission and reception of DECT signaling. A binary one is defined as having a peak frequency deviation of f_c+f and a binary zero being f_c-f were f_c is the carrier frequency and $f=288\ kHz$.

handset

See **portable part**.

harmonic distortion

Undesired frequency components added to signals because of nonlinear behavior of the device (for example, a mixer or an amplifier) through which signals pass. These unwanted components are harmonically related to the original signal.

HP-IB

The abbreviation for Hewlett-Packard Interface Bus. It is a parallel interface that allows you to "daisy-chain" more than one device to a port on a computer or instrument. Interface protocol is defined in IEEE 488.2. It is equivalent to the industry standard GPIB.

idle state

A transmitter is in the idle state when the RF output of the transmitter is turned off, but the rest of the base station or handset is operational and the unit is immediately available for use.

input attenuator

An attenuator between the input connector and the first mixer of a spectrum analyzer (also called an RF attenuator). The input attenuator is used to adjust the signal level incident to the first mixer, and to prevent gain compression due to high-level or broadband signals. It is also used to set the dynamic range by controlling the degree of internally-generated distortion. For some spectrum analyzers, changing the input attenuator settings changes the vertical position of the signal on the display, which then changes the reference level accordingly. In Hewlett-Packard microprocessor-controlled spectrum analyzers, the IF gain is changed to compensate for changes in input attenuator settings. Because of this, the signals remain stationary on the display, and the reference level is not changed.

intermodulation attenuation

A measure of the capability of the transmitter to inhibit the generation of intermodulation distortion products.

intermodulation distortion

Undesired frequency components resulting from the interaction of two or more spectral components passing through a device having nonlinear behavior, such as a mixer or an amplifier. The undesired components are related to the fundamental components by sums and differences of the fundamentals and various harmonics. The algorithm is:

$$f_1 \pm f_2, 2 \times f_1 \pm f_2, 2 \times f_2 \pm f_1, 3 \times f_1 \pm 2 \times f_2, \textit{ and so on}$$

limit line

A test limit made up of a series of line segments, positioned according to frequency or time, and amplitude, within the spectrum analyzer's measurement range. Two defined limit lines may be displayed simultaneously. One sets an upper test limit, the other sets a lower test limit. Trace data can be compared with the limit lines as the spectrum analyzer sweeps. If the trace data exceeds either the upper or lower limits, the spectrum analyzer displays a message or sounds a warning, indicating that the trace failed the test limits.

limit-line file
The user-memory file that contains the limit-line table entries. Limit lines are composed of frequency and amplitude components that make up a trace array and this data is stored in the file. The limit-line file feature is available on spectrum analyzers that are capable of limit-line operation. Refer also to **limit line**.

limit-line table
The line segments of a limit line are stored in the limit-line table. The table can be recalled to edit the line segments, then restored in the limit-line file. Refer also to **limit line**.

LO
The abbreviation for local oscillator. The local oscillator output in a superheterodyne system is mixed with the received signal to produce a sum or difference equal to the intermediate frequency (IF) of the receiver.

LO feedthrough
The response that occurs on a spectrum analyzer's CRT when the first local oscillator frequency is equal to the first IF. The LO feedthrough is a 0 Hz marker with no error, so it can be used to improve the frequency accuracy of spectrum analyzers with nonsynthesized LO systems.

log display
The display mode in which vertical deflection is a logarithmic function of the input-signal voltage. Log display is also called logarithmic display. The display calibration is set by selecting the value of the top graticule line (reference level), and scale factor in volts per division. On Hewlett-Packard spectrum analyzers, the bottom graticule line represents zero volts for scale factors of 10 dB/division or more. The bottom division, therefore, is not calibrated for those spectrum analyzers. Spectrum analyzers with microprocessors allow reference level and marker values to be indicated in dBm, dBmV, dBμV, volts, and occasionally in watts. Nonmicroprocessor-based spectrum analyzers usually offer only one kind of unit, typically dBm.

marker
A visual indicator we can place anywhere along the displayed trace. A marker readout indicates the absolute value of the trace frequency and amplitude at the marked point. The amplitude value is displayed with the currently selected units.

maximum input level
The maximum signal power that may be safely applied to the input of a spectrum analyzer. The maximum input level is typically 1 W (+30 dBm) for Hewlett-Packard spectrum analyzers.

memory
A storage medium, device, or recording medium into which data can be stored and held until some later time, and from which the entire original data may be retrieved.

memory card
A small, credit-card-shaped memory device that can store data or programs. The programs are sometimes called personalities and give additional capabilities to your instrument. Typically, there is only one personality per memory card. Refer also to **personality**.

menu
The spectrum analyzer functions that appear on the display and are selected by pressing front-panel keys. These selections may evoke a series of other related functions that establish groups called menus.

nonvolatile memory

Memory data that is retained in the absence of an ac power source. This memory is typically retained with a battery. Refer also to **battery-backed RAM**.

normal transmitted power

The Normal Transmitted Power (NTP) is the transmitted power averaged from the start of bit b0 of the physical packet to the end of the physical packet.

packet timing

There are four DECT packet types. These are defined as short, basic, low rate or high capacity packets depending on what the transmission medium selects as appropriate for the application. As the Data field is the only time varying parameter the data capacity of the packet is affected. All packet timings are derived from a full slot except the high capacity packet which is double the slot time.

Each packet can be one of two lengths. This depends if the Z Field is used as not all DECT transmissions will utilize it. If it is used then there are up to eight varying sizes of RF burst to measure.

Table Glossary-7. Burst Times

Packet	Duration	+ Z Field	Guard Space
Short Physical	83.3us	N/A	52.08us
Basic Physical	364.58us	368.06us	52.08us or 48.6us
Low Capacity	156.25us	159.72us	52.08us or 48.6us
Double Capacity	781.25us	784.72us	52.08us or 48.6us

parameter units

Standard units of measure, which include the following:

Measured Parameter	Unit Name	Unit Abbreviation
frequency	hertz	Hz
power level	decibel relative to 1 mW	dBm
power ratio	decibel	dB
voltage	volt	V
time	second	s
electrical current	ampere	A
impedance (resistance)	ohm	Ω

peak detection mode

The spectrum analyzer state where circuits calculate the peak value of a displayed signal. This value is determined by evaluating a series of measured values from an active trace.

peak detector

A detector that follows the peak or envelope of the signal applied to it. The standard detector in a spectrum analyzer is typically a peak detector. MIL-STD EMI measurements usually call for peak detection.

personality
: Applications available on a memory card or other electronic media that extends the capability of an instrument for specific uses. Examples include the digital radio personality and the cable TV personality.

physical packet
: In general the DECT packet contains three fields; the synchronization field, the data field and the collision detection field, and a guard space.

portable part
: The portable part (PP) is the portable part of a DECT communication system. A portable part is used with a fixed part in a DECT communication system. A PP can be used like a telephone in that you can initiate or end a phone call with it. The fixed part is also called the handset.

positive peak
: The maximum, instantaneous value of an incoming signal. On digital displays, each displayed point of the signal indicates the maximum value of the signal for that part of the frequency span or time interval represented by the point.

PP
: See **portable part**.

query
: Any spectrum analyzer programming command having the distinct function of returning a response. These commands may end with a question mark (?). Queried commands return information to the computer.

random-access memory
: RAM (random-access memory) or read-write memory, is a storage area allowing access to any of its storage locations. Data can be written to or retrieved from RAM, but data storage is only temporary. When the power is removed, the information disappears. User-generated information appearing on a display is RAM data.

read-only memory
: ROM (read-only memory) that is encoded into the spectrum analyzer's firmware. The data can be read only; it cannot be written to or altered by the user.

reference level
: The calibrated vertical position on the display used as a reference for amplitude measurement in which the amplitude of one signal is compared with the amplitude of another regardless of the absolute amplitude of either.

relative amplitude accuracy
: The uncertainty of an amplitude measurement in which the amplitude of one signal is compared with the amplitude of another, regardless of the absolute amplitude of either. Distortion measurements are relative measurements. Contributors to uncertainty include frequency response and display fidelity and changes of input attenuation, IF gain, scale factor, and resolution bandwidth.

RES
: The abbreviation for Radio Equipment Specifications. This is a sub-working group of ETSI.

resolution bandwidth
: The ability of a spectrum analyzer to display adjacent responses discretely (hertz, hertz decibel down). This term is used to identify the width of the resolution bandwidth filter of a spectrum analyzer at some level below the minimum insertion-loss point (maximum

deflection point on the display). Typically, it is the 3 dB resolution bandwidth that is specified, but in some cases the 6 dB resolution bandwidth is specified.

scale factor
The per-division calibration of the vertical axis of the display.

sensitivity
The level of the smallest sinusoid that can be observed on a spectrum analyzer, usually under optimized conditions of minimum resolution bandwidth, 0 dB input attenuation, and minimum video bandwidth. Hewlett-Packard defines sensitivity as the displayed average noise level. A sinusoid at that level appears to be about 2 dB above the noise.

serial prefix
Serial numbers that identify an instrument begin with a five-character prefix. The prefix in this case represents the version of firmware that particular instrument was shipped with.

single-sweep mode
The spectrum analyzer sweeps once when trigger conditions are met. Each sweep is initiated by pressing an appropriate front-panel key, or by sending a programming command.

softkey
Key labels displayed on a screen or monitor that are activated by mechanical keys surrounding the display, or located on a keyboard. Softkey selections usually evoke menus that are written into the program software. Front-panel key selections determine the menu (set of softkeys) appears on the display.

span
Span equals the stop frequency minus the start frequency. The span setting determines the horizontal-axis scale of the spectrum analyzer display.

span accuracy
The uncertainty of the indicated frequency separation of any two signals on the display.

spectral component
One of the sine waves comprising a spectrum.

spectrum
An array of sine waves differing in frequency and amplitude. They are properly related with respect to phase and, taken as a whole, form a particular time-domain signal.

spectrum analyzer
A device that effectively performs a Fourier transform and displays the individual spectral components (sine waves) that form a time-domain signal.

spurious emissions
The signals at frequencies other than those associated with the normal modulating and switching of the RF carrier.

spurious response
The undesired responses that appear on a spectrum analyzer display because of the input signal. Internally generated distortion products are spurious responses, as are image and multiple responses. These can be either harmonic responses or nonharmonic responses. Harmonic responses are second, third, fourth, and so on, harmonics of the input signal. Nonharmonic responses are intermodulation and residual responses.

step

The increment of change that results when you press the front-panel step keys, ▲ and ▼, or by program commands.

stop/start frequency

Terms used in association with the stop and start points of the frequency measurement range. Together they determine the span of the measurement range.

syntax

The grammar rules that specify how commands must be structured for an operating system, programming language, or applications.

synchronization field

The Synchronization or S field within the DECT packet is 32 bits long. The first 16 bits are a preamble and the second 16 bits define if it is a Fixed or Portable part transmission.

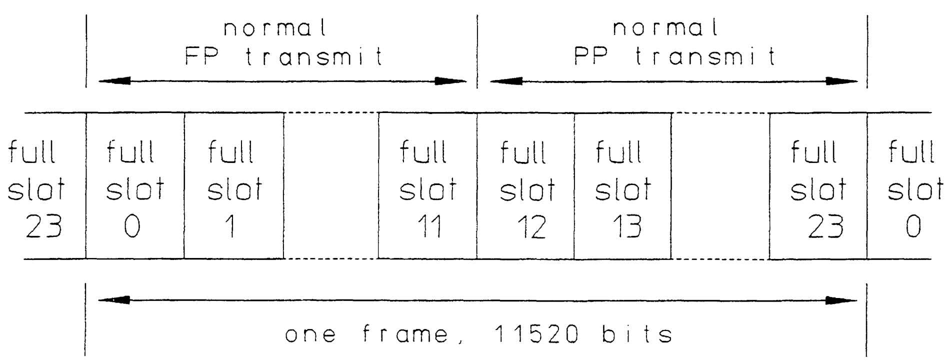
TDD

The abbreviation for time division duplexing. TDD is the transferring of data by simultaneous transmission and reception from two sources over the same frequency. The signal transmission from each source occurs at a different time interval.

TDMA

The abbreviation for time division multiple access. User signals are separated by the time they transmit, in addition to the frequency at which they transmit.

The TDMA/TDD structure for DECT is shown in Figure Glossary-14. The overall frame size is 10 ms long. Each frame consists of 11520-bits, therefore the bit rate is 1152 kbits/sec. Each frame consists of 24 slots.



frame

Figure Glossary-14. TDMA/TDD Structure For DECT

For two way traffic two channels are used. The first twelve slots of the frame are used for the transmission and the last twelve slots are used for the reception.

test limit

The acceptable results levels for any given measurement. The levels vary from country to country, and depend on the equipment being tested.

timeslot

For a DECT signal, a timeslot the part of the frame in which data is transmitted or received. Each timeslot is 4.17 ms long, and permits 11520-bits to be transmitted. Refer also to **frame**.

trace
A trace is made up of a series of data points containing frequency and amplitude information. The series of data points is often called an array. Traces A, B, and C are the typical names of traces that spectrum analyzer displays. The number of traces is specific to the instrument.

TX (transmit) band
The frequency range over which a DECT handset or base station can transmit carrier signals. The DECT transmit band (TX band) frequencies range from 1880 MHz to 1900 MHz.

units
Dimensions on the measured quantities. Units usually refer to amplitude quantities because they can be changed. In spectrum analyzers with microprocessors, available units are dBm (dB relative to 1 mW (milliwatt) dissipated in the nominal input impedance of the spectrum analyzer), dBmV (dB relative to 1 mV (millivolt)), dBμV (dB relative to 1 μV), volts, and, in some spectrum analyzers, watts.

update
To make existing information current; to bring information up to date.

video
A term describing the output of a spectrum analyzer's envelope detector. The frequency range extends from 0 Hz to a frequency that is typically well beyond the widest resolution bandwidth available in the spectrum analyzer. However, the ultimate bandwidth of the video chain is determined by the setting of the video filter.

video bandwidth
The cut-off frequency (3 dB point) of an adjustable low-pass filter in the video circuit. When the video bandwidth is equal to or less than the resolution bandwidth, the video circuit cannot fully respond to the more rapid fluctuations of the output of the envelope detector. The result is a smoothing of the trace, or a reduction in the peak-to-peak excursion, of broadband signals such as noise and pulsed RF when viewed in broadband mode. The degree of averaging or smoothing is a function of the ratio of the video bandwidth to the resolution bandwidth.

video filter
A post-detection, low-pass filter that determines the bandwidth of the video amplifier. It is used to average or smooth a trace. Refer also to **video bandwidth**.

zero span
The case in which a spectrum analyzer's local oscillator remains fixed at a given frequency so that the spectrum analyzer becomes a fixed-tuned receiver. In this state, the bandwidth is equal to the resolution bandwidth. Signal amplitude variations are displayed as a function of time. To avoid loss of signal information, the resolution bandwidth must be as wide as the signal bandwidth. To avoid any smoothing, the video bandwidth must be set wider than the resolution bandwidth.

Index

G

H

I

T

U

V

W

X

Z