# 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.


**Printed in USA March 2000**

User's Guide

# HP 85723A DECT Measurements Personality


HP Part No. 85723-90001
Printed in UK May 1993

# Hewlett-Packard Software Product License Agreement and Limited Warranty

**Important** Please carefully read this License Agreement before opening the 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.

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

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- 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
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- 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.

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## 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.

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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.**

**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.

## 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.

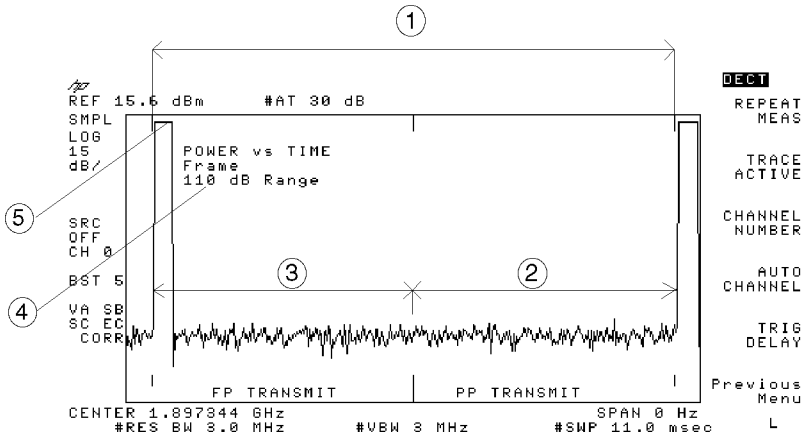


**Figure 0-1. Timing for Handset (PP) and Base Station ( FP) Transmission**

**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.

## In This Guide

This guide provides all the information needed to install and operate the DECT measurements personality.

To use this guide:

1. Perform the procedures in Chapter 1. The procedures in Chapter 1 explain how to prepare the spectrum analyzer for making a DECT measurement.
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.

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

- Chapter 3 contains the verification tests for the 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 DECT measurements personality.
- Chapter 5 contains information about what to do if you have a problem with the DECT measurements personality.
- Chapter 6 contains reference information about the DECT measurements personality's functions.
- Chapter 7 contains general reference information about the DECT measurements personality.
- Chapter 8 contains reference information about the DECT measurements personality's programming commands.

## 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 spectrum analyzer manuals. If your instrument has an "A" suffix refer to your Installation and Verification manual. If your instrument has an "E" suffix refer to your User'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.

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<br>1-800-16510170 (PLDT Subscriber Only) | (632) 8426809<br>1-800-16510288 (PLDT Subscriber Only) |
| Thailand | (088) 226-008 (outside Bangkok)<br>(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)<br>10800-650-0021 | 10800-650-0121 |
| India | 1-600-11-2929 | 000-800-650-1101 |

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# 1

# Getting Started

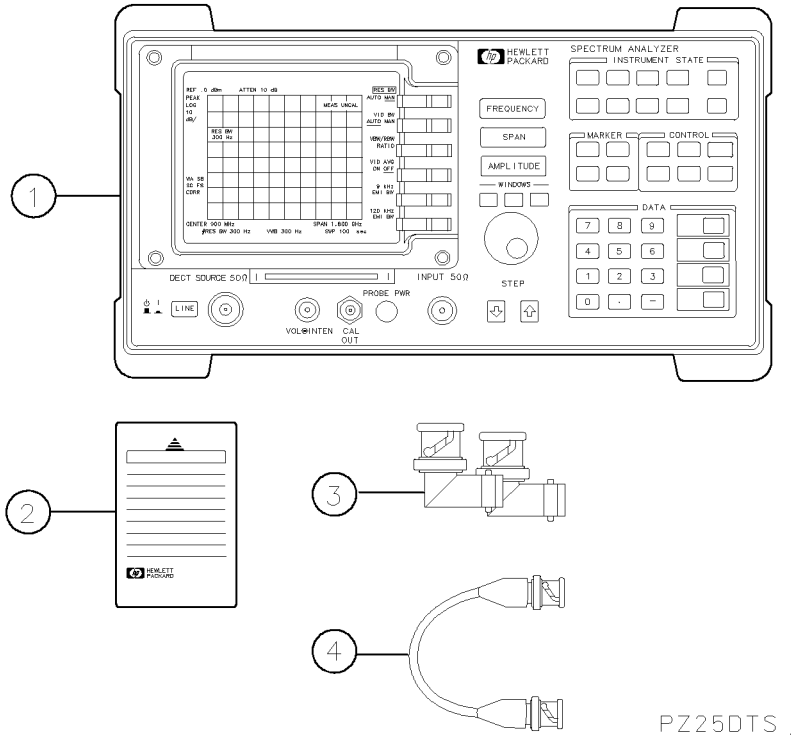
The procedures in this chapter describe how to prepare the spectrum analyzer to measure a DECT transmission. This chapter contains the following information:

- 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 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.



1 An HP 8593A/E, HP 8594A/E, HP 8595A/E, 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 101, the fast time-domain sweeps option card | None | Provides the 20 ms to 20 $\mu$s 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. |

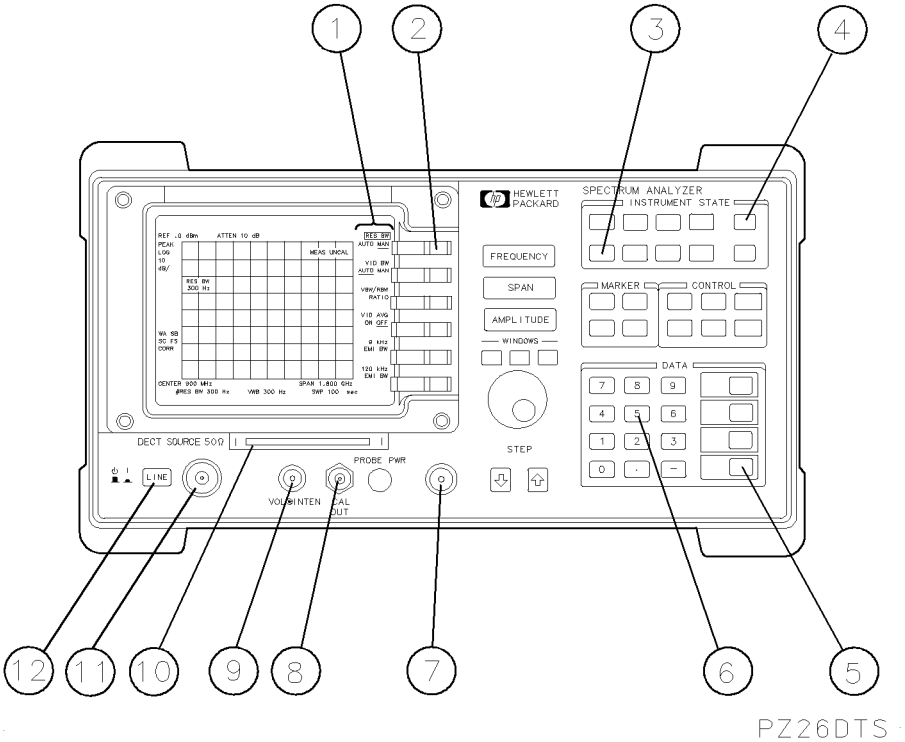
2 The HP 85723A DECT measurements personality read-only memory (ROM) card. The DECT measurements personality is a program that resides on this ROM card.

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.



**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 tracking generator's RF OUT 50Ω connector. (*Option 010 only.*)

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

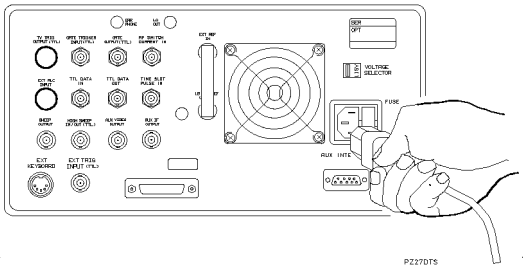
## Preparing to Make a Measurement

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

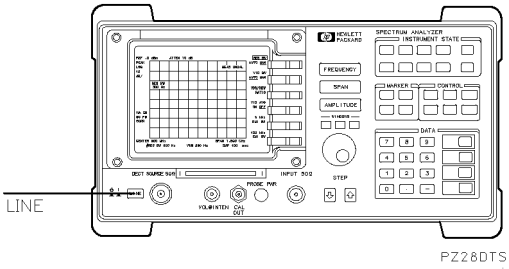
1. Load the DECT measurements personality into the spectrum analyzer's memory.
2. Perform the spectrum analyzer's self-calibration routines.
3. Connect the cables to the spectrum analyzer's rear panel.
4. Access the DECT measurements personality.
5. Configure the personality for your test equipment.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

## Step 1. Load the DECT measurements personality

**1** Plug the spectrum analyzer into an ac power supply.

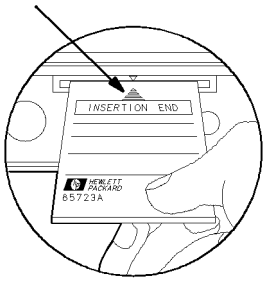


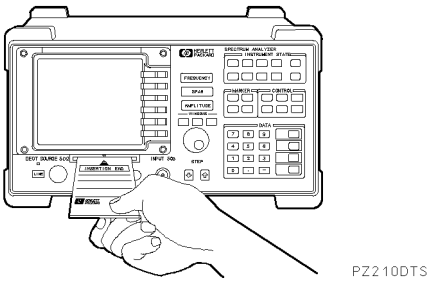

**2** Press the LINE key.




**3** Locate the arrow printed on the DECT measurements personality's card label.

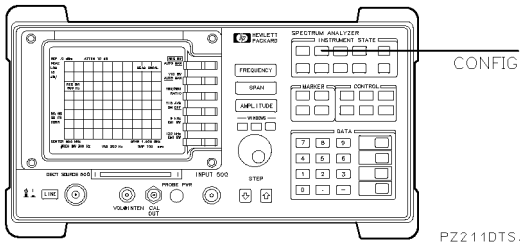
**4** Insert the card into the spectrum analyzer with the card's arrow matching the raised arrow on the bezel around the card-insertion slot.

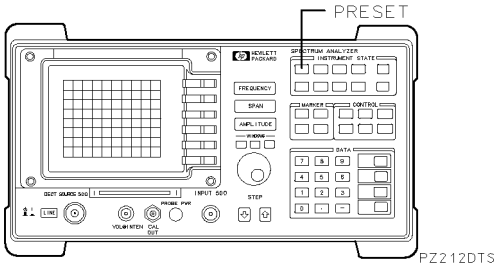


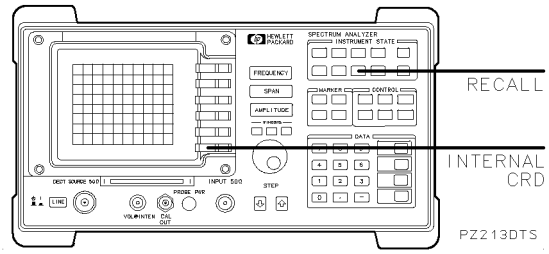

**5** If you have an HP 8590 A-Series spectrum analyzer press CONFIG, More 1 of 3, DISPOSE USER MEM, DISPOSE USER MEM. If you have an HP 8590 E-Series spectrum analyzer press CONFIG, MORE 1 of 3, Dispose User Mem, ERASE DLP MEM, ERASE DLP MEM.

**6** Press PRESET once the DISPOSE USER MEM or ERASE DLP MEM key is no longer highlighted.



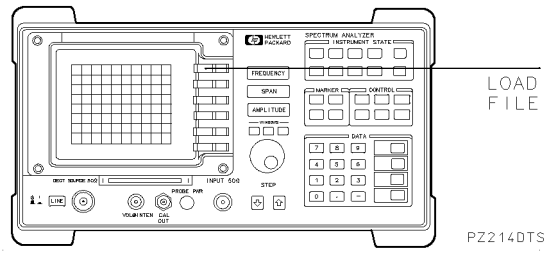
**7** Press (RECALL). Press the `INTERNAL CARD` softkey so that CARD is underlined.




**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.



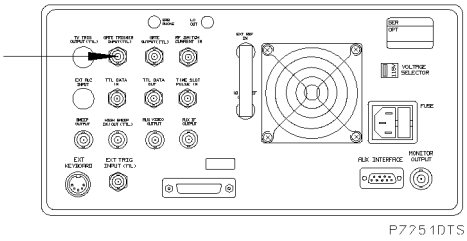

When the spectrum analyzer has finished loading the DECT measurements personality, the catalog entries will be blanked from the spectrum analyzer display.

After completing this procedure, the DECT measurements personality will remain in the spectrum analyzer memory until it is deleted with `DISPOSE USER MEM` for the HP 8590A-Series spectrum analyzer or `ERASE DLP MEM` for the HP 8590 E-Series spectrum analyzer.

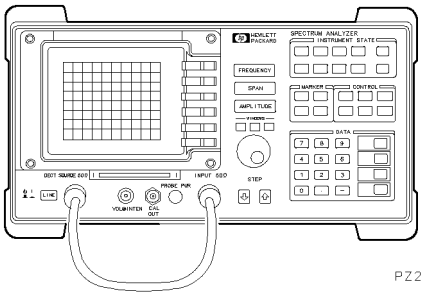
## Step 2. Perform the spectrum analyzer's self-calibration routines

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.

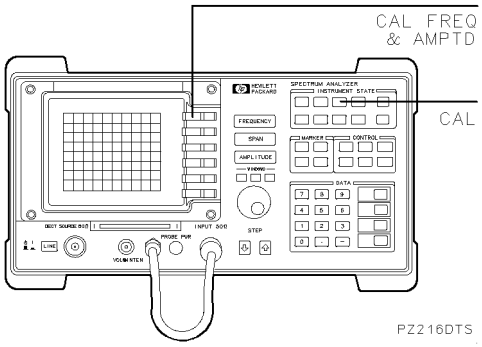
**1** Ensure that there is nothing connected to the GATE TRIGGER INPUT connector on the spectrum analyzer's rear panel.




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

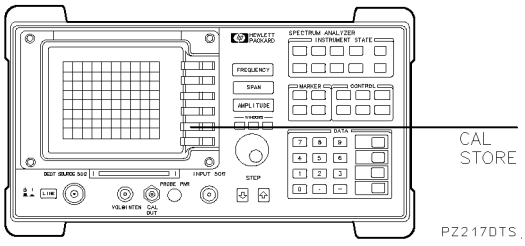



**3** Press (CAL), then `CAL FREQ & AMPTD`.



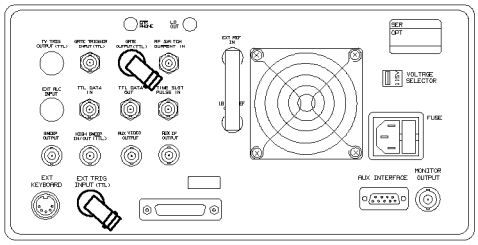

The spectrum analyzer's frequency and amplitude self-calibration routines take about 9 minutes to complete. `CAL:DONE` is displayed when the self-calibration routines are finished. If an error message is displayed, refer to the Installation and Verification Manual for the spectrum analyzer.

**4** Press `CAL STORE`.

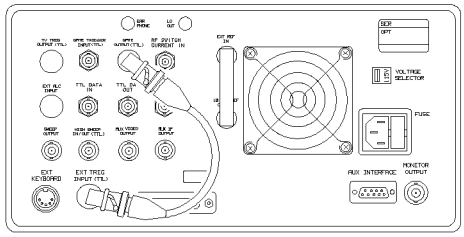


## Step 3. Connect the cables to the spectrum analyzer's rear panel

**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.

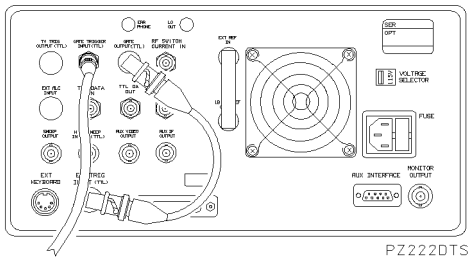


**2** Connect a short BNC cable between the two adapters.



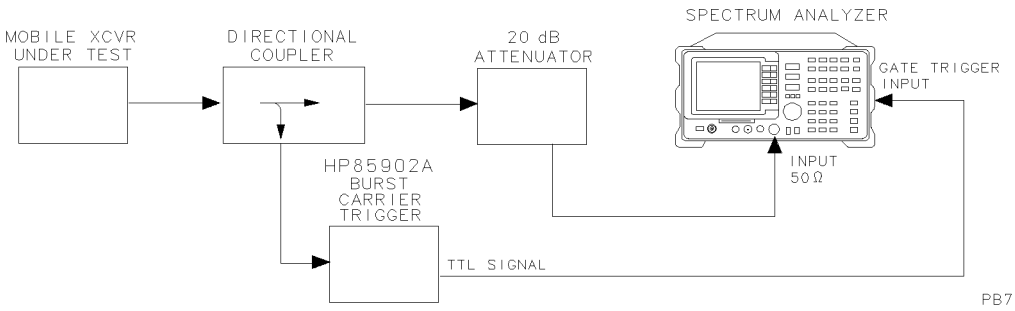

It is not necessary to remove the BNC cable after you have connected it to the right-angle adapters. This cable can remain attached to the spectrum analyzer for all of the DECT measurements and all of the self-calibration routines. If you need to move the spectrum analyzer, the right-angle adapters prevent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

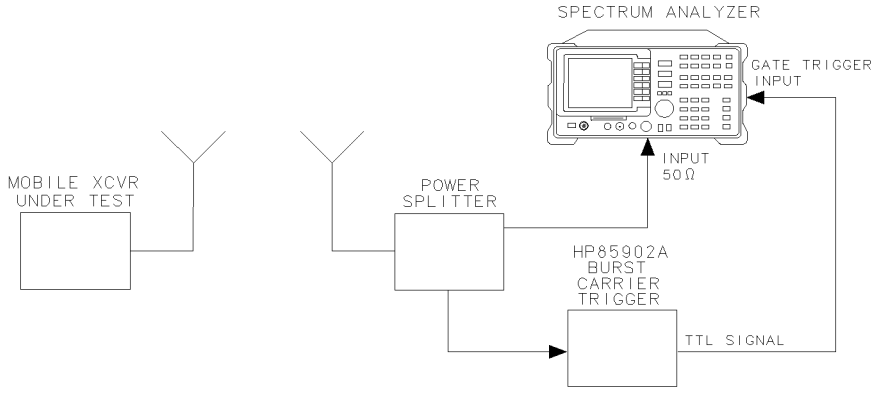



This TTL trigger signal provides an external trigger for the spectrum analyzer. The trigger signal needs to be a transistor-transistor logic (TTL) signal that generates a trigger signal edge for every DECT frame. The external trigger signal can be supplied by the unit under test, or by an associated 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.

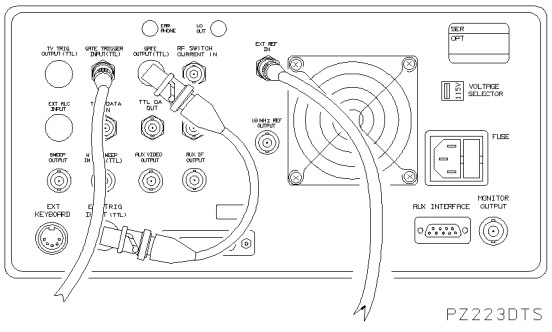



**Mobile Station in Self-Test Mode, Using a Directional Coupler**



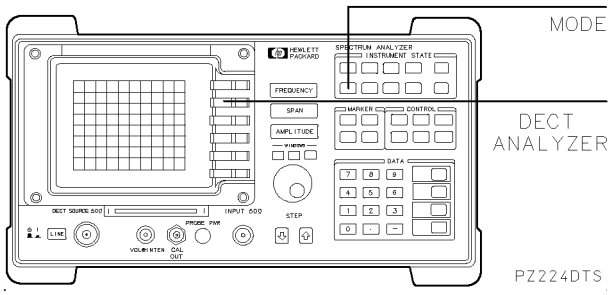

**Mobile Station in Self-Test Mode, Using a Power Splitter**

**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.



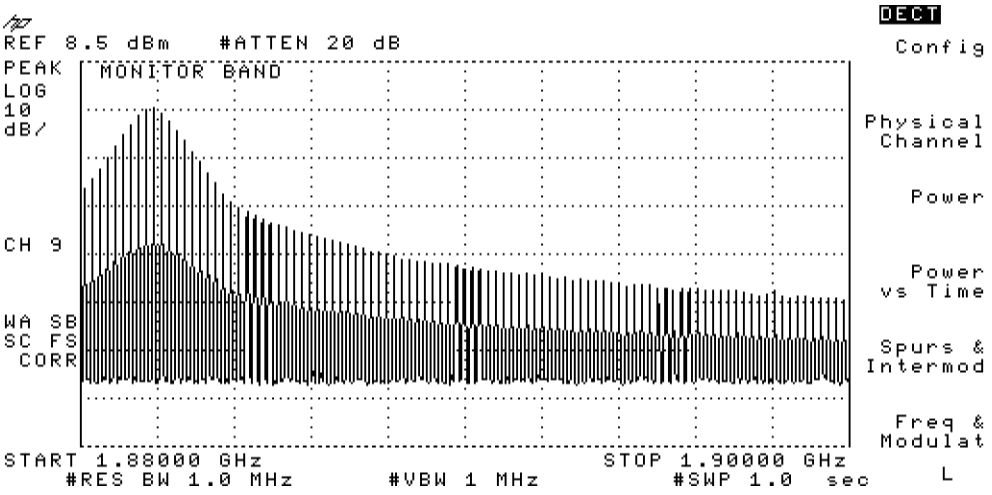
## Step 4. Access the DECT measurements personality

**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.

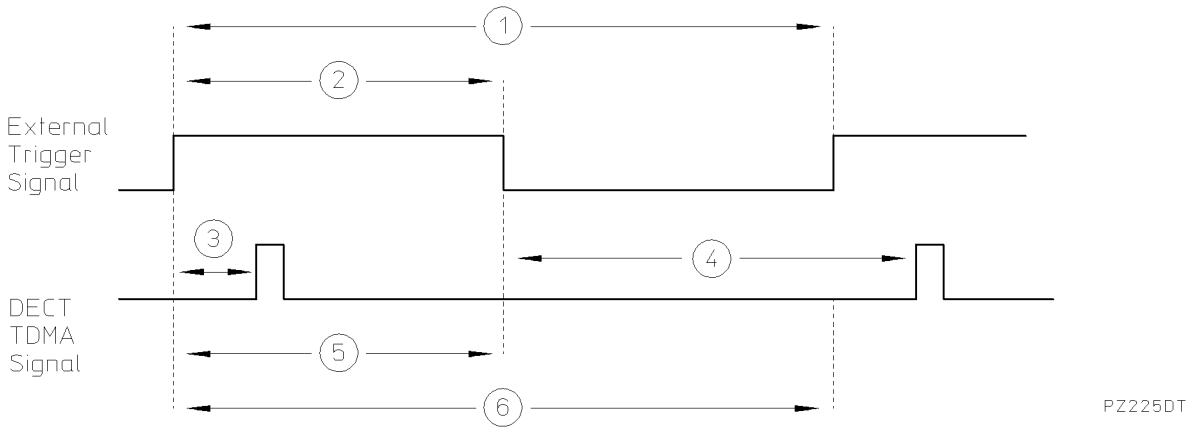



**Figure 1-1. Relationship Between the External Trigger and the DECT Frame**

**Table 1-1.**
**Relationship Between the External Trigger and the DECT Frame**

| 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.

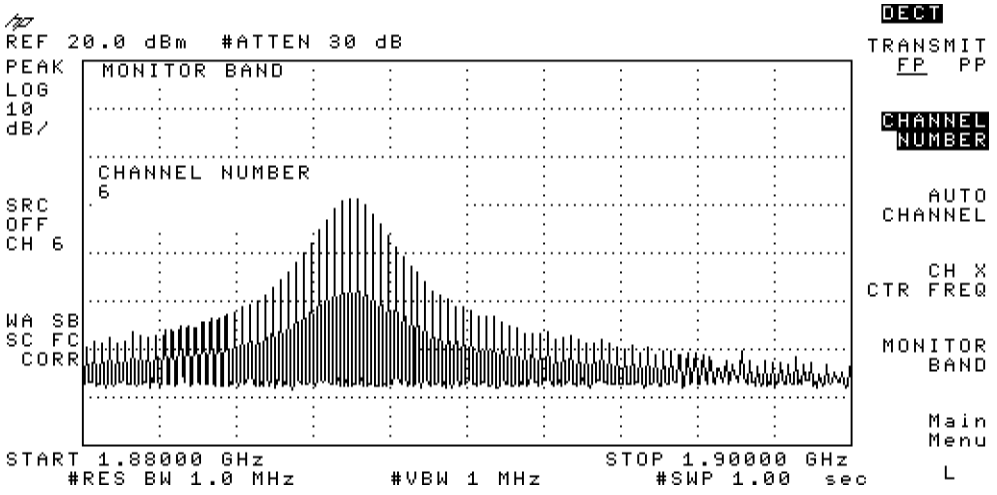



**Figure 1-2. Selecting Channel 1**

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

## 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.

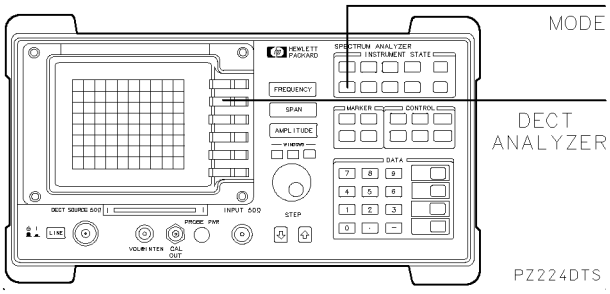
## To access the spectrum analyzer functions while using the DECT measurements personality mode

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

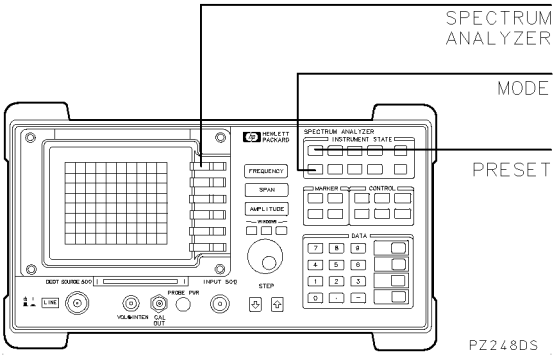
- Press (PRESET). (PRESET) changes all of the DECT measurements personality functions back to their default values, except for the functions in the configuration menu and `TRANSMIT FP PP` and `Demod`.

  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

This chapter demonstrates how to make measurements with the DECT measurements personality. This chapter contains procedures for performing the following measurements:

- 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.

---

**Note** Before you begin any of the following measurements, you need to do the following:

**1** Perform the procedures in "Preparing to Make a Measurement" in Chapter 1.

**2** Connect the RF signal from the transmitter to the spectrum analyzer input.

---

Once the 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.

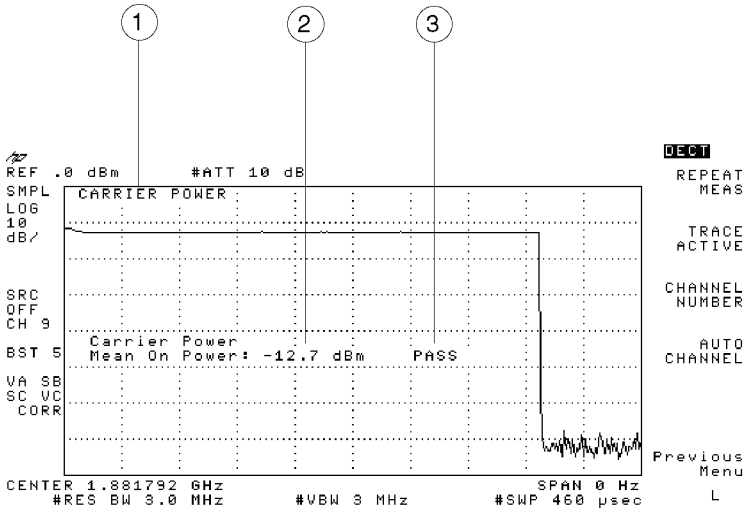



**Figure 2-1. Carrier Power Measurement**

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.

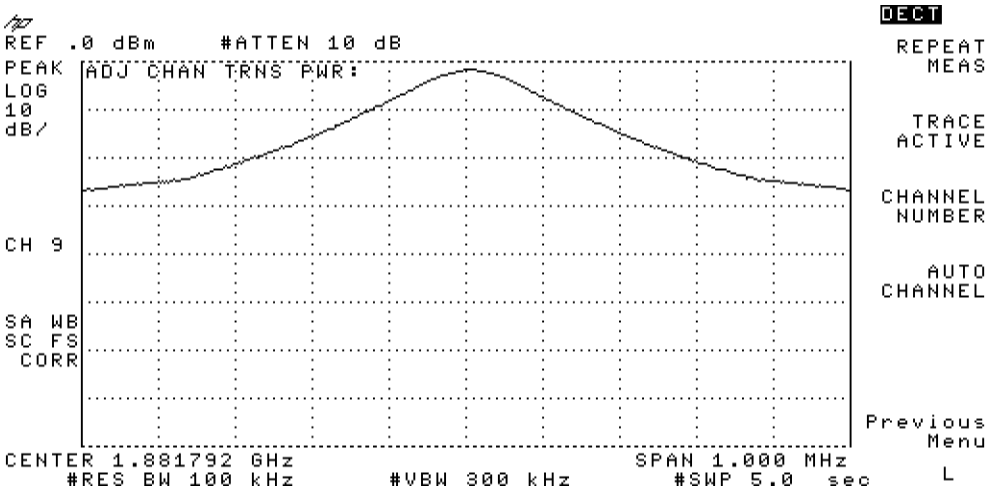



**Figure 2-2. A DECT Carrier with Switching Transients**

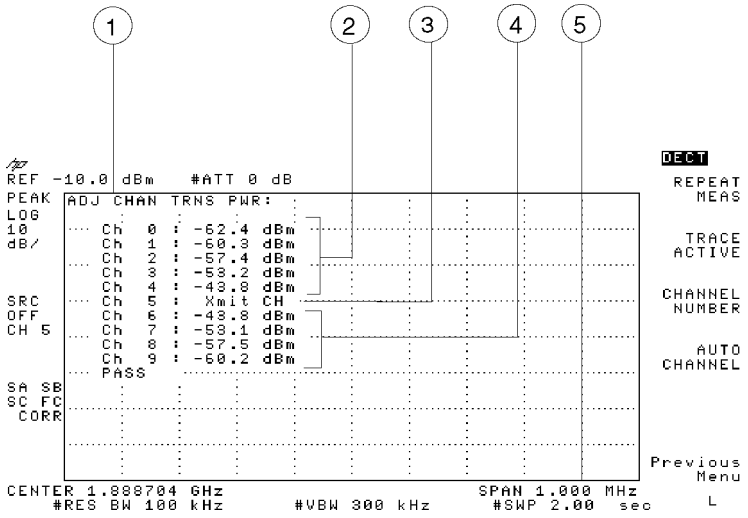



**Figure 2-3.**
**The Adjacent Channel Power due to Switching Transients Measurement Results**

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.

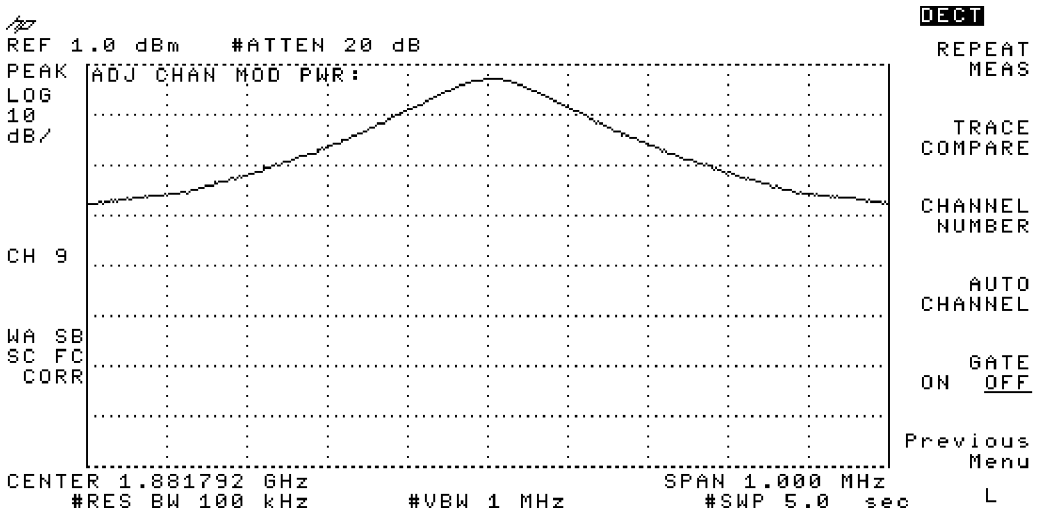



**Figure 2-4. A DECT Carrier with Switching Transients (Time-Gating is Not Used)**

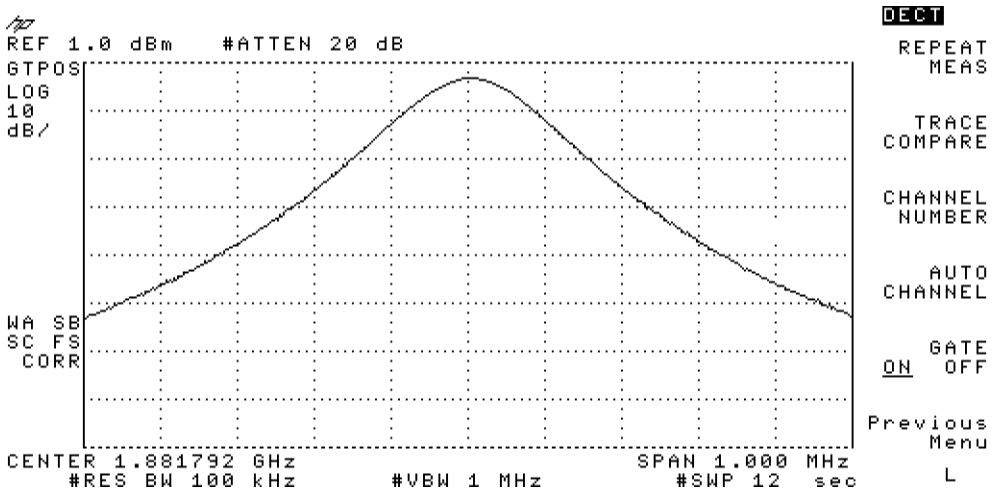



**Figure 2-5. A DECT Carrier without Switching Transients (Time-Gating is Used)**

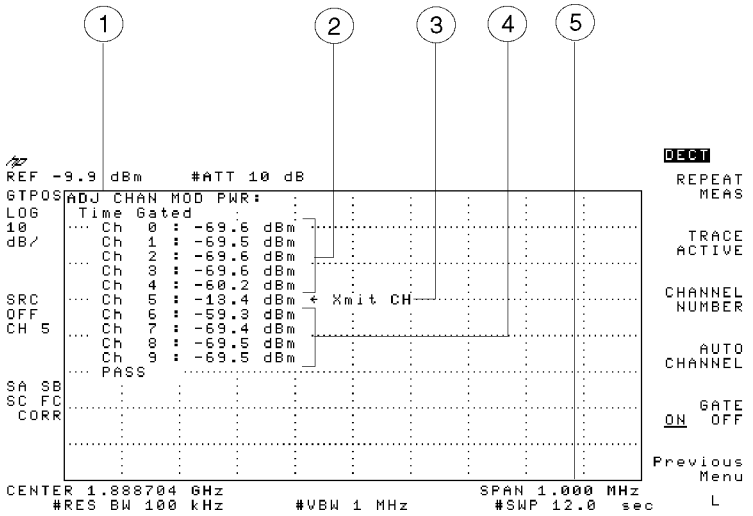



**Figure 2-6. The Adjacent Channel Power Measurement Results (Time-Gating is Used)**

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.

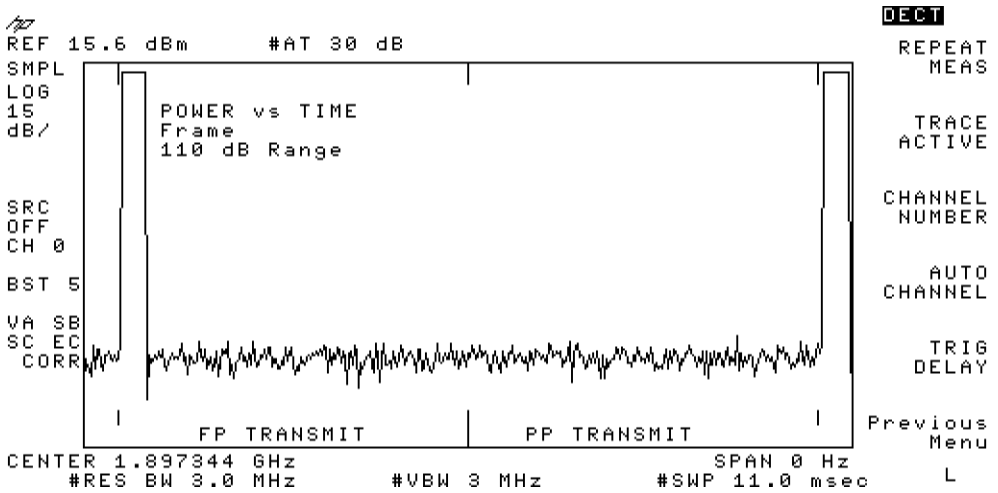



**Figure 2-7. Measuring the Average of Five Bursts**

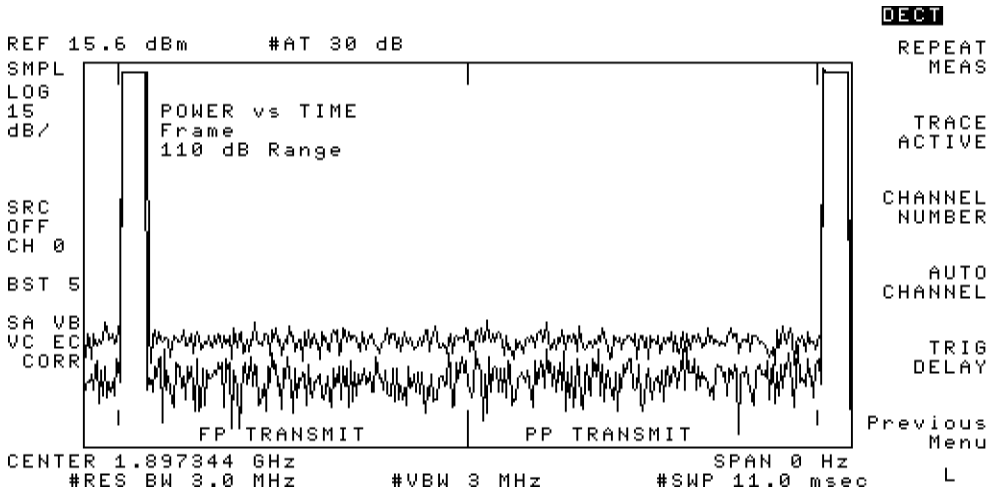



**Figure 2-8. Measuring the Maximum and Minimum Peaks of Five Bursts**

## 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.

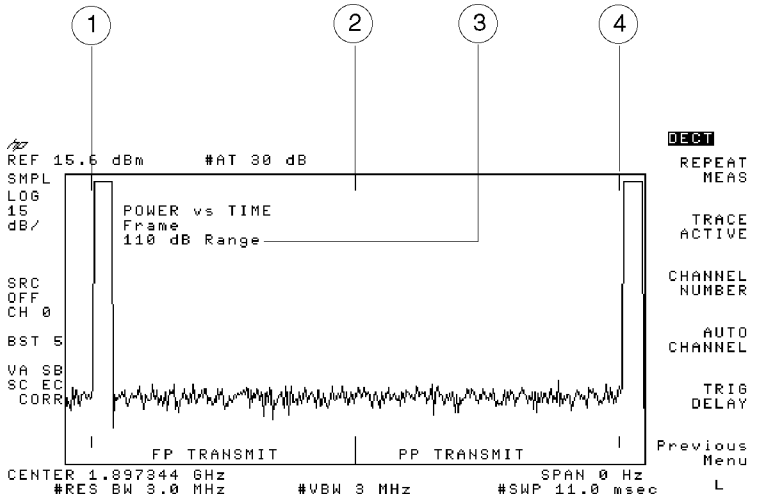



**Figure 2-9. Viewing a Frame**

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.

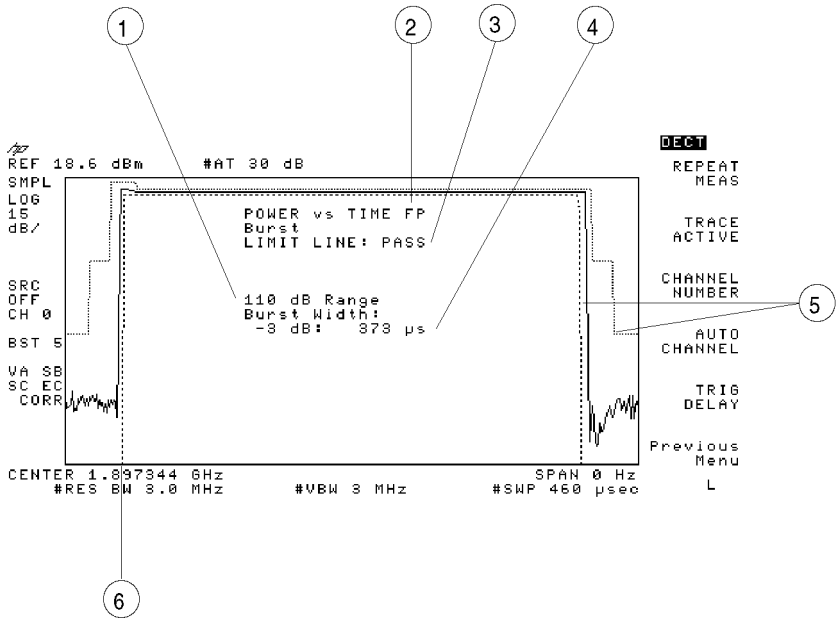



**Figure 2-10. Measure a Burst**

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.

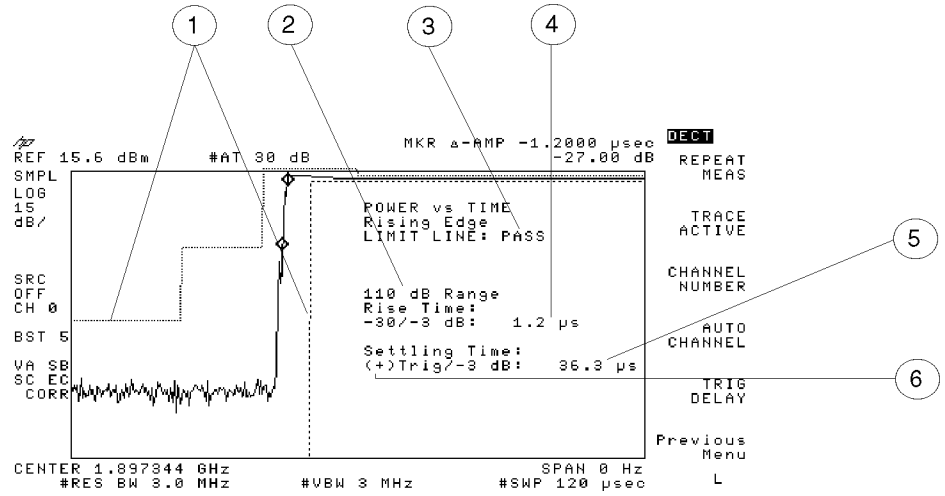



**Figure 2-11. Measuring the Rising Edge of a Burst**

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.

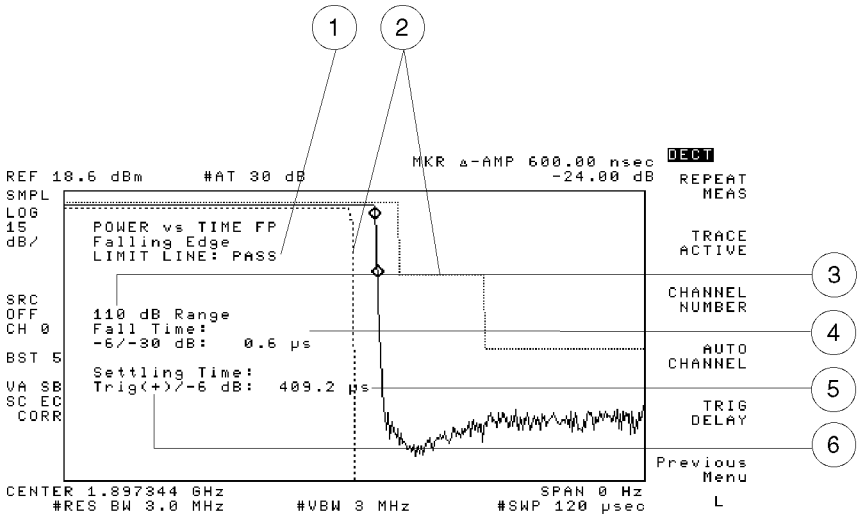



**Figure 2-12. Measuring the Falling Edge of a Burst**

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.

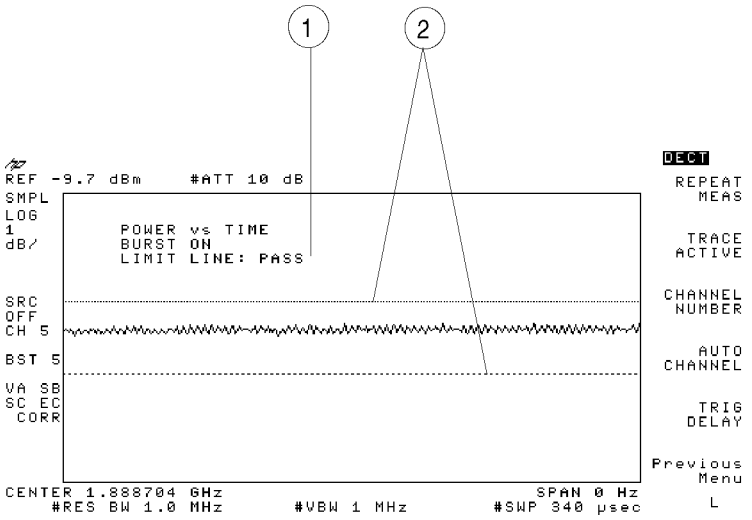



**Figure 2-13. Measuring the On Time of a Burst**

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`.

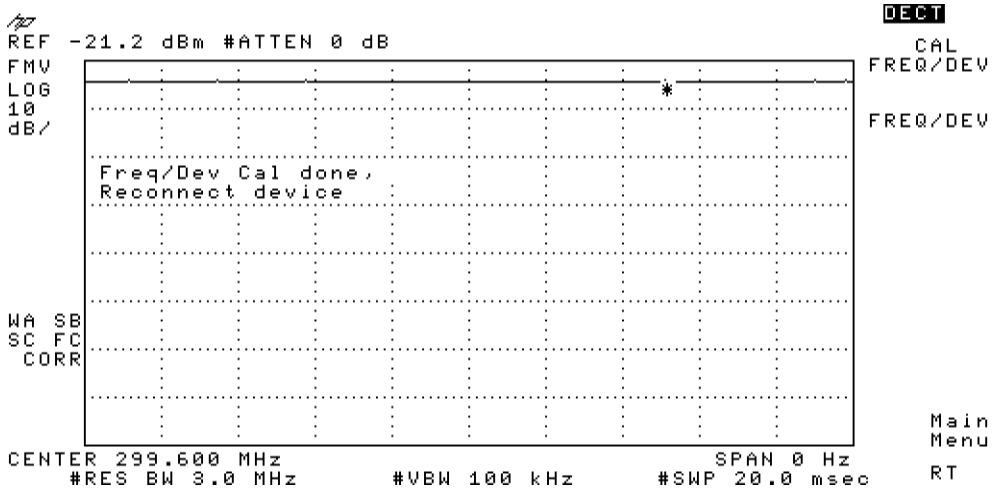
3 Connect a cable between the spectrum analyzer CAL OUT connector and the spectrum analyzer INPUT connector with the appropriate adapters.

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.

---

**Notes**

1. 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.
2. For HP 8590A Series spectrum analyzers the marker function ((MKR)) does not display the correct frequency on the spectrum analyzer display whilst using FM demodulation.

---

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

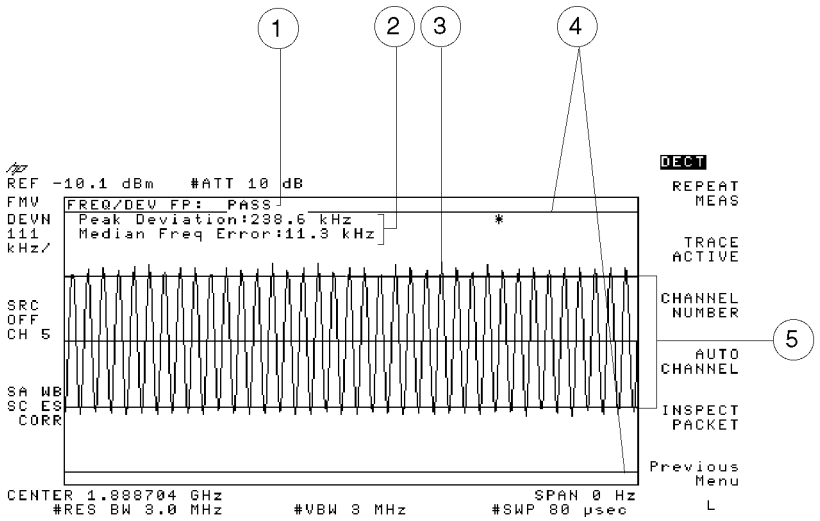



**Figure 2-14. Results of FREQ/DEV, with VIEW PKS LAST Set to LAST**

① Indicates if the frequency and deviation measurements were within the limits.
② The measurement results.
③ The waveform of the first 80 $\mu$s 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.

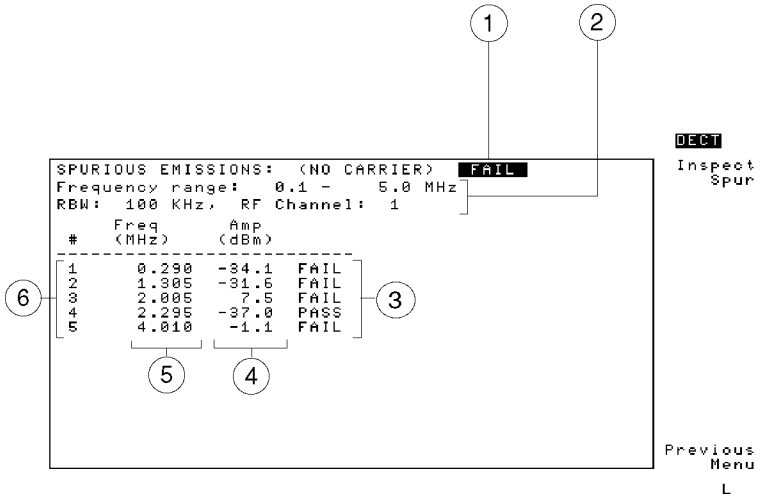



**Figure 2-15. Viewing the Table of Spurious Emissions**

① Indicates if the spurious emission test passed or failed. The 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.

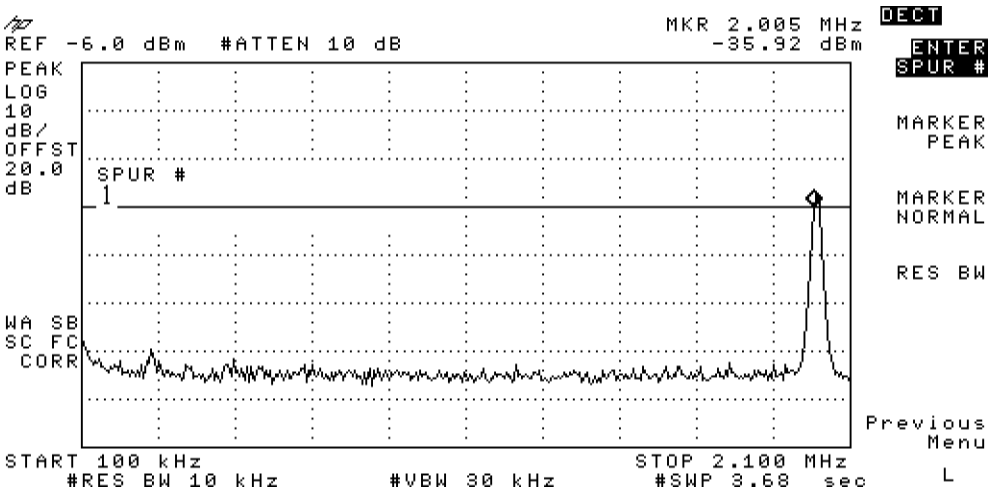
5 If you want to change the resolution bandwidth, press `RES BW`. You may want to decrease the resolution bandwidth for any spurious emissions in the table with an asterisk. (Decreasing the resolution bandwidth decreases the noise floor and increases the sensitivity of the spectrum analyzer.)

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.)

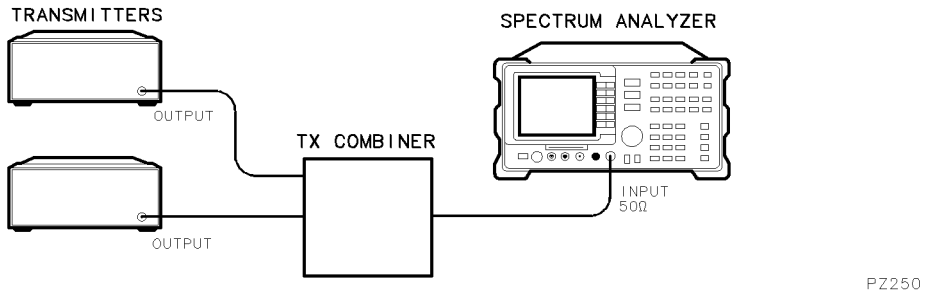



**Figure 2-16. Equipment Setup for the Intermodulation Attenuation Measurement**

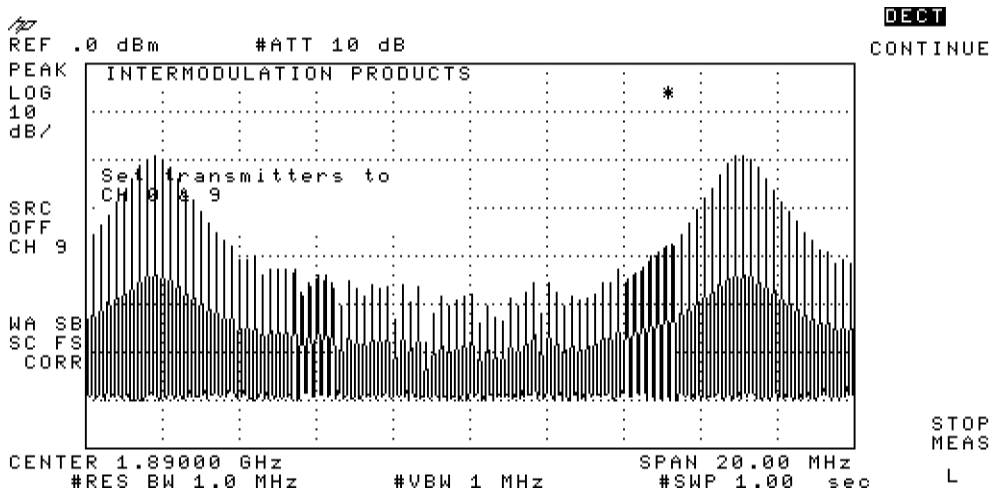



**Figure 2-17. Screen Display of the Two Carriers**

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.

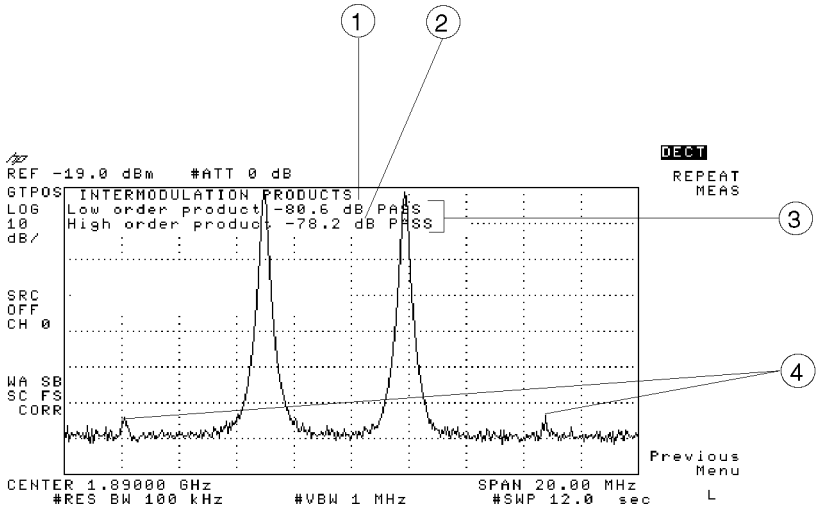



**Figure 2-18. Measuring Intermodulation Attenuation (Time-gating on)**

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.

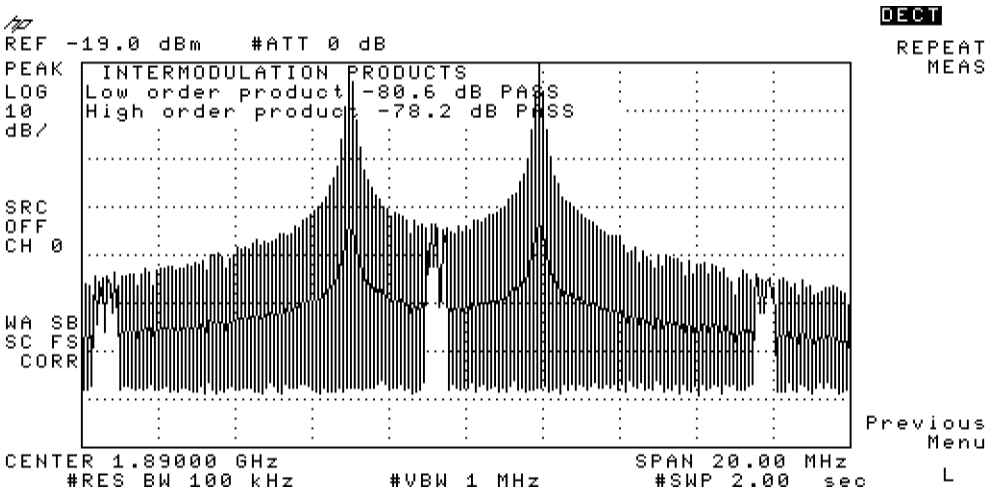



**Figure 2-19. Measuring Intermodulation Attenuation (Time-gating off)**

# 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.

## 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. If your spectrum analyzer has an A suffix you should read "Analyzer Measurements and Applications", Chapter 2 of the . If your spectrum analyzer has an E suffix read "Making Basic Measurements", Chapter 3 of the *HP 8590 Series Spectrum Analyzer User's Guide*. This will familiarize you with basic HP 8590 Series spectrum analyzer operation.
3. Perform the spectrum analyzer's self-calibration routines. If your spectrum analyzer has an A suffix you should refer to "Improving Accuracy with Self-Calibration Routines" in Chapter 1 of the for instructions. If your spectrum analyzer has an E suffix you should 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* or 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<br>Frequency Accuracy (CW): ±0.02%<br>Power Level Required: −10 dBm | HP 83630A<br>*or*<br>HP 8340A/B | P,A,T |
| Synthesizer/ Level Generator | Frequency Range: 50 MHz<br>Amplitude Range: −5 to 0 dBm<br>Flatness: ±0.15 dB<br>Attenuator Accuracy: ±0.09 dB<br>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<br>Duty Cycle: 50%<br>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

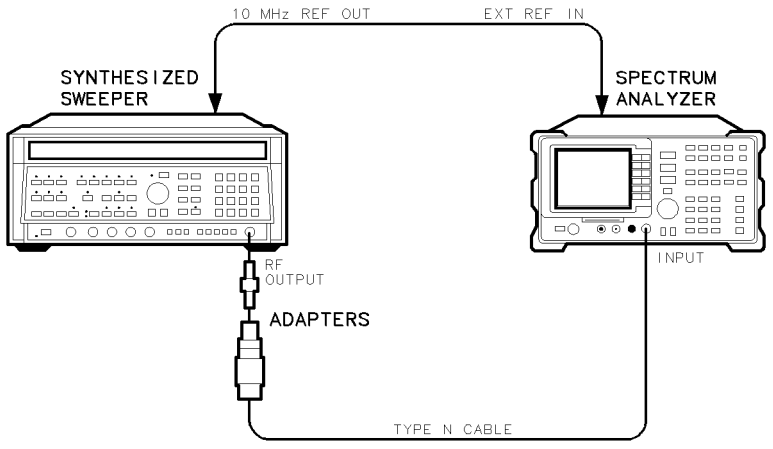



**Figure 3-1. Frequency Readout Accuracy Test Setup**

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, $\Delta$t markers are used. There is often up to 1 $\mu$s of jitter due to the 1 $\mu$s 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.

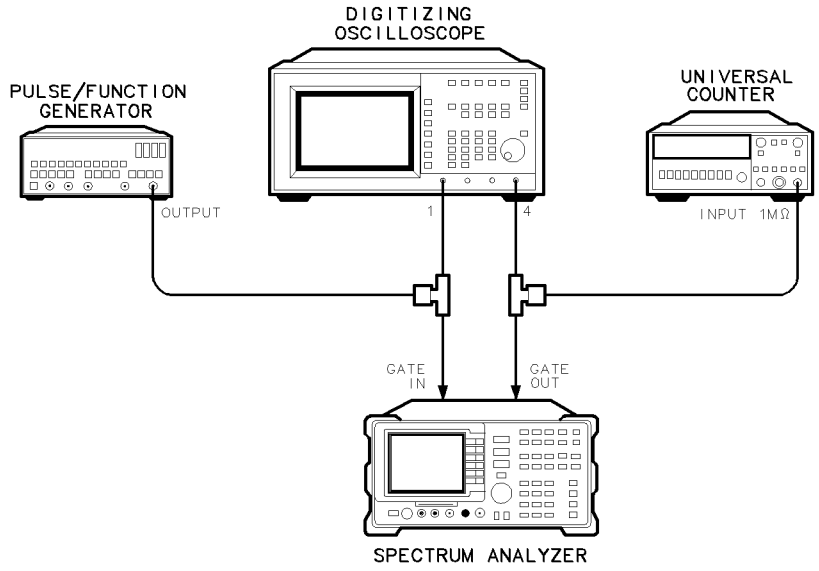



**Figure 3-2. Gate Delay and Gate Length Test Setup**

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 $\eta$s/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 $\mu$s

## 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.

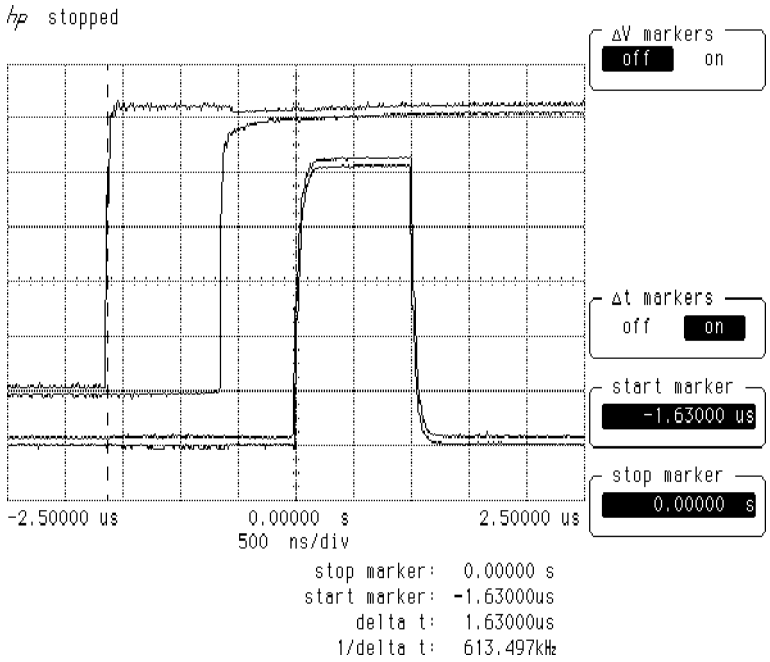



**Figure 3-3. Oscilloscope Display of Minimum and Maximum Gate Delay Values**

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 $\mu$s Gate Length value.

    1 $\mu$s Gate Length _____

    (the 1$\mu$s gate length minimum width should be greater than 800 $\eta$s and maximum width should be less than 1200 $\eta$s.

## 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.)

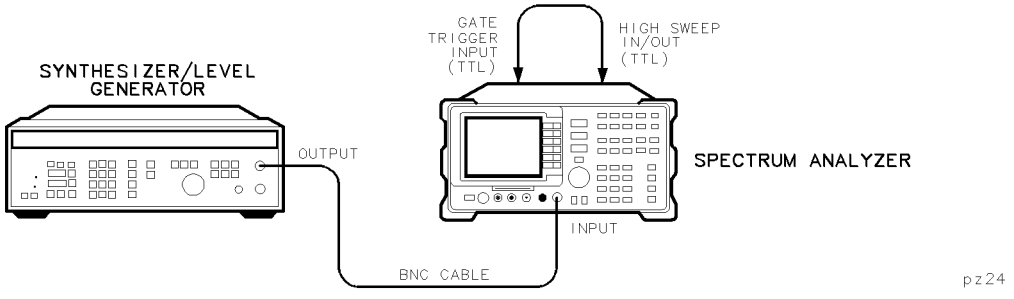



**Figure 3-4. Gate Delay and Gate Length Test Setup**

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 | | | Measurement Uncertainty |
|---|---|---|---|---|---|
| | | Min | Measured | Max | |
| 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 band-
                          width 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. If you have an HP 8590 A-Series spectrum analyzer refer to the  or if you have an HP 8590 E-Series 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 ele-
                                                   ments 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;";
3251    !
3252    OUTPUT @Sa;"LIMILO TRA;";
3253    OUTPUT @Sa;"LIMITEST1;";
3254    !
3255    OUTPUT @Sa;"@;";
3256    !
3257    END
```

*Enters 0 display units in trace elements 352 through 401.*

*Moves trace A into LIMILO. LIMILO represents the lower limit line.*

*Turns on limit line testing.*

*Ends the FUNCDEF declaration.*

## 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 measure-
                                           ment 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 success-
                                           fully 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                                          If Meas_state did not equal 1.
300     DISP "Measurement aborted"
310   END IF
320   !
330   END
```

## 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 deter-
                                                 mine if the measurement
                                                 failed.
50    !                                          Declares a variable that
60    REAL Meas_state                            will hold the measure-
                                                 ment state value.
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 mea-
                                                 surement 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 measure-
                                                 ment was successfully
                                                 completed.
170     PRINT "Adjacent Channel Power Due to Modulation";
180     OUTPUT @Sa;"_F?;"                        Queries _F. _F is a vari-
                                                 able 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?;"
270     ENTER @Sa;Acp_mod_res(*)
280     FOR A=0 TO 9
290     PRINT "CH ";A;" : ";Acp_mod_res(A+1)/10;" dBm"
300       NEXT A
310   ELSE
320     DISP "Measurement aborted"
330   END IF
340   !
350   END
```

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

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

*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.*

*If Meas_state did not equal 1.*

## 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 mea-
                                                         surement 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 mea-
                                                         surement 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 measure-
                                                         ment was successfully
                                                         completed.
170     PRINT "Adjacent Channel Power Due to Transients";
180     OUTPUT @Sa;"_F?;"                                Queries _F. _F is a vari-
                                                         able that contains a 0 if
                                                         the adjacent channel
                                                         power measurement
                                                         passed, or a 1 if the mea-
                                                         surement 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?;"
270     ENTER @Sa;Acp_trans_res(*)
280     FOR A=0 TO 9
290     PRINT "CH ";A;" : ";Acp_trans_res(A+1)/10;" dBm"
300     NEXT A
310   ELSE
320     DISP "Measurement Aborted"
330   END IF
340   !
350   END
```

*Queries _ACPTR. _ACPTR contains the result of the adjacent channel power due to switching transients.*

*Sets the spectrum analyzer trace data format to measurement units and enters the adjacent channel power due to switching transients into Acp_trans_res.*

*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.*

*If Meas_state did not equal 1.*

## 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       You can examine each trace element
element of trace A=";Trace_array(300);" dBm"   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 spec-
                                                 trum analyzer.
110   !
120   !
130   OUTPUT @Sa;"TDF P;"                        Sets the spectrum analyzer
                                                 trace data format to parame-
                                                 ter 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 measure-
                                                 ment state value. For
                                                 _PBURST, the only valid mea-
                                                 surement 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
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            You can examine each trace
element of trace A=";Trace_array(200);" dBm"         element by examining the data
                                                     in the trace array. In this ex-
                                                     ample, 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 ris-
                                           ing 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?;"                    Enters the value.
300     ENTER @Sa;Rise_time
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 measure-
                                                 ment
                                                 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?;"                    Queries the fall time value.
300     ENTER @Sa;Fall_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 "Fall time= ";Fall_time;" usec"
350     PRINT "Amplitude value for 300th       You can examine each trace ele-
element of trace A=";Trace_array(300);" dBm"   ment by examining the data in the
                                               trace array. In this example, the
                                               300th 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 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 measure-
                                             ment 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 mea-
                                             surement 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 con-
                                             tains 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 fre-
                                                 quency error.
90    !
100   ASSIGN @Sa TO 718                          Declares the I/O path to spec-
                                                 trum 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   REPEAT
180     ENTER @Sa;Meas_state
190   UNTIL Meas_state>0 AND Meas_state<3         Checks for a valid measure-
                                                 ment 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
280     UNTIL Meas_state>0 AND Meas_state<6
290     PRINT "FREQUENCY & DEVIATION: ";
300     OUTPUT @Sa;"_F?;"
310     ENTER @Sa;Fail_flag
320     IF Fail_flag=0 THEN
330       PRINT "PASSED"
340     ELSE
350       PRINT "FAILED"
360     END IF
370     OUTPUT @Sa;"_FDEV?;"
380     ENTER @Sa;Freq_dev
390     OUTPUT @Sa;"_FER?;"
400     ENTER @Sa;Freq_err_median
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
```

*Enters the measurement state into Meas_state.*

*Checks for a valid measurement state value. For _FRQDEV, the only valid measurement state values are a 1 through 5.*

*Queries _F. _F is a variable that contains a 0 if the frequency and deviation measurement passed, or a 1 if the measurement failed.*

*Enters the value.*

*Queries the peak carrier frequency deviation value.*

*Enters the value.*

*Queries the median carrier frequency error value.*

*Enters the value.*

## 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 mea-
                                                             surement 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 measure-
                                                             ment was successfully
                                                             completed.
220    PRINT "SPURIOUS EMISSIONS: ";
230    OUTPUT @Sa;"_F?;"                                     Queries _F. _F is a vari-
                                                             able 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 an-
                                                             alyzer 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
510         PRINT "   FAIL";
520       ELSE
530         PRINT "   PASS";
540       END IF
550       IF Sp_ok=0 THEN
560         PRINT " * (CHECK NOISE FLOOR)"
570       ELSE
580         PRINT
590       END IF
600     NEXT I
610   END IF
620 ELSE
630   DISP "Measurement aborted"
640 END IF
650 END
```

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

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

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

*Prints a carriage return and a line feed.*

*If Meas_state did not equal 1.*

## 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 intermodula-
                                                 tion product value.
80    REAL Int_high_res                          Holds the upper intermodula-
                                                 tion product value.
90    !
100   ASSIGN @Sa TO 718                          Declares the I/O path to spec-
                                                 trum 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 measure-
                                                 ment state value. A measure-
                                                 ment state value of 1 is re-
                                                 turned 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 trans-
                                                 mitted 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;"
280   ENTER @Sa;Meas_state
290   UNTIL Meas_state=3
300   OUTPUT @Sa;"_F?;"
310   ENTER @Sa;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?;"
390   ENTER @Sa;Int_low_res
400   OUTPUT @Sa;"_IMDU?;"
410   ENTER @Sa;Int_high_res
420   PRINT "Lower Product = ";Int_low_res;" dB"
430   PRINT "Upper Product = ";Int_high_res;" dB"
440   !
450   END
```

*Measures the gated power integral of the intermodulation products.*

*A measurement state value of 3 is returned if the measurement is successfully completed.*

*Queries _F. _F is a variable that contains a 0 if the intermodulation attenuation measurement passed, or a 1 if it failed.*

*Enters the value of _F into Fail_flag.*

*Queries the lower intermodulation product value.*

*Enters the value.*

*Queries the higher intermodulation product value.*

*Enters the value.*

# 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 (for A-Series spectrum analyzers) or the *HP 8590 Series Spectrum Analyzer User's Guide* (for E-Series spectrum analyzers) for more information about returning the spectrum analyzer for repair.

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**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 (for A-Series spectrum analyzers) or the *HP 8590 Series Spectrum Analyzer User's Guide* (for E-Series spectrum analyzers) 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 (for A-Series spectrum analyzers) or the *HP 8590 Series Spectrum Analyzer User's Guide* (for E-Series spectrum analyzers) 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. - If you have an HP 8590 A-Series spectrum analyzer press (CONFIG), MORE 1 of 3, DISPOSE USER MEM, DISPOSE USER MEM, (PRESET).
   - If you have an HP 8590 E-Series spectrum analyzer 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.

- If you have an HP 8590 A-Series spectrum analyzer you can only have the power versus time and modulation menus *or* the spurious and intermodulation menu loaded into the spectrum analyzer memory at one time. Therefore it is necessary to have the memory card inserted if you require to move between menus.
- If you have an HP 8590 E-Series spectrum analyzer 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

**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

**Colorado**
Hewlett-Packard Co.
24 Inverness Place, East
Englewood, CO 80112
(303) 649-5000

**Georgia**
Hewlett-Packard Co.
2000 South Park Place
Atlanta, GA 30339
(404) 955-1500

**Illinois**
Hewlett-Packard Co.
5201 Tollview Drive
Rolling Meadows, IL 60008
(708) 255-9800

**New Jersey**
Hewlett-Packard Co.
120 W. Century Road
Paramus, NJ 07653
(201) 599-5000

**Texas**
Hewlett-Packard Co.
930 E. Campbell Rd.
Richardson, TX 75081
(214) 231-6101

**EUROPEAN OPERATION HEADQUARTERS**
Hewlett-Packard S.A.
150, Route du Nant-d'Avril
1217 Meyrin 2/Geneva
Switzerland
(41 22) 780.8111

**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

**Germany**
Hewlett-Packard GmbH
Berner Strasse 117
6000 Frankfurt 56
West Germany
(49 69) 500006-0

**Great Britain**
Hewlett-Packard Ltd.
Eskdale Road, Winnersh Triangle
Wokingham, Berkshire RG11 5DZ
England
(44 734) 696622

**INTERCON OPERATIONS HEADQUARTERS**
Hewlett-Packard Company
3495 Deer Creek Rd.
Palo Alto, California 94304-1316
(415) 857-5027

**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

**Japan**
Yokogawa-Hewlett-Packard Ltd.
1-27-15 Yabe, Sagamihara
Kanagawa 229, Japan
(81 427) 59-1311

**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

**Singapore**
Hewlett-Packard Singapore
Pte. Ltd.
1150 Depot Road
Singapore 0410
(65) 273 7388

**Taiwan**
Hewlett-Packard Taiwan
8th Floor, H-P Building
337 Fu Hsing North Road
Taipei, Taiwan
(886 2) 712-0404

# 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.

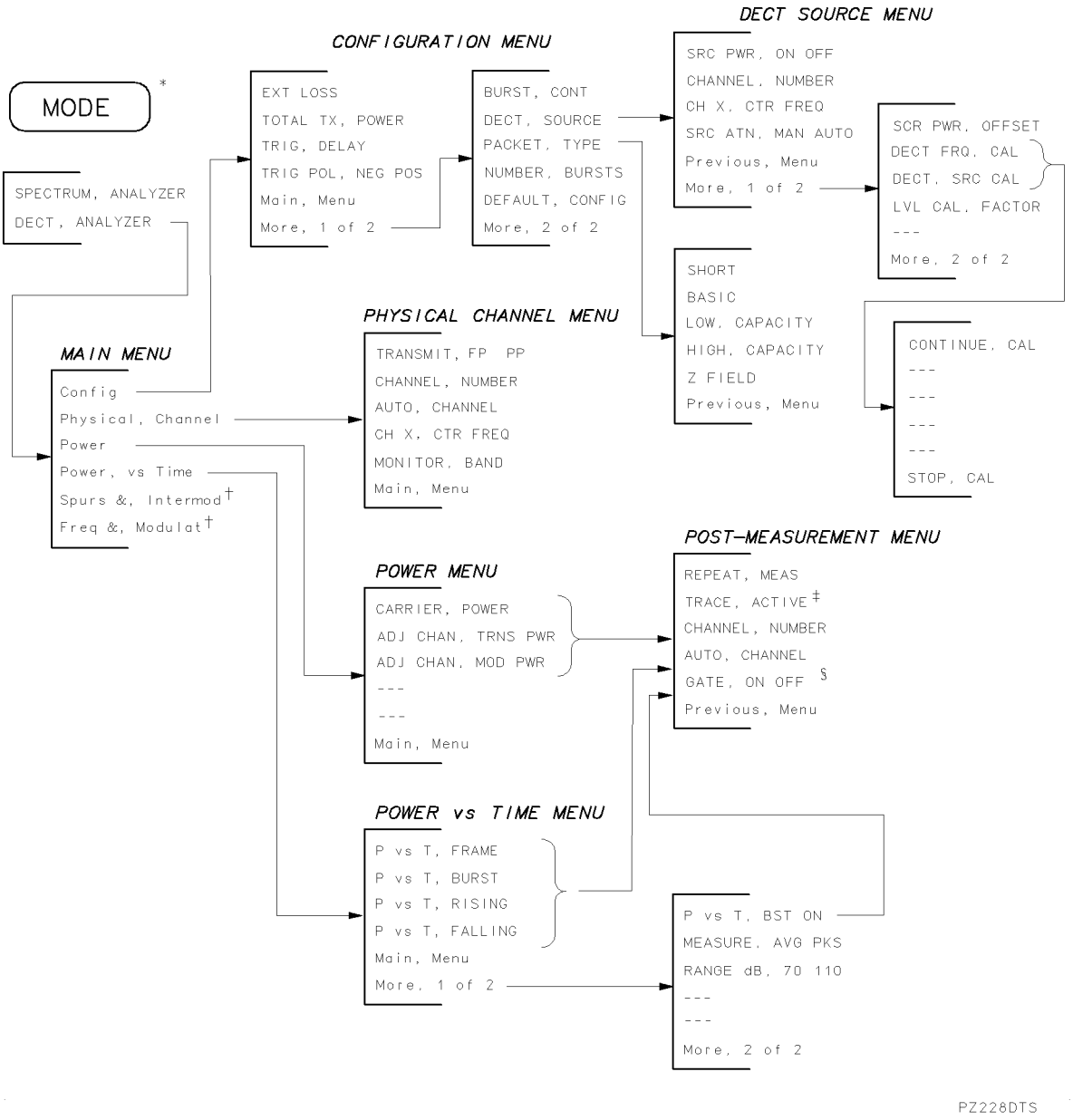



**Figure 6-1. Overall Menu Map**

* 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.

‡ When you press TRACE ACTIVE, the softkey label changes to TRACE COMPARE.

§ 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.

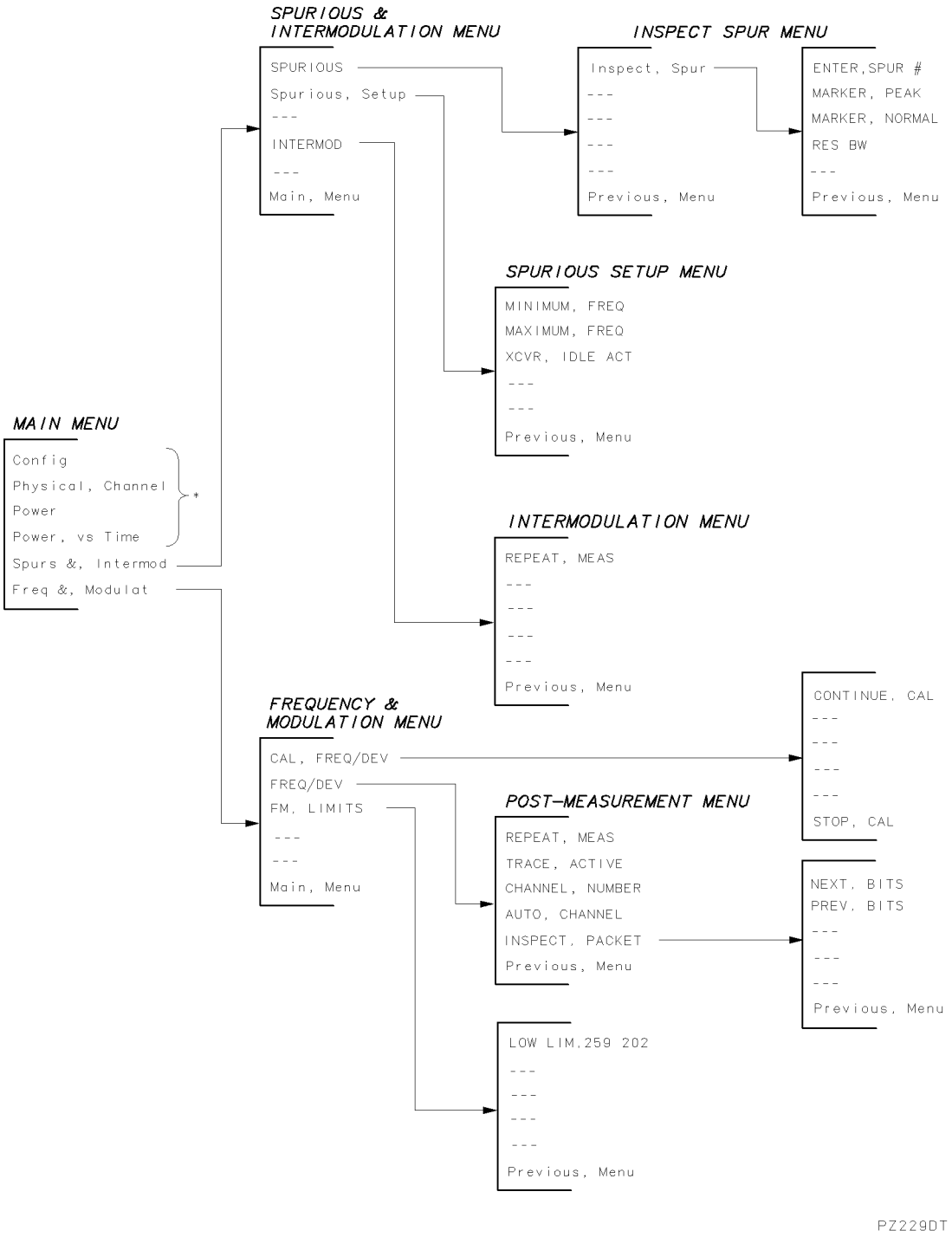
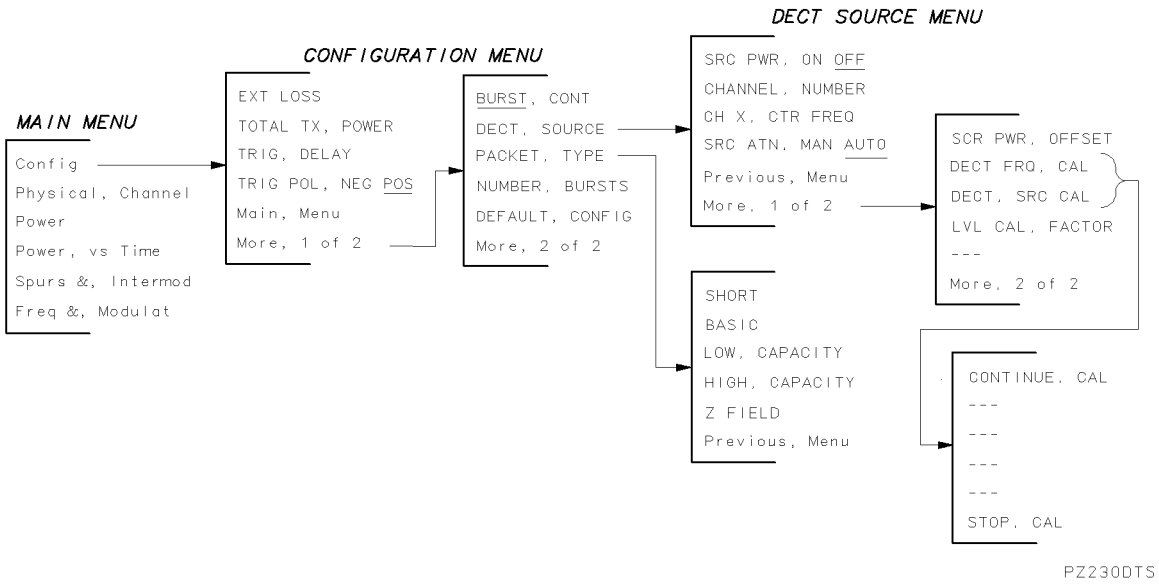



**Figure 6-1. Overall Menu Map (continued)**

* 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 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 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 $\mu$s to +1800 $\mu$s in 1 $\mu$s increments. If you do not enter a trigger delay, a default value of 0 $\mu$s 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.

`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 packets 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 $\mu$s. 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.

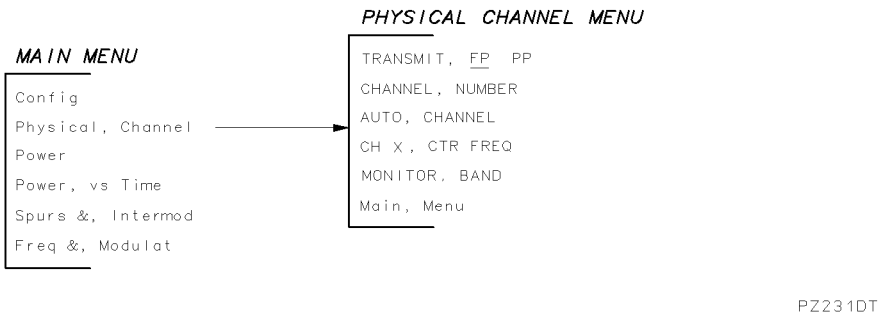
`NUMBER BURSTS` Allows you to change the number of bursts that are used in calculating the trace values. (The trace values can be calculated two different ways—refer to the description for `MEASURE AVG PKS` for more information.) You can change the number of bursts from 1 to 99,999 with the data keys. 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 $\mu$s, `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 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 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.

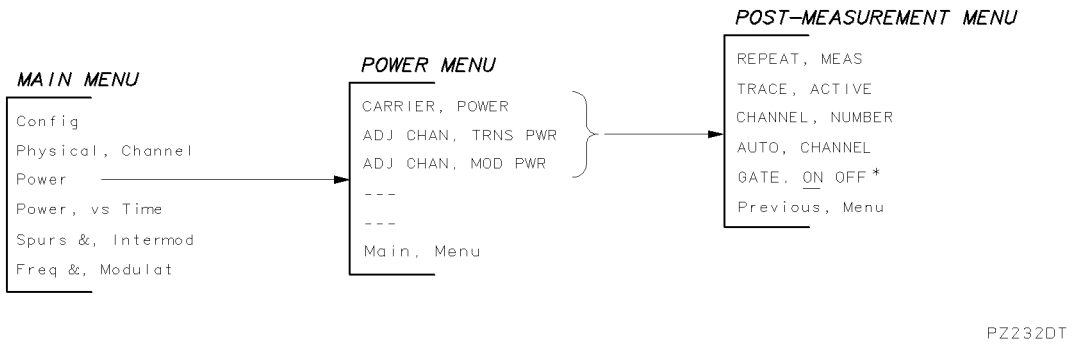
`CH X CTR FREQ` Allows you to enter the frequency of any arbitrary channel that you want to measure. `CH X CTR FREQ` can be helpful if you know the channel's frequency but not the channel number, or if you want to measure a frequency that does not correspond to a standard channel number. If you do not 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 $\mu$s |
| Basic | 460 $\mu$s |
| Low Capacity | 240 $\mu$s |
| High Capacity | 800 $\mu$s |

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.

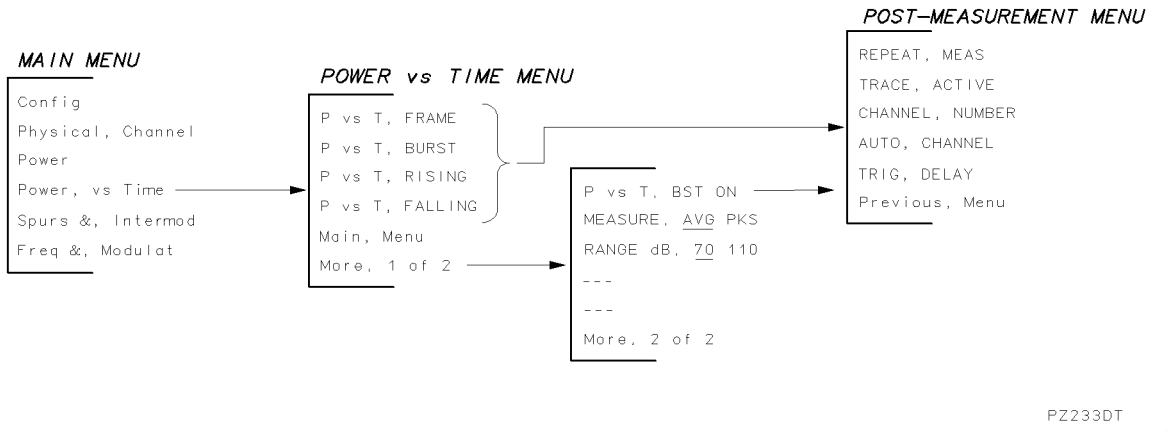
`ADJ CHAN MOD PWR` Measures the power that "leaks" from the transmitted channel due to the effect of modulation. The personality uses the spectrum analyzer's positive peak detector and an 1 MHz integration bandwidth to measure the power in the adjacent channels relative to the transmitting channel. The 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 $\mu$s | 120 $\mu$s | 120 $\mu$s | 60 $\mu$s |
| Basic | 11 ms | 460 $\mu$s | 120 $\mu$s | 120 $\mu$s | 340 $\mu$s |
| Low Capacity | 11 ms | 240 $\mu$s | 120 $\mu$s | 120 $\mu$s | 140 $\mu$s |
| High Capacity | 11 ms | 800 $\mu$s | 120 $\mu$s | 120 $\mu$s | 760 $\mu$s |

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.

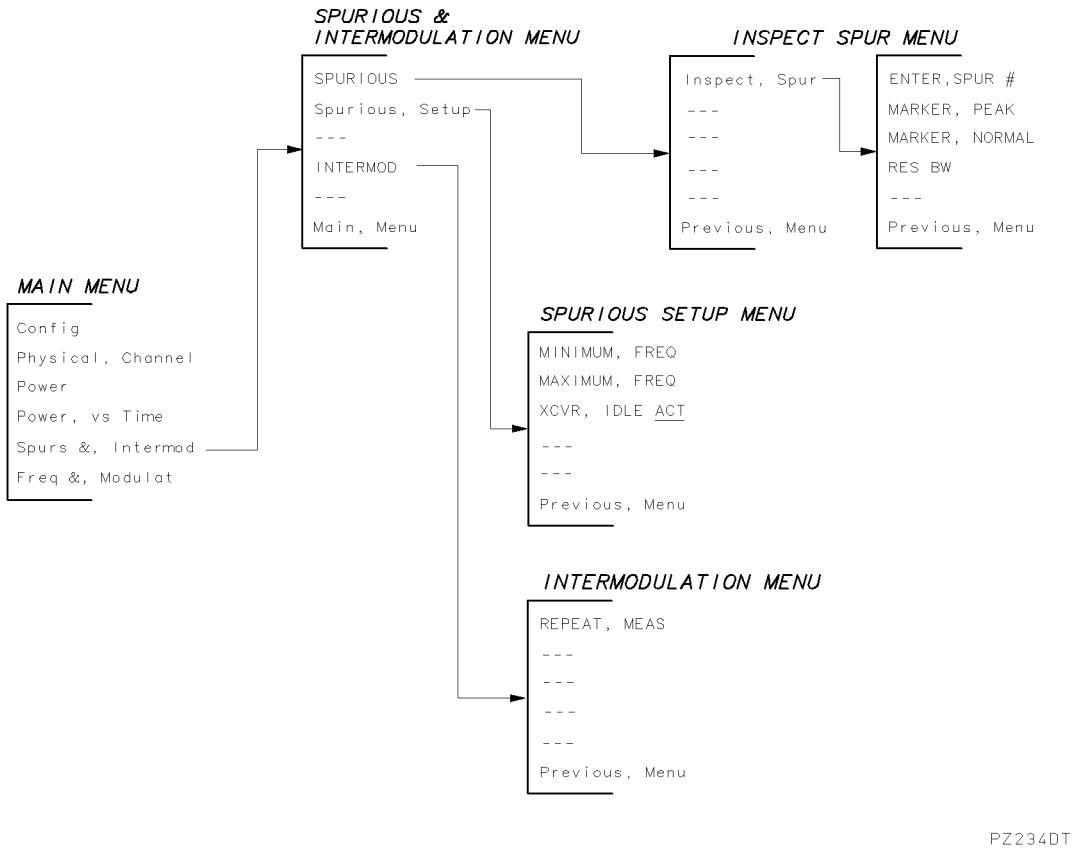
`MEASURE AVG PKS` Selects if the trace containing the averaged trace results is displayed, or if the traces containing the maximum and minimum trace results are displayed. If AVG is underlined, the displayed trace is an average of the trace values over multiple sweeps. If PKS is underlined, there are 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.

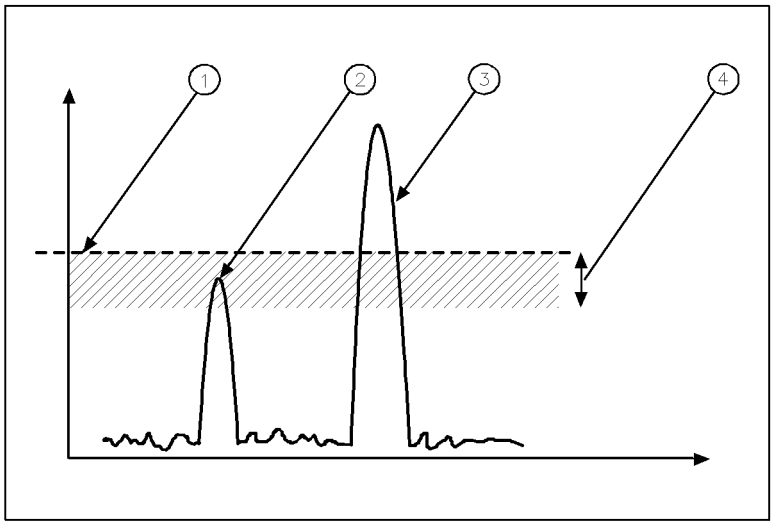



**Figure 6-2. The Spurious Emissions Limit**

**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<br>1860 MHz to 1870 MHz<br>1870 MHz to 1875 MHz<br>1875 MHz to 1878 MHz | Frequency ranges near the DECT band. | 1 MHz<br>300 kHz<br>100 kHz<br>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<br>1905 MHz to 1910 MHz<br>1910 MHz to 1920 MHz<br>1920 MHz to 1930 MHz | Frequency ranges near the DECT band. | 30 kHz<br>100 kHz<br>300 kHz<br>1 MHz |
| 1930 MHz to analyzer maximum | | 3 MHz |
| † Except for the following broadcast frequency bands. | | |
| 47 MHz to 74 MHz<br>87.5 MHz to 108 MHz<br>108 MHz to 118 MHz<br>174 MHz to 230 MHz<br>470 MHz to 862 MHz | | 100 kHz<br>100 kHz<br>100 kHz<br>100 kHz<br>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 8593A/E, 2.9 GHz for the HP 8594A/E, 6.5 GHz for the HP 8595A/E 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

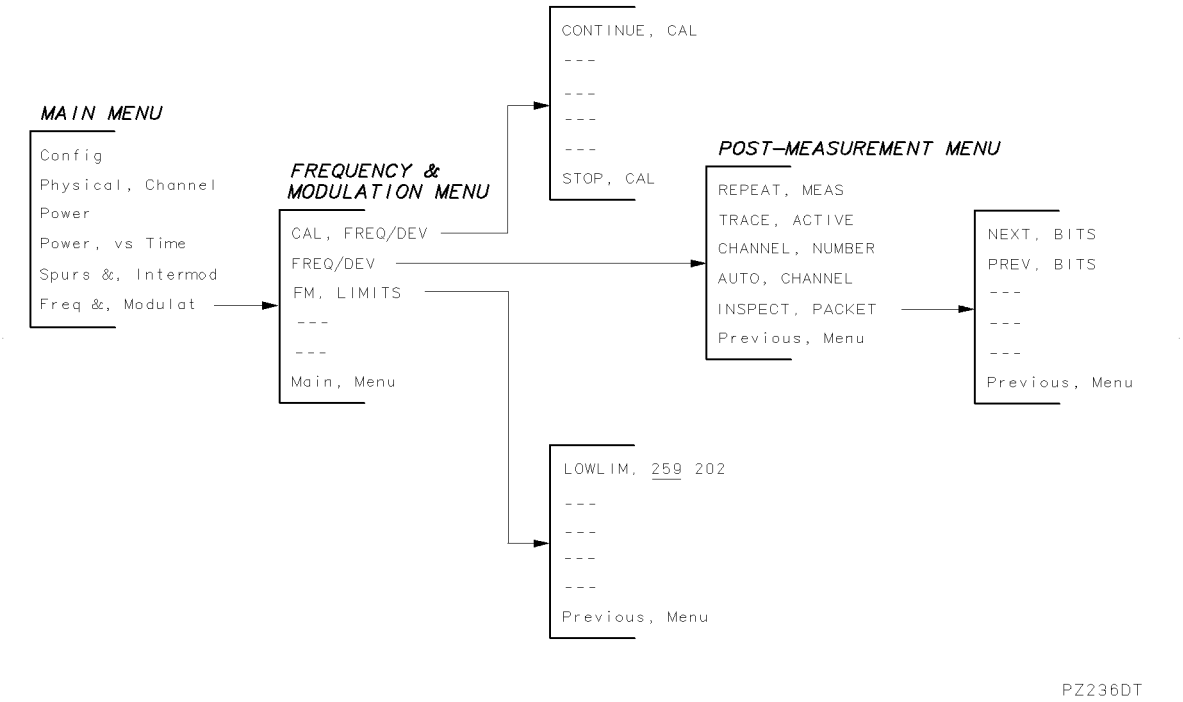
Pressing INTERMOD measures the intermodulation products and accesses the softkeys that allow you to repeat the measurement, or inspect the upper and lower intermodulation products.

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.

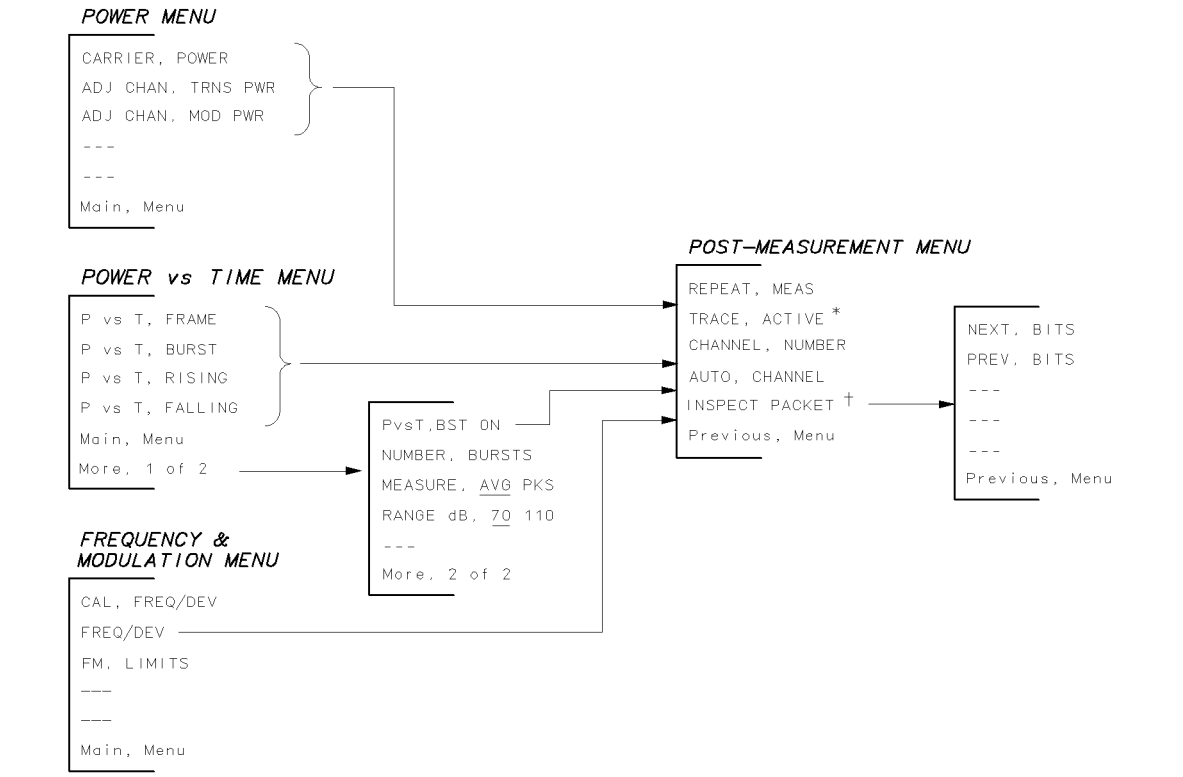
`LOW LIM 259 202` Allows you to select the lower frequency modulation limit. Pressing the softkey toggles the frequency modulation between 259 kHz and 202 kHz. Press the softkey so that the frequency modulation you require is underlined.

`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 $\mu$s increments.

- `NEXT BITS` Allows you to view the next 80 $\mu$s of the burst.
- `PREV BITS` Allows you to view the previous 80 $\mu$s 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.

# 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. |
| (MKR) | The HP 8590A Series spectrum analyzer marker function does not display the correct frequency on the spectrum analyzer screen whilst using FM demodulation. |
| (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 CENTER 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.

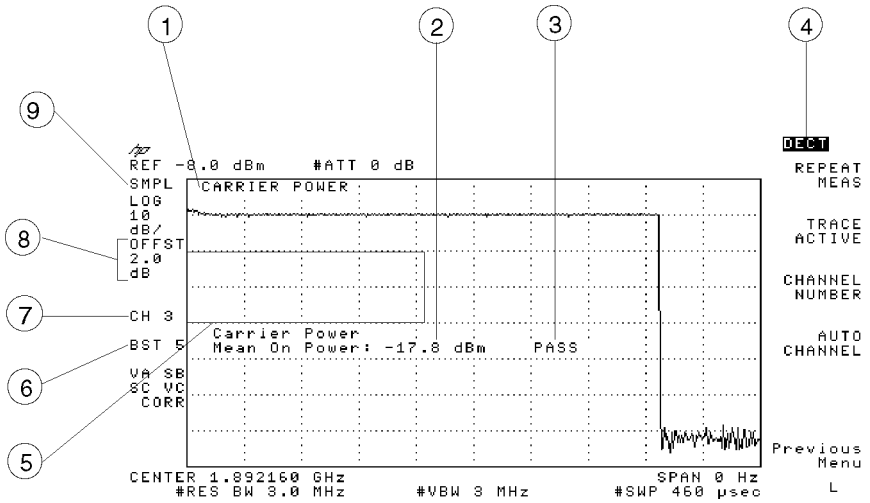



**Figure 7-1. DECT Screen Annotation**

**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<br>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<br>basic packet:1.15 μs<br>low capacity packet:0.6 μs<br>high capacity packet:2.2 μs | |
| Burst on (dependent on packet type) | short packet: 0.15μs<br>basic packet:0.85 μs<br>low capacity packet:0.35 μs<br>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))<br>(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* | | |
| 0.1 to 1850 MHz† and 1930 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<br>87.5 MHz to 108 MHz<br>108 MHz to 118 MHz<br>174 MHz to 230 MHz<br>470 MHz to 862 MHz | −55 dBm | |
| ‡ To make the spurious emissions test the ETSI specification requires that two filters are used.<br>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.<br>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 $\mu$s 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.

# 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 |
| **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 |
| **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 |

**Table 8-1. Functional Index (continued)**

| DECT Softkey | Corresponding Remote Command Sequence |
|---|---|
| **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 |

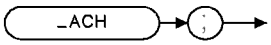
## Descriptions of the Programming Commands

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.

## Example

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

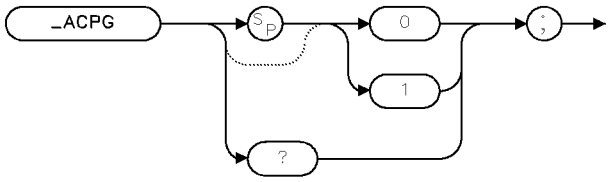
**Measurement State** Whenever _ACH is executed, it returns a value when the auto channel function is completed.

**_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




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

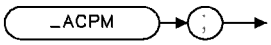
```
OUTPUT 718;"MOV _ACPG,1;"
```

*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

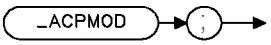
```
OUTPUT 718;"_ACPS;"      Sets up the adjacent channel power due to modulation
                         measurement.
OUTPUT 718;"ST 4;"       Changes the sweep time to 4 seconds.
OUTPUT 718;"_ACPM;"      Performs the adjacent channel power due to modulation
                         measurement.
```

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.<br>■ If the adjacent channel power measurement passed, the value of _F is a 0.<br>■ 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

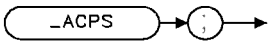
| | |
|---|---|
| `OUTPUT 718;"_ACPST;"` | *Sets up the adjacent channel power due to switching transients measurement.* |
| `OUTPUT 718;"ST 4;"` | *Changes the sweep time to 4 seconds.* |
| `OUTPUT 718;"_ACPMT;"` | *Performs the adjacent channel power due to switching transients measurement.* |

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.

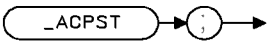
## Example

```
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.

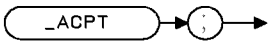
## Example

| | |
|---|---|
| `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.<br>■ If the adjacent channel power measurement passed, the value of _F is a 0.<br>■ 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 x 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.

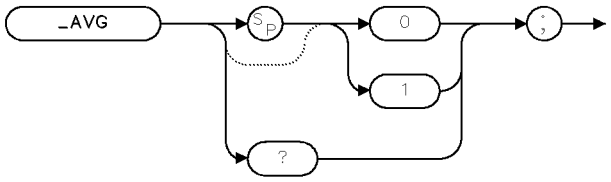
**Alternate Commands** You can also use the _ACPST and _ACPMT commands to measure adjacent channel power due to switching transients.

## See Also

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

# _AVG
# Average or Peaks for Power vs Time

## Syntax




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**

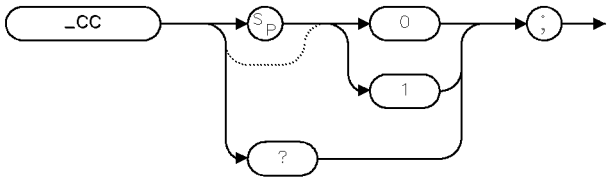
| Value | Description |
|---|---|
| 1 | The measurement was successfully completed. |
| 2 | The measurement was aborted. The measurement is aborted if the calibration signal is not connected to the spectrum analyzer input or the calibration signal amplitude is too low. |

**Parameter Variables** _CALFRQDEV uses _FCALF. Refer to Table 8-2 for more information.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _CALFRQDEV command.

# _CC
# Continuous Carrier or Burst Mode

## Syntax




Allows you to specify if the carrier to be measured is continuous or burst. The _CC command is equivalent to `BURST CONT`.

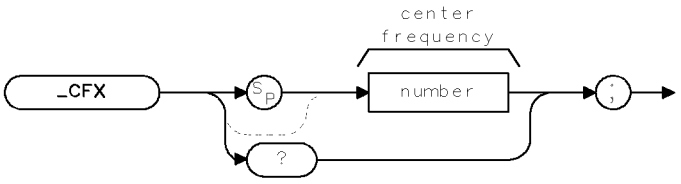
If _CC is set to 0, it is set to a burst carrier. If _CC is set to 1, it is set to a continuous carrier. The default value for _CC is 0.

## 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.*

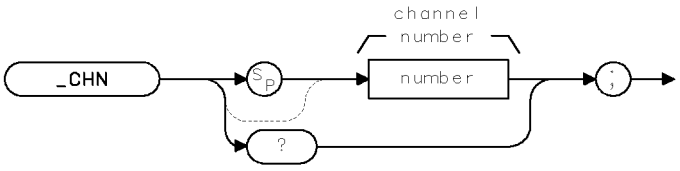
## Query Example

```
OUTPUT 718;"_CFX?;"
```

The query response will be the current frequency for channel X.

# _CHN
# Channel Number

## Syntax




XCHN

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?;"
```

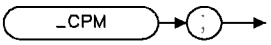
The query response will be a the current channel number.

## 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`.

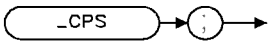
Refer to the description for _CPWR for information about the measurement state and measurement results from a carrier power measurement.

## See Also

"To measure the carrier power" in Chapter 4.

# _CPS
# Carrier Power Setup

## Syntax




XCPS

Performs the setup for the carrier power measurement.

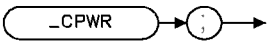
## Example

```
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.<br>■ If the carrier measurement passed, the value of _F is a 0.<br>■ 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

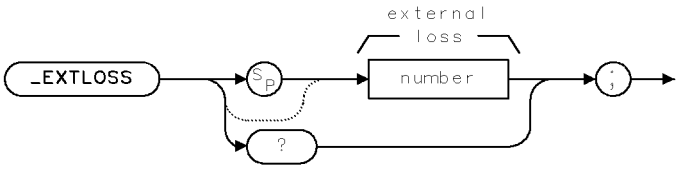
```
OUTPUT 718;"_DEFAULT;"
```

The default values are as follows:

| | |
|---|---|
| EXT LOSS | 0 dB |
| TOTAL TX POWER | +26 dBm |
| TRIG DELAY | 0 $\mu$S |
| TRIG POL NEG POS | POS |
| BURST CONT | BURST |
| TRANSMIT FP PP | FP |

# _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.

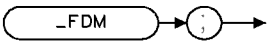
## Query Example

```
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.

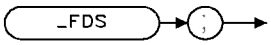
Before using _FDM, you need to use the _FDS command to perform the setup for the frequency and deviation measurement. The _FDS and _FDM commands are useful if you want to change the spectrum analyzer settings before making a frequency and deviation measurement. The combination of the _FDS and _FDM commands 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.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _FDM command.

# _FDS
# Frequency and Deviation Setup

## Syntax




XFDS

Performs the setup for the frequency and deviation measurement.

## Example

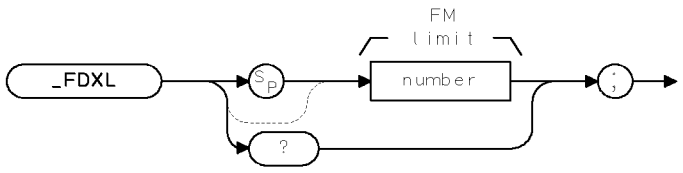
```
OUTPUT 718;"_FDS;"          Sets up the frequency and deviation measurement.
OUTPUT 718;"RB 30KHZ;"      Changes the resolution bandwidth to 30 kHz.
OUTPUT 718;"_FDM;"          Performs the frequency and deviation measurement.
```

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`.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _FDS command.

# _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.

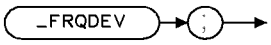
## See Also

"To use the spectrum analyzer's MOV command" in Chapter 4.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _FDXL command.

# _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.<br>■ If the frequency and deviation measurement passed, the value of _F is 0.<br>■ 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.

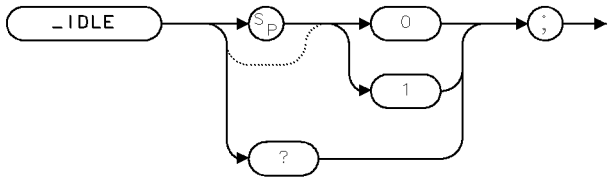
---

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _FRQDEV command.

---

# _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).

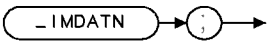
## See Also

"To measure the spurious emissions" in Chapter 4.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRB must be executed prior to using the _IDLE command.
For the HP 8590 E-Series spectrum analyzers _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.<br>■ If the intermodulation products pass (the intermodulation products are less than the intermodulation product limit) the value of _F is a 0.<br>■ 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.

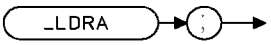
## See Also

"To measure the intermodulation attenuation" in Chapter 4.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRB must be executed prior to using the _IMDATN command.
For the HP 8590 E-Series spectrum analyzers _LDRB must be executed prior to the *first* usage of the _IMDATN command.

# _LDRA
# Loader A

## Syntax




XLDRA

_LDRA loads the power versus time, and frequency and modulation menus into the spectrum analyzer memory. _LDRA also erases the spurious and intermodulation menu from the spectrum analyzer memory. *For HP 8590 A-Series spectrum analyzer only.*

## Example

```
OUTPUT 718;"_LDRA;"
```

*Loads the power versus time, and frequency and modulation menus.*

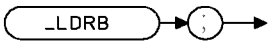
**Measurement State** The measurement state value is returned to the external controller to indicate when the load is finished.

**_LDRA 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. |

# _LDRB
# Loader B

## Syntax




XLDRB

_LDRB loads the spurious and intermodulation menu into the spectrum analyzer memory. For HP 8590 A-Series spectrum analyzers, _LDRB also erases the power versus time, and frequency and modulation menus from the spectrum analyzer memory.

## Example

```
OUTPUT 718;"_LDRB;"
```
*Loads the spurious and intermodulation menus.*

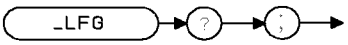
**Measurement State** The measurement state value is returned to the external controller to indicate when the load is finished.

**_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?;"
```

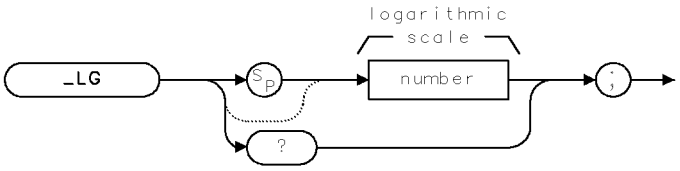
The query response will be the current menu stored in the spectrum analyzer memory.

**_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.*

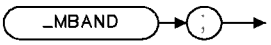
## Query Example

```
OUTPUT 718;"_LG?;"
```

The query response will be a the current setting for the amplitude scale.

# _MBAND
# Monitor Band

## Syntax




XMBAND

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.

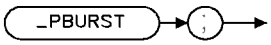
**Measurement Results** After executing _MBAND, the spectrum of the monitor band is stored in trace A. The measurement units for trace A are determined by the trace data format (TDF) command.

## 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.<br>■ If the burst width measurement passed, _F is 0.<br>■ 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.

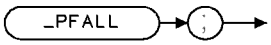
---

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _PBURST command.

---

# _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.<br>■ If the fall time measurement passed, _F is 0.<br>■ 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.

---

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _PFALL command.

---

# _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. | $\mu$s |
| 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.

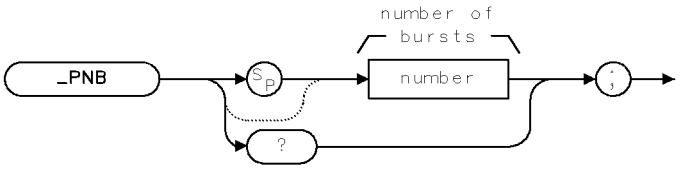
---

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _PFRAME command.

---

# _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?;"
```

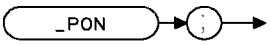
The query response will be a the current setting for the number of bursts.

## 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.<br>■ If the burst on measurement passed, _F is 0.<br>■ 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 |
| 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.

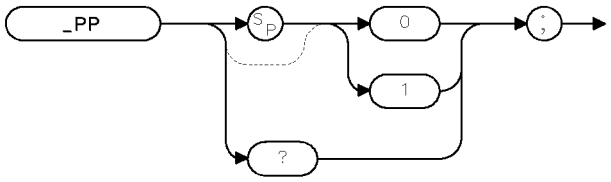
---

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _PON command.

---

# _PP
# Portable or Fixed Part

## Syntax




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.<br>■ If the rise time measurement passed, _F is 0.<br>■ 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.

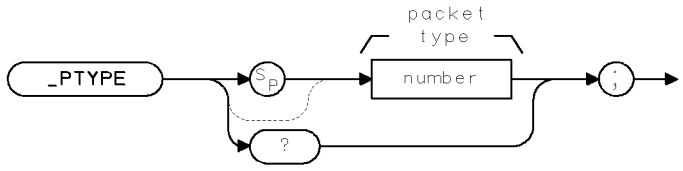
## See Also

"To measure the power versus time rising edge" in Chapter 4.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRA must be executed prior to using the _PRISE command.

# _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 the low capacity Packet.*

## Query Example

```
OUTPUT 718;"_PTYPE?;"
```

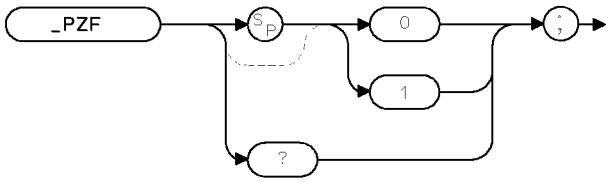
The query response will be a the current packet type.

## 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?;"
```

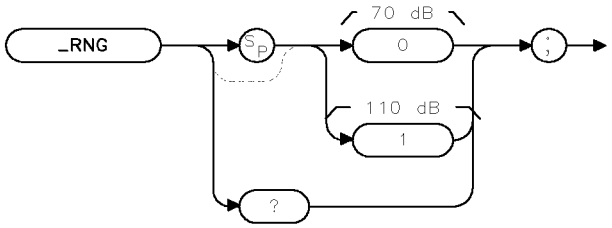
The query response will be a the current Z field.

## 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.

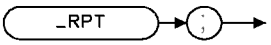
## Query Example

```
OUTPUT 718;"_RNG?;"
```

The query response will be the current value of _RNG.

# _RPT
# Repeat

## Syntax




XRPT

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;"
```

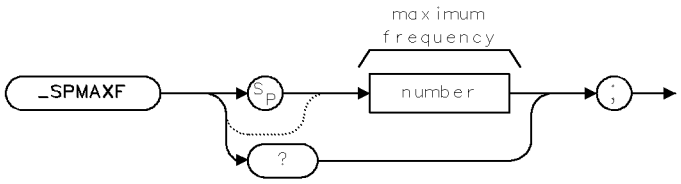
**Related Commands** _RPT will repeat the following measurements: _CPWR, _ACPT, _ACPMOD, _PFRAME, _PBURST, _PRISE, _PFALL, _PON, and _FRQDEV.

## 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.

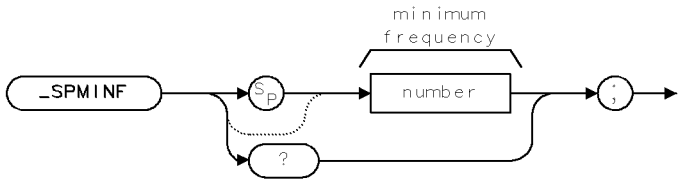
## See Also

"To measure the spurious emissions" in Chapter 4.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRB must be executed prior to using the _SPMAXF command.
For the HP 8590 E-Series spectrum analyzers _LDRB must be executed prior to the *first* usage of the _SPMAXF command.

# _SPMINF
# Minimum Frequency

## Syntax




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** For the HP 8590 A-Series spectrum analyzers _LDRB must be executed prior to using the _SPMINF command.
For the HP 8590 E-Series spectrum analyzers _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.<br>■ If _NOCAR is equal to 0, a carrier with an amplitude value of greater than −30 dBm was detected.<br>■ 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.<br>■ If the spurious emissions measurement passed, the value of _F is 0.<br>■ 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.<br>■ If the _SPFAIL array element is a "0," the spurious emission passed (it was less than the spurious emission limit).<br>■ 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.<br>■ If the value of the _SPOK array element is a "0," it indicates that the spurious emission could be spectrum analyzer noise.†<br>■ 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.

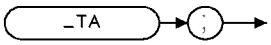
## See Also

"To measure the spurious emissions" in Chapter 4.

**Note** For the HP 8590 A-Series spectrum analyzers _LDRB must be executed prior to using the _SPUR command.
For the HP 8590 E-Series spectrum analyzers _LDRB must be executed prior to the *first* usage of the _SPUR command.

# _TA
# Trace Active

## Syntax




XTA

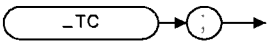
_TA allows you to view an active trace on the spectrum analyzer display after a measurement has been completed. The _TA command is equivalent to `TRACE ACTIVE`.

## Example

```
OUTPUT 718;"_TA;"
```

# _TC
# Trace Compare

## Syntax




XTC

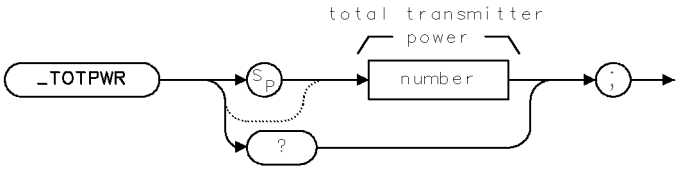
_TC copies the active trace from trace A into trace C. Trace A remains in the active mode, trace C is placed into the view mode (in the view mode, the trace is not updated). The _TC command is equivalent to `TRACE COMPARE`.

## 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.

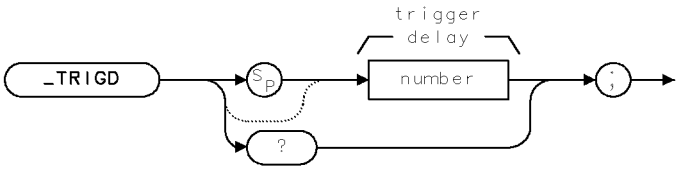
## Query Example

```
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 $\mu$s to +1800 $\mu$s in 1 $\mu$s increments. The measurement unit for _TRIGD is $\mu$s. If you do not enter a trigger delay, a default value of 0 $\mu$s is used.

## Example

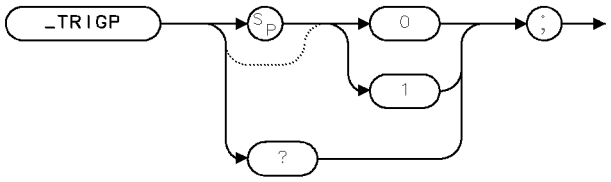
```
OUTPUT 718;"MOV _TRIGD,40;"
```
*Sets the trigger delay to 40 $\mu$s.*

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.

# 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:

$$f_1 \pm f_2, 2 \times f_1 \pm f_2, 2 \times f_2 \pm f_1, 3 \times f_1 \pm 2 \times f_2, \ and\ so\ on$$

**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, dB$\mu$V, 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-4. 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-1. 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.

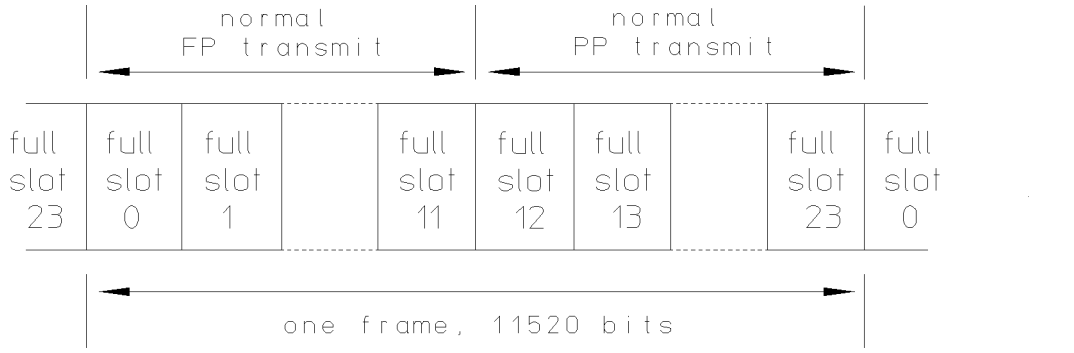



**Figure Glossary-1. TDMA/TDD Structure For DECT**

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)), dB$\mu$V (dB relative to 1 $\mu$V), 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