Errata

Title & Document Type: 85717A CT2-CAI Measurements Personality User's Guide

Manual Part Number: 85717-90007

Revision Date: 1996-12-01

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

www.tm.agilent.com

Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

User's Guide

HP 85717A CT2-CAI Measurements Personality

HEWLETT PACKARD

HP Part No. 85717-90007 Supersedes 85717-90004
Printed in USA December 1996

1400 Fountaingrove Parkway, Santa Rosa, CA 95403-1799, USA

Hewlett-Packard Software Product License Agreement and Limited Warranty

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

License Agreement

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

Use.

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

Copies and Adaptations.

- Customer may make copies or adaptations of the software:
  - For archival purposes, or
  - When copying or adaptation is an essential step in the use of the software with a computer so long as the copies and adaptations are used in no other manner.
- Customer has no other rights to copy unless they acquire an appropriate license to reproduce which is available from Hewlett-Packard for some software.
- Customer agrees that no warranty, free installation, or free training is provided by Hewlett-Packard for any copies or adaptations made by Customer.
- All copies and adaptations of the software must bear the copyright notices contained in or on the original.

Ownership.

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

Transfer of Rights in Software.

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

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

Sublicensing and Distribution.

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

Termination.

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

Updates and Upgrades.

- Customer agrees that the software does not include future updates and upgrades which may be available for HP under a separate support agreement.

Export.

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

Limited Warranty

Software.

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

Media.

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

Notice of Warranty Claims.

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

Limitation of Warranty.

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

Exclusive Remedies.

The remedies provided above are Customer's sole and exclusive remedies. In no event shall Hewlett-Packard be liable for any direct, indirect, special, 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.**

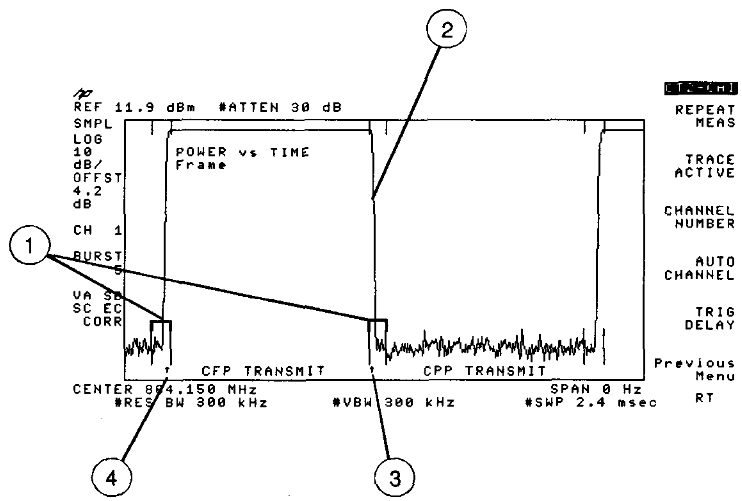
Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

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 CT2-CAI Mobile Communication System?

The second-generation cordless telephone (CT2) using the common air interface (CAI) specifications is a means of telephone communication without the transmission lines that traditionally link a telephone system. With CT2-CAI, the transmission occurs between a handset (also called a cordless portable part or CPP) and a base station (also called a cordless fixed part or CFP). The frequency for the handset and base station transmission is called the carrier frequency, and every carrier frequency is assigned to a channel. Because a handset and a base station 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 handset or the base station can only transmit during its assigned time period (so the time period is divided). Duplexing means that the transmissions from the handset and the base station appear to occur simultaneously to the telephone user.



Timing for Handset (CPP) and Base Station (CFP) Transmission

Number	Description
1	The time period in which the base station and handset transmissions occur. This time period is called a frame. Each frame is 2 ms long and contains 144 bits.
2	The time period (also called timeslot) in which the handset transmission occurs.
3	The guard period between the base station and handset transmissions. The guard period between the base station and handset transmissions is 3.5 or 5.5 bits. The guard period between the handset and base station transmissions is 4.5 or 6.5 bits. The shorter guard periods of 3.5 bits and 4.5 bits apply if a 68-bit burst is transmitted; the longer guard periods of 5.5 bits and 6.5 bits apply if a 66-bit burst is transmitted.
4	The time period (also call timeslot) in which the base station transmission occurs.
5	The base station burst.

Each CT2-CAI base station can support 40 channels spaced 100 kHz apart. The frequency band for the CT2-CAI channels is 864.15 to 868.05 MHz.

What Does the HP 85717A CT2-CAI Measurements Personality Do?

The HP 85717A CT2-CAI measurements personality can help determine if a CT2-CAI transmitter is working correctly. The HP 85717A adapts HP 8590 series spectrum analyzer hardware for the testing of a CT2-CAI transmitter according to the specifications in the ***MPT 1375 Common Air Interface Specification*** and ***I-ETS 300 131*** documents. The ***MPT 1375 Common Air Interface Specification*** and ***I-ETS 300 131*** documents define complex, multi-part measurements used to maintain an interference-free environment. For example, the documents include searching for spurious emissions and for measuring intermodulation products. The HP 85717A automatically makes these measurements using the algorithms defined by the ***MPT 1375 Common Air Interface Specification*** and *I-ETS* 300 ***131*** documents. The detailed results displayed by the measurements allow you analyze CT2-CAI 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 CT2-CAI 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 CT2-CAI measurement.
2. Once you have completed Chapter 1, you can proceed to Chapter 2. Chapter 2 contains the procedures for making measurements with the CT2-CAI measurements personality.

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

- Chapter 3 contains reference information about the CT2-CAI measurements personality's functions.
- Chapter 4 contains information error messages and troubleshooting with the CT2-CAI measurements personality.
- Chapter 5 contains reference information about the CT2-CAI measurements personality's programming commands.
- Chapter 6 contains information about how to use a computer to operate the CT2-CAI measurements personality.
- Chapter 7 contains specifications about the CT2-CAI measurements personality.
- Chapter 8 contains the verification tests for the CT2-CAI measurements personality. The verification tests should be performed at least once a year.

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.) If the **softkey** label contains upper and lowercase letters, pressing the **softkey** will access more softkeys. If the **softkey** label contains all uppercase letters, pressing the **softkey** will perform an immediate action.
`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's installation and operation and programming manuals. These manuals describe spectrum analyzer preparation and verification, and tell you what to do if something goes wrong. Also, they describe spectrum analyzer features and tell you how to make spectrum analyzer measurements. Consult these manuals whenever you have a question about standard spectrum analyzer use.

Contents

5. Programming Commands

Specifications

8. Verifying Operation

Glossary

Index

Figures

Tables

1

Getting Started

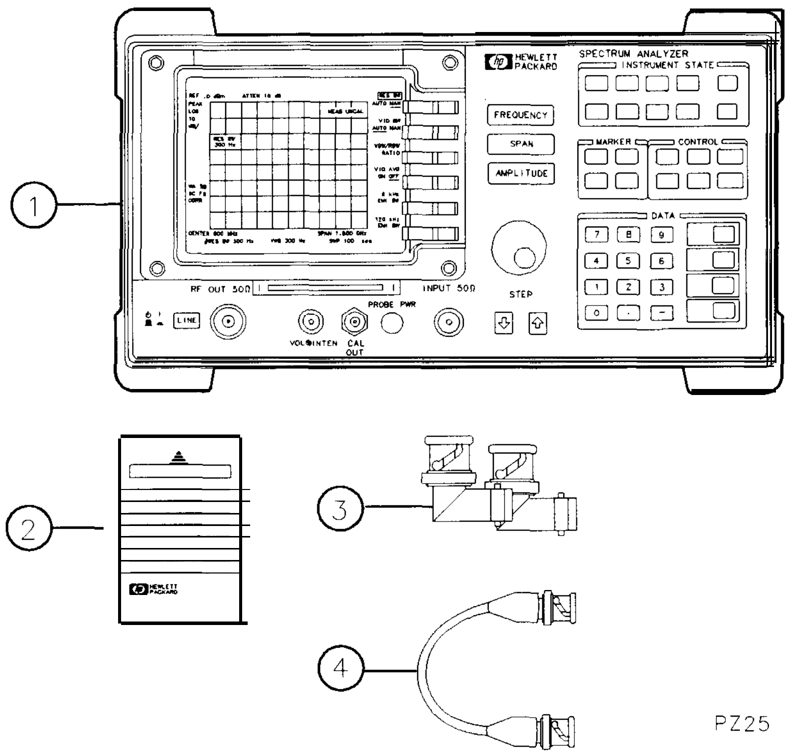
The procedures in this chapter describe how to prepare the spectrum analyzer to measure a CT2 transmission. This chapter contains the following information:

- 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.
- Information about the changes to the spectrum analyzer operation caused by the CT2-CAI measurements personality.
- 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 with Chapter 2.

The Equipment that You Will Need

To prepare the spectrum analyzer to measure a signal from a CT2 transmitter, you need the following equipment.



1 An HP 8591E, HP 8593E, HP 8594E, HP 8595E, or and 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 010, the internal tracking generator	A 0 dBm (± 1 dBm), 866 MHz (± 1 MHz) continuous wave signal from an external RF source. The signal must not have any harmonic or spurious signals greater than -25 dBc. An HP 8656B or 8657A signal generator is the recommended RF source.	Provides the 866 MHz signal that is needed for the HP 85717A power calibration routine.
Option 101, the fast time-domain sweeps option card	None	Provides the 20 ms to 20 μs sweep times in zero span.
Option 105, the time-gated spectrum analyzer option card	None	Provides the time gating needed in the power versus time and frequency and modulation measurements.
Option 110, the CT2 demodulator option card	An HP 53310A modulation domain analyzer.	Performs the frequency and deviation measurements.

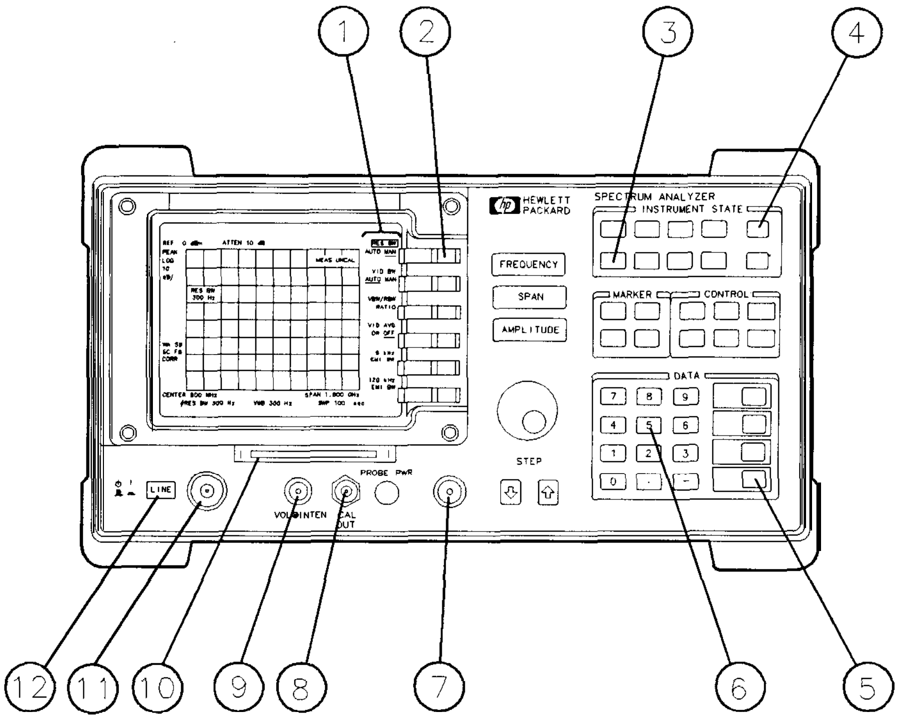
2 The HP 85717A CT2-CAI measurements personality read-only memory (ROM) card. The CT2-CAI measurement personality is a program that resides on this ROM card.

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 CT2-CAI measurements personality, you need to be familiar with the following features of an HP 8590 Series spectrum analyzer.



PZ26

Note	Generic 8590 Series spectrum analyzer front and rear panel illustrations are used throughout this manual. Depending on the model number and options, your analyzer's front and rear panels may be different.

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, **CT2-CAI 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 CT2-CAI 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 connector is where the signal to be measured is input.

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 50 Ω connector provides the signal for the HP 85717A power calibration routine. ***(Option 010 only.)***

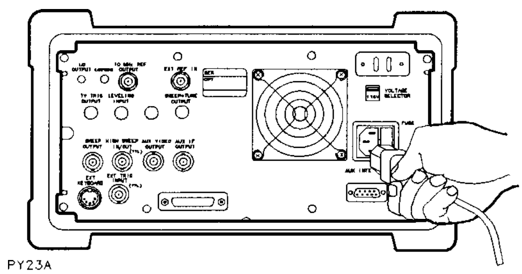
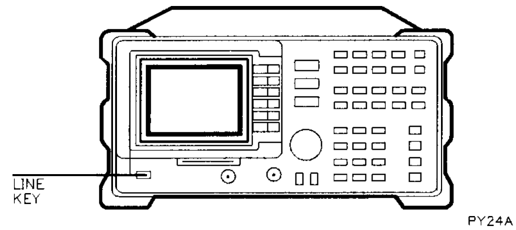
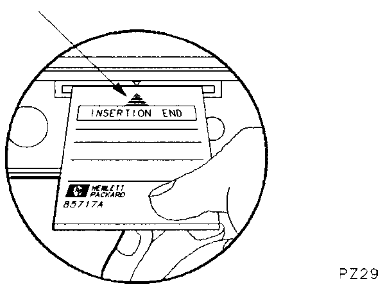
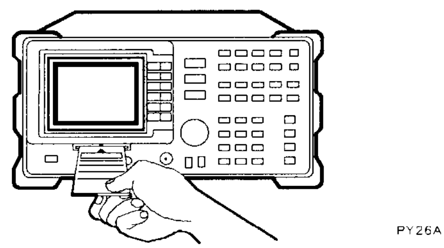
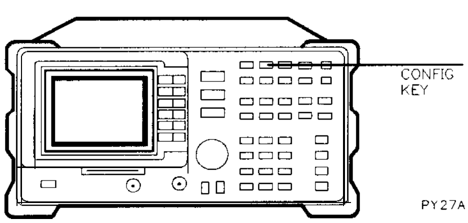
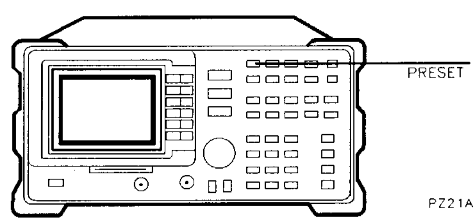
12 (LINE) turns the spectrum analyzer on or off.

Preparing to Make a Measurement

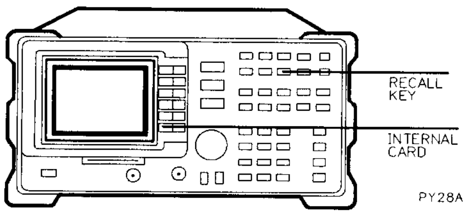
This section explains the steps that are necessary to prepare the spectrum analyzer for making CT2 measurements. The steps are as follows:

1. Load the CT2-CAI 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 CT2-CAI measurements personality.
5. Configure the personality for your test equipment.
6. Perform the power calibration routine.
7. Select a channel to test.

Step 1. Load the CT2-CAI measurements personality

1 Plug the spectrum analyzer into an ac power supply.	2 Press the (LINE) key.
	
3 Locate the arrow printed on the CT2-CAI measurement 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 Press (CONFIG), MORE 1 of 3 , ERASE DLP MEM , ERASE DLP MEM .	6 Press (PRESET).
	

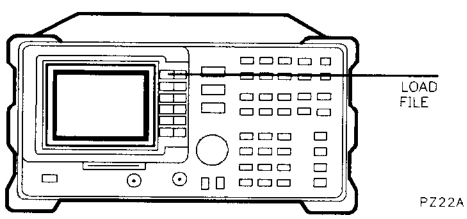
7 Press (RECALL). Press the **INTERNAL** CARD softkey so that CARD is underlined.



8 Press Catalog Card, CATALOG ALL. Ensure that "dCT2" is highlighted on the spectrum analyzer screen. If dCT2 is not highlighted, turn the large knob on the spectrum analyzer's front panel until "dCT2" is highlighted.

CT2	
dCT2	DLP
dCALPWR	DLP
dMDA	DLP
dCID	DLP

9 Press LOAD FILE. It takes about a minute to load the CT2-CAI measurement personality.



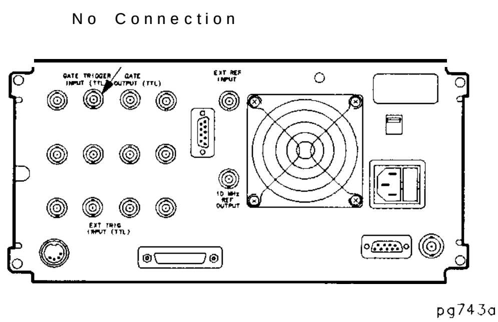
When the spectrum analyzer has finished loading the CT2-CAI measurements personality, the catalog entries will be blanked from the spectrum analyzer display.

After completing this procedure, the CT2-CAI measurements personality will remain in the spectrum analyzer memory until it is deleted with ERASE DLP MEM .

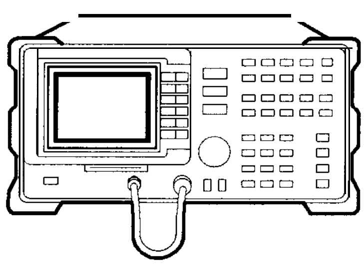
Step 2. Perform the spectrum analyzer's self-calibration routines

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

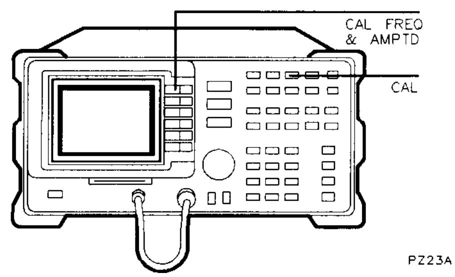
1 Ensure that there is nothing connected to the GATE TRIGGER INPUT connector on the spectrum analyzer's rear panel.



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

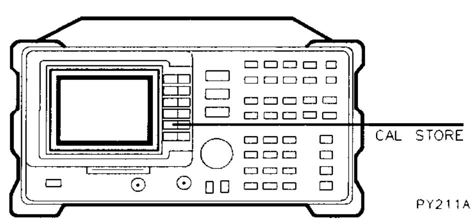


3 Press (CAL), then CAL FREQ & AMPTD .



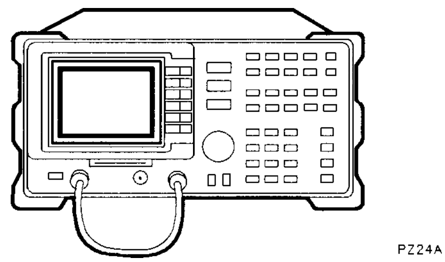
The spectrum analyzer's frequency and amplitude self-calibration routines take about 3 minutes to complete. CAL : DONE is displayed when the self-calibration routines are finished. If an error message is displayed, refer to the Installation and Verification Manual for the spectrum analyzer.

4 Press CAL STORE.

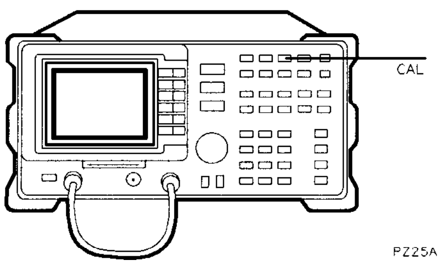


For Option ***010*** only: Perform steps 5 to 7 if your spectrum analyzer has Option 010 installed in it.

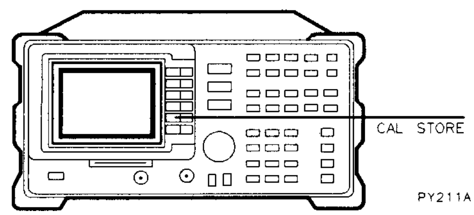
5 Connect a short cable between the spectrum analyzer's RF OUTPUT and the INPUT connectors using the appropriate adapters.



6 Press (CAL), MORE 1 of 3 , MORE 2 of 3 , CAL TRK GEN .

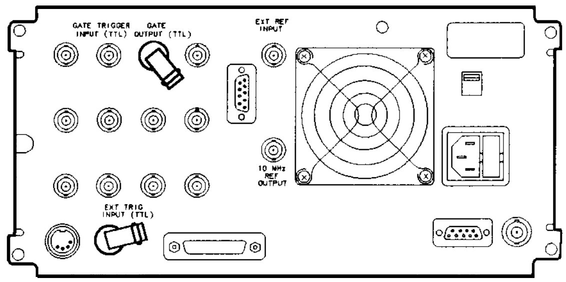
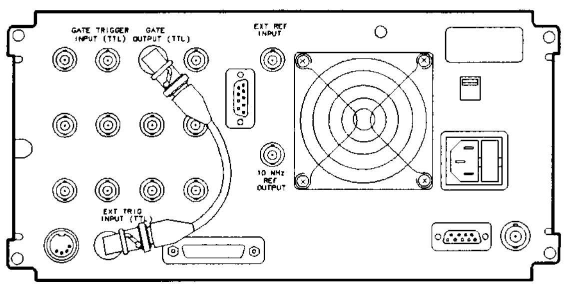


7 When the self-calibration routine for the tracking generator has finished, press CAL STORE.

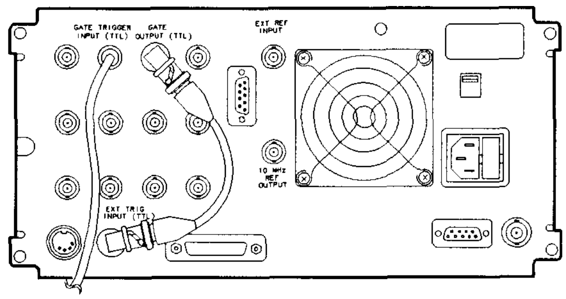


For the spectrum analyzer to meet its specifications and characteristics, the self-calibration routines should be performed periodically or whenever the ambient temperature changes. See the Operating Manual for the spectrum analyzer to learn how often the self-calibration routines should be performed.

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.
 pb753b
2 Connect a short BNC cable between the two adapters.
 pb754b
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 CT2 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.

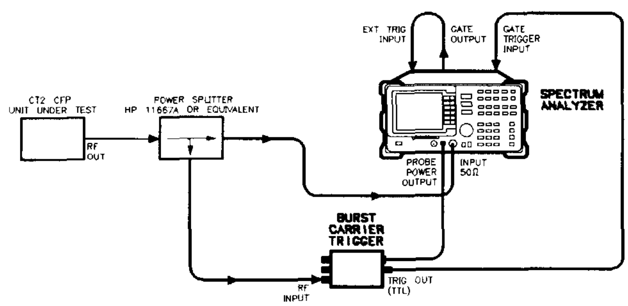
3 Connect a TTL trigger signal to the GATE TRIGGER INPUT connector on the rear panel of the spectrum analyzer.



pb756b

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 CT2 frame. The external trigger signal can be supplied by the unit under test, or by an HP 85902A Burst Carrier Trigger. External triggering of the spectrum analyzer is required for two of the CT2-CAI measurements personality's measurements.

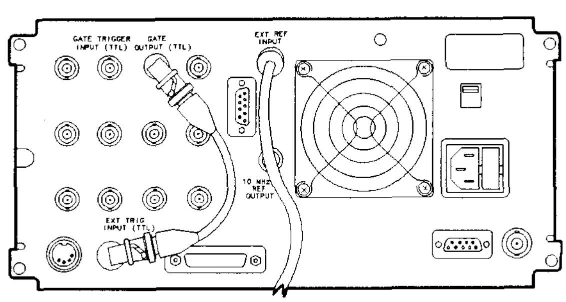
An example using the HP 85902A Burst Carrier Trigger is shown below.



pz273a

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

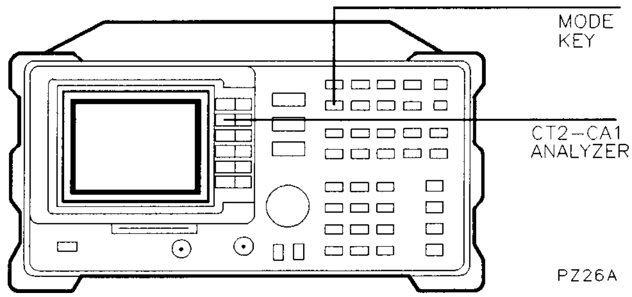
4 ***If*** you *do not* have ***Option 004:*** Disconnect the connector from the 10 MHz REF OUTPUT and EXT REF IN connectors on the rear panel. Connect the 10 MHz signal from a precision external frequency reference to the EXT REF IN connector.



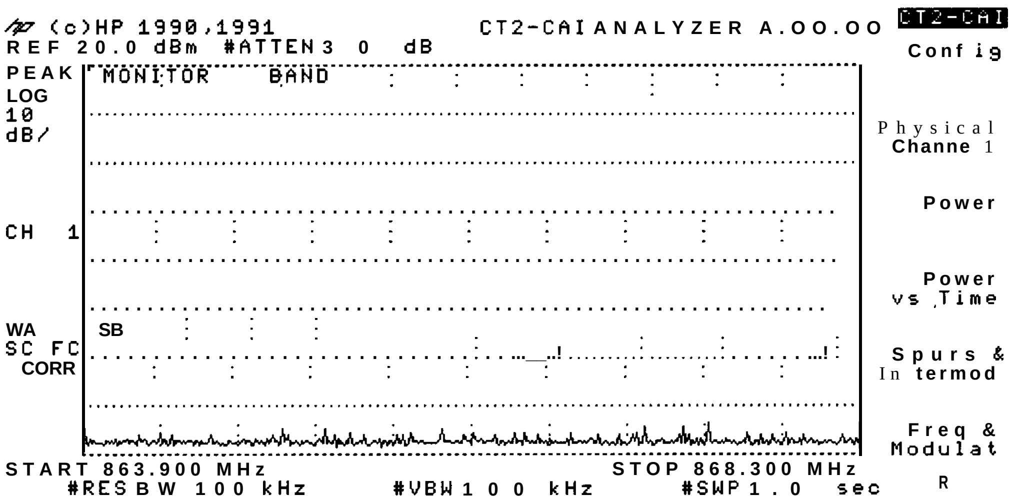
pb757b

Step 4. Access the CT2-CAI measurements personality

- Press (MODE), **CT2-CAI** ANALYZER to access the CT2-CAI measurements personality.



Notice that when the spectrum analyzer is using the CT2-CAI measurements personality, **CT2-CAI** is displayed in the upper right corner of the spectrum analyzer display.



Pressing **CT2-CAI** ANALYZER also accesses the main menu for the CT2-CAI 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 CT2-CAI 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, see to Chapter 4, "Error Messages and Troubleshooting."

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 (mid-point of CT2 frequency band) 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, ensure that POS is underlined in TRIG POL NEG POS .

   If necessary, 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 MEG 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 bit 1 of a 68 bit CFP burst (see Figure l-l). If you selected negative edge triggering, this is the time from the negative edge of the trigger pulse to the end of bit 68 of a 68 bit CFP burst (see Figure l-l). 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 see "To view the CFP or CPP 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 CONT underlined.

Pressing Config accesses the configuration softkeys. Because the CT2-CAI measurements personality uses the setting of the configuration softkeys when performing the measurements, you 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 measurement.

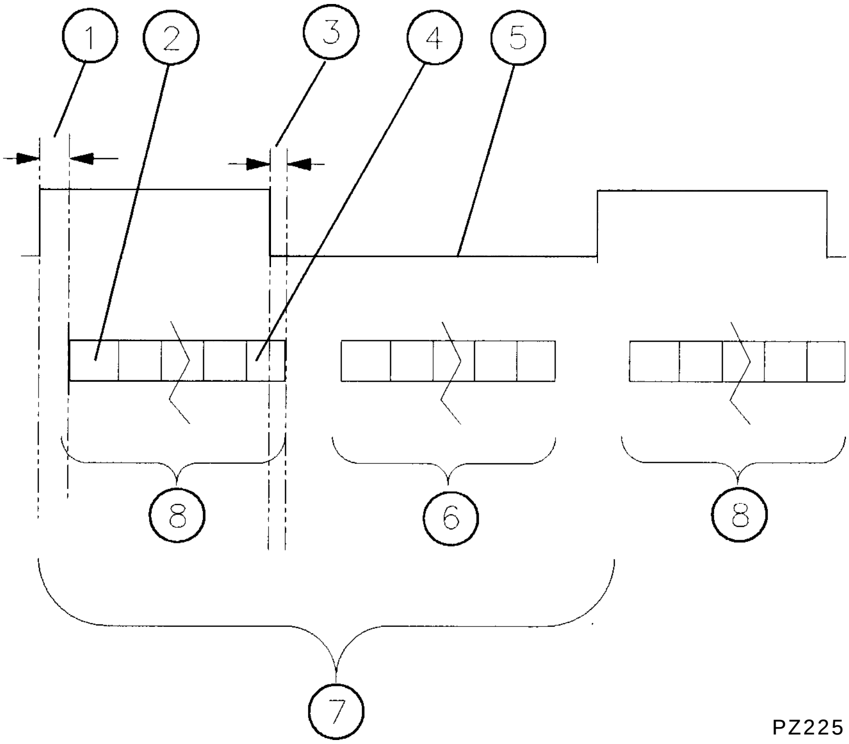


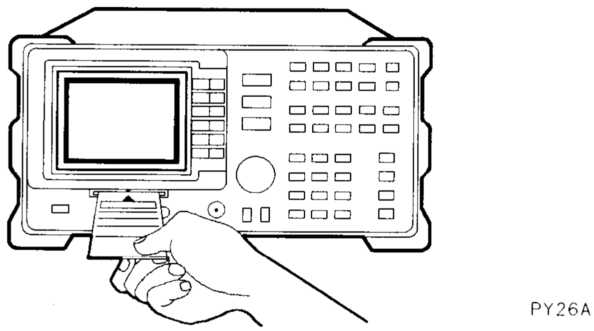
Figure l-l. Relationship Between the External Trigger and the CT2 Frame

Table l-l.
Relationship Between the External Trigger and the CT2 Frame

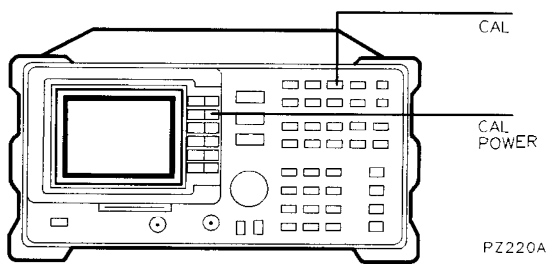
Number	Description
1	The trigger delay time if TRIG POL POS MEG is set to POS.
2	Bit 1 of a 68 bit CFP transmission.
3	The trigger delay time if TRIG POL POS NEG is set to NEG.
4	Bit 68 of a 68 bit CFP transmission.
5	The external trigger signal.
6	The handset (also called the cordless portable part or CPP) transmission.
7	A CT2 frame. A frame is 2 ms long.
8	The base station (also called the cordless fixed part or CFP) transmission.

Step 6. Perform the power calibration routine

1 Ensure that the HP 85717A memory card is inserted into the spectrum analyzer's memory card reader.

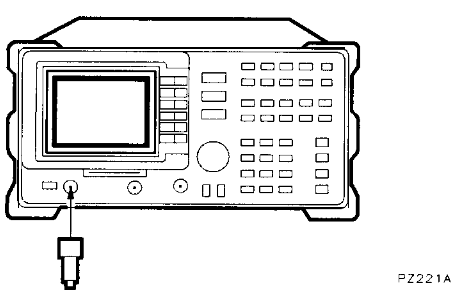


2 Press (CAL), CAL POWER.

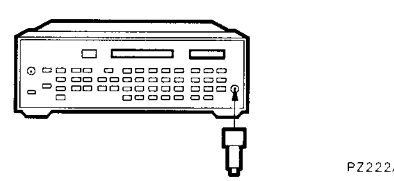


3 Connect a 6 dB fixed attenuator to the output of the RF source.

- If your spectrum analyzer has an Option 010 installed in it, connect the 6 dB fixed attenuator to the RF OUT connector on the front panel of the spectrum analyzer.
- If your spectrum analyzer does not have an Option 010 installed in it, connect the 6 dB fixed attenuator to the RF output of the source. An HP 8657A is the recommended RF source. Set output power of the RF source to **0** dBm **and** the **frequency to 866** MHz.

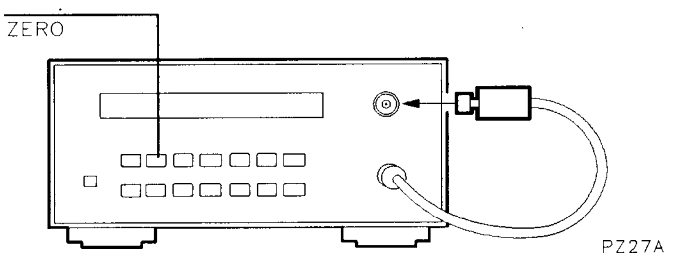


With Option 010

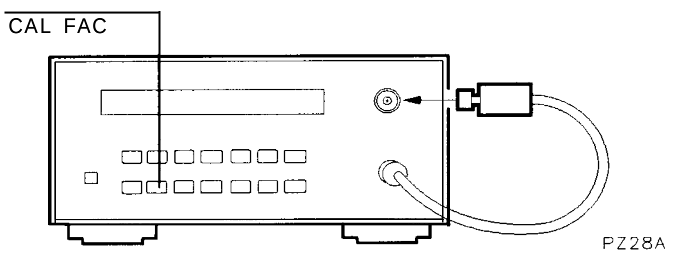


With an RF Source

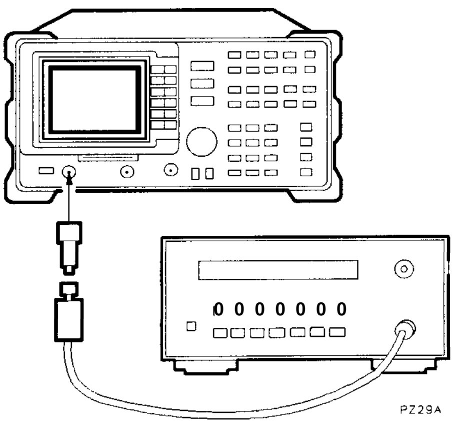
4 Zero and calibrate the power meter. See the documentation for your power meter for more information.



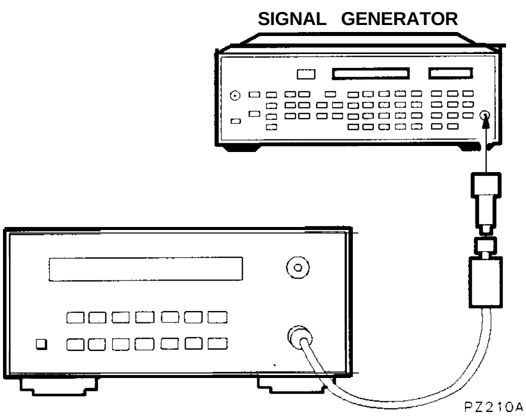
5 Enter the calibration factor for the HP 8491A/82A power sensor at 866 MHz into the power meter. See the documentation for your power meter for more information.



6 Connect the power sensor to the 6 dB fixed attenuator, and then press CONTINUE CAL .

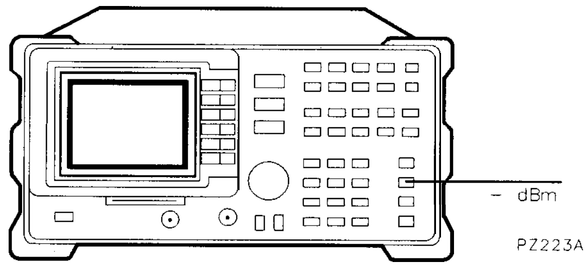


With an Option 010 Spectrum Analyzer

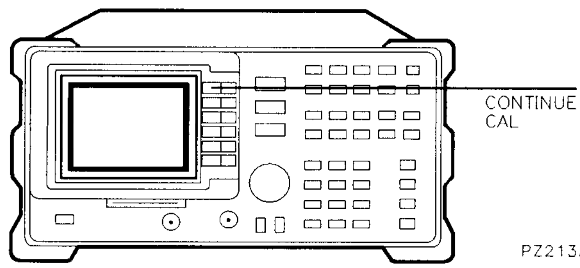


With an RF Source

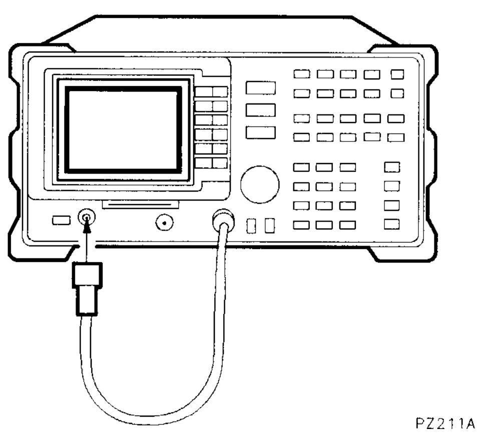
7 Use the spectrum analyzer's data keys to enter the power meter reading into the spectrum analyzer, then press (−dBm).



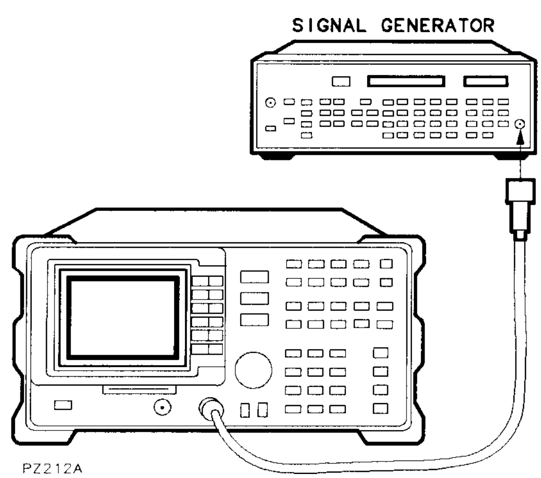
8 Press CONTINUE CAL.



9 Remove the power sensor from the 6 dB fixed attenuator. Connect the cables and any external test equipment (for example, a fixed attenuator or test fixture) that will be used for testing between the 6 dB fixed attenuator and the spectrum analyzer's INPUT connector.

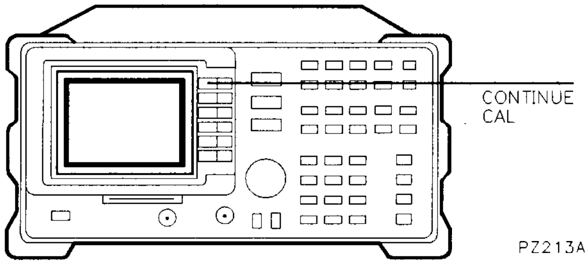


With an Option 010 Spectrum Analyzer



With an RF Source

10 Press CONTINUE CAL . The spectrum analyzer will measure the amplitude level at 866 MHz.



The power calibration routine calculates the difference between the amplitude level that the spectrum analyzer measures in step 10 and the power meter reading that you entered in step 7. This amplitude difference is stored as an amplitude correction factor and it will be applied to all measurements. When the spectrum analyzer is using this amplitude correction factor, an "A" is displayed before "CORR" on the left side of the spectrum analyzer display. If you want to turn off the amplitude correction temporarily, press (CAL), AMP COR ON OFF until OFF is underlined.

For best accuracy, you should perform the power calibration routine in the following circumstances:

- Whenever you change the cables, adapters, or other equipment that connects the transmitter to the spectrum analyzer.
- When there is a large change to the ambient temperature.
- At least once a day.

Step 7. 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 CT2-CAI measurements personality by pressing (MODE), CT2-CAI ANALYZER .

3 Press Physical Channel .

4 Select whether the base station (CFP) or handset (CPP) is to be tested. If you are testing a CFP, ensure that CFP is underlined in the TRANSMIT CFP CPP softkey label. If necessary, press TRANSMIT CFP CPP so that CFP is underlined. If you are testing a CPP, press TRANSMIT CFP CPP so that CPP 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 know the frequency of the channel, press CH 0 CTR FREQ , enter the frequency, then press (MHz). The channel number will be set to 0 automatically.

6 If the transmission burst length is 66 bits, ensure that 66 is underlined in the BITS 66 68 softkey label. If necessary, press BITS 66 68 so that 66 is underlined. If the transmission burst length is 68 bits, press BITS 66 68 so that 68 is underlined.

7 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 (CFP or CPP), the channel that you want tested, and the length of the burst.

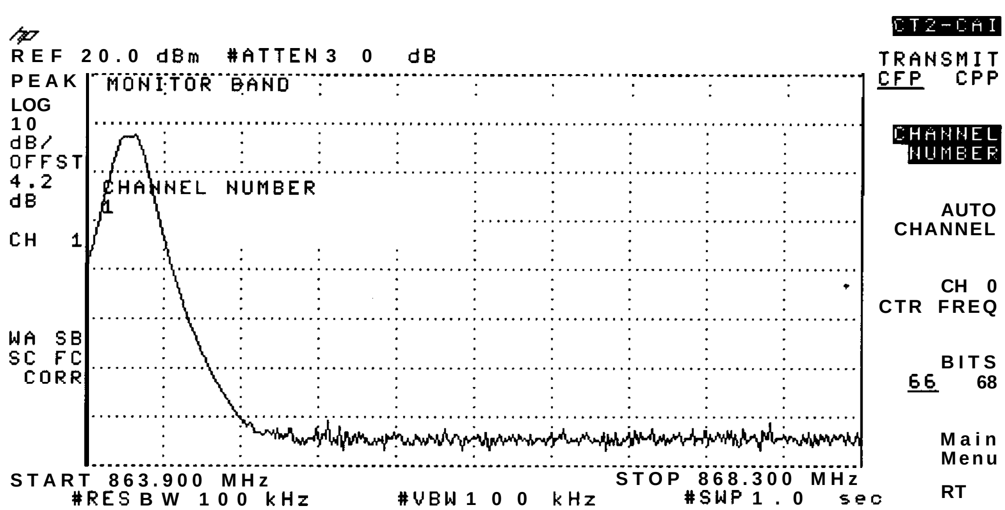


Figure 1-2. Selecting Channel 1

Notice that the channel number and the insertion loss entered into the EXT LOSS function are displayed on the left side of the spectrum analyzer display.

Spectrum Analyzer Functions and Annotation

This section contains information about how the CT2-CAI measurements personality changes the functions and screen annotation of an HP 8590 Series spectrum analyzer.

Changes to the Spectrum Analyzer Functions During CT2-CAI Operation

Most of the spectrum analyzer functions perform the same function regardless of whether the spectrum analyzer is using the CT2-CAI measurements personality mode or the spectrum analyzer mode. Some spectrum analyzer functions are either not available or are changed when the spectrum analyzer is using the CT2-CAI mode, however.

Note If you press SHOW OPTIONS and your spectrum analyzer has an Option 110 installed in it, the list of installed options displays Option 102, the AM/FM speaker and TV sync trigger circuitry card, instead of Option 110. Option 110 is incorrectly displayed as Option 102 because an Option 110 is a modified version of Option 102.

If you need to check if your spectrum analyzer has an Option 110 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 CT2-CAI mode:

AMPTD UNITS — The CT2-CAI measurements personality provides only dBm units.

(CAL) functions

REF LVL OFFSET — The CT2-CAI measurement personality offsets the reference level whenever a value is entered into the EXT LOSS function.

VID AVG ON OFF — The CT2-CAI measurements personality uses its own averaging function.

The following spectrum analyzer functions are changed by the CT2-CAI mode:

SCALE LOG/LIN — becomes SCALE LOG (linear scale is not available in the CT2-CAI mode).

(FREQUENCY) — Depending on the current CT2-CAI measurements personality measurement, (FREQUENCY) accesses either the spectrum analyzer frequency functions, or the CT2-CAI physical channel menu.

- If the current CT2-CAI measurement is a power, power versus time, or the frequency and modulation function, pressing (FREQUENCY) accesses the softkeys in the physical channel menu.
- If the current CT2-CAI function is MONITOR BAND or one of the spurious and intermodulation functions, pressing (FREQUENCY) accesses the spectrum analyzer frequency functions and CH 0 CTR FREQ .

CT2-CAI Measurements Personality Screen Annotation

When using the CT2-CAI 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 CT2-CAI measurements settings. Refer to Figure l-3 and Table l-2 for an explanation of the screen annotation that is related to the CT2-CAI measurements personality.

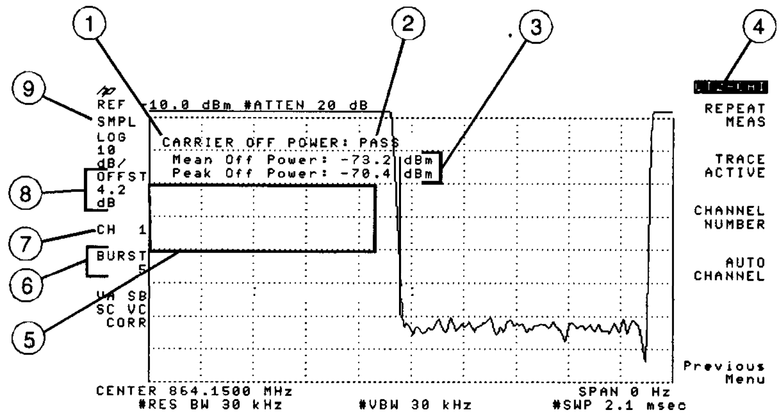


Figure l-3. CT2-CAI Screen Annotation

Table l-2. CT2-CAI Screen Annotation

Item	Display Annotation	Description
1	Measurement	The current CT2-CAI measurement.
2	PASS or FAIL messages	Indicates if the measurement results passed or failed the current measurement limits.
3	Measurement results	The measurement results.
4	CT2-CAI	Indicates the spectrum analyzer is using the CT2-CAI measurements personality (also referred to as the CT2-CAI mode).
5	Active function or error message	Indicates either the active function that has been selected or an error message.
6	BURST	Displays the number of bursts or sweeps that were used for the measurement.
7	CH	Displays the channel number.
8	OFFSET	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).

Accessing the Spectrum Analyzer Functions (Optional)

The menus of the CT2-CAI measurements personality provide the softkeys that are normally needed for making CT2 measurements. You may want to use some spectrum analyzer functions without leaving the CT2-CAI 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 CT2-CAI measurements personality.
- Access the spectrum analyzer mode.

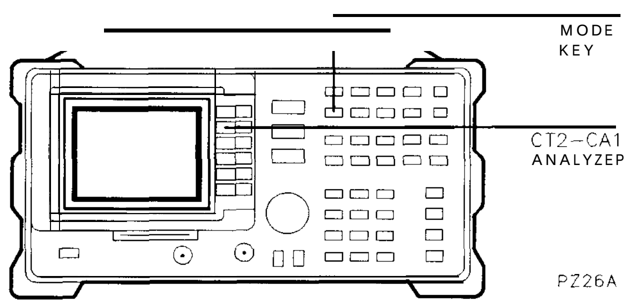
To access the spectrum analyzer functions while using the CT2-CAI measurements personality mode

1 To use a spectrum analyzer function without leaving the CT2-CAI 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 CT2-CAI measurements personality menu, you can do either of the following:

- To return to the CT2-CAI 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 CT2-CAI measurements personality, press (MODE), CT2-CAI ANALYZER.

Some spectrum analyzer front-panel keys can provide useful, supplemental functions for CT2 measurements, and most spectrum analyzer functions can be used while using the CT2-CAI measurements personality. See "Changes to the Spectrum Analyzer Functions During CT2-CAI Operation" in this Chapter for the list of the functions that cannot be used while in the CT2-CAI measurements personality.



To access the spectrum analyzer mode

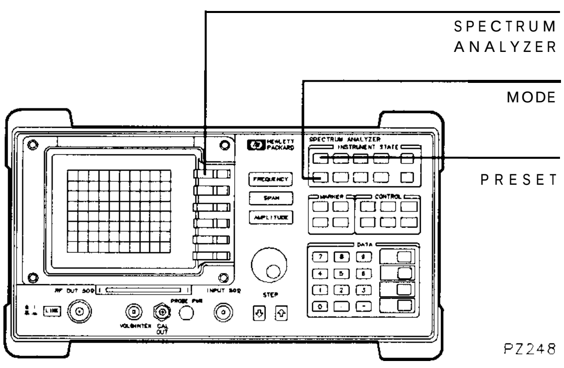
- Press (PRESET). [PRESET) changes all of the CT2-CAI measurements personality functions back to their default values, except for the functions in the configuration menu and TRANSMIT CFP CPP.

  or,

- Press (MODE), then SPECTRUM ANALYZER . Unlike (PRESET), SPECTRUM ANALYZER does not change any of the CT2-CAI measurements personality softkey settings.

When you press SPECTRUM ANALYZER or (PRESET), the spectrum analyzer will exit the CT2-CAI measurements personality and use the spectrum analyzer mode instead. When the spectrum analyzer is in the spectrum analyzer mode, CT2-CAI is no longer displayed in the upper right corner of the spectrum analyzer display.

The CT2-CAI measurements personality can be reaccessed by pressing (MODE), then CT2-CAI ANALYZER.



2

Making Measurements

This chapter demonstrates how to make measurements with the CT2-CAI measurements personality. This chapter contains procedures for performing the following measurements:

- Measuring the carrier power, the adjacent channel power, and the out of band power of a transmitter.
- Measuring the amplitude and timing of a CFP or CPP 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, see “The Post-Measurement Menu” in Chapter 3.

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.
- Carrier off power.
- Adjacent channel power.
- Out of band power.

Note Except for using time-gating (GATE ON OFF is set to ON) during the adjacent channel measurement, an external trigger is not required for any of the power measurements. See "To measure the adjacent channel power" 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. See "Step 7. Select a channel to test" in Chapter 1 for more information.

2 Press Power . (If Power is not displayed, press (MODE), **CT2-CAI 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 low power setting for a carrier, change the transmitter's RF output to the low power setting, then press REPEAT **MEAS** . The personality will measure the mean carrier power level, calculate the relative power decrease, compare that result against the low power limits, and then display the results.

6 Press Previous Menu if you are done with the carrier power measurement, or use one of the post-measurement functions.

CARRIER POWER measures the mean carrier power, compares it to the limits for a normal power carrier, and then displays the results. You can also use RANGE AUTO L **N** and REPEAT **MEAS** to test a low power carrier (see the description for **RANGE** AUTO L **N** in Chapter 6 for more information). Because the low power limits are based upon the measurement results for normal power, you must perform a measurement at the normal power setting before performing a measurement at the low power setting.

See Figure 2-1 for an example of the carrier power measurement.

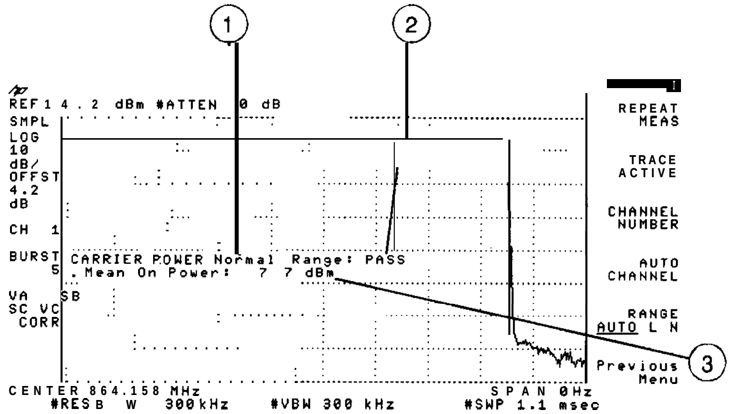


Figure 2-1. Carrier Power Measurement

① Indicates which limit (normal or low) was used for the comparison.

- If Normal is displayed, the transmitter's power level is compared to the normal limits for carrier power.
- If Low is displayed, the difference between the two power levels that were measured is compared to the low limit for the carrier power.

② Indicates if the transmitter's power level is within the power level limits. If the carrier power is within the power level limits, PASS is displayed on the analyzer screen. If the carrier power is too low, FAIL LO is displayed. If the carrier power is too high, FAIL HI is displayed.

③ 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.

To measure the carrier off power

1 Ensure that the channel number selection agrees with the transmitter's RF output. See "Step 7. Select a channel to test" in Chapter 1 for more information.

2 If CARRIER OFF PWR is not displayed, press Power. (If Power is not displayed, press (MODE), CT2-CAI ANALYZER to access Power).

3 Press CARRIER OFF PWR . The personality will make the measurement and display the results.

4 Press Previous Menu if you are done with the carrier off power measurement, or use one of the post-measurement functions.

CARRIER OFF PWR measures the mean and peak carrier power when the carrier is off, compares the results to the carrier off power level limit, and then displays the results.

See Figure 2-2 for an example of a carrier off power measurement.

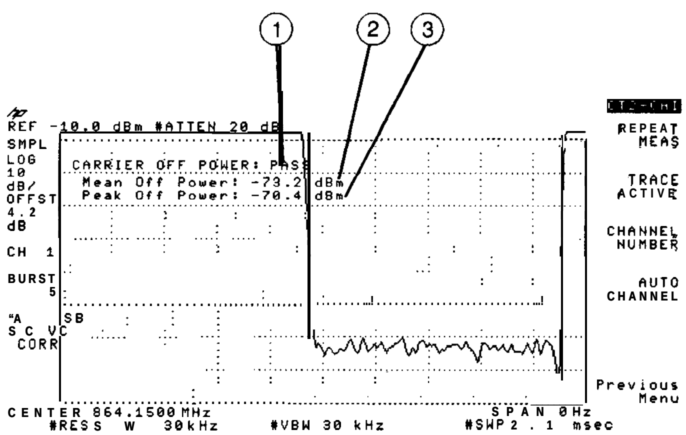


Figure 2-2. Carrier Off Power Measurement

① Indicates if the carrier off power level was within the limit. If the carrier off power is below the power level limit, PASS is displayed on the analyzer screen. If the carrier off power is above the limit, FAIL is displayed.

② Indicates the measured value of the mean carrier power when the carrier is off. (The CT2-CAI measurements personality defines the region between the points that are + 10 dB above the minimum carrier level to be the carrier off region.)

③ Indicates the measured peak carrier power when the carrier is off. The peak power is measured by making the measurement 25 μs inside the + 10 dB points (referenced to the minimum carrier level) of the burst.

To measure the adjacent channel power

1 Ensure that the channel number selection agrees with the transmitter's RF output. See "Step 7. Select a channel to test" in Chapter 1 for more information.

2 If ADJ CHAN POWER is not displayed, press Power. (If Power is not displayed, press (MODE), CT2-CAI ANALYZER to access Power).

3 Press ADJ CHAN POWER . 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 ***MPT 1375 Common Air Interface Specification*** and ***I-ETS 300 131*** documents specify that the adjacent channel power measurement should be made without time-gating, however.) To use time-gating, press GATE ON OFF so that ON is underlined, and then press REPEAT MEAS . (Because you need to use external triggering to use time-gating, ensure that the selection for TRANSMIT CFP CPP , TRIG POL NEG POS , and TRIG DELAY are correct. See "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.) When you no longer want time-gating, press GATE ON OFF until OFF is underlined.

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

ADJ CHAN POWER measures the power that "leaks" from the transmitted channel into adjacent channels, compares the results to the adjacent channel power level limit, and then displays the results. The personality uses the spectrum analyzer's positive peak detector and an 80 kHz integration bandwidth to measure the power in the adjacent channels. 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.

See Figure 2-3 and Figure 2-4 for examples of an adjacent channel power measurement.

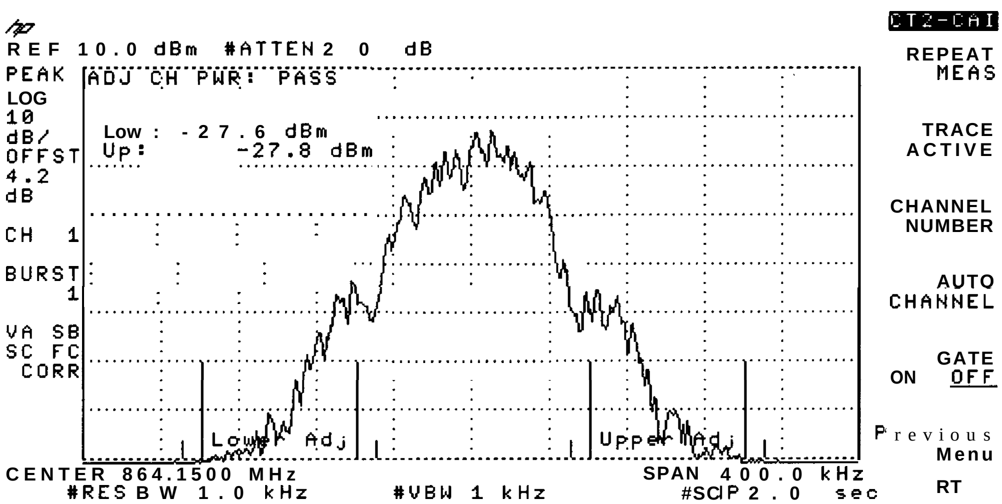


Figure 2-3. The Adjacent Channel Power Measurement (Time-Gating is Not Used)

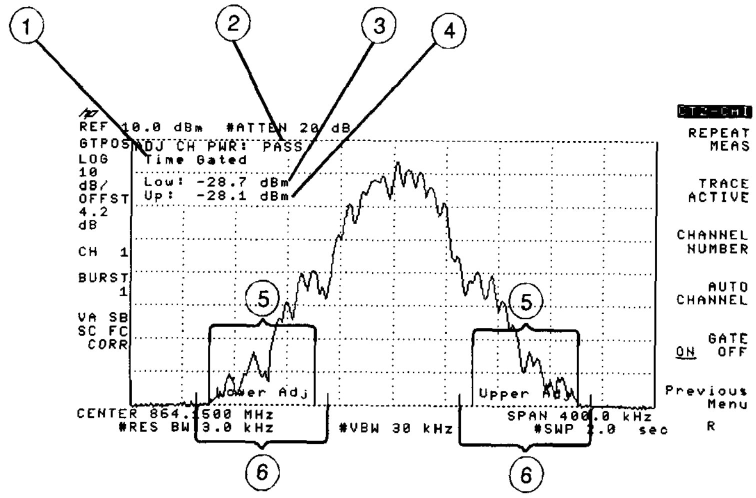


Figure 2-4. The Adjacent Channel Power Measurement with Time-Gating

① Indicates that time-gating was used when making the adjacent channel power measurement.

② Indicates if the power levels measured in the adjacent channels were within the adjacent channel power level limit. If the power is below the adjacent channel power limit, PASS is displayed on the analyzer screen. If the adjacent channel power is too high, FAIL is displayed.

③ Indicates the measured power level in the lower adjacent channel.

④ Indicates the measured power level in the upper adjacent channel.

⑤ Indicates the region (the 80 kHz bandwidth) where the adjacent channel power is measured.

⑥ Indicates the edges of the adjacent channels.

To measure the out of band power

1 Ensure that the channel number selection agrees with the transmitter's RF output. See "Step 7. Select a channel to test" in Chapter 1 for more information.

2 If OUT OF BAMD PWR is not displayed, press Power. (If Power is not displayed, press (MODE), CT2-CAI ANALYZER to access Power).

3 Press OUT OF BAND PWR . The personality measures the peak power at offsets of ±100 kHz and+/-500 kHz from the carrier and displays the results.

4 If you want to view a continuous limit line in addition to the results at the four frequency offsets points, press LMT LIME ON OFF so that ON is underlined. Notice that even if the signal exceeds the limit line at frequencies other than the specified frequency offsets, the signal will still pass the out of band power test; The ***MPT 1375 Common Air Interface Specification*** and ***I-ETS 300 131*** documents specify limits only at the offset frequencies.

5 Press Previous Menu if you are done with the out of band power measurement, or use one of the post-measurement functions.

OUT OF BAND PWR measures power emissions due to switching transients (also called AM splatter), and then compares the results to the out of band power limits. The power emissions are measured by measuring the peak power at offsets of ±100 kHz and f500 kHz from the carrier frequency.

See Figure 2-5 for an example of an out of band power measurement,

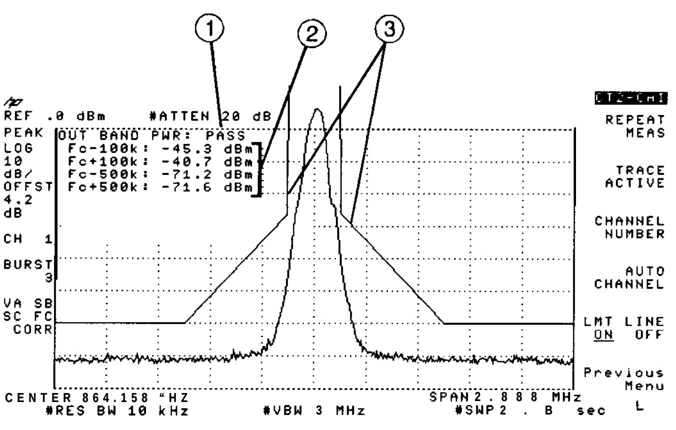


Figure 2-5. Out of Band Power Measurement

① Indicates if the measured power levels at the specified frequency offsets were within the limits. If all the power levels were within the limits, PASS is displayed on the analyzer screen. If at least one of the power levels exceeded its limit, FAIL is displayed.

② Indicates the measured power levels. ,

③ The limit line. The limit line is displayed only if LMT LINE ON OFF is set to ON.

Measuring the Amplitude and Timing of a CFP or CPP Transmission

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

This section contains the following procedures:

- Setup a power versus time measurement.
- View a frame.
- View the CFP or CPP burst.
- Measure the rising or falling edge 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 CFP CPP , TRIG POL NEG POS , and TRIG DELAY are correct. See "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. See "Step 7. 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), CT2-CAI ANALYZER to access Power vs Time).

3 Press P vs T Setup to access the power versus time setup functions.

4 If you want to select the number of sweeps the spectrum analyzer measures, press NUMBER BURSTS , enter the number of measurement sweeps (each sweep measures a burst) to be measured with the data keys, 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.

5 If you want to obtain a trace that is an average of the trace data over the number of bursts, press 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.

6 If the transmission burst length is 66 bits, ensure that 66 is underlined in the BITS 66 68 softkey label. If necessary, press BITS 66 68 so that 66 is underlined. Or, if the transmission burst length is 68 bits, press BITS 66 68 so that 68 is underlined.

7 Press Previous Menu if you are done with the P vs T Setup functions.

P vs T Setup allows you to change the number of bursts used for a power versus time measurement, select how the trace results are displayed, and select either a 66 or a 68 bit transmission burst length. See Figure 2-6 for an example of the trace results of averaging five bursts. See Figure 2-7 for an example of the trace results of the maximum and minimum peaks of five bursts.

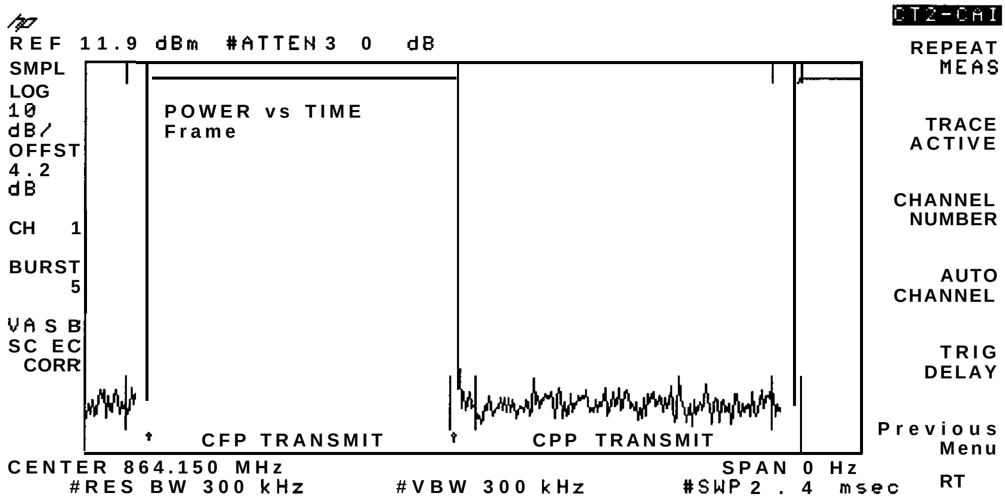


Figure 2-6. Measuring the Average of Five Bursts

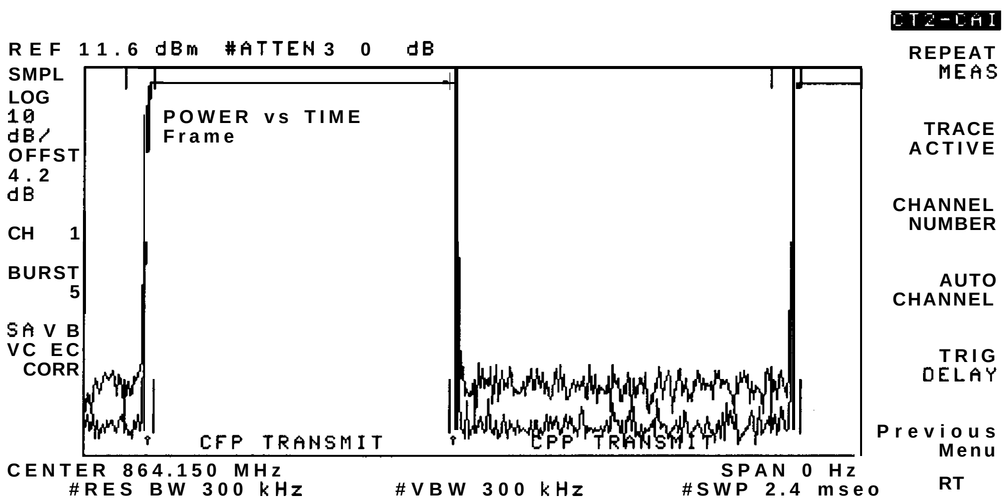


Figure 2-7. Measuring the Maximum and Minimum Peaks of Five Bursts

To view the frame

1 Ensure that the channel number selection agrees with the transmitter's RF output. See "Step 7. 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), CT2-CAI 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. See "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 within the CFP or CPP boundaries (see number 1 in Figure 2-8 for an example of the boundaries), press TRIG DELAY , then use the large knob on the spectrum analyzer's front panel to adjust the trigger delay until the burst is centered between the small vertical lines on the spectrum analyzer display,

5 Press Previous Menu if you are done 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 CFP and CPP 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 or P vs T FALLING. See Figure 2-8 for an example of viewing a frame.

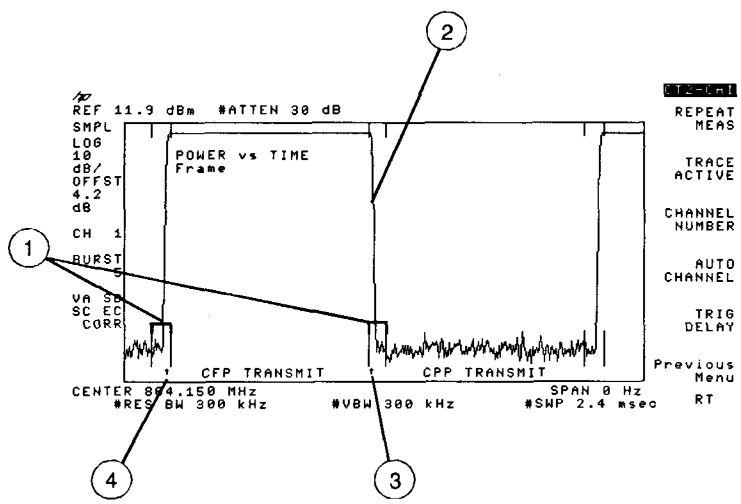


Figure 2-8. Viewing a Frame

① Indicates the area where the edges of the CFP or CPP burst should occur.

② The CFP signal. The CPP signal will appear in the CPP transmit portion of the time frame. You must use TRANSMIT CFP CPP to select the correct timing for the power versus time measurements.

③ Indicates where the end of bit 68 for a CFP transmission should occur. This position is also the reference position for external triggering when the trigger polarity is negative and the trigger delay is equal to 0.

④ Indicates where the start of bit 1 for a CFP 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 view the CFP or CPP burst

1. If P vs T BURST is not displayed, press Power vs Time. (If Power vs Time is not displayed, press (MODE), CT2-CAI ANALYZER to access Power vs Time).

2. Press P vs T BURST to display the CFP or CPP transmission burst.

3. If the burst is not symmetrical with respect to the limit line, 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 line. 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 done with the **P vs T BURST** measurement, or use one of the post-measurement functions.

P vs T BURST measures the burst width and compares the width of the burst against the minimum limit line edges 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 or P vs T FALLING. See Figure 2-9 for an example of measuring a burst.

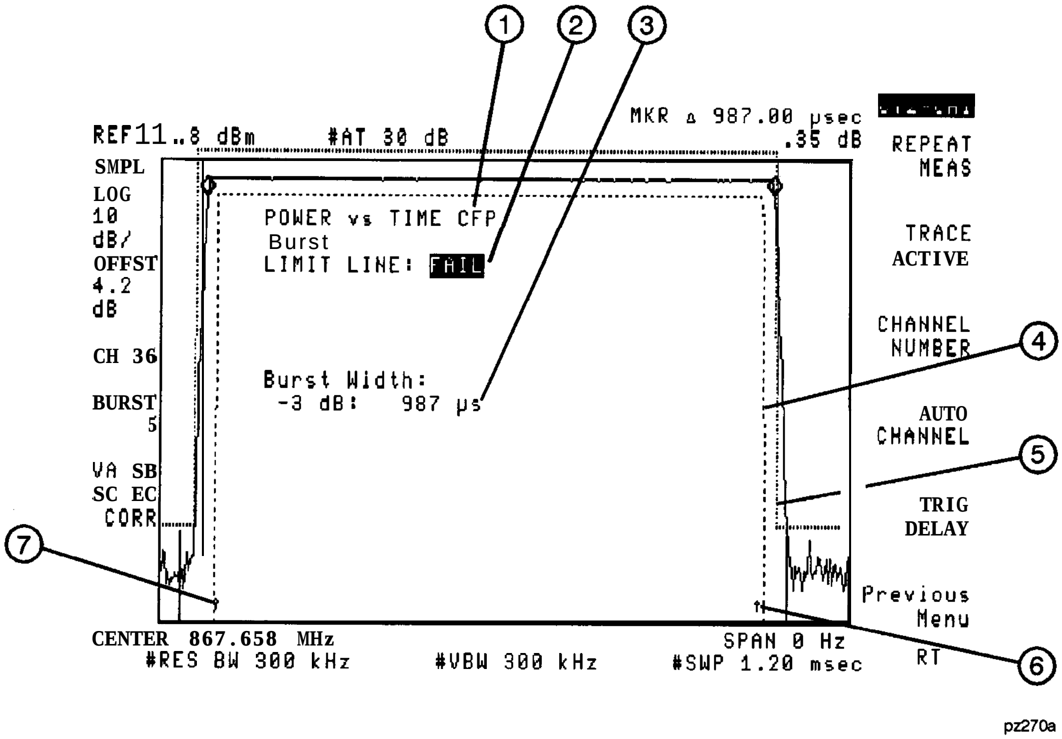


Figure 2-9. Measure a Burst

① Indicates which transmission (CFP or CPP) is displayed.

② Pass or Fail indication. If the burst is within the limit lines, PASS is displayed on the analyzer screen. If the burst is outside the limit lines, FAIL is displayed on the analyzer screen.

③ Indicates the width of the burst waveform. The burst width is measured -3 dB from the burst peak.

④ The inner limit line. This limit line indicates the minimum burst width.

⑤ The outer limit line. This limit line indicates the maximum burst width.

⑥ Indicates where the end of bit 68 for a CFP transmission should occur. This position is also the reference position for external triggering when the trigger polarity is negative and the trigger delay is equal to 0.

⑦ Indicates where the start of bit 1 for a CFP 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 or falling edge of a burst

1 Press Power vs Time . (If Power vs Time is not displayed, press (MODE), CT2-CAI 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 line. See the previous procedure "To view the CFP or CPP burst" for more information.

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

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

P vs T RISING allows you view the rising edge of a burst. See Figure 2-10 for an example of measuring the rising edge of a burst.

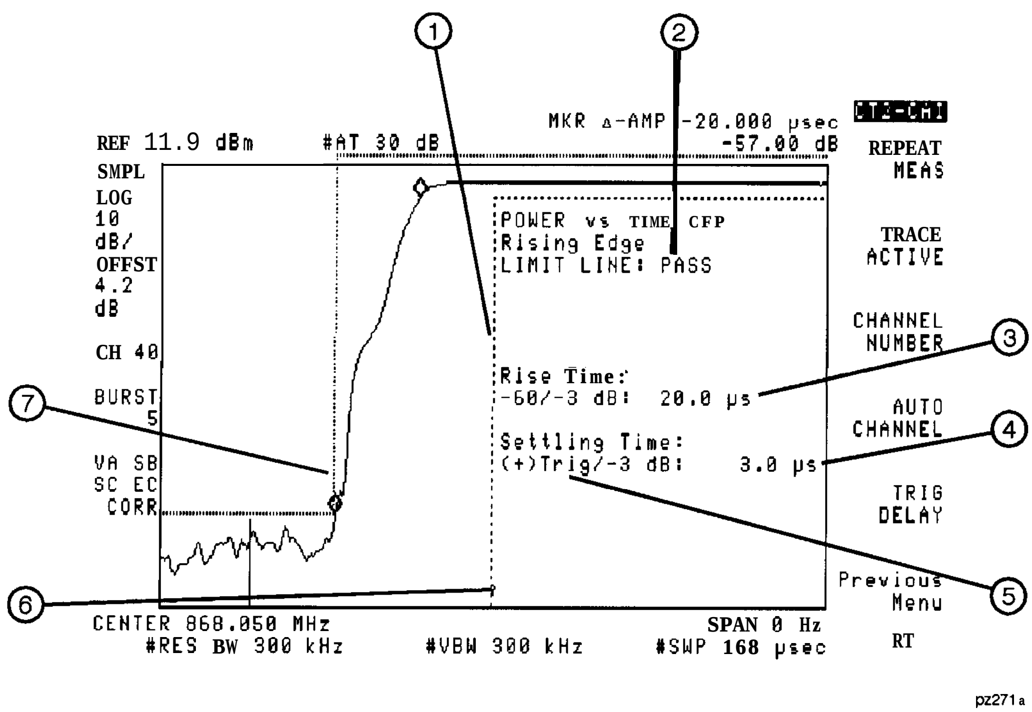


Figure Z-10. Measuring the Rising Edge of a Burst

① The inner limit line. This limit line indicates the minimum position for the rising edge for the burst.

② Pass or Fail indication. If the burst is within the limit lines, PASS is displayed on the analyzer screen. If the burst is outside the limit lines, FAIL is displayed on the analyzer screen.

③ Indicates the rise time. Rise time is the time it takes for the signal's amplitude to transition from -60 dB to -3 dB (referenced to the mean carrier power). NOTE: If no point on the trace is down by at least 60 dB, the rise time is computed from the lowest point on the trace.

④ Indicates the settling time. Settling time is the time it takes for the signal's amplitude to reach -3 dB *after* the trigger.

⑤ Indicates the triggering polarity. A " + " indicates positive triggering, a "-" indicates negative triggering. The triggering polarity is determined by TRIG POL NEG POS .

⑥ Indicates where the zero reference position occurs for positive triggering (also equivalent to the start of bit 1) of a 68 bit CFP burst. This arrow is displayed only for CFP bursts.

⑦ The outer limit line. This limit line indicates the maximum position for the rising edge of the burst.

P vs T FALLING allows you view the falling edge of a burst. See Figure 2-11 for an example of measuring the falling edge of a burst.

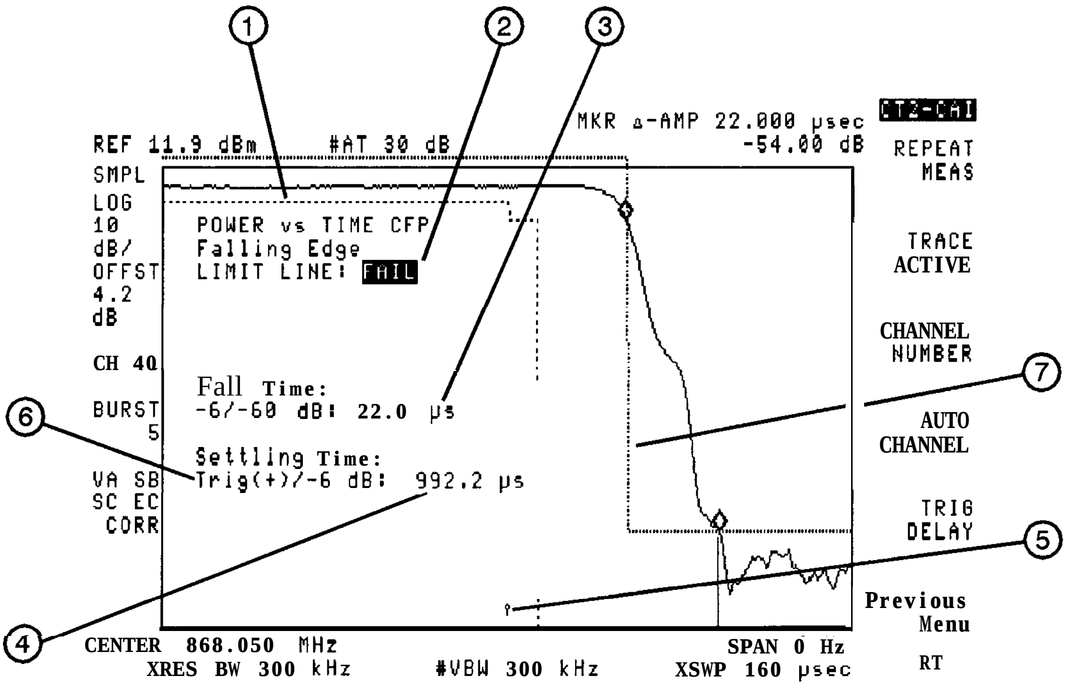


Figure 2-l 1. Measuring the Falling Edge of a Burst

① The inner limit line. This limit line indicates the minimum position for the falling edge for the burst.
② Pass or Fail indication. If the burst within the limit lines, PASS is displayed on the analyzer screen. If the burst is outside the limit lines, FAIL is displayed on the analyzer screen.
③ Indicates the fall time. Fall time is the time it takes for the signal's amplitude to transition from -6 dB to -60 dB (referenced to the mean carrier power). NOTE: If no point on the trace is down by at least 60 dB, the fall time is computed from the lowest point on the trace.
④ Indicates the settling time. Settling time is the time it takes for the signal's amplitude to reach -6 dB *after* the trigger.
⑤ Indicates where the zero reference position occurs for negative triggering (also equivalent to the end of bit 68) of a 68 bit CFP burst. This arrow is displayed only for CFP bursts.
⑥ Indicates the triggering polarity. A " + " indicates positive triggering, a "-" indicates negative triggering. The triggering polarity is determined by TRIG POL NEG POS .
⑦ The outer limit line. This limit line indicates the maximum position for the falling edge 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** .

There are two ways to perform the frequency error and frequency deviation measurements: with Option 110 (the CT2 demodulator card) or with an HP 53310A modulation domain analyzer.

This section contains the following procedures for performing the frequency and deviation measurement with Option 110:

- Perform the frequency and modulation calibration.
- Measure the frequency deviation. An external frame trigger signal is required when using Option 110 to measure the frequency deviation of a burst carrier. (Remember that for a burst carrier, BURST CONT is should be set to BURST.)

This section also contains the procedure for performing the frequency and deviation measurement with an HP 53310A modulation domain analyzer.

To perform the frequency and deviation calibration Option 110 only

1 Press Freq & Modulat . (If Freq & Modulat is not displayed, press (MODE), CT2-CAI ANALYZER to access Freq & Modulat.)

2 Press CAL FREQ/DEV .

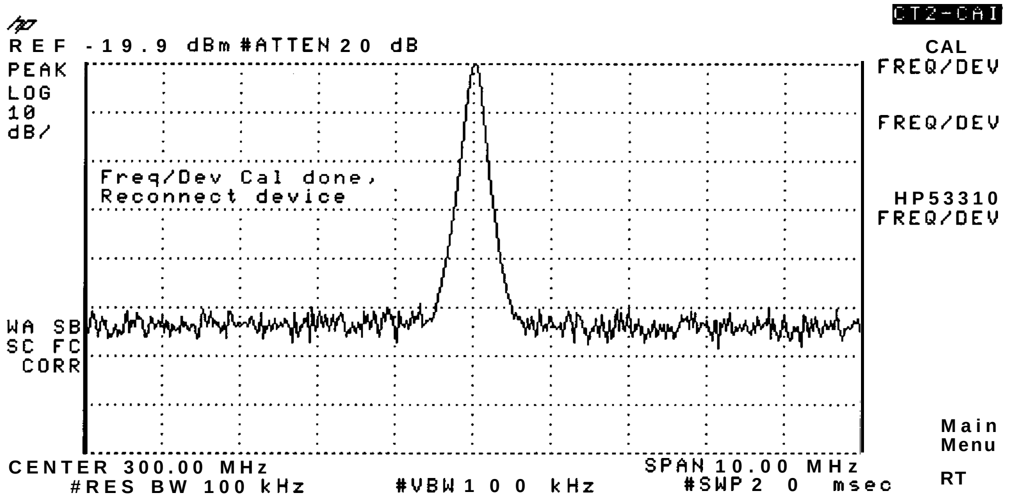
3 Connect a cable between the spectrum analyzer CAL OUT connector and the spectrum analyzer INPUT connector with the appropriate adapters.

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 110. When using FREQ/DEV , you should perform this calibration routine every 30 minutes or with a change in ambient temperature for best accuracy. Or, 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 110

1. Ensure that the channel number selection and the CFP or CPP selection (TRANSMIT CFP CPP) agree with the transmitter's RF output. See "Step 7. 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), **CT2-CAI** ANALYZER to access Freq & Modulat .)
3. Perform the frequency and deviation calibration routine, if necessary. See 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 following: the mean and median frequency error, and peak frequency deviation, and the frequency drift. If a trace is not displayed on the screen, the spectrum analyzer may not be triggering correctly. See "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information about setting the trigger time delay and trigger polarity.
5. If you want to view the maximum and minimum peaks of the carrier (over many sweeps) press VIEW PKS LAST so that PKS is underlined. If LAST is underlined in **VIEW** PKS LAST , only the last sweep is viewed (data from all the sweeps is used in calculating the numerical results, however).
6. Press Previous Menu if you are done with the frequency deviation measurement, or use one of the post-measurement functions.

FREQ/DEV uses Option 110 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. (The vertical scale for the frequency and deviation measurement is 15 kHz per division.) FREQ/DEV performs the frequency error, peak frequency deviation, and frequency drift 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 mean frequency error is the difference between the zero deviation line and the average of all the frequency deviation samples.
- The peak deviation is one-half the total difference between the maximum and minimum deviation.
- The frequency drift of the carrier is determined by measuring the frequency near the beginning of the burst and measuring the frequency near the end of the burst, and then subtracting the two frequency values.

See Figure 2-12 for an example of a frequency and deviation measurement.

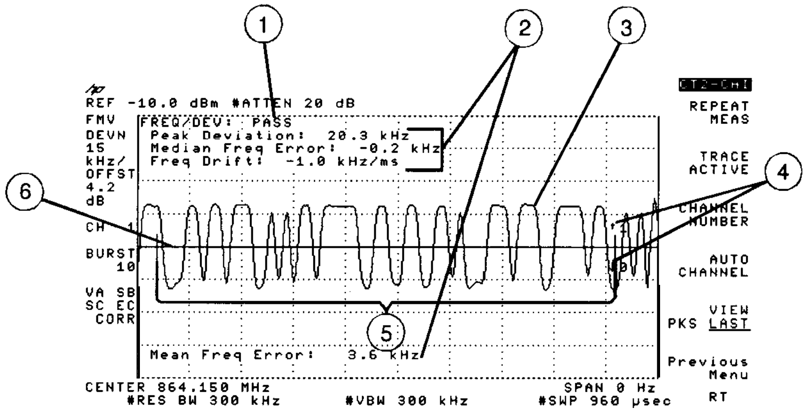


Figure 2-12. Results of FREQ/DEV, with VIEW PKS LAST Set to LAST

① Indicates if the frequency and deviation measurements were within the limits.
② The measurement results.
③ The waveform of the demodulated signal.
④ The "↑ 1" indicates that the bits in the burst that are equal to 1 are shown above the zero deviation line. The "↓ 0" indicates that the bits that are equal to 0 are shown below the zero deviation line.
⑤ Indicates the nominal burst width.
⑥ Nominal carrier frequency or zero deviation line.

To measure the frequency and deviation with an HP 53310A

1 Connect a cable from the AUX IF OUTPUT connector (located on the rear panel of the spectrum analyzer) to channel A of the HP 53310A. See Figure 2-13. (The spectrum analyzer is used as an RF down converter and controller for this measurement.)

2 Connect an HP-IB cable from the spectrum analyzer to the HP 53310A. See Figure 2-13.

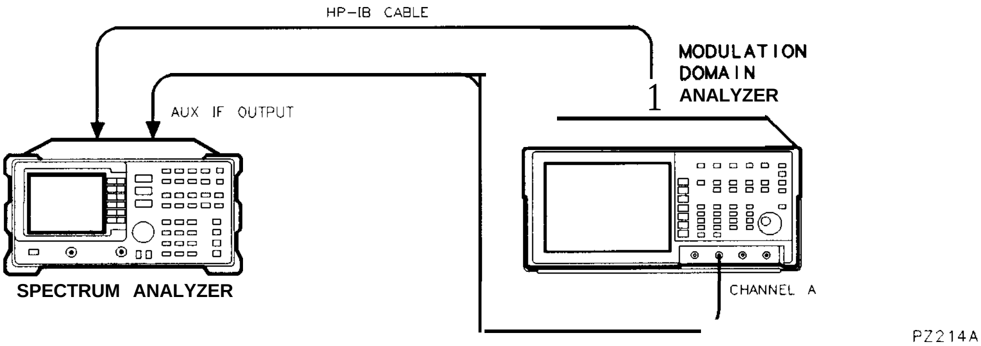


Figure 2-13. Equipment Setup

3 Ensure that there are no other controllers (for example, a computer) besides the spectrum analyzer connected to the HP-IB.

4 Ensure that there are no other instruments on the HP-IB that have an address of 12.

5 Check that the HP 53310A is at address 12. On the HP 53310A, press (Utility), HP-IB/PRINT MENU , then select addressed mode (addressed should be highlighted in talk only addressed). If the address is not set to 12, enter 12 as the address number and then press (ENTER).

6 Ensure that the HP 85717A ROM card is inserted into the spectrum analyzer's memory card reader.

7 Press Freq & Modulat . (If Freq & Modulat is not displayed, press (MODE), CT2-CAI ANALYZER to access Freq & Modulat .)

8 Press HP53310 FREQ/DEV . The personality instructs the HP 53310A to perform the measurement. When the HP 53310A is finished, the numeric measurement results are displayed on the spectrum analyzer display and the graphical results are displayed on the HP 53310A display.

9 If you want to change the HP 53310A markers or use the HP 53310A functions, press FREE RUN HP53310 and then manually control the HP 53310A modulation domain analyzer functions from the HP 53310A front panel.

10 If you want to update the spectrum analyzer display with the new HP 53310A results, press READ MARKERS . The spectrum analyzer display will be updated to the new frequency error and frequency deviation results based upon the current HP 53310A marker positions.

11 If you want the HP 53310A to position the markers automatically and the spectrum analyzer to display the frequency error and frequency deviation results, press SEARCH & READ.

12 Press Previous Menu if you are done with the frequency and deviation measurement.

See Figure 2-14 for an example of the spectrum analyzer display after the frequency and deviation measurement.

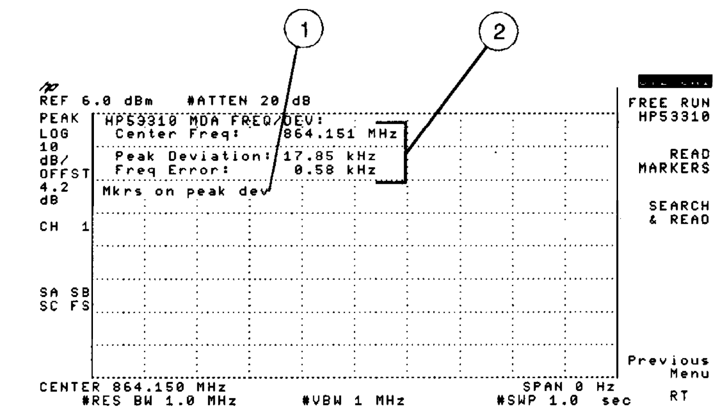


Figure 2-14. The Spectrum Analyzer Display

① Message indicating the location of the HP 53310A markers.
② The numeric results.

See Figure 2-15 for an example of the HP 53310A display after the frequency and deviation measurement.

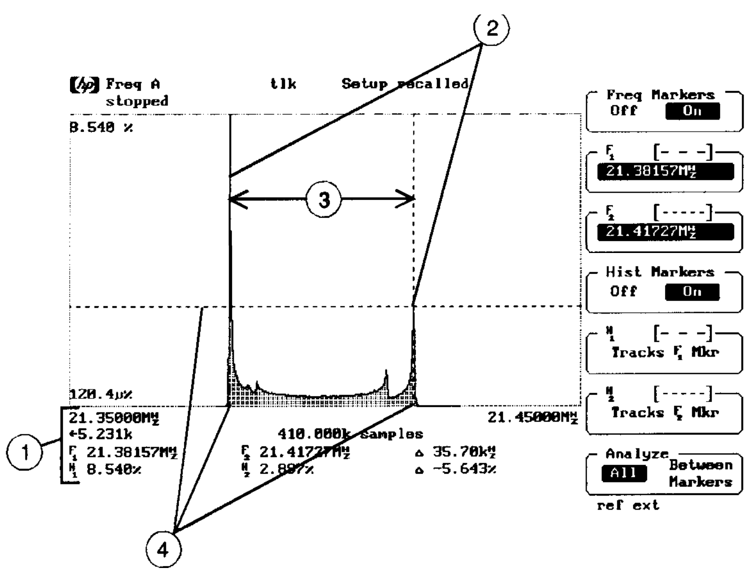


Figure 2-15. HP 53310A Display

① The numeric results.
② The frequency histogram peaks.
③ The peak-to-peak deviation (equal to the peak deviation times 2).
④ The markers.

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 spurious emissions or intermodulation attenuation.

To setup the testing parameters for a spurious emissions measurement

1 Press Spurs & Intermod. (If Spurs & Intermod is not displayed, press (MODE), CT2-CAI ANALYZER to access Spurs & Intermod .)

2 Press Spurious Setup to access the setup menu for the spurious measurements.

3 If you want to use a resolution bandwidth other than the default resolution bandwidth of 100 kHz, press TEST RBW MHz GHz . Select MHz to specify the resolution bandwidth used for test frequencies less than 1 GHz. Select GHz to specify the resolution bandwidth used for test frequencies of 1 GHz or greater. Then enter the desired resolution bandwidth by using the data keys, and then press the key for the appropriate frequency unit (for example, press (kHz) for the kHz frequency unit).

4 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.

5 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.

6 If you want the personality to use a table of amplitude correction factors from an amplitude correction factor trace register, press AMPC REG ON OFF so that ON is underlined, enter the trace register number of the amplitude correction factors, and then press (ENTER). You must have saved the table of amplitude correction factors in the trace register before using AMPC REG ON OFF *. See* the ***HP 8590 Series Operating Manual*** for information about entering and saving amplitude correction factors.

7 Press Previous Menu when you are done with the spurious emissions setup functions.

TEST RBW MHz GHz allows you to specify the resolution bandwidth used for the spurious emissions measurement. If you reduce the resolution bandwidth (for example, use a resolution bandwidth of 10 kHz), the sensitivity of the spectrum analyzer will improve, but the test time for the spurious emissions test will also increase greatly.

Because the spurious emissions measurement is performed over a wide frequency range, you may want to compensate for amplitude losses (over frequency) for the external equipment used for the spurious emissions measurement. You can compensate for those amplitude losses by entering amplitude correction factors into a table, saving that table, and then using the AMPC REG ON OFF function. When entering amplitude correction factors, you must enter in the difference between the value used for the external loss (the value entered into EXT LOSS) and the amplitude loss caused by the equipment (for example, fixed attenuators and cables). You must enter the difference between the amplitude loss and the external loss because the amplitude correction factors "adjust" the fixed value of the external loss. See Table 2-1 for and example of how the amplitude correction factors are determined for three different frequencies.

Table 2-1. Example of Determining the Amplitude Correction Factors

Frequency	Amplitude Loss of Equipment	Value of EXT LOSS	Amplitude Correction Factor
150 MHz	0.8 dB	3 dB	0.8 − 3 = −2.2 dB
866 MHz	3 dB	3 dB	3 − 3 = 0 dB
2 GHz	4.1 dB	3 dB	4.1 − 3 = 1.1 dB

To measure for spurious emissions

1 Ensure the state of the transmitter agrees with the setting for XCVR IDLE ACT . See 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), CT2-CAI 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 2-16.

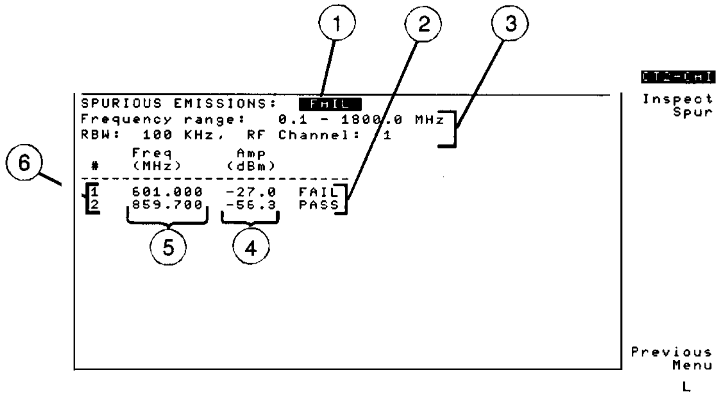


Figure 2-16. Viewing the Table of Spurious Emissions

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 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.
③ Indicates the resolution bandwidth, the current channel number, and frequency range used for the spurious emission test.
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. See "CHECK NOISE FLOOR" in Chapter 4 for information about reducing the noise floor level.

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.

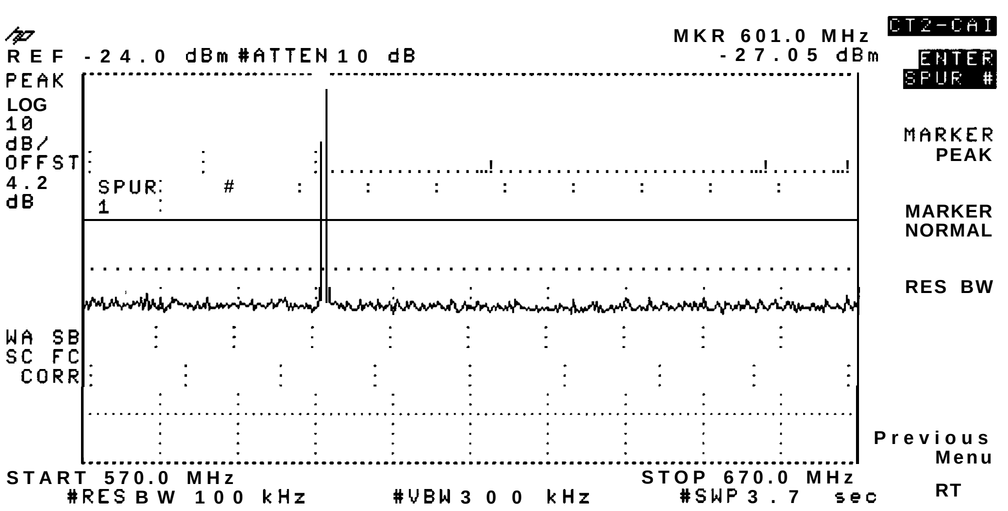
5 If you want to change the resolution bandwidth, press RES BW . You may want to decrease the resolution bandwidth for any spurious emissions in the table with an asterisk. (Decreasing the resolution bandwidth decreases the noise floor and increases the sensitivity of the spectrum analyzer.)

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 Because the intermodulation attenuation measurement is meant to measure the intermodulation products caused by two carriers, you must ensure that there are two carriers present, and the carriers need to be spaced at least 800 kHz apart. Connect the equipment as shown in Figure 2-17. (See Figure 2-18 for an example of the spectrum analyzer display of two carriers.)

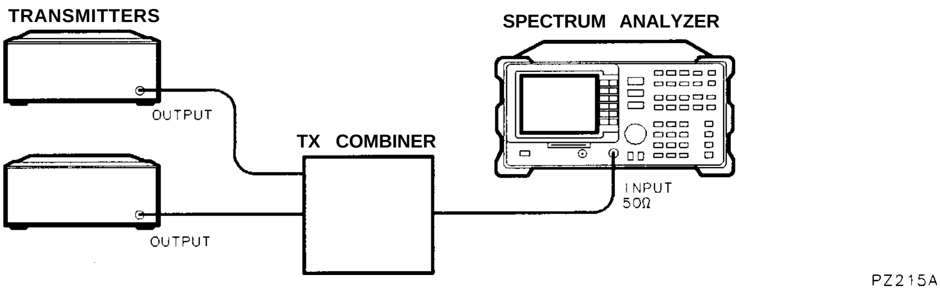


Figure 2-17. Equipment Setup for the Intermodulation Attenuation Measurement

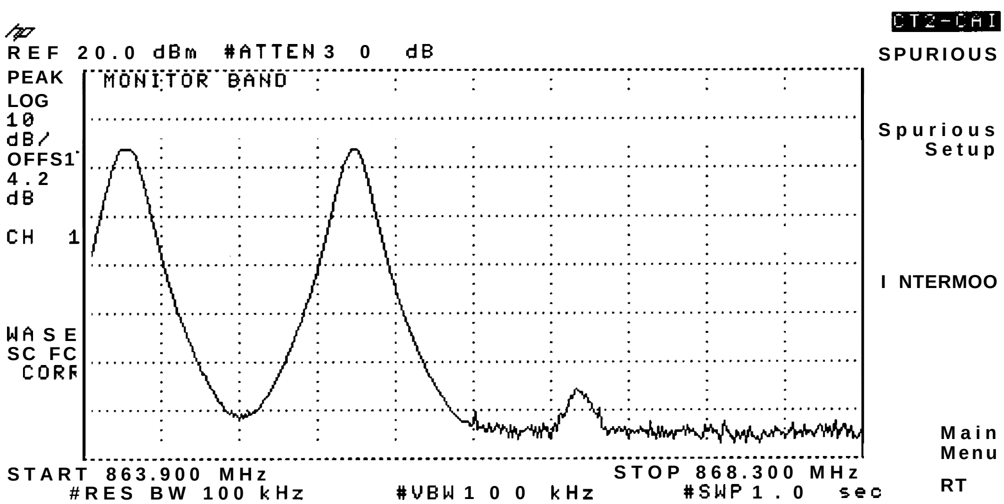


Figure 2-18. Screen Display of the Two Carriers

2 If INTERMOD is not displayed, press Spurs & Intermod. (If Spurs & Intermod is not displayed, press (MODE), CT2-CAI 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 If you want to view the upper product, press UPPER PRODUCT

6 If you want to view the lower product, press LOWER PRODUCT .

7 Press Previous Menu when you are done with the intermodulation attenuation measurement.

INTERMOD searches for the two carriers, determines the spacing between the two carriers, measures the amplitude levels of the third-order intermodulation products, and then displays the results.

See Figure 2-19 for an example of measuring intermodulation attenuation.

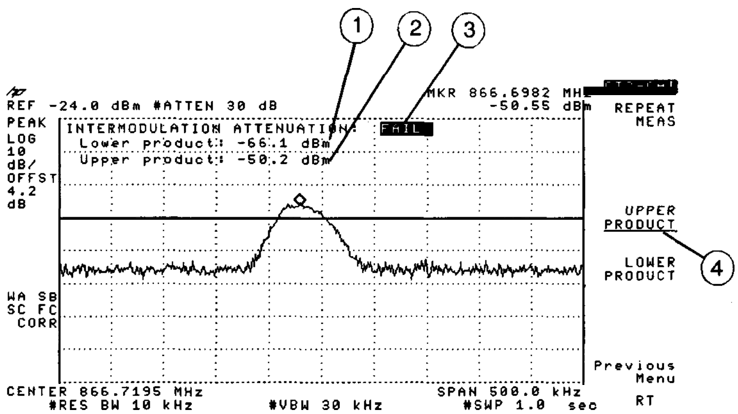


Figure 2-19. Measuring Intermodulation Attenuation

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 test passed or failed. If **FAIL** is displayed, at least one of the intermodulation products is above the limit.

④ For this example, PRODUCT is underlined in the UPPER PRODUCT softkey label to indicate that the spectrum of the upper product is being displayed.

3

Menu Map and Softkey Descriptions

This chapter contains the following:

- A menu map of the CT2-CAI measurements personality softkeys.
- Definitions of the CT2-CAI measurements personality softkeys. The softkeys are listed as they appear within a menu, and the CT2-CAI menus are presented as follows:

Configuration menu	Pressing Config accesses the configuration menu.
Physical Channel menu	Pressing Physical Channel access 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.
Calibration menu	Pressing CAL accesses the calibration menu for the CT2-CAI measurements personality.
Post-Measurement menu	Pressing a power measurement softkey, a power versus time measurement softkey, or FREQ/DEV accesses the post-measurement menu.

CT2-CAI Measurements Personality Menu Map

The following menu map is a graphic representation of how the CT2-CAI measurements personality's softkeys are accessed.

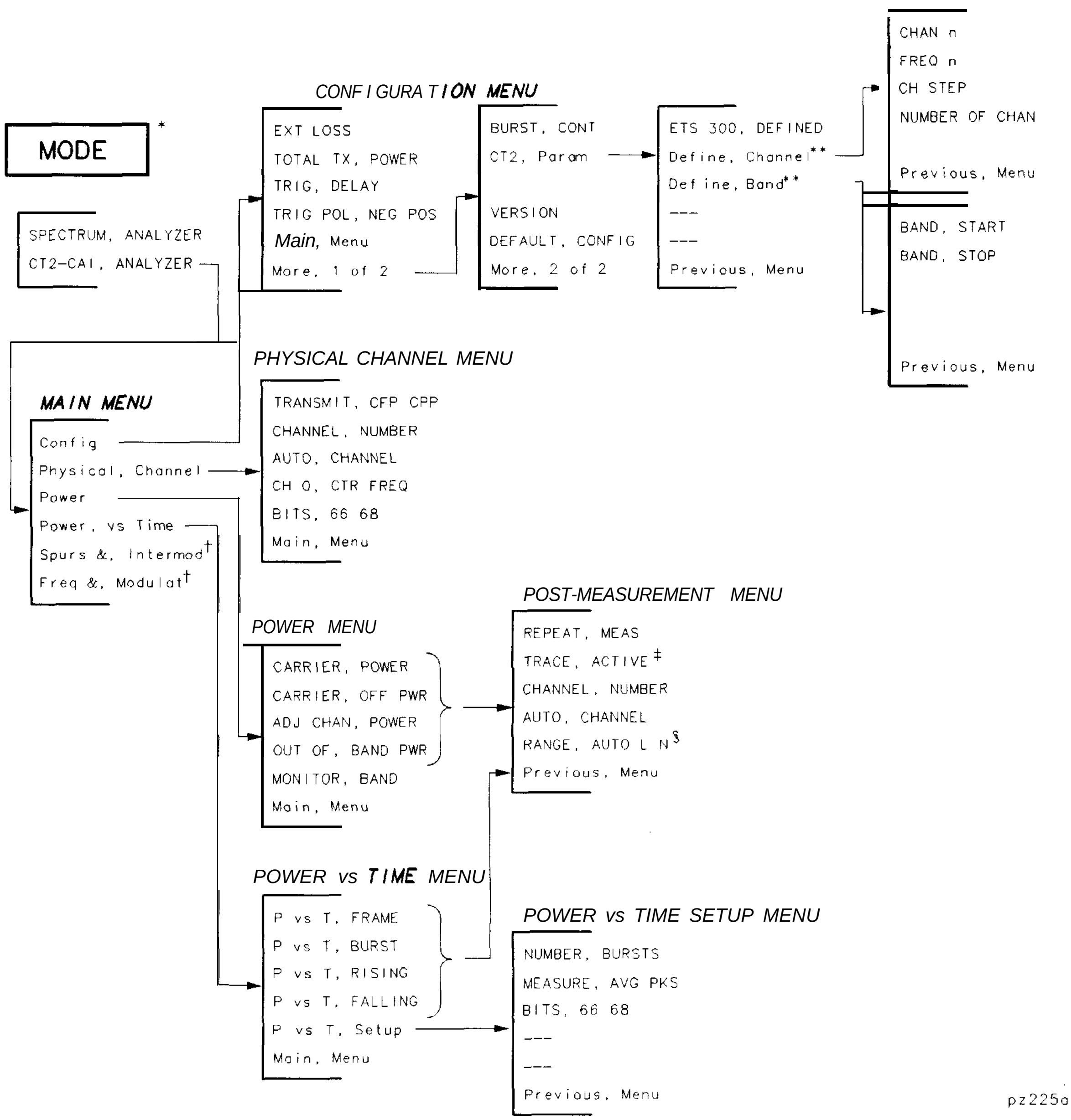


Figure 3-1. Overall Menu Map

* The first time you press (MODE), you access the MODE menu. If you press (MODE) again, you will access the current CT2-CAI menu.

† See 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: RANGE AUTO L N is available only for CARRIER POWER, GATE ON OFF is only available only for ADJ CHAN POWER, LMT LINE ON OFF is available only for OUT OF BAND PWR , TRIG DELAY is available only for the Power vs Time measurement functions, and VIEW PKS LAST is available only for FREQ/DEV

** The Define Channel and Define Band softkeys are available only if DEFINED is selected.

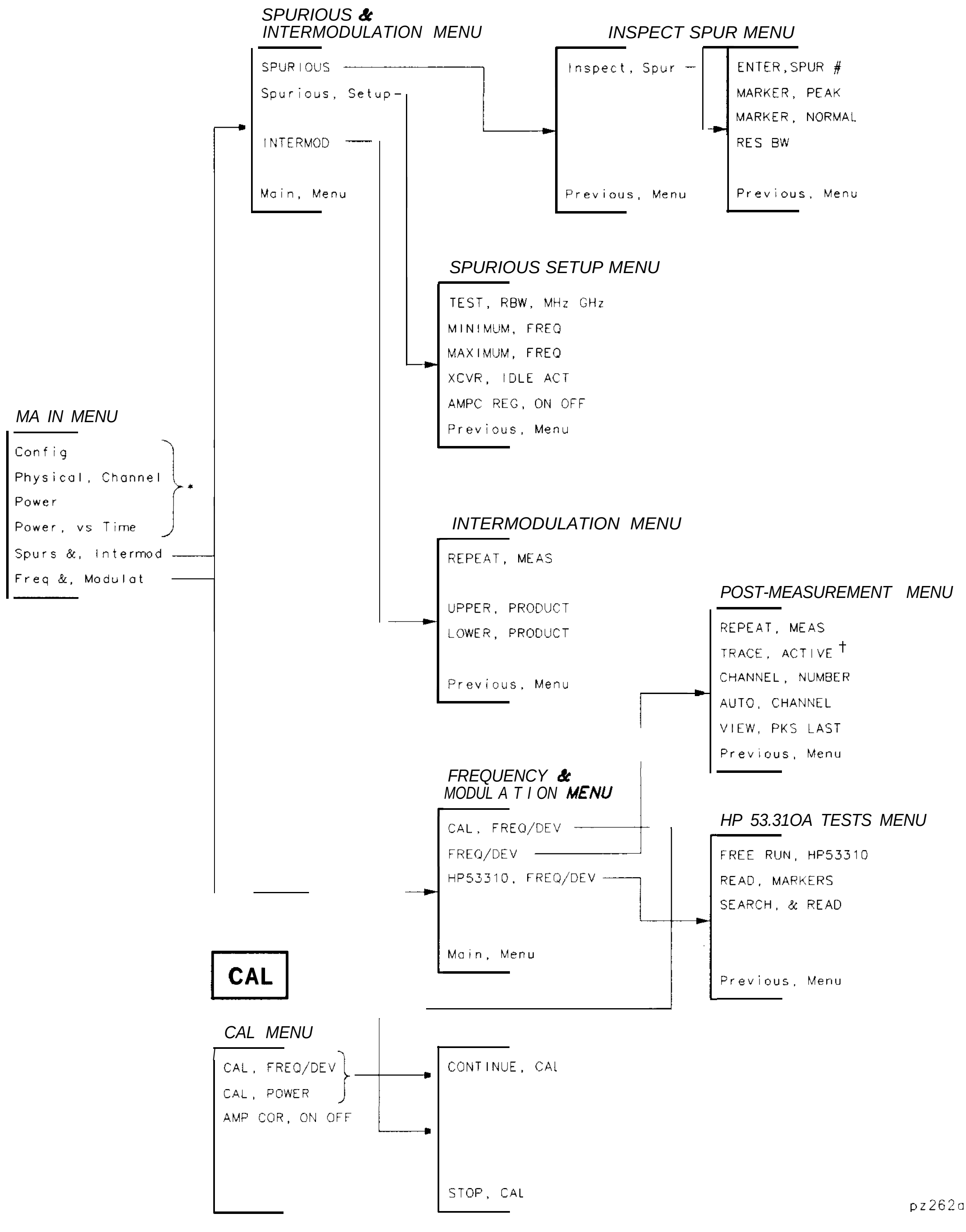


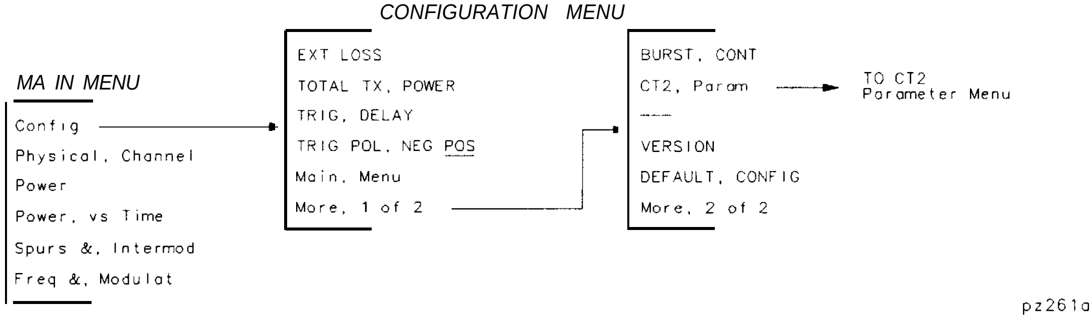
Figure 6-1. Overall Menu Map (continued)

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

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

The Configuration Menu

Pressing Config accesses the softkeys that allow you to configure the CT2-CAI 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.

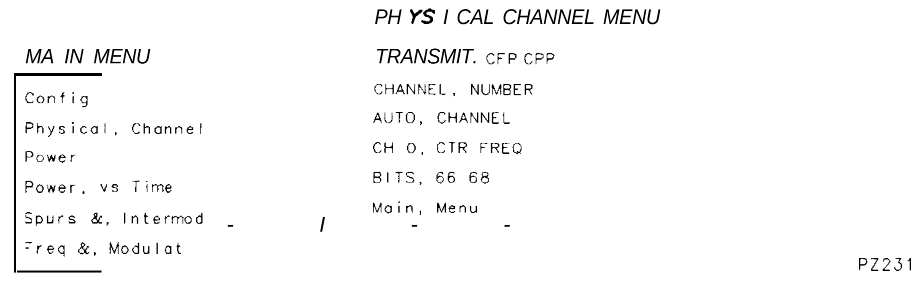
You can reset the configuration functions to their default values with DEFAULT CONFIG . For example, if you enter 3 dB of external loss with EXT LOSS , the value for EXT LOSS will be 3 dB until you change it (by using EXT LOSS), or use DEFAULT CONFIG .

The Configuration MenuSoftkeys

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 30 to 0 dB (referenced from the transmitter output) in 1 dB increments. If the total transmission power is not entered, a default value of + 13 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 the beginning of a 68 bit CFP burst (the start of bit 1). For a negative-edge trigger, the reference point is the end of a 68 bit CFP burst (the end of bit 68). You can enter a trigger delay from -2200 μs to + 1800 μs in 1 μs increments. If you do not enter a trigger delay, a default value of 0 μs is used.
TRIG POL NEG POS	Allows you to select the edge trigger polarity for the external transistor-transistor logic (TTL) trigger signal. If you select negative polarity, the spectrum analyzer will trigger on the negative (falling) edge of the trigger signal. Selecting positive polarity results in the spectrum analyzer triggering on the positive (rising) edge of the trigger signal. The default for this function is POS.
Main Menu	Allows you to return to the main menu.
More 1 of 2	Accesses the second level 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.
CT2 Param	Accesses softkeys that allow you to select either I-ETS 300 131 frequency parameter values or select and vary user-defined frequency parameter values.
VERSION	Displays the version of the CT2-CAI measurements personality, and the versions of the ***MPT 1375 Common Air Interface*** *Specification* and ***I-ETS 300 131*** documents that were used to derive the CT2-CAI measurement routines.
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 + 13 dBm, TRIG DELAY is set to 0 μs, TRIG POL NEG POS is set to POS, BURST CONT is set to BURST, TRANSMIT CFP CPP is set to CFP. DEFAULT CONFIG also sets the amplitude correction factor that is created by the power calibration routine to 0.
More 2 of 2	Returns to the first level of the configuration menu.

The Physical Channel Menu

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



The Physical Channel Menu Map

The Physical Channel Menu Softkeys

TRANSMIT CFP CPP
: Allows you to examine either the cordless fixed part (CFP) transmission or the cordless portable part (CPP) transmission in the power versus time and the frequency and modulation measurements. If CFP is underlined, the timing of the measurements is set to examine the cordless fixed part (also called the base station) transmission burst. When CPP is underlined, the timing of the measurements is set to examine the cordless portable part (also called the handset) transmission burst. The default for this function is CFP. The selection for CFP or CPP 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 CT2-CAI channel you want to measure. The CT2-CAI 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 40, inclusive. If you do not enter a channel number, or if you press (PRESET), the channel selection defaults to channel 1.

AUTO CHANNEL
: Automatically tunes to the channel having the highest carrier power level, and then displays the full frequency band of the CT2 radio by setting the start frequency of the spectrum analyzer to 863.9 MHz and the stop frequency to 868.3 MHz.

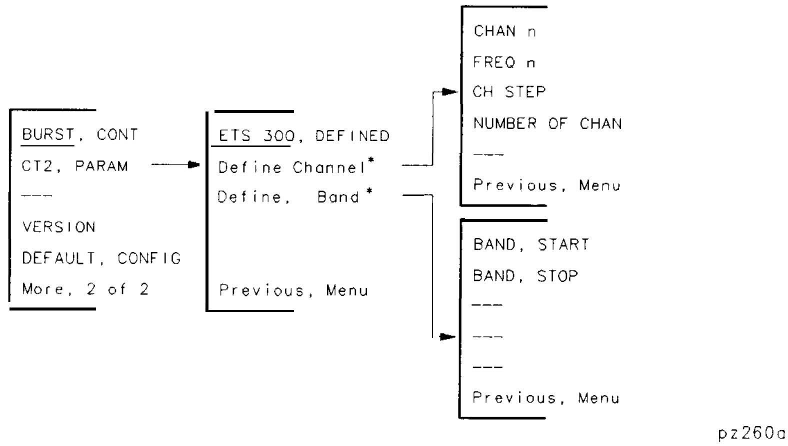
CH 0 CTR FREQ
: Allows you to enter the frequency of any arbitrary channel that you want to measure. CH 0 CTR FREQ can be helpful if you know the channel's frequency but not the channel number, or if you want to measure a frequency that does not correspond to a standard channel number. If you do not enter a frequency, the default frequency of 300 MHz will be used. Entering a frequency for channel 0 automatically changes the channel number to 0.

BITS 66 68
: Allows you to enter the length of the burst to be measured. MUX 1.4 type bursts have a length of 68 bits. MUX 1.2 and MUX 2 type bursts have a length of 66 bits. This function is used to establish the correct limit-line values for the power versus time measurements and to set the correct number of bits for the frequency and modulation measurements.

Main Menu
: Returns to the main menu.

The CT2 Parameter Menu

Pressing CT2 Param in the Config menu accesses softkeys that allow you to select either I-ETS 300 131 frequency parameter values or select and vary user-defined frequency parameter values.



The Configuration Menu Map

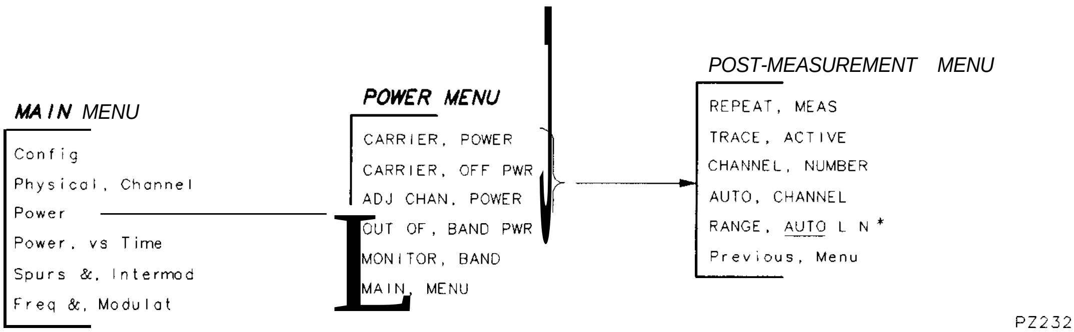
* The Define Channel and Define Band softkeys are available if DEFINED is selected

The CT2 Parameter Menu Softkey

ETS 300 DEFINED	Allows you to choose between I-ETS 300 131 frequency parameter values or user-defined frequency parameter values. The default values for the user defined parameters are equal to the IETS 300 131 values.
Define Channel	Accesses the menu for setting the user-defined values for the channel parameters.
Define Band	Accesses the menu for setting the user-defined values for the band parameters.
CHAN n	Allows you to enter the channel number that corresponds to the frequency entered with the FREQ n softkey
FREQ n	Allows you to enter the frequency that corresponds to the channel number entered with the CHAN n softkey
CH STEP	Allows you to enter the channel step size between adjacent channels..
NUMBER OF CHAN	Allows you to enter the highest channel number, the lowest channel number is always 1.
BAND START	Allows you to enter the band start (lowest) frequency in the CT2 band. This value is only used in spurious and monitor band measurements. As this parameter is independent of the channel tuning plan, you may include extra frequency margin in these measurements.
BAND STOP	Allows you to enter the BAND STOP (highest) frequency in the CT2 band. This value is only used in spurious and monitor band measurements. As this parameter is independent of the channel tuning plan, you may include an extra frequency margin in these measurements.

The Power Menu

Pressing Power accesses the softkeys that allow you to measure the transmitter's carrier power, the carrier off power, the adjacent channel power, and out of band power. The power menu functions not only make a measurement, but they also access additional softkeys. See "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 varies according to the measurement function as follows: RANGE AUTO L N is available only for CARRIER POWER , GATE ON OFF is only available only for ADJ CHAN POWER, and LMT LINE ON OFF is available only for OUT OF BAND PWR

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

Table 3-l shows the spectrum analyzer settings for each of the power measurements. The CT2-CAI measurements personality automatically sets the spectrum analyzer settings for each measurement.

Table 3-1. Spectrum Analyzer Settings for Power Measurements

Spectrum Analyzer Setting	CARRIER POWER	CARRIER OFF PWR	ADJ CHAN POWER	OUT OF BAND PWR	MONITOR BAND
Span	0 Hz	0 Hz	400 kHz	2 MHz	4.4 MHz
Resolution bandwidth	300 kHz	30 kHz	1 kHz	10 kHz	100 kHz
Video bandwidth	300 kHz	30 kHz	1 kHz	3 MHz	100 kHz
Sweep time	1.1 ms	2.1 ms	2.0 s	2.0 s	1.0 s
Detector	Sample	Sample	Peak	Peak	Peak
Trigger mode	Video *	Video *	Free run†	Free run	Free run

* The trigger mode for a burst carrier is video. The trigger mode for a continuous carrier is free run.
† If the time-gating function is used (GATE ON OFF is set to ON), the trigger mode changes to external triggering.

The limits and parameters for the power measurements can be changed remotely. See "Programming Basics for CT2-CAI Remote Operation" in Chapter 6 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. (See the description for RANGE AUTO L N in "The Post-Measurement Menu" for information about measuring the carrier power at a transmitter's low power setting.)

CARRIER OFF PWR — Measures the mean and peak power of the carrier when the carrier is off (the carrier is off between burst transmissions). The mean power is measured by determining the mean power in the region between the points that are + 10 dB above the minimum carrier level. The peak power is measured by making the measurement 25 μs inside the + 10 dB points of the burst. The average data from several bursts (the default number of bursts is 5) is used in calculating the carrier off power level and the peak power level.

ADJ CHAN POWER — Measures the adjacent channel power of the transmitter. (The adjacent channel power determines the leakage power in the adjacent channels to the carrier.) To measure the power in the adjacent channels, the power of each adjacent channel is measured using a 1 kHz resolution bandwidth and the positive-peak detector. The power measured by using the 1 kHz resolution bandwidth is summed to get the total power over the 80 kHz integration bandwidth. The positive-peak detector is used to ensure capture of the RF spectrum during the burst. The increased amplitude that results from the positive-peak detector (versus a sample detector) is subtracted out of the displayed result.

Select time-gating (set GATE ON OFF to ON) if you want to measure only the adjacent channel power due to modulation (and not from switching transients). See "The Post-Measurement Menu" for the description of GATE ON OFF .

OUT OF BAND PWR — Measures the out of band power due to switching transients (also called AM splatter). To determine the total out of band power, the CT2-CAI measurements personality measures the peak envelope power at offsets of ±100 kHz and ±500 kHz from the carrier frequency.

LMT LINE ON OFF can be used to display a continuous limit line (instead of only the ±100 kHz and ±500 kHz frequency offset points). See "The Post-Measurement Menu" for the description of LMT LINE ON OFF .

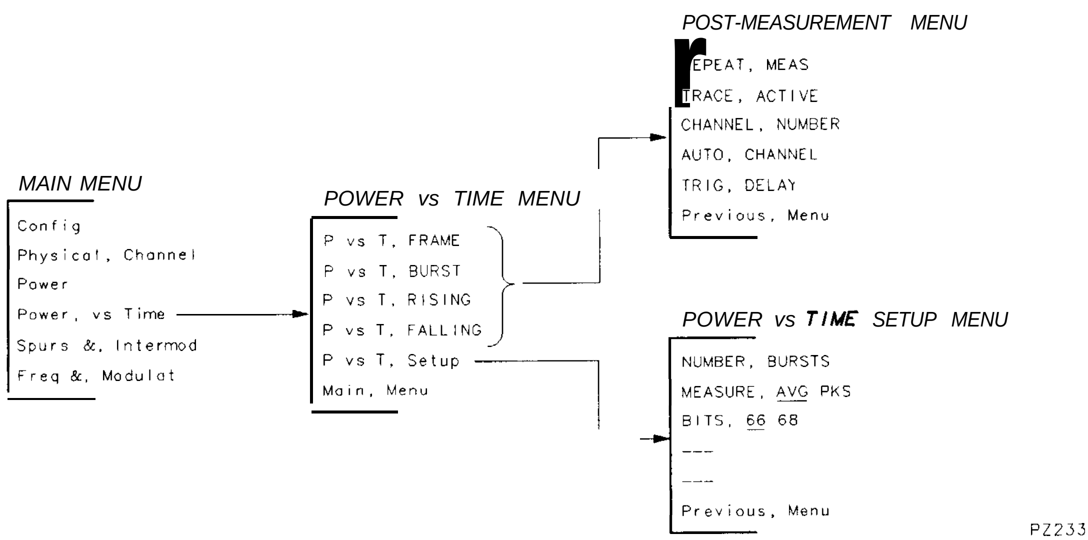
MONITOR BAND — Displays the full frequency band of the CT2 radio by setting the start frequency of the spectrum analyzer to 863.9 MHz and the stop frequency to 868.3 MHz.

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 CT2 burst structure. The power versus time functions allow you to view the full CT2 frame, the burst waveform, the rising edge of the burst, or the falling edge 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 CT2 burst waveform along with limit masks and numerical results.



The Power versus Time Measurement Menu Map

All power versus time measurements require an external trigger signal.

Table 3-2 shows the spectrum analyzer settings for each of the power versus time measurements. The CT2-CAI measurements personality automatically sets the spectrum analyzer settings for each measurement.

Table 3-2. Spectrum Analyzer Settings for Power vs. Time

Spectrum Analyzer Setting	P vs T FRAME	P vs T BURST	P vs T RISING	P vs T FALLING
Span	0 Hz	0 Hz	0 Hz	0 Hz
Resolution bandwidth	300 kHz	300 kHz	300 kHz	300 kHz
Video bandwidth	300 kHz	300 kHz	300 kHz	300 kHz
Sweep time	2.4 ms	1.2 ms	0.16 ms	0.16 ms
Detector	Sample	Sample	Sample	Sample
Trigger mode	External	External	External	External

The limits and parameters for the power versus time measurements can be changed remotely. See "Programming Basics for CT2-CAI Remote Operation" in Chapter 6 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 or P vs T RISING.

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.

P vs T Setup
: Accesses the menu that allows you to select the parameters used in a power versus time measurement. See "The Power versus Time Setup Menu Softkeys" below for the descriptions of the softkeys accessed by P vs T Setup .

Main Menu
: Returns to the main menu.

The Power versus Time Setup Menu Softkeys

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-see 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.

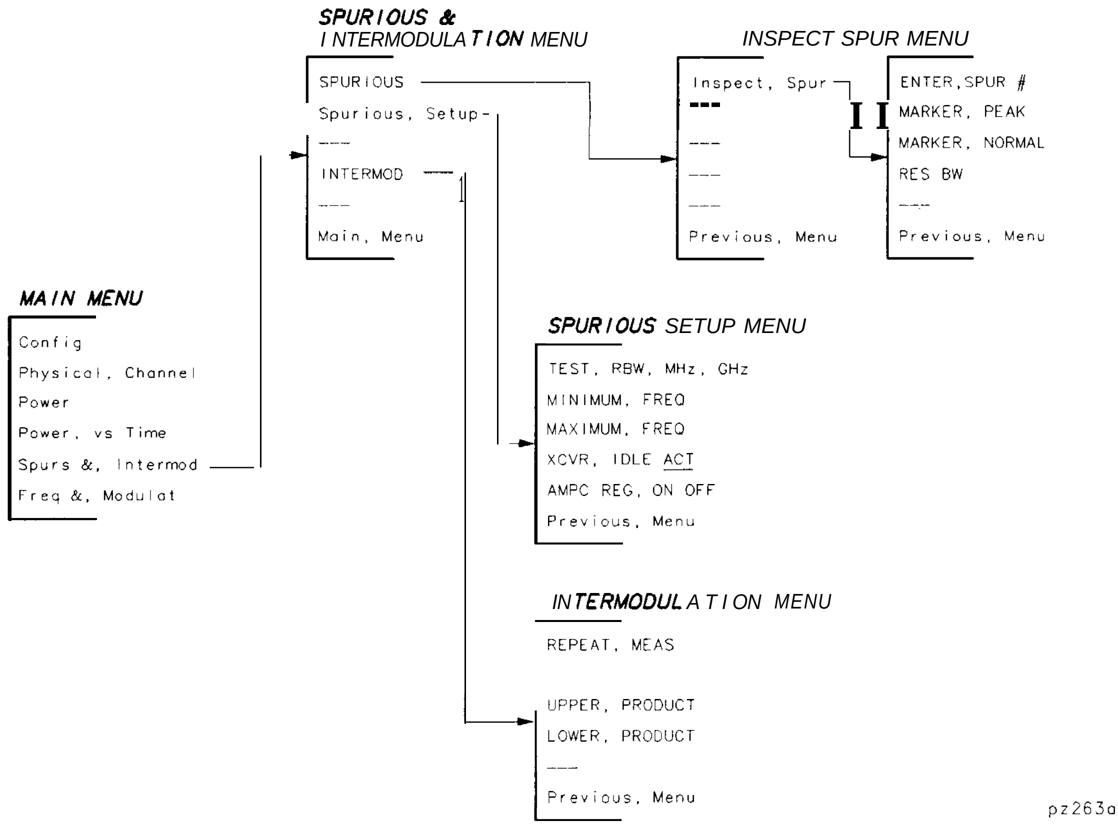
MEASURE AVG PKS
: Selects if the trace containing the averaged trace results is displayed, or if the traces containing the maximum and minimum trace results are displayed. If AVG is underlined, the displayed trace is an average of the trace values over multiple sweeps. If PKS is underlined, there are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

BITS 66 68
: Allows you to enter the length of the burst to be measured. MUX 1.4 type bursts have a length of 68 bits. MUX 1.2 and MUX 2 type bursts have a length of 66 bits. This function is used to establish the correct limit-line values for the power versus time measurements.

Previous Menu
: Returns to 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 and intermodulation attenuation measurements do not require an external trigger signal.

The limits and parameters for the spurious and intermodulation measurements measurements can be changed remotely. See "Programming Basics for CT2-CAI Remote Operation" in Chapter 6 for more information.

The Spurious and Intermodulation Menu Softkeys

SPURIOUS The CT2-CAI 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. See Figure 3-2 for an example of a spurious emission that passes the spurious emissions limit, and a spurious emission that fails.

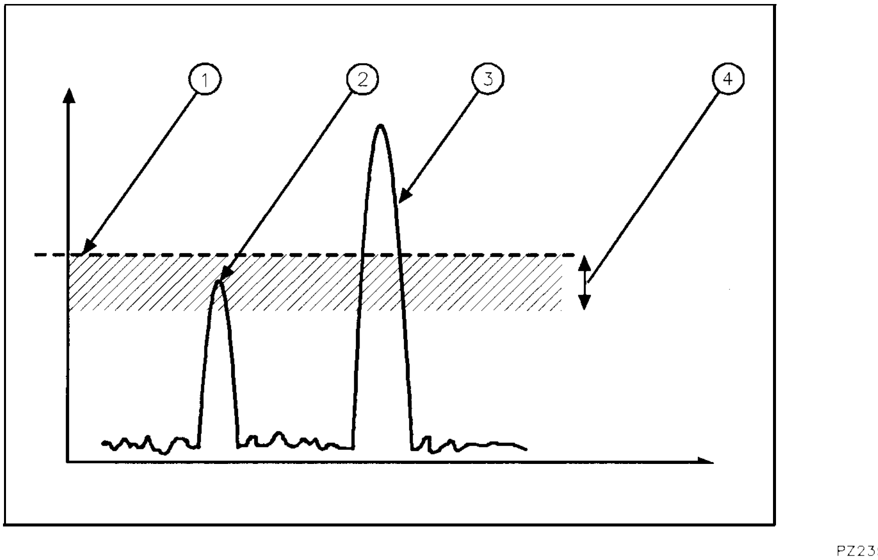


Figure 3-2. The Spurious Emissions Limit

Table 3-3. 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 (see the description for MAXIMUM FREQ for the default values). If the transmitter is in the active state, the CT2-CAI measurements personality automatically excludes the carrier frequency and frequencies less than 200 kHz from the carrier 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`.)

The resolution bandwidth: If you do not specify a resolution bandwidth, the default resolution bandwidth of 100 kHz is used. You can specify the resolution bandwidth the for the spurious emissions test with TEST RBW MHz GHz .

The frequency blocks: The CT2-CAI measurement personality uses up to 8 frequency blocks to cover the desired frequency range. Each block uses a resolution bandwidth, video bandwith, test span, and limits as listed in the following table.

Table 3-4. Frequency Blocks

Freq Block	Low Freq	High Freq	Resolution BW	Test Spans	Active Limit	Idle Limit
0	100 kHz	15.00 MHz	3 kHz	2 & 3 MHz	_SPXL	_SPXHI
1	15.00 MHz	_FA−_FMA	_SPRB	100 MHz**	_SPXL	_SPXHI
2	_FA−_FMA	_FA	10 kHz	_FMA	_SPXH	_SPXHI
3	_FA	_FB	10 kHz †	_FB-_FA*	_SPXH	_SPXLI
4	_FB	_FB+_FMB	10 kHz	_FMB	_SPXH	_SPXHI
5	_FB+_FMB	1000 MHz	_SPRB	100 MHz**	_SPXL	_SPXHI
6	1000 MHz	10.7 GHz	_SPRBG	1 GHz‡	_SPXGH	_SPXGHI
7	10.7 GHz	12.75 GHz	_SPRBG	1 GHz‡	_SPXGL	_SPXGLI

* For Active mode, frequencies within +/--FMC of carrier freq. are skipped.
† For Idle mode, resolution BW = 1 kHz
** Span is for the default 100 kHz resolution BW. The span is changed proportionaly for other resolution BW's; e.g., span is 10 MHz for a 10 kHz resolution BW.
‡ Span is for default 1 MHz resolution BW.

Table 3-5. Spurious Emission Variables

Variable (Remote)	Description	ETS 300 Value	User-Defined Value *	User-Defined Softkey
-FA	Freq of lower band edge	864.1 MHz	-DFA	BAND START
-FB	Freq of upper band edge	868.1 MHz	-DFB	BAND STOP
-FMA	Freq margin low side	2 MHz	-DFMA	none
-FMB	Freq margin high side	2 MHz	_DFMB	none
-FMC	Freq margin carrier	200kHz	-DFMC	none
		Default		**Softkev**
_SPRB	Res BW for freq < 1 GHz	100 kHz		TEST RBW MHz
_SPRBG	Res BW for freq > 1 Ghz	1 MHz		TEST RBW GHz
_SPXL	Out of band limit for Active	-54 dBm		none
_SPXH	In-band limit for Active	-36 dBm		none
-SPXGH	Out-of-band limit for Active, freq 1000 MHz to 10.7 GHz	-30 dBm		none
-SPXGL	Out-of-band limit for Active, freq 10.7 GHz to 12.75 GHz	-47 dBm		none
_SPXLI	In-band limit for Idle	-67 dBm		none
-SPXHI	Out-of-band limit for Idle, f ≤ 1GHz	-57 dBm		none
-SPXGHI	Out-of-band limit for Idle, 1000 MHz ≤ f ≤ 10.7 GHz	-47 dBm		none
_SPXLI	Out-of-band limit for Idle, 10.7 GHz ≤ f ≤ 12.75 GHz	-54 dBm		none

*The default values for the user-defined variables are the same as the ETS 300 values.
With DEFINED selected: -FA = -DFA, -FB = DFB, -FMA = -DFMA, -FMB= _DFMB, -FMC = -DFMC
With ETSI 300 selected: _FA, _FB, _FMA, _FMB, _FMC are set at their default values.

Spurious Setup
: Accesses the functions that allow you to change the testing parameters for testing spurious emissions with SPURIOUS. See "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 two carriers must be spaced at least 800 kHz apart. For the intermodulation attenuation measurement, the CT2-CAI measurements personality searches for the two carriers, determines the spacing between the carriers, and then consecutively tunes to the third-order product frequencies and measures the amplitude levels. The spectrum analyzer displays the intermodulation product with the highest amplitude level when the measurement is done.

  The intermodulation attenuation measurement can still be performed if there is only one carrier present. The CT2-CAI measurements personality assumes the lone carrier is the lowest frequency carrier and that the carrier spacing is 1 MHz. If only one carrier is present for the intermodulation attenuation measurement, the message (single lower carrier assumed) is displayed on the spectrum analyzer display.

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 CT2-CAI signals are correctly displayed when the resolution bandwidth is changed.)

Previous Menu
: Returns to the detected spurious emissions table.

The Spurious Setup MenuSoftkeys

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

TEST RBW MHz GHz — Allows you to select the resolution bandwidth used for testing. Pressing this softkey alternately selects MHz or GHz. With MHz selected, you can enter the resolution bandwidth used for test frequencies less than 1 GHz. With GHz selected, you can enter the resolution bandwidth used for test frequencies of 1 GHz and greater.

Although the *MPT 1375 Common Air Interface Specification* and *I-ETS 300 131* documents specify a 10 kHz resolution bandwidth for testing spurious emissions, below 1 GHz you may want to use the default resolution bandwidth of 100 kHz instead. The advantage of using a 100 kHz resolution bandwidth instead of a 10 kHz resolution bandwidth is that a 100 kHz resolution bandwidth minimizes the test time, and yet it is still narrow enough to allow sufficient sensitivity to detect spurious emissions. The measured values using a 100 kHz resolution bandwidth will be conservative, i.e. The spur values reported will be equal to or greater than the values obtained using a narrower resolution bandwidth.

For testing spurious emissions above 1 Ghz, you may want to use the default resolution bandwidth of 1 MHz instead of the 100 kHz specified in I-ETS 300 131.

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 1.8 GHz for the HP 8591A, 12.75 GHz for the HP 8593A, 2.9 GHz for the HP 8594A, and 6.5 GHz for the HP 8595A 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.

AMPC REG ON OFF — Allows you to turn on or off the amplitude correction factors from a trace register with amplitude correction factors in it. To use AMPC REG ON OFF ,

press AMPC REG ON OFF so that ON is underlined, enter the number of a trace register that contains amplitude correction factors, and then press (ENTER). (The amplitude correction factors must have been previously entered into the trace register; ***see*** the ***HP 8590 Series Operating Manual*** for more information.) When you use AMPC REG ON OFF , the amplitude correction factors from the trace register are used during the spurious emissions measurement instead of the amplitude correction factor generated by the power calibration routine. (The amplitude correction factor from the power calibration routine is automatically restored when a measurement other than the spurious emissions measurement is performed.) The default for AMPC REG ON OFF is OFF.

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.

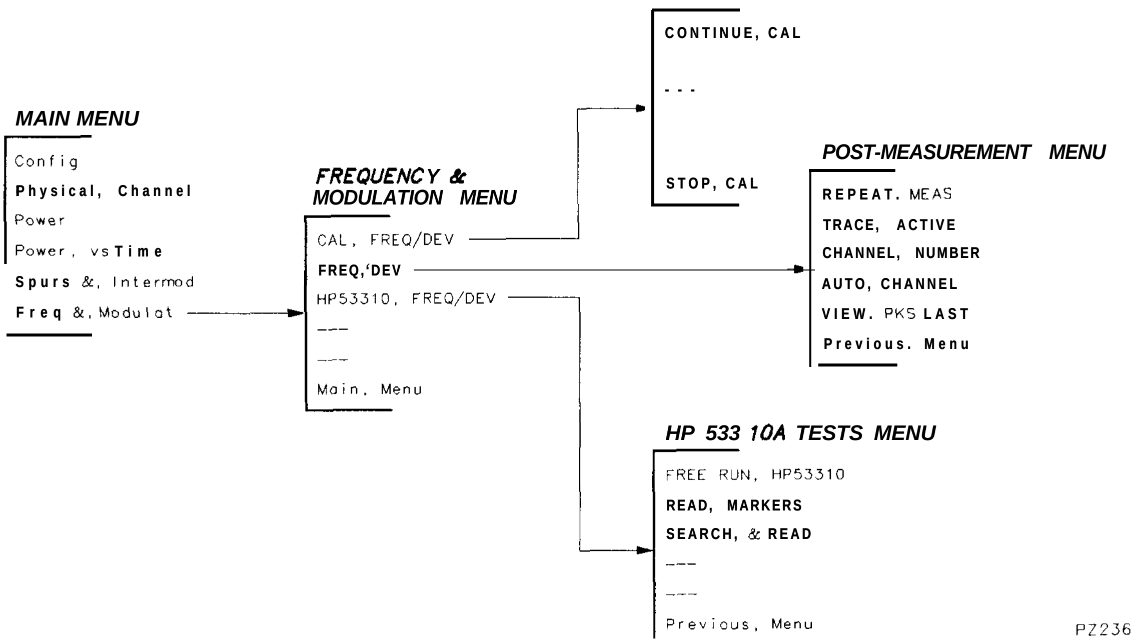
UPPER PRODUCT
: Displays the upper third-order intermodulation product. The upper third-order intermodulation product is the third-order intermodulation product that is at a frequency greater than the highest frequency carrier. When you press UPPER PRODUCT , the spectrum analyzer automatically tunes to the frequency of the upper third-order intermodulation product. PRODUCT is underlined in the UPPER PRODUCT softkey label when the upper product is displayed.

LOWER PRODUCT
: Displays the lower third-order intermodulation product. The lower third-order intermodulation product is the third-order intermodulation product that is at a frequency less than the lowest frequency carrier. When you press LOWER PRODUCT , the spectrum analyzer automatically tunes to the frequency of the lower third-order intermodulation product. PRODUCT is underlined in the LOWER PRODUCT softkey label when the lower product is displayed.

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 an CT2 demodulator card (Option 110) installed in your spectrum analyzer or use an HP 53310A modulation domain analyzer.



The Frequency and Modulation Measurement Menu Map

An external trigger is required to use FREQ/DEV , but an external trigger is not required to use HP53310 FREQ/DEV.

The Frequency and Modulation Menu Softkeys

FREQ/DEV *Option 110* Only: Measures both the mean and the median frequency error, the peak deviation, and the frequency drift 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	15 kHz/division
Sweep time	960 μs	Detector	FMV
Resolution Bandwidth	300 kHz	Trigger Mode	External *
Video bandwidth	300 kHz		

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

For the mean and median frequency error measurement: The CT2-CAI measurements personality determines the mean and median frequency error of the carrier. The mean frequency error is the average deviation of all sample points. The median frequency error is the midpoint between the maximum and minimum frequency deviation.

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.

For the mean frequency error, median frequency error, and the peak frequency deviation, data is taken across the whole burst, but only the data between the 5 percent and 95 percent portion of a nominal burst is used.

For the frequency drift: To determine the frequency drift, the median frequency is measured near the beginning of the burst and near the end of the burst, and then the frequency values are compared. The frequency is measured from 5 percent to 15 percent, and from 80 percent to 95 percent of a nominal burst.

For all the FREQ/DEV measurements, the data is processed for several bursts (the default number of bursts is 10). FREQ/DEV also accesses the post-measurement softkeys. See "The Post-Measurement Menu" in this chapter for more information about the post-measurement softkeys.

CAL FREQ/DEV *Option 110 Only:* Uses the spectrum analyzer's 300 MHz calibration signal to calibrate the CT2 demodulator card (Option 110) for FM offset and FM gain. When using FREQ/DEV , you should perform this calibration routine every 30 minutes or with a change in the ambient temperature for best accuracy.

HP53310 FREQ/DEV *With an HP 53310A* Only: Measures the carrier frequency, the frequency error, and the peak frequency deviation of a burst or continuous carrier. This measurement uses the fast histogram mode of the HP 53310A modulation domain analyzer (the histogram graphically displays the number of occurrences of bits in the spectrum analyzer's demodulated signal). The carrier frequency is assumed to be the midpoint between the two frequencies with the largest number of occurrences. The peak deviation is one half the deviation between these two frequencies with the largest number of occurrences.

The HP 53310A Frequency and Deviation Menu Softkeys

Pressing HP53310 **FREQ/DEV** measures the carrier frequency error and carrier frequency deviation. Pressing **HP53310A FREQ/DEV** also accesses the following softkeys.

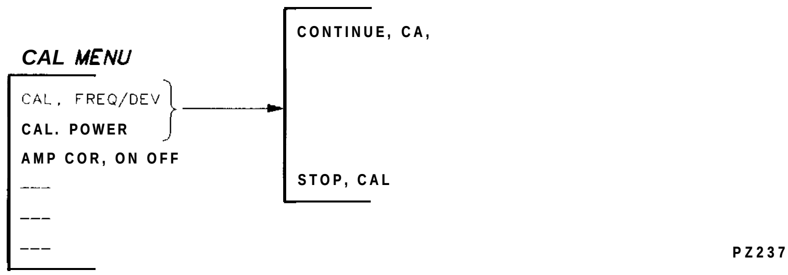
FREE RUN HP533 10
: Restarts the data acquisition of the HP 53310A, and leaves the HP 53310A in the "free run" mode. When in the free run mode, the active trace is displayed on the HP 53310A and you can move the HP 53310A markers.

READ MARKERS
: Reads the markers on the HP 53310A as positioned by the front panel controls on the HP 53310A. The carrier frequency, frequency error, and peak deviation as determined from these marker positions is displayed on the spectrum analyzer's display.

SEARCH & READ
: Automatically positions the markers at the two frequencies with the highest number of occurrences, reads the markers, and displays the results. The way SEARCH & READ reads the markers and displays of the results is equivalent to the way READ MARKERS reads the markers and displays the results.

The Calibration Menu

When the spectrum analyzer is using the CT2-CAI mode, pressing (CAL] accesses the CT2-CAI calibration functions.



The Calibration Menu Map

The Calibration Menu Softkeys

CAL FREQ/DEV — ***Option 110*** Only: Uses the spectrum analyzer's 300 MHz calibration signal to calibrate the CT2 demodulator card (Option 110) for FM offset and FM gain. When using FREQ/DEV , you should perform this calibration routine every 30 minutes or with a change in the ambient temperature for best accuracy. GAL FREQ/DEV can also be accessed by pressing Freq & Modulat .

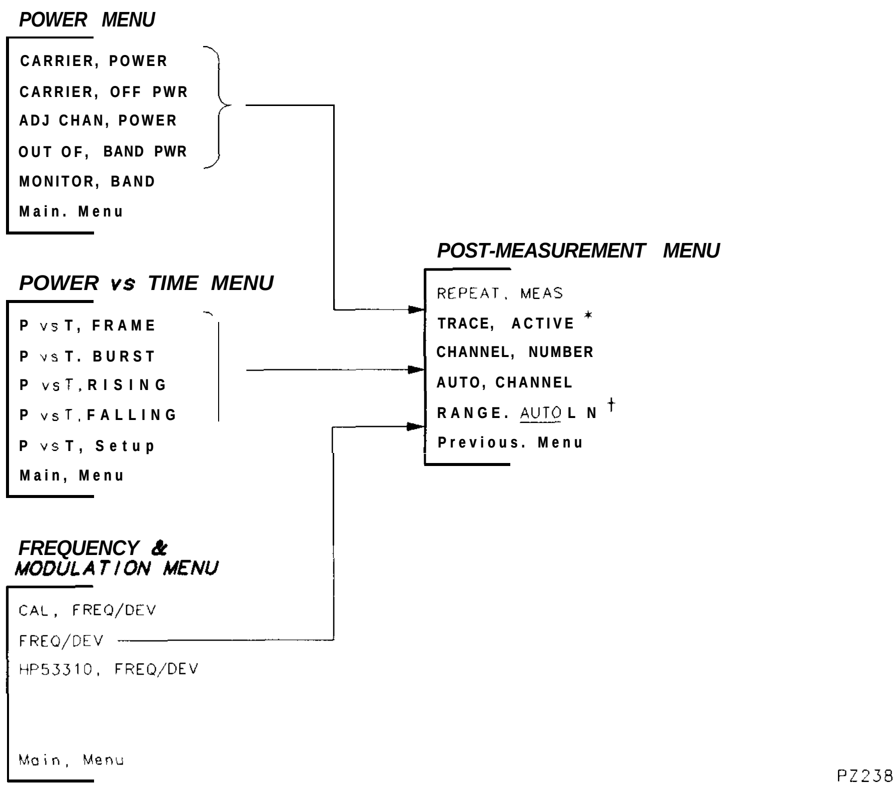
When the frequency deviation calibration routine is performed, the voltage on control line A (pin 1) of the auxiliary interface connector is changed to a transistor-transistor logic (TTL) high level.

CAL POWER — Initiates the power calibration routine. The power calibration routine allows you to calibrate the amplitude accuracy of the test equipment at a single frequency (866 MHz) in the middle of the CT2-CAI frequency band. After you complete the power calibration routine, the result is stored as an amplitude correction factor. This amplitude correction factor is applied to all CT2-CAI measurements unless you use AMP COR ON OFF to turn off the amplitude correction factor (set AMP COR ON OFF to OFF). DEFAULT CONFIG clears the amplitude correction factor by setting it to 0.

AMP COR ON OFF — Allows you to turn on or off the amplitude correction factor that was generated by the power calibration routine. If AMP COR ON OFF is set to OFF, exiting and then reentering the CT2-CAI measurements personality will set AMP COR ON OFF to ON.

The Post-Measurement Menu

Once the measurement has been completed, many of the CT2-CAI 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

† The softkey that is shown in this position varies according to the measurement function as follows: RANGE AUTO L N is available only for CARRIER POWER, GATE ON OFF is only available only for ADJ CHAN POWER, LMT LINE ON OFF is available only for OUT OF BAND PWR , TRIG DELAY is available only for the power vs time measurement functions, VIEW PKS LAST 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 ACTIVE TRACE , 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.
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.
RANGE AUTO L N	Allows you to select if a carrier should be tested using the limits for a normal-power or low-power carrier. When you use CARRIER POWER , a carrier within the normal power range needs to be measured first because the limits for the low-power range measurements are determined by the normal-power measurement. The ways that you can use RANGE AUTO L N are as follows: 1. If AUTO is selected, the CT2-CAI measurements personality will measure the carrier power and decide which limit (the limit for normal power or for low power) to use. 2. If L is selected, the carrier power difference from the normal power will be determined. The result is then compared to the low power limits. 3. If N is selected, the carrier power will be measured and compared against the normal power limit.
LMT LINE ON OFF	Allows you to turn on or off a limit line for the out of band power measurement. The limit line that is displayed consists of lines that connect the four frequency offset points together. Because the out of band power is only tested at the ±100 kHz and ±500 kHz frequency offsets, the signal can still pass the out of band power test even if the signal exceeds the limit line at a frequency other than the four offset frequencies (the current CT2 standards specify the power level only at the four offset frequencies).
TRIG DELAY	Allows you to enter the delay time from the external trigger signal to the reference point of the burst.
VIEW PKS LAST	Allows you to view the last trace taken in the frequency and deviation measurement (FREQ/DEV), or view the maximum and minimum peaks of all the traces that were taken in the frequency and deviation measurement.
GATE ON OFF	Allows you to exclude switching transients and measure only the adjacent channel power due to modulation. When time-gating selected (GATE ON OFF is set to ON), the Option 105 time-gated spectrum analysis card measures the spectrum during the middle portion (between 60 percent to 85 percent) of the burst, and so the spectrum due to switching transients at the beginning and end of the burst are excluded.
Previous Menu	Returns to the previous menu.

4

Error Messages and Troubleshooting

The purpose of this chapter is to help you if you have a problem operating the CT2-CAI measurements personality. If the problem is related to the spectrum analyzer and not the CT2-CAI 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. See "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. See "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.
- ❑ If you want the CT2-CAI 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. See the description for _CMIN in Chapter 5 for more information.

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. See "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information.
- ❑ If you want the CT2-CAI 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. See the description for _CMIN in Chapter 5 for more information.

CARRIER PRESENT, MEAS STOPPED

Indicates that although the XCVR IDLE ACT function is set to IDLE, the CT2-CAI measurements personality has detected a carrier with a power level greater than -30 dBm.

To solve this problem:

- ❑ Check that the CT2 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 test resolution bandwidth (TEST 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.

CT2 DEMOD CARD REQUIRED

Indicates that the spectrum analyzer does not have Option 110, the CT2 demodulator card, installed in it. (Option 110 is required for making a frequency deviation measurement with FREQ/DEV .)

To solve this problem:

- ▫ If there is an Option 110 installed in the spectrum analyzer, it could be malfunctioning. See the Installation and Verification Manual for your spectrum analyzer for more information about returning the spectrum analyzer for repair.

Note If you use SHOW OPTIONS to list the options installed in your spectrum analyzer, you should be aware that Option 110 is incorrectly displayed as Option 102. To check if your spectrum analyzer has an Option 110 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 110 is not installed in the spectrum analyzer, you can have an Option 110 installed in your spectrum analyzer. Contact your local HP sales and service office for more information.
- ❑ If you have an HP 53310A modulation domain analyzer, you can still make a frequency and deviation measurement with HP53310 FREQ/DEV .

INVALID TRACE REG, MEAS STOPPED

Indicates that the specified AMPCOR (amplitude correction factors) trace register was invalid.

To solve this problem:

- ❑ Check that the trace register number that you enter is the correct trace register number for the amplitude correction factors.
- ❑ Check that the amplitude correction factor data has been stored in the trace register. See the ***HP 8590 Series Operating Manual*** for more information about entering and saving amplitude correction factors.

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 CT2-CAI 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. See the Installation and Verification Manual for your spectrum analyzer 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. See the Installation and Verification Manual for your spectrum analyzer 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.

HP53310 NOT FOUND MEAS STOPPED

This message indicates that an HP-IB error has occurred during the frequency and deviation measurement.

To solve this problem:

- ❑ Check that an HP-IB cable connects the spectrum analyzer to the HP 53310A.

  See “To measure the frequency and deviation with an HP 53310A” in Chapter 2 for more information about connecting the spectrum analyzer to an HP 53310A.

- ❑ Check that the HP-IB address of the HP 53310A is 12.

  See “To measure the frequency and deviation with an HP 53310A” in Chapter 2 for more information.

INVALID SYMTAB ENTRY: SYMTAB OVERFLOW

Indicates that there was not enough available spectrum analyzer memory to load the CT2-CAI measurements personality.

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

1 Press (PRESET).

2 Press (CONFIG), MORE 1 of 3, DISPOSE USER MEM , DISPOSE USER MEM , (PRESET).

3 Reload the CT2-CAI measurements personality using the procedure "Step 1. Load the CT2-CAI measurements personality" in Chapter 1.

NEWER FIRMWARE REQUIRED: REV 26.10.90 OR LATER

This message indicates that the spectrum analyzer's firmware must be updated before the CT2-CAI 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.

POWER TOO HIGH

This message can appear during the power calibration routine. It indicates that the power level measured by the spectrum analyzer is more than 3 dB higher than the power entered for the power meter.

To solve this problem:

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

2 Repeat the power calibration routine. When you are doing the power calibration routine, check that the cables and 6 dB fixed attenuator are connected correctly.

POWER TOO LOW

This message can appear during the power calibration routine. It indicates that the power level measured by the spectrum analyzer is more than 20 dB lower than the power entered for the power meter.

To solve this problem:

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

2 Repeat the power calibration routine. Be sure that the cables and 6 dB fixed attenuator are correctly connected for performing the power calibration routine.

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.

Troubleshooting

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

If the CT2-CAI measurements personality does not make a measurement

If you press one of the measurement functions and the CT2-CAI measurements personality does 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.) See "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 in the BURST CONT softkey label is underlined. If you are testing a burst carrier, ensure that BURST in the BURST CONT softkey label is underlined. See "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. See "Step 3. Connect the cables to the spectrum analyzer's rear panel" in Chapter 1 for more information.

- ❑ If you pressed HP53310 FREQ/DEV , check that there are no other controllers on the HP-IB.

  If necessary, disconnect the HP-IB cable of other controller (for example, a computer) from the spectrum analyzer or the HP 53310A.

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 in the BURST CONT softkey label is underlined. If you are testing a burst carrier, ensure that BURST in the BURST CONT softkey label is underlined. See "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. See "Step 5. Configure the personality for your test equipment" in Chapter 1 for more information about TRIG DELAY and TRIG POL MEG POS.

- ❑ Check that TRANSMIT CFP CPP is set correctly.

  Ensure that if you are testing a cordless fixed part (CFP), CFP is underlined in the TRANSMIT CFP CPP softkey label. If you are testing a cordless portable part (CPP), ensure that CPP is underlined in the TRANSMIT CFP CPP softkey label. See "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. See “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 CT2-CAI measurements personality, you can call your nearest Hewlett-Packard Sales and Service office that is listed in the following table.

Table 4-1. Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS

Headquarters
Hewlett-Packard Co.
19320 Pruneridge Avenue
Cupertino, CA 95014
(800) 752-0900

California, Northern
Hewlett-Packard Co.
301 E. Evelyn
Mountain View, CA 94041
(415) 694-2000

California, Southern
Hewlett-Packard Co.
1421 South Manhattan Ave.
Fullerton, CA 92631
(714) 999-6700

Colorado
Hewlett-Packard Co.
24 Inverness Place, East
Englewood, CO 80112
(303) 649-5512

Atlanta Annex
Hewlett-Packard Co.
2124 Barrett Park Drive
Kennesaw, GA 30144
(404) 648-0000

Illinois
Hewlett-Packard Co.
5201 Tollview Drive
Rolling Meadows, IL 60008
(708) 2559800

New Jersey
Hewlett-Packard Co.
150 Green Pond Rd.
Rockaway, NJ 07866
(201) 586-5400

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

EUROPEAN FIELD OPERATIONS

Headquarters
Hewlett-Packard S.A.
150, Route du Nant-d'Avril
1217 Meyrin S/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
Hewlett-Packard Strasse
61352 Bad Homburg v.d.H
Germany
(49 6172) 16-O

Great Britain
Hewlett-Packard Ltd.
Eskdale Road, Winnersh Triangle
Wokingham, Berkshire RG41 5DZ
England
(44 734) 696622

INTERCON FIELD OPERATIONS

Headquarters
Hewlett-Packard Company
3495 Deer Creek Road
Palo Alto, California, USA
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

China
China Hewlett-Packard Company
38 Bei San Huan Xl Road
Shuang Yu Shu
Hai Dian District
Beijing, China
(86 1) 256-6888

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

Singapore
Hewlett-Packard Singapore (Pte.) Ltd.
150 Beach Road
#29-00 Gateway West
Singapore 0718
(65) 291-9088

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

5

Programming Commands

This chapter contains the following programming reference information:

- A table containing a cross reference of the CT2-CAI measurements personality softkey to the corresponding programming command.
- A table containing a cross reference of the CT2-CAI measurement to the limit and parameter variables.
- A table containing a cross reference of CT2-CAI measurements and the corresponding limit line function names.
- The descriptions of all the CT2-CAI measurements personality's programming commands.

This chapter contains reference information. Refer to Chapter 6 for information about operating the CT2-CAI measurements personality functions remotely.

Functional Index

The following table lists each CT2-CAI measurements personality softkey and references the corresponding remote command sequencethatperformsthe same operation remotely

Table 5- 1. Functional Index

CT2-CAI Softkey	Corresponding Remote Command Sequence
CT2-CAI ANALYZER	MODE 10 (See "To changetothe CT2-CAI mode remotely" in Chapter 6 for more information.)
Configuration Menu	
BURST CONT	C C
DEFAULT CONFIG	-DEFAULT
EXT LOSS	-EXTLOSS
TOTAL TX POWER	-TOTPWR
TRIG DELAY	_TRIGD
TRIG POL NEG POS	_TRIGP
Configuration Defined Parameter Menu	
ETS 300 DEFINED	_DPAR
CHAN n	-DCHN
FREQ n	_DFRN
CH STEP	-DCHSTP
NUMBER OF CHAN	_DNCH
BAND START	_DFA
BAND STOP	-DFB
Frequency and Modulation Menu	
CAL FREQ/DEV	-CALFRQDEV
FREQ/DEV	-FRQDEV or _FDS and _FDM
HP53310 FREQ/DEV	-MDAS(Sets up only the spectrum analyzer)
Physical Channel Menu	
AUTO CHANNEL	-ACH
BITS 66 68	-BB
CH 0 CTR FREQ	-CFZ
CHANNEL NUMBER	_CH
TRANSMIT CFP CPP	_CPP

Table 5-1. Functional Index (continued)

CT2-CAI Softkey	Corresponding Remote Command Sequence
Power Menu	
ADJ CHAN POWER	_ACP or _ACPS and -ACPM
CARRIER OFF PWR	_COPWR or _COS and _COM
CARRIER POWER	_CPWR or -CPS and -CPM
MONITOR BAND	_MBAND
OUT OF BAND PWR	_OBP or _OBPS and _OBPM
Power versus Time Menu	
BITS 66 68	-BB
MEASURE AVG PKS	-AVG
NUMBER BURSTS	-PNB
P vs T BURST	_PBURST
P vs T FALLING	_PFALL
P vs T FRAME	_PFRAME
P vs T RISING	_PRISE
Spurious and Intermodulation Menu	
AMPC REG ON OFF	-ATR
INTERMOD	_IMDATN
MAXIMUM FREQ	-SPMAXF
MINIMUM FREQ	-SPMINF
SPUR1 OUS	SPUR
TEST RBW MHz GHz	_SPRB, _SPRBG
XCVR IDLE ACT	-IDLE
Post-Measurement Menus	
AUTO CHANNEL	-ACH
CHANNEL NUMBER	_CH
GATE ON OFF	_ACPG
LMT LINE ON OFF	_OBPLL
RANGE AUTO L N	_CPRNG
REPEAT MEAS	-RPT
TRACE ACTIVE	-TA
TRACE COMPARE	_TC
TRIG DELAY	_TRIGD

Limit and Parameter Variables

Table 5-2 lists all the limit variables and parameter variables available for a CT2-CAI measurements personality command. For more information about using limit variables, see "To change the value of a limit variable" in Chapter 6. For more information about using parameter variables, see "To change the value of a parameter variable" in Chapter 6.

Table 5-2. Limit and Parameter Variables

Measurement	Variable Name	Description	Units	Default Value
Channel Number	_CMIN	Minimum power for a signal to be detected as a carrier.	dBm	-30
Power Measurements				
Carrier Power	_CPNB	Specifies the number of bursts used for the carrier power measurement.	None	5
	_CPXL	The low limit for normal carrier power	dBm	0
	-CPXH	The high limit for normal carrier power	dBm	10
	_CPXLL	The low limit for low carrier power	dB	-20
	_CPXHL	The high limit for low carrier power	dB	-12
	-VTMAR	The video trigger margin.	dB	30
Carrier Off Power	_COPNB	Specifies the number of bursts used for the carrier off power measurement.	None	5
	_COXA	The maximum limit for the mean carrier off power.	dBm	-67
	_COXP	The maximum limit for the peak carrier off power	dBm	-40
Adjacent Channel Power	-ACPNB	Specifies the number of bursts used for the adjacent channel power measurement.	None	1
	-ACPX	Maximum limit for the adjacent channel power	dBm	-20
Out of Band Power	_OBPNB	Specifies the number of bursts used for the out of band power measurement.	None	3
	_OBPXA	Maximum limit for the carrier power at the ±100 kHz offset from the carrier frequency.	dBm	-26
	_OBPXB	Maximum limit for the carrier power at the ±500 kHz offset from the carrier frequency.	dBm	-60

Table 5-2. Limit and Parameter Variables (continued)

Measurement	Variable Name	Description	Units	Default Value
Power versus Time Measurements				
Power versus Time Burst	-PBXL	The limit for the minimum width for a burst with 68 bits.	μs	0*
	-PBXH	The limit for the maximum width for a burst with 68 bits.	μs	0
	-PBXLS	The limit for the minimum width for a burst with 66 bits.	μs	0*
	_PBXHS	The limit for the maximum width for a burst with 66 bits.	μs	0
	_PBMAX	Sets how far from the carrier peak the burst width is measured.	dB	- 3
Power versus Time Falling	-PFXL	The limit for the minimum fall time for a burst.	μs	0*
	_PFXH	The limit for the maximum fall time for a burst.	μs	0
	-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	-PRXL	The limit for the minimum rise time for a burst.	μs	0*
	-PRXH	The limit for the maximum rise time for a burst.	μs	0
	_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
* The pass or fail message is not displayed when these variables are set to 0.				

Table 5-2. Limit and Parameter Variables (continued)

Measurement	Variable Name	Description	Units	Default Value
Spurious and Intermodulation Measurements				
Spurious	-DFMA	Defined frequency margin low side	Hz	2 MHz
	_DFMB	Defined frequency margin high side	Hz	2 MHz
	-DFMC	Defined frequency margin carrier	Hz	200 kHz
	_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: 41 to 68 MHz, 87.5 to 118 MHz, 162 to 230 MHz, and 470 to 862 MHz	dBm	-54
	-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
	_SPXGL	Specifies the limit for a spurious emission, from an active transmitter, for frequencies of 10.7 to 12.75 GHz	dBm	-47
	_SPXGH	Specifies the limit for a spurious emission, from an active transmitter, for frequencies greater than 1 GHz that are not within the frequency ranges listed for SPXGL.	dBm	-30
	_SPXLI	Specifies the limit for a spurious emission, from an idle transmitter, for frequencies from 864 to 868 MHz	dBm	-67
	_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
	SPXGLI	Specifies the limit for a spurious emission, from an idle transmitter, for frequencies 10.7 to 12.75 GHz	dBm	-54
	-SPXGHI	Specifies the limit for a spurious emission, from an idle transmitter, for frequencies greater than 1 GHz that are not within the frequency ranges listed for SPXGLI.	dBm	-47
ntermodulation	_IMDX	Intermodulation attenuation limit	dBm	-54

Table 5-2. Limit and Parameter Variables (continued)

Measurement	Variable Name	Description	Units	Default Value
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	14.4
(with Option 110 Only)	-FDXH	The limit for the maximum deviation of the FM signal	kHz	25.2
	_FERX	The limit for the maximum frequency error	kHz	10
	-FERDX	The limit for the maximum frequency drift	kHz	1
	_FNB	Specifies the number of bursts used in making the measurement		10
	-FWM	Specifies the margin between the trace endpoints and the outer edges of the areas used for frequency and deviation measurements.	Trace element	15
	-FWW	Specifies the width of the area used for the frequency drift measurement	Trace element	48
Frequency and Deviation	_MADRS	HP-IB address for the HP 53310A	None	12
(with the HP 53310A)	_MFI	The frequency increment used in testing	Hz	100
	-MNS	Number of measurement sweeps used for the measurement	None	40
	-MTH	The amplitude level used for the HP 53310A marker search	Percent	0.005

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. See "To create a limit line function" in Chapter 6 for more information about creating your own limit line function. Table 5-3 lists all the names of the limit line functions.

Table 5-3. Limit Line Function Names

Measurement	Limit Line Name
Out of Band Power	_OBPLIM
Power versus Time Burst	-PBLIM
Power versus Time Rising Edge	_PRLIM
Power versus Time Falling Edge	-PFLIM

Descriptions of the Programming Commands

This section contains the descriptions of the CT2-CAI measurement personality's programming commands. The commands are listed alphabetically.

See the programming examples in Chapter 6 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

```
OUTPUT718;"_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.)

-ACP
Adjacent Channel Power

Syntax

Measures the adjacent channel power of the transmitter. _ACP is equivalent to ADJ CHAN POWER .

Example

OUTPUT 718; "_ACP;"

Executing -ACP does the following:

1. Performs the adjacent channel power 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.

_ACP Measurement State Results

Value	Description
1	The measurement was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier power was too low.

Measurement Results The results of the _ACP command are stored in the variables and trace in the following table.

_ACP Measurement Results

Variable or Trace	Description	Units
ACPL	A variable that contains the amplitude level found in the lower adjacent channel.	dBm
-ACPU	A variable that contains the amplitude level found in the upper adjacent channel.	dBm
_ACPCP	A variable that contains the power of the carrier, found in zero span.	dBm
TRA	TRA is trace A. Trace A contains the swept RF spectrum that was used to measure adjacent channel power.	Determined by the trace data format (TDF) command

Limit and Parameter Variables -ACP uses -ACPX and -ACPNB. See Table 5-2 for more information.

-ACP Adjacent Channel Power

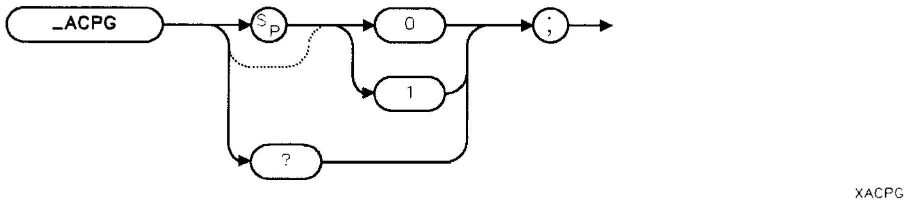
Alternate Commands You can also use the _ACPS and -ACPM commands to measure adjacent channel power.

See Also

"To measure the adjacent channel power" in Chapter 6.

_ACPG
Adjacent Channel Power Gated

Syntax



Allows you to use time-gating to exclude any switching transients from the adjacent channel power 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.

Example

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

Related Commands Use one of the adjacent channel power commands (_ACP or _ACPM) to perform the adjacent channel power measurement.

_ACPM
Adjacent Channel Power Measurement

Syntax

XACPM

Performs the adjacent channel power 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.***

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

See the description for -ACP for information about the measurement state and measurement results from an adjacent channel measurement.

_ACPS
Adjacent Channel Power Setup

Syntax

XACPS

Performs the setup for the adjacent channel power measurement.

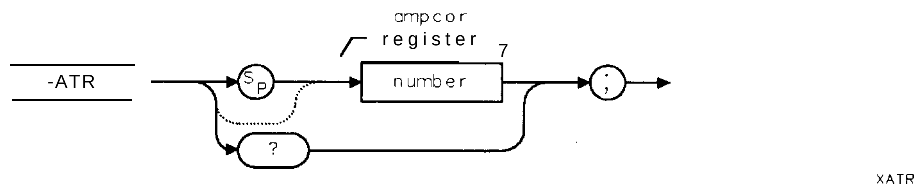
Example

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 measurement. The _ACPS and _ACPM commands are useful if you want to change the spectrum analyzer settings before making an adjacent channel power measurement. The combination of the _ACPS and -ACPM commands is equivalent to ADJ CHAN POWER .

-ATR
AMPCOR Trace Register

Syntax



Allows you to use the amplitude correction factors from a trace register for the spurious emissions measurement. _ATR is equivalent to AMPC REG ON OFF .

-ATR can accept an integer number from -1 to TRCMEM minus 1. (You have to query TRCMEM to find the value of TRCMEM for your spectrum analyzer.) The default value for _ATR is -1.

Example

OUTPUT 718;"MOV _ATR,13;" *Uses the amplitude correction factors from trace register 13 for the spurious emissions measurement.*

When you move a trace register number into _ATR, the CT2-CAI measurements personality uses the amplitude correction factors from that trace register when performing the spurious emissions measurement. If you move a trace register number into _ATR, there must be valid amplitude correction data in the trace register.

If you no longer **want** to use the amplitude correction factors from a trace register, move a -1 into _ATR. If you do not specify a trace register or if you move a -1 into _ATR, the amplitude correction factor from the power calibration routine is used instead of the amplitude correction factors from a trace register.

Related Commands -ATR is used by -SPUR (the spurious emissions measurement command).

Query Example

OUTPUT718;"_ATR?;"

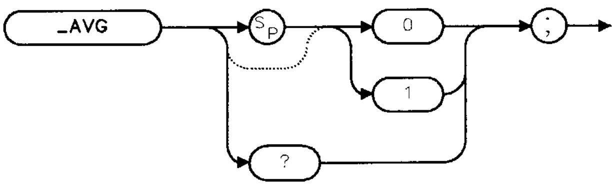
The query response will be an integer number of -1 (if amplitude correction factors are not used) or the number of the AMPCOR trace register.

See Also

See the descriptions for AMPCOR and SAVET in the ***HP 8590 Series Programming Manual*** for more information about creating and saving amplitude correction factors.

-AVG
Average or Peaks for Power vs Time

Syntax



XAVG

Selects how the trace data for a power versus time measurement is taken: as a trace that contains an average of the trace data, or as a trace for minimum trace peaks and a trace for the maximum trace peaks. _AVG is equivalent to MEASURE AVG PKS .

If -AVG is set to 0, it is set to measure both the minimum and maximum peaks of the bursts. If -AVG is set to 1, it is set to measure the average of the bursts. The default value for -AVG is 1.

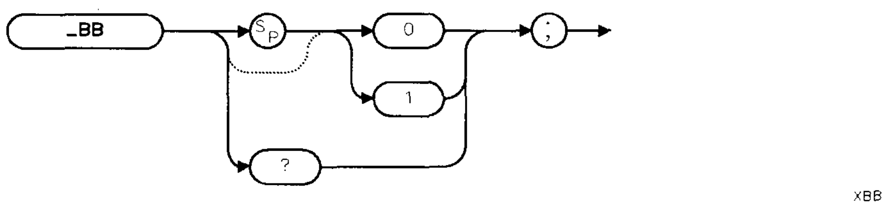
Example

OUTPUT 718;"MOV _AVG,0;" *Sets _AVG to measure the minimum and maximum peaks of the burst.*

You should set _AVG prior to executing _PBURST, _PRISE, or _PFALL. 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.

_BB
Bits Per Burst

Syntax



Allows you to enter the length of the burst to be measured. -BB is equivalent to BITS 66 68 .

If -BB is set to 0, it is set to 68 bits per burst. If -BB is set to 1, it is set to 66 bits per burst. The default for -BB is 1.

Example

OUTPUT 718;"MOV _BB,0;" *Sets the number of bits per burst to 68 bits.*

-CALFRQDEV
Calibrate Frequency Deviation

Syntax

XCALFR

Performs the calibration routine for the frequency and deviation measurement with Option 110. _CALFRQDEV is equivalent to CAL FREQ/DEV .

Example

OUTPUT 718; "_CALFRQDEV;"

-CALFRQDEV can only be performed if an Option 110 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.

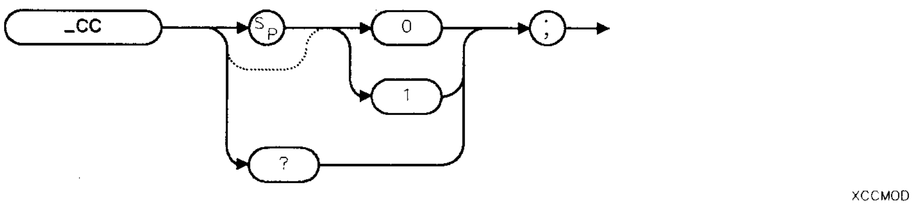
_CALFRQDEV Measurement State Results

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 XALFRQDEV uses _FCALF. See Table 5-2 for more information.

_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 COMT .

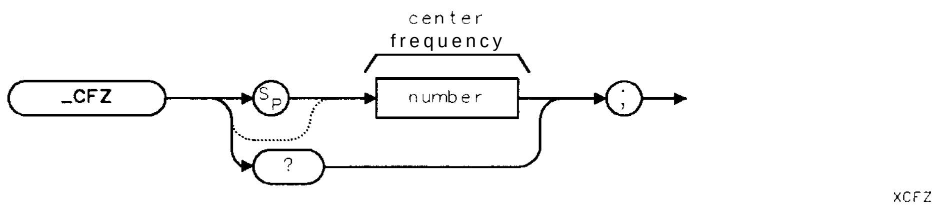
If _CC is set to 0, it is set to a burst carrier. If _CC is set to 1, it is set to a continuous carrier. The default value for -CC is 0.

Example

OUTPUT 718;"MOV _CC,0;" ***Sets XC for a burst carrier:***

_CFZ
Center Frequency for Channel Zero

Syntax



Allows you to enter the frequency of the channel that you want to measure. The _CFZ variable is equivalent to CH 0 CTR FREQ .

_CFZ can accept a real number. The measurement unit for -CFZ is Hz. The default value for -CFZ is 300 MHz.

Example

OUTPUT 718;"MOV _CFZ,840E6;" *Sets the center frequency of the spectrum analyzer to 840 MHz if the channel number is 0.*

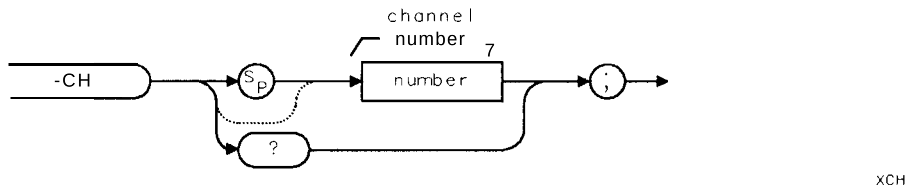
Query Example

OUTPUT718;"_CFZ?;"

The query response will be the current frequency for channel 0.

_CH
Channel Number

Syntax



Allows you to enter the channel number for the RF channel you want to measure. The -CH command is equivalent to CHANNEL NUMBER .

_CH can accept an integer number from 0 to 40. The default for _CH is 1.

Example

OUTPUT 718;"MOV _CH,2;" *Sets the channel number to 2.*

Limit and Parameter Variables -CH uses _CHFF, -CHFL, and -CHN. See Table 5-2 for more information.

Query Example

OUTPUT718;"_CH?;"

The query response will be a the current channel number.

See Also

"To use the spectrum analyzer's MOV command" in Chapter 6.

_COM
Carrier Off Power Measurement

Syntax

Performs the carrier off power measurement.

Example

OUTPUT718;"_COS;"	***Sets up the carrier off power measurement.***
OUTPUT 718; "RB10KHZ;"	***Changes the resolution bandwidth to 10 kHz.***
OUTPUT 718; "_COM;"	***Performs the carrier off power measurement.***

Before using _COM, you need to use the -COS command to perform the setup for the carrier off power measurement. The -COS and _COM commands are useful if you want to change the spectrum analyzer settings before making a carrier off power measurement. The combination of the _COS and _COM commands is equivalent the _COPWR command and CARRIER POWER .

See the description for _COPWR for information about the measurement state and measurement results from a carrier off power measurement.

-COPWR
Carrier Off Power

Syntax

XCOPWR

Measures the transmitter carrier off power. The _COPWR command is equivalent to CARRIER OFF PWR.

Example

OUTPUT718;"_COPWR;" *Performs the carrier off power measurement.*

Measures the mean and peak power of the transmitter carrier when the carrier is off. The mean power is measured by determining the mean power during the part of the burst between the + 10 dB points referenced to the minimum carrier level. The peak power is measured by making the measurement 25 μs inside the + 10 dB points of the burst.

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

_COPWR 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 was not a burst carrier. (If -CC is set to burst, the carrier must be a burst carrier.)
4	The measurement was aborted because the carrier was not a continuous carrier. (If -CC is set to continuous carrier, the carrier must be a nonburst carrier.)

Measurement Results The results of the carrier off measurement are placed in the variables and trace shown in the following table.

_COPWR Measurement Results

Variable or Trace	Description	Units
-FLF	A variable that contains the pass or fail results of the carrier off measurement. ■ If the carrier off measurement passed, the value of -FLF is a 0. ■ If the carrier off measurement failed, the value of -FLF is a 3.	None
_COA	A variable that contains the mean carrier off power.	dBm
-COP	A variable that contains the peak carrier off power.	dBm
TRA	TRA is trace A. Trace A contains the power waveform that was used to test for carrier off power.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _COPWR uses COXA, _COXP, and -COPNB. See Table 5-2 for more information.

Alternate Commands The _COS and _COM commands can be used instead of _COPWR if you want to change the spectrum analyzer settings before making a carrier off power measurement.

See Also

"To measure the carrier off power" in Chapter 6.

_COS
Carrier Off Power Setup

Syntax

Performs the setup for the transmitter carrier off power measurement.

Example

OUTPUT718;"_COS;"	***Sets up the carrier off power measurement.***
OUTPUT 718;"RB 10KHZ;"	***Changes the resolution bandwidth to 10 kHz.***
OUTPUT718;"_COM;"	***Performs the carrier off power measurement.***

The -COS and _COM commands can be used if you want to change the ‘spectrum analyzer settings before making a carrier off power measurement. The combination of the -COS and _COM commands is equivalent to the _COPWR command and CARRIER OFF PWR .

-CPM
Carrier Power Measurement

Syntax

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.

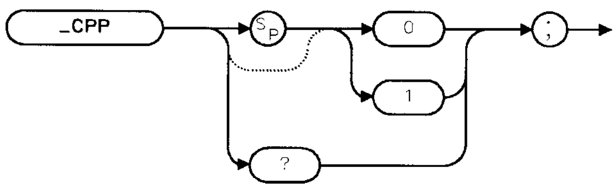
See the description for _CPWR for information about the measurement state and measurement results from a carrier power measurement.

See Also

"To measure the carrier power" in Chapter 6.

_CPP
Cordless Portable or Fixed Part

Syntax



XCPP

Allows you to select the if the cordless portable part (CPP) or cordless fixed part (CFP) transmission burst is measured in the power versus time measurements, and the frequency and deviation measurements. The _CPP variable is equivalent to `TRANSMIT CFP CPP`.

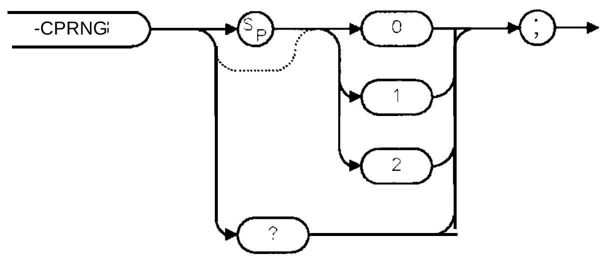
If _CPP is set to 0, the CT2-CAI measurements personality will measure the cordless fixed part transmission. If _CPP is set to 1, the cordless portable part transmission will be measured. The default value for _CPP is 0.

Example

OUTPUT 718;"MOV _CPP,0;"	*Sets _CPP to the cordless fixed part transmission.*

-CPRNG Carrier Power Range

Syntax



-CPRNG allows you to select if a carrier should be tested using the limits for a normal-power or a low-power carrier. -CPRNG is equivalent to **RANGE AUTO** L N .

Setting _CPRNG to 0 selects the low power range, 1 selects the normal power range, and 2 selects the automatic range. The default value for -CPRNG is 2.

Example

OUTPUT 718;"MOV _CPRNG,2;" *Sets the carrier power range to automatic.*

If you set -CPRNG to the low power setting, you must repeat the carrier power measurement with the -RPT command; do not use the -CPWR or -CPM command to repeat the carrier power measurement.

Related Commands The carrier power measurement (-CPWR, or -COS and -COM) commands use -CPRNG.

See Also

"To measure the carrier power" in Chapter 6.

_CPS
Carrier Power Setup

Syntax

Performs the setup for the carrier power measurement.

Example

OUTPUT718;"_CPS;"	***Sets up the carrier power measurement.***
OUTPUT 718;"RB 10KHZ;"	***Changes the resolution bandwidth to 10 kHz.***
OUTPUT718;"_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

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 was not a burst carrier. (If -CC is set to burst, the carrier must be a burst carrier.)
4	The measurement was aborted because the carrier was not a continuous carrier. (If _CC is set to continuous carrier, the carrier must be a nonburst 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
_FLF	A variable that contains the pass or fail results of the carrier power measurement. ■ If the carrier measurement passed, the value of -FLF is a 0 ■ If the carrier measurement failed the low limit, the value of -FLF is a "1" . If the carrier measurement failed the high limit, the value of _FLF is a "2."	None
-CPA	A variable that contains the mean carrier power amplitude.	dBm

_CPWR Measurement Results (continued)

Variable or Trace	Description	Units
_CPN	A variable that contains the results of the carrier power measurement as follows: • _CPN is equal to 0 if the carrier power was within the low power range. • _CPN is equal to 1 if the carrier power was within the normal power range.	None
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, -CPXLL, _CPXHL, and -CPNB. See Table 5-2 for more information.

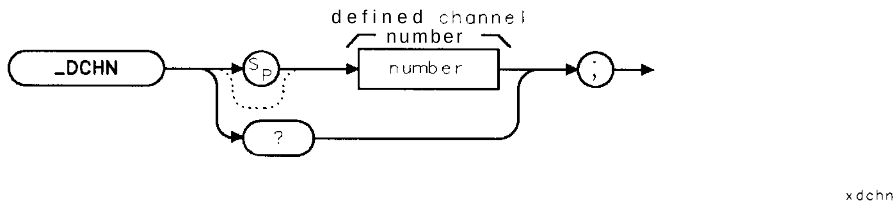
Alternate Commands If you want to change the spectrum analyzer settings before making a carrier power measurement, use _CPS and _CPM instead of the -CPWR command.

Related Commands _CPRNG determines if the carrier power is tested with the normal power limits or the low power limits.

See Also

"To measure the carrier power" in Chapter 6.

_DCHN
Defined Channel n



Description

This command sets the defined channel number in preparation for making measurements with user-defined parameters.

Softkey Equivalent: CHAN n in Define Channel menu

Example: -DCHN 20;

Range: Any integer from 1 to 999

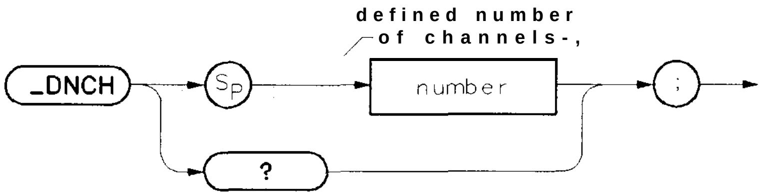
Units: none

Default Value: 1

Preset State: last value

Related Commands: _DPAR

_DNCH
Defined Number of Channels



pz264a

Description

This command sets the defined number of channels in preparation for making measurements with user-defined parameters.

Softkey Equivalent: NUMBER OF CHAN in Define Channel menu

Example: _DNCH 50;

Range: Any integer value from 1 to 999

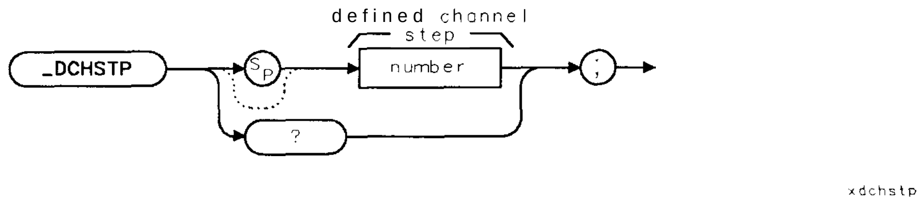
Units: none

Default Value: 40

Preset State: last value

Related Commands: _DPAR

_DCHSTP
Defined Channel Step



Description

This command sets the defined channel frequency in preparation for making measurements with user-defined parameters.

Softkey Equivalent: CH STEP in Define Channel menu

Example: _DCHSTP 50E4;

Range: Any real value from – 1 MHz to 1 MHz

Units: Hz

Default Value: 100 kHz

Preset State: last value

Related Commands: _DPAR

-DEFAULT
Default Configuration

Syntax

XDEFAU

Replaces the values and selections for the configuration functions to their default values. _DEFAULT is equivalent to DEFAULT COMFIG .

Example

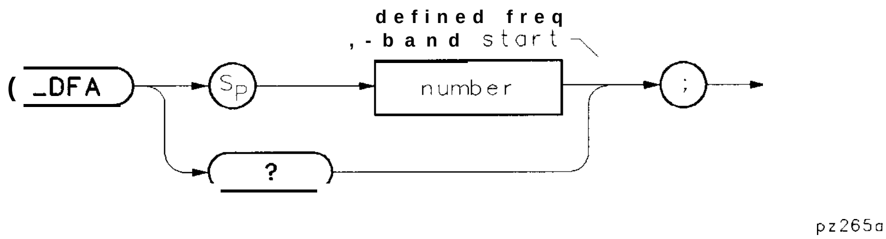
OUTPUT718;"_DEFAULT;"

The default values are as follows:

EXT LOSS	0 dB
TOTAL TX POWER	+ 13 dBm
TRIG DELAY	0 μS
TRIG POL NEG POS	POS
BURST CONT	BURST
TRANSMIT CFP CPP	CFP

_DEFAULT also sets the amplitude correction factor that is used for the CT2-CAI measurements to 0. The amplitude correction factor is created when you use the power calibration routine (CAL POWER).

_DFA
Defined Frequency Band Start



Description

This command sets the start frequency for the defined band in preparation for making measurements with user-defined parameters.

Softkey Equivalent: BAND START in Define Band menu

Example: _DFA 2.5E9;

Range: Any real value within the frequency range of the analyzer

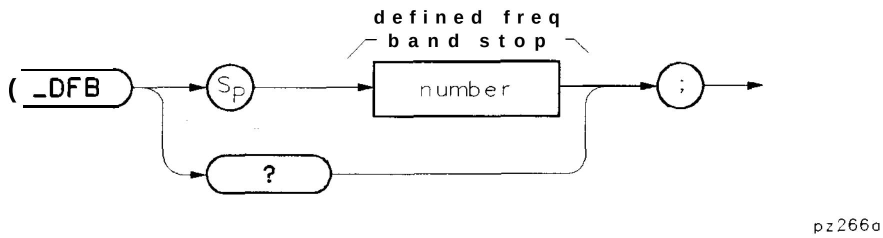
Units: Hz

Default Value: 864.1 MHz

Preset State: last value

Related Commands: _DPAR

-DFB
Defined Frequency Band Stop



Description

This command sets the stop frequency for the defined band in preparation for making measurements with user-defined parameters.

Softkey Equivalent: BAND STOP in Define Band menu

Example: _DFB 2.6E9;

Range: Any real value within the frequency range of the analyzer

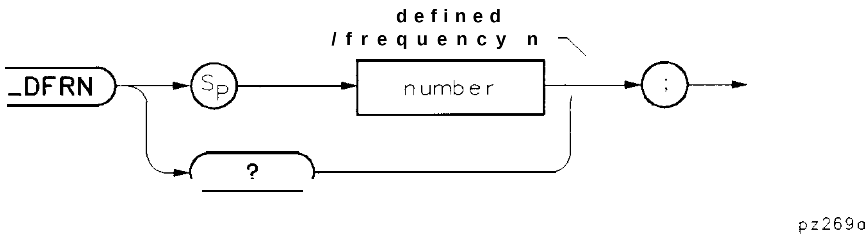
Units: Hz

Default Value: 868.1 MHz

Preset State: last value

Related Commands: _DPAR

_DFRN
Defined Frequency n



Description

This command sets the defined channel frequency for the defined band in preparation for making measurements with user-defined parameters.

Softkey Equivalent: CH FREQ in Define Channel menu

Example: _DFRN 2.8E9;

Range: Any real value within the frequency range of the analyzer

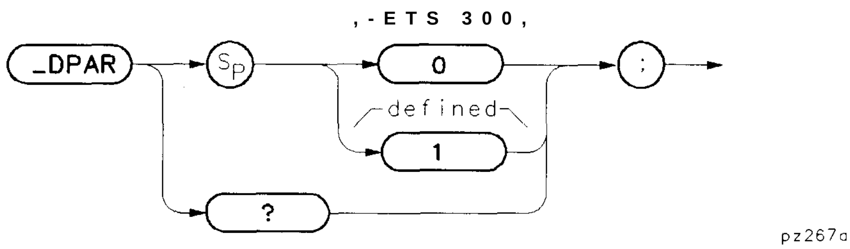
Units: Hz

Default Value: 864.15 MHz

Preset State: last value

Related Commands: _DPAR

_DPAR
Defined Parameter



Description

This command selects user-defined, or ETS 300 parameter values. The user-defined parameters include commands such as -DCHN (Defined Channel n).

Softkey Equivalent: CT2 Param in Conf ig menu

Example: _DPAR 0;

Valid Values: 0 = I ETS 300 131
1 = user-defined parameter values

Units: none

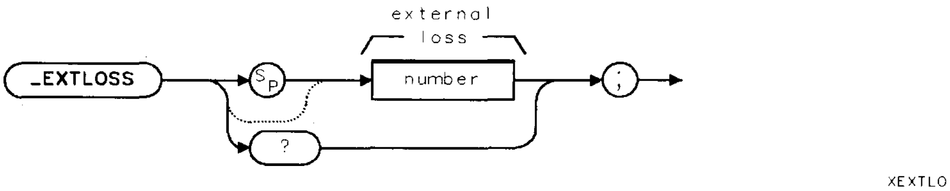
Default Value: 0

Preset State: last value

Related Commands: _DFRN, DCHN, -DCHSTP, _DNCH, _DFA, _DFB

-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 measurement 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

OUTPUT718;"_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

OUTPUT718;"_FDS;"	***Sets up the frequency and deviation measurement.***
OUTPUT 718;"RB 30KHZ;"	***Changes the resolution bandwidth to 30 kHz.***
OUTPUT718;"_FDM;"	***Performs the frequency and deviation measurement.***

An Option 110 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 .

See the description for _FRQDEV for information about the measurement state and measurement results from a frequency and deviation measurement.

-FDS
Frequency and Deviation Setup

Syntax

XFDS

Performs the setup for the frequency and deviation measurement.

Example

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

The _FDS and _FDM commands can be used if you want to change the spectrum analyzer settings before making a frequency and deviation measurement. (An Option 110 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 .

-FRQDEV
Frequency and Deviation

Syntax

XFRQDE

Measures the frequency deviation of the transmitter. -FRQDEV is equivalent to **FREQ/DEV** .

Example

OUTPUT718;"_FRQDEV;"

An Option 110 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 and a trace.

Measurement State A "1" is returned to the external controller to indicate when the _FRQDEV measurement is finished.

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
_FLF	A variable that contains the pass or fail results of the frequency and deviation measurement. ■ If the frequency and deviation measurement passed, the value of -FLF is 0. ■ If the frequency and deviation measurement failed, the value of -FLF is 3.	None
_FDEV	A variable that contains the peak frequency deviation of the carrier.	kHz
_FER	A variable that contains the median frequency error of the carrier.	kHz
_FERMN	A variable that contains the mean frequency error of the carrier.	kHz
_FERD	A variable that contains the frequency drift error of the carrier.	kHz
TRA	TRA is trace A. Trace A contains a demodulated carrier trace (the last trace) that was used to measure frequency deviation.	Determined by the trace data format (TDF) command

_FRQDEV Measurement Results (continued)

Variable or Trace	Description	Units
TRB	TRB is trace B. Trace B contains the maximum peaks of the traces that were used to measure frequency deviation.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the minimum peaks of the traces that were used to measure frequency deviation.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _FRQDEV uses _FDXL, _FDXH, _FERX, _FERDX, _FNB, _FWM, and -FWW. See Table 5-2 for more information.

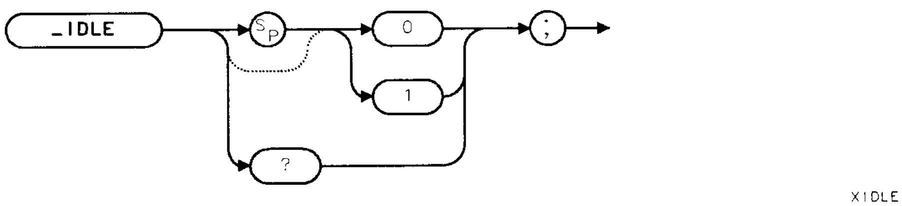
Alternate Commands You can also use the _FDS and _FDM commands to measure frequency and deviation.

See Also

"To measure the frequency and deviation with an Option 110" in Chapter 6.

-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 6.

_IMDATN
Intermodulation Attenuation Measurement

Syntax

XIMDAT

_IMDATN performs the intermodulation attenuation measurement. _IMDATN is equivalent to INTERMOD.

Example

```
OUTPUT718;"_IMDATN;"
```

Executing _IMDATN does the following:

1. Performs the intermodulation attenuation 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.

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 was successfully completed.
2	The measurement was aborted. The measurement is aborted if the carrier amplitude was too low.

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.	dBm
_IMDU	A variable that contains the value of the upper frequency intermodulation product.	dBm
-FLF	A variable that contains the pass or fail results of the intermodulation attenuation measurement. ■ If the intermodulation products pass (the intermodulation products are less than the intermodulation product limit) the value of _FLF is a 0. ■ If the intermodulation products fail (the intermodulation products are greater than the intermodulation product limit), the value of _FLF is a 3.	None

_IMDATN Measurement Results (continued)

Value	Description	Units
_IMDOK	A variable that contains an indicator for whether the noise floor level of the spectrum analyzer was too high to measure intermodulation products. For more information, see "CHECK NOISE FLOOR" in Chapter 4. ■ If the intermodulation products pass (the intermodulation products are less than the intermodulation product limit) the value of _IMDOK is a 1. ■ If an intermodulation product fails and the spectrum analyzer's calculated displayed average noise level exceeds the intermodulation product limit, the value of _IMDOK is a "0."	None

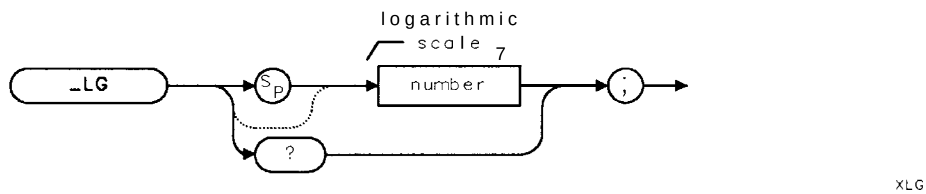
Limit and Parameter Variables _IMDATN uses _IMDX. See Table 5-2 for more information.

See Also

"To measure the intermodulation attenuation" in Chapter 6.

-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.

Example

OUTPUT `718;"MOV _LG,20;"`	***Sets the spectrum analyzer's amplitude scale to 20 dB per division.***

Query Example

OUTPUT`718;"_LG?;"`

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

_MBAND
Monitor Band

Syntax

Displays the full frequency band of the CT2 radio by setting the start frequency of the spectrum analyzer to 864.150 MHz and the stop frequency to 868.050 MHz. _MBAND is equivalent to MONITOR BAND .

Example

```
OUTPUT718;"_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 6.

_MDAS
Modulation Domain Analyzer Setup

Syntax

XMDAS

Sets up the spectrum analyzer for a frequency and deviation measurement with an HP 53310A. _MDAS does not perform the measurement, however. _MDAS is equivalent to the spectrum analyzer setup that is done by HP53310 **FREQ/DEV** .

Example

```
OUTPUT718;"_MDAS;"
```

You must connect an HP 53110A to the spectrum analyzer to use the _MDAS command. (See "To measure the frequency and deviation with an HP 53310A" in Chapter 2 for more information about connecting the HP 53310A to the spectrum analyzer.)

_MDAS performs only the setup for the frequency and deviation measurement; it does not make the measurement. To make the frequency and deviation measurement, you can manually operate the HP 53310A, or you can send programming commands to the HP 53310A. (Refer to the documentation for the HP 53310A for more information about sending programming commands to the HP 53310A.)

Executing _MDAS does the following:

1. Prepares the spectrum analyzer for the frequency and deviation measurement.
2. Returns the measurement state. The measurement state indicates if the setup was completed or aborted.

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

_MDAS Measurement State Results

Value	Description
1	The setup was successfully completed.
2	The setup was aborted because the carrier amplitude was too low.

Limit and Parameter Variables During the frequency and deviation measurement, the HP 53310A uses the following variables: _MADRS, _MFI, MTH, and _MNS. See Table 5-2 for more information.

_OBP
Out of Band Power

Syntax

XOBP

Measures the out of band power due to switching transients (also called AM splatter). _OBP is equivalent to OUT OF BAND PWR .

Example

OUTPUT718;"_OBP;"

To determine the out of band power, the CT2-CAI measurement personality measures the peak envelope power at offsets of ±100 kHz and ±500 kHz from the carrier frequency.

Measurement State A " 1 " is returned to the external controller to indicate when the measurement is finished.

Measurement Results The results of the _OBP command are stored in the variables and trace shown in the following table.

_OBP Measurement Results

Variable or Trace	Description	Units
_FLF	A variable that contains the pass or fail results of the out of band power measurement. ■ If the out of band power measurement passed, the value of -FLF is 0. ■ If the out of band power measurement failed, the value of -FLF is 3.	None
_OBPA	A variable that contains the out of band power at – 100 kHz.	dBm
_OBPB	A variable that contains the out of band power at + 100 kHz.	dBm
_OBPC	A variable that contains the out of band power at -500 kHz.	dBm
_OBPD	A variable that contains the out of band power at + 500 kHz.	dBm
TRA	TRA is trace A. Trace A contains the swept RF spectrum that was used to test for out of band power.	

Limit and Parameter Variables _OBP uses -OBPXA, _OBPXB, and _OBPNB. See Table 5-2 for more information.

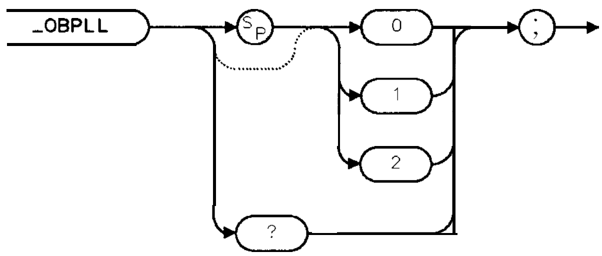
Alternate Commands You can use the _OBPS and _OBPM commands to perform the out of band power measurement instead of -OBP.

See Also

"To measure the out of band power" in Chapter 6.

_OBPLL
Out of Band Power Limit Line

Syntax



XOBPLL

Displays a limit line for the out of band power measurement. _OBPLL is equivalent to LMT LINE ON OFF.

If _OBPLL is set to 0, both the limit line and pass or fail message are not displayed. If _OBPLL is set to 1, the limit line is displayed but the pass or fail message is not displayed. If _OBPLL is set to 2, both the limit line and pass or fail message are displayed. The default value for _OBPLL is 0.

Example

OUTPUT 718;"MOV _OBPLL,2;" ***Displays both the limit line and the pass or fail message for the out of band power measurement.***

The limit line consists of lines that connect the frequency offsets points together. Because the out of band power is only tested at the ±100 kHz and ±500 kHz frequency offsets, the signal can still pass the out of band power test even if the signal exceeds the limit line at a frequency other than at the specified offset frequencies.

Related Commands Use the out of band commands, _OBP or _OBPS and _OBPM, to perform the out of band power measurement.

_OBPM
Out of Band Power Measurement

Syntax

XOBPM

Performs the out of band power measurement.

Example

OUTPUT718;"_OBPS;"	*Sets up the out of band power measurement.*
OUTPUT 718;"RB 10KHZ;"	*Changes the resolution bandwidth to 10 kHz.*
OUTPUT718;"_OBPM;"	*Performs the out of band power measurement.*

Before using _OBPM, you need to use the _OBPS command to perform the setup for the out of band power measurement. The _OBPS and _OBPM commands are useful if you want to change the spectrum analyzer settings before making a carrier off power measurement. The combination of the _OBPS and _OBPM commands is equivalent the _OBP command and OUT OF BAND PWR.

See the description for _OBP for information about the measurement state and measurement results from an out of band power measurement.

_OBPS
Out of Band Power Setup

Syntax

Performs the setup for the out of band power measurement.

Example

`OUTPUT 718;"_OBPS;"`	*Sets up the out of band power measurement.*
`OUTPUT 718;"RB 10KHZ;"`	*Changes the resolution bandwidth to 10 kHz.*
`OUTPUT 718;"_OBPM;"`	*Performs the out of band power measurement.*

The _OBPS and _OBPM commands can be used if you want to change the spectrum analyzer settings before making an out of band power measurement. The combination of the _OBPS and _OBPM commands is equivalent to the _OBP command and OUT OF BAND PWR .

_PBURST
Power versus Time Burst

Syntax

XPBURS

_PBURST performs the power versus time burst measurement. _PBURST is equivalent to P vs T BURST.

Example

```
OUTPUT718;"_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
-FLF	A variable that contains the pass or fail results of the power versus time burst width measurement. ■ If the burst width measurement pass or fail status is not enabled (the pass or fail status is not enabled if the low limit is equal to 0), _FLF is -1. ■ If the burst width measurement passed, _FLF is 0. ■ If the burst width measurement failed the low limit, -FLF is 1. ■ If the burst width measurement failed the high limit, -FLF is a 2.	None

_PBURST Measurement Results (continued)

Variable or Trace	Description	Units
LIMIFAIL	A spectrum analyzer command that contains the pass or fail results of the power versus time burst waveform compared to the limit line. ■ If LIMIFAIL is equal to 0, the waveform was equal to or outside of the lower limit-line. ■ If LIMIFAIL is equal to 1, the waveform failed the lower limit line boundary.	None
_PBTM	A variable that contains the measured width of the burst at -3 dB (or the value of _PBMAX) from the peak of the burst.	us
-PTTM	A variable that contains the time between the external trigger and the marker.	us
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 _PBXL, -PBXH, -PBXLS, -PBXHS, and -PBMAX. See Table 5-2 for more information.

Related Commands -CPP determines if the CFP or CPP transmission burst is measured. _AVG should be set prior the executing _PBURST.

See Also

"To measure the power versus time burst" in Chapter 6.

_PFALL
Power versus Time Falling Edge

Syntax

_PFALL performs the power versus time falling edge measurement. _PFALL is equivalent to P vs T FALLING.

Example

```
OUTPUT718;"_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
_FLF	A variable that contains the pass or fail results of the power versus time fall time measurement. ■ If the fall time measurement pass or fail status is not enabled (the pass or fail status is not enabled if the low limit is equal to 0), -FLF is -1. ■ If the fall time measurement passed, _FLF is 0. ■ If the fall time measurement failed the low limit, _FLF is 1. ■ If the fall time measurement failed the high limit. _FLF is a 2.	None

_PFALL Measurement Results (continued)

Variable or Trace	Description	Units
_LIMIFAIL	A spectrum analyzer command that contains the pass or fail results of the power versus time falling edge waveform compared to the limit line. ■ If LIMIFAIL is equal to 0, the waveform was equal to or outside of the lower limit-line. ■ If LIMIFAIL is equal to 1, the waveform failed the lower limit line boundary.	None
_PFTM	A variable that contains the fall time of the burst.	μs
_PTTM	A variable that contains the time between the external trigger and the marker.	μs
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _PFALL uses _PFXL, -PFXH, _PFMAX, and -PFMIN. See Table 5-2 for more information.

Related Commands -CPP determines if the CFP or CPP transmission burst is measured. _AVG should be set prior the executing _PFALL.

See Also

"To measure the power versus time falling edge" in Chapter 6.

_PFRAME
Power versus Time Frame

Syntax

XPFRAM

_PFRAME performs the power versus time frame measurement. _PFRAME is equivalent to P vs T FRAME.

Example

OUTPUT718;"_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 -PTTM 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 _PTTM variable.

_PFRAME Measurement Result

Variable or Trace	Description	Units
_PTTM	A variable that contains the time between the external trigger and the marker.	μs

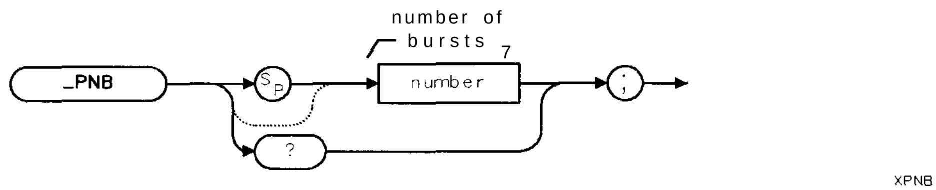
Related Commands -CPP determines if the CFP or CPP transmission burst is measured.

See Also

"To measure the power versus time frame" in Chapter 6.

_PNB
Power vs Time Number of Bursts

Syntax



Allows you to change the number of bursts that are used in calculating the results for a power versus time measurement. 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 the power versus time measurements to 1.*

Related Commands The functions performed by -AVG does not apply if -PNB is equal to 1.

Query Example

OUTPUT718;"_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 6.

_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

```
OUTPUT718;"_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
_FLF	A variable that contains the pass or fail results of the power versus time rise time measurement. ■ If the rise time measurement pass or fail status is not enabled (the pass or fail status is not enabled if the low limit is equal to 0), _FLF is -1. ■ If the rise time measurement passed, _FLF is 0. . If the rise time measurement failed the low limit, -FLF is 1. . If the rise time measurement failed the high limit, -FLF is a 2.	None

_PRISE Measurement Results (continued)

Variable or Trace	Description	Units
LIMIFAIL	A spectrum analyzer command that contains the pass or fail results of the power versus time rising edge waveform compared to the limit line. ■ If LIMIFAIL is equal to 0, the waveform was equal to or outside of the lower limit-line. ■ If LIMIFAIL is equal to 1, the waveform failed the lower limit line boundary.	None
_PRTM	A variable that contains the rise time of the burst.	μs
_PTTM	A variable that contains the time between the external trigger and the marker.	μs
TRA	TRA is trace A. Trace A contains the waveform of the average of the power versus time.	Determined by the trace data format (TDF) command
TRB	TRB is trace B. Trace B contains the waveform of the maximum peaks.	Determined by the trace data format (TDF) command
TRC	TRC is trace C. Trace C contains the waveform of the minimum peaks.	Determined by the trace data format (TDF) command

Limit and Parameter Variables _PRISE uses _PRXL, -PRXH, _PRMAX, and _PRMIN. See Table 5-2 for more information.

See Also

"To measure the power versus time rising edge" in Chapter 6.

-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 110). The _RPT command is equivalent to REPEAT NEAS .

Example

```
OUTPUT718;"_RPT;"
```

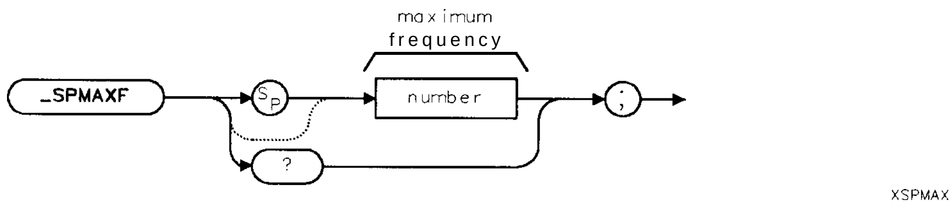
Related Commands -RPT will repeat the following measurements: _CPWR, _CPM, _COPWR, _COM, -ACP, _ACPM, _OBP, _OBPM, _PFRAME, _PBURST, _PRISE, _PFALL, _FRQDEV, and -FDM.

See Also

"To use the repeat command" in Chapter 6.

_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

OUTPUT718;"_SPMAXF?;"

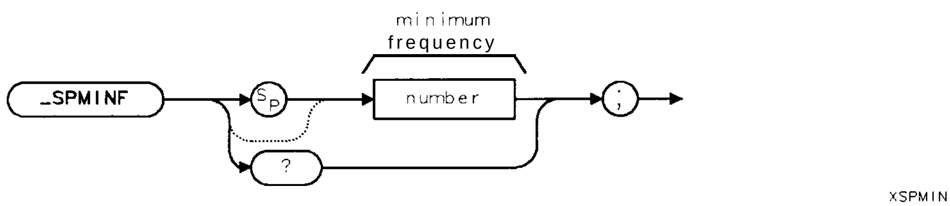
The query response will be a real number representing the current setting for the maximum frequency.

See Also

"To measure the spurious emissions" in Chapter 6.

_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).

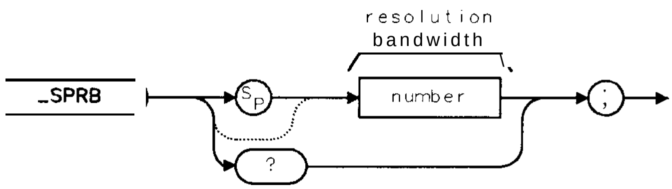
Query Example

OUTPUT718;"_SPMINF?;"

The query response will be a real number representing the current setting for the minimum frequency.

_SPRB
Test Resolution Bandwidth

Syntax



XSPRB

Sets the resolution bandwidth used during the spurious emissions measurement. _SPRB is equivalent to the MHz selection in TEST RBW MHz GHz .

_SPRB can accept a real number from 1 kHz to 3 MHz. The default value for _SPRB is 100 kHz. (You must specify a test resolution bandwidth that corresponds to one of the spectrum analyzer's available resolution bandwidths.)

Example

OUTPUT 718;"MOV _SPRB,300E3;" *Sets the test resolution bandwidth to 300 kHz.*

Related Commands _SPRB is used by -SPUR (the spurious emissions measurement command).

Query Example

OUTPUT718;"_SPRB?;"

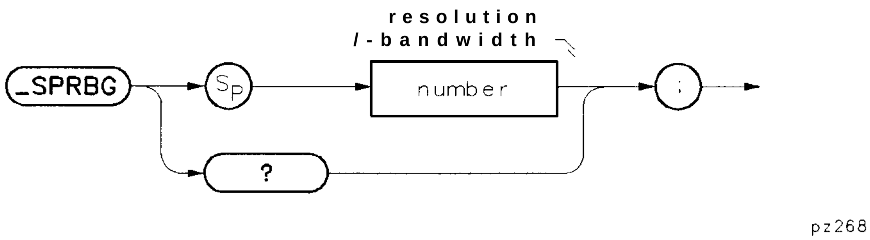
The query response will be a real number representing the current setting for the test resolution bandwidth.

See Also

"To measure the spurious emissions" in Chapter 6.

_SPRBG
Test Resolution Bandwidth

Syntax



Sets the resolution bandwidth used during the spurious emissions measurement. _SPRBG is equivalent to the GHz selection in TEST RBW MHz **GHz** .

_SPRB can accept a real number from 1 **kHz** to 3 MHz. The default value for SPRBG is 1 MHz. (You must specify a test resolution bandwidth that corresponds to one of the spectrum analyzer's available resolution bandwidths.)

Example

OUTPUT 718;"MOV _SPRBG,300E3;" ***Sets the test resolution bandwidth to 300 kHz.***

Related Commands SPRBG is used by SPUR (the spurious emissions measurement command).

Query Example

OUTPUT718;"_SPRBG?;"

The query response will be a real number representing the current setting for the test resolution bandwidth.

See Also

"To measure the spurious emissions" in Chapter 6.

-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 (see _IDLE) was set to idle.
3	The measurement was aborted because the specified **AMPCOR** trace register (see ATR) is invalid.

Measurement Results The results of the -SPUR command are stored in the variables and arrays shown in the following tables.

-SPUR Measurement Results

Value	Description
_NOCAR	A variable that indicates if a carrier signal with an amplitude level of greater than -30 dBm was detected. . If _NOCAR is equal to 0, a carrier with an amplitude value of greater than -30 dBm was detected. . If _NOCAR is equal to 1, no carrier with an amplitude value of -30 dBm was detected. (The measurement is still performed even if no carriers were detected.)

-SPUR Measurement Results (continued)

Value	Description
-FLF	A variable that contains the pass or fail results of the spurious emission measurement. ■ If the spurious emissions measurement passed, the value of -FLF is 0. ■ If the spurious emissions measurement failed, the value of -FLF is 3.

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. ‘lb convert to dBm, divide the value by 10.
-SPFM	The -SPFM array elements contain the MHz portion* of the frequency of each spur found.	MHz
-SPFK	The -SPFK array elements contain the kHz portion* of the frequency of each spur found.	kHz. To convert to MHz, divide the value by 1000.
-SPFAIL	The _SPFAIL array elements contain a value that indicates if the spur passed or failed the spurious emission limit. ■ If the _SPFAIL array element is a "0," the spurious emission passed (it was less than the spurious emission limit). ■ If the _SPFAIL array element is a "1," the spurious emission failed (it was greater than the spurious emission limit).	None
_SPOK	The _SPOK array elements contain a value that indicates whether (for that spur) the noise floor of the spectrum analyzer was too high to measure the spurious emission accurately. For more information, see "CHECK NOISE FLOOR" in Chapter 4. ■ If the value of the _SPOK array element is a "0," it indicates that the spurious emission could be spectrum analyzer noise.† ■ If the value is a "1," the spurious emission is a valid spurious emission.	None

‘The frequency of the spurious emission can be found as follows: Frequency = MHz portion + (kHz portion/1000)

† To be considered spectrum analyzer noise, the spectrum analyzer's calculated displayed average noise level must be greater than the spurious emissions limit minus the value of _SPMAR.

Limit and Parameter Variables -SPUR uses SPMAR, _SPXL, _SPXH, _SPXGL, -SPXGH, -SPXLI, _SPXHI, -SPXGLI, -SPXGHI, and _MAXST. See Table 5-2 for more information.

Related Commands _ATR, _IDLE, _MAXST, SPMAR, _SPMAXF, -SPMINF, and _SPRB.

See Also

"To measure the spurious emissions" in Chapter 6.

-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

```
OUTPUT718;"_TA;"
```

_TC
Trace Compare

Syntax

XTC

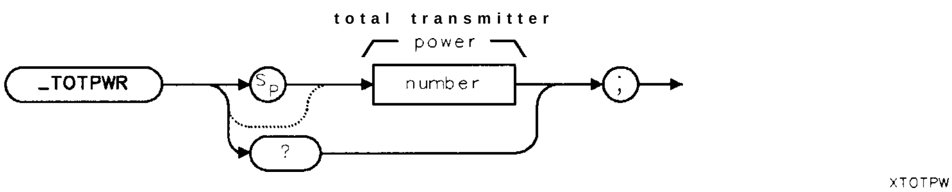
_TC copies the active trace from trace A into trace C. Trace A remains in the active mode, trace C is placed into the view mode (in the view mode, the trace is not updated). The _TC command is equivalent to TRACE COMPARE .

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 0 to 30. The measurement unit is dB. The default value for _TOTPWR is + 13 dB.

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 13.

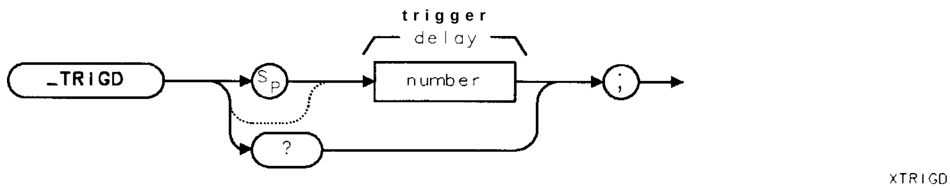
Query Example

`OUTPUT718;"_TOTPWR?;"`

The query response will be the current setting for the total power.

_TRIGD
Trigger Delay

Syntax



Allows you to enter the delay time from the external trigger signal to the reference point of the burst. The _TRIGD variable is equivalent to TRIG DELAY .

You can enter in an integer number for trigger delay from -2200 μs to + 1800 μs in 1 μs increments. The measurement unit for _TRIGD is μs. If you do not enter a trigger delay, a default value of 0 μs is used.

Example

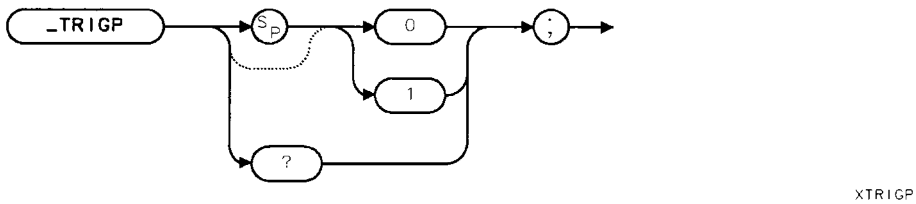
OUTPUT 718;"MOV _TRIGD,40;" *Sets the trigger delay to 40 μs.*

For a positive-edge trigger, the reference point is the beginning of a 68 bit burst (the start of bit 1). For a negative-edge trigger, the reference point is the end of a 68 bit burst (the end of bit 68).

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.

6

Programming Examples

This chapter explains how the CT2-CAI measurements personality's functions can be executed by using programming commands. When you use programming commands to operate the CT2-CAI 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 CT2-CAI measurements personality for remote operation.
- Programming basics for CT2-CAI remote operation.
- Programming examples for CT2-CAI remote operation.

Before you can program the spectrum analyzer, you must connect the spectrum analyzer to the computer. See Chapter 1 in the *HP 8590 Series Programming Manual* for more information.

All the examples in this chapter are written in HPBASIC.

Accessing the CT2-CAI Measurements Personality for Remote Operation

To use the CT2-CAI programming commands, the CT2-CAI measurements personality must be loaded into spectrum analyzer memory, and CT2-CAI mode must be selected. This section contains the following procedures:

- Load the CT2-CAI measurements personality remotely.
- Select the CT2-CAI mode remotely.

To load the CT2-CAI measurements personality remotely

1 If necessary, insert the HP 85717A CT2-CAI 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.

3 Dispose any personalities from the spectrum analyzer 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 "dCT2" 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 CT2-CAI measurement personality into spectrum analyzer memory. You may find it more convenient to use the spectrum analyzer's front-panel keys to load the CT2-CAI measurements personality into spectrum analyzer memory, however.

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/dCT2/;"`	*Loads the CT2-CAI measurements personality into spectrum analyzer memory. "dCT2" is the file name for the CT2-CAI 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 CT2-CAI 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.

2 Change to the CT2-CAI 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 CT2-CAI mode before you can send any CT2-CAI 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 CT2-CAI 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 CT2-CAI Remote Operation

This section contains information about how to use the CT2-CAI programming commands. Refer to the descriptions for the individual programming commands in Chapter 5 for more information about a specific programming command.

This section contains the following procedures:

- Use the MOV command.
- Use the CT2 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 CT2-CAI programming commands and variables from the spectrum analyzer programming commands because the CT2-CAI programming commands and variables begin with an underscore (_), and spectrum analyzer programming commands do not. For example, -CH is a CT2-CAI programming command, and MOV is a spectrum analyzer programming command.

This guide contains information about the CT2-CAI programming commands. *See* the *HP 8590 Series Programming Manual* 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 CT2-CAI command that can accept a value.

You are encouraged to use the MOV command when you need to move a value into a CT2-CAI 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 -CH command. The -CH command allows you to enter the channel number to be measured.

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

To use the CT2-CAI 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 CT2-CAI measurements can be done two ways:

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

or,

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

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

Example

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

To change the value of a limit variable

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

or,

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

The CT2-CAI 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. See Table 5-2 in Chapter 5 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_IMDX, -50;"`	*Changes the limit for intermodulation products from the default value of -54 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_IMDX,-50;"`	*Changes the limit for intermodulation products from the default value of -54 dBm to -50 dBm.*

The VARDEF command changes the CT2-CAI measurements personality that is currently in spectrum analyzer memory; the VARDEF command does not change the program on the HP 85717A memory card. If you reload the CT2-CAI measurements personality from the HP 85717A 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 CT2-CAI 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. See Table 5-2 in Chapter 5 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 CT2-CAI measurements personality that is currently in spectrum analyzer memory; the VARDEF command does not change the program on the HP 85717A memory card. If you reload the CT2-CAI measurements personality from the HP 85717A 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 (if the frequency and deviation measurement uses Option 110). You cannot use -RPT to repeat a spurious and intermodulation measurement, or a frequency and deviation measurement with the HP 53310A. Some CT2-CAI parameters such as channel number and trace status can be changed prior to executing -RPT.

Example

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

To determine when a measurement is done

1. Execute the CT2-CAI 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. See the description for the command in Chapter 5 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. See the description for the measurement command in Chapter 5 for more about error conditions and measurement state values.

It is necessary the 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 meas. state. Fbr _MBAND, the only valid measurement state value is a 1.*

Use an external keyboard to enter commands

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 Cl405 Option 2 cable from the spectrum analyzer's rear panel connection (marked EXT KEYBOARD) to the HP Cl405 Option ABA keyboard.

3 Press (LINE) to turn on the spectrum analyzer, then press CT2-CAI AMALYZER .

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).

You can enter the programming commands into the spectrum analyzer by using a keyboard that is connected to the spectrum analyzer's external keyboard connector. The external keyboard connector is included with an Option 021 or Option 023 spectrum analyzer. Refer to the Operating Manual for the spectrum analyzer for more information about the different external keyboard functions.

Because you are not using an external computer, the CT2-CAI 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 _CH,2;` *Changes the channel number to 2. _CH 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 out of band power, 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. (See Table 5-3 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 CT2-CAI measurements personality.

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

See the *HP 8590 Series Programming Manual* 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.

See the *HP 8590 Series Programming Manual* for more information about the LIMILO command.

5 Turn on limit line testing with the LIMITEST command.

See the *HP 8590 Series Programming Manual* for more information about the LIMITEST command.

6 End the FUNCDEF declaration.

Some measurements (out of band power, 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 CT2-CAI 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*
3244	`!`	
3245	`OUTPUT @Sa;"FUNCDEF _PBLIM,@";`	*Use the spectrum analyzer FUNCDEF command to redefine the limit line function for power versus time burst (-PBLIM).*
3246	`!`	
3247	`OUTPUT @Sa;"LIMIDEL;";`	*Deletes previous limit linefunctions.*
3253	`OUTPUT @Sa;"IF _BB,EQ,1;";`	*Does the following four programming lines if the length of the transmission burst is 66 bits per burst.*
3254	`OUTPUT @Sa;"MOV TRA[1,38],0;";`	*Enters 0 display units in trace elements 1 through 38.*
3255	`OUTPUT @Sa;"MOV TRA[39,344],7400;";`	*Enters 7400 display units in trace elements 39 through 344.*

3256	`OUTPUT @Sa;"MOV TRA[345,346],7100;";`	*Enters 7100 display units in trace elements 345 through 346.*
3257	`OUTPUT @Sa;"MOV TRA[347,401],0;";`	*Enters 0 display units in trace elements 347 through 401.*
3258	`OUTPUT @Sa;"ELSE ";`	*Does the following four programming lines if the length of transmission is 68 bits per burst.*
3259	`OUTPUT @Sa;"MOV TRA[1,33],0;";`	*Enters 0 display units in trace elements 1 through 33.*
3260	`OUTPUT @Sa;"MOV TRA[34,349],7400;";`	*Enters 7400 display units in trace elements 34 through 349.*
3261	`OUTPUT @Sa;"MOV TRA[350,351],7100;";`	*Enters 7100 display units in trace elements 350 through 351.*
3262	`OUTPUT @Sa;"MOV TRA[352,401],0;";`	*Enters 0 display units in trace elements 352 through 401.*
3263	`OUTPUT @Sa;"ENDIF;";`	*Ends the IF THEN ELSE statement.*
3264	`!`	
3265	`OUTPUT @Sa;"LIMILO TRA;";`	*Moves trace A into LIMILO. LIMILO represents the tower limit line.*
3267	`OUTPUT @Sa;"LIMITEST1;";`	*Turns on limit line testing.*
3268	`!`	
3269	`OUTPUT @Sa;"@;";`	*Ends the FUNCDEF declaration.*
3270	`!`	
3271	`END`	

Programming Examples

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

- Carrier power.
- Carrier off power.
- Adjacent channel power.
- Out of band power.
- Monitor band.
- Power versus time frame.
- Power versus time burst.
- Power versus time rising edge.
- Power versus time falling edge.
- Frequency and deviation.
- Spurious emissions.
- Intermodulation attenuation.

To measure the carrier power

This example shows how you can use the CT2-CAI programming commands to measure the carrier power and get the value for mean carrier power. Example 1 shows the carrier power measurement for a normal power range, example 2 shows the carrier power measurement for both normal and low power ranges.

Example 1

`10 !re-store"CPWR_EX1"`	
`20 !Shows how to use the _CPWR command`	
`30 !`	
`40 INTEGER Fail-flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 REAL Mean-pwr`	*Declares a variable that will hold the mean carrier power variable.*
`80 !`	
`90 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
`100 !`	
`110 !`	
`120 OUTPUT @Sa;"_CPWR;"`	*Performs the carrier power meas.*
`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<5`	*Checks for a valid measurement state value. For _CPWR, the only the valid measurement state values are 1 through 4.*
`160 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`170   PRINT "CARRIER POWER: ";`	
`180   OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. _FLF 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 value of _FLF 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 Measstate did not equal 1.

```
300     DISP "Measurement aborted"
310   END IF
320   !
330   END
```

Example 2

```
10    !re-store"CPWR_EX2"
20    !Shows how to use the _CPWR command
30    !(in both power ranges).
40
50    INTEGER Fail-flag
```

Declares a variable that will be used to determine if the measurement failed.

```
60    INTEGER Pwr_rng_flag
```

Declares a variable that will be used to determine what pwr. range is being tested.

```
70    !
80    REAL Meas_state
```

Declares a variable that will hold the meas. state value.

```
so    REAL Mean-pwr
```

Declares a variable that will hold the mean carrier power variable.

```
100   !
110   ASSIGN @Sa TO 718
```

Declares the I/O path to spectrum analyzer

```
120   !
130   !
140   DISP "Set Carrier Power to normal range,
press CONTINUE"
150   PAUSE
160   DISP
170   OUTPUT @Sa;"MOV _CPRNG,1;"
```

Selects the normal power range by moving a 1 into _CPRNG. You can also set _CPRNG to the automatic range instead of setting it to the normal power range. You must perform the carrier power measurement at the normal power range before performing a carrier power measurement in the low power range.

```
200   OUTPUT @Sa;"_CPWR;"
```

Performs the carrier power meas.

```
210   GOSUB Read-res
```

Jumps to a subroutine that reads the results.

```
220   DISP "Set Carrier Power to low range,
press CONTINUE"
230   PAUSE
240   DISP
```

`250 OUTPUT @Sa;"MOV _CPRNG,0;"`	*Selects the low power range. You can eliminate this statement if you set _CPRNG to the automatic range for the power range.*
`270 OUTPUT @Sa;"_RPT;"`	*Repeats the last measurement.*
`280 GOSUB Read-res`	*Jumps to a subroutine that reads the results.*
`290 STOP`	
`300 !`	
`310 !`	
`320 Read-res:`	*Read_res is a subroutine that reads the results.*
`330 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _CPWR measurement state.*
`340 ENTER @Sa;Meas_state`	*Enters the measurement state into Measstate.*
`350 UNTIL Meas_state>0 AND Meas_state<5`	*Checks for a valid measurement state value. For _CPWR, the only the valid measurement state values are 1 through 4.*
`360 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`370 PRINT`	
`380 PRINT "CARRIER POWER ";`	
`390 OUTPUT @Sa;"_CPN?;"`	*Queries _CPN. _CPN is a variable that indicates if the measurement results were within the low power range or the normal power range.*
`400 ENTER @Sa;Pwr_rng_flag`	*Enters the value of _CPN into Pwr_rng_flag.*
`410 IF Pwr_rng_flag=1 THEN`	*If _CPN was a 1, the measurement results were within the normal power range.*
`420 PRINT "Normal Range: ";`	
`430 ELSE`	*If _CPN* was *a 0, the measurement results were within the low power range.*
`440 PRINT "Low Range: ";`	
`450 END IF`	
`460 OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. _FLF is a variable that contains a 0* if *the carrier power meas. passed, or a 1* if *the measurement failed.*
`470 ENTER @Sa;Fail_flag`	*Enters the value of _FLF into Fail_flag.*
`480 SELECT Fail-flag`	

`490     CASE 0`	*If _FLF was a 0, the measurement passed.*
`500       PRINT "PASSED"`	
`510     CASE 1`	*If _FLF was a 1, the measurement failed the low power range limit.*
`520       PRINT "FAILED LOW LIMIT"`	
`530     CASE 2`	*If _FLF was a 2, the measurement failed the normal power range limit.*
`540       PRINT "FAILED HIGH LIMIT"`	
`550     END SELECT`	
`560     OUTPUT @Sa;"_CPA?;"`	*Queries _CPA. _CPA contains the result of the mean carrier power:*
`570     ENTER @Sa;Mean_power`	*Enters the mean carrier power into Mean_pwr.*
`580     PRINT`	
`590     PRINT "Mean On Power= ";Mean_power;" dBm"`	
`600   ELSE`	*If Measstate did not equal 1.*
`610     DISP "Measurement aborted"`	
`620     PAUSE`	
`630   END IF`	
`640   RETURN`	
`650`	
`660   END`	

To measure the carrier off power

This example shows how you can use the CT2-CAI programming commands to measure **the** carrier off power. This example will print the mean and peak carrier off power.

`10 ! re-store "COPWR_EX"`	
`20 !Shows how to use the _COPWR command`	
`30 !`	
`40 INTEGER Fail-flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`70 REAL Mean-off-pwr`	*Declares a variable that will hold the mean carrier off power*
`80 REAL Peak-off-pwr`	*Declares a variable that will hold the peak carrier off power*
`so !`	
`100 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
`110`	
`120`	
`130 OUTPUT @Sa;"_COPWR;"`	*Performs carrier off power measurement.*
`140 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _COPWR measurement state.*
`150   ENTER @Sa;Meas_state`	*Enters the measurement state into Meoxstate.*
`160 UNTIL Meas_state>0 AND Meas_state<5`	*Checks for a valid measurement state value. For _COPWR, the only the valid measurement state values are 1 through 4.*
`170 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successful.*
`180   PRINT "CARRIER OFF POWER: ";`	
`190   OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. -FLF is a variable that contains a 0 if the carrier off power measurement passed, or a 1 if the measurement failed.*
`200   ENTER @Sa;Fail_flag`	*Enters the value of -FLF into Fail_flag.*
`210   IF Fail_flag=0 THEN`	
`220     PRINT "PASSED"`	
`230   ELSE`	

`240       PRINT "FAILED"`	
`250     END IF`	
`260     OUTPUT @Sa;"_COA?;"`	*Queries _COA. _COA contains the result **of** the man carrier off power.*
`270     ENTER @Sa;Mean_off_pwr`	*Enters the mean carrier off power into Mean_off_pwr.*
`280     OUTPUT @Sa;"_COP?;"`	*Queries _COP. _COP contains the peak carrier off power value.*
`290     ENTER @Sa;Peak_off_pwr`	*Enters peak carrier off power into Peak_off_pwr.*
`300     PRINT`	
`310     PRINT "Mean Off Power= ";Mean_off_pwr;" dBm"`	
`320     PRINT "Peak Off Power= ";Peak_off_pwr;" dBm"`	
`330   ELSE`	*If Measstate did not equal 1.*
`340     DISP "Measurement aborted"`	
`350   END IF`	
`360   !`	
`370   END`	

To measure the adjacent channel power

This example shows how you can use the CT2-CAI programming commands to measure the adjacent channel power.

10	`!re-store"ACP_EX"`	
20	`!Shows how to use the _ACP 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 Acp_lower`	*Acp_lower holds the lower adjacent channel power*
80	`REAL Acp_upper`	*Acp_upper holds the upper adjacent channel power*
90	`REAL Acp_cp`	*Acp_cp holds the channel power*
100		
110	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
120		
130		
140	`OUTPUT @Sa;"_ACP;"`	*Performs adjacent channel power measurement.*
150	`REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _ACP measurement state.*
160	`  ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
170	`UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _ACP, the only the valid measurement state values are 1 and 2.*
180	`IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
190	`  PRINT "ADJACENT CHANNEL POWER: ";`	
200	`  OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. -FLF is a variable that contains a 0 if the adjacent channel power measurement passed, or a 1 if the measurement failed.*
210	`  ENTER @Sa;Fail_flag`	*Enters value of -FLFinto Fail-flag.*
220	`  IF Fail_flag=0 THEN`	
230	`    PRINT "PASSED"`	
240	`  ELSE`	
250	`    PRINT "FAILED"`	
260	`  END IF`	
270	`  OUTPUT @Sa;"_ACPL?;"`	*Queries _ACPL. -ACPL contains the result of the lower adjacent channel power*

`280 ENTER @Sa;Acp_lower`	*Value of _ACPL put into Acp_lower.*
`290 OUTPUT @Sa;"_ACPU?;"`	*Queries _ACPU. _ACPU contains the result of the upper adjacent channel power.*
`300 ENTER @Sa;Acp_upper`	*Value of _ACPU put into Acp_upper.*
`310 OUTPUT @Sa;"_ACPCP?;"`	*Queries the channel power value.*
`320 ENTER @Sa;Acp_cp`	*Enters the value of ACPCP into Acp_cp.*

```
330      PRINT
340      PRINT "Lower Adjacent Channel Power= ";
Acp_lower;" dBm"
350      PRINT "Upper Adjacent Channel Power= ";
Acp_upper;" dBm"
360      PRINT "Channel Power= ";Acp_cp;" dBm"
370    ELSE
380      DISP "Measurement aborted"
390    END IF
400    !
410    END
```

If Meas_state did not equal 1. (line 370)

To measure the out of band power

This example shows how you can use the CT2-CAI programming commands to measure the out of band power.

10	`! re-store "OBP_EX"`	
20	`!Shows how to use the _OBP 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 Obp_100k_lower`	*Declares a variable that will hold the out of band power at -100 kHz.*
80	`REAL Obp_100k_upper`	*Declares a variable that will hold the out of band power at + 100 kHz.*
90	`REAL Obp_500k_lower`	*Declares a variable that will hold the out of band power at -500 kHz.*
100	`REAL Obp_500k_upper`	*Declares a variable that will hold the out of band power at +500 kHz.*
110	`!`	
120	`ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
130	`!`	
140	`!`	
150	`OUTPUT @Sa;"_OBP;"`	*Performs out of band power meas.*
160	`REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _OBP measurement state.*
170	`  ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
180	`UNTIL Meas_state>0 AND Meas_state<2`	*Checks for a valid measurement state value. For _OBP, the only the valid measurement state value is a 1.*
190	`PRINT "OUT OF BAND POWER: ";`	
200	`OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. -FLF is a variable that contains a 0 if the out of band power measurement passed, or a 1 if the measurement failed.*
210	`ENTER @Sa;Fail_flag`	*Enters the value of _FLF into Fail_flag.*
220	`IF Fail_flag=0 THEN`	
230	`  PRINT "PASSED"`	
240	`ELSE`	
250	`  PRINT "FAILED"`	
260	`END IF`	
270	`OUTPUT @Sa;"_OBPA?;"`	*Queries the power level at the – 100 kHz frequency offset.*
280	`ENTER @Sa;Obp_100k_lower`	*Enters the value.*
290	`OUTPUT @Sa;"_OBPB?;"`	*Queries the power level at the + 100 kHz frequency offset.*

`300 ENTER @Sa;Obp_100k_upper`	*Enters the value.*
`310 OUTPUT @Sa;"_OBPC?;"`	*Queries the power level at the -500 kHz frequency offset.*
`320 ENTER @Sa;Obp_500k_lower`	*Enters the value.*
`330 OUTPUT @Sa;"_OBPD?;"`	*Queries the power level at the +500 kHz frequency offset.*
`340 ENTER @Sa;Obp_500k_upper`	*Enters the value.*

```
350 PRINT
360 PRINT "Out of band Power (-100 KHz)= ";Obp_100k_lower;" dBm"
370 PRINT "Out of band Power (+100 KHz)= ";Obp_100k_upper;" dBm"
380 PRINT "Out of band Power (-500 KHz)= ";Obp_500k_lower;"dBm"
390 PRINT "Out of band Power (+500 KHz)= ";Obp_500k_upper;" dBm"
400 !
410 END
```

To measure the monitor band

This example shows how you can use the CT2-CAI programming commands to view the monitor band and find the maximum amplitude of the trace.

Program	Description
`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 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 measurement state into Measstate.*
`150 UNTIL Meas_state>0 AND Meas_state<2`	*Checks **for** a valid measurement state value. For _MBAND, the only the 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-am-a y.*
`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 CT2-CAI programming commands to make a power versus time frame measurement and display the amplitude level of a trace element.

Program	Description
`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. Measstate.*
`150 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PFRAME, the only the 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-am-a y.*
`200   PRINT`	
`210   PRINT "Amplitude value for 300th element of trace A=";Trace_array(300);" dBm"`	*You can examine each trace element by examining the data in the trace array. In this example, the 300th trace element is examined.*
`220 ELSE`	*If Meas-state did not equal 1.*
`230   DISP "Measurement aborted"`	
`240 END IF`	
`250 !`	
`260 END`	

To measure the power versus time burst

This example shows how you can use the CT2-CAI programming commands to make a power versus time burst measurement and display the results.

This example also demonstrates how you can change the limit variables _PBXLS and _PBXHS for the power versus time burst measurement.

`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 INTEGER Limi_fail_flag`	*Declares a variable that will be used to determine if the waveform passed or failed the limit line test.*
`60 '`	
`70 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`80 REAL Burst-width`	*Declares a variable that will hold the value of the burst width.*
`90 REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
`100 !`	
`110 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
`120 '`	
`130 '`	
`140 OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
`150 OUTPUT @Sa;"MOV _PBXLS,940;"`	*Sets the minimum burst width limit for a 66 bit burst.*
`160 OUTPUT @Sa;"MOV _PBXHS,960;"`	*Sets the maximum burst width limit for a 66 bit burst.*
`170`	
`180 OUTPUT @Sa;"_PBURST;"`	*Performs the power versus time burst measurement.*
`190 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PBURST measurement state.*
`200   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas_state.*
`210 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PBURST, the only valid measurement state values are 1 and 2.*
`220 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`230   PRINT "POWER vs TIME"`	

`240 OUTPUT @Sa;"LIMIFAIL?;"`	*Determines if the waveform passed or failed the limit line by querying LIMIFAIL.*
`250 ENTER @Sa;Limi_fail_flag`	*Enters the value for LIMIFAIL into Limi_fail_flag.*
`260 PRINT "LIMIT LINE: ";` `270 IF Limi_fail_flag=0 THEN` `280   PRINT "PASSED"` `290 ELSE` `300   PRINT "FAILED"` `310 END IF` `320 PRINT "BURST WIDTH: ";`	
`330 OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. _FLF is a variable that contains a 0 if the power versus time burst measurement passed, or a 1 if the measurement failed.*
`340 ENTER @Sa;Fail_flag`	*Enters the value of -FLF into Fail-flag.*
`350 SELECT Fail-flag` `360 CASE -1` `370   PRINT "PASS/FAIL not enabled"` `380 CASE 0` `390   PRINT "PASSED"` `400 CASE 1` `410   PRINT "FAILED LOW LIMIT"` `420 CASE 2` `430   PRINT "FAILED HIGH LIMIT"` `440 END SELECT`	
`450 OUTPUT @Sa;"_PBTM?;"`	*Queries the carrier burst width value.*
`460 ENTER @Sa;Burst_width`	*Enters the value.*
`470 OUTPUT @Sa;"TRA?;"`	*Queries trace A.*
`480 ENTER @Sa;Trace_array(*)`	*Enters the trace data from trace a into Trace-array.*
`490 PRINT` `500 PRINT "Burst width= ";Burst_width;" usec"`	
`510 PRINT "Amplitude value for 200th element of trace A=";Trace_array(200);" dBm"`	*You can examine each trace element by examining the data in the trace array. In this example, the 200th trace element is examined.*
`520 ELSE`	*If Meas-state did not equal 1.*
`530   DISP "Measurement aborted"` `540 END IF` `550 !` `560 END`	

To measure the power versus time rising edge

This example shows how you can use the CT2-CAI 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.

Line	Statement	Description
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	`INTEGER Limi_fail_flag`	*Declares a variable that will be used to determine if the waveform passed or failed the limit line test.*
60	`!`	
70	`REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
80	`REAL Rise-time`	*Declares a variable that will hold the burst rise time value.*
90	`REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
100	`!`	
110	`ASSIGN @Sa TO 718`	*Declares an array that will hold analyzer trace data.*
120		
130	`:`	
140	`OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
150	`OUTPUT @Sa;"MOV _PRXL,10;"`	*Sets the lower limit for the rise time.*
160	`OUTPUT @Sa;"MOV _PRXH,20;"`	*Sets the upper limit for the rise time.*
170		
180	`OUTPUT @Sa;"_PRISE;"`	*Performs the power versus time rising measurement.*
190	`REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PRISE measurement state.*
200	`  ENTER @Sa;Meas_state`	*Enters the measurement state into Measstate.*
210	`UNTIL Meas_state>0 AND Meas_state<3`	*Checksfor a valid measurement state value. For _PRISE, the only the valid measurement state values are 1 and 2.*
220	`IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
230	`  PRINT "POWER VS TIME"`	
240	`  OUTPUT @Sa;"LIMIFAIL?;"`	*Determines if the waveform passed or failed the limit line by querying LIMIFAIL.*

`250 ENTER @Sa;Limi_fail_flag`	*Enters the value for LIMIFAIL into Limi-fail-flag.*
`260 PRINT "LIMIT LINE: ";`	
`270 IF Limi_fail_flag=0 THEN`	
`280   PRINT "PASSED"`	
`290 ELSE`	
`300   PRINT "FAILED"`	
`310 END IF`	
`320 PRINT "RISE TIME: ";`	
`330 OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. -FLF is a variable that contains a 0 if the power versus time rising edge measurement passed, or a 1 if the measurement failed.*
`340 ENTER @Sa;Fail_flag`	*Enters the value of _FLF into Fail_flag.*
`350 SELECT Fail-flag`	
`360 CASE -1`	
`370   PRINT "PASS/FAIL not enabled"`	
`380 CASE 0`	
`390   PRINT "PASSED"`	
`400 CASE 1`	
`410   PRINT "FAILED LOW LIMIT"`	
`420 CASE 2`	
`430   PRINT "FAILED HIGH LIMIT"`	
`440 END SELECT`	
`450 OUTPUT @Sa;"_PRTM?;"`	*Queries the rise time value.*
`460 ENTER @Sa;Rise_time`	*Enters the value.*
`470 OUTPUT @Sa;"TRA?;"`	*Queries trace A.*
`480 ENTER @Sa;Trace_array(*)`	*Enters trace A data into Trace-array.*
`490 PRINT`	
`500 PRINT "Rise time= ";Rise_time;" usec"`	
`510 PRINT "Amplitude value for 100th element of trace A=";Trace_array(100);" dBm"`	*You can examine each trace element by examining the data in the trace array. In this example, the 100th trace element is examined.*
`520 ELSE`	*If Meas_state did not equal 1.*
`530   DISP "Measurement aborted"`	
`540 END IF`	
`550 !`	
`560 END`	

To measure the power versus time falling edge

This example shows how you can use the CT2-CAI programming commands to measure the falling edge of a burst and display the results.

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

`10 ! re-store "PFALL_EX"`	
`20 !Shows how to use the _PFALL command`	
`30 !`	
`40 INTEGER Fail-flag`	*Declares a variable that will be used to determine if the measurement failed.*
`50 INTEGER Limi_fail_flag`	*Declares a variable that will be used to determine if the waveform passed or failed the limit line test.*
`60 !`	
`70 REAL Meas_state`	*Declares a variable that will hold the measurement state value.*
`80 REAL Fall-time`	*Declares a variable that will hold the value of the fall time of the burst.*
`90 REAL Trace_array(1:401)`	*Declares an array that will hold analyzer trace data.*
`100 !`	
`110 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
`120 !`	
`130 !`	
`140 OUTPUT @Sa;"TDF P;"`	*Sets the spectrum analyzer trace data format to parameter units (dBm for this example).*
`150 OUTPUT @Sa;"MOV _PFXL,5;"`	*Sets the lower limit for the fall time.*
`160 OUTPUT @Sa;"MOV _PFXH,20;"`	*Sets the upper limit for the fall time.*
`170 !`	
`180 OUTPUT @Sa;"_PFALL;"`	*Performs power versus time falling edge measurement.*
`190 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _PFALL measurement state.*
`200   ENTER @Sa;Meas_state`	*Enters the measurement state into Meas-state.*
`210 UNTIL Meas_state>0 AND Meas_state<3`	*Checks for a valid measurement state value. For _PFALL, the only the valid measurement state values are 1 and 2.*
`220 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`230   PRINT "POWER vs TIME"`	

```
240   OUTPUT @Sa;"LIMIFAIL?;"
```

Determines if the waveform passed or failed the limit line by querying LIMIFAIL.

```
250   ENTER @Sa;Limi_fail_flag
```

Enters the value for LIMIFAIL into Limi-fail-flag.

```
260   PRINT "LIMIT LINE: ";
270   IF Limi_fail_flag=0 THEN
280     PRINT "PASSED"
290   ELSE
300     PRINT "FAILED"
310   END IF
320   PRINT "FALL TIME.. ";
330   OUTPUT @Sa;"_FLF?;"
```

Queries _FLF. -FLF is a variable that contains a 0 if the power versus time falling edge measurement passed, or a 1 if the measurement failed.

```
340   ENTER @Sa;Fail_flag
```

Enters the value.

```
350   SELECT Fail-flag
360   CASE -1
370     PRINT "PASS/FAIL not enabled"
380   CASE 0
390     PRINT "PASSED"
400   CASE 1
410     PRINT "FAILED LOW LIMIT"
420   CASE 2
430     PRINT "FAILED HIGH LIMIT"
440   END SELECT
450   OUTPUT @Sa;"_PFTM?;"
```

Queries the fall time value.

```
460   ENTER @Sa;Fall_time
```

Enters the value.

```
470   OUTPUT @Sa;"TRA?;"
```

Queries trace A.

```
480   ENTER @Sa;Trace_array(*)
```

Enters trace A data into Trace-array.

```
490   PRINT
500   PRINT "Fall time= ";Fall_time;" usec"
510   PRINT "Amplitude value for 300th
element of trace A=";Trace_array(300);" dBm"
```

You can examine each trace element by examining the data in the trace array. In this example, the 300th trace element is examined.

```
520 ELSE
```

If Measstate did not equal 1.

```
530   DISP "Measurement aborted"
540 END IF
550 !
560 END
```

To measure the frequency and deviation with an Option 110

This example shows how you can use the CT2-CAI programming commands to measure the frequency and deviation measurements and display the results.

Program	Description
`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_med`	*Declares a variable that will hold the median carrier frequency error*
`90 REAL Freq_err_mean`	*Declares a variable that will hold the mean carrier frequency error*
`100 REAL Freq_drift`	*Declares a variable that will hold the carrier frequency drift error*
`110 !`	
`120 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer*
`130 !`	
`140 !`	
`150 OUTPUT @Sa;"_FRQDEV;"`	*Performs the frequency and deviation measurement.*
`160 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the -FRQDEV measurement state.*
`170   ENTER @Sa;Meas_state`	*Enters the measurement state into Measstate.*
`180 UNTIL Meas_state>0 AND Meas_state<2`	*Checks for a valid measurement state value. For _FRQDEV, the only the valid measurement state value is* **a** *1.*
`190 PRINT "FREQUENCY & DEVIATION: ";`	
`200 OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. _FLF is a variable that contains a 0 if the frequency and deviation measurement passed, or a 1 if the measurement failed.*
`210 ENTER @Sa;Fail_flag`	*Enters the value.*
`220 IF Fail_flag=0 THEN`	
`230   PRINT "PASSED"`	
`240 ELSE`	
`250   PRINT "FAILED"`	
`260 END IF`	
`270 OUTPUT @Sa;"_FDEV?;"`	*Queries the peak carrier frequency deviation value.*
`280 ENTER @Sa;Freq_dev`	*Enters the value.*

```
290  OUTPUT @Sa;"_FER?;"                          Queries the median carrier frequency
                                                  error value.
300  ENTER @Sa;Freq_err_med                       Enters the value.
310  OUTPUT @Sa;"_FERD?;"                         Queries the carrier frequency drift
                                                  value.
320  ENTER @Sa;Freq_drift                         Enters the value.
330  OUTPUT @Sa;"_FERMN?;"                        Queries the mean carrier frequency
                                                  error value.
340  ENTER @Sa;Freq_err_mean                      Enters the value.
350  PRINT
360  PRINT "Peak carrier frequency
deviation=";Freq_dev;"kHz"
370  PRINT "Median carrier frequency
error= ";Freq_err_med;"kHz"
380  PRINT "Carrier frequency
drift= ";Freq_drift;" kHz/msec"
390  PRINT "Mean carrier frequency
error= ";Freq_err_mean;"kHz"
400  !
410  END
```

To measure the spurious emissions

This example shows how you can use the CT2-CAI 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<4`	*Checks for a valid measurement state value. For SPUR, the only the valid measurement state values are 1 through 3.*
`210 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successful.*
`220 PRINT "SPURIOUS EMISSIONS: ";`	
`230 OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. -FLF is a variable that contains a 0 if the spurious emissions measurement passed, or a 1 if it failed.*
`240 ENTER @Sa;Fail_flag`	*Enters the value.*
`250 IF Fail_flag=0 THEN`	
`260 PRINT "PASSED"`	
`270 ELSE`	
`280 PRINT "FAILED"`	
`290 END IF`	
`300 PRINT "# Freq (MHz) Amp (dBm)"`	
`310 PRINT "-------------------------------"`	
`320 OUTPUT @Sa;"_SPN?;"`	*Queries the number of spurs found.*
`330 ENTER @Sa;Num_spurs`	*Enters the value.*
`340 IF Num_spurs<1 THEN`	*If the number of spurs is less than 1, then no spurs were detected.*
`350 PRINT "No spurs found"`	
`360 ELSE`	*Else the number of spurs is greater than 0.*
`370 FOR I=1 TO Num_spurs`	*Loops through each spur found.*
`380 OUTPUT @Sa;"_SPFM[";I; “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; “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; “I?;”`	*Queries the spectrum analyzer noise floor indicator*
`480 ENTER @Sa;Sp_ok`	*Enters the value.*
`490 PRINT I,Spur_frq_m+(Spur_frq_k/1000),Sp_amp;`	*Prints each spur.*

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

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

```
510          PRINT "   FAIL";
20         ELSE
```

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

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

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

```
570        ELSE
580          PRINT
```

Prints a carriage return and a line feed.

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

If Meas_state did not equal 1.

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

To measure the intermodulation attenuation

This example shows how you can use the CT2-CAI programming commandsto make an intermodulation attenuation measurement and display the results.

`10 !re-store"IMDATN_EX"`	
`20 !`	
`30 INTEGER Fail-flag`	*Declares a variable that will be used to determine if the measurement failed.*
`40 INTEGER Imd_ok`	*Declares a variable that will be used to indicate if the spectrum analyzer's noise floor was too high.*
`50 !`	
`60 REAL Meas_state`	*Declares a variable to hold the measurement state.*
`70 REAL Lower-prod`	*Holds the lower intermodulation product value.*
`80 REAL Upper-prod`	*Holds the upper intermodulation product value.*
`90 !`	
`100 ASSIGN @Sa TO 718`	*Declares the I/O path to spectrum analyzer:*
`110`	
`120 :`	
`130 OUTPUT @Sa;"_IMDATN;"`	*Performs the intermodulation attenuation measurement.*
`140 REPEAT`	*The REPEAT UNTIL loop is used to find a valid value for the _IMDATN measurement state.*
`150 ENTER @Sa;Meas_state`	*Enters the measurement state into Measstate.*
`160 UNTIL Meas_state>0 AND Meas_state<4`	*Checks for a valid measurement state value. For _IMDATN, the only the valid measurement state values are 1 through 3.*
`170 IF Meas_state=1 THEN`	*If the measurement state value is 1, the measurement was successfully completed.*
`180 PRINT "INTERMODULATION ATTENUATION: ";`	
`190 OUTPUT @Sa;"_FLF?;"`	*Queries _FLF. _FLF is a variable that contains a 0 if the intermodulation attenuation measurement passed, or a 1 if it failed.*
`200 ENTER @Sa;Fail_flag`	*Enters the value of _FLF into Fail_flag.*
`210 IF Fail_flag=0 THEN`	
`220 PRINT "PASSED"`	
`230 ELSE`	
`240 PRINT "FAILED"`	

```
250        OUTPUT@Sa;"_IMDOK?;"                      Queries the spectrum analyzer noise floor flag.
260        ENTER @Sa;Imd_ok                          Enters the value.
270        IF Imd_ok=0 THEN                          If _IMDOK was a 0, the noise floor was too high.
280          PRINT "(CHECK NOISE FLOOR)"
290        END IF
300      END IF
310      OUTPUT@Sa;"_IMDL?;"                         Queries the lower intermodulation product value.
320      ENTER @Sa;Lower_prod                        Enters the value.
330      OUTPUT @Sa;"_IMDU?;"                        Queries the upper intermodulation product value.
340      ENTER @Sa;Upper_prod                        Enters the value.
350      PRINT.
360      PRINT "Lower product=";Lower_prod;" dBm"
370      PRINT "Upper product=";Upper_prod;" dBm"
380    ELSE                                          If Meas_state did not equal 1.
390      DISP "Measurement aborted"
400    END IF
410    !
420    END
```

7

Specifications

This chapter contains general information about the operation of the CT2-CAI measurements personality. This chapter contains the following sections:

- The specifications and characteristics for the CT2-CAI measurements personality.
- Lists of the recommended accessories and spectrum analyzer options for use with the CT2-CAI measurements personality.

Specifications and Characteristics for the HP 85717A

This section contains the specifications and characteristics for the HP 85717A CT2-CAI 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-l apply if the following conditions are met:

- The CT2-CAI measurements personality is used with an HP 8591E, HP 8593E, HP 8594E, HP 8595E or HP 8596E spectrum analyzer.
- The necessary options are installed in the spectrum analyzer (see "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 instruments'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.
- After the following calibration routines have been performed: amplitude, frequency, frequency and deviation (Option 110 only), and tracking generator (Option 010 only). You must also perform the power calibration routine for the spectrum analyzer to meet the specifications listed as "with power calibration correction. "
- The measurements are performed on CT2-CAI transmitter signals.
- With the following spectrum analyzer settings:

  Total transmitter power (TOTAL TX POWER) of + 13 dBm

  External loss (EXT LOSS) of + 3 dB

  The other spectrum analyzer settings are set automatically by the CT2-CAI 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 CT2-CAI measurements personality uses the value of EXT LOSS to correct the spectrum analyzer reference level value.

Specifications and Characteristics

Table 7-1 lists all the specifications and characteristics for the CT2-CAI measurements personality. See "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 7-1. HP 85717A Specifications and Characteristics

Frequency Reference (Option 004 Only)		
Frequency error of Option 004	$\pm 1 \times 10^{-7}$/year (aging only).	
Power Calibration Uncertainty		
Power calibration uncertainty	±0.7 dB	±0.3 dB RSS
Carrier Power		
Amplitude range	+13 to −47 dBm (with default settings)	
Absolute amplitude accuracy:		
without power calibration correction	±4.5 dB	±2.0 dB RSS
with power calibration correction	±1.7 dB	±0.8 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	
Carrier Off Power		
Amplitude range	−10 to −70 dBm (characteristic)	
Absolute amplitude accuracy:		
without power calibration correction	±4.7 dB	±2.0 dB RSS
with power calibration correction	±2.6 dB	±1.0 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	
Adjacent Channel Power		
Integration bandwidth	80 KHz ±3%	
Range of spectrum before integration	+13 to −67 dBm (characteristic)	
Absolute amplitude accuracy:		
without power calibration correction	±4.7 dB	±2.0 dB RSS
with power calibration correction	±1.9 dB	±0.9 dB RSS
Relative amplitude accuracy:		
for 0 to −60 dB from a fixed ref level	±0.75 dB	

Table 7-1. HP 85717A Specifications and Characteristics (continued)

Out of Band Power		
Range	0 dBm to −65 dBm (characteristic)	
Absolute amplitude accuracy:		
without power calibration	±4.8 dB	±2.0 dB RSS
with power calibration	±2.9 dB	±1.2 dB RSS
Relative amplitude accuracy:		
for 0 to −70 dB from a fixed ref level	±1.0 dB	
Power versus Time		
Dynamic range for +10 dBm carrier	67 dB (characteristic)	
Vertical scale per division	1 dB to 10 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	6 μs	
Burst	3 μs	
Rising edge	0.4 μs	
Falling edge	0.4 μs	
Time error, absolute with respect to external trigger:		
RBW and VBW set to 300 KHz	±(3 μs + time resolution) (characteristic)	±(1.5 μs + time resolution) RSS (characteristic)
Time error, relative:		
RBW and VBW set to 300 KHz	±(1.3 μs + time resolution) (characteristic)	±(1.0 μs + time resolution) RSS (characteristic)
Sweep time accuracy, for sweep times < 20 ms	±0.02% (characteristic)	
Gate delay:		
Range	1 μs to 65.535 ms	
Resolution	1 μs	
Accuracy (from GATE TRIGGER INPUT to positive edge of GATE OUTPUT)	±(1 μs + (0.01% × GATE DELAY readout)) (there is up to 1 μs jitter due to 1 μs resolution of gate delay clock)	
Gate length:		
Range	1 μs to 65.535 ms	
Resolution	1 μs	
Accuracy (from positive edge to negative edge of GATE OUTPUT)	±(0.2 μs + (0.01% × GATE LENGTH readout))	
Gate amplitude* (additional error):		
Log scale	±0.3 dB	
Linear scale	±0.4% of reference level	
* With GATE ON enabled and triggered, CW signal, and peak detector mode.		

Table 7-1. HP 85717A Specifications and Characteristics (continued)

Spurious Emissions		
Sensitivity:		
Transmitter active, 100 KHz RBW,		
Displayed average noise level		
for the frequency range*		
100 KHz to 1 GHz	−55 dBm (characteristic)	
1 GHz to 2.9 GHz	−45 dBm (characteristic)	
2.9 GHz to 6.4 GHz	−65 dBm (characteristic)	
6.4 GHz to 12.75 GHz	−55 dBm (characteristic)	
Transmitter idle, no carrier,		
100 KHz RBW, displayed average noise		
level for the frequency range*		
100 KHz to 864 MHz, 868 MHz to 6.4 GHz	−67 dBm (characteristic)	
Transmitter idle, no carrier,		
1 KHz RBW, displayed average noise		
level for the frequency range		
864 MHz to 868 MHz	−87 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	
Intermodulation Attenuation		
Sensitivity with two +7 dBm carriers, 3 dB external loss, and 10 KHz RBW		
Displayed average noise level	−60 dBm (characteristic)	
Absolute amplitude accuracy:		
without power calibration correction	±4.7 dB	±2.1 dB RSS
with power calibration correction	±3.5 dB	±1.5 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 as follows:

HP 8591A, 9 KHz to 1.8 GHz
HP 8593A, 9 KHz to 22 GHz
HP 8594A, 9 KHz to 2.9 GHz
HP 8595A, 9 KHz to 6.5 GHz

Table 7-1. HP 85717A Specifications and Characteristics (continued)

Frequency and Deviation Measurement (with Option 110 Only)	
Total range from nominal carrier frequency	-60 KHz to +60 KHz
Level range	+ 13 to -25 dBm (characteristic)
Resolution	0.5 KHz (characteristic)
Frequency accuracy	+/-1.0 KHz + (carrier frequency) x (frequency reference error) *
Frequency temperature drift	± 1 .O KHz/° C (characteristic)
FM peak deviation accuracy (dc)	±1.5 KHz*
FM discriminator 3 dB bandwidth at 20 KHz peak deviation	dc to 70 KHz (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 CT2-CAI Measurements Personality

This section describes additional equipment and spectrum analyzer options that can be used with the spectrum analyzer and with the CT2-CAI measurements personality.

Recommended Accessories

This section lists the recommended accessories for use with the CT2-CAI measurements personality.

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 Cl405 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 Sties Option 021 *or* 023: HP Cl405 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, 6dB

The HP 8491A/B Option 006 is a 6 dB fixed attenuator. The HP 8491A/B Option 006 provides precision attenuation, a flat frequency response, and a low standing-wave ratio (SWR) over a broad frequency range.

The HP 8491A/B Option 006 fixed attenuator is the recommended fixed attenuator for the CT2-CAI measurements personality's power calibration routine.

Modulation Domain Analyzer

The HP 53310A modulation domain analyzer allows you to view frequency, phase, or time-interval measurements versus time. The HP 53310A can be used with the CT2-CAI measurements personality to perform frequency and deviation measurements.

Power Meter

The HP 437B or HP 438A power meter features automatic calibration and zeroing. The HP 437B or HP 437A can have a frequency range of 100 KHz to 50 GHz, depending on the power sensor used with the power meter.

Either the HP 437B or HP 438A power meter is the recommended power meter for the CT2-CAI measurements personality's power calibration routine.

Power Sensor

The HP 8481A or HP 8482A power sensor are designed to be used with the HP 437B power meters. Both of these power sensors provide accuracy, stability, and low standing wave ratios (SWR). Both HP 8481A and HP 8482A are 100 mW sensors that can measure power levels of -30 to +20 dBm. HP 8481A has a frequency range of 10 MHz to 18 GHz; HP 8482A has a frequency range of 100 KHz to 4.2 GHz.

The HP 8481A or HP 8482A power sensor is the recommended power sensor for the CT2-CAI measurements personality's power calibration routine.

Printer

fir use with an HP 8590 Series Option 021 or 023. The HP 2225A/D ThinkJet personal printer is a black and white graphics printer. 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 CT2-CAI 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 CT2-CAI measurements personality.

Internal Tracking Generator (Option 010)

Option 010 provides a built-in tracking generator for the HP 8591A, HP 8593A, HP 8594A, and HP 8595A. The tracking generator for the HP 8591A has a frequency range of 100 KHz to 1.8 GHz. The tracking generator for the HP 8593A, HP 8594A and HP 8595A has a frequency range of 300 KHz to 2.9 GHz.

You need either an Option 010 installed in your spectrum analyzer or an external RF source to perform the CT2-CAI measurements personality's power calibration routine.

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 Programming Manual.*

You need Option 021 installed in your spectrum analyzer to perform the frequency and deviation measurement with an HP 53310A.

Impact Cover Assembly (Option 040)

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

Fast Time Domain Sweeps (Option 101)

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

You must have an Option 101 installed in your spectrum analyzer to use the CT2-CAI 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 CT2-CAI 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 110).

You must have an Option 105 installed in your spectrum analyzer to use the CT2-CAI measurements personality. The Option 105 board assembly must have a number prefix of 3121K or higher.

CT2 Demodulator Card (Option 110)

Option 110 is provides the FM demodulation for the CT2-CAI measurements personality's frequency and deviation measurement function, **FREQ/DEV** . Option 110 is very similar to the HP 8590 Series spectrum analyzer Option 102, the AM/FM speaker and TV sync trigger circuitry card. Both Option 110 and 102 enable you to use amplitude or frequency demodulation. Option 110 has a wider FM bandwidth and less frequency drift than an Option 102, however.

You need either an Option 110 installed in your spectrum analyzer or an HP 53310A modulation domain analyzer to use the CT2-CAI frequency and modulation measurements.

8

Verifying Operation

This chapter contains test procedures that verify the electrical performance of the CT2 demodulator card (Option 110), the power calibration routine, and the time-gated spectrum analyzer card (Option 105). These tests verify that the CT2-CAI measurements personality performs within all specification listed in "Specifications and Characteristics for the HP 85717A" in Chapter 7. This chapter contains the following sections:

- Preparing for the verification tests.
- The following verification procedures:
  1. Frequency deviation accuracy (Option 110 only).
  2. Power calibration accuracy.
  3. Gate delay accuracy and gate length accuracy.
  4. 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. Read “Making a Measurement” in Chapter 1 of the *HP 8590 Series Operating Manual* to familiarize yourself with basic HP 8590 Series spectrum analyzer operation.
3. Perform the spectrum analyzer’s self-calibration routines. Refer to “Improving Accuracy with Self-Calibration Routines” in Chapter 1 of the *HP 8590 Series Operating Manual* 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 8-l list 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 8-3) 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 the CT2-CAI 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. See “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 an HP 8590 series spectrum analyzer Installation and Verification Manual for addresses and shipping instructions.

Recommended test equipment

Table 8-l lists the recommended test equipment for performing the verification tests.

Table 8-1. Recommended Test Equipment

Instrument	Critical Specifications for Equipment Substitution	Recommended Model	Use*
Synthesized Sweeper	Frequency Range: 860 MHz to 872 MHz Frequency Accuracy (CW): ±0.02% Power Level Range: -35 to + 16 dBm	HP 8340A/B	P,A,T
Synthesizer/ Level Generator	Frequency Range: 50 MHz Amplitude Range: + 12 to -85 dBm Flatness: ±0.15 dB Attenuator Accuracy:+/-0.09 dB	HP 3335A	P,A,T
Measuring Receiver	Compatible with Power Sensors Resolution: 0.01 dB Reference Accuracy: ± 1.2 %	HP 8902A	P,A,T
Power Sensor	Frequency Range: 860 MHz to 872 MHz Maximum SWR: 1.1 (at stated range)	HP 8482A	P,A,T
Oscilloscope	No Substitute	HP 54501A	P
Power Splitter	Frequency Range: 860 MHz to 872 MHz Insertion Loss: 6 dB (nominal) Output Tracking: <0.25 dB Equivalent Output SWR: < 1.22: 1	HP 11667A	P,A
6 dB Attenuator	Type N (m to f) Attenuation: 6 dB Frequency: 860 MHz to 872 MHz	HP 8491A Option 006	P
Universal Counter	Time Interval: 100 ns to 100 ms	HP 5316A	P
Pulse/Function Generator	Frequency: 100 Hz Duty Cycle: 50% Output: TTL Square Wave	HP 8116A	P

* P = Performance Test, A = Adjustment, T = Troubleshooting

1. Verifying Frequency Deviation Accuracy (Option 110 Only)

Specification

Frequency Accuracy:

±1 kHz + (carrier frequency × frequency reference accuracy)*

Frequency Deviation Accuracy (DC):

±1.5 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 110, the CT2 demodulator card.

Option 110 is a modified version of Option 102, the AM/FM speaker and TV sync trigger circuitry card. (Option 110 has been modified to enhance the frequency response of an Option 102.) Option 110 is meant to be used with the CT2-CAI measurements personality.

To determine the frequency accuracy of the Option 110, 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 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 110, the frequency of the input signal is changed in 15 kHz increments. The frequency deviation is then measured by the CT2-CAI measurements personality, and the result is displayed on the spectrum analyzer's screen. The 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

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 CT2-CAI measurements personality is loaded into the spectrum analyzer's memory. See "Step 1. Load the CT2-CAI 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 500 connector.
3. Press (PRESET) on the spectrum analyzer and wait for the preset to finish.
4. Press CT2-CAI ANALYZER and wait for the CT2-CAI 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. Connect the equipment as shown in Figure 8-l. Connect the HP 8340A/B 10MHz REF OUT connector to the spectrum analyzer's EXT REF IN connector with a cable.

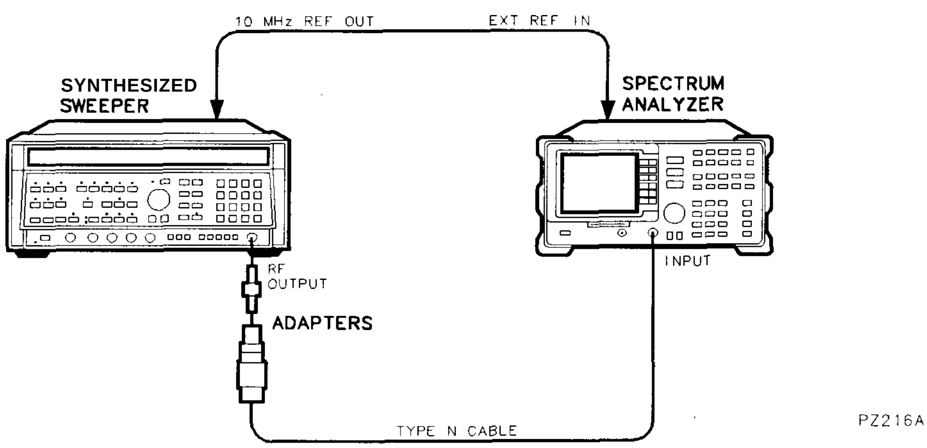


Figure 8-1. Frequency Readout Accuracy Test Setup

9. Press (INSTR PRESET] on the HP 8340A/B and set the controls as follows:

   CW .... 866.05 MHz
   POWER LEVEL ....,..............., -10 dBm

10. On the spectrum analyzer press the following keys:

    Main Menu

    Physical Channel 20 (ENTER)

    Main Menu

    Freq & Modulat

    FREQ/DEV

11. Wait for the spectrum analyzer to finish menu setup and then press the following spectrum analyzer keys:

    (TRIG)

FREE RUN

(MODE) (MODE)

12. 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 demodulated signal. (This is not the way FREQ/DEV is usually used.)

---

13. Read the mean frequency error (MEAN FREQ ERROR), and record it as the Frequency Accuracy.

    Frequency Accuracy ________________ kHz

    The results should be within ±1 kHz.

To determine the frequency deviation accuracy

14. On the HP 8340A/B set the frequency step size to 15 kHz.
15. On the HP 8340A/B press CW and the STEP (▲) key.
16. Repeat the measurement by pressing REPEAT MEAS on the spectrum analyzer. After the test is complete record the MEAN FREQ ERROR (mean frequency error) for Deviation Reading at 15 kHz.

    Deviation Reading 15 kHz ________________ kHz
17. Repeat steps 15 and 16 for Deviation Reading at 30 kHz.

    Deviation Reading 30 kHz ________________ kHz
18. Subtract the Frequency Accuracy reading recorded in step 13 from the Deviation Reading 15 kHz in step 16. Record the result here as the Frequency Deviation Accuracy 15 kHz.

    Frequency Deviation Accuracy 15 kHz ________________ kHz

    The results should be 15 kHz ±1.5 kHz.
19. Subtract the Frequency Accuracy reading recorded in step 13 from the Deviation Reading 30 kHz in step 17. Record the result here as the Frequency Deviation Accuracy 30 kHz.

    Frequency Deviation Accuracy 30 kHz ________________ kHz

    The results should be 30 kHz ±1.5 kHz.

2. Verifying Power Calibration Accuracy

Specification

±0.7 dB (with the following spectrum analyzer settings: 20 dB attenuation, 300 kHz resolution bandwidth, 300 kHz video bandwidth, 0 dBm reference level, from 860 MHz to 872 MHz.)

Related Adjustments

Frequency Response
Power calibration routine (CAL POWER).

Description

The power calibration accuracy is measured by first performing the power calibration routine, and then testing the spectrum analyzer's absolute amplitude accuracy. The spectrum analyzer's absolute amplitude accuracy is determined as follows:

1. The signal from the synthesized sweeper is output to both the spectrum analyzer and the measurement receiver.
2. The amplitude of the sweeper's signal is adjusted until the spectrum analyzer measures the amplitude of the signal at 1.0 dBm.
3. The amplitude of the sweeper's signal is measured by the measuring receiver.

Because the input signal to the spectrum analyzer is also the input signal to the measurement receiver, the difference between spectrum analyzer's measurement and the measuring receiver's measurement is the absolute amplitude accuracy.

Equipment

Synthesized Sweeper .... HP 8340A/B
Measurement Receiver .... HP 8902A
Power Splitter .... HP 11667A
Power Sensor .... HP 8482A
Attenuator .... HP 8491A/B Option 006

Adapters
Type N (f) to APC 3.5 (m) 1250-1750
APC 3.5 (f) to APC 3.5 (f) 5061-5311
Type N (m) to Type N (m) 1250-1475
Cables
Type N, 183 cm (72 in) .... HP 11500A

To perform the CAL POWER procedure

1. Ensure the CT2-CAI measurements personality is loaded into the spectrum analyzer memory.
2. Press (PRESET) on the spectrum analyzer and wait for the preset to finish.
3. On the spectrum analyzer, press CT2-CAI ANALYZER and wait for the personality initialization to complete.
4. Press the following spectrum analyzer keys:

   Config EXT LOSS 0.0 (+dB)

   TOTAL TX POWER 10.0 (+dBm)

5. Follow the procedure, "Step 6. Perform the power calibration routine" in Chapter 1 for performing the power calibration routine. For performing this verification test, the following equipment can be substituted for the equipment listed in the power calibration routine procedure:
   - You can use the HP 8902A measuring receiver instead of the HP 437B power meter.
   - You can use the HP 8340A/B synthesized sweeper instead of the HP 8657A RF source. (Spectrum analyzers with Option 010, the internal tracking generator, do not need an RF source.)

To determine the power calibration accuracy

6. Zero and calibrate the HP 8902A and the HP 8482A in log mode as described in the HP 8902A Operation Manual.
7. Connect the equipment as shown in Figure 8-2. Connect the power splitter to the spectrum analyzer using an adapter.

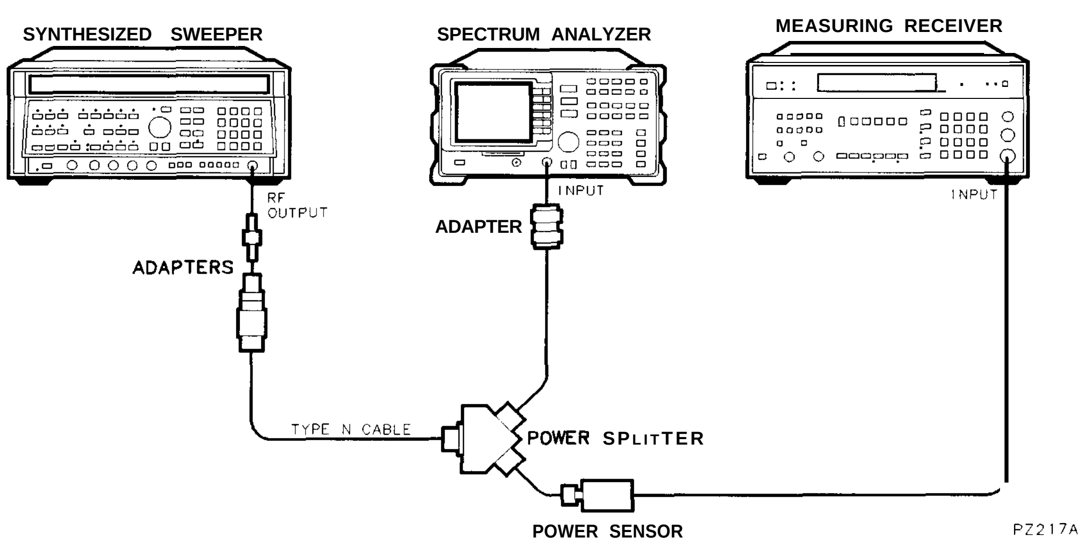


Figure 8-2. Power Calibration Verification

8. Press (INSTR PRESET) on the HP 8340A/B. Set the controls as follows:

   CW .... 860 MHz
   FREQ STEP .... 1 MHZ

POWERLEVEL . . . . +7 dBm

9. Press (PRESET) on the spectrum analyzer and wait for the preset to finish, then press the following spectrum analyzer keys:

(FREQUENCY) 860 (MHz)
(SPAN) 10 (MHz)
(BW) 300 (kHz)
VID BW AUTO MAN 300 (kHz)
(AMPLITUDE) 1 (dB)
ATTEN AUTO MAN 20 (dB)
(MEAS/USER) MORE 1 of 3, MORE 2 of 3, AMP COR, AMP COR ON OFF (ON should be underlined)
(PEAK SEARCH)
(SIGNAL TRACK) (turn signal tracking on)
(MKR)

10. Perform the following steps for each frequency listed in Column 1 of Table 8-2.

- On the synthesized sweeper, press (POWER LEVEL) and adjust the amplitude so the spectrum analyzer's marker amplitude reads 1.0 dBm ±0.05 dB.
- For each frequency listed in column 1 of Table 8-2, enter the cal factor for HP 8482A power sensor into the HP 8902A and record the result in column 2, the "Measuring Receiver Power Reading" column.
- On the synthesized sweeper, press (CW), and then press (STEP UP).

Table 8-2. Power Calibration Accuracy

Column 1	Column 2	Column 3
Synthesized Sweeper Frequency	Measuring Receiver Power Reading (dBm)	Test Result (dB)*
860 MHz	______	______
862 MHz	______	______
863 MHz	______	______
864 MHz	______	______
865 MHz	______	______
866 MHz	______	______
867 MHz	______	______
868 MHz	______	______
869 MHz	______	______
870 MHz	______	______
872 MHz	______	______

* The test result is equivalent to the measuring receiver power reading from column 2. minus 1 dB.

11. Subtract 1 dB from the measuring receiver power readings in column 2 of Table 8-2, and record the result in column 3, "Test Result." The test results should be within ±0.7 dB.

3. Verifying Gate Delay Accuracy and Gate Length Accuracy

Specifications

Gate Delay Refer to "Specifications and Characteristics for the HP 85717A" in Chapter 7 for specific values.

Gate Length Refer to "Specifications and Characteristics for the HP 85717A" 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, At markers are used. There is often up to 1 μs of jitter due to the 1 μs resolution of the gate delay clock. The "define measure" feature of the oscilloscope is used to measure and calculate the average length of the gate output automatically.

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

Equipment

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

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

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

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

1. Connect the equipment as shown in Figure 8-3.

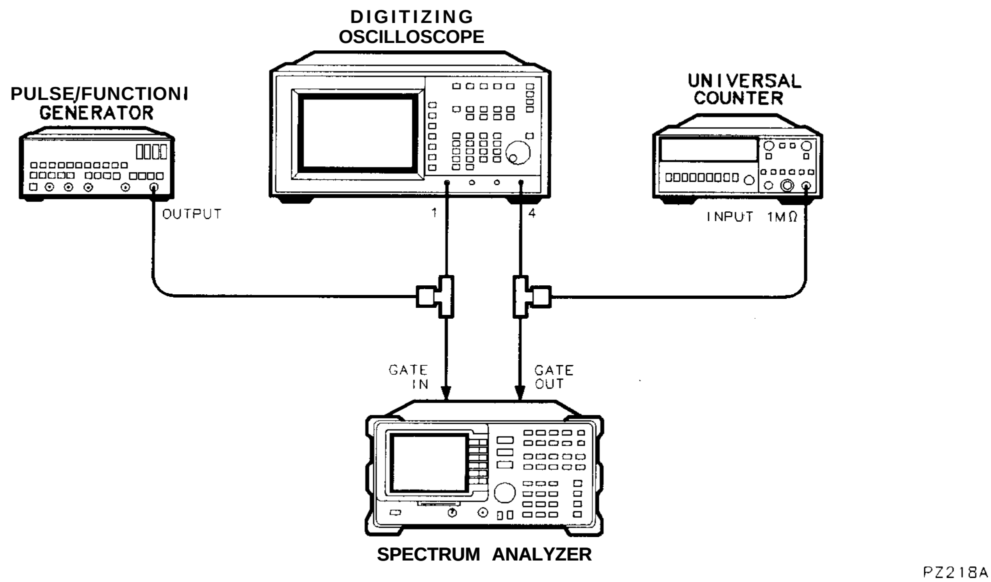


Figure 8-3. Gate Delay and Gate Length Test Setup

2. Press the following spectrum analyzer keys:

   (PRESET] (wait for preset to complete)

   (SPAN) ZERO SPAN

   (SWEEP) 20 (ms) GATE ON OFF (underline ON) GATE MENU GATE DELAY 1 (μs)

   GATE LENGTH 1 (μs)

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

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

5. Press the following keys on the oscilloscope:

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

3. Verifying Gate Delay Accuracy and Gate Length Accuracy

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:

(At AV)

At markers off on .... highlight on

stop marker .... 0 μs

To record the minimum and maximum gate delay values

7. On the oscilloscope, press start marker . Use the knob to position the start marker on the upper trace on the right side of the oscilloscope display. See Figure 8-4.

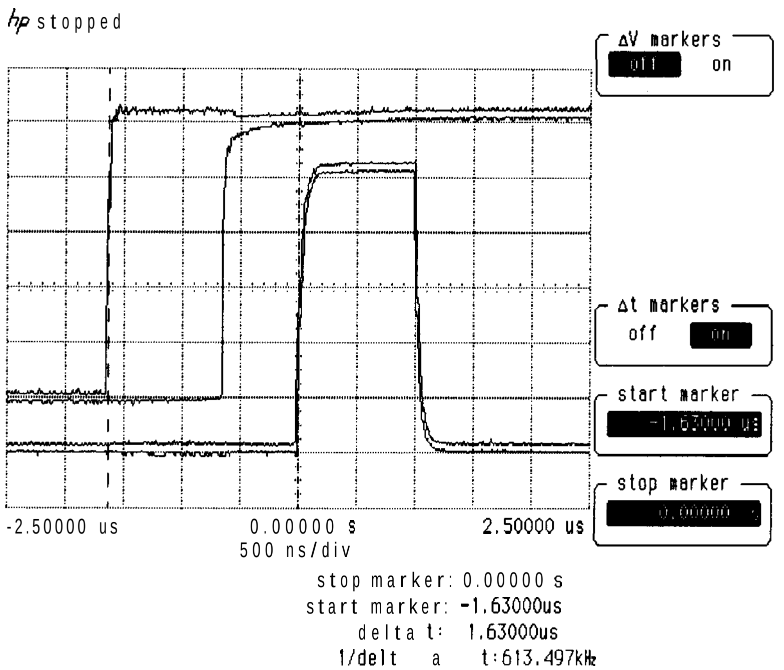


Figure 8-4. Oscilloscope Display of Minimum and Maximum Gate Delay Values

8. Record the At 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 At value of the start marker reading as the MAX Gate Delay.

MAX Gate Delay ____________

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

To determine small gate length

11. Press the following keys on the oscilloscope:

(BLUE) (+WIDTH) 4

(DEFINE MEAS)

statistics off on .... highlight ON

12. Read the average + width (4) displayed on the oscilloscope in the bottom right-hand annotation area.

13. Record this value as the 1 μs Gate Length value.

1 μs Gate Length ________________

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

To determine large gate length (clock accuracy term)

14. Press the following spectrum analyzer keys:

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

15. Set the universal counter controls as follows:

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

4. 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 85717A" in Chapter 7 for specific values.

Linear Scale Refer to "Specifications and Characteristics for the HP 85717A" 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. See 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, 75 Ω, 120 cm (48 in) . . . . HP part number 15525-80010

To determine the card insertion loss

1. Connect the equipment as shown in Figure 8-5. (For Option 001 spectrum analyzers, attach the 75 Ω cable to the spectrum analyzer's RF input connector rather than the 50 Ω cable.)

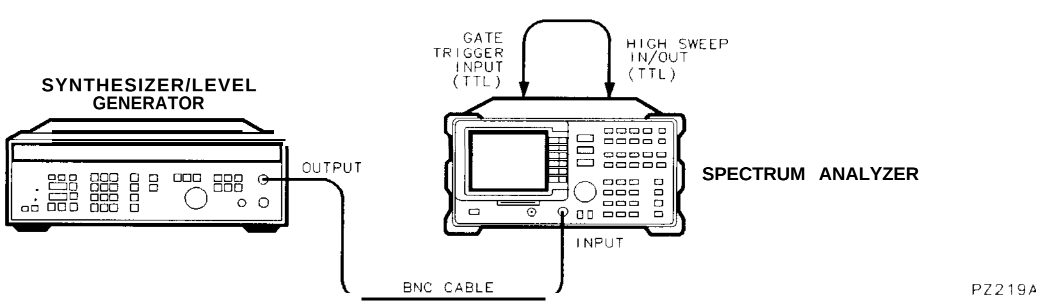


Figure 8-5. Gate Delay and Gate Length Test Setup

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 -3.0 dB and +3.0 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 8-3. Performance Verification Test Record (Page 1 of 2)

Hewlett-Packard Company

Address: ____________________ Report No. ____________________

____

____________________ Date ____________________

____________________ (e.g. 10 SEP 1989)

Model HP 8590 Series Spectrum Analyzer with HP 85717A

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	________	________	________
Measurement Receiver	________	________	________
Power Splitter	________	________	________
Power Sensor	________	________	________
Attenuator	________	________	________

Performance Verification Test Record (Page 2 of 2)

Hewlett-Packard Company Model HP 8590 Series Spectrum Analyzer with HP 85717A	Report No. ______________
Serial No. ______________	Date ______________

Test No.	Test Description	Results Min	Measured	Max	Measurement Uncertainty
1.	**Frequency Accuracy**				
	Frequency Deviation				
	Freq Accuracy	−1.0 kHz	______	1.0 kHz	±0.5 kHz
	Freq Deviation at 15 kHz	−13.5 kHz	______	16.5 kHz	±0.5 kHz
	Freq Deviation at 30 kHz	−28.5 kHz	______	31.5 kHz	±0.5 kHz
2.	**Power Cal Accuracy**				
	Power Accuracy at 860 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 862 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 863 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 864 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 865 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 866 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 867 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 868 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 869 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 870 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
	Power Accuracy at 872 MHz	−0.7 dB	______	+0.7 dB	+0.24/−0.25 dB
3.	**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
4.	**Gate Card Insertion Loss**	−3.0 dB	______	+3.0 dB	±0.092 dB

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 cordless 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.

CFP
See cordless fixed part.

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.

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.

cordless fixed part
The cordless fixed part (CFP) acts as the main control unit for sending and receiving transmissions from cordless portable parts. Multiple cordless portable parts can be used with a cordless fixed part in a CT2-CAI communication system. A CFP is also called a base station.

cordless portable part
The cordless portable part (CPP) is the portable part of a CT2-CAI communication system. A cordless portable part is used with a cordless fixed part in a CT2-CAI communication system. A CPP can be used like a telephone in that you can initiate or end a phone call with it. The cordless fixed part is also called the handset.

CPP
See cordless portable part.

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.

external trigger signal

For the CT2-CAI 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.

frame

For a CT2 signal, a frame represents the time period in which the CPP and CFP can be transmitting or receiving data. Each frame is equivalent to 144 bits (144 bits is the sum of the transmission burst length of the CPP, the transmission burst length of the CFP, and the guard bits). The time period in which the CFP or CPP transmission occurs is called a timeslot, and there are two timeslots per CT2 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.

handset

See cordless portable part.

harmonic distortion

Undesired frequency components added to signals because of nonlinear behavior of the device (for example, a mixer or an amplifier) through which signals pass. These unwanted components are harmonically related to the original signal.

HP-IB

The abbreviation for Hewlett-Packard Interface Bus. It is a parallel interface that allows you to "daisy-chain" more than one device to a port on a computer or instrument. Interface protocol is defined in IEEE 488.2. It is equivalent to the industry standard GPIB.

idle state

A transmitter is in the idle state when the RF output of the transmitter is turned off, but the rest of the base station or handset is operational and the unit is immediately available for use.

input attenuator

An attenuator between the input connector and the first mixer of a spectrum analyzer (also called an RF attenuator). The input attenuator is used to adjust the signal level incident to the first mixer, and to prevent gain compression due to high-level or broadband signals. It is also used to set the dynamic range by controlling the degree of internally-generated distortion. For some spectrum analyzers, changing the input attenuator settings changes the vertical position of the signal on the display, which then changes the reference level accordingly. In Hewlett-Packard microprocessor-controlled spectrum analyzers, the IF gain is changed to compensate for changes in input attenuator settings. Because of this, the signals remain stationary on the display, and the reference level is not changed.

intermodulation attenuation

A measure of the capability of the transmitter to inhibit the generation of intermodulation distortion products.

intermodulation distortion

Undesired frequency components resulting from the interaction of two or more spectral components passing through a device having nonlinear behavior, such as a mixer or an amplifier. The undesired components are related to the fundamental components by sums and differences of the fundamentals and various harmonics. The algorithm is:

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

limit line

A test limit made up of a series of line segments, positioned according to frequency or time, and amplitude, within the spectrum analyzer's measurement range. Two defined limit lines may be displayed simultaneously. One sets an upper test limit, the other sets a lower test limit. Trace data can be compared with the limit lines as the spectrum analyzer sweeps. If the trace data exceeds either the upper or lower limits, the spectrum analyzer displays a message or sounds a warning, indicating that the trace failed the test limits.

limit-line file

The user-memory file that contains the limit-line table entries. Limit lines are composed of frequency and amplitude components that make up a trace array and this data is stored in the file. The limit-line file feature is available on spectrum analyzers that are capable of limit-line operation. Refer also to **limit line.**

limit-line table

The line segments of a limit line are stored in the limit-line table. The table can be recalled to edit the line segments, then restored in the limit-line file. Refer also to **limit line.**

LO

The abbreviation for local oscillator. The local oscillator output in a superheterodyne system is mixed with the received signal to produce a sum or difference equal to the intermediate frequency (IF) of the receiver.

LO feedthrough

The response that occurs on a spectrum analyzer's CRT when the first local oscillator frequency is equal to the first IF. The LO feedthrough is a 0 Hz marker with no error, so it can be used to improve the frequency accuracy of spectrum analyzers with nonsynthesized LO systems.

log display

The display mode in which vertical deflection is a logarithmic function of the input-signal voltage. Log display is also called logarithmic display. The display calibration is set by selecting the value of the top graticule line (reference level), and scale factor in volts per division. On Hewlett-Packard spectrum analyzers, the bottom graticule line represents zero volts for scale factors of 10 dB/division or more. The bottom division, therefore, is not calibrated for those spectrum analyzers. Spectrum analyzers with microprocessors allow reference level and marker values to be indicated in dBm, dBmV, dBμV, volts, and occasionally in watts. Nonmicroprocessor-based spectrum analyzers usually offer only one kind of unit, typically dBm.

marker

A visual indicator we can place anywhere along the displayed trace. A marker readout indicates the absolute value of the trace frequency and amplitude at the marked point. The amplitude value is displayed with the currently selected units.

maximum input level

The maximum signal power that may be safely applied to the input of a spectrum analyzer. The maximum input level is typically 1 W (-30 dBm) for Hewlett-Packard spectrum analyzers.

memory

A storage medium, device, or recording medium into which data can be stored and held until some later time, and from which the entire original data may be retrieved.

memory card

A small, credit-card-shaped memory device that can store data or programs. The programs are sometimes called personalities and give additional capabilities to your instrument. Typically, there is only one personality per memory card. Refer also to **personality.**

menu

The spectrum analyzer functions that appear on the display and are selected by pressing front-panel keys. These selections may evoke a series of other related functions that establish groups called menus.

nonvolatile memory

Memory data that is retained in the absence of an ac power source. This memory is typically retained with a battery. Refer also to **battery-backed RAM.**

parameter units

Standard units of measure, which include the following:

Measured Parameter	Unit Name	Unit Abbreviation
frequency	hertz	Hz
power level	decibel relative to milliwatts	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 EM1 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.

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.

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.

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.

test limit
The acceptable results levels for any given measurement. The levels vary from country to country, and depend on the equipment being tested.

time-division duplexing
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.

timeslot
For a CT2 signal, a timeslot the part of the frame in which data is transmitted or received. Each timeslot is 1 ms long, and permits 66 or 68 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 CT2 handset or base station can transmit carrier signals. The CT2 transmit band (TX band) frequencies range from 864.15 to 868.05 MHz.

units
Dimensions on the measured quantities. Units usually refer to amplitude quantities because they can be changed. In spectrum analyzers with microprocessors, available units are dBm (dB relative to 1 mW (milliwatt) dissipated in the nominal input impedance of the spectrum analyzer), dBmV (dB relative to 1 mV (millivolt)), dBμV (dB relative to 1 μV), volts, and, in some spectrum analyzers, watts.

update
To make existing information current; to bring information up to date.

video
A term describing the output of a spectrum analyzer's envelope detector. The frequency range extends from 0 Hz to a frequency that is typically well beyond the widest resolution bandwidth available in the spectrum analyzer. However, the ultimate bandwidth of the video chain is determined by the setting of the video filter.

video bandwidth
The cut-off frequency (3 dB point) of an adjustable low-pass filter in the video circuit. When the video bandwidth is equal to or less than the resolution bandwidth, the video circuit cannot fully respond to the more rapid fluctuations of the output of the envelope detector. The result is a smoothing of the trace, or a reduction in the peak-to-peak excursion, of broadband signals such as noise and pulsed RF when viewed in broadband mode. The degree of averaging or smoothing is a function of the ratio of the video bandwidth to the resolution bandwidth.

video filter

A post-detection, low-pass filter that determines the bandwidth of the video amplifier. It is used to average or smooth a trace. Refer also to **video bandwidth.**

zero span

The case in which a spectrum analyzer's local oscillator remains fixed at a given frequency so that the spectrum analyzer becomes a fixed-tuned receiver. In this state, the bandwidth is equal to the resolution bandwidth. Signal amplitude variations are displayed as a function of time. To avoid loss of signal information, the resolution bandwidth must be as wide as the signal bandwidth. To avoid any smoothing, the video bandwidth must be set wider than the resolution bandwidth.

Index

R