The HP 8920/21
Test Set
User’s Quick Reference

© Hewlett-Packard Company 1990

Information contained in this document is subject to change without notice.

All rights reserved. Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyrights laws.

This material may be reproduced by or for the U.S. Government pursuant to the copyright license under the clause at DFARS 52.227-7013 (APR 1988).

Hewlett-Packard Company
Learning Products Department
TAF C34
Spokane, WA 99220 U.S.A.
The Instrument - At A Glance

Use this key to perform a receiver test or to generate a modulated RF signal.

Use this key to perform a transmitter test or to monitor and measure an RF signal.

Use this key to activate the blue labeled functions. Press and release, then press the key below the blue label.

Use this key to reset all instrument settings.
Some Of The Choices Made On The Screen

One-of-many:
Pushing the knob will display a list of choices in the lower-right corner of the screen. Turning the knob moves the cursor through the list. Pushing the knob again selects the choice adjacent to the cursor.

Numeric Entry:
Pushing the knob will highlight the data. The highlighted data can be changed by turning the knob. Pushing the knob again enters the data.

Underlined:
Pushing the knob will move the underline below a choice. The underlined choice is active.
# Table Of Contents

## Getting Started Information
- The Instrument - At A Glance ........................................... 2
- An example of how to make an FM radio SINAD check ........ 8

## Instrument Configuration
- To save instrument settings ............................................. 8
- To recall instrument settings ........................................... 9
- To adjust the screen brightness ...................................... 10
- To change the unit of measure ........................................ 11
- To run a memory card program ..................................... 12

## RX Test And RF Generator
- To set up single-tone modulation .................................. 14
- To set up single-tone modulation with signaling .............. 16
- To set up two-tone modulation ...................................... 18
- To choose an RF output port ......................................... 20

## TX Test And RF Analyzer
- To measure modulation ............................................... 21
- To measure RF frequency ............................................. 22
- To measure RF frequency error ..................................... 23
- To choose an RF input port .......................................... 24
AF Generators
To output an AF sine wave................................. 26
To output sine, square, triangle, or sawtooth waves..... 26

AF Analyzer
To measure audio distortion................................... 27
To measure audio frequency.................................. 28
To measure audio voltage.................................... 29

Oscilloscope
To change the scope input................................... 30
To change the scope vertical units per division......... 31
To change the scope horizontal units per division...... 33
To use the scope marker...................................... 33
To display a scope waveform before the trigger point.... 34

Spectrum Analyzer (Optional in HP 8920)
To use the spectrum analyzer marker...................... 35
To set up the spectrum analyzer tracking generator.... 36

Signaling (Optional in HP 8920)
To output tone sequential signaling....................... 38
To output a DTMF sequence................................ 40
To decode a signaling sequence............................ 42

Reference Information
Instrument terms and abbreviations....................... 45
Index......................................................... 63
An Example Of How To
Make An FM Radio SINAD Check

Front Panel Set Up

1. Press
2. Press

Connect to the
FM Transceiver's
Antenna Connector

Connect to the
FM Transceiver's
Speaker Output
3. Verify that SINAD is displayed.
4. Enter the RF frequency.
5. Enter the RF amplitude.
6. Verify that RF Out is underlined.
7. Verify that the modulation frequency displayed is 1 kHz.
8. Verify that the modulation type displayed is FM.
9. Enter the deviation.
10. Adjust the RF amplitude for a SINAD reading of 12 dB.
To Save Instrument Settings

1. Set up the instrument as desired.

2. Press

3. Press for SAVE

4. Enter number or name to identify, then press ENTER

NOTE: The number of changes made to the screen determines memory consumption.

If memory capacity is exceeded, you will get an error message. Refer to the User’s Guide and Reference manual.
To Recall Instrument Settings

1. Press recall to list the saved settings.

2. Use the Knob to choose the saved setting from list of choices.
To Adjust The Screen Brightness

1. Press

2. Press for CONFIG

3. Vary the screen intensity with the knob
To Change The Unit Of Measure

1. Position the cursor at a unit to change

2. Press desired unit
To Run A Memory Card Program

1. Insert a memory card

2. Press

3. List the choices

4. Choose Card

5. List the choices

6. Choose a program
7. Test Configuration

- Edit the test specifications
- Edit the test frequencies
- Edit the test sequence
- Edit the test configuration and/or Edit the test parameters

NOTE: Press the TESTS key to exit an editing screen.

8. Run the program

---

13
To Set Up
Single-Tone Modulation

1. Press

2. Enter the carrier frequency

3. Enter the carrier amplitude

4. Select the Output Port
5. Enter the modulation frequency

7. Choose the modulation type

6. List the modulation choices

8. Enter the depth or deviation
To Set Up Single-Tone Modulation With Signaling

1. Press

2. Enter the carrier frequency

3. Enter the carrier amplitude

4. Select the Output Port

5. Enter the modulation frequency

6. List the modulation choices

7. Choose the modulation type
8. Enter the depth or deviation

9. Refer to page 38 to set up the signaling then return to step 10

NOTE: The modulation type must be the same in AFGen 1 and AFGen 2.

10. Press to return to the RX Test screen

11. Turn signaling on/off
To Set Up Two-Tone Modulation

1. Press

2. Enter the carrier frequency

3. Enter the carrier amplitude

4. Select the Output Port

5. Enter the modulation frequency

6. List the modulation choices

7. Choose the modulation type
8. Enter the depth or deviation

9. Repeat steps 2 thru 5 for AFGen 2

NOTE: The modulation type must be the same in AFGen 1 and AFGen 2.
To Choose An RF Output Port

1. Press

![Diagram showing RX, RF Input, and Duplex Out buttons]

2. Underline RF Out or Dupl

![Diagram of RX Test panel with RF Level set to 0.0012]

20
To Measure Modulation

1. Press

2. Select the Tune Mode
   2a. Enter the Tune Freq if Manual Tune Mode is used

3. Select the Input Port

4. List the demodulation choices

5. Choose the demodulation type

6. Read
To Measure RF Frequency

1. Press

2. Underline Auto

3. Read

TX TEST

Frequency 149.978076
Power 0.0001

RX Deviation 80.81

5.61620
To Measure RF Frequency Error

1. Press

2. Underline Manual

3. Enter the Tune Freq

4. Select the Input Port

5. Read
To Choose An RF Input Port

1. Press

2. Underline RF In or Ant
To Output An AF Sine Wave

1. Press

2. Connect to AUDIO OUT

3. Enter the audio level

4. Enter the audio frequency

TX TEST

TX Frequency 149.378076
TX Power 0.0001

TX TEST
To Output A Sine, Square, Triangle, Or Sawtooth Waveform*

*Option 004 required in HP 8920

1. Choose ENCODER from the To Screen

2. Set the Mode to Func Gen

3. Enter the frequency

4. List the choices

5. Choose the waveform

6. List the choices

7. Choose Audio Out

8. Enter the level
To Measure Audio Distortion

1. Press

2. List the choices

3. Choose Distn

4. Read

NOTE: Measures the distortion on a 1 kHz tone using the input displayed here.
To Measure Audio Frequency

1. Press

2. List the choices

3. Choose AF Freq

4. Read

NOTE: Measures the frequency of the input displayed here.
To Measure Audio Voltage

1. Press

2. Connect to AUDIO IN

3. Read
To Change The Scope Input

1. Verify which input is selected

2. Select AF Anl from To Screen:

3. List the choices

4. Choose the input

5. Press PREV to return to the scope
To Change The Scope
Vertical Units Per Division

1. List the choices

2. Choose a vertical units per division

Scope Input Determines Unit of Measure

<table>
<thead>
<tr>
<th>Scope Input</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio In</td>
<td>V</td>
</tr>
<tr>
<td>FM</td>
<td>kHz</td>
</tr>
<tr>
<td>AM</td>
<td>%</td>
</tr>
<tr>
<td>SSB</td>
<td>mV</td>
</tr>
</tbody>
</table>

NOTE: To change the scope input see page 30.
To Change The Scope
Horizontal Units Per Division

1. List the choices

2. Choose a time
To Use The Scope Marker

1. List the choices
2. Choose Marker
3. Marker position
   Manually position the marker with the knob
   Push the knob to move the marker to the peak of the signal
   Push the knob to change the center frequency or ref level to marker's position
4. Read the marker position
To Display A Scope Waveform Before The Trigger Point

1. List the choices

2. Choose Trigger

3. Adjust the pre-Trigger position with the knob

Pre-trigger cursor
To Use The Spectrum Analyzer Marker

1. List the choices
2. Choose Marker
3. Marker position
   Manually position the marker with the knob
   Push the knob to move the marker to the peak of the signal
   Push the knob to change the center frequency or ref level to marker's position
4. Read the marker position
To Set Up The Spectrum Analyzer Tracking Generator

1. List the choices

2. Choose RF Gen

3. Underline Track
4. Adjust the offset frequency using the Knob

5. Enter the amplitude
To Output
Tone Sequential Signaling*

*Option 004 Required In HP 8920

1. Choose ENCODER from the To Screen

2. List the signaling mode choices

3. Choose Tone Seq

4. List the standard choices

5. Choose a standard
6. Enter a tone sequence using the symbols 0-9, A-E, and space

7. List the Send Mode choices

8. Choose the mode

9. List the output choices

10. Choose the output

11. Select Send
To Output A DTMF Sequence

1. Choose ENCODER from the To Screen

2. List the signaling mode choices

3. Choose DTMF

40
4. Enter the sequence

5. List the Send Mode choices

6. Choose the mode

7. List the output choices

8. Choose the output

9. Select Send
To Decode A
Signaling Sequence

1. Choose DECODER from the To Screen

2. List the signaling mode choices

3. Choose the signaling mode

4. List the standard choices

5. Choose a standard
6. List the choices of inputs

7. Choose the input

NOTE: Signal information is displayed in these columns.

8. Enter the estimated level of the input signal (after de-emphasis if used)

9. Push knob to arm the decoder for a measurement
Instrument Terms And Abbreviations

Refer to the Instrument User's Guide if more information is needed.

AF Anl- Audio Frequency Analyzer.

AF Anl In- Audio Frequency Analyzer Input.

AF Cnt Gate- Audio Frequency Counter Gate Time.

AF Gen1- Audio Frequency Generator 1.

AF Gen2- Audio Frequency Generator 2. Also used as the signaling Encoder.

Ant- Antenna.
Instrument Terms And Abbreviations

ANT IN- Antenna Input. An alternate input connector for the RF Analyzer and Spectrum Analyzer for low level measurements. RF power CANNOT be measured from this connector.

ASSIGN. The key used to assign USER keys to instrument settings. To assign a USER key, position the cursor adjacent to the setting, press SHIFT, ASSIGN, and then one of the user keys k1-k5 or k1'-k3'.

Atten Hold - Attenuator Hold. A setting that prevents the RF Generator output attenuator from changing ranges, limiting the amplitude adjustment range.

AUDIO IN (HI). External input connector for audio measurements.
AUDIO IN (LO). External input connector for floating measurements. To ground or float the connector use the Audio In Lo field on the AF ANL screen.

AUDIO OUT. External output connector for AF Gen1 and/or AFGen2 (Encoder).

AVG- Average. The key used to do measurement averaging. When used it smooths out the measurement of rapidly fluctuating signals. To activate averaging, position the cursor adjacent to the unit of measure of the measurement. Then press SHIFT, AVG, ENTER. To cancel averaging, press SHIFT, AVG, ON/OFF.

CONFIG- Configure. The key used to access the CONFIGURE screen to change the HP-IB address, define the printer type, setup serial communications, and several other instrument settings.
Instrument Terms And Abbreviations

DC FM Zero. This function removes DC offset when using DC-coupled FM.

DECODER. Signaling decoder.

Dupl- Duplex.

DUPLEX. The key used to access the DUPLEX TEST screen for simultaneous transmitter/receiver testing.

DUPLEX OUT. An alternate output connector for the RF Generator and Spectrum Analyzer Tracking Generator.
ENCODER. Signaling encoder.

Ext Load R- External Load Resistance.
This function is used to specify
the impedance of the device con-
nected to the AUDIO IN connector
for calibrated audio power mea-
surements.

Ext TX Key- External Transmitter Key.
This function keys a transmitter
through the MIC/ACC connector.

Filter 1. The AF Analyzer high-pass
and optional filters.

Filter 2. The AF Analyzer low-pass
and optional filters.
Instrument Terms And Abbreviations

Gain Cntl- Gain Control. This function selects the automatic or manual AF Analyzer input, De-Emp, and Notch gains. Auto is normally used.

HI LIMIT/LO LIMIT. The keys used to set high and low measurement limits. To enter the limits, position the cursor adjacent to the unit-of-measure of the measurement, then press SHIFT, LO or HI LIMIT, a value, ENTER. To cancel limits, press SHIFT, LO or HI LIMIT, ON/OFF.

HOLD. The key used to freeze information displayed on the screen. Select HOLD again to release the display.

IF Filter- Intermediate Frequency Filter. A field that selects the RF Analyzer IF bandwidth.

Input Atten- Input Attenuator.
k1, k2, k3, k4, k5. Local USER keys are for accessing a user-assigned field on the currently displayed screen. Pressing a local user key moves the cursor adjacent to the key's assigned field.

k1', k2', k3'. Global USER keys are for accessing a user-assigned field on another screen. Pressing the global user key displays the assigned field at the top of the currently displayed screen.
Instrument Terms And Abbreviations

MEAS RESET- Measurement Reset.

METER. The key used to display the analog meter. To set up the meter, position the cursor adjacent to the unit of measure of the measurement to display, then press SHIFT, METER.

MIC/ACC- Microphone/Accessory. A connector that is used to key a transmitter and/or modulate a carrier with a microphone.

Mic Pre-Emp (Auto)- Microphone Pre-Emphasis. This function automatically switches in and out the pre-emphasis network (750us).

Mic Pre-Emp (Hold)- Microphone Pre-Emphasis. This function allows manual switching in and out of the pre-emphasis network when FM modulation is used.
Mod In To- Modulation In To. This function selects the RF Generator's modulation type when using the Modulation Input and MIC/ACC connectors for external modulation.

Normalize (A-B). A Spectrum Analyzer entry to display the difference between the current screen and a previously saved screen.

Normalize (A Only). A Spectrum Analyzer entry to select a normal display

Normalize (Save B). A Spectrum Analyzer entry to save the current display.
Instrument Terms And Abbreviations

Pk Det To (De-Emp)- Peak Detector To (De-Emphasis). This function sets up the AF Analyzer to measure the peak voltage after the de-emphasis network.

Pk Det To (Filters)- Peak Detector To (Filters). This function sets up the AF Analyzer to measure the peak voltage after audio filters 1 and 2 and before the de-emphasis network.

PREV- Previous screen. The key used to toggle between the currently displayed screen and the previously accessed screen.

PRESET. The key used to reset the instrument’s settings to the factory-defined default states.
PRINT. The key used to print the currently displayed screen if a printer is connected to the rear-panel's SERIAL PORT or the HP-IB connector. To set up the instrument for printing, press SHIFT, CONFIG to access the CONFIGURE screen. On the screen select the printer port in the Print To field. For HP-IB printers enter the printers address in the Print Adrs field. This is a graphic pixel dump that requires an HP graphic-compatible printer.
Instrument Terms And Abbreviations

Range Hold. This function selects the automatic or manual control of all AF Analyzer and RF Analyzer gain, and tuning adjustments.

RECALL. The key used to recall previously saved settings.

REF SET- Reference Set. The key used to enter a measurement reference level. To enter a reference level, position the cursor adjacent to the unit of measure of the measurement. Then press SHIFT, REF SET, enter the ref level*, and complete the entry by pressing ENTER. To cancel ref set, press SHIFT, REF SET, ON/OFF.

*The currently displayed measurement value is used as the reference if you do not enter a specific value.
RELEASE. The key used to clear a user key's assignment.

RF Anl- Radio Frequency Analyzer.

RF Cnt Gate- Radio Frequency Counter Gate Time.

RF Gen- Radio Frequency Generator.

RF Offset (Gen-Anl)- Radio Frequency Offset (Generator-Analyzer). An entry that sets up the difference between the RF Generator and RF Analyzer frequencies. Automatically offsets the RF Analyzer tune frequency from the RF Generator frequency.
Instrument Terms And Abbreviations

RX- Receiver Test. The key used to access the RX TEST screen for performing tests on a radio receiver.

RX/TX Cntl (Auto)- RX TEST/TX TEST screen Control (Auto). This function enables automatic switching between the RX TEST and TX TEST screens.

RX/TX Cntl (Carrier)- Receiver/Transmitter Control (Carrier). This function automatically switches RX TEST and TX TEST screens when a signal is detected at the RF IN/OUT or ANT IN connector and Auto is selected in the RX/TX Cntl field.
RX/TX Cntl (Manual)- RX TEST and TX TEST screen Control (Manual).
This function disables automatic switching between the RX TEST and TX TEST screens.

RX/TX Cntl (ptt)- Receiver/Transmitter Control (push to talk). This function switches the instrument to the RX TEST screen when a microphone connected to the MIC/ACC connector is keyed, and Auto is selected in the RX/TX Cntl field.
Instrument Terms And Abbreviations

SAVE. The key used to save settings displayed on the screen. The number of settings that can be saved depends on the number of entries made since the default settings.

SCOPE- Oscilloscope. This selection accesses the OSCILLOSCOPE screen.

Sensitivity. A field that sets up the RF Analyzer's input sensitivity at the ANT IN connector. Measurements may not be as accurate when using High sensitivity.

Settling (Fast). This function sets up the AF Analyzer for fast settling. Use for measurements above 200 Hz.

Settling (Slow). This function sets up the AF Analyzer for slow settling. Use for measurements below 200 Hz.
SPEC ANL- Spectrum Analyzer. This selection accesses the SPECTRUM ANALYZER screen.

Squelch (Fixed). The instrument is set to the factory defined squelch level.

Squelch (Open). The instrument is set for no squelch.

Squelch (Pot). The instrument is set to manually adjust the squelch with the knob.
**Instrument Terms And Abbreviations**

**TESTS.** The key used to access the TESTS screen for running IBASIC programs.

**Tune Mode (Auto).** This function sets up the RF Analyzer to tune to the input signal and displays the signal's frequency.

**Tune Mode (Manual).** This function sets up the RF Analyzer to tune to the manually-entered frequency and displays the difference between the input signal and the manually entered frequency.

**TX- Transmitter Test.** The key used to access the TX TEST screen for performing tests on a radio transmitter.

**TX Pwr Meas- Transmitter Power Measurement Zero.** This function zeros the RF power meter.
Index

AM, demodulating 21
modulating 15

FM, demodulating 21
modulating 16

analog meter 52

Function Generator 26

Analyzer, RF 21,22,23,24

Generator, AF 25
Function 26
RF 14,16,18,20
HP-IB address 47

Input, Oscilloscope 30

instrument settings,
recalling 9
saving 8

intensity,
screen 10

marker,
Spectrum Analyzer 35
Oscilloscope 33
measurement averaging 47

measurement limits 50

measurement Signal to Noise and Distortion ratio 6

measurement,
audio frequency 28
audio level 29
audio power 49
audio voltage 29
distortion 27

modulation 21
RF frequency 22
RF frequency error 23

Decoder 42
demodulation type 21

DTMF 40

duplex out, RF Gen output 20

ENCODER 38
## Index

| memory card | 12 | scope input | 30 |
| modulation, | | Signal Generator | 14,16,18,20 |
| AM | 14 | signaling | 16,38,40 |
| FM | 14 | | |
| signaling | 16 | | |
| two-tone | 18 | | |
| modulation measurement | 21 | | |
| | | SINAD | 6 |

| Oscilloscope | | single-tone modulation | 14 |
| input | 30 | | |
| marker | 33 | Spectrum Analyzer | 35 |
| pre-trigger | 34 | Spectrum Analyzer marker | 35 |
| trigger | 34 | | |
| vertical units | 31 | square wave | 26 |
| horizontal units | 32 | time/div, | |
| print | 55 | Oscilloscope | 32 |
| | | tone generator | 25 |

| programs, | | | |
| running | 12 | tone seq | 38 |
| test parameters | 13 | tone sequential | 38 |
| test sequences | 13 | | |
| test specifications | 13 | Tracking Generator | 36 |
| reference set | 56 | triangle wave | 26 |

| RF frequency | 22 | trigger, | |
| RF frequency error | 23 | Oscilloscope | 34 |

| RF in/out, | | two-tone modulation | 18 |
| RF Analyzer input | 24 | | |
| RF Gen output | 20 | units, | |
| RF output port | 20 | changing | 11 |

| save | 8 | user keys assignment | 46 |
| sawtooth wave | 26 | | |
| scope | 30,31,32,33,34 | vert/div, | |
| | | Oscilloscope | 34 |