HP 3563A Installation Guide

Control Systems Analyzer

Serial Numbers
2927A00100

HEWLETT PACKARD

HP Part No. 03563-90007
Microfiche No. 03563-90207

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8600 Soper Hill Road
Everett, Washington 98205-1298 U.S.A.
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For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.
SAFETY SUMMARY
The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements. This is a Safety Class 1 instrument.

GROUND THE INSTRUMENT
To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS
Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE
Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure the safety features are maintained.

DANGEROUS PROCEDURE WARNINGS
Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

| Warning | Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting. |
SAFETY SYMBOLS

General Definitions of Safety Symbols Used On Equipment or In Manuals.

⚠️ Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

⚡ Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked.)

🔌 or 🌍 Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

🔌 Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.

‖ OR ‖ Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

Alternating current (power line.)

Alternating or direct current (power line.)

---

<table>
<thead>
<tr>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🚨 The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which if not correctly performed or adhered to, could result in injury or death to personnel.</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️ The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>📣 The NOTE sign denotes important information. It calls attention to procedure, practice, condition or the like, which is essential to highlight.</td>
</tr>
</tbody>
</table>
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Introduction

The HP 3563A

The HP 3563A Control Systems Analyzer is dual-channel FFT-based analyzer. The HP 3563A can perform time, spectrum and frequency-response measurements on analog signals from dc to 100 kHz. The same measurements can be made on digital signals with sample rates up to 256 kHz. Besides linear and logarithmic resolution measurement modes, the HP 3563A also provides swept sine measurements.

The analysis features of this instrument provide the flexibility to manipulate the gathered data into almost any format required through waveform math, frequency response synthesis, and curve fitting routines.

The HP 3563A has a pair of differential input channels and a built-in signal source. It is capable of two channel measurements, with any mix of analog or digital data on any channel. This analyzer also drives HP-GL plotters without a controller. External disc drives can be driven directly for data and instrument state storage.
Introduction

About This Guide

The HP 3563A Installation Guide contains installation and operating information, along with the operation verification tests and performance tests. It is included in the HP 3563A Documentation Set, as well as with the optional HP 3563A Service Manual.

This book is organized with the specifications, operation verification tests, and the performance tests near the beginning and the installation information at the back of the guide.

Options

There are eight options available for the HP 3563A. They are available either when the instrument is ordered, or they may be installed later. These options are listed in Table 1-1.

Table 1-1. HP 3563A Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>907</td>
<td>Front Handle Kit</td>
<td>5061-0091</td>
</tr>
<tr>
<td>908</td>
<td>Rack Mount Kit</td>
<td>5061-0079</td>
</tr>
<tr>
<td>909</td>
<td>Rack Mount and Front Handle Kit</td>
<td>5061-0085</td>
</tr>
<tr>
<td>910</td>
<td>Extra Operating Manuals (1 set)</td>
<td>*</td>
</tr>
<tr>
<td>915</td>
<td>Service Manual</td>
<td>03563-90006</td>
</tr>
<tr>
<td>921</td>
<td>PC File Utilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.5* disk</td>
<td>03563-19400</td>
</tr>
<tr>
<td></td>
<td>5.25* disk</td>
<td>03563-19401</td>
</tr>
<tr>
<td>922</td>
<td>Delete Cables</td>
<td>*</td>
</tr>
<tr>
<td>923</td>
<td>Add Cables</td>
<td>*</td>
</tr>
</tbody>
</table>

* May be ordered by individual part number.
Accessories

The following accessories are supplied with the HP 3563A:

- Line Power Cord: See Figure 5-2
- Pouch: HP 1540-1199
- Operating Manual: HP 03563-90000
- Installation Guide: HP 03563-90007
- Getting Started Guide: HP 03563-90001
- Application Note 243:
  - The Fundamentals of Signal Analysis: HP 5952-8898
- Application Note 243-2:
  - Control System Development Using Dynamic Signal Analyzers: HP 5958-5136 *
- Application Note 243-4:
  - Fundamentals of Z-Domain and Mixed Analog/Digital Measurements: HP 5952-7250 *
  - Curve Fitting in the HP 3562A: HP 5952-0001 *
  - Z-Domain Curve Fitting in the HP 3563A: HP 5952-7251 *
  - Programming Reference: HP 03563-90005
  - 16 Bit Probe Cable: HP 01650-61607
  - 16 Bit Probe Pod: HP 01650-61605
  - 8 Bit Probe Cable: HP 03563-61604
  - Grabber: HP 5959-0288
  - Pattern Generator or Probe Lead Set: HP 10347A

* Available from your local Hewlett-Packard sales and service office.

The following accessories are available:

- 8 Channel TTL Tristate Buffer Pod: HP 10346A
- Service Kit: HP 03563-84401
- Termination Adapter: HP 01650-63201
- Transit Case: HP 9211-2663

Note

The Service Kit, 03563-84401, as well as the Service Manual, HP 03563-90006, are required to service the HP 3563A.
Identification

Serial Numbers

This guide applies to analyzers with the serial number prefixes listed under Serial Numbers on the title page.

Hewlett-Packard makes frequent improvements to its products to enhance their performance, usability, or reliability, and to control costs. HP service personnel have access to complete records for each type of equipment, based on the equipment’s serial number. Whenever you contact HP about your HP 3563A, have the complete serial number available to ensure obtaining the most complete and accurate information possible.

A serial number label is attached to the rear of the analyzer. The serial number has two parts: the prefix (the first four numbers and a letter), and the suffix (the last five numbers).

![Figure 1-1. HP 3563A Serial Number](image)

Software Revision Code

As with changes to the instrument hardware, Hewlett-Packard makes changes to its software. To determine which version of software is in your analyzer, press the following keys:

```
[ Control ]
SPCL
FCTN
.......
SERVIC
TEST
.......
TEST
RESULT
.......
FAULT
LOG
```

The revision number is listed under the Fault Log display title.
Documentation Set

The contents of this guide apply to those instruments having the same serial number prefix as listed on the title page.

Instruments manufactured after the printing of this documentation set may have a serial number prefix which is not listed on the title page. This unlisted prefix indicates that the instrument is different from those documented in the documentation set. A yellow “Manual Changes” supplement which contains information documenting the differences may be included with a manual. In addition to instrument change information, the supplement may contain information for correcting the manual. To keep this documentation set as accurate as possible, Hewlett-Packard recommends that you periodically request the latest “Manual Changes” supplement.

Listed on the title page is a part number. This part number can be used to order extra copies of the installation guide. The microfiche part number can be used to order 4 by 6 inch microfilm transparencies of this guide.
Specifications describe the instrument's warranted performance. Supplemental characteristics are given as typical, but not warranted, performance figures and are intended to provide information useful in applying the instrument. These characteristics are denoted as 'typical,' 'nominal,' or 'approximately.'

### Time Domain Measurement

<table>
<thead>
<tr>
<th>Linear Resolution</th>
<th>Logarithmic Resolution</th>
<th>Swept Sine</th>
<th>Time Capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtered Time Record</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Compressed Time Buffer (1 to 10 records, chan 1 or 2)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Orbits (chan 1 versus chan 2)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Time Record (full span, chan 1 and 2)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Auto Correlation (chan 1 and 2)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross Correlation</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impulse Response</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Frequency Domain Measurements

<table>
<thead>
<tr>
<th>Linear Resolution</th>
<th>Logarithmic Resolution</th>
<th>Swept Sine</th>
<th>Time Capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Linear Spectrum (full span, chan 1 and 2)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Filtered Linear Spectrum (chan 1 and 2)</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Power Spectrum (chan 1 and 2)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Power Spectral Density (PSD, chan 1 and 2)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Square Root of PSD (chan 1 and 2)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Energy Spectral Density (ESD, chan 1 and 2)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross Power Spectrum</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Frequency Response (linear frequency spacing)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Response (logarithmic frequency spacing)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coherence Function (with averaging)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Amplitude Domain Measurements

<table>
<thead>
<tr>
<th>Linear Resolution</th>
<th>Logarithmic Resolution</th>
<th>Swept Sine</th>
<th>Time Capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histogram (chan 1 and 2)</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Probability Density Function (PDF, chan 1 and 2)</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Cumulative Density Function (CDF, chan 1 and 2)</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Demodulation is a valid preprocessing function for all linear resolution measurements when zooming. All linear and log resolution measurements can be performed on time throughput data with the exception of full span linear spectrum and input time record.

### Measurement Functions

The following table lists the functions the analyzer can measure directly based on the selected measurement mode. These measurements can be made with either analog or digital input signals.

### Frequency

**Measurement Range:**
64 μHz to 100 kHz. Both channels, single- or dual-channel operation.

**Accuracy:** ± 0.004% of frequency reading.

**Resolution:** Span/800. Both channels, single- or dual-channel operation, Linear Resolution mode.

<table>
<thead>
<tr>
<th>Spans</th>
<th>BaseBand</th>
<th>Zoom</th>
</tr>
</thead>
<tbody>
<tr>
<td># of spans</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td>min span</td>
<td>10.24 mHz</td>
<td>20.48 mHz</td>
</tr>
<tr>
<td>max span</td>
<td>100 kHz</td>
<td>100 kHz</td>
</tr>
<tr>
<td>time record (sec)</td>
<td>800/span</td>
<td>800/span</td>
</tr>
</tbody>
</table>

**Window Functions:** Flat Top, Hann, Uniform, Force, Exponential and User Defined.

<table>
<thead>
<tr>
<th>Window Parameters</th>
<th>FlatTop</th>
<th>Hann</th>
<th>Uniform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Equiv BW (% of span)</td>
<td>0.476</td>
<td>0.188</td>
<td>0.125</td>
</tr>
<tr>
<td>3 dB BW (% of span)</td>
<td>0.45</td>
<td>0.185</td>
<td>0.125</td>
</tr>
<tr>
<td>Shape factor</td>
<td>2.6</td>
<td>9.1</td>
<td>716</td>
</tr>
</tbody>
</table>

**Typical Real Time Bandwidths:**

- Single-channel, fast averaging: 10.00 kHz
- Single-channel, single display: 2.50 kHz
- Dual-channel, fast averaging: 5.00 kHz
- Dual-channel, single display: 2.00 kHz
- Throughput to CS/80 disk
  - Single-channel: 12.50 kHz
  - Dual-channel: 6.25 kHz
Amplitude

**Accuracy:** Defined as full scale accuracy at any of the calculated frequency points. Overall accuracy for the Linear or Logarithmic Resolution modes is the sum of the absolute accuracy, window flatness and noise level. Overall accuracy for Swept Sine mode is the sum of absolute accuracy and noise level.

**Input Connections:** Cases 1 and 2 are the recommended input connections. For these cases, the amplitude accuracy specified below is applicable.

**Case 1**

**Case 2**

Cases 3 and 4 are input connections which degrade amplitude accuracy. For these cases the amplitude accuracy specified below must be modified with the accuracy adders.

**Absolute Accuracy:** Single channel (Channel 1 or 2), input connections as shown in Case 1 or 2, above.
- ±0.15 dB ± 0.015% of input range
- (+27 dBV to -40 dBV)
- ±0.25 dB ± 0.025% of input range
- (-41 dBV to -51 dBV)

**DC Response:**

<table>
<thead>
<tr>
<th>Input Range (dBV rms)</th>
<th>dc Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>+27 to -35</td>
<td>&gt;30 dB below full scale</td>
</tr>
<tr>
<td>-35 to -51</td>
<td>&gt;20 dB below full scale</td>
</tr>
</tbody>
</table>

**Frequency Response Channel Match:** Specified or nominal accuracy for analog/analog, digital/digital and mixed analog/digital measurements.

**Analog/Analog:** For input connections as shown in Case 1 or 2 above and input signals at full scale on any pair of ranges, accuracy is ±0.1 dB, ±0.5 degree.

**Digital/Digital:** For simultaneous sampling on channels 1 and 2, accuracy is ±0.1 dB, ±0.5 degree.

**Mixed Analog/Digital:** With full scale inputs on both channels, computational delay between channels corrected for, 1:1 sampling ratio, 256 kHz sample clock, 16 averages, nominal accuracy is
- DC to 20 kHz ± .2 dB
- ± 1.0 degree
- 20 kHz to 100 kHz ± .2 dB
- ± 4.0 degree

**Single Channel Accuracy Adder:** Input connections as shown in Case 3 or 4 above. Add ±0.35 dB and ±4.0 degrees to the absolute accuracy.

**Dual Channel Accuracy Adder:** Add ±0.35 dB and ±4.0 degrees once for each input connected as shown in Case 3 or 4 above.

**Window Flatness:**
- Flat Top +0, -0.01 dB
- Hann +0, -1.5 dB
- Uniform +0, -4.0 dB

**Effective Log Resolution Window Flatness:** +1.72, -5.56 dB

**Noise Floor:** With flat top window, 50Ω source impedance and input set to the -51 dBV range.
- 20 Hz to 1 kHz (1 kHz span)
- $<-126$ dBV ($-134$ dBV/√Hz)
- 1 kHz to 100 kHz (100 kHz span)
- $<-115$ dBV ($-144$ dBV/√Hz)

**Dynamic Range:** All distortion (intermodulation and harmonic), spurious and alias products are ≥80 dB below full scale input range (16 averages).
Phase

Accuracy: Single channel, inputs connected as shown in Case 1 or 2; referenced to the trigger point.
<10 kHz ± 2.5 degrees
10 kHz to 100 kHz ± 12.0 degrees

Analog Inputs

Input Impedance: 1 MΩ ± 5% shunted by <100 pF.

Input Coupling: Inputs may be ac or dc coupled. Ac rolloff is < 3 dB at 1 Hz.

Crosstalk: −140 dB
(50Ω source, 50Ω input termination, input connectors shielded).

Common Mode Rejection:
0 Hz to 66 Hz 80 dB
66 Hz to 500 Hz 65 dB

Common Mode Voltage: dc to 500 Hz.

Common Mode Voltage:
500 Hz to 100 kHz.
The ac part of the signal is limited to 42 Vpeak or (Input Range)+(10 dB), whichever is the lesser level.

Common Mode Distortion: For the levels specified above, distortion of common mode signals will be less than the level of the rejected common mode signal.

External Trigger Input Impedance: Typically 50 kΩ ± 5%

External Sampling Input: TTL compatible input for signals ≤ 256 kHz (nominal maximum sampling rate).

External Reference Input:
Input Frequencies: 1, 2, 5 or 10 MHz ± 0.01%
Amplitude Range: 0 dBm to +20 dBm (50Ω)

Digital Inputs

Three digital inputs are on the rear panel of the analyzer. Two of the inputs are for measurement data, the third is the input for data qualifier lines. Measurement data signals can be up to 16-bits wide and must be parallel data in two's complement or offset-binary format. To fit the internal data format of the analyzer, the user must select either truncation of unused upper bits or rounding of the three lowest bits for data more than 13-bits wide. The data qualifier input accepts 8 qualifier lines, a trigger, and one clock signal. Input level is TTL compatible.

Maximum Input: ±30 Vpeak at probe tips.

Input Impedance: Nominally 100 kΩ and 8 pF at probe tips.

Data Lines:
Set Up Time: 20 ns with respect to data pod clock.
Hold Time: 5 ns with respect to data pod clock.

Qualifier Lines:
Set Up Time: 60 ns with respect to data pod clock.
Hold Time: 5 ns with respect to data pod clock.
Hold Time (16 bit data with 8 bit bus): 15 ns with respect to data pod clock.

Clock Lines:
Minimum Qualified Sample Rate: 0.001 Hz
Maximum Qualified Sample Rate: 256 kHz
Minimum Pulse Width: 55 ns
Maximum Clock Repetition Rate: 10 MHz
Clock Rise/Falltime: <100 ns
Trigger Modes: Free Run, Input Channel 1, Input Channel 2, Source and External Trigger. Free Run applies to all measurement modes. Input Channel 1, Input Channel 2, Source and External Trigger apply to the Linear Resolution, Time Capture and Time Throughput measurement modes.

Free Run: A new analog measurement is initiated by the completion of the previous measurement.

Input: A new measurement is initiated when the input to either Channel 1 or 2 meets the specified trigger conditions. Trigger level range is ±110% of full scale input range. Trigger level is user selected in steps of (input range in volts)/128.

Source: Measurements are synchronized with the periodic signal types (burst random, sine chirp, burst chirp, pulse, step, ramp, and arbitrary).

External: A new measurement is initiated by a signal applied to the front panel External Trigger input or the Digital Trigger port on the data qualifier pod. Analog trigger level range is nominally ±10 Vpeak; trigger level is user selected in 80 mV steps.

Trigger Delay: Pre- and post-trigger delay resolution is 1 sample (1/2048 of a time record).

Pre-Trigger: A measurement can be based on data that starts from 1 to 4096 samples (1/2048 to 2 time records) prior to trigger conditions being met.

Post-Trigger: A measurement is initiated from 1 to 65,536 samples (1/2048 to 32 time records) after triggering.

Analog Source

Random noise, burst random, sine chirp, burst chirp, fixed sine, swept sine, step, pulse, ramp and arbitrary signals are available from the front panel Source output. The random noise, burst random, sine chirp, burst chirp, and arbitrary signal types are band-limited and band-translated. DC offset is also user selectable.

Output Impedance: 50Ω (nominal)

Output Level: Between +10 and −10 Vpeak (ac + dc) into a ≥ 10 kΩ, <1000 pF load. Maximum current is 20 mA.

AC Level: ±5 Vpeak (≥ 10 kΩ, <1000 pF load)

DC Offset: ±10 Vpeak in 100 mV steps. Residual offset at 0 V offset ≤ 10 mV.

Percent In-Band Energy: 1 kHz span, 5 kHz center frequency. Random noise: 70% Sine chirp: 85%

Accuracy and Purity: Fixed or swept sine.

Flatness:
dc to 65 kHz ±1 dB
65 kHz to 100 kHz +1, −1.5 dB

Distortion: Including subharmonics
dc to 10 kHz −55 dB
10 kHz to 100 kHz −40 dB

Pulse: Nominally 1 sample wide and band-limited.

Digital Source

All of the analog signal types can be output from the digital source connector on the rear panel of the analyzer. Data format is 16-bit parallel in either two's complement or offset binary. Output level is TTL compatible.

Typical Transition Time: Low-to-high and high-to-low ≤ 20 ns

Maximum Load: 8 LSTTL

Maximum Output Rate:
256 kHz

Source Output Data Valid:
With respect to clock valid edge. Pre-clock ≥ 150 ns Post-clock ≥ 3500 ns
General

Specifications apply when AUTO CAL is enabled or within 5°C and 2 hours of last internal calibration.

**Ambient temperature:**
0° to 55°C

**Relative humidity:**
≤ 95% at 40°C

**Altitude:** ≤ 4570 m (15,000 ft)

**Storage:**
Temperature: −40° to +75°C
Altitude: ≤ 15240 m (50,000 ft)

**Power:**
86-127 VAC, 48 to 66 Hz
195-253 VAC, 48 to 66 Hz
450 VA maximum

**Weight:**
27 kg (58 lbs) net
36 kg (79 lbs) shipping

**Dimensions:**
Height: 222 mm (8.75 in)
Width: 426 mm (16.75 in)
Depth: 578 mm (22.75 in)

**HP-IB:**
Implementation of IEEE Std 488-1978
SH1 AH1 T5 TE0 L4 LE0 SR1 RL1 PP0 DC1 DT1 C0
Supports the HP 91XX, 795X and 796X families of disk drives. Also supports Hewlett-Packard Graphics Language (H2-GL) digital plotters.
Operation Verification Tests

Introduction

This chapter contains the operation verification tests. These tests check selected specifications in their worst case conditions to provide a high level of confidence (90%) that the instrument is operating properly. These verification procedures should be used for incoming and after-repair inspections.

Test Duration

Operation Verification Tests take approximately two hours to complete.

Caution

Before applying line power to the analyzer or testing its electrical performance, see Chapter 5, "Installation."

Operation Verification Test List

Table 3-1 lists all the specifications and the corresponding operation verification tests.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Operation Verification Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Hardware</td>
<td>Self Test</td>
</tr>
<tr>
<td>Residual dc Response</td>
<td>DC Offset</td>
</tr>
<tr>
<td>Absolute Accuracy</td>
<td>Amplitude Accuracy and Flatness</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>Amplitude and Phase Match</td>
</tr>
<tr>
<td>Frequency</td>
<td>Frequency Accuracy</td>
</tr>
<tr>
<td>Common Signal Rejection</td>
<td>Common Mode Rejection</td>
</tr>
<tr>
<td>Phase Accuracy</td>
<td>Single Channel Phase Accuracy</td>
</tr>
<tr>
<td>Noise Floor</td>
<td>Noise and Spurious Signal Level</td>
</tr>
</tbody>
</table>
Recommended Test Equipment

The equipment needed to perform the HP 3563A operation verification tests is listed in Table 3-2. Other equipment may be substituted for the recommended model if it meets or exceeds the listed critical specifications. You may have to modify the procedures to accommodate the different operating characteristics if substitutions are made.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications</th>
<th>Recommended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Calibrator</td>
<td>10 Hz to 100 kHz/ 1 mV to 10V</td>
<td>Fluke 5200A</td>
</tr>
<tr>
<td></td>
<td>Amplitude Accuracy: ± .1%</td>
<td>Alternative</td>
</tr>
<tr>
<td></td>
<td>Phase Locking Capability</td>
<td>HP 745A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Datron 4200</td>
</tr>
<tr>
<td>Two Channel Frequency Synthesizer</td>
<td>Frequency Range: 10 Hz to 1 MHz</td>
<td>HP 3326A</td>
</tr>
<tr>
<td></td>
<td>Frequency Accuracy: 10 ppm</td>
<td>Opt 002</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: 40 Vp-p</td>
<td>Alternative</td>
</tr>
<tr>
<td></td>
<td>Amplitude Accuracy: ≤ 0.2 dB from 1 Hz to 100 kHz</td>
<td>(2) HP 3325A / B</td>
</tr>
<tr>
<td></td>
<td>≤ 1 dB from 100 kHz to 1 MHz</td>
<td>Opt 001</td>
</tr>
<tr>
<td></td>
<td>Dynamic Range: ≤ - 80 dBc, 10 Hz to 100 kHz</td>
<td>Opt 002</td>
</tr>
<tr>
<td>Feedthrough Terminations</td>
<td>(2) 50Ω : ± 2 % at dc</td>
<td>HP 11048C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td>(1) 600Ω : ± 2% at dc</td>
<td>Pomona Elect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model 4119-50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 10100C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 11095A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pomona Elect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model 4119-500</td>
</tr>
<tr>
<td>Cables</td>
<td>(2) BNC to BNC: length ≤ 30 cm</td>
<td>HP 8120-1838</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 11170A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 03562-61620</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 8120-1840</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 11001-60001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pomona Elect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model 2948-24-0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pomona Elect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model 1613-8-0</td>
</tr>
<tr>
<td>Adapters</td>
<td>(2) BNC TEE (m) (f) (f)</td>
<td>HP 1250-0781</td>
</tr>
<tr>
<td></td>
<td>(1) BNC (f) to BNC (f)</td>
<td>HP 1250-0080</td>
</tr>
</tbody>
</table>
Initial Equipment Setup

When the recommended test equipment of Table 3-2 is used to complete the operational verification, the instruments listed below must be set to the preset conditions listed before beginning the test. In each test, any unspecified parameters should be set to the following conditions:

**Frequency Synthesizer**

- Function: SINE WAVE (~)
- Frequency: 1 kHz
- Amplitude: 1 mVrms
- Phase: 0 Degrees
- dc Offset: 0V
- Modulation: OFF
- Sweep: OFF

**AC Calibrator**

- Frequency: 1 kHz
- Amplitude: .01 Vrms
- Voltage Error %: OFF
- Vernier: 0
- Mode: OPER
- Control: LOCAL
- Phase Lock: OFF
- Sense: INTERNAL
How To Perform An Operation Verification Test

Conventions

There are two types of keys on the HP 3563A, hardkeys and softkeys. Hardkeys are organized on the front panel according to functional group. See Figure 3-1. In these procedures, the functional group is in brackets, the hardkeys appear in bold text, and the softkeys are in regular text.

1. For example:

   ![Diagram of hardkeys and softkeys]

   Functional Group

   Measurement

   FREQ

   SPAN

   Hardkeys

   Entry

   Softkeys

   kHz

2. This example instructs you to first press the hardkey FREQ which is found in the Measurement group followed by the softkey FREQ SPAN. Next, enter the number 10 on the numeric keypad located in the Entry group. Specify the measurement unit by pressing the kHz softkey.

![Figure 3-1. Front Panel Illustration]
Operation Verification Tests
How To Perform An Operation Verification Test

![Marker Values](image)

**Figure 3-2. HP 3563A Display**

---

**Note**

In the following test procedures, numeric values may require multiple keystrokes. In the previous example, the value 10 requires two keystrokes, 1 and 0. In the procedures, these keystrokes are represented as 10.

If you make an incorrect keystroke, press the previous hardkey. This will return you to a first level menu which allows you to continue with the procedure.

All tests must be performed with Automatic Calibration ON. When the instrument powers up, Auto Cal is on, **do not turn it off**.
Procedure

1. Start each operation verification test by setting the test equipment to the specified conditions. If no conditions are listed, set the test equipment to those listed in the preceding section, Initial Setup.

2. Enter the keys specified in the procedure.

3. Record the position of the X and Y markers as indicated for each test. Refer to Figure 3-2 for an example of the position of the X and Y marker readings. Additional information about reading the X and Y marker positions is available in the HP 3563A Operating Reference Manual.

4. Record the results of each test on the Operation Verification Test Record located at the end of this chapter. This test record may be reproduced without written permission of Hewlett-Packard.

5. If the HP 3563A fails a test, see the “If Test Fails” section at the end of each test.

---

Note

The instrument will not record any keystroke during a calibration cycle or a measurement. A status message appears in the lower-right corner of the display. Refer to Figure 3-2.

---

Note

To minimize the time required to change instrument configurations between tests, do the tests in the order shown.
1. **Self Test**

This test determines if the HP 3563A is operating correctly. No tests should be attempted until the instrument passes this test.

**Required Test Equipment**

None

**Test Duration**

This test takes about 1 minute to complete.

**Procedure**

1. Press the HP 3563A keys as follows:

```plaintext
[ Control ]
SPCL ....... SELF ...
FCTN TEST SELF TEST
```

2. During the Self Test cycle, the message “Diagnostic In Progress” will appear in the message area. Keystrokes are not recorded during calibration and measurements. You must wait until the measurement is completed.

3. When “Self Test Passes” is displayed in the lower right corner of the display, check PASS on the Operational Verification Test Record.

**If Test Fails**

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

“Fault Isolation Section”, Section VII.
2. DC Offset

This test measures the level of the dc offset generated with Auto Cal on.

**Required Test Equipment**

- 50Ω feedthrough terminations (2)
- Alligator Clip Cables

![CONTROL SYSTEMS ANALYZER Diagram](image)

Figure 3-3. DC Offset Setup
Procedure

1. Connect the HP 3563A as shown in Figure 3-3. Keep the leads to chassis ground as short as possible.

2. Press the HP 3563A keys as follows:

```
[ Control ]
  PRESET ......... RESET

[ Input Setup ]
  CAL ......... AUTO
              ON
              SINGLE
              CAL

[ Measurement ]
  WINDOW ......... UNIFRM

[ Measurement ]
  AVG

[ Entry ]
  2 ......... ENTER ......... STABLE

[ Measurement ]
  FREQ

[ Entry ]
  1 ......... kHz

[ Display ]
  UNITS ......... P SPEC ......... VOLTS
                 UNITS
                 RMS
                 VOLTS

[ Display ]
  A&B
```
Operation Verification Tests

2. DC Offset

[ Markers ]
  X ....... X
  VALUE

[ Entry ]
  0 ....... Hz

[ Input Setup ]
  RANGE

[ Entry ]
  -51 ....... dBVrms

[ Control ]
  START

3. Record the Ya marker reading on the Operational Verification Test Record for the Channel 1 measured value.

4. Record the Yb marker reading on the Operational Verification Test Record for the Channel 2 measured value.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

- Adjustments Section III
  Track and Hold Offset Adjustment
  Input DC Offset Adjustment

- Troubleshooting Section VIII
  A33, A35 Input Boards
  A32, A34 Analog Digital Converter Boards
3. Amplitude Accuracy And Flatness

This test measures the amplitude accuracy and flatness of the HP 3563A using the amplitude reference of the ac calibrator.

**Required Test Equipment**

Frequency Synthesizer
AC Calibrator
Female to Female Barrel
BNC Tee (m)(f)(f)
BNC Cable (3)
BNC (m) to dual banana
Single Banana to Single Banana

![Amplitude Accuracy and Flatness Setup](image-url)
Operation Verification Tests
3. Amplitude Accuracy And Flatness

Procedure

1. Connect the test instruments as shown in Figure 3-4.

2. Set the test instruments initially as follows:

**Frequency Synthesizer**
- Function ....... SINE WAVE (~)
- Frequency ...... 1 kHz
- Amplitude ...... 1 Vrms
- Phase .......... 0 Degrees
- dc Offset ...... 0V
- Modulation ...... OFF
- Sweep .......... OFF

**AC Calibrator**
- Frequency ...... 1 kHz
- Amplitude ...... 2.7698 Vrms
- Voltage Error % ...... OFF
- Vernier .......... 0
- Mode .......... OPER
- Control ......... LOCAL
- Phase Lock ...... ON
- Sense .......... INTERNAL

3. Press the HP 3563A keys as follows:

- [ Control ] PRESET ...... RESET
- [ Input Setup ] CAL ...... SINGLE
- [ Measurement ] WINDOW ...... FLAT
- [ ] TOP
3. Amplitude Accuracy And Flatness

Table 3-3. Amplitude Accuracy and Flatness

<table>
<thead>
<tr>
<th>HP 3563A Range Setting</th>
<th>Signal Frequency</th>
<th>AC Calibrator Amplitude</th>
<th>Lower Limit Specification</th>
<th>Upper Limit Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 dBVrms</td>
<td>1 kHz</td>
<td>2.8184 Vrms</td>
<td>8.849 dBV</td>
<td>9.151 dBV</td>
</tr>
<tr>
<td>9 dBVrms</td>
<td>99 kHz</td>
<td>2.8184 Vrms</td>
<td>8.849 dBV</td>
<td>9.151 dBV</td>
</tr>
<tr>
<td>0 dBVrms</td>
<td>1 kHz</td>
<td>1.0000 Vrms</td>
<td>-.1513 dBV</td>
<td>.1513 dBV</td>
</tr>
<tr>
<td>0 dBVrms</td>
<td>99 kHz</td>
<td>1.0000 Vrms</td>
<td>-.1513 dBV</td>
<td>.1513 dBV</td>
</tr>
<tr>
<td>-13 dBVrms</td>
<td>1 kHz</td>
<td>.22387 Vrms</td>
<td>-13.15 dBV</td>
<td>-12.85 dBV</td>
</tr>
<tr>
<td>-13 dBVrms</td>
<td>99 kHz</td>
<td>.22387 Vrms</td>
<td>-13.15 dBV</td>
<td>-12.85 dBV</td>
</tr>
</tbody>
</table>

4. For each of the frequencies listed in Table 3-3 perform steps a through g:

a. Press the HP 3563A keys as follows:

[ Measurement ]
AVG

[ Entry ]
4
...... ENTER ...... STABLE

[ Display ]
UNITS
...... P SPEC...... VOLTS
UNITS
...... RMS
...... VOLTS

[ Display ]
A&B

b. Set the AC Calibrator to the signal frequency specified in Table 3-3.

c. Set the AC Calibrator’s amplitude specified in Table 3-3.

d. Set the Frequency Synthesizer to the signal frequency specified in Table 3-3.
Operation Verification Tests
3. Amplitude Accuracy And Flatness

e. Press the HP 3563A keys as follows:

```
[ Control ]
START

[ Markers ]
SPCL
MARKER ...... MRKR →
PEAK
```
f. Record the Ya marker reading on the Operational Verification Test Record for Channel 1.
g. Record the Yb marker reading on the Operational Verification Test Record for Channel 2.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III
2nd Pass Gain Adjustment
ADC Offset and Reference Adjustment
Input Flatness Adjustment
Input Attenuator Adjustments
Calibrator Adjustment

Troubleshooting
Section VII
A33, A35 Input Boards
A32, A34 Analog Digital Converter Boards
A30 Analog Source Board
4. Amplitude and Phase Match

This test determines if the HP 3563A's amplitude and phase match between Channel 1 and Channel 2 are within the specified limits.

Required Test Equipment

BNC to BNC: length ≤ 30 cm (2)
BNC to BNC Cable
Female to Female Barre.
BNC Tee (m) (f) (f)

Figure 3-5. Amplitude and Phase Match Setup
Procedure

1. Connect the HP 3563A as shown in Figure 3-5. The cables to Channel 1 and Channel 2 must be the same length.

2. This test has six parts. Preset the HP 3563A by pressing the following keys:

- Control
  - PRESET
  - RESET

- Input Setup
  - CAL
  - SINGLE
  - CAL

- Input Setup
  - INPUT
    - CONFIG
    - CHAN 1
      - AC
    - CHAN 2
      - AC
    - GROUND
      - CHAN 1
    - GROUND
      - CHAN 2

- Input Setup
  - SELECT
  - TRIG

- Entry
  - 0
  - V

- Measurement
  - WINDOW
    - UNIFRM
    - (NONE)

- Measurement
  - AVG

- Entry
  - 16
  - ENTER

- Measurement
  - SOURCE
    - SOURCE
    - TYPE
    - PRIODC
    - CHIRP
Operation Verification Tests

4. Amplitude and Phase Match

[ Display ]
  MEAS
  DISP ...... FREQ
  RESP

[ Display ]
  SCALE ...... X FIXD
  SCALE

[ Entry ]
  .375, 100 ...... kHz

3. Press the HP 3563A keys as follows:

[ Input Setup ]
  RANGE ...... AUTO 1 ...... AUTO 2
  UP & DWN ...... UP & DWN

[ Measurement ]
  SOURCE ...... SOURCE
  LEVEL

[ Entry ]
  -49 ...... dBVrms

[ Display ]
  SCALE ...... Y FIXD
  SCALE

[ Entry ]
  -.2, .2 ...... dB

[ Control ]
  START

[ Markers ]
  Y

[ Entry ]
  -.1, .1 ...... dB

4. Verify the measurement is within the marker band on the display. If it is, check PASS on the Operation Verification Test Record for Part 1.
Operation Verification Tests
4. Amplitude and Phase Match

5. Press the HP 3563A keys as follows:

[ Measurement ]
SOURCE ....... SOURCE LEVEL

[ Entry ]
0 ....... dBVrms

[ Control ]
START

[ Markers ]
Y

[ Entry ]
-.1,.1 ....... dB

6. Verify the measurement is within the marker band on the display. If it is, check PASS on the Operation Verification Test Record for Part 2.

7. Press the HP 3563A keys as follows:

[ Measurement ]
SOURCE ....... SOURCE LEVEL

[ Entry ]
10 ....... dBVrms

[ Control ]
START

[ Markers ]
Y

[ Entry ]
-.1,.1 ....... dB

8. Verify the measurement is within the marker band on the display. If it is, check PASS on the Operation Verification Test Record for Part 3.
9. Press the HP 3563A keys as follows:

- Input Setup
  - RANGE

- Entry
  - -47 ...... dBVrms

- Measurement
  - SOURCE ...... SOURCE LEVEL

- Entry
  - -49 ...... dBVrms

- Display
  - COORD ...... PHASE

- Control
  - START

- Display
  - SCALE ...... Y FIXD
  - SCALE

- Entry
  - -1, 1 ...... Degree

- Markers
  - Y ...... Y VALUE

- Entry
  - -.5, .5 ...... Degree

10. If the measurement is within the marker band, check PASS on the Operation Verification Test Record for part 4.
Operation Verification Tests
4. Amplitude and Phase Match

11. Press the HP 3563A keys as follows:

```
[ Input Setup ]   [ Entry ]  dBVrms
RANGE ........... 0 ........... dBVrms
```

```
[ Measurement ]   [ Source ]
SOURCE ........... SOURCE
LEVEL
```

```
[ Entry ]
0 ........... dBVrms
```

```
[ Control ]
START
```

```
[ Markers ]
Y ........... Y
VALUE
```

```
[ Entry ]
-.5, .5 ........... degree
```

12. Verify the measurement is within the marker band on the display. If it is, check PASS on the Operation Verification Test Record for Part 5.

13. Press the HP 3563A keys as follows:

```
[ Input Setup ]
RANGE
```

```
[ Entry ]
10 ........... dBVrms
```

```
[ Measurement ]
SOURCE ........... SOURCE
LEVEL
```

```
[ Entry ]
10 ........... dBVrms
```

3-20
Operation Verification Tests
4. Amplitude and Phase Match

[ Control ]
START

[ Markers ]
Y .................................. Y
VALUE

[ Entry ]
-.5, .5 .......................... degree

14. Verify the measurement is within the marker band on the display. If it is, check PASS on the Operation Verification Test Record for Part 6.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III 2nd Pass Gain Adjustment
ADC Offset and Reference Adjustment
Input Flatness Adjustment
Input Attenuator Adjustments
Calibrator Adjustment

Troubleshooting
Section VII A33, A35 Input Boards
A32, A34 Analog Digital Converter Boards
A30 Analog Source Board
5. Frequency Accuracy

This test measures the frequency accuracy of the HP 3563A.

Required Test Equipment

- Frequency Synthesizer
- 50Ω feedthrough termination
- BNC to BNC Cable

![Diagram of test setup](image)

**Figure 3-6. Frequency Accuracy Setup**

Procedure

1. Connect the test equipment as shown in Figure 3-6.

2. Set the test instrument as follows:

**Frequency Synthesizer**

- Function: SINE WAVE (~)
- Frequency: 99 kHz
- Amplitude: 1 Vrms
- Phase: 0 Degrees
- dc Offset: 0V
- Modulation: OFF
- Sweep: OFF
3. Press the HP 3563A keys as follows:

[ Control ]
  PRESET ....... RESET

[ Input Setup ]
  CAL ....... SINGLE
             CAL

[ Input Setup ]
  RANGE

[ Entry ]
  0 ....... dBVrms

[ Measurement ]
  FREQ ....... CENTER
             FREQ

[ Entry ]
  99 ....... kHz

[ Measurement ]
  AVG

[ Entry ]
  2 ....... ENTER ....... STABLE

[ Control ]
  START

[ Markers ]
  X

4. Record the X marker reading as the measured value on the Operational Verification Test Record.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

  Adjustments  20.48 MHz Reference Adjustment
                Section III

  Troubleshooting  A31 Trigger Board
                    Section VII
6. Common Mode Rejection

This test measures the capability of the HP 3563A to ignore a signal which appears simultaneously and in phase at the high and low input of a single channel.

Required Test Equipment

Frequency Synthesizer
BNC to BNC: length ≤ 30 cm (2)
Common Mode Cable
BNC to BNC Cable
Alligator Cable
BNC (m) (f) (f)
Female to Female Barrel

---

![Diagram of Common Mode Rejection Setup #1](image)

**Figure 3-7. Common Mode Rejection Setup #1**

---

**Note**

If Common Mode Cable is not available for Setup #2, use the alternate setup, Figure 3-9.
Procedure

1. Connect the test instruments as shown in Figure 3-7.

2. Set the Frequency Synthesizer as follows:
   
<table>
<thead>
<tr>
<th>Function</th>
<th>SINE WAVE ((^\wedge))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Amplitude</td>
<td>1 mVrms</td>
</tr>
<tr>
<td>Phase</td>
<td>0 Degrees</td>
</tr>
<tr>
<td>dc Offset</td>
<td>0V</td>
</tr>
<tr>
<td>Modulation</td>
<td>OFF</td>
</tr>
<tr>
<td>Sweep</td>
<td>OFF</td>
</tr>
</tbody>
</table>

3. Press the HP 3563A keys as follows:

   [ Control ]
   PRESET ...... RESET

   [ Input Setup ]
   CAL ...... SINGLE
   CAL

   [ Measurement ]
   AVG ...... 16 ...... ENTER
   ...... STABLE

   [ Measurement ]
   WINDOW ...... FLAT
   TOP

   [ Display ]
   A&B

   [ Display ]
   UNITS ...... P SPEC
   UNITS ...... VOLTS
   RMS

   [ Input Setup ]
   RANGE ...... AUTO 1
   UP&DWN ...... AUTO 2
   UP&DWN
Table 3-4. Common Mode Rejection

<table>
<thead>
<tr>
<th>Signal Amplitude</th>
<th>Signal Frequency</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.536 Vrms</td>
<td>66 Hz</td>
<td>≥ 80 dB</td>
</tr>
<tr>
<td>3.536 Vrms</td>
<td>500 Hz</td>
<td>≥ 65 dB</td>
</tr>
</tbody>
</table>

4. For each of the frequencies listed in Table 3-4 perform steps a through h:

a. Set the Frequency Synthesizer as follows:
   - Amplitude ........ To signal amplitude in Table 3-4.
   - Frequency ........ To signal frequency in Table 3-4.

b. Press the HP 3563A keys as follows:

   [ Measurement ]
   FREQ ........ CENTER To signal frequency in Table 3-4.
   FREQ
   [ Control ]
   START
   [ Markers ]
   SPCL
   MARKER ........ MRKR ➔
   PEAK

c. Record the Ya marker amplitude reading on the Operation Verification Test Record as the first measurement for Channel 1.

d. Record the Yb marker amplitude reading on the Operation Verification Test Record as the first measurement for Channel 2.

e. Connect the test instruments as shown in Figure 3-8. If you do not have a common mode cable, use the alternate setup, Figure 3-9.
Figure 3-8. Common Mode Rejection Setup #2

Figure 3-9. Alternate Common Mode Rejection Setup #2
6. Common Mode Rejection

f. Press the HP 3563A keys as follows:

[ Control ]
START

[ Display ]
SCALE ...... Y AUTO
SCALE

[ Markers ]
X ...... To signal frequency in Table 3-4.

g. When the average is complete, the message “Measurement Complete” appears in the lower right hand corner of the display. Record the Ya amplitude reading on the Operation Verification Test Record as the second measurement for Channel 1.

h. Record the Yb amplitude reading on the Operation Verification Test Record as the second measurement for Channel 2.

5. Calculate the relative value for both channels:

First Measurement − Second Measurement = Relative Value

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III

Input dc Offset Adjustment
Calibrator Adjustment

Troubleshooting
Section VII

A33, A35 Input Boards
A30 Analog Source
7. Single Channel Phase Accuracy

This test measures the phase accuracy of the HP 3563A relative to the phase of the trigger signal. The frequency synthesizer is used to input a square wave to one channel and the external trigger input.

Required Test Equipment

Frequency Synthesizer
Female to Female Barrel
50Ω feedthrough termination
BNC to BNC: length ≤ 30 cm (2)
BNC Tees (2)
BNC to BNC Cable (2)

Figure 3-10. Single Channel Phase Accuracy
Operation Verification Tests
7. Single Channel Phase Accuracy

Procedure

1. Connect the test instruments as shown in Figure 3-10.

2. Set the test instrument initially as follows:

**Frequency Synthesizer**

- **Function**: SQUARE WAVE (~)
- **Frequency**: 9 kHz
- **Amplitude**: 1 Vrms
- **Phase**: 0 Degrees
- **dc Offset**: 0 V dc
- **Modulation**: OFF
- **Sweep**: Off

3. Press the HP 3563A keys as follows:

- **[ Control ]**
  - PRESET ....... RESET

- **[ Input Setup ]**
  - CAL ....... SINGLE CAL

- **[ Measurement ]**
  - SELECT
  - MEAS ....... POWER SPEC

- **[ Measurement ]**
  - AVG

- **[ Entry ]**
  - 5 ....... ENTER
    - STABLE
    - TIM AV ON

- **[ Measurement ]**
  - WINDOW ....... UNIFORM (NONE)
4. Record the Ya marker reading on the Operational Verification Test Record for Channel 1.

5. Record the Yb marker reading on the Operational Verification Test Record for Channel 2.

6. Change the frequency of the frequency synthesizer to 99 kHz.
Operation Verification Tests
7. Single Channel Phase Accuracy

7. Press the HP 3563A keys as follows:

[ Input Setup ]
SELECT
TRIG ....... CHAN 1
INPUT

[ Control ]
START

[ Markers ]
X

[ Entry ]
99 ....... kHz

8. Record the Ya marker reading on the Operational Verification Test Record for Channel 1.
9. Record the Yb marker reading on the Operational Verification Test Record for Channel 2.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments None

Troubleshooting
Section VII
A33, A35 Input Boards
A32, A34 Analog Digital Converter Boards
A31 Trigger Board
A6 Digital Filter Controller
A1 Digital Source
8. Noise and Spurious Signal Level

This test measures the level of the noise floor and any spurious signals generated within the HP 3563A.

Required Test Equipment

(2) 50Ω feedthrough terminations
Alligator Clip Cables (2)

![Diagram of control systems analyzer with labels for channel 1 and channel 2, and 50 ohm feedthrough termination.

Figure 3-11. Noise and Spurious Signal Level Setup

Procedure

1. Connect the test instruments as shown in Figure 3-11. Keep the leads from the feedthrough terminations to chassis ground as short as possible.

2. Press the HP 3563A keys as follows:

- [Control] PRESET ....... RESET
- [Input Setup] CAL ....... SINGLE CAL
### Operation Verification Tests
#### 8. Noise and Spurious Signal Level

**Input Setup**

<table>
<thead>
<tr>
<th>Entry</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>-51</td>
<td>dBVrms</td>
</tr>
</tbody>
</table>

**Input Setup**

<table>
<thead>
<tr>
<th>INPUT CONFIG</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHAN 1</td>
<td>AC</td>
</tr>
<tr>
<td></td>
<td>CHAN 2</td>
<td>AC</td>
</tr>
</tbody>
</table>

**Measurement**

<table>
<thead>
<tr>
<th>FREQ</th>
<th>FREQ SPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Entry**

<table>
<thead>
<tr>
<th>Entry</th>
<th>FREQ</th>
<th>START</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>kHz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entry</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

**Measurement**

<table>
<thead>
<tr>
<th>AVG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Entry**

<table>
<thead>
<tr>
<th>Entry</th>
<th>ENTER</th>
<th>STABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Measurement**

<table>
<thead>
<tr>
<th>WINDOW</th>
<th>UNIFORM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(NONE)</td>
</tr>
</tbody>
</table>

**Display**

<table>
<thead>
<tr>
<th>UNITS</th>
<th>P SPEC</th>
<th>VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITS</td>
<td></td>
<td>RMS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3-34
3. Press the HP 3563A keys as follows:

```
[ Control ]
START

[ Display ]
SCALE ...... Y AUTO
SCALE

[ Markers ]
SPCL
MARKER ...... MRKR →
PEAK
```

4. If the Ya marker reading is less than or equal to –131 dBVrms check PASS on the Operation Verification Test Record for Channel 1.

5. Press the HP 3563A keys as follows:

```
[ Display ]
B

[ Display ]
SCALE ...... Y AUTO
SCALE

[ Markers ]
SPCL
MARKER ...... MRKR →
PEAK
```

6. If the Yb marker reading is less than or equal to –131 dBVrms check PASS on the Operation Verification Test Record for Channel 2.
8. Noise and Spurious Signal Level

Table 3-5. Spurious Signals

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20Hz</td>
<td>1kHz</td>
<td>-131dBV</td>
</tr>
<tr>
<td>1kHz</td>
<td>10kHz</td>
<td>-131dBV</td>
</tr>
<tr>
<td>90kHz</td>
<td>10kHz</td>
<td>-131dBV</td>
</tr>
</tbody>
</table>

7. Perform steps a through d for the start frequencies in Table 3-5:

a. Press the HP 3563A keys as follows:

```
[ Measurement ]
FREQ ........ START FREQ

[ Display ]
A ........ FREQ SPAN

[ Control ]
START

[ Markers ]
SPCL MARKER ........ MRKR ➔ PEAK
```

b. If the Ya marker reading is less than or equal to -131 dBVrms check PASS on the Operation Verification Test Record for Channel 1.

c. Press the HP 3563A keys as follows:

```
[ Display ]
B

[ Markers ]
SPCL MARKER ........ MRKR ➔ PEAK
```

d. If the Yb marker reading is less than or equal to -131 dBVrms check PASS on the Operation Verification Test Record for Channel 2.
8. Repeat steps 7a through 7d for the remaining start frequencies in Table 3-5.

9. Press the HP 3563A keys as follows:

   [ Measurement ]
   WINDOW ........ FLAT
   TOP

   [ Display ]
   UNITS ........ P SPEC ...... V/√Hz
   UNITS ........ (V^2 PSD)

10. Perform steps a through e for each of the start frequencies listed in Table 3-6:

    a. Press the HP 3563A keys as follows:

   Table 3-6. Noise Level

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Hz</td>
<td>1 kHz</td>
<td>( \leq -134\sqrt{Hz} )</td>
</tr>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td>( \leq -144\sqrt{Hz} )</td>
</tr>
<tr>
<td>50 kHz</td>
<td>50 kHz</td>
<td>( \leq -144\sqrt{Hz} )</td>
</tr>
</tbody>
</table>

   [ Measurement ]
   FREQ ........ START FREQ
   ........ FREQ SPAN

   [ Control ]
   START
Operation Verification Tests
8. Noise and Spurious Signal Level
b. When the average is complete, press the HP 3563A keys as follows:

[ Display ]
A

[ Markers ]
SPCL
MARKER ...... MRKR ➔ PEAK
c. If the Ya marker reading is less than or equal to the specification, check PASS on the Operation Verification Test Record for Channel 1.
d. Press the HP 3563A keys as follows:

[ Display ]
B

[ Markers ]
SPCL
MARKER ...... MRKR ➔ PEAK
e. If the Yb marker reading is less than or equal to the specification, check PASS on the Operation Verification Test Record for Channel 2.

11. Repeat steps 10a through 10e for the remaining start frequencies in Table 3-6.

If Test Fails
If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III 2nd Pass Gain Adjustment
ADC Offset and Reference Adjustment

Troubleshooting
Section VII A33, A35 Input Boards
A32, A34 Analog Digital Converter
A5 Digital Filter
A4 Local Oscillator
9. Source Amplitude Accuracy and Flatness

This test measures the amplitude accuracy and flatness of the HP 3563A Source.

**Required Test Equipment**

BNC Cable

**Procedure**

1. Connect the HP 3563A Source to Channel 1.

2. Press the HP 3563A keys as follows:

   ```plaintext
   [ Control ]
   PRESET ........... RESET

   [ Input Setup ]
   CAL ........... SINGLE
                ......... CAL

   [ Input Setup ]
   INPUT CONFIG ....... GROUND
                        ......... CHAN 1

   [ Input Setup ]
   RANGE

   [ Entry ]
   5 ........... V

   [ Measurement ]
   MEAS MODE .......... SWEPT
                       .......... LINEAR
                       SINE .......... SWEEP

   [ Measurement ]
   SOURCE .......... SOURCE
                    LEVEL

   [ Entry ]
   4.47 ........... V
   ```
9. Source Amplitude Accuracy and Flatness

[ Display ]
UNITS ....... P SPEC......... VOLTS
          UNITS          RMS
          .......  VOLTS

[ Measurement ]
FREQ ....... STOP          FREQ

[ Entry ]
65 ....... kHz

[ Control ]
START

3. The sweep is done when the message, Measurement Complete, appears in the lower right hand corner of the display. Press the HP 3563A keys as follows:

[ Display ]
SCALE ....... Y FIXD          SCALE

[ Entry ]
9,11 ....... dB

4. If the trace is between the 9 dB and the 11 dB limits, check PASS on the Operation Verification Test Record for the 0 to 65 kHz span.

5. Press the HP 3563A keys as follows:

[ Measurement ]
FREQ ....... START          FREQ

[ Entry ]
65 ....... kHz

[ Control ]
START
6. When the sweep is done, press the HP 3563A keys as follows:

```
[ Display ]
   SCALE        Y FIXD
   SCALE

[ Entry ]
  8.5, 11      dB
```

7. If the trace is between the 8.5 dB and the 11 dB limits, check PASS on the Operation Verification Test Record for the 65 kHz to 100 kHz span.

**If Test Fails**

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

- **Adjustments**: None
- **Troubleshooting**
  - Section VIII
  - A30 Analog Source Board
Operational Verification Test Record

HP 3563 A
Control Systems Analyzer

Tested by: __________________________

Serial No. __________________________ Location: __________________________

Customer Name ____________________ Repair Order No. ____________________

Temperature Range __________________ Date: __________________________

Relative Humidity __________________

Instruments Used:

AC Calibrator ______________________ Model __________________________
Serial No. _______________________

Frequency Synthesizer ______________ Model __________________________
Serial No. _______________________

Digital Voltmeter __________________ Model __________________________
Serial No. _______________________

Other ______________________________

Other ______________________________

This Test Record Form may be reproduced without written permission of Hewlett-Packard
### 1. Self Test

**PASS**

### 2. DC Offset

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Measured Value</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHANNEL 1</td>
<td>CHANNEL 2</td>
</tr>
<tr>
<td>−51 dBV</td>
<td></td>
<td>&lt;−71 dBV</td>
</tr>
</tbody>
</table>

### 3. Amplitude Accuracy and Flatness

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Signal Frequency</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHANNEL 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHANNEL 2</td>
</tr>
<tr>
<td>9 dBV</td>
<td>1 kHz</td>
<td>8.849 dBV</td>
<td>9.151 dBV</td>
</tr>
<tr>
<td>9 dBV</td>
<td>99 kHz</td>
<td>8.849 dBV</td>
<td>9.151 dBV</td>
</tr>
<tr>
<td>0 dBV</td>
<td>1 kHz</td>
<td>−0.1513 dBV</td>
<td>0.1513 dBV</td>
</tr>
<tr>
<td>0 dBV</td>
<td>99 kHz</td>
<td>−0.1513 dBV</td>
<td>0.1513 dBV</td>
</tr>
<tr>
<td>−13 dBV</td>
<td>1 kHz</td>
<td>−1315 dBV</td>
<td>−12.85 dBV</td>
</tr>
<tr>
<td>−13 dBV</td>
<td>99 kHz</td>
<td>−1315 dBV</td>
<td>−12.85 dBV</td>
</tr>
</tbody>
</table>

### 4. Amplitude and Phase Match

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Part</th>
<th>PASS</th>
<th>Amplitude Specification</th>
<th>Part</th>
<th>PASS</th>
<th>Phase Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>−49 dBV</td>
<td>1</td>
<td>PASS</td>
<td>± 0.1 dB</td>
<td>4</td>
<td>PASS</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>−0 dBV</td>
<td>2</td>
<td></td>
<td>± 0.1 dB</td>
<td>5</td>
<td></td>
<td>± 0.5°</td>
</tr>
<tr>
<td>−10 dBV</td>
<td>3</td>
<td></td>
<td>± 0.1 dB</td>
<td>6</td>
<td></td>
<td>± 0.8°</td>
</tr>
</tbody>
</table>

### 5. Frequency Accuracy

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>99,000 Hz</td>
<td>Lower Limit</td>
<td>Upper Limit</td>
</tr>
<tr>
<td></td>
<td>98.996 kHz</td>
<td>99.004 kHz</td>
</tr>
</tbody>
</table>
6. Common Mode Rejection

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>CHANNEL 1</th>
<th>CHANNEL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Measurement</td>
<td>Second Measurement</td>
</tr>
<tr>
<td>66 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Single Channel Phase Accuracy

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Trigger</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slope</td>
<td>Type</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>EXT</td>
<td>- 92.5°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>CHAN 1</td>
<td>- 102°</td>
</tr>
</tbody>
</table>

8. Noise and Spurious Signal Level

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>PASS</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CHAN 1</td>
<td>CHAN 2</td>
</tr>
<tr>
<td>20 Hz</td>
<td>1 kHz</td>
<td></td>
<td>≤ - 131 dBV</td>
</tr>
<tr>
<td>1 kHz</td>
<td>10 kHz</td>
<td></td>
<td>≤ - 131 dBV</td>
</tr>
<tr>
<td>90 kHz</td>
<td>10 kHz</td>
<td></td>
<td>≤ - 131 dBV</td>
</tr>
</tbody>
</table>

Noise Level

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>PASS</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CHAN 1</td>
<td>CHAN 2</td>
</tr>
<tr>
<td>20 kHz</td>
<td>1 kHz</td>
<td></td>
<td>≤ - 134 dBV/√Hz</td>
</tr>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td></td>
<td>≤ - 144 dBV/√Hz</td>
</tr>
<tr>
<td>50 kHz</td>
<td>50 kHz</td>
<td></td>
<td>≤ - 144 dBV/√Hz</td>
</tr>
</tbody>
</table>

9. Source Amplitude Accuracy and Flatness

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hz to 65 kHz</td>
<td>PASS</td>
</tr>
<tr>
<td>65 kHz to 100 kHz</td>
<td>PASS</td>
</tr>
</tbody>
</table>
Performance Tests

Introduction

This chapter contains performance tests for the HP 3563A. These tests provide the highest level of confidence that the instrument is operating properly and verify that the HP 3563A is meeting its published specifications. Use the “Operational Verification,” Chapter 3, for incoming and after-repair inspections.

Test Duration

The performance tests take approximately eight hours to complete.

Caution

Before applying line power to the analyzer or testing its electrical performance, see Chapter 5, “Installation.”

Calibration Cycle

To verify the HP 3563A is operating within specifications, perform the performance tests every 12 months.
Performance Tests

Tested Specifications

The following table lists all the specifications and the corresponding performance tests.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Performance Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Talk/Phase Accuracy</td>
<td>Single Channel Phase Accuracy</td>
</tr>
<tr>
<td>Digital Reading</td>
<td>Digital I/O</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>Input Impedance</td>
</tr>
<tr>
<td>Dynamic Range</td>
<td>Anti-Alias Filter Response</td>
</tr>
<tr>
<td></td>
<td>Harmonic Distortion</td>
</tr>
<tr>
<td></td>
<td>Intermodulation Distortion</td>
</tr>
<tr>
<td>Noise Floor</td>
<td>Noise and Spurious Signal Level</td>
</tr>
<tr>
<td>Cross Talk</td>
<td>Cross Talk</td>
</tr>
<tr>
<td>Common Signal Rejection</td>
<td>Common Mode Rejection</td>
</tr>
<tr>
<td>External Reference Input</td>
<td>External Reference Test</td>
</tr>
<tr>
<td>Source dc Offset</td>
<td>Source Residual Offset</td>
</tr>
<tr>
<td>Source Accuracy and Purity</td>
<td>Source Amplitude Accuracy and Flatness</td>
</tr>
<tr>
<td>Source Distortion</td>
<td>Source Distortion</td>
</tr>
<tr>
<td>Source Noise</td>
<td>Source Energy Measurement</td>
</tr>
</tbody>
</table>

Recommended Test Equipment

The equipment needed to perform the HP 3563A performance tests is listed in Table 4-2. Other equipment may be substituted for the recommended model if it meets or exceeds the listed critical specifications. Instruments meeting or exceeding the critical specifications will provide a 4 to 1 (or better) test accuracy ratio for each characteristic calibrated in the performance test procedures. You may have to modify the procedures to accommodate the different operating characteristics if substitutions are made.
<table>
<thead>
<tr>
<th>Resistance</th>
<th>Tolerance</th>
<th>Power</th>
<th>HP Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kΩ</td>
<td>1%</td>
<td>0.25 W</td>
<td>0757-0280</td>
</tr>
<tr>
<td>100 kΩ</td>
<td>1%</td>
<td>0.25 W</td>
<td>0757-0465</td>
</tr>
</tbody>
</table>

**Assembly**

1. Cut resistor leads to 12mm on each end.
2. Solder one resistor lead to the center conductor of the BNC FEMALE connector.
3. Solder the CONDUCTOR CENTER PIN to the other lead of the resistor.
4. Screw the SLEEVE and the BNC MALE connector into place. Tighten securely.

**Figure 4-1. Constructing Feedthrough**
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications</th>
<th>Recommended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Calibrator</td>
<td>10 Hz to 100 kHz; 1 mV to 10V</td>
<td>Fluke 5200A</td>
</tr>
<tr>
<td></td>
<td>Amplitude Accuracy: ± .1%</td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td>Phase Locking Capability</td>
<td>HP 745A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Datron 4200</td>
</tr>
<tr>
<td>Two Channel Frequency</td>
<td>Frequency Range: 10 Hz to 1 MHz</td>
<td>HP 3326A</td>
</tr>
<tr>
<td>Synthesizer</td>
<td>Frequency Accuracy: 10 ppm</td>
<td>Opt 002</td>
</tr>
<tr>
<td></td>
<td>Synthesizer Amplitude Range: 40 Vp-p</td>
<td>Alternative:*</td>
</tr>
<tr>
<td></td>
<td>Amplitude Accuracy: 0.2 dB from 1 Hz to 100 kHz</td>
<td>(2) HP 3325A/B</td>
</tr>
<tr>
<td></td>
<td>≤ 0.2 dB from 1 Hz to 100 kHz</td>
<td>Opt 001</td>
</tr>
<tr>
<td></td>
<td>1 dB from 100 kHz to 1 MHz</td>
<td>Opt 002</td>
</tr>
<tr>
<td></td>
<td>Dynamic Range: ≤ - 80 dBc, 10 Hz to 100 kHz</td>
<td></td>
</tr>
<tr>
<td>Digital Voltmeter</td>
<td>5 1/2 digit, Math: Mean</td>
<td>HP 3456A</td>
</tr>
<tr>
<td></td>
<td>AC Voltage: 30 Hz to 100 kHz; 0.1 to 500V; ± 0.1%; ≥ 1 kΩ input impedance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dc Voltage: 1 V to 300 V; ± 0.1%</td>
<td></td>
</tr>
<tr>
<td>Low Distortion Oscillator</td>
<td>Frequency Range: 1 Hz to 100 kHz</td>
<td>HP 339A</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: 0.1 V to 1 Vrms</td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td>Distortion: ≤ - 80 dB (0.01%)</td>
<td>HP 3326A</td>
</tr>
<tr>
<td>Feedthrough Terminations</td>
<td>(2) 50Ω : ±2% at dc</td>
<td>HP 11048C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pomona Elect. Model 4119-50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 10100C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 11095A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pomona Elect. Model 4119-600</td>
</tr>
<tr>
<td></td>
<td>(2) 600Ω : ±2% at dc</td>
<td></td>
</tr>
<tr>
<td>Cables</td>
<td>(2) BNC to BNC: length ≤ 30 cm</td>
<td>HP 8120-1838</td>
</tr>
<tr>
<td></td>
<td>(2) BNC/BNC Cable 122 cm</td>
<td>HP 8120-1840</td>
</tr>
<tr>
<td></td>
<td>(1) BNC/Dual Banana</td>
<td>HP 11001-60001</td>
</tr>
<tr>
<td></td>
<td>(2) Single Banana/Single Banana</td>
<td>Pomona Elect. Model 2948-24-0</td>
</tr>
<tr>
<td></td>
<td>Common Mode Cable</td>
<td>HP 03562-61620</td>
</tr>
<tr>
<td></td>
<td>Test Board</td>
<td>HP 03563-66540</td>
</tr>
<tr>
<td></td>
<td>(3) 8-bit output probe cables</td>
<td>HP 03563-61604</td>
</tr>
<tr>
<td></td>
<td>(3) 16-bit input probe cable</td>
<td>HP 01550-61607</td>
</tr>
</tbody>
</table>

* May not meet MIL-4562A
** No specific model number is recommended, any variable AC power supply which meets the listed critical specifications may be used.
## Table 4-2. Recommended Test Equipment (cont’d)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications</th>
<th>Recommended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clips</td>
<td>(2) Alligator Clip</td>
<td>Pomona Elect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model 1613-B-0</td>
</tr>
<tr>
<td>Adapters</td>
<td>(1) BNC (m) to Dual Banana (f)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) BNC (f) to Dual Banana (m)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) BNC Tee (m)(f)(f)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) BNC (f) to BNC (f)</td>
<td>Pomona Elect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model 1296</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 1251-2277</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 1250-0781</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 1250-0080</td>
</tr>
<tr>
<td>Resistors</td>
<td>(2) Value: 100 kΩ</td>
<td>HP 0757-0280</td>
</tr>
<tr>
<td></td>
<td>Accuracy: 1%</td>
<td>(See Figure 4-1)</td>
</tr>
<tr>
<td></td>
<td>Power: 0.25W</td>
<td>HP 0757-0465</td>
</tr>
<tr>
<td></td>
<td>(1) Value: 1 kΩ</td>
<td>(See Figure 4-1)</td>
</tr>
<tr>
<td></td>
<td>Accuracy: 1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power: 0.25W</td>
<td></td>
</tr>
<tr>
<td>Test Board</td>
<td>No Substitute</td>
<td>HP 03563-66540</td>
</tr>
<tr>
<td>OR Cables</td>
<td>(3) 16-bit Input Probe Pod</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) 16-bit Pattern Generator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Grabbers (Package of 20)</td>
<td></td>
</tr>
</tbody>
</table>

* May not meet MIL-4562A

** No specific model number is recommended, any variable AC power supply which meets the listed critical specifications may be used.
Performance Tests

**Initial Equipment Setup**

When the recommended test equipment of Table 4-2 is used to complete the performance tests, the instruments below must be set to the preset conditions listed, before beginning a test. In each test, any unspecified parameters should be set to the following conditions:

**Frequency Synthesizer (Both Channels)**

<table>
<thead>
<tr>
<th>Function</th>
<th>SINE WAVE (~)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Voltage</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>OFF</td>
</tr>
<tr>
<td>Amplitude</td>
<td>1 mVrms</td>
</tr>
<tr>
<td>Phase</td>
<td>0 Degrees</td>
</tr>
<tr>
<td>dc Offset</td>
<td>0V</td>
</tr>
<tr>
<td>Modulation</td>
<td>OFF</td>
</tr>
<tr>
<td>Sweep</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**AC Calibrator**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>1 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>.01 Vrms</td>
</tr>
<tr>
<td>Voltage Error%</td>
<td>OFF</td>
</tr>
<tr>
<td>Vernier</td>
<td>0</td>
</tr>
<tr>
<td>Mode</td>
<td>OPER</td>
</tr>
<tr>
<td>Control</td>
<td>LOCAL</td>
</tr>
<tr>
<td>Phase Lock</td>
<td>OFF</td>
</tr>
<tr>
<td>Sense</td>
<td>INTERNAL</td>
</tr>
</tbody>
</table>

**Digital Voltmeter**

<table>
<thead>
<tr>
<th>Function</th>
<th>ac V (~V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>AUTO</td>
</tr>
<tr>
<td>Trigger</td>
<td>INTERNAL</td>
</tr>
<tr>
<td>Sample Rate</td>
<td>MAXIMUM</td>
</tr>
<tr>
<td>High Resolution</td>
<td>ON</td>
</tr>
<tr>
<td>Auto Cal</td>
<td>ON</td>
</tr>
</tbody>
</table>
How To Perform A Performance Test

Conventions

There are two types of keys on the HP 3563A, hardkeys and softkeys. Hardkeys are organized on the front panel according to functional group. See Figure 4-2. In these procedures, the functional group is in brackets, the hardkey appear in bold text and the softkeys are in regular text.

The following example sets a frequency span of 10 kHz. You first press the hardkey FREQ which is found in the Measurement group, followed by the softkey FREQ SPAN. Next, enter the number 10 on the numeric keypad located in the Entry group. Specify the measurement unit by pressing the kHz softkey.

![Functional Group Diagram]

**Note**

In the following test procedures, numeric values may require multiple keystrokes. In the previous example, the value 10 requires two keystrokes, 1 and 0. In the procedures, these keystrokes are represented as 10.

If you make an incorrect keystroke, press the previous hardkey. This will return you to a first level menu which allows you to continue with the procedure.

All test must be performed with Automatic Calibration ON. When the instrument powers up, Auto Cal is on, **do not turn it off**.
Performance Tests
How To Perform A Performance Test

Figure 4-2. HP 3563A Front View - Functional Groups

Figure 4-3. HP 3563A Display
Procedure

1. Start each performance test by setting the test equipment to the specified conditions. If no conditions are listed, set the test equipment to those listed in the preceding section, Initial Setup.

2. Enter the keys specified in the procedure.

3. Record the position of the X and Y markers as indicated for each test. Refer to Figure 4-3 for an example of the position of the X and Y marker readings. Additional information about reading the X and Y marker positions is available in the HP 3563A Operating Reference Manual.

4. Record the results of each of the performance tests on the “Performance Test Record,” located at the end of this chapter. This test record may be reproduced without written permission of Hewlett-Packard.

5. If the HP 3563A fails a test, see the “If Test Fails” section at the end of each test.

Note

The instrument will not record any keystroke during a calibration cycle or a measurement. A status message appears in the lower-right corner of the display. See Figure 4-3.

Note

To minimize the time required to change instrument configurations between tests, do the tests in the order given.
1. Self Test

This test determines if the HP 3563A is operating correctly. No tests should be attempted until the instrument passes this test.

Required Test Equipment

None

Test Duration

This test takes about 1 minute to complete.

Procedure

1. Press the HP 3563A keys as follows:

```
[ Control ]
SPCL
FCTN .... SELF TEST .... SELF TEST
```

2. During the Self Test cycle, the message “Diagnostic In Progress” will appear in the message area. Keystrokes are not recorded during calibration and measurements. You must wait until the measurement is completed.

3. When “Self Test Fasses” is displayed in the lower right corner of the display, check PASS on the Operational Verification Test Record.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

“Fault Isolation Section”, Section VII.
2. DC Offset

This test measures the level of the dc offset generated within the HP 3563A with Auto Cal on.

Specification

For range settings between +27 dBV and -35 dBV the dc offset will be greater than 30 dB below the range setting. For range settings between -36 dBV and -51 dBV the offset will be greater than 20 dB below the range setting.

Required Test Equipment

50Ω feedthrough terminations (2)
Alligator Clip Cables (2)

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 dBVrms</td>
<td>≤ -23 dBV</td>
</tr>
<tr>
<td>-35 dBVrms</td>
<td>≤ -65 dBV</td>
</tr>
<tr>
<td>-51 dBVrms</td>
<td>≤ -71 dBV</td>
</tr>
</tbody>
</table>

Figure 4-4. DC Offset Test Setup
Performance Tests
2. DC Offset

Procedure

1. Connect the HP 3563A as shown in Figure 4-4. Keep the leads to chassis ground as short as possible.

2. Press the HP 3563A keys as follows:

- [Control]
  - [Preset] ....... Reset

- [Input Setup]
  - [Cal] ....... Auto
  - ....... Single

- [Measurement]
  - [Window] ....... Uniform
    (none)

- [Measurement]
  - [Entry] ....... Enter
    - 2
    - Stable

- [Measurement]
  - [Entry] ....... KHz
    - 1

- [Display]
  - [Units] ....... Volts
    - Spec
    - RMS
    - Volts

- [Display]
  - [A&B]

- [Markers]
  - [Entry] ....... Hz
    - 0
3. For each of the range settings listed in Table 4-3, perform steps a through c:

   a. Press the HP 3553A keys as follows:

```
[ Input Setup ]
  RANGE ....... To range setting in Table 4-3.
```

```
[ Control ]
  START
```

   b. Record the Ya marker reading on the Performance Test Record for the Channel 1 measured value.

   c. Record the Yb marker reading on the Performance Test Record for the Channel 2 measured value.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III

Track and Hold Offset Adjustment
Input DC Offset Adjustment

Troubleshooting
Section VIII

A33, A35 Input Boards
A32, A34 Analog Digital Converter Boards
3. Amplitude Accuracy and Flatness

This test measures the amplitude accuracy and flatness of the HP 3563A using the amplitude reference of the ac calibrator.

Specification

If the measurement of a signal is between the BNC center conductor and BNC shell and the amplitude is equal to the range setting, the marker amplitude reading will not deviate from the actual signal amplitude by more than:

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>+27 dBV to −40 dBV</td>
<td>± 0.15 dB ± 0.015% Range Setting</td>
</tr>
<tr>
<td>−41 dBV to −51 dBV</td>
<td>± 0.25 dB ± 0.025% Range Setting</td>
</tr>
</tbody>
</table>

If the measurement of a signal includes a signal between the BNC shell and the chassis, the marker amplitude reading will not deviate from the actual signal amplitude by more than:

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>−27 dBV to −40 dBV</td>
<td>± 0.50 dB ± 0.015% Range Setting</td>
</tr>
<tr>
<td>−41 dBV to −51 dBV</td>
<td>± 0.60 dB ± 0.025% Range Setting</td>
</tr>
</tbody>
</table>

Required Test Equipment

Frequency Synthesizer
BNC Cable (3)
AC Calibrator
Single Banana to Single Banana
Female to Female Barrel
BNC to Dual Banana
BNC Tee (m)(f)(f)
Procedure

1. Connect the test instruments as shown in Figure 4-5.

2. Set the test instruments initially as follows:

**Frequency Synthesizer**

- **Function** ........ SINE WAVE (""")
- **Frequency** .......... 1 kHz
- **Amplitude** .......... 0.5 Vrms
- **Phase** ................ 0 Degrees
- **dc Offset** ............ 0V
- **Modulation** .......... OFF
- **Sweep** ............... OFF
Performance Tests
3. Amplitude Accuracy and Flatness

**AC Calibrator**
- Frequency: 1 kHz
- Amplitude: 2.8184 Vrms
- Voltage Error %: OFF
- Vernier: 0
- Mode: OPER
- Control: LOCAL
- Phase Lock: ON
- Sense: INTERNAL

3. Press the HP 3563A keys as follows:

- `[Control]` PRESET: RESET
- `[Input Setup]` CAL: SINGLE CAL
- `[Input Setup]` INPUT CONFIG: GROUND CHAN 1 GROUND CHAN 2
- `[Measurement]` WINDOW: FLAT TOP
- `[Measurement]` AVG: 4 ENTER
- `[Display]` UNITS: P SPEC UNITS RMS VOLTS
- `[Display]` A & B
Amplitude Accuracy and Flatness Measurement One

<table>
<thead>
<tr>
<th>HP 3563A Range</th>
<th>Signal Frequency</th>
<th>AC Calibrator Amplitude</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 dBVrms</td>
<td>1 kHz</td>
<td>2.8184 Vrms</td>
<td>8.849 dBV</td>
</tr>
<tr>
<td>9 dBVrms</td>
<td>99 kHz</td>
<td>2.8184 Vrms</td>
<td>8.849 dBV</td>
</tr>
<tr>
<td>-13 dBVrms</td>
<td>1 kHz</td>
<td>2.2387 Vrms</td>
<td>-13.15 dBV</td>
</tr>
<tr>
<td>-13 dBVrms</td>
<td>50 kHz</td>
<td>2.2387 Vrms</td>
<td>-13.15 dBV</td>
</tr>
<tr>
<td>-13 dBVrms</td>
<td>90 kHz</td>
<td>2.2387 Vrms</td>
<td>-13.15 dBV</td>
</tr>
<tr>
<td>-13 dBVrms</td>
<td>99 kHz</td>
<td>2.2387 Vrms</td>
<td>-13.15 dBV</td>
</tr>
<tr>
<td>-23 dBVrms</td>
<td>1 kHz</td>
<td>70.795 mVrms</td>
<td>-23.15 dBV</td>
</tr>
<tr>
<td>-23 dBVrms</td>
<td>99 kHz</td>
<td>70.795 mVrms</td>
<td>-23.15 dBV</td>
</tr>
<tr>
<td>-26 dBVrms</td>
<td>1 kHz</td>
<td>50.119 mVrms</td>
<td>-26.15 dBV</td>
</tr>
<tr>
<td>-21 dBVrms</td>
<td>1 kHz</td>
<td>89.125 mVrms</td>
<td>-21.15 dBV</td>
</tr>
<tr>
<td>-17 dBVrms</td>
<td>1 kHz</td>
<td>14125 Vrms</td>
<td>-17.15 dBV</td>
</tr>
<tr>
<td>-14 dBVrms</td>
<td>1 kHz</td>
<td>19953 Vrms</td>
<td>-14.15 dBV</td>
</tr>
<tr>
<td>-11 dBVrms</td>
<td>1 kHz</td>
<td>26184 Vrms</td>
<td>-11.15 dBV</td>
</tr>
</tbody>
</table>

BNC shell grounded

Procedure

1. Press the HP 3563A keys as follows:

   [ Input Setup ]
   RANGE ......... To range setting in Table 4-4.

   [ Measurement ]
   FREQ ......... CENTER ......... To signal frequency in Table 4-4.
   FREQ

2. Set the AC Calibrator to the signal frequency in Table 4-4.

3. Set the Frequency Synthesizer to the signal frequency in Table 4-4.

4. Set the AC Calibrator to the amplitude in Table 4-4.
Performance Tests
3. Amplitude Accuracy and Flatness

5. Press the HP 3563A keys as follows:

[ Control ]
START
[ Markers ]
SPCL
MARKER ....... MRKR →
PEAK

6. Record the Ya marker reading on the Performance Test Record for the measured value Channel 1.

7. Record the Yb marker reading on the Performance Test Record for the measured value Channel 2.

8. Repeat steps 1 through 7 for each of the remaining settings in Table 4-4.
Amplitude Accuracy and Flatness Measurement Two

Table 4-5. Amplitude Accuracy and Flatness Measurement Two

<table>
<thead>
<tr>
<th>HP 3563A Range</th>
<th>Signal Frequency</th>
<th>AC Calibrator Amplitude</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower Limit</td>
</tr>
<tr>
<td>−51 dBVrms</td>
<td>1 kHz</td>
<td>2.8184 mVrms</td>
<td>−51.25 dBV</td>
</tr>
<tr>
<td>−49 dBVrms</td>
<td>1 kHz</td>
<td>3.5461 mVrms</td>
<td>−49.25 dBV</td>
</tr>
<tr>
<td>−47 dBVrms</td>
<td>1 kHz</td>
<td>4.4668 mVrms</td>
<td>−47.25 dBV</td>
</tr>
<tr>
<td>−45 dBVrms</td>
<td>1 kHz</td>
<td>5.6234 mVrms</td>
<td>−45.25 dBV</td>
</tr>
<tr>
<td>−43 dBVrms</td>
<td>1 kHz</td>
<td>7.0795 mVrms</td>
<td>−43.25 dBV</td>
</tr>
<tr>
<td>−41 dBVrms</td>
<td>1 kHz</td>
<td>8.9125 mVrms</td>
<td>−41.25 dBV</td>
</tr>
<tr>
<td>−39 dBVrms</td>
<td>1 kHz</td>
<td>11.220 mVrms</td>
<td>−39.25 dBV</td>
</tr>
</tbody>
</table>

BNC shell grounded

Procedure

1. Press the HP 3563A keys as follows:

```
[RANGE]-------To range setting in Table 4-5.

[FREQ]------CENTER------To signal frequency
            FREQ in Table 4-5.
```

2. Set the AC Calibrator to the signal frequency in Table 4-5.

3. Set the Frequency Synthesizer to the signal frequency in Table 4-5.

4. Set the AC Calibrator to the amplitude in Table 4-5.
Performance Tests

3. Amplitude Accuracy and Flatness

5. Press the HP 3563A keys as follows:

CONTROL
START

[ Markers ]
SPCL
MARKER ....... MRKR->
PEAK

6. Record the Ya marker reading on the Performance Test Record for the measured value Channel 1.

7. Record the Yb marker reading on the Performance Test Record for the measured value Channel 2.

8. Repeat steps 1 through 7 for each of the remaining settings in Table 4-5.
Amplitude Accuracy and Flatness Measurement Three

Table 4-6. Amplitude Accuracy and Flatness Measurement Three

<table>
<thead>
<tr>
<th>HP 3563A Range</th>
<th>Signal Frequency</th>
<th>AC Calibrator Amplitude</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower Limit</td>
</tr>
<tr>
<td>8 dBVrms</td>
<td>1 kHz</td>
<td>2.5119 Vrms</td>
<td>7.499 dBV</td>
</tr>
<tr>
<td>8 dBVrms</td>
<td>99 kHz</td>
<td>2.5119 Vrms</td>
<td>7.499 dBV</td>
</tr>
<tr>
<td>−11 dBVrms</td>
<td>1 kHz</td>
<td>0.28184 Vrms</td>
<td>−11.50 dBV</td>
</tr>
<tr>
<td>−13 dBVrms</td>
<td>1 kHz</td>
<td>0.22387 Vrms</td>
<td>−13.50 dBV</td>
</tr>
<tr>
<td>−13 dBVrms</td>
<td>50 kHz</td>
<td>0.22387 Vrms</td>
<td>−13.50 dBV</td>
</tr>
<tr>
<td>−13 dBVrms</td>
<td>90 kHz</td>
<td>0.22387 Vrms</td>
<td>−13.50 dBV</td>
</tr>
<tr>
<td>−13 dBVrms</td>
<td>99 kHz</td>
<td>0.22387 Vrms</td>
<td>−13.50 dBV</td>
</tr>
<tr>
<td>−27 dBVrms</td>
<td>1 kHz</td>
<td>44.668 mVrms</td>
<td>−27.50 dBV</td>
</tr>
<tr>
<td>−27 dBVrms</td>
<td>99 kHz</td>
<td>44.668 mVrms</td>
<td>−27.50 dBV</td>
</tr>
</tbody>
</table>

Procedure

1. Press the HP 3563A keys as follows:

   [ Input Setup ]
   INPUT
   CONFIG ......... FLOAT
   CHAN 1
   ......... FLOAT
   CHAN 2

2. Reverse the banana plug connector at the ac calibrator so the high input signal goes to the BNC shell of HP 3563A's input channels. The BNC center conductor should be grounded for each channel.

3. Press the HP 3563A keys as follows:

   [ Input Setup ]
   RANGE ......... To range setting in Table 4-6

   [ Measurement ]
   FREQ ......... CENTER ......... To signal frequency in Table 4-6.
   FREQ

4. Set the AC Calibrator to the signal frequency in Table 4-6.

5. Set the Frequency Synthesizer to the signal frequency in Table 4-6.

6. Set the AC Calibrator to the amplitude in Table 4-6.
Performance Tests
3. Amplitude Accuracy and Flatness

7. Press the HP 3563A keys as follows:

[ Control ]
START

[ Markers ]
SPCL
MARKER ...... MRKR→
PEAK

8. Record the Ya marker reading on the Performance Test Record for the measured value Channel 1.

9. Record the Yb marker reading on the Performance Test Record for the measured value Channel 2.

10. Repeat steps 3 through 9 for each of the remaining settings in Table 4-6.

If Test Fails
If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III 2nd Pass Gain Adjustment
AC Offset and Reference Adjustment
Input Flatness Adjustment
Input Attenuator Adjustments
Calibrator Adjustment

Troubleshooting
Section VII A33, A35 Input Boards
A32, A34 Analog Digital Converter Boards
A30 Analog Source Board
4. Amplitude Linearity

This test measures the amplitude linearity of the HP 3563A by using the amplitude reference of the AC Calibrator.

Specification

If the measurement of a signal is between the BNC center conductor and BNC shell and the amplitude is equal to the range setting, the marker amplitude reading will not deviate from the actual signal amplitude by more than:

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>+27 dBV to -40 dBV</td>
<td>± 0.15 dB ± 0.015% Range Setting</td>
</tr>
<tr>
<td>-41 dBV to -51 dBV</td>
<td>± 0.25 dB ± 0.025% Range Setting</td>
</tr>
</tbody>
</table>

If the measurement of a signal includes a signal between the BNC shell and the chassis, the marker amplitude reading will not deviate from the actual signal amplitude by more than:

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>+27 dBV to -40 dBV</td>
<td>± 0.50 dB ± 0.015% Range Setting</td>
</tr>
<tr>
<td>-41 dBV to -51 dBV</td>
<td>± 0.60 dB ± 0.025% Range Setting</td>
</tr>
</tbody>
</table>

Required Test Equipment

Frequency Synthesizer
BNC Cable (3)
AC Calibrator
Single Banana to Single Banana
Female to Female Barrel
BNC to Dual Banana
BNC Tee (m)(f)(f)
Performance Tests
4. Amplitude Linearity

Figure 4-6. Amplitude Linearity Test Setup

Procedure

1. Connect the test instruments as shown in Figure 4-6.

2. Set the test instruments initially as follows:

Frequency Synthesizer

<table>
<thead>
<tr>
<th>Function</th>
<th>SINE WAVE (~)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Amplitude</td>
<td>1 Vrms</td>
</tr>
<tr>
<td>Phase</td>
<td>0 Degrees</td>
</tr>
<tr>
<td>dc Offset</td>
<td>0V</td>
</tr>
<tr>
<td>Modulation</td>
<td>OFF</td>
</tr>
<tr>
<td>Sweep</td>
<td>OFF</td>
</tr>
</tbody>
</table>
AC Calibrator
Frequency ........ 10 kHz
Amplitude ........ 10 Vrms
Voltage ........... OFF
Error % .......... 0
Vernier .......... OPER
Mode ........... LOCAL
Control .......... ON
Phase Lock ...... INTERNAL
Sense ..............

3. Press the HP 3563A keys as follows:

[ Control ]
PRESET .......... RESET

[ Input Setup ]
CAL ........ SINGLE

[ Measurement ]
WINDOW ....... FLAT
TOP

[ Measurement ]
AVG ........ 4
...... ENTER

...... STABLE

[ Input Setup ]
RANGE .......... 21 dBVrms

[ Measurement ]
FREQ ........ CENTER
FREQ

[ Input Setup ]
INPUT
CONFIG .......
GROUND
CHAN 1
GROUND
CHAN 2
Performance Tests
4. Amplitude Linearity

[ Display ]

UNIT  ...... P SPEC ...... VOLTS
UNIT  ...... RMS
...... VOLTS

[ Display ]

A&B

Note

Y AUTO SCALE may not scale below 100 mV when on the 21 dBV RMS range; however, the measurement value is correct. The Y scale can be set manually by using Y FIXED SCALE.

[ Display ]

COORD ...... MAG (LIN)

[ Display ]

SCALE ...... Y AUTO SCALE

Table 4-7. Amplitude Linearity

<table>
<thead>
<tr>
<th>AC Calibrator Amplitude</th>
<th>Specification BNC shell grounded</th>
<th>Specification BNC center conductor grounded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper Limit</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>10.00 Vrms</td>
<td>10.18 Vrms</td>
<td>9.827 Vrms</td>
</tr>
<tr>
<td>1000 Vrms</td>
<td>1.019 Vrms</td>
<td>981.4 mVrms</td>
</tr>
<tr>
<td>100.0 mVrms</td>
<td>103.2 mVrms</td>
<td>96.79 mVrms</td>
</tr>
<tr>
<td>10.00 mVrms</td>
<td>11.67 mVrms</td>
<td>8.329 mVrms</td>
</tr>
<tr>
<td>3.1623 mVrms</td>
<td>4.717 mVrms</td>
<td>1.608 mVrms</td>
</tr>
<tr>
<td>1.000 mVrms</td>
<td>2.517 mVrms</td>
<td>-517.1 μVrms</td>
</tr>
</tbody>
</table>

4. For each of the amplitudes listed in Table 4-9, perform steps a through d.

a. Set the AC Calibrator to the amplitude listed in Table 4-9.

b. Press the HP 3563A keys as follows:

[ Control ]

START

[ Markers ]

SPCL
MARKER ...... MRKR →
PEAK

4-26
c. Record the Ya marker reading on the Performance Test Record for the measured value Channel 1.

d. Record the Yb marker reading on the Performance Test Record for the measured value Channel 2.

5. Press the HP 3563A keys as follows:

```
[ Input Setup ]
INPUT
CONFIG ...... FLOAT
CHAN 1
...... FLOAT
CHAN 2
```

6. Reverse the banana plug connector at the ac calibrator so the high input signal goes to the BNC shell of HP 3563A’s input channels. The BNC center conductor should be grounded for each channel.

7. Repeat 4a through 4d for BNC center conductor grounded.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

- Adjustments
  - Section III
    - 2nd Pass Gain Adjustment
    - ADC Offset and Reference Adjustment
    - Input Flatness Adjustment
    - Input Attenuator Adjustments
    - Calibrator Adjustment

- Troubleshooting
  - Section VII
    - A33, A35 Input Boards
    - A32, A34 Analog Digital Converter Boards
    - A30 Analog Source Board
5. Amplitude and Phase Match

This test determines if the HP 3563A's amplitude and phase match between Channel 1 and Channel 2 are within the specified limits.

Specification

BNC shell of both channels grounded:
The amplitude deviation between channels will be no more than 0.1 dB, and the phase deviation no more than 0.5 degrees.

BNC center conductor of both channels grounded:
The amplitude deviation between channels will be no more than 0.8 dB, and the phase deviation no more than 8.5 degrees.

Required Test Equipment

BNC TEE (m)(f)(f)
BNC/Dual Banana Cable
BNC Male/Dual Banana Female
Female to Female Barrel
BNC Cable (2) ≤ 30 cm

Figure 4-7. Amplitude and Phase Match Test Setup
Procedure

1. Connect the HP 3563A as shown in Figure 4-7. The cables to Channel 1 and Channel 2 must be the same length.

2. Press the HP 3563A keys as follows:

```
[ Control ]
  PRESET ...... RESET

[ Input Setup ]
  CAL ...... SINGLE
          CAL

[ Input Setup ]
  INPUT CONFIG ...... CHAN 1
          AC
          CHAN 2
          AC
          GROUND
          CHAN 1
          GROUND
          CHAN 2

[ Input Setup ]
  SELECT TRIG ...... 0 ...... V
          ...... SOURCE TRIG

[ Measurement ]
  WINDOW ...... UNIFRM
              (NONE)

[ Measurement ]
  AVG ...... 16 ...... ENTER
          ...... STABLE

[ Measurement ]
  SOURCE ...... SOURCE
              TYPE ...... PRIODC
              CHIRP
```
Performance Tests
5. Amplitude and Phase Match

[ Display ]
MEAS
DISP ........ FREQ
RESP

[ Display ]
SCALE ........ X FIXD ........ [ Entry ]
 ........ .375, 100 kHz
SCALE

3. Press the HP 3563A keys as follows:

[ Input Setup ] ........ [ Entry ]
RANGE ........ -47 dBVrms

[ Measurement ]
SOURCE ........ SOURCE ........ [ Entry ]
LEVEL ........ -49 dBVrms

[ Display ]
SCALE ........ Y FIXD ........ [ Entry ]
SCALE ........ -.2, .2 dB

[ Control ]
START

[ Markers ] ........ [ Entry ]
Y ........ .1, .1 dB

4. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 1.

5. Press the HP 3563A keys as follows:

[ Input Setup ] ........ [ Entry ]
RANGE ........ 0 dBVrms

[ Measurement ]
SOURCE ........ SOURCE ........ [ Entry ]
LEVEL ........ 0 dBVrms

[ Control ]
START

[ Markers ] ........ [ Entry ]
Y ........ -.1, .1 dB

6. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 2.
7. Press the HP 3563A keys as follows:

```
[ Input Setup ]   [ Entry ]
RANGE           .......  10 dBVrms

[ Input Setup ]   [ Entry ]
SOURCE     ....... SOURCE LEVEL .......  10 dBVrms

[ Control ]
START

[ Markers ]   [ Entry ]
Y            ....... -.1,.1dB
```

8. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 3.

9. Press the HP 3563A keys as follows:

```
[ Input Setup ]   [ Entry ]
RANGE           ....... -47 dBVrms

[ Measurement ]   [ Entry ]
SOURCE     ....... SOURCE LEVEL ....... -49 dBVrms

[ Display ]
COORD ....... PHASE

[ Control ]
START

[ Display ]   [ Entry ]
SCALE    ....... Y FIXD SCALE ....... -1, 1 Degree

[ Markers ]   [ Entry ]
Y            ....... Y VALUE ....... -.5,.5 Degree
```

10. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 4.
5. Amplitude and Phase Match

11. Press the HP 3563A keys as follows:

[ Input Setup ] [ Entry ]
RANGE ......... 0 dBVrms

[ Measurement ] [ Entry ]
SOURCE ......... SOURCE LEVEL ......... 0 dBVrms

[ Control ]
START

[ Markers ] [ Entry ]
Y ......... Y ......... -.5, .5 Degree
VALUE

12. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 5.

13. Press the HP 3563A keys as follows:

[ Input Setup ] [ Entry ]
RANGE ......... 10 dBVrms

[ Measurement ] [ Entry ]
SOURCE ......... SOURCE LEVEL ......... 10 dBVrms

[ Control ]
START

[ Markers ] [ Entry ]
Y ......... Y ......... -.5, .5 Degree
VALUE

14. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 6.
15. Reverse one of the banana plug connectors so the center conductor of each channel's BNC is grounded.

16. Press the HP 3563A keys as follows:

```
Input Setup
INPUT
CONFIG ...... FLOAT
CHAN 1
...... FLOAT
CHAN 2

Display
COORD ...... MAG(dB)

Display
SCALE ...... Y FIXD
SCALE ...... Entry -1.1 dB

Measurement
SOURCE SOURCE
LEVEL ...... Entry -13 dBVrms

Input Setup
RANGE ...... Entry -13 dBVrms

Control
START

Markers
Y ...... Y
VALUE ...... Entry -.8, .8 dB
```

17. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 7.
18. Press the HP 3563A keys as follows:

- Input Setup: RANGE ......... 8 dBVrms
- Measurement: SOURCE ......... SOURCE LEVEL ......... 8 dBVrms
- Control: START
- Markers: Y ......... Y VALUE ......... -8, .8 dB

19. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 8.

20. Press the HP 3563A keys as follows:

- Input Setup: RANGE ......... -13 dBVrms
- Measurement: SOURCE ......... SOURCE LEVEL ......... -13 dBVrms
- Display: COORD ......... PHASE
- Control: START
- Display: SCALE ......... Y FIXD SCALE ......... -10, 10 Degree
- Markers: Y ......... Y VALUE ......... -8.5, 8.5 Degree
21. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 9.

22. Press the HP 3563A keys as follows:

- **Input Setup**
  - RANGE .............. 8 dBVrms

- **Measurement**
  - SOURCE .............. SOURCE
  - LEVEL .............. 8 dBVrms

- **Control**
  - START

- **Markers**
  - Y .............. Y
  - VALUE .............. -8.5, 8.5 Degree

23. If the measurement is within the marker band, check PASS on the Performance Test Record for Part 10.

**If Test Fails**

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

- **Adjustments**
  - Section III
    - 2nd Pass Gain Adjustment
    - ADC Offset and Reference Adjustment
    - Input Flatness Adjustment
    - Input Attenuator Adjustments
    - Calibrator Adjustment

- **Troubleshooting**
  - Section VII
    - A33, A35 Input Boards
    - A32, A34 Analog Digital Converter Boards
    - A30 Analog Source Board
6. Anti-Alias Filter Response

Signals with frequencies greater than 156 kHz may be shifted down into the 100 kHz frequency range as a result of the HP 3563A's 256 kHz sample rate. This test measures the ability of the 100 kHz low pass anti-alias filter to reject frequencies 156 kHz and greater.

Note

The frequency synthesizer may produce some spurious signals in the 0 to 100 kHz span. Ignore signals at frequencies other than those listed in the table when performing this test.

Specification

All signals aliasing into the 0 to 100 kHz frequency span will be attenuated at least 80 dB below the range setting.

Required Test Equipment

Frequency Synthesizer
Female to Female Barrel
50Ω feedthrough termination
BNC Cable (3)
BNC TEE (m)(f)(f)

Figure 4-8. Anti-Alias Filter Response Test
Procedure

1. Connect the test instruments as shown in Figure 4-8.

2. Set the test instruments initially as follows:

**Frequency Synthesizer**

- **Function**: SINE WAVE (~)
- **Frequency**: 156 kHz
- **Amplitude**: 1 Vrms
- **Phase**: 0 Degrees
- **dc Offset**: 0V
- **Modulation**: OFF
- **Sweep**: OFF

3. Press the HP 3563A keys as follows:

- [Control]
  - **Preset**: RESET
- [Input Setup]
  - **Cal**: SINGLE
  - **Range**: 1 Vrms
- [Measurement]
  - **Avg**: 16
  - **Window**: FLAT
  - **Input Config**: GROUND CHAN 1
  - **Input Config**: GROUND CHAN 2

---

Performance Tests

6. Anti-Alias Filter Response
Performance Tests
6. Anti-Alias Filter Response

[ Display ]
A&B

[ Display ]
UNITS......P SPEC......VOLTS
UNITS......RMS
......VOLTS

Table 4-8. Anti-Alias Filter

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Alias Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>156 kHz</td>
<td>100 kHz</td>
</tr>
<tr>
<td>184 kHz</td>
<td>72 kHz</td>
</tr>
<tr>
<td>206 kHz</td>
<td>50 kHz</td>
</tr>
<tr>
<td>267 kHz</td>
<td>11 kHz</td>
</tr>
</tbody>
</table>

4. For each of the signal frequencies listed in Table 4-8 perform steps a through d:

a. Set the frequency synthesizer to the signal frequency in Table 4-8.

b. Press the HP 3563A keys as follows:

[ Control ]
START

[ Markers ]
X......To alias frequency in Table 4-8.

c. If the Ya reading is less than or equal to –80 dBVrms check PASS on the Performance Test Record for Channel 1.

d. If the Yb reading is less than or equal to –80 dBVrms check PASS on the Performance Test Record for Channel 2.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments                        None
Section III

Troubleshooting                   A32, A34 Analog Digital Converter Boards
Section VIII
7. Frequency Accuracy

This test measures the frequency accuracy of the HP 3563A using the Frequency Synthesizer as a reference.

Specification

The frequency reading will not deviate from the actual signal frequency by more than 0.004%.

Required Test Equipment

Frequency Synthesizer
50Ω feedthrough termination
BNC Cable

Figure 4-9. Frequency Accuracy Test Setup
Performance Tests
7. Frequency Accuracy

Procedure

1. Connect the test equipment as shown in Figure 4-9.

2. Set the Frequency Synthesizer as follows:
   - Function ........ SINE WAVE (\~)
   - Frequency ....... 99 kHz
   - Amplitude ........ 1 Vrms
   - Phase ............ 0 Degrees
   - dc Offset ........ 0V
   - Modulation ........ OFF
   - Sweep ............ OFF

3. Press the HP 3563A keys as follows:

   - Control
     - PRESET ......... RESET
   - Input Setup
     - CAL ......... SINGLE
     - CAL
   - Input Setup
     - RANGE ......... 0 dBVrms
   - Measurement
     - FREQ ......... CENTER
     - FREQ ......... 99 kHz
     - FREQ ......... 0.5 kHz
     - SPAN
   - Measurement
     - AVG ......... 2
     - ENTER
     - STABLE
   - Control
     - START
   - Markers
     - X

4. Record the X marker reading as the measured value on the Performance Test Record.
If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

Adjustments
Section III

Troubleshooting
Section VIII

<table>
<thead>
<tr>
<th>20.48 MHz Reference Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A31 Trigger Board</td>
</tr>
</tbody>
</table>
8. Input Coupling Insertion Loss

This test measures the insertion loss at 1 Hz due to the ac coupling capacitors. The amplitude of a 1 Hz signal is measured in both ac and dc coupled modes. The insertion loss is calculated as:

\[
\text{dc Coupled Amplitude} \div \text{ac Coupled Amplitude} = \text{Insertion Loss}
\]

Specification

The insertion loss at 1 Hz due to the ac coupling capacitors will be less than 3 dB (41.3%).

Required Test Equipment

Frequency Synthesizer
50Ω feedthrough termination
BNC Tee (m)(f)(f)
Female to Female Barrel
BNC cable (3)

![Figure 4-10. Input Coupling Insertion Loss Test Setup](image)
Procedure

1. Connect the test equipment as shown in Figure 4-10.

2. Set the Frequency Synthesizer initially as follows:
   - Function: SINE WAVE (\(^\sim\) )
   - Frequency: 1 Hz
   - Amplitude: 1 Vrms
   - Phase: 0 Degrees
   - dc Offset: 0 V
   - Modulation: OFF
   - Sweep: OFF

3. Press the HP 3563A keys as follows:

   [Control]
   PRESET ............ RESET

   [Input Setup]
   CAL ............ SINGLE

   [Input Setup] [Entry]
   RANGE ............ 1 Vrms

   [Measurement] [Entry]
   FREQ ............ FREQ
   SPAN ............ 100 Hz

   [Measurement]
   WINDOW ............ UNIFRM
   (NONE)

   [Measurement] [Entry]
   AVG ............ 4

   [Display]
   UNITS ............ P SPEC

   UNITS ............ RMS

   VOLTS

   VOLTS
Performance Tests
8. Input Coupling Insertion Loss

[ Input Setup ]
INPUT
CONFIG ....... Chan 1
AC

[ Control ]
START

---

Note

Wait for measurement to finish before proceeding. “Measurement Complete” will appear in the status line of the display.

---

[ Markers ]

X ....... 1 Hz ....... XMRKR
SCALE

[ Control ]

SAVE
RECALL ....... SAVE DATA # ....... 1
ENTER

INPUT
CONFIG ....... Chan 1
DC

[ Control ]
START

[ Operators ]

MATH ....... DIV ....... SAVED
1

---

Note

Ignore math overflow message.

---

4. Record the Ya reading on the Performance Test Record for Channel 1.
5. Press the HP 3563A keys as follows:

```
[ Display ]
  B

[ Input Setup ]
  INPUT
  CONFIG  ......  CHAN 2
          AC

[ Control ]
  START

[ Markers ]
  X  ......  X MRKR
           SCALE

[ Control ]
  SAVE
  RECALL  ......  SAVE
           DATA #
           ENTER

[ Input Setup ]
  INPUT
  CONFIG  ......  CHAN 2
          DC

[ Control ]
  START
```

**Note**  
Wait for measurement to finish before proceeding. “Measurement Complete” will appear in the status line of the display.

6. Record the Yb reading on the Performance Test Record for Channel 2.
Performance Tests
8. Input Coupling Insertion Loss

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

Adjustments

None

Troubleshooting

A33, A35 Input Boards

Section VIII
9. Single Channel Phase Accuracy

This test measures the phase accuracy of the HP 3563A relative to the phase of the trigger signal. The Frequency Synthesizer is used to input a square wave to one channel and the external trigger input.

Specification

When the BNC shell of a channel is grounded, the marker phase reading will not deviate from the actual phase of the signal relative to the trigger by more than:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Phase Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hz to &lt;10 kHz</td>
<td>± 2.5 degrees</td>
</tr>
<tr>
<td>10 kHz to 100 kHz</td>
<td>± 12.0 degrees</td>
</tr>
</tbody>
</table>

When the BNC center conductor of a channel is grounded, the marker phase reading will not deviate from the actual phase of the signal relative to the trigger by more than:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Phase Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to &lt;10 kHz</td>
<td>± 6.5 degrees</td>
</tr>
<tr>
<td>10 kHz to 100 kHz</td>
<td>± 16.0 degrees</td>
</tr>
</tbody>
</table>

Required Test Equipment

- Frequency Synthesizer
- 50Ω feedthrough termination
- BNC Tees (2) (m)(f)(f)
- Female to Female Barre
- BNC/Dual Banana
- BNC (m)/Banana (f)
- BNC Cable (2)
- BNC Cable: length ≤ 30 cm (2)

![Diagram of test setup](image)

Figure 4-11. Single Channel Phase Accuracy Test Setup
Performance Tests
9. Single Channel Phase Accuracy

Procedure

1. Connect the test instruments as shown in Figure 4-11.

2. Set the Frequency Synthesizer as follows:

   - Function: Square Wave
   - Frequency: 9 kHz
   - Amplitude: 1 Vrms
   - DC Offset: 0 Vdc
   - Phase: 0 Degrees
   - Modulation: OFF
   - Sweep: OFF

3. Press the HP 3563A keys as follows:

   - Control
     - PRESET: RESET
   - Input Setup
     - CAL: SINGLE CAL
   - Measurement
     - SELECT
     - MEAS: POWER SPEC
   - Input Setup
     - INPUT
     - CONFIG: GROUND CHAN 1
     - GROUND CHAN 2
   - Measurement
     - AVG
     - Entry: 5
     - ENTER
     - STABLE
     - TIM AV
     - ON
Performance Tests
9. Single Channel Phase Accuracy

[Measurement]
WINDOW .... UNIFRM
(NONE)

[Input Setup] [Entry]
SELECT TRIG .... 0 V

[Display]
MEAS DISP .... FILTRD INPUT .... LINEAR SPEC1

[Display]
B .... LINEAR SPEC2

[Display]
A&B

[Display]
COORD .... PHASE

Table 4-9. Single Channel Phase Accuracy

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Trigger Slope</th>
<th>Trigger Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>INPUT Channel 1</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>INPUT Channel 2</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>EXTERNAL</td>
</tr>
<tr>
<td>9 kHz</td>
<td>NEG</td>
<td>EXTERNAL</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>INPUT Channel 1</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>INPUT Channel 2</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>EXTERNAL</td>
</tr>
</tbody>
</table>

4. For each of the frequencies listed in Table 4-9 perform steps a through d:

a. Set the Frequency Synthesizer as follows:
   Frequency .... To signal frequency in Table 4-9.

b. Press the HP 3563A keys as follows:

[Input Setup]
SELECT TRIG .... To trigger slope in Table 4-9.

.... To trigger type in Table 4-9.
Performance Tests
9. Single Channel Phase Accuracy

To select an external trigger type, press:

\[ \ldots \ldots \quad \text{MORE} \quad \ldots \ldots \quad \text{EXT} \quad \text{TRIG} \]

\[ \text{[ Control ]} \]
\[ \text{START} \]

\[ \text{[ Markers ]} \]
\[ X \quad \ldots \ldots \quad \text{To signal frequency in Table 4-9.} \]

c. Record the Ya marker reading on the Performance Test Record for CHANNEL 1 measured value, BNC shell grounded.

d. Record the Yb marker reading on the Performance Test Record for CHANNEL 2 measured value, BNC shell grounded.

5. Reverse one of the banana plug connectors so the center conductor of each channel's BNC is grounded.

6. Press the HP 3563A keys as follows:

\[ \text{[ Input Setup ]} \]
\[ \text{INPUT} \]
\[ \text{CONFIG} \quad \ldots \ldots \quad \text{FLOAT} \]
\[ \text{CHAN 1} \]
\[ \ldots \ldots \quad \text{FLOAT} \]
\[ \text{CHAN 2} \]

7. Repeat steps 4a through 4d for the BNC center conductors grounded.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
None

Troubleshooting
Section VII

A33, A35 Input Boards
A32, A34 Analog Digital Converter Boards
A31 Trigger Board
A6 Digital Filter Controller
A1 Digital Source
10. Digital Input/Output

This test verifies the instrument’s ability to take a digital measurement. The digital source is used to verify the operation of Input Pod 1 and Input Pod 2, using both internal and external paths. The digital source is used to verify the Qualifier Pod, Pod Q, by using an external path.

Required Test Equipment

A40 Test Board
8-bit Probe Cables (3)
16-bit Probe Cables (3)
Pattern Generator Probe Lead Set

Note

If the A40 Test Board is not available, see the alternate setup following this procedure.

Figure 4-12. Digital Input/Output Test Setup
Performance Tests
10. Digital Input/Output

Procedure

1. Press the Line switch OFF.

2. Using the cables, connect the test board to the rear panel of the HP 3563A as shown in Figure 4-12. Verify the jumper is in the normal position (N).

3. Press the Line switch ON.

4. Press the HP 3563A keys as follows:

```
[ Control ]
  PRESET ...... RESET

[ Control ]
  SPCL
  FCTN ...... SERVIC ...... TEST
             ...... TEST INPUT
             ...... DIGITAL ...... INTERN
             ...... PATH
```

5. If the test passes, check PASS on the Performance Test Record for Internal Path.

6. Press the HP 3563A keys as follows:

```
...... INPUT
POD 1
```

---

**Note**

Wait for the test to finish before proceeding. This test takes approximately 1 minute to complete.

---

7. If the test passes, check PASS on the Performance Test Record for Input Pod 1.

8. Press the HP 3563A keys as follows:

```
...... INPUT
POD 2
```

---

**Note**

Wait for the test to finish before proceeding. This test takes approximately 1 minute to complete.

---

9. If the test passes, check PASS on the Performance Test Record for Input Pod 2.
10. Press the HP 3563A keys as follows:

    ...... QUALFR
    POD

Note: Wait for the test to finish before proceeding. This test takes approximately 1 minute to complete.

11. If the test passes, check PASS on the Performance Test Record for Qualifier Pod.

12. Press the HP 3563A keys as follows:

    [ Control ]
    SPCL
    FCTN
    ...... SERVIC
    ...... TEST
    ...... TEST
    ...... SOURCE
    ...... ARBITRARY

Note: This test takes approximately 1 minute to complete.

13. If the test passes, check PASS on the Performance Test Record for Arbitrary Source.
Performance Tests
10. Digital Input/Output

Alternate Setup for Digital Input/Output Test

Use this test method to verify the operation of the digital input/output if the A40 Test Board is not available.

Required Test Equipment

- 16-bit input probe cables (3)
- 16-bit input probe pods (3)
- 8-bit output probe cables (3)
- Pattern Generator Probe Lead Set (3)
- Grabbers (4 packages of 20 each)

Figure 4-13. Pod Line Description
### Table 4-10. Cable Connections

<table>
<thead>
<tr>
<th>Source LSB Pod Line</th>
<th>Input Pod 1 Line</th>
<th>Input Pod 2 Line</th>
<th>Qualifier Pod Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Q0 (0)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Q1 (1)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>Q2 (2)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Q3 (3)</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>Q4 (4)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>Q5 (5)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>6</td>
<td>Q6 (6)</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>7</td>
<td>Q7 (7)</td>
</tr>
<tr>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td>nc&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source MSB Pod Line</th>
<th>Input Pod 1 Line</th>
<th>Input Pod 2 Line</th>
<th>Qualifier Pod Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8</td>
<td>8</td>
<td>TRG (15)</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>9</td>
<td>nc</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>10</td>
<td>nc</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>11</td>
<td>nc</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>nc</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>13</td>
<td>nc</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>14</td>
<td>nc</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>15</td>
<td>nc</td>
</tr>
<tr>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td>nc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pod X Line</th>
<th>Input Pod 1 Line</th>
<th>Input Pod 2 Line</th>
<th>Qualifier Pod Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCE CLK</td>
<td>CLK</td>
<td>CLK</td>
<td>CLK</td>
</tr>
<tr>
<td>GND</td>
<td>GND</td>
<td>GND</td>
<td>GND</td>
</tr>
</tbody>
</table>

<sup>1</sup> No Connection

### Procedure

1. Press the Line switch OFF.

2. Connect the six probe pods to the six probe cables.

### Hint

The self-tests for Input Pod 1, Input Pod 2 and the Qualifier Pod, can be run independently. The test setup may be easier if you connect the Input Pods and the Qualifier Pod one at a time to the Source and Pod X lines.
Performance Tests
10. Digital Input/Output

3. Connect the grabbers to the ends of the probe pods.

4. Install the three 16-bit input probe cables into the analyzer’s Pod Q, Input Pod 1, and Input Pod 2 rear-panel connectors.

5. Install the three 8-bit output probe cables into the Source’s LSB Pod, the Source’s MSB Pod, and Pod X rear-panel connectors.

6. Refer to Figure 4-13 for the description of each pod line. Connect the cables using the grabbers as indicated in Table 4-10. Connect the lines in each row together.

7. Press the Line switch ON.

8. Press the HP 3563A keys as follows:

```
[ Control ]
PRESET ...... RESET
[ Control ]
SPCL
FCTN ...... SERVIC ...... TEST
 ...... TEST INPUT
 ...... DIGITAL ...... INTERN
 ...... PATH
```

9. If the test passes, check PASS on the Performance Test Record for Internal Path.

10. Press the HP 3563A keys as follows:

```
 ...... INPUT
 ...... POD 1
```

**Note**  
Wait for the test to finish before proceeding. This test takes approximately 1 minute to complete.

11. If the test passes, check PASS on the Performance Test Record for Input Pod 1.

12. Press the HP 3563A keys as follows:

```
 ...... INPUT
 ...... POD 2
```

**Note**  
Wait for the test to finish before proceeding. This test takes approximately 1 minute to complete.
13. If the test passes, check PASS on the Performance Test Record for Input Pod 2.

14. Press the HP 3563A keys as follows:

\[ \ldots \ldots \text{QUALFR} \]
\[ \text{POD} \]

\[ \text{Note} \]
Wait for the test to finish before proceeding. This test takes approximately 1 minute to complete.

15. If the test passes, check PASS on the Performance Test Record for Qualifier Pod.

16. Press the HP 3563A keys as follows:

\[ \begin{array}{c}
\text{[ Control ]} \\
\text{SPCL} \\
\text{FCTN} \\
\ldots \ldots \\
\text{SERVIC} \\
\text{TEST} \\
\ldots \ldots \\
\text{TEST} \\
\text{SOURCE} \\
\ldots \ldots \\
\text{ARBITRARY}
\end{array} \]

\[ \text{Note} \]
This test takes approximately 1 minute to complete.

17. If the measurements pass, check PASS on the Performance Test Record for Arbitrary Source.

\[ \text{If Test Fails} \]

If any of the tests fails, start by checking the connections. If the connections are correct, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the \textit{HP 3563A Service Manual}:

\begin{itemize}
  \item Adjustments
  \item Section III
  \item Troubleshooting
  \item Section VII
\end{itemize}

A10 Digital I/O
A20 Digital Interface
A21 Digital Interface
11. Input Impedance

This test measures the input impedance of the HP 3563A as a series resistance and capacitance. The digital multimeter is used to measure the input resistance directly. The input capacitance is then measured by inputting a 100 kHz signal from the synthesizer. This equation is used to calculate the capacitance:

\[ C = 15.92 \times 10^{-12} \sqrt{\frac{V_{in}^2}{V_{c}^2}} - 1.210 \]

**Note**  
An LCR meter can be used to measure the input capacitance directly.

**Specification**

Input Resistance (R) = 1 M\(\Omega\) \(\pm\) 50 k\(\Omega\) (5%)
Input Capacitance (C) \(\leq\) 100 pF

**Required Test Equipment**

Frequency Synthesizer
50\(\Omega\) feedthrough termination
Digital Voltmeter
BNC/Dual Banana Cable
100 k\(\Omega\) Resistor (See Figure 4-14)
BNC/BNC Cable
<table>
<thead>
<tr>
<th>Resistance</th>
<th>Tolerance</th>
<th>Power</th>
<th>HP Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kΩ</td>
<td>1%</td>
<td>0.25 W</td>
<td>0757-0465</td>
</tr>
</tbody>
</table>

Assembly

1. Cut resistor leads to 12mm on each end.
2. Solder one resistor lead to the center conductor of the BNC FEMALE connector.
3. Solder the CONDUCTOR CENTER PIN to the other lead of the resistor.
4. Screw the SLEEVE and the BNC MALE connector into place. Tighten securely.

Figure 4-14. Constructing Feedthrough
Performance Tests

Input Resistance Test

![Digital Voltmeter and Control Systems Analyzer](image)

**Figure 4-15. Input Resistance Test Setup**

**Procedure**

1. Connect the test instruments as shown in Figure 4-15.

2. Set the digital voltmeter initially as follows:
   - Function ........ 2 WIRE OHM
   - Range ............ AUTO
   - Trigger ........... INTERNAL
   - Sample Rate ........ Maximum
   - High Resolution .... ON
   - Auto Cal ........... ON

3. Press the HP 3563A keys as follows:

   - Control ]
   - PRESET ........... RESET

   - [ Input Setup ]
   - CAL ........... SINGLE
   - CAL

4-60
4. For each of the range settings listed in Table 4-11 perform steps a and b:

   a. Press the HP 3553A keys as follows;

   [ Input Setup ]
   RANGE       . . . . . . To the range setting in Table 4-11.

   b. Record the digital voltmeter reading on the Performance Test Record.

5. Change the BNC input connector to Channel 2 and repeat steps 4a and 4b.
Performance Tests

Input Capacitance Test

![Diagram of test setup](image)

**Figure 4-16. Input Capacitance Test Setup**

**Procedure**

1. Connect the test instruments as shown in Figure 4-16.

2. Set the Frequency Synthesizer as follows:

<table>
<thead>
<tr>
<th>Function</th>
<th>Sine Wave (～)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>100 kHz</td>
</tr>
<tr>
<td>Amplitude</td>
<td>1 Vrms</td>
</tr>
<tr>
<td>Phase</td>
<td>0 Degrees</td>
</tr>
<tr>
<td>dc Offset</td>
<td>0 V</td>
</tr>
<tr>
<td>Modulation</td>
<td>OFF</td>
</tr>
<tr>
<td>Sweep</td>
<td>OFF</td>
</tr>
<tr>
<td>High Voltage</td>
<td>ON</td>
</tr>
</tbody>
</table>
3. Press the HP 3563A keys as follows:

[ Control ]
PRESET ........ RESET

[ Input Setup ]
CAL ........ AUTO
OFF

[ Measurement ] [ Entry ]
AVG ........ 16 ........ ENTER
........ STABLE

[ Input Setup ]
INPUT
CONFIG ........ CHAN 1
AC
........ CHAN 2
AC
........ GROUND
CHAN 1
........ GROUND
CHAN 2

[ Input Setup ] [ Entry ]
RANGE ........ 0 dBVrms

[ Control ]
START

[ Display ]
UNITS ........ P SPEC
UNITS ........ VOLTS
........ RMS
........ VOLTS

[ Display ]
COORD ........ MAG
(LIN)

[ Markers ] [ Entry ]
X ........ 100 kHz

4. Record the Ya amplitude reading in the Vc position of the Performance Test Record for Channel 1.
Performance Tests

5. Move the setup to Channel 2.

6. Press the HP 3563A keys as follows:

```
[ Display ]
  B

[ Control ]
  START

[ Display ]
  COORD ...
  MAG (LIN)
```

7. Record the \( Y_b \) amplitude reading in the \( V_c \) position of the Performance Test Record for Channel 2.

8. Remove the 100 k\( \Omega \) resistor from the signal path and connect the BNC cable with the 50\( \Omega \) termination directly to the HP 3563A's Channel 1 input connector.

9. Press the HP 3563A keys as follows:

```
[ Display ]
  A

[ Control ]
  START
```

10. Record the \( Y_a \) amplitude reading in the \( V_{in} \) position of the Performance Test Record for Channel 1.

11. Connect the 50\( \Omega \) termination to Channel 2.

12. Press the HP 3563A keys as follows:

```
[ Display ]
  B

[ Control ]
  START
```
13. Record the Yb amplitude reading in the Vin position of the Performance Test Record for Channel 2.

14. Use the equation given on the Performance Test Record to calculate the input capacitance.

**If Test Fails**

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

- **Adjustments**
  - Section III
  - None

- **Troubleshooting**
  - Section VIII
  - A33, A35 Input Boards
12. Harmonic Distortion

This test measures the harmonic distortion generated in the HP 3563A when a full scale input is present.

Specification

The relative amplitude of all harmonics will be at least 80 dB below the fundamental amplitude.

Required Test Equipment

Low Distortion Oscillator
600Ω feedthrough termination
BNC Tee (m)(f)(f)
Female to Female Barrel
Single Banana/Single Banana Cable
BNC/Dual Banana Cable
BNC Cable (2) ≤ 30 cm
Harmonic Distortion Test One

Figure 4-17. Harmonic Distortion Test One Setup

Procedure

1. Connect the test instruments as shown in Figure 4-17.

2. Set the Low Distortion Oscillator initially as follows:
   
   Frequency ......... 49 kHz
   Amplitude ......... 1 Vrms
3. Press the HP 3563A keys as follows:

| Control   |  |  |
|-----------|  |  |
| PRESET    |  |  |
| [Input Setup] |  |  |
| CAL       |  |  |
| [Input Setup] |  |  |
| RANGE     |  |  |
| [Input Setup] |  |  |
| INPUT     |  |  |
| CONFIG    |  |  |
| . . .     |  |  |
| CHAN 1    |  |  |
| AC        |  |  |
| . . .     |  |  |
| CHAN 2    |  |  |
| AC        |  |  |
| . . .     |  |  |
| GROUND    |  |  |
| CHAN 1    |  |  |
| . . .     |  |  |
| GROUND    |  |  |
| CHAN 2    |  |  |
| [Measurement] |  |  |
| WINDOW    |  |  |
| . . .     |  |  |
| FLAT TOP  |  |  |
| [Display] |  |  |
| UNITS     |  |  |
| . . .     |  |  |
| P SPEC    |  |  |
| . . .     |  |  |
| VOLTS     |  |  |
| . . .     |  |  |
| RMS       |  |  |
| . . .     |  |  |
| VOLTS     |  |  |
Table 4-12. Harmonic Frequencies

<table>
<thead>
<tr>
<th>Oscillator Coarse Frequency</th>
<th>Signal Frequency</th>
<th>Harmonic Number</th>
<th>Harmonic Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 kHz</td>
<td>49500 Hz</td>
<td>2nd</td>
<td>99 kHz</td>
</tr>
<tr>
<td>32 kHz</td>
<td>33000 Hz</td>
<td>3rd</td>
<td>99 kHz</td>
</tr>
<tr>
<td>24 kHz</td>
<td>24750 Hz</td>
<td>4th</td>
<td>99 kHz</td>
</tr>
<tr>
<td>19 kHz</td>
<td>19800 Hz</td>
<td>5th</td>
<td>99 kHz</td>
</tr>
</tbody>
</table>

4. For each of the signal frequencies listed in Table 4-12 perform steps a through g:

a. Set the Low Distortion Oscillator as follows:

Frequency ... To coarse frequency in Table 4-12.

b. Press the HP 3563A keys as follows:

- Measurement [ ]
  - FREQ
  - CENTER
  - FREQ

- Measurement [ ]
  - AVG
  - OFF

- Control [ ]
  - START

- Display [ ]
  - SINGLE

- Markers [ ]
  - X
  - To signal frequency in Table 4-12.

c. Adjust the Low Distortion Oscillator’s frequency vernier until it equals the signal frequency.

d. Adjust the Low Distortion Oscillator’s amplitude vernier until Ya = 0 dBVrms ± 01 dBVrms.
Performance Tests
12. Harmonic Distortion

c. Press the HP 3563A keys as follows:

[ Display ]
A&B

[ Measurement ] [ Entry ]
AVG ...... 4 ...... ENTER
...... STABLE

[ Measurement ]
FREQ ...... MAX
...... SPAN

[ Control ]
START

[ Markers ] [ Entry ]
X ...... 99 kHz

f. Record the Ya marker amplitude reading on the Performance Test Record as the harmonic frequency amplitude for Channel 1.

g. Record the Yb marker amplitude reading on the Performance Test Record as the harmonic frequency amplitude for Channel 2.

Note
The HP 3563A is a mathematical instrument and can not read an amplitude of 0. As a result the HP 3563A may read amplitudes at or near 0 as very low values (such as -780 dB.)
Harmonic Distortion Test Two

Procedure

1. Connect the test instruments as shown in Figure 4-18. The chassis ground cable must go to the ground terminal of the Low Distortion Oscillator.

2. Press the HP 3563A keys as follows:

```
[ Input Setup ]
INPUT
CONFIG ......... FLOAT
               CHAN 1
               FLOAT
               CHAN 2
```
Table 4-13. Harmonic Frequencies

<table>
<thead>
<tr>
<th>Oscillator Coarse Frequency</th>
<th>Signal Frequency</th>
<th>Harmonic Number</th>
<th>Harmonic Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 kHz</td>
<td>49500 Hz</td>
<td>2nd</td>
<td>99 kHz</td>
</tr>
<tr>
<td>32 kHz</td>
<td>33000 Hz</td>
<td>3rd</td>
<td>99 kHz</td>
</tr>
<tr>
<td>24 kHz</td>
<td>24750 Hz</td>
<td>4th</td>
<td>99 kHz</td>
</tr>
<tr>
<td>19 kHz</td>
<td>19800 Hz</td>
<td>5th</td>
<td>99 kHz</td>
</tr>
</tbody>
</table>

3. For each of the signal frequencies listed in Table 4-13 perform steps a through g:

   a. Set the Low Distortion Oscillator as follows:
      Frequency  .......... To coarse frequency in Table 4-13.

   b. Press the HP 3563A keys as follows:
      
      Measurement  
      FREQ  .......... CENTER  
      FREQ  .......... To signal frequency in Table 4-13.

      Measurement  
      AVG  .......... OFF

      Control  
      START

      Display  
      SINGLE

      Markers  
      X  .......... To signal frequency in Table 4-13.

   c. Adjust the Low Distortion Oscillator’s frequency vernier until it equals the signal frequency.

   d. Adjust the Low Distortion Oscillator’s amplitude vernier until Ya = 0 dBVrms ±01 dBVrms.

   e. Press the HP 3563A keys as follows:
      
      Display  
      A&B

      Measurement  
      AVG  .......... 4  
      ENTER

      Measurement  
      AVG  .......... STABLE
a. Record the Y marker amplitude reading on the Performance Test Record as the harmonic frequency amplitude for Channel 1.

b. Record the Yb marker amplitude reading on the Performance Test Record as the harmonic frequency amplitude for Channel 2.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

- Adjustments
  - 2nd Pass Gain Adjustment
  - Section III ADC Offset and Reference Adjustment

- Troubleshooting
  - A33, A35 Input Boards
  - Section VII A32, A34 Analog Digital Converter Boards
13. **Intermodulation Distortion**

This test measures the level of the intermodulation distortion products generated within the HP 3563A to the 4th order.

The Frequency Synthesizer may produce some spurious signals in the 0 to 100 kHz span. Ignore signals at frequencies other than those listed in the tables when performing this test.

**Specification**

The amplitude of all intermodulation products will be at least 80 dB below the fundamental amplitude.

**Required Test Equipment**

- Frequency Synthesizer
- 1 kΩ resistors (2) (See Figure 4-20)
- BNC Tee (2) (m)(f)(f)
- BNC (m)/Dual Banana
- BNC to Banana Cable
- (2) Female to Female Barrel
- BNC/BNC Cable (2)
- Single Banana to Single Banana
- BNC/BNC ≤ 30 cm (2)
Figure 4-19. Intermodulation Distortion Test One Setup

**Note**

If the "COMBINED" mode is used on the Frequency Synthesizer, output from Channel A with one 50Ω termination instead of the 1 kΩ series resistors.
Performance Tests
13. Intermodulation Distortion

Intermodulation Distortion Test Measurement One

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Tolerance</th>
<th>Power</th>
<th>HP Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kΩ</td>
<td>1%</td>
<td>0.25 W</td>
<td>0757-0465</td>
</tr>
</tbody>
</table>

Assembly
1. Cut resistor leads to 12mm on each end.
2. Solder one resistor lead to the center conductor of the BNC FEMALE connector.
3. Solder the CONDUCTOR CENTER PIN to the other lead of the resistor.
4. Screw the SLEEVE and the BNC MALE connector into place. Tighten securely.

Figure 4-20. Constructing a Feedthrough
Procedure

1. Connect the test instruments as shown in Figure 4-19. Keep the connecting cables as short as possible.

2. Set the test instruments initially as follows:

**Frequency Synthesizer Channel A**
- Function: Sine Wave (~)
- Frequency: 20 kHz
- Amplitude: 1 Vrms
- Phase: 0 Degrees
- dc Offset: 0 V
- Modulation: OFF
- Sweep: OFF

**Frequency Synthesizer Channel B**
- Function: Sine Wave (~)
- Frequency: 26 kHz
- Amplitude: 1 Vrms
- Phase: 0 Degrees
- dc Offset: 0 V
- Modulation: OFF
- Sweep: OFF

3. Press the HP 3563A keys as follows:

```
[ Control ] 
PRESET .............. RESET

[ Input Setup ] 
CAL .............. SINGLE 
CAL

[ Input Setup ] [ Entry ]
RANGE .............. 2 Vrms

[ Input Setup ]
INPUT 
CONFIG .............. GROUND 
CHAN 1
.............. GROUND 
CHAN 2
```
Performance Tests
13. Intermodulation Distortion

[ Measurement ]
WINDOW  .......  FLAT TOP

[ Measurement ]
FREQ  .......  CENTER
FREQ

[ Entry ]
20 kHz

[ Display ]
UNITS  .......  P SPEC
UNITS

VOLTS

RMS

VOLTS

[ Display ]
A & B

[ Markers ]
X  .......  20 kHz

4. Adjust the amplitude of Frequency Synthesizer Channel A until Ya=0 dBVrms 50 dB.

5. Press the HP 3563A keys as follows:

[ Markers ]
X  .......  26 kHz

6. Adjust the amplitude of Frequency Synthesizer Channel B until Ya=0 dBVrms 50 dB.

---

**Note**

The amplitude of Frequency Synthesizer Channel A may change after adjusting Frequency Synthesizer Channel B. Verify the amplitude of each synthesizer before proceeding with step 7.
Table 4-14. Intermodulation Distortion Measurement One

<table>
<thead>
<tr>
<th>Fundamental Frequencies</th>
<th>Harmonic Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>F1</td>
<td>F2</td>
</tr>
<tr>
<td>20 kHz</td>
<td>26 kHz</td>
</tr>
<tr>
<td>20 kHz</td>
<td>26 kHz</td>
</tr>
<tr>
<td>20 kHz</td>
<td>26 kHz</td>
</tr>
<tr>
<td>20 kHz</td>
<td>26 kHz</td>
</tr>
</tbody>
</table>

7. Press the HP 3563A keys as follows:

```
[ Measurement ]        [ Entry ]
  AVG                 16
                    ...... ENTER
...... STABLE

[ Display ]
  SCALE               [ Entry ]
                    Y FIXD
                    ...... SCALE
                    -100, .1 dB
```

8. For each of the harmonic frequencies listed in Table 4-14 perform steps a through c:

a. Press the HP 3563A keys as follows:

```
[ Measurement ]        [ Control ]
  FREQ                 START
                    CENTER
                    FREQ
```

To harmonic frequency in Table 4-14.

b. If the Ya marker reading is less than or equal to -80 dBVrms, check PASS on the Performance Test Record for Measurement One, Channel 1 with the BNC shell grounded.

c. If the Yb marker reading is less than or equal to -80 dBVrms, check PASS on the Performance Test Record for Measurement One, Channel 2 with the BNC shell grounded.
Intermodulation Distortion Test Measurement Two

![Diagram of test setup](Figure 4-21. Intermodulation Distortion Test Two Setup)

**Note**

If the “COMBINED” mode is used on the Frequency Synthesizer, output from Channel A with one 50Ω termination instead of the 1 kΩ series resistors.

**Procedure**

1. Connect the test instruments as shown in Figure 4-21, so the center conductor of each channel’s BNC is grounded.
2. Press the HP 3563A keys as follows:

\[
\begin{array}{|l|}
\hline
\text{INPUT} \\
\text{CONFIG} \\
\hline
\text{FLOAT} & \text{CHAN 1} \\
\hline
\text{FLOAT} & \text{CHAN 2} \\
\hline
\end{array}
\]

3. For each of the harmonic frequencies listed in Table 4-15 perform steps a through c.

\[
\begin{array}{|c|c|c|}
\hline
\text{F1} & \text{F2} & \text{Harmonic Frequency} \\
\hline
20 \text{ kHz} & 26 \text{ kHz} & 6 \text{ kHz} \\
20 \text{ kHz} & 26 \text{ kHz} & 14 \text{ kHz} \\
20 \text{ kHz} & 26 \text{ kHz} & 12 \text{ kHz} \\
20 \text{ kHz} & 26 \text{ kHz} & 8 \text{ kHz} \\
\hline
\end{array}
\]

a. Press the HP 3563A keys as follows:

\[
\begin{array}{|c|}
\hline
\text{FREQ} \\
\text{FREQ} \\
\hline
\end{array}
\]

To harmonic frequency in Table 4-15.

b. If the Ya marker reading is less than or equal to –80 dBVrms, check PASS on the Performance Test Record for Measurement One, Channel 1 with the BNC center conductor grounded.

c. If the Yb marker reading is less than or equal to –80 dBVrms, check PASS on the Performance Test Record for Measurement One, Channel 2 with the BNC center conductor grounded.

4. Connect the test instruments as shown in Figure 4-19.

5. Change the frequency of Frequency Synthesizer Channel A to 89 kHz.

6. Change the frequency of Frequency Synthesizer Channel B to 99 kHz.
Performance Tests
13. Intermodulation Distortion

7. Press the HP 3563A keys, as follows:

[ Measurement ]
AVG ...... AVG
OFF

[ Measurement ]
FREQ ...... CENTER
FREQ

[ Entry ]
89 kHz

[ Control ]
START

[ Markers ]
X ...... 89 kHz

8. Adjust the amplitude of Frequency Synthesizer Channel A until Ya = 0 dB 50 mdB.

9. Press the HP 3563A keys as follows:

[ Measurement ]
FREQ ...... CENTER
FREQ

[ Entry ]
99 kHz

[ Markers ]
X ...... 99 kHz

10. Adjust the amplitude of Frequency Synthesizer Channel B until Ya = 0 dB 50 mdB.

11. Press the HP 3563A keys as follows:

[ Measurement ]
AVG ...... STABLE

<table>
<thead>
<tr>
<th>Fundamental Frequencies</th>
<th>Harmonic Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>F2</td>
</tr>
<tr>
<td>89 kHz</td>
<td>99 kHz</td>
</tr>
<tr>
<td>89 kHz</td>
<td>99 kHz</td>
</tr>
<tr>
<td>89 kHz</td>
<td>99 kHz</td>
</tr>
<tr>
<td>89 kHz</td>
<td>99 kHz</td>
</tr>
</tbody>
</table>

Table 4-16. Intermodulation Distortion Measurement Two

12. For each of the harmonic frequencies listed in Table 4-16 perform steps a through c:

a. Press the HP 3563A keys as follows:
Performance Tests

13. Intermodulation Distortion

b. If the Ya marker reading is less than or equal to –80 dBVrms, check PASS on the
Performance Test Record for Measurement Two, Channel 1 with the BNC shell floating.

c. If the Yb marker reading is less than or equal to –80 dBVrms, check PASS on the
Performance Test Record for Measurement Two, Channel 2 with the BNC shell floating.

13. Connect the test instruments as shown in Figure 4-21 so the center conductor of each channel’s
BNC is grounded.

14. For each of the harmonic frequencies listed in Table 4-16 perform steps a through c:

a. Press the HP 3553A keys as follows:

b. If the Ya marker reading is less than or equal to –80 dBVrms, check PASS on the
Performance Test Record for Measurement Two, Channel 1 with the BNC center
conductor grounded.

c. If the Yb marker reading is less than or equal to –80 dBVrms, check PASS on the
Performance Test Record for Measurement Two, Channel 2 with the BNC center
conductor grounded.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified
service technician see the following sections in the *HP 3563A Service Manual*:

- Adjustments
- Section III
- 2nd Pass Gain Adjustment
- ADC Offset and Reference Adjustment
- Troubleshooting
- Section VII
- A33, A35 Input Boards
- A32, A34 Analog Digital Converter Boards

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14. Noise and Spurious Signal Level

This test measures the level of the noise floor and any spurious signals generated within the HP 3563A.

Specification

When the input is terminated with a 50 Ω load, the amplitude of all spurious signals must be at least 80 dB below the range setting. When using a flat top window and a 50 Ω load, the average noise level must be less than:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Noise Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Hz to 1 kHz</td>
<td>-134 dB/√Hz</td>
</tr>
<tr>
<td>1 kHz to 100 kHz</td>
<td>-144 dB/√Hz</td>
</tr>
</tbody>
</table>

Required Test Equipment

50Ω feedthrough terminations (2)
Alligator Clip Cable (2)

![Figure 4-22. Noise and Spurious Signal Level Test Setup](image-url)
Procedure

1. Connect the test instruments as shown in Figure 4-22. Keep the leads from the feedthrough terminations to chassis ground as short as possible.

2. Press the HP 3563A keys as follows:

   - **Control**
     - PRESET .......... RESET

   - **Input Setup**
     - CAL ............ SINGLE
     - CAL

   - **Input Setup**
     - RANGE ........... -51 dENVrms

   - **Input Setup**
     - INPUT
       - CONFIG ........... CHAN 1
       - AC
       - CHAN 2
       - AC

   - **Measurement**
     - FREQ ............ FREQ
     - SPAN ............. 1 kHz
     - START ............ 20 Hz
     - FREQ

   - **Measurement**
     - AVG ............. 20
     - ENTER
     - STABLE

   - **Measurement**
     - WINDOW ........... UNIFRM
     - (NONE)

   - **Display**
     - UNITS ............ P SPEC
     - UNITS
     - RMS
     - VOLTS
     - VOLTS

---

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Performance Tests
14. Noise and Spurious Signal Level

3. Press the HP 3563A keys as follows:

[ Control ]
START

[ Display ]
SCALE ....... Y AUTO
SCALE

[ Markers ]
SPCL MARKER ....... MRKR→
PEAK

4. If the Ya marker reading is less than or equal to -131 dBVrms, check PASS on the Performance Test Record for Channel 1.

5. Press the HP 3563A keys as follows:

[ Display ]
B

[ Display ]
SCALE ....... Y AUTO
SCALE

[ Markers ]
SPCL MARKER ....... MRKR→
PEAK
6. If the Yb marker reading is less than or equal to $-131 \text{ dBVrms}$, check PASS on the Performance Test Record for Channel 2.

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Hz</td>
<td>1 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>1 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>10 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>20 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>30 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>40 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>50 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>60 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>70 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
<tr>
<td>80 kHz</td>
<td>10 kHz</td>
<td>$\leq -131 \text{ dBV}$</td>
</tr>
</tbody>
</table>

7. For the rest of the start frequencies in Table 4-17 perform steps a through d:

a. Press the HP 3553A keys as follows:

```
[ Measurement ]
FREQ . . . .  START TO start frequency in Table 4-17.
FREQ . . . .  FREQ
SPAN . . . .  SPAN
```

```
[ Display ]
A
```

```
[ Control ]
START
```

```
[ Markers ]
SPCL
MARKER . . . .  MRKR--> PEAK
```

b. If the Ya marker reading is less than or equal to $-131 \text{ dBVrms}$, check PASS on the Performance Test Record for Channel 1.
Performance Tests
14. Noise and Spurious Signal Level

c. Press the HP 3563A keys as follows:

```
[ Display ]
B

[ Markers ]
SPCL
MARKER ........ MRKR
PEAK
```

d. If the Yb marker reading is less than or equal to \(-131 \text{ dBVrms}\), check PASS on the Performance Test Record for Channel 2.

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Hz</td>
<td>1 kHz</td>
<td>(\leq -134 \text{ dBV/} \sqrt{\text{Hz}})</td>
</tr>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td>(\leq -144 \text{ dBV/} \sqrt{\text{Hz}})</td>
</tr>
<tr>
<td>50 kHz</td>
<td>50 kHz</td>
<td>(\leq -144 \text{ dBV/} \sqrt{\text{Hz}})</td>
</tr>
</tbody>
</table>

Table 4-18. Noise Level

8. Press the HP 3563A keys as follows:

```
[ Measurement ]
WINDOW ........ FLAT
TOP

[ Display ]
UNITS ........ P SPEC
UNITS (\sqrt{\text{PSD}})
```

9. For each of the start frequencies listed in Table 4-18 perform steps a through e:

a. Press the HP 3563A keys as follows:

```
[ Measurement ]
FREQ ........ START
FREQ
........ FREQ
SPAN

[ Control ]
START
```

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b. When the average is complete, press the HP 3563A keys as follows:

[ Display ]
A

[ Markers ]
SPCL
MARKER ....... MRKR→
PEAK

c. If the Ya marker reading is less than or equal to the specification, check PASS on the Performance Test Record for Channel 1.

d. Press the HP 3563A keys as follows:

[ Display ]
B

[ Markers ]
SPCL
MARKER ....... MRKR→
PEAK

e. If the Yb marker reading is less than or equal to the specification, check PASS on the Performance Test Record for Channel 2.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments
Section III

2nd Pass Gain Adjustment
ADC Offset and Reference Adjustment

Troubleshooting
Section VII

A33, A35 Input Boards
A32, A34 Analog Digital Converter
A5 Digital Filter
A4 Local Oscillator
15. Cross Talk

The cross talk test measures the amount of energy in one channel that has been coupled across from the other channel. This is accomplished by placing a high signal level on one channel and then measuring the relative signal amplitude on the other channel.

Specification

When a 50Ω termination is used, the cross talk between channels will be at least 140 dB below the input signal level.

Required Test Equipment

Frequency Synthesizer
50Ω feedthrough termination
Alligator/Alligator Clip
BNC Cable

Cross Talk Channel 1 Test

Figure 4-23. Cross Talk Channel 1 Test Setup
Procedure

1. Connect the test instruments as shown in Figure 4-23.

2. Set the Frequency Synthesizer as follows:
   
<table>
<thead>
<tr>
<th>Function</th>
<th>Sine Wave (~)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>99 kHz</td>
</tr>
<tr>
<td>Amplitude</td>
<td>14 Vrms</td>
</tr>
<tr>
<td>High Voltage</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>ON</td>
</tr>
<tr>
<td>Phase</td>
<td>0 Degrees</td>
</tr>
<tr>
<td>dc Offset</td>
<td>0 V</td>
</tr>
<tr>
<td>Modulation</td>
<td>OFF</td>
</tr>
<tr>
<td>Sweep</td>
<td>OFF</td>
</tr>
</tbody>
</table>

3. Press the HP 3563A keys as follows:

   [ Control ]
   PRESET          RESET

   [ Input Setup ]
   CAL             SINGLE
   CAL

   [ Measurement ]
   FREQ            CENTER
   FREQ            99 kHz

   [ Measurement ]
   WINDOW          FLAT
   TOP

   [ Measurement ]
   AVG             16
   ENTER
   STABLE

   [ Input Setup ]
   RANGE           AUTO 1
   UP & DWN        AUTO 2
   UP & DWN
Performance Tests
15. Cross Talk

[ Control ]
START

[ Display ]
A & B

[ Markers ]  [ Entry ]
X ...... 99 kHz

[ Display ]
SCALE ...... Y FIXD ...... [ Entry ]
SCALE -140, 30 dB

[ Display ]
B

[ Markers ]
Y

4. Using the marker knob, move the Y marker to the center of the X marker dot and press the HP 3563A keys as follows:
 ...... HOLD Y
 ...... UPPER

[ Display ]
A

5. Using the marker knob, move the Y marker to the center of the X marker dot.

6. If the delta Y is greater than or equal to 140 dB, check PASS on the Performance Test Record for Channel 1.
Cross Talk Channel 2 Test

Figure 4-24. Cross Talk Channel 2 Test

Procedure

1. Connect the test instruments as shown in Figure 4-24.

2. Press the HP 3563A keys as follows:

   [ Markers ]
   Y
   OFF

   [ Control ]
   START

   [ Display ]
   A&B

   [ Markers ]
   X
   ......... 99 kHz

   [ Display ]
   A

   [ Markers ]
   Y
Performance Tests

15. Cross Talk

3. Using the marker knob, move the Y marker to the center of the X marker dot and press the HP 3563A keys as follows:

   
   ....... HOLD Y
   UPPER

   [ Display ]
   B

4. Using the marker knob, move the Y marker to the center of the X marker dot.

5. If the delta Y is greater than or equal to 140 dB, check PASS on the Performance Test Record for Channel 2.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

Adjustments

None

Troubleshooting

Section VIII

A33, A35 Input Boards
16. Common Mode Rejection

This test measures the capability of the HP 3563A to ignore a signal which appears simultaneously and in phase at the high and low input of a single channel.

Specification

When a common mode signal is input to a single channel, the relative value compared to the amplitude of the input single will be:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hz to 66 Hz</td>
<td>80 dB</td>
</tr>
<tr>
<td>66 Hz to 500 Hz</td>
<td>65 dB</td>
</tr>
</tbody>
</table>

Required Test Equipment

Frequency Synthesizer
Common Mode Cable
BNC Tee
Female to Female Barrel
Alligator/Alligator Cable
BNC to BNC: length ≤ 30 cm (2)
BNC Cable

Figure 4-25. Common Mode Rejection Test Setup One
Performance Tests
16. Common Mode Rejection

Procedure

1. Connect the test instruments as shown in Figure 4-25.

2. Set the Frequency Synthesizer as follows:
   - Function ........ Sine Wave (~)
   - Frequency ...... 1 kHz
   - Amplitude ...... 1 mVrms
   - Phase .......... 0 Degrees
   - Modulation ..... Off
   - Sweep .......... Off

3. Press the HP 3563A keys as follows:

   [ Control ]
   PRESET ........ RESET

   [ Input Setup ]
   CAL ............ SINGLE
               ............ CAL

   [ Measurement ]
   AVG ............ 16 ............ ENTER
               ............ STABLE

   [ Measurement ]
   WINDOW .......... FLAT
                   ............ TOP

   [ Display ]
   A & B

   [ Display ]
   UNITS ............ P SPEC
                   ............ UNITS
                   ............ VOLTS
                   ............ RMS

   [ Input Setup ]
   RANGE ............ AUTO 1
                   ............ AUTO 2
                   UP&DWN .......... UP&DWN
Performance Tests

16. Common Mode Rejection

Figure 4-26. Common Mode Rejection Test Setup Two

Figure 4-27. Alternate Common Mode Rejection Test Setup Two
Table 4-19. Common Mode Rejection

<table>
<thead>
<tr>
<th>Signal Amplitude</th>
<th>Signal Frequency</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.536 Vrms</td>
<td>66 Hz</td>
<td>≥ 80 dB</td>
</tr>
<tr>
<td>3.536 Vrms</td>
<td>500 Hz</td>
<td>≥ 65 dB</td>
</tr>
</tbody>
</table>

4. For each of the frequencies listed in Table 4-19 connect the test instruments as shown in Figure 4-25 and perform steps a through d:

   a. Set the Frequency Synthesizer as follows:

      Amplitude ...... To signal amplitude in Table 4-19
      Frequency ...... To signal frequency in Table 4-19

   b. Press the HP 3563A keys as follows:

      [ Measurement ]
      FREQ ...... CENTER To signal frequency in Table 4-19.
      FREQ

      [ Control ]
      START

      [ Markers ]
      SPCL
      MARKER
      MRKR →
      PEAK

   c. Record the Ya marker amplitude reading on the Performance Test Record as the first measurement for Channel 1.

   d. Record the Yb marker amplitude reading on the Performance Test Record as the first measurement for Channel 2.

5. Connect the test instruments as shown in Figure 4-26 or Figure 4-27. For each of the frequencies listed in Table 4-19, perform steps a through c.

   a. Press the HP 3563A keys as follows:

      [ Control ]
      START

      [ Display ]
      SCALE ...... Y AUTO
      SCALE

      [ Markers ]
      X ...... To signal frequency in Table 4-19.
b. When the average is complete, record the \( Y_a \) amplitude reading on the Performance Test Record as the second measurement for Channel 1.

c. Record the \( Y_b \) amplitude reading on the Performance Test Record as the second measurement for Channel 2.

6. Calculate the relative value for both channels:

\[
\text{First Measurement} - \text{Second Measurement} = \text{Relative Value}
\]

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

<table>
<thead>
<tr>
<th>Adjustments</th>
<th>Input dc Offset Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section III</td>
<td>Calibrator Adjustment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Troubleshooting</th>
<th>A33, A35 Input Boards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section VII</td>
<td>A30 Analog Source</td>
</tr>
</tbody>
</table>
17. External Reference Test

This test determines if the external reference input will lock on to an external signal that is within the specified range.

Specification

The HP 3563A will lock to external signals of 1, 2, 5, and 10 MHz ± 0.01%. The amplitude of the signal must be between 0 dBm and +20 dBm.

Required Test Equipment

Frequency Synthesizer
BNC Cable

Figure 4-28. External Reference Test Setup
Procedure

1. Connect the HP 3563A as shown in Figure 4-28.

2. Set Frequency Synthesizer as follows:
   - Function: Sine Wave (~)
   - Frequency: 1.000 MHz
   - Amplitude: 0 dBm
   - Phase: 0 Degrees
   - dc Offset: 0 V
   - Modulation: OFF
   - Sweep: OFF

3. Press the HP 3563A keys as follows:
   - Control: PRESET, RESET
   - Input Setup: CAL, SINGLE, CAL

4. Slowly decrease the frequency in 100 Hz steps on the Frequency Synthesizer until the “EXT Reference Not Locked” message is displayed.

5. Record the frequency value on the Performance Test Record.

6. Change the Frequency on the Frequency Synthesizer to 10.000 MHz.

7. On the HP 3563A press:
   - Control: PRESET

8. Slowly increase the frequency in 1 kHz step on the Frequency Synthesizer until the “EXT Reference Not Locked” message is displayed.

9. Record the frequency value on the Performance Test Record.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Adjustments Section III 20.48 MHz Reference Adjustment

Troubleshooting Section VIII A31 Trigger Board
18. Source Residual Offset

This test measures the level of residual offset generated by the source at the 0V offset setting.

Specification

The source residual offset will be no more than 10 mV at the 0V offset setting.

Required Test Equipment

Digital Voltmeter
BNC/Dual Banana Cable

![Source Residual Offset Test Setup Image]

Procedure

1. Connect the test instruments as shown in Figure 4-29.

2. Set the digital voltmeter as follows:

<table>
<thead>
<tr>
<th>Function</th>
<th>dc (--- V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>Auto</td>
</tr>
<tr>
<td>Trigger</td>
<td>Internal</td>
</tr>
<tr>
<td>Sample Rate</td>
<td>Maximum</td>
</tr>
<tr>
<td>High Resolution</td>
<td>ON</td>
</tr>
<tr>
<td>Auto Cal</td>
<td>ON</td>
</tr>
</tbody>
</table>
3. Press the HP 3563A keys as follows:

```
[ Control ]
  PRESET ....... RESET

[ Input Setup ]
  CAL ......... SINGLE

[ Measurement ]
  SOURCE ....... SOURCE
    LEVEL ......... [ Entry ]

[ Entry ]
  1 V

[ Entry ]
  SOURCE ......... FIXED
    TYPE ......... SINE

[ Entry ]
  100 kHz
```

4. Record the digital voltmeter reading on the Performance Test Record for the 1V setting.

5. Press the HP 3563A keys as follows:

```
[ Measurement ]
  SOURCE ....... SOURCE
    LEVEL ......... [ Entry ]

[ Entry ]
  5 V
```

6. Record the digital voltmeter reading on the Performance Test Record for the 5V setting.

**If Test Fails**

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

**Adjustments**

None

**Troubleshooting**

A30 Analog Source Board

Section VIII
19. Source Amplitude Accuracy and Flatness

This test measures the amplitude accuracy and flatness of the HP 3563A Source.

Specification

The amplitude reading will not deviate from the source amplitude setting by more than 1 dB (12.2%) when terminated into 1M for frequencies between 0 Hz and 65 kHz, and +1 dB, −1.5 dB for frequencies between 65 kHz and 100 kHz.

Procedure

1. Connect the HP 3563A Source to Channel 1.

2. Press the HP 3563A keys as follows:

```
[ Control ]
PRESET ...... RESET

[ Input Setup ]
CAL ...... SINGLE
CAL

[ Input Setup ]
INPUT CONFIG ...... GROUND
CHAN 1

[ Input Setup ]
RANGE ...... 5 V

[ Measurement ]
MEAS MODE ...... SWEPT
SINE ...... LINEAR
SWEEP

[ Measurement ]
SOURCE TYPE ...... SOURCE
ON

...... SOURCE LEVEL ...... 4.47 V

[ Display ]
UNITS ...... P SPEC
UNITS ...... VOLTS
RMS
...... VOLTS
```

4-104
Performance Tests
19. Source Amplitude Accuracy and Flatness

[ Measurement ]
FREQ ........ STOP ........ [ Entry ]
FREQ

[ Control ]
START

3. When the sweep is complete, press the HP 3563A keys as follows:

[ Display ]
SCALE ........ Y FIXD ........ [ Entry ]
SCALE

4. If the trace is between the 9 dB and the 11 dB limits, check PASS on the Performance Test Record for the 0 to 65 kHz span.

5. Press the HP 3563A keys as follows:

[ Measurement ]
FREQ ........ START ........ [ Entry ]
FREQ

[ Control ]
START

6. When the sweep is complete, press the HP 3563A keys as follows:

[ Display ]
SCALE ........ Y FIXD ........ [ Entry ]
SCALE

7. If the trace is between the 8.5 dB and the 11 dB limits, check PASS on the Performance Test Record for the 65 kHz to 100 kHz span.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

Troubleshooting
Section VIII

A30 Analog Source Board
20. Source Distortion

This test measures the level of any spurious signals generated by the HP 3563A Source.

Specification

When the source is set between dc and 10 kHz, the distortion will be at least 60 dB below the signal level. When the source is set between 10 kHz and 100 kHz, the distortion will be at least 40 dB below the signal level.

Required Test Equipment

BNC Cable

Procedure

1. Connect the HP 3563A Source to Channel 1.
2. Press the HP 3563A keys as follows:

```
[ Control ]
PRESET ....... RESET

[ Input Setup ]
CAL ....... SINGLE
CAL

[ Input Setup ]
INPUT CONFIG ....... CHAN 1
AC
...... GROUND
CHAN 1

[ Measurement ]
WINDOW ....... FLAT
TOP

[ Measurement ] [ Entry ]
AVG ....... 4 ....... ENTER
...... STABLE

[ Display ] [ Entry ]
SCALE ....... X FIXD
SCALE ....... .375,100 kHz
```
Table 4-20. Source Distortion

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Source Amplitude</th>
<th>Source Frequency</th>
<th>Delta Y Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mVpk</td>
<td>25 mVpk</td>
<td>10 kHz</td>
<td>60 dB</td>
</tr>
<tr>
<td>5 Vpk</td>
<td>5 Vpk</td>
<td>10 kHz</td>
<td>60 dB</td>
</tr>
<tr>
<td>25 mVpk</td>
<td>25 mVpk</td>
<td>99 kHz</td>
<td>40 dB</td>
</tr>
<tr>
<td>5 Vpk</td>
<td>5 Vpk</td>
<td>99 kHz</td>
<td>40 dB</td>
</tr>
</tbody>
</table>

3. For each of the range settings listed in Table 4-20 perform steps a through e:

a. Press the HP 3563A keys as follows:

```
[ Markers ]
Y OFF

[ Input Setup ]
RANGE ........ To range setting in Table 4-20.

[ Measurement ]
SOURCE ........ SOURCE LEVEL
SOURCE ........ FIXED
SOURCE TYPE ... SINE

................ To source amplitude in Table 4-20.

................ To source frequency in Table 4-20.

[ Control ]
START

[ Display ]
SCALE ........ Y AUTO
SCALE
SPCL MARKER ... MRKR→
PEAK

[ Markers ]
Y
```

b. Using the marker knob, move the Y marker to the center of the X marker dot.
Performance Tests
20. Source Distortion

c. Press the HP 3563A keys as follows:

```
[ Markers ]
Y ........ HOLD Y
UPPER
```

d. Using the marker knob, move the Y marker until the delta Y reading equals the delta Y value in Table 4-20.

e. If there is no distortion above the lower Y marker line, check PASS on the Performance Test Record.

If Test Fails

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the HP 3563A Service Manual:

- Adjustments
  - Section III
  - Source dc Offset Adjustment

- Troubleshooting
  - Section VII
  - A30 Analog Source Board
  - A4 Local Oscillator Board
21. Source Energy Measurement

This test measures the in-band energy of the HP 3563A noise source using the power marker function of the HP 3563A and a true rms voltmeter.

Specification

The percentage in-band energy of the random noise will be at least 70%. The percentage in-band energy of the chirp will be at least 85%.

Required Test Equipment

Digital Voltmeter
BNC Tee
BNC/Dual Banana

Figure 4-30. Source Energy Measurement Test Setup
Performance Tests
21. Source Energy Measurement

Procedure

1. Connect the test instruments as shown in Figure 4-30.

2. Set the test instruments initially as follows:

   Digital Voltmeter
   Function ............ ac V (V)
   Trigger ............ Internal

3. Press the HP 3563A keys as follows:

   [Control]
   PRESET ............ RESET

   [Input Setup]
   CAL ............ SINGLE
   CAL

   [Input Setup]
   INPUT
   CONFIG ............ GROUND
   CHAN 1

   [Measurement]
   WINDOW ............ UNIFRM
        (NONE)

   [Input Setup]
   RANGE ............ AUTO 1
                    UP&DWN

   [Measurement]
   SOURCE ............ SOURCE
                    LEVEL
                    1 Vrms

   [Measurement]
   FREQ ............ FREQ
                    SPAN
                    CENTER
                    5 kHz
                    1 kHz

   [Entry]
### Performance Tests
#### 21. Source Energy Measurement

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>ENTER</td>
</tr>
<tr>
<td></td>
<td>STABLE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>START</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCALE</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Note**

Wait until the measurement is finished before pressing POWER. The X & Y markers must be off.

<table>
<thead>
<tr>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITS</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>COORD</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Note**

Wait for the measurement to finish before proceeding.

<table>
<thead>
<tr>
<th>Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPCL</td>
</tr>
<tr>
<td>MARKER</td>
</tr>
<tr>
<td>CALC</td>
</tr>
<tr>
<td>POWER</td>
</tr>
</tbody>
</table>

**Note**

X and Y markers must be off.
Performance Tests
21. Source Energy Measurement

4. Take at least 160 averages by pressing the Digital Voltmeter keys as follows:
   MATH
   2
   RDGS
   STORE

5. After the “RDGS STORE” annunciator turns off, press the Digital Voltmeter keys as follows:
   HOLD
   RDGS
   STORE
   RECALL
   0

6. Record the voltmeter average on the Performance Test Record.

7. Record the HP 3563A power measurement on the Performance Test Record.

8. Press the HP 3563A keys as follows:

   [ Measurement ]
   SOURCE  ......  PRIODC
             CHIRP

   [ Input Setup ]
   SELECT  ......  SOURCE
             TRIG

   [ Control ]
   START

   [ Markers ]
   SPCL  ......  MARKER  ......  POWER
   MARKER  ......  CALC

---

Note

Wait for the measurement to finish before proceeding.

---

4-112
9. Take at least 160 averages by pressing the Digital Voltmeter keys as follows:

   MATH
   2
   RDGS
   STORE

10. After the “RDGS STORE” annunciator turns off, press the Digital Voltmeter keys as follows:

    HOLD
    RDGS
    STORE
    RECALL
    0

11. Record the voltmeter average on the Performance Test Record.

12. Record the HP 3563A power measurement on the Performance Test Record.

13. The percentage in-band energy for random noise and chirp are calculated using the following formula:

   \[
   \frac{\sqrt{\text{HP3563A Reading}}}{\text{Voltmeter Reading}} \times 100 = \text{Percentage In-Band Energy}
   \]

**If Test Fails Check:**

If this test fails, contact your local Hewlett-Packard sales and service office or have a qualified service technician see the following sections in the *HP 3563A Service Manual*:

- **Adjustments**: None
- **Troubleshooting Section VII**: A30 Analog Source Board
  - A1 Digital Source Board
  - A4 Local Oscillator Board
Performance Test Record

HP 3563 A
Control Systems Analyzer

Calibration Entity: ________________________________
Address: ______________________ Test by: __________
Serial No. ____________________ Report/Order No. ______
Temperature Range ________ Test Date: ____________
Relative Humidity ___________ Power Line Frequency ______
Installed Options ______________

Instruments Used:

AC Calibrator __________________________ Model ___________________
____________________________________ Serial No. __________________
Traceability No. ____________________ Cal Due Date ____________

Frequency Synthesizer ________________ Model ___________________
____________________________________ Serial No. __________________
Traceability No. ____________________ Cal Due Date ____________

Digital Voltmeter ____________________ Model ___________________
____________________________________ Serial No. __________________
Traceability No. ____________________ Cal Due Date ____________

Other ________________________________

Other ________________________________

Optional Comments ____________________
______________________________________
______________________________________

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## 1. Self Test

**PASS**

## 2. DC Offset

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Measured Value</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHANNEL 1</td>
<td>CHANNEL 2</td>
</tr>
<tr>
<td>7 dBV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-35 dBV</td>
<td></td>
<td>&lt;=-65 dBV</td>
</tr>
<tr>
<td>-51 dBV</td>
<td></td>
<td>&lt;=-71 dBV</td>
</tr>
</tbody>
</table>

## 3. Amplitude Accuracy and Flatness Measurement One

**BNC shell grounded**

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Signal Frequency</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Limit</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>9 dBV</td>
<td>1 kHz</td>
<td>8.849 dBV</td>
<td>9.151 dBV</td>
</tr>
<tr>
<td>9 dBV</td>
<td>99 kHz</td>
<td>8.849 dBV</td>
<td>9.151 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>1 kHz</td>
<td>-13.15 dBV</td>
<td>-12.85 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>50 kHz</td>
<td>-13.15 dBV</td>
<td>-12.85 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>90 kHz</td>
<td>-13.15 dBV</td>
<td>-12.85 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>95 kHz</td>
<td>-13.15 dBV</td>
<td>-12.85 dBV</td>
</tr>
<tr>
<td>-23 dBV</td>
<td>1 kHz</td>
<td>-23.15 dBV</td>
<td>-22.85 dBV</td>
</tr>
<tr>
<td>-23 dBV</td>
<td>95 kHz</td>
<td>-23.15 dBV</td>
<td>-22.85 dBV</td>
</tr>
<tr>
<td>-26 dBV</td>
<td>1 kHz</td>
<td>-26.15 dBV</td>
<td>-25.85 dBV</td>
</tr>
<tr>
<td>-21 dBV</td>
<td>1 kHz</td>
<td>-21.15 dBV</td>
<td>-20.85 dBV</td>
</tr>
<tr>
<td>-17 dBV</td>
<td>1 kHz</td>
<td>-17.15 dBV</td>
<td>-16.85 dBV</td>
</tr>
<tr>
<td>-14 dBV</td>
<td>1 kHz</td>
<td>-14.15 dBV</td>
<td>-13.85 dBV</td>
</tr>
<tr>
<td>-11 dBV</td>
<td>1 kHz</td>
<td>-11.15 dBV</td>
<td>-10.85 dBV</td>
</tr>
</tbody>
</table>

## Amplitude Accuracy and Flatness Measurement Two

**BNC shell grounded**

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Signal Frequency</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Limit</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>51 dBV</td>
<td>1 kHz</td>
<td>-51.25 dBV</td>
<td>-50.75 dBV</td>
</tr>
<tr>
<td>-49 dBV</td>
<td>1 kHz</td>
<td>-49.25 dBV</td>
<td>-48.75 dBV</td>
</tr>
<tr>
<td>-47 dBV</td>
<td>1 kHz</td>
<td>-47.25 dBV</td>
<td>-46.75 dBV</td>
</tr>
<tr>
<td>-45 dBV</td>
<td>1 kHz</td>
<td>-45.25 dBV</td>
<td>-44.75 dBV</td>
</tr>
<tr>
<td>-43 dBV</td>
<td>1 kHz</td>
<td>-43.25 dBV</td>
<td>-42.75 dBV</td>
</tr>
<tr>
<td>-41 dBV</td>
<td>1 kHz</td>
<td>-41.25 dBV</td>
<td>-40.75 dBV</td>
</tr>
<tr>
<td>-39 dBV</td>
<td>1 kHz</td>
<td>-39.25 dBV</td>
<td>-38.75 dBV</td>
</tr>
</tbody>
</table>
### Amplitude Accuracy and Flatness Measurement Three

**BNC center conductor grounded**

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Signal Frequency</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower Limit</td>
<td>Upper Limit</td>
<td>CHANNEL 1</td>
</tr>
<tr>
<td>8 dBV</td>
<td>1 kHz</td>
<td>7.499 dBV</td>
<td>8.501 dBV</td>
</tr>
<tr>
<td>8 dBV</td>
<td>99 kHz</td>
<td>7.499 dBV</td>
<td>8.501 dBV</td>
</tr>
<tr>
<td>-11 dBV</td>
<td>1 kHz</td>
<td>-11.50 dBV</td>
<td>-10.50 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>1 kHz</td>
<td>-13.50 dBV</td>
<td>-12.50 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>50 kHz</td>
<td>-13.50 dBV</td>
<td>-12.50 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>90 kHz</td>
<td>-13.50 dBV</td>
<td>-12.50 dBV</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>99 kHz</td>
<td>-13.50 dBV</td>
<td>-12.50 dBV</td>
</tr>
<tr>
<td>-27 dBV</td>
<td>1 kHz</td>
<td>-27.50 dBV</td>
<td>-26.50 dBV</td>
</tr>
<tr>
<td>-27 dBV</td>
<td>99 kHz</td>
<td>-27.50 dBV</td>
<td>-26.50 dBV</td>
</tr>
</tbody>
</table>

### 4. Amplitude Linearity

**Signal Frequency = 10 kHz**

**Range Setting = 10 Vrms**

**BNC shell grounded**

<table>
<thead>
<tr>
<th>Amplitude</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper Limit</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>10.00 V rms</td>
<td>10.18 V rms</td>
<td>9.827 V rms</td>
</tr>
<tr>
<td>1.000 V rms</td>
<td>1.019 V rms</td>
<td>981.4 mV rms</td>
</tr>
<tr>
<td>100.0 mV rms</td>
<td>103.2 mV rms</td>
<td>96.79 mV rms</td>
</tr>
<tr>
<td>10.00 mV rms</td>
<td>11.67 mV rms</td>
<td>8.329 mV rms</td>
</tr>
<tr>
<td>3.1623 mV rms</td>
<td>4.717 mV rms</td>
<td>1.608 mV rms</td>
</tr>
<tr>
<td>1.000 mV rms</td>
<td>2.517 mV rms</td>
<td>-517.1 μ Vrms</td>
</tr>
</tbody>
</table>

**BNC center conductor grounded**

<table>
<thead>
<tr>
<th>Amplitude</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper Limit</td>
<td>Lower Limit</td>
</tr>
<tr>
<td>10.00 V rms</td>
<td>10.59 V rms</td>
<td>9.439 V rms</td>
</tr>
<tr>
<td>1.000 V rms</td>
<td>1.061 V rms</td>
<td>942.6 mV rms</td>
</tr>
<tr>
<td>100.0 mV rms</td>
<td>1074 mV rms</td>
<td>92.91 mV rms</td>
</tr>
<tr>
<td>10.00 mV rms</td>
<td>12.09 mV rms</td>
<td>7.941 mV rms</td>
</tr>
<tr>
<td>3.1623 mV rms</td>
<td>4.850 mV rms</td>
<td>1.485 mV rms</td>
</tr>
<tr>
<td>1.000 mV rms</td>
<td>2.559 mV rms</td>
<td>-555.9 μ Vrms</td>
</tr>
</tbody>
</table>
### 5. Amplitude and Phase Match

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Part</th>
<th>PASS</th>
<th>Amplitude Specification</th>
<th>Part</th>
<th>PASS</th>
<th>Phase Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>−47 dBV</td>
<td>1</td>
<td>PASS</td>
<td>± 0.1 dB</td>
<td>4</td>
<td>PASS</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>0 dBV</td>
<td>2</td>
<td>PASS</td>
<td>± 0.1 dB</td>
<td>5</td>
<td>PASS</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>10 dBV</td>
<td>3</td>
<td>PASS</td>
<td>± 0.1 dB</td>
<td>6</td>
<td>PASS</td>
<td>± 0.5°</td>
</tr>
</tbody>
</table>

**BNC center conductor grounded**

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Part</th>
<th>PASS</th>
<th>Amplitude Specification</th>
<th>Part</th>
<th>PASS</th>
<th>Phase Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>−13 dBV</td>
<td>7</td>
<td>PASS</td>
<td>± 0.8 dB</td>
<td>9</td>
<td>PASS</td>
<td>± 8.5°</td>
</tr>
<tr>
<td>8 dBV</td>
<td>8</td>
<td>PASS</td>
<td>± 0.8 dB</td>
<td>10</td>
<td>PASS</td>
<td>± 8.8°</td>
</tr>
</tbody>
</table>

### 6. Anti-Alias Filter Response

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Alias Frequency</th>
<th>PASS</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>156 kHz</td>
<td>100 kHz</td>
<td>CHANNEL 1</td>
<td>CHANNEL 2</td>
</tr>
<tr>
<td>184 kHz</td>
<td>72 kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>206 kHz</td>
<td>50 kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>257 kHz</td>
<td>11 kHz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 7. Frequency Accuracy

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>99,000 Hz</td>
<td>98.996 kHz</td>
<td>99.004 kHz</td>
</tr>
</tbody>
</table>

### 8. Input Coupling Insertion Loss

<table>
<thead>
<tr>
<th>Insertion Loss</th>
<th>Specification</th>
<th>Insertion Loss</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 3 dB</td>
<td></td>
<td>&lt; 3 dB</td>
</tr>
</tbody>
</table>
### 9. Single Channel Phase Accuracy

**BNC shell grounded**

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Trigger</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slope</td>
<td>Type</td>
<td>Lower Limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHANNEL 1</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>CHANNEL 1</td>
<td>−92.5°</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>CHANNEL 2</td>
<td>−92.5°</td>
</tr>
<tr>
<td>9 kHz</td>
<td>NEG</td>
<td>EXT</td>
<td>87.5°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>CHANNEL 1</td>
<td>−102°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>CHANNEL 2</td>
<td>−102°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>EXT</td>
<td>−102°</td>
</tr>
</tbody>
</table>

**BNC center conductor grounded**

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Trigger</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slope</td>
<td>Type</td>
<td>Lower Limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHANNEL 1</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>CHANNEL 1</td>
<td>−96.5°</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>CHANNEL 2</td>
<td>−96.5°</td>
</tr>
<tr>
<td>9 kHz</td>
<td>POS</td>
<td>EXT</td>
<td>83.5°</td>
</tr>
<tr>
<td>9 kHz</td>
<td>NEG</td>
<td>EXT</td>
<td>−96.5°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>CHANNEL 1</td>
<td>−106°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>CHANNEL 2</td>
<td>−106°</td>
</tr>
<tr>
<td>99 kHz</td>
<td>POS</td>
<td>EXT</td>
<td>74°</td>
</tr>
</tbody>
</table>

### 10. Digital Input/Output

<table>
<thead>
<tr>
<th>Digital Internal Path</th>
<th>PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Pod 1</td>
<td>Src Clk Connection</td>
</tr>
<tr>
<td></td>
<td>Dig Pod 1 Zeros</td>
</tr>
<tr>
<td></td>
<td>Dig Pod 1 Ones</td>
</tr>
<tr>
<td>External Pod 2</td>
<td>Src Clk Connection</td>
</tr>
<tr>
<td></td>
<td>Dig Pod 2 Zeros</td>
</tr>
<tr>
<td></td>
<td>Dig Pod 1 Ones</td>
</tr>
<tr>
<td>Qualifier Pod</td>
<td>Dig Qualifier Zeros</td>
</tr>
<tr>
<td></td>
<td>Dig Qualifier Ones</td>
</tr>
<tr>
<td>Arbitrary Source</td>
<td>Address</td>
</tr>
<tr>
<td></td>
<td>Pre-Scaler</td>
</tr>
<tr>
<td></td>
<td>Zeros</td>
</tr>
<tr>
<td></td>
<td>Ones</td>
</tr>
</tbody>
</table>
## 11. Input Impedance

### Resistance Measurement

<table>
<thead>
<tr>
<th>Range Setting</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower Limit</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>20 dBV</td>
<td>950 kΩ</td>
<td>1050 kΩ</td>
</tr>
<tr>
<td>0 dBV</td>
<td>950 kΩ</td>
<td>1050 kΩ</td>
</tr>
<tr>
<td>-13 dBV</td>
<td>950 kΩ</td>
<td>1050 kΩ</td>
</tr>
</tbody>
</table>

### Capacitance Measurement

<table>
<thead>
<tr>
<th>Channel 1</th>
<th>Channel 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vc = Vrms</td>
<td>Vc = Vrms</td>
</tr>
<tr>
<td>Vin = Vrms</td>
<td>Vin = Vrms</td>
</tr>
</tbody>
</table>

\[
c = 15.92 \times 10^{-12} \sqrt{\frac{V_{in}^2}{V_c^2}} - 1.210
\]

<table>
<thead>
<tr>
<th>Measured Value</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td></td>
</tr>
<tr>
<td>pf</td>
<td></td>
</tr>
<tr>
<td>Channel 2</td>
<td></td>
</tr>
<tr>
<td>pf</td>
<td>&lt; 100 pF</td>
</tr>
</tbody>
</table>

## 12. Harmonic Distortion

### Measurement One

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Measured Value</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Harmonic Frequency Amplitude</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Channel 1</td>
<td>Channel 2</td>
</tr>
<tr>
<td>49500 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33000 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>245750 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19800 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Measurement Two

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Measured Value</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Harmonic Frequency Amplitude</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Channel 1</td>
<td>Channel 2</td>
</tr>
<tr>
<td>49500 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33000 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24750 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19800 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 13. Intermodulation Distortion Measurement One

**BNC shell grounded**

<table>
<thead>
<tr>
<th>Harmonic Frequency</th>
<th>Channel 1 Specification</th>
<th>Channel 2 Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>14 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>12 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>8 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
</tbody>
</table>

**BNC center conductor grounded**

<table>
<thead>
<tr>
<th>Harmonic Frequency</th>
<th>Channel 1 Specification</th>
<th>Channel 2 Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>14 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>12 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\leq -80$ dB</td>
</tr>
</tbody>
</table>

### Intermodulation Distortion Measurement Two

**BNC shell floating**

<table>
<thead>
<tr>
<th>Harmonic Frequency</th>
<th>Channel 1 Specification</th>
<th>Channel 2 Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>79 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>20 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>69 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
</tbody>
</table>

**BNC center conductor grounded**

<table>
<thead>
<tr>
<th>Harmonic Frequency</th>
<th>Channel 1 Specification</th>
<th>Channel 2 Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>79 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>20 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
<tr>
<td>69 kHz</td>
<td>$\leq -80$ dB</td>
<td>$\leq -80$ dB</td>
</tr>
</tbody>
</table>
### 14. Noise and Spurious Signal Level

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Hz</td>
<td>1 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>1 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>10 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>20 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>30 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>40 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>50 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>60 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>70 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>80 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
<tr>
<td>90 kHz</td>
<td>10 kHz</td>
<td>≤ -131 dBV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Start Frequency</th>
<th>Frequency Span</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Hz</td>
<td>1 kHz</td>
<td>≤ -134 dBV/√Hz</td>
</tr>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td>≤ -144 dBV/√Hz</td>
</tr>
<tr>
<td>50 kHz</td>
<td>50 kHz</td>
<td>≤ -144 dBV/√Hz</td>
</tr>
</tbody>
</table>

### 15. Cross Talk

<table>
<thead>
<tr>
<th>PASS</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td>Channel 2</td>
</tr>
<tr>
<td>≥ 140 dB</td>
<td></td>
</tr>
</tbody>
</table>

### 16. Common Mode Rejection

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>CHANNEL 1</th>
<th>CHANNEL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Measurement</td>
<td>Second Measurement</td>
<td>Relative Value</td>
</tr>
<tr>
<td>66 Hz</td>
<td>≥ 80 dB</td>
<td></td>
</tr>
<tr>
<td>500 Hz</td>
<td>≥ 65 dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>CHANNEL 2</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Measurement</td>
<td>Second Measurement</td>
<td>Relative Value</td>
</tr>
<tr>
<td>66 Hz</td>
<td>≥ 80 dB</td>
<td></td>
</tr>
<tr>
<td>500 Hz</td>
<td>≥ 65 dB</td>
<td></td>
</tr>
</tbody>
</table>
### 17. External Reference Test

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Measured Value</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MHz</td>
<td></td>
<td>&lt;999.90 kHz</td>
</tr>
<tr>
<td>10 MHz</td>
<td></td>
<td>&gt;910.001 MHz</td>
</tr>
</tbody>
</table>

### 18. Source Residual Offset

<table>
<thead>
<tr>
<th>Voltage Range Setting</th>
<th>Specification</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower Limit</td>
<td>Upper Limit</td>
</tr>
<tr>
<td>1 Vpk</td>
<td>-10 mVpk</td>
<td>10 mVpk</td>
</tr>
<tr>
<td>5 Vpk</td>
<td>-10 mVpk</td>
<td>10 mVpk</td>
</tr>
</tbody>
</table>

### 19. Source Amplitude Accuracy and Flatness

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hz to 65 kHz</td>
<td>PASS</td>
</tr>
<tr>
<td>65 kHz to 100 kHz</td>
<td>PASS</td>
</tr>
</tbody>
</table>

### 20. Source Distortion

<table>
<thead>
<tr>
<th>Source Amplitude</th>
<th>Source Frequency</th>
<th>PASS</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mVpk</td>
<td>10 kHz</td>
<td></td>
<td>≥ 60 dB</td>
</tr>
<tr>
<td>5 Vpk</td>
<td>10 kHz</td>
<td></td>
<td>≥ 60 dB</td>
</tr>
<tr>
<td>25 mVpk</td>
<td>99 kHz</td>
<td></td>
<td>≥ 40 dB</td>
</tr>
<tr>
<td>5 Vpk</td>
<td>99 kHz</td>
<td></td>
<td>≥ 40 dB</td>
</tr>
</tbody>
</table>

### 21. Source Energy Measurement

**Random Noise:**

\[
\text{HP 3563A Reading ( } \checkmark \text{ ) } \times 100 = \frac{\% \text{ in-band energy}}{\checkmark} \geq 70\%
\]

**Periodic Chirp:**

\[
\text{HP 3563A Reading ( } \checkmark \text{ ) } \times 100 = \frac{\% \text{ in-band energy}}{\checkmark} \geq 85\%
\]
Installation

Incoming Inspection

The HP 3563A Control Systems Analyzer was carefully inspected both mechanically and electrically before shipment. It should be free of marks or scratches and in perfect electrical order upon receipt. Shipped with the analyzer is the power cord, (3) 16-bit probe cables, (3) 16-bit probe pods, (3) 8-bit probe cables, a pattern generator probe lead set, grabbers, a pouch and the documentation set.

Inspect the analyzer for physical damage which may have occurred during transit. If the analyzer was damaged in transit, save all packing materials, file a claim with the carrier, and call your Hewlett-Packard sales and service office.

Warning

If the analyzer is mechanically damaged, the integrity of the protective earth ground may be interrupted. Do not connect the analyzer to power if it is damaged.
Safety Considerations

The HP 3563A is a Safety Class 1 instrument (provided with a protective earth terminal). Although this instrument has been designed in accordance with international safety standards, this manual contains information, cautions and warnings which must be followed to ensure safe operation and retain the HP 3563A in safe operating condition. Service and adjustments should be performed only by qualified personnel who are aware of the hazards involved.

Warning  Before applying line power to the analyzer or testing its electrical performance, read this chapter.

Incoming Tests

Finish incoming inspection by testing the electrical performance of the analyzer using the operational verification tests in Chapter 3 or the performance tests in Chapter 4 of this Installation Guide. The operation verification tests verify the basic operating integrity of the analyzer; these tests take about two hours to complete. The performance tests verify that the analyzer meets all the performance specifications; these tests take about eight hours to complete.

Dimensions and Weight

Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>222mm (8.75 in)</td>
</tr>
<tr>
<td>Width</td>
<td>426mm (16.75 in)</td>
</tr>
<tr>
<td>Depth</td>
<td>578mm (22.75 in)</td>
</tr>
</tbody>
</table>

Weight

27 kg (58 lbs)net
36 kg (79 lbs)shipping
Power Requirements

The analyzer can operate from a single-phase ac power source supplying voltages as shown in Table 5-1. With all options installed, power consumption is 450 Volt-amps.

The line-voltage selector switch is set at the factory to match the most commonly used line voltage of the country of destination; the appropriate fuse is also installed. To check or change either the line-voltage selector switch or the fuse see Figure 5-1, Table 5-1, and the following procedures.

---

**Warning**

Only a qualified service person, aware of the hazards involved, should measure the line voltage.

---

**Caution**

Before applying ac line power to the analyzer, ensure the line-voltage selector switch on the rear panel is set for the proper line voltage and the correct line fuse is installed in the fuse holder.

---

![Figure 5-1. Voltage Selection and Fuse Replacement](Image Link)
Table 5-1. Line Voltage Ranges and Fuse Selection

<table>
<thead>
<tr>
<th>AC Line Voltage</th>
<th>Frequency</th>
<th>Selector Switch</th>
<th>HP Part No.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>86-127 Vac</td>
<td>48-66</td>
<td>115</td>
<td>2110-0056</td>
<td>6A/250V Normal Blo</td>
</tr>
</tbody>
</table>

To change the line voltage selector switch:

See Figure 5-1 and Table 5-1

1. Unplug the power cord from the analyzer.
2. Slide the Line Voltage Selector switch to the proper voltage.

To change the fuse:

See Figure 5-1 and Table 5-1

1. Unplug the power cord from the analyzer.
2. Using a small screw driver, turn the fuse holder cap to the left and remove (counter clockwise).
3. When the fuse cap is free from the housing, pull the fuse from the fuse holder cap.
4. Select the proper fuse and insert it into the fuse holder cap.
5. Insert the fuse holder cap and turn to the right (clockwise).
Power Cable and Grounding Requirements

Power Cable

The analyzer is equipped with a three-conductor power cord which grounds the analyzer when plugged into an appropriate receptacle. The type of power cable plug shipped with each analyzer depends on the country of destination. See Figure 5-2 for the available power cables and plug configuration.

---

Warning

The power cable plug must be inserted into an outlet provided with a protective earth terminal. Defeating the protection of the grounded analyzer cabinet can subject the operator to lethal voltages.
<table>
<thead>
<tr>
<th>Country</th>
<th>Plug Type</th>
<th>Cable Type</th>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line</td>
<td>Neutral</td>
<td>Earth</td>
<td>Line</td>
<td></td>
</tr>
<tr>
<td>220V - 5A</td>
<td>BS 1363A</td>
<td>HP 5041-5811</td>
<td>OPERATION</td>
<td></td>
</tr>
<tr>
<td>PLUG*</td>
<td>CEE7-V11</td>
<td>HP 5041-5810</td>
<td>220V - 6A</td>
<td>OPERATION</td>
</tr>
<tr>
<td>PLUG*</td>
<td>NEMA-G-15P</td>
<td>HP 5041-5806</td>
<td>250V - 6A</td>
<td>OPERATION</td>
</tr>
<tr>
<td>PLUG*</td>
<td>NEMA 198/AS C112</td>
<td>HP 5041-5805A</td>
<td>220V - 6A</td>
<td>OPERATION</td>
</tr>
<tr>
<td>PLUG*</td>
<td>NEMA 5-15P</td>
<td>HP 5041-5820</td>
<td>250V - 10A</td>
<td>OPERATION</td>
</tr>
<tr>
<td>PLUG*</td>
<td>MITI 41-9692</td>
<td>HP 5041-5839</td>
<td>125V - 12A</td>
<td>OPERATION</td>
</tr>
<tr>
<td>PLUG*</td>
<td>SEV 1011.1959-24507</td>
<td>HP 5041-5813</td>
<td>220V - 6A</td>
<td>OPERATION</td>
</tr>
<tr>
<td>PLUG*</td>
<td>DHCR 107</td>
<td>HP 5041-5815</td>
<td>220V - 6A</td>
<td>OPERATION</td>
</tr>
</tbody>
</table>

*The number shown for the plug is the industry identifier for the plug only; the number shown for the cable is an HP part number for a complete cable including the plug.

**UL listed for use in the United States of America.
Grounding

The HP-IB connector pin 12 and pins 18 through 24 are tied to protective earth ground and the HP-IB cable shield. The instrument frame, chassis, covers, and all exposed metal surfaces, are connected to protective earth ground. The outer conductor of the analog BNCs, Channel 1 and Channel 2, is NOT connected to protective earth ground, and can be raised to a maximum of 42 Vpk with respect to instrument chassis.

Warning

Do NOT interrupt the protective earth ground or “float” the HP 3563A. This action could expose the operator to potentially hazardous voltages.

Operator Maintenance

Operator maintenance is limited to setting the voltage selection, replacing the line fuse (described in a previous section, Power Requirements), cleaning the fan filter, and if necessary, cleaning the display. There are no operator controls or user-serviceable parts inside the HP 3563A. Only trained service personnel should perform instrument repairs.

Warning

Under no circumstances should an operator remove any covers, screws, or in any other way enter the HP 3563A. There are no operator controls inside the HP 3563A.
Cleaning the Air Filter

The cooling fan’s air filter is located on the rear panel. To service the filter, remove the power cable and remove the four knurled nuts that hold the filter to the rear panel. Clean the filter using a solution of warm water and a mild soap or replace the filter, HP 3150-0218.

The air filter should be cleaned every 30 days.

Cleaning the Display (CRT)

The analyzer display is not removable by the operator. Under normal operating conditions the only cleaning required will be an occasional dusting with a soft brush. A household-type tack cloth, or other type of lint remover, may also be used.

However, if a foreign material adheres itself to the display; remove the power cable, dampen a soft, lint-free cloth with a mild detergent mixed in water, and carefully wipe the display.

To prevent damage to the display, do not use cleaning solutions other than the above.

______________________________

Warning  Do not apply any water mixture directly to the display or allow moisture to go behind the front panel. Moisture behind the front panel will severely damage the instrument.

______________________________
Analyzer Cooling

Cooling air enters the analyzer through the rear panel and exhausts through the side panels. Install the analyzer to allow free circulation of cooling air.

Installation

The analyzer is shipped with plastic feet in place, ready for use as a bench analyzer. The plastic feet are shaped to make full-width modular instruments align when they are stacked.

To install the analyzer in an equipment cabinet, follow the instructions shipped with the rack mount kit, option 908.

Turning on the HP 3563A

Caution

Before applying ac line power to the analyzer, ensure the line-voltage selector switch on the rear panel is set for the proper line voltage and the correct line fuse is installed in the fuse holder. See the previous section, “Power Requirements”.

Apply proper line power to the analyzer. Press the rocker-switch in the lower left-hand corner of the analyzer to the ON position, (1). The analyzer requires a minute to warm up and self-calibrate.

When using the analyzer for the first time, run the analyzer self test to ensure proper operation (see Chapter 3, “Operation Verification Tests”).

For additional measurement information or other operating information, see the HP 3563A Getting Started Manual.
Installation

HP-IB System Interface Connections

The analyzer is compatible with the Hewlett-Packard Interface Bus (HP-IB). The HP-IB is Hewlett-Packard’s implementation of IEEE Standard 488.2. The analyzer is connected to the HP-IB by connecting an HP-IB interface cable to the connector located on the rear panel. Total allowable transmission path length is 2 meters times the number of devices or 20 meters, whichever is less. Operating distances can be extended using an HP-IB Extender.

For additional information about HP-IB programming see the HP 3563A Programming Reference.

Labeling the Digital Probes and Cables

Labels for the digital probes and cables have been provided to aid in the setup of digital measurements.

Labeling the Input Cables
Qualifier Pod, Input Pod 1 and Input Pod 2

1. Refer to Figure 5-3.

2. Install the Cable labels shown as #1 in Figure 5-3. Four labels are provided so you can mark both ends of the cable.

3. Install the Pod label shown as #2 in Figure 5-3.

4. Install the Pod Pinout label shown as #3 in Figure 5-3.

5. Install the Probe Tip labels, shown as #4 in Figure 5-3, to match the pinouts on the Pod Pinout label (#3).

   For example, the third pinout on the right of the Qualifier Pod cable is the TRG pinout. Place the TRG Probe Tip label on the corresponding third probe tip from the right.

6. Repeat steps 1 - 5 for the remaining Input Pods, Input Pod 1 and Input Pod 2.

Note

Please note the second position from the right is GROUND, GND. X OVF on the Probe Tip label refers to OVF on the Pinout label of the Qualifier Pod.
Figure 5-3. Input Probes, Cable and Labels

1 Cable labels
2 Pod label
3 Pod Pinout label
4 Probe Tip labels

- Not used for Input Pods/Cables
Installation

Labeling the Output Cables
Pod X, Source Pod MSB and Source Pod LSB

1. Refer to Figure 5-4.

2. Install the Pod Pinout label shown as #1 in Figure 5-4.

3. Install the Probe Tip labels, shown as #2 in Figure 5-4, to match the pinouts on the Pod Pinout label (#1).

   For example, the third pinout on the right of the Pod X is the SCE END pinout. Place the SCE END Probe Tip label on the corresponding third probe tip from the right.

4. Repeat steps 1 - 3 for the remaining Source Pods, Source Pod MSB and Source Pod LSB.

Note

We recommend disconnecting the excess ground probe tips on Pod X and the Qualifier Pod, Pod Q.
Figure 5-4. Output Cables, Pods and Labels
Operating Environment

The operating and storage environment specifications for the analyzer, are listed below. Specifications apply when AUTO CAL is enabled or within 5°C and 2 hours of last internal calibration.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>0°C to 55°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>(\leq 95%) at 40 °C</td>
</tr>
<tr>
<td>Altitude</td>
<td>(\leq 4570) m (15,000 ft)</td>
</tr>
</tbody>
</table>

**Warning**  
To prevent potential fire or shock hazard, do not expose the analyzer to rain or other excessive moisture.

Protect the analyzer from moisture and temperatures or temperature changes which cause condensation within the analyzer.
Storage and Shipment

Storage

Store the analyzer in clean, dry and static free environment. Additional environmental specifications are listed below:

Temperature: \(-40^\circ\) to \(+75^\circ\) C
Altitude: \(\leq 15240\) m (50,000 ft)

Shipment

![Diagram](image)

**Figure 5-5. Repackaging for Shipment**

We recommend saving the original packing material. If this is not possible and the analyzer needs to be returned, containers and materials identical to those used in factory packaging are available through Hewlett-Packard sales offices and the factory. See Figure 5-5.

If the analyzer is being returned to Hewlett-Packard for service, attach a tag describing the type of service required, the return address, model number and full serial number. Also mark the container \textit{FRAGILE} to ensure careful handling. In any correspondence, refer to the analyzer by model number and full serial number. (See Chapter 1 for more information about the analyzer's serial number.)