Errata

**Document Title:** Receiver Testing (AN 421-28)

**Part Number:** 5954-9658

**Revision Date:** August 1987

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**HP References in this Application Note**

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**Description**  Functional testing of a receiver determines whether a given unit will deliver the performance as stated by the manufacturer. Tests of the tuner, pre-amplifier, power amplifier and the signal switching paths are quite common. Receiver tests are designed to measure the signal distortion and sensitivity, and response at various amplifier settings for different types of signal inputs. The signal inputs can vary from pure audio signals to modulated RF.

**Problem**  Receiver test applications require that the I/O signals be switched to a variety of instruments for different tests while rejecting noise and maintaining signal integrity. More than 12 data points for each test must be collected and stored for future analysis. Final test for a receiver production line will encompass hundreds of PASS/FAIL data points per day. Because of the complexity of the tests and the amount of data gathered, data analysis (computer) is a major factor.

**Solution**  Hewlett-Packard instrumentation can provide signal stimulus/measurement capability, switch a variety of signals and make PASS/FAIL decisions. A variety of modules ensures that all signals can be switched by one instrument. The switch expands to several hundred channels. A mechanical interface increases test flexibility by providing a standard inter-connection between the Unit-Under-Test and the test system.

When connected to a powerful computer, the computer-aided-test system is capable of handling large amounts of data and performing comprehensive analysis for the product line using Statistical Quality Control (SQC). Instrument intelligence off-loads some tasks and frees the computer for more important analysis. This distributed intelligence approach can greatly improve test throughput.
IMPLEMENTATION

Frequency Response  A large part of receiver testing is devoted to monitoring and analyzing the response on the pre-amplifier and power amplifier inputs at medium and high gain settings. The amplifiers are the heart of any receiver, and testing at key frequencies and gains determines whether the receiver’s amplifiers are operating within the stated specifications for a specific frequency range.

Total Harmonic Distortion  Total Harmonic Distortion (THD) is an indicator of the non-linearity response of the amplifiers for signal harmonics. A dynamic signal analyzer will input and monitor the effects of a white noise source into the amplifiers.

Signal-to-Noise Ratio  The Signal-to-Noise (S/N) ratio is a measure of the noise present in the amplifier. A dynamic signal analyzer will input the signal and the audioband RMS voltmeter will monitor the output signals.

Tuner Response  Frequency response, THD and S/N ratio tests are applied to the tuner section of the receiver. The RF signal generator provides signals modulated by the dynamic signal analyzer and monitored by the audioband RMS voltmeter and the dynamic signal analyzer.

Receiver Control  The receiver must be placed in defined functional states for each test. A remote control interface tied to a set of digital I/O lines will control the receiver. A breadboard is needed to power the remote control. The applying of AC power to the receiver is controlled by a general purpose switch.

KEY SYSTEM FEATURES
Data storage
SQC analysis
Networking
Low development time

TYPICAL CONFIGURATION

**Computer-Aided-Test System**

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<th>Item</th>
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<tbody>
<tr>
<td>HP 3235A</td>
<td>1</td>
</tr>
<tr>
<td>Relay multiplexer channels</td>
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</tr>
<tr>
<td>RF multiplexer channels</td>
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<td>25-40</td>
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<td>GP switching channels</td>
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</tr>
<tr>
<td>Breadboard power supply</td>
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</table>

**Computer/Software**

- HP Series 300 computer
- Disc drive (HP 9153B)
- Printer (HP Laserjet Plus)
- Software - HP BASIC and HP FTM/300

**Other Equipment**

- True RMS Voltmeter (HP 3457A or HP 34520A)
- Dynamic Signal Analyzer (HP 3562A)
- RF Signal Generator (HP 8656B)

**TYPICAL SYSTEM PRICE:**

$40,000 to $65,000