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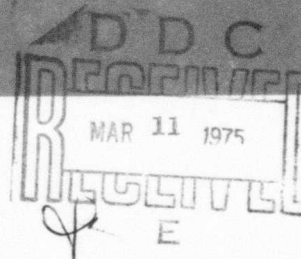
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# INTEGRATED CIRCUIT ELECTROMAGNETIC SUSCEPTIBILITY INVESTIGATION - PHASE II

## TEST AND MEASUREMENT SYSTEMS

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**INTEGRATED CIRCUIT  
ELECTROMAGNETIC  
SUSCEPTIBILITY INVESTIGATION  
PHASE II.**

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**TEST AND MEASUREMENT SYSTEMS.**

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SUBMITTED TO:  
CONTRACTING OFFICER  
U.S. NAVAL WEAPONS LABORATORY  
DAHLGREN, VA. 22448  
CONTRACT NO. N00178-73-C-0362



**MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - EAST**

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PREFACE

This document is one of eight task-oriented reports prepared under Contract No. N00178-73-C-0362 for the U. S. Naval Weapons Laboratory, Dahlgren, Virginia 22448.

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## 1. INTRODUCTION AND SUMMARY

This report describes the RF test fixture and the semi-automatic test set up developed on contract number N00178-73-C-0362 to investigate the susceptibility of integrated circuits to high power RF signals. Some of the material contained herein has appeared in previous reports, but is also included here to provide a complete testing document.

Test fixtures were fabricated to permit testing of integrated circuits with up to 16 leads on three different package styles (flat-pack, dual in-line, and T0-5 can) while fully biased and operational. The semi-automatic test system was developed to facilitate collecting the enormous amount of data needed for the integrated circuit susceptibility investigation. The heart of the system is an HP9810A programmable calculator and a 50-channel scanning digital voltmeter; however, several circuits had to be designed and fabricated to aid in biasing and loading the IC and to interface with the computer.

To facilitate reading, figures start on page 16 and tables start on page 74.

## 2. TEST FIXTURES

Development of suitable test fixtures and a semi-automatic test system to assist in collection and recording of data was a key achievement of this program. This section describes the test fixtures and the principles used in their design. Design of the test fixtures incorporated the following requirements:

- (1) interface the IC with conventional RF transmission lines
- (2) provide operational conditioning for biased testing of ICs
- (3) permit determination of dissipated RF power within the IC to an absolute accuracy of 10%
- (4) exhibit a bandwidth of 100 MHz to 12.4 GHz
- (5) permit repeatable measurements.

A test fixture for each of the three package styles (flat-pack, dual in-line, and T0-5 can) is now available. In an earlier report we had indicated an approach involving a universal base module containing the RF input lines and having bias units incorporated into each line to separate the video and RF frequencies. After further consideration, we decided that the advantages associated with having more than one complete test fixture available outweighs the small cost savings associated with the universal base module concept. Consequently, a complete test fixture is available for each package style.

Each fixture features stripline technology to interface between the IC package and conventional RF transmission line. Stripline launchers accomplish the transition from coaxial transmission line to the stripline paths on the board. Type N connectors provide standard, reliable, well shielded RF connections. Such connection ease expedites measurements at all ports. The video inputs to the test fixture are through type BNC connectors. Paragraphs 2.1, 2.2, and 2.3 describe the test fixtures for the flat-pack, dual in-line, and T0-5 can packages, respectively. The bias units are the same for all the test fixtures and are described in paragraph 2.4

**2.1 Flat Pack Test Fixture** - Figure 1 is an exploded view of the test fixture which will accommodate flat pack ICs having up to 16 leads. Items (19) and (20) form the stripline feed system (consisting of two copper clad, low loss tangent, dielectric boards). The bottom board has the stripline paths etched upon it. Installation holes in the centers of the top dielectric board and cover plate permit the IC to be placed within the fixture. An IC lead locator plug, item (15), taken from an integrated circuit test socket is press fitted into the center of the bottom dielectric board. It holds the device in a consistent orientation which assures proper alignment of the leads.

A cover plug, item (12), fits snugly into the installation hole enclosing the IC within the stripline feed system. The cover plug also provides dielectric continuity above the device and RF shielding integrity for the top aluminum cover plate. By applying pressure upon the IC leads which lay atop the stripline feed system in the fixture, the cover plug connects the IC to the stripline. Rubber pads, item (13), evenly distribute the pressure to all IC leads. A toggle clamp, item (4), provides an adjustable pressure to enable a reliable connection.

Structural rigidity is required of the fixture to permit repeatable data. Consequently, the stripline boards are enclosed in an aluminum housing which keeps the dielectric boards from flexing or moving. Screws shorting the two ground planes together are located at intervals of less than one-half wavelength at the highest frequency of interest to prevent propagation of higher order modes.

The bias units, item (27), are connected to the stripline type N launchers and are held in place by the test fixture skirt, item (22). The lower connector on each bias unit is the RF input (or output) and is DC isolated from the IC. DC bias and video pulses can be applied or measured using the upper connector on each bias unit.

**2.2 Dual In-Line Package Test Fixture** - Figure 2 is an exploded view of the test fixture which will accommodate dual in-line packaged ICs having up to 16 pins.



Items (10) and (11) form the stripline feed system. The top board has the stripline paths etched upon it. A 16 pin dual in-line socket, item (8), is used to assure a consistent orientation of the IC under test. The copper on the ground plane side of the top board has been removed from under the socket and holes drilled through the dielectric board for the 16 pins from the socket. Each pin is soldered to the appropriate stripline center conductor. The socket is held securely in place by small tabs, item (6), bolted to the top plate of the aluminum housing. The cover plug, item (1), and spring loaded hold down, item (2), assures RF shielding integrity for the top plate. Removal of the IC is facilitated by a lever, item (18), and two small teflon rods, item (19).

Structural rigidity is obtained in the same manner as for the flat pack package test fixture. Bias units are connected and used in the same way as for the flat pack package test fixture.

**2.3 T0-5 Package Test Fixture** - The T0-5 package test fixture was designed to accommodate T0-5 cans having 8 or 10 pins. Figure 3 is an exploded view of the test fixture. Items (9) and (10) from the stripline feed system. The top board has the stripline paths etched upon it. Two interchangeable top boards are required; one for 8-pin T0-5 packages, another for 10-pin packages. A socket, item (7), is used to assure a consistent orientation of the IC under test. A test cap, item (6), provides alignment guides for the pins to facilitate placement of the IC into the socket. The copper on the ground plane side of the top board has been removed from under the socket and holes drilled through the dielectric board for the socket pins. Each pin is soldered to the appropriate stripline center conductor. The test cap and socket are held securely in place by the aluminum housing, with the top plate contacting the lip around the bottom of the test cap. The cover plug, item (1), and spring loaded hold down, item (2), assures RF shielding integrity for the top plate. Removal of the IC is facilitated by a lever, item (21), and a small teflon rod, item (13).

Structural rigidity is obtained in the same manner as for the flat pack package test fixture. Bias units are also connected and used in the same way.

**2.4 Bias Unit** - The function of the bias insertion unit is to provide a low-pass path for the video signals while providing high-pass characteristics for the RF signal. The problem is complicated by the wide RF frequency band (100 MHz to 10 GHz) over which the unit must perform. Desirable video section performance is free passage of video signals up to approximately 10 MHz while rejecting RF signals by approximately 20 dB. The RF section must provide RF transmission properties with no large reflections due to mismatches in the line, especially near the video section connection. The basic design requires a capacitor (DC block) in the RF line to reject low frequency signals and an inductor (RF choke) in the video line to reject high frequency signals. Achieving a good RF choke in the microwave region is difficult across a wide band due to resonances in interwinding capacitances or distributed parameters. The use of ferrite material as a core offered the best chance for success.

After considerable development, success was achieved with the design diagrammed in figure 4. A 2 1/2 turn choke on a ferrite core provided the RF choke while a commercial DC block (coaxial) is used in the RF line to isolate low frequency signals. Figure 5 is a cutaway drawing of the assembled bias unit.

This bias unit provides a nominal 20 dB isolation from the RF path to the bias input port, passes a one microsecond, one ampere pulse with an 80 nanosecond rise-time from the bias port to the test IC, and has an RF path insertion loss of 3.5 dB or less. Figure 6 shows the measured insertion loss from the RF path to the bias input port. Figure 7 shows the measured RF insertion loss through the RF path.

Figure 8 shows the setup used to measure the video path response to short, high current pulses. Figure 9 compares the open circuit voltage available from the pulse generator to the received pulse at the test device port. At current levels up to

one ampere, no ferrite saturation effects are seen, and the risetime is shown to be approximately 80 nanoseconds. Protection offered to the RF generator by the DC block is shown in figure 10. Table 1 lists the data for loss calibration for the 16 bias units used for the interference testing.



## 3. SEMI-AUTOMATED TEST SYSTEM

To facilitate collecting the enormous amount of data needed for the integrated circuit susceptibility investigation, MDAC-E developed a semi-automatic test system specifically for use on this contract. The heart of the system is an HP9810A programmable calculator and a 50-channel scanning digital voltmeter. Data is recorded on a digital tape cassette for later processing in an HP9830A computer. The following paragraphs describe the test set ups, test procedures, computer programs, and peripheral equipment designed and fabricated to aid in testing the various types of integrated circuits.

3.1 Crystal Detector Calibration - One of the critical tasks in setting up the semi-automatic test system was the calibration of the crystal detectors to permit determination of RF power level at each port of the test fixture during a test. A test requires monitoring the power entering one port and exiting from as many as 16 ports (the other 15 pins on the IC plus the reflected power from the input port). Seventeen HP423A crystal detectors were calibrated by subjecting them to sequential steps of RF power while monitoring the detected voltages. Each crystal detector was terminated in a 10K ohm resistor. This value was chosen as a compromise for obtaining adequate detected output voltage while not appreciably affecting rise and fall times during testing for pulsed conditions.

Calibrations were performed at all five test frequencies (.22, .91, 3.0, 5.6 and 9.1 GHz). The data was processed to obtain a least squares fit to the equation:

$$y = B_0 + B_1x + B_2x^2 + B_3x^3$$

where:  $y = \log_{10}$  (RF power)

$x = \log_{10}$  (detected voltage)

and  $B_0$ ,  $B_1$ ,  $B_2$ , and  $B_3$  are the calculated coefficients. The cubic-order power-series-fit proved to be quite adequate over the power range of .01 to 100 milliwatts required



for testing after accounting for the various coupling and attenuation factors associated with each port. Table 2 shows a typical data tabulation where the actual and calculated values are compared. Figure 11 shows a graph of a typical calculated function and the measured data points. Tables 3 through 7 show the values of the coefficients which are used by the HP9810A calculator to compute the various power levels as the detected voltages are measured.

Figure 12 shows the data acquisition and recording set up for the crystal detector calibration. Figures 13 through 17 are block diagrams of the RF portions of the crystal calibration test set ups for each of the five test frequencies. The HP9810A program used to acquire and record the crystal detector calibration data is shown in table 8. The recorded data at this stage is not in array format. To change the data to an array format, which is desirable for data reduction by the HP9830A, and to obtain a hard copy of the data, the recorded data was then processed on the HP9830A computer calculator, using the program shown in table 9, and recorded. The program shown in table 10 was then used in calculating the calibration coefficients on the HP 9830A.

**3.2 RF Test Fixture Calibration** - Each test fixture was characterized for dissipation loss without bias units. Dissipation loss is a measure of the fraction of RF power lost from a given path within the fixture. That fraction of power not dissipated in the fixture or coupled out of the ports must be delivered to the IC. Fixture dissipation had to be determined accurately, since a knowledge of power dissipation within the device to an absolute accuracy of  $\pm 10\%$  was desired.

Dissipation losses are primarily due to characteristics of the stripline paths within the fixture. The dissipative loss per stripe,  $L$ , is defined as the ratio:

$$L = \frac{P_{in}}{P_{out}} > 1$$

where  $P_{out}$  is the power delivered at the end of the stripe for an input power  $P_{in}$ .

Since each stripe is the same length and shape,  $L$  is assumed to be the same value for each of the  $i$  stripes. This assumption was verified experimentally.

Referring to figure 18, the power which comes out of each port must be  $L$  times greater at the center of the fixture. Hence,  $P_{dist}$ , the total power distributed from the center, is given by:

$$P_{dist} = \sum_{j=1}^i L P_j$$

$P_a$  is the amount of power available for distribution from the center of the fixture and is given by:

$$P_a = \frac{P_{incident}}{L}$$

Conservation of energy requires that these two quantities be equal. Hence:

$$P_a = P_{dist}$$

$$\text{and, } L^2 = \frac{P_{incident}}{\sum P_j} \quad (j = 1 \rightarrow i)$$

It is not possible to measure directly the loss per stripe because of lack of connectors at the IC end of each stripe. A dummy IC was made for each test fixture which shorted stripes together so that a continuous path was provided between ports.

By using each port for power input to the fixture at each given frequency,  $i$  different values of  $L$  were measured for each fixture. Statistical analyses were performed on this group of loss factors to compute the average loss and the standard error. The test fixture calibration was performed using the semi-automatic test system. In operating the system for test fixture calibration, the operator initiates the data cycle by pressing the CONTINUE button on the HP9810A calculator. The system sequentially samples the RF power level of the required number of ports by means of the calibrated crystal detectors and records the data. The operator then changes the input ports, presses the CONTINUE button again, and more data is acquired and recorded. This process is repeated until all ports have been used as

input ports. The HP9810A then calculates and prints out (on a typewriter) the calculated loss when using each port as an input, the mean loss and the standard error (all in dB).

Figure 19 shows the data acquisition and recording set up for test fixture calibration. Figures 20 through 24 are block diagrams of the RF portions of the test set ups. Table 11 is a listing of the HP9810A program for the test fixture calibration and table 12 lists the data register allocations for that program. Tables 13 through 17 show the data resulting from the measurements and calculations for the 16 pin dual in-line package test fixture. Tables 18 through 22 are the results for the 8 pin TO-5 package test fixture.

**3.3 Interference Testing Using the Semi-Automatic Test System** - The semi-automatic test system is illustrated in figure 25. Acquisition and storage of the data in the laboratory is controlled by an HP9810A calculator. It also directs the data recording on digital tape cassettes. Analysis of this data is performed using an HP9830A computer. A hard copy of the data, an example of which is shown in table 23 is prepared to verify successful data runs and as insurance against mishap with the tape. The computer is also used to prepare curves such as shown in figure 26, thus providing a pictorial representation of the data to aid in analysis.

In operating the semi-automatic test set-up for interference testing, the operator selects an input power level to be applied to the device and initiates the data cycle by pressing the CONTINUE button on the HP9810A calculator. The system sequentially samples the RF power level of the required number of ports by means of the calibrated crystal detectors, computes the ratio of power delivered to the device to the input power (the calibration factor) using a stored program and constants, then measures various device voltages and currents. Selected device voltages and currents and the calibration factor are stored along with the corrected power dissipated in the chip (which is the independent variable) on the digital tape cassette. A photograph of the system in operation is shown in figure 27.



The test set ups and computer programs used are very similar for all the device types tested. There are some differences due to the number of ports to be monitored, bias and loading requirements, test equipment availability, and improvements in programming techniques over the term of the contract.

**3.3.1 7400 NAND Gate Interference Testing** - The 7400 NAND gate contains four 2-input NAND gates in a 14 pin flat pack. Nondestructive measurements were made with the device in active bias states using the RF test fixture described previously. Figure 28 shows the data acquisition and recording set up for interference testing of the 7400. Figures 29 through 33 are block diagrams of the RF portions of the 7400 interference test set ups for each of the five test frequencies. Figure 34 shows the interference test flow diagram for the 7400 device and table 24 is the program for the HP9810A used to incorporate this procedure. To keep track of the data, each device was given a pre-test sample number which encoded all the pertinent data about its test configuration (frequency, port, bias state, and device number from 0 to 9). This sample number is entered into the measurement system manually and becomes a part of each file of data on the magnetic tape.

Table 25 is a listing of the program for the HP9830A to change the data acquired by the HP9810A to an array format, which can be used more efficiently by the HP9830A during later data reduction. Table 26 is a listing of the program for the HP9830A to plot the 7400 data after conversion to the array format.

**3.3.2 741 Operational Amplifier Interference Testing** - Interference testing on the 741 operational amplifier was conducted in a manner similar to that for the 7400. Figure 35 shows the data acquisition and recording test set up for the testing. Figures 36 through 40 are block diagrams of the RF portions of the test set ups. Table 27 is the program for the HP9810A used to acquire and record the data and table 28 is a list of the data register locations required for the program. The test frequency, port, and device number were encoded and entered into the measurement



system manually. Table 29 is a listing of the program for the HP9830A to change the data acquired by the HP9810A to an array format. Table 30 is a listing of the program for the HP9830A to plot the 741 data.

**3.3.3 MOS 4011 Interference Testing** - The MOS 4011 contains four 2-input NAND gates utilizing CMOS fabrication techniques in a 14 pin flat pack. Figure 41 shows the data acquisition and recording test set up for interference testing of this device. Figures 42 through 45 are block diagrams of the RF portions of the test set ups. Figure 46 shows the interference test flow diagram and table 31 is the program for the HP9810A used to incorporate this procedure. Table 32 is a list of the data register locations required by the program. The test frequency, port, and device number were encoded and entered into the measurement system manually. Table 33 is a listing of the program for the HP9830A to change the data acquired by the HP9810A to an array format and table 34 is a listing of the program for the HP9830A to plot the MOS 4011 data.

**3.3.4 2002 Hybrid Interference Testing** - Figure 47 shows the data acquisition and recording test set up for interference testing of the 2002 hybrid. Figures 48 through 51 are block diagrams of the RF portions of the test set ups. Table 35 is a listing of the program for the HP9810A used for the interference testing and table 36 lists the data register locations required by the programs. Again the test frequency, port, and device numbers were encoded and entered. Table 37 is a listing of the program for the HP9830A to print the 2002 data.

**3.3.5 Extra Digital Devices Interference Testing** - The following digital devices received more limited interference testing than the devices discussed above: 3021, 7432, 7402, 7404, 7405, 7450, 7473, and 7479. This testing was performed to verify the MDAC-E 7400 susceptibility model for other devices. These devices were tested using only four input power levels (vs 20 for the others): (1) no input power, (2) power which would cause a previously set interference threshold to be crossed,

(3) maximum power the crystal detectors could safely stand, and (4) a point approximately half-way between the interference threshold and the crystal detector maximum. As shown in figure 52 the interference threshold level was determined using a comparator box, which compared the output from the device under test to a previously determined level. RF power with a pulse width of 500 microsecond was applied to the device when setting up the interference threshold level, to reduce heating effect contributions, but the data was obtained with CW input at that level. Block diagrams of the RF test set ups are the same as for the 2002 (Figures 48 through 51). Table 38 is a listing of the HP9810A program. The data register locations are the same as for the 2002 (table 36). Table 39 is a listing of the program for the HP9830A to reduce the data from the HP9810A.

**3.4 Special Circuits** - Design and fabrication of several special circuits were required to bias, load, and test the various types of ICs whose susceptibility was evaluated. These circuits were shown in block diagrams in preceeding paragraphs where applicable. The following paragraphs give a short description of the function of each circuit along with a schematic.

**3.4.1 Digital Control Box** - The digital control box supplies worst case loading to the digital device under test while providing voltage and current monitoring of all device terminals. A schematic of the digital control box is shown in figure 53.

**3.4.2 Operational Amplifier Control Box** - The operational amplifier control box supplies loading to the operational amplifiers contained in the linear test devices and provides voltage and current monitoring of all device terminals. A schematic of this control box is shown in figure 54.

**3.4.3 MOS Control Box** - This circuit provides biasing and loading for the MOS digital devices and also provides for voltage and current monitoring of the devices. The schematic is shown in figure 55.

3.4.4 Comparator Box - The Comparator Box is used to monitor the output(s) of the devices during the Extra Digital Devices Interference Testing and to indicate when an interference threshold is exceeded. A schematic of the comparator is shown in figure 56.

3.4.5 Comparator Control Box - The comparator control box supplies loading to the comparator linear test device and provides voltage and current monitoring of all device terminals. A schematic of this control box is shown in figure 57.

3.4.6 Voltage Regulator Control Box - The voltage regulator control box supplies loading to the positive and negative voltage regulators contained in the linear test devices and provides voltage and current monitoring of all device terminals. A schematic of this control box is shown in figure 58.



## 4. CATASTROPHIC FAILURE TESTS

Tests were performed to determine the power levels at which catastrophic failure occur for the 7400 and the 741 operational amplifier. 800 7400's were tested: 20 in each of two states, at each of four input ports, at each of five frequencies. 560 741's were tested: 20 with input power at each of seven ports, at each of four frequencies (9.1 GHz was not included). Figures 59 through 63 shows block diagrams of the test setups for the catastrophic failure testing.



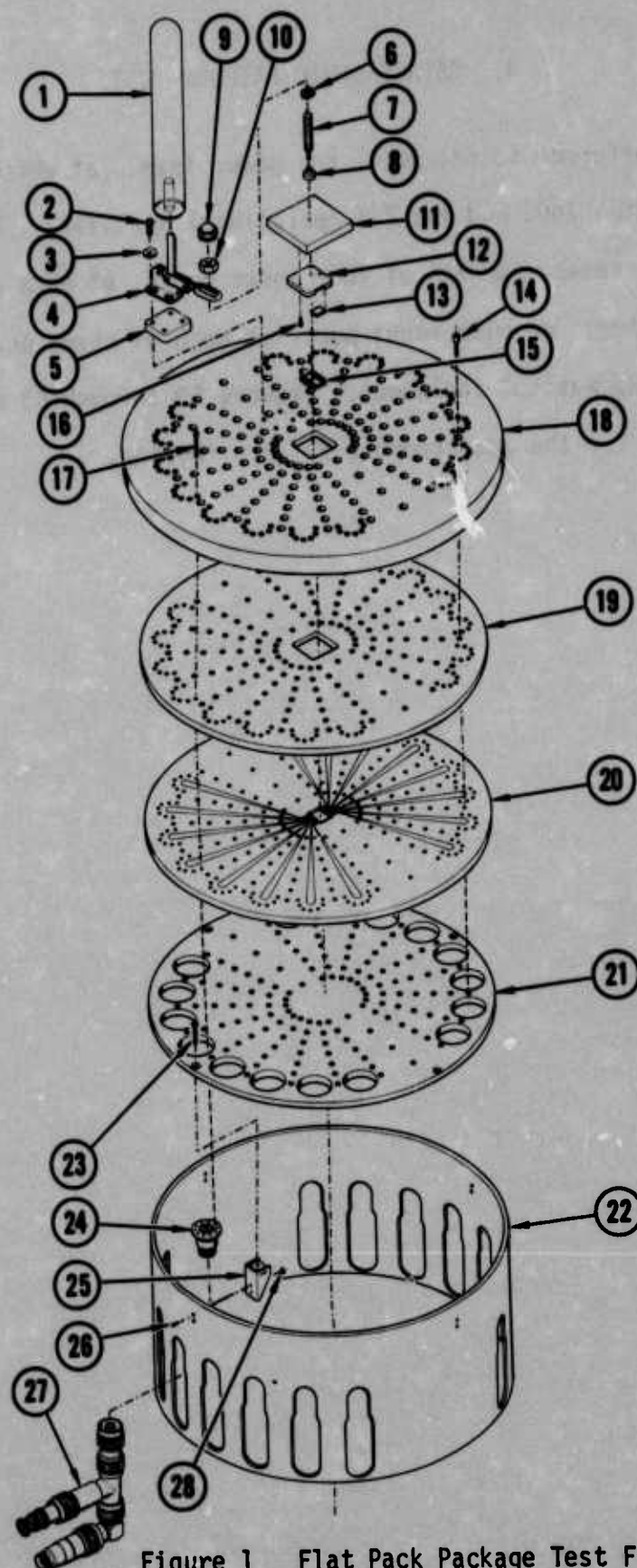


Figure 1 Flat Pack Package Test Fixture - Exploded View

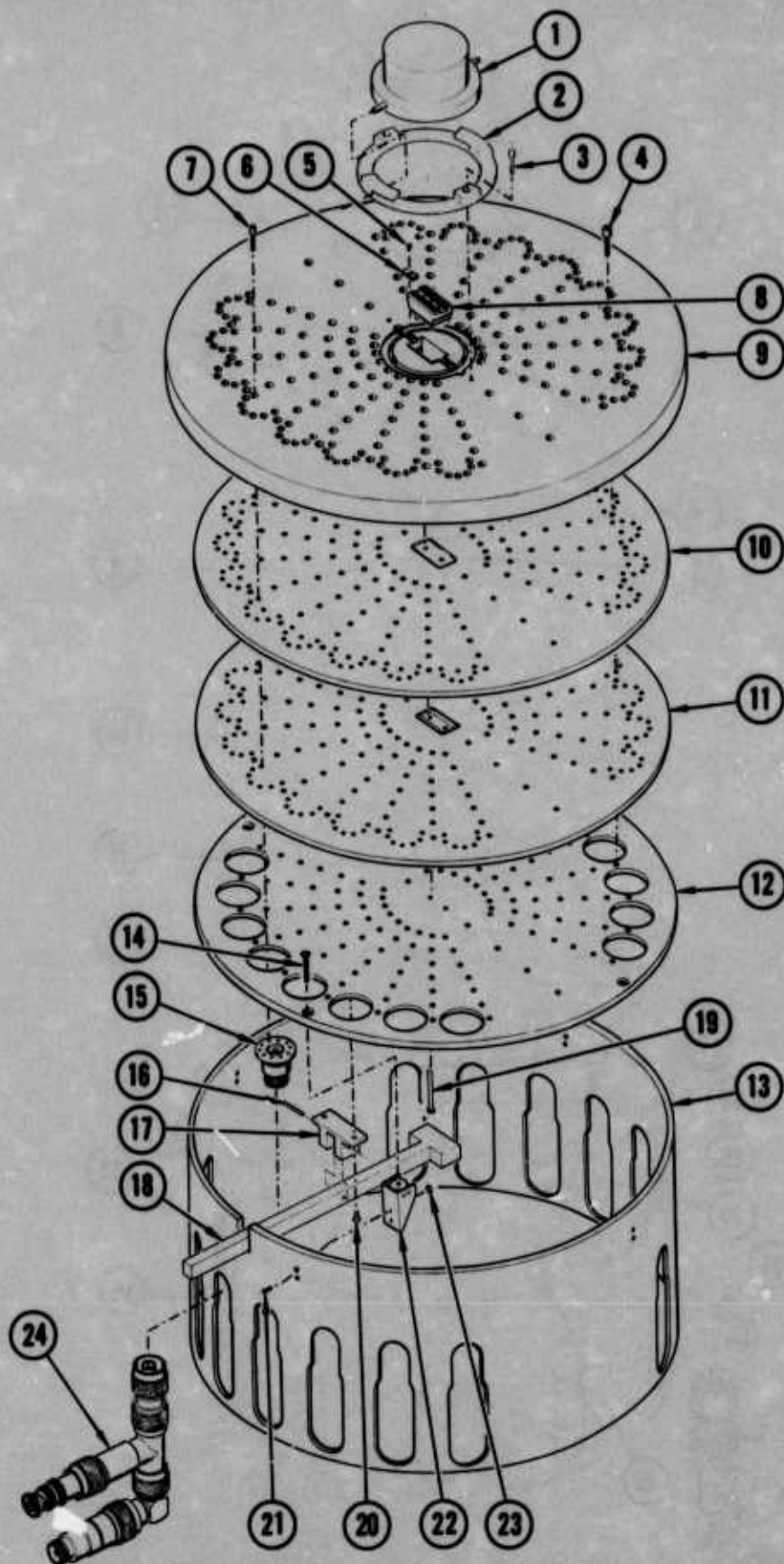


Figure 2 Dual In-Line Package Test Fixture - Exploded View

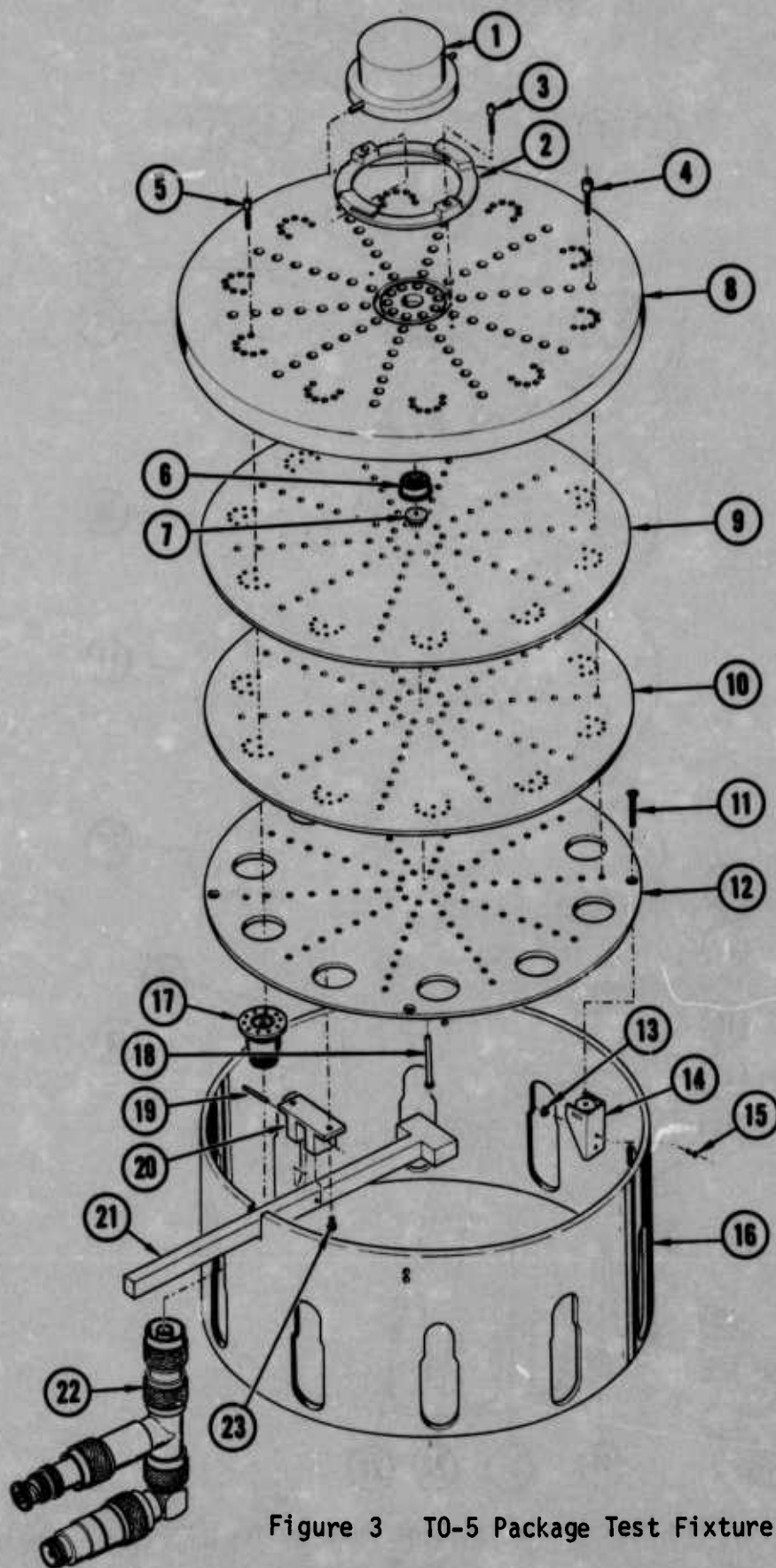


Figure 3 T0-5 Package Test Fixture - Exploded View



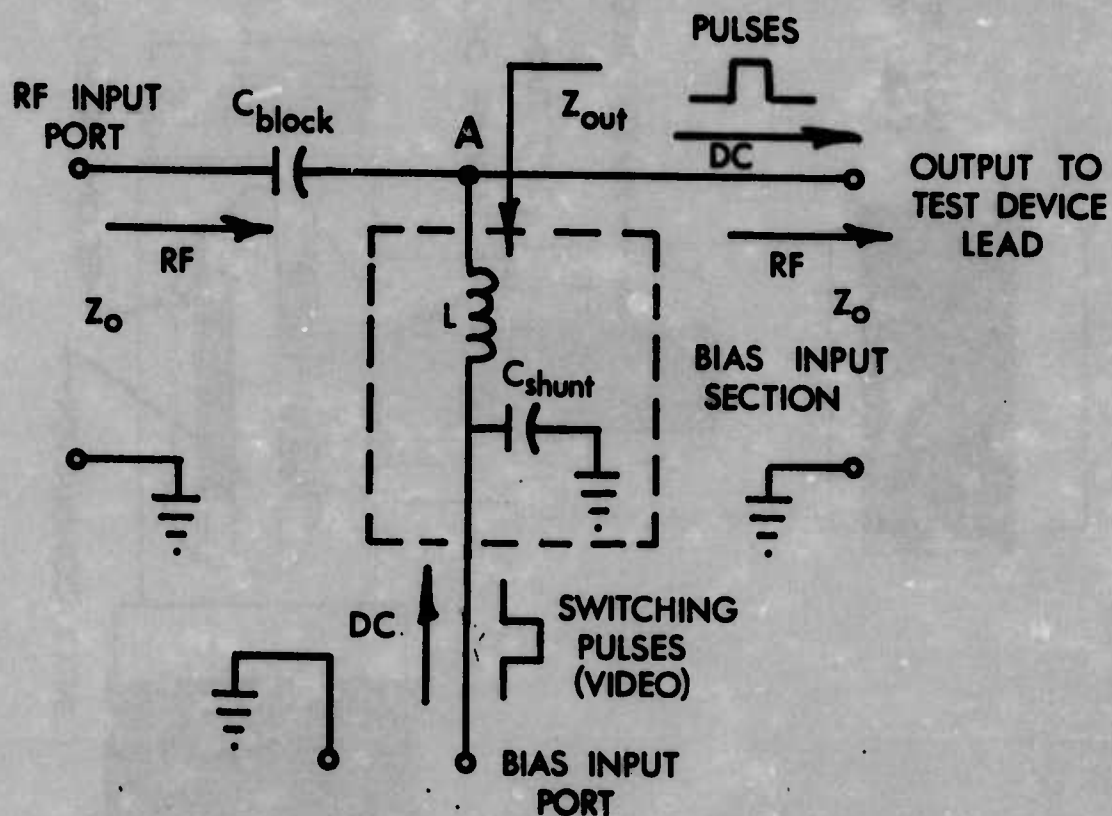


Figure 4 Bias Unit With 2 1/2 Turn Ferrite Choke



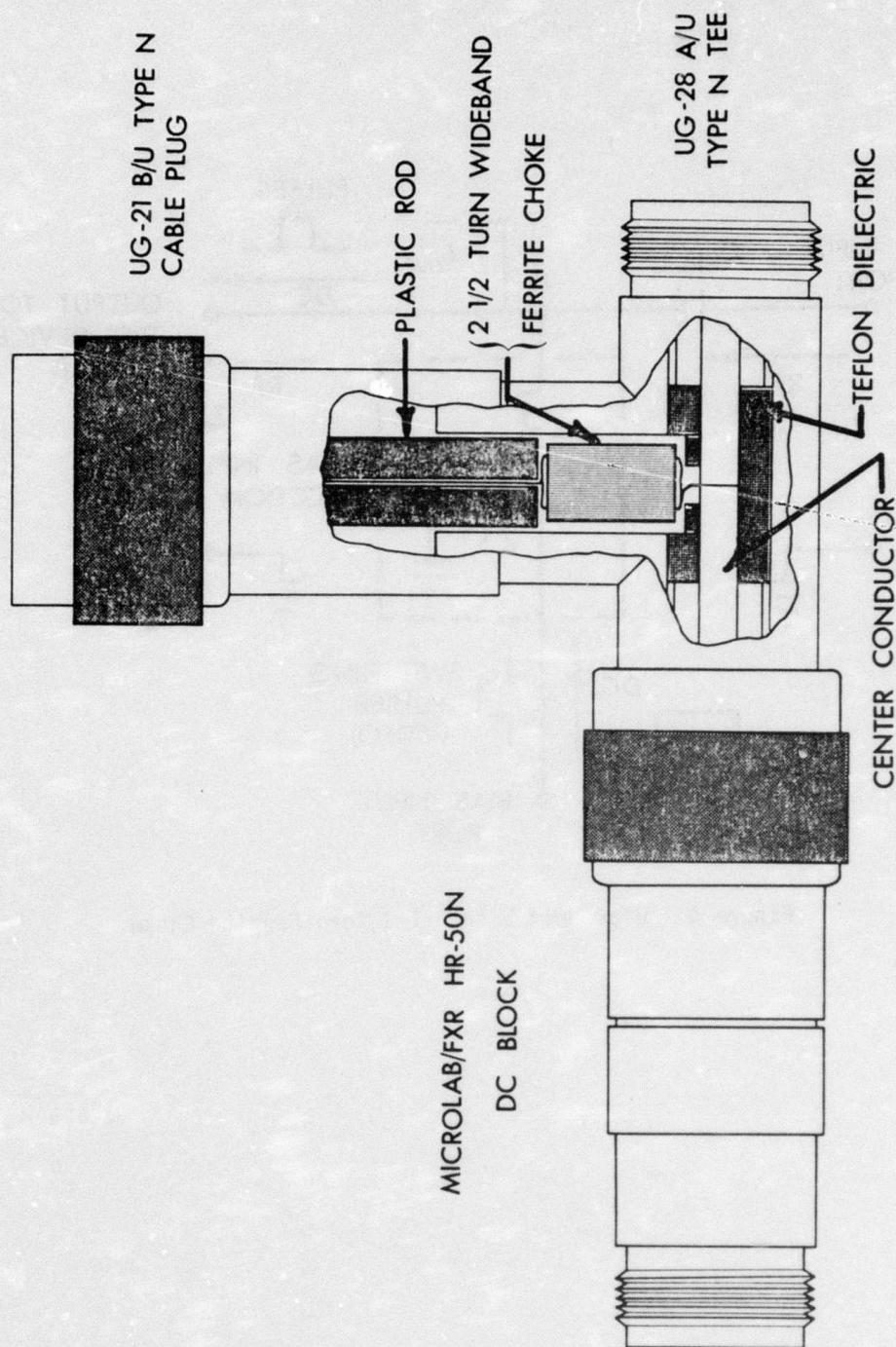
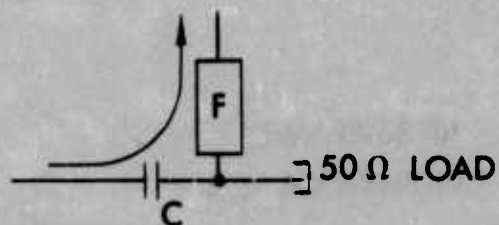


FIGURE 5 CUTAWAY DRAWING OF THE ASSEMBLED BIAS UNIT



C: FXR HR-50 N

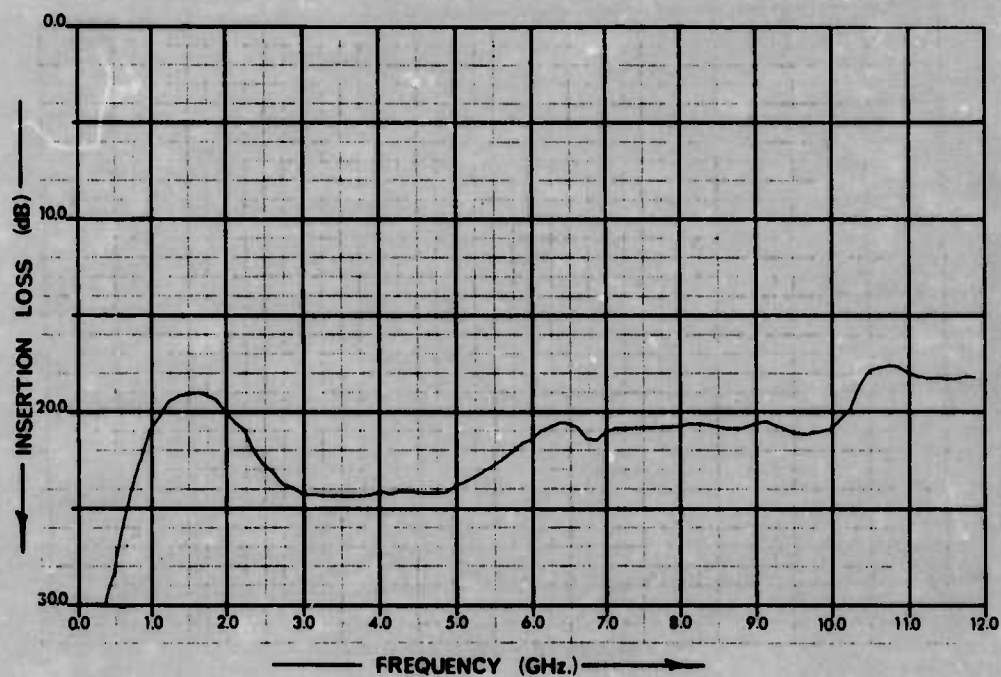


FIGURE 6 RF ISOLATION FROM RF PATH TO BIAS INPUT PORT

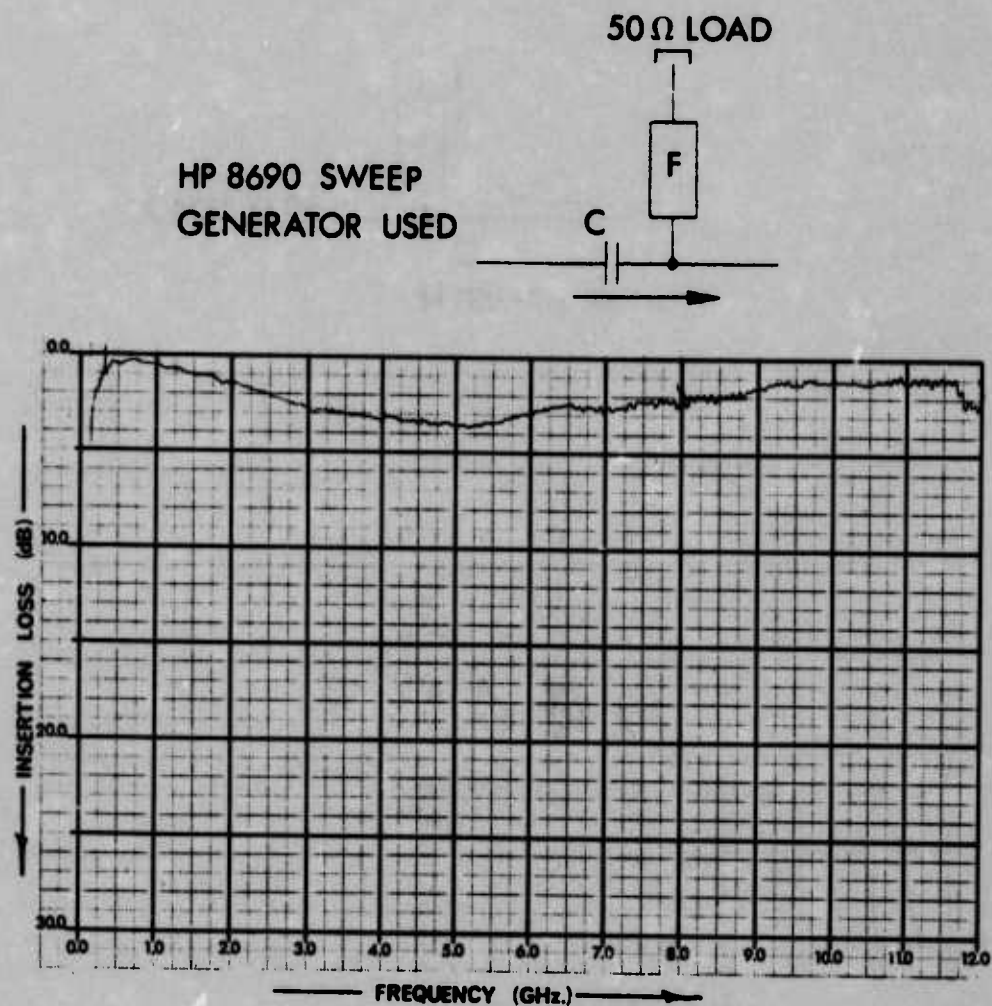


FIGURE 7 BIAS UNIT RF PATH INSERTION LOSS



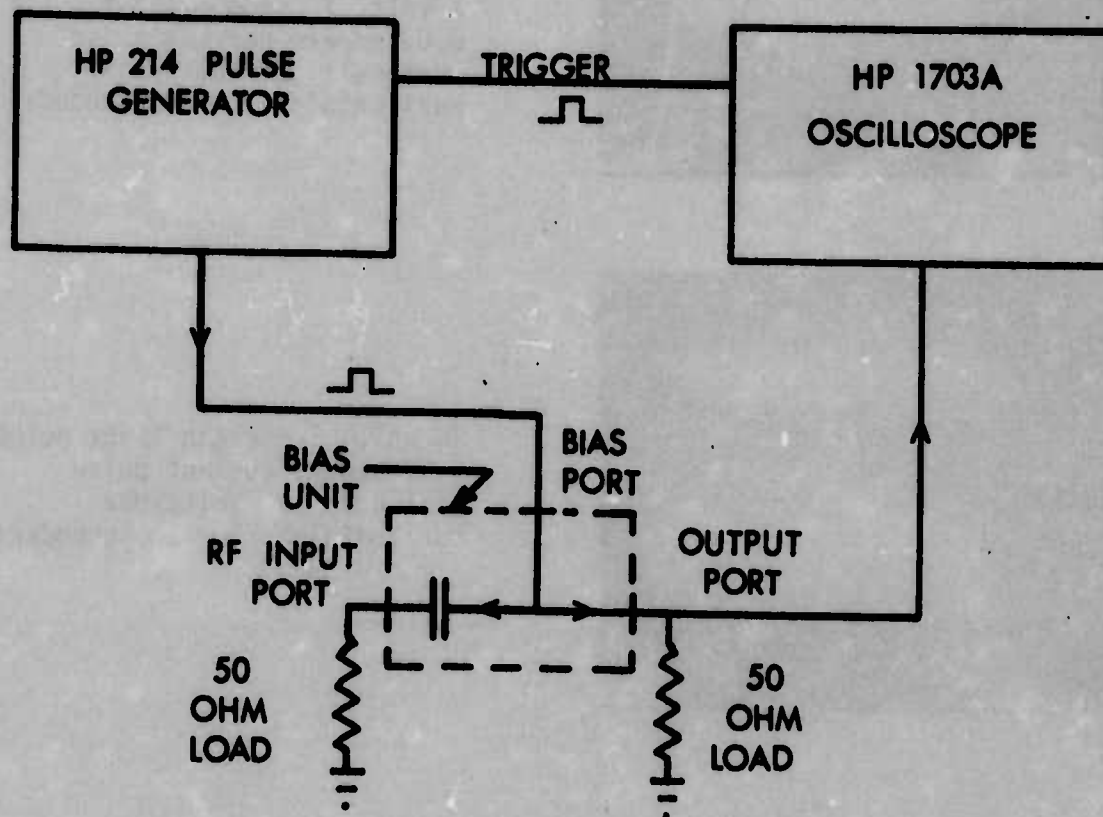
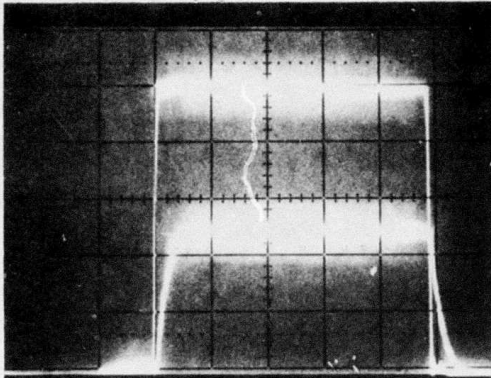
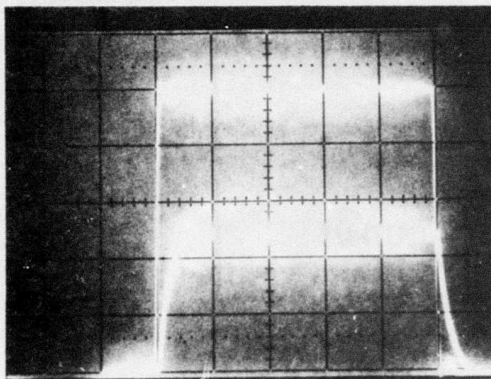


FIGURE 8 SETUP USED TO MEASURE CURRENT SATURATION EFFECTS UPON THE 2 1/2 TURN FERRITE CHOKE

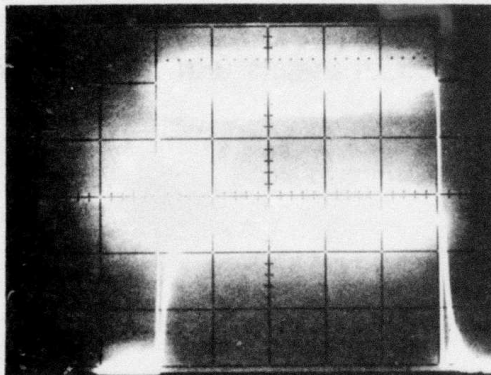


Top pulses in each photograph are input pulses to the bias unit. The bottom pulses are the output pulses from the bias unit's output port. All pulses are delivered to a 25 ohm load.

1 volt, 1  $\mu$ second input pulse  
0.01 ampere current pulse  
vertical: .20 volts/div  
horizontal: 200 nanoseconds/div

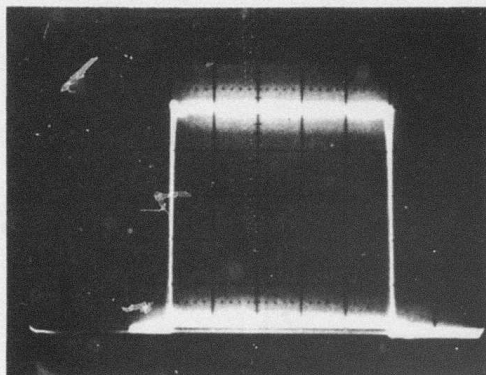


10 volt, 1  $\mu$ second input pulse  
0.10 ampere current pulse  
vertical: 2 volts/div  
horizontal: 200 nanoseconds/div



100 volt, 1  $\mu$ second input pulse  
1.0 ampere current pulse  
vertical: 20 volts/div  
horizontal: 200 nanoseconds/div.

FIGURE 9 SATURATION EFFECTS FROM HIGH CURRENT LEVELS UPON THE FERRITE CHOKE



Vertical: 2 Volts/div  
0.08 amp/div

Horizontal: 200 nanosecond  
per div.

Upper trace: open circuit voltage  
available from  
generator

Lower trace: voltage delivered  
to RF generator

FIGURE 10 ISOLATION OF THE RF GENERATOR FROM INPUT PULSES DUE TO THE  
MICROLAB/FXR DC BLOCKS CAPACITIVE REACTANCE



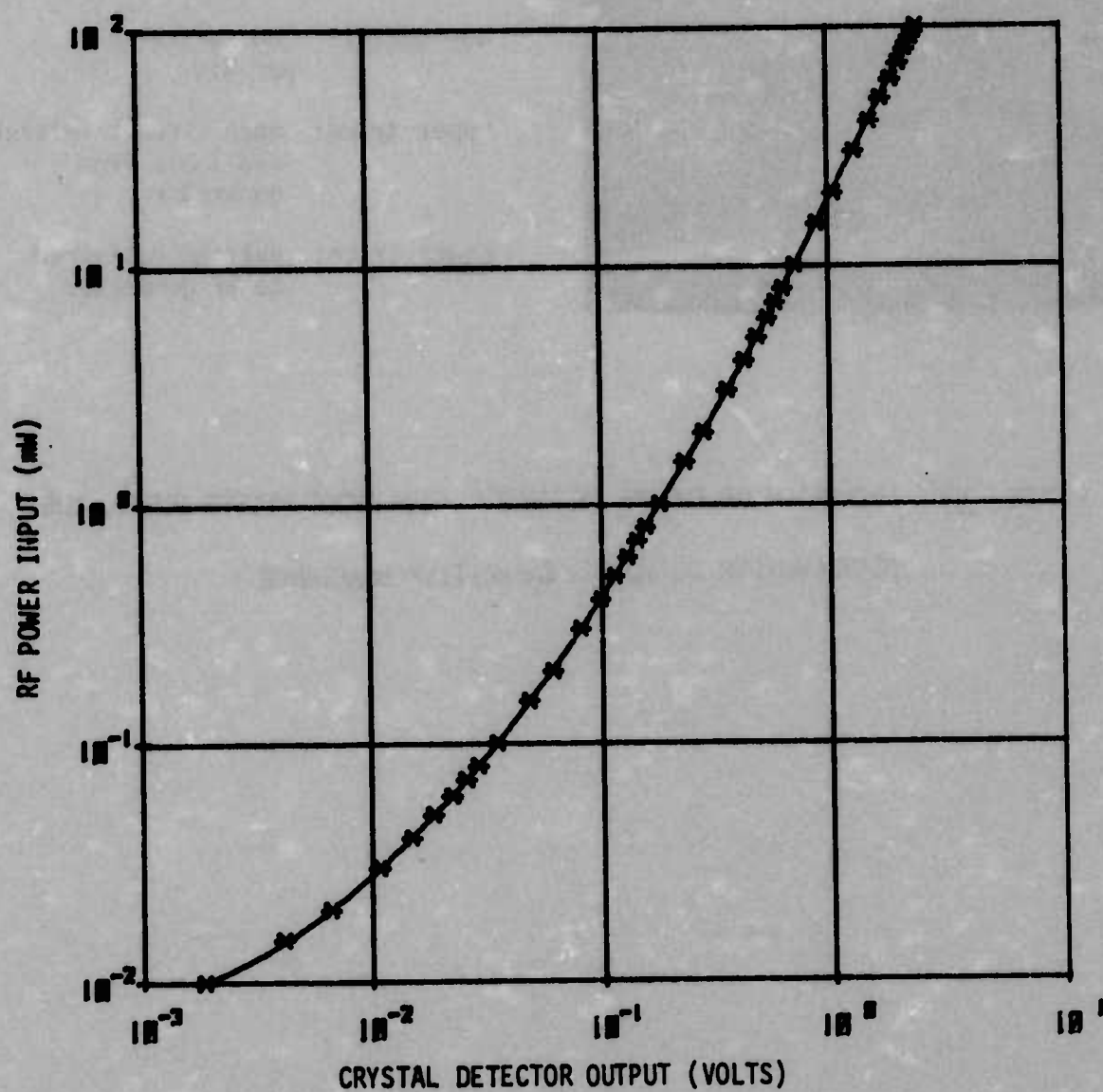


FIGURE 11 TYPICAL CRYSTAL CALIBRATION CURVE

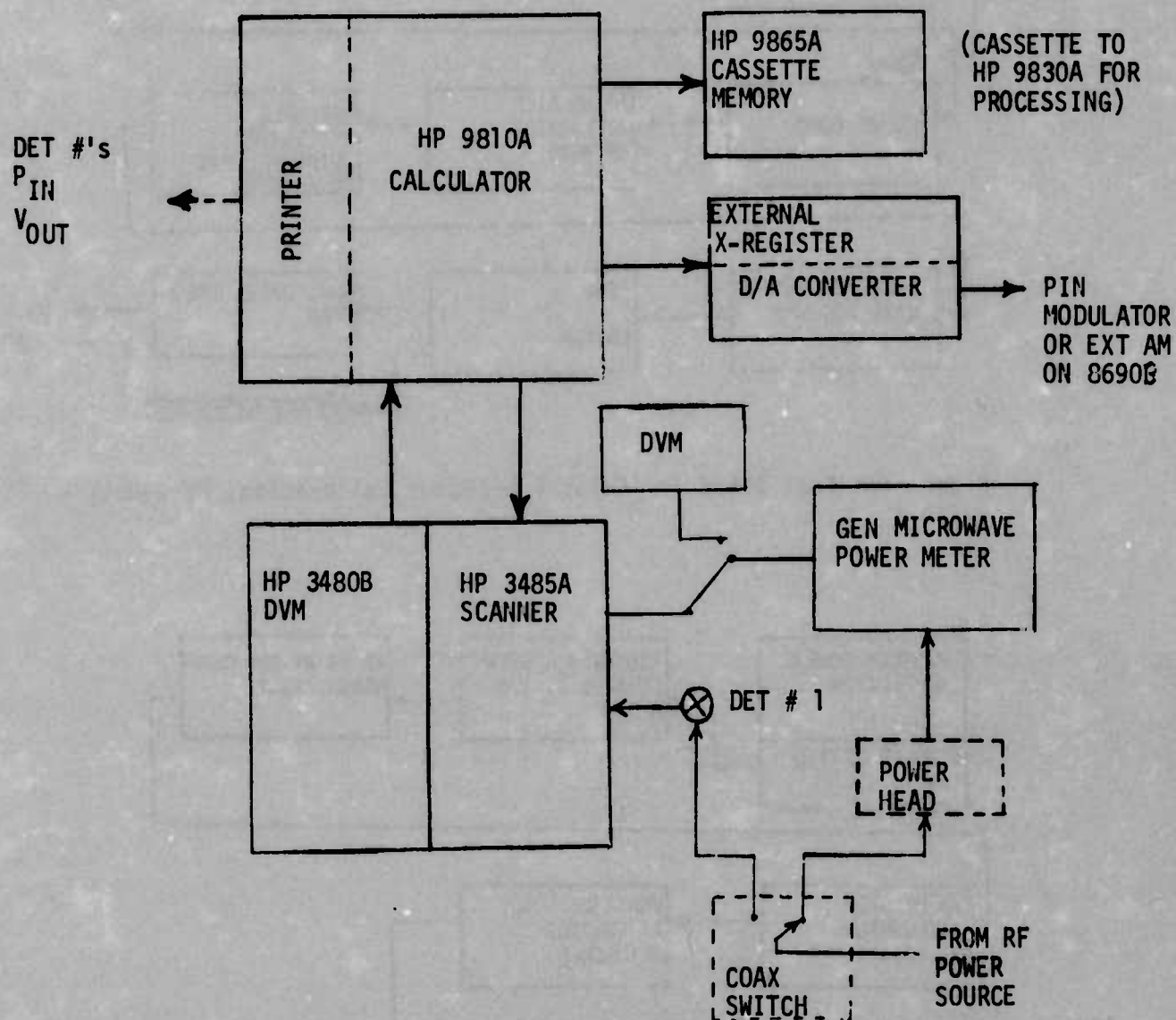


Figure 12 GENERAL TEST SETUP FOR CRYSTAL DETECTOR CALIBRATION

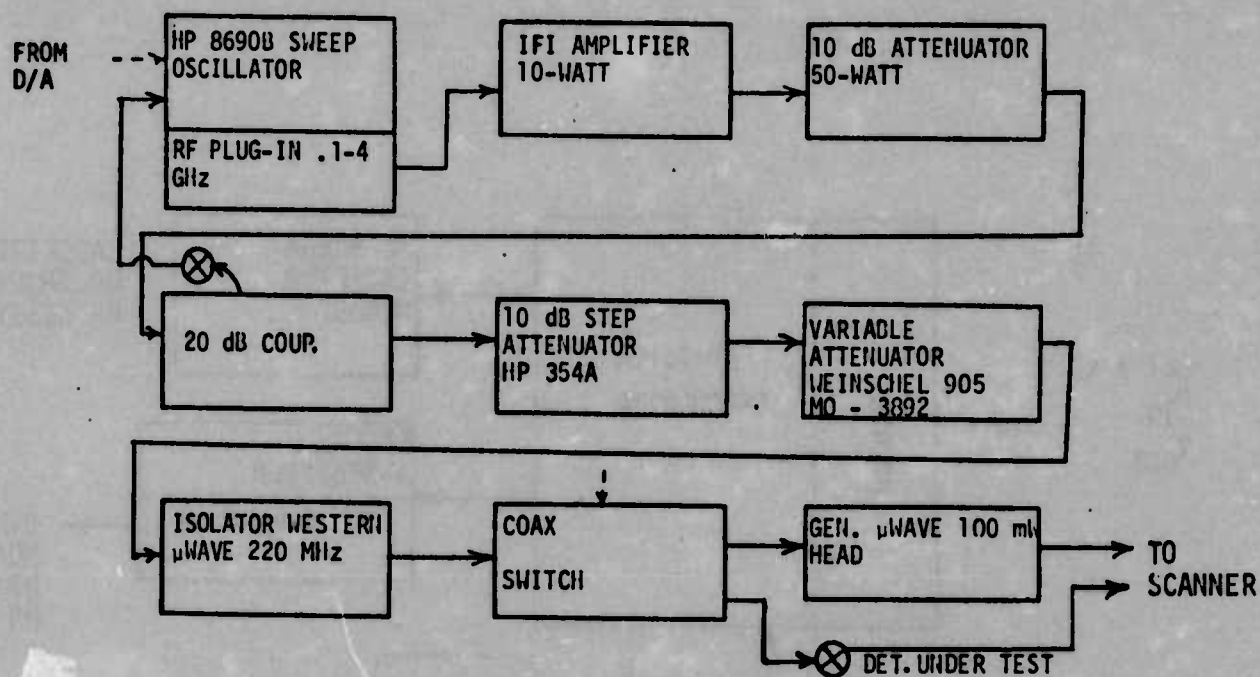


Figure 13 Test Setup for Crystal Detector Calibration, Frequency = .22 GHz

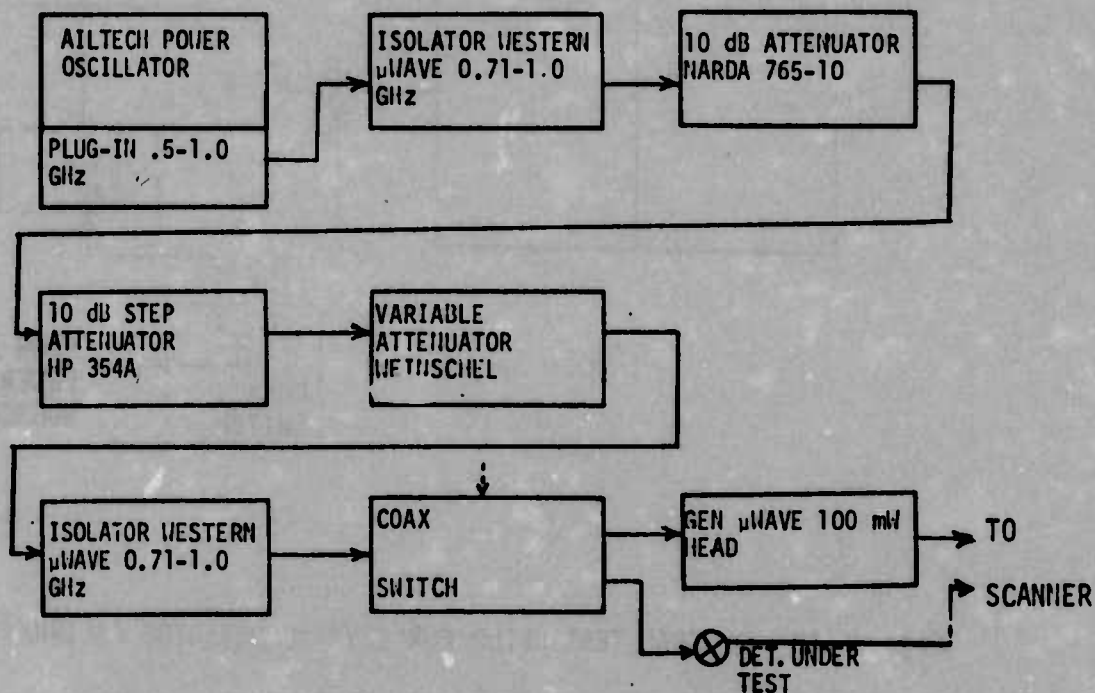


Figure 14 Test Setup for Crystal Detector Calibration, Frequency = 0.91 GHz



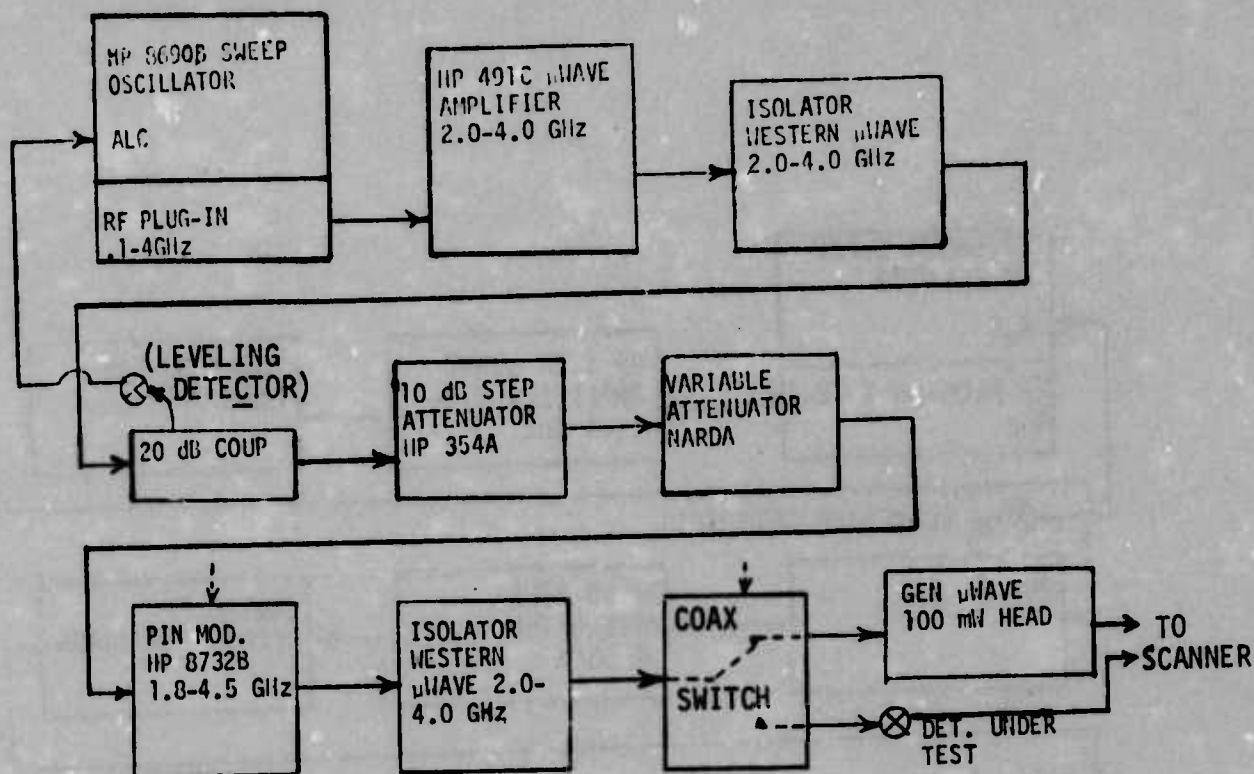


Figure 15 Test Setup for Crystal Detector Calibration, Frequency = 3 GHz

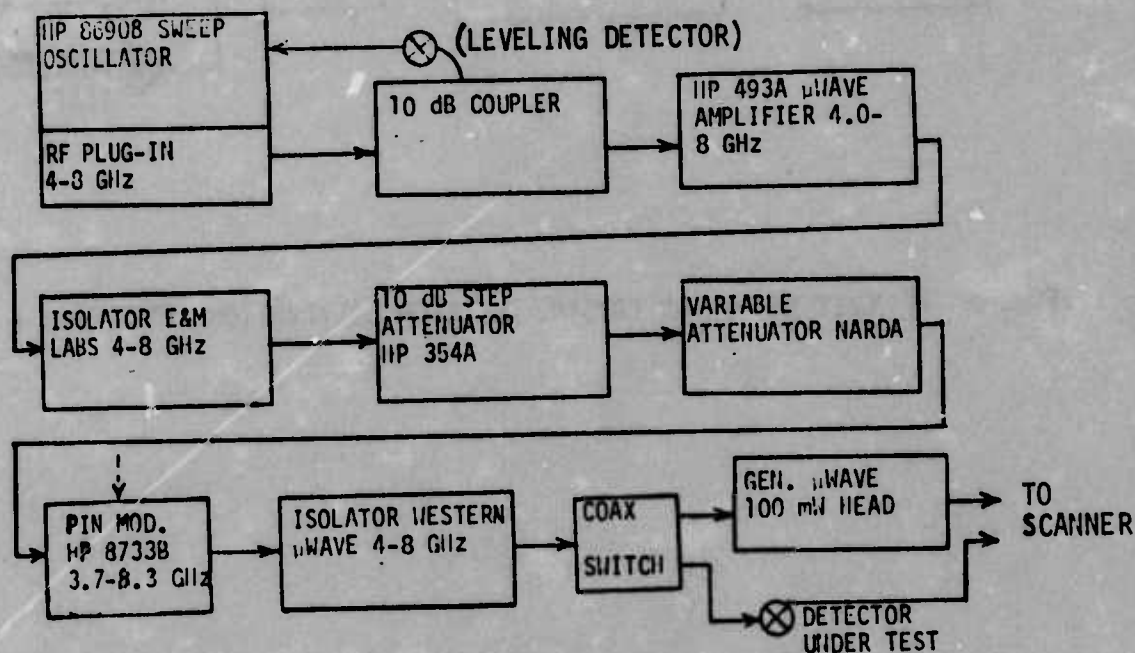


Figure 16 Test Setup for Crystal Detector Calibration, Frequency = 5.6 GHz

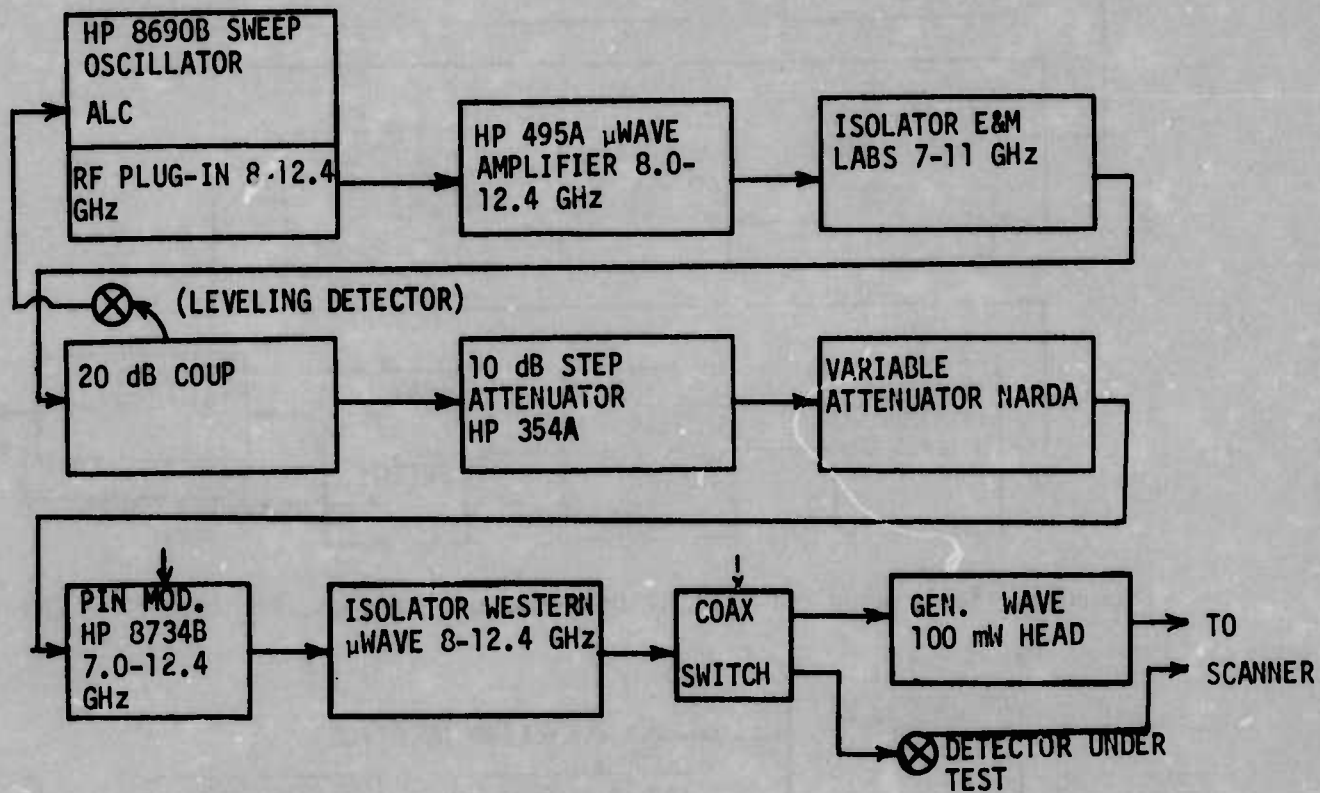
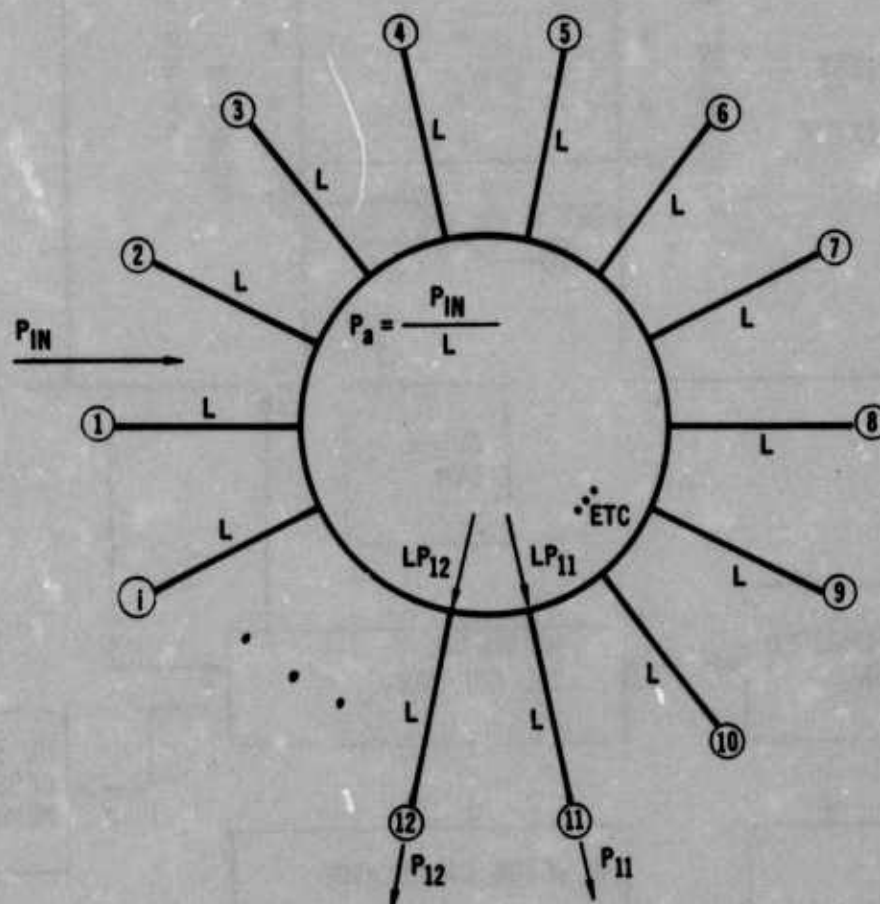


Figure 17 TEST SETUP FOR CRYSTAL DETECTOR CALIBRATION, FREQUENCY = 9.1 GHz



$P_a$  - POWER AVAILABLE FOR DISTRIBUTION TO OUTPUT PORTS

$P_j$  - POWER MEASURED OUT OF J'TH PORT

$$P_a = \frac{P_{IN}}{L} = \frac{1}{\sum_{j=1}^i LP_j} \text{ HENCE, } L^2 = \frac{P_{IN}}{\sum_{j=1}^i P_j}$$

FIGURE 18 DETERMINATION OF FIXTURE DISSIPATION LOSS



A

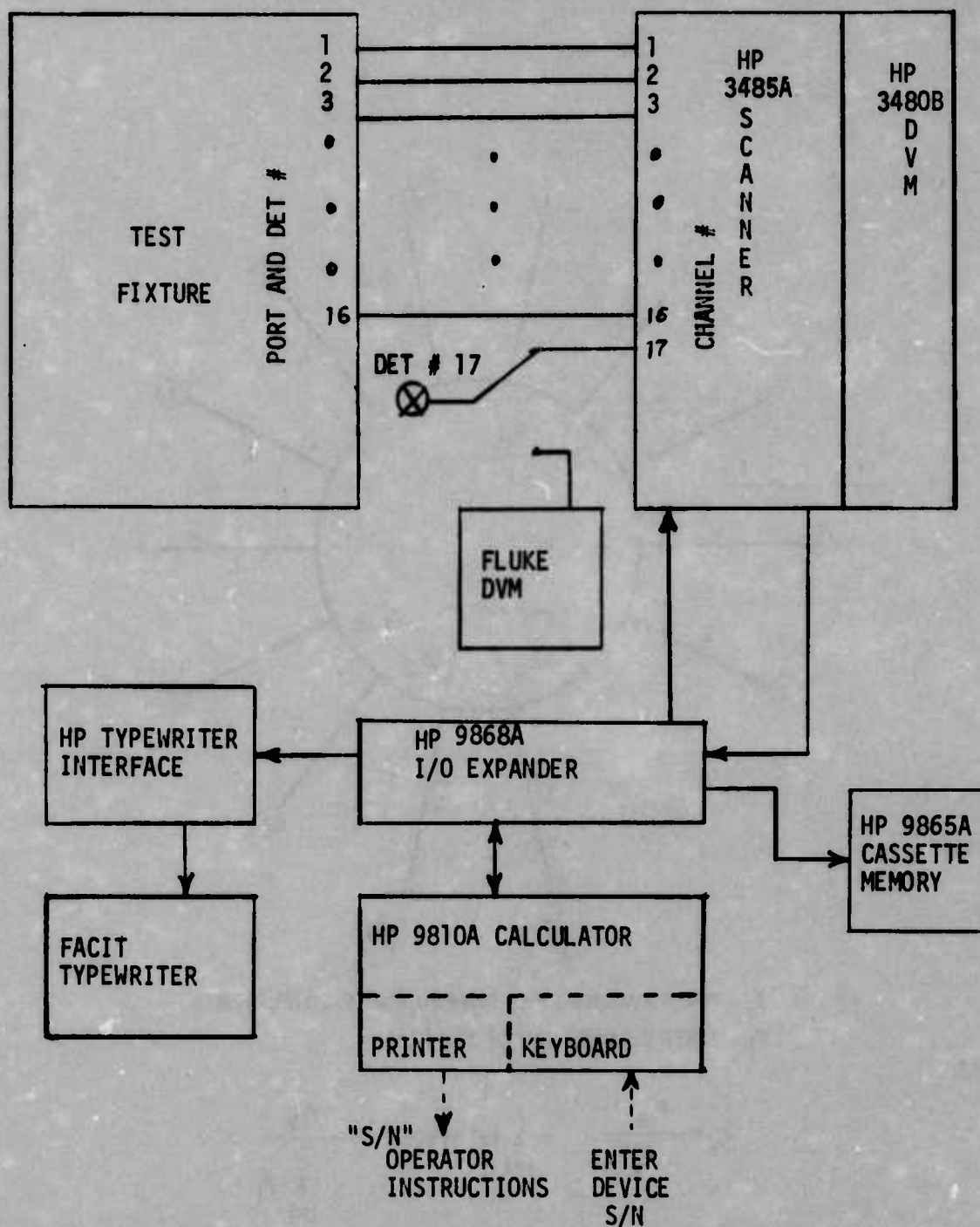


Figure 19 HP 9810A DATA SYSTEM FOR ALL FREQUENCIES FOR FIXTURE CALIBRATION

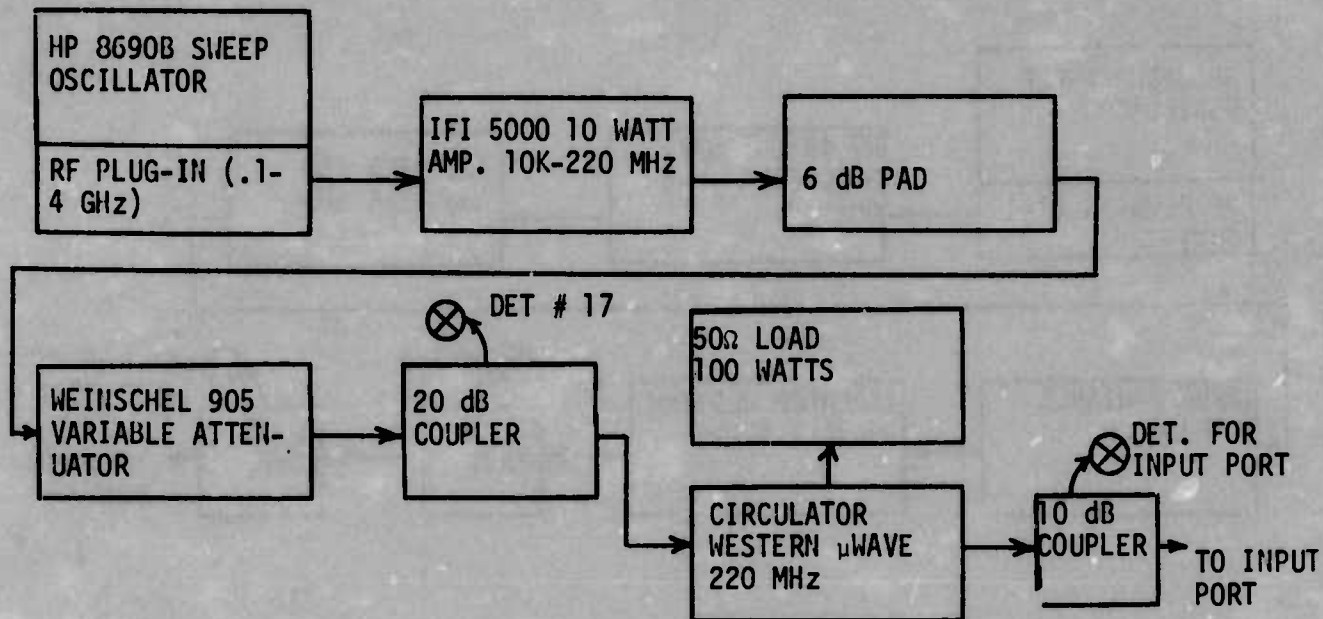


Figure 20 RF SETUP FOR FIXTURE CALIBRATION  $f = 0.22$  GHz

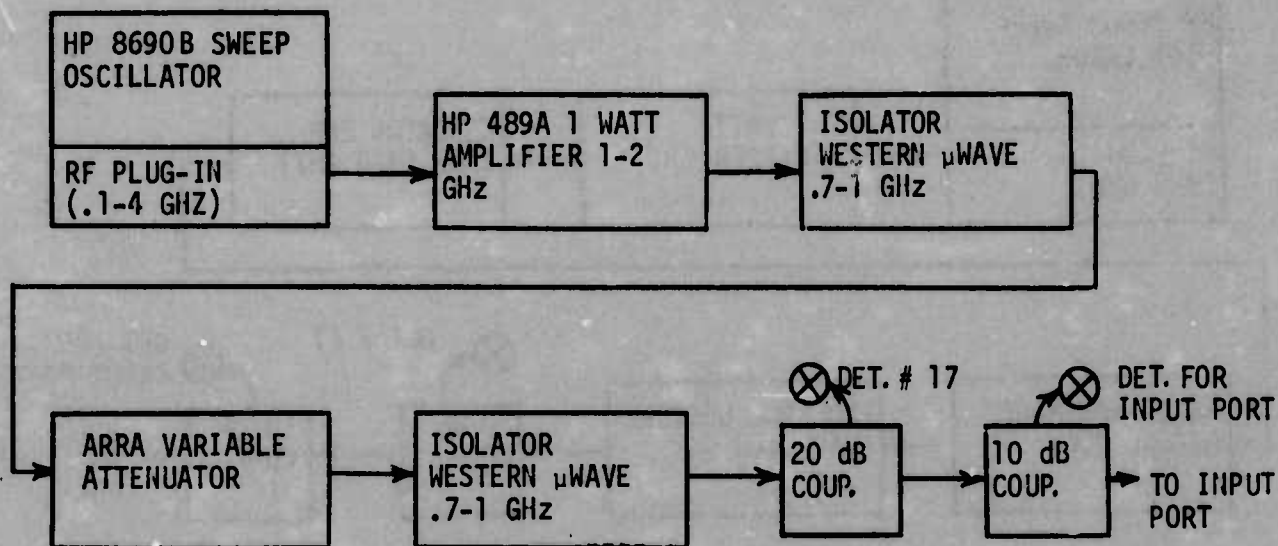


Figure 21 RF SETUP FOR FIXTURE CALIBRATION  $f = 0.91$  GHz

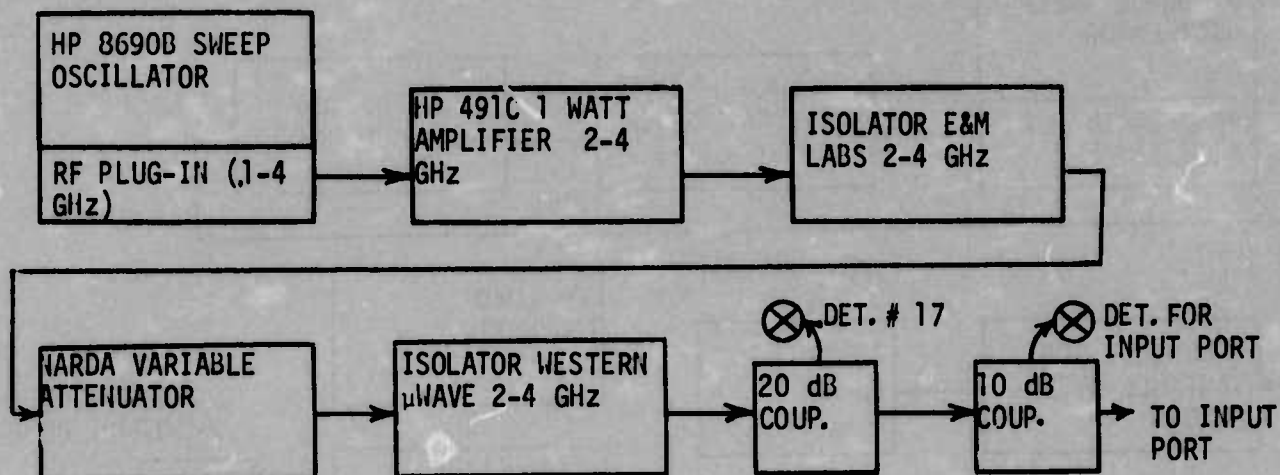


Figure 22 RF SETUP FOR FIXTURE CALIBRATION  $f = 3.0$  GHz

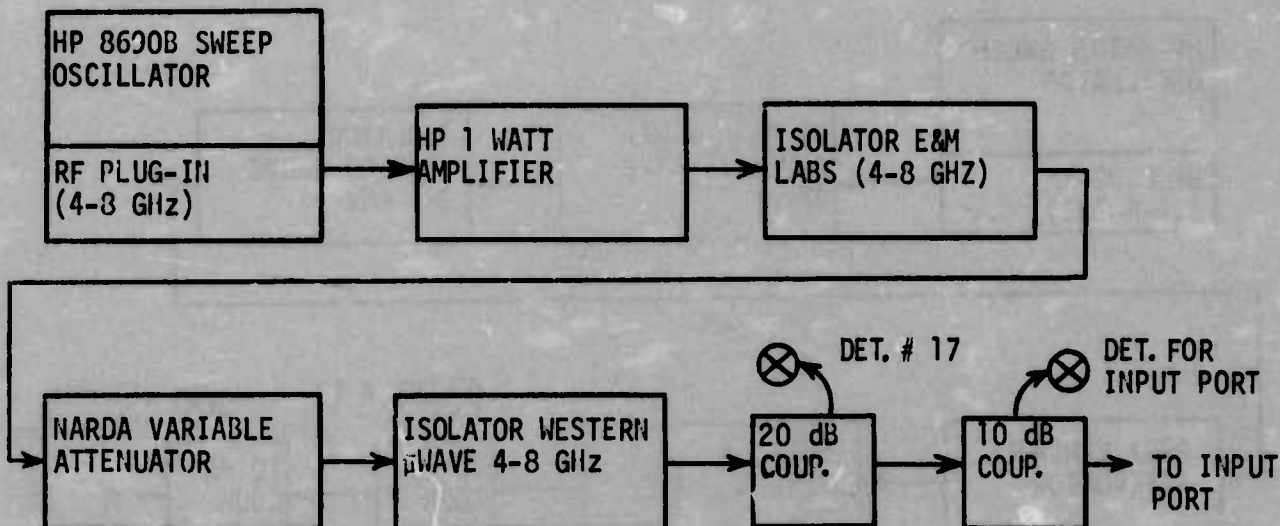


Figure 23 RF SETUP FOR FIXTURE CALIBRATION  $f = 5.6$  GHz



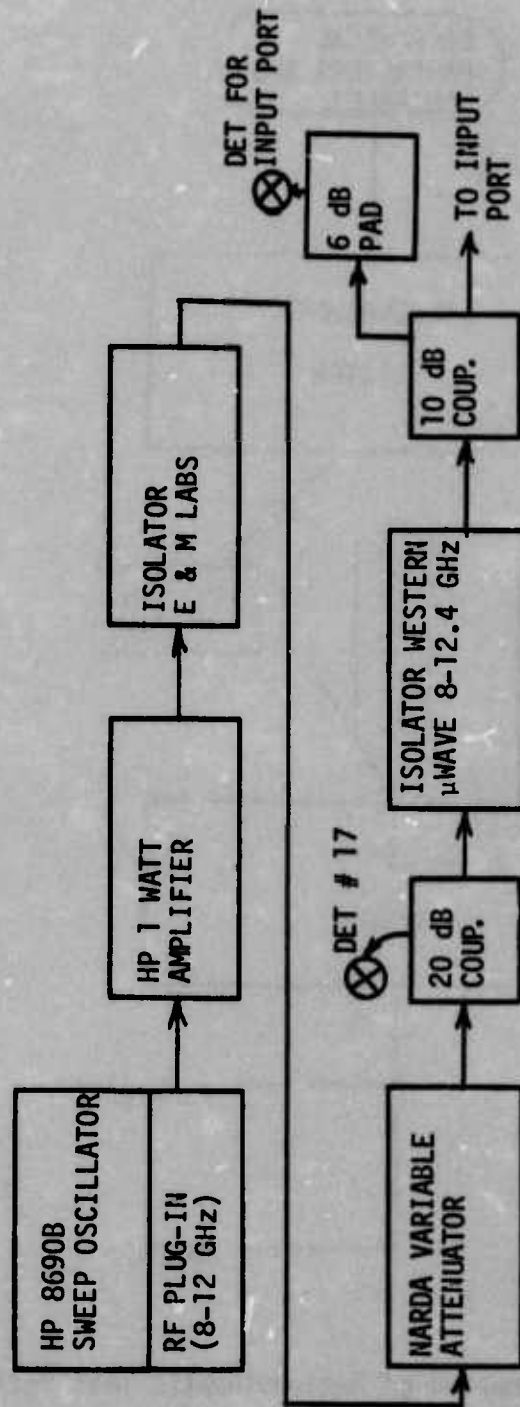


Figure 24 RF SETUP FOR FIXTURE CALIBRATION  $f = 9.1$  GHz

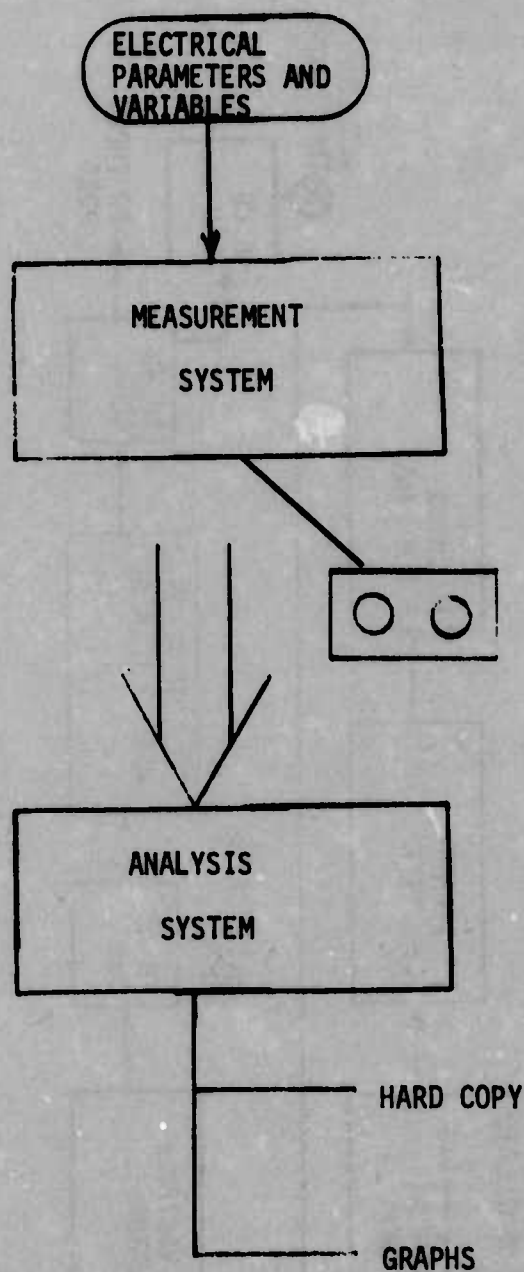


Figure 25 Illustration of Semi-Automatic Test System Measurement and Analysis

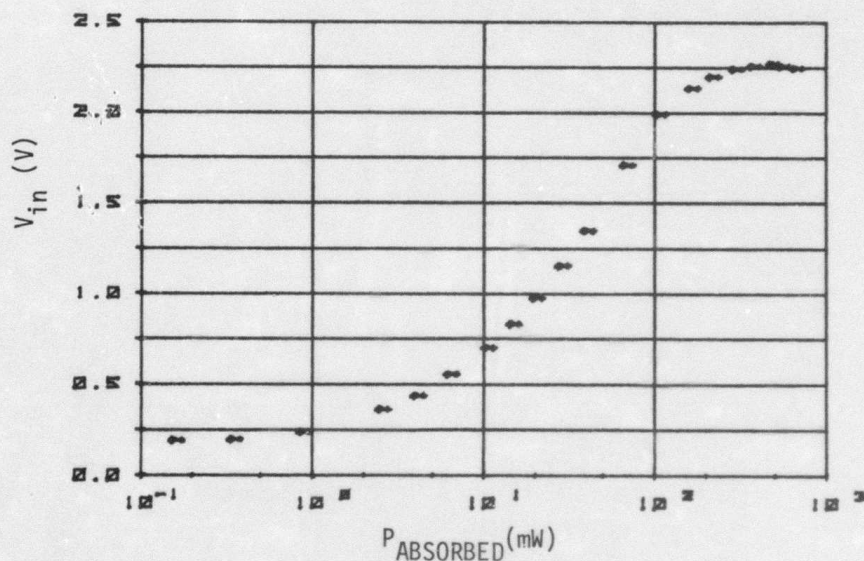
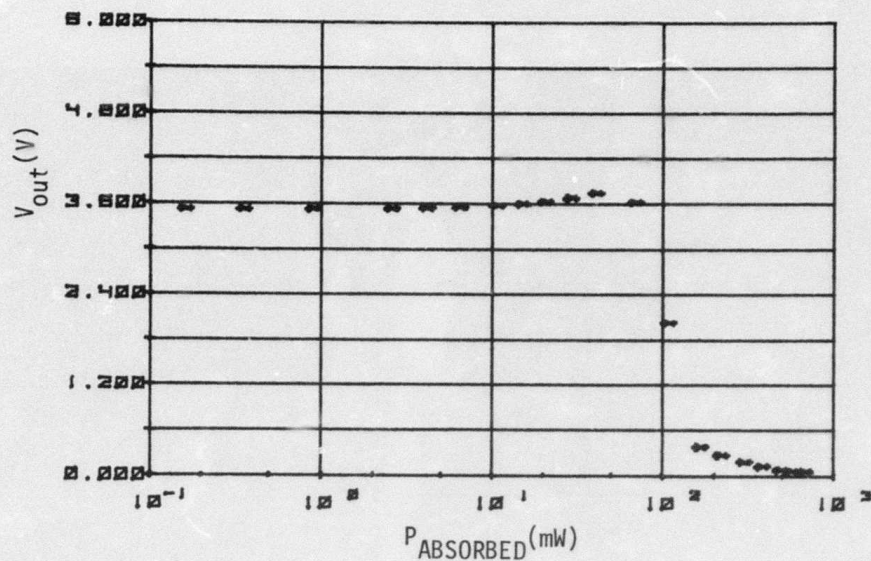


FIGURE 26 EXAMPLES OF  $V_{OUT}$  AND  $V_{IN}$  VS  $P_{absorbed}$   
RF INJECTED INTO INPUT PORT OF 7400 DEVICE.

INPUT LOW, OUTPUT HIGH BIAS STATE, 220 MHz





FIGURE 27 SET II - AUTOMATED MEASUREMENT TEST SETUP

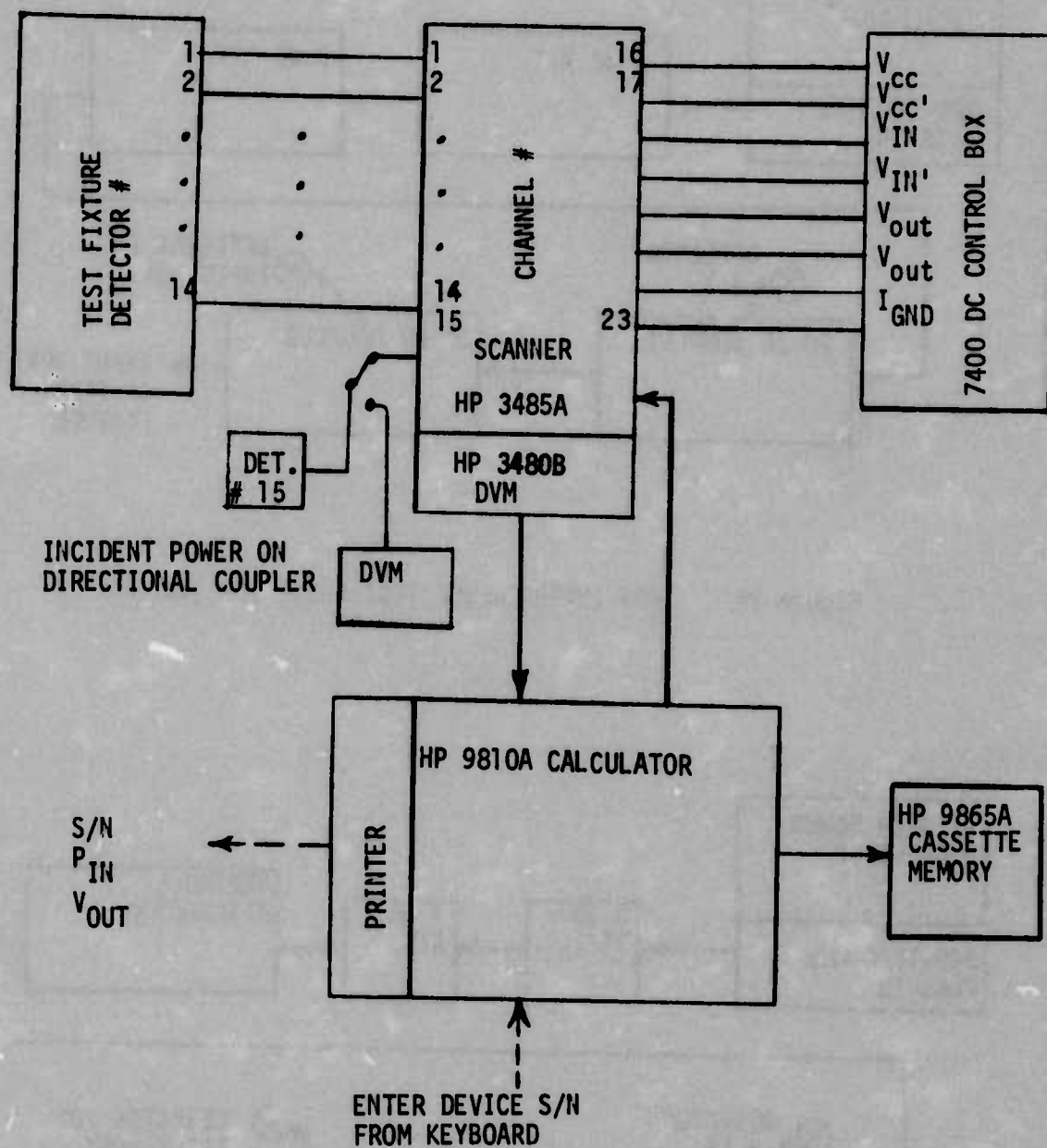


Figure 28 GENERAL TEST SETUP FOR 7400 INTERFERENCE TESTING

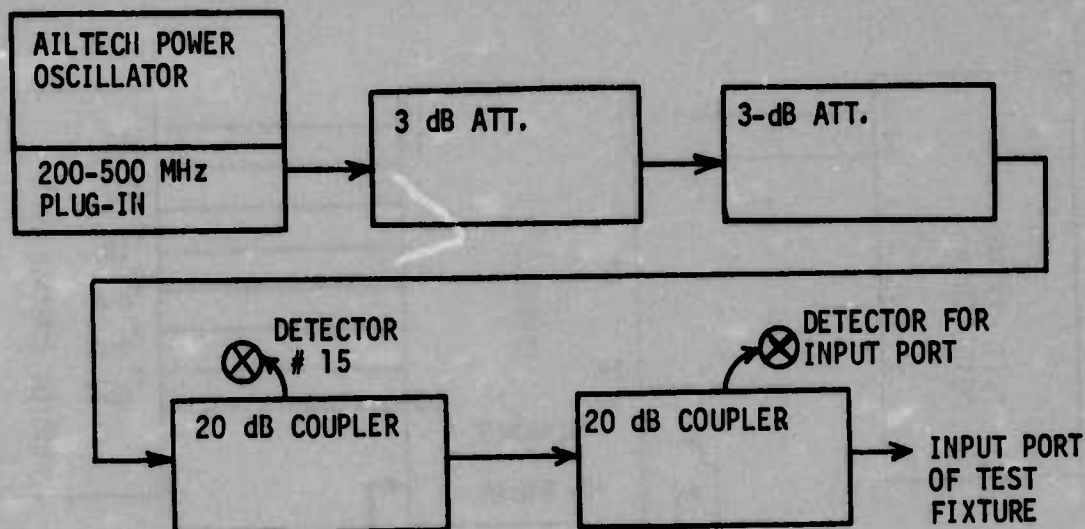


Figure 29 7400 INTERFERENCE TEST SETUP FOR .22 GHz

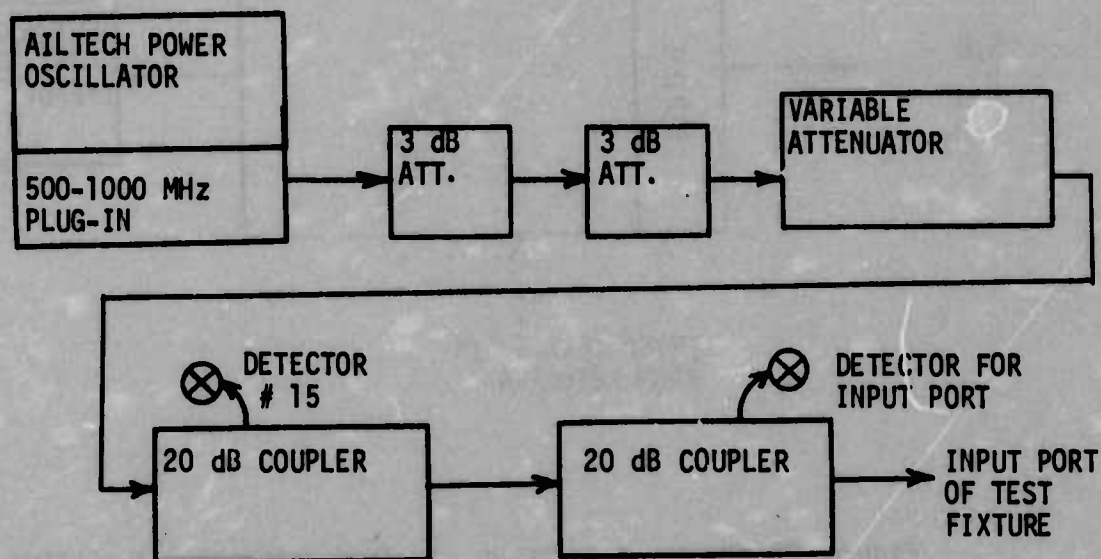


Figure 30 7400 INTERFERENCE TEST SETUP FOR .91 GHz



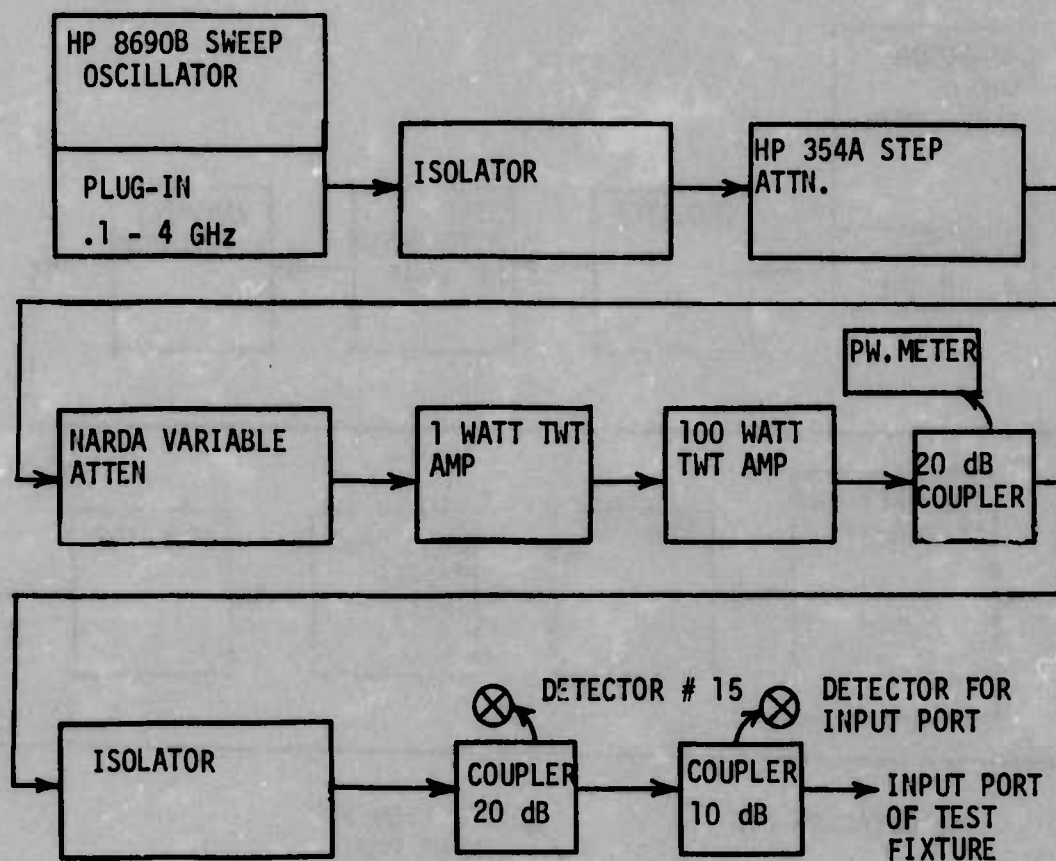


Figure 31 7400 INTERFERENCE TEST SETUP FOR 3.0 GHz

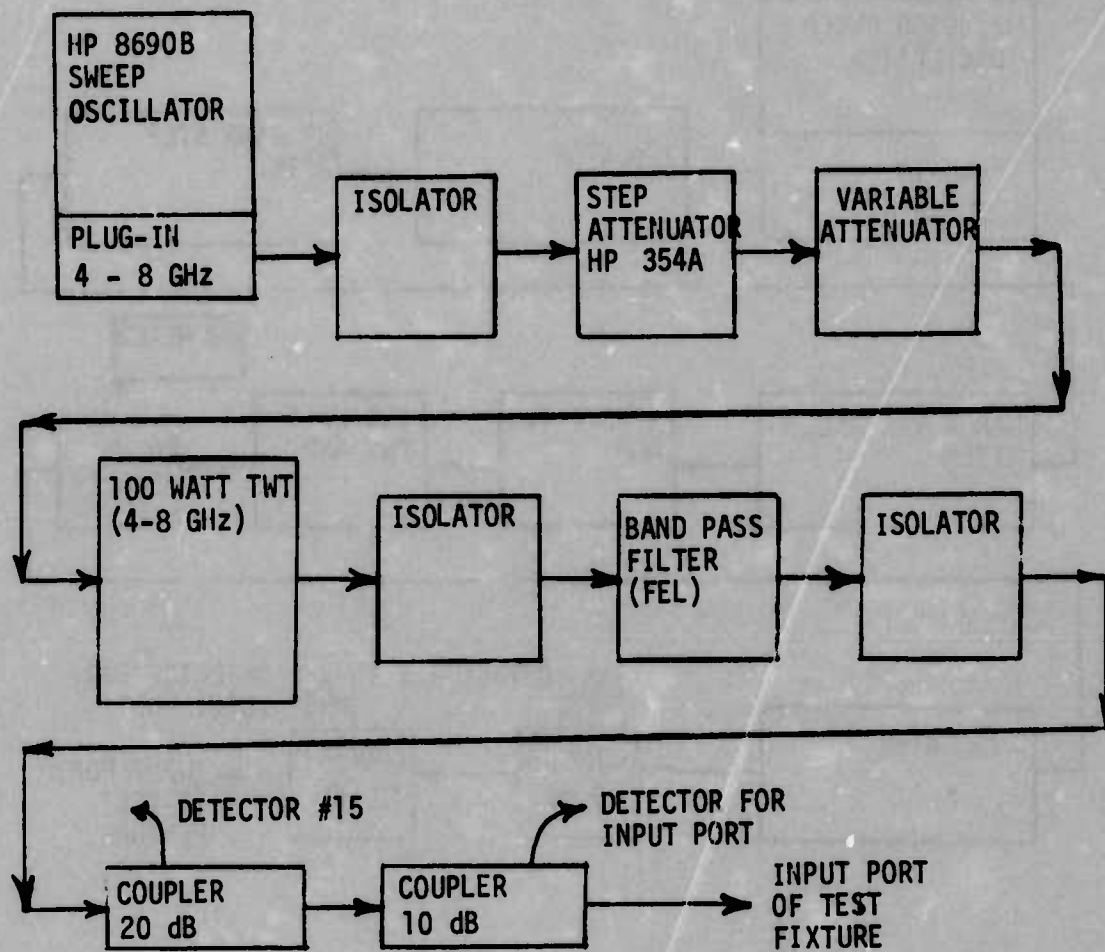
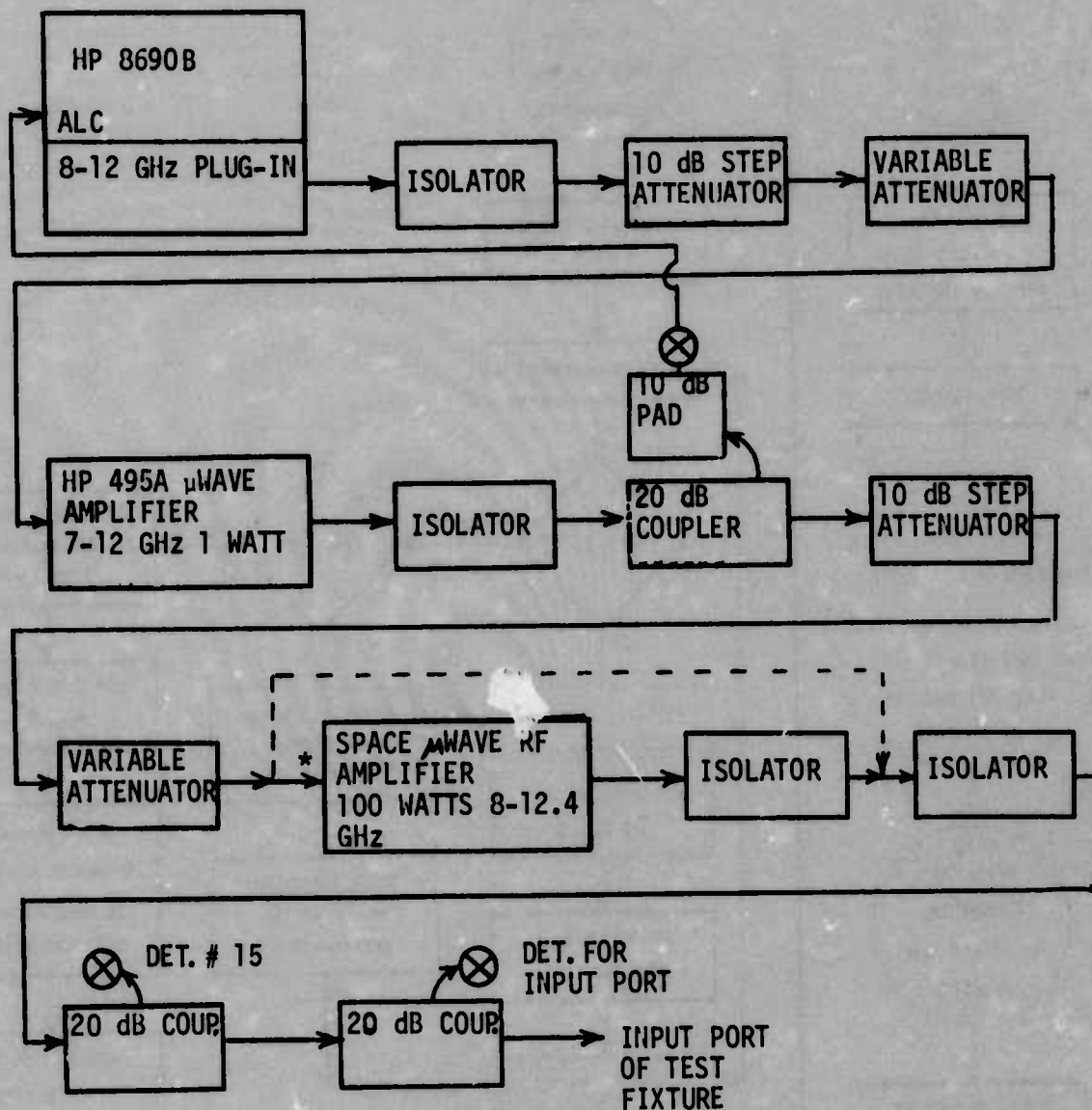


Figure 32 7400 Interference Test Setup for 5.6 GHz



\* USE 100-WATT AMPLIFIER AND ISOLATOR COMBINATION ONLY AS NEEDED

Figure 33 7400 INTERFERENCE TEST SETUP FOR 9.1 GHz



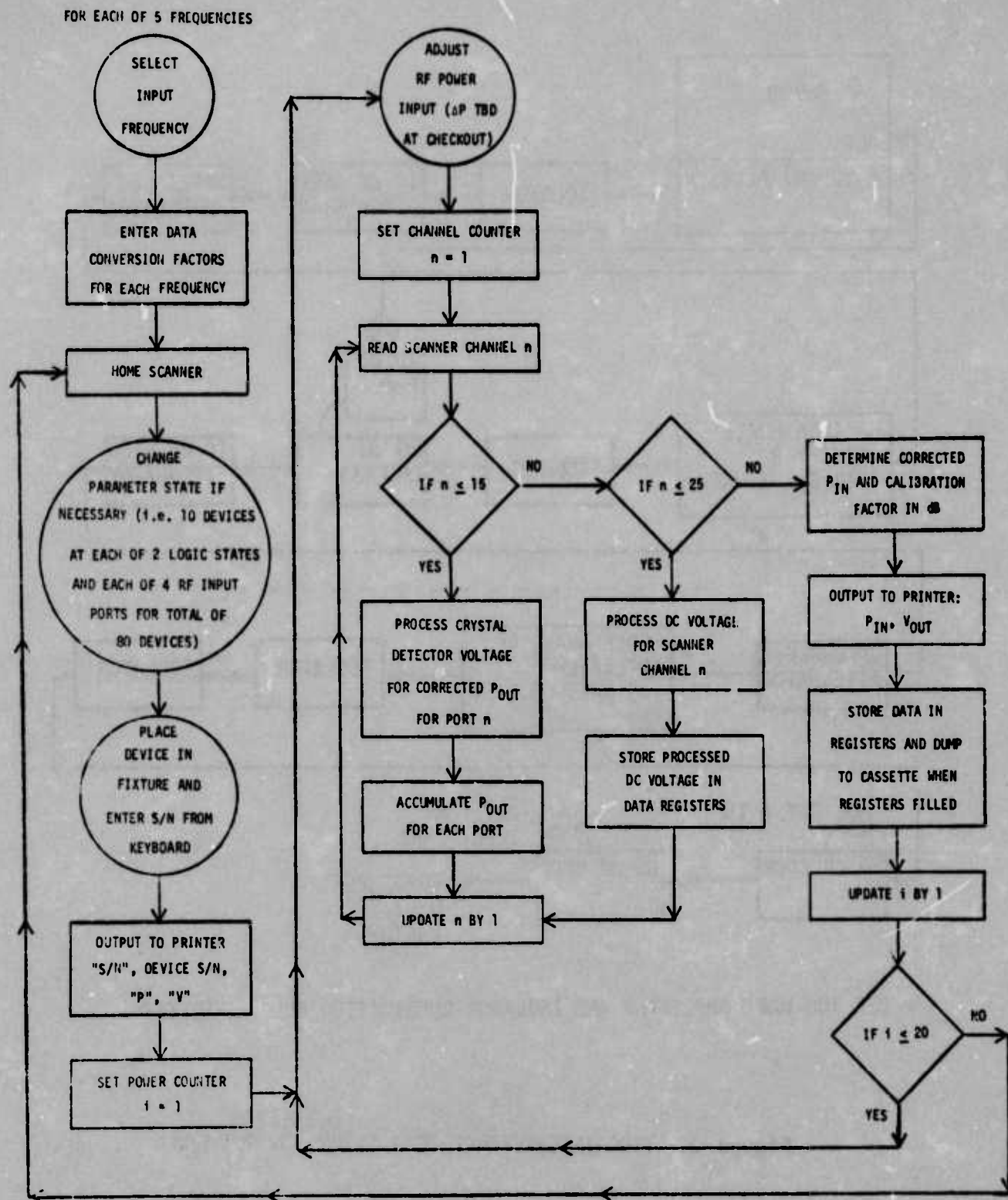


FIGURE 34 7400 INTERFERENCE TEST FLOW DIAGRAM

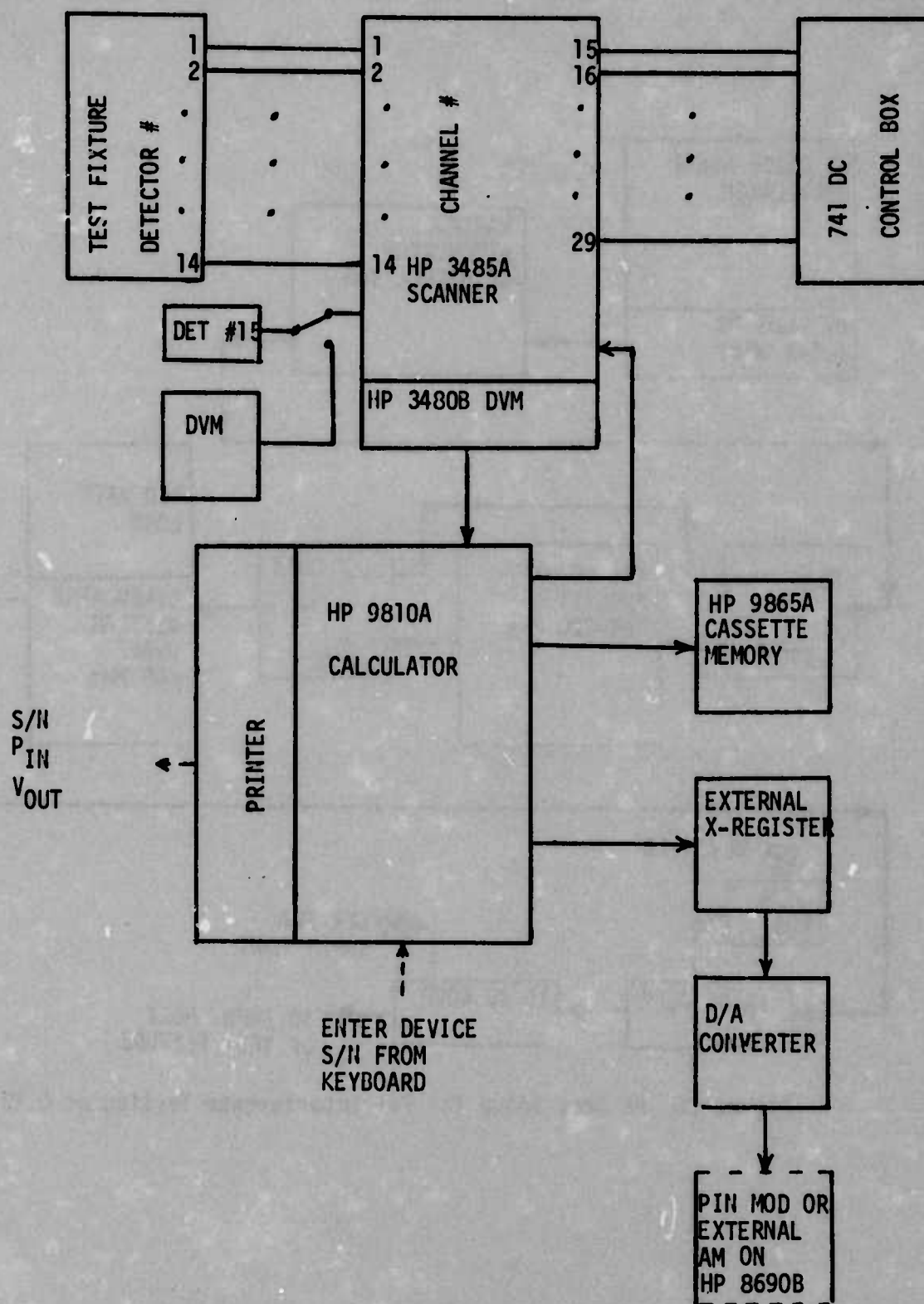


Figure 35 General Test Setup for 741 Interference Testing

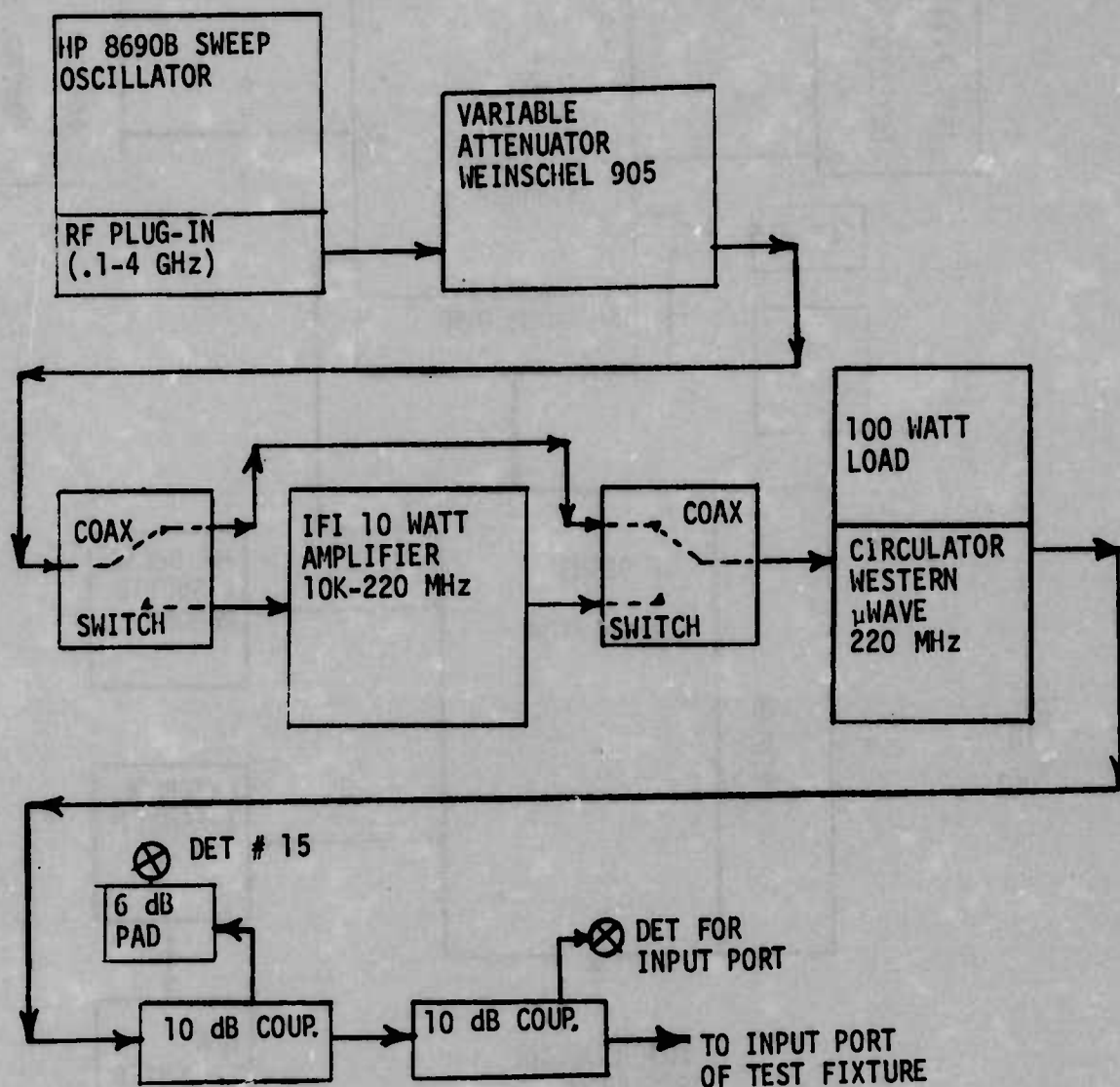


Figure 36 RF Test Setup for 741 Interference Testing at 0.22 GHz



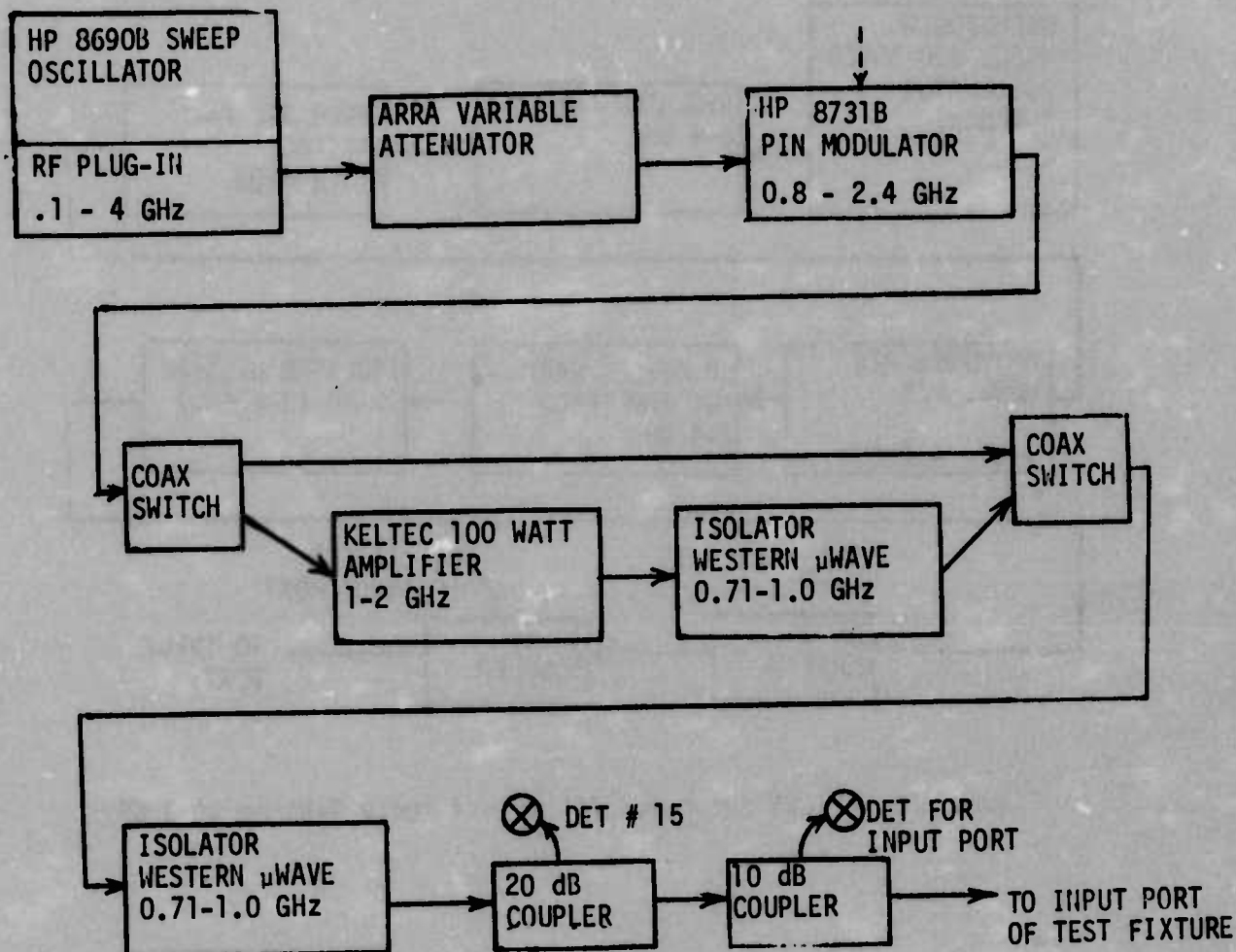


Figure 37 RF Test Setup for 741 Interference Testing at 0.91 GHz

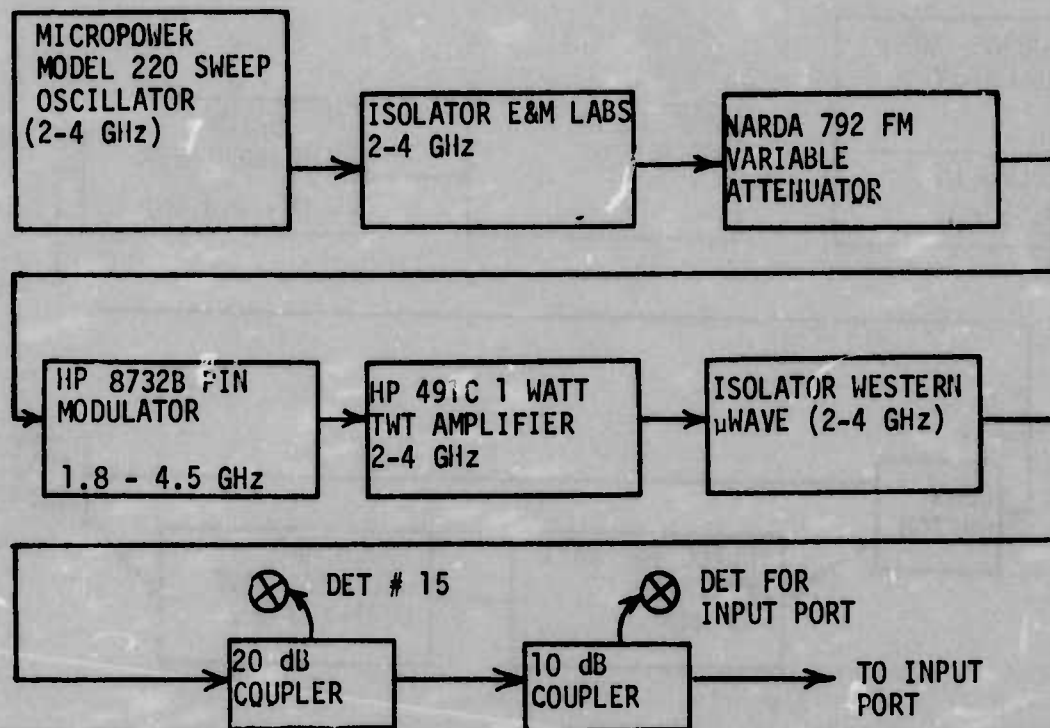


Figure 38 RF Test Setup for 741 Interference Testing at 3 GHz

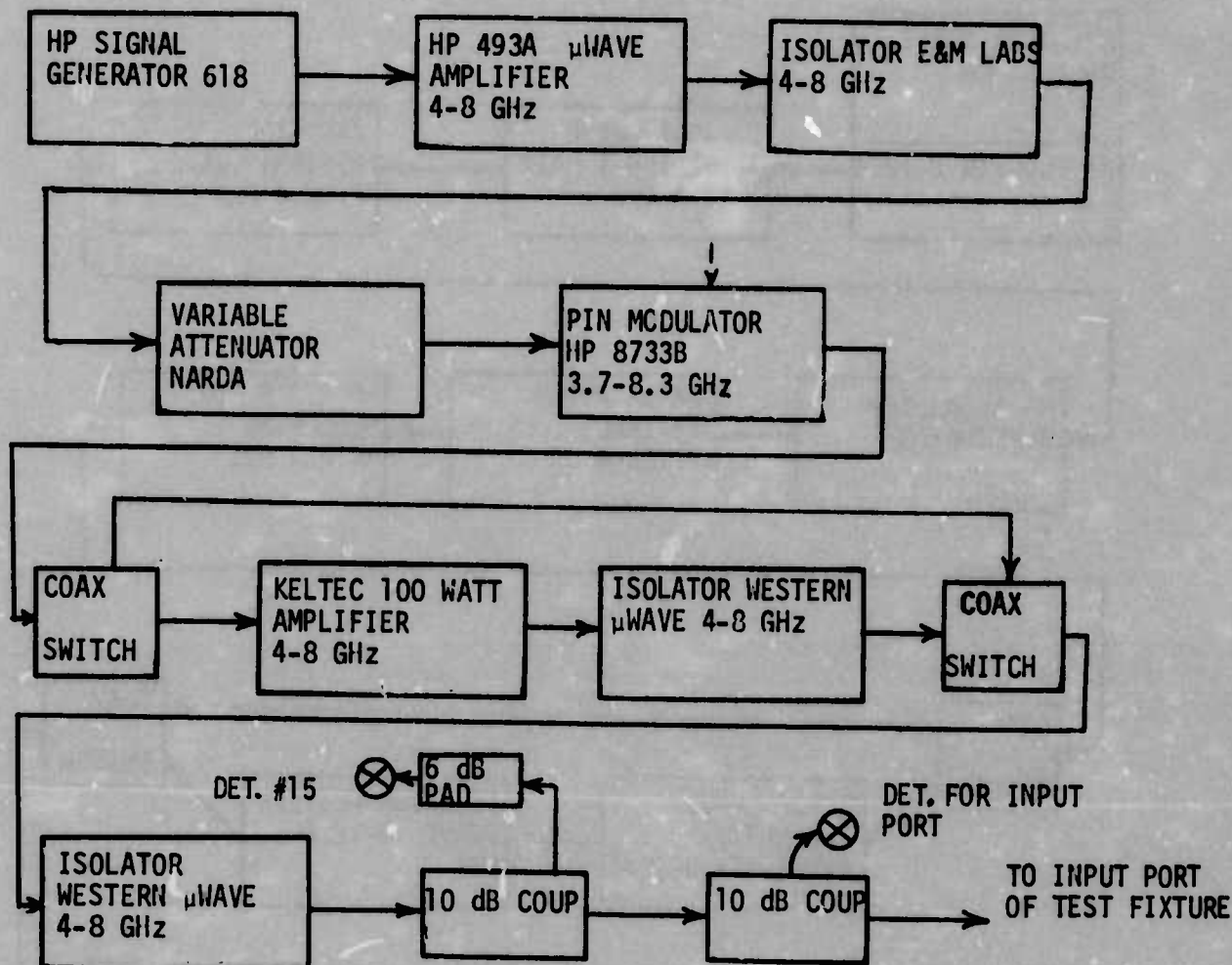


Figure 39 RF Test Setup for 741 Interference Testing at 5.6 GHz



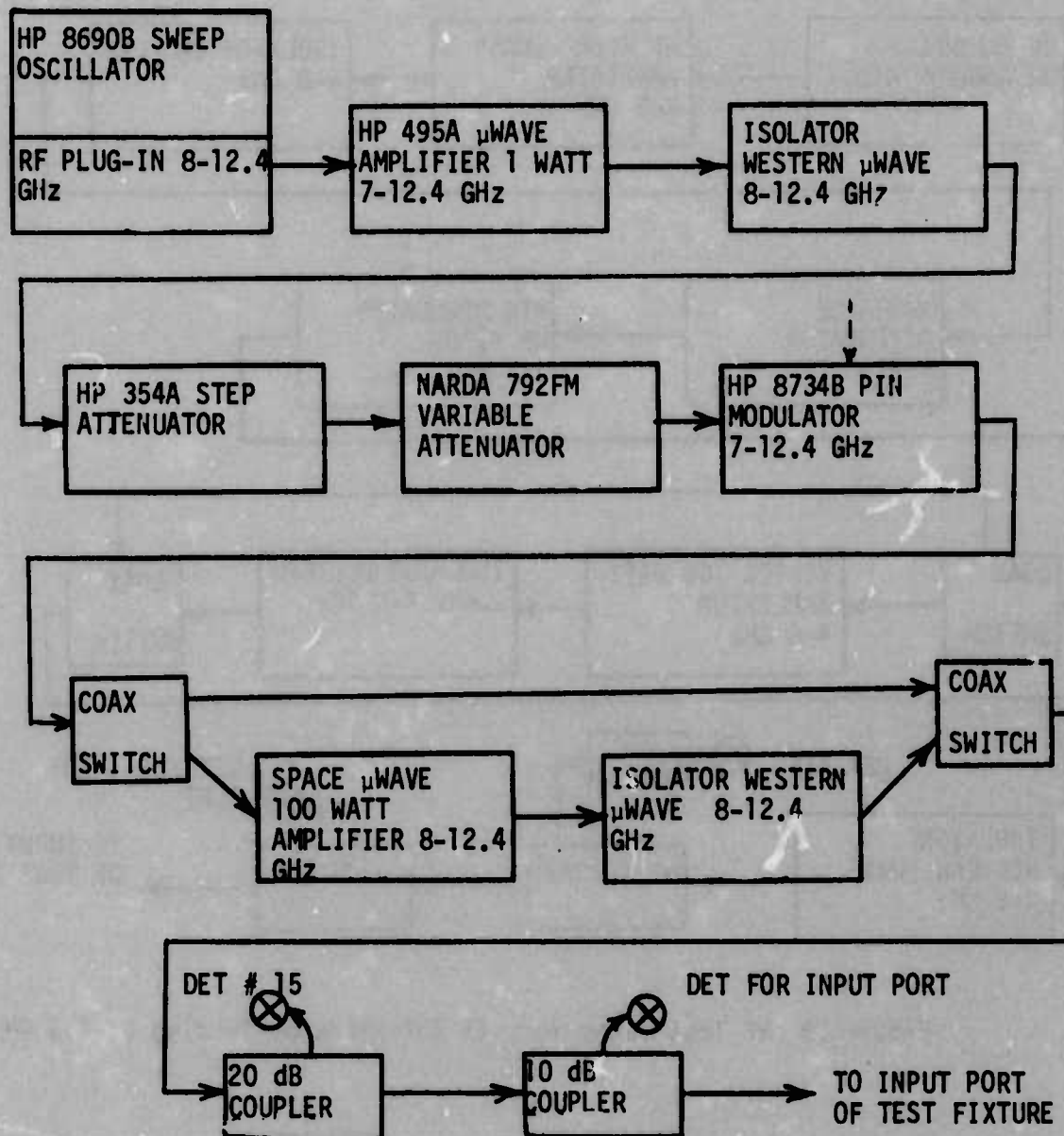


Figure 40 741 Interference Test Setup for  $f = 9.1$  GHz

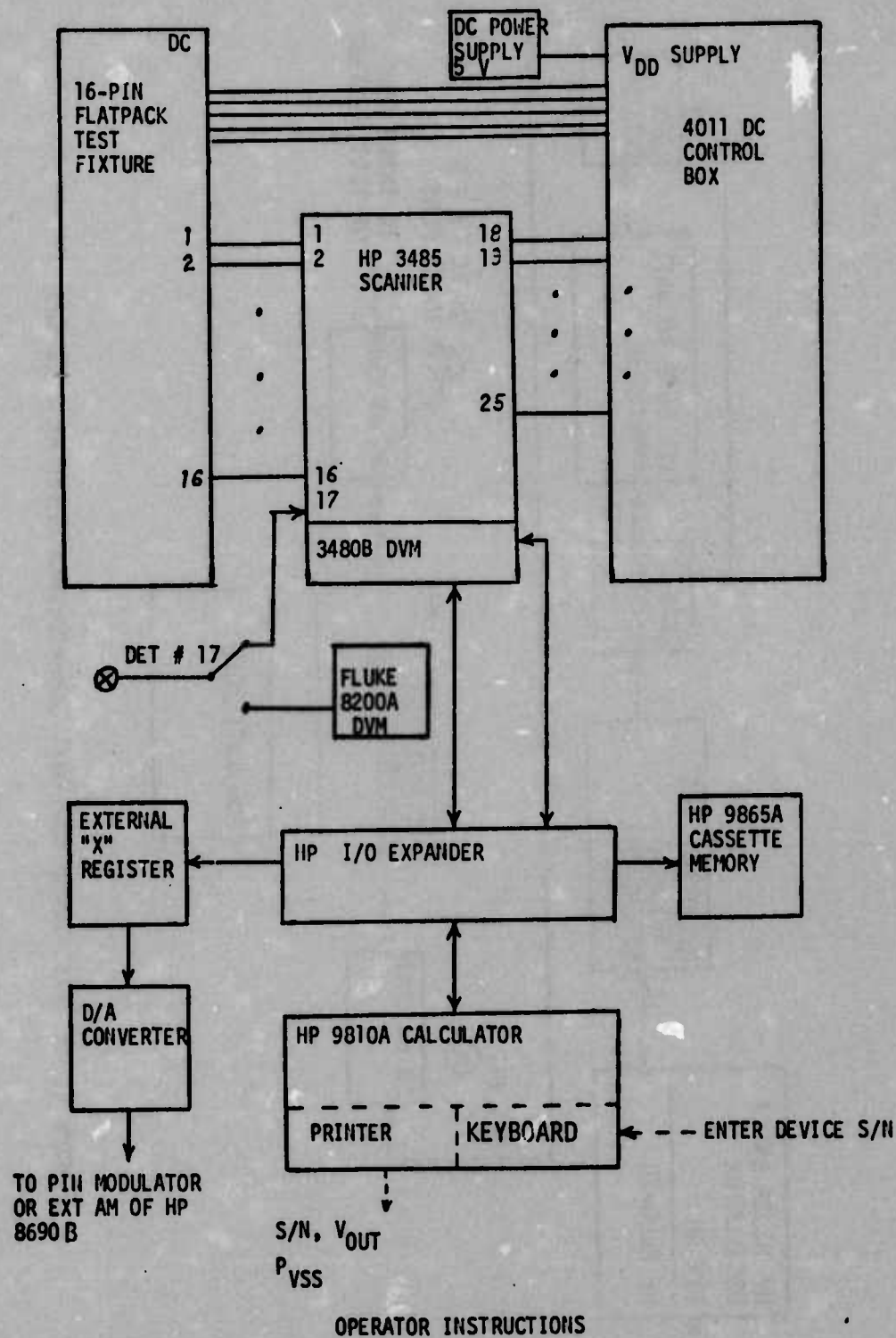


Figure 41 General Test Setup for MOS 4011 Interference Testing

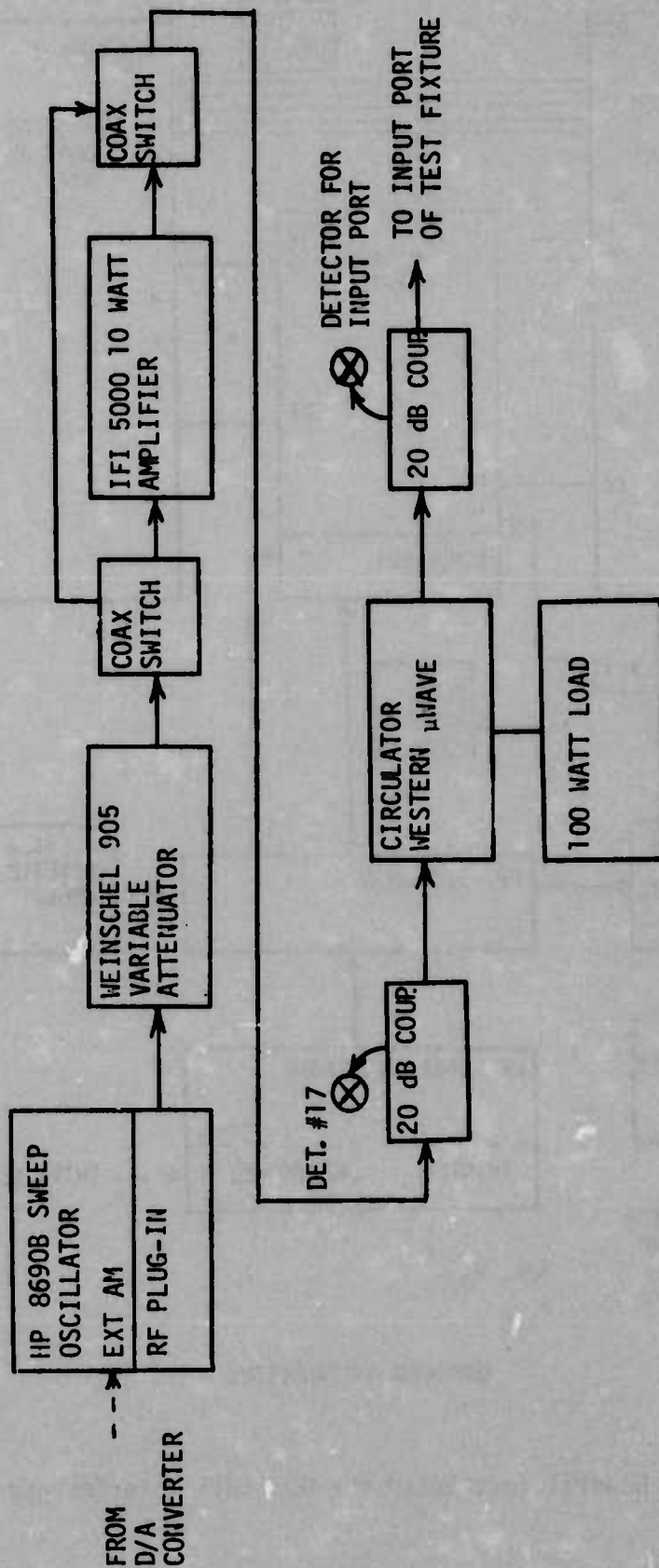


Figure 42 RF Test Setup for 4011 Interference Tests at 0.22 GHz



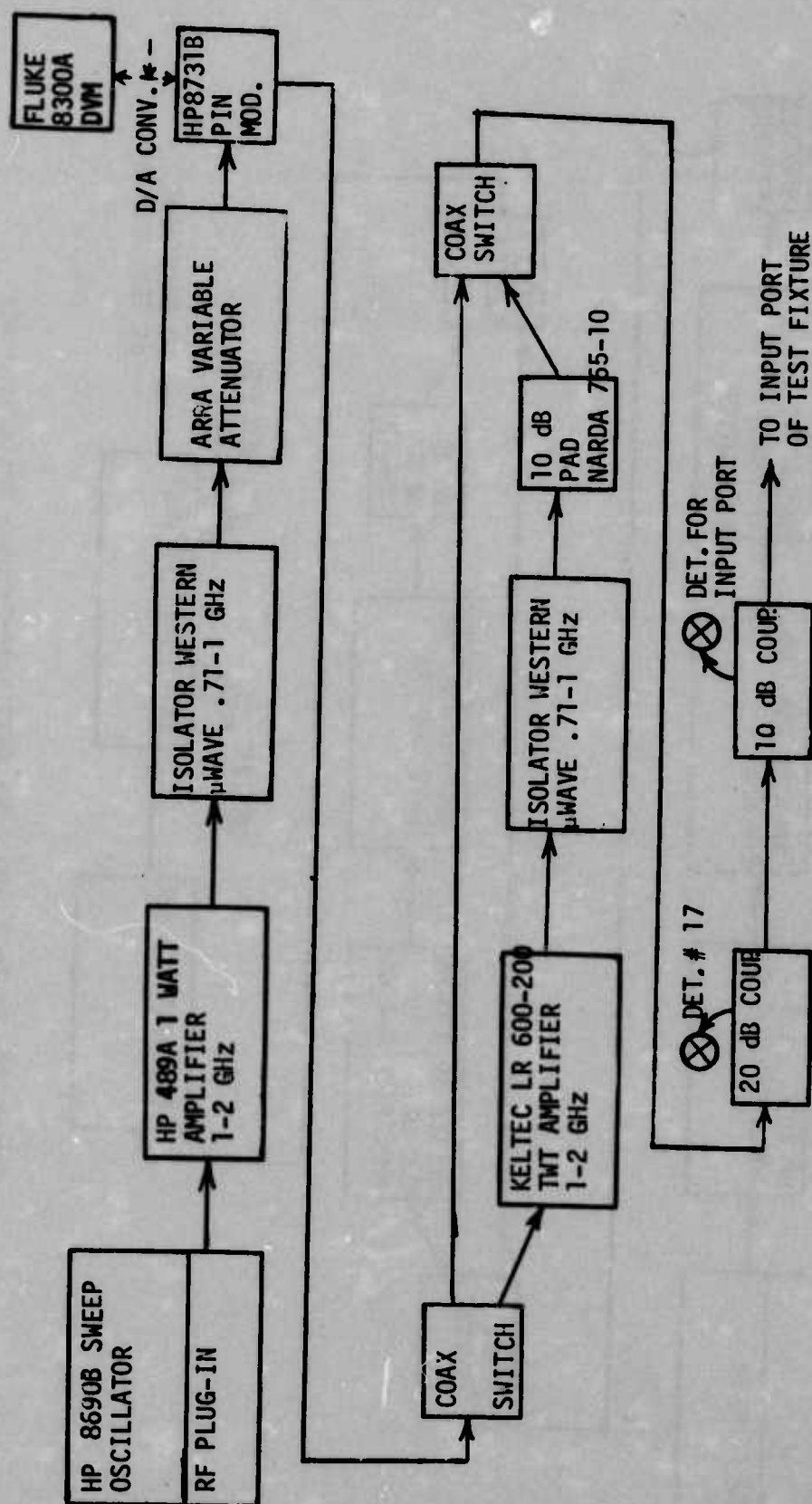


Figure 43 RF Test Setup for 4011 Interference Tests at 0.91 GHz

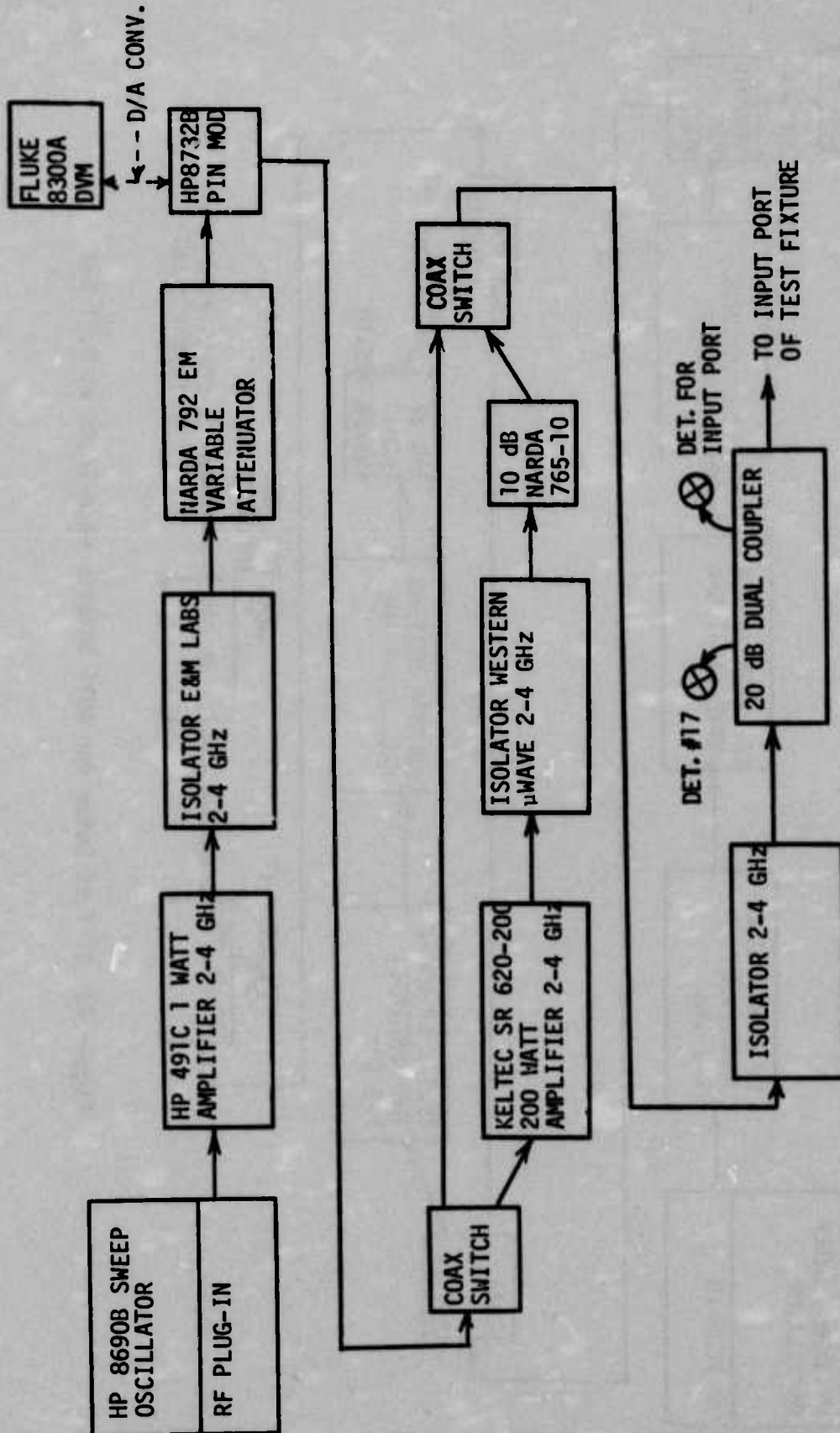


Figure 44 RF Test Setup for 4011 Interference Tests at 3 GHz

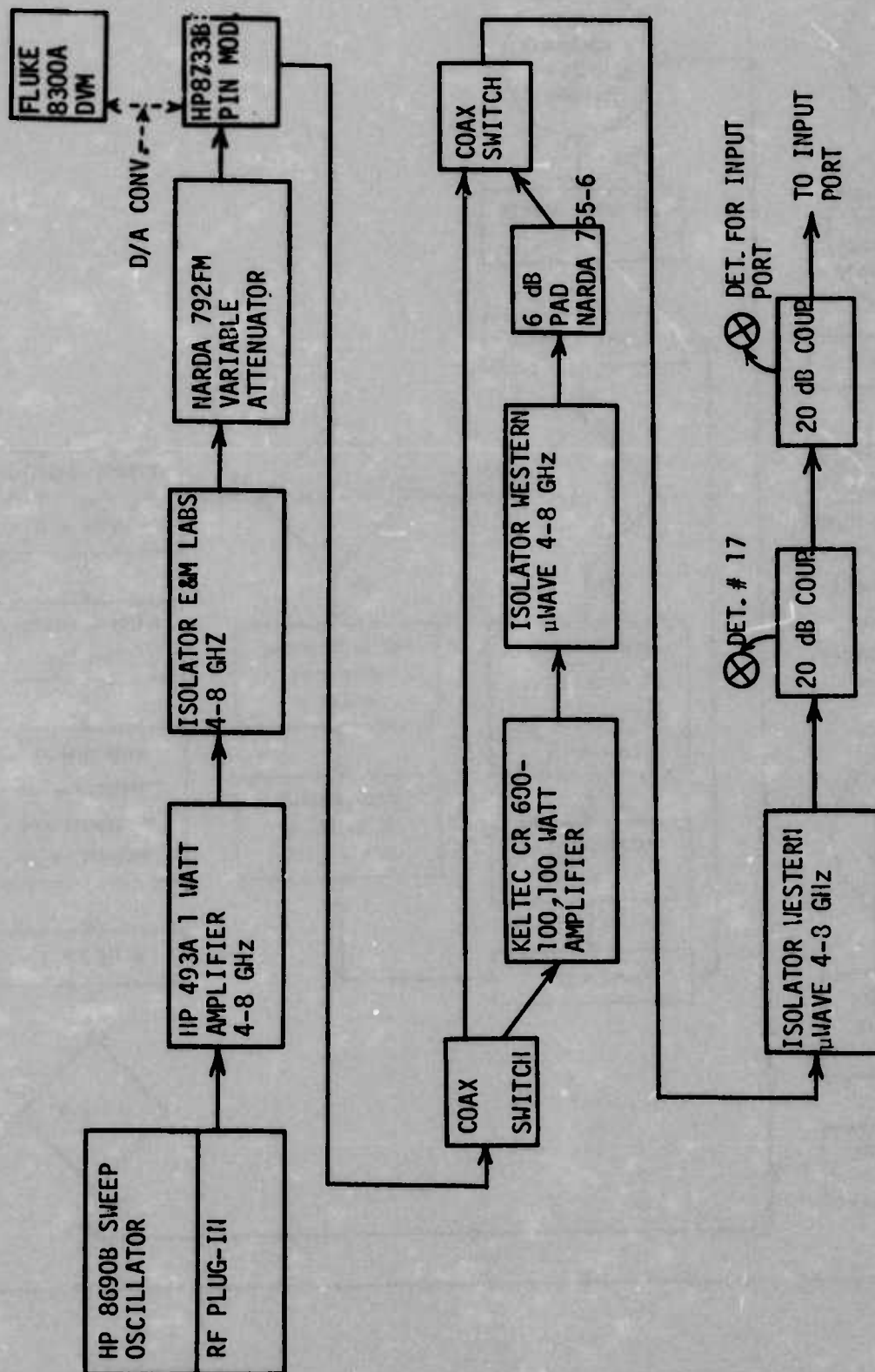


Figure 45 RF Test Setup for 4011 Interference Tests at 5.6 GHz

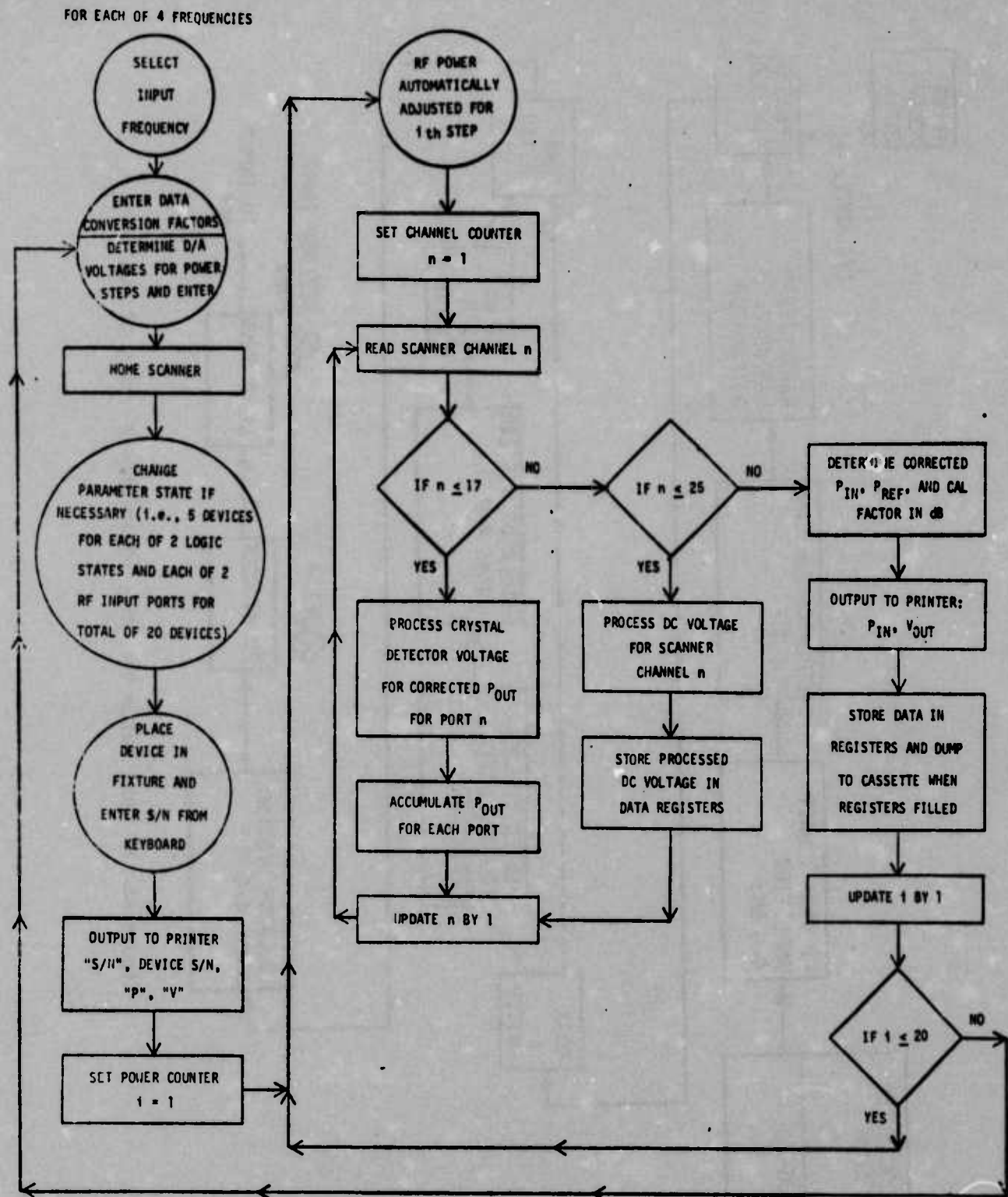


Figure 46 4011 Interference Test Flow Diagram



A

## INTEGRATED CIRCUIT SUSCEPTIBILITY

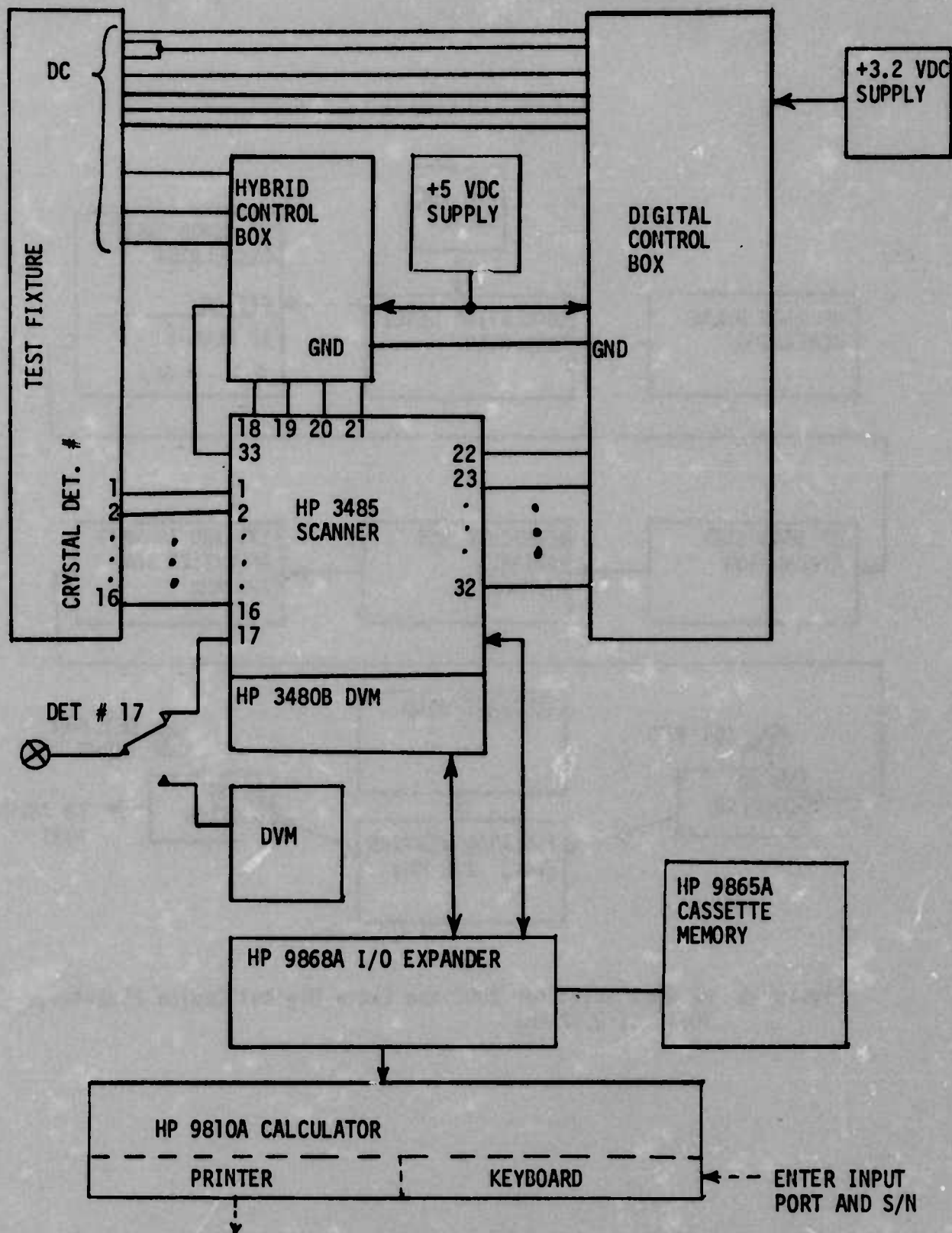
MDC E1099  
12 JULY 1974

Figure 47 General Test Setup for 2002 Hybrid Interference Test

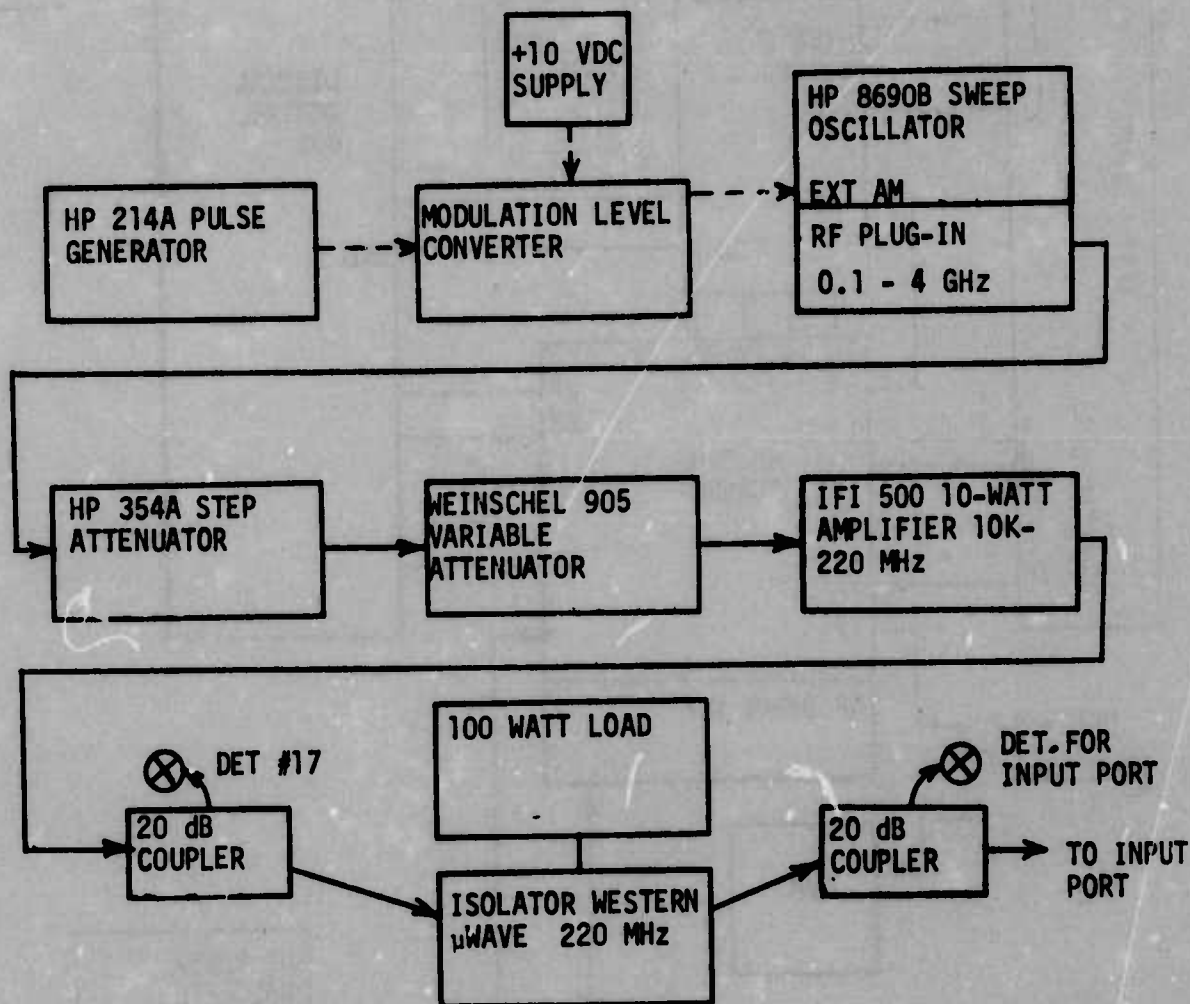


Figure 48 RF Test Setup for 2002 and Extra Digital Device Interference Tests at 0.22 GHz

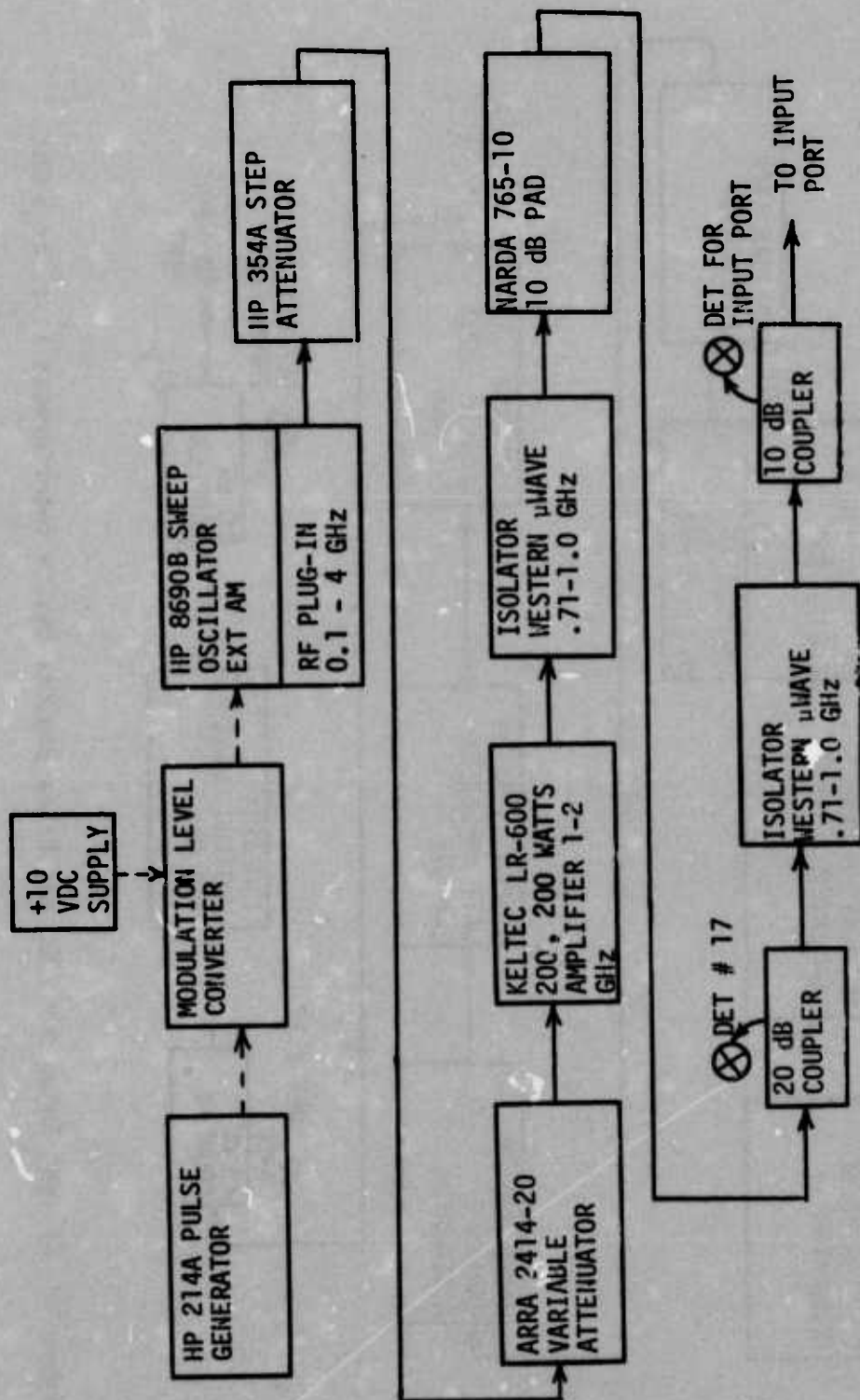


Figure 49 RF Test Setup for 2002 and Extra Digital Device Interference Tests at 0.91 GHz

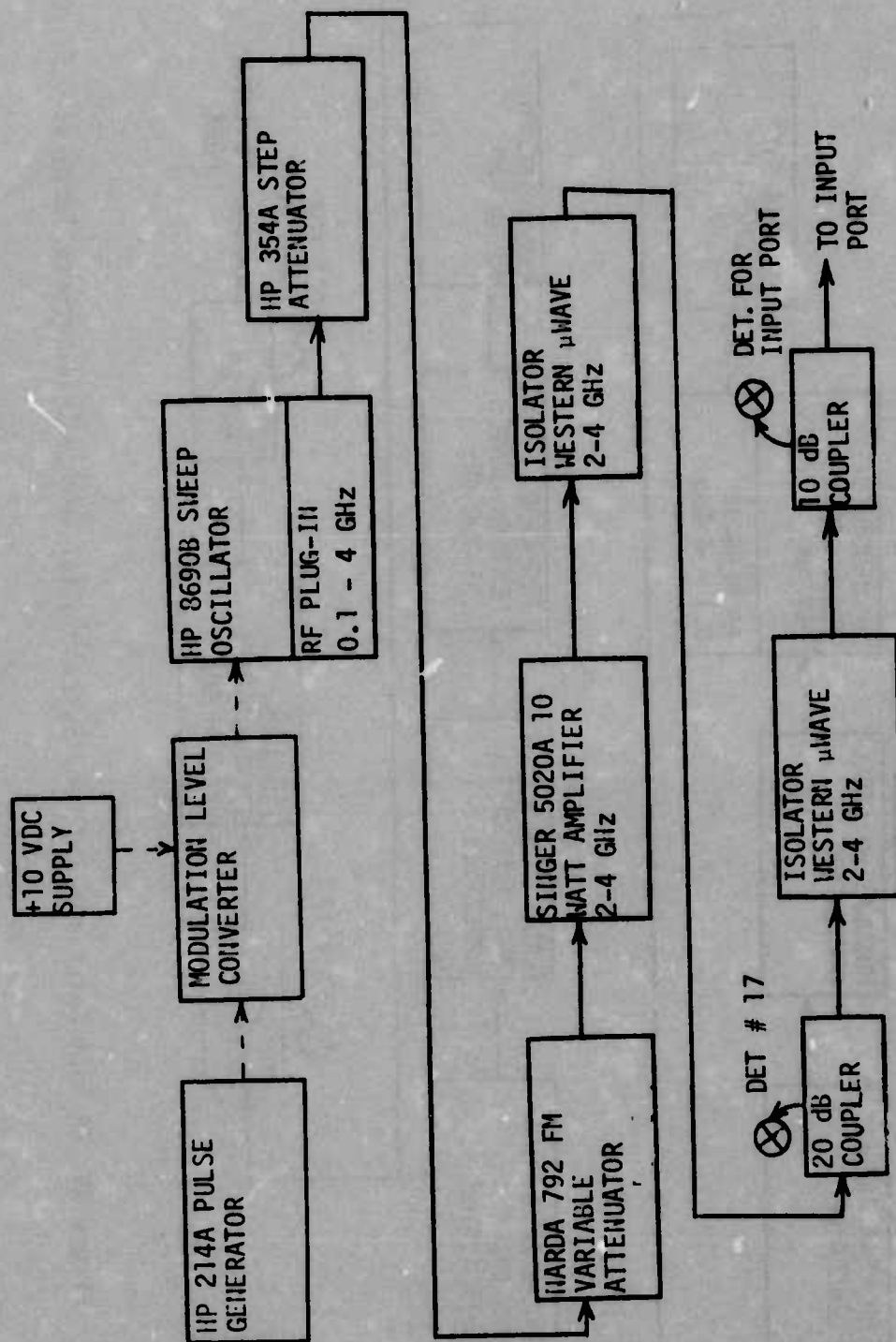


Figure 50 RF Test Setup for 2002 and Extra Digital Device Interference Tests at 3 GHz



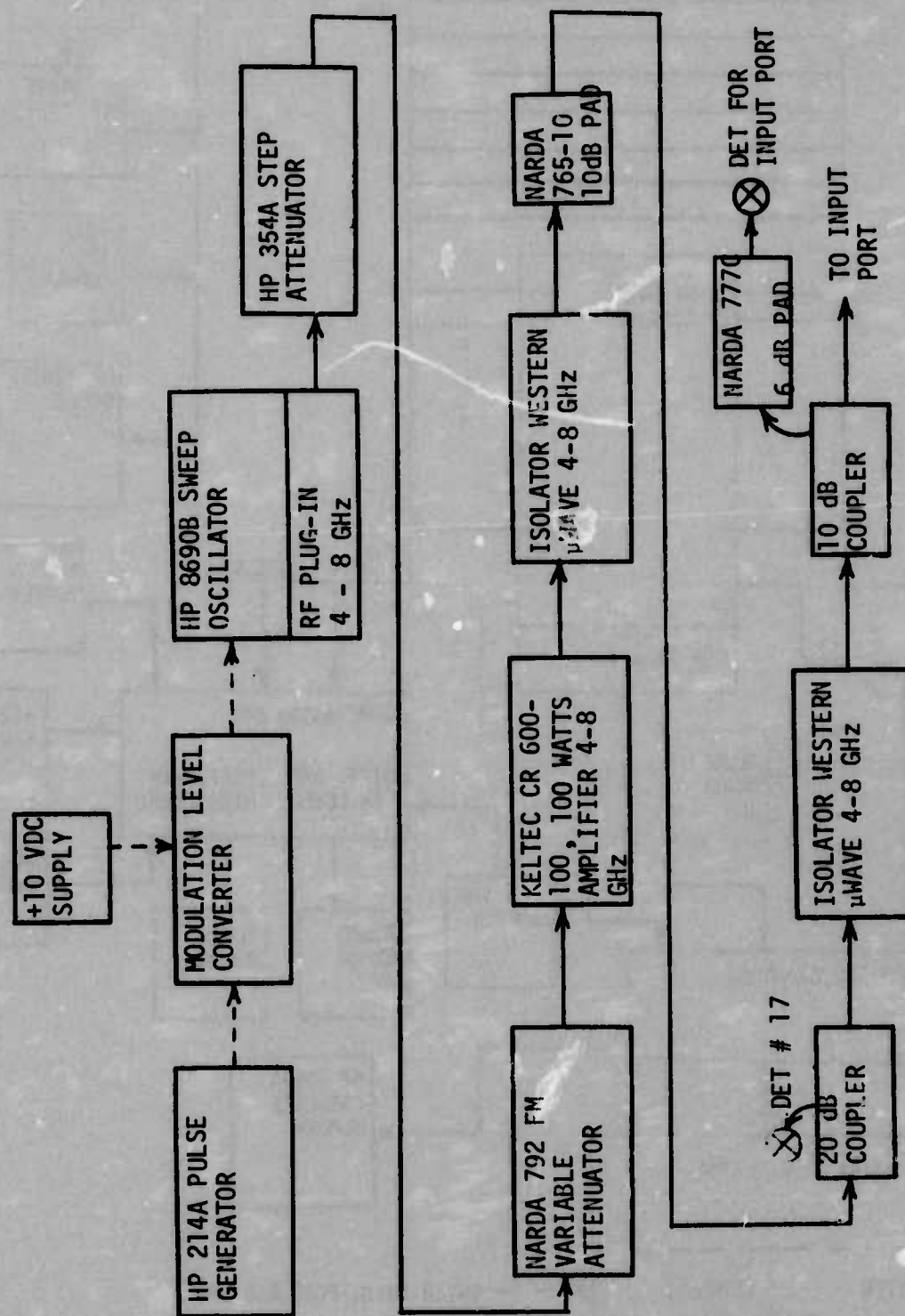


Figure 51 RF Test Setup for 2002 and Extra Digital Device Tests at 5.6 GHz

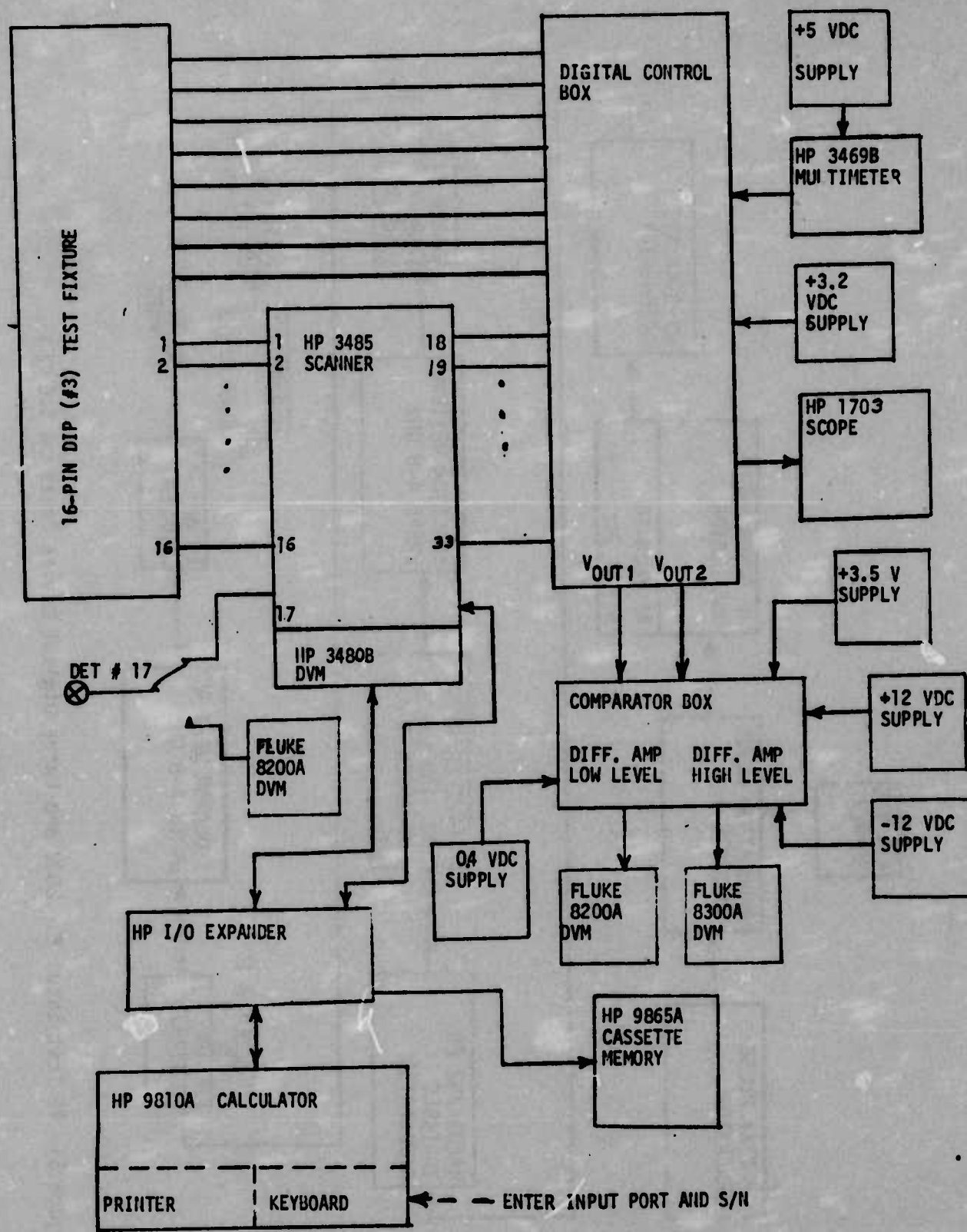
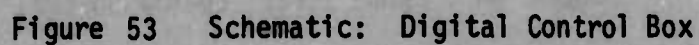


Figure 52 General Test Setup for Extra Digital Device Interference Testing





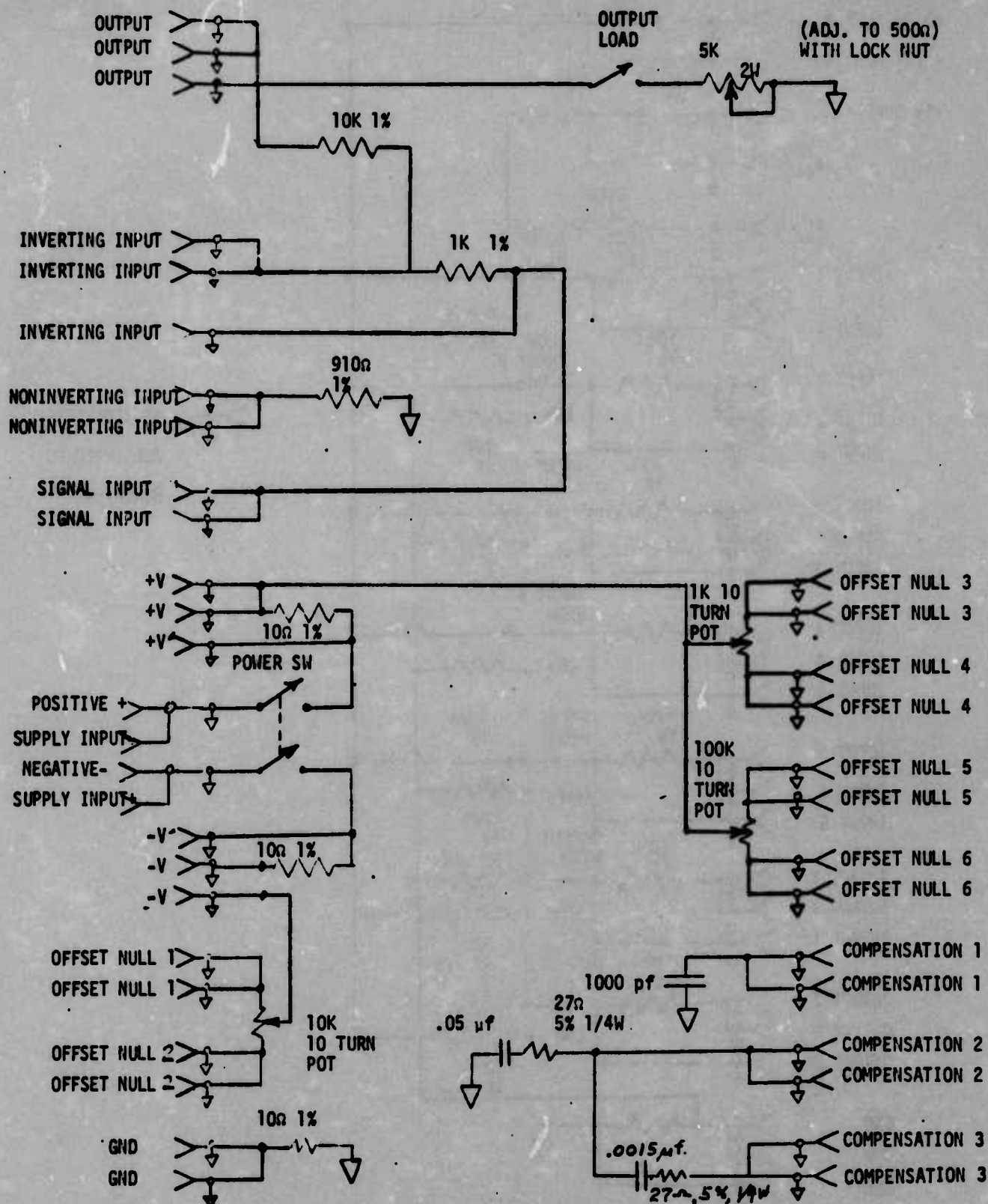


Figure 54 Schematic: Op-Amp Control Box



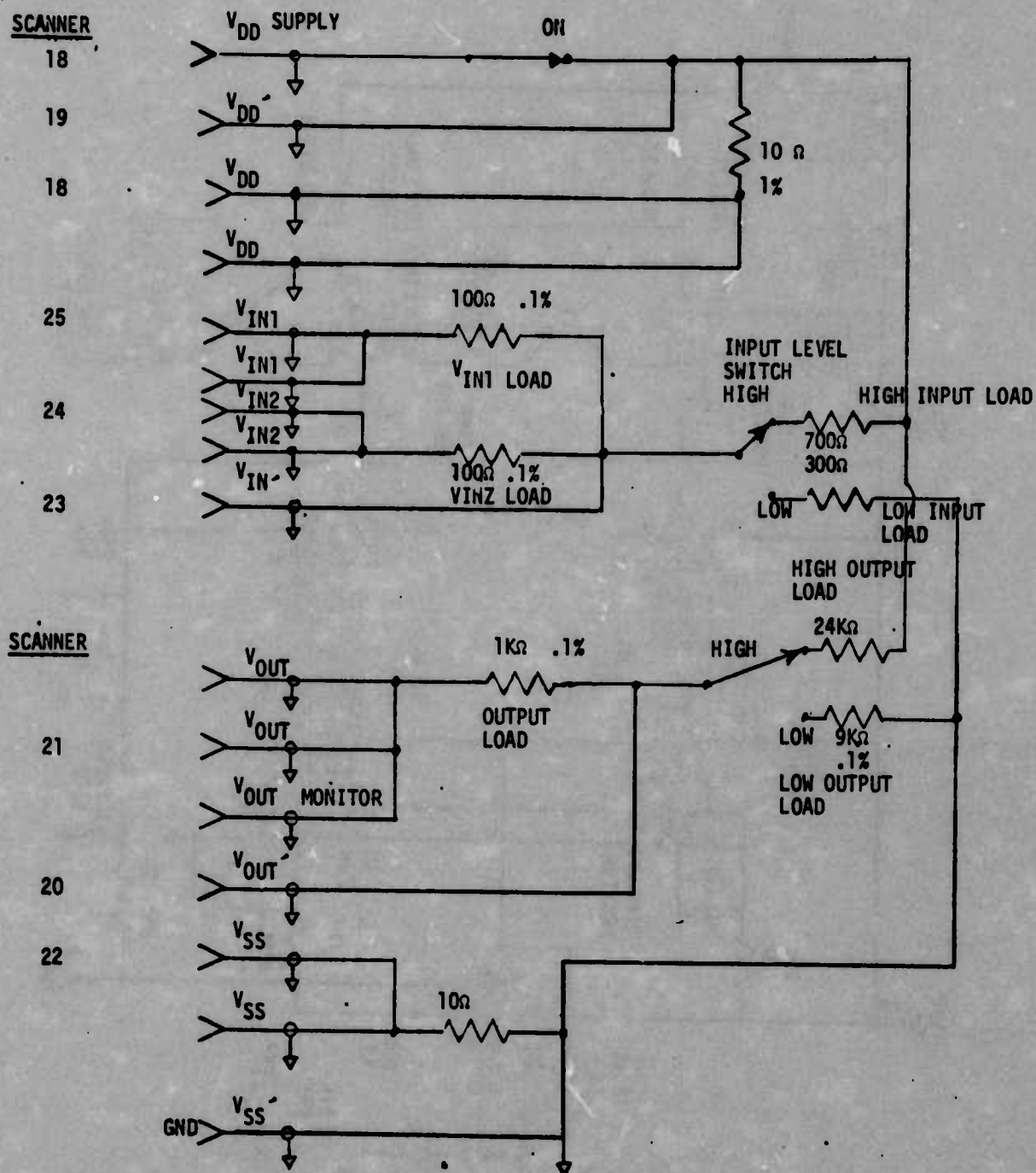


Figure 55 Schematic: MOS Control Box

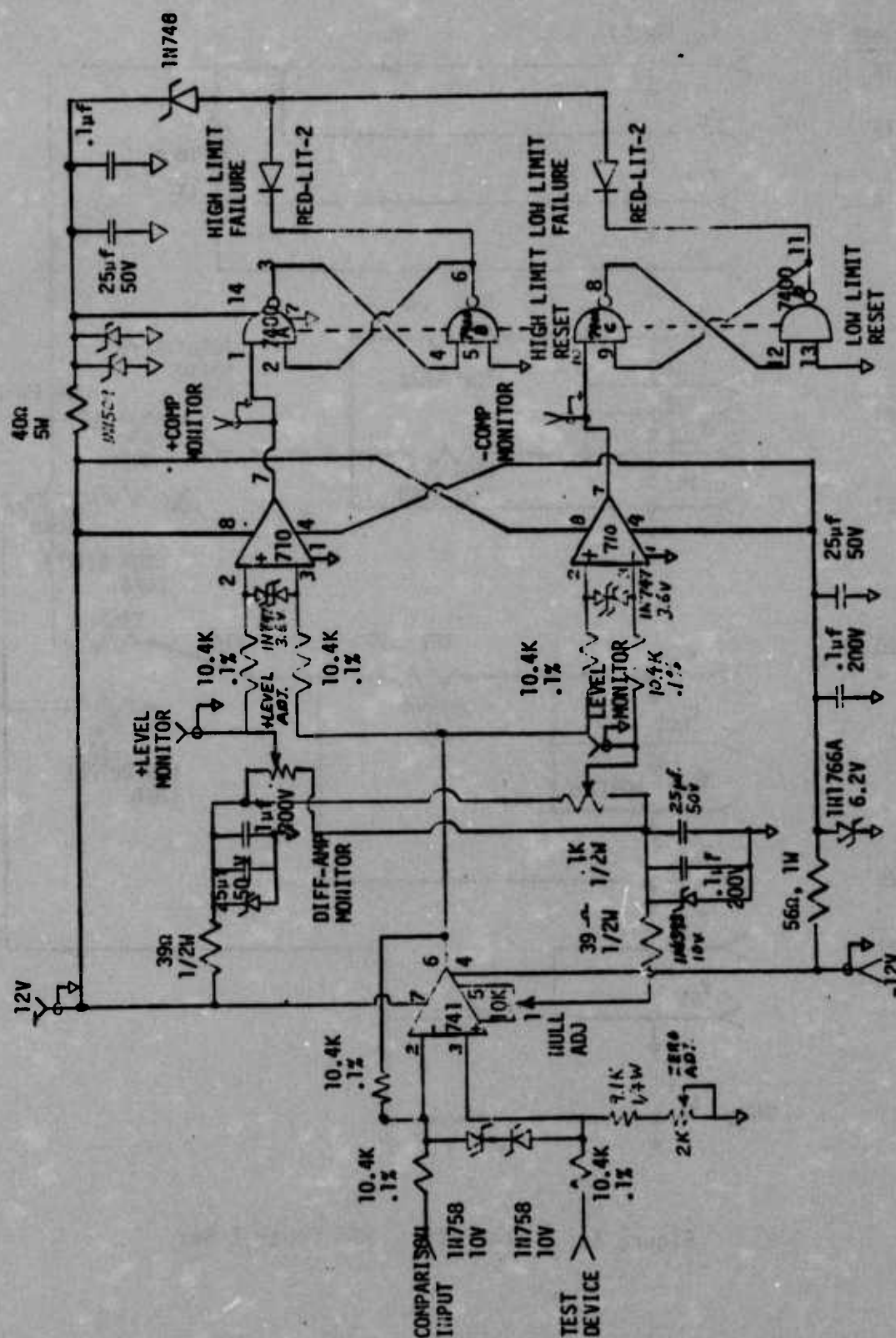


Figure 56 Schematic-Comparator

A

## INTEGRATED CIRCUIT SUSCEPTIBILITY

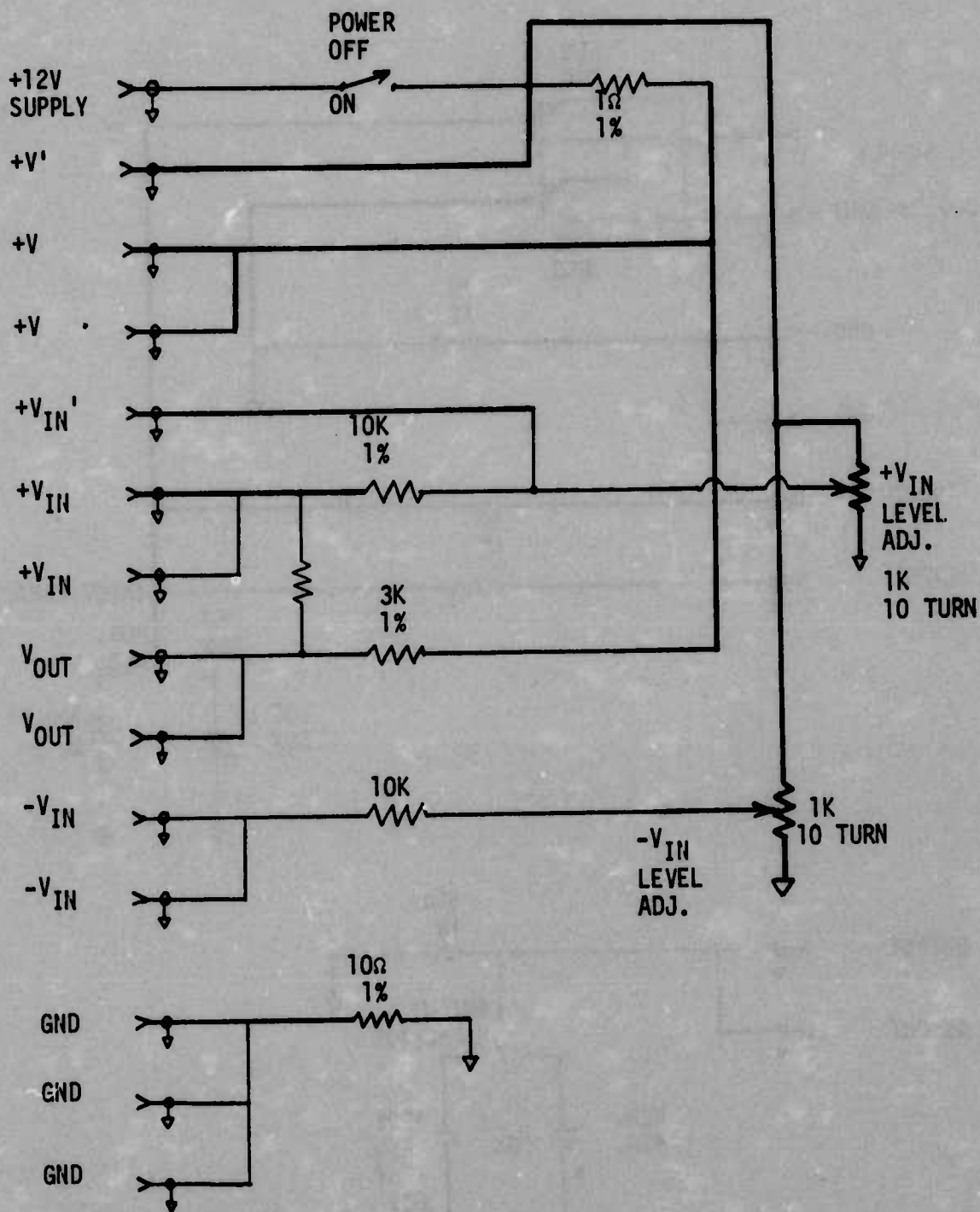
MDC E1099  
12 JULY 1974

Figure 57 Schematic: Comparator Control Box



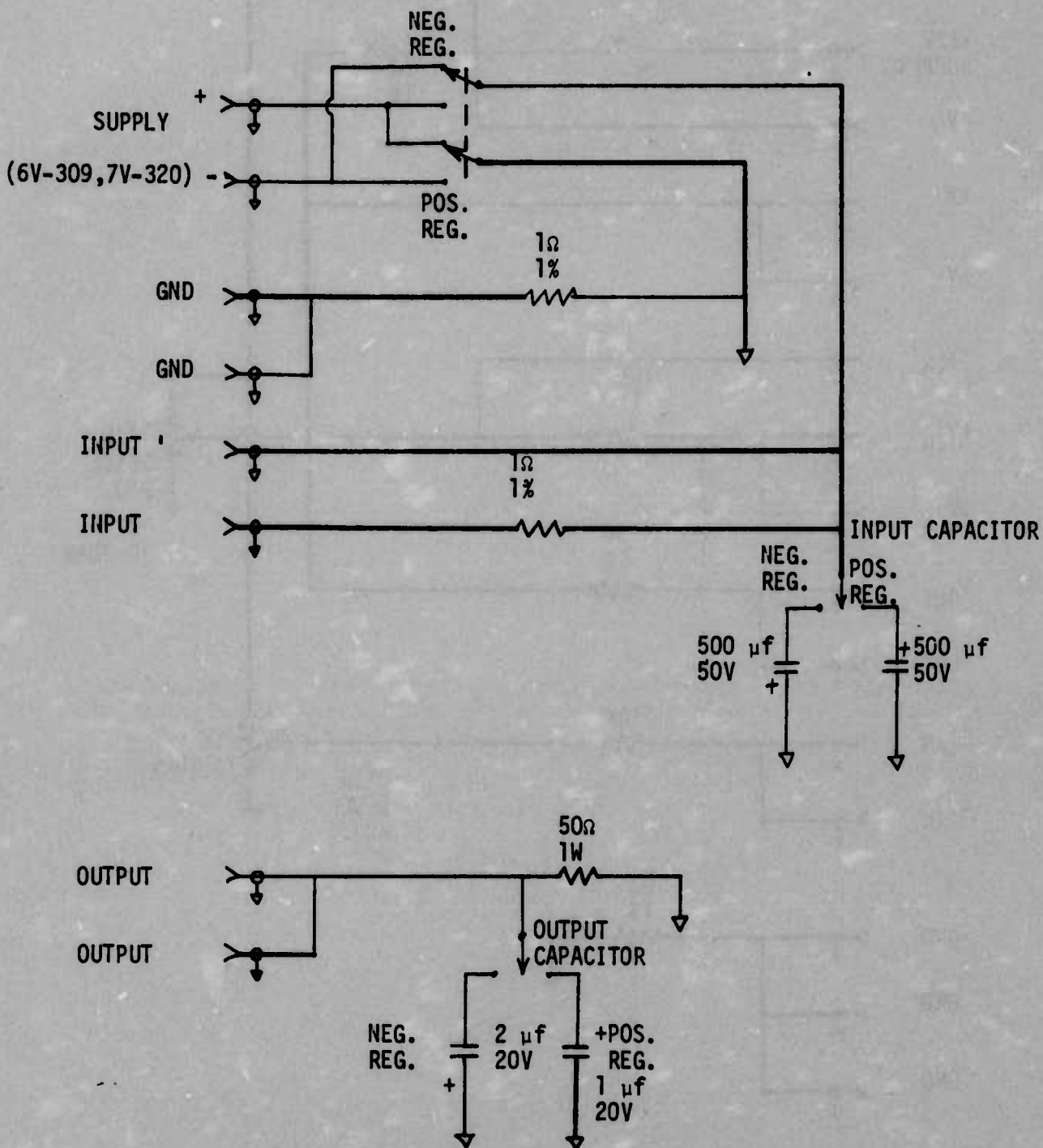


Figure 58 Schematic: Voltage Regulator Control Box



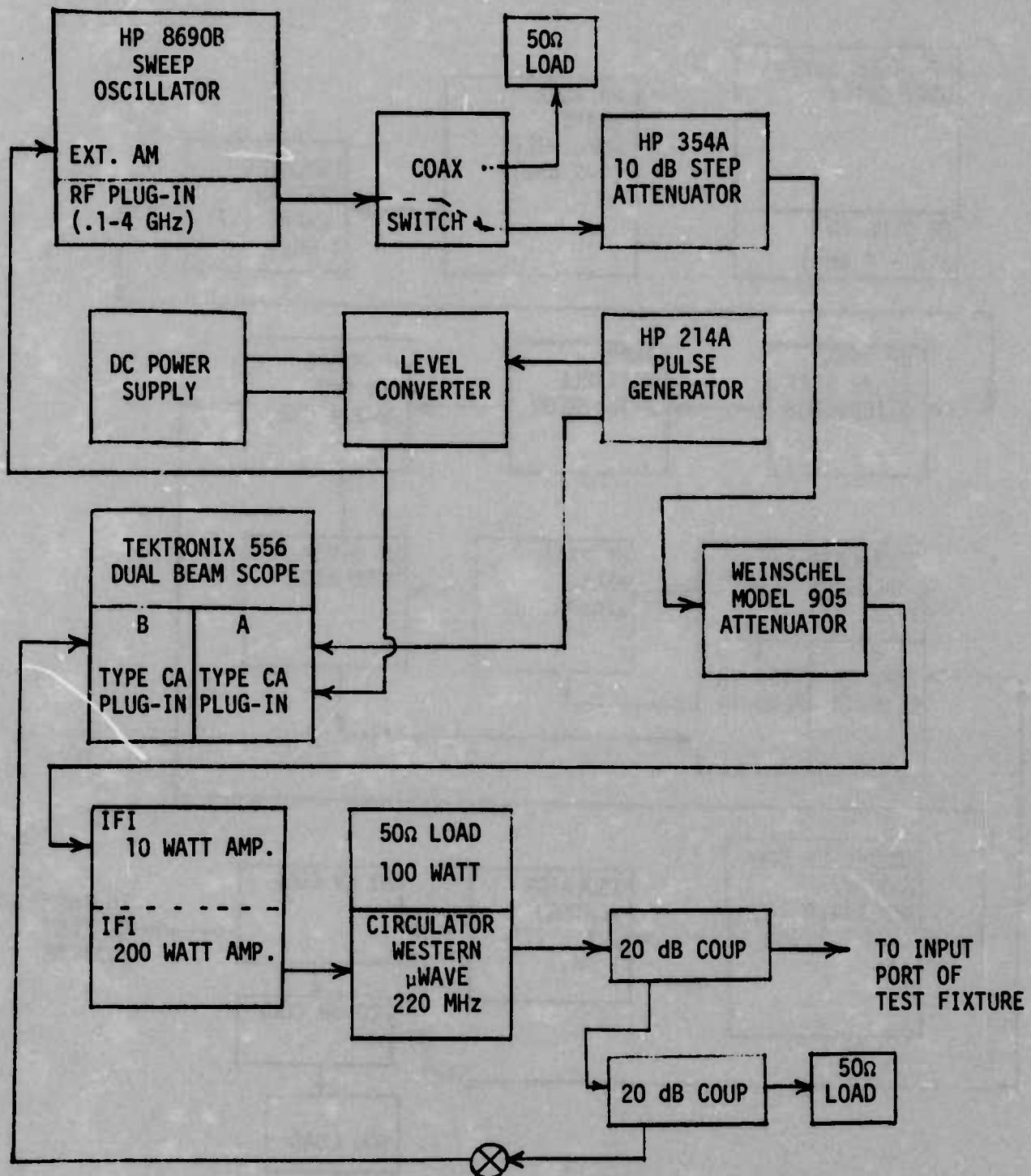


FIGURE 59 TEST SETUP FOR CATASTROPHIC FAILURE TESTING  
OF 7400 AND 741 AT 0.22 GHz

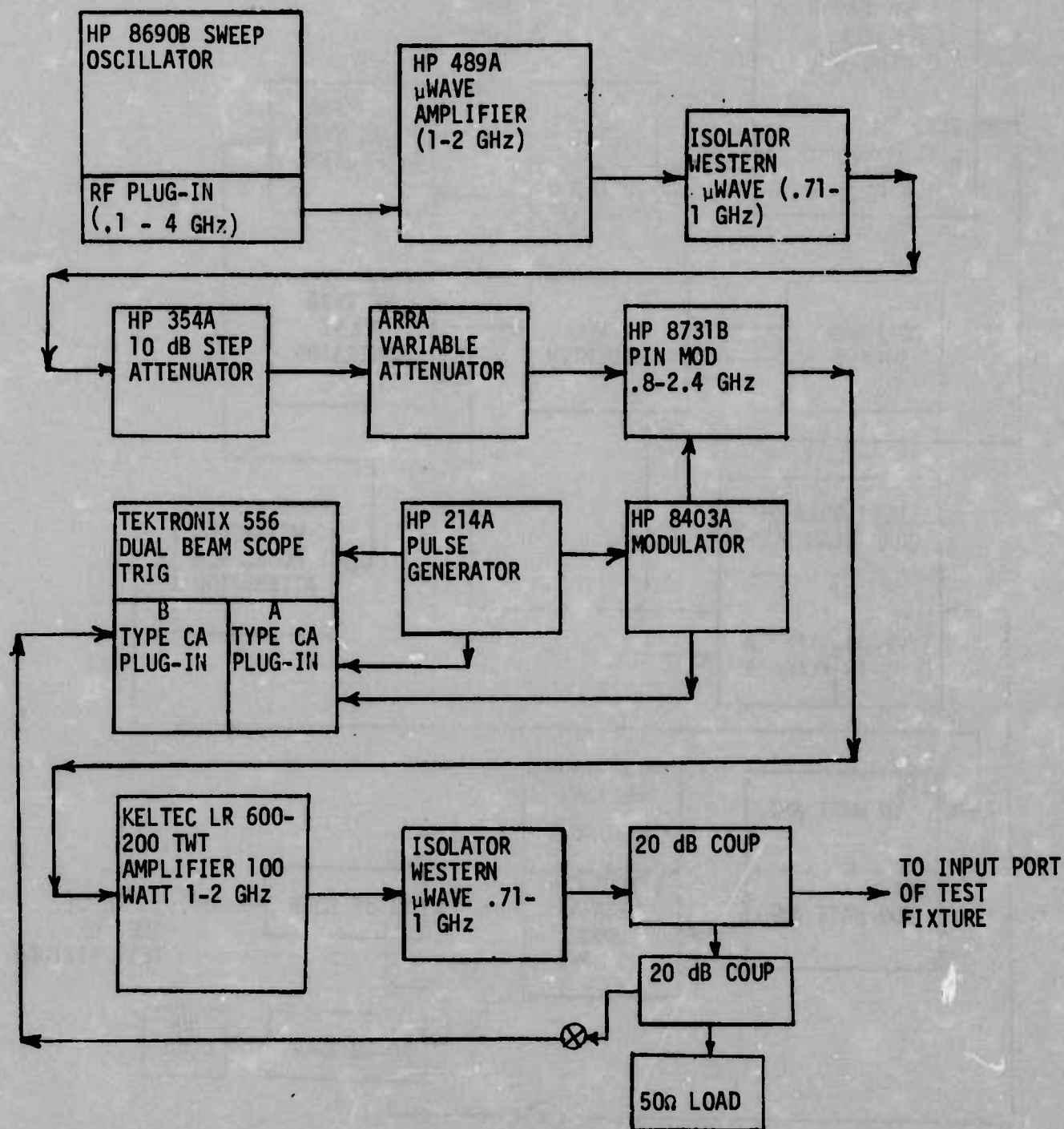


Figure 60 Test Setup for Catastrophic Failure Testing of 7400 and 741 at 0.91 GHz

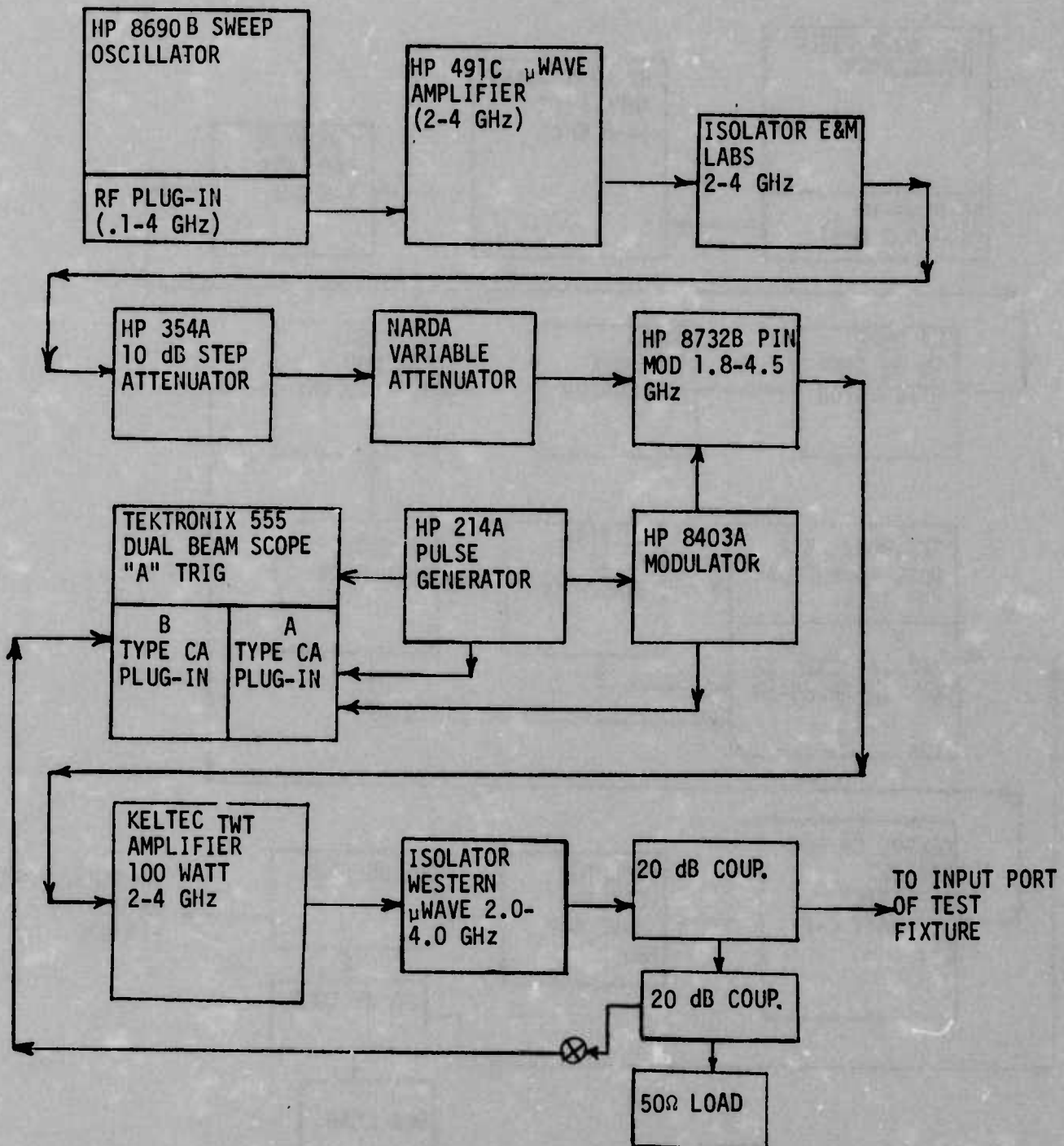


Figure 61 Test Setup for Catastrophic Failure Testing of 7400 and 741 at 3 GHz

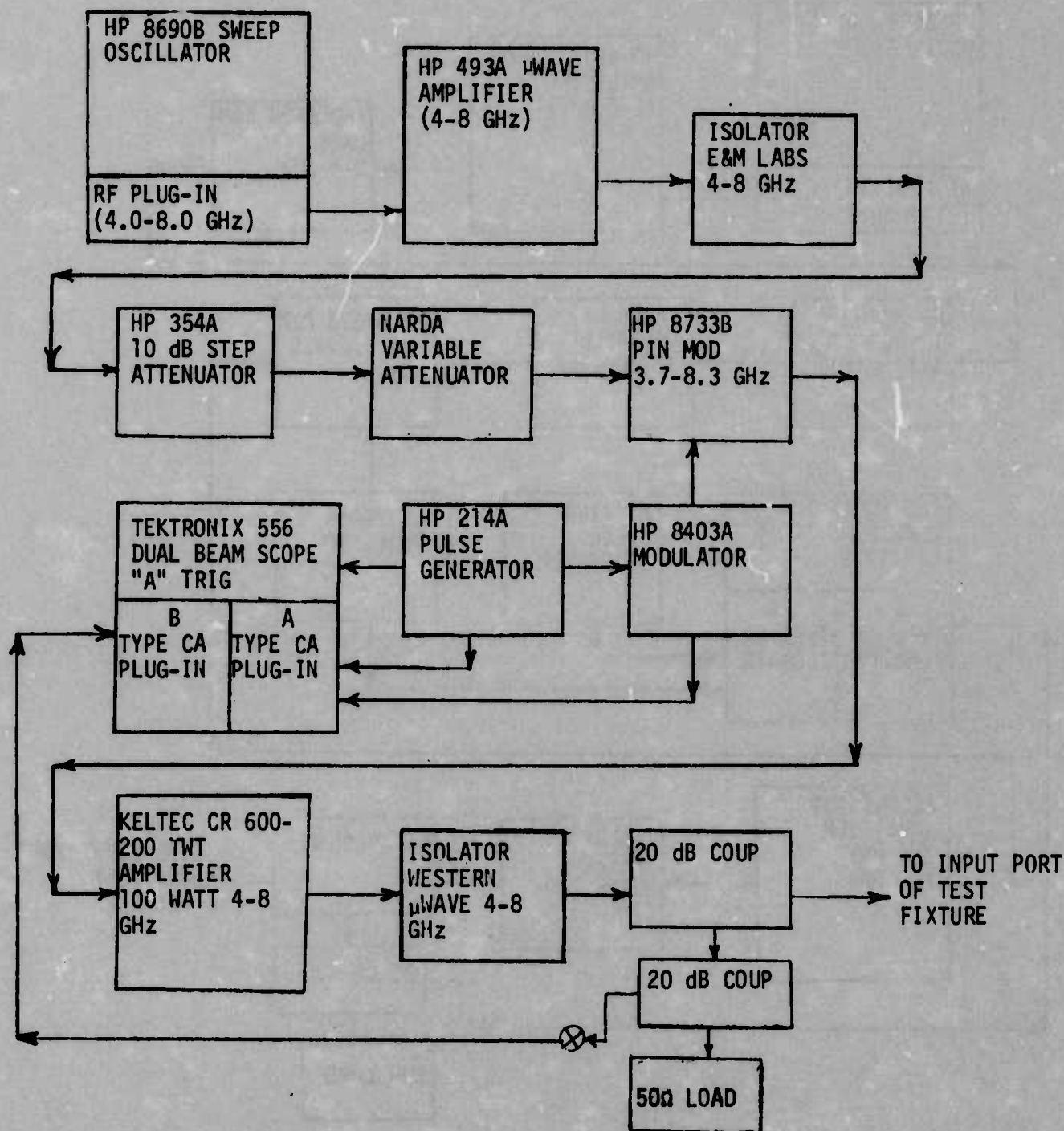


Figure 62 Test Setup for Catastrophic Failure Testing of 7400 and 741 at 5.6 GHz



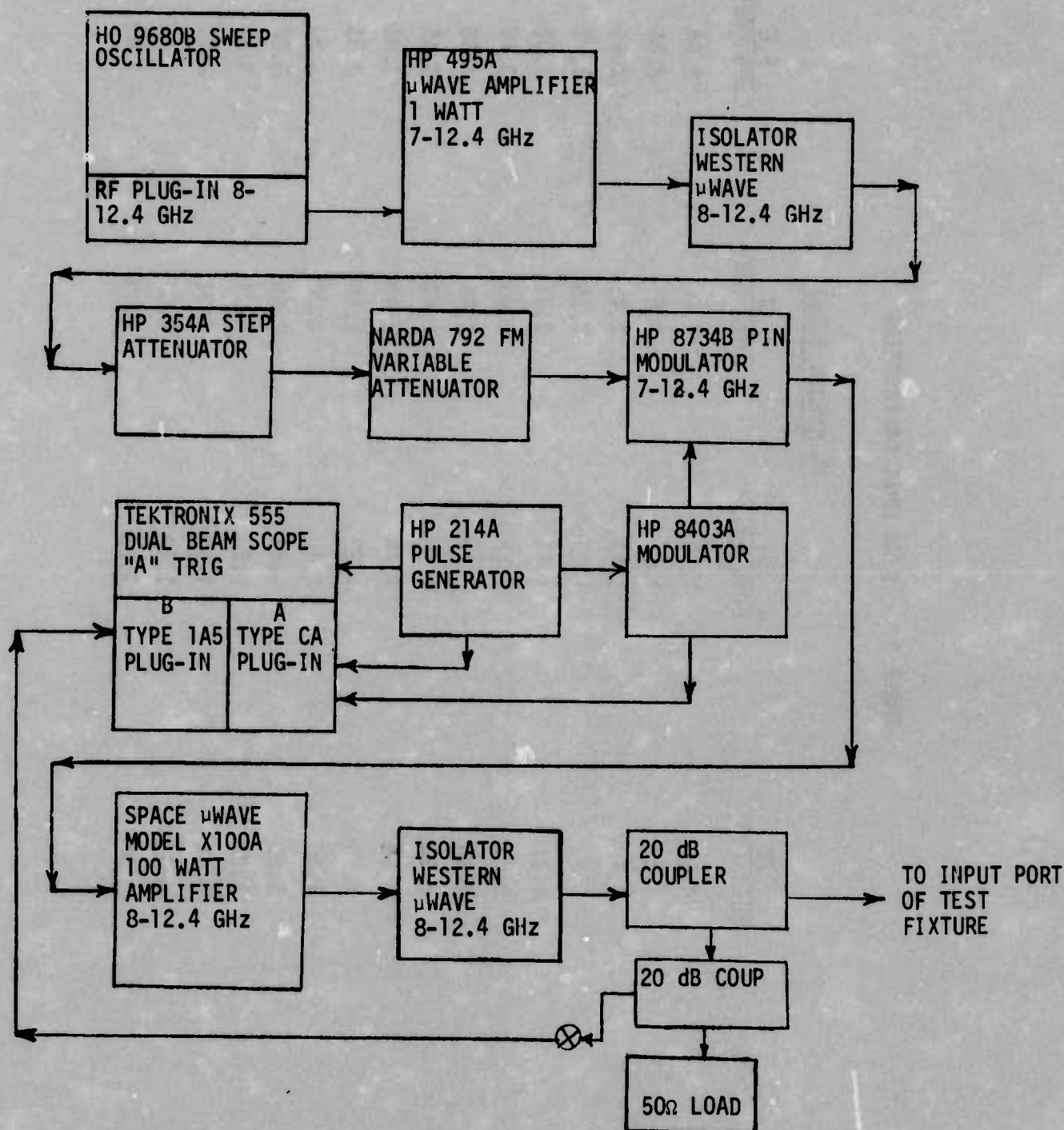


Figure 63 Test Setup for Catastrophic Failure Testing of 7400 9.1 GHz

TABLE 1 BIAS UNIT CALIBRATION

| UNIT NO. | FREQUENCY (GHz)                |                                |                              |                                |
|----------|--------------------------------|--------------------------------|------------------------------|--------------------------------|
|          | $\frac{.22}{\text{LOSS (dB)}}$ | $\frac{.91}{\text{LOSS (dB)}}$ | $\frac{3}{\text{LOSS (dB)}}$ | $\frac{5.6}{\text{LOSS (dB)}}$ |
| 1        | 4.00                           | 1.19                           | 2.48                         | 2.84                           |
| 2        | 4.27                           | 1.18                           | 2.51                         | 2.85                           |
| 3        | 4.52                           | 1.14                           | 2.45                         | 2.90                           |
| 4        | 5.02                           | 1.29                           | 2.55                         | 2.82                           |
| 5        | 4.27                           | 1.15                           | 2.71                         | 3.06                           |
| 6        | 5.02                           | 1.25                           | 2.53                         | 3.15                           |
| 7        | 4.34                           | 1.13                           | 2.44                         | 3.08                           |
| 8        | 4.34                           | 1.18                           | 2.63                         | 3.42                           |
| 9        | 5.59                           | 1.28                           | 2.49                         | 2.82                           |
| 10       | 4.70                           | 1.22                           | 2.55                         | 2.93                           |
| 11       | 4.90                           | 1.19                           | 2.30                         | 3.57                           |
| 12       | 4.90                           | 1.23                           | 2.65                         | 3.28                           |
| 13       | 4.30                           | 1.20                           | 2.71                         | 3.01                           |
| 14       | 4.48                           | 1.13                           | 2.34                         | 2.87                           |
| 15       | 4.63                           | 1.13                           | 2.57                         | 3.48                           |
| 17       | 3.94                           | 1.05                           | 2.13                         | 3.43                           |

TABLE 2 TYPICAL CRYSTAL CALIBRATION DATA

S/N = 2.91000

## COEFFICIENTS

B( 0) = 1.2707600  
 B( 1) = 1.8522600  
 B( 2) = 0.1669000  
 B( 3) = -0.0268600

| VOLTS   | MILLIWATTS | Y'       | ERROR (%) |
|---------|------------|----------|-----------|
| 0.00184 | 0.01000    | 0.01006  | -0.63063  |
| 0.00410 | 0.01500    | 0.01464  | 2.39674   |
| 0.00659 | 0.02000    | 0.02011  | -0.56073  |
| 0.01075 | 0.03000    | 0.02993  | 0.22854   |
| 0.01483 | 0.04000    | 0.04034  | -0.85928  |
| 0.01832 | 0.05000    | 0.04985  | 0.30539   |
| 0.02198 | 0.06000    | 0.06039  | -0.65043  |
| 0.02530 | 0.07000    | 0.07045  | -0.64706  |
| 0.02840 | 0.08000    | 0.08027  | -0.33626  |
| 0.03432 | 0.10000    | 0.10012  | -0.11734  |
| 0.04746 | 0.15000    | 0.14917  | 0.55004   |
| 0.06032 | 0.20000    | 0.20361  | -1.80563  |
| 0.08012 | 0.30000    | 0.29934  | 0.21924   |
| 0.09868 | 0.40000    | 0.40176  | -0.44087  |
| 0.11443 | 0.50000    | 0.49805  | 0.38929   |
| 0.13050 | 0.60000    | 0.60501  | -0.83448  |
| 0.14400 | 0.70000    | 0.70156  | -0.22314  |
| 0.15710 | 0.80000    | 0.80105  | -0.13118  |
| 0.18170 | 1.00000    | 1.00314  | -0.31351  |
| 0.23200 | 1.50000    | 1.47753  | 1.49824   |
| 0.28080 | 2.00000    | 2.01529  | -0.76460  |
| 0.35440 | 3.00000    | 2.96917  | 1.02781   |
| 0.42100 | 4.00000    | 3.97940  | 0.51500   |
| 0.47730 | 5.00000    | 4.94206  | 1.15874   |
| 0.53070 | 6.00000    | 5.94709  | 0.88191   |
| 0.57730 | 7.00000    | 6.89731  | 1.46695   |
| 0.62370 | 8.00000    | 7.91132  | 1.10851   |
| 0.70580 | 10.00000   | 9.87174  | 1.28260   |
| 0.88600 | 15.00000   | 14.92309 | 0.51275   |
| 1.05200 | 20.00000   | 20.49366 | -2.46829  |
| 1.29600 | 30.00000   | 30.29784 | -0.99280  |
| 1.51000 | 40.00000   | 40.50085 | -1.25212  |
| 1.68900 | 50.00000   | 50.20193 | -0.40387  |
| 1.86300 | 60.00000   | 60.66256 | -1.10427  |
| 2.00900 | 70.00000   | 70.23142 | -0.33060  |
| 2.14900 | 80.00000   | 80.09138 | -0.11423  |
| 2.27600 | 90.00000   | 89.61976 | 0.42249   |
| 2.38900 | 100.00000  | 98.56803 | 1.43197   |

RMS ERROR = 0.98765 PERCENT



Table 3 Crystal Detector Calibration for .22 GHz

| CRYSTAL | B(0)    | B(1)    | B(2)     | B(3)      |
|---------|---------|---------|----------|-----------|
| 1       | 1.21158 | 1.81590 | 0.291131 | 0.0350609 |
| 2       | 1.24074 | 1.79556 | 0.297538 | 0.0373098 |
| 3       | 1.23564 | 1.81008 | 0.322782 | 0.0424489 |
| 4       | 1.20574 | 1.86404 | 0.314155 | 0.0384294 |
| 5       | 1.19481 | 1.85190 | 0.197600 | 0.0000358 |
| 6       | 1.24345 | 1.83651 | 0.276008 | 0.0322073 |
| 7       | 1.18596 | 1.85907 | 0.241479 | 0.0201003 |
| 8       | 1.20217 | 1.83820 | 0.214148 | 0.0081422 |
| 9       | 1.24621 | 1.87547 | 0.226720 | 0.0109330 |
| 10      | 1.18101 | 1.88188 | 0.290815 | 0.0348513 |
| 11      | 1.26691 | 1.86180 | 0.249975 | 0.0214213 |
| 12      | 1.24609 | 1.81700 | 0.256647 | 0.0257495 |
| 13      | 1.28168 | 1.87127 | 0.311244 | 0.0386666 |
| 14      | 1.26642 | 1.79186 | 0.212334 | 0.0139630 |
| 15      | 1.25083 | 1.84017 | 0.235486 | 0.0199060 |
| 16      | 1.27627 | 1.99836 | 0.345040 | 0.0421244 |
| 17      | 1.22667 | 1.79601 | 0.235048 | 0.0192368 |

Table 4 Crystal Detector Calibration Coefficients for .91 GHz

| CRYSTAL | B(0)    | B(1)    | B(2)     | B(3)      |
|---------|---------|---------|----------|-----------|
| 1       | 1.26608 | 1.80527 | 0.259396 | 0.0271789 |
| 2       | 1.27636 | 1.77042 | 0.239902 | 0.0204803 |
| 3       | 1.28785 | 1.76456 | 0.284451 | 0.0353526 |
| 4       | 1.25658 | 1.83276 | 0.261251 | 0.0262011 |
| 5       | 1.19111 | 1.84995 | 0.195178 | 0.0018103 |
| 6       | 1.23989 | 1.82310 | 0.261538 | 0.0256129 |
| 7       | 1.18055 | 1.85284 | 0.233946 | 0.0147341 |
| 8       | 1.22359 | 1.83593 | 0.194614 | 0.0014644 |
| 9       | 1.24661 | 1.86559 | 0.219143 | 0.0094050 |
| 10      | 1.17248 | 1.87113 | 0.280579 | 0.0299600 |
| 11      | 1.28972 | 1.84059 | 0.234094 | 0.0162157 |
| 12      | 1.24014 | 1.82607 | 0.276245 | 0.0304371 |
| 13      | 1.27212 | 1.85121 | 0.295265 | 0.0335471 |
| 14      | 1.27301 | 1.79602 | 0.249553 | 0.0256183 |
| 15      | 1.24890 | 1.83210 | 0.220251 | 0.0115535 |
| 16      | 1.26884 | 1.96376 | 0.302778 | 0.0292455 |
| 17      | 1.22657 | 1.80361 | 0.254249 | 0.0250931 |



Table 5 Crystal Detector Calibration Coefficients for  
3 GHz

| CRYSTAL | B(0)    | B(1)    | B(2)     | B(3)      |
|---------|---------|---------|----------|-----------|
| 1       | 1.27763 | 1.81892 | 0.263690 | 0.0251775 |
| 2       | 1.28302 | 1.78576 | 0.253112 | 0.0248788 |
| 3       | 1.29163 | 1.77227 | 0.280223 | 0.0334609 |
| 4       | 1.26470 | 1.84092 | 0.261317 | 0.0244254 |
| 5       | 1.19930 | 1.86181 | 0.198932 | 0.0000000 |
| 6       | 1.23358 | 1.83813 | 0.272475 | 0.0270827 |
| 7       | 1.18078 | 1.86341 | 0.238082 | 0.0131825 |
| 8       | 1.21794 | 1.84851 | 0.202025 | 0.0012353 |
| 9       | 1.24672 | 1.88003 | 0.233851 | 0.0126360 |
| 10      | 1.17681 | 1.88742 | 0.284124 | 0.0272287 |
| 11      | 1.26364 | 1.85084 | 0.233118 | 0.0130534 |
| 12      | 1.23927 | 1.83673 | 0.272627 | 0.0261232 |
| 13      | 1.26724 | 1.88329 | 0.329327 | 0.0421188 |
| 14      | 1.27187 | 1.78476 | 0.251192 | 0.0200216 |
| 15      | 1.24135 | 1.84327 | 0.223890 | 0.0098869 |
| 16      | 1.27151 | 1.98515 | 0.307480 | 0.0270774 |
| 17      | 1.21854 | 1.81764 | 0.280198 | 0.0333236 |

Table 6 Crystal Detector Calibration Coefficients for  
5.6 GHz

| CRYSTAL | B(0)    | B(1)    | B(2)     | B(3)      |
|---------|---------|---------|----------|-----------|
| 1       | 1.29461 | 1.79075 | 0.223596 | 0.0153620 |
| 2       | 1.28414 | 1.77989 | 0.242594 | 0.0209951 |
| 3       | 1.29507 | 1.77151 | 0.274308 | 0.0317389 |
| 4       | 1.27982 | 1.84971 | 0.265698 | 0.0261293 |
| 5       | 1.22245 | 1.85525 | 0.188531 | 0.0000001 |
| 6       | 1.23468 | 1.83720 | 0.262285 | 0.0241400 |
| 7       | 1.19720 | 1.86466 | 0.229990 | 0.0130577 |
| 8       | 1.22201 | 1.84760 | 0.190717 | 0.0000001 |
| 9       | 1.24856 | 1.88552 | 0.227181 | 0.0100407 |
| 10      | 1.18795 | 1.88286 | 0.278124 | 0.0295213 |
| 11      | 1.27018 | 1.85684 | 0.236416 | 0.0184783 |
| 12      | 1.24434 | 1.84279 | 0.273079 | 0.0290070 |
| 13      | 1.27030 | 1.89418 | 0.329192 | 0.0426467 |
| 14      | 1.26289 | 1.78335 | 0.263753 | 0.0272889 |
| 15      | 1.24186 | 1.84348 | 0.214324 | 0.0087737 |
| 16      | 1.27460 | 2.00459 | 0.316760 | 0.0334410 |
| 17      | 1.20244 | 1.81554 | 0.264836 | 0.0260548 |

Table 7 Crystal Detector Calibration Coefficients for  
9.1 GHz

| CRYSTAL | B(0)    | B(1)    | B(2)     | B(3)      |
|---------|---------|---------|----------|-----------|
| 1       | 1.32402 | 1.82107 | 0.241207 | 0.0190506 |
| 2       | 1.30934 | 1.80303 | 0.257192 | 0.0243327 |
| 3       | 1.31229 | 1.79759 | 0.285859 | 0.0328200 |
| 4       | 1.32211 | 1.84600 | 0.239467 | 0.0163895 |
| 5       | 1.28484 | 1.89469 | 0.209176 | 0.0000000 |
| 6       | 1.25896 | 1.86727 | 0.278290 | 0.0262121 |
| 7       | 1.24194 | 1.88356 | 0.236714 | 0.0142114 |
| 8       | 1.23284 | 1.87247 | 0.202222 | 0.0000000 |
| 9       | 1.26049 | 1.90474 | 0.230906 | 0.0061021 |
| 10      | 1.22897 | 1.90423 | 0.271844 | 0.0235726 |
| 11      | 1.30727 | 1.86117 | 0.210239 | 0.0034527 |
| 12      | 1.27749 | 1.83829 | 0.236720 | 0.0124962 |
| 13      | 1.28878 | 1.90109 | 0.308784 | 0.0341583 |
| 14      | 1.25911 | 1.79075 | 0.287093 | 0.0347386 |
| 15      | 1.24244 | 1.84655 | 0.200972 | 0.0041398 |
| 16      | 1.30114 | 2.05071 | 0.353879 | 0.0426360 |
| 17      | 1.22237 | 1.82678 | 0.288599 | 0.0331120 |

Table 8 HP 9810A Program for Crystal Detector Calibration

|                  |                  |                  |
|------------------|------------------|------------------|
| 0000-- . ---20   | 0051-- L ---40   | 0101-- S O ---44 |
| 0001-- . ---55   | 0052-- IND ---31 | 0102-- LBL ---51 |
| 0002-- CLX ---37 | 0053-- I ---65   | 0103-- E ---60   |
| 0003-- LBL ---51 | 0054-- XTO ---23 | 0104-- CNT ---47 |
| 0004-- A ---62   | 0055-- C ---61   | 0105-- XEY ---30 |
| 0005-- FMT ---42 | 0056-- H ---74   | 0106-- 3 ---03   |
| 0006-- FMT ---42 | 0057-- - ---34   | 0107-- 1 ---01   |
| 0007-- D ---63   | 0058-- M ---70   | 0108-- XLY ---30 |
| 0008-- E ---60   | 0059-- E ---60   | 0109-- XLY ---52 |
| 0009-- XTO ---23 | 0060-- XTO ---23 | 0110-- GTO ---44 |
| 0010-- . ---21   | 0061-- E ---60   | 0111-- LBL ---51 |
| 0011-- CNT ---47 | 0062-- a ---13   | 0112-- C ---61   |
| 0012-- GTO ---44 | 0063-- FMT ---42 | 0113-- CNT ---47 |
| 0013-- FMT ---42 | 0064-- 1 ---01   | 0114-- DN ---25  |
| 0014-- STP ---41 | 0065-- 0 ---00   | 0115-- 1 ---01   |
| 0015-- XTO ---23 | 0066-- UP ---27  | 0116-- 0 ---00   |
| 0016-- 0 ---00   | 0067-- b ---14   | 0117-- 0 ---00   |
| 0017-- PHT ---45 | 0068-- X>Y ---53 | 0118-- X ---36   |
| 0018-- 1 ---01   | 0069-- GTO ---44 | 0119-- GTO ---44 |
| 0019-- XTO ---23 | 0070-- S/R ---77 | 0120-- LBL ---51 |
| 0020-- a ---13   | 0071-- LBL ---51 | 0121-- D ---63   |
| 0021-- XTO ---23 | 0072-- F ---16   | 0122-- LBL ---51 |
| 0022-- b ---14   | 0073-- STP ---41 | 0123-- C ---61   |
| 0023-- LBL ---51 | 0074-- FMT ---42 | 0124-- DN ---25  |
| 0024-- B ---66   | 0075-- 4 ---04   | 0125-- 1 ---01   |
| 0025-- FMT ---42 | 0076-- 1 ---01   | 0126-- 0 ---00   |
| 0026-- 4 ---04   | 0077-- FMT ---42 | 0127-- X ---36   |
| 0027-- 1 ---01   | 0078-- 1 ---01   | 0128-- GTO ---44 |
| 0028-- FMT ---42 | 0079-- FMT ---42 | 0129-- LBL ---51 |
| 0029-- SFL ---54 | 0080-- PSE ---57 | 0130-- D ---63   |
| 0030-- FMT ---42 | 0081-- PSE ---57 | 0131-- LBL ---51 |
| 0031-- CNT ---47 | 0082-- FMT ---42 | 0132-- E ---60   |
| 0032-- 5 ---05   | 0083-- 3 ---03   | 0133-- XEY ---30 |
| 0033-- 0 ---00   | 0084-- 3 ---03   | 0134-- 1 ---01   |
| 0034-- UP ---27  | 0085-- . ---21   | 0135-- 0 ---00   |
| 0035-- a ---13   | 0086-- UP ---27  | 0136-- XEY ---30 |
| 0036-- + ---33   | 0087-- CNT ---47 | 0137-- X>Y ---53 |
| 0037-- YTO ---40 | 0088-- CNT ---47 | 0138-- DN ---25  |
| 0038-- 5 ---05   | 0089-- FMT ---42 | 0139-- GTO ---44 |
| 0039-- 0 ---00   | 0090-- 4 ---04   | 0140-- LBL ---51 |
| 0040-- XFR ---67 | 0091-- 1 ---01   | 0141-- D ---63   |
| 0041-- IND ---31 | 0092-- FMT ---42 | 0142-- DN ---25  |
| 0042-- 5 ---05   | 0093-- 1 ---01   | 0143-- . ---21   |
| 0043-- 0 ---00   | 0094-- FMT ---42 | 0144-- 1 ---01   |
| 0044-- FMT ---42 | 0095-- UP ---27  | 0145-- X ---36   |
| 0045-- 4 ---04   | 0096-- 2 ---02   | 0146-- LBL ---51 |
| 0046-- 2 ---02   | 0097-- 1 ---01   | 0147-- D ---63   |
| 0047-- XTO ---23 | 0098-- UP ---27  | 0148-- G ---15   |
| 0048-- CNT ---47 | 0099-- a ---13   | 0149-- FLX ---26 |
| 0049-- FMT ---42 | 0100-- . ---52   | 0150-- 3 ---03   |
| 0050-- FMT ---42 |                  |                  |



Table 8 HP 9810A Program for Crystal Detector Calibration (Cont)

|        |     |      |        |     |      |        |     |      |
|--------|-----|------|--------|-----|------|--------|-----|------|
| 0151-- |     | --36 | 0201-- |     | --36 | 0251-- |     | --04 |
| 0152-- | DN  | --25 | 0202-- | DI  | --25 | 0252-- | DP  | --27 |
| 0153-- | INT | --64 | 0203-- | KEY | --30 | 0253-- | 0   | --08 |
| 0154-- | XTO | --23 | 0204-- | FMT | --42 | 0254-- | FMT | --42 |
| 0155-- | IND | --31 | 0205-- | FMT | --42 | 0255-- | 5   | --05 |
| 0156-- | a   | --13 | 0206-- | W   | --56 | 0256-- | XTO | --23 |
| 0157-- | CNT | --47 | 0207-- | XCY | --52 | 0257-- | GTO | --44 |
| 0158-- | CNT | --47 | 0208-- | W   | --70 | 0258-- | LBL | --51 |
| 0159-- | FMT | --42 | 0209-- | IND | --31 | 0259-- | A   | --63 |
| 0160-- | FMT | --42 | 0210-- | PSE | --57 | 0260-- | LBL | --51 |
| 0161-- | YTO | --40 | 0211-- | CLR | --20 | 0261-- | F   | --10 |
| 0162-- | IND | --31 | 0212-- | INT | --64 | 0262-- | FMT | --42 |
| 0163-- | I   | --65 | 0213-- | XCY | --52 | 0263-- | FMT | --42 |
| 0164-- | XTO | --23 | 0214-- | INT | --64 | 0264-- | C   | --61 |
| 0165-- | C   | --61 | 0215-- | 0   | --71 | 0265-- | H   | --74 |
| 0166-- | H   | --74 | 0216-- | L   | --72 | 0266-- | A   | --62 |
| 0167-- | -   | --34 | 0217-- | XTO | --23 | 0267-- | W   | --73 |
| 0168-- | D   | --63 | 0218-- | YTO | --40 | 0268-- | G   | --15 |
| 0169-- | E   | --60 | 0219-- | PSE | --57 | 0269-- | E   | --66 |
| 0170-- | XTO | --23 | 0220-- | FMT | --42 | 0270-- | CNT | --47 |
| 0171-- | .   | --21 | 0221-- | FMT | --42 | 0271-- | a   | --13 |
| 0172-- | FMT | --42 | 0222-- | KEY | --30 | 0272-- | A   | --62 |
| 0173-- | STP | --41 | 0223-- | PMT | --45 | 0273-- | W   | --73 |
| 0174-- | FMT | --42 | 0224-- | 1   | --01 | 0274-- | G   | --15 |
| 0175-- | 3   | --03 | 0225-- | UP  | --27 | 0275-- | E   | --66 |
| 0176-- | 3   | --03 | 0226-- | E   | --60 | 0276-- | FMT | --42 |
| 0177-- | .   | --21 | 0227-- | 4   | --04 | 0277-- | 1   | --01 |
| 0178-- | UP  | --27 | 0228-- | 1   | --01 | 0278-- | XTO | --23 |
| 0179-- | G   | --15 | 0229-- | UP  | --27 | 0279-- | 6   | --19 |
| 0180-- | 1   | --01 | 0230-- | a   | --13 | 0280-- | S/R | --77 |
| 0181-- | 0   | --00 | 0231-- | XCY | --52 | 0281-- | END | --4  |
| 0182-- | DIV | --35 | 0232-- | GTO | --44 |        |     |      |
| 0183-- | YTO | --40 | 0233-- | LBL | --51 |        |     |      |
| 0184-- | IND | --31 | 0234-- | B   | --66 |        |     |      |
| 0185-- | +   | --33 | 0235-- | CNT | --47 |        |     |      |
| 0186-- | a   | --13 | 0236-- | FMT | --42 |        |     |      |
| 0187-- | XFR | --67 | 0237-- | 5   | --05 |        |     |      |
| 0188-- | IND | --31 | 0238-- | EEX | --26 |        |     |      |
| 0189-- | a   | --13 | 0239-- | FMT | --42 |        |     |      |
| 0190-- | UP  | --27 | 0240-- | FMT | --42 |        |     |      |
| 0191-- | INT | --64 | 0241-- | a   | --13 |        |     |      |
| 0192-- | -   | --34 | 0242-- | E   | --60 |        |     |      |
| 0193-- | UP  | --27 | 0243-- | C   | --61 |        |     |      |
| 0194-- | EEX | --26 | 0244-- | D   | --71 |        |     |      |
| 0195-- | 3   | --03 | 0245-- | a   | --13 |        |     |      |
| 0196-- | DIV | --35 | 0246-- | D   | --63 |        |     |      |
| 0197-- | RUP | --22 | 0247-- | IFG | --43 |        |     |      |
| 0198-- | KEY | --30 | 0248-- | FMT | --42 |        |     |      |
| 0199-- | J   | --01 | 0249-- | XTP | --41 |        |     |      |
| 0200-- | 0   | --00 | 0250-- | 0   | --10 |        |     |      |

Table 9 HP 9830A Program to Convert Data to Matrix Format for 1 Crystal

```
10 DISP "FIRST FILE #";
20 REM PROGRAM TO CONVERT FROM DATA TO MATRIX FORMAT FOR 1 CRYSTAL
30 INPUT N
40 DISP "FIRST MATRIX FILE#";
50 INPUT M
60 DIM A[84,1],CS[8,41]
70 REDIM A[84,1]
80 LOAD DATA N,A
90 C[1,1]=C[2,1]=A[1,1]
100 GOTO 180
110 C[5,1]=C[6,1]=A[43,1]
120 C[7,1]=C[8,1]=A[64,1]
130 GOTO 160
140 IF A[22,1]#C[1,1] THEN 560
150 IF A[1,1]#C[3,1] THEN 560
160 IF I=1 THEN 260
170 FOR J=0 TO 1
180 FOR K=2 TO 41
190 V=A[K,1]
200 P=INT(V)/1000
210 V=10*(V-INT(V))
220 C[1,K]=P
230 C[2,K]=V
240 NEXT K
250 GOTO 400
260 FOR J=0 TO 1
270 FOR K=2 TO 21
280 V=A[J*21+K,1]
290 P=INT(V)/1000
300 V=10*(V-INT(V))
310 IF J>0 THEN 350
320 C[2*J+3,K]=P
330 C[2*J+4,K]=V
340 GOTO 370
350 C[2*J-1,K+20]=P
360 C[2*J,K+20]=V
370 NEXT K
380 NEXT J
390 NEXT I
400 FOR I=1 TO 41
410 WRITE (15,430)C[1,I],C[2,I]
420 NEXT I
430 FORMAT 4F10.5
440 REDIM A[2,42]
460 FOR K=1 TO 41
470 A[1,K]=C[1,K]
```

Table 9 HP 9830A Program to Convert Data to Matrix Format for 1 Crystal (cont)

```
480 A[2,K]=C[2,K]
490 NEXT K
500 A[1,42]=A[2,42]=A[1,1]
510 STORE DATA #5,M,A
520 N=N+1
530 M=M+1
550 GOTO 70
560 DISP "S/N NOT =";
570 END
```



Table 10 HP 9830A Program to Calculate Coefficients for Crystal Detectors -  
Degree = 3

```
10 DIM CS[36],B[8],A[2,42]
20 REM PROGRAM TO CALCULATE CRYSTAL DETECTOR COEFFICIENTS
30 DISP "FIRST FILE #, # OF FILES";
40 INPUT N1,N2
50 FOR L=0 TO N2-1
60 MAT C=ZER
70 MAT B=ZER
80 B[1]=1
90 W=N=S1=S2=S3=S4=S5=0
100 D1=D2=3
110 LOAD DATA N1+L,A
120 FIXED 6
130 FOR H=2 TO 41
140 B[2]=LGT(A[2,H])
150 Y=LGT(A[1,H])
160 FOR I=2 TO D2
170 B[I+1]=B[I]*B[2]
180 NEXT I
190 B[D2+2]=Y
200 R=0
210 FOR I=1 TO D2+2
220 FOR J=I TO D2+2
230 R=R+1
240 C[R]=C[R]+E[I]*B[J]
250 NEXT J
260 NEXT I
270 S1=S1+B[2]
280 S2=S2+B[2]^2
290 S3=S3+Y
300 S4=S4+Y^2
310 S5=S5+B[2]*Y
320 N=N+1
330 NEXT H
340 D1=3
350 IF W=0 THEN 830
360 T=0
370 FOR I=1 TO D1+1
380 B[I]=0
390 FOR J=1 TO D1-I+2
400 R=(I+J-1)*(D2+2-0.5*(I+J))
410 B[I]=B[I]+C[T+J]*C[R]
420 NEXT J
430 T=I*(D2+(3-I)/2)
440 NEXT I
450 R1=0
460 FOR I=2 TO D1+1
470 R1=R1+C[I*(D2+(3-I)/2)]^2
```

Table 10 HP 9830A Program to Calculate Coefficients for Crystal Detector -  
Degree = 3 (cont)

```
480 NEXT I
490 TO=C[(D2+1)*(D2+2)/2]
500 TO=TO-C[D2+1]^2
510 FOR I=1 TO 3
520 PRINT
530 NEXT I
540 PRINT " ", "S/N ="A[1,1];"SECOND CALIBRATION"
550 PRINT
560 PRINT
570 PRINT " ", "COEFFICIENTS"
580 PRINT
590 FORMAT 12X,F2.0,F12.7
600 FOR I=1 TO D1+1
610 WRITE (15,590)"B("I-1")="B[I]
620 NEXT I
630 PRINT
640 PRINT
650 PRINT " ", "R SQUARE ="R1/TO
660 PRINT
670 PRINT " ", " VOLTS","MILLIWATTS"," Y' ", " ERROR(%)"
680 Q=0
690 FOR I=2 TO 41
700 X1=A[2,I]
710 Y1=A[1,I]
720 Y2=10^(B[1]+B[2]*LGT(X1)+B[3]*(LGT(X1))^2+B[4]*(LGT(X1))^3)
730 Q=Q+((Y1-Y2)/Y1)^2
740 PRINT " ",X1,Y1,Y2,100*(Y1-Y2)/Y1
750 NEXT I
760 PRINT
770 PRINT
780 PRINT " ", "RMS ERROR ="100*SQR(Q/40)"PERCENT"
790 FOR J=1 TO 6
800 PRINT
810 NEXT J
820 GOTO 1210
830 P=W=1
840 D2=D2+1
850 FOR J=1 TO D2
860 C[P]=SQRC[P]
870 FOR I=1 TO D2-J+1
880 C[P+I]=C[P+I]/C[P]
890 NEXT I
900 R=P+I
910 S=R
920 FOR I=1 TO D2-J
930 P=P+1
940 FOR M=1 TO D2+2-J-I
```

Table 10 HP 9830A Program to Calculate Coefficients for Crystal Detectors -  
Degree = 3 (cont)

```
950 C[R+M-1]=C[R+M-1]-C[P]*C[P+M-1]
960 NEXT M
970 R=R+M-1
980 NEXT I
990 P=S
1000 NEXT J
1010 T=(D2+1)*(D2+2)/2
1020 FOR I=1 TO D2-1
1030 T=T-1-I
1040 C[T]=1/C[T]
1050 FOR J=1 TO D2-I
1060 P=D2+1-I-J
1070 P=P*(D2+1-(P-1)/2)-I
1080 R=P-J
1090 S=0
1100 U=I+J+1
1110 V=P
1120 FOR K=1 TO J
1130 V=V+U-K
1140 S=S-C[R+K]*C[V]
1150 NEXT K
1160 C[P]=S/C[R]
1170 NEXT J
1180 NEXT I
1190 C[1]=1/C[1]
1200 GOTO 360
1210 NEXT L
1220 END
```



Table 11 General Fixture Calibration Program (HP 9810A)- 16 Pins

|                |                |                |
|----------------|----------------|----------------|
| 0000--CLK---20 | 0051--YTO---40 | 0101--H---56   |
| 0001--K---55   | 0052--DIV---35 | 0102--L---60   |
| 0002--CLX---37 | 0053--N---73   | 0103--a---13   |
| 0003--FMT---42 | 0054--FMT---42 | 0104--FMT---42 |
| 0004--FMT---42 | 0055--STP---41 | 0105--STP---41 |
| 0005--E---60   | 0056--XTO---23 | 0106--1---01   |
| 0006--N---73   | 0057--1---01   | 0107--XTO---23 |
| 0007--XTO---23 | 0058--0---00   | 0108--a---13   |
| 0008--E---60   | 0059--8---10   | 0109--FMT---42 |
| 0009--a---13   | 0060--PNT---45 | 0110--4---04   |
| 0010--CNT---47 | 0061--INT---64 | 0111--1---01   |
| 0011--D---63   | 0062--UP---27  | 0112--FMT---42 |
| 0012--A---62   | 0063--EEX---26 | 0113--1---01   |
| 0013--XTO---23 | 0064--2---02   | 0114--FMT---42 |
| 0014--A---62   | 0065--DIV---35 | 0115--PSE---57 |
| 0015--CNT---47 | 0066--DN---25  | 0116--PSE---57 |
| 0016--C---61   | 0067--UP---27  | 0117--PSE---57 |
| 0017--A---62   | 0068--INT---64 | 0118--CNT---47 |
| 0018--a---13   | 0069-- - ---34 | 0119--CNT---47 |
| 0019--D---63   | 0070--EEX---26 | 0120--LBL---51 |
| 0020--FMT---42 | 0071--2---02   | 0121--C---61   |
| 0021--CNT---47 | 0072--X---36   | 0122--FMT---42 |
| 0022--FMT---42 | 0073--YTO---40 | 0123--3---03   |
| 0023--XFR---67 | 0074--8---10   | 0124--3---03   |
| 0024--FMT---42 | 0075--9---11   | 0125-- . ---21 |
| 0025--FMT---42 | 0076--FMT---42 | 0126--UP---27  |
| 0026--F---16   | 0077--4---04   | 0127--FMT---42 |
| 0027--a---13   | 0078--1---01   | 0128--4---04   |
| 0028--E---60   | 0079--FMT---42 | 0129--1---01   |
| 0029--b---14   | 0080--SFL---54 | 0130--FMT---42 |
| 0030-- . ---21 | 0081--FMT---42 | 0131--1---01   |
| 0031--CNT---47 | 0082--CNT---47 | 0132--FMT---42 |
| 0032--SFL---54 | 0083--FMT---42 | 0133--a---13   |
| 0033--FMT---42 | 0084--FMT---42 | 0134--UP---27  |
| 0034--XFR---67 | 0085--YTO---40 | 0135--XFR---67 |
| 0035--0---00   | 0086--E---60   | 0136--8---10   |
| 0036--PNT---45 | 0087--XTO---23 | 0137--9---11   |
| 0037--1---01   | 0088--CNT---47 | 0138--X=Y---50 |
| 0038--XTO---23 | 0089--H---56   | 0139--DN---25  |
| 0039--0---00   | 0090--0---71   | 0140--GTO---44 |
| 0040--CLX---37 | 0091--IND---31 | 0141--LBL---51 |
| 0041--XTO---23 | 0092--E---60   | 0142--D---63   |
| 0042--1---01   | 0093--a---13   | 0143--1---01   |
| 0043--9---11   | 0094--CNT---47 | 0144--7---07   |
| 0044--XTO---23 | 0095--A---62   | 0145--X=Y---50 |
| 0045--2---02   | 0096--N---73   | 0146--DN---25  |
| 0046--0---00   | 0097--D---63   | 0147--GTO---44 |
| 0047--LBL---51 | 0098--CLR---20 | 0148--LBL---51 |
| 0048--B---66   | 0099--H---56   | 0149--D---63   |
| 0049--FMT---42 | 0100--A---62   | 0150--DN---25  |
| 0050--FMT---42 |                |                |

# INTEGRATED CIRCUIT SUSCEPTIBILITY

MDC E1099  
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Table 11

General Fixture Calibration Program (HP 9810A)- 16 Pins  
(cont)

|      |     |      |     |      |      |     |    |
|------|-----|------|-----|------|------|-----|----|
| 0151 | -15 | 0201 | 07  | 0251 | CNT  | 47  |    |
| 0152 | LLA | 0202 | CNT | 47   | 0252 | CNT | 47 |
| 0153 | CHS | 0203 | 1   | 01   | 0253 | 1   | 01 |
| 0154 | 3   | 0204 | XTO | 23   | 0254 | 8   | 10 |
| 0155 | X>Y | 0205 | +   | 33   | 0255 | UP  | 27 |
| 0156 | CLX | 0206 | b   | 14   | 0256 | a   | 13 |
| 0157 | KEY | 0207 | XFR | 67   | 0257 | XCY | 52 |
| 0158 | CNT | 0208 | IND | 31   | 0258 | PSE | 57 |
| 0159 | CNT | 0209 | b   | 14   | 0259 | GTO | 44 |
| 0160 | LBL | 0210 | UP  | 27   | 0260 | LBL | 51 |
| 0161 | D   | 0211 | INT | 64   | 0261 | C   | 61 |
| 0162 | DN  | 0212 | -   | 34   | 0262 | XFR | 67 |
| 0163 | K   | 0213 | UP  | 27   | 0263 | 1   | 01 |
| 0164 | 4   | 0214 | EEX | 26   | 0264 | 7   | 07 |
| 0165 | XTO | 0215 | 7   | 07   | 0265 | XTO | 23 |
| 0166 | 8   | 0216 | DIV | 35   | 0266 | DIV | 35 |
| 0167 | 8   | 0217 | RUP | 22   | 0267 | 1   | 01 |
| 0168 | a   | 0218 | KEY | 30   | 0268 | 0   | 00 |
| 0169 | UP  | 0219 | XFR | 67   | 0269 | 6   | 06 |
| 0170 | 2   | 0220 | 8   | 10   | 0270 | CNT | 47 |
| 0171 | X   | 0221 | 8   | 10   | 0271 | 8   | 10 |
| 0172 | 1   | 0222 | X   | 36   | 0272 | 9   | 11 |
| 0173 | 9   | 0223 | X   | 36   | 0273 | XFR | 67 |
| 0174 | +   | 0224 | RUP | 22   | 0274 | +   | 33 |
| 0175 | YTO | 0225 | KEY | 30   | 0275 | 8   | 10 |
| 0176 | b   | 0226 | X   | 36   | 0276 | 9   | 11 |
| 0177 | XFR | 0227 | X   | 36   | 0277 | XTO | 23 |
| 0178 | IND | 0228 | X   | 36   | 0278 | b   | 14 |
| 0179 | b   | 0229 | DN  | 25   | 0279 | XFR | 67 |
| 0180 | UP  | 0230 | +   | 33   | 0280 | 1   | 01 |
| 0181 | INT | 0231 | YE  | 24   | 0281 | 8   | 10 |
| 0182 | -   | 0232 | +   | 33   | 0282 | XTO | 23 |
| 0183 | UP  | 0233 | 8   | 10   | 0283 | IND | 31 |
| 0184 | EEX | 0234 | 7   | 07   | 0284 | DIV | 35 |
| 0185 | 5   | 0235 | DN  | 25   | 0285 | b   | 14 |
| 0186 | DIV | 0236 | K   | 55   | 0286 | 9   | 11 |
| 0187 | DN  | 0237 | 5   | 05   | 0287 | 0   | 00 |
| 0188 | KEY | 0238 | UP  | 27   | 0288 | XTO | 23 |
| 0189 | UP  | 0239 | 8   | 10   | 0289 | a   | 13 |
| 0190 | 1   | 0240 | 9   | 11   | 0290 | CLX | 37 |
| 0191 | 0   | 0241 | XFR | 67   | 0291 | UP  | 27 |
| 0192 | X   | 0242 | +   | 33   | 0292 | LBL | 51 |
| 0193 | XFR | 0243 | a   | 13   | 0293 | E   | 60 |
| 0194 | 8   | 0244 | XTO | 23   | 0294 | XFR | 67 |
| 0195 | 8   | 0245 | b   | 14   | 0295 | IND | 31 |
| 0196 | X   | 0246 | YTO | 40   | 0296 | a   | 13 |
| 0197 | DN  | 0247 | IND | 31   | 0297 | +   | 33 |
| 0198 | +   | 0248 | b   | 14   | 0298 | 1   | 01 |
| 0199 | YTO | 0249 | 1   | 01   | 0299 | E   | 60 |
| 0200 | 8   | 0250 | E   | 60   | 0300 | 1   | 01 |

# INTEGRATED CIRCUIT SUSCEPTIBILITY

MDC E1099  
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Table 11 General Fixture Calibration Program (HP 9810A)- 16 Pins  
(cont)

|                 |                 |                 |
|-----------------|-----------------|-----------------|
| 0301-- 0 ---00  | 0351-- CNT---47 | 0401-- 3 ---01  |
| 0302-- 0 ---06  | 0352-- FMT---42 | 0402-- YTO---23 |
| 0303-- UP---27  | 0353-- 4 ---04  | 0403-- 6 ---14  |
| 0304-- a ---13  | 0354-- 8 ---10  | 0404-- LBL---51 |
| 0305-- X<Y---52 | 0355-- FMT---42 | 0405-- F ---16  |
| 0306-- DN---25  | 0356-- YTO---40 | 0406-- FMT---42 |
| 0307-- GTO---44 | 0357-- DIV---35 | 0407-- 4 ---04  |
| 0308-- LBL---51 | 0358-- N ---73  | 0408-- . ---21  |
| 0309-- E ---60  | 0359-- CNT---47 | 0409-- 4 ---04  |
| 0310-- DN---25  | 0360-- UP---27  | 0410-- . ---21  |
| 0311-- YTO---40 | 0361-- - ---34  | 0411-- 0 ---00  |
| 0312-- 1 ---01  | 0362-- UP---27  | 0412-- 6 ---14  |
| 0313-- 0 ---00  | 0363-- FMT---45 | 0413-- FMT---42 |
| 0314-- 7 ---07  | 0364-- CLR---20 | 0414-- 4 ---04  |
| 0315-- FMT---42 | 0365-- SFL---54 | 0415-- 8 ---10  |
| 0316-- 4 ---04  | 0366-- XEY---30 | 0416-- PNT---45 |
| 0317-- 8 ---10  | 0367-- CLR---20 | 0417-- CNT---47 |
| 0318-- FMT---42 | 0368-- n ---56  | 0418-- FMT---42 |
| 0319-- CLR---20 | 0369-- 0 ---71  | 0419-- 4 ---04  |
| 0320-- SFL---54 | 0370-- a ---13  | 0420-- . ---21  |
| 0321-- UP---27  | 0371-- XTO---23 | 0421-- 1 ---01  |
| 0322-- DN---25  | 0372-- CNT---47 | 0422-- 7 ---07  |
| 0323-- CLR---20 | 0373-- CNT---47 | 0423-- . ---21  |
| 0324-- UP---27  | 0374-- CNT---47 | 0424-- 4 ---04  |
| 0325-- CNT---47 | 0375-- CNT---47 | 0425-- XFR---67 |
| 0326-- CNT---47 | 0376-- CNT---47 | 0426-- IND---31 |
| 0327-- CNT---47 | 0377-- CNT---47 | 0427-- a ---13  |
| 0328-- CNT---47 | 0378-- CNT---47 | 0428-- FMT---42 |
| 0329-- CNT---47 | 0379-- M ---70  | 0429-- 4 ---04  |
| 0330-- CNT---47 | 0380-- I ---65  | 0430-- 8 ---10  |
| 0331-- CNT---47 | 0381-- L ---72  | 0431-- FMT---42 |
| 0332-- CNT---47 | 0382-- L ---72  | 0432-- PNT---45 |
| 0333-- CNT---47 | 0383-- I ---65  | 0433-- CLR---20 |
| 0334-- CNT---47 | 0384-- IND---31 | 0434-- SFL---54 |
| 0335-- UP---27  | 0385-- A ---62  | 0435-- XEY---30 |
| 0336-- IFG---43 | 0386-- XTO---23 | 0436-- FMT---42 |
| 0337-- FMT---42 | 0387-- XTO---23 | 0437-- 1 ---01  |
| 0338-- CNT---47 | 0388-- YTO---40 | 0438-- UP---27  |
| 0339-- FMT---42 | 0389-- CNT---47 | 0439-- E ---60  |
| 0340-- 4 ---04  | 0390-- 0 ---71  | 0440-- 1 ---01  |
| 0341-- . ---21  | 0391-- 1/X---17 | 0441-- 7 ---07  |
| 0342-- 1 ---01  | 0392-- XTO---23 | 0442-- UP---27  |
| 0343-- 0 ---00  | 0393-- CLR---20 | 0443-- 6 ---14  |
| 0344-- . ---21  | 0394-- SFL---54 | 0444-- X<Y---52 |
| 0345-- 3 ---03  | 0395-- XEY---30 | 0445-- GTO---44 |
| 0346-- CNT---47 | 0396-- FMT---42 | 0446-- LBL---51 |
| 0347-- XFR---67 | 0397-- 9 ---11  | 0447-- F ---16  |
| 0348-- 1 ---01  | 0398-- 0 ---66  | 0448-- CNT---47 |
| 0349-- 0 ---00  | 0399-- XTO---23 | 0449-- XFR---67 |
| 0350-- 8 ---10  | 0400-- a ---13  | 0450-- 1 ---01  |



Table 11

General Fixture Calibration Program (HP 9810A) - 16 Pins  
(cont)

|                 |                 |                 |
|-----------------|-----------------|-----------------|
| 0451-- 0 ---00  | 0501-- 0 ---71  | 0551-- 0 ---64  |
| 0452-- 6 ---06  | 0502-- IND---31 | 0552-- 0 ---10  |
| 0453-- FMT---42 | 0503-- E ---60  | 0553-- FMT---42 |
| 0454-- 4 ---04  | 0504-- a ---13  | 0554-- CNT---47 |
| 0455-- . ---21  | 0505-- CNT---47 | 0555-- UP---27  |
| 0456-- 1 ---01  | 0506-- 0 ---71  | 0556-- N ---70  |
| 0457-- 0 ---00  | 0507-- 1/X---17 | 0557-- UP---27  |
| 0458-- . ---21  | 0508-- XTO---23 | 0558-- IND---31 |
| 0459-- 4 ---04  | 0509-- CNT---47 | 0559-- CLR---20 |
| 0460-- FMT---42 | 0510-- UP---27  | 0560-- SFL---54 |
| 0461-- 4 ---04  | 0511-- - ---34  | 0561-- CLR---20 |
| 0462-- 8 ---10  | 0512-- UP---27  | 0562-- XEY---30 |
| 0463-- FMT---42 | 0513-- FMT---42 | 0563-- L ---70  |
| 0464-- CLR---20 | 0514-- XFR---67 | 0564-- 0 ---71  |
| 0465-- 1 ---65  | 0515-- 1 ---01  | 0565-- YTO---40 |
| 0466-- N ---73  | 0516-- 0 ---00  | 0566-- YTO---40 |
| 0467-- C ---61  | 0517-- 6 ---06  | 0567-- UP---27  |
| 0468-- I ---65  | 0518-- UP---27  | 0568-- 8 ---10  |
| 0469-- D ---63  | 0519-- XFR---67 | 0569-- D ---63  |
| 0470-- E ---60  | 0520-- 1 ---01  | 0570-- UP---27  |
| 0471-- N ---73  | 0521-- 0 ---00  | 0571-- B ---66  |
| 0472-- XTO---23 | 0522-- 7 ---07  | 0572-- UP---27  |
| 0473-- CNT---47 | 0523-- DIV---35 | 0573-- 9 ---11  |
| 0474-- n ---56  | 0524-- XEY---30 | 0574-- UP---27  |
| 0475-- 0 ---71  | 0525-- K ---55  | 0575-- CNT---47 |
| 0476-- IND---31 | 0526-- 4 ---04  | 0576-- UP---27  |
| 0477-- E ---60  | 0527-- UP---27  | 0577-- - ---34  |
| 0478-- a ---13  | 0528-- 5 ---05  | 0578-- FMT---42 |
| 0479-- CNT---47 | 0529-- X ---36  | 0579-- XFR---67 |
| 0480-- UP---27  | 0530-- YTO---40 | 0580-- IND---31 |
| 0481-- - ---34  | 0531-- IND---31 | 0581-- 0 ---00  |
| 0482-- UP---27  | 0532-- 0 ---00  | 0582-- FMT---42 |
| 0483-- CNT---47 | 0533-- YTO---40 | 0583-- 4 ---04  |
| 0484-- PNT---45 | 0534-- + ---33  | 0584-- 8 ---10  |
| 0485-- CNT---47 | 0535-- 1 ---01  | 0585-- PNT---45 |
| 0486-- UP---27  | 0536-- 9 ---11  | 0586-- CNT---47 |
| 0487-- M ---70  | 0537-- DN---25  | 0587-- FMT---42 |
| 0488-- UP---27  | 0538-- UP---27  | 0588-- 5 ---05  |
| 0489-- IND---31 | 0539-- XSO---12 | 0589-- EEX---26 |
| 0490-- CLR---20 | 0540-- XTO---23 | 0590-- FMT---42 |
| 0491-- SFL---54 | 0541-- + ---33  | 0591-- FMT---42 |
| 0492-- XEY---30 | 0542-- 2 ---02  | 0592-- a ---13  |
| 0493-- CLR---20 | 0543-- 0 ---00  | 0593-- E ---60  |
| 0494-- XTO---23 | 0544-- RUP---22 | 0594-- C ---61  |
| 0495-- 0 ---71  | 0545-- FMT---42 | 0595-- 0 ---71  |
| 0496-- XTO---23 | 0546-- 4 ---04  | 0596-- a ---13  |
| 0497-- R ---62  | 0547-- 8 ---10  | 0597-- D ---63  |
| 0498-- L ---72  | 0548-- PNT---45 | 0598-- IFG---43 |
| 0499-- CNT---47 | 0549-- CNT---47 | 0599-- FMT---42 |
| 0500-- n ---56  | 0550-- FMT---42 | 0600-- SIF---41 |

Table 11

General Fixture Calibration Program (HP 9810A)- 16 Pins  
(cont)

|                  |                  |                  |
|------------------|------------------|------------------|
| 0601-- 1 ---01   | 0651-- E ---60   | 0701-- 4 ---04   |
| 0602-- 9 ---11   | 0652-- IND ---31 | 0702-- . ---21   |
| 0603-- UP ---27  | 0653-- CNT ---47 | 0703-- 4 ---04   |
| 0604-- 9 ---11   | 0654-- π ---56   | 0704-- . ---21   |
| 0605-- 0 ---00   | 0655-- R ---62   | 0705-- 0 ---00   |
| 0606-- FMT ---42 | 0656-- π ---56   | 0706-- α ---10   |
| 0607-- 5 ---05   | 0657-- E ---60   | 0707-- FMT ---42 |
| 0608-- XTO ---23 | 0658-- α ---13   | 0708-- 1 ---04   |
| 0609-- 1 ---01   | 0659-- FMT ---42 | 0709-- 8 ---10   |
| 0610-- XTO ---23 | 0660-- STP ---41 | 0710-- PNT ---45 |
| 0611-- + ---33   | 0661-- FMT ---42 | 0711-- CNT ---47 |
| 0612-- 0 ---00   | 0662-- 4 ---04   | 0712-- FMT ---42 |
| 0613-- CNT ---47 | 0663-- 8 ---10   | 0713-- 4 ---04   |
| 0614-- 1 ---01   | 0664-- FMT ---42 | 0714-- . ---21   |
| 0615-- 7 ---07   | 0665-- CLR ---20 | 0715-- 1 ---01   |
| 0616-- UP ---27  | 0666-- SFL ---54 | 0716-- 4 ---04   |
| 0617-- XFR ---67 | 0667-- XEY ---30 | 0717-- . ---21   |
| 0618-- 0 ---00   | 0668-- π ---56   | 0718-- 4 ---04   |
| 0619-- XCY ---52 | 0669-- 0 ---71   | 0719-- XFR ---67 |
| 0620-- GTO ---44 | 0670-- α ---13   | 0720-- IND ---31 |
| 0621-- LBL ---51 | 0671-- XTO ---23 | 0721-- α ---10   |
| 0622-- B ---66   | 0672-- CNT ---47 | 0722-- FMT ---42 |
| 0623-- CNT ---47 | 0673-- CNT ---47 | 0723-- 4 ---04   |
| 0624-- XFR ---67 | 0674-- CNT ---47 | 0724-- 8 ---10   |
| 0625-- 1 ---01   | 0675-- CNT ---47 | 0725-- FMT ---42 |
| 0626-- 9 ---11   | 0676-- CNT ---47 | 0726-- PNT ---45 |
| 0627-- UP ---27  | 0677-- CNT ---47 | 0727-- CLR ---20 |
| 0628-- 1 ---01   | 0678-- CNT ---47 | 0728-- SFL ---54 |
| 0629-- 6 ---06   | 0679-- L ---72   | 0729-- XEY ---30 |
| 0630-- DIV ---35 | 0680-- 0 ---71   | 0730-- FMT ---42 |
| 0631-- YTO ---40 | 0681-- YTO ---40 | 0731-- 1 ---01   |
| 0632-- 1 ---01   | 0682-- YTO ---40 | 0732-- E ---60   |
| 0633-- 9 ---11   | 0683-- UP ---27  | 0733-- 1 ---01   |
| 0634-- YE ---24  | 0684-- 8 ---10   | 0734-- 7 ---07   |
| 0635-- 2 ---02   | 0685-- D ---63   | 0735-- UP ---27  |
| 0636-- 0 ---00   | 0686-- UP ---27  | 0736-- α ---10   |
| 0637-- DIV ---35 | 0687-- B ---66   | 0737-- XCY ---52 |
| 0638-- XFR ---67 | 0688-- UP ---27  | 0738-- GTO ---44 |
| 0639-- 1 ---01   | 0689-- 9 ---11   | 0739-- LBL ---51 |
| 0640-- 9 ---11   | 0690-- UP ---27  | 0740-- G ---15   |
| 0641-- XSO ---12 | 0691-- CLR ---20 | 0741-- CNT ---47 |
| 0642-- - ---34   | 0692-- SFL ---54 | 0742-- FMT ---42 |
| 0643-- DN ---25  | 0693-- XEY ---30 | 0743-- 4 ---04   |
| 0644-- J ---76   | 0694-- FMT ---42 | 0744-- . ---21   |
| 0645-- XTO ---23 | 0695-- 1 ---01   | 0745-- 9 ---11   |
| 0646-- 2 ---02   | 0696-- XTO ---23 | 0746-- . ---21   |
| 0647-- 0 ---00   | 0697-- α ---13   | 0747-- 4 ---04   |
| 0648-- FMT ---42 | 0698-- LBL ---51 | 0748-- CNT ---47 |
| 0649-- FMT ---42 | 0699-- G ---15   | 0749-- FMT ---42 |
| 0650-- H ---73   | 0700-- FMT ---42 | 0750-- 4 ---04   |



Table 11 General Fixture Calibration Program (HP9810A)- 16 Pins (cont)

|              |   |       |              |       |              |       |
|--------------|---|-------|--------------|-------|--------------|-------|
| 0751--       | a | ---10 | 0801--PNT--- | 45    | 0851--CH---  | 47    |
| 0752--PNT--- |   | 42    | 0802--CLR--- | 20    | 0852--F---   | 16    |
| 0753--CLR--- |   | 20    | 0803--SFL--- | 54    | 0853--a---   | 10    |
| 0754--M---   |   | 70    | 0804--XEY--- | 30    | 0854--E---   | 60    |
| 0755--E---   |   | 60    | 0805--CLR--- | 20    | 0855--b---   | 14    |
| 0756--A---   |   | 62    | 0806--A---   | 62    | 0856--.      | ---21 |
| 0757--N---   |   | 73    | 0807--B---   | 66    | 0857--FMT--- | 42    |
| 0758--CNT--- |   | 47    | 0808--YTO--- | 40    | 0858--STP--- | 41    |
| 0759--UP---  |   | 27    | 0809--O---   | 71    | 0859--END--- | 46    |
| 0760--       |   | 34    | 0810--L---   | 72    |              |       |
| 0761--FMT--- |   | 42    | 0811--1/X--- | 17    |              |       |
| 0762--CNT--- |   | 47    | 0812--XTO--- | 23    |              |       |
| 0763--XFR--- |   | 67    | 0813--E---   | 60    |              |       |
| 0764--1---   |   | 01    | 0814--CNT--- | 47    |              |       |
| 0765--9---   |   | 11    | 0815--L---   | 72    |              |       |
| 0766--FMT--- |   | 42    | 0816--O---   | 71    |              |       |
| 0767--4---   |   | 04    | 0817--YTO--- | 40    |              |       |
| 0768--8---   |   | 10    | 0818--YTO--- | 40    |              |       |
| 0769--FMT--- |   | 42    | 0819--CNT--- | 47    |              |       |
| 0770--PNT--- |   | 45    | 0820--F---   | 16    |              |       |
| 0771--CLR--- |   | 20    | 0821--A---   | 62    |              |       |
| 0772--SFL--- |   | 54    | 0822--C---   | 61    |              |       |
| 0773--XEY--- |   | 30    | 0823--XTO--- | 23    |              |       |
| 0774--CLR--- |   | 20    | 0824--O---   | 71    |              |       |
| 0775--YTO--- |   | 40    | 0825--a---   | 13    |              |       |
| 0776--XTO--- |   | 23    | 0826--CNT--- | 47    |              |       |
| 0777--A---   |   | 62    | 0827--UP---  | 27    |              |       |
| 0778--N---   |   | 73    | 0828--       | ---34 |              |       |
| 0779--D---   |   | 63    | 0829--FMT--- | 42    |              |       |
| 0780--A---   |   | 62    | 0830--XFR--- | 67    |              |       |
| 0781--a---   |   | 13    | 0831--1---   | 01    |              |       |
| 0782--D---   |   | 63    | 0832--9---   | 11    |              |       |
| 0783--CNT--- |   | 47    | 0833--UP---  | 27    |              |       |
| 0784--E---   |   | 60    | 0834--1---   | 01    |              |       |
| 0785--a---   |   | 13    | 0835--0---   | 00    |              |       |
| 0786--a---   |   | 13    | 0836--DIV--- | 35    |              |       |
| 0787--O---   |   | 71    | 0837--DN---  | 25    |              |       |
| 0788--a---   |   | 13    | 0838--K---   | 55    |              |       |
| 0789--CNT--- |   | 47    | 0839--5---   | 05    |              |       |
| 0790--UP---  |   | 27    | 0840--FMT--- | 42    |              |       |
| 0791--       |   | 34    | 0841--4---   | 04    |              |       |
| 0792--FMT--- |   | 42    | 0842--8---   | 10    |              |       |
| 0793--CNT--- |   | 47    | 0843--PNT--- | 45    |              |       |
| 0794--XFR--- |   | 67    | 0844--CNT--- | 47    |              |       |
| 0795--2---   |   | 02    | 0845--FMT--- | 42    |              |       |
| 0796--0---   |   | 00    | 0846--FMT--- | 42    |              |       |
| 0797--FMT--- |   | 42    | 0847--N---   | 73    |              |       |
| 0798--4---   |   | 04    | 0848--E---   | 60    |              |       |
| 0799--8---   |   | 10    | 0849--YE---  | 24    |              |       |
| 0800--FMT--- |   | 42    | 0850--XTO--- | 23    |              |       |



Table 12 General Fixture Calibration Program Data Register Allocation

|    |                                                    |    |
|----|----------------------------------------------------|----|
| a  | CHANNEL COUNTER                                    |    |
| b  | INDIRECT AND SCRATCH                               |    |
| 0  | FREQUENCY, PORT COUNTER                            |    |
| 1  | LOSS IN dB WITH INPUT PORT #                       | 1  |
| 2  |                                                    | 2  |
| 3  |                                                    | 3  |
| 4  |                                                    | 4  |
| 5  |                                                    | 5  |
| 6  |                                                    | 6  |
| 7  |                                                    | 7  |
| 8  |                                                    | 8  |
| 9  |                                                    | 9  |
| 10 |                                                    | 10 |
| 11 |                                                    | 11 |
| 12 |                                                    | 12 |
| 13 |                                                    | 13 |
| 14 |                                                    | 14 |
| 15 |                                                    | 15 |
| 16 |                                                    | 16 |
| 17 | INCIDENT POWER COUPLER FACTOR                      |    |
| 18 | REFLECTED POWER COUPLER FACTOR                     |    |
| 19 | M                                                  |    |
| 20 | E                                                  |    |
| 21 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - DETECTOR # | 1  |
| 22 | $B_2$ & $B_3$                                      | 1  |
| 23 | $B_0$ & $B_1$                                      | 2  |

# INTEGRATED CIRCUIT SUSCEPTIBILITY

MDC E1099  
12 JULY 1974

Table 12 (Continued)

|    |                                                  |    |
|----|--------------------------------------------------|----|
| 24 | DETECTOR COEFFICIENTS $B_2$ & $B_3$ - DETECTOR # | 2  |
| 25 | $B_0$ & $B_1$                                    | 3  |
| 26 | $B_2$ & $B_3$                                    | 3  |
| 27 | $B_0$ & $B_1$                                    | 4  |
| 28 | $B_2$ & $B_3$                                    | 4  |
| 29 | $B_0$ & $B_1$                                    | 5  |
| 30 | $B_2$ & $B_3$                                    | 5  |
| 31 | $B_0$ & $B_1$                                    | 6  |
| 32 | $B_2$ & $B_3$                                    | 6  |
| 33 | $B_0$ & $B_1$                                    | 7  |
| 34 | $B_2$ & $B_3$                                    | 7  |
| 35 | $B_0$ & $B_1$                                    | 8  |
| 36 | $B_2$ & $B_3$                                    | 8  |
| 37 | $B_0$ & $B_1$                                    | 9  |
| 38 | $B_2$ & $B_3$                                    | 9  |
| 39 | $B_0$ & $B_1$                                    | 10 |
| 40 | $B_2$ & $B_3$                                    | 10 |
| 41 | $B_0$ & $B_1$                                    | 11 |
| 42 | $B_2$ & $B_3$                                    | 11 |
| 43 | $B_0$ & $B_1$                                    | 12 |
| 44 | $B_2$ & $B_3$                                    | 12 |
| 45 | $B_0$ & $B_1$                                    | 13 |
| 46 | $B_2$ & $B_3$                                    | 13 |
| 47 | $B_0$ & $B_1$                                    | 14 |
| 48 | $B_2$ & $B_3$                                    | 14 |
| 49 | $B_0$ & $B_1$                                    | 15 |

Table 12 (Continued)

|    |                                       |               |
|----|---------------------------------------|---------------|
| 50 | DETECTOR COEFFICIENTS - $B_2$ & $B_3$ | DETECTOR # 15 |
| 51 | $B_0$ & $B_1$                         | 16            |
| 52 | $B_2$ & $B_3$                         | 16            |
| 53 | $B_0$ & $B_1$                         | 17            |
| 54 | $B_2$ & $B_3$                         | 17            |
| 55 | SPARE                                 |               |
| 56 | SPARE                                 |               |
| 57 | SPARE                                 |               |
| 58 | SPARE                                 |               |
| 59 | SPARE                                 |               |
| 60 | SPARE                                 |               |
| 61 | SPARE                                 |               |
| 62 | SPARE                                 |               |
| 63 | SPARE                                 |               |
| 64 | SPARE                                 |               |
| 65 | SPARE                                 |               |
| 66 | SPARE                                 |               |
| 67 | SPARE                                 |               |
| 68 | SPARE                                 |               |
| 69 | SPARE                                 |               |
| 70 | SPARE                                 |               |
| 71 | SPARE                                 |               |
| 72 | SPARE                                 |               |
| 73 | SPARE                                 |               |
| 74 | SPARE                                 |               |
| 75 | SPARE                                 |               |



# INTEGRATED CIRCUIT SUSCEPTIBILITY

MDC E1099  
12 JULY 1974

Table 12 (Continued)

|     |                                     |
|-----|-------------------------------------|
| 76  | SPAKE                               |
| 77  | SPARE                               |
| 78  | SPARE                               |
| 79  | SPARE                               |
| 80  | SPARE                               |
| 81  | SPARE                               |
| 82  | SPARE                               |
| 83  | SPARE                               |
| 84  | SPARE                               |
| 85  | SPARE                               |
| 86  | SPARE                               |
| 87  | TEMPORARY STORAGE FOR CALCULATING P |
| 88  | LOG V                               |
| 89  | INPUT PORT                          |
| 90  | POWER OUT OF PORT # 1               |
| 91  | 2                                   |
| 92  | 3                                   |
| 93  | 4                                   |
| 94  | 5                                   |
| 95  | 6                                   |
| 96  | 7                                   |
| 97  | 8                                   |
| 98  | 9                                   |
| 99  | 10                                  |
| 100 | 11                                  |
| 101 | 12                                  |

# INTEGRATED CIRCUIT SUSCEPTIBILITY

MDC E1099  
12 JULY 1974

Table 12 (Continued)

|     |                      |    |
|-----|----------------------|----|
| 102 | POWER OUT OF PORT 13 |    |
| 103 |                      | 14 |
| 104 |                      | 15 |
| 105 |                      | 16 |
| 106 | INCIDENT POWER       |    |
| 107 | TOTAL POWER OUT      |    |
| 108 | S/H                  |    |

Table 13

Dissipation Loss Data for  
16 Pin DIP Test Fixture at  
0.22 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.1369   |
| 2    | 0.1790   |
| 3    | 0.1715   |
| 4    | 0.1532   |
| 5    | 0.1626   |
| 6    | 0.0748   |
| 7    | 0.1650   |
| 8    | 0.1698   |
| 9    | 0.1833   |
| 10   | 0.1625   |
| 11   | 0.1764   |
| 12   | 0.1557   |
| 13   | 0.1333   |
| 14   | 0.1734   |
| 15   | 0.1814   |
| 16   | 0.1738   |

MEAN = 0.1596

STANDARD ERROR = 0.0262

ABSOLUTE LOSS FACTOR = 1.0374

Table 14

Dissipation Loss Data  
for 16 Pin DIP Test Fixture  
at 0.91 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.3517   |
| 2    | 0.4721   |
| 3    | 0.4837   |
| 4    | 0.5139   |
| 5    | 0.4787   |
| 6    | 0.4157   |
| 7    | 0.3713   |
| 8    | 0.4804   |
| 9    | 0.5095   |
| 10   | 0.3941   |
| 11   | 0.4221   |
| 12   | 0.4409   |
| 13   | 0.5746   |
| 14   | 0.6120   |
| 15   | 0.5008   |
| 16   | 0.6633   |

MEAN = 0.4791

STANDARD ERROR = 0.0839

ABSOLUTE LOSS FACTOR = 1.1166



Table 15

Dissipation Loss Data for  
16 Pin DIP Test Fixture at  
3 GHz

| PORT | LOSS (dB) |
|------|-----------|
| 1    | 0.1611    |
| 2    | 0.2371    |
| 3    | 0.2189    |
| 4    | 0.1635    |
| 5    | 0.1733    |
| 6    | 0.1989    |
| 7    | 0.2347    |
| 8    | 0.1972    |
| 9    | 0.2017    |
| 10   | 0.2070    |
| 11   | 0.2376    |
| 12   | 0.1697    |
| 13   | 0.1321    |
| 14   | 0.1882    |
| 15   | 0.2496    |
| 16   | 0.1815    |

MEAN = 0.1970

STANDARD ERROR = 0.0319

ABSOLUTE LOSS FACTOR = 1.0464

Table 16

Dissipation Loss Data for  
16 Pin DIP Test Fixture at  
5.6 GHz

| PORT | LOSS (dB) |
|------|-----------|
| 1    | 1.0181    |
| 2    | 0.7169    |
| 3    | 1.0751    |
| 4    | 0.5275    |
| 5    | 0.5637    |
| 6    | 1.2343    |
| 7    | 0.6952    |
| 8    | 0.9124    |
| 9    | 0.9274    |
| 10   | 0.7600    |
| 11   | 1.2159    |
| 12   | 0.8551    |
| 13   | 0.6707    |
| 14   | 1.4796    |
| 15   | 0.7602    |
| 16   | 1.0528    |

MEAN = 0.9044

STANDARD ERROR = 0.2542

ABSOLUTE LOSS FACTOR = 1.2315

Table 17

Dissipation Loss Data for  
16 Pin DIP Test Fixture at  
9.1 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.9107   |
| 2    | 0.5559   |
| 3    | 0.4131   |
| 4    | 0.7084   |
| 5    | 0.5642   |
| 6    | 0.6113   |
| 7    | 0.7256   |
| 8    | 1.3006   |
| 9    | 1.1167   |
| 10   | 0.6015   |
| 11   | 0.4773   |
| 12   | 0.4697   |
| 13   | 0.4818   |
| 14   | 0.5247   |
| 15   | 0.6945   |
| 16   | 1.1751   |

MEAN = 0.7089

STANDARD ERROR = 0.2661

ABSOLUTE LOSS FACTOR = 1.1773

Table 18

Dissipation Loss Data for  
8 Pin TO-5 Test Fixture at  
0.22 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.1519   |
| 2    | 0.8181   |
| 3    | 0.1392   |
| 4    | 0.0000   |
| 5    | 0.1938   |
| 6    | 0.3123   |
| 7    | 0.3386   |
| 8    | 0.2383   |

MEAN = 0.3079

STANDARD ERROR = 0.2255

ABSOLUTE LOSS FACTOR = 1.0735

Table 19

Dissipation Loss  
Data for 8 Pin  
T0-5 Test Fixture  
at 0.91 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.4150   |
| 2    | 1.0125   |
| 3    | 0.5663   |
| 4    | 0.4030   |
| 5    | 0.3797   |
| 6    | 0.4132   |
| 7    | 0.4316   |
| 8    | 0.4331   |

MEAN = 0.5068

STANDARD ERROR = 0.1983

ABSOLUTE LOSS FACTOR = 1.1238

Table 21

Dissipation Loss  
Data for 8 Pin  
T0-5 Test Fixture  
at 5.6 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.6941   |
| 2    | 1.1559   |
| 3    | 0.8308   |
| 4    | 0.9468   |
| 5    | 0.8308   |
| 6    | 1.1359   |
| 7    | 0.9228   |
| 8    | 0.9321   |

MEAN = 0.9311

STANDARD ERROR = 0.1454

ABSOLUTE LOSS FACTOR = 1.2391

Table 20

Dissipation Loss Data  
for 8 Pin T0-5 Test  
Fixture at 3 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 0.3019   |
| 2    | 0.6478   |
| 3    | 0.3319   |
| 4    | 0.2966   |
| 5    | 0.2757   |
| 6    | 0.3976   |
| 7    | 0.4162   |
| 8    | 0.3973   |

MEAN = 0.3831

STANDARD ERROR = 0.1117

ABSOLUTE LOSS FACTOR = 1.0922

Table 22

Dissipation Loss Data  
for 8 Pin T0-5 Test  
Fixture at 9.1 GHz

| PORT | LOSS(dB) |
|------|----------|
| 1    | 2.3016   |
| 2    | 1.7793   |
| 3    | 1.8985   |
| 4    | 2.0717   |
| 5    | 2.1899   |
| 6    | 2.6554   |
| 7    | 2.4368   |
| 8    | 2.6065   |

MEAN = 2.2425

STANDARD ERROR = 0.2977

ABSOLUTE LOSS FACTOR = 1.6759



TABLE 23 EXAMPLE OF 741 INTERFERENCE SUSCEPTIBILITY DATA

S/N = 330

| P(mW)    | C.F.(dB) | VOUT   | IOUT   | VNI   | INI     | VON2   | ION2    | VON6   |
|----------|----------|--------|--------|-------|---------|--------|---------|--------|
| -0.0001  | 0.000    | -4.927 | 9.85   | 0.00  | -0.0106 | -11.82 | -0.0278 | -11.82 |
| 0.0384   | 2.253    | -4.988 | 9.98   | 0.00  | -0.0110 | -11.82 | -0.0280 | -11.82 |
| 0.0596   | 2.229    | -5.019 | 10.04  | 0.00  | -0.0110 | -11.82 | -0.0282 | -11.82 |
| 0.0851   | 2.493    | -5.068 | 10.14  | -0.00 | -0.0112 | -11.82 | -0.0284 | -11.81 |
| 0.2514   | 2.519    | -5.380 | 10.76  | 0.00  | -0.0110 | -11.81 | -0.0300 | -11.81 |
| 0.4498   | 2.530    | -5.772 | 11.54  | 0.00  | -0.0111 | -11.80 | -0.0314 | -11.80 |
| 0.9689   | 2.508    | -6.652 | 13.30  | -0.00 | -0.0112 | -11.78 | -0.0354 | -11.78 |
| 1.6265   | 2.512    | -7.564 | 15.13  | -0.00 | -0.0112 | -11.75 | -0.0394 | -11.75 |
| 3.0516   | 2.496    | -8.912 | 17.82  | -0.00 | -0.0111 | -11.72 | -0.0444 | -11.72 |
| 10.5494  | 2.446    | -8.993 | 17.99  | -0.00 | -0.0109 | -11.72 | -0.0446 | -11.72 |
| 18.5502  | 2.419    | -8.972 | 17.94  | 0.00  | -0.0108 | -11.72 | -0.0442 | -11.72 |
| 34.0799  | 2.383    | -8.922 | 17.84  | -0.00 | -0.0108 | -11.73 | -0.0442 | -11.72 |
| 54.5367  | 2.354    | -8.843 | 17.69  | 0.00  | -0.0108 | -11.73 | -0.0438 | -11.72 |
| 103.4030 | 2.453    | 9.829  | -19.66 | 0.00  | -0.0081 | -11.94 | -0.0054 | -11.95 |
| 134.7200 | 2.355    | 9.732  | -19.46 | 0.00  | -0.0099 | -11.94 | -0.0054 | -11.94 |
| 198.5100 | 2.209    | 9.506  | -19.01 | 0.00  | -0.0107 | -11.94 | -0.0056 | -11.94 |
| 277.1050 | 2.085    | 9.195  | -18.39 | 0.00  | -0.0107 | -11.94 | -0.0060 | -11.94 |
| 396.2030 | 1.961    | 8.721  | -17.44 | 0.00  | -0.0110 | -11.94 | -0.0064 | -11.94 |
| 521.0260 | 1.867    | 8.186  | -16.37 | 0.00  | -0.0109 | -11.93 | -0.0068 | -11.94 |
| 760.4520 | 1.713    | 7.254  | -14.51 | 0.00  | -0.0105 | -11.86 | -0.0222 | -11.93 |

| P(mW)    | ION6    | VCC+  | ICC+  | VCC-   | ICC-   | VII     | III     |
|----------|---------|-------|-------|--------|--------|---------|---------|
| -0.0001  | -0.0278 | 11.93 | 0.80  | -11.84 | -11.50 | 0.0032  | 0.4940  |
| 0.0384   | -0.0280 | 11.93 | 0.80  | -11.84 | -11.80 | -0.0024 | 0.4996  |
| 0.0596   | -0.0284 | 11.93 | 0.90  | -11.84 | -11.70 | -0.0052 | 0.5024  |
| 0.0851   | -0.0286 | 11.93 | 0.90  | -11.84 | -11.80 | -0.0097 | 0.5068  |
| 0.2514   | -0.0298 | 11.93 | 0.90  | -11.83 | -12.50 | -0.0381 | 0.5353  |
| 0.4498   | -0.0316 | 11.93 | 0.80  | -11.82 | -13.40 | -0.0737 | 0.5708  |
| 0.9689   | -0.0356 | 11.93 | 0.90  | -11.80 | -15.40 | -0.1539 | 0.6510  |
| 1.6265   | -0.0396 | 11.93 | 1.30  | -11.77 | -17.70 | -0.2366 | 0.7338  |
| 3.0516   | -0.0446 | 11.93 | 0.90  | -11.74 | -20.30 | -0.3596 | 0.8568  |
| 10.5494  | -0.0454 | 11.93 | 1.00  | -11.74 | -20.50 | -0.3666 | 0.8638  |
| 18.5502  | -0.0452 | 11.93 | 0.90  | -11.74 | -20.50 | -0.3647 | 0.8618  |
| 34.0799  | -0.0448 | 11.93 | 1.00  | -11.74 | -20.30 | -0.3598 | 0.8569  |
| 54.5367  | -0.0444 | 11.93 | 0.90  | -11.74 | -20.10 | -0.3516 | 0.8487  |
| 103.4030 | -0.0052 | 11.71 | 22.00 | -11.97 | -0.50  | 1.4130  | -0.9157 |
| 134.7200 | -0.0054 | 11.71 | 21.90 | -11.96 | -0.60  | 1.5130  | -1.0157 |
| 198.5100 | -0.0054 | 11.71 | 21.70 | -11.96 | -0.70  | 1.7090  | -1.2117 |
| 277.1050 | -0.0058 | 11.72 | 21.40 | -11.96 | -0.90  | 1.9090  | -1.4117 |
| 396.2030 | -0.0062 | 11.72 | 20.70 | -11.96 | -1.00  | 2.1450  | -1.6477 |
| 521.0260 | -0.0064 | 11.73 | 19.80 | -11.96 | -1.10  | 2.3260  | -1.8287 |
| 760.4520 | -0.0066 | 11.75 | 18.20 | -11.96 | -1.10  | 2.5610  | -2.0636 |

ALL VOLTAGES IN VOLTS  
ALL CURRENTS IN MILLIAMPS

Table 24 7400 Interference Test Program (HP9810A)

|                |                |                |
|----------------|----------------|----------------|
| 0000--CLR---20 | 0051-- 2 ---02 | 0101--XFR---67 |
| 0001--FMT---42 | 0052-- 4 ---04 | 0102-- 1 ---01 |
| 0002--XFR---67 | 0053--CLX---37 | 0103-- 6 ---06 |
| 0003--XFR---67 | 0054--XTO---23 | 0104-- UP---27 |
| 0004-- 2 ---02 | 0055-- 3 ---03 | 0105--INT---64 |
| 0005-- 4 ---04 | 0056-- 2 ---02 | 0106-- - ---34 |
| 0006--PNT---45 | 0057--XTO---23 | 0107-- UP---27 |
| 0007--LBL---51 | 0058-- 4 ---04 | 0108--EEX---26 |
| 0008-- A ---62 | 0059-- 1 ---01 | 0109-- 5 ---05 |
| 0009--FMT---42 | 0060--LBL---51 | 0110--DIV---35 |
| 0010-- 4 ---04 | 0061-- B ---66 | 0111--RUP---22 |
| 0011-- 1 ---01 | 0062--FMT---42 | 0112--XEY---30 |
| 0012--FMT---42 | 0063-- 4 ---04 | 0113-- 1 ---01 |
| 0013--SFL---54 | 0064-- 1 ---01 | 0114-- 0 ---00 |
| 0014--FMT---42 | 0065--FMT---42 | 0115-- X ---36 |
| 0015--PSE---57 | 0066-- 1 ---01 | 0116-- DN---25 |
| 0016--FMT---42 | 0067--FMT---42 | 0117--XTO---23 |
| 0017--FMT---42 | 0068--STP---41 | 0118-- 4 ---04 |
| 0018--YTO---40 | 0069-- 1 ---01 | 0119-- 6 ---06 |
| 0019--DIV---35 | 0070--XTO---23 | 0120--YTO---40 |
| 0020-- H ---73 | 0071-- a ---13 | 0121-- 4 ---04 |
| 0021--FMT---42 | 0072--SFL---54 | 0122-- 5 ---05 |
| 0022--STP---41 | 0073--LBL---51 | 0123--XFR---67 |
| 0023--XTO---23 | 0074-- C ---61 | 0124-- 1 ---01 |
| 0024-- 3 ---03 | 0075--FMT---42 | 0125-- 7 ---07 |
| 0025-- 0 ---00 | 0076-- 3 ---03 | 0126-- UP---27 |
| 0026--PNT---45 | 0077-- 3 ---03 | 0127--INT---64 |
| 0027-- UP---27 | 0078-- . ---21 | 0128-- - ---34 |
| 0028--EEX---26 | 0079-- UP---27 | 0129-- UP---27 |
| 0029-- 3 ---03 | 0080--FMT---42 | 0130--EEX---26 |
| 0030--DIV---35 | 0081-- 4 ---04 | 0131-- 7 ---07 |
| 0031-- DN---25 | 0082-- 1 ---01 | 0132--DIV---35 |
| 0032-- UP---27 | 0083--FMT---42 | 0133-- DN---25 |
| 0033--INT---64 | 0084-- 1 ---01 | 0134--CHS---32 |
| 0034-- - ---34 | 0085--FMT---42 | 0135--XTO---23 |
| 0035-- 1 ---01 | 0086-- 1 ---01 | 0136-- 4 ---04 |
| 0036-- 0 ---00 | 0087-- 5 ---05 | 0137-- 6 ---10 |
| 0037-- X ---36 | 0088-- UP---27 | 0138--YTO---40 |
| 0038-- DN---25 | 0089-- a ---13 | 0139-- 4 ---04 |
| 0039--INT---64 | 0090--X>Y---53 | 0140-- 7 ---07 |
| 0040-- UP---27 | 0091--GTO---44 | 0141--XFR---67 |
| 0041-- 1 ---01 | 0092--LBL---51 | 0142--IND---31 |
| 0042--XTO---23 | 0093-- I ---65 | 0143-- a ---13 |
| 0043-- 2 ---02 | 0094--CNT---47 | 0144-- UP---27 |
| 0044-- 3 ---03 | 0095--RUP---22 | 0145-- 4 ---04 |
| 0045--X=Y---50 | 0096-- K ---55 | 0146-- 5 ---05 |
| 0046--CNT---47 | 0097-- 4 ---04 | 0147--XTO---23 |
| 0047-- 1 ---01 | 0098--XTO---23 | 0148-- 6 ---14 |
| 0048-- 0 ---00 | 0099-- 2 ---02 | 0149--LBL---51 |
| 0049-- + ---33 | 0100-- 6 ---06 | 0150-- D ---63 |
| 0050--YTO---40 |                |                |

Table 24

7400 Interference Test Program (HP 9810A)  
(cont)

0151--G 0---44  
0152--D R---77  
0153--LBL---51  
0154--H ---74  
0155--XTO---23  
0156--IND---31  
0157-- - ---34  
0158--b ---14  
0159--1 ---01  
0160--XTO---23  
0161-- + ---33  
0162--b ---14  
0163--4 ---04  
0164--9 ---11  
0165--UP---27  
0166--b ---14  
0167--X<Y---52  
0168--DN---25  
0169--GTO---44  
0170--LBL---51  
0171--D ---63  
0172--XFR---67  
0173--2 ---02  
0174--6 ---06  
0175--XTO---23  
0176--b ---14  
0177--XFR---67  
0178--X ---36  
0179--4 ---04  
0180--6 ---06  
0181--XFR---67  
0182-- + ---33  
0183--4 ---04  
0184--5 ---05  
0185--UP---27  
0186--b ---14  
0187--XSQ---12  
0188--XFR---67  
0189--X ---36  
0190--4 ---04  
0191--7 ---07  
0192-- + ---33  
0193--b ---14  
0194--XSQ---12  
0195--XFR---67  
0196--X ---36  
0197--b ---14  
0198--XFR---67  
0199--X ---36  
0200--4 ---04

0201--5 ---10  
0202-- - ---34  
0203--DN---25  
0204--K ---55  
0205--5 ---05  
0206--UP---27  
0207--1 ---01  
0208--5 ---05  
0209--UP---27  
0210--a ---13  
0211--X<Y---52  
0212--GTO---44  
0213--LBL---51  
0214--E ---60  
0215--CNT---47  
0216--XFF---67  
0217--0 ---00  
0218--INT---64  
0219--XEY---30  
0220--EEX---26  
0221--6 ---06  
0222--DIV---35  
0223--DN---25  
0224--DIV---35  
0225--1 ---01  
0226--8 ---10  
0227--XFR---67  
0228-- + ---33  
0229--2 ---02  
0230--4 ---04  
0231--XTO---23  
0232--b ---14  
0233--YE---24  
0234--IND---31  
0235--DIV---35  
0236--b ---14  
0237--YE---24  
0238--DIV---35  
0239--1 ---01  
0240--8 ---10  
0241--XFR---67  
0242--2 ---02  
0243--3 ---03  
0244--UP---27  
0245--9 ---11  
0246--X ---36  
0247--2 ---02  
0248--2 ---02  
0249-- + ---33  
0250--YTO---40

0251--L ---14  
0252--DN---25  
0253--YTO---40  
0254--IND---31  
0255--b ---14  
0256--GTO---44  
0257--LBL---51  
0258--J ---75  
0259--LBL---51  
0260--E ---60  
0261--2 ---02  
0262--3 ---03  
0263--XEY---30  
0264--9 ---11  
0265--XFR---67  
0266--X ---36  
0267--2 ---02  
0268--3 ---03  
0269-- + ---33  
0270--YTO---40  
0271--2 ---02  
0272--5 ---05  
0273--DN---25  
0274--XFR---67  
0275--1 ---01  
0276--8 ---10  
0277--X ---36  
0278--5 ---05  
0279--UP---27  
0280--a ---13  
0281--X<Y---52  
0282--GTO---44  
0283--LBL---51  
0284--G ---15  
0285--CNT---47  
0286--XEY---30  
0287--1 ---01  
0288--1 ---01  
0289--X=Y---50  
0290--GTO---44  
0291--LBL---51  
0292--G ---15  
0293--CNT---47  
0294--DN---25  
0295--YTO---40  
0296--IND---31  
0297-- + ---33  
0298--2 ---02  
0299--5 ---05  
0300--GTO---44



Table 24 7400 Interference Test Program (HP 9810A) (cont)

|                |                |                |
|----------------|----------------|----------------|
| 0301--LBL---51 | 0351-- J ---75 | 0401--FMT---42 |
| 0302-- J ---75 | 0352-- 1 ---01 | 0402--SFL---54 |
| 0303--LBL---51 | 0353-- E ---60 | 0403--FMT---42 |
| 0304-- G ---15 | 0354--GTO---44 | 0404-- 2 ---02 |
| 0305-- 1 ---01 | 0355--LBL---51 | 0405-- 3 ---03 |
| 0306-- 8 ---10 | 0356-- 0 ---61 | 0406-- UP---27 |
| 0307--XFR---67 | 0357--LBL---51 | 0407-- 9 ---11 |
| 0308-- + ---33 | 0358-- 1 ---65 | 0408--XFR---67 |
| 0309-- a ---13 | 0359-- 2 ---02 | 0409-- X ---36 |
| 0310--XTO---23 | 0360-- 2 ---02 | 0410-- 2 ---02 |
| 0311-- b ---14 | 0361--XEY---30 | 0411-- 3 ---03 |
| 0312-- DN---25 | 0362-- a ---13 | 0412-- + ---33 |
| 0313-- YE---24 | 0363--X>Y---53 | 0413--YTO---40 |
| 0314--IND---31 | 0364--GTO---44 | 0414-- a ---13 |
| 0315-- X ---36 | 0365--LBL---51 | 0415--XFR---67 |
| 0316-- b ---14 | 0366-- a ---13 | 0416--IND---31 |
| 0317--XFR---67 | 0367--CNT---47 | 0417-- a ---13 |
| 0318-- 2 ---02 | 0368--PSE---57 | 0418--CHS---32 |
| 0319-- 4 ---04 | 0369--PSE---57 | 0419-- UP---27 |
| 0320-- UP---27 | 0370--JFG---43 | 0420-- 1 ---01 |
| 0321-- a ---13 | 0371-- DN---25 | 0421--CHS---32 |
| 0322--X=Y---50 | 0372--GTO---44 | 0422-- L ---60 |
| 0323-- DN---25 | 0373--LBL---51 | 0423--XFR---67 |
| 0324--GTO---44 | 0374-- L ---72 | 0424--IND---31 |
| 0325--LBL---51 | 0375--SFL---54 | 0425-- a ---13 |
| 0326-- F ---16 | 0376-- DN---25 | 0426-- + ---33 |
| 0327-- DN---25 | 0377-- YE---24 | 0427--YTO---40 |
| 0328--YTO---40 | 0378--IND---31 | 0428--IND---31 |
| 0329--IND---31 | 0379-- - ---34 | 0429-- a ---13 |
| 0330-- + ---33 | 0380-- 2 ---02 | 0430--XEY---30 |
| 0331-- 2 ---02 | 0381-- 5 ---05 | 0431--DIV---35 |
| 0332-- 5 ---05 | 0382--LBL---51 | 0432--FMT---42 |
| 0333--GTO---44 | 0383-- L ---72 | 0433--FMT---42 |
| 0334--LBL---51 | 0384-- 1 ---01 | 0434-- a ---56 |
| 0335-- J ---75 | 0385--XTO---23 | 0435--CLR---20 |
| 0336--LBL---51 | 0386-- + ---33 | 0436--INT---64 |
| 0337-- F ---16 | 0387-- 2 ---02 | 0437--FMT---42 |
| 0338--XFR---67 | 0388-- 5 ---05 | 0438--PNT---45 |
| 0339-- 0 ---00 | 0389--YTO---40 | 0439-- DN---25 |
| 0340-- UP---27 | 0390--IND---31 | 0440-- K ---55 |
| 0341--INT---64 | 0391-- 2 ---02 | 0441-- 4 ---04 |
| 0342-- - ---34 | 0392-- 5 ---05 | 0442-- UP---27 |
| 0343-- DN---25 | 0393--GTO---44 | 0443-- 1 ---01 |
| 0344--DIV---35 | 0394--LBL---51 | 0444-- 0 ---60 |
| 0345--YTO---40 | 0395-- J ---75 | 0445-- X ---36 |
| 0346--IND---31 | 0396--LBL---51 | 0446-- 1 ---01 |
| 0347-- + ---33 | 0397-- a ---13 | 0447-- E ---60 |
| 0348-- 2 ---02 | 0398--FMT---42 | 0448--YTO---40 |
| 0349-- 5 ---05 | 0399-- 4 ---04 | 0449--IND---31 |
| 0350--LBL---51 | 0400-- 1 ---01 | 0450-- a ---13 |

Table 24 7400 Interference Test Program (HP 9810A)(cont)

0451-- 5 ---05  
0452-- E ---60  
0453--XFR---67  
0454--IND---31  
0455-- a ---13  
0456--PNT---45  
0457-- 1 ---01  
0458--XTO---23  
0459-- + ---33  
0460-- 2 ---02  
0461-- 3 ---03  
0462--XFR---67  
0463-- 2 ---02  
0464-- 3 ---03  
0465-- UP---27  
0466-- 3 ---03  
0467--X>Y---53  
0468--GTO---44  
0469--LBL---51  
0470-- B ---66  
0471--CNT---47  
0472-- 1 ---01  
0473-- 9 ---11  
0474-- UP---27  
0475-- 3 ---03  
0476-- 0 ---00  
0477--FMT---42  
0478-- 5 ---05  
0479--XTO---23  
0480--GTO---44  
0481--LBL---51  
0482-- A ---62  
0483--LBL---51  
0484-- H ---74  
0485--EEX---26  
0486-- 3 ---03  
0487-- X ---36  
0488-- DN---25  
0489-- UP---27  
0490--INT---64  
0491-- - ---34  
0492-- UP---27  
0493--EEX---26  
0494-- 4 ---04  
0495--DIV---35  
0496-- DN---25  
0497--S/R---77  
0498--END---46

Table 25 7400 Data Tape to Matrix Tape Conversion Program for HP 9830A

```

10 CONT FS[20,9],A
20 DISP "FIRST MATRIX TAPE FILE#";
30 INPUT Q
40 DIM C[19]
50 DISP "FIRST FILE #, # OF FILES";
60 INPUT M,N
70 FOR I=0 TO N-1
80 LOAD DATA M+I,C
90 IF I>0 THEN 110
100 A=C[1]
110 IF A#C[1] THEN 490
120 FOR J=1 TO 2
130 FOR K=1 TO 9
140 T[J+2*I,K]=C[K+1+9*(J-1)]
150 NEXT K
160 NEXT J
170 NEXT I
180 FOR I=1 TO 20
190 T[I,4]=1000*T[I,4]
200 T[I,6]=10*T[I,6]
210 T[I,8]=10*T[I,8]
220 T[I,9]=1000*T[I,9]
230 NEXT I
240 PRINT
250 PRINT
260 PRINT
270 WRITE (15,200)A
280 FORMAT 30X,"S/N =",F7.0
290 PRINT
300 PRINT
310 FORMAT "
320 WRITE (15,310)"
330 FOR I=1 TO 20

```

P(mk) C.F.(dB) VCC ICC YIN IIN,F4.0  
VOUT IOUT



Table 25      7400 Data Tape to Matrix Tape Conversion Program (cont)

```

340 WRITE (15, 350) F[I, 1], F[I, 2], F[I, 3], F[I, 4], F[I, 5], F[I, 6], F[I, 7], F[I, 8], F[I, 9]
350 FORMAT 5X, F10.4, 2F8.3, 4F8.3, 4F8.3
360 NEXT I
370 PRINT
380 PRINT
390 PRINT
400 PRINT
410 PRINT
420 PRINT
430 PRINT
440 STORE DATA #5, Q
450 Q=Q+1
460 M=M+10
470 GOTO 70
480 END
490 DISP "S/N NOT ="A;C[1]
500 STOP

```

Table 26      General Plot Program from Matrix Tapes for 7400 for HP 9830A

```
10 COM FS[20,9],A
20 DIM C[19]
30 DISP "FIRST FILE #";
40 INPUT P
60 LOAD DATA P
70 SCALE 0,8.5,0,10
80 OFFSET 2,1.5
90 XAXIS 0,1.5,0,6
100 YAXIS 0,0.7,0,7
110 FOR J=0 TO 3
120 PLOT (LGT(2)+J)*1.5,0,1
130 LABEL (*,1,3.4,PI/2,7/6)
140 CPLOT 0,-0.3
150 LABEL (*)"-";
160 PLOT (LGT(5)+J)*1.5,0,1
170 CPLOT 0,-0.3
180 LABEL (*)"-";
190 NEXT J
200 DISP "YMIN,YMAX";
210 INPUT N,M
220 SCALE -7/3,10/3,N-1.5*(M-N)/7,N+8.5*(M-N)/7
230 FOR I=-1 TO 3
240 LABEL (*,1.5,1.7,0,7/6)
250 PLOT I,N,1
260 CPLOT -2,-2
270 LABEL (310,1.5,1.7,0,7/6)10;
280 CPLOT 0,0.6
290 LABEL (320,1.125,1.7,0,7/6)I;
300 NEXT I
310 FORMAT F3.0
320 FORMAT F2.0
330 LABEL (*,1.5,1.7,0,7/6)
340 A=(M-N)/5
350 FOR I=0 TO 5
360 PLOT -1,N+A*I,1
370 CPLOT -7,-0.3
380 LABEL (400)N+A*I;
390 NEXT I
400 FORMAT F7.3
410 LABEL (*,1,0.8,0,7/6)
420 FOR I=1 TO 20
430 PLOT LGT(F[I,1]),ABS(F[I,7]),1
440 CPLOT -0.3,-0.3
450 LABEL (*)"*"
460 IPLOT 0,0,1
470 NEXT I
```

Table 26

General Plot Program from Matrix Tapes for 7400 for HP 9830A

(cont)

```
480 PEN
490 SCALE 0,8.5,0,10
500 OFFSET 2,1.5
510 FOR I=1 TO 4
520 PLOT I*1.5,0,1
530 PLOT I*1.5,7,2
540 NEXT I
550 FOR I=1 TO 10
560 PLOT 0,I*0.7,1
570 PLOT 6,I*0.7,2
580 NEXT I
590 PEN
600 SCALE -7/3,10/3,N-1.5*(M-N)/7,N+8.5*(M-N)/7
610 FOR Q=P+1 TO P+9
620 LOAD DATA Q
630 FOR I=1 TO 20
640 PLOT LGT(F[I,1]),ABS(F[I,7]),1
650 CPLOT -0.3,-0.3
660 LABEL (*) "*"
670 NEXT I
680 NEXT Q
690 PLOT 0.15,7.5,1
700 LABEL (*) A
710 END
```



Table 27 HP 9810A 741 Interference Program

|                |                |                |
|----------------|----------------|----------------|
| 0000--FLI---42 | 0049--DN---25  | 0098--2---02   |
| 0001--XFR---67 | 0050--XT0---23 | 0099--0---00   |
| 0002--XFR---67 | 0051--1---01   | 0100--XT0---23 |
| 0003--0---00   | 0052--7---07   | 0101--b---14   |
| 0004--PNT---45 | 0053--LBL---51 | 0102--XFR---67 |
| 0005--LBL---51 | 0054--A---62   | 0103--IND---31 |
| 0006--H---56   | 0055--FMT---42 | 0104--b---14   |
| 0007--1---01   | 0056--4---04   | 0105--FMT---42 |
| 0008--XT0---23 | 0057--1---01   | 0106--4---04   |
| 0009--2---02   | 0058--FMT---42 | 0107--2---02   |
| 0010--0---00   | 0059--SFL---54 | 0108--XT0---23 |
| 0011--XFR---67 | 0060--FMT---42 | 0109--PSE---57 |
| 0012--5---05   | 0061--PSE---57 | 0110--PSE---57 |
| 0013--1---01   | 0062--PSE---57 | 0111--PSE---57 |
| 0014--FMT---42 | 0063--CLX---37 | 0112--1---01   |
| 0015--4---04   | 0064--XT0---23 | 0113--XT0---23 |
| 0016--2---02   | 0065--7---07   | 0114--a---10   |
| 0017--XT0---23 | 0066--8---10   | 0115--SFL---54 |
| 0018--FMT---42 | 0067--XT0---23 | 0116--LBL---51 |
| 0019--FMT---42 | 0068--9---11   | 0117--D---62   |
| 0020--YTO---40 | 0069--4---04   | 0118--FMT---42 |
| 0021--DIV---35 | 0070--CHT---47 | 0119--3---03   |
| 0022--N---73   | 0071--1---01   | 0120--3---03   |
| 0023--FMT---42 | 0072--XT0---23 | 0121--.---21   |
| 0024--STP---41 | 0073--0---00   | 0122--UP---27  |
| 0025--XT0---23 | 0074--LBL---51 | 0123--FMT---42 |
| 0026--7---07   | 0075--C---61   | 0124--4---04   |
| 0027--6---06   | 0076--FMT---42 | 0125--1---01   |
| 0028--PNT---45 | 0077--4---04   | 0126--FMT---42 |
| 0029--UP---27  | 0078--1---01   | 0127--1---01   |
| 0030--EEX---26 | 0079--FMT---42 | 0128--FMT---42 |
| 0031--2---02   | 0080--1---01   | 0129--a---10   |
| 0032--DIV---35 | 0081--FMT---42 | 0130--UP---27  |
| 0033--DN---25  | 0082--XFR---67 | 0131--XFR---67 |
| 0034--UP---27  | 0083--7---07   | 0132--1---01   |
| 0035--INT---64 | 0084--3---03   | 0133--7---07   |
| 0036-- - ---34 | 0085--UP---27  | 0134--X=Y---50 |
| 0037--1---01   | 0086--XFR---67 | 0135--DN---25  |
| 0038--0---00   | 0087--2---02   | 0136--GT0---44 |
| 0039--X---36   | 0088--0---00   | 0137--LBL---51 |
| 0040--DN---25  | 0089--X=Y---50 | 0138--M---70   |
| 0041--INT---64 | 0090--GT0---44 | 0139--1---01   |
| 0042--UP---27  | 0091--S/R---77 | 0140--5---05   |
| 0043--5---05   | 0092--LBL---51 | 0141--X<Y---30 |
| 0044--X<Y---30 | 0093--a---10   | 0142--X>Y---53 |
| 0045--X>Y---53 | 0094--5---05   | 0143--GT0---44 |
| 0046--UP---27  | 0095--0---00   | 0144--LBL---51 |
| 0047--4---04   | 0096--XFR---67 | 0145--J---65   |
| 0048--+---35   | 0097--1---01   | 0146--CHT---47 |

Table 27 HP 9810A 741 Interference Program (cont)

|                 |                 |                 |
|-----------------|-----------------|-----------------|
| 0141-- 01 ---25 | 0196-- XTO---40 | 0245-- DN---25  |
| 0142-- 1 ---15  | 0197-- 7 ---07  | 0246-- XFR---67 |
| 0149-- EEX---26 | 0198-- 1 ---01  | 0247-- 1 ---01  |
| 0150-- CHS---32 | 0199-- PSE---57 | 0248-- 5 ---05  |
| 0151-- 3 ---03  | 0200-- 1 ---01  | 0249-- DIV---35 |
| 0152-- X>Y---53 | 0201-- XTO---23 | 0250-- YE---24  |
| 0153-- CLX---37 | 0202-- + ---33  | 0251-- IND---31 |
| 0154-- XEY---30 | 0203-- 6 ---14  | 0252-- DIV---35 |
| 0155-- CNT---47 | 0204-- XFR---67 | 0253-- 1 ---01  |
| 0156-- CNT---47 | 0205-- IND---31 | 0254-- 7 ---07  |
| 0157-- LBL---51 | 0206-- 6 ---14  | 0255-- XFR---67 |
| 0158-- M ---70  | 0207-- UP---27  | 0256-- 0 ---00  |
| 0159-- DN---25  | 0208-- INT---64 | 0257-- UP---27  |
| 0160-- K ---55  | 0209-- - ---34  | 0258-- 1 ---01  |
| 0161-- 4 ---04  | 0210-- UP---27  | 0259-- 6 ---06  |
| 0162-- XTO---23 | 0211-- EEX---26 | 0260-- X ---36  |
| 0163-- 1 ---01  | 0212-- 7 ---07  | 0261-- 6 ---06  |
| 0164-- 8 ---10  | 0213-- DIV---35 | 0262-- 1 ---01  |
| 0165-- a ---13  | 0214-- RUP---22 | 0263-- + ---33  |
| 0166-- UP---27  | 0215-- XEY---30 | 0264-- YTO---40 |
| 0167-- 2 ---02  | 0216-- XFR---67 | 0265-- 6 ---14  |
| 0168-- X ---36  | 0217-- 1 ---01  | 0266-- DN---25  |
| 0169-- 1 ---01  | 0218-- 8 ---10  | 0267-- YTO---40 |
| 0170-- 9 ---11  | 0219-- X ---36  | 0268-- IND---31 |
| 0171-- + ---33  | 0220-- X ---36  | 0269-- 6 ---14  |
| 0172-- YTO---40 | 0221-- RUP---22 | 0270-- GTO---44 |
| 0173-- L ---14  | 0222-- XEY---30 | 0271-- LBL---51 |
| 0174-- XFR---67 | 0223-- X ---36  | 0272-- H ---74  |
| 0175-- IND---31 | 0224-- X ---36  | 0273-- LBL---51 |
| 0176-- 6 ---14  | 0225-- X ---36  | 0274-- F ---16  |
| 0177-- UP---27  | 0226-- DN---25  | 0275-- 6 ---06  |
| 0178-- INT---64 | 0227-- + ---33  | 0276-- 2 ---02  |
| 0179-- - ---34  | 0228-- YE---24  | 0277-- XEY---30 |
| 0180-- UP---27  | 0229-- + ---33  | 0278-- 1 ---01  |
| 0181-- EEX---26 | 0230-- 7 ---07  | 0279-- 6 ---06  |
| 0182-- 5 ---05  | 0231-- 1 ---01  | 0280-- XFR---67 |
| 0183-- DIV---35 | 0232-- DN---25  | 0281-- X ---36  |
| 0184-- DN---25  | 0233-- K ---55  | 0282-- 0 ---00  |
| 0185-- XEY---30 | 0234-- 5 ---05  | 0283-- + ---33  |
| 0186-- UP---27  | 0235-- UP---27  | 0284-- YTO---40 |
| 0187-- 1 ---01  | 0236-- 1 ---01  | 0285-- 1 ---01  |
| 0188-- 0 ---00  | 0237-- 5 ---05  | 0286-- 9 ---11  |
| 0189-- X ---36  | 0238-- UP---27  | 0287-- DN---25  |
| 0190-- XFR---67 | 0239-- a ---13  | 0288-- YE---24  |
| 0191-- 1 ---01  | 0240-- X<Y---52 | 0289-- IND---31 |
| 0192-- 8 ---10  | 0241-- GTO---44 | 0290-- X ---36  |
| 0193-- X ---36  | 0242-- LBL---51 | 0291-- a ---13  |
| 0194-- DN---25  | 0243-- F ---16  | 0292-- XFR---67 |
| 0195-- + ---33  | 0244-- CNT---47 | 0293-- 1 ---01  |

Table 27 HP 9810A 741 Interference Program (cont)

```

0294-- 7 ---07
0295-- UP---27
0296-- a ---13
0297--X=Y---50
0298--RUP---22
0299--GTO---44
0300--LBL---51
0301-- G ---15
0302--RUP---22
0303--GTO---44
0304--LBL---51
0305-- N ---73
0306--LBL---51
0307-- G ---15
0308--XFR---67
0309--DIV---35
0310-- 1 ---01
0311-- 6 ---06
0312--LBL---51
0313-- N ---73
0314--XTO---23
0315--IND---31
0316-- + ---33
0317-- 1 ---01
0318-- 9 ---11
0319--LBL---51
0320-- H ---74
0321-- 1 ---01
0322-- E ---60
0323--GTO---44
0324--LBL---51
0325-- D ---63
0326--LBL---51
0327-- I ---65
0328-- 2 ---02
0329-- 9 ---11
0330--KEY---30
0331-- a ---13
0332--X>Y---53
0333--GTO---44
0334--LBL---51
0335-- K ---55
0336--CNT---47
0337--PSE---57
0338--PSE---57
0339--IFG---43
0340-- DN---25
0341--GTO---44
0342--LBL---51

```

```

0343-- 1 ---75
0344--SFL---54
0345-- DN---25
0346-- YE---24
0347--IND---31
0348-- - ---34
0349-- 1 ---01
0350-- 9 ---11
0351--LBL---51
0352-- J ---75
0353-- 1 ---01
0354--XTO---23
0355-- + ---33
0356-- 1 ---01
0357-- 9 ---11
0358--YTO---40
0359--IND---31
0360-- 1 ---01
0361-- 9 ---11
0362--GTO---44
0363--LBL---51
0364-- H ---74
0365--LBL---51
0366-- K ---55
0367--XFR---67
0368-- 5 ---05
0369-- 1 ---01
0370--FMT---42
0371-- 4 ---04
0372-- 2 ---02
0373--XTO---23
0374--FMT---42
0375-- 4 ---04
0376-- 1 ---01
0377--FMT---42
0378--SFL---54
0379--FMT---42
0380-- 1 ---01
0381-- 6 ---06
0382-- UP---27
0383--XFR---67
0384-- 0 ---00
0385-- X ---36
0386-- 6 ---06
0387-- 2 ---02
0388-- + ---33
0389--YTO---40
0390-- a ---13
0391--XFR---67

```

```

0392--INT---31
0393-- a ---13
0394--CHS---32
0395-- UP---27
0396-- 1 ---01
0397-- D ---63
0398--XFR---67
0399--IND---31
0400-- a ---13
0401-- - ---33
0402-- - ---40
0403--IND---31
0404-- a ---13
0405--KEY---30
0406--DIV---35
0407--FMT---42
0408--FMT---42
0409-- a ---56
0410--CLR---20
0411--INT---64
0412--FMT---42
0413--PNT---45
0414-- DN---25
0415-- K ---55
0416-- 4 ---04
0417-- UP---27
0418-- 1 ---01
0419-- 0 ---00
0420-- X ---36
0421-- 1 ---01
0422-- E ---60
0423--YTO---40
0424--IND---31
0425-- a ---13
0426-- 1 ---01
0427-- E ---60
0428--XFR---67
0429--IND---31
0430-- a ---13
0431--PNT---45
0432-- 1 ---01
0433--XTO---23
0434-- + ---33
0435-- 0 ---00
0436--XTO---23
0437-- + ---33
0438-- 2 ---02
0439-- 1 ---00
0440--XFR---67

```



Table 27 HP 9810A 741 Interference Program (cont)

|        |     |     |    |        |     |     |    |
|--------|-----|-----|----|--------|-----|-----|----|
| 0441-- | H   | --- | 00 | 0471-- |     | --- | 02 |
| 0442-- | UP  | --- | 27 | 0472-- | b   | --- | 00 |
| 0443-- | 3   | --- | 03 | 0473-- | X=Y | --- | 50 |
| 0444-- | X>Y | --- | 53 | 0474-- | GTO | --- | 44 |
| 0445-- | GTO | --- | 44 | 0475-- | LBL | --- | 51 |
| 0446-- | LBL | --- | 51 | 0476-- | n   | --- | 56 |
| 0447-- | C   | --- | 61 | 0477-- | CNT | --- | 47 |
| 0448-- | CNT | --- | 47 | 0478-- | GTO | --- | 44 |
| 0449-- | FMT | --- | 42 | 0479-- | LBL | --- | 51 |
| 0450-- | 5   | --- | 05 | 0480-- | R   | --- | 62 |
| 0451-- | EEX | --- | 26 | 0481-- | LBL | --- | 51 |
| 0452-- | FMT | --- | 42 | 0482-- | a   | --- | 13 |
| 0453-- | FMT | --- | 42 | 0483-- | XFR | --- | 67 |
| 0454-- | a   | --- | 13 | 0484-- | 5   | --- | 05 |
| 0455-- | E   | --- | 60 | 0485-- | 1   | --- | 01 |
| 0456-- | C   | --- | 61 | 0486-- | FMT | --- | 42 |
| 0457-- | FMT | --- | 42 | 0487-- | 4   | --- | 04 |
| 0458-- | STP | --- | 41 | 0488-- | 2   | --- | 00 |
| 0459-- | 3   | --- | 03 | 0489-- | XTO | --- | 23 |
| 0460-- | 3   | --- | 03 | 0490-- | FMT | --- | 42 |
| 0461-- | UP  | --- | 27 | 0491-- | FMT | --- | 42 |
| 0462-- | 7   | --- | 07 | 0492-- | R   | --- | 62 |
| 0463-- | 6   | --- | 06 | 0493-- | N   | --- | 70 |
| 0464-- | FMT | --- | 42 | 0494-- | n   | --- | 56 |
| 0465-- | 5   | --- | 05 | 0495-- | FMT | --- | 42 |
| 0466-- | XTO | --- | 23 | 0496-- | STP | --- | 41 |
| 0467-- | 2   | --- | 02 | 0497-- | S/R | --- | 77 |
| 0468-- | 1   | --- | 01 | 0498-- | END | --- | 46 |
| 0469-- | UP  | --- | 27 |        |     |     |    |
| 0470-- | XFR | --- | 67 |        |     |     |    |

Table 28 Register Allocation For Revised 741 HP 9810A Program

|    |                                                      |    |
|----|------------------------------------------------------|----|
| a  | CHANNEL COUNTER                                      |    |
| b  | SCRATCH AND INDIRECT                                 |    |
| 0  | FREQUENCY, POWER COUNTER FOR DUMPING TO CASSETTE     |    |
| 1  | LOSS FOR PORT 1                                      |    |
| 2  |                                                      | 2  |
| 3  |                                                      | 3  |
| 4  |                                                      | 4  |
| 5  |                                                      | 5  |
| 6  |                                                      | 6  |
| 7  |                                                      | 7  |
| 8  |                                                      | 8  |
| 9  |                                                      | 9  |
| 10 |                                                      | 10 |
| 11 |                                                      | 11 |
| 12 |                                                      | 12 |
| 13 |                                                      | 13 |
| 14 |                                                      | 14 |
| 15 | INCIDENT POWER COUPLER COEFFICIENT                   |    |
| 16 | REFLECTED POWER COUPLER COEFFICIENT                  |    |
| 17 | INPUT PORT                                           |    |
| 18 | LOG V                                                |    |
| 19 | CAL. FACTOR ADDRESS, V & I ADDRESSES                 |    |
| 20 | POWER COUNTER FOR PIN MODULATOR                      |    |
| 21 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - DETECTOR # 1 |    |
| 22 | $B_2$ & $B_3$ DETECTOR                               | 1  |
| 23 | $B_0$ & $B_1$ DETECTOR                               | 2  |
| 24 | $B_2$ & $B_3$ DETECTOR                               | 2  |

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Table 28 (cont)

| 25 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - | DETECTOR # 3 |
|----|-----------------------------------------|--------------|
| 26 | $B_2$ & $B_3$                           | 3            |
| 27 | $B_0$ & $B_1$                           | 4            |
| 28 | $B_2$ & $B_3$                           | 4            |
| 29 | $B_0$ & $B_1$                           | 5            |
| 30 | $B_2$ & $B_3$                           | 5            |
| 31 | $B_0$ & $B_1$                           | 6            |
| 32 | $B_2$ & $B_3$                           | 6            |
| 33 | $B_0$ & $B_1$                           | 7            |
| 34 | $B_2$ & $B_3$                           | 7            |
| 35 | $B_0$ & $B_1$                           | 8            |
| 36 | $B_2$ & $B_3$                           | 8            |
| 37 | $B_0$ & $B_1$                           | 9            |
| 38 | $B_2$ & $B_3$                           | 9            |
| 39 | $B_0$ & $B_1$                           | 10           |
| 40 | $B_2$ & $B_3$                           | 10           |
| 41 | $B_0$ & $B_1$                           | 11           |
| 42 | $B_2$ & $B_3$                           | 11           |
| 43 | $B_0$ & $B_1$                           | 12           |
| 44 | $B_2$ & $B_3$                           | 12           |
| 45 | $B_0$ & $B_1$                           | 13           |
| 46 | $B_2$ & $B_3$                           | 13           |
| 47 | $B_0$ & $B_1$                           | 14           |
| 48 | $B_2$ & $B_3$                           | 14           |
| 49 | $B_0$ & $B_1$                           | 15           |



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Table 28 (cont)

|    |                                                       |
|----|-------------------------------------------------------|
| 50 | DETECTOR COEFFICIENTS - $B_2$ & $B_3$ - DETECTOR # 15 |
| 51 | VOLTAGE FOR PIN MODULATOR FOR POWER STEP # 1          |
| 52 | 2                                                     |
| 53 | 3                                                     |
| 54 | 4                                                     |
| 55 | 5                                                     |
| 56 | 6                                                     |
| 57 | 7                                                     |
| 58 | 8                                                     |
| 59 | 9                                                     |
| 60 | 10                                                    |
| 61 | 11                                                    |
| 62 | 12                                                    |
| 63 | 13                                                    |
| 64 | 14                                                    |
| 65 | 15                                                    |
| 66 | 16                                                    |
| 67 | 17                                                    |
| 68 | 18                                                    |
| 69 | 19                                                    |
| 70 | 20                                                    |
| 71 | TEMPORARY STORAGE FOR CALCULATING P                   |
| 72 | SPARE                                                 |
| 73 | POWER STEP TO ADD LARGE AMPLIFIER                     |
| 74 | SPARE                                                 |
| 75 | SPARE                                                 |
| 76 | S/N                                                   |
| 77 | $P_{IN}$                                              |
| 78 | CAL FACTOR                                            |
| 79 | $V_{OUT}$                                             |
| 80 | $V_{OUT} - V'_{OUT}$                                  |
| 81 | $V_{NI}$                                              |
| 82 | $V_{NI} - V'_{NI}$                                    |
| 83 | $V_{ON \#2}$                                          |
| 84 | $V_{ON \#2} - V'_{ON \#2}$                            |
| 85 | $V_{ON \#6}$                                          |

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Table 28 (cont)

|     |                            |
|-----|----------------------------|
| 86  | $V_{ON \#6} - V'_{ON \#6}$ |
| 87  | $V_{CC+}$                  |
| 88  | $V_{CC+} - V'_{CC+}$       |
| 89  | $V_{CC-}$                  |
| 90  | $V_{CC-} - V'_{CC-}$       |
| 91  | $V_{II}$                   |
| 92  | $V_{II} - V'_{II}$         |
| 93  | $P_{IN}$                   |
| 94  | CAL FACTOR                 |
| 95  | $V_{OUT}$                  |
| 96  | $V_{OUT} - V'_{OUT}$       |
| 97  | $V_{NI}$                   |
| 98  | $V_{NI} - V'_{NI}$         |
| 99  | $V_{ON \#2}$               |
| 100 | $V_{ON \#2} - V'_{ON \#2}$ |
| 101 | $V_{ON \#6}$               |
| 102 | $V_{ON \#6} - V'_{ON \#6}$ |
| 103 | $V_{CC+}$                  |
| 104 | $V_{CC+} - V'_{CC+}$       |
| 105 | $V_{CC-}$                  |
| 106 | $V_{CC-} - V'_{CC-}$       |
| 107 | $V_{II}$                   |
| 108 | $V_{II} - V'_{II}$         |

Table 29 HP 9830A Program to Convert from Data to Matrix Tapes for 741

```

10 COM FS[20,16],A
20 REM REV. PROG. TO CONVERT FROM DATA TO MATRIX TAPE FOR 741
30 DIM C[37]
40 DISP "FIRST MATRIX TAPE FILE #";
50 INPUT Q
60 DISP "FIRST FILE #";
70 INPUT M
80 FOR I=0 TO 9
90 LOAD DATA M+I,C
100 IF I>0 THEN 120
110 A=C[1]
120 IF A#C[1] THEN 630
130 FOR J=1 TO 2
140 FOR K=1 TO 16
150 IF J+2*I#1 THEN 170
160 IF K=2 THEN 190
170 F[J+2*I,K]=C[K+1+16*(J-1)]
180 GO TO 200
190 F[J+2*I,2]=0
200 NEXT K
210 NEXT J
220 NEXT I
230 R2=5000
240 FOR I=1 TO 20
250 F[I,4]=F[I,4]*2
260 F[I,6]=F[I,6]*10/9.1
270 F[I,8]=F[I,8]*1000/R2
280 F[I,10]=F[I,10]*1000/R2
290 F[I,12]=F[I,12]*100
300 F[I,14]=F[I,14]*100
310 NEXT I
320 PRINT
330 PRINT

```



Table 29 HP 9830A Program to Convert from Data to Matrix Tape for 741 (cont)

```

340 PRINT
350 PRINT
360 WRITE (15,370)A
370 FORMAT 30X,"S/N =",F7.0
380 PRINT
390 PRINT
400 FORMAT "      P(MW)  C.F.(DB)  WOUT  IOUT  VNI  INI",F4.0
410 WRITE (15,400)"  VON2  ION2  VON6"
420 FOR I=1 TO 20
430 WRITE (15,440)F[I,1],F[I,2],F[I,3],F[I,4],F[I,5],F[I,6],F[I,7],F[I,8],F[I,9]
440 FORMAT 5X,F9.4,F9.3,F8.3,F8.2,F7.2,F8.4,F8.2,F8.4,F8.2
450 NEXT I
460 PRINT
470 PRINT
480 PRINT
490 PRINT
500 FORMAT "      P(MW)  ION6  VCC+  IOC+  VCC-",F4.0
510 WRITE (15,500)"  IOC-  VII  III"
520 FOR I=1 TO 20
530 WRITE (15,550)F[I,1],F[I,10],F[I,11],F[I,12],F[I,13],F[I,14],F[I,15],F[I,16]
540 NEXT I
550 FORMAT 5X,2F9.4,F7.2,3F8.2,F9.4,F8.4
560 FOR I=1 TO 12
570 PRINT
580 NEXT I
590 STORE DATA #5,Q
600 Q=Q+1
610 M=M+10
620 GOTO 80
630 DISP "S/N NOT ="A;C[1]
640 STOP
650 END

```

Table 30

741 Interference Data Plot Program from Matrix Tape (HP 9830A)

```
10 COM FS[20,16],A
20 REM PROGRAM TO PLOT 741 DATA FROM MATRIX TAPE
30 DISP "DATA COLUMN #";
40 INPUT Y
50 DISP "FIRST MATRIX FILE #";
60 INPUT X
70 DISP "YMIN,YMAX";
80 INPUT N,M
90 DISP "PLACE PAPER-PLATEN; CONT & EXEC"
100 STOP
110 SCALE 0,11,0,7.5
120 OFFSET 2.5,1.5
130 XAXIS 0,1.4,0,7
140 YAXIS 0,0.5,0,5
150 LABEL (*,2,3.4,PI/2,5/7)
160 FOR J=0 TO 4
170 PLOT (LGT(2)+J)*1.4,0,1
180 CPLOT 0,-0.3
190 LABEL (*)"-";
200 PLOT (LGT(5)+J)*1.4,0,1
210 CPLOT 0,-0.3
220 LABEL (*)"-";
230 NEXT J
240 FOR I=1 TO 5
250 PLOT I*1.4,0,1
260 PLOT I*1.4,5,2
270 NEXT I
280 FOR I=1 TO 10
290 PLOT 0,I*0.5,1
300 PLOT 7,I*0.5,2
310 NEXT I
320 SCALE -53/14,57/14,N-1.5*(M-N)/5,N+6*(M-N)/5
330 FOR I=-2 TO 3
340 LABEL (*,1.5,1.7,0,5/7)
350 PLOT I,N,1
360 CPLOT -2,-2
370 LABEL (410,1.5,1.7,0,5/7)10;
380 CPLOT 0,0.6
390 LABEL (420,1.125,1.7,0,5/7)I;
400 NEXT I
410 FORMAT F3.0
420 FORMAT F2.0
430 LABEL (*,1.5,1.7,0,5/7)
440 J=(M-N)/5
450 FOR I=0 TO 5
460 PLOT -2,N+J*I,1
470 CPLOT -9,-0.3
480 LABEL (500)N+J*I;
```

Table 30

741 Interference Data Plot Program from Matrix Tape (HP 9830A)  
(cont)

```
490 NEXT I
500 FORMAT F6.2
510 FOR K=1 TO 10
520 LOAD DATA X
530 LABEL (*,1,0.8,0.5/7)
540 PLOT -2.07,F[1,Y],1
550 CPLOT -0.3,-0.3
560 LABEL (*)"X"
570 FOR I=2 TO 20
580 IF LGT(F[I,1])>-2 THEN 600
590 F[I,1]=0.01
600 PLOT LGT(F[I,1]),F[I,Y],1
610 CPLOT -0.3,-0.3
620 LABEL (*)"*";
630 NEXT I
640 X=X+1
650 NEXT K
660 PLOT 0.2,M-1.7*(M-N)/10,1
670 LABEL (*)A
680 GOTO 90
690 END
```



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Table 31

4011 Interference Test Program (HP 9810A)

|                |                |                |
|----------------|----------------|----------------|
| 0000--FMT---42 | 0051-- 3 ---11 | 0101--XFR---67 |
| 0001--XFR---67 | 0052--LBL---51 | 0102--IND---31 |
| 0002--XFR---67 | 0053-- 8 ---66 | 0103-- 6 ---14 |
| 0003-- 0 ---00 | 0054--FMT---42 | 0104--FMT---42 |
| 0004--PNT---45 | 0055-- 4 ---04 | 0105-- 4 ---04 |
| 0005--LBL---51 | 0056-- 1 ---01 | 0106-- 2 ---02 |
| 0006-- 8 ---62 | 0057--FMT---42 | 0107--XTO---23 |
| 0007-- 1 ---01 | 0058--SFL---54 | 0108--PSE---57 |
| 0008--XTO---23 | 0059--FMT---42 | 0109--PSE---57 |
| 0009-- 2 ---02 | 0060--PSE---57 | 0110--PSE---57 |
| 0010-- 0 ---00 | 0061--CLX---37 | 0111-- 1 ---01 |
| 0011--XFR---67 | 0062--XTO---23 | 0112--XTO---23 |
| 0012-- 5 ---05 | 0063-- 8 ---10 | 0113-- 8 ---13 |
| 0013-- 5 ---05 | 0064-- 9 ---11 | 0114--LBL---51 |
| 0014--FMT---42 | 0065--XTO---23 | 0115-- 0 ---63 |
| 0015-- 4 ---04 | 0066-- 1 ---01 | 0116--FMT---42 |
| 0016-- 2 ---02 | 0067-- 0 ---00 | 0117-- 3 ---03 |
| 0017--XTO---23 | 0068-- 0 ---00 | 0118-- 3 ---03 |
| 0018--FMT---42 | 0069--PSE---57 | 0119-- . ---21 |
| 0019--FMT---42 | 0070-- 1 ---01 | 0120-- UP---27 |
| 0020--YTO---40 | 0071--XTO---23 | 0121--FMT---42 |
| 0021--DIV---35 | 0072-- 0 ---00 | 0122-- 4 ---04 |
| 0022-- 8 ---73 | 0073--LBL---51 | 0123-- 1 ---01 |
| 0023--FMT---42 | 0074-- 0 ---61 | 0124--FMT---42 |
| 0024--STP---41 | 0075--FMT---42 | 0125-- 1 ---01 |
| 0025--XTO---23 | 0076-- 4 ---04 | 0126--FMT---42 |
| 0026-- 8 ---10 | 0077-- 1 ---01 | 0127-- 8 ---13 |
| 0027-- 6 ---06 | 0078--FMT---42 | 0128-- UP---27 |
| 0028--PNT---45 | 0079-- 1 ---01 | 0129--XFR---67 |
| 0029-- UP---27 | 0080--FMT---42 | 0130-- 1 ---01 |
| 0030--EEX---26 | 0081--XFR---67 | 0131-- 9 ---11 |
| 0031-- 3 ---03 | 0082-- 7 ---07 | 0132--X=Y---50 |
| 0032--DIV---35 | 0083-- 5 ---05 | 0133-- DN---25 |
| 0033-- DN---25 | 0084-- UP---27 | 0134--GTO---44 |
| 0034-- UP---27 | 0085--XFR---67 | 0135--LBL---51 |
| 0035--INT---64 | 0086-- 2 ---02 | 0136-- 8 ---60 |
| 0036-- - ---34 | 0087-- 0 ---00 | 0137-- 1 ---01 |
| 0037-- 1 ---01 | 0088--X=Y---50 | 0138-- 7 ---07 |
| 0038-- 0 ---00 | 0089--GTO---44 | 0139--X<Y---30 |
| 0039-- X ---36 | 0090--S/R---77 | 0140--X>Y---53 |
| 0040-- DN---25 | 0091--LBL---51 | 0141--GTO---44 |
| 0041--INT---64 | 0092-- 1 ---72 | 0142--LBL---51 |
| 0042-- UP---27 | 0093-- 5 ---05 | 0143-- 1 ---75 |
| 0043-- 4 ---04 | 0094-- 4 ---04 | 0144--CNT---47 |
| 0044--X=Y---50 | 0095--XFR---67 | 0145-- DN---25 |
| 0045-- 1 ---01 | 0096-- + ---33 | 0146-- 8 ---15 |
| 0046-- 6 ---06 | 0097-- 2 ---02 | 0147--EEX---26 |
| 0047-- UP---27 | 0098-- 0 ---00 | 0148--CHS---32 |
| 0048--CNT---47 | 0099--XTO---23 | 0149-- 3 ---03 |
| 0049--YTO---40 | 0100-- 6 ---14 | 0150--X>Y---53 |
| 0050-- 1 ---01 |                |                |

Table 31

4011 Interference Test Program (HP 9810A)(cont)

|                |                |                |
|----------------|----------------|----------------|
| 0151--CLX---37 | 0201-- b ---14 | 0251-- 1 ---01 |
| 0152--XEY---30 | 0202--XFR---67 | 0252-- 9 ---11 |
| 0153--CNT---47 | 0203--IND---31 | 0253--XFR---67 |
| 0154--CNT---47 | 0204-- b ---14 | 0254-- 0 ---00 |
| 0155--LBL---51 | 0205-- UP---27 | 0255-- UP---27 |
| 0156-- E ---60 | 0206--INT---64 | 0256-- 1 ---01 |
| 0157-- DN---25 | 0207-- - ---34 | 0257-- 1 ---01 |
| 0158-- K ---55 | 0208-- UP---27 | 0258-- X ---36 |
| 0159-- 4 ---04 | 0209--EEX---26 | 0259-- 7 ---07 |
| 0160--XTO---23 | 0210-- 7 ---07 | 0260-- 6 ---06 |
| 0161-- 7 ---07 | 0211--DIV---35 | 0261-- + ---33 |
| 0162-- 7 ---07 | 0212--RUP---22 | 0262--YTO---40 |
| 0163-- a ---13 | 0213--XEY---30 | 0263-- b ---14 |
| 0164-- UP---27 | 0214--XFR---67 | 0264-- DN---25 |
| 0165-- 2 ---02 | 0215-- 7 ---07 | 0265--YTO---40 |
| 0166-- X ---36 | 0216-- 7 ---07 | 0266--IND---31 |
| 0167-- 1 ---01 | 0217-- X ---36 | 0267-- b ---14 |
| 0168-- 9 ---11 | 0218-- X ---36 | 0268--GTO---44 |
| 0169-- + ---33 | 0219--RUP---22 | 0269--LBL---51 |
| 0170--YTO---40 | 0220--XEY---30 | 0270-- 1 ---65 |
| 0171-- b ---14 | 0221-- X ---36 | 0271--LBL---51 |
| 0172--XFR---67 | 0222-- X ---36 | 0272-- F ---16 |
| 0173--IND---31 | 0223-- X ---36 | 0273-- 7 ---07 |
| 0174-- b ---14 | 0224-- DN---25 | 0274-- 8 ---10 |
| 0175-- UP---27 | 0225-- + ---33 | 0275--XEY---30 |
| 0176--INT---64 | 0226-- YE---24 | 0276-- 1 ---01 |
| 0177-- - ---34 | 0227-- + ---33 | 0277-- 1 ---01 |
| 0178-- UP---27 | 0228-- 7 ---07 | 0278--XFR---67 |
| 0179--EEX---26 | 0229-- 8 ---10 | 0279-- X ---36 |
| 0180-- 5 ---05 | 0230-- DN---25 | 0280-- 0 ---00 |
| 0181--DIV---35 | 0231-- K ---55 | 0281-- + ---33 |
| 0182-- DN---25 | 0232-- 5 ---05 | 0282--YTO---40 |
| 0183--XEY---30 | 0233-- UP---27 | 0283-- 7 ---07 |
| 0184-- UP---27 | 0234-- 1 ---01 | 0284-- 6 ---06 |
| 0185-- 1 ---01 | 0235-- 7 ---07 | 0285-- DN---25 |
| 0186-- 0 ---00 | 0236-- UP---27 | 0286-- YE---24 |
| 0187-- X ---36 | 0237-- a ---13 | 0287--IND---31 |
| 0188--XFR---67 | 0238--X<Y---52 | 0288-- X ---36 |
| 0189-- 7 ---07 | 0239--GTO---44 | 0289-- a ---13 |
| 0190-- 7 ---07 | 0240--LBL---51 | 0290--XFR---67 |
| 0191-- X ---36 | 0241-- F ---16 | 0291-- 1 ---01 |
| 0192-- DN---25 | 0242--CNT---47 | 0292-- 9 ---11 |
| 0193-- + ---33 | 0243-- DN---25 | 0293-- UP---27 |
| 0194--YTO---40 | 0244--XFR---67 | 0294-- a ---13 |
| 0195-- 7 ---07 | 0245-- 1 ---01 | 0295--X=Y---50 |
| 0196-- 8 ---10 | 0246-- 7 ---07 | 0296--RUP---22 |
| 0197--PSE---57 | 0247--DIV---35 | 0297--GTO---44 |
| 0198-- 1 ---01 | 0248-- YE---24 | 0298--LBL---51 |
| 0199--XTO---23 | 0249--IND---31 | 0299-- G ---15 |
| 0200-- + ---33 | 0250--DIV---35 | 0300--RUP---22 |

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Table 21 4011 Interference Test Program (HP 9810A)(cont)

|                |                |                |
|----------------|----------------|----------------|
| 0301--GTO---44 | 0351--XTO---23 | 0401--IND---31 |
| 0302--LBL---51 | 0352-- + ---33 | 0402-- a ---13 |
| 0303-- H ---74 | 0353-- 7 ---07 | 0403--XEY---30 |
| 0304--LBL---51 | 0354-- 6 ---06 | 0404--DIV---35 |
| 0305-- G ---15 | 0355-- DN---25 | 0405--FMT---42 |
| 0306--XFR---67 | 0356--YTO---40 | 0406--FMT---42 |
| 0307--DIV---35 | 0357--IND---31 | 0407-- n ---56 |
| 0308-- 1 ---01 | 0358-- 7 ---07 | 0408--CLX---37 |
| 0309-- 8 ---10 | 0359-- 6 ---06 | 0409--INT---64 |
| 0310-- UP---27 | 0360--GTO---44 | 0410--FMT---42 |
| 0311-- 1 ---01 | 0361--LBL---51 | 0411--PNT---45 |
| 0312--CHS---32 | 0362-- I ---65 | 0412-- DN---25 |
| 0313--XFR---67 | 0363--LBL---51 | 0413-- K ---55 |
| 0314-- + ---33 | 0364-- K ---55 | 0414-- 4 ---04 |
| 0315-- 7 ---07 | 0365--XFR---67 | 0415-- UP---27 |
| 0316-- 6 ---06 | 0366-- 5 ---05 | 0416-- 1 ---01 |
| 0317--XTO---23 | 0367-- 5 ---05 | 0417-- 0 ---00 |
| 0318-- b ---14 | 0368--FMT---42 | 0418-- X ---36 |
| 0319-- DN---25 | 0369-- 4 ---04 | 0419-- 2 ---02 |
| 0320--XTO---23 | 0370-- 2 ---02 | 0420-- E ---60 |
| 0321--IND---31 | 0371--XTO---23 | 0421--YTO---40 |
| 0322-- b ---14 | 0372--FMT---42 | 0422--IND---31 |
| 0323--LBL---51 | 0373-- 4 ---04 | 0423-- a ---13 |
| 0324-- H ---74 | 0374-- 1 ---01 | 0424-- 4 ---04 |
| 0325--XTO---23 | 0375--FMT---42 | 0425-- E ---60 |
| 0326--IND---31 | 0376--SFL---54 | 0426--XFR---67 |
| 0327-- + ---33 | 0377--FMT---42 | 0427--IND---31 |
| 0328-- 7 ---07 | 0378-- 1 ---01 | 0428-- a ---13 |
| 0329-- 6 ---06 | 0379-- 1 ---01 | 0429--PNT---45 |
| 0330--LBL---51 | 0380-- UP---27 | 0430-- 1 ---01 |
| 0331-- I ---65 | 0381--XFR---67 | 0431--XTO---23 |
| 0332-- 1 ---01 | 0382-- 0 ---00 | 0432-- + ---33 |
| 0333-- E ---60 | 0383-- X ---36 | 0433-- 0 ---00 |
| 0334--GTO---44 | 0384-- 7 ---07 | 0434--XTO---23 |
| 0335--LBL---51 | 0385-- 8 ---10 | 0435-- + ---33 |
| 0336-- D ---63 | 0386-- + ---33 | 0436-- 2 ---02 |
| 0337--LBL---51 | 0387--YTO---40 | 0437-- 0 ---00 |
| 0338-- J ---75 | 0388-- a ---13 | 0438--XFR---67 |
| 0339-- 2 ---02 | 0389--XFR---67 | 0439-- 0 ---00 |
| 0340-- 5 ---05 | 0390--IND---31 | 0440-- UP---27 |
| 0341--XEY---30 | 0391-- a ---13 | 0441-- 3 ---03 |
| 0342-- a ---13 | 0392--CHS---32 | 0442--X>Y---53 |
| 0343--X>Y---53 | 0393-- UP---27 | 0443--GTO---44 |
| 0344--GTO---44 | 0394-- 2 ---02 | 0444--LBL---51 |
| 0345--LBL---51 | 0395-- D ---63 | 0445-- C ---61 |
| 0346-- K ---55 | 0396--XFR---67 | 0446--CNT---47 |
| 0347--CNT---47 | 0397--IND---31 | 0447--FMT---42 |
| 0348--PSE---57 | 0398-- a ---13 | 0448-- 5 ---05 |
| 0349--PSE---57 | 0399-- + ---33 | 0449--EEX---26 |
| 0350-- 1 ---01 | 0400--YTO---40 | 0450--FMT---42 |



Table 31      4011 Interference Test Program (HP 9810A)(cont)

0451--FMT---42  
0452-- a ---13  
0453-- E ---60  
0454-- C ---61  
0455--IFG---43  
0456--FMT---42  
0457--STP---41  
0458-- 2 ---02  
0459-- 3 ---03  
0460-- UP---27  
0461-- 8 ---10  
0462-- 6 ---06  
0463--FMT---42  
0464-- 5 ---05  
0465--XTO---23  
0466-- 2 ---02  
0467-- 1 ---01  
0468-- UP---27  
0469--XFR---67  
0470-- 2 ---02  
0471-- 0 ---00  
0472--X=Y---50  
0473--GTO---44  
0474--LBL---51  
0475-- R ---62  
0476--CNT---47  
0477--GTO---44  
0478--LBL---51  
0479-- B ---66  
0480--LBL---51  
0481-- L ---72  
0482--XFR---67  
0483-- 5 ---05  
0484-- 5 ---05  
0485--FMT---42  
0486-- 4 ---04  
0487-- 2 ---02  
0488--XTO---23  
0489--FMT---42  
0490--FMT---42  
0491-- R ---62  
0492-- M ---70  
0493-- n ---56  
0494--FMT---42  
0495--STP---41  
0496--S/R---77  
0497--END---46

Table 32 4011 Interference Test Program Register Allocations

|    |                                                      |    |
|----|------------------------------------------------------|----|
| a  | CHANNEL COUNTER                                      |    |
| b  | SCRATCH & INDIRECT                                   |    |
| 0  | FREQUENCY (GHz), COUNTER FOR DUMPING TO CASSETTE     |    |
| 1  | LOSS FOR PORT 1                                      |    |
| 2  |                                                      | 2  |
| 3  |                                                      | 3  |
| 4  |                                                      | 4  |
| 5  |                                                      | 5  |
| 6  |                                                      | 6  |
| 7  |                                                      | 7  |
| 8  |                                                      | 8  |
| 9  |                                                      | 9  |
| 10 |                                                      | 10 |
| 11 |                                                      | 11 |
| 12 |                                                      | 12 |
| 13 |                                                      | 13 |
| 14 |                                                      | 14 |
| 15 |                                                      | 15 |
| 16 |                                                      | 16 |
| 17 | INCIDENT POWER COUPLER COEFFICIENT                   |    |
| 18 | REFLECTED POWER COUPLER COEFFICIENT                  |    |
| 19 | INPUT PORT                                           |    |
| 20 | POWER COUNTER FOR PIN MODULATOR                      |    |
| 21 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - DETECTOR # 1 |    |
| 22 | $B_2$ & $B_3$                                        | 1  |
| 23 | $B_0$ & $B_1$                                        | 2  |
| 24 | $B_2$ & $B_3$                                        | 2  |

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Table 32 (cont)

|    |                                                      |    |
|----|------------------------------------------------------|----|
| 25 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - DETECTOR # 3 |    |
| 26 | $B_2$ & $B_3$                                        | 3  |
| 27 | $B_0$ & $B_1$                                        | 4  |
| 28 | $B_2$ & $B_3$                                        | 4  |
| 29 | $B_0$ & $B_1$                                        | 5  |
| 30 | $B_2$ & $B_3$                                        | 5  |
| 31 | $B_0$ & $B_1$                                        | 6  |
| 32 | $B_2$ & $B_3$                                        | 6  |
| 33 | $B_0$ & $B_1$                                        | 7  |
| 34 | $B_2$ & $B_3$                                        | 7  |
| 35 | $B_0$ & $B_1$                                        | 8  |
| 36 | $B_2$ & $B_3$                                        | 8  |
| 37 | $B_0$ & $B_1$                                        | 9  |
| 38 | $B_2$ & $B_3$                                        | 9  |
| 39 | $B_0$ & $B_1$                                        | 10 |
| 40 | $B_2$ & $B_3$                                        | 10 |
| 41 | $B_0$ & $B_1$                                        | 11 |
| 42 | $B_2$ & $B_3$                                        | 11 |
| 43 | $B_0$ & $B_1$                                        | 12 |
| 44 | $B_2$ & $B_3$                                        | 12 |
| 45 | $B_0$ & $B_1$                                        | 13 |
| 46 | $B_2$ & $B_3$                                        | 13 |
| 47 | $B_0$ & $B_1$                                        | 14 |
| 48 | $B_2$ & $B_3$                                        | 14 |
| 49 | $B_0$ & $B_1$                                        | 15 |
| 50 | $B_2$ & $B_3$                                        | 15 |



# INTEGRATED CIRCUIT SUSCEPTIBILITY

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Table 32 (cont)

|    |                                                       |    |
|----|-------------------------------------------------------|----|
| 51 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - DETECTOR # 16 |    |
| 52 | $B_2$ & $B_3$                                         | 16 |
| 53 | $B_0$ & $B_1$                                         | 17 |
| 54 | $B_2$ & $B_3$                                         | 17 |
| 55 | VOLTAGE FOR PIN MODULATOR STEP # 1 (No RF)            |    |
| 56 | 2                                                     |    |
| 57 | 3                                                     |    |
| 58 | 4                                                     |    |
| 59 | 5                                                     |    |
| 60 | 6                                                     |    |
| 61 | 7                                                     |    |
| 62 | 8                                                     |    |
| 63 | 9                                                     |    |
| 64 | 10                                                    |    |
| 65 | 11                                                    |    |
| 66 | 12                                                    |    |
| 67 | 13                                                    |    |
| 68 | 14                                                    |    |
| 69 | 15                                                    |    |
| 70 | 16                                                    |    |
| 71 | 17                                                    |    |
| 72 | 18                                                    |    |
| 73 | 19                                                    |    |
| 74 | 20                                                    |    |
| 75 | POWER STEP TO ADD LARGE AMPLIFIER                     |    |
| 76 | CAL. FACTOR ADDRESS, V ADDRESSES                      |    |
| 77 | LOG V                                                 |    |

Table 32 (cont)

|     |                                       |
|-----|---------------------------------------|
| 78  | TEMPORARY STORAGE FOR CALCULATING P   |
| 79  | BIAS UNIT REFLECTION LOSS COEFFICIENT |
| 80  | SPARE                                 |
| 81  | SPARE                                 |
| 82  | SPARE                                 |
| 83  | SPARE                                 |
| 84  | SPARE                                 |
| 85  | SPARE                                 |
| 86  | S/H                                   |
| 87  | $P_{DISS}$                            |
| 88  | $P_{REF}$                             |
| 89  | CAL. FACTOR                           |
| 90  | $V_{DD}$                              |
| 91  | $V'_{DD}$                             |
| 92  | $V'_{OUT}$                            |
| 93  | $V_{OUT}$                             |
| 94  | $V_{SS}$                              |
| 95  | $V_{IN}$                              |
| 96  | $V_{IN2}$                             |
| 97  | $V_{IN1}$                             |
| 98  | $P_{DISS}$                            |
| 99  | $P_{REF}$                             |
| 100 | CAL. FACTOR                           |
| 101 | $V_{DD}$                              |
| 102 | $V'_{DD}$                             |
| 103 | $V'_{OUT}$                            |

Table 32 (cont)

|     |           |
|-----|-----------|
| 104 | $V_{OUT}$ |
| 105 | $V_{SS}$  |
| 106 | $V'_{IN}$ |
| 107 | $V_{IN2}$ |
| 108 | $V_{IN1}$ |



Table 33 4011 Data Tape to Matrix Tape Conversion Program (HP 9830A)

```

10 COM FS[23,11],A
20 DIM C[23]
30 MAT F=ZER
40 DISP "FIRST FILE #, # OF FILES";
50 INPUT M,N
60 DISP "FIRST MATRIX FILE #";
70 INPUT Q
80 FOR I=0 TO N-1
90 LOAD DATA M+I,C
100 IF I>0 THEN 120
110 A=C[1]
120 IF A#C[1] THEN 480
130 FOR J=1 TO 2
140 FOR K=1 TO 11
150 IF C[K+1+9*(J-1)]<-1E+60 THEN 170
160 F[J+2*I,K]=C[K+1+11*(J-1)]
170 NEXT K
180 NEXT J
190 NEXT I
200 FOR I=1 TO 20
210 F[I,5]=(F[I,5]-F[I,4])*100
220 F[I,8]=(F[I,8])*(-100)
230 F[I,6]=F[I,7]
240 F[I,9]=(F[I,9]-F[I,10])*2.5
250 NEXT I
260 PRINT
270 PRINT
280 PRINT
290 WRITE (15,300)A
300 FORMAT 30X,"S/N=",F7.0
310 PRINT
320 PRINT
330 FORMAT " PD(MW) ER(MW) CF(DB) VDD IDD IOUT VOUT ISS "

```

Table 33 4011 Data Tape to Matrix Tape Conversion Program (HP 9830A)(cont)

```

340 WRITE (15,330)" IINRF VIN2 VIN1"
350 FOR I=1 TO 20
360 WRITE (15,450)F[I,1],F[I,2],F[I,3],F[I,4],F[I,5],F[I,6],F[I,7],F[I,8],
370 WRITE (15,460)F[I,9],F[I,10],F[I,11]
380 NEXT I
390 PRINT
400 PRINT
410 PRINT
420 PRINT
430 PRINT
440 PRINT
450 FORMAT F9.3,F8.3,F6.2,2F6.3,F7.3,F6.3,F6.2
460 FORMAT 3F7.3
470 GOTO 500
480 DISP "S/N NOT = "A;C[1]
490 STOP
500 DISP "CHANGE TO MATRIX TAPE";
510 STOP
520 STORE DATA Q
530 M=M+10
540 Q=Q+1
550 DISP "CHANGE TO DATA TAPE";
560 STOP
570 GOTO 80

```

Table 34

General Plot Program from Matrix Tape For 4011

```
10 COM FS[23,11],A
20 MAT F=ZER
30 DISP "FOR PLOT,WRITE COL# & PRESS EXEC";
40 INPUT K
50 DISP "FIRST MATRIX FILE NO.";
60 INPUT Q
70 SCALE 0,8.5,0,10
80 OFFSET 2,1.5
90 XAXIS 0,1.5,0,6
100 YAXIS 0,0.7,0,7
110 FOR J=0 TO 3
120 PLOT (LGT(2)+J)*1.5,0,1
130 LABEL (*,1,3.4,PI/2,7/6)
140 CPLOT 0,-0.3
150 LABEL (*)"-";
160 PLOT (LGT(5)+J)*1.5,0,1
170 CPLOT 0,-0.3
180 LABEL (*)"-";
190 NEXT J
200 DISP "YMIN,YMAX";
210 INPUT N,M
220 SCALE -7/3,10/3,N-1.5*(M-N)/7,N+8.5*(M-N)/7
230 FOR I=-1 TO 3
240 LABEL (*,1.5,1.7,0,7/6)
250 PLOT I,N,1
260 CPLOT -2,-2
270 LABEL (310,1.5,1.7,0,7/6)10;
280 CPLOT 0,0.6
290 LABEL (320,1.125,1.7,0,7/6)I;
300 NEXT I
310 FORMAT F3.0
320 FORMAT F2.0
330 LABEL (*,1.5,1.7,0,7/6)
340 A=(M-N)/5
350 FOR I=0 TO 5
360 PLOT -1,N+A*I,1
370 CPLOT -7,-0.3
380 LABEL (400)N+A*I;
390 NEXT I
400 FORMAT F7.3
410 LABEL (*,1,0.8,0,7/6)
420 FOR G=Q TO Q+4
430 LOAD DATA G
440 FOR I=1 TO 20
450 F[1,1]=0.1
460 PLOT LGT(F[I,1]),ABS(F[I,K]),1
470 CPLOT 0.3,-0.3
```



Table 34      General Plot Program from Matrix Tape for 4011 (cont)

```
480 LABEL (*) "*"
490 IPLOT 0,0,1
500 NEXT I
510 NEXT G
520 PEN
530 SCALE 0,8.5,0,10
540 OFFSET 2,1.5
550 FOR I=1 TO 4
560 PLOT I*1.5,0,1
570 PLOT I*1.5,7,2
580 NEXT I
590 FOR I=1 TO 10
600 PLOT 0,I*0.7,1
610 PLOT 6,I*0.7,2
620 NEXT I
630 PEN
640 GOTO 30
```

Table 35 2002 Hybrid Interference Test Program (HP 9810A)

|                    |                      |                  |
|--------------------|----------------------|------------------|
| 0000--CLX---20     | 0051--FMT---42       | 0101--INT---42   |
| 0001--K---55       | 0052--4---04         | 0102--a---13     |
| 0002--CLX---37     | 0053--1---01         | 0103--UP---27    |
| 0003--FMT---42     | 0054--FMT---42       | 0104--XFR---67   |
| 0004--XFR---67     | 0055--SFL---54       | 0105--1---01     |
| 0005--XFR---67     | 0056--FMT---42       | 0106--9---11     |
| 0006--0---00       | 0057--CNT---47       | 0107--X=Y---50   |
| 0007--PNT---45     | 0058--FMT---42       | 0108--DN---25    |
| 0008--LBL---51     | 0059--FMT---42       | 0109--GTO---44   |
| 0009--R---62       | 0060--YTO---40       | 0110--LBL---51   |
| 0010--CNT---47     | 0061--E---60         | 0111--E---60     |
| 0011--1---01       | 0062--XTO---23       | 0112--1---01     |
| 0012--6---06       | 0063--CNT---47       | 0113--7---07     |
| 0013--XTO---23     | 0064-- $\pi$ ---56   | 0114--XEY---30   |
| 0014--2---02       | 0065--0---71         | 0115--X>Y---53   |
| 0015--0---00       | 0066--IND---31       | 0116--GTO---44   |
| 0016--CNT---47     | 0067--E---60         | 0117--LBL---51   |
| 0017--1---01       | 0068--a---13         | 0118--J---75     |
| 0018--XTO---23     | 0069--FMT---42       | 0119--CNT---47   |
| 0019--0---00       | 0070--CNT---47       | 0120--DN---25    |
| 0020--FMT---42     | 0071--STP---41       | 0121--G---15     |
| 0021--FMT---42     | 0072--CLX---37       | 0122--EEX---26   |
| 0022--1---65       | 0073--XTO---23       | 0123--CHS---32   |
| 0023--N---73       | 0074--7---07         | 0124--3---03     |
| 0024-- $\pi$ ---56 | 0075--5---05         | 0125--X>Y---53   |
| 0025--1/X---17     | 0076--PSE---57       | 0126--CLX---37   |
| 0026--XTO---23     | 0077--FMT---42       | 0127--XEY---30   |
| 0027--CNT---47     | 0078--4---04         | 0128--CNT---47   |
| 0028-- $\pi$ ---56 | 0079--1---01         | 0129--CNT---47   |
| 0029--0---71       | 0080--FMT---42       | 0130--LBL---51   |
| 0030--a---13       | 0081--1---01         | 0131--E---60     |
| 0031--XTO---23     | 0082--FMT---42       | 0132--DN---25    |
| 0032--FMT---42     | 0083--PSE---57       | 0133--K---55     |
| 0033--STP---41     | 0084--PSE---57       | 0134--4---04     |
| 0034--XTO---23     | 0085--PSE---57       | 0135--XTO---23   |
| 0035--1---01       | 0086--1---01         | 0136--5---05     |
| 0036--9---11       | 0087--XTO---23       | 0137--7---07     |
| 0037--PNT---45     | 0088--a---13         | 0138--a---13     |
| 0038--FMT---42     | 0089--LBL---51       | 0139--UP---27    |
| 0039--FMT---42     | 0090--D---63         | 0140--2---02     |
| 0040--YTO---40     | 0091--FMT---42       | 0141--X---36     |
| 0041--DIV---35     | 0092--3---03         | 0142--1---01     |
| 0042--N---73       | 0093--3---03         | 0143--9---11     |
| 0043--FMT---42     | 0094-- $\cdot$ ---21 | 0144-- $+$ ---33 |
| 0044--STP---41     | 0095--UP---27        | 0145--YTO---40   |
| 0045--XTO---23     | 0096--FMT---42       | 0146--b---14     |
| 0046--7---07       | 0097--4---04         | 0147--XFR---67   |
| 0047--3---03       | 0098--1---01         | 0148--IND---31   |
| 0048--PNT---45     | 0099--FMT---42       | 0149--b---14     |
| 0049--LBL---51     | 0100--1---01         | 0150--UP---27    |
| 0050--B---66       |                      |                  |

Table 35 2002 Hybrid Interference Test Program (HP 9810A)(cont)

|                |                |                |
|----------------|----------------|----------------|
| 0151--INT---64 | 0201--YE---24  | 0251--RUP---22 |
| 0152-- - ---34 | 0202-- + ---33 | 0252--GTO---44 |
| 0153--UP---27  | 0203--5 ---05  | 0253--LBL---51 |
| 0154--EEX---26 | 0204--8 ---10  | 0254--H ---74  |
| 0155--5 ---05  | 0205--DN---25  | 0255--LBL---51 |
| 0156--DIV---35 | 0206--K ---55  | 0256--G ---15  |
| 0157--DN---25  | 0207--5 ---05  | 0257--XFR---67 |
| 0158--XEY---30 | 0208--UP---27  | 0258--DIV---35 |
| 0159--UP---27  | 0209--1 ---01  | 0259--1 ---01  |
| 0160--1 ---01  | 0210--7 ---07  | 0260--8 ---10  |
| 0161--0 ---00  | 0211--UP---27  | 0261--LBL---51 |
| 0162--X ---36  | 0212--a ---13  | 0262--H ---74  |
| 0163--XFR---67 | 0213--X<Y---52 | 0263--UP---27  |
| 0164--5 ---05  | 0214--GTO---44 | 0264--7 ---07  |
| 0165--7 ---07  | 0215--LBL---51 | 0265--5 ---05  |
| 0166--X ---36  | 0216--F ---16  | 0266--XFR---67 |
| 0167--DN---25  | 0217--CNT---47 | 0267-- + ---33 |
| 0168-- + ---33 | 0218--DN---25  | 0268--a ---13  |
| 0169--YTO---40 | 0219--XFR---67 | 0269--XTO---23 |
| 0170--5 ---05  | 0220--1 ---01  | 0270--b ---14  |
| 0171--8 ---10  | 0221--7 ---07  | 0271--YTO---40 |
| 0172--PSE---57 | 0222--DIV---35 | 0272--IND---31 |
| 0173--1 ---01  | 0223--YE---24  | 0273--b ---14  |
| 0174--XTO---23 | 0224--IND---31 | 0274--YTO---40 |
| 0175-- + ---33 | 0225--DIV---35 | 0275-- + ---33 |
| 0176--b ---14  | 0226--1 ---01  | 0276--7 ---07  |
| 0177--XFR---67 | 0227--9 ---11  | 0277--5 ---05  |
| 0178--IND---31 | 0228--YTO---40 | 0278--LBL---51 |
| 0179--b ---14  | 0229--9 ---11  | 0279--I ---65  |
| 0180--UP---27  | 0230--2 ---02  | 0280--1 ---01  |
| 0181--INT---64 | 0231--GTO---44 | 0281--E ---60  |
| 0182-- - ---34 | 0232--LBL---51 | 0282--GTO---44 |
| 0183--UP---27  | 0233--I ---65  | 0283--LBL---51 |
| 0184--EEX---26 | 0234--LBL---51 | 0284--D ---60  |
| 0185--7 ---07  | 0235--F ---16  | 0285--LBL---51 |
| 0186--DIV---35 | 0236--DN---25  | 0286--J ---75  |
| 0187--RUP---22 | 0237--YE---24  | 0287--1 ---01  |
| 0188--XEY---30 | 0238--IND---31 | 0288--7 ---07  |
| 0189--XFR---67 | 0239--X ---36  | 0289--XFR---67 |
| 0190--5 ---05  | 0240--a ---13  | 0290-- + ---33 |
| 0191--7 ---07  | 0241--XFR---67 | 0291--2 ---02  |
| 0192--X ---36  | 0242--1 ---01  | 0292--0 ---00  |
| 0193--X ---36  | 0243--9 ---11  | 0293--XEY---30 |
| 0194--RUP---22 | 0244--UP---27  | 0294--a ---13  |
| 0195--XEY---30 | 0245--a ---13  | 0295--X>Y---52 |
| 0196--X ---36  | 0246--X=Y---50 | 0296--GTO---44 |
| 0197--X ---36  | 0247--RUP---22 | 0297--LBL---51 |
| 0198--X ---36  | 0248--GTO---44 | 0298--K ---55  |
| 0199--DN---25  | 0249--LBL---51 | 0299--CNT---47 |
| 0200-- + ---33 | 0250--G ---15  | 0300--PSE---57 |



Table 35      2002 Hybrid Interference Test Program (HP 9810A)(cont)

|                |                |                |
|----------------|----------------|----------------|
| 0301--PSE---57 | 0351-- 9 ---11 | 0401--EEX---26 |
| 0302-- 7 ---07 | 0352-- 6 ---06 | 0402-- 3 ---03 |
| 0303-- 5 ---05 | 0353--CNT---47 | 0403-- X ---36 |
| 0304--XEY---30 | 0354-- 9 ---11 | 0404--YTO---40 |
| 0305-- a ---13 | 0355-- 7 ---07 | 0405--IND---31 |
| 0306-- + ---33 | 0356--XTO---23 | 0406-- a ---13 |
| 0307--YTO---40 | 0357-- a ---13 | 0407-- 1 ---01 |
| 0308-- 6 ---14 | 0358--LBL---51 | 0408-- E ---60 |
| 0309-- DN---25 | 0359-- L ---72 | 0409-- YE---24 |
| 0310--YTO---40 | 0360--XFR---67 | 0410--IND---31 |
| 0311--IND---31 | 0361--IND---31 | 0411-- a ---13 |
| 0312-- 6 ---14 | 0362-- a ---13 | 0412--EEX---26 |
| 0313--GTO---44 | 0363-- UP---27 | 0413-- 3 ---03 |
| 0314--LBL---51 | 0364-- 1 ---01 | 0414-- X ---36 |
| 0315-- I ---65 | 0365-- E ---60 | 0415--YTO---40 |
| 0316--LBL---51 | 0366--XFR---67 | 0416--IND---31 |
| 0317-- K ---55 | 0367--IND---31 | 0417-- a ---13 |
| 0318--FMT---42 | 0368-- a ---13 | 0418-- 1 ---01 |
| 0319-- 4 ---04 | 0369--CNT---47 | 0419-- E ---60 |
| 0320-- 1 ---01 | 0370-- - ---34 | 0420-- YE---24 |
| 0321--FMT---42 | 0371-- 1 ---01 | 0421--IND---31 |
| 0322--SFL---54 | 0372-- 0 ---00 | 0422-- a ---13 |
| 0323--FMT---42 | 0373-- X ---36 | 0423--EEX---26 |
| 0324--XFR---67 | 0374--YTO---40 | 0424-- 3 ---03 |
| 0325-- 9 ---11 | 0375--IND---31 | 0425-- X ---36 |
| 0326-- 3 ---03 | 0376-- a ---13 | 0426--YTO---40 |
| 0327-- UP---27 | 0377-- 1 ---01 | 0427--IND---31 |
| 0328--XFR---67 | 0378-- E ---60 | 0428-- a ---13 |
| 0329-- 9 ---11 | 0379-- 1 ---01 | 0429--XFR---67 |
| 0330-- 4 ---04 | 0380-- 0 ---00 | 0430-- 7 ---07 |
| 0331-- - ---34 | 0381-- 5 ---05 | 0431-- 5 ---05 |
| 0332-- 2 ---02 | 0382-- UP---27 | 0432--CHS---32 |
| 0333-- 0 ---00 | 0383-- a ---13 | 0433-- UP---27 |
| 0334-- X ---36 | 0384--XKY---52 | 0434--XFR---67 |
| 0335--YTO---40 | 0385--GTO---44 | 0435-- 9 ---11 |
| 0336-- 9 ---11 | 0386--LBL---51 | 0436-- 2 ---02 |
| 0337-- 4 ---04 | 0387-- L ---72 | 0437-- + ---33 |
| 0338--XFR---67 | 0388--CNT---47 | 0438--YTO---40 |
| 0339-- 9 ---11 | 0389--CNT---47 | 0439-- 7 ---07 |
| 0340-- 5 ---05 | 0390--XFR---67 | 0440-- 4 ---04 |
| 0341-- UP---27 | 0391--IND---31 | 0441--XEY---30 |
| 0342--XFR---67 | 0392-- a ---13 | 0442--DIV---35 |
| 0343-- 9 ---11 | 0393-- UP---27 | 0443--FMT---42 |
| 0344-- 6 ---06 | 0394-- 1 ---01 | 0444--FMT---42 |
| 0345-- - ---34 | 0395-- E ---60 | 0445-- a ---56 |
| 0346-- 1 ---01 | 0396--XFR---67 | 0446--CLX---37 |
| 0347-- 0 ---00 | 0397--IND---31 | 0447--INT---64 |
| 0348-- 0 ---00 | 0398-- a ---13 | 0448--FMT---42 |
| 0349-- X ---36 | 0399--CNT---47 | 0449--PNT---45 |
| 0350--YTO---40 | 0400-- - ---34 | 0450-- DN---25 |

Table 35      2002 Hybrid Interference Test Program (HP 9810A)(cont)

|        |     |     |    |        |     |     |    |
|--------|-----|-----|----|--------|-----|-----|----|
| 0451-- | P   | --- | 55 | 0480-- | UP  | --- | 47 |
| 0452-- | 4   | --- | 04 | 0481-- | INT | --- | 42 |
| 0453-- | UP  | --- | 27 | 0482-- | STP | --- | 41 |
| 0454-- | 1   | --- | 01 | 0483-- | 3   | --- | 03 |
| 0455-- | 0   | --- | 00 | 0484-- | 6   | --- | 06 |
| 0456-- | X   | --- | 36 | 0485-- | UP  | --- | 27 |
| 0457-- | YTO | --- | 40 | 0486-- | 7   | --- | 07 |
| 0458-- | 7   | --- | 07 | 0487-- | 3   | --- | 03 |
| 0459-- | 5   | --- | 05 | 0488-- | FMT | --- | 42 |
| 0460-- | XFR | --- | 67 | 0489-- | 5   | --- | 05 |
| 0461-- | 9   | --- | 11 | 0490-- | XTO | --- | 23 |
| 0462-- | 3   | --- | 03 | 0491-- | 1   | --- | 01 |
| 0463-- | PNT | --- | 45 | 0492-- | XTO | --- | 23 |
| 0464-- | XFR | --- | 67 | 0493-- | +   | --- | 33 |
| 0465-- | 1   | --- | 01 | 0494-- | 0   | --- | 00 |
| 0466-- | 0   | --- | 00 | 0495-- | XFR | --- | 67 |
| 0467-- | 6   | --- | 06 | 0496-- | 0   | --- | 00 |
| 0468-- | UP  | --- | 27 | 0497-- | UP  | --- | 27 |
| 0469-- | FMT | --- | 42 | 0498-- | 9   | --- | 11 |
| 0470-- | 5   | --- | 05 | 0499-- | X>Y | --- | 53 |
| 0471-- | EEX | --- | 26 | 0500-- | GTO | --- | 44 |
| 0472-- | FMT | --- | 42 | 0501-- | LBL | --- | 51 |
| 0473-- | FMT | --- | 42 | 0502-- | B   | --- | 66 |
| 0474-- | a   | --- | 13 | 0503-- | CNT | --- | 47 |
| 0475-- | E   | --- | 60 | 0504-- | GTO | --- | 44 |
| 0476-- | C   | --- | 61 | 0505-- | LBL | --- | 51 |
| 0477-- | 0   | --- | 71 | 0506-- | A   | --- | 62 |
| 0478-- | a   | --- | 13 | 0507-- | STP | --- | 41 |
| 0479-- | D   | --- | 63 | 0508-- | END | --- | 46 |

Table 36 General Device and 2002 Interference Test Register Allocations

|    |                                                      |                 |
|----|------------------------------------------------------|-----------------|
| a  | CHANNEL COUNTER                                      |                 |
| b  | SCRATCH AND INDIRECT                                 |                 |
| 0  | FREQUENCY (GHz), INTERFERENCE LEVEL COUNTER          |                 |
| 1  | LOSS FOR PORT 1                                      |                 |
| 2  |                                                      | 2               |
| 3  |                                                      | 3               |
| 4  |                                                      | 4               |
| 5  |                                                      | 5               |
| 6  |                                                      | 6               |
| 7  |                                                      | 7               |
| 8  |                                                      | 8               |
| 9  |                                                      | 9               |
| 10 |                                                      | 10              |
| 11 |                                                      | 11              |
| 12 |                                                      | 12              |
| 13 |                                                      | 13              |
| 14 |                                                      | 14              |
| 15 |                                                      | 15              |
| 16 |                                                      | 16              |
| 17 | INCIDENT POWER COUPLER COEFFICIENT                   |                 |
| 18 | REFLECTED POWER COUPLER COEFFICIENT                  |                 |
| 19 | INPUT PORT                                           |                 |
| 20 | NUMBER OF DC PARAMETERS TO BE MONITORED              |                 |
| 21 | DETECTOR COEFFICIENTS - $B_0$ & $B_1$ - DETECTOR # 1 |                 |
| 22 |                                                      | $B_2$ & $B_3$ 1 |
| 23 |                                                      | $B_0$ & $B_1$ 2 |



Table 36 (cont)

|    |                                                    |    |
|----|----------------------------------------------------|----|
| 24 | DETECTOR COEFFICIENTS - $B_2$ & $B_3$ - DETECTOR # | 2  |
| 25 | $B_0$ & $B_1$                                      | 3  |
| 26 | $B_2$ & $B_3$                                      | 3  |
| 27 | $B_0$ & $B_1$                                      | 4  |
| 28 | $B_2$ & $B_3$                                      | 4  |
| 29 | $B_0$ & $B_1$                                      | 5  |
| 30 | $B_2$ & $B_3$                                      | 5  |
| 31 | $B_0$ & $B_1$                                      | 6  |
| 32 | $B_2$ & $B_3$                                      | 6  |
| 33 | $B_0$ & $B_1$                                      | 7  |
| 34 | $B_2$ & $B_3$                                      | 7  |
| 35 | $B_0$ & $B_1$                                      | 8  |
| 36 | $B_2$ & $B_3$                                      | 8  |
| 37 | $B_0$ & $B_1$                                      | 9  |
| 38 | $B_2$ & $B_3$                                      | 9  |
| 39 | $B_0$ & $B_1$                                      | 10 |
| 40 | $B_2$ & $B_3$                                      | 10 |
| 41 | $B_0$ & $B_1$                                      | 11 |
| 42 | $B_2$ & $B_3$                                      | 11 |
| 43 | $B_0$ & $B_1$                                      | 12 |
| 44 | $B_2$ & $B_3$                                      | 12 |
| 45 | $B_0$ & $B_1$                                      | 13 |
| 46 | $B_2$ & $B_3$                                      | 13 |
| 47 | $B_0$ & $B_1$                                      | 14 |
| 48 | $B_2$ & $B_3$                                      | 14 |
| 49 | $B_0$ & $B_1$                                      | 15 |

Table 36 (cont)

|    |                                                       |    |
|----|-------------------------------------------------------|----|
| 50 | DETECTOR COEFFICIENTS - $B_2$ & $B_3$ - DETECTOR # 15 |    |
| 51 | $B_0$ & $B_1$                                         | 16 |
| 52 | $B_2$ & $B_3$                                         | 16 |
| 53 | $B_0$ & $B_1$                                         | 17 |
| 54 | $B_2$ & $B_3$                                         | 17 |
| 55 | LOSS WITH OLD HP BIAS UNIT AND FIXTURE                |    |
| 56 | SPARE                                                 |    |
| 57 | LOG V                                                 |    |
| 58 | TEMPORARY STORAGE FOR CALCULATING P                   |    |
| 59 | SPARE                                                 |    |
| 60 | SPARE                                                 |    |
| 61 | SPARE                                                 |    |
| 62 | SPARE                                                 |    |
| 63 | SPARE                                                 |    |
| 64 | SPARE                                                 |    |
| 65 | SPARE                                                 |    |
| 66 | SPARE                                                 |    |
| 67 | SPARE                                                 |    |
| 68 | SPARE                                                 |    |
| 69 | SPARE                                                 |    |
| 70 | SPARE                                                 |    |
| 71 | SPARE                                                 |    |
| 72 | SPARE                                                 |    |
| 73 | S/N                                                   |    |
| 74 | $P_{DISS}$                                            |    |
| 75 | CAL. FACTOR                                           |    |

Table 36 (cont)

|     |                                                                              |
|-----|------------------------------------------------------------------------------|
| 76  | P                                                                            |
| 77  | P                                                                            |
| 78  | P                                                                            |
| 79  | P                                                                            |
| 80  | P                                                                            |
| 81  | P                                                                            |
| 82  | P                                                                            |
| 83  | P                                                                            |
| 84  | P                                                                            |
| 85  | P                                                                            |
| 86  | P                                                                            |
| 87  | P                                                                            |
| 88  | P                                                                            |
| 89  | P                                                                            |
| 90  | P                                                                            |
| 91  | P                                                                            |
| 92  | P <sub>INC</sub>                                                             |
| 93  | V <sub>OUT 1</sub> (VOLTAGE MONITORED ON PRINTER) (V <sub>COLL</sub> - 2002) |
| 94  | I <sub>OUT 1</sub> (I <sub>COLL</sub> - 2002)                                |
| 95  | V <sub>OUT 2</sub> (V <sub>BASE</sub> - 2002)                                |
| 96  | I <sub>OUT 2</sub> (NOTHING - 2002)                                          |
| 97  | V <sub>IN 1</sub> (V <sub>IN 9</sub> - 2002)                                 |
| 98  | I <sub>IN 1</sub> (I <sub>IN 1 + 2</sub> )                                   |
| 99  | V <sub>IN 2</sub> (V <sub>IN 1 + 2</sub> )                                   |
| 100 | I <sub>IN 2</sub> (I <sub>IN 1 + 2</sub> )                                   |
| 101 | V <sub>IN 3</sub>                                                            |



# INTEGRATED CIRCUIT SUSCEPTIBILITY

MDC E1099  
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Table 36 (cont)

|     |                             |
|-----|-----------------------------|
| 102 | $I_{IN\ 3}$                 |
| 103 | $V_{IN\ 4}$                 |
| 104 | $I_{IN\ 4}$                 |
| 105 | $V_{CC}$                    |
| 106 | $I_{CC}$                    |
| 107 | $I_{GND}$                   |
| 108 | SPARE ( $I_{EMIT}$ ON 2002) |

Table 37 2002 Hybrid Data Reduction Program (HP 9830A)

```

10 DIM A[8,36],C[36]
20 DISP "FILE #";
30 INPUT M
40 FOR K=0 TO 7
50 I=0
60 LOAD DATA M+K C
70 IF K#0 THEN 110
80 C[3]=0
90 S=C[1]
100 I=1
110 IF K#1 THEN 130
120 I=7
130 IF S#C[1] THEN 650
140 IF S#C[1] THEN 650
150 FOR J=1 TO 36
160 A[X+I,J]=C[J]
170 NEXT J
180 NEXT K
190 FOR J=1 TO 8
200 PRINT
210 NEXT J
220 WRITE (15,230)S
230 FORMAT 35X,"S/N =",F5.0
240 PRINT
250 FORMAT 4F13.4,F1.1
260 FOR I=0 TO 4 STEP 4
270 FORMAT F3.0,"RF LEVEL " F3.0,"RF LEVEL " F3.0,"RF LEVEL "
    PARAMETER " ,I+0,I+1,I+2,I+3
280 WRITE (15,270)"
290 PRINT
300 WRITE {15,250}"
310 WRITE {15,250}"
320 WRITE {15,250}"
330 PRINT
    P INC. " ,A[I+1,20],A[I+2,20],A[I+3,20],A[I+4,20]
    P DIS. " ,A[I+1,2],A[I+2,2],A[I+3,2],A[I+4,2]
    C.F. " ,A[I+1,3],A[I+2,3],A[I+3,3],A[I+4,3]

```

Table 37 2002 Hybrid Data Reduction Program (cont)

```

340 GOTO 410
350 FOR K=1 TO 16
360 FORMAT F5.0,1X,4F13.4,F1.1
370 WRITE (15,360) "P",K,A[1,K+3],A[2,K+3],A[3,K+3],A[4,K+3]
380 NEXT K
390 WRITE (15,250) "P INC. ",A[1,20],A[2,20],A[3,20],A[4,20]
400 PRINT
410 WRITE (15,250) "V COLL ",A[I+1,21],A[I+2,21],A[I+3,21],A[I+4,21]
420 WRITE (15,250) "I COLL ",A[I+1,22],A[I+2,22],A[I+3,22],A[I+4,22]
430 WRITE (15,250) "V BASE ",A[I+1,23],A[I+2,23],A[I+3,23],A[I+4,23]
440 WRITE (15,250) "V IN 9 ",A[I+1,25],A[I+2,25],A[I+3,25],A[I+4,25]
450 WRITE (15,250) "I IN 9 ",A[I+1,26],A[I+2,26],A[I+3,26],A[I+4,26]
460 WRITE (15,250) "V IN 1&2 ",A[I+1,27],A[I+2,27],A[I+3,27],A[I+4,27]
470 WRITE (15,250) "I IN 1&2 ",A[I+1,28],A[I+2,28],A[I+3,28],A[I+4,28]
480 WRITE (15,250) "V IN 3 ",A[I+1,29],A[I+2,29],A[I+3,29],A[I+4,29]
490 WRITE (15,250) "I IN 3 ",A[I+1,30],A[I+2,30],A[I+3,30],A[I+4,30]
500 WRITE (15,250) "V IN 4 ",A[I+1,31],A[I+2,31],A[I+3,31],A[I+4,31]
510 WRITE (15,250) "I IN 4 ",A[I+1,32],A[I+2,32],A[I+3,32],A[I+4,32]
520 WRITE (15,250) "V CC ",A[I+1,33],A[I+2,33],A[I+3,33],A[I+4,33]
530 WRITE (15,250) "I CC ",A[I+1,34],A[I+2,34],A[I+3,34],A[I+4,34]
540 WRITE (15,250) "V GND ",A[I+1,35],A[I+2,35],A[I+3,35],A[I+4,35]
550 WRITE (15,250) "I ENT ",A[I+1,36],A[I+2,36],A[I+3,36],A[I+4,36]
560 FOR K=1 TO 4
570 PRINT
580 NEXT K
590 NEXT I
600 FOR K=1 TO 8
610 PRINT
620 NEXT K
630 M=M+8
640 GOTO 40
650 DISP "S/N NOT =" ; S ; C[1]
660 STOP
670 END

```



Table 38

## Extra Digital Device Interference Test Program (HP 9810A)

|                |                |                |
|----------------|----------------|----------------|
| 0000--CLP---20 | 0051-- 1 ---01 | 0101--PSE---57 |
| 0001-- K ---55 | 0052-- 9 ---11 | 0102-- 1 ---01 |
| 0002--CLX---37 | 0053--PNT---45 | 0103--XTO---23 |
| 0003--FMT---42 | 0054--FMT---42 | 0104-- a ---13 |
| 0004--XFR---67 | 0055--FMT---42 | 0105--LBL---51 |
| 0005--XFR---67 | 0056--YTO---40 | 0106-- D ---63 |
| 0006-- 0 ---00 | 0057--DIV---35 | 0107--FMT---42 |
| 0007--PNT---45 | 0058-- N ---73 | 0108-- 3 ---03 |
| 0008--LBL---51 | 0059--FMT---42 | 0109-- 3 ---03 |
| 0009-- A ---62 | 0060--STP---41 | 0110-- . ---21 |
| 0010--CNT---47 | 0061--XTO---23 | 0111-- UP---27 |
| 0011--CNT---47 | 0062-- 7 ---07 | 0112--FMT---42 |
| 0012--CNT---47 | 0063-- 3 ---03 | 0113-- 4 ---04 |
| 0013--CNT---47 | 0064--PNT---45 | 0114-- 1 ---01 |
| 0014--CNT---47 | 0065--LBL---51 | 0115--FMT---42 |
| 0015--CNT---47 | 0066-- B ---66 | 0116-- 1 ---01 |
| 0016--CNT---47 | 0067--FMT---42 | 0117--FMT---42 |
| 0017--CNT---47 | 0068-- 4 ---04 | 0118-- a ---13 |
| 0018--CNT---47 | 0069-- 1 ---01 | 0119-- UP---27 |
| 0019--CNT---47 | 0070--FMT---42 | 0120--XFR---67 |
| 0020--CNT---47 | 0071--SFL---54 | 0121-- 1 ---01 |
| 0021--CNT---47 | 0072--FMT---42 | 0122-- 9 ---11 |
| 0022--CNT---47 | 0073--CNT---47 | 0123--X=Y---50 |
| 0023--CNT---47 | 0074--FMT---42 | 0124-- DN---25 |
| 0024--CNT---47 | 0075--FMT---42 | 0125--GTO---44 |
| 0025--CNT---47 | 0076--YTO---40 | 0126--LBL---51 |
| 0026--CNT---47 | 0077-- E ---60 | 0127-- E ---60 |
| 0027-- 1 ---01 | 0078--XTO---23 | 0128-- 1 ---01 |
| 0028-- 6 ---06 | 0079--CNT---47 | 0129-- 7 ---07 |
| 0029--XTO---23 | 0080-- π ---56 | 0130--XEY---30 |
| 0030-- 2 ---02 | 0081-- 0 ---71 | 0131--X>Y---53 |
| 0031-- 0 ---00 | 0082--IND---31 | 0132--GTO---44 |
| 0032--CNT---47 | 0083-- E ---60 | 0133--LBL---51 |
| 0033-- 1 ---01 | 0084-- a ---13 | 0134-- J ---75 |
| 0034--XTO---23 | 0085--FMT---42 | 0135--CNT---47 |
| 0035-- 0 ---00 | 0086--CNT---47 | 0136-- DN---25 |
| 0036--FMT---42 | 0087--STP---41 | 0137-- G ---15 |
| 0037--FMT---42 | 0088--CLX---37 | 0138--EEX---26 |
| 0038-- I ---65 | 0089--XTO---23 | 0139--CHS---32 |
| 0039-- N ---73 | 0090-- 7 ---07 | 0140-- 3 ---03 |
| 0040-- π ---56 | 0091-- 5 ---05 | 0141--X>Y---53 |
| 0041--1/X---17 | 0092--PSE---57 | 0142--CLX---37 |
| 0042--XTO---23 | 0093--FMT---42 | 0143--XEY---30 |
| 0043--CNT---47 | 0094-- 4 ---04 | 0144--CNT---47 |
| 0044-- π ---56 | 0095-- 1 ---01 | 0145--CNT---47 |
| 0045-- 0 ---71 | 0096--FMT---42 | 0146--LBL---51 |
| 0046-- a ---13 | 0097-- 1 ---01 | 0147-- E ---60 |
| 0047--XTO---23 | 0098--FMT---42 | 0148-- DN---25 |
| 0048--FMT---42 | 0099--PSE---57 | 0149-- K ---55 |
| 0049--STP---41 | 0100--PSE---57 | 0150-- 4 ---04 |
| 0050--XTO---23 |                |                |

Table 38 Extra Digital Device Interference Test Program (HP 9810A)(cont)

|                |                |                |
|----------------|----------------|----------------|
| 0151--XTO---23 | 0201-- 7 ---07 | 0251-- F ---16 |
| 0152-- 5 ---05 | 0202--DIV---35 | 0252-- DI---25 |
| 0153-- 7 ---07 | 0203--RUP---22 | 0253-- YE---24 |
| 0154-- a ---13 | 0204--XEY---30 | 0254--IND---31 |
| 0155-- UP---27 | 0205--XFR---67 | 0255-- X ---36 |
| 0156-- 2 ---02 | 0206-- 5 ---05 | 0256-- a ---13 |
| 0157-- X ---36 | 0207-- 7 ---07 | 0257--XFR---67 |
| 0158-- 1 ---01 | 0208-- X ---36 | 0258-- 1 ---01 |
| 0159-- 9 ---11 | 0209-- X ---36 | 0259-- 9 ---11 |
| 0160-- + ---33 | 0210--RUP---22 | 0260-- UP---27 |
| 0161--YTO---40 | 0211--XEY---30 | 0261-- a ---13 |
| 0162-- b ---14 | 0212-- X ---36 | 0262--X=Y---50 |
| 0163--XFR---67 | 0213-- X ---36 | 0263--RUP---22 |
| 0164--IND---31 | 0214-- X ---36 | 0264--GTO---44 |
| 0165-- b ---14 | 0215-- DN---25 | 0265--LBL---51 |
| 0166-- UP---27 | 0216-- + ---33 | 0266-- G ---15 |
| 0167--INT---64 | 0217-- YE---24 | 0267--RUP---22 |
| 0168-- - ---34 | 0218-- + ---33 | 0268--GTO---44 |
| 0169-- UP---27 | 0219-- 5 ---05 | 0269--LBL---51 |
| 0170--EEX---26 | 0220-- 8 ---10 | 0270-- H ---74 |
| 0171-- 5 ---05 | 0221-- DN---25 | 0271--LBL---51 |
| 0172--DIV---35 | 0222-- K ---55 | 0272-- G ---15 |
| 0173-- DN---25 | 0223-- 5 ---05 | 0273--XFR---67 |
| 0174--XEY---30 | 0224-- UP---27 | 0274--DIV---35 |
| 0175-- UP---27 | 0225-- 1 ---01 | 0275-- 1 ---01 |
| 0176-- 1 ---01 | 0226-- 7 ---07 | 0276-- 8 ---10 |
| 0177-- 0 ---00 | 0227-- UP---27 | 0277--LBL---51 |
| 0178-- X ---36 | 0228-- a ---13 | 0278-- H ---74 |
| 0179--XFR---67 | 0229--X<Y---52 | 0279-- UP---27 |
| 0180-- 5 ---05 | 0230--GTO---44 | 0280-- 7 ---07 |
| 0181-- 7 ---07 | 0231--LBL---51 | 0281-- 5 ---05 |
| 0182-- X ---36 | 0232-- F ---16 | 0282--XFR---67 |
| 0183-- DN---25 | 0233--CNT---47 | 0283-- + ---33 |
| 0184-- + ---33 | 0234-- DN---25 | 0284-- a ---13 |
| 0185--YTO---40 | 0235--XFR---67 | 0285--XTO---23 |
| 0186-- 5 ---05 | 0236-- 1 ---01 | 0286-- b ---14 |
| 0187-- 8 ---10 | 0237-- 7 ---07 | 0287--YTO---40 |
| 0188--PSE---57 | 0238--DIV---35 | 0288--IND---31 |
| 0189-- 1 ---01 | 0239-- YE---24 | 0289-- b ---14 |
| 0190--XTO---23 | 0240--IND---31 | 0290--YTO---40 |
| 0191-- + ---33 | 0241--DIV---35 | 0291-- + ---33 |
| 0192-- b ---14 | 0242-- 1 ---01 | 0292-- 7 ---07 |
| 0193--XFR---67 | 0243-- 9 ---11 | 0293-- 5 ---05 |
| 0194--IND---31 | 0244--YTO---40 | 0294--LBL---51 |
| 0195-- b ---14 | 0245-- 9 ---11 | 0295-- I ---65 |
| 0196-- UP---27 | 0246-- 2 ---02 | 0296-- 1 ---01 |
| 0197--INT---64 | 0247--GTO---44 | 0297-- E ---60 |
| 0198-- - ---34 | 0248--LBL---51 | 0298--GTO---44 |
| 0199-- UP---27 | 0249-- I ---65 | 0299--LBL---51 |
| 0200--EEX---26 | 0250--LBL---51 | 0300-- D ---63 |

Table 38 Extra Digital Device Interference Test Program (HP 9810A)(cont)

|                |                |                |
|----------------|----------------|----------------|
| 0301--LDL---51 | 0351--E---60   | 0401--ITC---40 |
| 0302--J---75   | 0352--YFF---67 | 0402--IND---31 |
| 0303--1---01   | 0353--IND---31 | 0403--a---13   |
| 0304--7---07   | 0354--a---13   | 0404--XFR---67 |
| 0305--XFR---67 | 0355--CNT---47 | 0405--7---07   |
| 0306--+---33   | 0356-----34    | 0406--5---05   |
| 0307--2---02   | 0357--1---01   | 0407--CHS---32 |
| 0308--0---00   | 0358--0---00   | 0408--UP---27  |
| 0309--XEY---30 | 0359--X---36   | 0409--XFR---67 |
| 0310--a---13   | 0360--YTO---40 | 0410--9---11   |
| 0311--X>Y---53 | 0361--IND---31 | 0411--2---02   |
| 0312--GTO---44 | 0362--a---13   | 0412--+---33   |
| 0313--LBL---51 | 0363--1---01   | 0413--YTO---40 |
| 0314--K---55   | 0364--E---60   | 0414--7---07   |
| 0315--CNT---47 | 0365--1---01   | 0415--4---04   |
| 0316--PSE---57 | 0366--0---00   | 0416--XEY---30 |
| 0317--PSE---57 | 0367--5---05   | 0417--DIV---35 |
| 0318--7---07   | 0368--UP---27  | 0418--FMT---42 |
| 0319--5---05   | 0369--a---13   | 0419--FMT---42 |
| 0320--XEY---30 | 0370--XCY---52 | 0420--n---56   |
| 0321--a---13   | 0371--GTO---44 | 0421--CLX---37 |
| 0322--+---33   | 0372--LBL---51 | 0422--INT---64 |
| 0323--YTO---40 | 0373--L---72   | 0423--FMT---42 |
| 0324--b---14   | 0374--CNT---47 | 0424--PNT---45 |
| 0325--DN---25  | 0375--CNT---47 | 0425--DN---25  |
| 0326--YTO---40 | 0376--XFR---67 | 0426--K---55   |
| 0327--IND---31 | 0377--IND---31 | 0427--4---04   |
| 0328--b---14   | 0378--a---13   | 0428--UP---27  |
| 0329--GTO---44 | 0379--UP---27  | 0429--1---01   |
| 0330--LBL---51 | 0380--1---01   | 0430--0---00   |
| 0331--I---65   | 0381--E---60   | 0431--X---36   |
| 0332--LBL---51 | 0382--XFR---67 | 0432--YTO---40 |
| 0333--K---55   | 0383--IND---31 | 0433--7---07   |
| 0334--FMT---42 | 0384--a---13   | 0434--5---05   |
| 0335--4---04   | 0385--CNT---47 | 0435--XFR---67 |
| 0336--1---01   | 0386-----34    | 0436--9---11   |
| 0337--FMT---42 | 0387--EEX---26 | 0437--3---03   |
| 0338--SFL---54 | 0388--3---03   | 0438--PNT---45 |
| 0339--FMT---42 | 0389--X---36   | 0439--XFR---67 |
| 0340--9---11   | 0390--YTO---40 | 0440--1---01   |
| 0341--3---03   | 0391--IND---31 | 0441--0---00   |
| 0342--XTO---23 | 0392--a---13   | 0442--6---06   |
| 0343--a---13   | 0393--1---01   | 0443--UP---27  |
| 0344--LBL---51 | 0394--E---60   | 0444--FMT---42 |
| 0345--L---72   | 0395--YE---24  | 0445--5---05   |
| 0346--XFR---67 | 0396--IND---31 | 0446--EEX---26 |
| 0347--IND---31 | 0397--a---13   | 0447--FMT---42 |
| 0348--a---13   | 0398--EEX---26 | 0448--FMT---42 |
| 0349--UP---27  | 0399--3---03   | 0449--a---13   |
| 0350--1---01   | 0400--X---36   | 0450--E---60   |



Table 38 Extra Digital Device Interference Test Program (HP 9810A) (cont)

0451-- C ---61  
0452-- 0 ---71  
0453-- a ---13  
0454-- D ---63  
0455--CNT---47  
0456--FMT---42  
0457--STP---41  
0458-- 3 ---03  
0459-- 6 ---06  
0460-- UP---27  
0461-- 7 ---07  
0462-- 3 ---03  
0463--FMT---42  
0464-- 5 ---05  
0465--XT0---23  
0466-- 1 ---01  
0467--XT0---23  
0468-- + ---33  
0469-- 0 ---00  
0470--XFR---67  
0471-- 0 ---00  
0472-- UP---27  
0473-- 5 ---05  
0474--X>Y---53  
0475--GT0---44  
0476--LBL---51  
0477-- B ---66  
0478--CNT---47  
0479--GT0---44  
0480--LBL---51  
0481-- A ---62  
0482--STP---41  
0483--END---46

Table 39 Extra Digital Device Data Reduction and Print

```

10 DIM A[4,36],C[36]
20 DISP "FILE #";
30 INPUT H
40 FOR K=0 TO 3
50 LOAD DATA H+K,C
60 FOR J=1 TO 36
70 IF K#0 THEN 90
80 C[3]=0
90 A[K+1,J]=C[J]
100 NEXT J
110 NEXT K
120 FOR J=1 TO 12
130 PRINT
140 NEXT J
150 FORMAT 4F13.4,F1.1
160 FORMAT 6X,"PARAMETER
170 WRITE (15,160)
180 PRINT
190 WRITE {15,150}"
200 WRITE {15,150}"
210 WRITE {15,150}"
220 PRINT
230 FOR K=1 TO 16
240 FORMAT F5.0,1X,4F13.4,F1.1
250 WRITE (15,240)"
260 NEXT K
270 WRITE (15,150)"
280 PRINT
290 WRITE {15,150}"
300 WRITE {15,150}"
310 WRITE {15,150}"
320 WRITE {15,150}"
330 WRITE {15,150}"

S.N. "A[1,1],A[2,1],A[3,1],A[4,1]
P DIS. "A[1,2],A[2,2],A[3,2],A[4,2]
C.F. "A[1,3],A[2,3],A[3,3],A[4,3]

O RF LEVEL 1 RF LEVEL 2 RF LEVEL 3 RF LEVEL"

P INC. "A[1,20],A[2,20],A[3,20],A[4,20]

V OUT 1 "A[1,21],A[2,21],A[3,21],A[4,21]
I OUT 1 "A[1,22],A[2,22],A[3,22],A[4,22]
V OUT 2 "A[1,23],A[2,23],A[3,23],A[4,23]
I OUT 2 "A[1,24],A[2,24],A[3,24],A[4,24]
V IN 1 "A[1,25],A[2,25],A[3,25],A[4,25]

```

Table 39 Extra Digital Device Data Reduction and Print (cont)

|   |     |   |   |   |       |   |       |   |       |   |       |
|---|-----|---|---|---|-------|---|-------|---|-------|---|-------|
| I | IN  | 1 | " | A | 1, 26 | A | 2, 26 | A | 3, 26 | A | 4, 26 |
| V | IN  | 2 | " | A | 1, 27 | A | 2, 27 | A | 3, 27 | A | 4, 27 |
| I | IN  | 2 | " | A | 1, 28 | A | 2, 28 | A | 3, 28 | A | 4, 28 |
| V | IN  | 3 | " | A | 1, 29 | A | 2, 29 | A | 3, 29 | A | 4, 29 |
| I | IN  | 3 | " | A | 1, 30 | A | 2, 30 | A | 3, 30 | A | 4, 30 |
| V | IN  | 4 | " | A | 1, 31 | A | 2, 31 | A | 3, 31 | A | 4, 31 |
| I | IN  | 4 | " | A | 1, 32 | A | 2, 32 | A | 3, 32 | A | 4, 32 |
| V | CC  |   | " | A | 1, 33 | A | 2, 33 | A | 3, 33 | A | 4, 33 |
| I | CC  |   | " | A | 1, 34 | A | 2, 34 | A | 3, 34 | A | 4, 34 |
| I | GND |   | " | A | 1, 35 | A | 2, 35 | A | 3, 35 | A | 4, 35 |

```

340 WRITE (15,150) "
350 WRITE (15,150) "
360 WRITE (15,150) "
370 WRITE (15,150) "
380 WRITE (15,150) "
390 WRITE (15,150) "
400 WRITE (15,150) "
410 WRITE (15,150) "
420 WRITE (15,150) "
430 WRITE (15,150) "
440 FOR K=1 TO 17
450 PRINT
460 NEXT K
470 M=M+4
480 GOTO 40
490 END

```



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