

J68340A TEST BAY

CONTENTS

	<u>Page</u>
1. GENERAL	1
2. TEST BAY.	1
3. RF SWEEP OSCILLATOR	1
4. IF SWEEP OSCILLATOR	4
5. 30 CYCLE SWITCH	5
6. IF DETECTOR PANEL	5
7. POWER METER	5
8. DUMONT 2551 OSCILLOSCOPE	5
9. RF FREQUENCY METER.	5
10. RF CRYSTAL MONITOR.	5
11. RF ATTENUATOR	6
12. IF DETECTOR	6
13. IF ATTENUATOR PANEL	6

1. GENERAL

1.01 The J68340A Test Bay is a rolling bay, requiring no installation. It may be used alone, or in combination with the J68333A Test Bench. Detailed instructions showing the application and use of this bay are given in Sections R90.300, R90.310, R20.360, and associated sections, where applicable. This section will be restricted to the general operation of the individual components of the bay.

2. TEST BAY

(A) Preparation for Service

2.01 Apply power to the test bay by connecting the power cord to a 108-122 volt 60 cycle power source. The bay should be grounded through the third wire of the power cord. Do not use this test bay with an AC regulator of the type which severely distorts the 60 cycle wave form.

2.02 Operate the MAIN POWER switch to ON and note that the ventilating fan is operating. Interconnect the component panels as required, and operate each as described in its own operating section, below.

This material is for the use of Bell System employees only, and its distribution is in no sense a publication. Neither this material, nor any portion of it, is to be reproduced in any form, without the written permission of the American Telephone and Telegraph Company.

(B) Removal from Service

- 2.03 Remove power from each component panel in use as described in its operating section.
- 2.04 Remove power from the bay by turning the MAIN POWER switch to OFF.

3. RF SWEEP OSCILLATOR

(A) Preparation for Service

3.01 Before applying power, check that the MAIN POWER switch on the meter and control panel is operated to ON. Operate the RF SWEEPER switch, also on the meter and control panel, to ON, thus energizing the oscillator through the KS-5789 Rectifier.

Note: A time delay relay energizes the tube heater for about one minute before applying the high voltage.

3.02 Make the connections shown in Fig. 1. For the list 1 test bay, the SLOPE switch on the IF sweep oscillator should be in the OFF position.

(B) Adjustment of Frequency and Sweep Bandwidth

- 3.03 Operate the SWEEP switch on the RF oscillator panel to ON.
- 3.04 On the oscilloscope, set the Y-AXIS AMPLIFIER switch to INPUT UNDER 25 V RMS. Adjust the vertical and horizontal gain and position controls to give a pattern on the center of the oscilloscope screen with a width of about 3 inches and a height of about 2 inches.
- 3.05 The oscilloscope presentation should be a pair of horizontal straight lines.

(1) If there are irregularities or a feathery appearance of the upper trace, adjust the MAGNETIC SHUNT knob on the RF oscillator panel and the ACCELERATOR potentiometer on the meter and control panel to give a clear, steady trace.

(2) If necessary, adjust the CATHODE potentiometer on the meter and control panel to make the upper oscilloscope trace horizontal.

(3) If the upper oscilloscope trace is flat at the center, but falls off at the ends, the sweep may be wider than necessary, or the output impedance may not be optimum. Adjust the IMPEDANCE knob on the Oscillator Panel for maximum output consistent with reasonable flatness.

3.06 Determine the operating frequency of the oscillator by proceeding as follows:

(1) Adjust the wavemeter tuning until a small "V" shaped notch or pip appears in the upper oscilloscope trace. (See par. 9.01) The pip indicates the resonant frequency of the wave meter in the sweep band produced by the oscillator.

(2) Rotate the wavemeter adjusting knob to increase its resonant frequency (higher scale numbers correspond to increased frequency). The pip should move toward the right-hand end of the trace. If it moves to the left, set the pip somewhat to the left of the center of the trace and operate the SWEEP switch momentarily to OFF several times until the pip appears on the right side of the center of the trace with the SWEEP switch turned to ON.

Note: This procedure should be followed whenever the sweep has been off and turned on again to assure the proper direction of sweep.

(3) Adjust the wavemeter until the pip is located at the center of the upper trace. At this point the wavemeter reading indicates the oscillator center frequency.

3.07 To change the center frequency of the oscillator check the adjustment covered in par. 3.06 (2) above and then continue as follows:

(1) If the desired center frequency is higher than the oscillator setting adjust the wavemeter so that the pip on the oscilloscope trace is moved to the right-hand end.

(2) Rotate the FREQUENCY knob in a clockwise direction, at the same time observing the position of the pip on the oscilloscope trace. It should move towards the left-hand end since the oscillator center frequency is being increased relative to the wavemeter setting.

(3) Check the oscillator frequency by adjusting the wavemeter so as again to center the pip. If the correct center frequency has not yet been

arrived at, repeat Step (2) above. By proceeding in this manner and always keeping the pip in sight until the desired center frequency is obtained the oscillator can be readily adjusted to any desired center frequency.

(4) During these operations the CATH and ACCELERATOR voltage controls on the meter and control panel, and the MAGNETIC SHUNT and IMPEDANCE knobs on the oscillator panel should be adjusted from time to time as outlined in par. 3.05. Higher frequencies require higher cathode voltage and decreased magnetic shunting to maintain satisfactory oscillation.

(5) If the desired center frequency is lower than the oscillator setting the procedure is similar except that the pip on the oscilloscope trace is moved to the left-hand end of the trace and the oscillator frequency is reduced by rotating the FREQUENCY knob counterclockwise.

3.08 The sweep bandwidth is controlled by the SWEEP ADJ knob; turning in a clockwise direction widens the bandwidth. To set up a specific sweep bandwidth proceed as follows:

(1) Adjust the wavemeter to place the pip successively at the extreme left and right hand ends of the upper trace, reading the wavemeter for each position. If the center frequency has been properly determined, the end frequencies should be nearly symmetrically located about it, with the low-frequency at the left-hand end of the trace. The total sweep bandwidth is equal to the difference between the frequencies corresponding to the wavemeter readings for pips at the two ends of the trace.

(2) Adjust the sweep bandwidth as required by means of the SWEEP ADJ control, determining the new bandwidth as in Step (1) above.

(3) It will be found that as the sweep width is varied, the low frequency end remains relatively fixed. It is necessary, therefore, to readjust the FREQUENCY knob to maintain the desired center frequency.

(4) After completing a bandwidth adjustment it may be necessary to adjust the IMPEDANCE control as described in par. 3.05 Step (3).

(C) Single-Frequency Output

3.09 A single frequency output ("continuous wave" operation) can be obtained from the oscillator by operating the SWEEP

switch to OFF. Since the sweep motor comes to a stand-still at a random position in the sweeping cycle, further adjustments must be made to develop a specified frequency.

3.10 To set the oscillator for specific single frequency proceed as follows:

(1) Adjust the RF sweep oscillator as in par. 3.07 above, so that the single frequency desired is within the sweeping range. Tune the wavemeter to the desired frequency. Turn the SWEEP control to OFF.

(2) The oscilloscope traces will be a pair of straight horizontal lines. While watching the oscilloscope, adjust the screwdriver control located under the SWEEP ADJ knob to a position where one trace drops vertically, then returns to its original position. Carefully adjust the control until the trace drops down a maximum distance, generally about 1/4", and holds that position. The oscillator is now set to the wavemeter frequency.

Note: This control rotates the sweep motor shaft by means of a friction drive. To engage this drive it is necessary to press the adjusting shaft in firmly while turning it to the proper position.

(3) Since the wavemeter absorbs power, it is desirable to detune it during subsequent measurements.

(D) Removal from Service

3.11 To take the oscillator out of service operate the RF SWEEPER switch on the meter and control panel to OFF.

4. IF SWEEP OSCILLATOR

(A) Preparation for Service

4.01 Check that the MAIN POWER switch on the meter and control panel is operated to ON. Operate the PWR switch on the IF oscillator panel to ON. Operate the OSC switch to ON.

Note: The oscillator should be energized for at least 5 minutes to assure adequate frequency stability for subsequent tests.

4.02 To develop a sweep frequency, operate the SWEEP switch to ON.

4.03 The regulated power supply should be adjusted to 200 volts by plugging in a suitable external voltmeter to the MEAS 200V pin jacks, and adjusting the ADJ 200V potentiometer. This is a screwdriver adjustment.

(B) Connections for Testing Purposes

4.04 Output power from the oscillator is available from the OUT-1 and OUT-2 jacks.

4.05 Vertical deflecting voltage for the oscilloscope is available from the SCOPE-Y jack. This jack is connected to a relay which is driven by a 30 cycle multi-vibrator, so that voltages are alternately applied to the oscilloscope from the XTAL-1 and XTAL-2 jacks.

4.06 Horizontal sweep voltage for an oscilloscope is available from the SCOPE-X jack. This voltage is controlled by and synchronous with the oscillator sweep.

(C) Adjustments During Operation

4.07 Oscillator - No adjustments are ordinarily required in the oscillator circuit under sweep frequency conditions, these adjustments having been made in the factory or during servicing tests. To set the frequency at mid-band for fixed frequency ("continuous-wave") operation, operate the SWEEP switch to OFF and adjust the SWEEP OSC dial to the 70 MC calibration mark on its scale. This dial is mounted on the end of the sweeping motor shaft.

4.08 Slope Circuit

(1) Provision is made to develop a diagonal slope in one of the horizontal traces on the oscilloscope. This is accomplished by turning the SLOPE switch to ON.

(2) The slope of the trace may be adjusted by the ADJ SLOPE potentiometer.

4.09 Oscilloscope Vertical Switching Circuits

(1) Vertical voltages for the oscilloscope, from crystal detectors connected to the XTAL-1 and XTAL-2 jacks, are applied alternately to the SCOPE-Y jack by means of a 30 cycle relay. The phase of this switching action with respect to the horizontal sweep voltage is adjustable with the ADJ 30~ potentiometer, a screwdriver control.

(2) The voltage from the XTAL-1 jack can be attenuated over an approximate range of 0 to 2.5 db by the ADJ XTAL 1 potentiometer.

4.10 Frequency Meter - The frequency meter is connected in series with the output from the oscillator to provide a means for measuring the frequency for a fixed frequency output or to give a frequency marker pip in the oscillator output under

sweeping condition. At resonance, the frequency meter gives a loss of about 0.2 db in oscillator power. The unit is calibrated directly in megacycles, and is tuned by the FREQ. METER knob.

(D) Removal from Service

4.11 To take the oscillator out of service, operate the POWER, SWEEP, OSC, and SLOPE switches to the OFF position.

5. 30 CYCLE SWITCH

5.01 This panel is used in the list 2 test bay in place of the IF sweep oscillator. It provides the 30 cycle switching and power supply functions of the IF sweep oscillator.

(A) Preparation for Service

5.02 With the MAIN POWER switch on the meter and control panel in the ON position, operate the POWER switch on the 30-cycle switch panel to ON.

5.03 Power Supply - The regulated power supply should be adjusted to 200 volts by plugging a suitable external voltmeter into the MEAS 200 V pin jacks, and adjusting the ADJ 200 V screwdriver control potentiometer.

(B) Adjustments During Operation

5.04 30 Cycle Switch

(1) When the oscilloscope is patched into the SCOPE Y jack, it is switched alternately between the XTAL 1 and XTAL 2 jacks at a 30 cycle rate by means of a relay. Voltages from any two crystal detectors connected to these jacks are simultaneously viewed on the oscilloscope, due to persistence of vision.

(2) The phase of the switching action is adjusted by the ADJ 30~ screwdriver control. The adjustment of this control is covered in Section R70.204.

(3) The ADJ XTAL 1 control knob attenuates the input to the XTAL-1 jack so that its level may be conveniently matched to the XTAL-2 jack input. The range of attenuation is about 0 to 2.5db.

(C) Removal from Service

5.05 Turn the POWER switch on the 30 cycle switch panel to the OFF position.

6. IF DETECTOR PANEL

6.01 IF Detector - If the signal to be detected is plugged into the DET IN jack, the rectified output is obtainable from the DET OUT jack.

Warning: The detector may be damaged by applying a signal of more than +10 dbm.

6.02 IF Frequency Meter - If the IF IN and IF OUT jacks are connected in series with an IF circuit in the range 52-89 MC, a small absorption dip will be introduced in the transmission characteristic at the frequency indicated on the FREQ. METER dial. Normally, the frequency meter is inserted in series with the input to an IF detector. When a IF signal is applied, the frequency is indicated by a small pip on the trace of the oscilloscope connected in the detector output circuit.

6.03 Oscilloscope Pre-amplifier - To make the pre-amplifier operative, operate the PRE AMP switch on the meter and control panel to ON. This turns on the heater supply. To obtain plate voltage for the pre-amplifier, turn on the PWR switch of the IF sweep oscillator (or the 30 cycle switch, for list 2 test bays). If a signal not greater than 0.1 volt peak-to-peak is now patched to the PRE AMP-IN jack, the amplified output may be obtained from the PRE AMP-OUT jack. The pre-amplifier is normally connected between the SCOPE Y JACK of the IF sweep oscillator (or the 30 cycle switch) and the oscilloscope vertical input, for tests involving low levels to the IF or RF detectors.

7. POWER METER

7.01 Operating methods for the J68340E Power Meter may be found in Section R70.232.

8. DUMONT 2551 OSCILLOSCOPE

8.01 Operating methods for the Dumont model 2551 oscilloscope may be found in the manufacturer's instruction book supplied with the instrument.

9. RF FREQUENCY METER

9.01 The RF frequency meter is normally connected between a microwave signal source and a detector or other power indicator upon which its reaction may be noted. The frequency at which such reaction occurs may be determined by noting the reading of the scale on the sleeve and thimble of the frequency meter and referring to the calibration chart mounted on the side of the test bay, interpolating, if necessary.

10. RF CRYSTAL MONITOR

10.01 The RF crystal monitor is connected to the end of a waveguide where it is desired to detect a reference or test signal, between 3700 and 4200 MC. The DC output together with any modulation envelope which may be present is obtained from the coaxial jack on the monitor, and is normally patched to the XTAL 1 or XTAL 2

jacks of either the IF sweep oscillator panel or the 30 cycle switch panel. It may also be patched to the METER IN jack of the meter and control panel, to observe the DC component on the XTAL CURRENT meter.

Warning: The crystal in the RF monitor may be damaged by applying a signal of more than +8 dbm.

11. RF ATTENUATOR

11.01 The RF attenuator is inserted in the desired waveguide path and is adjusted as required. The dial reads insertion loss directly in db. A small knurled nut located near the main dial should be adjusted so that the dial turns with reasonable friction in either direction.

12. IF DETECTOR

12.01 A separate IF detector is supplied with the test bay to eliminate the need for long patch cords between it and the equipment under test. The IF signal

to be detected should be connected to its coaxial input jack through a patch cord not more than 6" long. A cable (ED-63941-01, G65) normally connects its BNC type output jack to the XTAL-1 or XTAL-2 jack of either the IF sweep oscillator panel or the 30 cycle switch panel, depending on the list number of the test bay.

Warning: The detector may be damaged by applying a signal of more than +10 dbm.

13. IF ATTENUATOR PANEL

13.01 The input and output jacks of the KS-14190 and KS-14191 attenuators located on this panel appear on the front panel. Push buttons are used to either add or remove a fixed value of loss which is indicated just above the button. A pad is inserted by pushing the proper button once. It is removed by a second push. These attenuators are used in test circuits as required in the Practice pertaining to the unit being tested.

Bell Telephone Laboratories, Inc.