Chapter 8
3630A/3631A Test Sets Information

8-1 INTRODUCTION

This chapter describes the 3630A and 3631A Test Sets. It provides installation and operation information, an overall functional description, mainframe PCB descriptions, and RF deck assembly descriptions.

8-2 INSTALLATION AND OPERATION

The 363XA Frequency Converter Test Sets are four-channel receivers that measure magnitude and phase of frequency conversion devices. They can operate with two source signals and the receiver signal, all at different frequencies and controlled from the VNA front panel.

These test sets can be configured by the user to address a wide variety of applications. Information pertaining to the operation of these test sets is provided in Appendix A, at the rear of this manual.

8-3 FUNCTIONAL DESCRIPTION

The 3630A and 3631A Test Sets (Figure 8-1, page 8-7) are similar in construction and operation. The 3631A differs only by having an additional front end frequency multiplier for its higher frequency operation to 60 GHz. Figure 8-2, page 8-8, shows assembly locations.

Front End

The test sets receive RF energy from the source. This energy is divided. A portion goes to a step attenuator, then out to the RF OUT port. Another portion goes out to the SOURCE LOCK OUT port. The device-under-test (DUT) uses these two signals and returns the Test A/B (T_A and T_B) and Reference A/B (R_A and R_B) signals to the test set front panel ports.

First and Second IF Down Conversion

The test sets have two primary modes of operation: direct and heterodyne. The direct mode is for frequencies between 40 MHz and 270 MHz. The heterodyne mode is for frequencies from 270 MHz to 40 GHz.

In the direct mode, dual samplers A9T and A11T are like closed switches and send the test (T_A and T_B) and reference (R_A and R_B) signals to the buffer amplifiers A8T and A10T.

In the heterodyne mode, A9T and A11T switch either at the frequency of the first local oscillator (LO 1) or at harmonics of the first LO. The A5T First Local Oscillator PCB— controlled by the VNA — outputs a 357 MHz to 536.5 MHz LO frequency.

The first LO output goes to the A12T power amplifier assembly, where it is amplified to drive the harmonic generator. This produces the harmonic pulses necessary for heterodyning in the samplers.

The A12T first LO output goes to A9T and A11T, via the A25T RF splitter assembly. The switching action of a sampler causes a mixing of the first LO frequencies and the input signal (T_A, T_B, R_A, or R_B). This heterodyning action provides the desired intermediate frequency (IF) of 89 MHz ±4 MHz. The resultant first IF signals are input to buffer amplifiers A8T and A10T.

In the buffer amplifiers, the direct mode signal (40 MHz to 270 MHz) or first IF signal (89 MHz) is mixed with the second local oscillator (LO 2) signal. The A4T LO 2 PCB, which is controlled by the VNA, outputs an LO frequency in the range between 12.25 MHz and 272.25 MHz.

The heterodyning of the direct mode/first IF and second LO frequencies produces the desired second IF of 2.25 MHz. The buffer amplifier assemblies provide 0 dB conversion gain. The second IF test and reference signals (T_A, R_A, and R_B) from the A8T and A10T buffer amplifiers go to the A24T Source Lock/Reference Select assembly. The second IF test signal T_B — which is output by one half of the A8T buffer amplifier — goes directly to the A1T Channel B IF Amplifier.

Source Lock/ Reference Signal Selection

The A24T Source Lock/Reference Select assembly (also referred to as the LRL Module), contains switches for selecting the desired second IF signal source for the A2T Reference Channel IF Amplifier, the A3T Channel A IF Amplifier, and the VNA Source Lock circuitry.

The A24T switches are controlled by the VNA through the A6T Digital Interface PCB. The second IF signal source for the A2T Reference Channel IF Amplifier is either R_A or R_B. The second IF signal source for the A3T Channel IF Amplifier is either T_A or R_A. The second IF signal source for the VNA Source Lock circuitry is R_A for forward measurements and R_B for reverse measurements.

Third IF Down Conversion and Amplification

The A1T, A2T, and A3T Channel IF Amplifiers have two modes of operation — measurement (LO) and calibration (CAL). In the measurement mode, the second IF signal is mixed with the third local oscillator (LO 3) signal of 2⅓ MHz received from the VNA via the A16T Three-Way Power Divider.

The heterodyning of the second IF and third LO frequency produces the desired third IF of 83⅓ kHz. The third IF signal is then amplified as required by five gain-ranging amplifiers before being output to the VNA Synchronous Detector circuits. The gain-ranging amplifiers are controlled by the VNA, through the A6T Digital Interface PCB.

The VNA automatically places the Channel IF Amplifiers in the calibration mode every three minutes. In this mode, an 83⅓ kHz signal is received from the VNA via the A16T Three-Way Power Divider. This 83⅓ kHz calibration signal goes directly to the gain-ranging amplifiers. These amplifier are then automatically calibrated to assure optimum accuracy and predictability of the Channel IF Amplifier outputs.