1 Frequency Stabilization

This Word Document contains a Description of all circuitry and devices provided for determining and stabilizing frequency. For suppression of spurious radiation and limiting power,

The R/T 1601 uses a coaxial magnetron to generate the Radiated/ transmitted signal . the magnetron is a single frequency device that when energized transmits a unique frequency. Transmit frequency control is as follows:

1.1 MODULATOR

Two separate line type modulators are contained in the R-T unit. One operates at a PRF of 1536 Hz and is used for ranges of 10 NM or less in Search-one and Search-two operation; the other operates at a PRF of 200 Hz and is used in all other modes of operation. Each modulator produces a negative going, 330 volts at 110 amps pulse. The 200-Hz pulse is 2.35-microsecond wide; the 1536-Hz pulse is 0.2-microseconds wide. Depending upon the operating mode selected at the radar indicator, a trigger pulse is supplied to either the 200-Hz modulator or the 1536-Hz modulator The selected modulator generates the proper output pulse, which is applied through a pulse transformer T1 on the main frame to the cathode of the magnetron, driving the magnetron into oscillation.

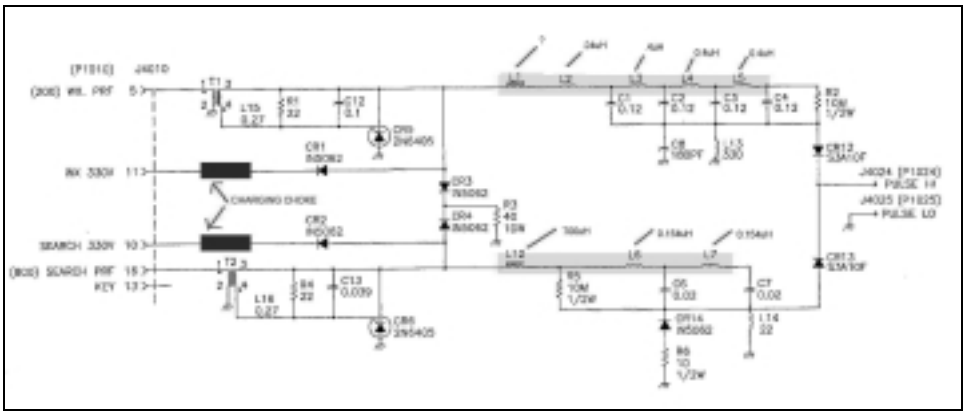

Figure 1-1 Modulator Schematic

Since the two modulators are nearly identical in operation, only the 200-Hz circuit need be described. Refer to Figure 1-1.

The 200-Hz modulator consists of two stages; a pulse-forming network, with switching-SCR CR5, and a negative 330-volt charging network. The pulse-forming network consists of L1, capacitors C1 through C4, and coils L2 through L5. Negative 330 volts from the power supply is applied through a charging choke (L)on the main frame, to the modulator. The current from the charging choke (L)passes through CR1 and L1 and enables the pulse-forming network to charge to approximately twice the input voltage (approximately –660 volts). Upon application of the

200-Hz PRF, trigger pulse through T1, SCR CR5 fires. This discharges the pulse-forming network through the SCR, via diode CR12 and pulse transformer T1 into the magnetron , to produce the 10 kW, 9375 MHz magnetron output. Resistor R3 and diode CR3 provide a rapid discharge path for positive kick-back current produced after the discharge of the pulse-forming network..

A cycle is thus completed and one magnetron pulse is produced. On each successive modulator trigger pulse another 2.35-microsecond, negative 330 volt, 110-ampere pulse is applied to pulse transformer T1, to produce another magnetron output pulse. The relationships for the 1536-Hz modulator are similar except the elapsed times are shorter.

1.2 COAXIAL MAGNETRON

The coaxial magnetron is a single-cavity oscillator with an operating frequency of 9375 MHz. the 5.5 kV, 4.5 A pulse from the secondary of pulse transformer T1 is applied to the cathode of the strapped vane magnetron. This drives the magnetron into oscillations producing a 9375 MHz, 10 kW nominal peak power output signal. The magnetron in the RT-1601 is tunable and operates at 9375±5 MHz, a requirement for beacon mode operation.

Additional details are found in Sub-folder 8-Operational Description it contains the word document MAINTMANSECT1.doc. This document provides a detailed description on how the R/T works and a block diagram functional Discussion of the R/T's Circuits.

1.3 RF FILTER

The nature of the magnetron is so that moding effects produce spurs of unwanted oscillations on the output signal. The RDR-1601 produces noise spurs at about 9680 MHz. These spurs are out of the allowed transmit band for the radar, and are above the permitted levels allowed by the FCC. A filter is used to suppress the spurious noise signals from the magnetron. The filter reduces these spurs by about 30dB, bringing the spurs under 60dB below the peak of the carrier. The total transmit power was reduced .45dB due to the filter's insertion loss.

For aircraft installation the filter may be installed anywhere in the wave guide run between the RT and the antenna. For more information refer to the installation manual.