 7309

3 November 1964

GLASS HOUSE MODIFICATIONS
MODE C

1. GENERAL.

It is proposed that an extended capability, hereafter referred to as Mode C, be added to the two GLASS HOUSE systems now being modified. This added capability will allow accurate measurement of the power levels and frequencies of signals received by the system. The accuracy goals for the system will be better than ±3 db relative power level measurement, better than ±6 db absolute power level measurement, and frequency accuracy to better than ±150 kc.

1.1 System Details.

A block diagram which shows Mode C and its relation to Modes A and B is shown in Figure 1.

1.1.1 Power Splitting.

Mode C uses a number of common components of Mode A and is capable of simultaneous operation with Mode B. When Mode C is energized, the components of Mode A which have high power drain(signal modifier unit, 2 watt transmitter, and 10 watt power amp) are turned off to conserve power.

The input RF for Mode C is derived from a 15 db directional coupler which allows simultaneous operation with Mode B with minimum loss of sensitivity to Mode B. When Mode A is operated, the -15 db leg of the directional coupler will be opened with a diode switch to avoid shunting of the antenna by the 50 ohm impedance of the directional coupler. Including the directional coupler loss, the typical Mode B system noise figure is 8 db or less referred to the antenna input terminal. Mode C system sensitivity will be on the order of -100 dbm with an equivalent noise figure of 22 db. This is considered more than adequate for the intended application.

1.1.2 Tuning Generator.

Mode C uses the Mode A tunable preselector, RF head, mixer, and local oscillator. The Mode A tuning generator will be redesigned to provide 256 equal frequency steps for Mode C and 128 steps for Mode A. Each 20 Mc sweep will be accomplished in 10 seconds for Mode C and 5 seconds for Mode A. The timing source for the new tuning generator will be derived from the 25 kc crystal reference oscillator to allow exact reconstruction of the frequency sweep during data analysis. The sweep linearization circuitry will be redesigned to provide a more linear sweep to allow the desired frequency resolution.

1.1.3 Log IF and IF Attenuator.

The 21.4-Mc IF from the Mode A mixer will be sent through a crystal filter with 120-kc bandwidth to achieve the desired frequency resolution. A Log IF amplifier will follow the crystal filter. This amplifier will compress a 30 db input range into a 20 db output range. The output will be made nearly linear in db (i.e., 1.5 db in = 1.0 db out) to retain resolution for data analysis. A 30 db attenuator which precedes the IF amplifier will be switched in and out on alternate frequency sweeps. This will provide a total power handling range of 60 db above the -100 dbm system noise level. Thus, signals which saturate the IF amplifier with 0 db attenuation will be measurable on the next sweep when the 30 db attenuation will be in the line.

1.1.4 Detectors and Reference Tone.

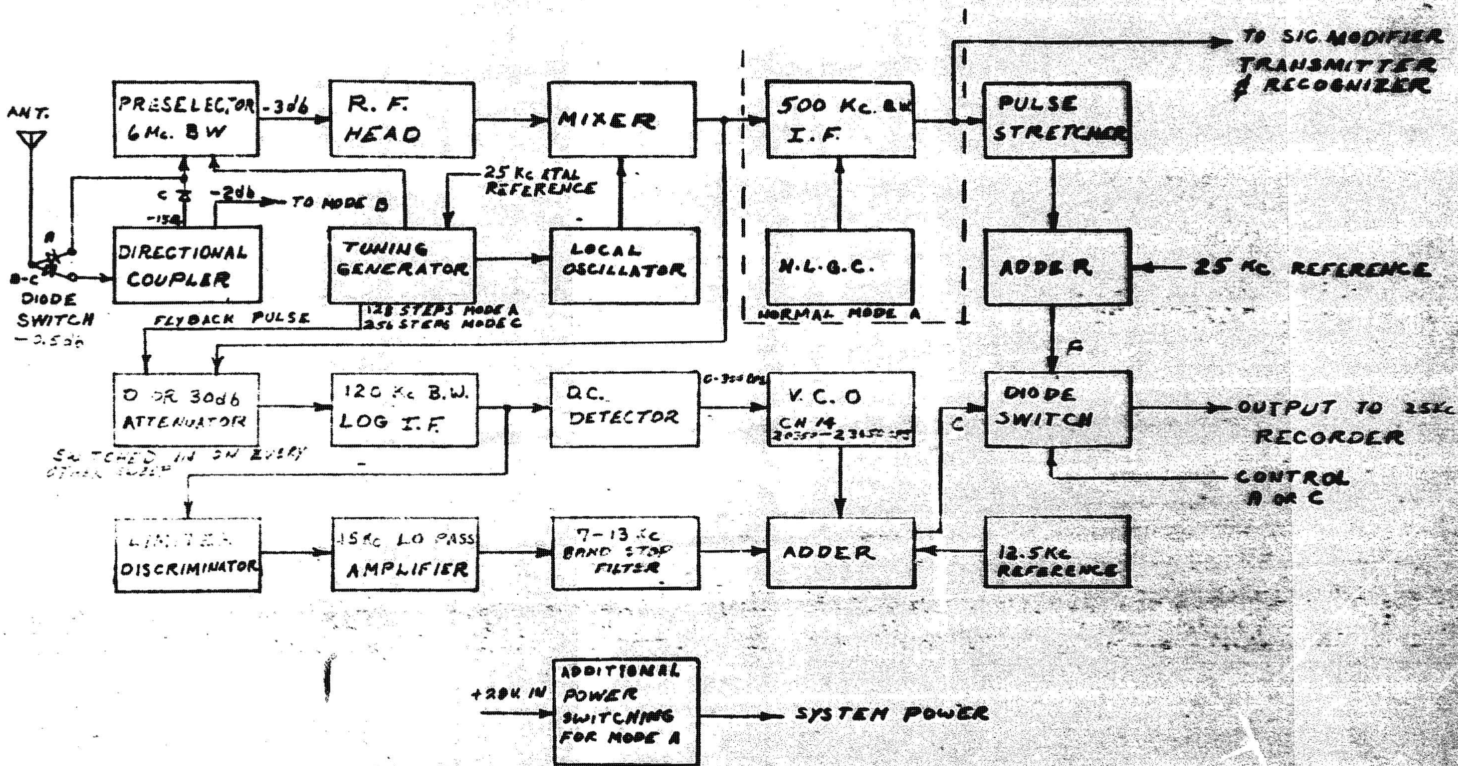
A detector on the IF output will provide signal amplitude information which will be used to modulate an IRIG channel 14 voltage controlled oscillator. A discriminator on the same IF output will provide FM detection and a video output from 100 cps to 15 kc. A band reject filter from 7 to 13 kc in this video output will help to minimize beats between the video and the reference tone which might be in the range of the VCO. A 12.5 kc reference tone will be derived from the existing 25 kc reference oscillator and added to the VCO output and the discriminator video output. The combined output will be sent through a diode switch to the recorder.

1.1.5 Additional Modifications.

Solid-state power and control switching will be provided to accomplish the transition between Modes A and C. Mode A will operate when +28 v power is supplied on two separate lines. Mode C will operate when power is removed from the appropriate one of the two lines.

Two additional crystal controlled frequencies will be added to the Mode A calibration generator to provide an accurate frequency calibration for Mode C. The three frequencies will be turned on sequentially at 5 minute intervals.

The Mode A DC-DC converter will be redesigned to supply the added power drain of the additional circuitry.



GLASS HOUSE POWER MEASUREMENT
MODE C