Exhibit 8: Operational Description

External Radio Frequency Power Amplifier ACOM 2100

Model 2100

Operational Description

The ACOM2100 is a complete and self-contained linear amplifier that covers the amateur band 1.8-54MHz and provides 1500W-output power with 50 to 85W exciter drive. It is based on and is very similar to our previous model ACOM1500 (FCC ID: X8NX8NAA1500) but the HV power transformer has been replaced by a more powerful one in order to be capable of continuous carrier operation at the rated power (1500W). The plate DC voltage is increased to 3000V to improve the plate efficiency and reduce the heat dissipation at the same time.

Amplifier's tuning is simplified by a plate-load True Resistance Indicator (TRI) which helps the operator to quickly and precisely match antennas and eliminates probability of inadvertent mistune. The antenna impedance matching capability is up to VSWR 3:1 or higher. A fixed matching circuit to the tubes input is employed which results in a very good load to the exciter over the entire frequency band from 1.8 to 54MHz, yielding a good linearity.

Look at the schematic diagram (Exhibit 3). The high-performance ceramic-metal radial beam tetrode V1, type 4CX1000A, with a plate dissipation of 1000W, is grid-driven. It can dissipate up to 1000W when forced air cooled and is specifically designed for class AB1 RF linear amplifiers. The input signal from the RF INPUT jack is passed through a broadband input matching circuit, which comprises some components in the INPUT1, INPUT2, and INPU3 PCBs and a 30 Ohm/100W RF swamping resistor (Rsw). This circuit tunes out the tube input capacitance. The swamping resistor Rsw is not an attenuator but it is a termination load for this circuit. It could not be eliminated since a severe impedance mismatch to the driver would prevent using the amplifier at all.
Cathode resistors Rc create DC and RF negative feedback, thus stabilizing the gain and equalizing the frequency response. The varistor VSsg in the screen grid circuit protects the tube and the screen grid voltage regulator in the events of an internal tube flashover.

The nominal voltages and currents of the tube at rated output power are as follows:

- plate DC voltage: 3000V;
- plate DC current: 0.88A;
- screen grid DC voltage: 325V;
- screen grid DC current: 35mA;
- control grid bias DC voltage: -55 ... -66V, adjusted individually for 250mA idling plate current.

The combination LpI-RpI in the plate circuit is a VHF/UHF parasitic suppressor. DC plate voltage is fed through chokes RFCI-RFC2 and the capacitor Cb3 blocks it from the output. The output circuit comprises LPI, LP2, LL, CPI-CP3, and CLI-CL3 which form a classic Pi-L network and suppress the harmonic frequency emissions. This tank is switched and tuned over the bands by the band switch SIA-SIC and the air variable capacitors CPI, 2 and CLI, 2. The output signal is fed through an additional VHF low-pass filter for frequencies above 55MHz (LfI, Lf2 and Cf). Then it is passed through the vacuum antenna relay KI, wattmeter current transformer TAI, and a high-pass filter RFCasw-Casw for frequencies below I00kHz, to the antenna switch and the three outputs. The chokes RFC3 and RFCasw keep track of the antenna relay contact conditions and together with Casw prevent the plate supply from reaching the antenna. RFCasw shunts the high voltage to ground should the DC blocking capacitor Cb3 fail. The resistor Rasw protects the amplifier from charging Electro-static energy fed by the antenna.

The PLATE CAPACITIVE DIVIDER and RF WATTMETER are the main sources of information for the control circuit of the amplifier during the antenna impedance matching process. The control circuit is based on the 80C552 micro-controller from Philips which uses a 16MHz quartz crystal clock.

All suupply voltages are delivered from the MAINS&LOW VOLTAGE and HIGH VOLTAGE SUPPLY PCBs. The control grid, screen grid, and plate currents, as well as the plate cooling airflow temperature, reflected power etc. are permanently monitored by the micro-controller. Many software-derived protections are based on this information.