ACOM International, Inc.

Exhibit 8: Operational Description

External Radio Frequency Power Amplifier ACOM 1010

Model 1010

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Operational Description

The ACOM1010 is a complete and self-contained linear amplifier that covers the amateur band 1.8-29.7MHz and provides 700W-output power with typically 60W-exciter drive. It is based on and similar to our previous model ACOM1000 (FCC ID: OITA1000) but lower power and without the six meters band.

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 tube input is employed which results in a very good load to the exciter over the entire frequency band from 1.8 to 29.7MHz, yielding a good linearity.

Look at the schematic diagram (Exhibit 3). The high-performance ceramic-metal tetrode V1, type 4CX800A (GU74B) from SVETLANA, with a plate dissipation of 800W, is grid-driven. The input signal is fed through the fixed input-matching circuit, which comprises several L/C components and a 50 Ohm/100W RF swamping resistor (Rsw) in the INPUT PCB. This circuit tunes out the input capacitance of the tube. The swamping resistor is not an attenuator but it is a termination load for the input matching circuit. It could not be eliminated since a severe impedance mismatch to the driver would prevent using the amplifier at all.

The ceramic-composite resistors Rc.1 and Rc.2 create a DC and RF negative feedback in the cathode circuit, thus stabilizing the gain and equalizing the tube specimen performance. The varistor VSsg in the screen grid circuit protects the tube screen grid and the voltage regulator in the events of dynatron effect or a tube internal flashover.

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

DC plate voltage: 2300V for SSB and 2000V for RTTY;
DC plate current: 0.48A for SSB and 0.42A for RTTY;
DC screen voltage: 265V;
DC screen current: 30mA;
DC grid bias: -48V (adjusted individually for idling plate current).

The combination of Lp1/Rp1 in the plate circuit suppresses possible VHF/UHF parasitic generation. The output resonant circuit comprises the tube output capacitance, Lp1, CP1, CP2, CP3, LP1, LP2, CL1, CL2, CL3, CL4, and LL, all connected in a double-Pi-L network. It transforms the antenna impedance to the tube-optimum load impedance, and besides suppresses the harmonic frequency emissions. The tank is tuned over the bands and the impedance matching is controlled by the ceramic-supported air variable capacitors CP1, CP2, CL1, and CL2. The DC plate voltage is fed through the plate-choke RFC1 to the anode, in a parallel circuit with the tank. The series capacitors Cb3.1 and Cb3.2 prevent the DC voltage from reaching the resonant tank and/or amplifier's output, while the low-pass filter Cb1.1/Cb1.2/RFC2/Cb2 prevents the RF voltage from reaching the DC power source.

The output signal is fed through a piece of coaxial cable, to the "RF OUTPUT" connector through the wattmeter. A high-pass filter at the output (integrated with the wattmeter) eliminates the influence of eventual close-sited powerful LF/MF transmitters as well as 50/60Hz power lines on the amplifier. Also, it prevents DC high voltage from reaching the antenna output, thus improving operator's safety.

The amplifier is controlled by a microprocessor system, based on the ATmega micro-controller from Atmel. It uses a 4MHz clock, stabilized by a piezo-ceramic resonator. An intended constructive capacitance Ca feeds information from the plate RF voltage. Together with the directional RF wattmeter at the output, they are the main information sources for the control circuit to form the TRI aid during the antenna impedance matching process. The relay K1 0n the wattmeter PCB switches the antenna for transmit and receive. The relay K2 on the same PCB selects two different antenna outputs A1 and A2.

All supply voltages are delivered from conventional rectifiers and linear regulators and no switching supplies are used. The currents of the tube control grid, screen grid, and plate, as well as the forward and reflected power, the alternative anode voltage etc are continuously monitored by the uP controller. Many software-derived protections are based on this information in order to insure normal tube regime and antenna tuning, thus drastically reducing the probability of any inadvertent operator's mistakes or apparatus irregularities that could arise during exploitation of the amplifier.