Exhibit 8: Operational Description

External Radio Frequency Power Amplifier ACOM 600S

Model 600S

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Operational Description

7-3.Simplified schematic diagram; theory of operation

a) Power Amplifier Module.

See Fig. 7-1 – ACOM 600S Simplified Schematic Diagram.

The "heart" of the power amplifier module comprises two pieces of dual N-channel field-effect (LDMOS) transistors (Q101-Q101A and Q102-Q102A) type MRFE6VP6300H. The pair of transistors in each housing is paralleled, and the two housings operate in a push-pull configuration with a common grounded source. In order to provide minimum intermodulation distortions (IMD), the transistors operate in a linear AB class.

The manufacturer (Freescale Semiconductor) guaranties their endurance to mismatch with an arbitrary phase and SWR up to 65:1. Besides this, each device is capable to dissipate 300W (total 600W) heat power in a continuous carrier mode. These transistors have excellent temperature conductivity which allows the amplifier to operate in continuous carrier mode with only 30% of their maximum allowed heat load. This guarantees the high reliability of the amplifier.

The input signal enters connector J403 (RF INPUT), passes through the contacts of the input relay on the Wattmeter board (turned in transmit – upwards the schematic diagram) and through connectors J405 and J101, reaches the input attenuator ATT101 (10 dB). Besides reducing the input signal level to the gates, the attenuator provides a significant improvement of the input SWR toward the transceiver.

From the attenuator output, the input signal is passed on to a balanced broadband matching circuit comprising the transformer T101 and several R-L-C networks which compensate the input capacitance of the transistors through the whole frequency range and provides two driving voltages for the transistors gates with equal amplitude but 180º out of phase (in anti-phase).

The balanced choke/transformer T102 in the power supply, through its two main windings T102 and T102B feeds DC supply voltage +50V from Power Supply Unit (connectors J103 and J104), to the drains of the transistors Q101 and Q102 (the Power Supply Unit is described in (c) below).

The choke/transformer T102 contains yet one – third winding – T102A, which serves for creation of a local negative feed back. Through the R-L-C networks R113-114, L105-106, and C115-116, it returns a small part of the output voltage toward the gates of the transistors, but in anti-phase. It not only flattens the amplifier frequency response through the operating frequency range, but also guarantees the amplifier parameters irrespective of possible transistor tolerances.

The signal amplified by the transistors Q101 and Q102 is transferred from their drains through the matching transformers T103–T103B, balun transformer T104, and connector J102, through connector J301 toward the Filters unit input.

The Filters unit serves to provide the necessary harmonics and parasitic suppression in the output signal. It allows the signal of the main operating frequency to pass to its output (connector J302) and at the same time suppresses the signals with second and all higher harmonic frequencies (which are normally generated by the final transistors). For covering the whole operating frequency range, the Filters unit includes eight separate low-pass filters, one

of which is selected by switching of several relays, controlled by the Control unit (described in (b) below) depending on the current operating frequency band.

For a correct selection of the necessary filter, a small part of the input signal is diverted through connectors J405 – J504 to be fed to the Control unit frequency counter input. According to the measured frequency or the commands coming through the CAT/AUX or the RS232 interfaces, the Control unit selects the necessary filter through the relay-coils control signals fed via connectors J503-J303.

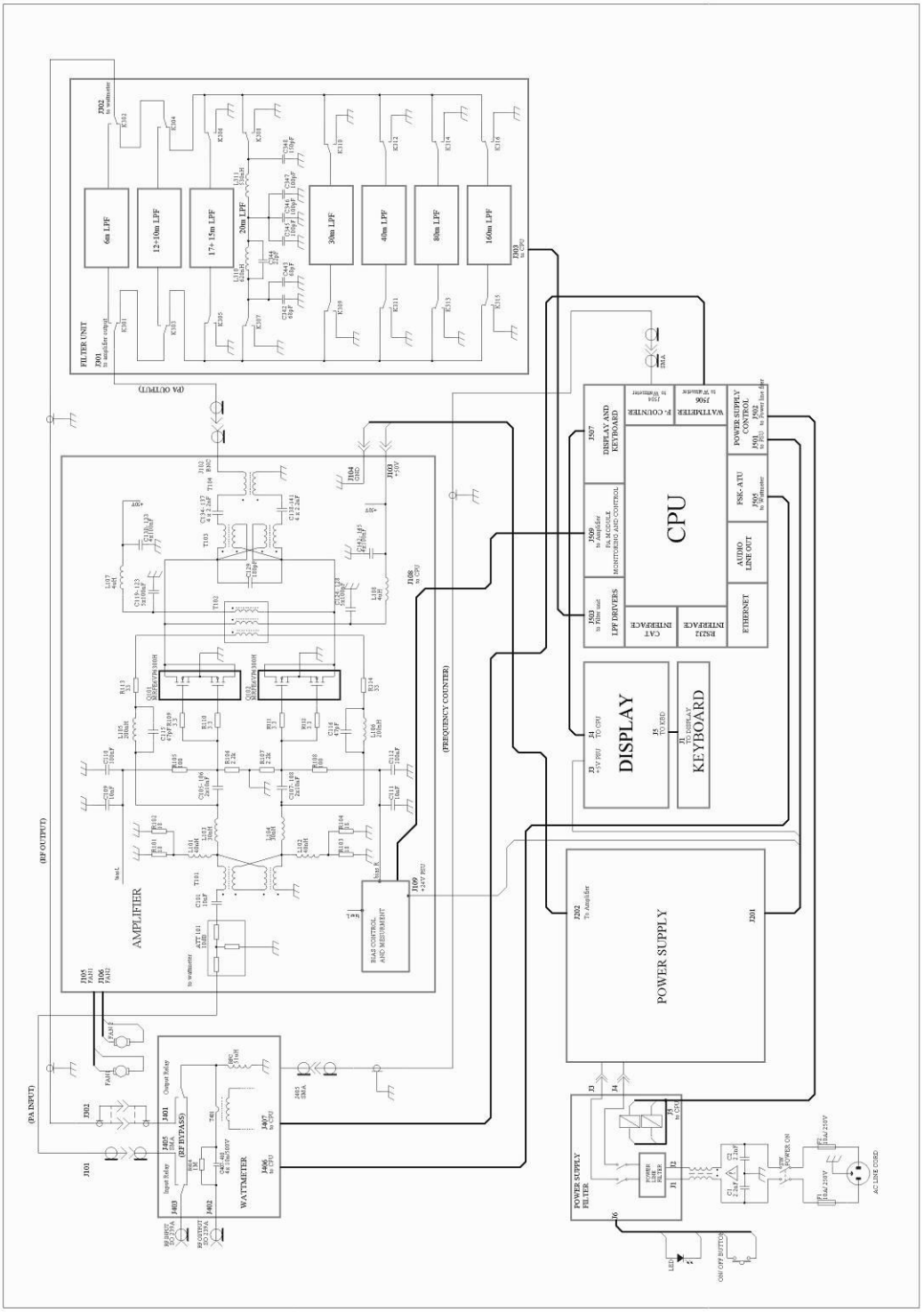

Fig. 7-1 ACOM 600S Simplified Schematic Diagram

From The Filters unit output (connector J302) and through connector J401, and the output relay contacts (located on the Wattmeter PCB), the amplified and filtered signal reaches the amplifier output - J402.

The Wattmeter unit is based on a bridge circuit which comprises the current transformer T401 and some other components (not shown in the block diagram). It measures the forward and the reflected power at the amplifier output and feeds information to the Control unit for indication and development of the protection functions of the amplifier.

The DC bias voltages for the gates of the final transistors are produced by the “Bias control and Measurement” circuit. In the Technical compact disk (CD – option to the amplifier) is given a procedure for adjusting the idling current of the transistors.

b) The Control unit of the amplifier is based on a digital signal processor (DSP) manufactured by MICROCHIP. The Control unit implements the following functions:

- controls the operating modes: Stand-by, Operate/RX, Operate/TX etc.;

- measures and monitors the analogue and digital signals in the amplifier;

- protects the amplifier from overloading and the critical regimes at wrong operation or abnormal ambient conditions;

- files in the amplifier nonvolatile memory a log of the last 28 switching offs type “serious failure” (HARD FAULT) and the amplifier parameters registered at the moment of faults rise. They can be visualized or downloaded in a plain-text format file by the operator’s wish;

- by means of the system interfaces the Control unit monitors the staus and controls the operation of all modules in the amplifier: display and keyboard, frequency counter, wattmeter, power supply unit, FSK/ATU (for control of external Automatic Antenna Tuner or Antenna Selector from ACOM – ready for a future development), Power Amplifier Module (PAM), and low-pass filters unit (LPF).

The user interfaces of the Control unit allow connection with additional external devices:

- CAT/AUX interface for connection with various transceivers;

- RS232 interface for connection with computer or Remote Control Unit.

In order to facilitate the diagnostics of possible failure, after which the amplifier modules should not be powered before the failure has been repaired, a special regime is designed. By means of a low power DC external source only the Control unit can be powered, so that the data from its nonvolatile memory can be downloaded and saved in a computer plain-text format file for further analysis and troubleshooting (the FAULTS LOG with the history of the last 28 protection trips of the type HARD FAULT). See also Sections 4-6(c), 5-5, and 7-4.

c) Power Supply Unit

The main power switch (POWER ON) is located on the rear panel of the amplifier. It interrupts the mains cable right after the main fuses and cuts off supply to all internal circuits. When switched ON it starts only an extra- low-power DC-DC converter providing the Low Energy (waiting) mode of the power supply with a negligible consumption (below 1VA). There are 3 ways to further activate the amplifier in the working mode:

- locally (manually) – by pressing the “ON-OFF” button on the front panel (Fig. 3-1) for 1-2s;

- remotely - by applying a low-power DC voltage pulse to the “ON_RMT” line: +3 to +6V towards ground for 1-2s – see S. 2-4(a); this line is brought to connector

CAT/AUX pin 11 and its consumption varies from 5 to 20mA depending on the input voltage value (between +3 and +6V is admissible);

- remotely – by the serial RS232 interface – through the simultaneous activation of the RTS and DTR hand-shake signals for 1-2s (normally they do not overlap while they serve for control of the serial data flows exchange).

Irrespective of how the amplifier has been activated, it can be de-activated - returned to the Low Energy (waiting) mode of the power supply - in any of the above three ways (but use “OFF” command by the RS232 interface). At tripping a protection of the HARD FAULT type, the amplifier is self-protected, returning to the same Low Energy (waiting) mode of the power supply with a consumption below 1VA.

The Power Supply Unit (PSU) consists of two main assemblies:

- a rectifier and switching mode stage, not insulated from the mains; they provide a preliminary regulation at 390V and power factor correction (PFC); the latter serves to minimize the mains-frequency harmonics currents, ensuring a high power factor of the consumed current, and also limiting the start-up mains current;

- mains-separated switching mode converter “390/50V” which supplies the power amplifier module with +50V, insulated from the mains and regulated DC voltage; this is the main power supply of the amplifier and it is protected against excessive consumption over 1200W; it is controllable ON and OFF with a logic signal from the Control unit in the amplifier Operate and Stand-by modes respectively.

In addition to the low-power and the main (+50V/1200W) power supplies, the PSU produces also three auxiliary voltages:

- +13V DC voltage (non-insulated from the mains) for primary turning on and supporting the “PFC control" assembly in the Power Supply unit;

- +5V DC voltage, insulated from the mains, for power supply of the Control unit, the low-power circuits in the Power amplifier module, Filters, and Wattmeter units of the amplifier;

- +26V DC voltage, insulated from the mains - this is the operating voltage for the relays, fans, and other low-power circuits in the amplifier.

Very efficient symmetrical L-C filters are placed at the input and output of the power supply unit. They suppress the interferences in the radio frequency spectrum, providing perfect electromagnetic compatibility (EMC) with both receivers and transmitters in the shack, exceeding the worldwide adopted standards. They also give the power supply an extra resistance against external interferences propagating along the power network.