RM Costruzioni Elettroniche S.n.c.
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Servizio Tecnico / Technical Service

Object: HLA 305 Overview of circuit operation.

OFF State: (S5 Position OFF)
RF enters RTX connector and is taken directly via RL1 to ANT output connector.

On State:
RF enters RTX connector and is sampled from T8. This sampled signal is rectified and used to switch on Tr2, (RF operated switch), that switches the relay RL1 to transmit state and switches on DC supply to the bias circuit, (see below). RF is then passed through ATT1 to reduce the input power by 4dB. Power is then split equally to the input of each push-pull amplifier section via T1. The outputs are then recombined with the output combiner T6. Each section of the amplifier consists of a Push-Pull pair, (Tr7,8 and Tr9,10), of transistors. The output is passed to a 5 pole Cauer output filter for each band, (from L9 to L20). The output then passes through the directional coupler (T7) where forward and reflected power is sampled. The RF output then passes via RL1 to the ANT output connector.
If the external PTT connector, is utilized and the amplifier in switched on, (S5 ON), the amplifier may be manually or automatically switched (by the drive radio or manually by user) to transmission state by the grounding of this connector.

Bias Circuit:
This consists of IC10 and associated components. It provides a stabilized and temperature compensated output. Temperature compensation is taken from D12 positioned on the case of TR10. Bias voltage is adjusted via Trim 3 to preset quiescent collector current .

Microprocessor:
IC3 (PIC18F46K20) operates on its internally generated clock (16MHz) and receives a 3,3VDC regulated supply from IC5. The MCU monitors input power, output power, input current, reflected power via the ADC inputs from the sample and hold circuit IC4,IC12 and heat-sink temperature from NTC 1.
The MCU controls the operation of the front panel mounted LCD display and adjusts the temperature controlled speed of the heat-sink mounted cooling fans if fitted.
The MCU is also used to block the operation of the amplifier if any of the input signals are outside of preset limits. For example; Excessive input power, Excessive Load VSWR, Excessive temperature and out of frequency range. The amplifier is shutdown by disabling the bias supply and opening both RL1 relay to bypass the amplifier. The error is signaled by a message on the display for the corresponding error an audible error tone via B1 and illumination of the warning LED (LED19), on the front panel. The amplifier must be reset by a power cycle to resume operation. Tr5 buffers the MCU output for fan control, buzzer signal to B1 and
Bias/Relay cut off via Tr3 which latches on pulling the relay and bias supply switching transistor input (Tr2), to ground disabling the amplifier.
The MCU may receive updated firmware by either connection of the corresponding in circuit programmer via J2 or via Conn3 with a Personal Computer and associated boot loader application via serial interface and an external RS232 level converter.

Input power:
T8 and associated components sample the incoming RF and generate a DC voltage from IC9 that is passed to the sample and hold circuit IC4,IC12.

Output Power:
Is sampled from the directional coupler (T7) DC output is then
passed to the sample and hold circuit (IC4, IC12)

Load VSWR:
Reflected power sampled from the directional coupler (T7) DC output is then passed to the sample and hold circuit (IC4,IC12). VSWR is calculated within the MCU.

Heatsink Temperature:
NTC1 provides the temperature signal connected directly to the MCU (IC3).

DC Power connector Conn1:
+13.6VDC supply is connected via Conn1. Reverse polarity protection is provided by D29,30&31 and the input is fused with FUSE5,6&7, (max 45A input). The fused input supply is connected directly to the Collector of TR7,8,9&10 via suitable RF chokes L7,8,28&29. A switched supply is taken via the front panel switch S5 to provide DC supply to the RF relay RL1 the bias supply, MCU supply and associated ancillary circuits.
With S5 in the OFF position the amplifier will not operate and if connected into the RF line will simply bypass the RF via the two rear connectors RTX and ANT.

Front Panel:
This contains S5 main ON/OFF switch, as mentioned above, S7 SSB/AM switch. S7 set to SSB adds an additional 1-2second delay to the release time of RL1 when the RF signal is zero to avoid relay chatter in single sideband (no RF carrier) voice transmissions.
S6 switch provides to set operative band or automatic mode.
S8 operate on input attenuator.
LCD Display, 2x16 line display which provides user information about current status and temperature. The LCD display is also used to indicate any of the error conditions, Excessive input >15W, Excessive load VSWR >2.5, Excessive heat-sink temperature.