

## 6. TECHNICAL DESCRIPTION

### 6.1 Control Unit

The Control Unit contains a loudspeaker, two printed circuit boards, Control Board 600 and Audio Processing Board 601 and a membrane keyboard. In addition an optional Squelch Board 602 and an optional Line Transformer Board 603 may be installed. It furthermore contains connections for handset, headphones, extension speaker, morse-key and telex-equipment. The Block Diagram of the Control Unit illustrates the functions of each circuit board while the Interconnection Diagram shows the interconnections between the boards (see chapter 8 for diagrams). The Control Unit is housed in a Moryl (PPO) cabinet suitable for tabletop or bulkhead mounting. The front panel can be tilted for convenient operation when the unit is mounted vertically as well as horizontally.

### 6.2 Transceiver Unit

The Rx/Tx Assembly of the Transceiver Unit contains the Receiver Signal Path 618, the Exciter Signal Path 619, a Master Oscillator 612 (or 613, 614) and two Synthesizer Boards 611, one controlling the receiver the other controlling the exciter. These boards are located in the lower door of the unit. The cabinet itself contains a Switched Mode Power Supply which converts the battery voltage to a stabilized 48 V voltage supplying the Power Amplifier and the Voltage Converter Board 621. The Voltage Converter produces various supply voltages necessary in the equipment and provides galvanic isolation from the battery. Supply voltages, signal and control voltages are distributed via the Interconnection Board 620 to external units and to the Transceiver Control Board 624 which performs the central control of the Transceiver Unit. The exciter output signal from the Rx/Tx Assembly is routed to the Power Amplifier Board 626 the output from which is filtered by the harmonic filters on P.A. Filters 627 (or 628, 629).

### 6.3 Antenna Tuning Unit

The ATU consists of a Tuning Network, a Measuring System and a Microprocessor Part. During the tune sequence a 6 dB Attenuator is switched in to keep the load of the Power Amplifier at approx. 50 ohms. The MPU will set up the Tuning Network to give the best obtainable SWR, on basis of the measuring system. The Tuning Network comprises Capacitor Bank I, Capacitor Bank II and an Inductor Bank. With these it is possible to form either an L or a pi matching network. The capacitor Banks and the Inductor Bank are built up by binary related capacitors respectively binary related coils. The setting of the Capacitors and Coils is accomplished by relays.

## 6.4 AC Power Supply Unit

The P 8250 is a combined AC/DC Power Supply especially developed for powering the TRP 8250 Series. The input power for P 8250 is AC, and the output is an unregulated 32 V DC voltage. Where a battery is required as a reserve source of electrical energy to the radiotelephone equipment, it can be connected via the P 8250 power supply. By means of the switch on the front panel it is possible to select between AC or Battery operation.

## 6.5 ALC and Protection system

**6.5.1 Automatic Level Control (ALC)** The Transceiver Unit has an advanced microprocessor controlled automatic level system, which ensures that the optimum power is delivered to the Antenna Tuning Unit. The Tune Sequence, which is initiated either by pressing TUNE on the Control Unit front panel or by keying the transmitter after a frequency change has been carried out, is terminated by a CW pulse of full power with a duration of 70 ms. The signal level at the output of the Transceiver Unit is measured by means of a voltage and current peak-detector placed at the output of the P.A. Filter Assembly 627, 628 or 629. The detector voltage (9.0 V at 250 W output power) is applied to the Transceiver Control Board 624, PL3-9 (FILPEAK), and compared with the output voltage (8.62 V) of the "SETPPOINT REGISTER" in IC42-3,2. The error signal ALC is fed to the Exciter Signal Path 619, PL1-12 driving a voltage controlled attenuator placed in the exciter signal path. Finally the ALC voltage is compared in IC42-5,6 with a ramp voltage generated by the "ALCHOLD REGISTER" and the corresponding DAC (IC24). When the two voltages equals, the ramp is stopped and switch IC44-10,11 is closed. The ALC voltage is now constant generated by the "ALCHOLD REGISTER" and thereby the gain of the Transmitter Signal Path is independent of the modulating signal. When MEDIUM POWER is selected, the ALC voltage generated by the "ALCHOLD REGISTER" is increased by 0.93 V. In LOW POWER a 14 dB attenuator placed on the Power Amplifier Assembly 626 controlled by PAATT is activated and the ALC voltage is equal to the Full Power preset value.

### 6.5.2 Protection Circuits

**6.5.2.1 Power Amplifier Protection** The Power Amplifier Protection can be divided into two main groups, SWR protection and thermal protection. The SWR protection contains a reflected power and output voltage detector placed at the output of the Power Amplifier Assembly 626. The output of the detector (PAPEAK) is connected to the Transceiver Control Board 624, PL2-7 and is OR'ed together with the FILPEAK voltage from the P.A. Filter Assembly 627, 628 or 629. Now, if the SWR at the output of the Power Amplifier Assembly 626 increases during a transmission an error voltage is generated at IC42-1 exceeding the voltage generated by the "ALCHOLD REGISTER" thereby increasing the ALC voltage and reducing the output power within 1 ms to a permissible level. The output of the reflected power and output voltage detector is also used to make an independent local protection of the Power Amplifier by activating the 14 dB attenuator if the detector voltage exceeds 10 V. This ensures fully protection of the Power Amplifier if the ALC loop should be faulty or disconnected. To reset the attenuator it is necessary to turn off

the main power of the Transceiver in a few seconds. The thermal protection consists of two thermostats mounted on the heatsink of the Power Amplifier Assembly and an average/peak power detector. One thermostat is activated if the heatsink temperature exceeds 100 deg. C. Thereby logical signal TC1 fed to the Transceiver Control Board 624 , PL2-5 goes low and the output power is reduced by 5 dB. This is carried out by changing the reference voltage from the "SETPPOINT REGISTER" to 4.36 V and increasing the voltage from the "ALCHOLD REGISTER" by 0.82 V relative to the Full Power preset value. The other thermostat is activated if the temperature of the heatsink exceeds 110 deg. C. In this case the supply voltage to the preamplifier is cut off. The average power and the peak power are compared in IC41-3,2. If, in a Full Power transmission, the average power exceeds the peak power minus 3 dB, the logical signal at IC41-1 goes high. If this condition has been present during one minute, e.g. by transmitting CW with continuous key-down or broadcast mode telex, the output power will be reduced by 3 dB (SETPPOINT voltage 5.71 V, ALCHOLD voltage increased by 0.54 V relative to Full Power preset value). The power will recover to Full Power level when the transmitter has been muted during two minutes. To enable Full Power ARQ Telex Transmission the system accepts keying dutycycles less than 50 % and modulation rates greater than 3 baud without power reduction.

**6.5.2.2 ATU Protection** To protect the Antenna Tuning Unit against excess current, for instance if the antenna is shortcircuited , an average current detector is provided. The output of the detector IANTAVR is connected to the Transceiver Control Board 624 , PL4-14 and is OR'ed together with the FILPEAK voltage from the P.A. Filter Assembly 627 , 628 or 629 . Now, if the average current exceeds 6 A during a transmission an error voltage is generated at IC42-1 exceeding the voltage generated by the "ALCHOLD REGISTER" thereby increasing the ALC voltage and reducing the output power and thereby the average current. If the SWR at the input of the Antenna Tuning Unit exceeds 1:3 logical signal SWROK goes high and Power Display Annunciator on Control Unit front panel starts flashing informing the operator that a better antenna match might be obtained by carrying out a new Tune Sequence. To prevent overheating of the Antenna Tuning Unit a temperature sensor is incorporated. If the internal temperature of the Antenna Tuning Unit exceeds 85 deg. C, logical signal TCO goes low and the output power is reduced by 5 dB. (SETPPOINT voltage 4.36 V, ALCHOLD voltage increased by 0.82 V relative to Full Power preset value).

**6.5.2.3 Reduced Power-Indication** In case of 5 dB reduced power condition due to thermal protection the annunciator "Reduced Power" on the Control Unit front panel is lit. The annunciator "Reduced Power" will also turn on if the average power, in a full power transmission, exceeds the peak power minus 3 dB during one minute. In this condition the power is reduced by 3 dB.



