ATR500

P/N 500-(0XX)-(0XX)

P/N 500-(1XX)-(1XX)

VHF Communication Transceiver

Maintenance Manual

Dokument-Nr.: 01.125.010.13e
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List of Revisions

Revision	Date	Description of Change
1.0	20.11.2002	Initial release
2.0	30.08.2006	Review of Section 3
3.0	10.03.2007	General review
3.01	21.03.2007	Para. 3.5.6.2: Requirement changed to 1.3 VRMS to cover all HW change states

List of Service-Bulletins (SB)

ON RECEIPT OF SERVICE BULLETINS, INSERT SERVICE BULLETINS IN THE MANUAL, AND ENTER DATE INSERTED AND INITIALS.

SB Number	REV No.	Date	Insertion Date	Inserted by

CONTENTS

1 GENERAL

1.1 Introduction

This manual contains information relative to the maintenance of the VHF Communications Transceiver ATR500 manufactured by Filser Electronic GmbH .

For information relative to the installation and operation of the VHF Communications Transceiver ATR500 please refer to ATR500 Installation and Operation Manual. (Document Number 01.125.010.71)

1.2 Purpose of Equipment

The Filser ATR500 is a VHF communication transceiver covering the aeronautical radio frequency range from 118.000 MHz to 136.975 MHz with 720 channels at a channel spacing of 25 kHz.

The VHF Communication Transceiver ATR500 is designed to meet all operational requirements encountered in VFR and IFR flying. The ATR500 additionally provides a VOX activated intercom.

1.3 Design Features

1.3.1 Survey of Variants

Part Number	Description
P/N 500-(0XX)-(0XX)	External ON/OFF switch for display illumination
P/N 500-(1XX)-(1XX)	manually adjustable display illumination

1.3.2 Controls and Display

- On Off Switch
- Volume Control
- The display can show active frequency and a stand- by frequency..
- The unit is able to store 9 frequencies
- The operating frequency can be set into the active area or stored in memory.
- The unit has an intercom (IC) operation facility that has VOX capability. VOX is a voice level threshold-controlled switch used to activate intercommunication automatically when a crewmember starts to speak.
- Two Microphones and two Headphones and an additional speaker can be connected to the unit.

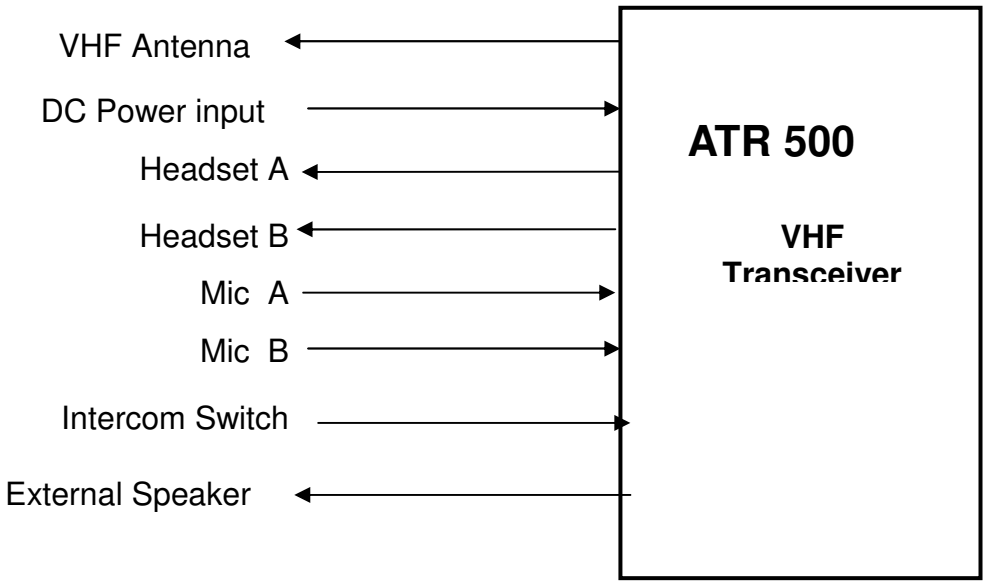
1.3.3 Electronics

- Solid-state transmitter provides 4 watts minimum output power.
- The digital frequency synthesizer utilizes state-of-the-art integrated circuits.
- Crystal filter selectivity.
- Carrier controlled squelch.

1.3.4 Mechanical Design

- Modular design for easy maintenance.
- Panel mounted.

1.4 ATR500 System - Overview Diagram

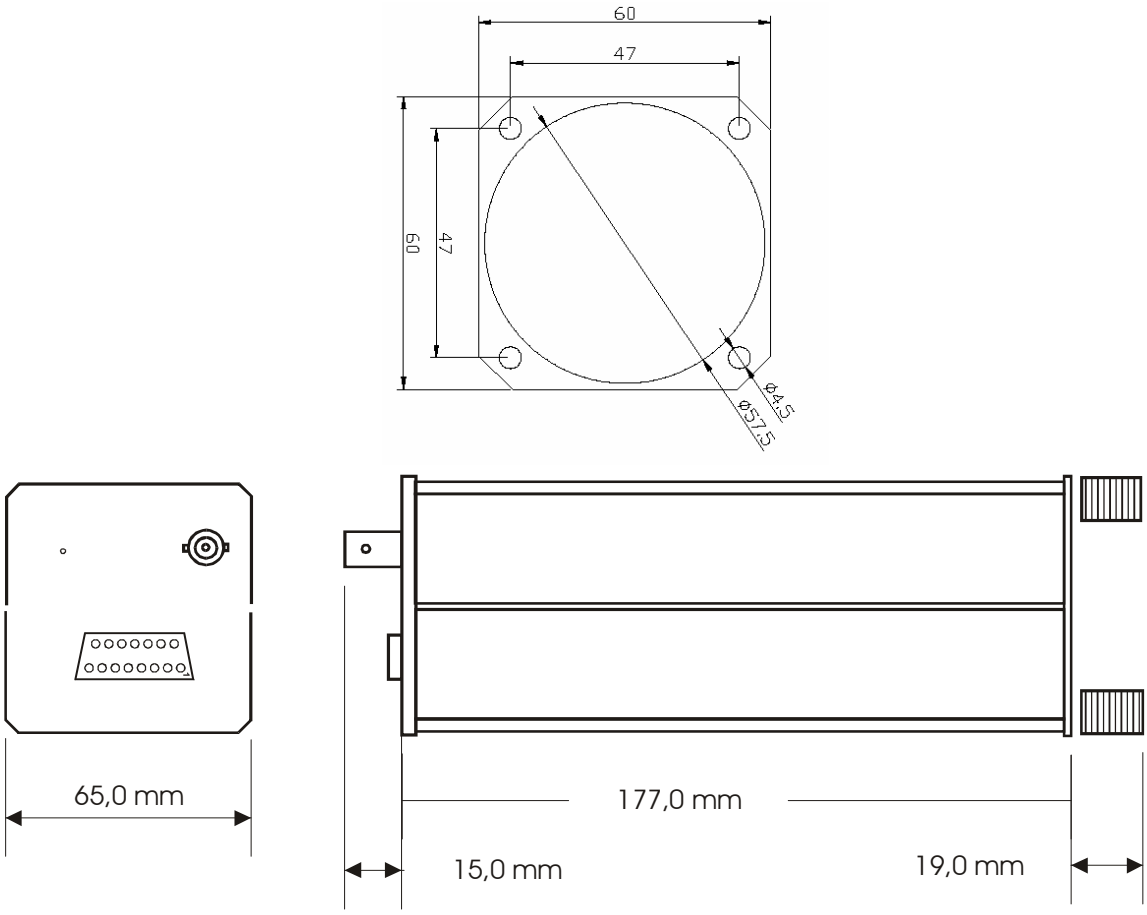


1.4.1 ATR500 Display and Controls

1: MEM/SET	select frequency from memory position (M1 .. M9) direct frequency input (SET)
2: rotary knob	change values
3: VOL/SQ	select VOL, SQ, VOX, DIM, CON
4: STORE	save frequency
5: ON/OFF	on/off (press for 0,5 resp. 3 s)
6: ↔	select MHz/kHz setting start INIT mode
7: ↕ (UP/DOWN)	swap active/stand-by frequency

1.5 Weight and Overall Dimensions

WEIGHT	1,55 lbs (0,7 Kg),
DIMENSIONS	Height: = 2.4 in (6, 1 cm)
	Width: = 2.4 in (6, 1 cm)
	Depth: = 7.4 in (19 cm) (behind aircraft panel)



1.6 Description of Equipment

The ATR500 VHF Communications Transceiver is a single block unit with 57mm diameter for mounting in an instrument panel or console. It is fastened by four screws. All controls and indicating displays are located on the front panel. The rear panel of the unit locates the 15pole D-Sub equipment connector for connecting the aircraft wiring and the BNC type connector for the antenna line.

The ATR500 operates at 14V DC and features typical 6 Watts of transmitter power. It can also be operated down to 9 VDC with reduced RF power (emergency operation).

The ATR500 has 25 kHz receiver selectivity, and operating frequency range is 118.000 to 136.975 MHz.

The ATR500 has the capability of programming up to 9 memory channel frequencies for later recall.

To prevent accidental long term transmission the transmitter automatically turns off after two minutes (for example, when a TX button becomes stuck ON).

The ATR500 VHF Communications Transceiver consists of five modules:

Receiver transmitter board, AF Stage board, Antenna board, display circuitry, and the microprocessor board.

1.7 Technical Characteristics

SPECIFICATION CHARACTERISTIC	
JTSO COMPLIANCE	JTSO-2C37e, ED-23B Class 4
	JTSO-2C38e, ED-23B Class C
TSO COMPLIANCE:	TSO-C37d, RTCA DO-186A Class 4
	TSO-C38d, RTCA DO-186A Class C
POWER REQUIREMENTS:	14VDC (9 to 15VDC)
Receiver:	0.1 A at standby, max. 0.5A
Transmitter:	2.5A
OPERATING VOLTAGE RANGE	
Maximum Voltage	20.0 VDC
Minimum Voltage	11.0 VDC
Emergency Voltage	9.0 VDC
FREQUENCY RANGE:	118.000 MHz to 136.975 MHz
	The lowest selectable channel frequency is 118.000 MHz and the highest selectable channel frequency is 136.975 MHz.
NUMBER OF CHANNELS	760
CHANNEL SPACING	25 kHz
EMISSION DESIGNATOR	6k00A3E
MODE OF OPERATION	Simplex
FREQUENCY STABILITY	±30 ppm
MOUNTING:	Panel mounted, no shock mounting required
OPERATING TEMPERATURE RANGE	-20°C to +55°C
Short time Operating Temperature	+70°C

GROUND SURVIVAL TEMPERATURE	LOW -55°C / HIGH +85°C
MAXIMUM OPERATING ALTITUDE	50 000 ft.
VIBRATION	RTCA DO-160D, Cat. S, Vibration Curve M
HUMIDITY	RTCA DO-160D; Cat. A
OPERATIONAL SHOCK	6 G in any direction
CRASH SAFETY	(impulse) 25 G in any direction (shock) (Sustained) 25 G in any direction
COMPASS SAFE DISTANCE	30 cm
RTCA DO-160D Env. Cat.	[C1Z]CAA[SM]XXXXXXZBABZ[YY]M[B3F3]XXA
TRANSMITTER	
POWER OUTPUT:	6 Watts typical 4 Watts minimum
MODULATION:	70 % modulation capability with 98 % limiting. Less than 10 % distortion at 85 % modulation.
SIDETONE OUTPUT:	100mW into 500 ohms headphones
MICROPHONE:	Standard microphone (electret). Must provide 100 mVRMS into 100 Ω load. Or dynamic microphone. Microphone gain adjustment is provided
HARMONIC CONTENT:	Greater than 60 dB down from carrier.
UNINTENTIONAL TRANSMISSION	The Transmitter switches to receive mode after 2 minutes of continuous transmission
MODULATION FIDELITY	Less than 6 dB variation between 350 Hz and 2500 Hz
MODULATION:	Less than 25 % distortion at 70 % modulation.
CARRIER NOISE LEVEL	at least 35 dB below demodulated output at m= 70 %
UNWANTED FREQUENCY MODULATION	less than 3 kHz at m= 70 % / 1000 Hz
DUTY CYCLE:	1:4 (1 minute transmit: 4 minutes receive)
RECEIVER	
RECEIVER SENSITIVITY:	2.5 µV EMF (-105 dBm) will produce not less than 6dB S+N/N with m= 30% / 1KHz
RECEIVER SELECTIVITY:	6dB bandwidth at not less than fc ±8.0 kHz 40dB bandwidth with no more than fc ±17.0 kHz 60dB bandwidth no more than fc ±25.0 kHz
RECEIVER OUTPUT:	4 W minimum into 4Ω.
AGC CHARACTERISTIC:	From 10 µV to 10,000 µV audio output will not vary more than 6 dB.
DISTORTION	less than 25 % at rated output (m= 85% at a level of –33dBm) and less than 15 % at 10 dB below rated output (m=30 % at a level of –33 dBm) over the range of 350 to 2500 Hz.
SQUELCH:	Automatic squelch (adjustable) with manual disable.

SPURIOUS RESPONSES AND CROSS MODULATION PRODUCTS	At least 80 dB down.
INTERMODULATION AND DESENSITISATION	The VHF Transceiver ATR500 meets the equipment parameters, which are effective from 1 January 1995 due the change of ICAO Annex 10, dated 21 November 1985
INTERCOM INPUT:	The microphone is connected to the intercom input. The receiver is operational and microphone audio appears at the audio output along with receive audio. 100 mVRMS of microphone audio is required for 100 mW output.
Telecommunication Data	
Manufacturer	Filser Electronic GmbH
Type Designation	ATR500
EASA Number	LBA.O.10.911/113 JTSO
Transmitter Power Output	6 W
Frequency	118.000 – 136.975 MHz
Emission Designator	6k00A3E

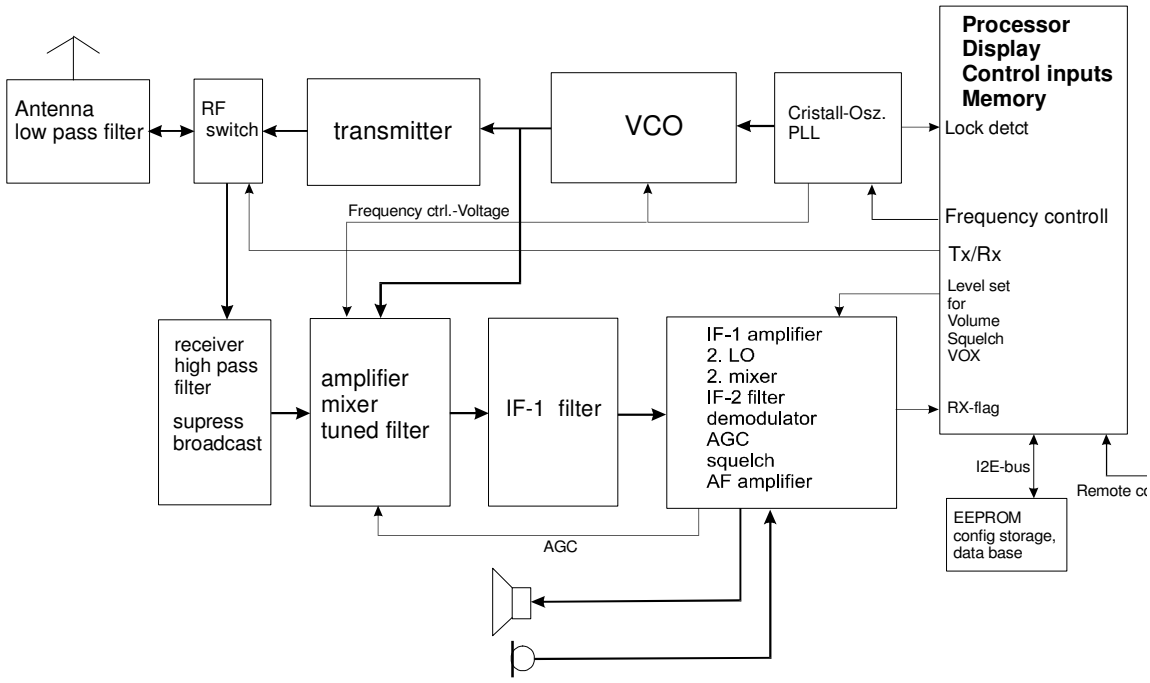
1.8 Instructions for Continued Airworthiness

This VHF Transceiver ATR500 is designed and manufactured to allow ”on-condition maintenance”. There are no periodic maintenance required to maintain continued airworthiness. No maintenance is required until the equipment does not properly perform its intended function. Following any maintenance action, a complete maintenance test has to be performed.

2 SECTION II THEORY OF OPERATION

2.1 Introduction

The figure below presents a simplified block diagram of the ATR500 This diagram is intended to show flow between the modules and basic switching functions.



ATR500 Hardware Block Overview Diagram

2.2 Theory of Operation

2.2.1 Receiver

The receiver is a dual-conversion super heterodyne receiver using IF frequencies 21.4 MHz and 455 kHz.

The RF signal from the antenna is fed via the low-pass antenna filter and the Receiver/Transmitter Antenna switch to a high-pass filter (rejection of unwanted FM broadcast signals) followed by a low-pass filter (rejection of image frequency) to the Double Tuned Preselector Circuit .

The preselector is tuned by the VCO Control Voltage.

The desired RF signal is applied to the AGC controlled diode attenuator and the RF amplifier and then to the mixer.

The injection signal from the VCO is fed to the mixer at a frequency 21.4 MHz above the desired signal. The resulting IF signal of 21.4 MHz is fed to the 21.4 MHz crystal filter.

This crystal filter provides bandwidth and selectivity required for equioment intended for operation in an environment with 25 kHz channel spacing.

The IF signal is coupled from the crystal filter to the first IF amplifier. The amplified IIF signal is then fed to the second mixer, which further amplifies the signal and converts it to a 455 kHz second IF. After band pass filtering, the second IF is fed to the limiting amplifier and detector. The audio is recovered using a quadrature detector. The demodulated RF signal is sent to an Audio Low Pass Filter and then to the AF buffer followed by the Audio Low Pass Filter which forms the climax low pass filter.

The AGC voltage derived from the detector's voltage controls the gain of the RF and IF amplifiers, as well as the squelch control circuit.

The squelch function can be overridden by the SQ-Switch-control for listening to weak RF-input signals and for testing the receiver function (SQ-01).The squelch circuit prevents the radio from squelching if no RF carrier is received.

- * SQ 1 = Squelch open
- * SQ 2 = Squelch closed at RF level below -100 dBm
- * SQ 2 to 10 = Squelch threshold at RF levels between -100 dBm and -65 dBm
- SQ 10 = Squelch opens with RF level exceeding – 65 dBm

The received signal is fed to the volume control and then coupled to the input of the buffer amplifier. The audio signal then is amplified to an audio power of 4 watts into a 4 ohms load for speaker output and 100 mW of audio power into 500 ohms load for headphones or an audio panel. The sidetone and the intercom signals are also amplified by the audio amplifier.

2.2.2 Frequency Synthesizer

The microprocessor-controlled synthesizer/VCO is a phase locked loop (PLL) circuit using a reference frequency of 6.4 MHz.

The transmitter and local oscillator signals are generated in 25 kHz increments from: 118.000 – 136.975 MHz in the transmit mode and 139.400 – 158.375 MHz in the receive mode.

2.2.3 Modulator

MIC 1 input can be switched from Standard (Electret) Microphone to Dynamic Microphone. In the Dynamic Microphone position the MIC AF is amplified by a microphone pre-amplifier.

MIC 2 is a Standard (Electret) Microphone input. The MIC level for MIC 1 and 2 can be set on the display. The AF signal is fed to the microphone amplifier.

The amplified AF signal is fed to the intercom and VOX switches and to the Modulation amplifier.

Following the Intercom buffer the AF signal (in receive mode) is coupled to the AF amplifier. The AF signal is feed to the VOX switch. The VOX threshold level is set by the user.

The output of the AF preamplifier is coupled to the transmitter power amplifier via the modulator amplifier.

2.2.4 Transmitter

The transmit buffer output signal is fed to the pre-driver, which is followed by the driver. The driver output signal is supplied to the final power amplifier.

The detected Sidetone signal derived from the transmitter output signal is coupled to the modulation amplifier and to the sidetone buffer followed by the AF power amplifier.

2.2.5 Microprocessor

The Microprocessor contains a non-volatile FLASH program memory

The microprocessor sends data to the synthesizer.

The display is a LCD type displaying the active operating frequency at all times. The display is controlled by a dot matrix LCD driver.

The control switches of the control head are directly coupled to the microprocessor.

The digitally-controlled potentiometers. are used to set squelch level, volume, VOX and MIC level.

2.2.6 Software

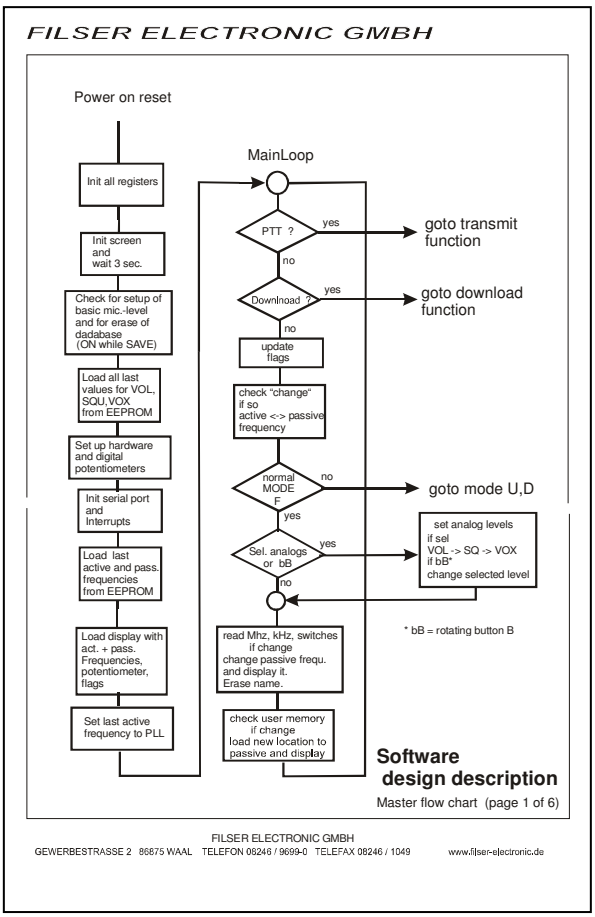
After the unit is switched on initialization starts with a sequence of following processes:

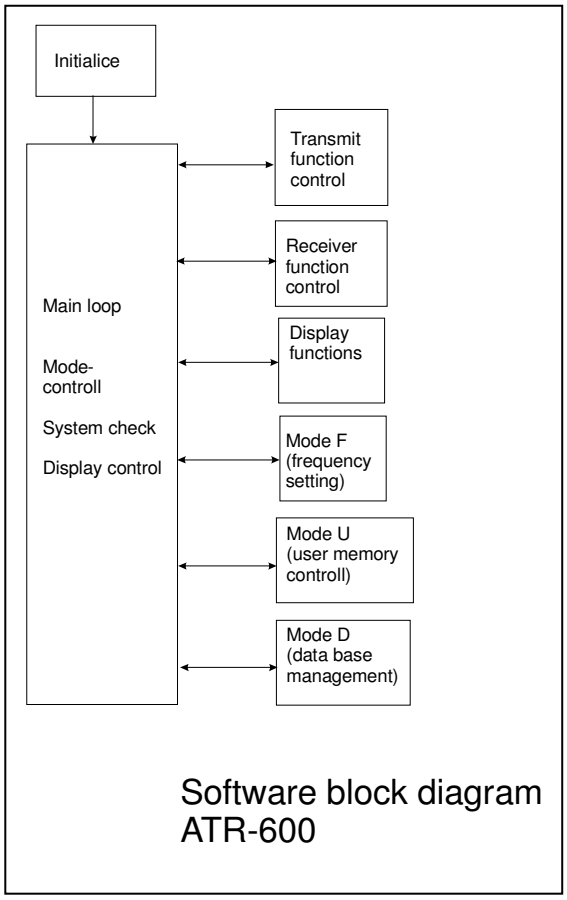
1. Initialization of all registers.
2. System check. (Activation of set-up for setting of microphone level .)
3. Set-up of hardware and digital potentiometers.
4. Set the initialization screen displaying the radio type and software
5. Reading the last used frequencies (user and standby) from the external EEPROM.
6. Set-up of the working display with passive and active frequencies.
7. Sending the frequency data to the PLL

After this, the software enters the main loop where the operational jobs will be done.

1. Checking the status of the PTT line (i.e. PTT key pressed) and start the transmit process if the key is activated.
2. Management of frequency change and setting of flags as RX, TX, ERROR.
3. Selection and setting of analog inputs as Volume, Squelch and VOX.
4. Checks active memory address. If changed, and sends the new frequency to the passive display.
5. Checks the serial interface for remote control input or for a download request.

2.2.6.1 Software Flowchart





3 SECTION III MAINTENANCE

3.1 Maintenance Policy

The use of SMD technology and the high integration level of the complex integrated circuits used in the VHF Transceiver ATR500 require the use of expensive technical equipment and skilled personnel for the repair of this equipment. In order to minimize service problems and to provide our customers with an optimum of product support, Filser Electronic GmbH determined that repairs of the VHF Transceiver ATR500 will only be carried out by the manufacturer.

The Final Test specified in this section is indented to determine the airworthiness of the equipment under test. If there is any fault determined when conducting the Final Test, the faulty unit and the completed Reshipment Form shall be sent to the manufacturer for maintenance.

The Reshipment Form is part of this manual.

The shipping address for repairs is

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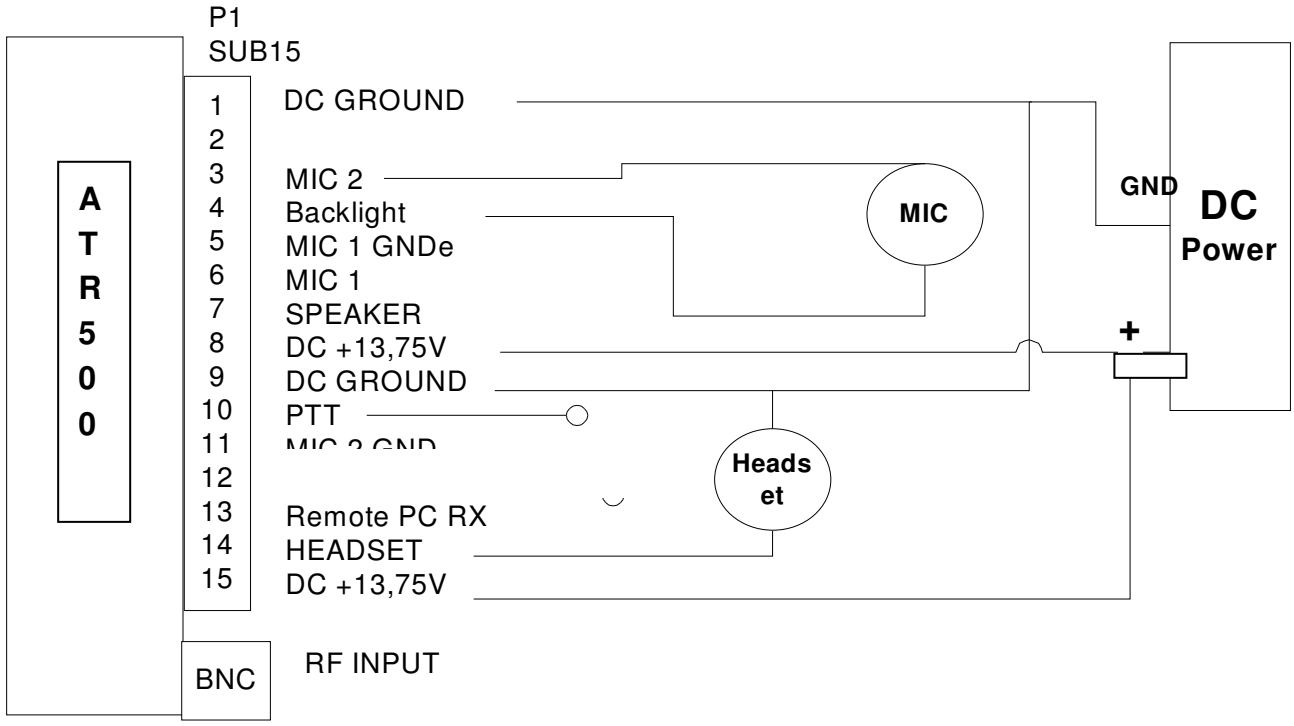
Gewerbestrasse 2
86875 Waal
GERMANY
Tel.: +49 8246/9699-0
Fax.: +49 8246/1049
Homepage: www.filser.de
Email: info@filser.de

3.2 Standard Test Signal

- All RF signal levels are expressed in terms of dBm (0 dBm = 1 mW into 50 ohms or 225 mV across 50 ohms). Additionally the equivalent value expressed in Volts EMF ("Hard" microvolts) is given in brackets.
- A standard modulation test signal is a 1000 Hz tone.
- A standard test signal is an RF carrier amplitude modulated 30% at 1,000 Hz.

3.3 Test Setup



Bench Test Setup

3.4 Test Equipment

The following table specifies the test equipment required to perform the maintenance procedures described in this manual. Equivalent test equipment may be used.

Test Equipment List

Type	Characteristics	Example
RF Signal Generator	Frequency: 0.14 – 525 MHz RF Output: 1 µV to 250m V -113dBm to -5 dBm Modulation: 30 to 85 % Generator Impedance: 50 Ohms	Rhode & Schwarz CMTA 54
Audio Signal Generator	Frequency: 10 Hz to 10 kHz Distortion 1 %	Rhode & Schwarz CMTA 54
Regulated DC Power Supply	Output: 0 to 30 VDC, 0 to 5 Amps	Rhode & Schwarz CMTA 54
Frequency Counter	Frequency Range: 10 Hz to 520 MHz	Rhode & Schwarz CMTA 54
RF Power Meter	Power Range: 0 to 10 W	Rhode & Schwarz CMTA 54
Modulation Meter	AM Modulation Percent: 0-100 % FM Deviation: 0- 10 kHz	Rhode & Schwarz CMTA 54
Audio Voltmeter and Distortion Analyzer	Frequency Range: 10 Hz to 10 kHz Sensitivity: 1 mV to 100 V Distortion Range: 1 % to 100 %	Rhode & Schwarz CMTA 54
Oscilloscope	Frequency Range: DC to 100 MHz Input Impedance: 1 me ohm	Rhode & Schwarz CMTA 54
Digital Multimeter	Input Impedance: 10 megohm DC Volts: 10 mV to 100 V DC Amperes 0 to 2 A Accuracy: 1 % min.	Kontron Model DMM 3020
RF-Attenuator	Frequency Range: DC to 1 GHz Attenuation: 20 dB / 20 W	Narda Model 766-20

3.5 Final Test Procedure

3.5.1 General

The airborne VHF Communications Transceiver ATR500 / P/N 500-(xxx)- (xxx), shall be tested to demonstrate airworthiness of the unit.
The performed tests cover all important technical parameters of the ATR500.

3.5.2 Test conditions

All RF levels in the subsequent tests are expressed in terms of dBm (0 dBm corresponds to 1 mW into 50 ohms), additionally the voltage levels in V EMF, resp. "HARD MICROVOLTS" are indicated in brackets.

Standard impedance is 50 Ohms.

Unless otherwise specified, the supply voltage for the tests is 13.75 VDC.

All tests are conducted under standard test conditions

3.5.3 EUT Identity

Determine equipment type, part number, serial number, hardware and software change index. Enter these data in the Final Test Report Form.

3.5.4 Initial Settings

Read the initial settings of MIC, SQL, VOX and the setting of the microphone switch switch. Record these data in the test report.

3.5.5 Control Functions

a) Verify that display: shows SW version following switching ON.

b) Verify function of frequency selectors.

3.5.6 Receiver

FIGURE 01 RECEIVER TEST SETUP

3.5.6.1 Sensitivity

Connect the equipment as shown in Figure 01. Set SQL to 01.

Determine the signal-plus-noise to noise ratio obtained with an RF input level of -105 dBm (2,5 µV EMF) modulated 30% at 1000 Hz with an audio output power not lower than 10 dB below the declared audio output power (1,3 VRMS at speaker output).

Record the result in the Final Test Report.

Conduct this test at 118.00 MHz, 127.000 MHz and 136.975 MHz.

Requirement: (S+N)/N **≥6 dB**.

3.5.6.2 Gain

Connect the equipment as shown in figure 01.

At 127.000 MHz determine the AF output level obtained wit VOL setting 32 and an RF input signal of -93 dBm (10 µV EMF, modulated 30% at 1000 Hz.

Record the result in the Final Test Report.

Requirement: AF Output Level: **≥1.3 VRMS**.

3.5.6.3 AGC Characteristics

Connect the equipment as shown in figure 01. Set VOL to 20.

At 127.000 MHz variation in AF output level obtained when the RF input signal level modulated 30% / 1000 Hz is varied from -93 dBm to -33 dBm (10 µV to10 mV EMF).

Record the result in the Final Test Report.

Requirement: AF Level Variation: **≥3 dB.**

3.5.6.4 Audio Distortion

Connect the equipment as shown in fig. 1

Set signal generator to 127.000 MHz modulated 85% / 1000 Hz at an RF level of -33 dBm (10 mV EMF).. Determine the distortion in the receiver output with the receiver output adjusted to rated output power (4W into 4 ohms)..

Record the result in the Final Test Report.

Requirement: Audio Distortion: **≤25%** at rated power output.

3.5.6.5 Audio response

Connect the equipment as shown in fig. 1

Set signal generator to 127.000 MHz modulated 30% / 1000 Hz at an RF level of -53 dBm (1 mV EMF)..

Adjust receiver output level to 1 VRMS at 1000 Hz.

Determine the variation in receiver output level with respect to the audio output level obtained at 1000 Hz when the modulation frequency is set to 350 Hz, 2500 Hz and 4000 Hz..

Record the result in the Final Test Report.

Requirement: Audio Response: **≤6 dB**. for 350 Hz and 2500 Hz

Determine the attenuation of the audio output level at 4000 Hz..

Record the result in the Final Test Report.

Requirement: at least **18 dB** below that output obtained at 1 kHz

3.5.6.6 Selectivity

Connect the equipment as shown in fig. 1

Set receiver to 127.000 MHz.

Set signal generator to 127.000 MHz modulated 80 % / 400 Hz at an RF level of -106 dBm (2.24 µV EMF).

Adjust receiver output level to 0.8 to 1.2 VRMS. This is the reference output level. Do not change the VOL setting.

Increase signal generator RF output level to -100 dBm (4.5 µV EMF).

Vary the signal generator frequency and determine the frequencies above and below the channel frequencies where reference output level is obtained.

Record the frequency differences in the Final Test Report.

Requirement: **Δf ≥±8.0 kHz**

Increase signal generator RF output level to -66 dBm (224 µV EMF).

Vary the signal generator frequency and determine the frequencies above and below the channel frequencies where reference output level is obtained.

Record the frequency differences in the Final Test Report.

Requirement: **Δf ≤±17.0 kHz**

Increase signal generator RF output level to -46 dBm (2.24 mV EMF).

Vary the signal generator frequency and determine the frequencies above and below the channel frequencies where reference output level is obtained.

Record the frequency differences in the Final Test Report.

Requirement: **Δf ≤±25.0 kHz**

3.5.6.7 Audio Noise Level

Connect the equipment as shown in figure 01.

At 127.000 MHz, determine the signal-plus-noise to noise ratio obtained with an RF input level of -67 dBm (200 µV EMF) modulated 30% at 1000 Hz (-93 dBm).

Record the result in the Final Test Report.

Requirement: **(S+N)/N ≥25 dB**.

3.5.6.8 Spurious Responses

Connect the equipment as shown in fig. 1

Set the equipment under test to118.000 MHz.

Set signal generator to 160.800 MHz at an RF level of -33dBm (10 mV EMF) modulated 30 % at 1000 Hz.

Determine the signal-plus-noise to noise ratio.

Record the result in the Final Test Report.

Set receiver to 127.500 MHz.

Set signal generator to 127.650 MHz at an RF level of -33dBm (10 mV EMF) modulated 30 % at 1000 Hz.

Determine the signal-plus-noise to noise ratio.

Record the result in the Final Test Report.

Requirement: **(S+N)/N ≤6 dB**.

3.5.6.9 Microphony-Test

Check for any microphony effect by knocking with the hand site of a screwdriver on the housing.

Record the result in the Final Test Report.

Requirement: **No microphony effect** (OK).

3.5.6.10 Low Voltage Operation

Operate the equipment under test at 10.0 VDC Supply Voltage.

Check that the display shows BAT and that receiver and transmitter provide intelligible communication.

Requirement: Display shows BAT. **intelligible communication**.

3.5.7 Transmitter

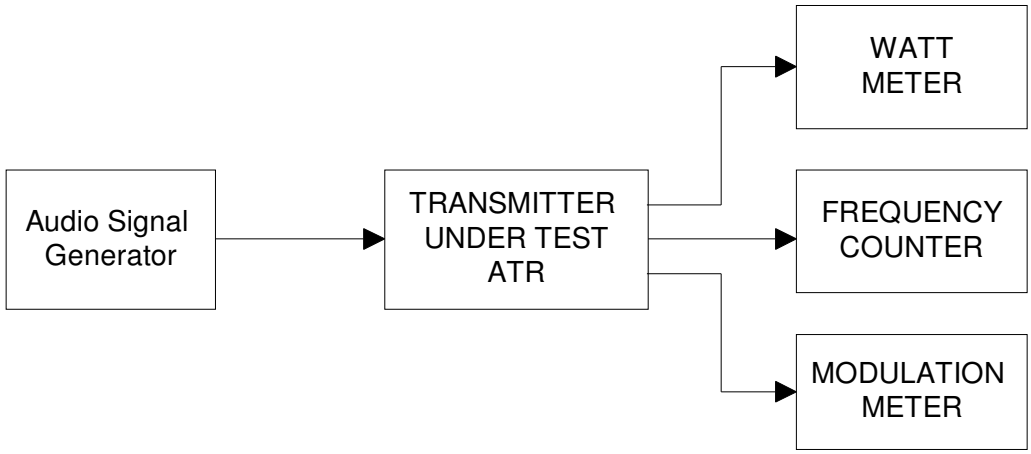


FIGURE 02 – TEST SETUP TRANSMITTER TESTS

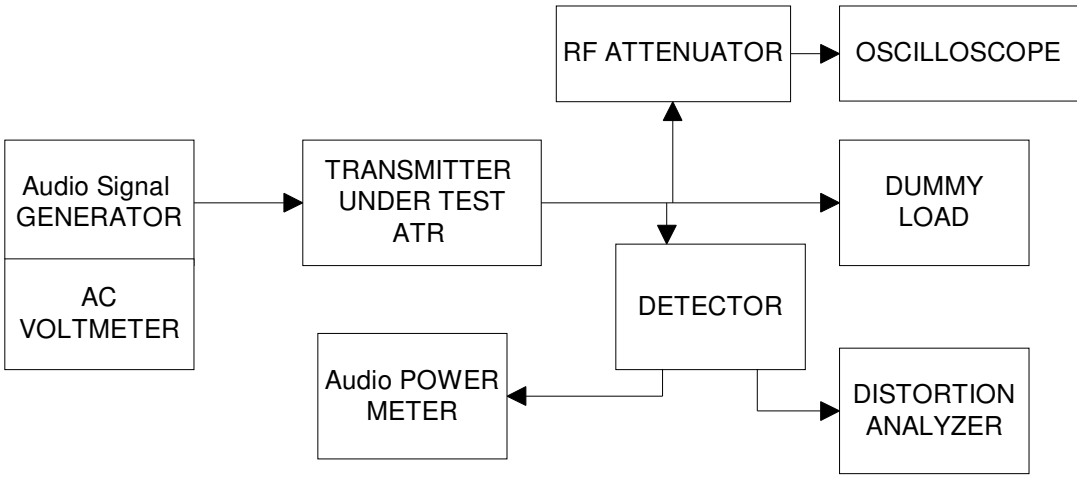


FIGURE 03 – TEST SETUP TRANSMITTER TESTS

3.5.7.1 RF Power Output

Connect the equipment as shown in Figure 02.

Key the transmitter and determine the RF output power with both the transmitter unmodulated and modulated 70 % at 1000 Hz.

Record the result in the Final Test Report.

Conduct this test at 118.00 MHz, 127.000 MHz and 136.975 MHz.

Requirement: **≥4.0 W** modulated and unmodulated.

3.5.7.2 Frequency Tolerance

Connect the equipment as shown in Figure 02..

Key the transmitter. Do not modulate the transmitter, and determine the difference between channel frequency and the frequency of the transmitter output signal.

Record the result in the Final Test Report.

Conduct this test at 118.00 MHz, 127.000 MHz and 136.975 MHz.

Requirement: **≤±1000 Hz,**

3.5.7.3 Unwanted frequency modulation

Connect the equipment as shown in Figure 02.

Key the transmitter and modulate the transmitter 70 % at 1000 Hz.

Determine the frequency modulation of the output signal.

Record the result in the Final Test Report.

Conduct this test at 118.00 MHz, 127.000 MHz and 136.975 MHz.

Requirement: **≥3.0 kHz**.

3.5.7.4 Audio Distortion

Connect the equipment as shown in Figure 03.

Set the equipment under test to127.000 MHz, key the transmitter and modulate the transmitter 70 % at 1000 Hz.

Determine the distortion in the detected output.

Record the result in the Final Test Report.

Conduct this test at 118.00 MHz, 127.000 MHz and 136.975 MHz.

Requirement: **≥10 %**.

3.5.7.5 Audio Response

Connect the equipment as shown in Figure 03.

Set the equipment under test to127.000 MHz.

a. Modulation Fidelity:

Key the transmitter and modulate the transmitter 70 % at 1000 Hz.

Determine the audio level of the detected output. This is he reference level (0 dB).

With the modulation voltage level kept constant, modulate the transmitter at 350 Hz and 2500 Hz:

Determine the variation in detected output level in dB with reference to the 0 dB reference level and record the result in the Final Test Report.

Requirement: **≤6dB.**

b. Sidetone

Key the transmitter and modulate the transmitter 70 % at 1000 Hz.

Determine the audio level of the sidetone output. This is he reference level (0 dB).

With the modulation voltage level kept constant, modulate the transmitter at 350 Hz and 2500 Hz: Determine the variation in sidetone output level in dB with reference to the 0 dB reference level and record the result in the Final Test Report.

Requirement: **≤10 dB.**

3.5.8 Reset to Initial Settings

After completion of the tests set the equipment under test back to the initial settings of MIC, SQL, VOX and MIC Switch.

ATR500 VHF COMMUNICATION TRANSCEIVER FINAL TEST REPORT

MOD SW:	**MOD HW:**	**S/N:**	**P/N: 500-( )-( )**
Initial MIC Setting:	**Initial SQL Setting:**	**Initial VOX Setting:**	**MIC Switch Setting: DYN / STD**

Test conditions

All RF levels are "HARD MICROVOLTS" or "equivalent source emf" as defined in the specifications. Standard impedance is 50 Ohms. Unless otherwise specified, test signal is 127,00MHz and m=30% / RF 1mV= -53dBm and supply voltage is 13.8 VDC..

Control Functions	
Display: shows SW version following power- ON.	(OK)
Function of frequency selectors	(OK)

Receiver		
Sensitivity @ 118.000 MHz, m=30% / 1kHz / 2,5µ V (-105dBm) SNR	dB (<6dB)	
@ **127.000 MHz,** m=30% / 1kHz / 2,5µ V (-105dBm) SNR.	dB (<6dB)	
@ **136.975 MHz**, m=30% / 1kHz / 2,5µ V (-105dBm) SNR.	dB (<6dB)	
Gain@ 127.000 MHz, m=30% / 1kHz / 10µ V (-93dBm) Audio output power @ VOL. 32	> 1.3 VRMS	
AGC characteristic m=30%@1kHz /10µV - 10mV (-93dBm to –33dBm)	dB (<3dB)	
Audio distortion 127.000 MHz / m=85% / 1kHz / -33 dBm (10 mV EMF) 4 W Output into 4 ohms	% (25 %)	
Audio frequency response		
350Hz	dB (< 6dB	
1000 Hz)	0 dB	
2,5kHz	dB (< 6dB	
. 4kHz	dB (>18dB	
Bandwidth at 6dB (>=± 8 kHz) Reference audio level obtained with RF signal -106 dBm / m=80% / 400 Hz	-kHz	+kHz
Selectivity at 60dB (<=± 25 kHz) Reference audio level obtained with RF signal -106 dBm / m=80% / 400 Hz	-kHz	+kHz
Audio Noise Level 127.000 MHz / m=30% / 1kHz / -67dBm (-67 dbm) S+N/N	dB (≤25 dB)	
Spurious Responses		
Test signal 160.800 MHz -33 dBm (10 mV EMF) / m=30%/1KHz RX 118.000 MHz S+N/N	dB (< 6dB)	
Test signal 127.650 MHz-33 dBm (10 mV EMF) / m=30%/1KHz RX 127.650 MHz S+N/N	dB (< 6dB)	
Microphony-Test	(OK)	

ATR500 VHF COMMUNICATION TRANSCEIVER FINAL TEST REPORT

S/N:	**P/N:**

Low Voltage Operation @ 10VDC Supply Voltage	
Display shows BAT	(OK)
Receiver function (intelligible communication)	(OK)
Transmitter function (intelligible communication)	(OK)
	(OK)
Microphony Test	(OK)

Transmitter	**RF Power Output** minimum 4W unmodulated	m=70 %	**Frequency tolerance** m= 70 % / 1000 Hz <±1 kHz	**Unwanted frequency modulation**. m=70% /1KHz <3 kHz
118.000 MHz	W	W	Hz	Hz
127.000 MHz	W	W	Hz	Hz
136.975 MHz	W	W	Hz	Hz
Audio distortion	m=70% / 1 kHz			% (<10%)
Audio response				
a. Modulation fidelity	m=70% / 3 Max. variation between 350Hz to 2,5 kHz			dB (>=6dB)
b. Sidetone	m=70% / Max. variation between 350Hz to 2,5 kHz			dB (>=10dB)

After completion of the tests the equipment under test was set to the initial settings of MIC, SQL, VOX and MIC Switch.

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Tested by Stamp Date

Filser Electronic GmbH

Reshipment Form

Kundennummer / *customer no:*
Name, Adresse / *name, address:*
Telefon / *phone:*
Telefax / *fax:*
E-Mail / e-mail:

Filser Electronic GmbH
Gewerbestraße 2

86875 Waal

Rücksendung / **Reshipment**

Damit Sie Ihr Gerät so schnell wie möglich zurück bekommen, beschreiben Sie bitte genau den Grund Ihrer Rücksendung.
To handle your reshipment, we need an exact description.

Gerät / *Device*	ATR500	S/N:	P/N:
		HW:	SW:
Flugzeugtyp *Type of aircraft*			

Einbaubeschreibung:
Please describe your installation:

Umgebungsbedingungen und Verhalten des Gerätes:
E*nvironmental conditions and failure description:*

Falls notwendig, bitte Anlageblatt beifügen!

In case of insufficient space please use an additional sheet!

Vielen Dank für Ihre Angaben. Wir werden die Bearbeitung so schnell wie möglich durchführen.

Thank you for your input. We will handle your request as soon as possible.

Ihre/*Yours* Filser Electronic GmbH