



## ATR500

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

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

## VHF Communication Transceiver



## Installation and Operation

Dokument-Nr.: 01.1251.010.71e

Revision: 1.06

Date: 27.07.2007

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## List of Changes

Revision	Date	Description of Change
1.00	09.01.2006	initial version
1.01	07.02.2007	new chapter "Customer Support"
1.02	26.02.2007	Troubleshooting, if CON was misadjusted
1.03	21.03.2007	Description of equipment prior to P/N 500-(1XX)-(1XX)
1.04	02.04.2007	microphones/headphones: parallel connection
1.05	30.05.2007	MIC setting completed
1.06	27.07.2007	External Fuse 4 A.

## List of Service Bulletins (SB)

Service Bulletins have to be inserted into this manual and to be enlisted in the following table.

SB No	Rev. No	Issue Date	Entry Date	Name

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## 1 GENERAL

### 1.1 Symbols



Instructions whose non-observance can cause damage to the device or other parts of the equipment.



Supplementary information.

### 1.2 Customer Support

For fastest handling of reshipments please use the reshipment form available from our homepage [www.filser.de](http://www.filser.de).



Any suggestions for improvement of our manuals are welcome. Feel free to contact [service@filser.de](mailto:service@filser.de).

### 1.3 Survey of Part Numbers

No	Part Number	Description
1	P/N 500-(0XX)-(0XX) prior to S/N 00301 04	no background illumination
2	P/N 500-(1XX)-(1XX) from S/N 00301 04	background illumination adjustable in the INIT Menu
3	P/N 500-(1XX)-(1XX)	background illumination adjustable in the normal Menu

### 1.4 System Description

- VHF Communication Transceiver for installation in aircraft
- operating frequency range from 118.000 to 136.975 MHz
- 25 kHz channel spacing (760 channels)
- panel mounting in a 57 mm cut-out
- memory capacity for 9 user defined frequency entries



To avoid unintentional permanent transmit operation, the transmitter automatically stops transmission after two minutes of uninterrupted operation.

## 1.5 Technical Data

<b>GENERAL</b>	
COMPLIANCE	JTSO-2C37e, ED-23B Class 4 JTSO-2C38e, ED-23B Class C TSO-C37d, RTCA DO-186A Class 4 TSO-C38d, RTCA DO-186A Class C LBA.O.10.911/113 JTSO
DIMENSIONS	Height: 61 mm (2,4 in) Width: 61 mm (2,4 in) Depth: 190 mm (7,4 in) behind Panel
WEIGHT	0,49 kg (1,1 lbs)
MOUNTING	Panel mounting
OPERATING TEMPERATURE RANGE	-20 °C .. +55 °C, 30 minutes at +70 °C
STORAGE TEMPERATURE RANGE	-55 °C .. +85 °C
POWER REQUIREMENTS	14 VDC (9 to 18 VDC)
CURRENT CONSUMPTION	Transmitter: 2,5 A Receiver: 0,1 A (stand-by), max. 0,5 A
FUSE	external fuse required: 4 A, slow blow
FREQUENCY RANGE	118,000 MHz .. 136,975 MHz
FREQUENCY STABILITY	±30 ppm
<b>TRANSMITTER</b>	
POWER OUTPUT	6 W (nominal) 4 W (minimal)
MODULATION	≥ 70 % modulation capability limited to 98% distortion < 10 % at 70 % modulation
SIDETONE OUTPUT	100 mW into 500 Ω (headphone)
MICROPHONE	Standard microphone with 100 mVRMS (MIC 1 or MIC 2) or dynamic microphone (MIC 1 switchable)
DUTY CYCLE	2 minutes on, 4 minutes off; auto turn-off after 2 minutes of continuous transmit operation

<b>RECEIVER</b>	
RECEIVER SENSITIVITY	2,5 $\mu$ V EMF (6 dB S+N/N, m = 30 % /1 kHz)
BANDWIDTH	-6 dB bandwidth > $\pm$ 8.0 kHz
SELECTIVITY	-40 dB bandwidth < $\pm$ 17.0 kHz -60 dB bandwidth < $\pm$ 22.0 kHz
RECEIVER OUTPUT	$\geq$ 4 W into 4 $\Omega$ (speaker output)
AGC CHARACTERISTICS	AF output deviation < 3 dB from 10 $\mu$ V to 10 mV
SQUELCH	automatic squelch (adjustable)
SPURIOUS RESPONSES	> 80 dB
INTERCOM INPUT	The microphone is connected to the intercom input. 100 mVRMS at the microphone input produce 100 mW output power at the headphone output.

## 1.6 Telecommunication Data

Depending on your national telecommunications legislation, the following data may be required when applying for the aircraft radio station license:

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



## 1.7 Environmental Conditions

Characteristic DO-160D	Section	Cat.	Condition
Temperature / Altitude	4.0	C1	
Low ground survival temperature	4.5.1		- 55 °C
Low operating temperature	4.5.1		- 20 °C
High ground survival Temperature	4.5.2		+ 85 °C
High Short-time Operating Temperature	4.5.2		+ 70 °C
High Operating Temperature	4.5.3		+ 55 °C
In -Flight Loss of Cooling	4.5.4	Z	No auxiliary cooling required
Altitude	4.6.1	C1	50,000 ft
Temperature Variation	5.0	C	2 °C change rate minimum per minute
Humidity	6.0	A	
Shock	7.0	A	6 G operational shocks 20 G crash safety Test Type R in all 6 directions
Vibration	8.0	S	Vibration Curve M
Explosion Proofness	9.0	X	No test required
Water Proofness	10.0	X	No test required
Fluids Susceptibilities	11.0	X	No test required
Sand and Dust	12.0	X	No test required
Fungus Resistance	13.0	X	No test required
Salt Spray	14.0	X	No test required
Magnetic Effect	15.0	Z	< 0.3 m Compass Safe Distance
Power Input (DC)	16.0	B	
Voltage Spike Conducted	17.0	A	
Audio Frequency Conducted Susceptibility	18.0	A	
Induced Signal Susceptibility	19.0	A	
Radio Frequency Susceptibility	20.0	TT	
Emission of RF Energy	21.0	M	
Lightning Induced Transient Susceptibility	22.0	B3F 3	
Lightning Direct Effects	23.0	X	No test required
Icing	24.0	X	No test required
Electrostatic Discharge (ESD)	25.0	A	

## 1.8 Scope of Delivery

order no.	description
ATR500	ATR500, 760 channel communication transceiver
01.1251.010.71e	manual ATR500 „Installation and Operation“
	EASA Form 1

## 1.9 Accessories

### Maintenance Manual

Bestellnummer	description
01.125.010.13e	Maintenance Manual

### Cable Looms

order no.	description
BSKS500A	cable loom with free ends for gliders
BSKS500E	cable loom with free ends for airplanes <b>incl.</b> connector set
BSKS500F	cable loom with free ends for airplanes (with light). <b>without</b> connector set
BSKS500U	cable loom for ATR500 with 2 headset connectors and 1 PTT
BSKS500V	cable loom for ATR500 with 2 headset connectors and 2 PTT
BSKSZUB	connector set
ZSHM10	swan neck microphone

### Antennas for Planes

order. no.	description
SP100	folded-top antenna, alu, with 10 m antenna cable
SP2000	folded-top antenna, cable, BNC-jack
SP200010	antenna cable for SP2000, 10 m

### Mobile Station

order. no.	description
ZGS6	carrying bag (leather) incl. battery, antenna and mike
AL2000	charger
32023100	antenna
ZDHMGS6	dynamic hand-microphone
PNEGAK01	replacement battery 12V/6,5Ah for GS6/GS7

## 2 INSTALLATION

### 2.1 Unpacking

- Carefully unpack the equipment.
- Damages due to transport must be reported to the shipping company.
- Save the shipping container and all packing materials to substantiate your claim.



For storage or reshipment the original packaging should be used.

### 2.2 Requirements

- In arrangement with an avionics shop, location and kind of the installation are specified. An avionics shop can install all cables. Refer to 1.9 Accessories for cable looms.
- The equipment is front-laterally fixed in the instrument panel in a 57 mm cut-out using four M4 screws (included in delivery).
- Leave sufficient space for the installation of cables and connectors.
- Avoid sharp bends and the routing of cables close to control cables.
- Avoid installation close to heat sources.
- Care for adequate convection cooling.



Note 2.4.2 Microphone Connection BEFORE mounting!

## 2.3 Antenna

Use an omni-directional vertical polarized VHF COM antenna with a 50 Ohm impedance. Wideband comm antennas provide efficient operation over the VHF communications band.

### Installation recommendations:

- consider the manufacturer's recommendations
- Mount the antenna in vertical position so on or under the belly that it is as far distant as possible from all protruding parts (propeller, chassis, vertical stabilizer).
- To avoid any mutual interference of the radios, the antenna isolation between a voice transmission and a navigation antenna as well as between double COM antennas should be as high as possible. A separation of 2 meters usually is sufficient.
- The metallic contact between airplane surface and antenna must be very good. On non-metallic airplanes a metal foil (min. 80 cm x 80 cm) shall be used as electrical counterweight on the inside of the belly.
- For glider installation the internal antenna installed by the manufacturer should be used.

## 2.4 On-Board Wiring

### 2.4.1 Annotations

- Keep wiring as short as possible.
- Avoid cable running near strong high frequency sources such as ignition coil, generator or battery charger.
- Refer to 1.9 Accessories for cable looms.
- All cables can be installed by an aeronautical-engineering enterprise.
- The cables must be approved for airplane installation.
- conductor cross-section:
  - power, GND: AWG18 (0.96 mm<sup>2</sup>)
  - signals: AWG22 (0.38 mm<sup>2</sup>)
- external slow-blow fuse (4 A) required.

## 2.4.2 Microphone Connection

Microphone inputs:

MIC 1: switchable („Mic Switch“ on the right side of the equipment) for


- dynamic microphones (factory setting)
- standard microphones

MIC 2: only for standard microphones

The input for standard microphones is appropriate for input voltages of 50 mVpp to 2 Vpp. This input has a bias voltage of 8 V at 330 ohms. Sensitivity is adjustable in the init menu with MIC.

The input for dynamic microphones is appropriate for input voltages of 5 mVpp to 10 mVpp. This input has no bias.

Use microphones of the same type, since the settings described in the following are always concerning both microphone inputs.

	<p>Check setting of the MIC switch on the right side of the radio BEFORE mounting! (Factory setting: dynamic microphone) Two microphones may be connected parallel per microphone input.</p>
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## 2.4.3 Headphone Connection

Headphones may be connected parallel as long as the total impedance doesn't fall below 8  $\Omega$ .

### 2.4.4 Display Illumination

#### From No 2 of 1.3 Survey of Part Numbers!

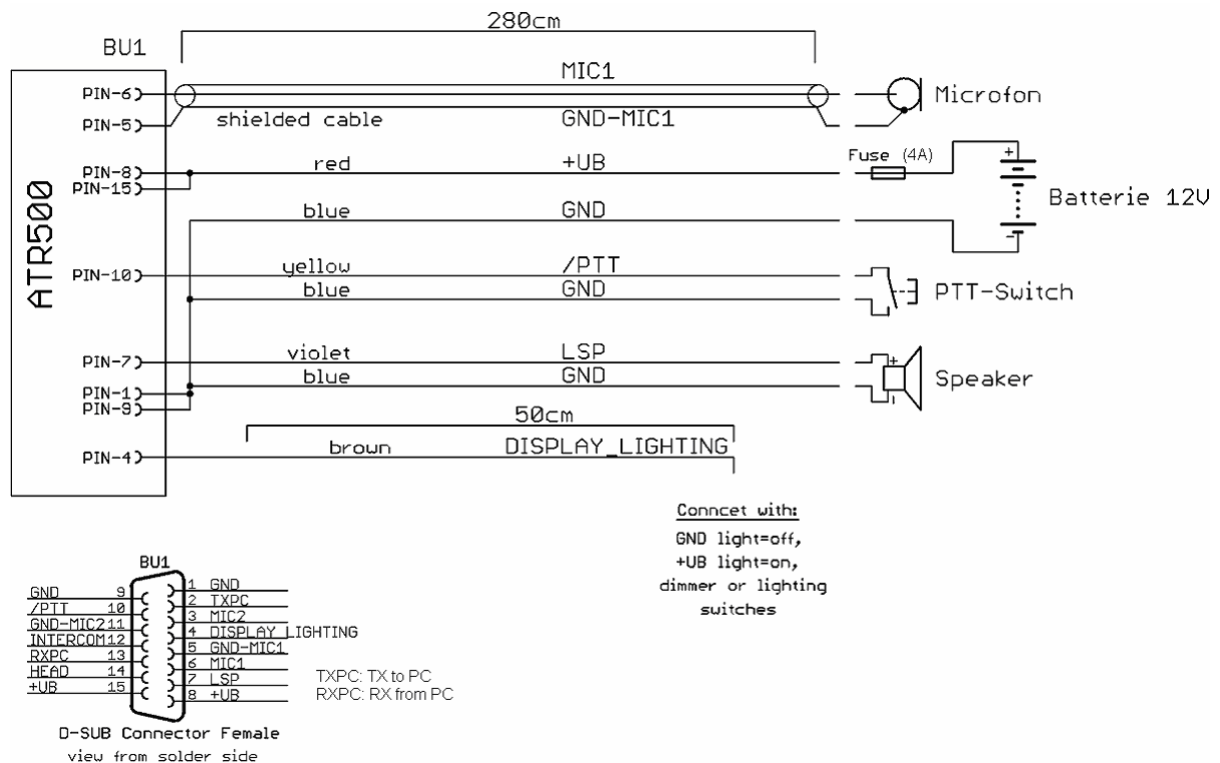
„DISPLAY\_LIGHTING“ (Pin 4) must be connected according to the desired function:

- GND illumination off
- +UB illumination on
- dimmer illumination external adjustable
- switch illumination external switchable

If pin 4 is connected to an external voltage supply, illumination can be adjusted by the DIM function (refer to 4.4.5, page 23).

### 2.4.5 Wiring Single-Seater

Cable loom BSKS500A

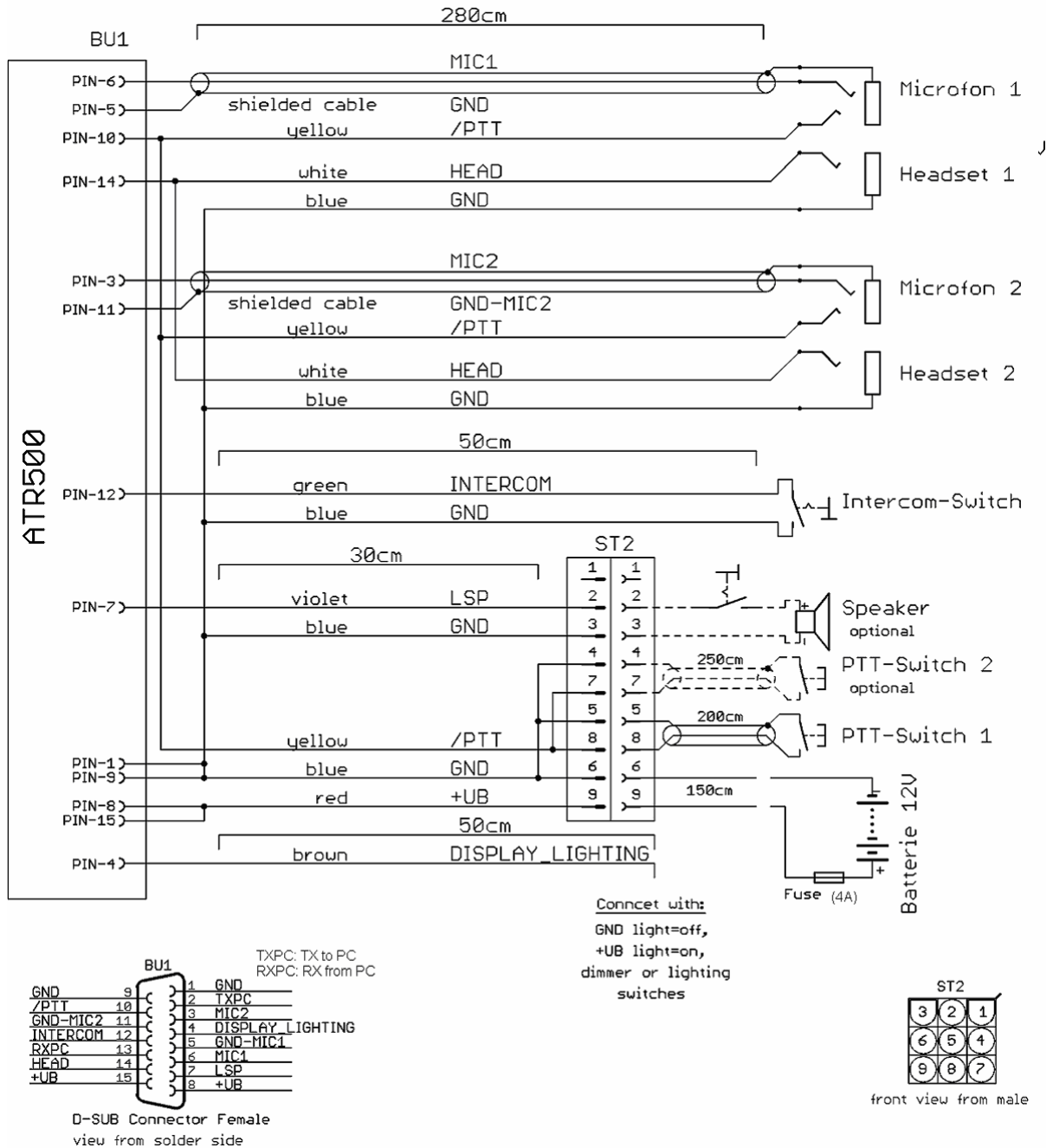


**DISPLAY\_LIGHTING: Refer to 2.4.4 for connection.**

### 2.4.6 Wiring Double-Seater with Intercom

#### Cable Looms:

BSKS500U: 1 PTT button; BSKS500V 2 PTT buttons.



**DISPLAY\_LIGHTING: Refer to 2.4.4 for connection.**

## 2.5 Microphone Settings

Settings of MIC- und VOX-values are essential for intercom operation.

Using VOX the threshold level is adjusted so that usual flight noise is not transmitted to the headphones, but only an additional signal caused by speaking will start intercom operation.

With very strong background noise or uncompensated microphones VOX can be deactivated by setting VOX01.

In this case intercom is activated using a press-to-talk key (PTT), which connects pin 12 (intercom) of the equipment connector to GND. If required, e. g. in a tandem cockpit, use two parallel connected PTT keys.

For operating in VOX mode pin 12 has to be connected permanently to GND.

Transmission merely operates when PTT is pressed.

The suppression of background noise is only possible using differential microphones, as they are usual with modern headsets. Normal electret microphones are not suitable.



For setting refer to 4.2.1 MIC-setting.



## 2.6 Installation Check

When installation is completed all steering and control functions of the aircraft are to be examined, in order to exclude disturbances by the wiring.

Subsequently, check antenna matching. Insert a standing wave meter, respectively a direction-sensitive RF power meter into the antenna line. Determine standing wave ratio (SWR) over the entire operating frequency range. The SWR shall not exceed 3:1 (the reflected power shall not exceed 25% of the forward power). If this value is exceeded, a mismatching is present, which can be caused e. g. by incorrect or insufficient electrical counterweight, bad contacting or incorrect radiator length.



With COM antennas attached on the fuselage lower side this measurement must be accomplished during flight, in order to avoid faulty measurements.

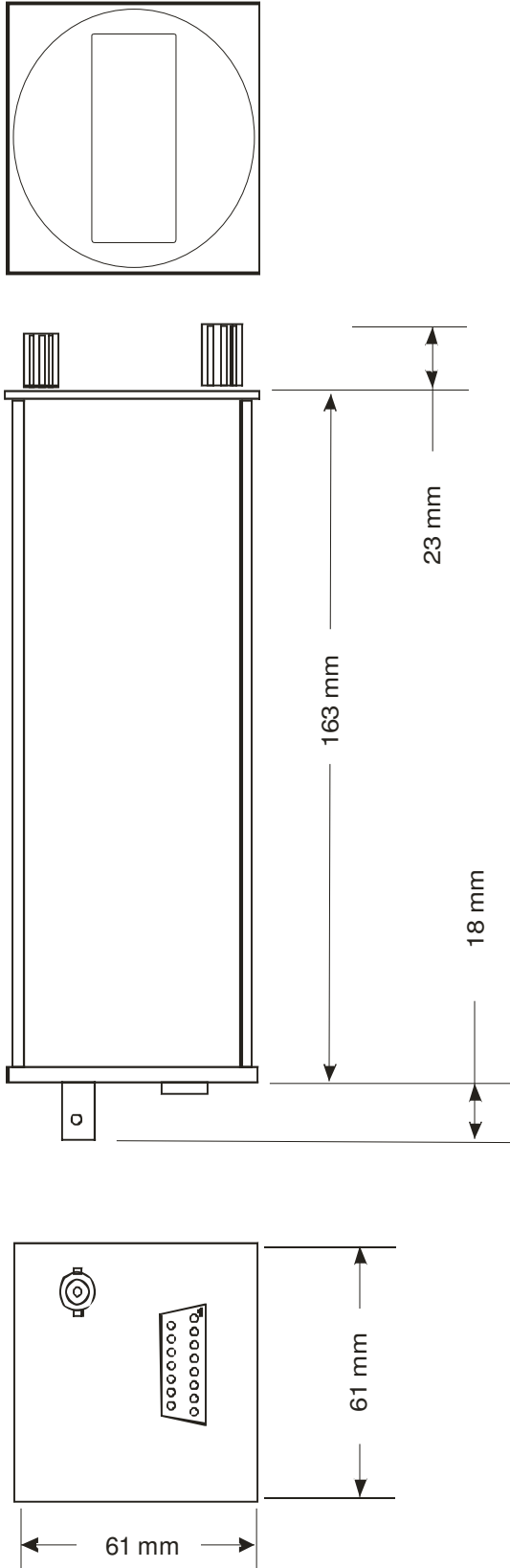
After the antenna measurement a communication test with an aeronautical station shall be accomplished.

Furthermore a test flight is recommended, in order to guarantee the proper in-flight operation of the radio:

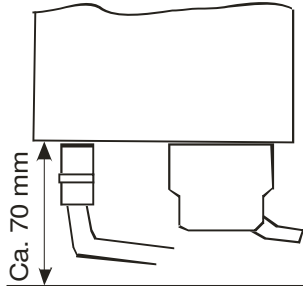
- In a flight altitude of at least 1500 ft contact a ground station in a distance of at least 100 km (60 nautical miles).
- Pay attention to unusual electrical interference.
- If possible, perform the radio test on frequencies within the upper and lower VHF communication frequency range.

### 3 DRAWINGS

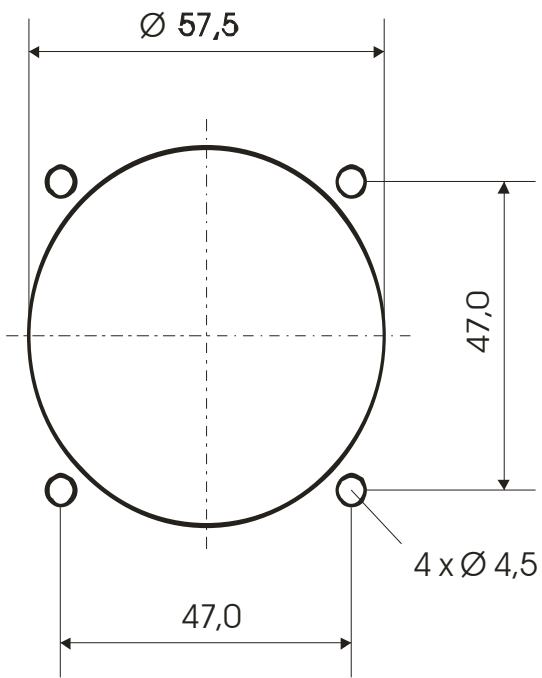
#### 3.1 Equipment



#### 3.2 Equipment Connectors



#### 3.3 Panel Cut-out



Not full scale!

## 4 OPERATION

For figure of controls refer to page 27.

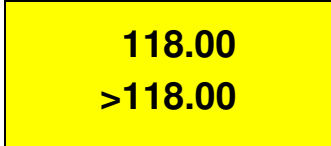
### 4.1 ON/OFF

- power on: press about 0,5 s
- power off: press about 3 s

Display after power on


	device type software release
---	---------------------------------

Afterwards one of the following viewings appears, depending on the position of the MEM switch:

	active frequency stand-by frequency
---	--

or

	active frequency memory position
---	-------------------------------------

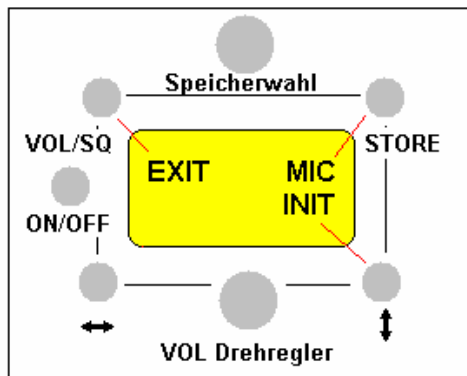
	At power on the last settings are used.
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## 4.2 INIT Menu

The INIT Menu contains

- MIC Setting (microphone level)
- reset to factory settings
- contrast (**previous to P/N 500-(1XX)-(1XX)**, refer to 4.4.6)

Call INIT Menu: keep pressed ↔ at power on



Bedienung im INIT-Modus

Key Assignment:

EXIT: VOL/SQ  
 MIC: STORE  
 INIT: ↓  
 CON: ↔

### 4.2.1 MIC-setting

The MIC level simultaneously effects MIC 1 and MIC 2. Therefore two equivalent standard microphones must be used to ensure successful intercom operation.

- For setting MIC, VOX previously must be set to 5 (refer to 4.4.4).
- select MIC: press STORE

**EXIT**

**MIC:05**

MIC:nn, nn = 01 .. 32

- set level: turn VOL  
 lowest sensitivity: MIC01  
 usually setting for avionic headsets: 01 .. 05  
 The microphone level can be adjusted using headphones: With engine running talk loud and clearly and vary MIC until VOX switches on and off satisfactorily.
- exit: press VOL/SQ

## 4.2.2 Reset



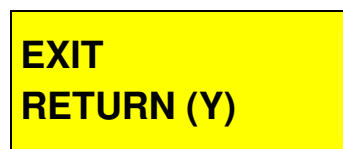
- Select INIT: press UP/DOWN  
All values will be set to factory defaults:

MEM1	118.00	VOL	03
MEM2	127.00	SQ	08
MEM3	136.97	VOX	05
MEM4	127.50	MIC	05
MEM5	130.47	DIM	10
MEM6-9	118.00	CON	05

## 4.3 Return-Mode (from P/N 500-(1XX)-(1XX))

The return mode determines, if the display automatically returns to frequency view after changes by the user (VOL, VOX, etc.).

- Call menu: keep ↑ pressed during power on



RETURN: Y/N

- select (Yes/No): VOL
  - yes: switch to frequency view after 5 s (default)
  - no: remain in actual setting item
- exit: VOL/SQ

## 4.4 VOL, SQ, VOX, DIM, CON – Basic Settings

### 4.4.1 General


Select one of the following setting modes: press VOL/SQ (repeatedly).

- VOL            volume
- SQ            squelch
- VOX          threshold of intercom function
- DIM          display background illumination
- CON          display contrast
- frequency view

Use the rotary knob to change values.

Return to frequency view:


press  $\leftrightarrow$  or  $\uparrow$  or wait for auto-return (after 5 s without manipulation).  
(Auto-return can be switched off as described in chapter 4.3.)

	<p>If contrast was misadjusted and the display is not readable:</p> <ul style="list-style-type: none"> <li>• Switch power off and on again.</li> <li>• Wait for 5 s, then press VOL/SQ 5 times.</li> <li>• Turn VOL to set contrast.</li> </ul>
---	---

### 4.4.2 VOL – Volume



VOL:nn, nn = 01 ... 16  
(prior to P/N 500-(1XX)-(1XX): nn = 01 .. 32)

	<p>VOL only affects the received signal, not the intercom level, which is set ex-factory.</p>
---	---

### 4.4.3 Squelch

**127.50**  
**SQ :03**

SQ :nn, nn = 01 .. 10



Usual setting is 03 .. 05. Superior values can cause unwanted suppression of low signals.

Squelch does not affect the intercom function.

### 4.4.4 VOX – Threshold of Intercom Function

With VOX the volume threshold is set to avoid transmission of normal noise in the cockpit to the headphones.

Only an additional voice signal activates intercom operation.

**127.50**  
**VOX:05**

VOX:nn, nn = 01 .. 10

### 4.4.5 DIM – Background Illumination

precondition: corresponding wiring (refer to 2.4.4).

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

**127.50**  
**DIM:10**

DIM:nn, nn = 01 .. 10

**P/N 500-(0XX)-(0XX) from S/N 00301 04**

- call LIGHT menu: keep ↑ pressed during power on.

**EXIT**  
**LIGHT**

- press ↑

**EXIT**  
**LIGHT:05**

LIGHT:nn, nn = 01 .. 32

- exit: VOL/SQ

**4.4.6 CON – Contrast****from P/N 500-(1XX)-(1XX)**

**127.50**  
**CON:10**

CON:nn, nn = 01 .. 10

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

- call INIT-Menu: keep ↔ pressed during power on.
- select „CON“: press ↔

**EXIT**  
**CON:16**

CON:nn, nn = 01 .. 32

- exit: VOL/SQ



## 4.5 Frequency Setting

### 4.5.1 Direct Input

- turn MEM to position „SET“

<p><b>127.00</b> <b>&gt;136.95</b></p>	<p>active frequency stand-by frequency</p>
--	--

- select setting of MHz or kHz using “↔”  
“>”/“<” marks the selected part of the frequency value (MHz/kHz)
- turn VOL to change values
- press ↑ (UP/DOWN) to activate stand-by frequency  
(swap previously active and stand-by frequency)

### 4.5.2 Select Frequency from Memory Position

- Turn „MEM“ to select position (M1...M9)  
The stored frequency is displayed and set as active frequency.

<p><b>136.95</b> <b>M2</b></p>	<p>stored frequency selected memory position</p>
------------------------------------	--

### 4.5.3 Save new Frequency

- Set frequency (manually) (refer to 4.5.1).
- Select memory position (M1 .. M9).  
Position and according frequency are displayed and active, the previously active frequency is stored in the background.
- Press STORE, to save the memorized value.  
(The present value will be overwritten.)

## 4.6 Automatic Frequency Checkup

If „–“ is displayed behind the frequency value, the equipment is not able to set the frequency. Transmit/receive operation stops.  
In this case the ATR500 and has to be sent to the manufacturer.



If „–“ appears for less than 1 second, an extreme radio interference could be the reason. This is no malfunction of the device.

## 4.7 BAT – Low-Battery

If battery voltage drops below 10,5 V, a blinking „B“ is displayed.

## 4.8 Transmit Operation

Pushing PTT starts transmission on the selected frequency shown in the upper line. This operation is indicated by “T”.



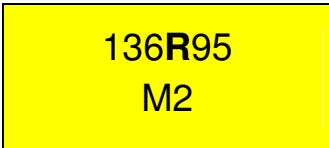
136T95  
M2

„T“ indicates correct operating of the transmitter.

To avoid unintended transmission the transmitter stops after two minutes and the display changes from “T” to “E”.

To start transmission again, release PTT and push again.

## 4.9 Receive Operation



136R95  
M2

While receiving (squelch is open) “R” is shown.

## 4.10 Controls



- |                   |  |
|-------------------|--|
| 1: MEM/SET        | select frequency from memory position (M1 .. M9)<br>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 bzw. 3 s)  |
| 6: ↔              | select MHz/kHz setting<br>start INIT mode  |
| 7: ↑<br>(UP/DOWN) | swap active/stand-by frequency   |

