

# **BECKER**

AVIONIC SYSTEMS

**VHF  
Transceiver**

**AR 3209 - ( )**

**Upwards serial no.: 150**

## **Installation and Operation**

Manual  
Issue 1

DV 37502.03  
January 1999

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AR 3209 - ( )

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## **Section I GENERAL DESCRIPTION**

### **1.1 Introduction**

The following manual describes the VHF transceiver AR 3209 - ( ) upwards serial no. 150. The manuals DV 37502.03 ("Installation and Operation") and DV 37502.04 ("Maintenance and Repair") contain the following section :

Section		DV 37502.03	DV 37502.04
1	General Information	X	X
2	Installation	X	X
3	Operation	X	X
4	Theory of operation		X
5	Maintenance and Repair		X
6	Illustrated Parts List		X
7	Modification and Changes		X
8	Circuit Diagrams		x

### **1.2 Purpose of equipment**

The VHF transceiver enables voice communication on 760 channels in the 118.000 MHz to 136.975 MHz range with a channel spacing of 25 kHz. It complies with the requirements of ICAO Annex 10 valid from 01.01.1995.

### **1.3 General description**

The VHF transceiver is designed with sufficient mechanical strength to enable it to be fitted in an aircraft without any limitations. There is no restriction within the verified environmental classes on fitting in the instrument panel or centre console or operating console, or fixed mounting in the fuselage, of all types of aircraft including helicopter.

The VHF transceiver has been developed as a single block unit. Its dimensions correspond to the ARINC standard for control equipment. It is held in place by means of four DZUS fasteners. All controls, indicators and displays are located on the front plate. The back side of the unit contains: the two unit connector plugs for connection to the aircraft wiring system, and the antenna.

After it is switched on, the unit performs a self test. All segments of the displays flash during the self test. If faults are detected, the LCD's (liquid crystal display) displays a fault code for approximately five seconds. The VHF transceiver then automatically activates the mode set before it was switched off.

The VHF transceiver is fitted with a single superheterodyne receiver. A squelch (muting) circuit suppresses transmitters or disturbances below a certain field strength. The switching threshold can be set. The squelch function can also be switched off.

The transmitter is designed to be wideband over the 118.000 MHz to 136.975 MHz range. The sidetone is automatically switched to the headphone output during transmission.

The oscillator frequency of the receiver and the transmitting frequency of the transmitter are generated by a VCO (voltage controlled oscillator). This is monitored by a digital frequency evaluation circuit. This digital frequency processing operates in conjunction with a microprocessor.

The microphone inputs are designed for parallel both dynamic and standard microphones. The inputs are connected to a dynamic volume compressor which keeps the modulation voltage constant over a wide input voltage range.

The frequency indication is by means of two liquid crystal displays (LCD). The required operating frequency is set using the MHz and kHz frequency selector switches. The MHz rotary switch engages at 1 MHz steps and the kHz rotary switch at 25 kHz steps.

The VHF transceiver also contains a memory device for storing 20 different frequencies which remain stored even with the unit switched off without an auxiliary battery.

Aircraft internal communication is possible in the IC (intercom) mode. Activation is by means of an external IC button (or switch) which is to be connected to the equipment connector.

The AF auxiliary input enables AF signal switching of auxiliary units in the aircraft. The switched AF signals can, however, only be monitored in the reception mode.

If illumination of the LCD's is required, this can be connected either directly to the supply voltage or via a dimmer.

### **Special functions**

VHF transceiver contains some special functions which can be set in the service mode.

- The squelch sensitivity, IC, sidetone and AF external input volume can be directly set on the control unit.
- The frequency setting can be inhibited. The VHF transceiver then operates only on the frequencies stored in the storage channels.
- The storage of frequencies in the storage channels can be inhibited.
- Stored frequencies can be erased.
- Access to the service mode can be interlocked with a 4-digit password.

**1.4 Variants survey**

Type designation Part-No.:	Power supply voltage	Transmitter output	Panel lighting	Panel colour
AR 3209 - (09) - 110 0514.373-910	13,75 V	≥ 5 W	13,75 V / 27,5 V	schwarz
AR 3209 - (09) - 010 0514.381-910	13,75 V	≥ 5 W	5 V	schwarz
AR 3209 - (09) - 111 0514.301-910	13,75 V	≥ 5 W	13,75 V / 27,5 V	grau
AR 3209 - (09) - 011 0514.403-910	13,75 V	≥ 5 W	5 V	grau
AR 3209 - (11) - 110 0514.454-910	13,75 V 27,5 V	≥ 6,5 / ≤ 10 W	13,75 V / 27,5 V	schwarz
AR 3209 - (11) - 010 0514.462-910	13,75 V 27,5 V	≥ 6,5 / ≤ 10 W	5 V	schwarz
AR 3209 - (11) - 111 0514.470-910	13,75 V 27,5 V	≥ 6,5 / ≤ 10 W	13,75 V / 27,5 V	grau
AR 3209 - (11) - 011 0514.489-910	13,75 V 27,5 V	≥ 6,5 / ≤ 10 W	5 V	grau

**1.5 Technical data**

**1.5.1 Power supply data AR 3209 - (09)**

Nominal supply voltage	13.75 V.d.c.
Supply voltage range	12.4 V to 15.1 V
Emergency operation	10.0 V

Power consumption without panel lighting

Standby reception mode	≤ 70 mA
Reception mode	≤ 500 mA
Transmission mode	≤ 2.5 A

Panel lighting

5V DC	1 A
13,75 V DC	400 mA

**1.5.2 Power supply data AR 3209 - (11)**

Nominal supply voltage	13.75 V.d.c.
Supply voltage range	12.4 V to 15.1 V

Emergency operation	10.0 V
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**or**

Nominal supply voltage	27.5 V.d.c.
Supply voltage range	24.8 V to 30.3 V

Emergency operation	20.0 V
---------------------	--------

Power consumption without panel lighting

Standby reception mode	≤ 70 mA
Reception mode	≤ 500 mA
Transmission mode	≤ 2.5 A

Panel lighting

5V DC	1 A
13,75 V DC	400 mA
27,5 V DC	200 mA

**1.6 General data AR 3209 - (09) AR 3209 - (11)**

Frequency range	118.000 MHz to 136.975 MHz
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Number of channels	760
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Channel spacing	25 kHz
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Storage temperature range	-55° C to +85° C
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Operating temperature range as per EUROCAE/RTCA ED-14C/DO-160C	-20° C to + 55° C short-time + 70° C
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Operating altitude as per EUROCAE/RTCA ED-14C/DO-160C	50 000 ft
--	-----------

Vibration as per EUROCAE/RTCA ED-14C/DO-160C	Cat. NM
---	---------

Humidity as per EUROCAE/RTCA ED-14C/DO-160C	Cat. A/+50° C: 95%, 48 h
--	--------------------------



**1.6.1 Dimensions AR 3209 - (09) AR 3209 - (11)**

Front panel	146 mm x 47,5 mm
Depth of unit without cable connector	194 mm
Weight	
AR 3209 - (09)	1 kg
AR 3209 - (11)	1,2 kg
Fuse internal	5 A automatic cut-out

**1.6.2 Receiver data AR 3209 - (09) AR 3209 - (11)**

Type of receiver	Single superhetrodyne receiver
Sensitivity	$\leq 5 \mu\text{V}$ EMF for 6 dB = SINAD (mod. 1000 Hz/30%)
IF bandwidth	$\geq \pm 8$ kHz at 6 dB attenuation
Selectivity	$\geq 40$ dB at $\pm 17$ kHz $\geq 60$ dB at $\pm 25$ kHz
Squelch	Can be adjusted and switched off
AGC characteristic for 5 $\mu\text{V}$ to 100 mV EMF	$\leq 6$ dB
Distortion $m = 85\%$	$\leq 15\%$
Audio frequency response relative to 1000 Hz	$\leq 6$ dB 350 Hz to 2500 Hz $\geq 18$ dB at 4000 Hz
Intermediate frequency	21.4 MHz
Rated output	
for speaker operation	
at 13.75 V nominal operatingvoltage	$\geq 3$ W into 4 $\Omega$
at 10.0 V operating voltage (emergency mode)	$\geq 1.5$ W into 4 $\Omega$
with headset connected	
at 13.75 V nominal operating voltage	$\geq 100$ mW into 600 $\Omega$
at 10.0 V operating voltage (emergency mode)	$\geq 30$ mW into 600 $\Omega$
Audio auxiliary input adjustable (regardless of volume)	1 V to 8 V at 600 $\Omega \pm 10\%$

**1.6.3 Transmitter data AR 3209 - (09) AR 3209 - (11)**

Transmitter output AR 3209 - (09) at 10.0 V operating voltage (emergency mode)	$\geq 5 \text{ W into } 50 \Omega$ $\geq 2 \text{ W into } 50 \Omega$
Transmitter output AR 3209 - (11) at 27.5 V nominal operating voltage at 20.0 V operating voltage (emergency mode)	$\geq 10 \text{ W into } 50 \Omega$ $\geq 10 \text{ W into } 50 \Omega$
Transmitter output AR 3209 - (11) at 13.75 V nominal operating voltage at 10.0 V operating voltage (emergency mode)	$\geq 6.5 \text{ W into } 50 \Omega$ $\geq 2 \text{ W into } 50 \Omega$
Frequency tolerance	$\leq 15 \text{ ppm}$
Duty cycle	1:4 (Min)
Type of modulation	A3E amplitude modulation
Modulation factor	$\geq 70\%$ to $\leq 99\%$ (dynamic compressor)
Distortion at 70% modulation	$\leq 15\%$
Modulation bandwidth	350 Hz to 2500 Hz
Frequency response	-6 dB (reference to 1 kHz / 0 dB)
Input voltage (m = 70%)	
Dynamic microphone	$\leq 2 \text{ mV balanced } 200 \Omega$ (dynamic compressor)
Standard microphone	$\leq 120 \text{ mV } 150 \Omega$ (dynamic compressor)
FM deviation with modulation m = 70% f = 1.25 kHz	$\leq 3 \text{ kHz}$
Sidetone	true, adjustable
Automatic shutdown on short circuit of transmit button	after 2 mins of continuous transmission, the transmitter shuts down. Activated by releasing the transmit button and re-pressing.

#### **1.6.4 Software**

The frequency processing, frequency storage and frequency display are controlled by microprocessors. The software was classified as Category "ESSENTIAL" Level 2 in agreement with the EUROCAE/RTCA Document ED12A/DO-178A.

#### **1.7 Approval**

BZT-No.: A127849H  
LBA-No.: 10.911/96JTSO

#### **1.8 Regulations**

JTSO - 2C37d, ED-23A, Equipment Class 4  
JTSO - 2C38d, ED-23A, Equipment Class C  
EUROCAE/RTCA ED-14C/DO-160C  
EUROCAE/RTCA ED-12A/DO-178A  
FTZ 17T R2010

**1.9 Environmental Qualification Form**

The following performance standards under environmental test conditions have been established in accordance with the procedures set forth in EUROCAE/RTCA Document No. ED-14C/DO-160C.

Environmental condition	ED - 14C DO - 160C	Category	Performance
Temperature	4.0	D1	
Low operating temperature	4.5.1		- 20° C
Low ground survival (storage temperature)			- 55° C
High short-time operating temperature	4.5.2		+ 70° C
High operating temperature	4.5.3		+ 55° C
High ground survival (storage) temperature			85° C
Min. operating pressure (equivalent altitude)	4.6.1		50.000 ft.
Temperature variation	5.0	B	
Humidity	6.0	A	48 hrs at up to 50° C and 95% relative humidity
Shock :	7.0		
Operational shocks	7.2		11 ms at 6 G for all three dimensional axes
Crash safety shocks	7.3		11 ms at 15 G for all three dimensional axes
Vibration	8.0	MN	
Magnetic effect	15.0	Z	Deflection of 1° of compass at a distance of   30 cm
Power input variation	16.0	B	The equipment functions on a 10-volt emergency power supply
Resistance to voltage spikes on equipment power leads	17.0	A	
Audio-frequency conducted susceptibility	18.0	B	
Susceptibility to induced magnetic and electric - fields at 400 Hz	19.0	A	
Radio-frequency interference susceptibility	20.0	T	
Spurious RF emissions	21.0	A	

**1.10 Accessories**

Unit connection

Cable socket 25 pin

Article no. 0725.021.277

Connector housing

Article no. 0775.479-277

Cable socket 15 pin

Article no. 0248.436.277

incl. connector housing

Antenna plug

Article no. 0725.706-277

Manual Installation and Operation

Article no. 0525.154-071

Manual Maintenance and Repair

Article no. 0525.162-071

(Components maintenance manual)

**1.11 Scope of delivery**

Operating instructions

Article no. 0891.436-071

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## **Section II INSTALLATION**

### **2.1 General**

The installation of the VHF transceiver depends on the type of aircraft and its equipment. Therefore, only general information can be given in this Section.

### **2.2 Testing before installation**

#### **2.2.1 General**

Before installing the VHF transceiver in an aircraft, inspect the unit for signs of transport damage.

#### **2.2.2 Visual Inspection**

Before commissioning, visually inspect the unit paying particular attention to the following defects :

- (a) Dirt, dents, scratches, corrosion or broken attaching parts, damaged paintwork on housing, parts of the housing and panel.
- (b) Dirt or scratches on the identification plate, front panel, LCD or inscriptions.
- (c) Dirt, bent or broken pins, displaced inserts of plugs and sockets.
- (d) Dirt and mechanical damage to pushswitches and operating knobs.

### **2.3 Mechanical installation**

#### **2.3.1 Mechanical installation of VHF transceiver.**

The VHF transceiver is designed for instrument panel or control console mounting in the aircraft.

The equipment is secured to the airframe by four DZUS fasteners. Mounting information for the fastener strips is compiled in Fig. 2-9, Fig. 2-8 shows all dimensions relevant to installing the transceiver.

In aircraft where no panel cutout is provided, it can be produced in accordance with the dimensional requirements as per Fig. 2-9, it being good practice to use the flat fastener strips.

### **2.3.2 Notes on factory setting (power supply)**

#### **AR 3209 - (09)**

The AR 3209 - (09) VHF transceiver is designed for only 13.75 V supply and is therefore set to this voltage on delivery. If slide switch S4 is not set to 13.75 V the unit will not work.

#### **AR 3209 - (11)**

The AR 3209 - (11) VHF transceiver is designed for both 13.75 V and 27.5 V. The AR 3209 - (11) is set to 27.5 V on delivery. If the VHF transceiver is to be operated on 13.75 V, slide switch S4 has to be set to 13.75 V (refer to "Setting the AR 3209 - (11) supply voltage" section). If the slide switch is not changed from 27.5 V to 13.75 V and 13.75 V is applied, the AR 3209 - (11) VHF transceiver operates on reduced output.

#### **Caution**

If the VHF transceiver is set to 13.75 V and 27.5 V supply is applied, the unit will be damaged.

## **2.4 Installation wiring**

### **2.4.1 General**

The installation wiring is shown in Fig. 2-10 and Fig. 2-11.

- (a) Use only cable which is fit for use in aircraft (self extinguishing). AWG 20 for power supply and AWG 22 for other cables.
- (b) Fit rubber sleeves over the solder joints on the equipment connector.
- (c) Protect the power supply with a 7,5 A fuse or circuit breaker.

#### **NOTE**

The VHF transceiver is protected internally by a 5 A fuse.

- (d) No RF cables should be included in the cable harnesses of the system and the routing of connecting cables alongside cables which carry audio power or pulses should also be avoided.
- (e) Carefully check the wiring before switching on the unit and check particularly that (+) and (-) have not been reversed.

#### **2.4.2 Microphone connection**

The VHF transceiver enables a maximum of two dynamic microphones and two standard microphones (d.c. supply) to be connected at the same time. A balanced input transformer with an impedance of 200 Ohm is fitted at the input of the dynamic microphone.

##### **NOTE**

The dynamic mike input sensitivity can be changed in the service mode.

#### **2.4.3 Speaker connection**

A 40hm to 8 Ohm speaker can be connected to audio output P2- 1AF-asym.

##### **CAUTION**

The magnetic field of a speaker influences the magnetic compass. When choosing the mounting point, a minimum distance of 1.3 m must be maintained between the speaker and the magnetic compass.

#### **2.4.4 Headphone connection**

Up to two headphones with an impedance of 600 Ohm can be connected to the audio output P2 - 2,3 AF-HI/LO.

#### **2.4.5 Intercom mode "IC connection".**

The intercom mode is designed for aircraft with a high noise level and assumes operation using headsets. Additional wiring on the equipment connector with an IC switch is necessary (refer to Fig. 2-10 and Fig. 2-11).

The normal R/T communication takes place with the IC switch in the OFF position. When the IC switch is set to ON, R/T communication can be carried on as before but intercommunication is also possible between two crew members. The IC is switched off during transmission. The IC volume can be changed in the service mode.

#### **2.4.6 Auxiliary" audio input**

The AF-AUX (P2/4) auxiliary audio input enables the switching of audio signals from other equipment in the aircraft. The switched-in audio signals can, however, only be monitored in the reception mode. The facility to switch two units together will be used particularly in those aircraft which are fitted with a VHF transceiver and an NAV receiver. An audio input voltage of 1 V to 8 V, 600 Ohm is necessary to drive the audio amplifier (can be adjusted in the "Service" mode).

#### **2.4.7 Setting the squelch sensitivity**

The sensitivity of the squelch can be directly set on the VHF transceiver at any time in the SQL function service mode.

**2.4.8 Setting the sidetone volume**

The sidetone volume can be directly set on the VHF transceiver at any time in the SIDE function service mode.

**2.4.9 Panel lighting**

The VHF transceiver is fitted with panel lighting. It is to be connected to the aircraft external power supply via the aircraft wiring at terminal P2 pin 23 / pin 10 or to a dimmer control (refer to the following illustration). For aircraft without an external power supply, the lighting power should be supplied via a separate lighting switch to save power.

**CAUTION**

The lighting is not switched off when the unit is switched off (ON/OFF switch).

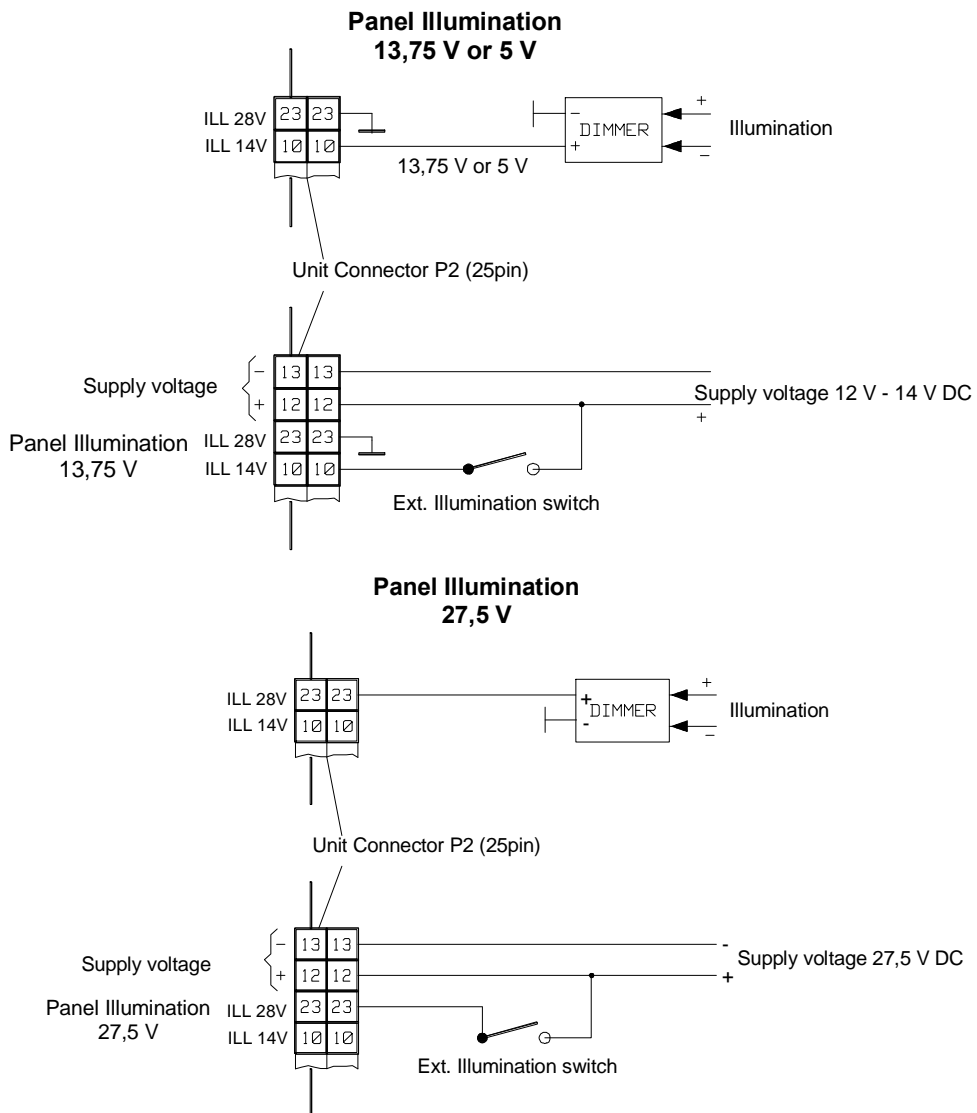


Fig. 2-1 Interwiring panel lighting

#### 2.4.10 Internal automatic cut-out

The VHF transceiver is fitted with an automatic cut-out . The released automatic cut-out is reactivated by means of a peaked object.

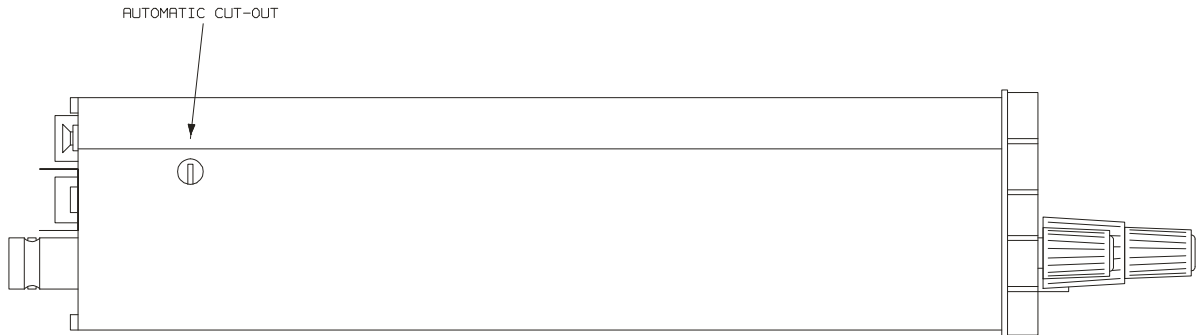


Fig. 2-2 Internal automatic cut-out

#### 2.5 Replacement of the AR 2009, AR 2010 and AR 2011 VHF transceivers by the AR 3209-( ) VHF transceiver

Replacement of the listed VHF transceivers by the AR 3209 - ( ) is simple.

The AR 3209 - ( ) has the same 15-way connector on the back with the same pin allocation as on the AR 2009 - AR 2011 VHF transceivers. Undo the four quick-release fasteners and remove the VHF transceiver from the holder. Then disconnect the 15-way connecting plug and antenna plug and remove the VHF transceiver. Fit the new VHF transceiver in the reverse order.

#### Caution

Before the new VHF transceiver is fitted, check the settings such as the supply voltage connection, microphone connection, headset connection and speaker connection.

**2.5.1 Setting the AR 3209 - (11) supply voltage**

The 13.75 V/27.5 V supply voltages are set using slide switch S4 on the back of the unit. The VHF transceiver is set to 13.75 V on delivery. 13.75 V must be visible on the cover panel. To change over to 27.5 V supply voltage remove the cover panel (two screws) and refit the other way round. This will securely lock the slide switch in the correct position and 27.5 V will then be visible in the cover panel.

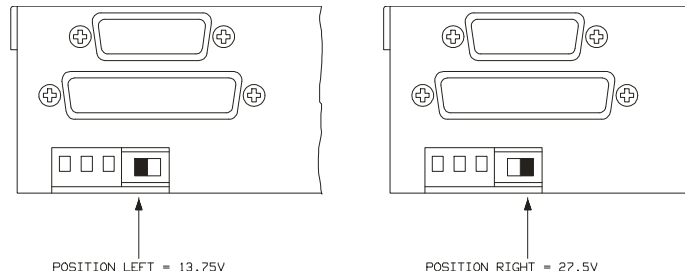


Fig. 2-3 Position of voltage changeover switch

**2.5.2 Microphone connection for a standard or dynamic microphone**

Three dil switches are located under the cover panel of slide switch S4 (selection of supply voltage). Dil switches 2 and 3 are to be set according to the microphone to be connected.

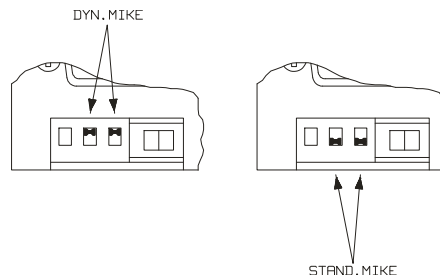


Fig. 2-4 Position of dil switches S1 - S3 for a particular microphone

**2.5.3 300 Ohm headphone connection**

If the replaced VHF transceiver had been operated with a 300 Ohm headphone, the left hand dil switch must be set to the down position (300 Ohm and AF-sym position).

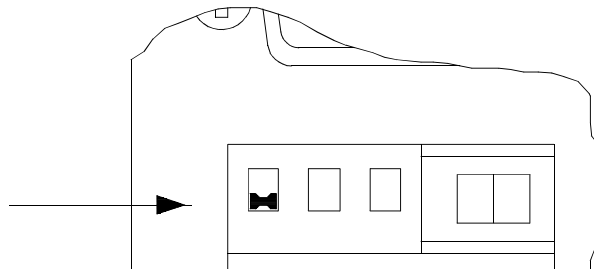


Fig. 2-5 Position of dil switches S1 - S3 for headphone connections

**2.5.4 4 Ohm speaker connection**

If the replaced VHF transceiver was operated with a 4 Ohm speaker, dil switch 1 must be set to the top position 4.

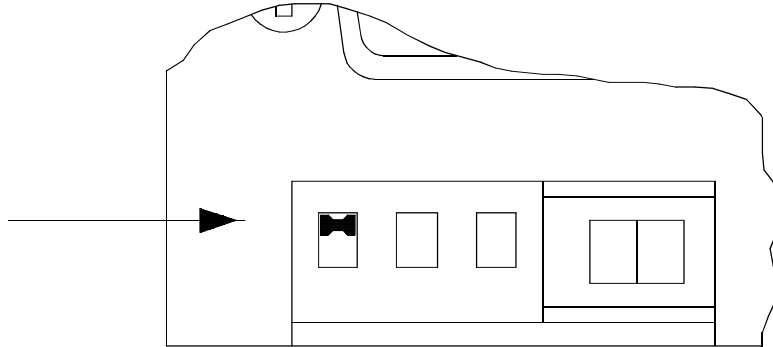


Fig. 2-6 Position of dil switches S1, S2, S3 for changeover of headphone / speaker connections

**2.5.5 300 Ohm balanced connection**

A 300 Ohm balanced, floating AF output is available at connector P2. If this AF output is required, bridge BR1 on the circuit board must be removed. Dil switch 1 must be set to the top position "Speaker operation".

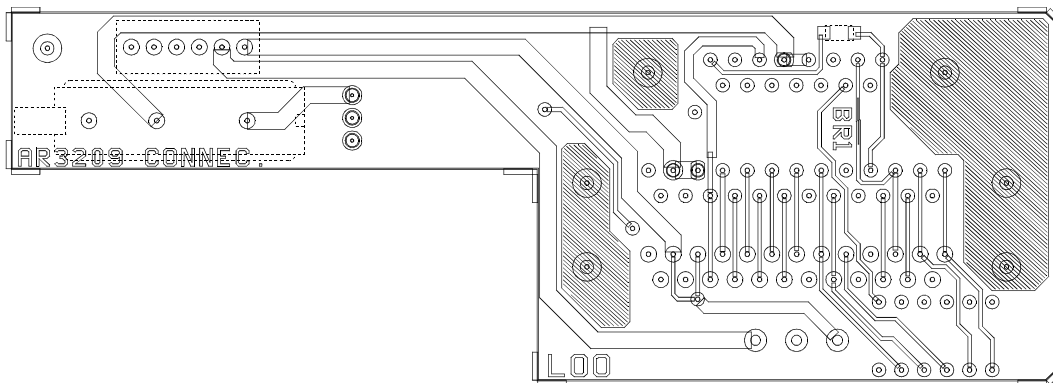


Fig. 2-7 Position of bridge BR 1

**2.5.6 Speaker muting**

The VHF transceiver AR 3209 - ( ) is equipped with two separate audio outputs for loudspeaker and headphone. The loudspeaker is under standard condition switch off in order to avoid acoustic feedback. The COMM 2000 VHF transceiver comprised only one audio output. This audio output can be connected the loudspeaker or the headphone. In the IC-mode the loudspeaker therefore will be switched off via the IC-switch, but the headphone is available for IC-operation. In order to avoid any changes during retrofitting the loudspeaker output of the VHF-transceiver AR 3209 - ( ) has to be switched to continuous operating; this can be done in service mode (compare para. 3 speaker muting switch ON/OFF).

AR 3209 - ( )

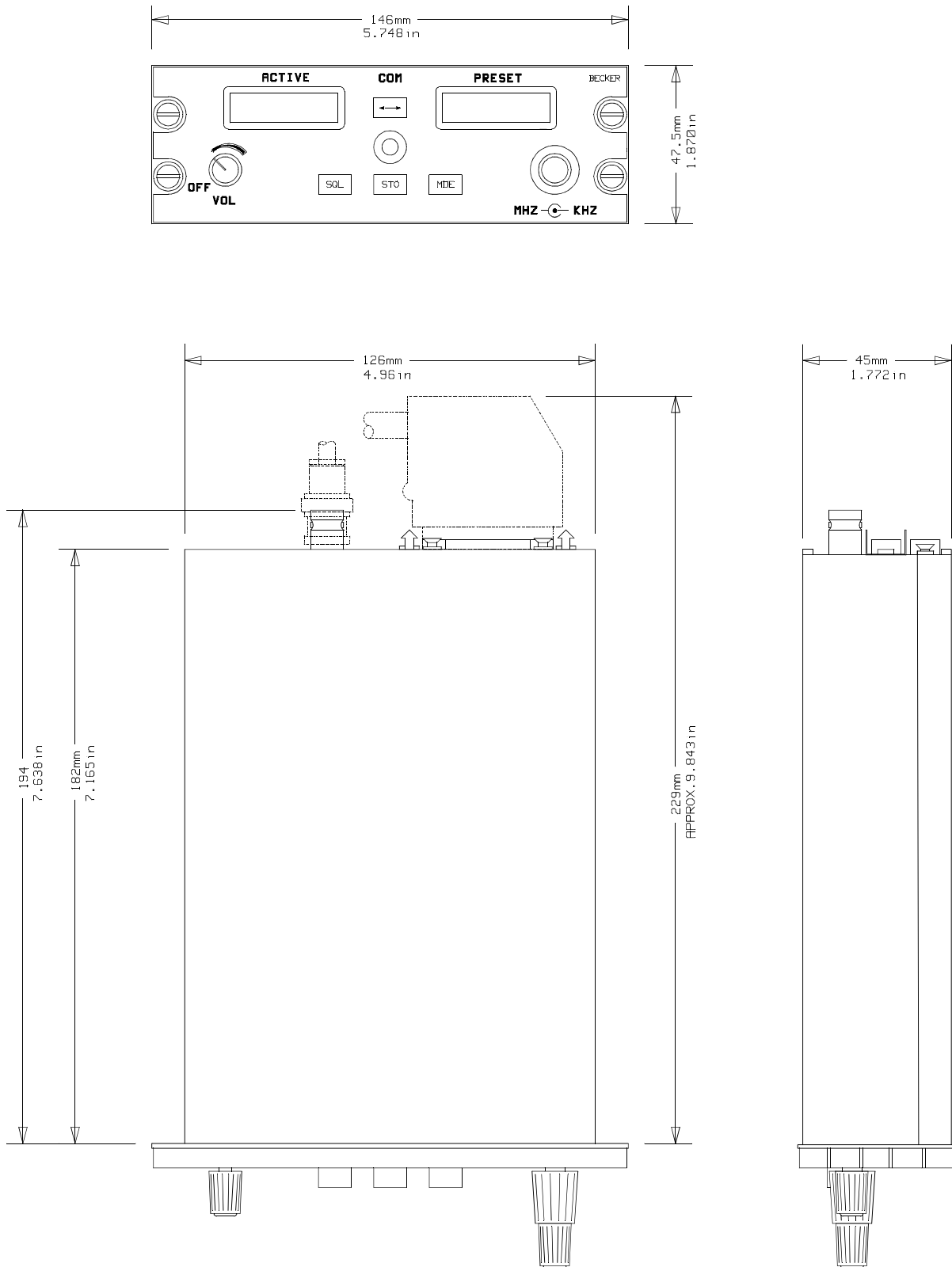


Fig. 2-8 Mounting dimensions VHF transceiver



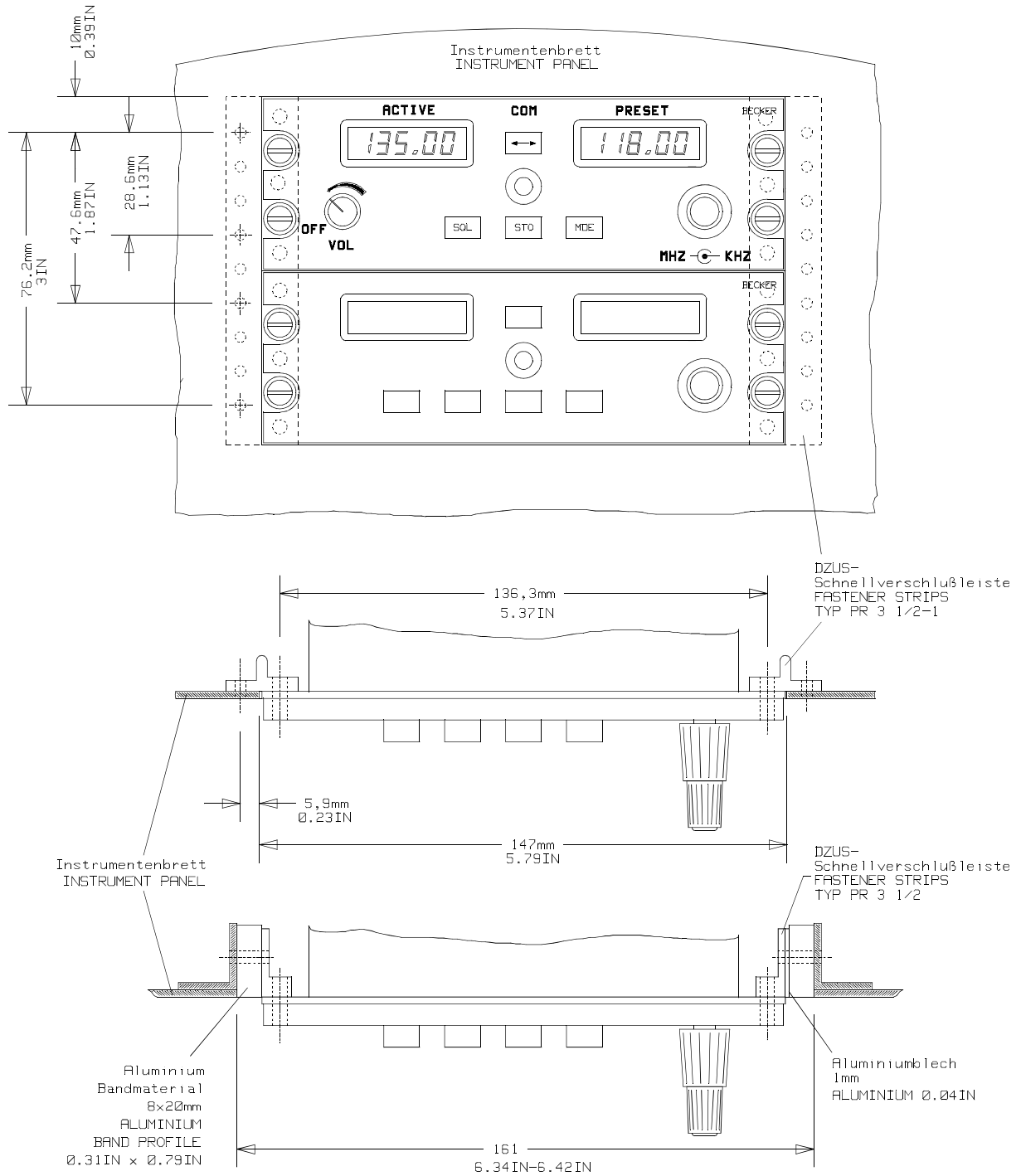


Fig. 2-9 Installation of fastener strips

## AR 3209 - ( )

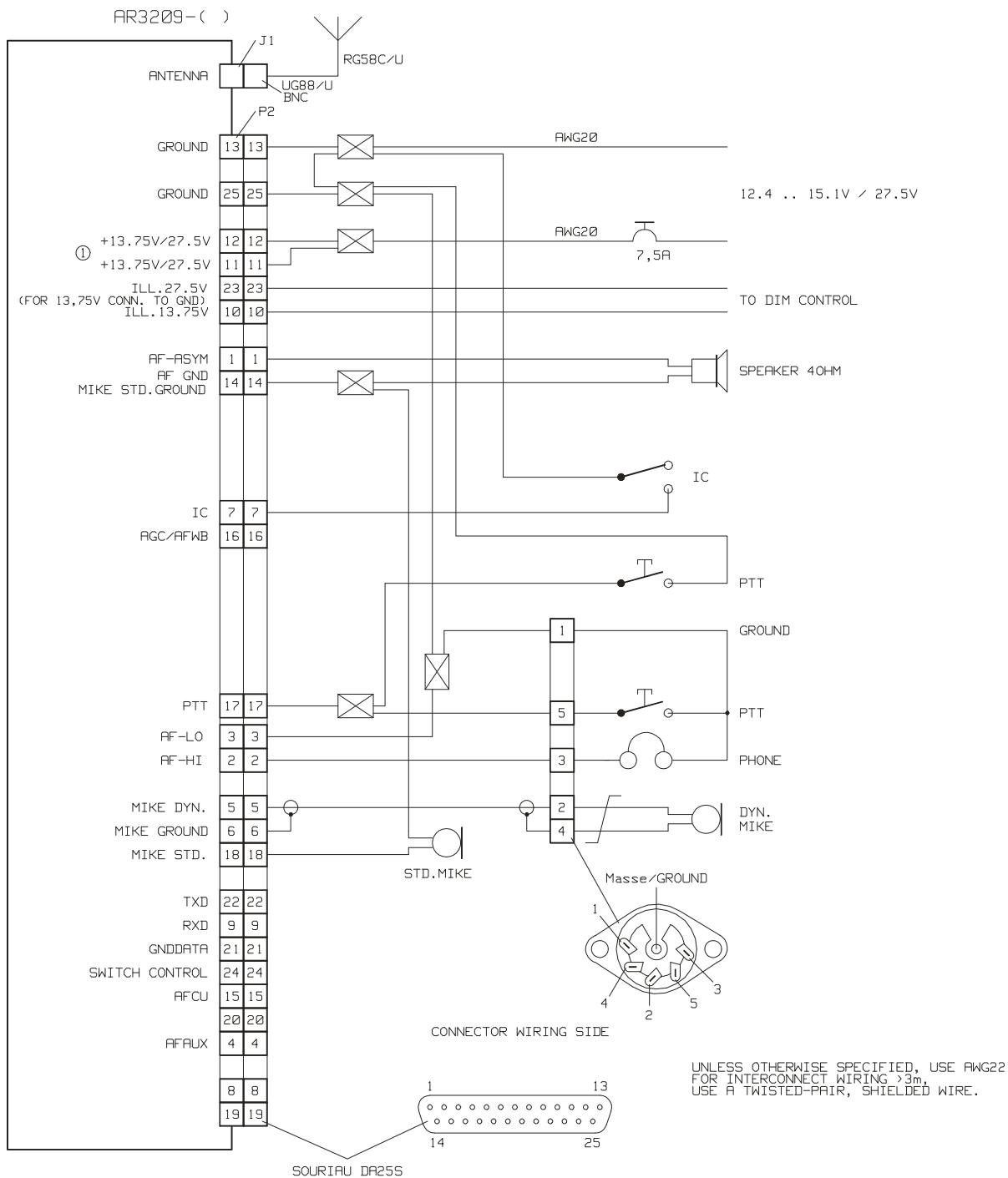


Fig. 2-10 Interwiring of the VHF transceiver AR 3209 - ( )

## AR 3209 - ( )

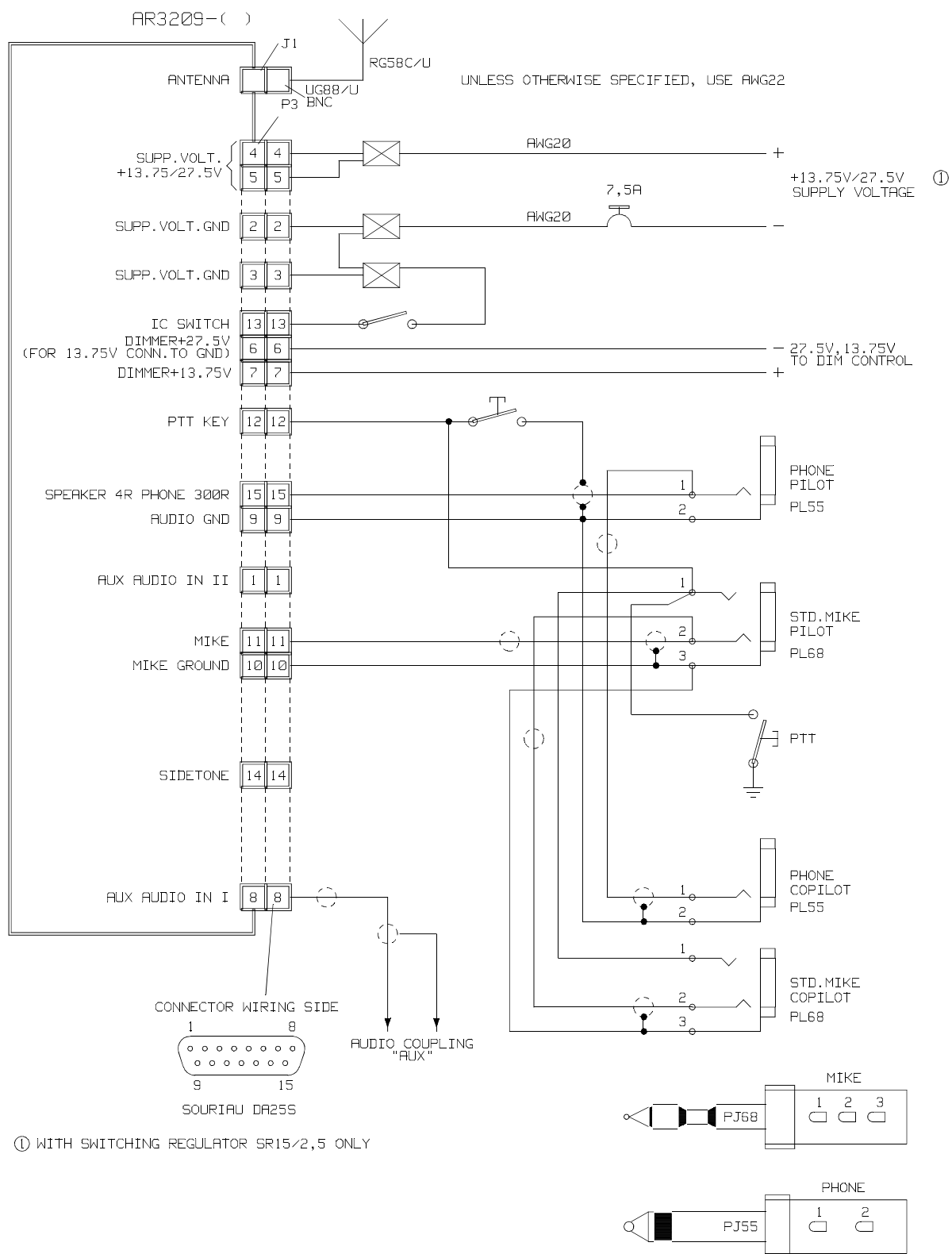


Fig. 2-11 Interwiring of the VHF transceiver AR 3209 - ( ) - AR 2009/AR 2010/AR 2011

## **2.6 Testing after installation**

### **2.6.1 Ground test with engine shut down**

- a.) After installation of the unit, measure the antenna tuning between the base of the antenna and the antenna connecting cable using a VHF reflection-coefficient meter (voltage standing wave meter).
- b.) The VSWR (voltage standing wave ratio) over the complete frequency range of the unit shall be within 3:1. If this matching value is incorrect, this indicates a mismatch, caused for example by an incorrect or unsatisfactory counterpoise, a cable with an impedance which deviates significantly from 50 Ohm or an incorrectly tuned antenna.
- c.) After the antenna measurement, check the readability by carrying out a speech test with a ground station.

### **2.6.2 Ground test with engine running**

- a.) With the engine running at cruising speed check that the aircraft power supply is within the permissible tolerances.
- b.) When performing the succeeding speech test, ensure that the distance from the ground station is as great as possible, at least 100 m. With the engine at cruising speed, the cabin noise of the aircraft should be only slightly transmitted and communication should be clear and distinct. Hold the microphone close to the lips when speaking.
- c.) Switch on the aircraft intercom using the IC switch (if fitted) and carry out a speech test with the engine running at cruising speed. If necessary, adjust the IC volume (refer to the service mode in the operating instructions (section 3)).
- d.) Switch on the squelch switch and check the squelch function. The point at which the squelch operates is set in the service mode (refer to operating instructions, section 3).

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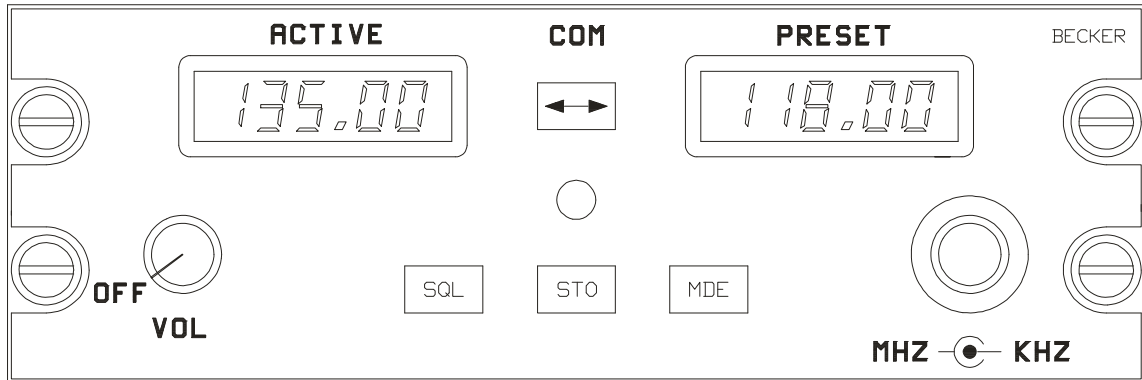
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AR 3209 - ( )







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**Section III OPERATION**

**3.1 Controls and indicators**



Meaning of symbols on controls and indicators

	Function key	Selection of mode.
	Exchange key	Mode 2: Exchange of preset frequency and active frequency.
	Store key	Storage of set frequency or other settings.
	Squelch key	Switching the squelch on or off.
	Frequency selector	Switching the indicated switch frequency in 1 MHz (outer rotary switch) steps or the storage channel upwards or downwards in steps of 10.
	Frequency selector	Switches the indicated (inner rotary switch) frequency in 25 kHz steps or the storage channel by 1 step in each case upwards or downwards, without carry over.

AR 3209- ( )



Adjustment of volume.

LCD (liquid crystal display) elements

135.00 (left indication)

Indication of active transmission/  
reception frequency (active frequency).

118.00 (right indication)

Indication of preset transmission/  
reception frequency (preset frequency).

CH 01 (right indication)

CH indication steady : indicates the  
storage channel.



(right indication)

CH indication flashes :  
if the initiated storage operation is  
not completed by pressing the store  
key.

LED indicator



(Green LED  
comes on)

Transmit indication (PTT button pressed).

Rear of unit



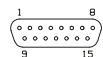
BNC

50 Ohm antenna connecting sockets.



25-pin D sub-male  
male

Equipment connector for connecting  
the installation wiring.



15-pin D sub-male  
male

Equipment connector for connecting  
the installation wiring Retrofit-connection  
for Comm 2000 series.



### 3.1.1 Operating instructions

- a. Switching on the VHF transceiver.

#### **CAUTION**

Do not switch on the VHF transceiver when engines are being started or shut down.

- b. Switch on the VHF transceiver using the ON/OFF switch (rotate volume control clockwise).
- c. Both LCDs must show the numbers 188.88 flashing (unit test approximately 2 seconds). If the test is positive, the transceiver automatically switches to the mode which was selected before switch-off. If the test is negative, the LCD flashes for approximately 5 seconds. A fault report can be called up by pressing the store key. After approximately 5 seconds the VHF transceiver automatically switches to the mode which was selected before switch-off. The fault report in the display can be interrupted by pressing the STO-Key.
- d. The following fault signals are possible :
- E1 Processor defective,
  - E2 Synthesizer failed,
  - E3 Fault in EE-PROM,
  - E4 Controller (PIC) audio assembly defective.
- e. The various modes are comprehensively described, together with the setting of the equipment configuration in the service mode, in the Annex to the General Operating Instructions.

#### 3.1.1.1 Transmit/receive mode

- a. Set the frequency of the local ground station in the preset display and press the exchange key. Rotate the VOL control to the centre position.

#### **NOTE**

If the error message E2 appears in the left indication during operation, the synthesizer is not latching and further R/T operation is no longer possible. The VHF transceiver must be checked in the next service station.

- b. Operate the transmit button and call the ground station. Hold the microphone close to the lips for optimum speech transmission.

#### **NOTE**

The green LED indicates transmit mode. During transmission a protective circuit prevents a frequency change or frequency channel change even if the frequency selector switch is rotated. The keying functions on the control panel are also inhibited.

Where there is acoustic feedback during transmission the side tone volume on the VHF transceiver must be turned down (refer to Service Mode for adjustment).

- c. Set the correct reception volume using the VOL control whilst the ground station is answering.
- d. Switch on the squelch (press SQL key again). Weak reception signals and reception noises are suppressed. The switch-on threshold of the squelch can be set in the service mode.

**NOTE**

- When changing the mode or the frequencies (PRESET-ACTIVE frequency) the change is automatically stored 2 seconds after the last change took place. Due to this delay changes which were made immediately before switching off the transceiver will not be memorized. Exception: Memory actions are stored by pressing the STO key.

3.1.1.2 Operation of intercom mode

- a. Switch on the IC switch (external).
- b. Operate the intercommunication (IC).
- c. If necessary, the IC volume can be adjusted to the noise level of the aircraft (for adjustment refer to service mode).

3.1.1.3 Audio auxiliary input

A second and third radio unit (navigational receiver) can be monitored simultaneously via the Audio auxiliary input. During transmission the auxiliary input is switched off from the Audio end amplifier. If necessary, the input sensitivity can be matched to the noise level of the aircraft (for setting refer to service mode).

### **3.1.2 Jamming of transmit button**

The VHF transceiver is fitted with a protective circuit to protect against jamming of the transmit button or a short circuit on the key supply line. For continuous transmissions exceeding two minutes the protective circuit automatically switches from transmission to reception. This avoids the selected channel being blocked.

It is possible to activate the transmitter again immediately by re-pressing the transmit button. In the event of a fault, this is only possible after the short circuit has been cleared or the transmit button released.

#### **CAUTION**

In order to be able to continue transmitting even with the transmit button jammed, the VHF transceiver must be switched off and then back on again. After that the VHF transceiver then continues to operate in the transmit mode for a further two minutes.

### **3.2 Operation of the various modes**

The VHF transceiver performs various functions which are covered by individual operating modes. The mode is selected by briefly pressing the MDE key.

Modes:

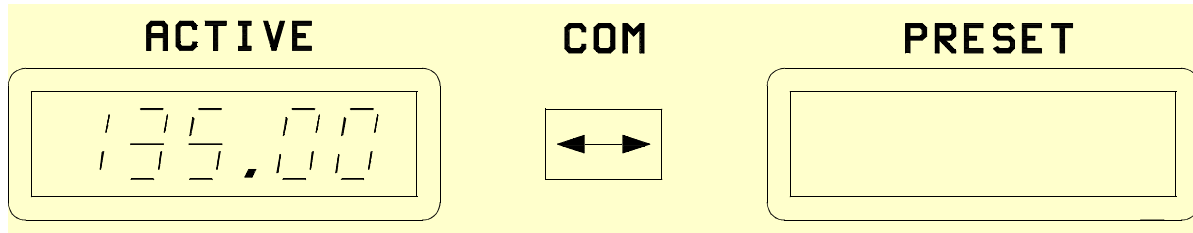
1. Indication of active frequency in the left hand display. The right hand display is switched off. The active frequency can be directly changed using the frequency selectors. Frequencies can also be stored in the individual storage channels.
2. Indication of active and preset frequencies. The preset frequency can be set using the frequency selectors. When the exchange button is pressed the active and preset frequencies are interchanged. Further activation of the button reverses the frequency change. Frequencies can also be stored in the individual storage channels.
3. Display of the storage frequencies in the storage channels and storing frequencies in the storage channels.
5. Service mode, for setting the equipment configuration.

#### **NOTE**

When changing the mode or the frequencies (PRESET-ACTIVE frequency) the change is automatically stored 2 seconds after the last change took place. Due to this delay changes which were made immediately before switching off the VHF transceiver will not be memorized. Exception: Memory actions are stored by pressing the STO key.

### 3.2.1 Mode 1

The left display indicates the active frequency. The right display is switched off.



The active frequency can be changed with the MHz and kHz frequency selector switches.

#### Storage operation

- a. Press STO key.
- b. The active frequency remains displayed in the left LCD, the VHF transceiver is ready to transmit and receive on this frequency.
- c. The active frequency appears flashing in the right hand LCD. The required frequency can be set using the kHz frequency selector and MHz frequency selector.
- d. Press STO key.
- e. The next free channel is shown flashing "ch". Press the STO key. The selected frequency is stored in the free speaker channel and the storage process is ended. A no memory channel is free, the highest assign memory channel is selected automatically.

or

select the channel to be overwritten using the kHz frequency selector and press the STO key. This means that this channel will be overwritten with the new frequency and the storage process ended.

#### Note

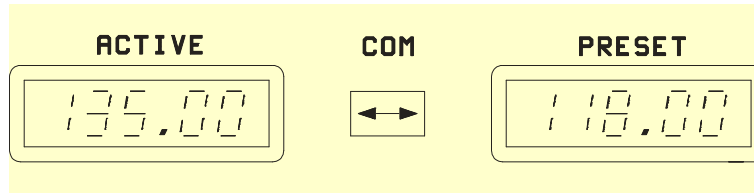
If no input takes place within approximately seven seconds, the VHF transceiver switches to the previously set mode.

#### Leaving the mode

To leave the mode, press the MDE key.

### 3.2.2 Mode 2

Select mode 2 using the MDE key. The last indicated active and preset frequencies in each case are displayed in the right and left LCDs.



The preset frequency (right LCD) is set using the MHz and kHz frequency selectors. Press the Exchange key to effect an exchange from the active to the preset frequency. Further activation of the key reverses the frequency change.

#### Storage process

Pressing the STO key activates a storage operation as described in Mode 1. The preset frequency appears flashing in the right hand LCD.

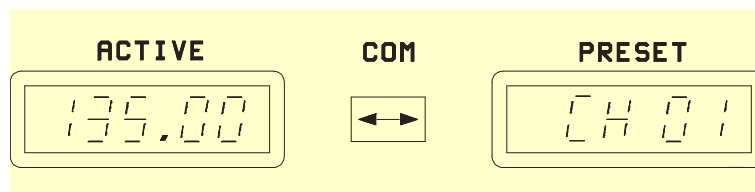
#### Leaving the mode

Press the MDE key to leave the mode.

### 3.2.3 Mode 3 (Displays of fixed frequencies in the various channels)

#### Channel selection mode

Select the mode using the MDE key. The last indicated storage channel appears in the right LCD and the stored frequency in the left LCD. The VHF transceiver is ready to transmit and receive on this frequency.



Select the required channel using the kHz frequency selector (steps of 1) or MHz frequency selector (steps of 10).

#### Note

The VHF transceiver is always ready to transmit and receive on the frequency shown in the left "ACTIVE" display.

### **Storage process**

Pressing the STO key activates a storage process as described in Mode 1 (with a slight change). In Modes 1 and 2 the frequency shown in the left hand display remains active regardless of the storage process.

### **3.3 Service mode (equipment configurations)**

The service mode is meant to enable the ground technicians to set the equipment configuration and must not be used in flight.

The following settings can be changed or set:

SQL	Setting the switch-on threshold of the squelch,
Slde	Setting the sidetone volume,
AU	Setting the audio auxiliary volume,
IC	Setting the IC volume,
SF5	Inhibiting the frequency setting (channel selection only (ON/OFF)),
SF6	Inhibiting the frequency storage (ON/OFF),
SF7	Erasure of stored frequencies,
COdE	Entering a password to interlock the equipment configuration,
SF9	Dynamic mike input sensitivity,
SF10	Inhibiting the transmit mode for one or more memory channel,
FSqL	no function,
SF12	Loudspeaker muting switch ON/OFF,
—.—	Indication the software version and change status.

#### **NOTE**

The standard values for the equipment configuration SqL, Slde, AU IC, and SF9 are stored in the EE-PROM. If reversion to the standard values is required, the portable VHF transceiver must be switched off and switched on again by simultaneously pressing the STO and MDE keys.

Calling up the service mode

Switch off the VHF transceiver. Hold the mode key (MDE) pressed and at the same time switch on the unit. The VHF transceiver switches to the service mode without a unit test. S<sub>q</sub>L appears in the left indication and the switch on threshold of the squelch is shown on the right indication.

**NOTES**

- The settings S<sub>q</sub>L to Spec. Nr.: are selected in steps by briefly pressing the MDE key in the service mode. If the MDE key is pressed at the end of the setting Spec. Nr., the setting S<sub>q</sub>L then appears. If a direct return to the S<sub>q</sub>L setting is required the MDE key must be pressed for at least one second.
- In the service mode the VHF transceiver operates independently of the settings on the control panel, on the frequency which was last set as the active frequency.
- The user can interlock his equipment configuration settings with the aid of a password. The VHF transceiver is delivered from the factory without a password. Section COdE "Entry of password for interlocking the equipment configuration" describes how to enter a password.

Setting the squelch threshold

If function S<sub>q</sub>L is called up, the following displays appear:

left LC-Display	S <sub>q</sub> L	
right LC-Display	00 to 200	Standard value 100
sensitivity	(HI < -> LO)	

Set the squelch threshold using the kHz switch (steps of 5) or MHz switch (steps of 10). The set value is stored by pressing the STO key.

Setting the sidetone level

Call up the SIdE function using the MDE key. The following displays appear:

left LC-Display	SF 2	
right LC-Display	00 to 63	Standard value 32
	(LO level HI)	

Set the sidetone level using the kHz switch (steps of 1) or MHz switch (steps of 10). The set value is stored by pressing the STO key.

Setting the audio auxiliary level

Call up the AU function using the MDE key. The following displays appear:

left LC-Display	AU	
right LC-Display	00 to 63 (LO level HI)	Standard value 63

Set the audio auxiliary level using the kHz switch (steps of 1) or MHz switch (steps of 10). The set value is stored by pressing the STO key.

Setting the IC level

Call up the IC function using the MDE key. The following displays appear:

left LC-Display	IC	
right LC-Display	00 to 63 (LO level HI)	Standard value 32

Set the IC level using the kHz switch (steps of 1) or MHz switch (steps of 10). The set value is stored by pressing the STO key.

Release the frequency setting (channel selection only).

Call up function SF 5 using the MDE key. The following displays appear:

left LC-Display	SF 5	
right LC-Display	ON or OFF	

Select the required function using the kHz key and store the function by pressing the STO key.

- OFF = Frequency setting not possible. The VHF transceiver can only work on the frequencies stored in the individual channels.
- ON = Frequency setting possible (standard setting).



Release the frequency storage

Call up function SF 6 using the MDE key. The following displays appear:

left LC-Display	SF 6
right LC-Display	ON or OFF

Select the required function using the kHz switch and store the selection by pressing the STO key.

OFF = The storage of frequencies in the individual channels is not possible. The VHF transceiver can only work on the set frequency.  
ON = Storage of frequencies in the individual channels is possible (standard setting).

Erase stored frequencies

Call up function SF 7 using the MDE key. The following displays appear:

left LC-Display	SF 7
right LC-Display	CH channel number

Select the channel to be erased using the kHz (steps of 1) or MHz (steps of 10) switch. The stored frequency is erased by pressing the STO key. The channel No. 1 cannot be erased.

Entry of password to interlock the equipment configuration.

Call up the COdE function using the MDE key. The following displays appear:

left LC-Display	COdE
right LC-Display	0000

Set any 4-digit numerical code using the kHz (steps of 1) or MHz (steps of 10) switch. Store the numerical code by pressing the STO key.

**NOTE**

As soon as a password is given a 0 appears in the bottom line when the service mode is called up. The numerical code must then be input using the MHz or kHz switch and press the STO key. If the VHF transceiver detects a false numerical code, it automatically switches to the last mode. If the password is to be erased or changed, this is done by calling up the service mode using the old password. The SF 15 function is then chosen and either a 0 is entered everywhere or the changed numerical code is entered.

Setting the dynamic mike input sensitivity

Call up function SF 9 using the MDE key. The following displays appear.

left LC-Display	SF 9
right LC-Display	00 bis 63 Standard value 32 (LO sensitivity HI)

The dynamic mike input sensitivity can be changed upwards or downwards using the kHz switch. The set value is stored by pressing the STO key.

Inhibiting the transmit mode for one or more memory channel

Call up function SF 10 using the MDE key. The following displays appear:

left LC-Display	SF 10
right LC-Display	CH channel number

Using the kHz (steps of 1) or MHz (steps of 10) switch, select the desired channel for inhibiting the transmit mode. Store the channel by pressing the STO key. Several channels can be selected on priority channels. When the STO key is pressed again, the inhibiting transmit mode is canceled.

FSQL

no function

Speaker muting switch ON/OFF

Call up function SF 12 using the MDE key. The following displays appear:

Top line	SF 12
Bottom line	OFF or On
OFF =	Speaker muting on
On =	Speaker always switched on

Select the function using the kHz switch. Store the required function by pressing the STO key. This selection becomes active after ending the service mode.

Indication the software spec. no.: and change status

Call up function using the MDE key. The following displays appear:

left LC-Display

software spec. no.: and change status Microprocessor

right LC-Display  
(PIC)

software spec. no.: and change status CO-Microprocessor

Ending of the service mode

The VHF transceiver must be switched off to end the service mode.

### 3.4 Safety instructions

The following instructions must be followed for safe operation of the VHF transceiver:

- Switch off the unit when starting or shutting down engines.
- A speech test is to be performed before startup and it should be noted that if the speech test is carried out close to the ground station the results may be positive even if the antenna cable is broken or short-circuited. At a distance of 5 to 10 km no connection will be made.
- Use a loud voice for speech communication and hold the microphone close to the lips. Otherwise cabin noise can be intrusive and make understanding difficult.
- Use only microphones or headsets which are suitable for use in aircraft. In aircraft made of wood or synthetic materials or in gliders or helicopters, incoming radiation on the equipment antenna can affect the integrated amplifier of the microphone (feedback). This is noticeable in the ground station by whistling and/or heavy distortion. The described disturbances can occur in different ways on the different transmission channels.
- Transmit buttons can stick and cause continuous transmission. Observe the green-LED display