

# **BECKER**

AVIONIC SYSTEMS

**VHF-Transceiver**

**AR 3201 - ( )**

## **Installation and Operation**

Manual DV 28110.03

Issue 1 April 1992

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**Section 1 GENERAL INFORMATION**

**1.1 Introduction**

The following Handbooks describe the VHF-communications transceiver AR 3201 - ( ).  
 The Handbooks DV 28110.03 („ Installation and Operation “) and DV 28110.04 („Maintenance and Repair“) contain the following sections :

	Section	DV 28110.03	DV 28110.04
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
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**1.2 Purpose of equipment**

The VHF transceiver permits transceiver communication on 760 channels in the frequency range 118.000 MHz to 136.975 MHz with a channel spacing of 25 kHz. It can also be limited to 135.975 MHz = 720 channels by incorporating a different PROM. Extensions for additional modes such as temperature and operating voltage measurements, etc. are provided for.

The VHF transceiver is physically designed for unrestricted application in category II aircraft. In the environmental categories there is no limitation for application in the instrument panel and for use in

rigid fuselage mounting in all aircraft. The VHF transceiver is designed for compliance with RTCA and EUROCAE airworthiness requirements.

### **1.3 General description**

The VHF transceiver is designed as a single-block unit with dimensions in keeping with 58 mm diameter standard instrument size. Mounting is by means of four screws (behind-panel fitting). All controls and indicators are located on the front panel. The rear panel locates the connector for connecting the transceiver to aircraft wiring, the antenna socket and a test connector.

The transceiver features a single superhet receiver. A squelch circuit suppresses noise and input signals below a specific field strength. The switching threshold is adjustable from without through the case. The squelch can be defeated with the squelch switch.

The transmitter has wideband tuning over the range 118.000 MHz to 136.975 MHz. Transmitter output power is greater than 5 watt. In transmitter operation sidetone is automatically on. In transceiver with serial No. of 4000 and above, an arrow flashes on and off in the upper left side of the LCD during transmission

The injection frequency of the receiver and the transmit frequency of the transmitter are generated by a voltage-controlled oscillator (VCO) which is signalled by a digital frequencysynthesizer in conjunction with a microprocessor.

The microphone input is designed for a dynamic microphone or for a standard microphone, the transceiver being infactory-set for a dynamic microphone. Conversion to a standard microphone is done in transceivers up to serial No. 86 by resoldering a jumper on the soldering side of the audio module. As of serial number No. 86 the conversion is made by reconnecting a wire jumper on the component side of the audio module. The microphone input is connected to a dynamic compressor which maintains the modulation depth constant over a microphone input voltage range of approx. 40 dB.

The frequency indication is a liquid crystal display ( LCD). The MHz and kHz frequency selectors permit selection of the desired channel frequency. The MHz frequency selector indexes in steps of 1 MHz, the kHz frequency selector in 25 kHz steps.

The transceiver also contains a memory for storing four different channel frequencies, even when the transceiver is OFF. The stored frequencies are called up by the channel selector switch in positions 1 - 4. In switch position A a further channel frequency can be set which is, however, lost when the transceiver is switched off. In transceiver with serial No. fo 4000 or above, the channel frequency set in position A is also stored and not deleted when the unit is powerd down.

In addition, when the VHF transceiver is powered up, a self-test function is automatically activated to test the LCD. For a period of a few seconds, all of the segments in the LCD flash on (188.88). Aterwards, either the frequency 121.5 MHz appears (channel selector switch in position A), or one of the 4 stored frequencies (depending on the position of the channel selector switch). The VHF transceiver is now ready for operation.

In Transceiver with serial No. of 4000 or above, either the most recently set frequency in channel A appears, or one of four stored frequencies (depending on the position of the channel celector switch). When the self-test function is activated, an arrow flashes on and off in addition to the digits 188.88 (⇐ 188.88).

The transceiver also contains a stage for monitoring the aircraft supply voltage. This stage is ON as soon as the transceiver is switched on. Should the aircraft supply voltage drop to 11 V - 10.5 V, the readout will commence flashing.

For operation on an 28 V aircraft system a voltage regulator (VR 2011 ) is necessary. In aircraft with no power circuit (gliders) the battery box (BK 5) is provided.

When using the emergency power unit EPU 400 the transceiver can be continued to be operated at reduced output power (12 V operating voltage) even when aircraft power is down.

When operating the IC mode, the transceiver can be used for intercommunications.

The auxiliary audio input permits input of audio signals from other equipment in the aircraft, however, these auxiliary audio input is standard as of module No. 471 . Up to module No. 470 this feature was only available as an option.

If LCD illumination is required, it can be connected either directly to the operating voltage or to a dimmer.

The standard version can be extened by optional voltage and temperature measuring facilities without affecting the airworthiness of the transceiver.

An optional voltage and temperature measurement circuit permits measurement of either two different voltages or two different temperatures or a single voltage and a single temperature with the aid of two corresponding sensors and two external pushbuttons. The LCD provides indication on pressing the external pushbuttons for approx. 4 seconds. Temperature can be indicated in Fahrenheit or Celsius.

#### **1.4 Variants survey**

Table 1 -1 surveys the variants of transceiver AR 3201 - ( ). The various variants are not different in appearance, i.e. dimensions, case depth, etc. being the same for all variants. The necessary accessories are given in the List of Accessories at the end of Section 1 for the various variants, all of which have no effect on airworthiness of the transceiver.

**Transceiver AR 3201-( )**

Drawing No./ Order No	Type	Voltage measurement	Temperature measurement in deg Celsius	Temperature measurement in deg. Fahrenheit	760 channel	720 channel
28110-00000.000 389.528-910	AR 3201-( )	no	no	no	yes	
28111 -00000.000 397.156-910	AR 3201-(1)	yes	yes	no	yes	
28112-00000.000 397.164-910	AR 3201-(2)	yes	no	yes	yes	
28113-00000.000 397.172-910	AR 3201-(3)	no	yes two different temperatures	no	yes	
28114-00000.000 397.180-910	AR 3201-(4)	no	no	yes two different temperatures	yes	
28120-00000.000 767.018-910	AR 3201-(10)	no	no	no		yes
28121 -00000.000 767.026-910	AR 3201-(11)	yes	yes	no		yes
28122-00000.000 767.034-910	AR 3201-(12)	yes	no	yes		yes
28123-00000.000 767.042-910	AR 3201-(13)	no	yes two different temperatures	no		yes
28124-00000.000 767.050-910	AR 3201-(14)	no	no	yes two different temperatures		yes

Table 1-1



## 1.5 Specifications

### 1.5.1 General data Transceiver

Operating voltage	12,4 V . . . 15,1 V
Emergency operation (10,0 V)	Intelligible communication
Current consumption 14 V without Panel illumination	
Receive „stand by“	typ. 70 mA
Receive „stand by“ with auxiliary input	typ. 90 mA
Transmit	typ. 1 .8 A
Panel illumination	13,8 V / 40 mA DC
Fuse	5A
Operating temperature range	D1 - 20° . . . + 55°C,
Env. Cat. RTCA DO - 160A	shorttime temperature + 70°C
Altitude max.	D1 50000 ft
Env. Cat. RTCA DO - 160A	
Vibration	MNO
Env. Cat. RTCA DO - 160A	
Dimensions	
Panel	60.6 mm x 60.6 mm
Mounting depth	212.5 mm
Weight	0.9 kg

### 1.5.2 Receiver specifications

Type Receiver	Single superhet
Frequency range	118.000 MHz . . . 136.975 MHz
Channels	760
Channel spacing	25 kHz
Sensitivity (mod. 1000 Hz/30%)	$\leq 5\mu\text{V}$ emf for 6 dB $\frac{S+N}{N}$
Bandwidth	$\geq \pm 8$ kHz at 6 dB down
Selectivity	$\geq 40$ dB at $\pm 17$ kHz $\geq 60$ dB at $\pm 25$ kHz

Squelch	fixed in unit, defeatable with squelch switch
AGC characteristic from 5 $\mu$ V . . . 100 mV emf	$\leq 6$ dB
Undesired radiation	$\leq 4 \times 10^{-10}$ watt
Distortion / m = 85%	$\leq 10$ %
Frequency response audio channel relative to 1000 Hz / 0 dB	$\leq 6$ dB 350 Hz . . . 2500 Hz $\geq 18$ dB at 5000 Hz
Intermediate frequency	21.4 MHz
Rated audio output	
Speaker	at 13.8 V operating voltage $\geq 2.5$ watt into 4 $\Omega$ typ. 3 watt at 10.0 V operating voltage $\geq 1.5$ watt into 4 $\Omega$
Headphone	at 13.8 V operating voltage $\geq 40$ mW into 300 $\Omega$ at 10.0 V operating voltage $\geq 30$ mW into 300 $\Omega$
Audio power output unregulated	100 mV/30% mod. Ri $\geq 10k\Omega$
Auxiliary input	1 V eff. / 600 $\Omega$

**1.5.3 Transmitter specifications**

Transmitter output	at 13.8 V operating voltage $\geq 5$ watt  at 10.0 V operating voltage (Emergency operation) $\geq 2$ watt
Mode of modulation	amplitude modulation A3E
Modulation depth	$\geq 85\%$ $\leq 100$ % (dynamic compressing)
Input voltage for m = 85 %	
dyn. mike	no overmodulation at input voltages ca. 2mV Dynamic-Compressor
Standard mike	ca. 200 mV Dynamic-Compressor
Frequency deviation	$\leq 0.002\%$
Undesired radiation	$\leq 2.5 \times 10^{-5}$ watts
Spurious emissions within the 108 - 117.95 MHz range	$\leq 2 \times 10^{-7}$ watts

Frequency response	≤ 6 dB 350 Hz . . . 2500 Hz
Distortion / m = 85% / 1000 Hz	≤ 10%
m = 85% / 350 - 1000 Hz	≤ 20%
Carrier noise level	≥ 35 dB

#### 1.5.4 Optional functions

Digital voltmeter (operating voltage indication)	7 V . . . 35 V DC ± 0.1 V
Digital thermometer	- 20°C . . . +100°C
Temperature sensor	Linear tolerance ± 1,5°C

#### NOTE

The VHF transceiver is designed for the frequency range 118 to 137 MHz. The frequency range between 136 MHz and 137 MHz may not be used for mobile aircraft radio communications until after January 1990, in accordance with the relevant regulations.

#### 1.6 Certification

FTZ certification	LB 393/83
LBA certification	10.911/76
Specification	
RTCA DO - 156	
RTCA DO - 157	
RTCA DO - 160A	
EUROCAE ED 23 / ED 24 / ED 14A	
Performance classification	D1 / A/MNO/XXXXXXABABA

#### 1.7 Accessories

The following connectors are necessary for connecting the transceiver without options :

1 Cable connector plug for transceiver	Order No. 430.722-277
Antenna connector plug UG 88/U for transceiver	Order No. 725.706-277
IC-Switch	Order No. 213.055-278

When the transceiver incorporates the temperature or voltage measurement option, the following items are required :

1 Cable connector complete                                          Order No. 431.036-950

Detail parts

1 Cable connector plug for option	Order No. 710.687-277
Temperature sensor - 65°C . . . 150°C	Order No. 431.044-955
Bounceless pushbuttons	Order No. 724.742-278

**1.8        Scope of delivery**

Screw block	Order No. 472.875-203
Spring washer	Order No. 213.126-213

**1.9        Software**

Frequency synthesizer, frequency storage and frequency display of the AR 3201 - ( ) are controlled by a microprocessor. The software used has been categorized to Function Criticality Category

„ESSENTIAL“

according to the guide, lines of RTCA DO - 178.

Uses class was determined to be

„CLASS X“

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## **Section 2 INSTALLATION**

### **2.1 General**

Installation of the VHF communication transceiver and the battery box depends on the type of aircraft and equipment involved, the instructions given in this section thus being only generally applicable.

### **2.2 Pre-installation check**

#### **2.2.1 General**

Prior to fitting the new system in the aircraft, the units must be checked according to the following procedure to establish whether they have been damaged in transit.

#### **2.2.2 Visual inspection**

Prior to commissioning the equipment, carry out a visual inspection to establish any of the following deficiencies.

1. Soilage, dents, scratches, corrosion, broken fasteners, damaged paintwork on enclosures and parts thereof.
2. Soilage and scratches on the nameplate, front panel and markings.
3. Soilage, bends or broken-off pins, cracked plug and socket inserts.
4. Soilage and mechanical damage to rotary switches, LCD elements, knobs and pushbutton.

### **2.3 Mechanical installation**

#### **2.3.1 Mechanical installation VHF transceiver**

The VHF transceiver is designed for incorporating in an aircraft instrument panel in behind panel installation. The circular cutout and the fastener holes must be drilled in accordance with the standard for small size instruments. Location must be min. 30 cm away from the magnetic compass of the aircraft to avoid the compass being affected by the transceiver. Dimensional requirements are shown in Fig. 2-4. Four DUZ fasteners (supply) are used to secure the unit.

#### **2.3.2 Mechanical installation of a temperature sensor**

The VHF transceiver permits indication of temperatures in the range - 20° C to +100° C with the aid of an integral measuring circuit and a connected remote temperature sensor. The latter is located in accordance with the particular requirements and local conditions. The wiring can be seen from Fig. 2-5. Only use shielded flexed leads, noting the color coding of the connecting cables. The red lead must be connected to J 3101/8, the blue lead to J 3101/2. The shielding must be connected to pin 4 of J 3101.

The temperature measuring circuit in the VHF transceiver and the temperature sensor are calibrated in the factory together for optimum temperature measuring accuracy. Should the device or the temperature sensor develop a fault or should the transceiver need replacing, the device will need recalibrating according to the instructions as given in Section 5, Item 5.7.

## **2.4 Installation wiring**

### **2.4.1 General**

Fig. 2-5 illustrates the installation wiring of the VHF transceiver. In wiring the VHF transceiver the battery voltage feeder cable should be AWG 20.

#### **NOTE**

- a) Only use airworthy cable, i.e. self-extinguishing in suitable AWG for power supply and the other lines.
- b) Pull rubber sleeves over the solder junctions on the instrument connector.
- c) A 3 A fuse or circuit breaker must be incorporated in the power supply.
- d) Prior to switching on the unit, carefully check the wiring, particularly making sure that +ve and -ve are not confused.

#### **CAUTION**

The AR 3201 - ( ) is only protected against wrong polarity when a fuse is incorporated in the power supply, i.e. so that the fuse blows, leaving the unit undamaged. If no fuse is provided, the unit can be ruined. In this case, the unit is not covered by our guarantee.

Suitable type cable sets are available for aircraft wiring (contact manufacturer).

#### **CAUTION**

Never tie any aircraft wiring into the connecting lines. In addition, the connecting cable must not be put down together with line carrying pulsed information (IFC's, DME, XPR, SLAVED GYRO) the same applying to autopilot supply and control lines.

### **2.4.2 Microphone connection**

The VHF-transceiver features a microphone amplifier as standard which is compatible with both a dynamic microphone and a standard microphone. Unless stated otherwise, the transceiver is set in the factory for a dynamic microphone connection. By resoldering jumper Br 4001 on the audio module the microphone input can be changed from a dynamic microphone to a standard microphone. This jumper is accessible after unscrewing the case and removing the audio module. As of serial No. 86, conversion from dynamic to standard microphone has been simplified, jumper 4401 then no longer requiring resoldering but merely reconnecting, without requiring removal of the audio module.



**View showing components side of audio module**

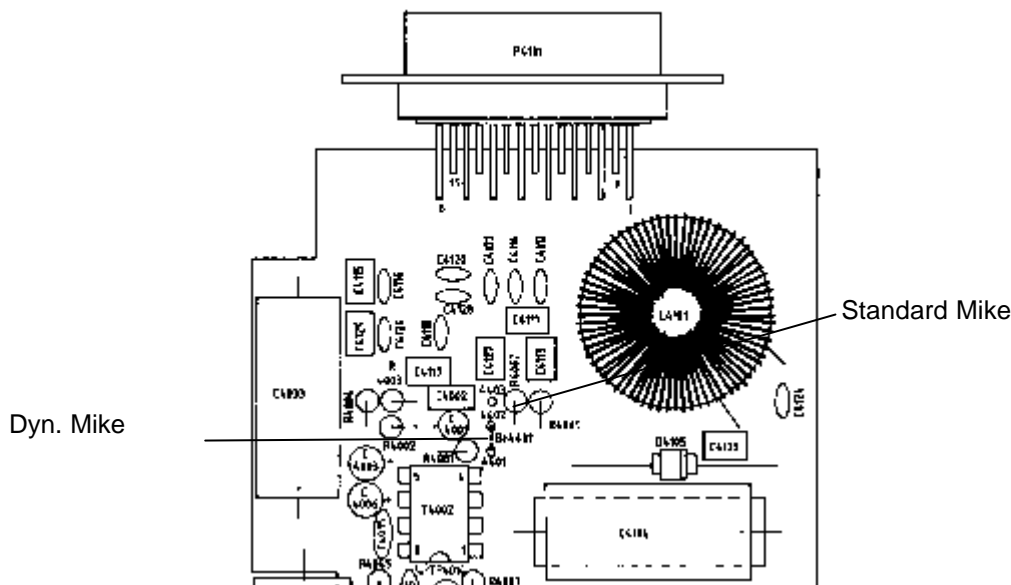


Fig. 2-1 Jumpers location for charging the microphone input from dynamic to standard microphone

**2.4.3 Speaker/headphones connection**

The audio output of the transceiver is compatible with a 4Ω speaker or headphone with an impedance of 300Ω - 600Ω or both in parallel without having to switch the transceiver over.

**CAUTION**

The magnetic field of the speaker will affect the compass, therefore, minimum spacing between speaker and compass must be 1.3 m when selecting speaker location.

**2.4.4 IC connection**

The IC connection is provided for aircraft with high ambient noise and requires use of the headset together with an IC switch in the unit connector for the additional wiring (see aircraft wiring Fig. 2-4). The normal communications position is the OFF position of the IC-switch, i.e. in the ON position communications operation is the same as before, however, with intercommunication between the two crew members without having to press the (PTT) button.

**2.4.5 Panel lighting**

The transceiver features a panel lighting circuit which must be connected to the + 14 V supply voltage by connection P 4101/7 or to a dimmer control. It is good practice to provide the lighting externally via a separate lighting switch to save current in aircraft having no power system, e.g. gliders.

**CAUTION**

The lighting is not switched off on operation of the ON/OFF switch.

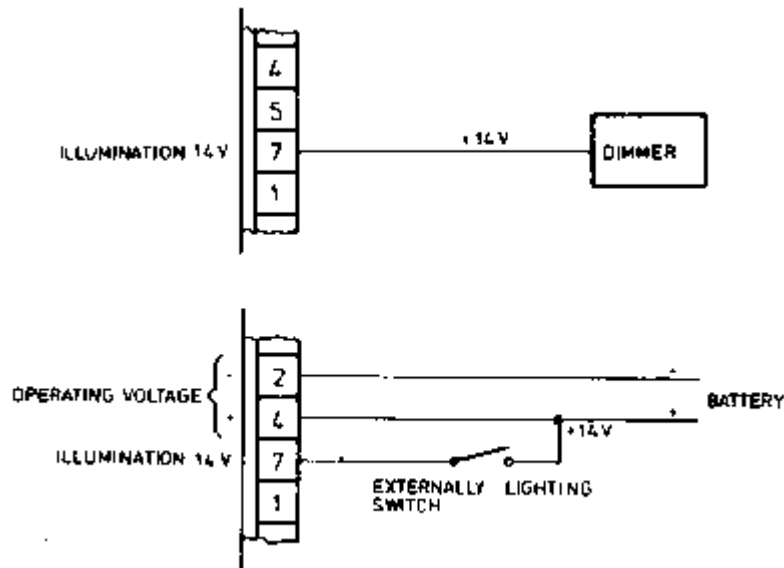


Fig. 2-2 Panel connection

## 2.5 Auxiliary audio input (optional) (standard as of module No. 471)

The auxiliary audio input permits audio input from other equipment in the aircraft. This input can only be heard, however, in the RX mode. The possibility of circuiting two units together finds application in aircraft having, for instance, only one transceiver and one NAV receiver. When using the auxiliary audio input, a 680Ω resistor must be switched to GND. When circuiting units together, 100Ω decoupling resistors must be included (see following diagrams). Output of the audio listening amplifier requires an audio input voltage of approx. 1 V/600Ω .

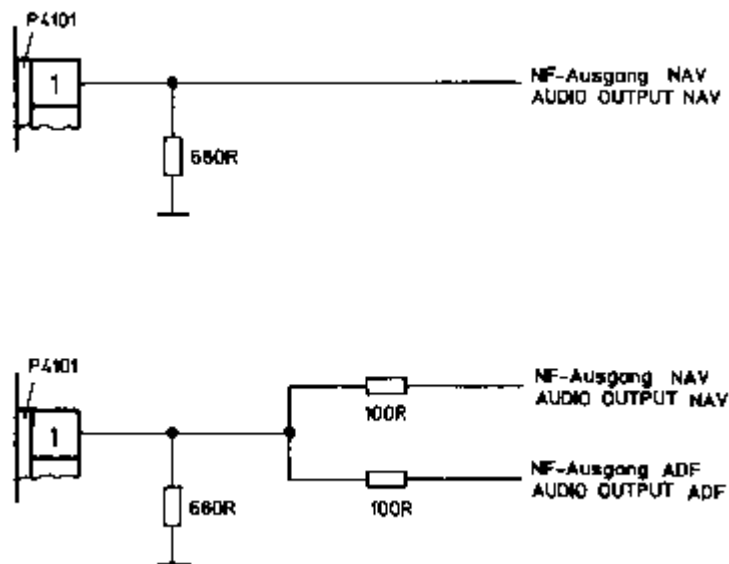


Fig. 2-3 Auxiliary audio input

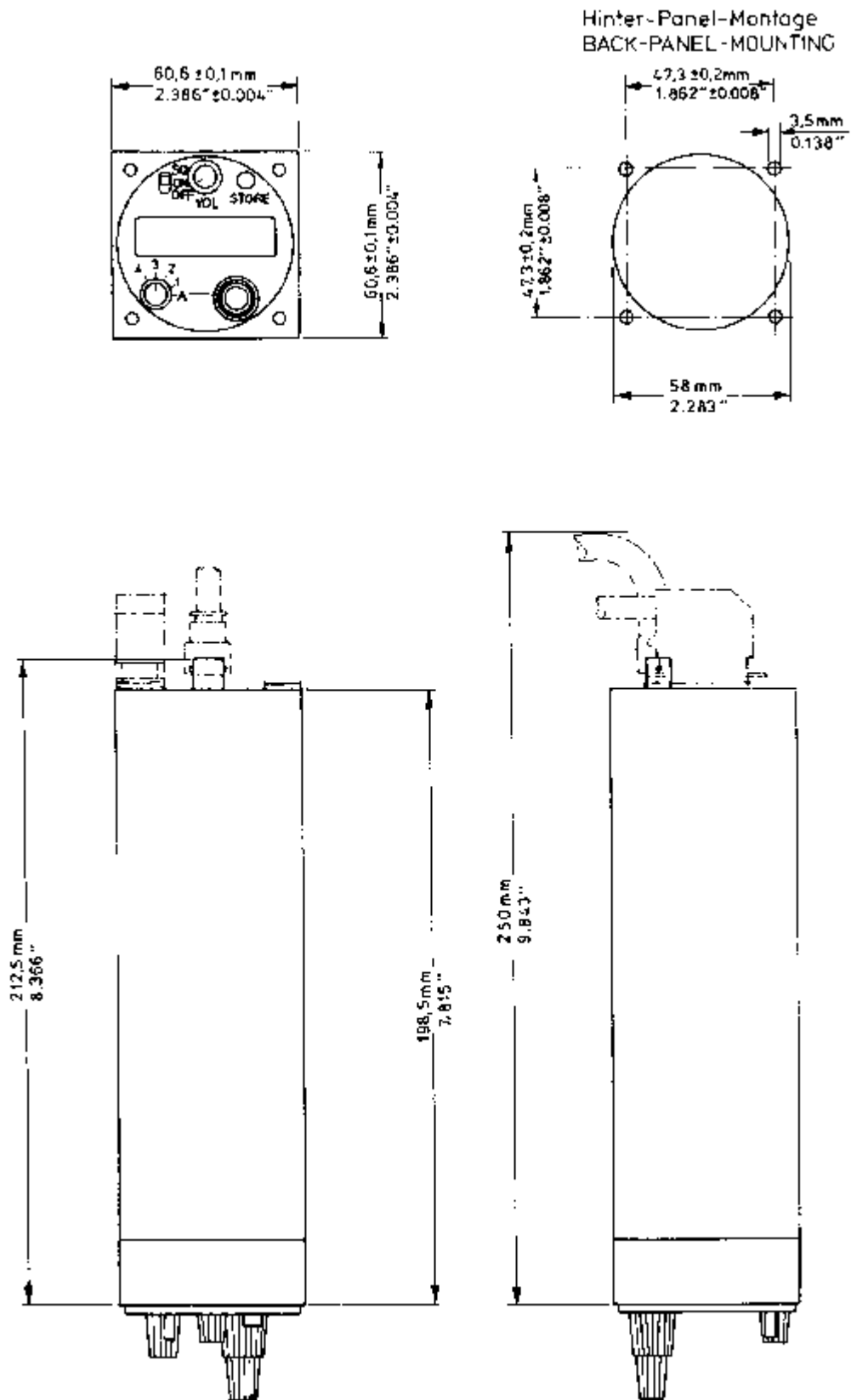


Fig. 2-4 Dimensions of VHF transceiver

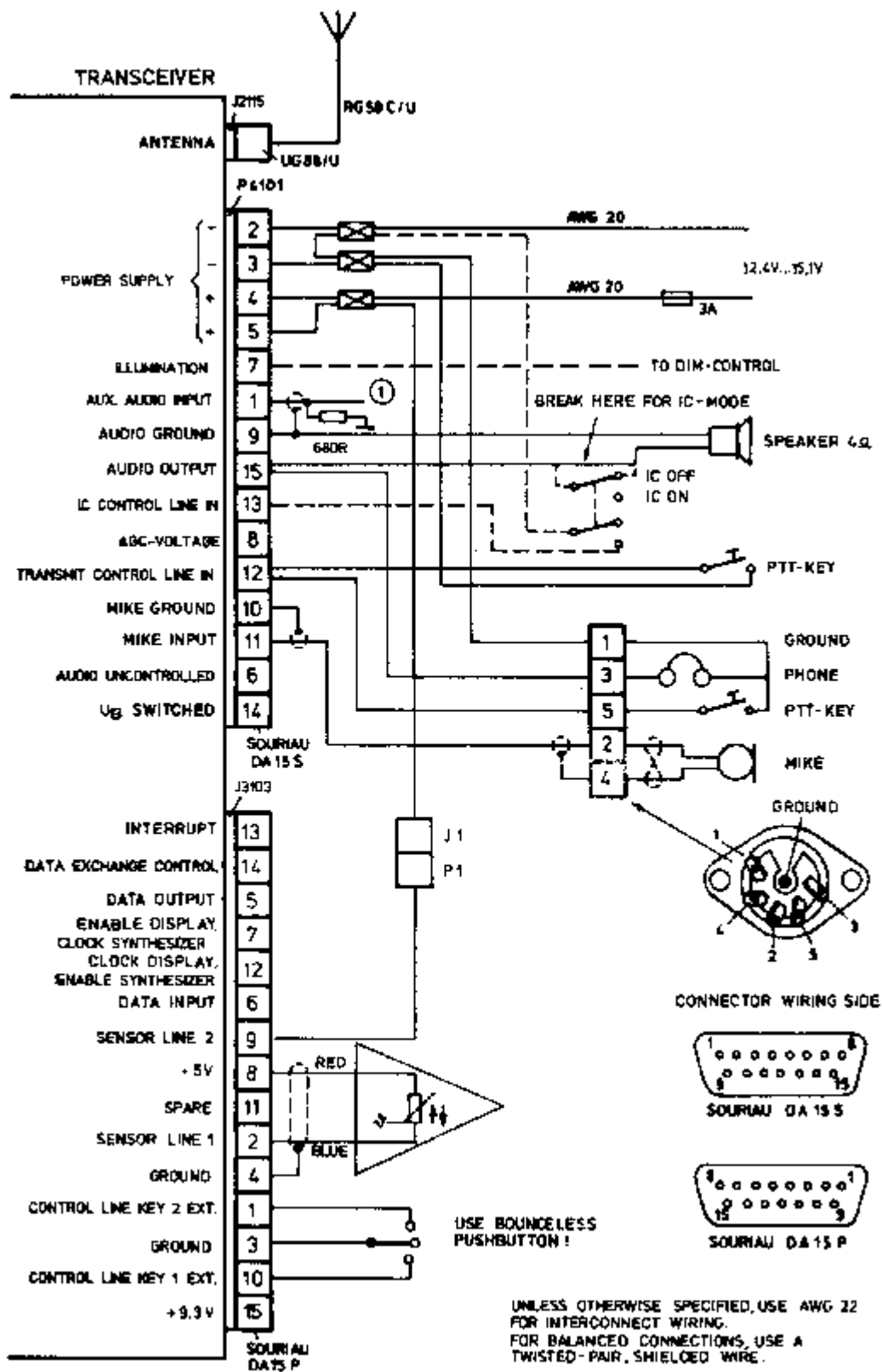


Fig. 2-5 Aircraft wiring

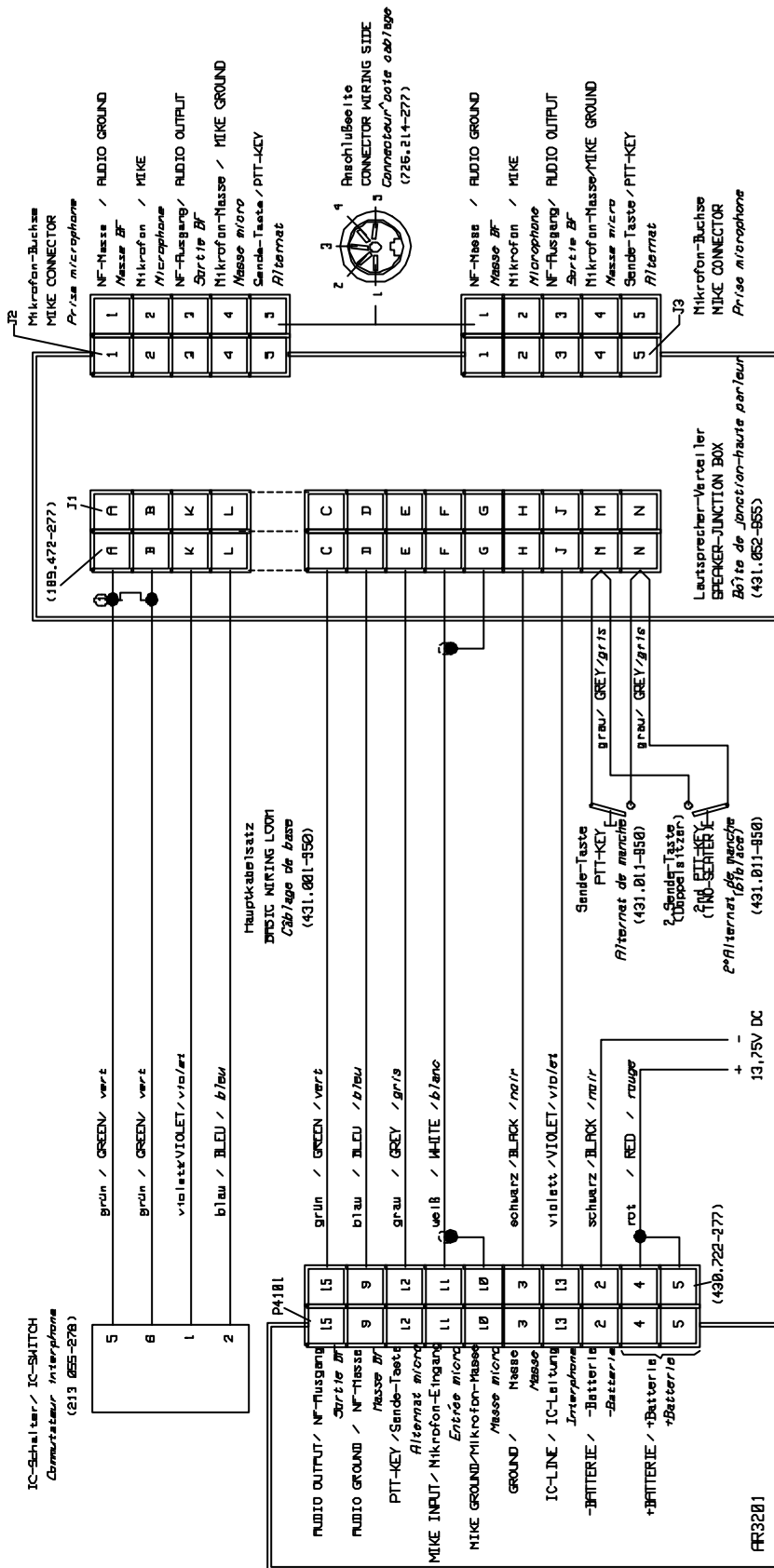


Fig. 2-6 Wiring diagram AR 3201 - ( ) with Speaker - Junction

**Achtung !** Das Magnetfeld des Lautsprechers beeinflusst den Kompass.  
Bei der Wahl des Einbaustandes ist ein Mindestabstand von 1,3 m zwischen Lautsprecher und Kompass einzuhalten!

**CAUTION !** THE MAGNETIC FIELD OF THE SPEAKER WILL EFFECT THE COMPASS.  
THEREFORE MINIMUM SPACE BETWEEN SPEAKER AND COMPASS MUST BE 1,3 m WHEN SELECTING SPEAKER LOCATION!

**Attention !** Le champ magnétique de votre boîte de jonction haut-parleur influence votre compas.  
Une distance minimum de 1,3 m devra être respectée lors du montage!

Anmerkung / NOTE / Remarque

① Brücke, falls kein IC-Schalter montiert. K und L frei.  
JUMPER IF NO IC-SWITCH IS USED. NO CONNECTION AT K AND L.

Pont, au cas où le commutateur interphone n'est pas monté. K et L non occupés.

( ) Bestell-Nr. / STOCK NO. / No. de commande

Bordverkabelung AR3201 mit Hauptkabelsatz und Lautsprecher-Verteiler  
WIRING DIAGRAM AR3201 WITH BASIC WIRING LOOM and SPEAKER-JUNCTION BOX  
Câble à bord pour le AR3201 avec câblage de base et jonction-haut-parleur

## 2.6 Testing after installation

### 2.6.1 Ground testing with engine OFF

After installing the transceiver, measure antenna matching between antenna base and antenna feeder by means of a VHF reflection meter (voltage/standing-wave meter).

Over the complete frequency range of the transceiver, the voltage/standing-wave ratio must be within the value 3 : 1. Exceeding this value is an indication of mismatch, which can be due to a wrong or inadequate counterweight.

After antenna measurement, carry out a voice test with the ground station.

### 2.6.2 Ground testing with engine ON

With the engine running make sure that the aircraft voltage is within the permissible tolerances at approx. 14 V. Make the test at engine cruising speed. Carry out speech test at a long distance away from the ground station. At engine cruising speed the cabin noise of the aircraft must only be heard muted thus making for clear, intelligible conversation. Hold microphone close to lips when speaking. Switch on intercommunications by means of the IC switch (when provided) and carry out speech test at engine cruising speed.

If necessary, correct volume by means of IC control (see Fig. 2-7).

Apply squelch switch and check squelch function. The squelch threshold can be set from without by means of the squelch control.

#### CAUTION

In speaker operation no acoustic feedback should occur via the sidetone. If necessary, turn down sidetone by means of the SIDETONE control.

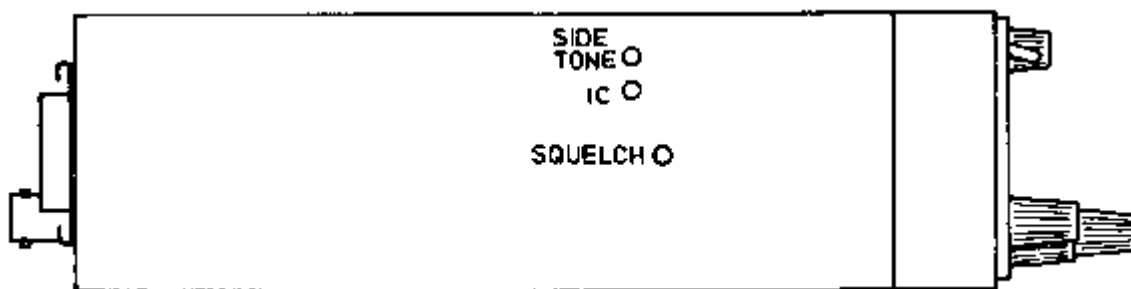


Fig. 2-7 Location of IC control

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**Section 3 Operating Instructions**

**3.1 Control and Indicators**

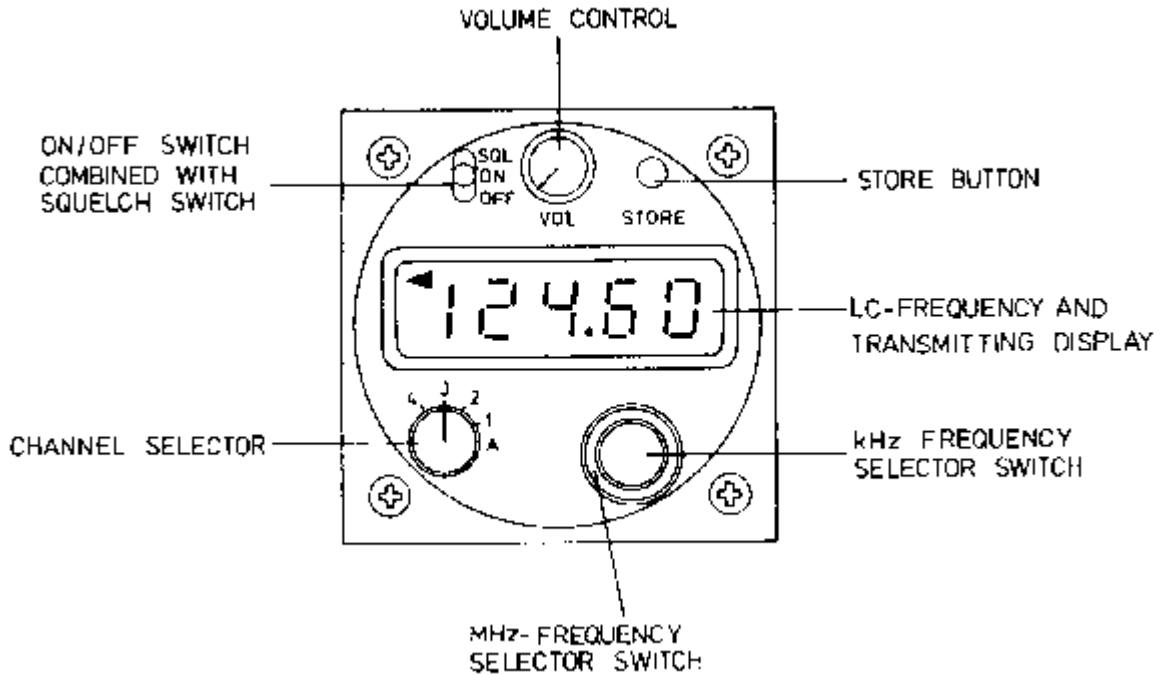


Fig. 3-1 Controls and indicators

Controls and indicators	Description	Function
Volume control	Potentiometer	Turning control clock-wise increases volume continuously.
ON/OFF switch combined with squelch	3-position rocker switch	Position OFF : VHF transceiver OFF. Position ON : VHF transceiver ON, squelch OFF (input noise audible). Position SQL : Transceiver ON, Squelch ON. Input limited to transmitters having a field strength exceeding the set squelch threshold

Controls and indicators	Description	Function
Channel selector	5-position rotary switch	<p>Position A :</p> <p>When the transceiver is powered up, a brief test routine is performed for the segments of the display. Afterwards the channel frequency 121,500 MHz appears in the display and the transceiver is ready for operation. In models with serial no. of 4000 or above, the most recently set frequency instead of 121,500 MHz.</p> <p>The setting of channel frequencies is performed with the channel selector switch in position A, regardless of the units serial number</p> <p>Position 1 through 4 :</p> <p>If is wished to store a channel frequency in any one of the four memory locations, then channel frequency to be stored must first be set with the frequency selector switch in position A. Then the desired memory location is selected using the channel selector switch, and the Store button is pressed. Stored channel frequencies remain in the memory even, when the unit is powered down and can be immediately called up again after the unit has been switch on.</p>
MHz frequency selector switch	Rotary switch (continuous)	Switches the MHz steps indicated by the frequency readout.
kHz frequency selector switch	Rotary switch (continuous)	Switches the 25 kHz steps indicated in the frequency readout. The 3rd digit behind the point is not indicated, e.g. 125.52 = 125.525 MHz.
Frequency indication	LC display 5 digits	When the unit switched on, following completion of the self-test routine the frequency appers in the display on which the unit is ready to operate. During transmission, in models with serial no. 4000 or above arrow also flashes on and off.

Controls and indicators	Description	Function
Store button	Pushbutton	Briefly pressing the STORE button causes the display frequency to be stored in one of the four memory locations, provided that the channel selector switch is not in position A, but set to one of the four memory positions (1 - 4). In models with serial no. of 4000 or above the STORE button must be held depressed for approx. 2 seconds in order for the displayed channel frequency to be written into the selected memory location.

### 3.2 Operating instructions for serial no. 0 to serial no. 3999

**NOTE**

Switch off transceiver when engines are started or stopped.

1. Switch on VHF transceiver with ON/OFF switch. For a few seconds the LC display reads 188.88 (display test). The transceiver then automatically switches to 121.500 MHz (emergency frequency) when the channel selector is in position A. When it is positioned to one of the stored channel frequencies (switch position 1-4) the display reads the stored channel frequency. To select a channel frequency other than the stored channel frequencies, position channel selector to A and then set the desired frequency by means of the MHz and kHz frequency selector switches.
2. Set to frequency of local ground station and position VOL control to center position.
3. Operate PTT key and call ground station. For optimum intelligibility keep microphone almost touching lips.
4. On response from the ground station adjust for desired volume using VOL control.
5. Position ON/OFF switch to SQL to suppress weak input signals and input noise.
6. The sidetone volume can be adapted to the noise level of the aircraft by means of the sidetone volume control.

### 3.3 Operating instructions serial no. 4000 upwards

**NOTE**

Switch off transceiver when engines are started or stopped.

1. Use the ON/OFF switch to turn on the VHF transceiver. For a few seconds, the digits 188.88 will appear in the LCD (display test), as well as an arrow to indicate transmission mode. Afterwards the VHF transmitter automatically switches to the most recently set frequency, if the channel

selector switch is in position A. If the channel selector switch is set to one of the stored channel frequencies (any one of switch positions 1 through 4), then the channel frequency stored in that memory location will appear in that display. If any other channel frequency is desired other than those channel frequencies stored, then the channel selector switch should be set to position A whereupon the desired frequency can be set using the MHz and kHz frequency selector dials.

2. Repeat steps 2 through 6 of Section 3.2.

### **3.4 Storing frequencies**

Four memory locations are available for channel frequencies; each of these can be used to store any channel frequency used for aircraft communications. They can be used in any desired order. To store, proceed as follows :

- a) Switch the channel selector switch to position A.
- b) Use the MHz and kHz rotary switches to set the desired channel frequency.
- c) Set the channel selector switch to the desired memory location.
- d) Press the store button. For models with serial nos. of 4000 or above, the STORE button must be held depressed for approx. 2 seconds.

#### **NOTE**

When overwriting a stored channel frequency, the same procedure as listed in steps a. through d. should be followed.

### **3.5 Setting the emergency frequency**

#### **3.5.1 Setting the emergency frequency on models with serial numbers up to 3999**

As already described in the operating instructions, the transceiver automatically switches to the emergency frequency 121.500 MHz when the channel selector is positioned to A in switching the transceiver on. To quickly switch to the emergency frequency in an emergency situation best procedure is to switch the channel selector to A and to briefly switch the transceiver off/on, after which the transceiver operates on the emergency frequency of 121.500 MHz. Under normal operating conditions, this can be set by means of the frequency selector switches. Another possibility is to store the emergency frequency directly in one of the four available channels.

#### **3.5.2 Setting the emergency frequency on models with serial numbers of 4000 or above**

In models with serial numbers of 4000 or above, the emergency frequency 121.500 MHz does not automatically appear when the channel selector switch is in position A and the transceiver is powered up. It is recommended to store the distress frequency in one of the 4 memory locations.

In models with serial numbers of 4000 or above, an arrow flashes on and off in the LCD during transmission. This is activated by the microprocessor, which outputs the instruction for this along with the other data for the liquid-crystal display.

### **3.6 LC display blinking**

As soon as the operating voltage for the transceiver drops to a value of 10.5 V to 11 V, the display starts blinking to signalize, e.g. in battery operation that the batteries need recharging. The display will start blinking in transmitter operation since this situation involves the highest current drain.

Since the discharge curves of batteries greatly depend on the type of batteries involved, e.g. lead-acid or nickel batteries and on the ambient temperature of the batteries, no accurate indication can be given as to how long the transceiver will remain fully functional on commencement of LC display blinking. After a few keying cycles, the batteries can be empty in transmitter operation. In receiver operation the instrument will remain functional for approx. 1-2 hours from commencement of blinking.

At an operating voltage of 10 V, the transceiver remains fully functional, but at reduced output power.

### **3.7 IC operation**

1. Switch on IC switch.
2. Carry out speech test.
3. IC volume can be adapted to the noise level of the aircraft by means of the IC volume control see (Fig. 2-7).

### **3.8 Optional temperature, voltage measurement**

When the standard version is supplemented by optional temperature and voltage measurement circuits, note:

Temperature of voltage is measured continuously, whereas display follows only after pressing the external pushbutton for approx. 4 sec, after which the previously set channel frequency appears.

#### **NOTE**

Independent of the temperature or voltage measurement, transceiver operation is available at the set channel frequency even when the instrument is displaying a temperature or voltage indication.

### **3.9 Auxiliary audio input (optional) (standard as of module No. 471)**

Via the auxiliary audio input, other radio equipment (e.g. navigation receiver) can be monitored. When the system is wired up for this application, the volume control of the remote equipment must be set so that these inputs are intelligible and can be differentiated from each other.

During transmission the auxiliary input from the audio output amplifier is OFF.

### **3.10 No channel frequency storage**

When the stored frequencies are lost when the transceiver is switched off, first measure the battery voltage at the two button batteries which must be 2.4 V. These batteries are automatically charged when the transceiver is switched on. When the unit is not switched on for a long time, or in lengthy storage, the batteries may become discharged. To recharge the battery, it is sufficient to simply connect the transceiver to the aircraft voltage for a couple of hours. The service life of a new battery is between 3 and 5 years.

### **3.11 Precautions**

In order to secure a reliable transceiver operation, please note the following precautions:

- a) Before running-up the engines, ensure that the transceiver is switched off.
- b) Always conduct a verbal pre-flight check. Note that in the vicinity of a flight control, a broken or shorted antenna cable must not necessarily impair the function. At a distance of 5-10 km from the ground station, however, the connection will doubtlessly fail.
- c) Transceiver communication contact should always be conducted using a clear, loud voice and by speaking directly into the microphone. Otherwise, cabin background noise could predominate, making the message inaudible.
- d) Use suitable microphones or headset for aircraft only. With certain aircraft types (wood or fibre-glass aircraft, gliders and helicopters) the signals transmitted by the unit's antenna may be picked up and enhanced by the integrated microphone amplifier (feed back). As a result, the signal received by the flight control will be superimposed by whistles and/or strong distortion. This phenomenon may not necessarily remain constant for all channels.
- e) The PTT button of the microphone or control unit might jam, causing the system to remain in the transmission mode. In order to rule such cases out, please ensure that the arrow in the frequency display (from serial no. 4000 onwards) illuminates during the transmission mode, and extinguishes when the PTT button is released.