

ATR833 - OLED VHF Communication Transceiver



P/N 833-(1xx)-(1xx)

Operation and Installation

(Document-No. 01.1402.010.71e)

Change History

Revision	Date	Description of Change
1.00	11.08.2009	FAV – First Release
1.01	15.10.2009	Changed order of Basic Settings (SW5.6)

List of the Service Bulletins (SB)

Services bulletins are to be inserted in the manual and to be put down in this table.

SB Number	Rev. No.	Issue Date	Entry Date	Name

Survey of Variants

Part Number	Description
P/N 833(000)-(000)	Base Variation
P/N 833(100)-(100)	Introduction from: <ul style="list-style-type: none"> • 2 standards of microphone inputs • To 2 dynamic microphone inputs • Additional audio input • DUAL Watch function
P/N 833(101)-(101)	LC Display replaced by OLED Display
P/N 833(103)-(101)	SW V5.5 new operating functions: Master Reset → Factory Settings Energy Saving Mode → Display Darkening

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1 GENERAL

This manual contains information about the physical, mechanical and electrical characteristics as well as information about installation and operation of the aeronautical radio device VHF ATR833.

1.1 Symbols

	Advices whose non-observance can cause radiation damage to the human body or ignition of combustible materials.
---	---

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

	Information
---	-------------

1.2 Abbreviations

Abb.	Name/subject	Definition
PTT	Push to Talk	activates transmitter
VOX	Voice Recognition	Intercom is activated by talking
INT	Intercom	On board communication
SQ	Squelch	
DIM	Dimming	Display Brightness
EXT	External audio input	

1.3 Customer Support

In order to facilitate a rapid return of shipments, please follow the instructions of the input guide “Reshipment RMA” provided at the Service-Area within the Funkwerk Avionics web portal www.funkwerk-avionics.com.



Any suggestions for improvement of our manuals are welcome. Contact: service@funkwerk-avionics.com.



Informations on software updates are available at Funkwerk Avionics.

1.4 Features

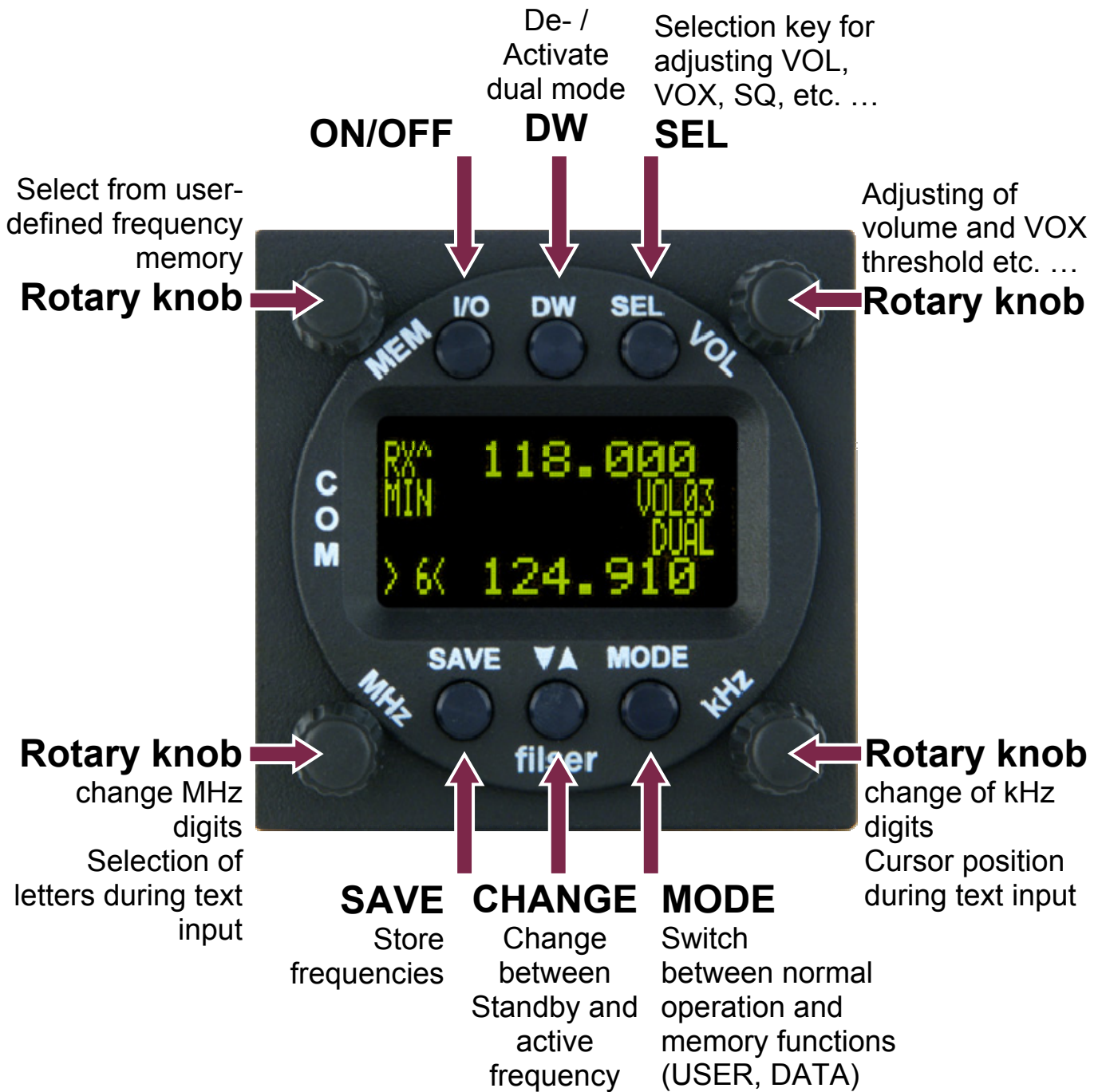
- VHF communication transceiver for aircraft installation
- frequency range 118,000 to 136,975 MHz
- channel spacing 8,33/25 kHz (2278/760 canals)
- 4 microphone inputs (2 x standard, 2 x dynamic)
- auxiliary audio input
- mounting: 57 mm cut out
- 100 user defined frequencies which can be titled with a name up to 8 characters
- frequency database with 5896 entries – selection of entries by input of the airfield name - update through serial interface - frequencies of european airfields pre-installed.

















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

2 OPERATION

2.1 Controls



	ON/OFF	Switch On press button for approx. 0,5 s Switch Off press button for approx. 3 s
	DUAL WATCH	Activates the mode for mutual interception of two frequencies
	CHOICE	1. Selection of the different pages of the basic settings VOL, SQ, VOX, DIM etc. →press button shortly 2. MIC settings → press button for 5 seconds
	SAVE	Store the active frequency on the selected memory position (see section. 2.5.4 page 16)
	CHANGE	Switch between Active and Standby frequency
	MODE	Switch between direct input mode (normal operation) and memory administration (frequency memories USER and DATA)
 	MEM – Rotary Knob	Rotary Knob for the selection of a stored <u>user-defined</u> frequency
 	VOL – Rotary Knob	1. Setting of the volume (earphone, loudspeaker) 2. Change of the basic settings, accessed by SEL
 	MHz – Rotary Knob	1. Change MHz digits of the Standby frequency directly 2. Enter letters in the modes USER and DATA
 	kHz – Rotary Knob	1. Change kHz digits of the Standby frequency directly 2. Cursor positioning in the modes USER and DATA

2.2 ON/OFF

ON: press button for 0.5 s

OFF: press button for 3 s

After turning-on the display appears as follows:



(Example)

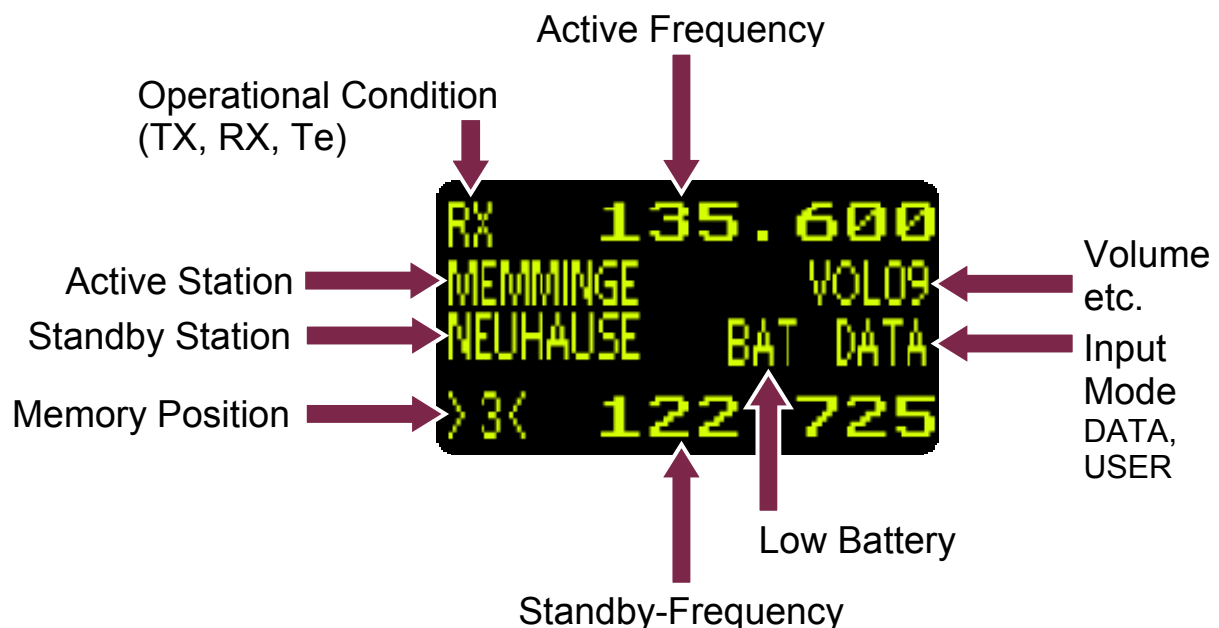
Device Name
ATR833

Software-Version
e.g. v5.4

State of the frequency database (if loaded)
e.g. D24.04.2006

The radio device starts in normal mode (direct frequency input) under use of the last settings.

2.3 Display



Display	Meaning	Remark
RX	Operational Condition - Reception	Indicates when reception takes place. (Squelch open)
TX	Operational Condition - Transmit	Transmitter works properly
Te	Transmitter was automatically switched off after 2 min continuous transmission	
135.600	Active Frequency	
MEMMINGE	Name of the Active Frequency	Assigned name in user-defined memory or frequency database
VOL	Volume Level (indicated by default)	If SEL was pressed, at this position the respective values of the other basic settings are indicated (see 2.4)
SQ	Squelch	
VOX	Voice Detection	Intercom controlled by voice
DIM	Display Brightness	
INT	Intercom - Volume	
EXT	Volume of external audio-signals	
TXm	PTT-Button Selection	Left/Right/Both
NEWHOUSE	Name of the Standby Frequency	Assigned naming in user-defined memory or frequency database
BAT	Low Battery <10,5V	Possible defective battery or generator
Er	Internal failure/ transmission interrupted	Device must be sent back to the manufacturer

Display	Meaning	Remark
DATA	Access to frequency database active	Selectable with MODE Access to Database is Read Only, Search entries by input of airfield name
USER	Define and Store entries in the user-defined frequency list (0-99)	Selectable with MODE store the Standby-Frequency at the currently selected memory position (see 2.5.4)
DUAL	DUAL Watch is activated	Activated by DW (2.5.5)
>3<	Selected Memory Position (appearance of brackets shows whether the standby frequency and stored information comply)	[] selected storage space in the user-defined frequency list (0-99) <> frequency does not comply with the stored one.
122.725	Standby - Frequency	

2.4 Basic Settings

Between the different menu points of the basic settings can be switched with the **SEL** button.

0. VOL Volume
1. SQ Squelch
2. VOX.... Configuration of the threshold value to activate Intercom
3. DIM..... Display Brightness
4. INT Intercom-Volume
5. EXT Volume of external audio-signals
6. TXm.... PTT-Key Choice (Left/Right/Both)
7. Back to Frequency Setting

The settings of the volume can be controlled by the **VOL** rotary knob.

The return to the standard display (VOL) works automatically after 6 seconds or can be reached by pressing the **SEL** button several times.

2.4.1 VOL – Volume

Normally (not necessarily selected with the **SEL** button) with the rotation of the **VOL** key, the reception volume can be adjusted.



The VOL-Setting does only affect the received signal, not the Intercom level, which is pre-configured by factory.

2.4.2 SQ – Squelch

By pressing the **SEL** key once, with the help of the **VOL** rotary knob Squelch can be adjusted.



The setting for the Squelch is dependent on different factors. For motor aircrafts an initial setting of 7-8 applies, gliders may use settings below that value. A high number reflects a high input sensitivity and may result in disturbances from different sources (engine, strobe lights).



The default Squelch setting is 07 ... 08. Higher values could suppress weak signals. Squelch does not impact the Intercom.

2.4.3 VOX – Voice Detection (Intercom Function)

By pressing the **SEL** key twice, with the help of the **VOL** rotary knob, the threshold value for voice detection can be adjusted.

VOX defines the volume threshold at which normal noise during flight is not transferred into the headset. Only an additional voice signal activates intercom operation.

The higher the value, the louder you need to speak in order to activate the Intercom connection.



In case of a noisy background or uncompensated microphones it is possible to deactivate VOX with VOX: 01. If done so, Intercom is enabled by use of the Intercom-Switch.



In order to configure the microphone sensitivity (see 2.8.4) VOX should be set to VOX: 05, allowing further adjustments during flight.

2.4.4 DIM – Display Brightness

By pressing the **SEL** key six times, with help from the **VOL** rotary knob, the strength of the background illumination of the display can be set.



2.4.5 INT – Intercom-Volume

By pressing the **SEL** key four times, with help from the **VOL** rotary knob the Intercom Volume level can be controlled.



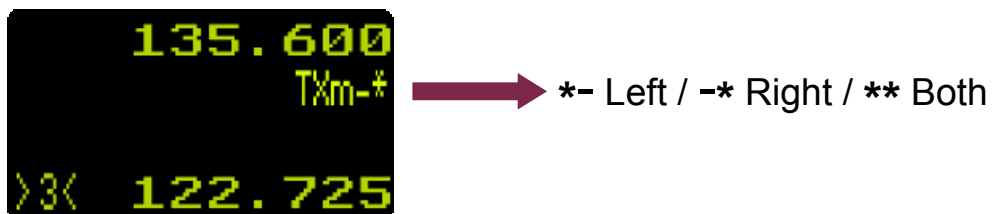
2.4.6 EXT – Volume of the external Audio-entrance

By pressing the **SEL** key five times, with help from the **VOL** rotary knob, the volume from the connected external audio signals (Warning tone, music, etc...) can be set.



2.4.7 TXm – Activation of the PTT-buttons

By pressing the **SEL** key three times, with the help of the **VOL** rotary knob, the PTT-buttons can be selected.



2.5 Frequency Settings

The input of a frequency can be done in three different ways, by:

- Direct/manual input (with the lower rotary knobs for the **MHz** and **KHz** Range).
- Selection from the user-defined frequency list (Memory Positions 0-99) with the **MEM** rotary knob.
- Selection from the frequency database (if loaded) in the DATA-Mode

Between these input modes, it can be switched with the **MODE** key. The currently active mode is indicated on the third line on the right.

- No indication..... direct input with **MHz** and **KHz** or selection from the user-defined frequency list with **MEM**
- USER..... no frequency selection only Edit and Storing in the user-defined frequency list.
- DATA Search in the frequency database (if loaded)

2.5.1 Manual Input

The frequency can be set with the **MHz** and **KHz** rotary knobs. It is indicated as Standby-Frequency in the lower line.

During the input the existing name (left on the third line) is overwritten. The indication of the memory position (format of the brackets) changes from **[xx]** in **>xx<**, showing that the new Standby-Frequency does not comply with the contents of the indicated frequency memory position.

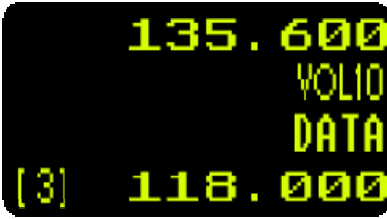


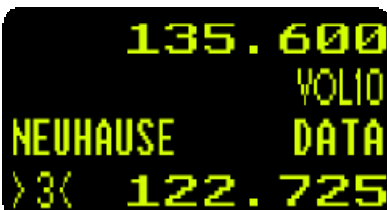
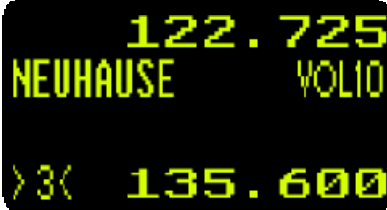
 switches active and standby-frequencies.

2.5.2 Select frequency from memory position

With **MEM**, a stored frequency can be selected from the user-defined frequency. In this case the respective memory position **[xx]** (xx = becomes 0 ... 99) as well as the frequency name and the stored frequency are indicated.

2.5.3 Select frequency from the frequency database

This function is available only with installed frequency database.


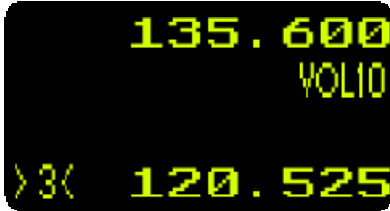
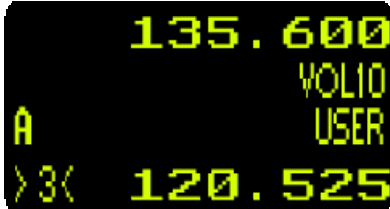
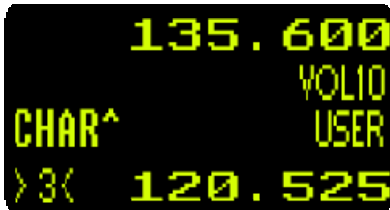

Step	Display (Example)
1. <u>Change to DATA mode:</u> press MODE until DATA appears on the right in the third line.	
2. <u>Searching the Database:</u> a. Input the first letters of the desired station KHZ ... positions the cursor MHz . selects the letters <i>at the position of the cursor the cursor symbol "^^" and the chosen letters blink alternately</i> b. The first found entry which fits the search criteria is displayed with its name and the belonging frequency. c. The selection of other, also fitting entries is done with MEM	  
3. <u>Activation of the selected frequency:</u> Once the desired frequency is found, it can be activated with ▲▼ . The device changes back to the direct input mode.	

The database search can be canceled at anytime with the **MODE** button. The selected frequency remains as the standby-frequency.

2.5.4 Editing of the User-Defined frequency list

The Standby frequency given in the lower line can be named and stored in the user's list (user-defined frequency list).

Before saving, the desired memory position must be chosen in the direct input mode (the third line indicates neither USER nor DATA) with **MEM**. The currently stored entry will be overwritten.

Step	Display (Example)
<p>1. <u>Select memory position:</u> In the direct input mode press MEM to select a memory position. The current entry is now indicated with frequency and the respective designator.</p>	
<p>2. <u>Setting Frequency:</u> a) Direct input with MHz or KHz b) select frequency in DATA-Mode (see 2.5.3)</p>	
<p>3. <u>Change into USER-Mode:</u> Press MODE to enter USER-Mode "USER" is displayed (third line on the right).</p>	
<p>4. <u>Enter frequency name:</u> The input of the user-defined designator is done with the lower rotary knobs. KHz..... positions the Cursor MHz selects the letters</p>	
<p>5. <u>Store Entry:</u> Press SAVE to store the chosen frequency with the defined name on the indicated memory position. In the lower line „SAVE“ appears for 2 seconds, after that the device changes back into the direct input mode.</p>	


2.5.5 DUAL Watch

The ATR833 owns one receiver, therefore, DUAL-Watch (listen to two frequencies) happens alternately between the active and the standby frequency.

By pressing the **DW** key DUAL Watch is activated, pressing **DW** again deactivates it.

The two frequencies, the receiver shall alternately listen to, should be entered before activating DUAL Watch, since changes in the standby frequency would deactivate this mode again.

Another important precondition is the setting of the Squelch value (SQ). It must at least be set to **SQ: 02** (SQ-setting see 2.4.2). Only if a noise suppression takes place, it can be evaluated whether nothing is received on the active frequency.

	<p>SQ must be set to a value that is at least 02, because otherwise no noise reduction would happen, in this case it would not be possible to determine if a reception takes place or not.</p>
---	--

When the DUAL Watch is activated, DUAL will be shown in the third line.

When there is no reception on the active frequency, the receiver switches to the standby frequency. The active frequency has priority and it is monitored every 2 seconds for a duration of 0.3 seconds. If reception on the active frequency is recognized again, the monitoring of the standby frequency is interrupted until no reception takes place on the active frequency.

Which frequency is currently monitored will be shown behind RX: “**RX^**” if the active frequency is monitored and “**RX_**” if the Standby-Frequency is monitored.

```

RX^  135.600
      VOL16
      DUAL
>3<  122.725
  
```

```

RX_  135.600
      VOL16
      DUAL
>3<  122.725
  
```

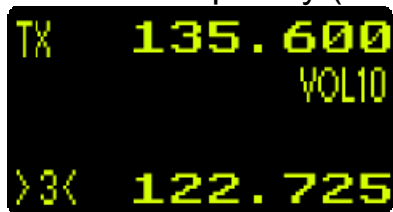
In DUAL Watch Mode it is possible to switch between the standby-frequency and the active frequency. Transmission is always done on the active frequency.

Quick approach:

- Select or enter a Standby-Frequency, which should be additionally monitored.
- Set SQ with the **SEL** key and the **VOL** rotary knob to a value of at least 02.
- Activate DUAL Watch with **DW** (DUAL is shown)
- As soon as no reception is determined on the activate frequency, the mutual monitoring between active and Standby-Frequency starts (2 seconds Standby and 0.3 seconds active frequency)
- In order to deactivate DUAL Watch: press **DW** once more or change the frequency.

2.6 Transmission

By pushing the PTT button, the device starts transmission on the selected frequency (shown in the upper line).

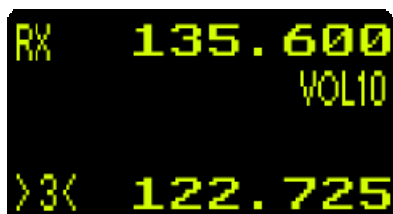


```
TX 135.600
VOL10
>3< 122.725
```

“TX“ indicates correct operation of the transmitter.

In order to avoid unintended transmissions, the transmitter stops after two minutes and the display changes from „TX“ to „Te“. In order to re-start transmission, release PTT and push it again.

2.7 Reception



```
RX 135.600
VOL10
>3< 122.725
```

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

2.8 Enhanced Settings

In the following section configurations beyond the basic settings are explained.

In order to save energy and to extend lifetime of the OLED Display an **automatic Darkening of the Display** “ENERGY SAVING MODE“ can be configured.

The **Master Reset - Function** sets the user settings back to the factory settings.

In the **SET UP - Menu** the frequency databases (including the user-defined frequency list) can be deleted and the channel spacing can be configured.

In the **MIC - Settings** the microphone sensitivity is configurable.

MODE + Turning on	Energy Saving Mode
MODE + SEL + Turning on	Master Reset (Factory Settings)
SAVE + Turning on	SET-UP Menu
Press SEL longer than 5 seconds	MIC - Settings

2.8.1 Energy Saving Mode – Darkening the Display

Available since P/N 833-(103)-(101) software version V5.5

The Energy Saving Mode - Menu can be accessed by pressing the **MODE** key and the **I/O** key simultaneously.

With the **VOL** rotary knob a time span can be defined, after which the display automatically darkens if no key or rotary knob was in use. The time span can be set up to 30 minutes. The automatic darkening can be deactivated with selecting the “Never“ option (default). By pressing the **MODE** key again, the setting is saved and the menu is left.

2.8.2 Master Reset - Set back to factory settings

Available since P/N 833-(103)-(101) software version V5.5

The factory settings can be reset only from the switched-off device. In order to reset to factory settings press the **I/O** key (to switch on), the **MODE** key and the **SEL** key simultaneously. The display shows “SETTING RESTORE“. After releasing the keys the settings are reset to the factory settings. This will be confirmed by the message, “SUCCESSFULLY“.

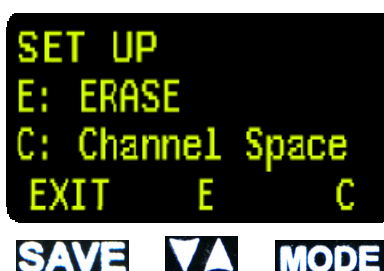
2.8.3 SET UP - Menu

The SET UP-Menu is activated by pressing the **SAVE** key and the **I/O** key simultaneously.

The following functions are available:

- ERASE – To delete data memories (USER, DATA)
- Channel Spacing–Setting of the channel spacing(25kHz / 8,33kHz)

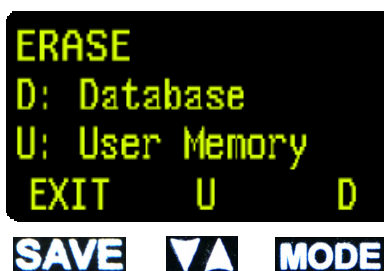
The selection between the options of the SET UP-Menu is done with the lower row of keys.



The SET UP-Menu is left with the **SAVE** key. The device remains switched-on and returns to the normal display mode.

2.8.3.1 ERASE – Delete the data memories

In the SET UP–Menu, by pressing the **I/O** key, the “ERASE” menu opens:



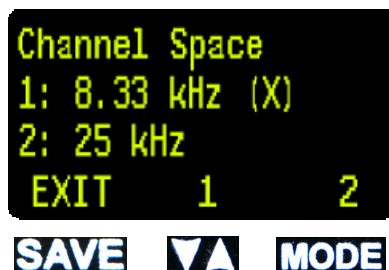
The erasing of the user-defined frequency can now be with the **I/O** keys. The process takes a few minutes and the display presents the message: “ERASING”.

The Frequency Database can be deleted with the **MODE** key.

If the user-defined frequency list was deleted, the display shows “INIT----” instead of the frequency names.

2.8.3.2 Channel Space

In the SET UP–Menu, by pressing the **MODE** key, the “Channel Space“ sub menu is opened:




This menu enables to select the desired channel spacing. The actual channel spacing is marked with an “(X)” at the end of the line.

2.8.4 MIC – Settings

Every microphone input can be individually configured. Therefore different types of microphones can be used.

Microphone Input	Left	Right
standard	Ls.MIC	Rs.MIC
dynamic	Ld.MIC	Rd.MIC

Per microphone input a maximum of two parallel installed microphones may be connected. (see 3.6.1)

	<p>For setting MIC, VOX must be set to 5 previously (for VOX - Settings refer to section 2.4.3 page 12).</p>
---	--

The MIC-settings are opened by pressing the **SEL** key 5 seconds or longer. A countdown will appear in the upper line on the left side. After the countdown is finished the MIC-settings menu will be displayed.



With the **MEM** rotary knob, the microphone is chosen (for example, “Ld“ for Left/dynamic).

With the **VOL** rotary knob, it is possible to configure the input sensitivity of the preamplifier "MIC" (01=insensitivity, 10=max. sensitivity), the so adjusted microphone level is indicated below.

To correctly set the microphone level, it must be configured with a running engine and speaking at a normal volume, while doing this the microphone level should be set to approximately 2.00 (bar graph should reach the middle of the scale)

With the **MEM** rotary knob, e.g. to configure another microphone, the present settings are saved.

To save and to exit the menu press the **SEL** button.

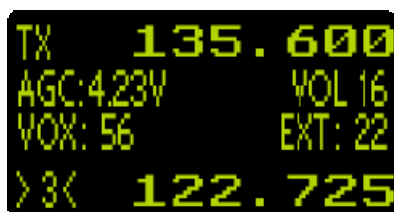
2.8.5 Test Mode

The Test-Modus is used for testing purposes. It is activated in the MIC-Settings menu (see 2.8.4). In order to reach the test mode from normal operation:

- SEL** press for 5 seconds
(MIC – setting turns on)
- MODE** press shortly ("test" appears)
- SEL** press shortly, to leave the menu.



The test display will now appear:



Screen contents and meaning:

AGC:... receiver RF input level

VOX:... sum of the microphone input levels

Ext: external audio input level

To exit test mode, restart the device.

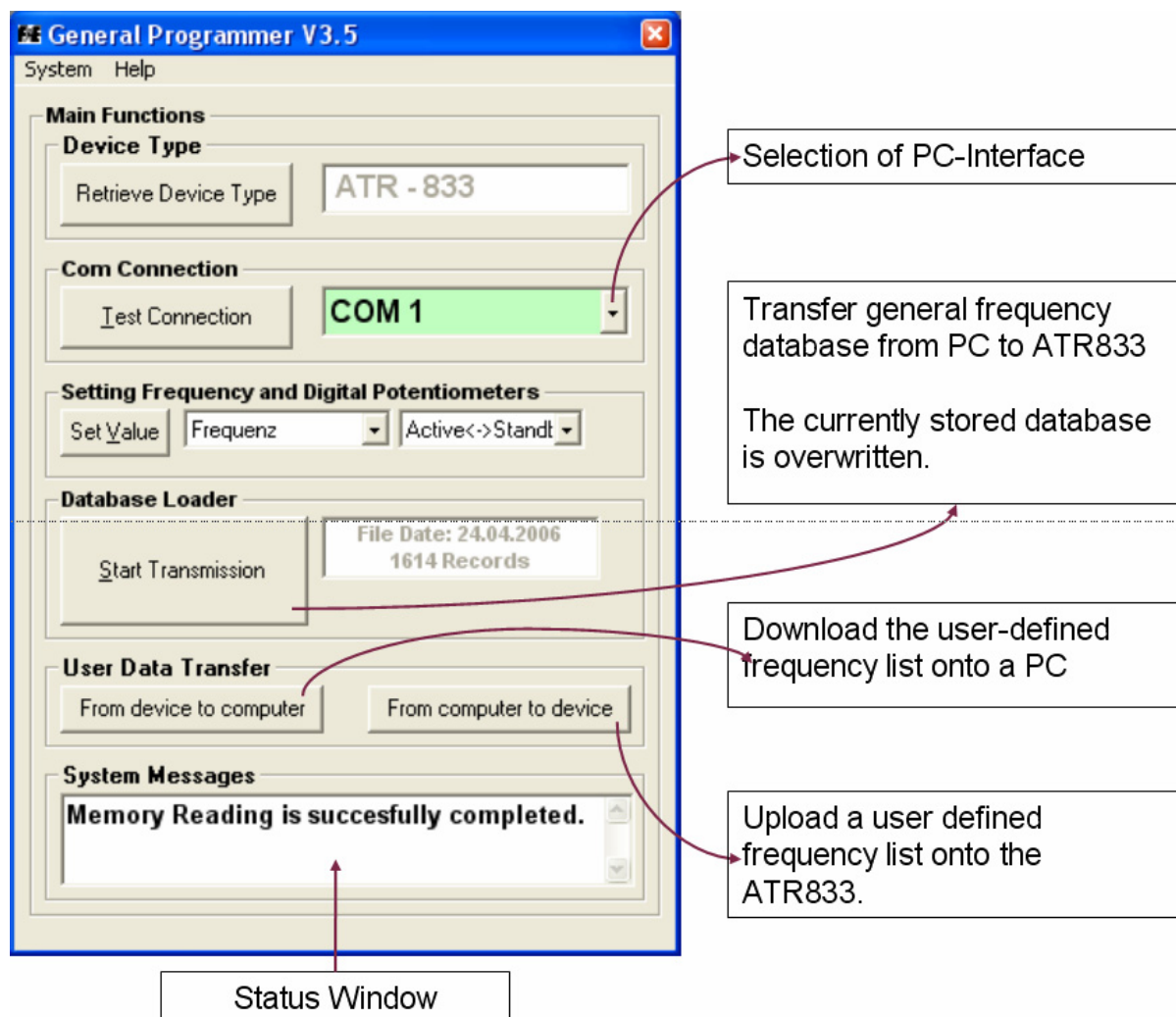
2.9 Managing the Database

The user-defined frequency list (memory positions 0-99), as well as the general frequency database can be edited and updated on a PC.

For that, a suitable cable set (with RS232 connector) as well as the transfer software for PCs (Windows) are required.

The transfer software "General Programmer" can be downloaded from www.funkwerk-avionics.com website, under SERVICE→INFO as packed file ("ATR_Programmer_v3.5"). The cable set (order no.: ZATRPCKABEL) can be obtained in our online shop or from our distributors.

The transfer software must be unzipped and installed per setup.exe. If the ATR833 is correctly connected while the software is started, the user interface appears as follows:



The screenshot shows the 'General Programmer V3.5' window with the following sections and callouts:

- Main Functions:**
 - Device Type:** A text box contains 'ATR - 833'. A callout points to this box: "Selection of PC-Interface".
 - Com Connection:** A dropdown menu is set to 'COM 1'. A callout points to this dropdown: "Transfer general frequency database from PC to ATR833".
 - Setting Frequency and Digital Potentiometers:** Includes 'Set Value', 'Frequenz', and 'Active<->Standt' dropdowns.
 - Database Loader:** A 'Start Transmission' button is next to a box showing 'File Date: 24.04.2006' and '1614 Records'. A callout points to this box: "The currently stored database is overwritten." and another callout points to the 'Start Transmission' button: "Download the user-defined frequency list onto a PC".
 - User Data Transfer:** Two buttons: 'From device to computer' and 'From computer to device'. A callout points to the 'From computer to device' button: "Upload a user defined frequency list onto the ATR833.".
- System Messages:** A text area at the bottom displays 'Memory Reading is successfully completed.'. A callout points to this area: "Status Window".

2.9.1 Transfer of the general frequency database

The general frequency database can be updated with "start of transmission". This overwrites the existing database..

The database file is a text file with fixed sized columns. The frequency names shall never exceed the length of 8 characters. Blanks and numbers are permitted. Frequency name and frequency are separated by a blank.

```
24.04.2006
A CORUNA 118,305
AACHEN M 122,875
AALBORG 118,300
AALEN-HE 122,400
AARHUS 118,525
ABERDE-T 118,100
ABERDE-I 135,175
ACHMER 123,050
AGEN LA 121,300
```

After selecting "Start Transmission" the selection of the input file is requested. After selection of the corresponding file and confirmation the file transfer starts. The progress can be monitored on the ATR833 display:



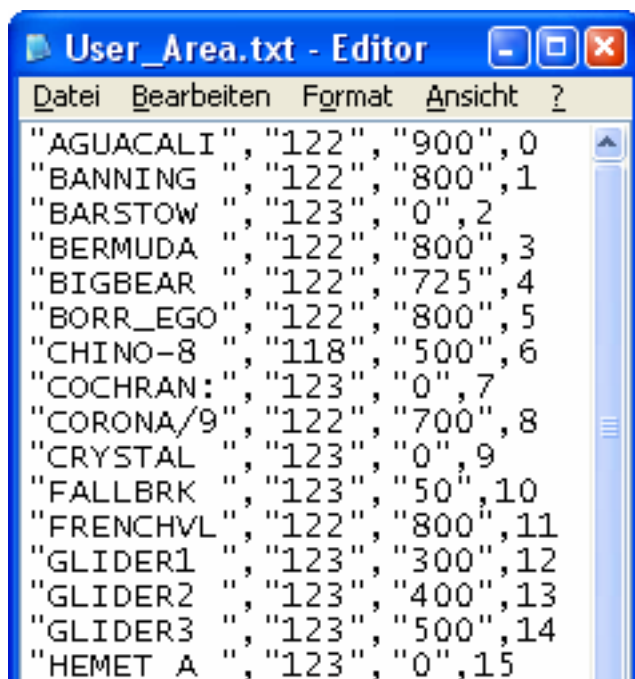
```
Start read Data
record #:
    01614
```

While the transfer of the general database is only possible in one direction (PC→ATR833), the user-defined frequency list of the ATR833 can be downloaded and uploaded (after modification) again.

2.9.2 Transfer of the user-defined frequency list

While transferring a file onto the ATR833, pay attention to the file name which should be "User_Area.txt". Furthermore the contained data must follow the suitable format (see following extract).

"Name5678","MHz","kHz", Memory Position (0-99)



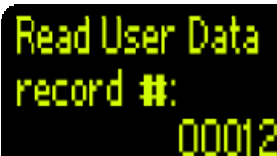
```

"AGUACALI", "122", "900", 0
"BANNING ", "122", "800", 1
"BARSTOW ", "123", "0", 2
"BERMUDA ", "122", "800", 3
"BIGBEAR ", "122", "725", 4
"BORR_LEGO", "122", "800", 5
"CHINO-8 ", "118", "500", 6
"COCHRAN:", "123", "0", 7
"CORONA/9", "122", "700", 8
"CRYSTAL ", "123", "0", 9
"FALLBRK ", "123", "50", 10
"FRENCHVL", "122", "800", 11
"GLIDER1 ", "123", "300", 12
"GLIDER2 ", "123", "400", 13
"GLIDER3 ", "123", "500", 14
"HEMET A ", "123", "0", 15
  
```

The datasets are transferred in the order as they are given by the file's content. Hence, row 1 corresponds to memory position 0 and row 100 corresponds to memory position 99. The datasets should be sorted before the upload, for that the number at the end of the row may be modified in order to re-arrange the sequence fitting individual needs.

In order to avoid errors due to a wrong list format, it is recommended to download the "User-Area.txt" file and to modify this downloaded file.

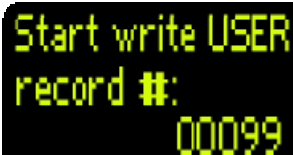
By selecting the button „From device to computer“ the "User_Area.txt" file is downloaded in the program root or in the last opened directory. The transfer progress can be monitored on the ATR833 display:



```

Read User Data
record #:
  00012
  
```

For uploading a file the button „From computer to device“ must be pressed. After selection of the "User_Area.txt" file and confirmation, the transfer starts. The transfer progress can again be monitored on the ATR833 display



```

Start write USER
record #:
  00099
  
```

2.10 Remote Control Panel

In Tandem-aircrafts it is possible to control the ATR833 by a second control panel (ATR600RT Remote Control Unit), which is connected to the RS232 interface of the ATR833. This second control panel enables to set frequencies and adjust Volume, Squelch, VOX and other basic settings (see 2.4).

In case of an error in the transmission between ATR833 and its remote unit, following error messages may appear in the second line besides „VOLxx“:

1e = Time-out-transmission error

2e = erroneous transmission (e.g. checksum error)

3e = unknown command

The error message disappears as soon as a correct command is received or the frequency is changed.

A malfunction of the remote unit does not impact the reliable operation of the ATR833.



If the channel spacing (see 2.8.3.2) is changed at the main device, the remote unit needs to be re-started in order to consider this change.

3 INSTALLATION

3.1 Advices and Tips

The following suggestions should be considered before installing

The assigned installation company could perform wiring. For diagrams refer to section 3.7 *Wiring*.

3.2 Telecommunication Data

The following data may be required when applying for the aircraft radio station license:


Manufacturer:	Funkwerk Avionics GmbH
Type Designation:	ATR833
EASA Number:	EASA.21O.0193
Transmitter Power Output:	6 W
Frequency:	118,000 – 136,975 MHz
Emission Designator:	6k00A3E for 25kHz channel spacing 5k00A3E for 8,33kHz channel spacing

3.3 Scope of delivery

Part Number	Description
ATR833	ATR833 - VHF communication transceiver
ZUB2 (4 pcs)	Mounting Screw ATR833 – for panels up to 3mm
SSATR2	Connector (Only if no cable set was ordered)
01.1402.010.71e	User Manual „Operation and Installation“
	EASA Form 1

3.4 Unpacking and Inspecting the Equipment

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


	For storage or reshipment the original packaging should be used.
---	--

3.5 Mounting

- In cooperation with a maintenance shop, location and kind of the installation are specified. The maintenance shop can supply all cables. Suitable sets of cables are available from Funkwerk Avionics GmbH.
- Select a position away from heat sources. Care for adequate convection cooling.
- Leave sufficient space for the installation of cables and connectors.
- Avoid sharp bends and wiring close to control cables.
- Leave sufficient lead length for inspection or repair of the wiring of the connector.
- Bend the harness at the rear connectors to inhibit water droplets (formed due to condensation) from collecting in the connector.
- Remove rotary knobs before mounting:
 - Lift-off faceplate with an appropriate tool
 - Loosen screw and remove rotary knob
 - Insert cap correctly orientated!
- The equipment is fixed front-laterally with four 6-mm through-hole screws in a 57 mm cut-out.
- For mounting details/drawing refer to chapter 3.13.2 Mounting Advices.

3.6 Equipment Connections

One 25 pin D-SUB miniature connector includes all electrical connections, except for the antenna

	<p>The (+UB)-wire has to protected by circuit breaker (4 Amp. slow-blow)!</p>
---	---

3.6.1 Microphone-Connection

Microphone	Left	Right
standard	Ls.MIC	Rs.MIC
dynamics	Ld.MIC	Rd.MIC

The inputs for standard microphones are appropriate for input voltages of 50 mVpp to 2 Vpp. These inputs have a bias voltage of 8 V at 330 ohms. Sensitivity is adjustable in the init menu with MIC. (see 2.8.4).

The inputs for dynamic microphones are appropriate for input voltages of 5 mVpp to 10 mVpp. These inputs have no bias.

In general standard and dynamic microphones (headsets) can be used simultaneously.

In motor gliders, when the engine is running, the dynamic microphones should be turned off (switch Ld/Rd inputs to GND), in order to avoid the transmission of the engine's noise.

If no dynamic microphone is installed, the input sensitivity MIC for Ld/Rd shall be set to 1 (MIC01...see 2.8.4 MIC – Settings page 22). Therewith these microphone inputs are set to “insensitive“.

Per microphone input two microphones may be connected in parallel.


3.6.2 Headset-Connection

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

3.6.3 Audio-Input

The external audio input can be used for the input of warn tones or music etc. In order to avoid disturbances while this input is not used, the respective wire needs to be short-circuited. Therefore connect PIN4 to GND.

With cable sets available from Funkwerk Avionics the external audio-input (cinch jack) is already short-circuited by a blind plug. This blind plug can be easily removed in order to use the external audio input

	<p>If the external audio wire (PIN4) is not used it needs to be short-circuited with GND, in order to avoid disturbances received through that wire.</p>
---	--

3.7 Wiring

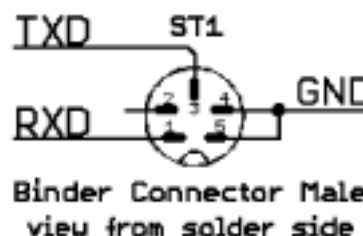
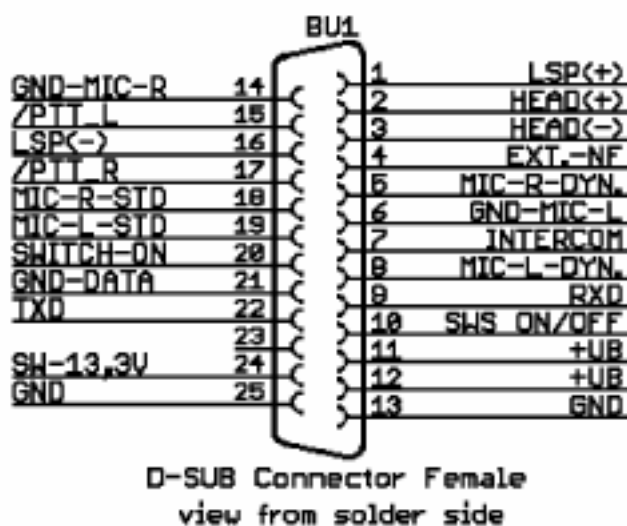
3.7.1 Conductor Cross Section

Power Supply (Power, GND): AWG18 (0,96 mm²)

Signals: AWG22 (0,38 mm²)

The conductors must be approved for aircraft us.

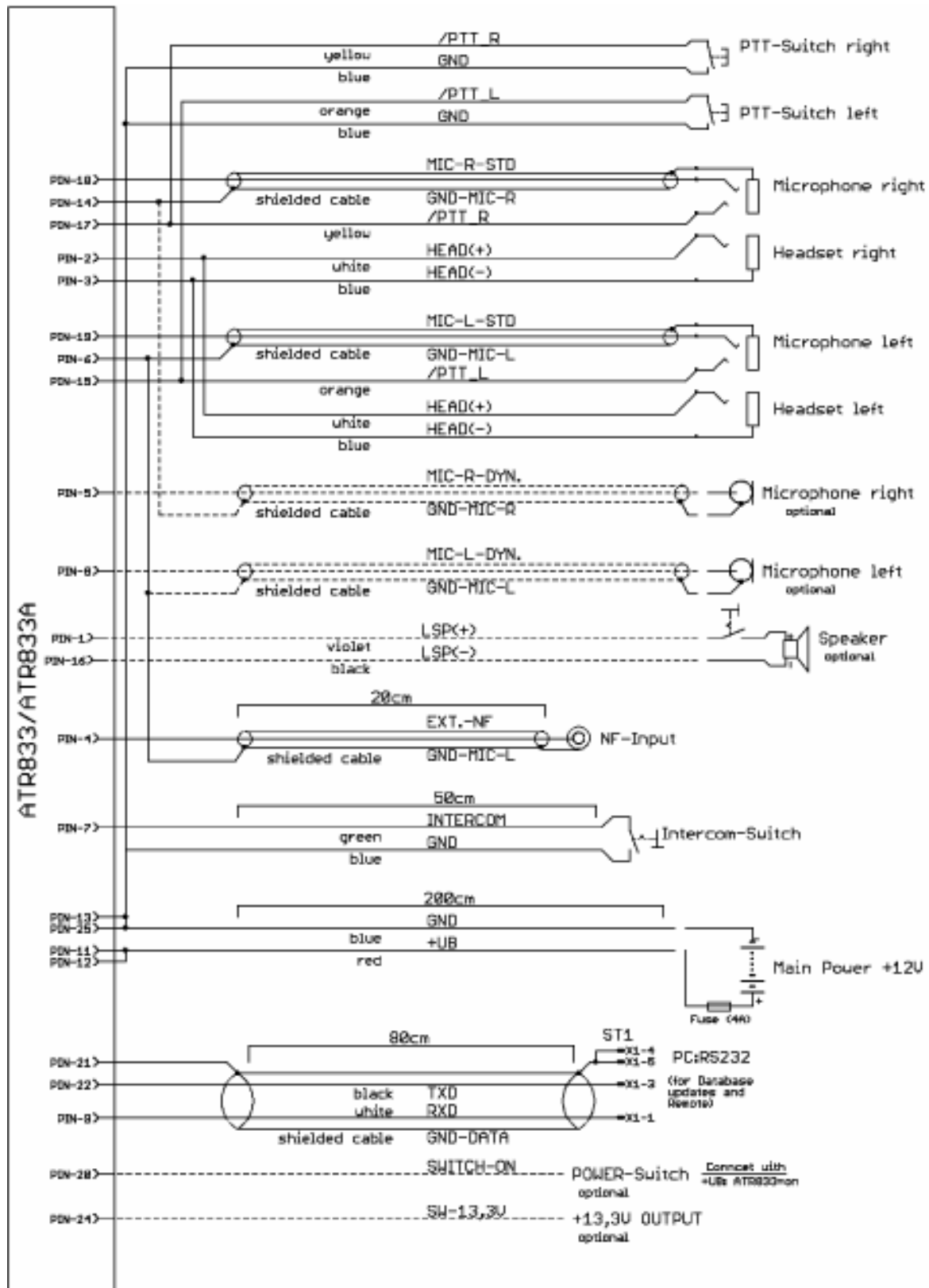
3.7.2 Connector – Pin Allocation



SSATR2 – D-Sub connector
ATR833 25-pole

RS232-connector in cable sets
BSKS833T and BSKSZUB

3.7.3 Wiring Diagram



PIN 24: I = 200 mA (internal fuse)

3.8 Antenna

3.8.1 Antenna Selection

- A VHF-COM-Antenna with an impedance of 50 Ohm is required.
- Choose an antenna type approved for the aircraft and the mounting location.
- Specified features depend on proper installation of the antenna.

3.8.2 Installation Recommendation

- Take note of the antenna manufacturer's instructions.
- The metallic contact between airplane surface and antenna-GND 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.
- To avoid a 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 large as possible. A distance of 2 meters usually is sufficient.
- Assemble 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)
- For glider installation the internal antenna installed by the manufacturer should be used.



The HF antenna wire must not be included in any other cable sets, for example power supply or microphone. It must also not be placed together with other antenna wires, for example NAV or Transponder.

3.9 Microphone Settings

The settings of MIC and VOX values are essential for Intercom. (MIC=Microphone level see 2.8.4, VOX=threshold level see 2.4.3).

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 VOX=01 (see 2.4.3). In this case intercom is activated using the intercom switch (not PTT), which connects pin 7 (intercom) of the equipment connector to GND.

If necessary, e. g. in a tandem cockpit, use two parallel connected PTT buttons.

For operation in VOX mode pin 7 has to be connected to GND permanently.

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.

3.10 Post-Installation Check



A certified maintenance shop must verify proper operation of the VHF Transceiver System.

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

The SWR shall not exceed 3:1.

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 2000 ft contact a ground station in a distance of at least 50 km (30 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

3.11 Starting up

Turn the device on with 

After start-up the following screen appears:



The Start Screen indicates device type and software version as well as the date of the frequency database.

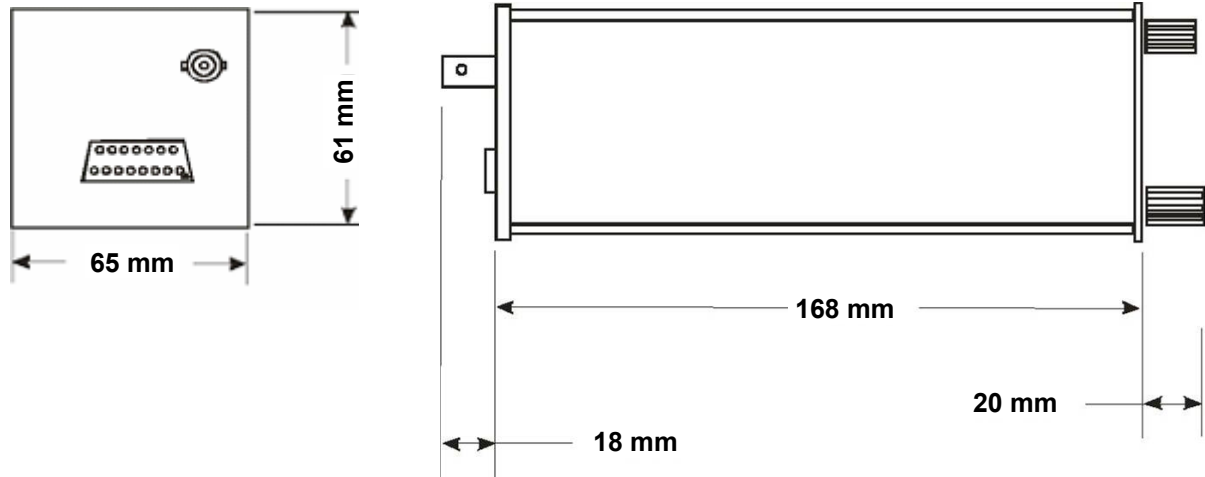
After that screen the device changes into normal operation (direct input mode).

3.12 Accessories

Suitable accessories like antennas, cable sets, connectors or switches can be purchased at our online shop on www.funkwerk-avionics.com.

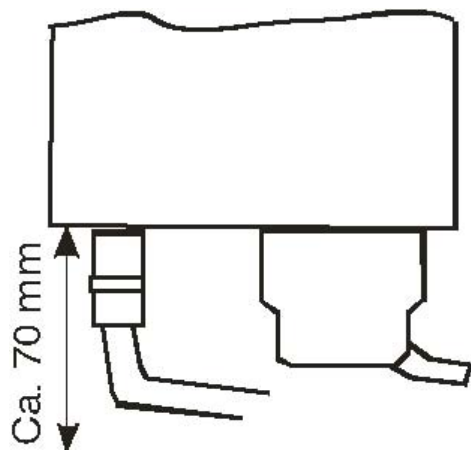
3.13 Drawings

3.13.1 Dimensions

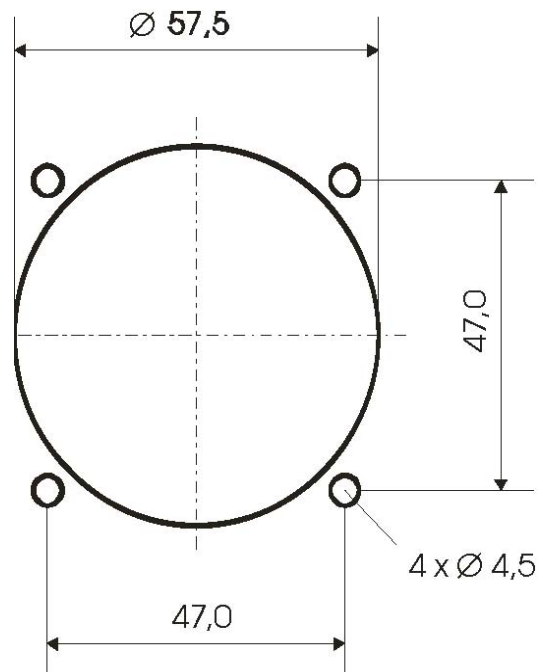


3.13.2 Mounting Advices

Connection Area



Panel Cut-out



For mounting in panels with a thickness of 3 mm to 5 mm longer screws are required. Order no.: ZUB1.

4 APPENDIX

4.1 Frequency/Channel-Plan

In the following table examples for operating and displayed frequencies in the range between 118.000 ... 118.100 MHz are given. This table can be continued to 136.975 MHz following the same scheme.

Operating frequency (MHz)	Channel Spacing (kHz)	Displayed Channel 8.33/25 kHz Mode	Displayed Channel 25 kHz Mode
118.0000	25	118.000	118.000
118.0000	8.33	118.005	
118.0083	8.33	118.010	
118.0166	8.33	118.015	
118.0250	25	118.025	118.020
118.0250	8.33	118.030	
118.0333	8.33	118.035	
118.0416	8.33	118.040	
118.0500	25	118.050	118.050
118.0500	8.33	118.055	
118.0583	8.33	118.060	
118.0666	8.33	118.065	
118.0750	25	118.075	118.070
118.0750	8.33	118.080	
118.0833	8.33	118.085	
118.0916	8.33	118.090	
118.1000	25	118.100	118.100
118.1000	8.33	118.105	
etc.	etc.	etc.	etc.

4.2 Technical Data

GENERAL	
COMPLIANCE	ETSO-2C37e,ED-23B Class 4 ETSO-2C38e,ED-23B Class C TSO-C37d, RTCA DO-186A Class 6 TSO-C38d, RTCA DO-186A Class E
DIMENSIONS	Height: 65 mm (2,56 in) Width: 65 mm (2,56 in) Length: 248 mm (9,76 in) behind the panel
WEIGHT	1,32 lbs (0,6 kg)
MOUNTING	Panel Mounted
TEMPERATURE RANGES OPERATION STORAGE	-20 °C ... +55 °C,30 min at +70 °C -55 °C .. +85 °C
MAX. HEIGHT	50000ft
VIBRATION	DO-160D, Cat. S, Vibration Curve M
HUMIDITY	RTCA DO-160D, Cat. A
SHOCK	6 G operation 20 G crash safety
RTCA DO-160D ENV.CAT.	[C1Z]CAA[SM]XXXXXXXXZBAAA[YY]M[B3F3]XXA
POWER SUPPLY	13,8 VDC (11 VDC ... 18 VDC) <ul style="list-style-type: none"> • transmitter: 2,5A • receiver: 0,2A (Standby),max. 0,5A • audio power amplifier: up to 1A emergency ops, restricted function: 11 VDC
POWER CONSUMPTION	Standby: 2,8W, transmitting 35W
FUSE	external fuse required: 4 A, slow-blow
FREQUENCY RANGE	118,000 MHz .. 136,975 MHz
FREQUENCY STABILITY	±30 ppm at -20 °C .. + 55 °C
COMPASS-SAFE DISTANCE	30cm
INTERCOM-INPUT	The microphone inputs are connected to the Intercom input. 100 mVRMS at the microphone input produce 0,5 W output power at the Headphone output (300 Ω).
NF (AUDIO) - INPUT	1V/600Ω

TRANSMITTER	
POWER OUTPUT	6 W (nominal) 4 W (minimal)
HARMONIC DISTORTION	< 10 % bei 70 % modulation
SIDETONE OUTPUT	>0,5W into 300Ω (per headphone)
MICROPHONE INPUTS	2 x standard (50mV...2V) into 100Ω 2 x dynamic microphone
HARMONIC CONTENT	>60dBc
MODULATION FIDELITY	deviation 6dB (350...2500Hz)
CARRIER NOISE LEVEL	>35dB at 70% modulation
UNWANTED FREQUENCY-MODULATION	<1kHz at m=70% / 1kHz
DUTY CYCLE	2 minutes on, 4 minutes off; automatic turn-off after 2 minutes of continuous transmit operation
RECEIVER	
SENSITIVITY	-105 dBm (6 dB S+N/N, m = 30 % / 1 kHz)
BANDWIDTH / 25 KHZ	-6-dB-bandwidth > ±8.0 kHz
BANDWIDTH / 8.33 KHZ	-6-dB- bandwidth > ±2.78 kHz
SELECTIVITY (channel spacing 25 KHZ)	-40-dB- bandwidth < ±17.0 kHz -60-dB- bandwidth < ±22.0 kHz
SELECTIVITY (channel spacing 8.33 KHZ)	-60-dB- bandwidth < ±7.37 kHz
SPEAKER-OUTPUT	≥4 W into 4 Ω (speaker output)
AGC CHARACTERISTICS	AF output deviation < 6 dB from 10 μV to 10 mV
SQUELCH	Automatic Squelch (adjustable)
SPURIOUS RESPONSES	> 80 dB
DISTORTION (350...2500Hz)	<25% at rated power (85% / -33dBm) <10% at 10dB below rated power (70% / -33dBm)

4.3 Environmental Conditions

Characteristic DO-160D	Section	Cat	Condition
Temperature / Altitude	4.0		
Low ground survival temperature	4.5.1	C1	- 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	35 000 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	Less than 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	

Characteristic DO-160D	Section	Cat	Condition
Induced Signal Susceptibility	19.0	A	
Radio Frequency Susceptibility	20.0	YY	
Emission of RF Energy	21.0	M	
Lightning Induced Transient Susceptibility	22.0	B3 F3	
Lightning Direct Effects	23.0	X	No test required
Icing	24.0	X	No test required
Electrostatic Discharge (ESD)	25.0	A	