VHF-Transceiver

AR6201-(XXX)

Installation and Operation

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Section 3 OPERATION

Note: In this section the display content is mainly shown for transceiver working in 8.33+25 kHz mixed Mode. Dedicated pictures for 25 kHz Mode are not explicitly shown, because the display content is very similar (They differ only in number of digits for frequency. Refer chapter 3.4).

3.1 Safety Instructions

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

Switch OFF the unit before 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. In this case at a distance of 5 to 10 km communication might not be possible.

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 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 frequencies.

For power supply voltages below 10 V the speaker output of the transceiver is automatically switched off, without dedicated notification of the user!
For power supply voltages below 10V pilots have to use the headphone output.
Depending on settings of installation setup “LOW BATT” may be indicated if supply voltage drops below predefined threshold.
If this threshold is adjusted in range 10.2 … 10.5 V this “LOW BATT” warning may be used as an indication, that pilot should connect his headset, because speaker may be switched off soon.

3.2 Controls and Indicators

Figure 3-1 controls and indicators

3.2.1 Controls

	Symbol	Description	Main Function
1		IC/SQL (Intercom/Squelch)	”Short press” during normal operation toggles squelch ON/OFF state. “Long press” during normal operation activates IC menu.
2		MDE (Mode)	“Short press” during normal operation changes the frequency selection mode. “Long press” during normal operation activates the pilots menu.
3		STO (Store)	”Short press” during normal operation activates storage procedure.
4		↕/SCN (Exchange/SCAN)	”Short press” during standard mode or scan mode exchanges preset frequency and active frequency. “Long press” activates scan mode.
5		Volume Knob	Switches the transceiver ON/OFF and adjusts volume level of received signal.
6		Rotary encoder	Turning rotary encoder changes the settings of several parameters (frequency, IC-volume, VOX …). Pushing the rotary encoder toggles between the digits and acts as an enter key.

Long press is detected when the user presses and holds the key for at least 2 seconds, otherwise short press is assumed.

When any user action is done (e.g. pressing a key) and the operation performed by this control is not allowed at this time, then for a short period of time whole content of the display is inverted.

Beside the main functions described in the table above, the controls are also used for further functions. This will be described in the dedicated chapter.

3.2.2 Symbols shown on Display

Symbol	Meaning
IC	Intercom operation active (triggered by VOX or external IC key).
	Intercom operation via VOX is disabled.
TX	The transceiver is in transmit operation
SQL	The squelch function is active. Noisy signals will be suppressed.
SCAN	Transceiver operates in scan mode.
►	In scan mode an arrow is visible. The arrow points to that frequency (active or preset) from which the audio is derived.
STO	The transceiver performs a storage operation

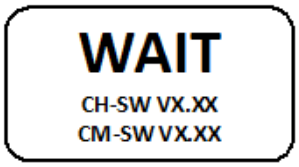
3.3 Start–Up

CAUTION: Do not switch ON the VHF transceiver when engines are being started or shut down.

Note: Excessive pulses on the DC bus of the aircraft may cause damage on electrical circuits of any installed instrument.

a. Switch ON the VHF transceiver by turning the volume knob.

b. During PBIT the display indicates the message ”WAIT”, the software version of “Control Head” (CH) and the software version of “Chassis Module” (CM) are indicated.



c. If the PBIT has detected error(s), the display indicates ”FAILURE” (for details see chapter 3.13)

d. If no errors have been detected the transceiver will start in the latest used frequency selection mode before switching off the unit.

3.4 Channel Spacing Mode

The channel spacing in which the transceiver shall work can be toggled by pressing by pressing "STO" and "MDE" keys simultaneously for at least 2 seconds.

8.33 kHz channel spacing (left) / 25 kHz channel spacing (right)

This toggling of channel spacing mode is only available for AR6201-(0XX) variants. The AR6201-(1XX) variants can't be toggled. The AR6201-(1XX) variants are working in 25 kHz Mode only.

In the 25 kHz Mode only 5 digits will be shown. Only operating frequencies with a distance of 25 kHz will be selected (refer table below). If 8.33 kHz channels are not needed, this mode has the advantage, that tuning is a little bit faster, because the 8.33 kHz frequencies will be skipped.

In the "8.33+25 kHz mixed mode" 6 digits will be shown. The transceiver can be tuned to all frequencies. The channel spacing and operating frequency is derived automatically from the selected and displayed frequency (refer table below).

Operating Frequency (MHz)	Channel Spacing (kHz)	Displayed Frequency in 8.33+25 kHz mixed Mode	Displayed Frequency in 25 kHz Mode
118.0000	25	118.000	118.00
118.0000	8.33	118.005	N/A
118.0083	8.33	118.010	N/A
118.0166	8.33	118.015	N/A
118.0250	25	118.025	118.02
118.0250	8.33	118.030	N/A
118.0333	8.33	118.035	N/A
118.0416	8.33	118.040	N/A
118.0500	25	118.050	118.05
118.0500	8.33	118.055	N/A
118.0583	8.33	118.060	N/A
118.0666	8.33	118.065	N/A
118.0750	25	118.075	118.07
118.0750	8.33	118.080	N/A
118.0833	8.33	118.085	N/A

Operating Frequency (MHz)	Channel Spacing (kHz)	Displayed Frequency in 8.33+25 kHz mixed Mode	Displayed Frequency in 25 kHz Mode
118.0916	8.33	118.090	N/A
118.1000	25	118.100	118.10
118.1000	8.33	118.105	N/A
etc.	etc.	etc.	etc.
136.9750	25	136.975	136.97
136.9750	8.33	136.980	N/A
136.9833	8.33	136.985	N/A
136.9916	8.33	136.990	N/A

3.5 Receive and Transmit Operation

3.5.1 Receive Operation

If PTT key is not pressed, the transceiver stays in receive operation.

In receive operation the headset and (if enabled) the speaker output providing a mixed signal consisting of:
- received signal from antenna on operating frequency
- intercom voice (if intercom is active)
- signal from auxiliary input (if enabled)

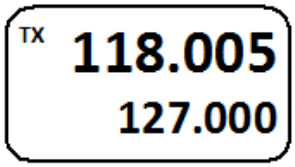
The signal from the auxiliary input may automatically be muted under special conditions.
For details refer chapter 3.9.

In receive operation user actions are allowed (changing operation modes, channel spacing, menus, storing, external intercom, ….).

3.5.2 Transmit Operation

If PTT is pressed the transceiver switches into transmit operation. Microphone(s) signals are modulating the transmitter.

Transmit operation is indicated by the “TX” symbol on the left upper corner of the display



In TX operation, the most user actions (changing operation mode, channel spacing …) normally allowed in receive operation are blocked. As an exception, the preset frequency in standard mode may still be changed even during transmission.

During TX operation no intercom operation is possible.

During TX operation, the sidetone (demodulated audio of the emitted signal) is available on the headphone output. The speaker is switched off.

Note: Transmit operation will automatically be terminated (return to receive operation) after 120 seconds of continuous transmitting even if PTT is still pressed. In this case "STUCK PTT" will be indicated (refer chapter 3.13). For initiating a new transmission, PTT line needs first to become inactive.

3.6 Operation Modes

The transceiver will always work in one of the four operation modes:
- Standard mode
- Direct tune mode
- Channel mode
- Scan mode

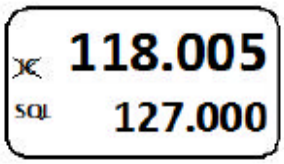
The first three modes (standard mode, direct tune mode, channel mode) are called frequency selection modes and providing different user interface for convenient selection of the operating frequency.
The three frequency selection modes can be toggled by consecutive short pressing of "MDE". They will be toggled in the following order: standard mode, direct tune mode, channel mode, standard mode, etc.

The forth mode is a special mode called SCAN-Mode for monitoring two frequencies at the same time.
SCAN Mode can be entered and left by long press of "↕/SCN" key.

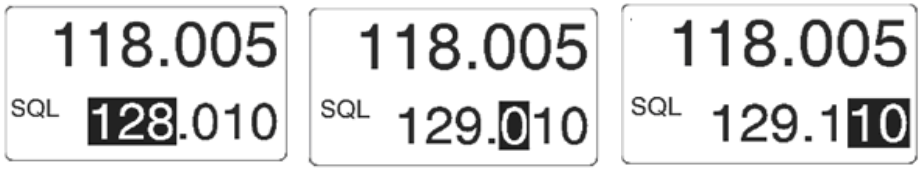
3.6.1 Standard Mode

Standard mode can be entered by consecutive short pressing of "MDE".
Standard mode will be leaved by selecting another operation mode.

In standard mode the display will indicate the active frequency in the top line and preset frequency in the bottom line.



The active frequency can not be edited directly (like in direct tune mode). But the preset frequency can be changed and set by consecutive turning and pushing the "Rotary encoder".



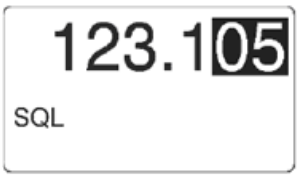
A short press of the "↕/SCN" key exchanges the active and preset frequency. Exchange is disabled while the transceiver is in transmit operation.

3.6.2 Direct Tune Mode

Direct tune mode can be entered by consecutive short pressing of “MDE”.
Direct tune mode will be leaved by selecting another operation mode.

In direct tune mode the active frequency is indicated in the top line. The battery voltage is indicated in the bottom line.

The active frequency can be set directly by pushing and turning the rotary encoder. The changes became active immediately.

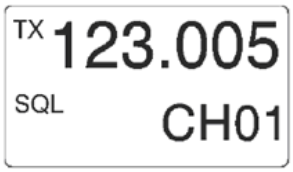


Changing the active frequency is possible only when the transceiver is not transmitting.

3.6.3 Channel Mode

Channel mode can be entered by consecutive short pressing of “MDE”.
Channel mode will be leaved by selecting another operation mode.

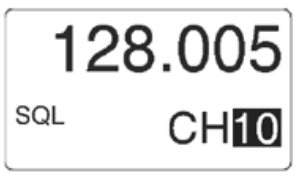
In channel mode the active frequency is indicated in the top line. In the bottom line of the display, the channel number is indicated.



When changed from direct tune mode to channel mode the active frequency stays the same. If the frequency has already an assigned channel number from manual storing, that channel number will be indicated. Otherwise “CH--” will be indicated.

In channel mode only frequencies which have been stored before (automatically or manual) may be selected.

The channel can be selected by pushing and turning the rotary encoder.

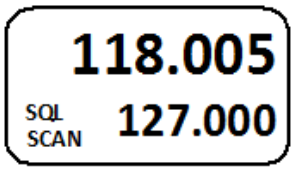


Note: If the device is operating in the 25 kHz mode a selection of an earlier stored 8.33 kHz channel is not possible. For selection of 8.33 kHz channels the device has to be operated in the 8.33+25 kHz mixed mode.

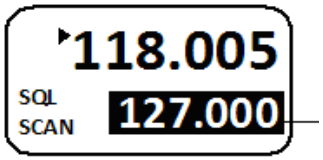
3.6.4 Scan Mode

The Scan mode can be entered from all frequency selection modes by a long press of “↕/SCN” key. The Scan mode can be left by a short press of the “MDE” key. After leaving scan mode, device will enter the standard mode.

Both, preset and active frequency is indicated on the display. The active frequency is indicated in the top line. The preset frequency is indicated in the bottom line. The SCAN sign in the display indicates that scan mode is active.

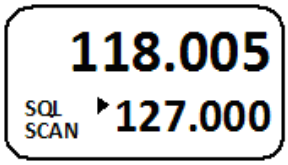


If signal is detected on the active frequency and signal is also detected on the preset frequency, then the preset frequency is inverted and blinking. The active frequency has priority. The arrow sign “►” near active frequency indicates that audio from active frequency is provided to the audio outputs. Content of display is shown in picture below.



In addition to the blinking of the preset frequency an audio notification (“BEEP”) can be enabled in the installation setup. If enabled a short “BEEP” will be heard once, when a signal on preset frequency is detected, while a signal on active frequency is present and audible.

If a signal is detected on preset frequency, while nothing on the active frequency is received, the transceiver will automatically switch over to the preset frequency. The arrow sign near preset frequency indicates that preset frequency audio is provided to the audio outputs. Content of display is shown in picture below.

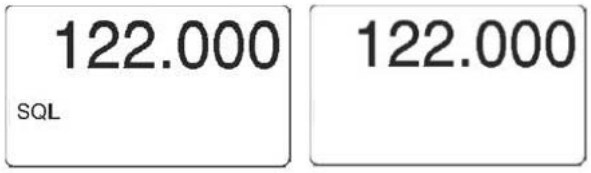


Short press of the “↕/SCN” key exchanges preset frequency and active frequency without leaving scan mode. Exchange is disabled while the transceiver is in transmit operation.
Short press of the encoder push button activates setting of preset frequency (like in standard mode).

Note: Transmission is always done on active frequency even if monitored frequency is currently audible.

3.7 Squelch

In normal operation (no menu opened) the squelch can be toggled between on and off state by short press of the “SQL/IC” key.



Squelch On (left) / Squelch Off (right)

If the squelch function is active (on), noisy signals will be muted.
The threshold for the squelch can be adjusted in the pilots menu.

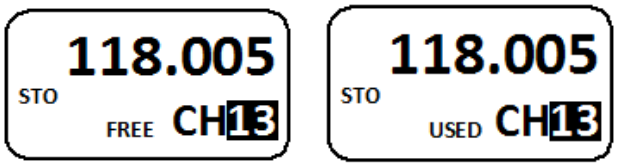
3.8 Storage Function

The transceiver has two kind of storage functions implemented:
- Manual storing of frequencies
- Automatically storing of frequencies

3.8.1 Manual Storage Function

Manual storage of frequencies can be activated by pressing “STO” key in standard mode, direct tune or scan mode.

During storage procedure the display will look similar to the channel mode. But as difference “STO” is displayed on left side of the display. On the top line active frequency is indicated. On the bottom line channel number is indicated. If channel is free, then ”FREE” is displayed. If channel contains already an earlier stored frequency ”USED” is displayed.



“FREE” and “USED” channel indication.

By entering the storage procedure, the transceiver will first propose the next free channel for storing the active frequency. Beside the proposed channel also every other channel in range 10 to 99 can be selected by turning the rotary knob. For every selected channel “USED” or “FREE” will be indicated respectively.

By pressing the “STO” key once again, the active frequency will be stored on selected channel, independent if the channel is “FREE” or “USED”. Afterwards transceiver will automatically go back to previous mode (standard mode / direct tone mode / scan mode).

If during storage procedure no action occurs during 7 seconds the transceiver returns to the previous mode without storing the frequency.

The stored frequencies can be recalled in channel mode.

3.8.2 Automatic Storage Function

The transceiver contains an automatic storage function operating in standard mode, direct tune mode and scan-mode.

When changing to a new active frequency, the previous active frequency is stored in memory channel CH01. The frequencies previously located in CH01, CH02 … CH08 are shifted to memory channels CH02, CH03, …. CH09. By this algorithm the last 9 used active frequencies are always stored.

The automatically stored frequencies can be recalled in channel mode.

3.9 Auxiliary Audio Input

The transceiver has an auxiliary audio input. This auxiliary audio input can generally be enabled or disabled in the installation setup.
If enabled the audio signal applied on this input will be fed to the audio output(s) when the

transceiver is in receive operation.
If disabled, the audio signals applied on this input will be ignored.

Furthermore in installation setup can also be enabled/disabled a so called “auto aux mute function”. If this function is enabled the audio signal from the auxiliary audio input will be muted automatically, when the transceiver detects (based on squelch evaluation) a received antenna signal or user deactivate squelch manually.
If this function is disabled the signal from the auxiliary audio input will be fed to the audio output independent of received signal or squelch status.

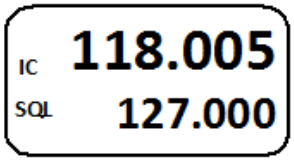
The auxiliary audio input signal is (if enabled and not muted) mixed with the received signal from antenna (passing squelch) and the intercom signal (when activated).

3.10 Intercom Operation

The transceiver has an internal built in intercom. When intercom operation is activated, the signals of the microphones are mixed, gained and fitted to the headphone output. In this way aircraft internal communication via headsets is possible. Both pilots will hear each other.

During receive operation the intercom operation may be activated by one of the two possibilities:
- Automatically via VOX (threshold adjustable in the intercom menu).
- Externally via intercom switch (pin P1-7).

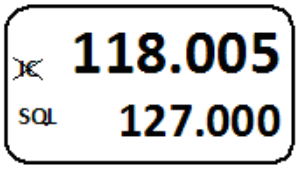
If intercom operation is activate the “IC” sign will be displayed.



Intercom operation is not possible in transmit operation.

Intercom activation via VOX is not possible if:
- Speaker is enabled (see next chapter).
- User switched the VOX off (refer intercom menu)

In both cases the display will show the ⊠ sign to indicate that activation via VOX is not possible.



Intercom operation can be activated by external intercom switch independent of VOX or speaker status (enabled/disabled). The external intercom switch has priority. Speaker output is switched off during intercom operation.

3.11 VOX & Speaker Operation

Depending on wiring and installation setup, the speaker may be enabled always or the speaker is enabled/disabled by an external switch. (For details refer chapter 2.4.2, /MIKE_SW).

When speaker operation is enabled, the VOX is always forced off and intercom via VOX is not possible (to avoid oscillation of VOX due to feedback).

Speaker output will be switched off even if speaker is enabled in following cases:
- Transceiver is in transmit operation.
- Intercom was activated by external intercom switch.
- Power supply is below 10 Volt.

3.12 Menus

During normal operation in one of the four operation modes above the following menus can be entered:
- IC menu for adjustment of intercom volume and VOX threshold.
- Pilots menu for adjustment of panel brightness and squelch threshold.

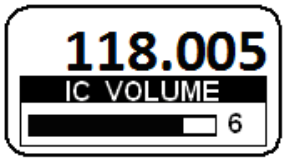
3.12.1 Intercom Menu

The intercom menu can be entered by long press of “IC/SQL” key.
The intercom menu can be left by waiting 5 seconds doing no action or by short press of “MDE”.

The intercom menu consists of two pages:
- Intercom volume (first page).
- Intercom VOX (second page).

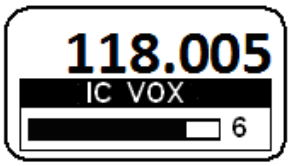
When in intercom menu, toggling between intercom volume and intercom VOX can be done by short press of the “IC/SQL” key.

Intercom Volume is displayed as first page (after entering the intercom menu). The active frequency is indicated in the top line of the display. On the bottom line is indicated ”IC Volume” with bar graph and value.



By turning the rotary encoder the intercom volume can be changed.
0 means minimum volume.
46 means maximum volume.

By a short press of the “IC/SQL” key (or pushing the rotary push button) the next page **Intercom VOX** is displayed. The active frequency is indicated in the top line of the display. On the bottom line is indicated ”IC VOX” with bar graph and value.

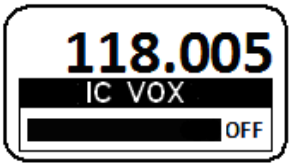


By turning the rotary encoder the intercom VOX threshold can be changed.
-30 means that VOX is very sensitive. A very silent signal already activates the intercom operation.
+10 means that VOX is quite insensitive. Only a loud signal activates the intercom operation.

Note: For a VOX threshold setting of -15 a good VOX behavior should be achieved in most aircrafts. This requires that the mike sensitivity had been correct adjusted (installation setup). If the mike sensitivity is not correct adjusted VOX may work not satisfying.

An adjustment of the VOX threshold level is not possible if the VOX is forced off (due to enabled speaker).

VOX can be switched off by turning the VOX threshold level “above” +10. In this case the display will show:



When VOX is switched off, the intercom operation may still be activated by the external intercom switch.

3.12.2 Pilots Menu

The pilots menu can be entered by long press of “MDE” key.
The pilots menu can be left by waiting 5 seconds doing no action or by short press of “MDE”

The pilots menu consists of two pages:
- Brightness (first page).
- Squelch (second page).

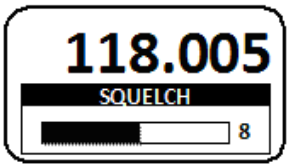
When in pilot menu, toggling between brightness and squelch can be done by short press of the push-button of rotary encoder.

Brightness is displayed as first page (after entering pilot menu). The active frequency is indicated in the top line of the display. The brightness value in the bottom line of the display.

By turning the rotary encoder the panel brightness (illumination for push-buttons and LCD) can be changed from 0 to 100.
0 means that the illumination is off.
100 means that the illumination is maximum.

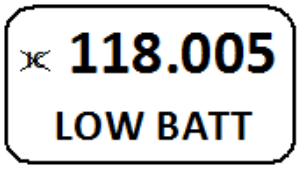
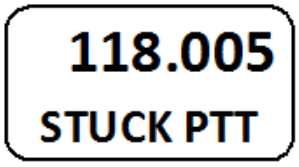
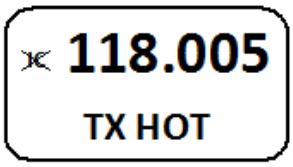
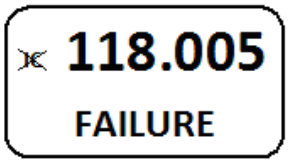
Note: This page is not available if in the installation setup the dimming input is set to 14 V or 28 V.

By a short press of the push button of the rotary encoder the next page **Squelch** is displayed. The active frequency is indicated in the top line of the display. On the bottom line is indicated ”SQUELCH” with bar graph and value.



By turning the rotary encoder the squelch threshold can be changed from 6 to 26.
6 means that also very week and noisy signals will be audible. Squelch opens around -105 dBm.
26 means that only quite strong signals with low noise content will be audible. Squelch opens around -87 dBm.

3.13 Warning and Failure Indications

Display Contents	Description
 Appearance about every 5 seconds.	"LOW BATT" is indicated if the supply voltage of the transceiver is below the threshold defined in the installation setup. Transceiver is still operable. Depending on supply voltage transceiver may have a reduced performance. Below 10 V speaker output is switched off! Possible reasons for indication: - Problems with capacity of accumulator (gliders). - Power interrupts. - General problem with power supply. - Wrong (too high) adjusted threshold in installation setup.
 Appearance about every 5 seconds.	"STUCK PTT" is indicated after 120 seconds of continues transmitting. The transceiver goes back to receive mode even if the PTT line is still active (GND). For initiating a new transmission, the PTT line needs first to become inactive (open). Possible reasons for indication: - Transmitting more than 120 seconds. - Stuck of PTT-key. - PTT line permanent grounded (short circuit in installation).
 Appearance about every 5 seconds.	"TX HOT" is indicated if the internal device temperature exceeds +75°C. Transceiver is still operable. Performance of transmitter is reduced. Possible reasons for indication: - Very hot environmental temperature, long transmissions times and insufficient airflow conditions.
 Appearance about every 5 seconds.	The transceiver has detected an internal failure during normal operation. Depending on failure reason, the device may be still operable with degraded performance or not operable at all. Possible reasons for indication: - Out of specified environmental conditions - HW or SW failure inside the transceiver. Contact maintenance shop for assistance.
	The transceiver has detected an internal failure during start up. Depending on failure reason, the device may be still operable with degraded performance or not operable at all. Possible reasons for indication: - Out of specified environmental conditions - HW or SW failure inside the transceiver. Contact maintenance shop for assistance.