KRT2 Comm Radio

Installation & User Manual

8300-084

ATS, Inc.

1500 S. Old Missouri Rd
Springdale, AR 72764

Postal Service Address:

PO Box 189
Springdale, AR 72765

www.atsinc.aero

Installation & User Manual
For
KRT2 Comm Radio

Document Revision

Revision	Date	Description	Page #
IR	10/31/2012	Initial Release	

List of Service-Bulletins (SB)

1. General

This manual contains information about the physical, mechanical and electrical properties as well as a description for the operation and installation of the KRT2 Comm Radio.

1.1 Symbols

WARNING
Non-compliance may cause personal injury due to radiation or fire.

CAUTION
Non-compliance may cause damage or incorrect operation of the KRT2 Comm Radio.

INFORMATION

1.2 Abbreviations

Abb	Description	Definition
PTT	Push to Talk	Transmitter activation
VOX	Voice operated intercom	Voice level setting for the activation of the intercom
INT	Intercom level	Intercom volume level setting
SQ	Squelch	Squelch setting
DIM	Dimmer	Display brightness setting
CON	Contrast	Display contrast setting
EXT	External audio input	External Audio input level setting

1.3 KRT2 Transceiver properties

- VHF airband transceiver
- Power output 6 W (nominal) 4 W (minimum)
- Frequency range 118.000 to 136.975 MHz
- Channel spacing 8.33 or 25 kHz (2278 channel)
- Fast channel selection
- 2 Microphone inputs (2 x standard or 2 x dynamics)
- Audio-input for other audio devices (300 mV pp required)
- Installation: Standard panel cut-out (2-1/4")
- 100 user definable frequencies
- Built-in VOX intercom
- Dual watch function to monitor standby frequency

Continuous transmissions will be turned off after 2 minutes. (Stuck mic function).

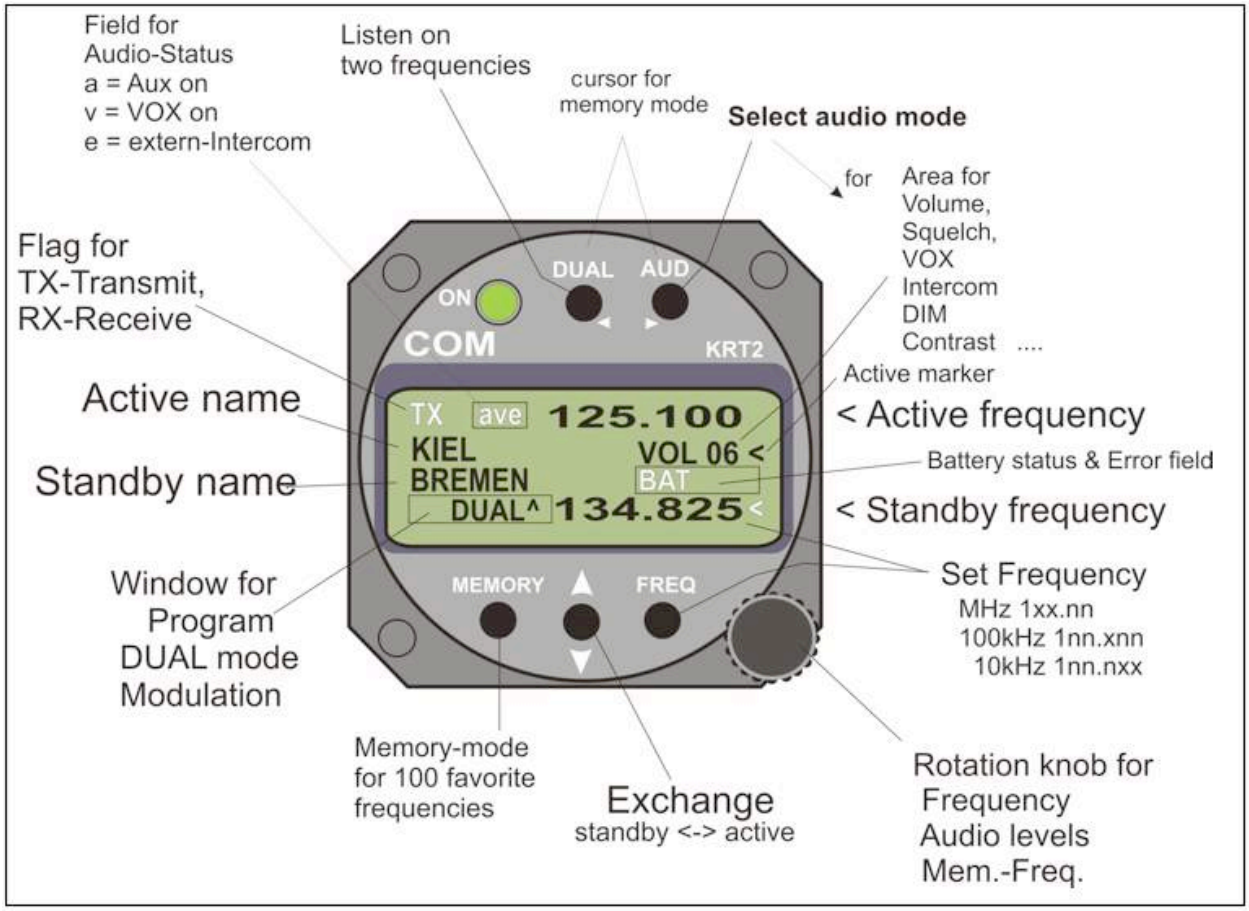
In the United States, the 8.33kHz channel spacing may not be used. There is currently no provision in the regulations for 8.33kHz channel spacing.

1.3.1 FCC Statement

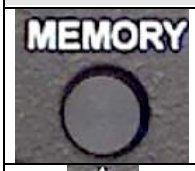
FCC ID: OT4KRT2
This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2. Controls

2.1 Control Elements Overview



Item	Name	Function
	ON / OFF	Self-Locking Power Switch
	DUAL WATCH	1. Scanning between the Active and Standby frequencies 2. Positioning cursor to the left when programming the station designator
	AUDIO SELECT	1. Stepping through the audio menus VOL, SQ, VOX, TX, INT, EXT, DIM, CON, SIT, and MIC 2. Positioning cursor to the right when programming the station designator

Item	Name	Function
	FAVORITES	1. Frequency and designator selection from the favorites list 2. Programming the favorites (frequency and designator)
	EXCHANGE	Exchange of the Active and Standby frequencies
	FREQUENCY	1. Selection of the frequency range - MHz, 100kHz, 10kHz 2. Toggles between frequency and designator when programming the favorites
	ENCODER KNOB	Sets all variable values in any menu 1. Volume setting of headsets and speakers 2. MHz/kHz selection of the standby frequency in the 3 different ranges 3. Favorite selection 4. Alpha character selection when programming favorites 5. Change of microphone settings

2.2 Display

Indication	Meaning	Remarks
RX	Reception	RX is displayed during reception with a squelch value of 02 or more
TX	Transmission	Transmitter operating normally
Te	Transmission cutoff	Transmitter was turned off automatically after 2 minutes of continuous operation
125.100	Active frequency	
KIEL	Active frequency station designator	Displayed when frequency and designator is stored in the favorites list
VOL	Receiver volume level (default after a certain time delay)	When AUD is pressed the corresponding Audio Menu item and setting is displayed

Indication	Meaning	Remarks
SQ	Squelch	
VOX	Voice operated intercom	
DIM	Display brightness	
CON	Display contrast	
INT	Intercom volume	
EXT	Volume of external devices	
TX**	PTT button selection	Left / Right / Both
SIDE	Side tone	set volume played back through headset during transmitter operation
BREMEN	Standby frequency station designator	Displayed when frequency and designator is stored in the favorites list
DUAL	Active frequency AND standby frequency are monitored simultaneously	DUAL function is deactivated by frequency change or by pressing the DUAL button again
[03] (MEMORY)	Favorite list index (0-99)	When frequency and designator are stored in this index, they are displayed
125.100 upper	Active frequency	
134.825 lower	Standby frequency	
<	The pointer indicates what the encoder knob will change 1) VOL, SQ, VOX,...etc 2) Standby frequency	Arrow is positioned in correspondence to the button pressed (AUD or FREQ)

Indication	Meaning	Remarks
BAT	Supply voltage is low < 10.5 V	Battery low or Battery / Generator faulty
Er_ANT	Antenna error	Bad antenna match
a v e	Status of certain Audio menu functions	a = AUX. Input active v = VOX active e = external Intercom switch active
Er_PLL	Internal error, no transmission possible	Return the transceiver for maintenance
Er_ADC	Internal error, unit not usable	Return the transceiver for maintenance
Er_FPA	Internal error, unit not usable	Return the transceiver for maintenance
Er_I2C	Internal error, unit not usable	Return the transceiver for maintenance
ERr_si53	Internal error, unit not usable	Return the transceiver for maintenance
Er_D10	Internal error, reception corrupt	Return the transceiver for maintenance
Key_Block	Internal error, unit not usable	Return the transceiver for maintenance

3. Operation

3.1 General

There is a normal operating mode in which the encoder knob is always connected to the volume (VOL). The normal operating mode can be left by pressing the AUD, FREQ, or MEMORY button.
When not in the normal mode and there is no pilot action for more than 10 seconds the unit returns to the normal mode.

3.2 Powering up the unit

ON / OFF switching is achieved with a self-locking switch.
After power up the following displays will show up:

Note the software version shown in the lower left corner

The unit then starts in the normal operating mode using and displaying the data last used.

3.3 Frequency Selection

There are three different ways to select frequency:

- Direct input
- Selection from the favorites list
- Input from remote tuning (EFIS)

3.3.1 Direct Frequency Selection

The Standby frequency is set with the encoder knob in three (3) different ranges. The selected range is highlighted and can be changed with the FREQ button.

Frequency ranges are:
1xx.nnn
1nn.xnn
1nn.nxx

Press the FREQ button once or several times until the desired frequency range is highlighted.

When the pointer is not next to the standby frequency window, it will be repositioned with the first press of the FREQ button.

The EXCHANGE button switches between the active and standby frequencies

When the EXCHANGE button is not pressed after entering a new frequency, the standby frequency display will return to its normal appearance after 20 seconds.

3.3.2 Frequency Selection from the Favorites list

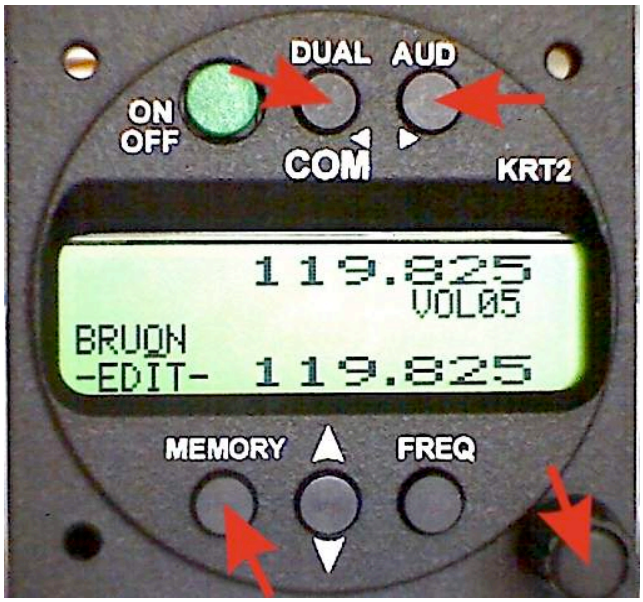
By pressing the memory button and operating the encoder knob a specific favorite list can be accessed [xx] (xx = index 0 through 99). When a frequency and station designator have been defined, they will be displayed in the Standby and station designator windows.

The favorite list designators can be sorted in alphabetical order (see section 3.3.3 for sorting instructions)

3.3.3 Storing and Editing Favorites

Any displayed standby frequency can be given a designator and both can be stored together as favorites in the favorite list. Both, the frequency and designator of a favorite can be edited.

First press the MEMORY button and using the encoder knob go to the desired favorite list position, which may be empty of the favorite to be edited (index [00 … 99]).
Press the MEMORY button a second time and -EDIT- will show up in the program window.



In the designator window a blinking cursor will appear under the most left character.

The encoder knob selects the desired character.

The AUD button positions the cursor one character to the right. The dual button positions the cursor one character to the left and simultaneously erases this character.

The station designator can consist of a maximum of 8 characters.

Press the FREQ button and follow the normal direct input procedure to edit the frequency.

Press the MEMORY button in order to go to the station designator window for editing the designator if required.

Pressing MEMORY again terminates editing and SAVE? will appear.

SAVE? is available for 20 seconds and must be acknowledged by the EXCHANGE button. No acknowledgement within 20 seconds results in the termination of the storing procedure.

When the EXCHANGE button is pressed, SORT? will show up.

SORT? is available for 20 seconds and must be acknowledged by the EXCHANGE button.

When sorting was acknowledged with the EXHCNAGE button, all 99 favorites will be sorted in alphabetical order, which can take several minutes.

During the sort procedure RUN nn is displayed in the program window, with nn being the running index.

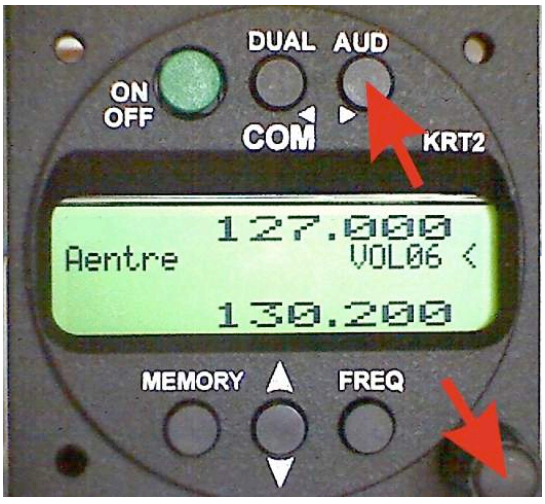
When the MEMORY button is pressed during the time when SORT? is displayed the sorting procedure will not start and storing and editing is terminated. The transceiver then resumes the normal operating mode.

When the MEMORY button is pressed during the time when RUN-nn is displayed the sorting procedure is terminated. The favorite list then is sorted partially only and the transceiver resumes the normal operating mode.

Further favorites can be stored or edited by following the normal input procedure.

For time saving purposes it is recommended to initiate the sorting procedure after the last favorite has been saved or edited.

3.4 AUD - Audio Menu



Any action in the Audio Menu requires the pointer (<) to be next to the Audio menu window (see picture). When the pointer is next to the standby frequency window, the pointer can be repositioned by pressing the AUD button once.

VOLnn is the Audio menu default display. No action on any control for more than 10 seconds will result in the VOLnn display. Audio Menu items can be accessed in the following order by repeatedly pressing the AUD button.

VOL (default) SQ VOX TXm** INT EXT DIM CON SIT MIC

3.4.1 VOL - Volume

Turning the encoder knob changes the receiver volume.

VOL nn Range: 01 – 16

The VOL setting only concerns the receiver and not the intercom system. Intercom volume values are set in the INT audio menu.

3.4.2 SQ – Squelch

Pressing the AUD button once enables the encoder squelch level setup mode.

SQ nn Range: 01 – 10

The Squelch setting is dependent on several factors.
An initial setting of 05-08 is recommended. The lower the Squelch level value the higher the input sensitivity. A high sensitivity setting is susceptible to noise from other sources like ignition, strobes, etc.

Standard SQ-level is 05 ... 08. Higher setting may suppress strong input signals. Squelch does not influence the intercom system.

3.4.3 VOX – Intercom Voice Trigger Level

Pressing the AUD button twice enables the voice trigger level setup mode, which triggers the intercom.

The intercom voice trigger level must be set to such a value, which prevents normal cockpit noise from being heard in the headset. The intercom system shall only be activated when talking at a normal voice level into the microphone.

The higher the trigger level the louder the voice must be in order to trigger the intercom system.
VOX on condition is indicated by the flag “v”.

VOX nn Range: 01 – 10

The intercom will not function unless pin 12 is switched to ground. This enables the intercom feature. The switch should be installed on the instrument panel near the KRT2.

3.4.4 TXm – PTT Switch Selection

Pressing the AUD button three times enables the PTT switch setup mode. In addition when either the Left or Right PTT switch is disabled (not-Both) the respective microphone channel is disabled during transmissions.

TXm Range: *- Left / -* Right / ** Both**

3.4.5 INT – Intercom Volume

Pressing the AUD button four times enables the intercom volume setup mode.

INTnn Range: 01 – 10

3.4.6 EXT – External Audio Input Volume

Pressing the AUD button five times enables the external audio input volume setup mode. External audio inputs can be audio alarms, voice alarms, music etc. Activation occurs for settings >00 and will be indicated by the flag “a”.

EXTnn Range: 01 – 10

3.4.7 DIM – Display Brightness (Battery Voltage)

Pressing the AUD button six times enables display brightness setup mode.

Display lighting current drain at maximum brightness is only 10mA. Maximum brightness is glare free even in darkness and can be used continuously.
Below the dimming is the current battery voltage being supplied to the KRT2

DIMnn Range: 01 – 10

3.4.8 CON – Display Contrast

Pressing the AUD button seven times enables the display contrast setup mode.

CONnn Range: 01 – 10

3.4.9 SIT – Side tone

Pressing the AUD button eight times enables the side tone setup mode.

SITnn Range: 01 – 10

3.4.10 MIC – Setup

Each of the two microphone input channels can be configured individually, which allows different microphone types to be used.

A maximum of two microphones of the same type may be connected to each microphone input channel (see Microphone Connection).

The MIC – Setup is the last item of the Audio menu and can be accessed by pressing the AUD button nine times.

By pressing the DUAL button repeatedly L, R and AUTO can be selected. L (R) means left (right) microphone input channel. The AUTO function is explained later.

By rotating the encoder knob the displayed microphone input channel amplifier gain (MIC-level-01-=-low-gain,-09-=high-gain) can be selected

individually. The microphone signal level is dynamically displayed as bar and as numeric value (from-0.00-to-1.00) in the line below.

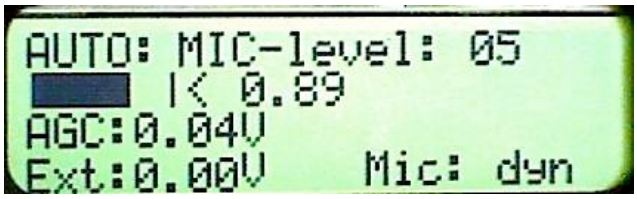
The initial MIC-level should be 05, the engine should be running, use a headset and speak at a normal voice level to fine-tune the MIC-level. Whenever a new MIC-level was selected, the dynamic bar indicator should then be at about 50%.

When the microphone setup menu is left, the new value is stored.
The range of the MIC-level for standard microphones is 01 to 09.
MIC levels 10 and 11 are special settings for low microphone levels like dynamic microphones often used in gliders.

10 is used for non-amplified Electret microphones with a 8 volt supply voltage.

11 is for dynamic microphones only.

In the AUTO mode every 30 sec. the left microphone impedance is measured. When using an Electret microphone and a dynamic microphone is recognized, internal switchover to the dynamic microphone type will take place. When using a dynamic microphone and an Electret microphone is recognized, internal switchover to the Electret microphone type will take place. Microphone type switchover always affects both microphone channels.



The present recognized type will be indicated (Mic: dyn/std).
To activate the auto recognition (instead of the standard 30 second interval) leave AUTO and then set back to AUTO.

The MIC submenu is left by pressing the AUD button.

Additional indications

Additional indications for test purposes:

AGC: ..... HF receiver Automatic Gain Control

Ext: ..... External audio input voltage

Mic: dyn or Mic: std
Indicates, which microphone type was selected either by the user or recognized in the AUTO mode.

3.5 Dual Watch

Because the KRT2 radio contains only one receiver, DUAL watch is achieved by alternating between the active and standby frequencies.

The DUAL button activates and deactivates the dual watch function. Deactivation can also take place by pressing either the FREQ or MEMORY buttons.

The frequencies to be watched, should be selected prior to the DUAL watch selection.
Scanning of frequencies is only possible when differentiating between radio noise and radio transmissions. This can be achieved with the squelch system set to a value of 02 or higher.

There must be radio noise suppression in order to recognize reception. SQ must be 02 or higher.

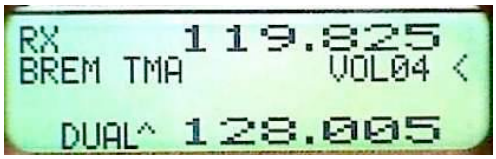
When DUAL watch is activated, DUAL is displayed on the lowest line. The pointer next to the DUAL display indicates the frequency on which there is reception.

The Active frequency always has priority, so the receiver remains on the Active frequency as long as there is reception on the Active frequency.

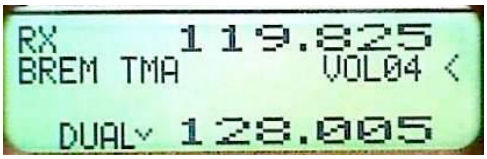
When there is no reception on both the Active frequency and the Standby frequency the receiver scans both frequencies 5 times per second.

When there is reception on the Standby frequency the receiver stays on the Standby frequency, however it switches to the Active frequency every 2 seconds for 0.3 seconds. When reception is detected on the Active frequency the receiver stays on the Active frequency.

The pointer next to the DUAL display indicates on which frequency there is reception.



Active frequency reception



Standby frequency reception

Standby and Active frequencies can be exchanged when in the DUAL mode. The transmitter operates on the Active frequency only.

Summary:

- Select the Standby frequency to be watched additionally.
- With the AUD button and turning knob set SQnn to 02 or higher.
- With the DUAL button activate the DUAL watch function.
- When there is no reception on both the Active frequency and the Standby frequency the receiver scans both frequencies 5 times per second.
- When scanning, the Active frequency always has priority.
- Deactivate the DUAL watch function with the DUAL or FREQ or MEMORY buttons.

3.6 Transmitter Operation

The unit transmits on the active frequency (upper line) as long as a PTT (push to talk) switch is pressed

Transmission

Reception

TX indicates normal transmitter operation.

In the lower left corner of the display the carrier modulation is dynamically displayed. It corresponds to the side tone, which is not available on gliders when no earphones are in use.

In order to avoid the blocking of the frequency by unintentional long transmissions (stuck microphone) the transmitter is switched off after two minutes and the display changes from TX to Te. To resume transmission the PPT switch first must be released and then be pressed again.

3.7 Self-Test Monitor

There is a permanent background test system active.

The field for battery status & error (see Control Elements Overview) is used to indicate warnings and in case of hardware failure, different error reports.

The warnings are:

BAT low battery voltage (becomes active < 10,5V)

At transmission

A-match bad antenna match or antenna defective.

Also while transmission the TX-flag (top left) can change to

Te Transmission time has exceed (> 2 minutes)

All other reports starting with Er…. Indicating a major hardware failure and consequently the radio has to be returned to factory.

3.7.1 Optical Side Tone

Especially on glider use, where no headset is present to get the side tone, it is very helpful to see the microphone working.

At lower left side, there is a modulation indicator showing that there is speaking activity while transmitting. When there is no speaking, it becomes a small dot approximately in the center.

It also indicates a bad antenna match by getting far out of the center.

3.8 Resetting to Factory Settings

Returning to the factory settings can only be initiated during power-up.

During power-up the MEMORY and DUAL buttons must be pressed simultaneously and the display will show SET DEFAULTS. When the buttons are released the resetting to the factory settings takes place. When resetting is completed DONE is displayed.

Resetting to the factory settings will not change any data in the favorite list memory.

3.9 Setup Menu

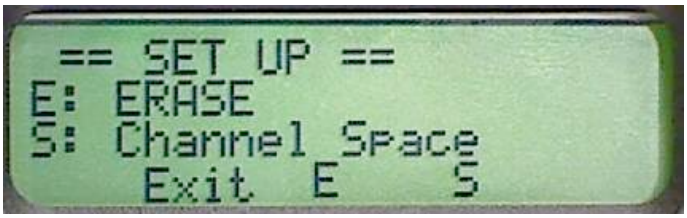
During power-up the MEMORY buttons must be pressed

There are two functions within the Setup menu:

- ERASE – Erasing of the favourites (frequency and designator)
- Channel Spacing – 25kHz / 8.33kHz

In the United States, the 8.33kHz channel spacing may not be used. There is currently no provision in the regulations for 8.33kHz channel spacing.

Programming of the Setup is done with the lower 3 buttons. Their function is described on the display.



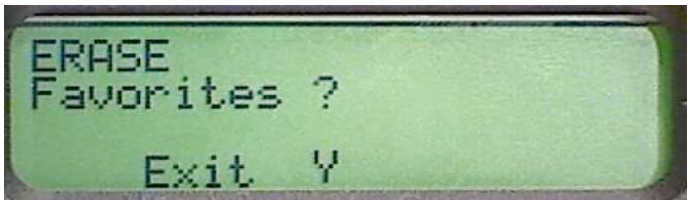
MEMORY EXCHANGE FREQ

Setup program is exited with the MEMORY button. The unit remains powered and the normal operating mode is resumed.

EXCHANGE = 

3.9.1 ERASE – Erasing the Favorites

When in the Setup menu select the “ERASE“ submenu with the EXCHANGE button.



MEMORY EXCHANGE FREQ

Erasing the favorites (frequency and designator) starts after the EXCHANGE button is pressed again. This procedure may last a few minutes during which time ERASING is displayed.

All INFO frequencies and designators that were stored on delivery are lost and all favorite index positions (01 to 99) are available to the user.

3.9.2 Channel Spacing

When in the SET UP Menu, pressing the MEMORY button will change into the Channel Space submenu.

MEMORY EXCHANGE FREQ

The desired channel spacing then can be selected and the (X) indicates the actual channel spacing.

4. Installation

4.1 Unpacking and Inspecting the Equipment

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

For storage or reshipment the original packing material should be used.

4.2 Mounting

- Avoid installing the unit in the vicinity of heat sources. Sufficient air circulation is required.
- There must be sufficient space for cables and connectors.
- Avoid sharp bends and wiring close to control cables.
- Cable length must be such that connectors are accessible for repair.
- The wiring to the transceiver must be installed such that water droplets formed by condensation will not run into the connector.
- Remove the encoder knob in order to install the transceiver:
    - Remove the encdoer knob cap with an appropriate tool.
    - Loosen the screw and remove the turning knob.
    - Re-install cap correctly oriented!
- Installation is from the front side of the instrument panel with three 4mm screws in a 57mm (2.25”) panel cut-out.
- For installation details and drawings refer to **Final Audio Setup**

4.3 Electrical Connections

The 15-pin D-Sub connector contains all electrical connections except the antenna.

The battery plus connection must be protected with a 4 amp slow blow fuse.

4.3.1 Microphone Connection

Both the L (left) and R (right) microphone input channels can either be connected to standard microphones (standard signal level 1Vpp) or to dynamic microphones (standard signal level 5mV to 10mV).

For standard microphones a supply voltage of 8V at 330Ω is provided. Elementary Electret microphones can also be connected. They have considerably lower signal levels and therefore require an 8V supply voltage.

The microphone input channel amplifier gain can be selected via the MIC Setup menu.

When dynamic microphones are used in gliders the 8V supply voltage is switched off for power saving purposes.

Standard microphones normally used in headsets together with dynamic microphones generally cannot be used at the same time.

Motor gliders should have a toggle switch installed to differentiate between motor less flight with dynamic microphones and powered flight with headsets.

When the AUTO mode is selected in the MIC-Setup menu the KRT2 automatically recognizes to which microphone type has been switched and acts accordingly.

Because the 8V supply voltage is switched off when dynamic microphones are used during glider flight the second (copilot) headset microphone is disabled.

A maximum of two microphones of same type may be connected to each microphone input channel.

4.3.2 Earphone Connection

Several earphones of same type can be connected in parallel. The total impedance should not be less than 60 Ohms.

4.3.3 External Audio Input

Audio alarms or even music can be made available via the external audio input. When this input is not used it must be connected to ground in order to avoid noise. PIN5 must be connected to Battery minus (GND).

Add note here about EXT Audio impedance or something like that…basically let people know that straight audio out isn't enough and there needs to be an amplifier.

4.4 Final Audio Setup

This is an overview for a correct audio set up depending on the usage.

4.4.1 For Powered Aircraft

Press button AUD 3x for VOX: Set to VOX 3 (turn off).
Press button AUD 4x for TXm: Set to TXm**,
or on condition.
Press button AUD 6x for EXT: Set to EXT 00 (turn off),
or on condition.
Press button AUD 10x for EXT: Set to MIC-Level 3,
or on condition.

4.4.2 For Gliders

Press button AUD 3x for VOX: Set to VOX 10 (turn off).
Press button AUD 4x for TXm: Set to TXm**.
Press button AUD 6x for EXT: Set to EXT 00 (turn off).
Press button AUD 10x for EXT: Set to MIC-Level 11.

4.4.3 For Motor Gliders

For change mode (motoring & headset – gliding & dynamic microphone)

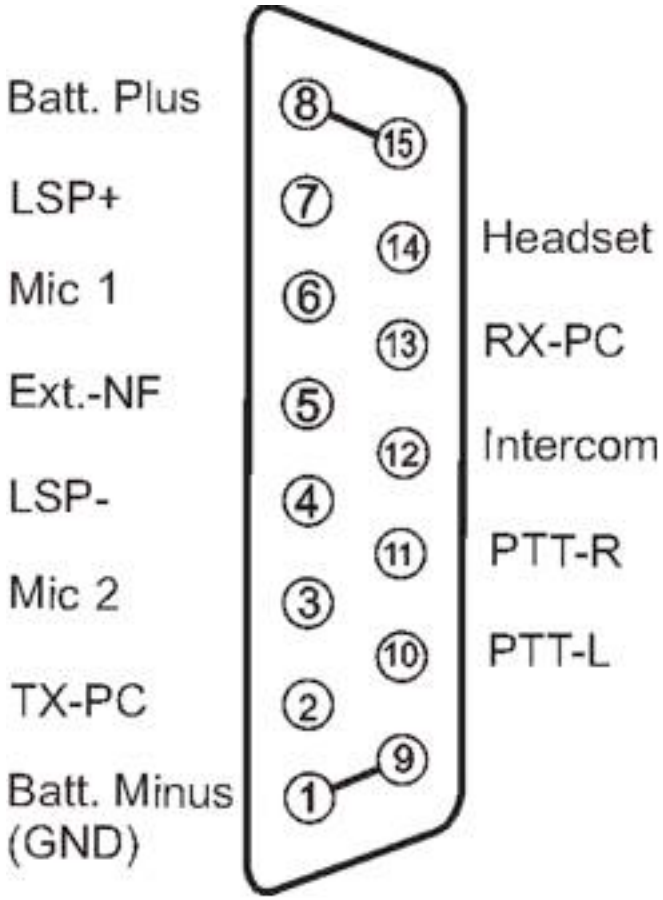
Press button AUD 3x for VOX: Set to VOX 3.
on condition at motoring.
Press button AUD 4x for TXm: Set to TXm**.
Press button AUD 6x for EXT: Set to EXT 00 (turn off),
or on condition.
Press button AUD 10x for EXT: Set to MIC-Level 5,
select AUTO

4.5 Wiring

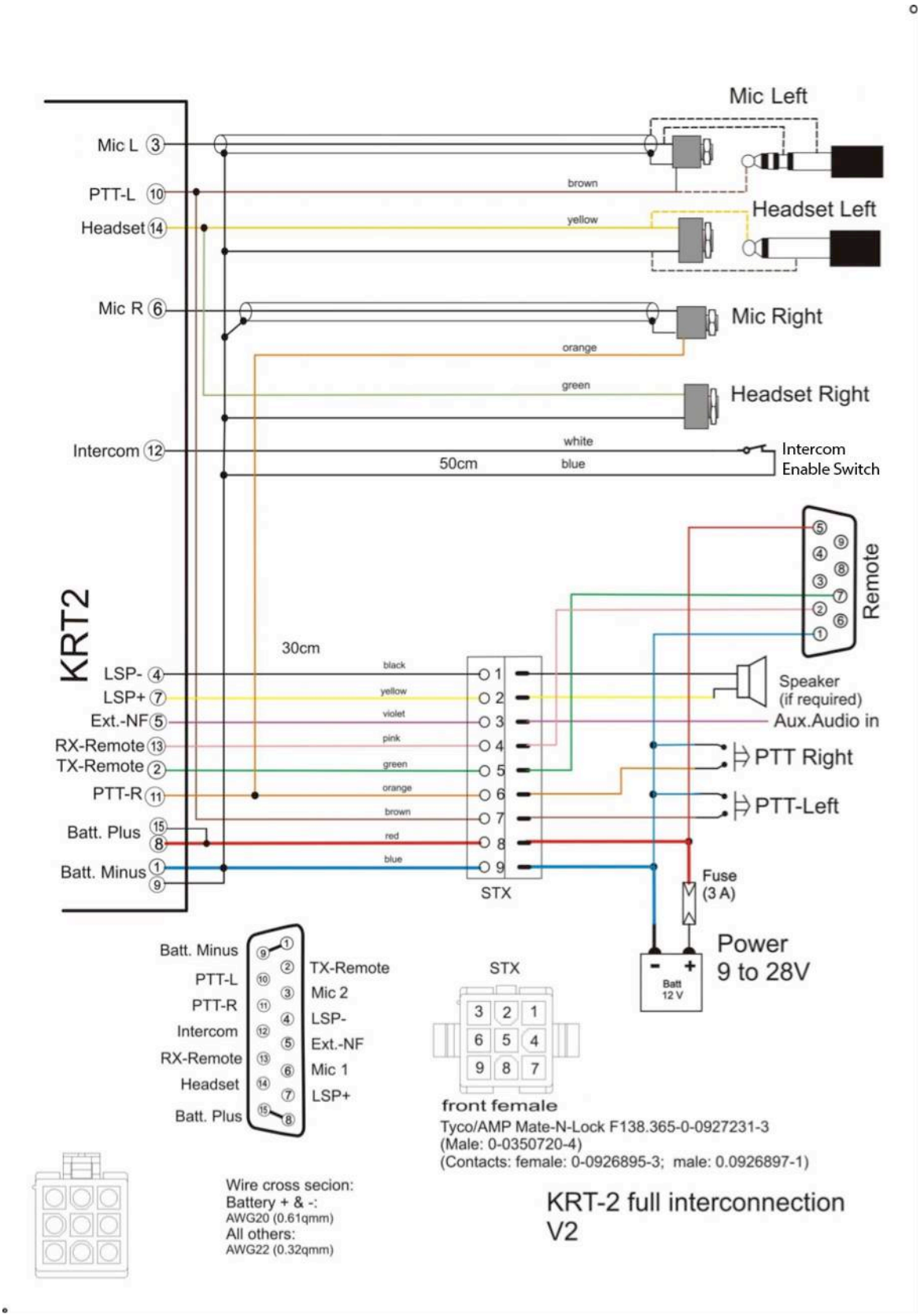
4.5.1 Wire Gauges

Supply lines (Power, GND):	AWG18
Control lines:	AWG22

4.5.2 Connector Pin Configuration

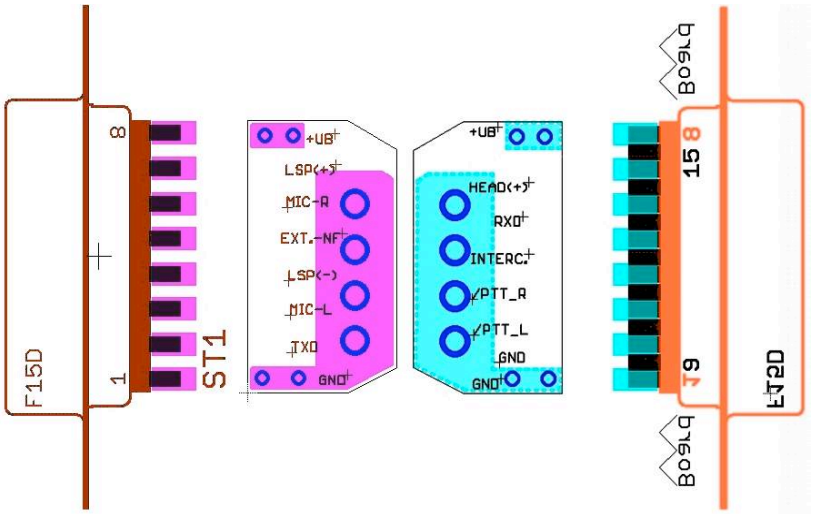


4.5.3 Wiring Diagram



4.5.4 Connection Support

In order to connect shields of all cables at a single point and to avoid ground loops an adapter board as shown is recommended. The adaptor board and connectors have been provided with the KRT2



The adapter board is placed between the connector pin rows and soldered to the BAT plus pins 8, 15 and GND pins 1, 9. Further information printed on the board serves to connect all cables to its corresponding pins.

4.6 Antenna

4.6.1 Antenna Selection

- A 50 Ohms impedance VHF-COM-antenna is required.
- The antenna must be approved in respect to aircraft type and installation location.
- The antenna specifications can only be fulfilled when properly installed.

4.6.2 Installation Recommendation

- The manufactures instructions have to be observed.
- The metallic contact between airplane surface and antenna ground must be very good. Non-metallic airplanes must have installed a metal sheet, foil or mesh of at least 80×80 cm inside the fuselage as electric counterweight..

- In order to avoid interference the distance between a COM an NAV antenna or between a COM and another COM antenna should be as large as possible. A distance of 2 meters normally is sufficient.
- The antenna must vertically be installed as far as possible away from parts like propeller, landing-gear, rudder etc., that may influence propagation of the radio signals.
- In gliders the internal antenna provided by the airplane manufacturer is to be used.

The RF-antenna cable may not be part of other cable sets like power-supply or microphone. It must not be placed together with any other COM, NAV, or transponder antenna cable.

4.7 Microphone General

The correct setting of the MIC and VOX values is of great importance for the proper function of the Intercom system (see 3.4.3. VOX Intercom Voice Trigger Level and 3.4.10. MIC Setup).

The VOX intercom voice trigger level must be set to such a value that the intercom system is activated when speaking at a normal voice level into the microphone. It shall not be triggered by normal cockpit noise.

When there is extreme cockpit noise or there are uncompensated microphones VOX can be deactivated with VOX=01 to enable manual intercom operation.

The manual intercom operation is activated with one or two separate, parallel connected, optional intercom switches. These switches are not the PTT switches. The intercom switches connect pin 12 (intercom) with GND (pin1-and-9).

An **e** will be indicated if pin 12 is not on GND.

Communication with the VOX system requires pin 12 to be connected to GND by means of one or two intercom switches.

The KRT2 unit **transmits** only when a PTT switch is pressed.

Cockpit noise suppression is only possible with differential microphones used in modern headsets. Normal Electret microphones are not suitable.

4.8 Post Installation Check

A complete check of all airplane systems is required to certify that the new wiring is not causing any malfunction.

The standing wave ratio must be less than 3:1.

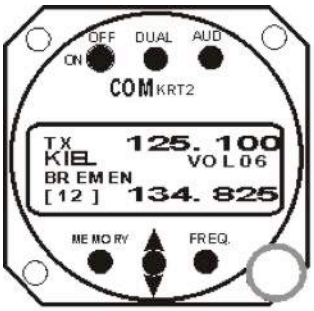
A test flight is recommended to verify proper transceiver operation.

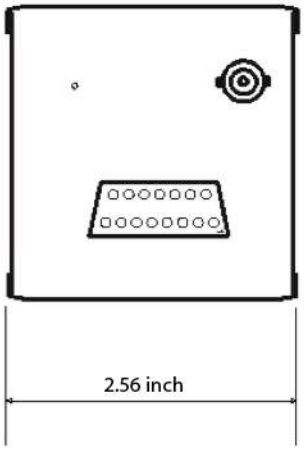
The following items should be checked:

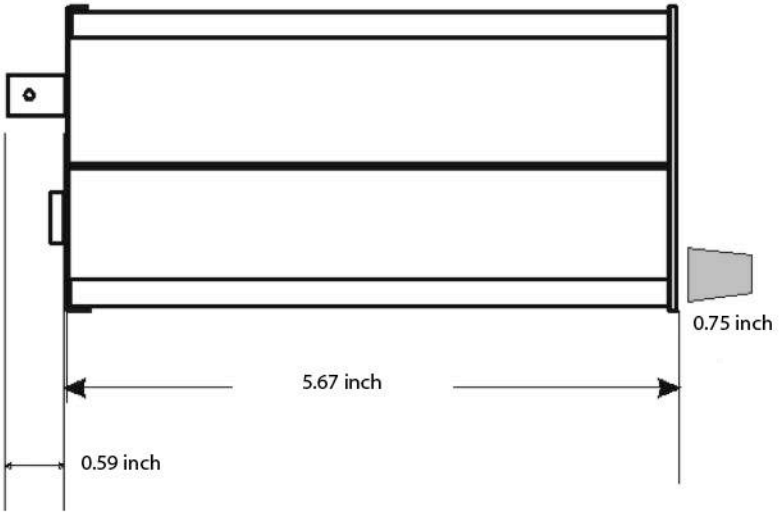
- Check transceiver operation with a radio station at least 25 miles away when at 2000ft or above.
- Check if there is unusual electrical interference or noise.
- If possible check the transceiver operation on low and high frequencies of the VHF frequency band.

4.9 Drawings

4.9.1 Dimensions







5. Annex

5.1 Frequency / Channel Schedule

The following table contains the operating and displayed frequencies between 118.000 and... 118.100 MHz. The table can be continued up to 136.975 MHz following the same principle.

Operating frequency (MHz)	Cannel 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

5.2 Technical Data

GENERAL	
Compliance **Standards**	FCC ID: OT4KRT2 Meets ETSO-2C169a, ED-23B Class 4 Meets ED-23B Class C Meets TSO-C169a,Class 6 Meets TSO-C169a, Class H1 & H2
Standards	EUROCAE ED-23B RTCA DO-160E RTCA DO-178B Software Level D
Dimensions	Height: 2.56 inch Width: 2.56 inch Depth: 5.67 inch plus rear panel plugs 2.36 inch
Weight	0.79 lb (360 grams)
Mounting	panel mounting, cut-out Ø 2.25 inch
Temperature Ranges **Operation** **Storage**	 -20 °C to +55 °C -55 °C to +85 °C
Maximum Height	35000 ft
Vibration	DO-160E, Cat. S, Vibration Curve M
Humidity	RTCA DO-160E, Cat. A
Shock	6 G operation 20 G crash safety
RTCA DO-160F ENV. CAT.	[C1Z]CAA[SM]XXXXXXZBAAA[YY]M[B3F3]XXA
Power Supply **Power Consumption**	9 VDC to 33VDC test @ 12VDC • Transmitter: 2.0 A (typ.) • Receiver: 0.1 A • Illumination 0.02A • Audio Power amp. Up to 1A emergency operation: 9 VDC Standby 1W, Transmit 30 W
Frequency Range	118.000 .. 136.995 MHz
Frequency Stability	±5 ppm
Fuse	external fuse required: 4 A, slow-blow
Compass Safe Distance	12 inch

ATS, Inc.

1500 S. Old Missouri Rd
Springdale, AR 72764

Postal Service Address:

PO Box 189
Springdale, AR 72765

www.atsinc.aero