# Retrofit-Instructions

## AR6201

## Technical Instruction

Manual AR6201 Retrofit-Instructions
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## Preface

Dear Customer,

Thank you for purchasing Becker Avionics products.

We are pleased that you have chosen our product and we are confident that it will meet your expectations.

For development of our product, the guidelines for highest quality and reliability have been borne in mind, supplemented by selection of high quality material, responsible production and testing in accordance to the ISO 9001 and DIN EN 9100 standards.

Our competent customer support department will respond on any technical question you may have.

Please do not hesitate to contact us at any time.

## VHF-Transceiver


AR4201 (Single Block Transceiver)


AR6201 (Single Block Transceiver)

## List of Effective Pages and Changes

Only technical relevant modifications are described in this table.

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| Chapter 1 – 6 | 11/2016 | | |
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# Table of Contents

## List of Abbreviations

| List of Abbreviations | |
|---|---|
| AC | Advisory Circular |
| A/C | Aircraft |
| AFM | Aircraft Flight Manual |
| AFMS | Aircraft Flight Manual Supplement |
| AMC | Acceptable Means of Compliance |
| AML | Aircraft Model List |
| CG | Centre of Gravity |
| CPD | Circuit Protection Device |
| CSxx | Certification Specification xx |
| EMC | Electro Magnetic Compliance |
| EMI | Electro Magnetic Interference |
| GM | Guidance Material |
| ICA | Instructions for Continued Airworthiness |
| IO | Installation Order |
| MOC | Means of Compliance |
| NAA | National Aviation Authority |
| STC | Supplement Type Certificate |
| TC | Type Certificate |

## General Safety Definitions


Indicates a hazardous situation which, if not avoided, will result in death or serious injury.


Indicates a hazardous situation which, if not avoided, could result in death or serious injury.


Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.


Is used to address practices not related to physical injury.


Safety instructions (or equivalent) signs indicate specific safety-related instructions or procedures.

## Disposal

**⚠CAUTION** The packaging material is inflammable, if it is disposed of improperly by burning, toxic fumes may develop.

This product contains materials that fall under the special disposal regulation, which corresponds to the EC directive for dangerous disposal material. We recommend disposing of the respective materials in accordance with the respectively valid environmental laws. The following table states the materials suitable for recycling and the materials which have to be disposed of separately.

| Material | Suitable for recycling | Disposal |
|---|---|---|
| Metal | yes | no |
| Plastics | yes | no |
| Circuit boards | no | yes |

Dispose of the circuit boards:

- Disposal via a technical waste dump which is allowed to take on e.g. electrolytic aluminium capacitors. Do under no circumstances dump the circuit boards with normal waste dump.

## Warranty Conditions

### User Conversions and Changes are not permitted

Any change made by the user excludes any liability on our part (excluding the work described in this manual).

- The device must not be opened.
- Do not make any modifications to the device, except for those described in the manual.
- Make connections to the inputs, outputs and interfaces only in the manner described in the manual.
- Fix the devices according to the mounting instructions.
  We cannot provide any guarantee for other mounting methods.

## Conditions of Utilization

### General introductory notes

With this device you bought a product which was manufactured and tested before delivery with the utmost care.

Please take your time to read the following notes which you ought to follow closely during installation and operation.

Unless, all claims under the warranty will become void and a reduced service life or even damages must be expected.

**⚠CAUTION** The user is responsible for protective covers and/or additional safety measures in order to prevent damages to persons and electric accidents.

### Additional Conditions of Utilization

For more details please refer to I&O manual:
http://www.becker-avionics.com/downloads/ → AR620X Family.

## Non Warranty Clause

We checked the contents of this publication for compliance with the associated hard and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.

# 1. General Description

## 1.1. Introduction

This manual contains technical instructions about the retrofit procedure of VHF transceivers.

Before starting any work please read this manual carefully.

The retrofit work depends on the type of aircraft and its equipment. Therefore, this instructions only provides general information.

## 1.2. Device Assignment

This manual is valid for the following devices:

- Retrofitting AR4201 → AR6201

# 2. Preparation - Transceiver Replacement

## 2.1. Visual Inspection

- Inspect the structure of the VHF-COM installation area to be free from any mechanical defect like cracks or deformation.

**SAFETY INSTRUCTIONS** In case of any findings involve qualified and authorized personnel for trouble shooting and repair before performing retrofit-instructions.

- Verify that cable loom, cable connectors and contact pins of the installation are in good condition.
- Inspect the existing antenna in respect to mechanical damages on the antenna body and a sound structure of the sealing between the antenna foot and the aircraft skin.
- If possible, perform a VSWR test on the antenna system.
- The aircraft skin should also be inspected for signs of cracks in the close vicinity of the antenna mounting holes.
- Check the power supply protection (fuse or circuit breaker).
    - For the AR6201 a 7.5 A external circuit breaker or fuse shall be installed.

## 2.2. Functional Test

- With running engine and all electrical systems "ON" a TX and RX communication test with the tower or any other station within a line of sight between both antennas should be performed.
    - Ascertain that neither of the both signals (RX/TX) is overlaid by any distortion from generator or ignition system of the aircraft.

**SAFETY INSTRUCTIONS** In case of any findings involve qualified and authorized personnel for trouble shooting and repair before performing retrofit-instructions.

# 3. Replacement of the Transceiver

## 3.1. AR4201 → AR6201

In most cases, a retrofit of the AR4201 with an AR6201 will not cause any problems. In a few cases differences may occur due to pin incompatibility.

The AR4201 normally is mounted from the rear side of the instrument panel.

### 3.1.1. Removal of AR4201


- Disconnect the AR4201 from cable loom and antenna lead.
- Remove the screws (4) from each corner of the bezel and move the unit carefully out from the instrument panel.
- Inspect the wirings behind the instrument panel and make sure no other cable connector or pitot-static hose came loose during the removal of the AR4201.

**Wiring Check:**

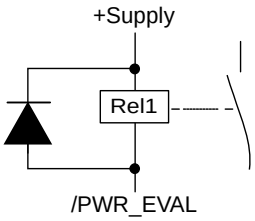
- Check if pin 24 (P1) on the AR4201 is used.
  - o If "yes" check and identify the connected equipment.
    AR4201 P1 pin 24 = switched power output.
    AR6201 P1 pin 24 = open collector (max. 100 mA).

**AR6201:**

P1-24 = Power Indication (/PWR_EVAL)

This output indicates whether the transceiver is in "ON" or "OFF" status by means of an open collector function. The output internally connects to ground when the unit is "ON" and allow a current of maximum 100 mA to drive an external relay for example. The output shows high impedance when the transceiver is "OFF".

**Note: In order to avoid damage of this output a protection diode in parallel to the external relay shall connected.**




- If necessary modify the cable harness.

- Compare wiring requirements (see table "Pin Compatibility AR4201 - AR6201" page 11).
  For more details please refer to I&O manual: http://www.becker-avionics.com/downloads/ → AR620X Family

## 3.2. Pin Compatibility AR4201 - AR6201

| Pin No. | AR4201 - P1 Pin Name | AR4201 Function | AR6201 - P1 Pin Name | AR6201 Function | Full compatible |
|---|---|---|---|---|---|
| P1-1 | AF-ASYM | Speaker output, unbalanced | SPK_HI | Speaker output, unbalanced | Yes |
| P1-2 | AF-HI | Headphone output, balanced | HDPH1_A | Headphone 1 output, balanced | Yes |
| P1-3 | AF-LO | Headphone output, balanced | HDPH1_B | Headphone 1 output, balanced | Yes |
| P1-4 | AFAUX | Auxiliary audio input, unbalanced | AF_AUX_IN_HI | Auxiliary audio input, unbalanced | Yes |
| P1-5 | MIKE DYN | Dynamic microphone input, high side, unbalanced | MIKE_DYN_HI | Dynamic microphone input, high side, balanced | Yes |
| P1-6 | MIKE GROUND | Ground for dynamic microphone, unbalanced | MIKE_DYN_LO | Dynamic microphone input, low side, balanced | No |
| P1-7 | IC | Intercom input | IC | Intercom input | Yes |
| P1-8 | TEMS1 | Input for temperature sensor | MIKE_STD_LO | Ground | No |
| P1-9 | RXD | RS232-serial-data-line | MIKE_STD2_HI | Standard microphone 2 input, high side, unbalanced | No |
| P1-10 | -ILLUMINATION | Illumination, low side | ILL_LO | Illumination, low side | Yes |
| P1-11 | +13.75 V | Positive power supply | P_SUPP | Positive power supply | Yes |
| P1-12 | +13.75 V | Positive power supply | P_SUPP | Positive power supply | Yes |
| P1-13 | GROUND | Power supply ground | P_SUPP_GND | Power supply ground | Yes |
| P1-14 | AF GND<br>MIKE STD GND | Ground | SPK_LO | Ground | Yes |
| P1-15 | AFCU | Normally not used in installation | LINE_OUT | Normally not used in installation | No |
| P1-16 | AGC/AFWB | Normally not used in installation | AGC_OUT | Normally not used in installation | No |
| P1-17 | PTT | Press to talk | /PTT | Press to talk | Yes |
| P1-18 | MIKE STD1 | Standard microphone input, high side, unbalanced | MIKE_STD1_HI | Standard microphone 1 input, high side, unbalanced | Yes |
| P1-19 | CODE PIN | Used for identification of the connection | MIKE_STD3_HI | Standard microphone 3 input, high side, unbalanced | No |
| P1-20 | TEMS2 | Headphone 2 | HDPH2_A | Headphone 2 output, balanced | No |
| P1-21 | GNDDATA | Ground | AF_AUX_IN_LO | no Ground | No |
| P1-22 | TXD | RS232-serial-data-line | HDPH2_B | Headphone 2 output, balanced | No |
| P1-23 | ILLUMINATION | Illumination, high side | ILL_HI | Illumination, high side | Yes |
| P1-24 | +13.75V SWITCHED | Power on monitor<br>Switched positive power supply. | /PWR_EVAL | Power on monitor,<br>open collector output,<br>conducting to GND for "On" | No |
| P1-25 | GROUND | Power supply ground | P_SUPP_GND | Power ground | Yes |

### 3.2.1. **Dynamic Microphone Input**

Retrofitting an AR4201 with the AR6201 in a typical glider installation with a dynamic microphone is shown below:

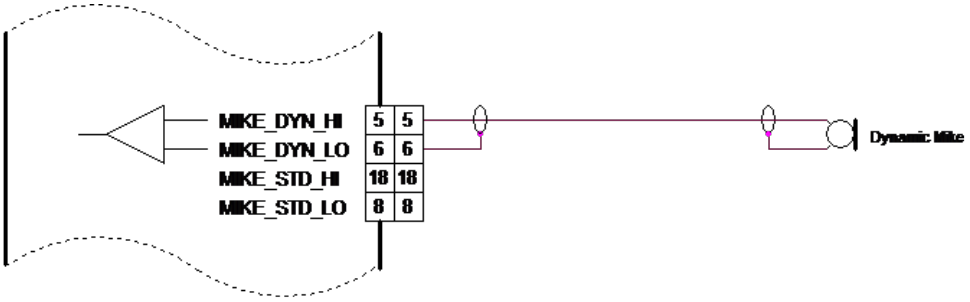



Figure 3-1: AR6201 with Wiring Interface for AR4201

Connect the cable shielding to pin P1-6, which is the low side input for dynamic microphone. Because in AR6201 this input is balanced, the cable shield is no longer connected to ground (unlike it was with the AR4201). In most cases, it is not a problem.

If interference with the microphone signal does occur, it is recommended to carry out the following modification:

Connect Pin P1-6 with Pin P1-8 (the cable shield is grounded). See Figure.

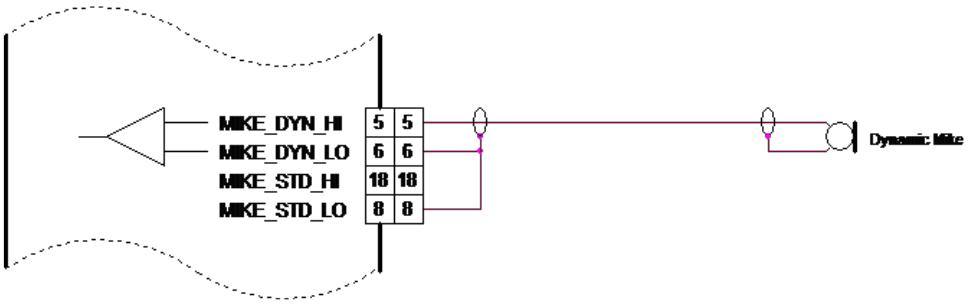



Figure 3-2: Modified Dynamic Microphone Wiring Interface for AR6201

### 3.2.2. **Temperature Sensor**

The AR6201 has no temperature sensor input. Remove wire from pin P1-8 and pin P1-20.

### 3.2.3. **RS232 Interface**

The AR6201 has no RS232 interface for remote control. Remove wire from pin P1-9 and pin P1-22.

### 3.2.4. **AFCU/AGC/AFWB**

Not used in aircraft installations, remove wire from pin P1-15 and pin P1-16.

### 3.2.5. **CPIN (if Installed)**

No influence in retrofit installation, please remove coding cap from the connector hole.

### 3.2.6. **+13.75 V Switched (AR4201) - PWR_EVAL (AR6201)**

The AR6201 provides on pin P1-24 a low signal when the unit is switched on and a high impedance signal, when switched off.

**Note:** **This is not compatible to the AR4201, which provided a positive power supply when switched on and high impedance when switched off.**

In cases where slave equipment needs to be switched ON/OFF in sync with the AR6201 connect a relay to pin P1-24.

## 3.3. Verification

- Check that the AR6201 is fixed correctly.
- Check that the AR6201 wirings are completed.
- Check the power supply lines and confirm correct polarity.
- Check the power supply protection (fuse or circuit breaker).
    - For the AR6201 a 7.5 A external circuit breaker or fuse shall be installed.
- Check on all systems that connectors are in place and mechanically secured.
- Inspect the installation behind the instrument panel.
    - Make sure that all cable looms, wirings and connectors are placed securely and have to be clear of the steering devices when fully moved in all directions.
    - Make sure that all pitot/static tubes are in place and mechanically secured.

# 4. Post Installation Test

- Power up the AR6201, after self-test procedure the display shows the software status of the unit.
- Carry out the "Configuration Setup", to check and/or set the correct microphone type, ports, etc.

For details about "Installation Setup" please refer to I&O manual:
http://www.becker-avionics.com/downloads/ → AR620X Family

**Note: It is assumed that the "Configuration Setup" has been done before the Post Installation Tests will be carried out.**

Once the 620X is installed, complete a test procedure to verify system functionality. Ensure compliance with authority required procedures. Refer to the installation order of the minor change document or use an own approved test protocol for VHF units. The following chapter provides guidance for such tests.

## 4.1.1. Mechanical Installation and Wiring Check

- Verify all cables are fixed securely and shields connected properly to signal ground.
- Check the movement of aircraft controls to verify there is no interference.
- Verify all screws are tight and the connectors on the rear side of the unit are secured.

## 4.1.2. Power Supply

- Check the power supply lines and confirm correct polarity.
- Confirm that the aircraft power supply is within the specified limits, with and without a running engine.

## 4.1.3. Receiver / Transmitter Operation

- Power up the 620X and tune it to a local station for a communication test.
- Verify that the receiver output produces a clear and readable audio and ask the local station for proper readability for the transmit signal of the 620X.
- Repeat this communication test with an airborne station within ≈ 20-40 NM (Nautical Miles).

## 4.1.4. Antenna Check

- Check the VSWR (voltage standing wave ratio) over the complete frequency band (e.g. by using a VHF Reflection-Coefficient Meter).
  The VSWR ratio should be less than 2:1 and is not acceptable when exceeding 3:1.

### 4.1.5. Interference Check

- Check the 620X while engine is running and all other avionics/ electrical systems on the aircraft are powered, to verify that no significant interference exists.
- Check also that the 620X does not cause significant interference with other systems.

The installer´s standard test procedure may be used for the interference check and the table can be taken as a reference. Depending on the individual avionic systems installed in the aircraft, it might be necessary to extend the following checklist accordingly.

| **Aircraft System Checklist** | **Function** | |
|---|---|---|
| | **OK** | **NOT OK** |
| DME | | |
| Audio | | |
| Generators / Inverters | | |
| GPS System | | |
| Compass 1 | | |
| ADF | | |
| VHF / NAV1 all channels | | |
| VHF / NAV 2 all channels | | |
| Marker Receiver | | |
| Motor(s) | | |
| Engine Instruments | | |
| Stormscope | | |
| Transponder | | |
| Air Data Computer | | |
| Autopilot and Servos | | |

- Power the GPS and make sure that not less than 5 satellites are tracked.
- Check the interference between the VHF-COM and the GPS receiver (when activated in NAV mode).
- Select the following channels/frequencies on the 620X and on each frequency stay in TX and RX mode for at least 30 seconds.
- Verify that GPS integrity flag is always out of view.

| Channel | Frequency (MHz) |
|---|---|
| 121.140 | 121.1416 |
| 121.150 | 121.1500 |
| 121.155 | 121.1500 |
| 121.160 | 121.1583 |
| 121.165 | 121.1666 |
| 121.175 | 121.1750 |
| 121.180 | 121.1750 |
| 121.185 | 121.1833 |
| 121.190 | 121.1916 |
| 121.200 | 121.2000 |
| 121.205 | 121.2000 |
| 121.210 | 121.2083 |
| 131.240 | 131.2416 |
| 131.250 | 131.2500 |
| 131.255 | 131.2500 |
| 131.260 | 131.2583 |
| 131.265 | 131.2666 |
| 131.275 | 131.2750 |
| 131.280 | 131.2750 |
| 131.285 | 131.2833 |
| 131.290 | 131.2916 |
| 131.300 | 131.3000 |
| 131.305 | 131.3000 |
| 131.310 | 131.3083 |

For the remaining avionic equipment repeat all interference checks during a flight and include all equipment not previously checked out on ground. A communication performance test in the low, mid and high frequency band of the 620X should be included.

- Verify the receiver output produces a clear and understandable audio output.
- Verify the transmitter by contacting another station and getting a report of reliable communications.
- Perform the range check with a station at least 100 m from your own position.
- Check the intercom function by talking into the microphone, while the engine is running at cruising rpm. You should hear yourself and/or your co-pilot loud and clear.
- Switch "ON" the squelch and check that the normal radio noise, without a present carrier signal, it will be constantly suppressed. The threshold of the squelch can be set in the user menu.

### 4.1.6. **Flight Test Check**

It is highly recommended to perform flight test as final installation verification. The performance of the 620x may be verified by contacting a ground station at a range of at least 50 NM while maintaining an appropriate altitude and over all normal flight attitudes.

- Check the performance in the low, mid and high band frequencies.

## 4.2. Magnetic Compass Interference Test

- Check the interference of the magnetic compass in 30° steps over a full 360° turn.
- Record the found deviation from the aircraft compass deviation table after the AR6201 installation.
- At each step, keep the PTT button pressed for at least 5 seconds and see if the compass reading is changing during this time.
- The maximum allowed deviation shall not exceed ±10°.
- A compass swing must be performed if deviation has been found out of tolerance.

| Steer | Magnetic bearing | Deviation old table | Deviation found | Deviation With TX | Max. |
|---|---|---|---|---|---|
| | 000 | | | | ±10° |
| | 030 | | | | ±10° |
| | 060 | | | | ±10° |
| | 090 | | | | ±10° |
| | 120 | | | | ±10° |
| | 150 | | | | ±10° |
| | 180 | | | | ±10° |
| | 210 | | | | ±10° |
| | 240 | | | | ±10° |
| | 270 | | | | ±10° |
| | 300 | | | | ±10° |
| | 330 | | | | ±10° |

# 5. Technical Data

In the airplane flight manual (AFM), weight, balance and electrical load records shall be updated after successful completion of this retrofit work.

For current detailed data please refer to I&O manual:
http://www.becker-avionics.com/downloads/ → AR620X Family

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# 6. Index



We reserve the right to make technical changes.
The data correspond to the current status at the time of printing.


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