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# ATR 720 A

## TRANSCEIVER



### INSTALLATION MANUAL

001.7.000

FEB. 1984

ATR 720  
COMMUNICATIONS TRANSCEIVER

ATR 720 LIST OF EFFECTIVE PAGES

The List of Effective Pages lists all the Pages contained in the Installation Manual including those pages which were intentionally left blank (Ø).

Using this page, the user may verify if the manual on hand is in agreement and thus considered complete. Undated pages are original pages whereas dated pages are those that have been changed or added.

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SECTION I  
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical and electrical characteristics of the Avionic H.B. Dittel GmbH ATR 720.

1.2 PURPOSE OF EQUIPMENT

The ATR 720 COMM combines in a single panel mounted unit a 720 channel VHF COMM Transceiver with push button frequency selectors.

1.3 DESIGN FEATURES

A. Controls

1. On-Off switch is independent of volume control settings allowing the volume to remain at desired levels.
2. Control head with push button frequency selector.
3. Automatic squelch eliminates pilot responsibility for continuously monitoring squelch adjustments. Squelch threshold automatically adjusts to open on readable signals. SQ-toggle switch in lower position opens squelch to test COMM receiver sensitivity and to listen to extremely weak signals.
4. Frequency selector mechanism features human engineered push buttons with airline type drum readout.

B. Electronics

1. Varactor diode tuned filters eliminates use of mechanical tuning shafts and mechanisms.
2. Transistorized transmitter provides 4 watts minimum output power and long term reliability superior to tube designs.
3. The digital frequency synthesizers utilize state of the art integrated circuits to replace all but 1 crystal.

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4. Crystal filter selectivity.
5. Carrier controlled squelch with carrier squelch back up functionally described above.
6. Tight AGC (typically 0.5 db from  $\mu\text{V}$  to 100 mV) minimizes audio level variations.

C. Construction

1. Modular construction for ease of maintenance.
2. Rack mounted, removable from the front panel.
3. Anti-theft locking mechanism.

1.4 POWER REQUIREMENTS

The ATR 720 requires 13.75 volts for proper operation. Aircraft having electrical power plants producing 27.5 volts, requires the installation of a voltage converter. The PS 2814 Voltage Converter, designed to convert 27.5 volts to 13.75 volts, may be conveniently remote mounted in the aircraft.

1.5 TECHNICAL CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
ATR 720 TRANSCEIVER	
RTCA COMPLIANCE:	
Comm Transmit	RTCA Do 157, Class 4
Comm Receive	RTCA Do 156, Class C
Environmental	RTCA Do 160: B2A/MS/XXXXXXA5B6B
Temperature Range	-40° C to +55° C (-20°C to +55°C Bundesrepublik Deutschland)
Altitude	20,000 ft
MOUNTING:	Panel mounted, no shock mounting required
SIZE:	77 x 57 x 200 mm

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SPECIFICATION	CHARACTERISTICS
<p>WEIGHT:</p> <p>POWER REQUIREMENTS:            COMM Receive            COMM Transmit (Tone)</p>	<p>7,65 N (780 gr.)            excluding external connectors and harness.</p> <p>13.75 V (or 27.5 V with PS 2814)            0.1 - 0.4 amps            1.4 amps (0.8 amps unmodulated)</p>
COMM TRANSCEIVER	
<p>CRYSTAL CONTROLLED:</p> <p>FREQUENCY RANGE:</p> <p>FREQUENCY STABILITY:</p>	<p>720 channels</p> <p>118.00 to 135.975 MHz with 25 kHz spacing</p> <p><math>\pm</math> 0.003 %</p>
TRANSMITTER	
<p>VHF POWER OUTPUT:</p> <p>MODULATION:</p> <p>MICROPHONE:</p> <p>SIDETONE:</p> <p>DUTY CYCLE:</p>	<p>4 watts minimum, 50 ohm load</p> <p>85% modulation capability with 90% limiting, less than 15 % distortion at 80 % mod.</p> <p>Carbon or dynamic mike (adjustable)</p> <p>Adjustable up to 80 mw into 200 ohm headphones</p> <p>5 minutes on, 5 minutes off (50 %)</p>
RECEIVER	
<p>SENSITIVITY:</p> <p>SELECTIVITY:</p>	<p>1.5 uV will provide a 6 db minimum signal plus noise to noise ratio</p> <p>Typical 6 db at <math>\pm</math> 8 kHz, 70 dB at <math>\pm</math> 25 kHz</p>

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SPECIFICATIONS	CHARACTERISTICS
SPURIOUS RESPONSES:	Down at least 60 db
SQUELCH:	Automatic squelch (carrier to noise) with manual disable and carrier squelch override.
AGC CHARACTERISTICS:	From 5 uv to 20,000 uv audio output will not vary more than 0.5 db.
A U D I O	
EXTERNAL AUDIO INPUT:	External Audio-Frequency input with adjustable sensitivity (10 mV - 1 V for rated speaker output)
FREQUENCY RESPONSES:	Within 8 db from 350 Hz to 2500 Hz, min 18 db down at 5000 Hz
HEADPHONE OUTPUT:	80 mw into 200 ohm
SPEAKER OUTPUT:	3 Watts audio output
INTERPHONE:	interphone capability with external switch (refer to appropriate electrical installation diagram in Section 2).
PS 2814 VOLTAGE CONVERTER	
WEIGHT:	4.2N (430 gr.) excluding harness
POWER: Input Volts	27.5 vdc
Output Volts	13.75 vdc (nominal)
Output Current continuous	2.0 A
Output Current 50% duty	5.0 A



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1.6 UNITS AND ACCESSORIES SUPPLIED

- A. ATR 720 COMM
- B. ATR 720 installation kit includes mating connectors, radio rack mounting hardware, etc.

1.7 ACCESSORIES REQUIRED BUT NOT SUPPLIED

- A. Communication antenna and cables
- B. Headphones and speaker:
  - 1. Headphones: Low impedance types, 200 to 1000 ohms.
  - 2. Speaker: Voice coil impedance 4 to 8 ohms nominal.
- C. PS 2814 Voltage Converter, 27.5 V to 13.75 V (required in 27.5. V installation only).
- D. Microphone: Low impedance carbon, or dynamic with transistor pre-amp, when using "Carbon-Mike-adjustment", low impedance dynamic microphone when using "Dynamic-Mike-adjustment". Refer to § 2.2.2.
- E. Interconnection with Main Plug Unit 889 and BS9  
This is an useful help to connect the ATR 720 COMM to external accessories.

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SECTION II  
INSTALLATION  
OPERATION

2.1 GENERAL

This section contains suggestions and factors to consider before installing the ATR 720 COMM unit and PS 2814 Voltage Converter (27.5 V installations only). Close adherence to these suggestions will assure a more satisfactory performance from the equipment.

2.2 UNPACKING AND INSPECTING

Exercise extreme care when unpacking each unit. Make a visual inspection of each unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. When all equipment is removed, place in the shipping container all packing materials for use in unit storage or reshipment. The ATR 720 installation will conform the standards designated by the customer, installing agency and existing conditions as to unit location and type of installation.

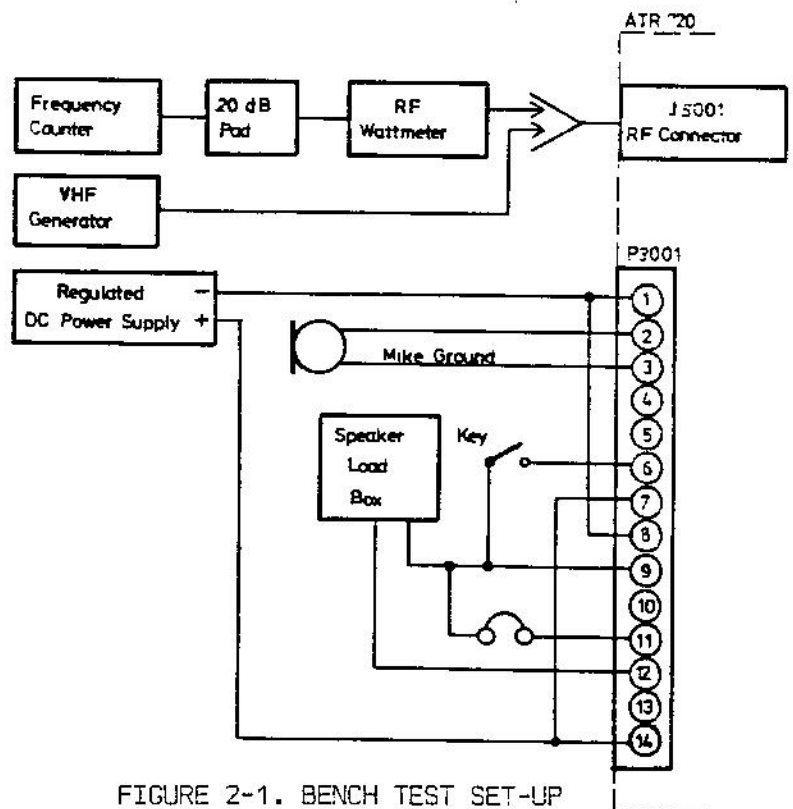


FIGURE 2-1. BENCH TEST SET-UP

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2.2.1 Electrical Bench Test

Test Equipment Recommended

- a. VHF Signal Generator: HP Model 6080 or equivalent.
- b. RF Power Wattmeter: Bird Truline Model 43 or equivalent.
- c. Regulated DC Supply with 12 to 15 Vdc at 2 amperes capability.
- d. Frequency Counter: HP Model 5383 A or equivalent.
- e. Oscilloscope: National VP 5510 A or equivalent.
- f. Speaker Load Box: with 4 watt capability.
- g. 20 dB, 20 watt pad.
- h. Audio Detector: Texscan Model DC-50 or equivalent.
- i. Low Impedance microphone with a push-to-talk-switch (preferably the microphone that will be used in the aircraft).

2.2.1.1 Test Procedure

- a. Connect the COMM Unit into the test set-up, diagramed in Figure 2-1, and set the DC supply for 13,75 vdc.
- b. Connect the VHF signal generator to J 5001, set the generator output level to 1.5 uV with 30% - 1 kHz modulation.
- c. Set the COMM VOLUME CONTROL for a 100 mW reading on the speaker load box meter.
- d. Remove the modulation, look for a 6 dB change on the speaker load box meter.
- e. Disconnect the signal generator. Connect the RF wattmeter and frequency counter as diagramed in Figure 2-1.
- f. Connect the wattmeter to J 5001. Key the transmitter and talk into the microphone. The wattmeter indicator should react with a wiggle.
- g. With the transmitter keyed, use the frequency counter to check the Unit's frequency programming. Check all kHz steps from 118.000 MHz to 118.975 MHz and all MHz steps from 118.000 MHz to 135.000 MHz.
- h. Check all MHz steps from 110.000 MHz to 117.000 MHz, all MHz steps from 136.000 MHz to 139.000 MHz and all kHz steps from 139.000 MHz to 139.875 MHz. With the transmitter keyed, use the wattmeter to guarantee that there is no RF-output signal in this frequency range.

2.2.2 Microphone Adjustment

It is recommended that the microphone adjustment (see Figure 2-2) be performed while the Unit is on the bench using the aircraft's microphone(s). This adjustment can be made in the aircraft, however, it would require removal and insertion of the unit since the MIKE SELECTOR is located on the side of the chassis. Should the aircraft be equipped with more than one microphone, the type of microphones should be identical.

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Adjustment:

a. Dynamic Microphone

Using a low impedance dynamic microphone (200 ohms) turn the microphone gain trimm-potentiometer R 3104 full

- clockwise -

Note: This position is preset by the manufacturer

b. Carbon Standard Microphone or Dynamic Microphone with Preamplifier

Using a carbon standard microphone or a dynamic microphone with preamplifier turn the microphone gain trimm potentiometer R 3104 full

- counter clockwise -

**C A U T I O N**

Do not force microphone selector

2.2.3 Sidetone Adjustment

- a. Connect the Unit into the test set-up diagramed in Figure 2-1.
- b. Connect the RF wattmeter or a suitable dummy load to J5001.
- c. Key the transmitter and talk into the microphone.
- d. Adjust SIDETONE control R 5201 for a comfortable listening level from the headphones.
- e. Disconnect the Unit from the test set-up.

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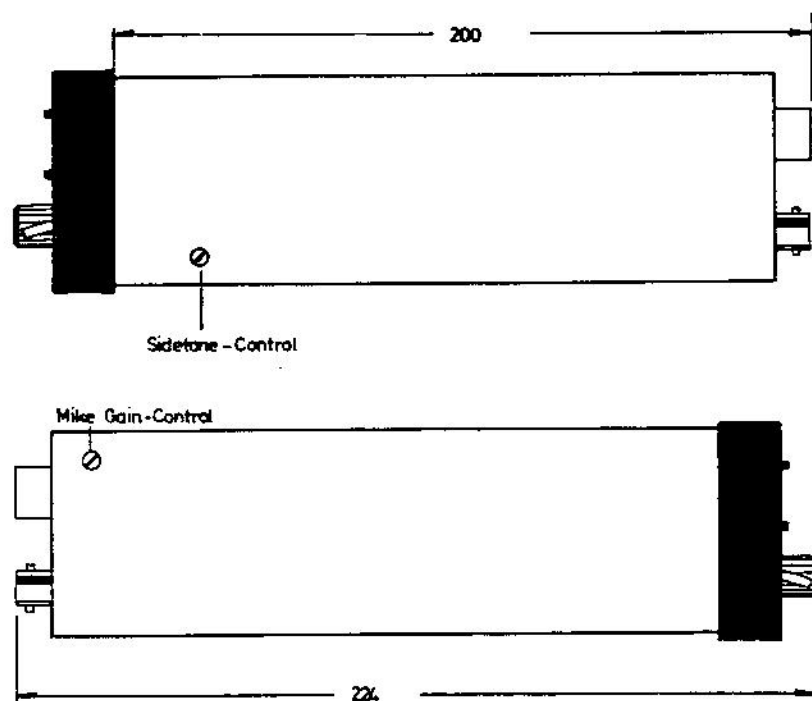


Figure 2-2. MIKE SELECTOR AND SIDETONE CONTROL

2.2.4 External Audio-Frequency Volume Adjustment

When using the external audio-frequency input (P 3001 Pin 4), the sensitivity of this input may be adjusted with R 3107, which is located on the Audio-Frequency/Synthesizer board. R 3107 is pre-adjusted to 0.5 V RMS sensitivity for rated speaker output, which is sufficient in the most cases. For further details of adjustment see "ATR 720 - Maintenance Manual" § 4.5.4 and Figure 6-3. Turning R 3107 clockwise, the sensitivity of this input is to be increased.

2.2.5 Interphone Interconnection

For Interphone wiring see ATR Interconnect diagram. An external double-pole switch is recommended.

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2.3 ATR 720 INSTALLATION

Listed below are factors and suggestions to consider before installing your ATR 720 system. Close adherence to these suggestions will assure more satisfactory performance from your equipment.

- a. The ATR 720 is mounted rigid in the aircraft panel. Determine that the location and installation of radio equipment provides sufficient visibility and handling of the controls for the pilot in his normal position. Mark and cut the mounting holes as shown in Figure 2-3. The purpose of the "behind aircraft panel mount cutout is to allow a margin of error in cutout size and prevent the mounting tray front edge from being visible. The mounting tray lip should extend through the mounting hole flush with the instrument panel to insure proper plug in engagement.
- b. Avoid mounting close to any high external heat source. If this is done, no blower or ram air cooling will be required.
- c. Remember to allow adequate space for installation of cables and connectors.
- d. Secure the mounting rack to instrument panel per Figure 2-3. The rearward mounting holes must be attached to a structural member of the panel by means of support brackets, in order to avoid vibration.
- e. Turn the locking screw counter clockwise till the holddown device is in a vertical position. Slide the unit into the mounting rack until the front lobe touches the mounting rack. Insert a small screw driver through a hold in the front panel to engage the locking screw. Turn clockwise until the rear lobe engages the mounting rack. Continue turning until the unit is secure in the mounting rack. Do not overtighten.
- f. The installing agency will supply and fabricate all external cables. The plugs required are supplied.

2.4 PS 2814 INSTALLATION (For use in 27.5 V installations only)

- a. Select the PS 2814 location considering good thermal conductivity to the airframe, convenient cable routing, proximity to the ATR 720 and separation from other heat sources.
- b. Refer to Figure 2-4 for the PS 2814 mounting dimensions.
- c. Secure the PS 2814 firmly in place.
- d. The installing agency will supply and fabricate external cables.

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2.5 ANTENNA INSTALLATION

- a. A conventional 50 ohm vertically polarized COMM antenna is required with the ATR 720. Vertical bent whip antennas are not recommended. Wideband COMM antennas provide efficient operation over the COMM band. Antennas should be installed per manufacturers recommendations. Additional recommendations are as follows:
1. Mount antenna on flat metal surface or install a ground plane at least 50 cm x 50 cm.
  2. The antenna should be well removed from any projections and the engine(s) and propeller.
  3. The COMM antenna should be well separated from any NAV Antenna to minimize COMM interference to NAV while transmitting.
- b. Refer to Figure 2-5 for the COMM antenna cable connector assembly.

2.6 CABLING

- a. The length and routing of the external cables must be carefully studied and planned prior to installation. Avoid sharp bends and placing cables too near the aircraft control cables.
- b. Fabricate the external cables in accordance with the installation drawing that fulfills the system requirement.

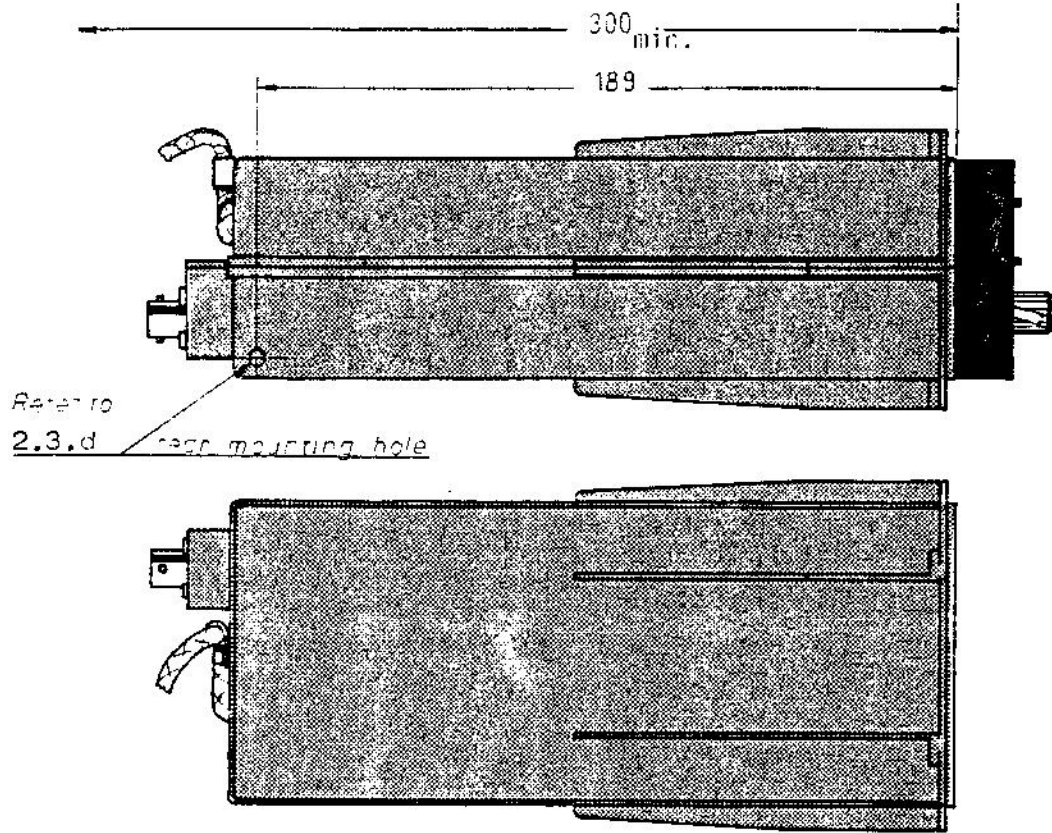
- N O T E -

Use good quality stranded wire that will not support a flame and with at least 600 volt insulation. It is recommended that the mike audio line is shielded.

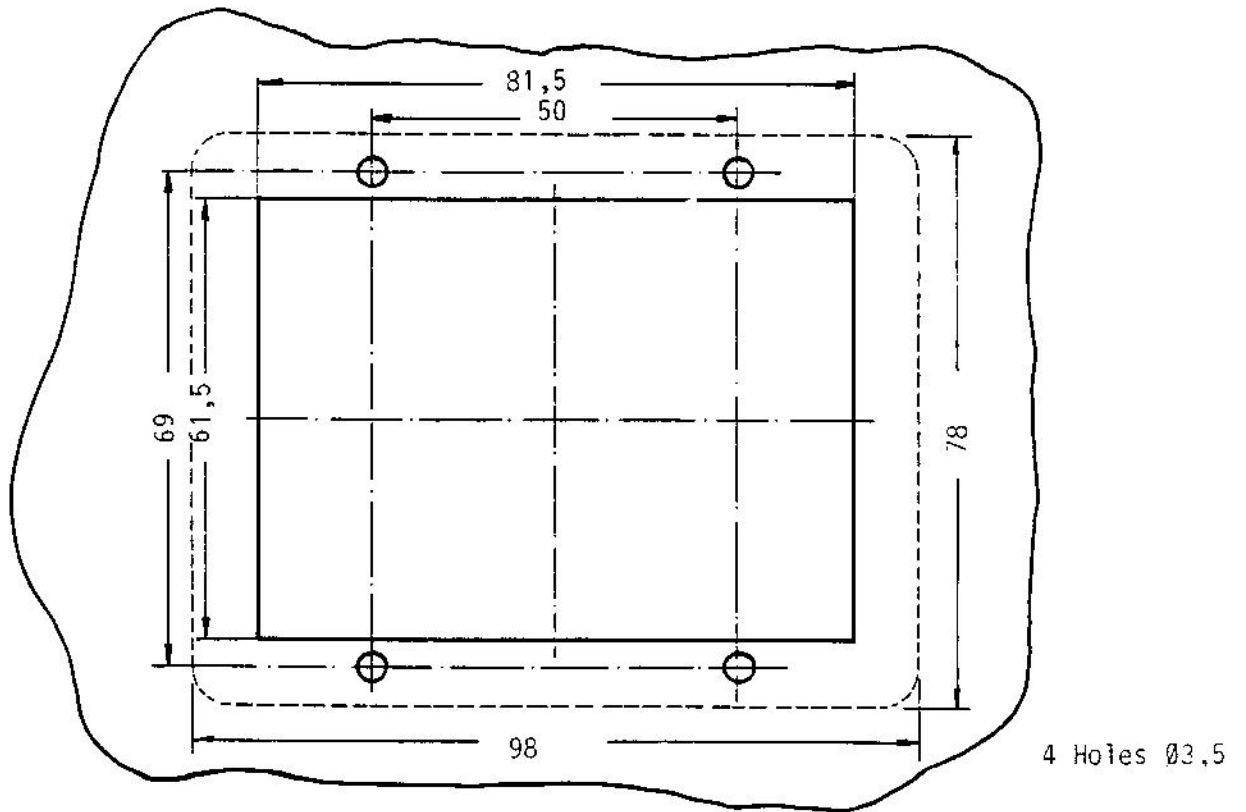
- c. Since other radio equipment will possibly utilize the same speaker circuits for muting, speaker selection and microphone switching must be devised by the installing agency.

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All Dimensions in mm!



PANEL CUTOUT TEMPLATE

FIGURE 2-3. ATR 720 OUTLINE AND MOUNTING DRAWING



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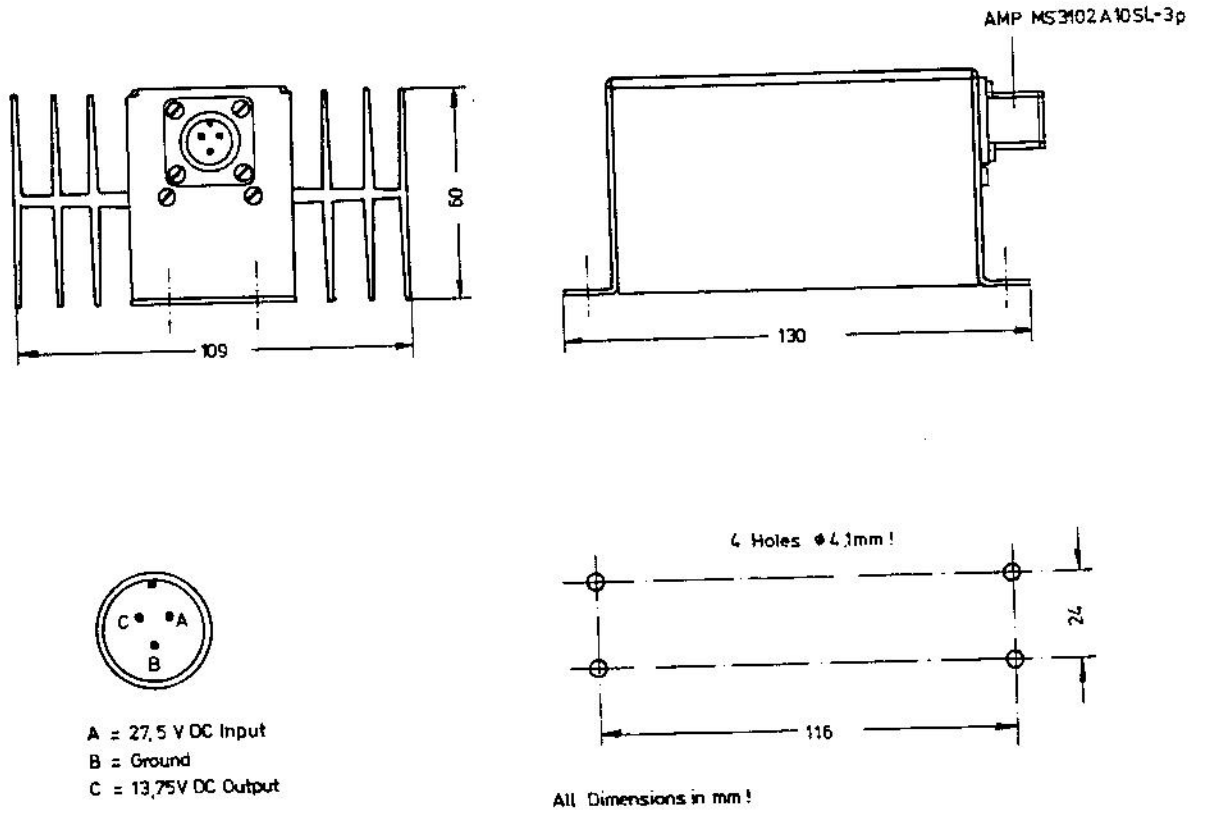
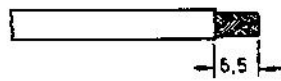


FIGURE 2-4. PS 2814 VOLTAGE CONVERTER  
OUTLINE AND MOUNTING DRAWING

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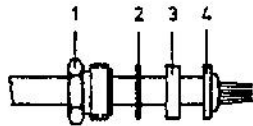


All Dimensions in mm!

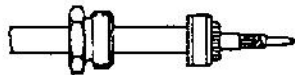
Trim coax cable (RG 58 C/U) outer insulation as shown.



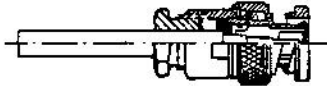
Fold out braid. Trim cable dielectric as shown.  
Do not damage center conductor!  
Tin center conductor.



Pull braid forward and towards center conductor and slide Parts 1 - 4 over coax as shown



Push Part 4 to section.  
Fold back braid as shown. Trim excess braid. Slide on contact and solder to center conductor.  
Do not damage insulation by strong heating!  
Remove excess solder from contact.



Slide prepared coax into plug-body and put on the screw with a screw-spanner.

FIGURE 2-5. ANTENNA CABLE ASSEMBLY

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2.7 OPERATION

2.7.1 GENERAL

All controls requires to operate the ATR 720 are located on the unit front panel.

2.7.2 ATR 720 COMM CONTROLS

2.7.2.1 COMM ON-OFF CONTROL

The ON-OFF control is located on the lower left side. Power is supplied to the COMM when this control is in the ON (upper) position.

2.7.2.2 COMM SQUELCH CONTROL

The SQUELCH CONTROL is located on the lower right side. In the normal (upper) position of this toggle switch weak signals are suppressed. The SQ-OFF position (lower position) is used to defeat the COMM automatic squelch for test purposes and listening to extremely weak signals.

2.7.2.3 COMM VOLUME CONTROL

The Volume (VOL) control, located between ON-OFF and SQUELCH-switches is used to adjust the transceiver audio volume. The ATR 720 system power ON/OFF switch is independent of this control, allowing the COMM volume to remain at a desired preset level.

2.7.2.4 COMM FREQUENCY SELECTOR

The ATR 720 transmit/receive frequency is selected by the eight push-buttons located above and under the transmit/receive frequency display windows. Pushing the buttons above the display windows, the frequency-display normally counts down. Pushing the buttons under the display windows, the frequency-display normally counts up.

- CAUTION -

- The sequence of the "10 MHz" push button is:

. . . 1 2 3 1 2 3 **2** 1 2 3 ... when counting up, and  
. . . 3 2 1 3 2 1 **2** 3 2 1 ... when counting down.

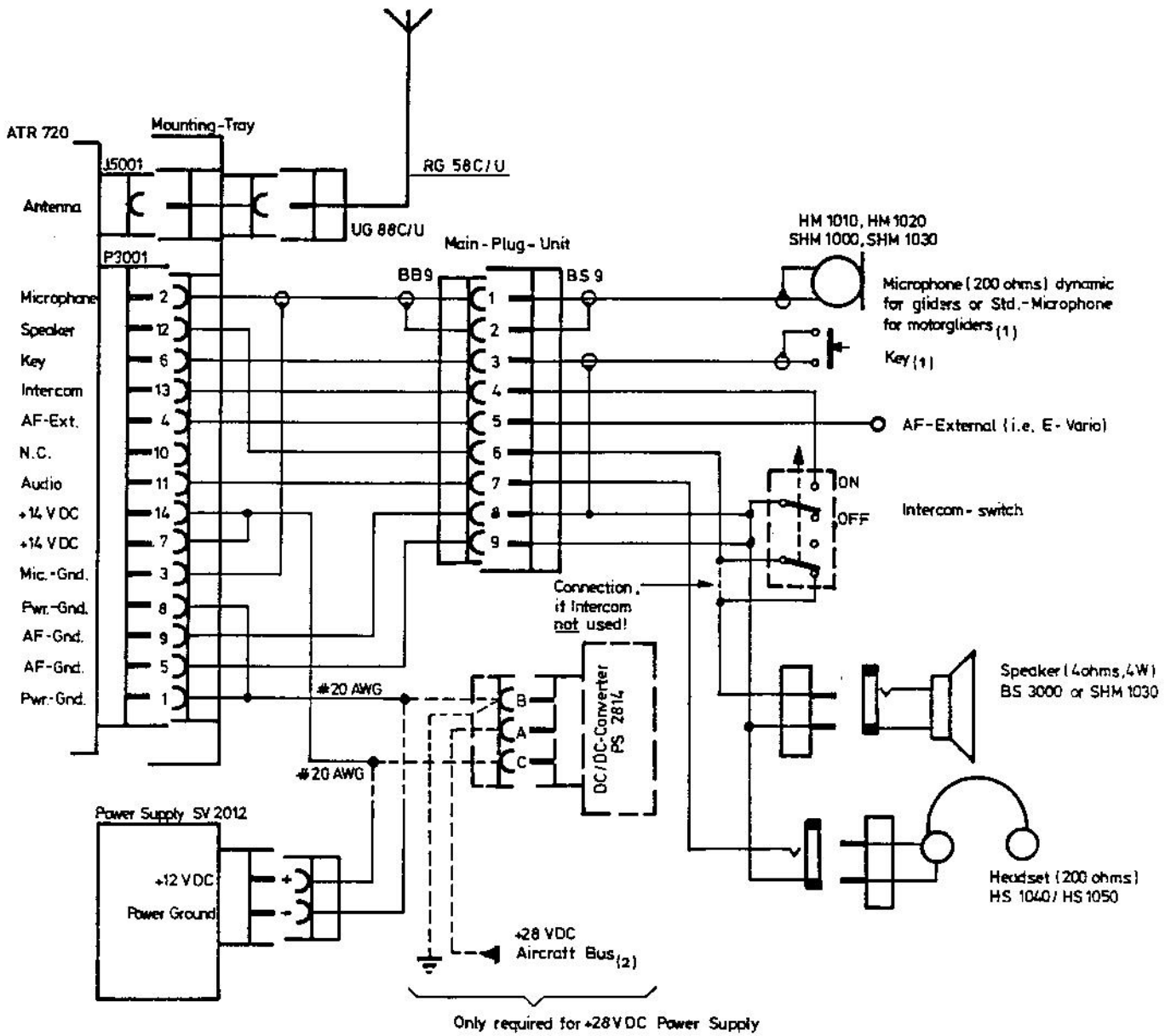
- The sequence of the "25 KHz" push button is:

. . . 0 2 5 7 0 **5** 0 2 5 7 . . . when counting up, and  
. . . 0 7 5 2 0 **5** 0 7 5 2 . . . when counting down.

In the case of selecting a frequency out of the radio frequency range 118.000 - 135.975 MHz, an internal logic circuit disables the transmit/receive-function. An additional warning signal is produced in the transmit mode in the speaker, but not in the headset.

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Minimum Wire Size #22 AWG  
unless otherwise specified.

NOTES

- 1) 2 Microphones and 2 Keys for double-seated gliders.
- 2) Use 2.5 Amp thermal circuit breaker supplied with PS 2814 or 2.5 Amp fuse.

FIGURE 2-6. ATR 720 INTERCONNECTION DIAGRAM 14/28 V DC

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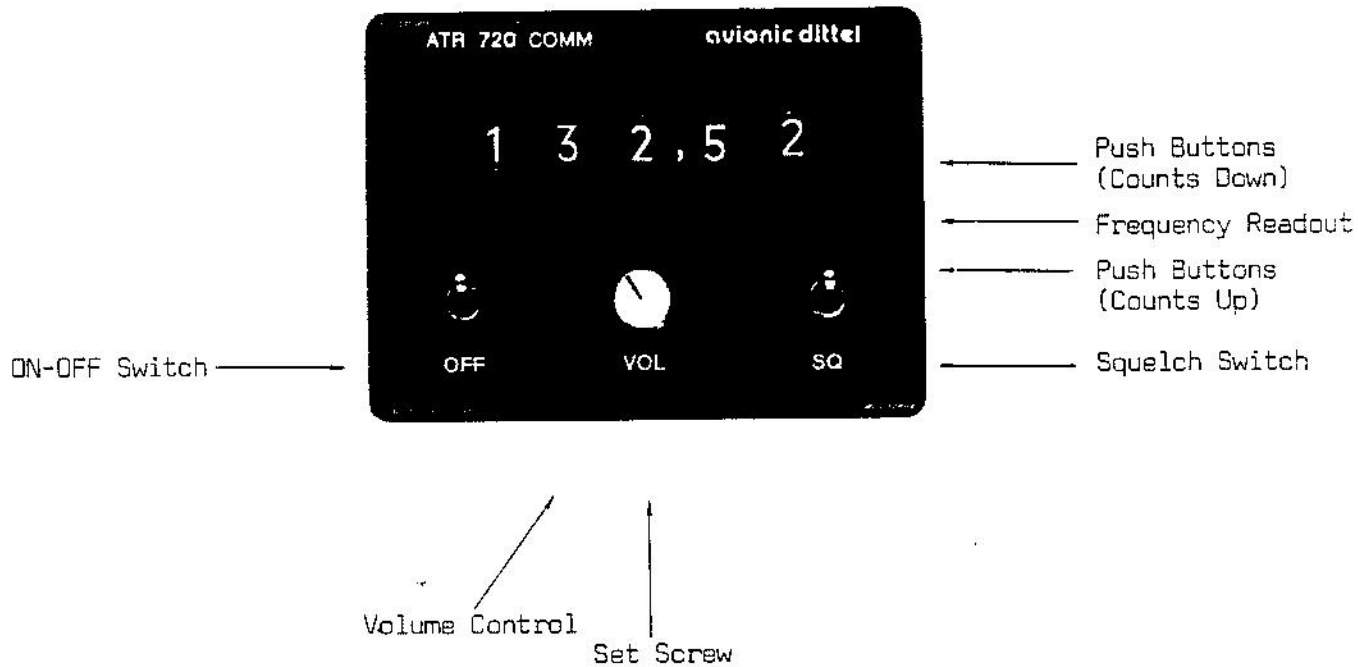


FIGURE 2-7. ATR 720 CONTROL FUNCTIONS

2.7.3 POST-INSTALLATION CHECKOUT

An operational performance flight test is recommended after the installation is completed to insure satisfactory performance of the equipment in its normal environment.

To check the communications transceiver, maintain an appropriate altitude and contact a ground station facility at a range of at least fifty nautical miles. Contact a ground station close in. Place the squelch knob in the test position and listen for any unusual electrical noise which would reduce the COMM receiver sensitivity by increasing the squelch threshold. If possible, verify the communications capability on both the HIGH and LOW ends of the VHF COMM band.

