



Transponder

ATC 4401-1-xxx

INSTALLATION AND OPERATION

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RECORD OF REVISIONS

REV. NO.	ISSUE DATE	INSERTED		REV. NO.	ISSUE DATE	INSERTED	
		DATE	BY			DATE	BY

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INTRODUCTION

1. General

The transponder ATC 4401-1-xxx is described in this manual "Installation and Operation".

2. Manufacturer

The transponder ATC 4401-1 was developed and is manufactured by :

Becker Flugfunkwerk GmbH
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CERTIFIED QUALITY SYSTEM

The Becker quality management system is certified according to :

DIN EN ISO 9001 CERT Reg. - Nr. 70 100 M 2082

LICENSES AND APPROVALS

LBA.G.0075	Production Organization Approval, JAR-21, Subpart G
LBA.0166	Maintenance Organization Approval, JAR-145

3. Safety information

- Do not connect the transponder to alternating current voltage or to voltage sources exceeding 32.2 V DC.
- Do not connect the transponder with reversed polarity to a voltage source.
- The use of the transponder in ambient temperatures below -20° C and above + 70° C is to be avoided.
- Switch off the unit when starting or shutting down engines.

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- The transponder should be protected from the aircraft power supply by its own 3 A circuit breaker.
- Do not set a code with 75xx / 76xx / 77xx. These special codes are reserved for air emergencies.
- Voltages > 42 V are possible within the transponder.

4. Layout of manual

The manual is divided up into three sections. Section 1 contains a general description of the transponder and the technical data of the device. Section 2 contains the installation instructions and Section 3 describes operation of the device.

5. Revisions to the manual

All changes to the manual are recorded consecutively on the preliminary page "Record of Revisions".

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GENERAL DESCRIPTION

1. Application

The transponder ATC 4401-1 is the airborne component of the Air Traffic Control Radar Beacon System ATCRBS. It functions in accordance with the secondary radar principle and allows the respective ground stations to locate, identify and track aircraft.

2. General description

- A. The transponder ATC 4401-1 is designed as a monobloc unit and is intended for installation in the instrument panel of aircraft. The dimensions correspond to the standard instrument size with a 58 mm (2 1/4") diameter.
- B. All control elements are located on the front panel of the unit. The 25-pin unit connector for connection to the aircraft interwiring and the TNC antenna socket are located at the rear.
- C. The control head contains the electrical modules comprising the processor board, display board and switch board.
- D. The electronic components of the rear main unit consist of the receiver board, the transmitter board, the power supply board and the interwiring board.
- E. The transponder permits the following functions:
 - (1) Mode A - in this mode, the code set on the transponder is sent as a reply to interrogation from a ground station.
 - (2) Mode C - in this mode, the encoded flight level is sent in addition to the possibilities of mode A.
 - (3) Indication of flight level (altitude/100) in feet if an encoding altimeter is connected to the transponder.
 - (4) Additional identification function. The Ident button of the transponder is pressed here when an instruction to this effect is issued by air traffic control personnel. The special pulse (SPI) transmitted as a result permits immediate identification of the aircraft on the controller's radar screen by means of additional marking of the object display.
 - (5) Self-test. All segments of the liquid crystal display flash for 3 seconds and an unit test is performed at the same time.

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3. Technical data

A. General data

Supply voltage	9.0 V - 32.2 V DC
Max. current consumption at (without panel illumination)	Code 7777 and 1200 interrogations/s
ATC 4401-1-250	1.1 A at 14 V
ATC 4401-1-175	0.7 A at 14 V
ATC 4401-1-250	0.6 A at 28 V
ATC 4401-1-175	0.4 A at 28 V
- in standby mode	0.3 A at 14 V 0.2 A at 28 V
Panel illumination	≤ 0.13 A at 14 V ≤ 0.07 A at 28 V
Power-up time	3 s (internal self-test)
External fuse protection	3 A medium slow-blow
Internal fuse protection	electronic and fuse
- external encoding altimeter fuse	5 A quick-acting, SMD 1 A quick-acting, SMD
Operating temperature range	- 20° C to + 55° C (short-time + 70° C)
Storage temperature range	- 55° C to + 85° C
Max. operating altitude :	
- ATC 4401-1-175	15000 ft.
- ATC 4401-1-250	50000 ft.
Vibration according to EUROCAE/RTCA ED-14D/DO-160D	Cat. S, vibration curve M Cat. U, vibration curve G
Humidity according to EUROCAE/RTCA ED-14D/DO-160D	Cat. A / + 50°C; 95% RH, 48 h
Magnetic effect	Category Z
Compass safe distance	30 cm
Mechanical dimensions :	
- Front panel	61.3 x 61.3 mm (H x W) (2.413 x 2.413 inch)
- Case depth (without antenna socket) (with antenna socket)	192 mm (7.559 inch) 205 mm (8.071 inch))
Weight	≤ 0.75 kg (1.653 lb)

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B. Receiver data

Operating modes	Mode A Mode A + C
Receive frequency	1030 MHz \pm 0.2 MHz
Sensitivity (MTL)	- 74 dBm (for 90 % reply rate)
Selectivity	\pm 15 MHz > 65 dB \pm 25 MHz > 70 dB
Dynamic range	\geq 60 dB
Bandwidth	\pm 3 MHz < 3 dB
Side lobe suppression	3-pulse method
Nominal impedance	50 Ω

C. Transmitter data

Transmit frequency	1090 MHz \pm 3 MHz
Transmitter type	Solid state
Transmit power :	
- ATC 4401-1-175	min. 160 W (at antenna socket of the unit)
- ATC 4401-1-250	min. 250 W (at antenna socket of the unit)
Reply limitation	effective as from 1200 replies/s
Nominal output impedance	50 Ω
Reply code (mode A)	ICAO coding system with 4096 reply possibilities (octal code)
Flight level code (mode C)	ICAO coding system 100-foot steps from
- ATC 4401-1-175	-1000 to 31000 ft.
- ATC 4401-1-250	-1000 to 62700 ft.
Transmit pulse shape	pulse width 0.45 μ s \pm 0.1 μ s rise time 0.05 to 0.1 μ s fall time 0.05 to 0.2 μ s

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- D. Transponder antenna DMNI 70-1 (blade antenna)
- | | |
|----------------------------|--------------------------------|
| Frequency range | 950 MHz to 1220 MHz |
| Standing wave ratio (VSWR) | < 1.5 : 1 |
| Impedance | 50 Ω , nominal |
| Type | corresponds to $\lambda/4$ rod |
| Polarization | vertical |
| Radiation | omnidirectional |
| Peak power output | max. 2 KW |
| Connection | C socket |
| DC resistance | idle (∞) |
| Insulation resistance | > 100 M Ω |
| Weight | approx. 113 g |
- E. Transponder antenna ANT 2000 (rod antenna)
- | | |
|----------------------------|--------------------------------|
| Frequency range | 1030 MHz to 1090 MHz |
| Standing wave ratio (VSWR) | < 1.25 : 1 |
| Impedance | 50 Ω , nominal |
| Type | corresponds to $\lambda/4$ rod |
| Polarization | vertical |
| Radiation | omnidirectional |
| Peak power output | max. 2 KW |
| Connection | BNC socket |
| DC resistance | idle (∞) |
| Insulation resistance | min. 1000 M Ω |
| Weight | approx. 20 g |

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F. Environmental conditions

Input voltage range	9.0 to 33 V DC
- nominal input voltage	27.5 V DC
- emergency input voltage	9.0 V DC
Low operating temperature	-20°C
High operating temperature	+55°C
High short-time operating temperature	+70°C
Storage temperature range	-55°C to +85°C
In-flight loss of cooling	Cat. Z, no auxiliary cooling required
Altitude max. :	
- ATC 4401-1-175	15000 ft.
- ATC 4401-1-250	50000 ft.
Humidity rating	RTCA DO-160D, Cat. B
Vibration	ED-14D/DO-160D, Cat. S, vibration curve M Cat. U, vibration curve G
Operational shocks	6 g in any direction
Crash safety	20 g shocks 20 g acceleration
Compass safe distance	30 cm
Magnetic effect	ED -14D/DO-160D category Z

Environmental categories :

ATC 4401-1-175:
 EUROCAE/RTCA ED14D/DO-160D
 Env.Cat. [A1Z]BAB[(SM)(UG)]XXXXXXZBABA[WW]B[XXXX]XXA

ATC 4401-1-250:
 EUROCAE/RTCA ED14D/DO-160D
 Env.Cat. [D1Z]BAB[(SM)(UG)]XXXXXXZBABA[WW]B[XXXX]XXA

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G. Environmental qualification for ATC 4401-1-175

EUROCAE/RTCA ED-14D/DO-160D, Change 2

CONDITION	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature/Altitude	4.0	Equipment tested to Category A1
Low Temperature	4.5.1	Equipment tested to Category A1
High Temperature	4.5.2, 4.5.3	Equipment tested to Category A1
In-Flight Loss of Cooling	4.6.2	Equipment identified as Category Z, No test required
Altitude	4.6.1	Equipment tested to Category A1
Decompression	4.6.2	Equipment tested to Category A1
Overpressure	4.6.3	Equipment tested to Category A1
Temperature Variation	5.0	Equipment tested to Category B
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Category B
Vibration	8.0	Equipment tested to Category S, aircraft zone 2 for fixed-wing reciprocating and turboprop multi-engine over 5,700 kg, multi-engine less than 5,700 kg and single engine less than 5,700 kg aircraft using vibration curve M. Equipment tested to Category U, aircraft zone 2 for helicopters fixed-wing reciprocating and turbojet engine using vibration curve G.
Explosion Proofness	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus Resistance	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment is Category Z
Power Input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Conducted Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio-Frequency Susceptibility	20.0	Equipment tested for conducted and radiated susceptibility to Category W
Radio Frequency Emission	21.0	Equipment tested to Category B
Lightning Induced Transients Susceptibility	22.0	Equipment identified as Category XXXX, no test performed
Lightning Direct Effects	23.0	Equipment identified as Category X, no test performed
Icing	24.0	Equipment identified as Category X, no test performed
ESD	25.0	Equipment tested to Category A

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- H. Environmental qualification for ATC 4401-1-250
 EUROCAE/RTCA ED-14D/DO-160D, Change 2

CONDITION	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature/Altitude	4.0	Equipment tested to Category D1
Low Temperature	4.5.1	Equipment tested to Category D1
High Temperature	4.5.2, 4.5.3	Equipment tested to Category D1
In-Flight Loss of Cooling	4.6.2	Equipment identified as Category Z, No test required
Altitude	4.6.1	Equipment tested to Category D1
Decompression	4.6.2	No test required
Overpressure	4.6.3	No test required
Temperature Variation	5.0	Equipment tested to Category B
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Category B
Vibration	8.0	Equipment tested to Category S, aircraft zone 2 for fixed-wing reciprocating and turboprop multi-engine over 5,700 kg, multi-engine less than 5,700 kg and single engine less than 5,700 kg aircraft using vibration curve M. Equipment tested to Category U, aircraft zone 2 for helicopters fixed-wing reciprocating and turbojet engine using vibration curve G.
Explosion Proofness	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus Resistance	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment is Category Z
Power Input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Conducted Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio-Frequency Susceptibility	20.0	Equipment tested for conducted and radiated susceptibility to Category W
Radio Frequency Emission	21.0	Equipment tested to Category B
Lightning Induced Transients Susceptibility	22.0	Equipment identified as Category XXXX, no test performed
Lightning Direct Effects	23.0	Equipment identified as Category X, no test performed
Icing	24.0	Equipment identified as Category X, no test performed
ESD	25.0	Equipment tested to Category A

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4. Software

The transponder ATC 4401-1 is controlled by a microcontroller in the control head. The software was classified as category "C" in accordance with the EUROAE/RTCA document ED12B/DO-178B.

5. System approvals

JTSO LBA.O.10.930/062JTSO

6. Scope of delivery

Transponder ATC 4401-1-175 Article-No. 0547.972-915

Transponder ATC 4401-1-250 Article-No. 0547.980-915

7. Accessories (not contained in scope of delivery)

Standard cable connector, 25-pin (crimp) Article-No. 0552.798-954

Standard cable connector, 25-pin (soldering) Article-No. 0552.801-954

Shielded cable connector, 25-pin (crimp) Article-No. 0555.681-954

Shielded cable connector, 25-pin (soldering) Article-No. 0555.673-954

TNC-coax cable connector for RG-58C/U (crimp) Article-No. 0551.694-277

TNC-coax cable connector for RG-223/U (crimp) Article-No. 0551.732-277

TNC-coax cable connector for RG-58C/U
and RG-223/U (soldering) Article-No. 0552.781-277
or spare connector Article-No. 0725.900-277

Transponder antenna ANT 2000 Article-No. 0707.007-952

Transponder antenna DMNI 70-1 Article-No. 0706.991-952

for antenna ANT 2000 :

BNC-antenna connector for RG-58C/U (crimp) Article-No. 0551.708-277

BNC-antenna connector for RG-223/U (crimp) Article-No. 0551.740-277

BNC-antenna connector for RG-58C/U
and RG-223/U (soldering) Article-No. 0522.771-277

for antenna DMNI 70-1 :

C-antenna connector for RG-58C/U (crimp) Article-No. 0551.716-277

C-antenna connector for RG-223/U (crimp) Article-No. 0551.759-277

C-antenna connector for RG-58C/U
and RG-223/U (soldering) Article-No. 0551.724-277

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INSTALLATION

1. General

Installation of the transponder ATC 4401-1 depends on the aircraft type and its equipment. Therefore, only general information can be provided in this section.

2. Inspection before installation

Before the transponder is installed in an aircraft, a visual inspection for possible transport damages shall be performed.

A. Visual inspection

Please look out for the following defects:

- (1) Dirt, dents, scratches, corrosion, broken fastening elements on housing and housing parts.
- (2) Dirt and scratches on nameplate, front plate and inscriptions.
- (3) Dirt, bent or broken pins, cracked insert of unit connector and antenna socket.
- (4) Dirt, stiffness and mechanical damage to the pushbuttons, rotary switches and LC displays.
- (5) Missing screws.

B. Checking procedure

Connect the transponder to the test setup (e.g. ramp test set) and carry out the following tests :

- (1) Checking receiver sensitivity
- (2) Checking side lobe suppression (SLS)
- (3) Checking reply pulses and output power
- (4) Checking transmit frequency
- (5) Checking reply limiting (AOC)

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- (6) Checking the SPI hold time
- (7) Checking mode A coding
- (8) Checking mode C coding
- (9) Panel illumination.

3. Mechanical installation

- A. The transponder is designed for installation in the instrument panel of an aircraft. It is constructed for mounting behind the panel. The circular cut out and the mounting holes are to be drilled in accordance with the small instrument size. The mounting place shall be at least 30 cm from the magnetic aircraft compass, to avoid any interference to the magnetic compass by the transponder.

The necessary dimensions are given in Fig. 2-1. Attachment is by means of four screws, which are included in the delivery.

4. Aircraft wiring

- A. The aircraft wiring of the transponder is shown in Fig. 2-4.

CAUTION : The transponder supply lines must not be loomed together with other equipment looms. In addition care must be taken to avoid running all transponder wiring in the close vicinity of ADF or other pulse equipment looms.

For installations in a more severe electromagnetical environment use shielded cable connectors (refer to accessories) and a common shielding for the transponder interwiring.

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B. Pin connections of the unit connector

Connector: P 1

<u>Pin :</u>		<u>Input :</u>	<u>Output:</u>
1	Altitude pulse A1	X	
2	Altitude pulse A2	X	
3	Altitude pulse A4	X	
4	Ident button, external	X	
5	DME/transponder suppression	X	X
6	Supply voltage switched (altimeter)		X
7	Reply output		X
8	RX-A (RS 422)	X	
9	RX-B (RS 422)	X	
10	Illumination A	X	
11	Supply voltage +14V/28V DC	X	
12	Supply voltage +14V/28V DC	X	
13	Supply voltage GND	X	
14	Altitude pulse B1	X	
15	Altitude pulse B2	X	
16	Altitude pulse B4	X	
17	Altitude pulse C1	X	

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<u>Pin :</u>		<u>Input :</u>	<u>Output:</u>
18	Altitude pulse C2	X	
19	Altitude pulse C4	X	
20	Altitude pulse D4	X	
21	TX-A (RS 422)	X	
22	TXB (RS 422)	X	
23	Illumination B	X	
24	Function ON, external	X	
25	Supply voltage GND	X	

C. DME suppression

If required, connect the suppression in/out of transponder to the corresponding pin of the DME unit using coaxial cable.

D. External IDENT push-button

If this input (Pin 4 of unit connector P1) is briefly connected to GND (e.g. by an external push-button), the IDENT function is started in the same way as when using the IDENT push-button on the front panel.

E. Illumination

If the supply voltage is +14 V, then connect the illumination voltage to pin 10 of P 1 and attach pin 23 to the illumination ground.

If the supply voltage is +28 V, then connect the illumination voltage to pin 23 of P 1 and attach pin 10 to the illumination ground.

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5. Installing the transponder antennas DMNI 70-1 or ANT 2000

- A. The transponder antenna is fitted to the underside of the aircraft fuselage at a horizontal, flat location. This location should not be in the “shadow” of aircraft structure items. The highest range is achieved when the antenna is located at the low point on the aircraft fuselage.
- B. The installation dimensions of the transponder antennas DMNI 70-1 are shown in Fig. 2-2 those of the ANT 2000 in Fig. 2-3.

CAUTION :

- Transponder antenna DMNI 70-1 is provided with a cork gasket which must be interposed between the skin of the aircraft and the antenna. To mount the antenna use only stainless screws in conjunction with lock washers.
- The transponder antenna ANT 2000 is provided with a silicone rubber gasket which must also be interposed between the skin of the aircraft and the antenna.
- In aircraft having a wooden or plastic airframe an electric counter-weight plate or panel must be located within the fuselage at the antenna location with minimum dimensions 40 x 40 cm.

C. Antenna cable

Use RG-223/U antenna cable with a length of no more than 5 m for installation of the transponder ATC 4401-1-175. RG-58C/U or RG-223/U can be used for the transponder ATC 4401-1-250. RG-223/U should be used preferentially.

6. Checking after installation

A. General

After the installation, check the transponder to ensure satisfactory operation of the unit.

B. Pre-flight check using self test

Switch-on test :

Switch the transponder operating mode switch from OFF to SBY. All the digits of LC display must flash for 3 seconds. The unit is subject to a self-test in this time.

Test triggering :

Press the VFR1 button (F) and VFR2 button simultaneously. At this test all segments must flash into display (E) as long as the buttons are pressed. Additionally the transmitter and evaluation are tested on correct function in the SBY, ON and ALT modes.

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In case of a failure appears the report e.g. "E10" in the top line of the display. Switch OFF the transponder at such "E" fault indications.

C. Antenna matching

The antenna in the aircraft shall provide a VSWR of $\leq 1.5 : 1$.

D. Test and adjustment of transmit frequency

Set code 0000 on the transponder and mode A interrogation on the ramp test set. Check transmit frequency by means of the ramp test set. Transmit frequency must be 1090 ± 3 MHz. If necessary use screw driver through hole in the top cover and adjust the transmit frequency.

E. Check of the transmit power

After installation of equipment and antenna the transmit power has to be checked at the antenna end of the feeder line :

Requirement for ATC4401-1-175: ≥ 71 W (18.5 dBW)

Requirement for ATC4401-1-250: ≥ 125 W (21 dBW)

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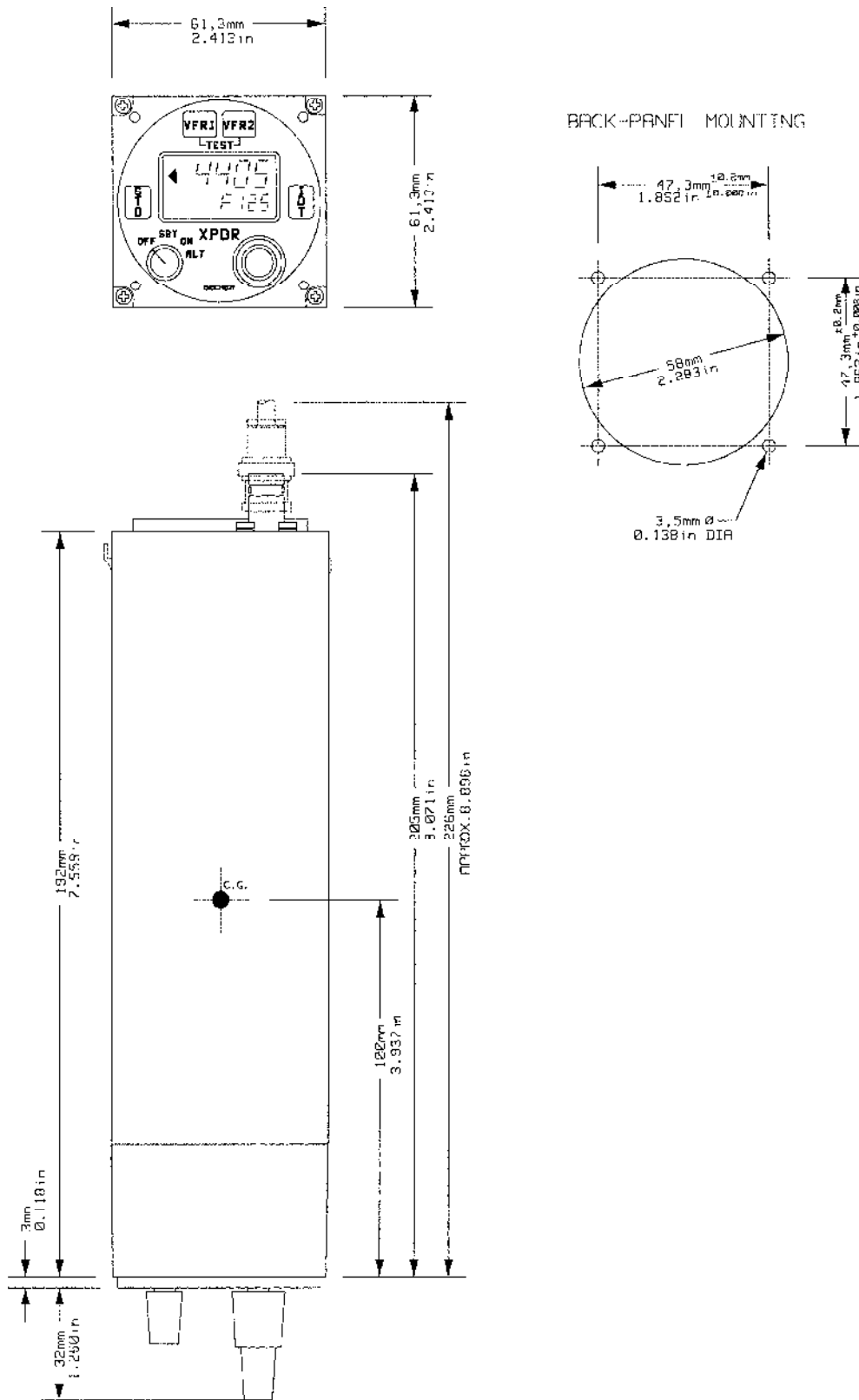


Fig. 2-1 Installation dimensions ATC 4401-1

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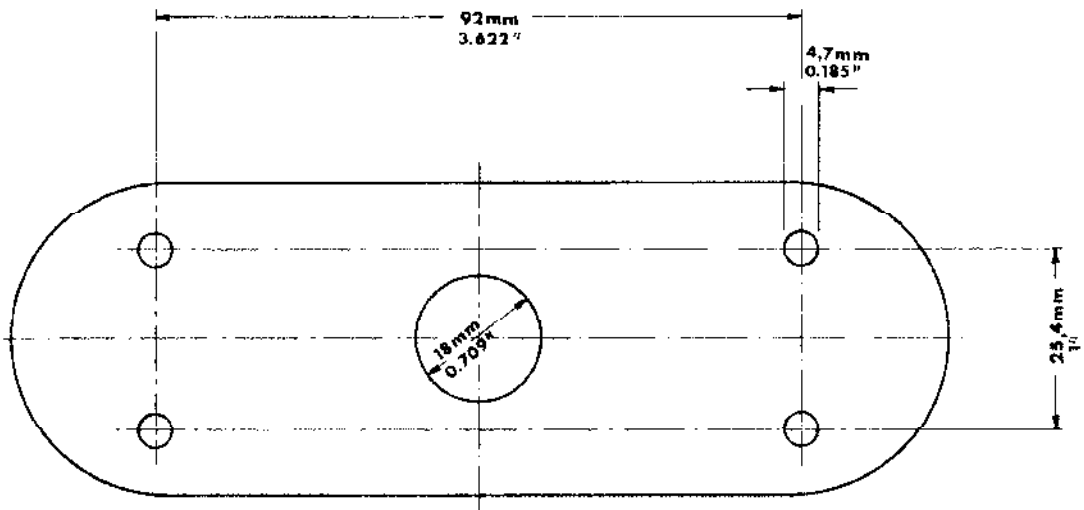
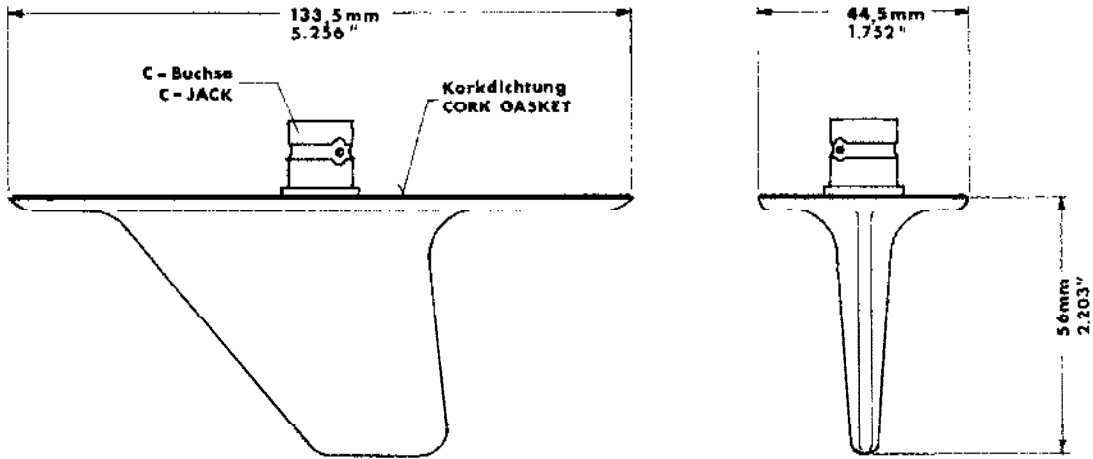


Fig. 2-2 Installation dimensions DMNI 70-1

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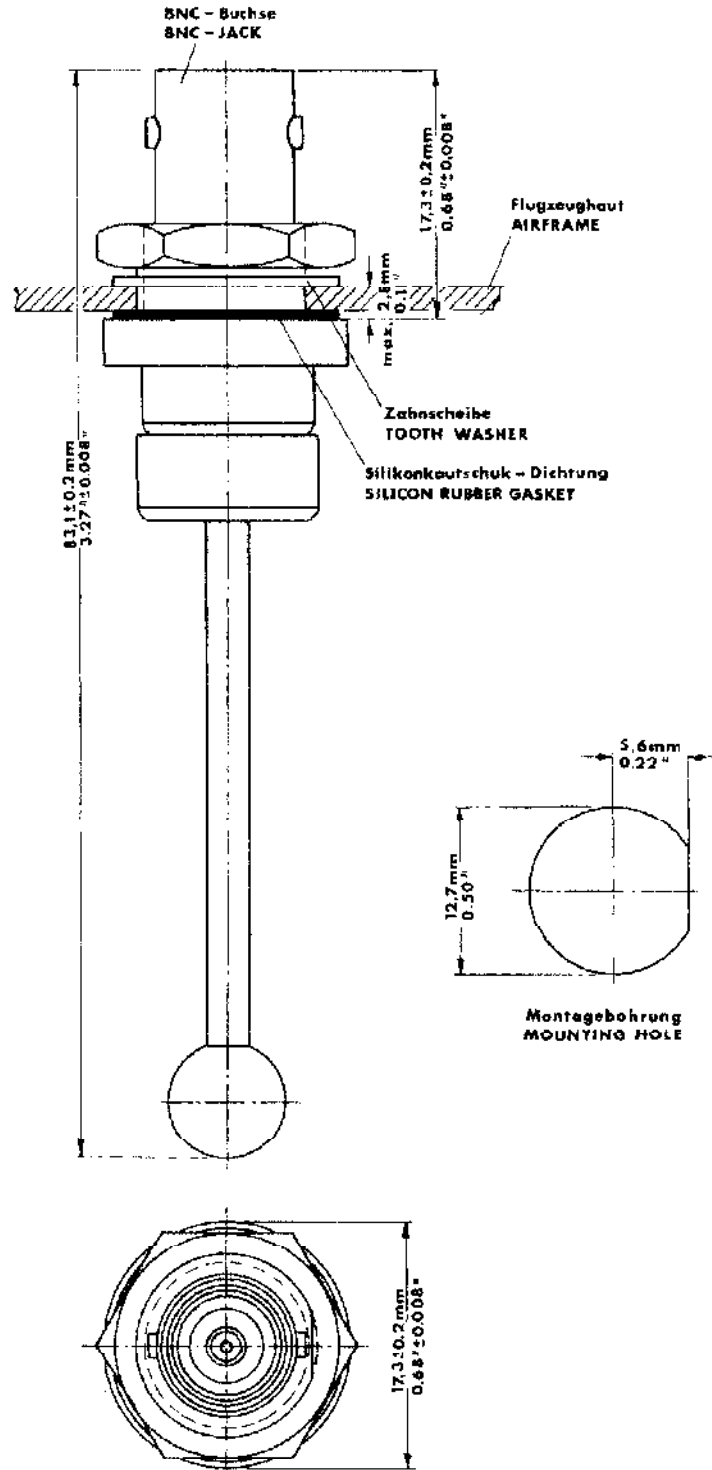


Fig. 2-3 Installation dimensions ANT 2000

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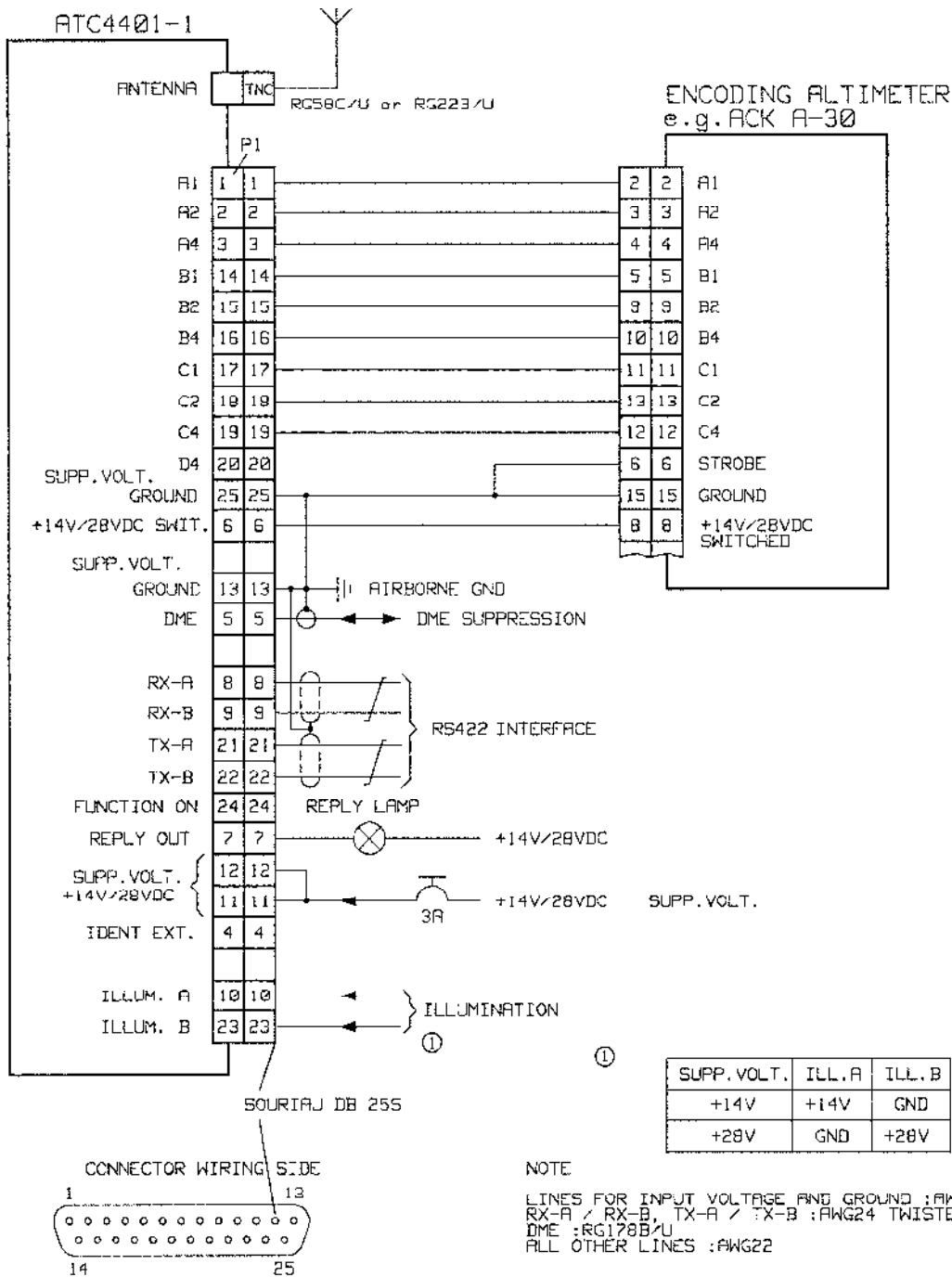


Fig. 2-4 Installation wiring ATC 4401-1 with encoding altimeter

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OPERATION

1. Controls and indicators

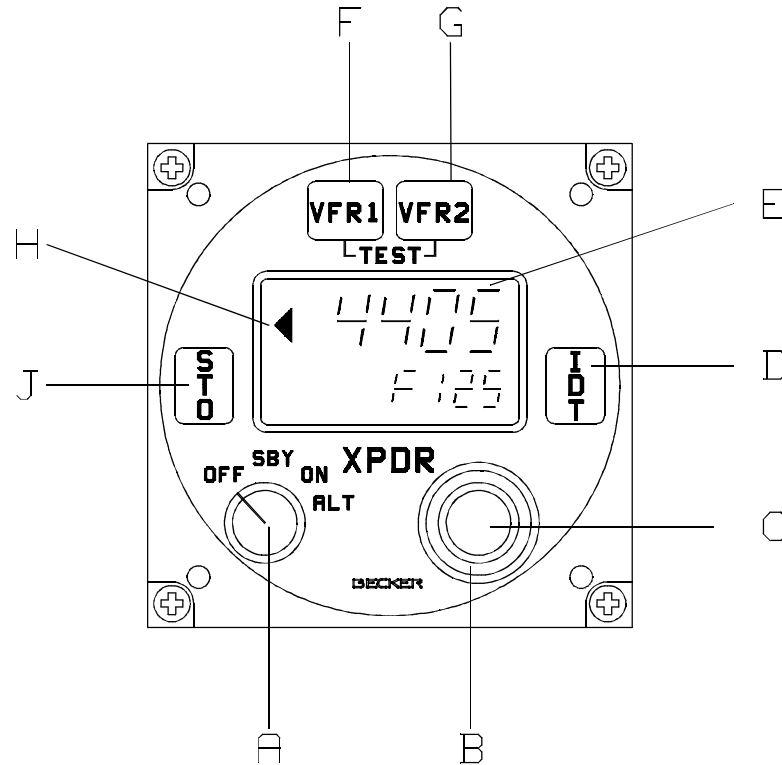


Fig. 3-1 Front view of the ATC 4401-1

2. Function of controls and indicators

- | | |
|--|--|
| <p>A OFF/SBY/ON/ALT rotary mode switch with 4 detent positions</p> | <p>OFF position : Transponder is switched off (except panel lighting).</p> <p>SBY position : Standby mode is switched on.</p> <p>ON position : Mode A is switched on.</p> <p>ALT position : Mode A+C is switched on.</p> |
| <p>B Rotary coding switch with 8 detents positions, continuously rotatable</p> | <p>Control of the cursor in one of the 4 code digits or from the display field.</p> |
| <p>C Rotary coding switch with 8 detents positions, continuously rotatable</p> | <p>Setting the code digits from 0 to 7.</p> |

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- | | | |
|---|---------------------------|--|
| D | Ident push-button
IDT | In Mode A and Mode A+C this triggers the transmission of an identification impulse additional to the Mode A reply code for approx. 18 seconds. During this time "Idt" appears in the bottom line of the LC display. |
| E | 2-line LC display | <p>Code indication (top line) :
Codes from 0000 to 7777 are possible.</p> <p>Mode indication (bottom line) :
SBY mode:
"SbY" is displayed.</p> <p>Mode A (ON):
"On" (can be changed in the configuration mode) appears in the display. "Idt" is displayed for the duration of the identification function.</p> <p>Mode A+C (ALT):
If a valid altitude is present, the flight level (height in steps of 100 ft) preceded by F (e.g. "F241 = 24100 ft) appears. If no valid altitude code is present, "F---" is displayed. The flight level display can be switched off in the configuration mode. "Idt" is displayed for the duration of the identification function.</p> |
| F | Code push-button
VFR1 | Activates a first user-specific VFR code. |
| G | Code push-button
VFR2 | Activates a second user-specific VFR code. |
| H | Reply indication
REPLY | The triangle signals a Transponder reply. |
| J | Store push-button
STO | Stores user-specific VFR codes or changes in the configuration mode. |

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3. Operating instructions for the transponder

A. Switching on the unit (pre-flight check)

- (1) Check that the circuit breaker is set and switch on the aircraft power supply .

CAUTION : Do not switch on the transponder if the motors or engines are being started or shut down.

- (2) Using mode switch (A), switch the transponder from OFF to SBY. A test then follows automatically for 3 seconds. The display is flashing with all digits and the unit is subject to a self-test simultaneously.
- (3) After the switch-on test has elapsed and no error-message is written in the display, the transponder switches to the mode set on the mode switch (A).

B. Flight operation in Mode A (transponder reply code only)

- (1) The transponder remains switched in the standby mode until requested by the ground station (ATC) to transmit a code, e.g. "squawk alpha 6426".
- (2) Check the code display. Do not set a code with 75xx / 76xx / 77xx. These codes are reserved for emergencies.
- (3) Using the double rotary switch (B,C) set the 4-digit code requested by ATC as follows :
 - (a) Using switch (B) move the cursor to the particular digit. Digits 0 to 7 can then be set using switch (C).

NOTES : If switch (B) is turned clockwise or counter-clockwise, the cursor is moved one position to the right or the left. The cursor appears only in the code display and is indicated by the flashing digit. If no cursor is visible, the first digit flashes after a clockwise rotation and the last digit after a counter-clockwise rotation. When the code is being changed in the ON or ALT position, the transponder temporarily switches to the standby mode.

The active time of the cursor and the rate of flashing can be changed in the configuration mode.

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- (b) If the cursor is not moved again within of 3 seconds (can be changed in configuration mode) or if the cursor is moved so far that it can no longer be seen in the display field or the identification switch is pressed (in the ON or ALT mode), the code currently set is switched active.

NOTES : Whilst settings are taking place, the transmission branch of the transponder is inhibited to prevent unintentional transmission.

If only two digits were named by ATC, e.g. "Squawk alpha 64", then a zero is to be used for positions three and four, i.e. "6400".

- (4) Set mode switch (A) from SBY to ON. The transponder immediately replies with the set code. A triangle on the left next to the code signals the transponder replies.
- (5) After a "squawk ident" request from ATC, press Ident button IDT (D) briefly. This transmits an additional special pulse (SPI) for approx. 18 seconds, which enables the aircraft to be clearly identified on the radar screen of the controller. "Idt" appears in the bottom line of the LC display during this time.
- (6) The last used code is stored in each case and is also activated when the transponder is switched on.

C. Flight operation in Mode A+C (reply code and altitude code)

- (1) ATC requests the transmission "alpha/charlie" or "charlie", switch the transponder to ALT using mode switch (A).

NOTE : This only makes sense if the transponder is connected to a coding altimeter. If not, tell ATC that you do not have mode C ("mode charlie not available").

- (2) The transponder replies using the code set under section B and in response to mode C requests it transmits the flight level of the aircraft to ATC. A triangle on the left next to the code signals the transponder replies.
- (3) After a "squawk ident" request from ATC, press Ident button IDT (D) briefly. This transmits an additional special pulse (SPI) for approx. 18 seconds, which enables the aircraft to be clearly identified on the radar screen of the controller. "Idt" appears in the bottom line of the LC display during this time.

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- (4) In a normal installation the blind encoder is only powered if the transponder is not switched OFF (at least SBY).

A blind encoder needs a warm-up time (sometimes a several minutes).

Therefore although the solid state transponder needs no warm-up time, turn the transponder to SBY immediately after starting the engine.

D. Special VFR codings

- (1) Two user-specific VFR codes can be stored and activated on the transponder.

- (2) Storing a new VFR code

- (a) Set the code to be stored in accordance with section B.
- (b) Press store push-button STO (J), the set code then flashes.
- (c) Press the VFR1 push-button (F) or the VFR2 push-button (G) within 3 seconds to store the code under the corresponding button.
- (d) If neither button (F) or (G) is pressed within 3 seconds, the flashing stops and the storage operation is aborted.

NOTE : If one of the two buttons (F) or (G) is pressed without the STO button having been pressed beforehand, then the stored code allocated this button appears in the code display and is switched to active after 3 seconds (can be changed in the configuration mode). If the same button is again pressed within 3 seconds, the previous code appears.

- (3) Activation of the VFR codes

- (a) Press the VFR push-button 1 or 2 (F, G). The selected code is then displayed. After 3 seconds, the displayed code becomes active and overwrites the previously-set reply code.
- (b) Pressing button (F) or (G) again within 3 seconds reactivates the previously-set reply code.

NOTE : When the unit is delivered, the store buttons are not assigned a code. This means that if these buttons are pressed for 0.5 seconds, "----" is shown in the code display and the transponder then switches back to the previously-active code.

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E. Special codings for air emergencies

- (1) Special codings, which depend on the type of incident, are stipulated for certain air emergencies :
 - 7500 Hijacking of the aircraft
 - 7600 Failure of radio communications
 - 7700 Emergency on board which constitutes an immediate danger to the aircraft
- (2) The code evaluation devices of the radar systems automatically alarm the controllers at the radar screens immediately if one of these special codes is received.
- (3) Unintentional transmission of an emergency code is prevented in that the transponder replies are inhibited whilst the code is being set. This applies particularly where the new code is being set in the ON or ALT modes. Also if a special code is called up, no transponder reply takes place during the period in which the previous code can be reactivated (approximately 3 seconds).

F. Test

The following different tests are integrated in the transponder or can be triggered at the transponder :

- (1) Automatic switching-on test, in which the display (E) is flashing with all digits for 3 seconds. The unit is subject to a self-test in this time.
- (2) A permanent test runs in the background of the transponder operation. The built-in FPGA organizes the required resources for this. The transmitter recognizes a mismatching or own abnormal behavior and delivers an alarm signal to the FPGA.
- (3) A further test of the unit is triggered, if the VFR1 button (F) and VFR2 button (G) are pressed simultaneously. At this test all segments must flash into display (E) as long as the buttons are pushed. Additionally the transmitter and evaluation are tested on correct function in the SBY, ON and ALT modes.
- (4) In case of a failure appears the report e.g. "E10" in the top line of the display. Switch OFF the transponder at such "E" fault indications.

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G. Configuration mode

- (1) The configuration mode is used to set the unit on the ground and must not be called up in flight.
- (2) The configuration mode is activated as follows :
 - (a) Switch the mode switch (A) from OFF to SBY and press and hold the VFR1 button (F) at the same time until flashing off. After the display test (3 seconds), the software version number (e.g. 1 00) is displayed for 2 seconds in the bottom line.
 - (b) The parameter number can be set in the code display (top line) using rotary switch (B) and the parameter value in the mode display (bottom line) using rotary switch (C).
 - (c) The following parameter settings are possible :

P-No	Description	Parameter (value)	Operation
P01	Reset to factory setting	1	no change
		2	all parameters to standard, (memory blank = "----")
P02	Flight level (FL) display with Mode C (bottom line of display)	1	FL is suppressed
		2 (standard)	FL is displayed
P03	Cursor flashing frequency	1	Flashing frequency 0.5 Hz
		2 (standard)	Flashing frequency 1 Hz
P04	Cursor active time	3 s (standard) 1 s (min.) 5 s (max.)	in second steps
P05	Delay time for activation of code	3 s (standard) 1 s (min.) 5 s (max.)	in second steps
P06	Delay time for return to previous code	3 s (standard) 1 s (min.) 5 s (max.)	in second steps
P07	Display "On" in Mode A (bottom line of display)	1	no indication
		2 (standard)	"On" is displayed
P08	Idt time	15 s (min.) 18 s (standard) 30 s (max.)	in second steps

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- (3) Press store button (J) to leave the configuration mode and store the set values. This stores the new parameters and the transponder changes to the mode set by mode switch (A).
- (4) If a key other than the memory button (J) is pressed, "FAIL" appears for 2 seconds in the code display. This occurs without influencing the previous operation, i.e. programming can then be continued.
- (5) To leave the configuration mode without storing, set mode switch (A) to OFF. This switches off the transponder and changes in the configuration mode are not stored.

Example for unit configuration:

