

# **Control Unit**

## **CU 5401 - ( )**

### **INSTALLATION AND OPERATION**

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# BECKER

AVIONIC SYSTEMS

## INSTALLATION AND OPERATION

CU 5401 - ( )

### RECORD OF REVISIONS

REV. NO.	ISSUE DATE	INSERTED		REV. NO.	ISSUE DATE	INSERTED	
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GENERAL DESCRIPTION

1. Application

Together with the the ATC 3401 - (1) -R remote control transponder the CU 5401 - ( ) forms the aircraft part of the air traffic control radar beacon system.

2. General description

- A. The CU 5401 - ( ) control unit is designed for installation in the instrument panel of aircraft. The dimensions of the unit correspond to the ARINC standard for instruments.
- B. All controls are located on the front panel of the unit. The 15-pole unit connector is mounted on the back of the control unit.
- C. The control unit contains the display board, switch board, processor board and power supply board electrical assemblies.
- D. The CU 5401 - ( ) control unit in conjunction with the ATC 3401 - (1) - R remote control transponder enables the following modes to be operated:
  - (1) Standby mode (SBY)
  - (2) ON mode (Mode A) whereby the code set on the control unit is sent back in reply to interrogation from a ground station.
  - (3) ALT mode (Mode C) whereby the coded flight level is also transmitted in addition to the facilities of Mode A. This requires a coding altimeter to be connected to the transponder.
  - (4) Identity transmission using the IDENT button. The identifying impulse transmitted (SPI impulse) enables the aircraft to be immediately identified on the radar screen of the air traffic controller.
  - (5) Test function of the unit by pressing the VFR and CODE buttons simultaneously.

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3. Technical data

Supply voltage	13.75 to 27.5 V.d.c.
- in emergency mode	10 V.d.c.
Current consumption (without panel lighting)	≤ 60 mA at 13.75 V ≥ 60 mA at 27.5 V
Panel lighting	≤ 160 mA at 13.75 V ≥ 80 mA at 27.5 V
Altitude max.	35,000 ft
Operating temperature range	- 20° C to + 55° C (short-time + 70° C)
Environmental class	DO-160C Env. Cat. (A1C1)- BA(MN)XXXXXXXXZBABATAXXX
Dimensions H x W x D	61.3 x 61.3 x 62 mm
Weight	0.26 kg

4. Approvals

LBA no.:	10.930/54JTSO
BAPT no.:	A133695K

5. Available models

CU 5401-(1)-X01, Bel. 14/28V, red-orange	Part-No. 0503.797-915
CU 5401-(1)-X11, Bel. 14/28V, blue-white	Part-No. 0508.497-915

6. Accessories (not included in scope of delivery)

Unit cable socket 15-pole (crimp version)	Part No.: 0501.794-954
Unit cable socket 15-pole (solder version)	Part No.: 0501.808-954

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INSTALLATION

1. General

The installation of the control unit depends on the type of aircraft and its equipment. Therefore, only general information can be given in this section.

2. Inspection before installation

Before installing the control unit in an aircraft, a visual examination for transport damage is to be carried out paying particular attention to the following.

- A. Dirt, dents, scratches, corrosion, broken attaching parts on the housing and housing parts.
- B. Dirt and scratches on the identification plate, front panel and marking.
- C. Dirt, bent or broken pins, cracked unit connector insert.
- D. Missing screws.

3. Mechanical installation

The control unit is designed for installation in the instrument panel or operating console of aircraft. Attachment is by means of four screws. Fig. 2-1 shows all the necessary dimensions required for installation.

4. Aircraft wiring

Fig. 2-2 shows the wiring of the CU 5401 - ( ) control unit with the ATC 3401-(1)-R transponder. The details of cable cross-sections and shielding given in the illustration are to be complied with.

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5. Test after installation

A. General

Carry out the following functional test after installation of the control unit and transponder.

B. Preflight check using test function

Switch the transponder from OFF to SBY using the mode switch. A display test then automatically takes place for 3 seconds. A complete test function is not possible until the warm up time (30 seconds) has elapsed. The test is initiated by simultaneously pressing the VFR and CODE buttons.

If a fault is detected by the test function, this is indicated as follows after both buttons are released.

E1 = ROM fault

E3 = EEPROM fault

E5 = Interface fault

E6 = RAM fault

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BACK-PANEL MOUNTING

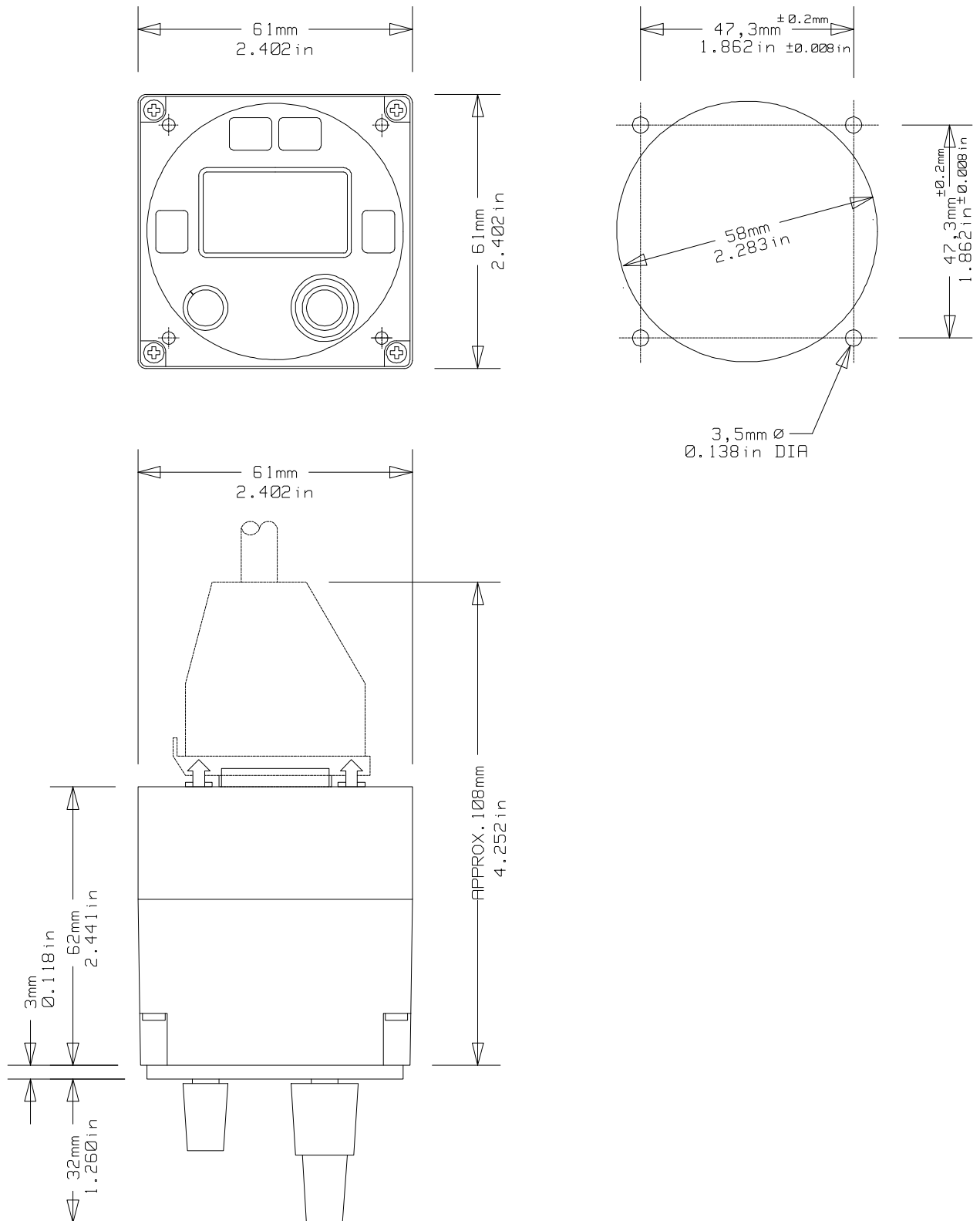
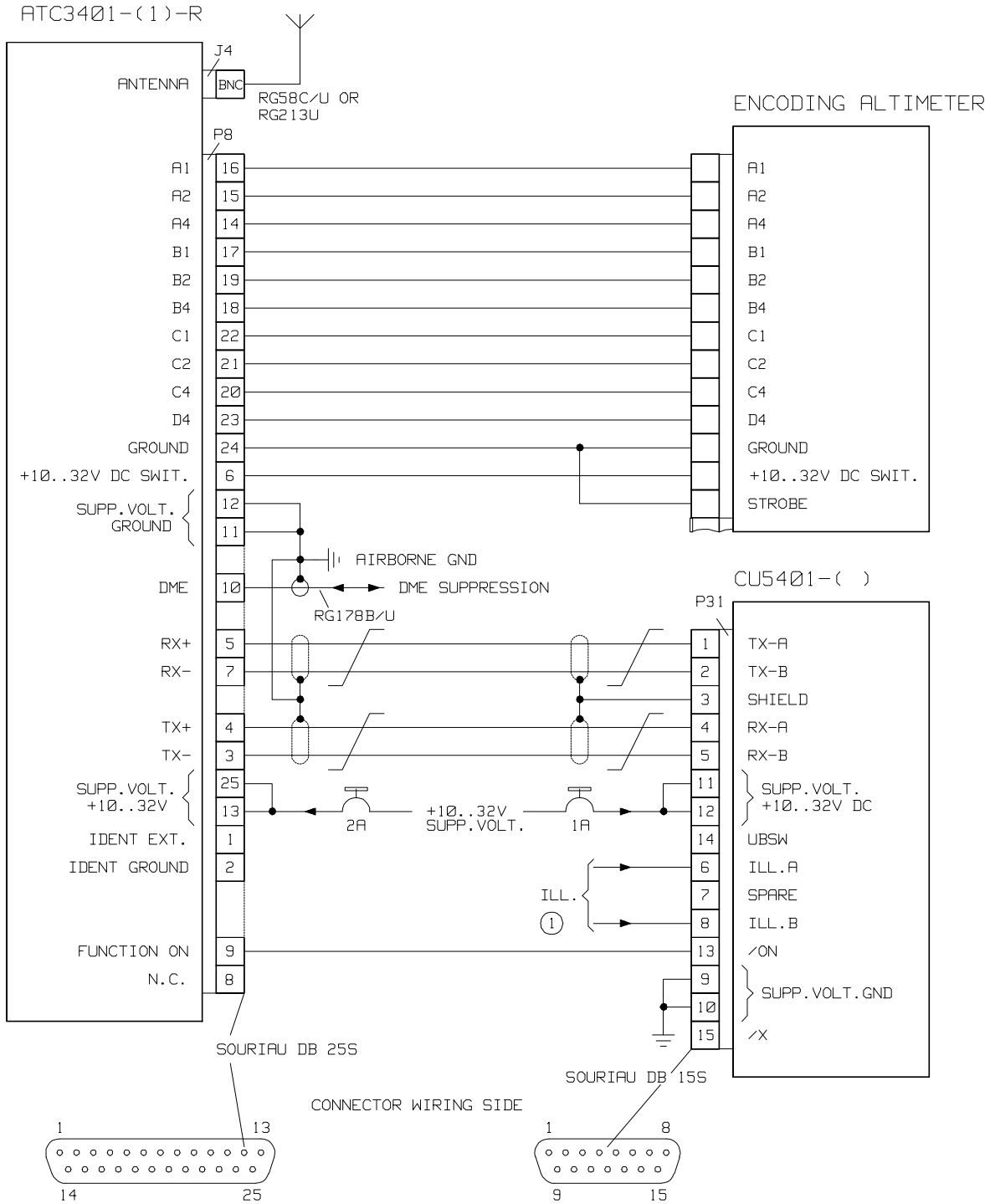


Fig. 2-1 Installations dimensions Control unit CU 5401-( )

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#### NOTE

ALL LINES EXCEPT  
 INPUT VOLTAGE AND GROUND :AWG22  
 FOR INPUT VOLTAGE AND GROUND :AWG20  
 FOR RX, TX :AWG24 TWISTED AND SHIELDED  
 DME,FUNCTION ON :RG178

SUPP. VOLT.	ILL. A	ILL. B
+14V	+14V	GND
+28V	GND	+28V

Fig. 2-2 Interwiring diagram CU 5401-( ) with Transponder ATC 3401 - (1) - R

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OPERATION

1. Controls and indicators

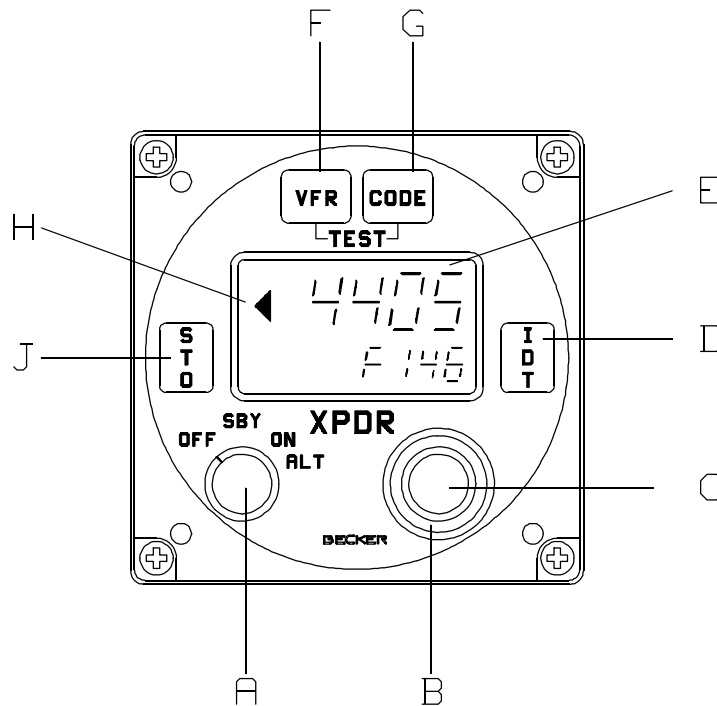


Fig. 3-1 Front panel of CU 5401 - ( )

2. Function of controls and indicators

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

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D	Identification push-button IDT	In the ON and ALT modes this triggers the transmission of an identification impulse additional to the Mode A reply code for approximately 25 seconds. During this time Idt appears in the bottom line of the LC display.
E	2 line LC display	Code indication (top line):  Codes from 0000 to 7777 are possible.  Mode indication (bottom line):  SBY mode: "SbY" is displayed. This display flashes during the warm up phase, i.e. for 30 seconds after power on.  ON mode: "On" (can be changed in the configuration mode) appears in the display. Idt is displayed for the duration of the identification function.  ALT mode: If a valid altitude code is present, the flight level (height in steps of 100 ft) preceded by F (e.g. "F241 = for 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.
F	Code pushes-button VFR	Activates a user-specific VFR code.
G	Code push-button CODE	Activates a user-specific transponder reply code.
H	Reply display REPLY	The triangle signals a transponder reply and/or activation of the identification function.
J	Store push-button STO	Stores user-specific transponder codes or changes in the configuration mode.

3. Operating instructions for the transponder

- A Switch on the unit (preflight check)
- (1) Check that the circuit breaker is set and switch on the aircraft power supply.  
  
**WARNING:** Do not switch on the transponder if the motors or engines are being started or shut down.
  - (2) Using the mode switch (A), switch the transponder from OFF to SBY. A display test then follows automatically for 3 seconds.

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- (3) The transponder is in the warm up phase for 30 seconds after power on. After the display test (3 seconds) has elapsed, "SbY" flashes for 27 seconds in the mode display. The transponder cannot transmit during this time.
- (4) After the warm up phase has elapsed, the transponder switches to the mode set on the mode switch (A).

B. Flight operation in the ON mode (transponder reply code only)

- (1) The transponder remains switched in the standby mode until requested from the ground station (ATC) to send 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 counterclockwise, the cursor is moved one position to the left or the right. 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 counterclockwise 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.

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

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- (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 (D) briefly. This transmits an additional, special impulse (SPI) for approximately 25 seconds, which enables the aircraft to be clearly identified on the radar screen of the controller. It 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.
- (7) During the approach, ATC normally gives the instruction "squawk standby". The transponder must then be immediately switched to SBY using mode switch (A), because the high transmission power of the unit can cause disturbance on the radar screen. The transponder remains in the standby mode until a new instruction to transmit is received.

C. Flight operation in the ALT mode (reply code and altitude code)

- (1) If ATC requests the transmission of "alpha/charly" or "charly", 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 a mode C ("mode charly 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 the ident button (D) briefly. This transmits an additional special impulse (SPI) for approximately 25 seconds which enables the aircraft to be clearly identified on the radar screen of ATC. It appears in the bottom line of the LC display during this time.
- (4) During the approach, ATC normally gives the instruction "squawk standby". The transponder must then be switched to SBY using mode switch (A), because the high transmission power of the unit can cause disturbance on the radar screen. The transponder remains in the standby mode until a new request to send is received.

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D. Special codings

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

Button (F) : User-defined VFR code  
Button (G) : User-defined transponder code

- (2) Storing a new code

- (a) Set the code to be stored in accordance with section B.
- (b) Press store button (J), the set code then flashes.
- (c) Press the VFR button (F) or CODE button (G) within 3 seconds to store the code under the corresponding button.
- (d) If neither button (F) nor (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 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 a memory code

- (a) Press the VFR button (F) or CODE button (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. Test

- (1) A complete test function is only possible after the warm up phase has elapsed. The test is activated by simultaneously pressing the VFR (F) and CODE (G) buttons. All digits in the display flash. If the test function detects faults, these are displayed as follows after both buttons (F) and (G) are released.

E 1 = ROM fault  
E 3 = EEPROM fault  
E 5 = Interface fault  
E 6 = RAM fault

F. Special codes for air emergencies

- (1) Special codes, which depend on the type of incident, are stipulated for certain air emergencies.

- 7500 Hijacking of the aircraft
- 7600 Failure of radio communication
- 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 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).

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) Press and hold the CODE button (G) and at the same time switch mode switch (A) from OFF to SBY. After the display test (3 seconds), the software version numbers are displayed for approx. 2 seconds :

On the left, two positions of the version number of the transponder.  
Right two positions of the version number of the control unit.

- (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).

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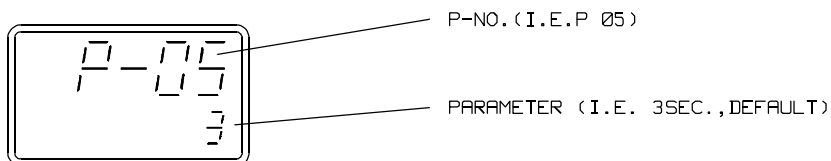
(c) The following settings are possible :

P number	Description	Parameter (value)	Operation
P 01	Reset to factory setting	1	No change
		2	All parameters to standard (memory blank = "----")
P 02	Flight level (FL) display with Mode C (bottom line of display)	1	FL is suppressed
		2 (standard)	FL is displayed
P 03	Cursor-flashing frequency	1	Flashing frequency 0.5 Hz
		2 (standard)	Flashing frequency 1 Hz
P 04	Cursor active time	3 s (standard) 1 s (min.) 5 s (max.)	
P 05	Delay time for activation of code	3 s (standard) 1 s (min.) 5 s (max.)	
P 06	Delay time for return to previous code	3 s (standard) 0 s (min.) 5 s (max.)	
P 07	Display "On" in Mode A (bottom line of display)	1	No display
		2 (standard)	"On" is displayed

- 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.

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Example of a unit configuration :



G. Safety precautions

- Do not connect the control unit to an a.c. voltage or voltage source of more than 32.2 V.d.c.
- Do not connect the control unit to a power source with the polarities incorrect.
- Avoid installing and using the control unit in environmental temperatures below - 20° C and over + 55° C.
- Switch off the unit when starting or shutting down motors or engines.
- The control unit should be protected from the aircraft system by its own 1 A circuit breaker.
- Do not set a code with 75XX/76XX/77XX. These special codes are reserved for emergencies.
- In the ON and ALT modes, the identification impulse is transmitted in addition to the reply code for approximately 25 seconds only in response to Mode A requests.