BECKER
AVIONIC SYSTEMS

Audio Control Unit

ACU 5100-(x)-(xxx)

Installation and Operation

Manual	DV 64410.03
Issue 3	February 2004

FIRST ISSUE AND CHANGES

Issue . . . . . 3 . . . . . February 2004

LIST OF EFFECTIVE PAGES

Page No.:	Date :	Page No.:	Date :
Title	02/2004		
i-1 - i-2	02/2004		
1 -I - 1-II	02/2004		
1-1 - 1-8	02/2004		
2-I - 2-II	02/2004		
2-1 - 2-8	02/2004		
3-I - 3-II	02/2004		
3-1 - 3-22	02/2004		

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SAFETY INFORMATION

For the safe operation of Audio Control Unit ACU 5100 the following notes have to followed :

- Do not connect the unit to an a.c. voltage or voltage source of more than 30.3 V d.c.

- Do not connect the unit to a power source with the polarities incorrect.

- The unit should be protected from the aircraft system by its own 1 A circuit braker.

- A speech test is to be performed before startup.

- Use a loud voice for speech communication and hold the microphone close to the lips. Otherwise cabin noise can be intrisive and make understanding difficult.

- Use only microphone or headsets which are suitable for use in the aircraft.

   Additional instructions :

- Additional safety instructions in this manual shall also be complied with.

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ACU 5100

TABLE OF CONTENTS

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Section 1 GENERAL INFORMATION

1.1 Introduction

The BECKER ACU 5100 Audio Control Unit is described in the "Installation and Operation" DV 64410.03 and "Maintenance and Repair" DV 64410.04 manuals.

The manuals contain the following sections :

Section		DV 64410.03	DV 64410.04
1	General Information	X	X
2	Installation	X	X
3	Operation	X	X
4	Theory of Operation		X
5	Maintenance and Repair		X
6	Ilustrated Parts List		X
7	Modification and Changes		X
8	Circuit Diagrams		X
9	List of the used Abbreviations		X

1.2 Application

The ACU 5100 audio control unit is part of the Digital Voice Communication System DVCS 5100 and provided for installation in an aircraft. It serves for the control of REU 5100 remote electronic unit. Maximum six audio control units can be connected to the REU 5100. The audio control unit is identical for each installation location (cabin, cockpit, etc.).

1.3   General description

1.3.1   Mechanical description

The ACU 5100 is designed for installation in the operator console of aircraft. The dimensions corr-espond to the ARINC 601 standard for control units. Installation is by means of four DZUS fasteners.

The two unit connectors and one unit connector jack are fitted on the back. The audio control unit con-sists of the following electrical assemblies respectively circuit boards :

- Illumination Board,
- Processor Board and connector board BG-17,
- Connector Board.

1.3.2   Electrical description

All controls and indicators of the ACU 5100 are located on the front panel :

1 rotary switch, 10 positions, to preselect the active transceiver as well as Public Address or Intercom mode. Also to select dual transmission mode if provided (option).

Up to 22 pushbuttons (momentary action), of which

- 8 monitoring buttons furnished with two LEDs each for transceivers / PA (green LED: mo-nitoring; yellow LED: transmitting)

- up to 8 monitoring buttons with LEDs for navigation receivers (green LED: monitoring)

- 1 PTT button, toggle switch (momentary action)

- 1 VOICE button with LED to switch on and off the ident filter (green LED: filter on, ident fre-quency 1020 Hz suppressed)

- 2 buttons lettered ISOL CALL, or CLR, respectively with LEDs to control the intercom functions between cockpit and cabin area and to enable RX / TX monitoring in the cabin

- 1 SPKR button with LED to switch on and off the cockpit speaker (green LED: speaker on) if speaker function is provided

- 1 TEST button to initiate the BITE for all control functions

- 1 INIT button to on/off switch for ACU initialization

1 toggle switch with locking lever lettered EMER to initiate fall-back into Back-up operation (optional).

1 dual increment sensor without detent to control main volume and using the respective TX or RX pushbutton - to set the individual RX volumes. The 2nd portion serves as IC volume control.

The functional inscriptions of key caps, rotary switch, and increment sensor are finished in white trans-lucent characters. Inscription of key caps is variable, i.e. easily changed on the complete unit. Illumina-tion is compatible with commonly used night vision goggles (NVG).

Every audio control unit has a microcontroller to process switch and button activations as well as indication signals. Control data is transferred via the Becker Bus Interface. SLAVE position (toggle switch) and Back-up toggle switch are not be routed through the interface but must be hard-wired in order to allow Back-up operation, even if the unit had failed.

Audio control units are factory configurable to different operation profiles, e.g. disabling certain transceiver or receiver accessibility in the cabin / passenger area. Audio control units may also be equipped with front panels imprinted to customer requests.
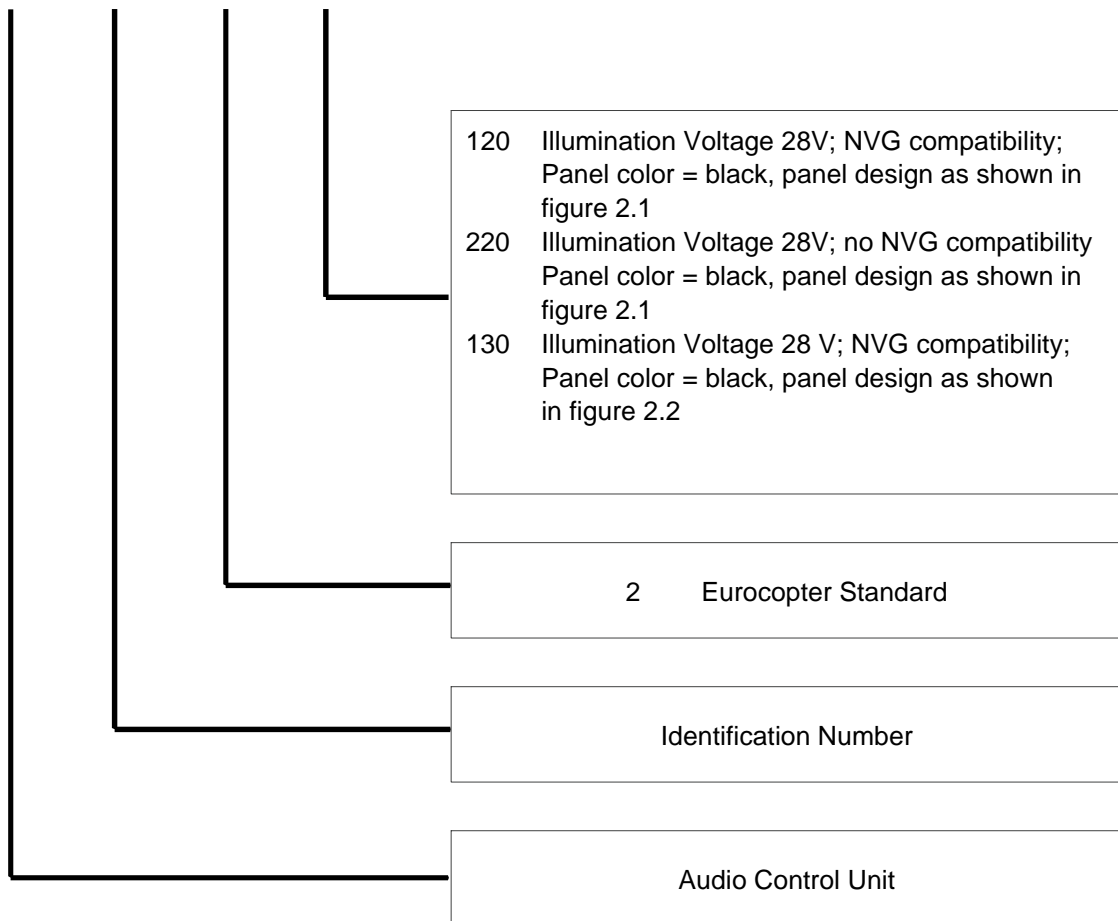
Identification of Article

Types of Audio Control Unit

Audio Control Unit   Part Number ACU 5100-(X)-(XXX)

ACU 5100-(X)-(XXX)

120	Illumination Voltage 28V; NVG compatibility; Panel color = black, panel design as shown in figure 2.1
220	Illumination Voltage 28V; no NVG compatibility Panel color = black, panel design as shown in figure 2.1
130	Illumination Voltage 28 V; NVG compatibility; Panel color = black, panel design as shown in figure 2.2

2	Eurocopter Standard

Identification Number

Audio Control Unit

1.4   Technical data

1.4.1   Power Supply

Supply voltage (Bus) I   27.5 V DC nominal
                                                               18.0 V DC emergency

Supply voltage (Bus) II   27.5 V DC nominal
                                                               18.0 V DC emergency

Current consumption (with panel illumination)   < 120 mA (one ACU)

2 dim inputs :

Illumination control voltage for NVG   0...15 V DC
Illumination control voltage for night   15...22 V DC
Illumination control voltage for day   22...27.5 V DC

1.4.2   Control data transfer ACU-REU

Interface   BBI, Becker Bus Interface

Protocol   BBP, Becker Bus Protocol

1.4.3   Mechanical data

Width   145.8 mm

Heigth   75.8 mm

Depth   108.8 mm

Standard   ARINC 601

Weight   ≤ 600 g

Mounting   D-ZUS

1.4.4   Unit connectors

- connector P1   10-pol. series 851
- connector P2 (B-Bus)   19-pol. series 851
- locking device   bajonet

1.4.5   Environmental conditions

Input voltage range   22.0 to 30.3 V DC
- nominal input voltage   27.5 V DC
- emergency input voltage   18.0 V DC

Operating temperature   -40° C … +70° C

Storage temperature   -55° C … +85° C

Altitude max.   50,000 ft.

Humidity rating   RTCA DO-160D, Cat. B,

Vibration   RTCA DO-160D, Cat. S,
                                                          vibration curves M
                                                          RTCA DO-160D, Cat. U,
                                                          vibration curves F/F1

Operational shock   6 g in all direction

Crash safety   20 g shocks
                                                          20 g acceleration

Compass safe distance magnetic effect   no influence at a distance
                                                          of 30 cm, EUROCAE /
                                                          RTCA ED-14D/DO-160D Class Z

Environmental categories :

EUROCAE/RTCA ED-14D/DO-160D
Env.Cat. [D1-]BB[(BR)][(SM)(UF/F1)]XXXXXXZBAAA[VVR]M[A3E3]XXA

1.5   Software

All data for ACU 5100 is stored in the microcontroller. If the control elements are altered, a data transmission immediately takes place to the remote electronic unit. The software is classed as level C in accordance with the EUROCAE / RTCA document ED12B / DO-178B.

ACU 5100

1.6 Approvals

LBA-No.: TBD

JAR TSO   JTSO - C50c Audio Selector
                                                          Panels and Amplifiers

Software   EUROCAE/RTCA DO-178B/
                                                          ED-12B Level C

1.7 Environmental qualification (EUROCAE/RTCA ED-14D/DO-160D)

Characteristic ED-14D/DO-160D	Section	Category	Condition
Temperature / Altitude	4.0	D1	
Low ground survival temperature	4.5.1	D1	-55° C
Low operating temperature	4.5.1	D1	-40° C
High ground survival temperature	4.5.2	D1	+85° C
High short-time operating temperature	4.5.2	D1	+70° C
High operating temperature	4.5.3	D1	+55° C
In-Flight loss of cooling	4.5.4	-	no auxiliary cooling required
Altitude	4.6.1	D1	50,000 ft.
Temperature variation	5.0	B	5° C per minute
Humidity	6.0	B	48 h at 65°C at 95% RH
Shock	7.0	B	Test Type R in all 6 directions
Vibration	8.0	S	M
		U	F/F1
Explosion proofness	9.0	X	
Water proofness	10.0	X	
Fluids susceptibilities	11.0	X	
Sand and dust	12.0	X	
Fungus resistance	13.0	X	
Salt spray	14.0	X	
Magnetic effect	15.0	Z	less than 0.3 m
Power input (DC)	16.0	B	
Voltage spike	17.0	A	
Audio frequency conducted susceptibility	18.0	A	
Induced signal susceptibility	19.0	A	
Radio frequency susceptibility	20.0	VVR	
Emission of RF	21.0	M	
Lightning induced transient susceptibility	22.0	A3E33	
Lightning direct effects	23.0	X	
Icing	24.0	X	
Electrostatic discharge (ESD)	25.0	A	

Page 1-6   DV 64410.03/.04   Issue 3 Feb/2004

1.8 Scope of delivery

ACU 5100-(2)-(120) audio control unit (NVG)   Article-No.: 0527.025-921

ACU 5100-(2)-(220) audio control unit (SUN)   Article-No.: 0551.309-921

ACU 5100-(2)-(130) audio control unit (NVG)   Article-No.: 0546.801-921

NOTE: The variants are different by a NVG or SUN panel and by other panel markings.

1.9 Accessories (not contained in the scope of delivey)

Connector Kit CK 5102-C   Article-No.: 0586.889-954

consist of

    10-pol. cable connector, crimp   Article-No.: 0858.188-277

    19-pol. cable connector, crimp   Article-No.: 0794.279-277

CSW 5100 configuration software   Article-No.: 0543.195-909

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TABLE OF CONTENTS

Page 2-II

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Section 2 INSTALLATION

2.1 General

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

2.2 Inspection before installation

Before installing the audio control unit in an aircraft, carry out a visual inspection for any transport damage, paying particular attention to the following:

- Dirt, dents, scratches, corrosion, broken attaching parts on the housing and housing parts.

- Dirt and scratches on the identification plate, front panel and marking.

- Dirt, bent or broken pins, cracked connector inserts.

- Dirt and mechanical damage on the rotary switches, push-buttons and knobs.

- Missing screws.

2.3 Mechanical installation

The audio control unit is designed for installation in the operator console of an aircraft. The necessary dimensional details are given in Fig. 2-1. The unit is attached using four DZUS fasteners.

2.4 Aircraft wiring

2.4.1 General

The ACU connections can be see in Fig. 2-4 to Fig. 2-6 . The following points are to be observed for the wiring :

a. Only cable fit for aviation (self-extinguishing) may be used. AWG 20 for power supply and AWG 24 for other cables.

b. The interface lines are each to be laid as 2-core twisted and screened (AWG 24) cables.

c. Every single cable harness of a unit connector must get a separate screening.

d. Rubber sleeves are to be fitted over the soldering points on the unit connector.

e. No HF cable should be included in the cable harnesses. Laying connecting cables together with cables which cary AF power or impulses is also be avoided.

f. Check the wiring carefully before switching on the units, particularly that (UB+) and (GND) have not been mixed up.
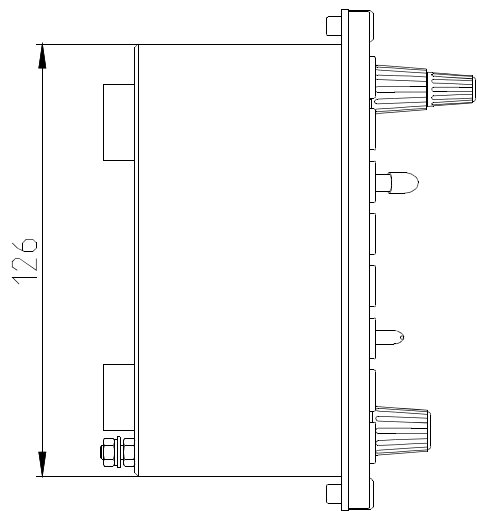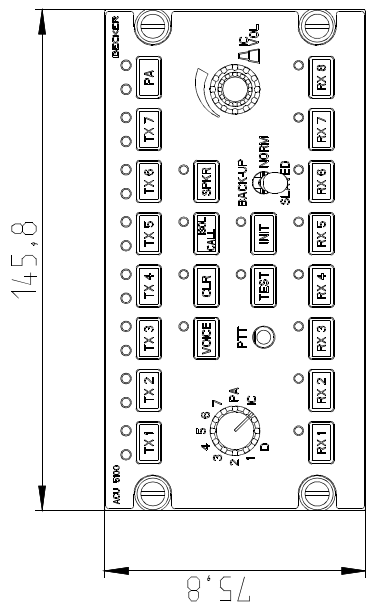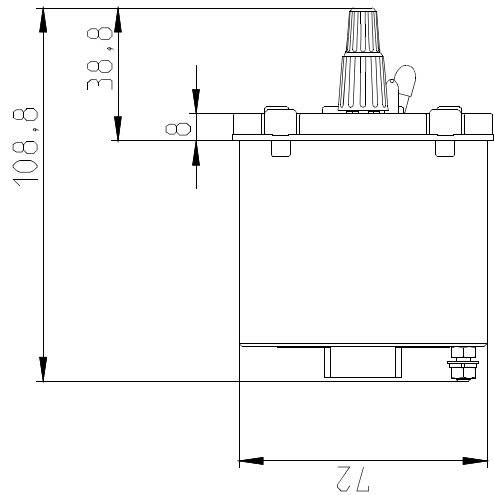
Fig. 2-1   Installation dimensions ACU 5100-(x)-(xxx) (measures in mm)
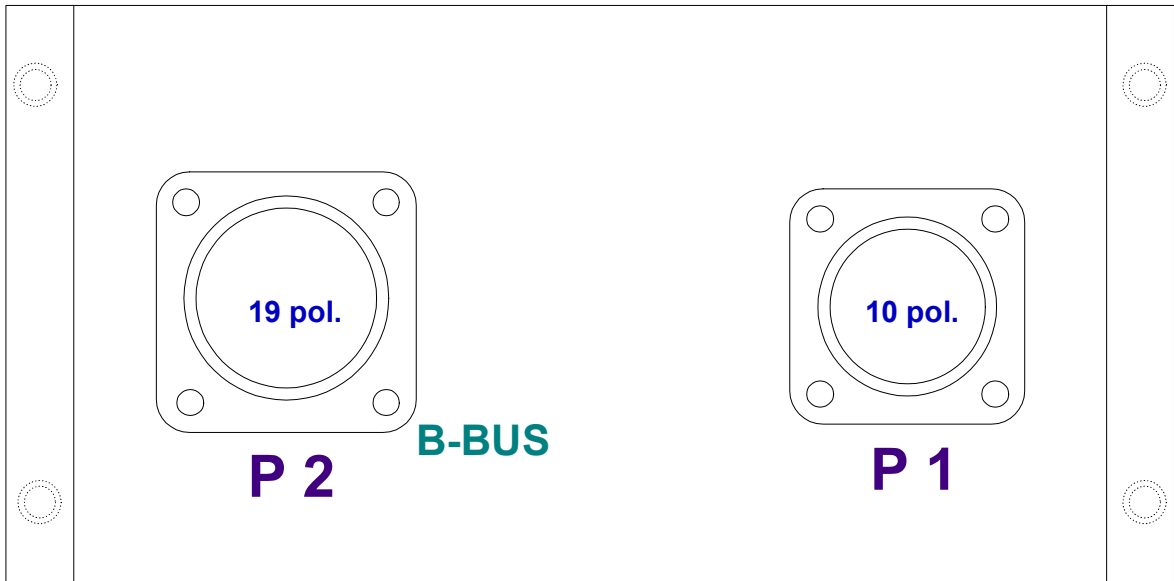
Fig. 2-2 Physical locations of ACU 5100 connectors
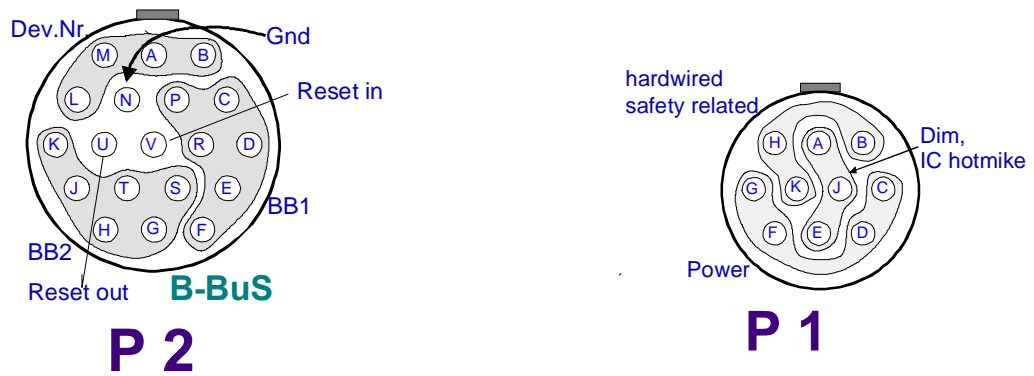
Fig. 2-3 Logical pin assignment ACU 5100

2.4.2 Panel illumination

The audio control unit is fitted with panel lighting. It can also be connected via a dimmer system.

Panel illumination connection	Remark
Plug P 1 - Pin E	Dim Control in 1
Plug P 1 - Pin A	Dim Control in 2

2.4.3 Connector pin assignments

P1   Type 851-02 E 12-10 P 50, shell 12, 10-pol., bayonet

Pin	Connection	Remark
C	DC1	+27.5 V
D	GND1	
G	DC2	+ 27.5 V
F	GND2	
H	PTT	
B	Back-up	
K	Slaved	
J	Hot mike in	
E	Dim Control in 1	
A	Dim Control in 2	brightness of LED's

P2   Type 851-02 E 14-19 P 50, shell 14, 19-pol., bayonet

Pin	Connection	Remark
L	Dev Nr Bit 0	
M	Dev Nr Bit 1	
A	Dev Nr Bit 2	
B	Dev Nr Bit 3	
U	Reset out	
V	Reset in	
N	GND	
C	BB1-HI-in	
D	BB1-LO-in	
P	BB1-SH-in	

Pin	Connection	Remark
E	BB1-HI-out	
F	BB1-Lo-out	
R	BB1-SH-out	
G	BB2-HI-in	
H	BB2-Hi-out	
S	BB2-SH-in	
J	BB2-HI-out	
K	BB2-LO-out	
T	BB2-SH-out	

ACU

DC 1 +28V C
DC 1   GND D

P1

DC 2   +28V G
DC 2   GND F
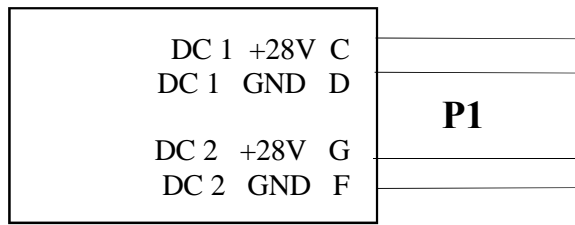
Fig. 2-4 ACU 5100 power connections

ACU

PTT H

Back Up-Switch Out B
Slave-Switch Out K

Hot Mike In J

All P1

Dim Control In 1 E
Dim Control In 2 A
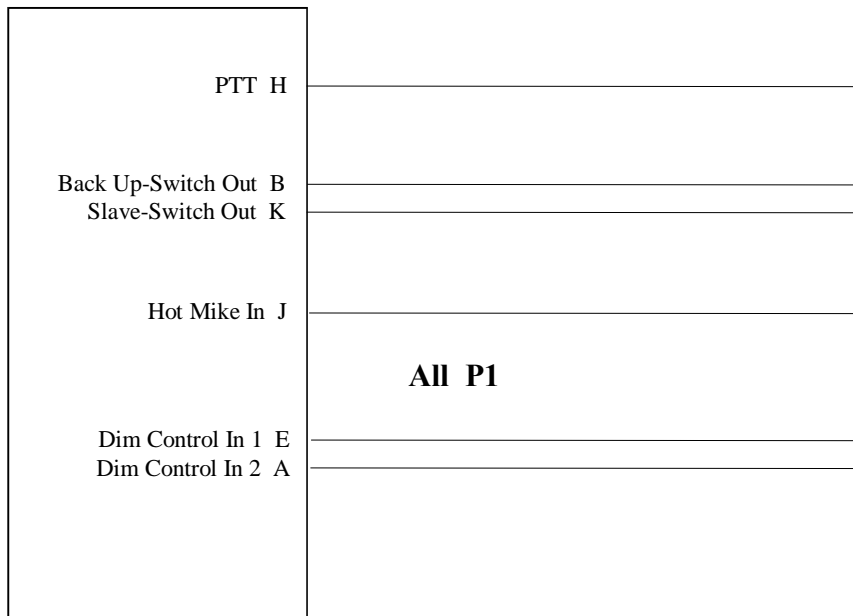
Fig. 2-5 ACU 5100 connections

2.5 Configuration software

The factory configuration of the DVCS 5100 can be changed with aid of a Personal Computer or Laptop and the software CSW 5100 (Article-No. 0543.195-909).

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Co-Pilot ACU 1

B Bit 3
A Bit 2
M Bit 1
L Bit 0
N Addr. GND

BB1 In (Hi) C
BB1 In (Lo) D
BB2 In (Hi) G
BB2 In (Lo) H
Reset In V

U Reset Out
E (Hi) BB1 Out
F (Lo) BB1 Out
J (Hi) BB2 Out
K (Lo) BB2 Out

120Ω   120Ω

Termination

Pilot ACU 2

E (Hi) BB1 Out
F (Lo) BB1 Out
J (Hi) BB2 Out
K (Lo) BB2 Out
U Reset Out

Reset In V
BB1 In (Hi) C
BB1 In (Lo) D
BB2 In (Hi) G
BB2 In (Lo) H

B Bit 3
A Bit 2
M Bit 1
L Bit 0
Addr. GND N

Cabin ACU 3

B Bit 3
A Bit 2
M Bit 1
L Bit 0
N Addr. GND

BB1 In (Hi) C
BB1 In (Lo) D
BB2 In (Hi) G
BB2 In (Lo) H
Reset In V

U Reset Out
E (Hi) BB1 Out
F (Lo) BB1 Out
J (Hi) BB2 Out
K (Lo) BB2 Out

Cabin ACU 4

E (Hi) BB1 Out
F (Lo) BB1 Out
J (Hi) BB2 Out
K (Lo) BB2 Out
U Reset Out

Reset In V
BB1 In (Hi) C
BB1 In (Lo) D
BB2 In (Hi) G
BB2 In (Lo) H

B Bit 3
A Bit 2
M Bit 1
L Bit 0
Addr. GND N

Cabin ACU 5

B Bit 3
A Bit 2
M Bit 1
L Bit 0
N Addr. GND

BB1 In (Hi) C
BB1 In (Lo) D
BB2 In (Hi) G
BB2 In (Lo) H
Reset In V

U Reset Out
E (Hi) BB1 Out
F (Lo) BB1 Out
J (Hi) BB2 Out
K (Lo) BB2 Out

Cabin ACU 6

E (Hi) BB1 Out
F (Lo) BB1 Out
J (Hi) BB2 Out
K (Lo) BB2 Out
U Reset Out

BB1 In (Hi) C
BB1 In (Lo) D
BB2 In (Hi) G
BB2 In (Lo) H
Reset In V

B Bit 3
A Bit 2
M Bit 1
L Bit 0
Addr. GND N

REU

(Hi) BB1 Out E
(Lo) BB1 Out F
(Hi) BB2 Out J
(Lo) BB2 Out K
Reset Out U

C BB1 In (Hi)
D BB1 In (Lo)
G BB2 In (Hi)
H BB2 In (Lo)
V Reset In

B Bit 3
A Bit 2
M Bit 1
L Bit 0
N Addr. GND

120Ω   120Ω

Termination

Note 1: The ends of each Bus must be terminated with 120 W. It can be in the harness or on a separate Junction Block.
Note 2: For correct operation with one ACU removed, a dummy mating connector will have to be connected in it's place.
Note 3: The wiring shields can be connected to the connector backshells.

Fig. 2-6 ACU 5100 bus connections

TABLE OF CONTENTS

Section 3 OPERATION

3.1 Operating controls
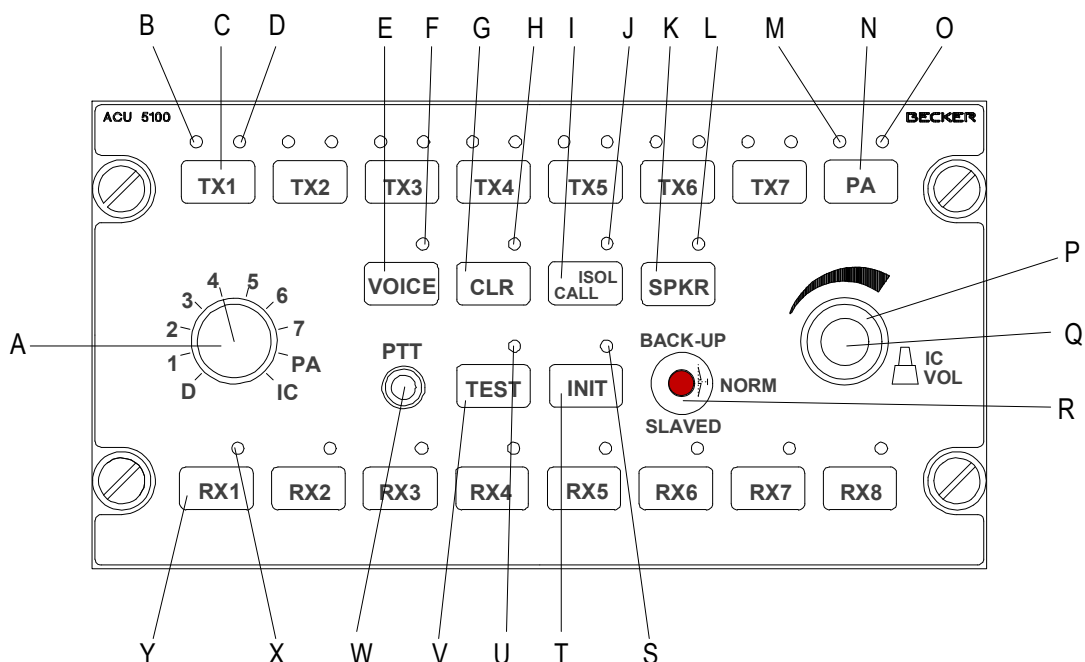
Fig. 3-1   Front panel of the Audio Control Unit with generic button-inscription

3.2 Description and function of the operating controls and indicators

Item	Control / indicator	Description	Function
A	Transmitter selector switch	Rotary switch with 10 lock positions	Position 1 to 7: Transmitting mode with PTT Position D : Dual transmitting mode with PTT Position PA: Cabin address mode with PTT Position IC: Intercom mode
B	TX indicators 1 to 7	7 LED's, yellow	Transmit mode indication for T/R units 1 to 7 LED lights up = Transmit mode
C	TX1 to TX7 buttons	7 push-buttons	On/Off switch for audio monitoring of the T/R units 1 to 7
D	Indicators TX1 to TX7	7 LED's, green	Monitoring indication for the T/R units 1 to 7: LED lights up = Audio monitoring ON LED goes off = Audio monitoring OFF LED flashing = Reception volume can be adjusted

Item	Control / indicator	Description	Function
E	VOICE button	Push-button	On/Off switch for the IDENT mode
F	VOICE indicator	LED, green	LED lights up = 1020 Hz filter ON LED goes off = 1020 Hz filter OFF
G	CLR button	Push-button	On/Off switch for enable the cabin ACU's clearence to transmit
H	CLR indicator	LED, green	LED lights up = Clearence ON LED goes off = Clearence OFF
I	ISOL CALL button	Push-button	Initiates an Intercom Request Call from cabin ACU on both cockpit ACU's
J	ISOL CALL indicator	LED, green	LED lights up = Intercom request call ON LED goes off = Intercom request call OFF
K	SPKR button	Push-button	On/Off switch for audio monitoring via the cockpit speaker
L	SPKR indicator	LED, green	LED lights up = Speaker ON LED goes off = Speaker OFF
M	PA indicator	LED, yellow	LED lights up = Public address transmit mode
N	PA button	Push-button	On/Off switch for public address activation
O	PA indicator	LED, green	LED lights up = Public address monitoring ON LED goes off = Public address monitoring OFF
P	VOL control	Rotary knob, continuously rotable	Volume adjustment of audio monitoring and VOX level adjustment
Q	IC volume control	Rotary knob, continuously rotable	Volume adjustment of intercom
R	BACK-UP switch	Toggle switch with 3 lock positions	Position NORM: Normal operation Position SLAVED: Slave operation Position BACK-UP: Emergency operation
S	INIT indicator	LED, green	LED lights up = Initialization ON LED goes off = Initialization OFF

Item	Control / indicator	Description	Function
T	INIT button	Push-button	On/Off switch for ACU initialization
U	TEST indicator	LED, green	LED flashing = Continuous Built-In Test LED lights up = Initiated Test
V	TEST button	Push-buton	Activation of test function
W	PTT switch	Toggle switch with 2 key position	Press PTT switch = Transmitter is keyed Release PTT switch = Reception
X	RX indicators 1 to 8	8 LED's, green	Receive indication for audio monitoring of the receivers RX1 to RX8 LED lights up = Receiver ON LED goes off = Receiver OFF
Y	RX1 to RX8 buttons	8 push-buttons	On/Off switch for audio monitoring of the connected receivers

3.3 Operating instructions

3.3.1 Preparations (power-up test)

1. Switch on the unit by using the audio selector master switch (circuit breaker).

2. When the Audio Control Unit is powered, the device is tested automatically during initialization ("P-BIT" , Power-up Built-In Test). All the microprocessors and memories are tested as well as data-transfer between Audio Control Units and Remote Electronic Unit, the indication LEDs on all ACUs.

3. On completion of the test and if the P-BIT has not detected any defects, the green TEST LED lights up continuously for 5 seconds.

3.3.2 Radio operation

3.3.2.1 Radio monitoring

For radio monitoring, the transceiver is selected by means of the respective monitoring button :

1. Press key briefly → monitoring ON, associated green LED lights up.

2. Press key briefly once more → monitoring OFF, LED goes off.
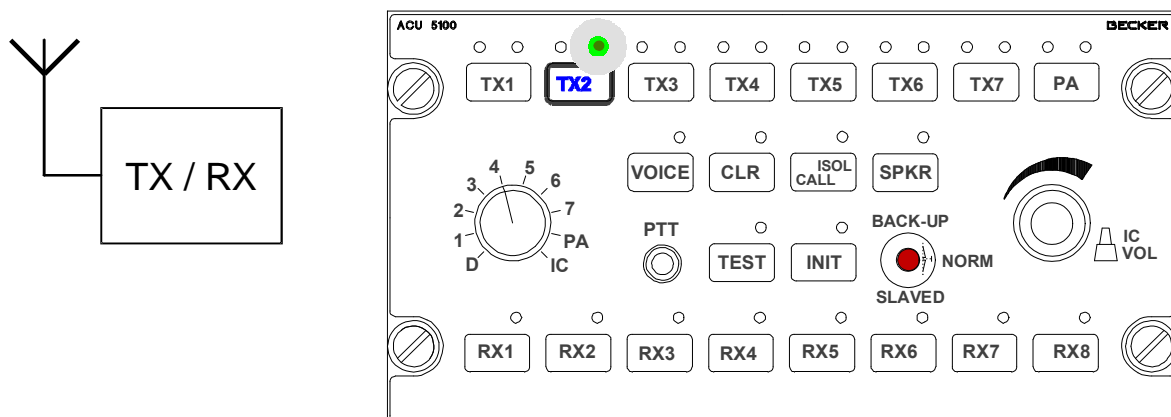
Several transceivers may be selected for monitoring at the same time.

3.3.2.2 Individual volume adjustment
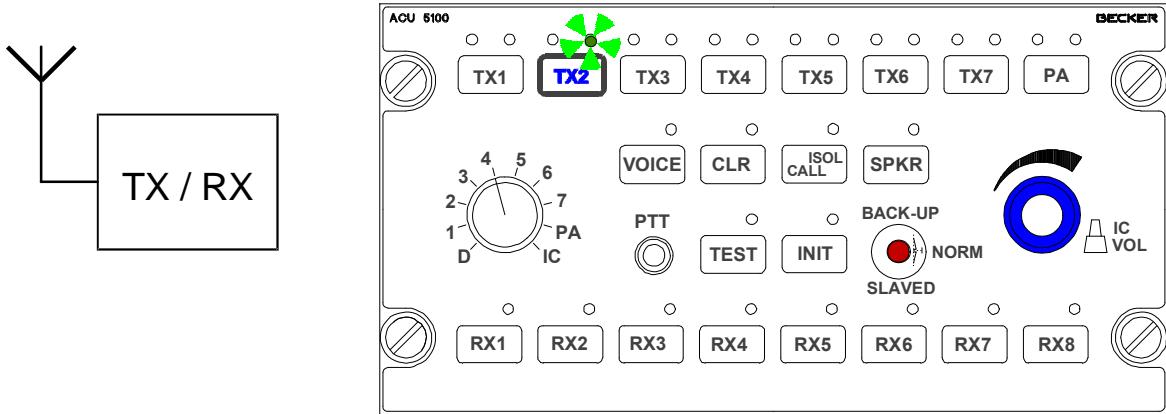
1. Press monitoring key somewhat longer , either in OFF state or during monitoring → reception volume can be adjusted using the VOL incremental sensor as long as the green LED above the button is flashing.

2. The LED is flashing after keyhold or VOL sensor action. Flashing can be stopped manually by pressing the monitoring key.

3. The LED stops flashing if any other key is actioned and the corresponding channel remains activated for monitoring.

3.3.2.3 Main volume adjustment

Main volume can be adjusted at any time by turning just the VOL sensor. This action adjusts the sum volume of all activated channels.

3.3.3   Transmission

3.3.3.1   Selecting a radio
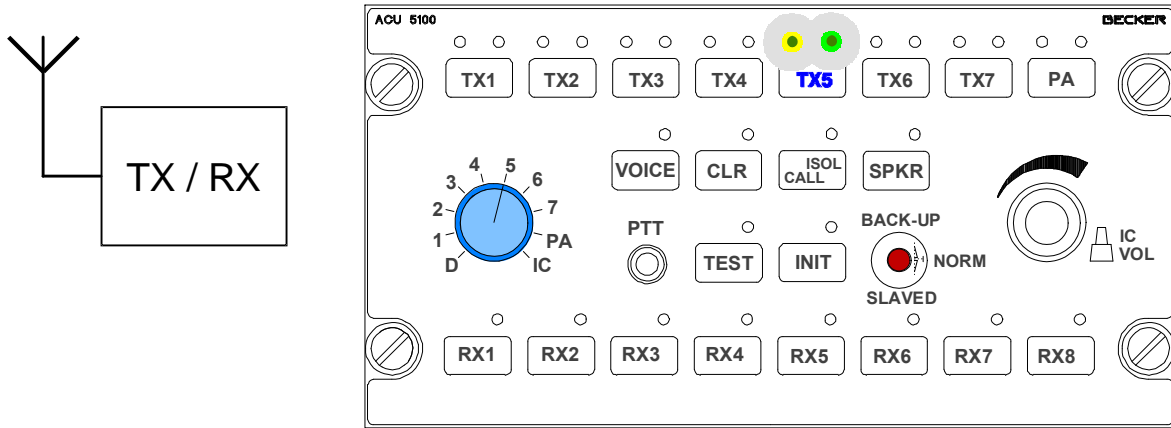
For transmission via an individual radio, the transceiver is pre-selected by means of the transmitter rotary switch.

- Pre-select transmitter (TX rotary switch)

3.3.3.2   Forced monitoring

1. The reception signal of the radio which is pre-selected for transmission is monitored, even if it was not active for monitoring before (forced monitoring). To indicate forced monitoring both the green and the yellow LED will light up.

2. Using the corresponding monitoring key and the VOL sensor, the monitoring volume can be adjusted as described above.

3. The monitoring state returns into the previous state, when turning the TX rotary switch, that means monitoring "on" or "off" respectively.

4. Forced monitoring can be deactivated during installation setup.

Function	Indication overview
Monitoring selected	green LED lit
TX selected	both green and amber LEDs lit
Transmit	green LED extinguished and amber LED lit

3.3.3.3 Transmitting
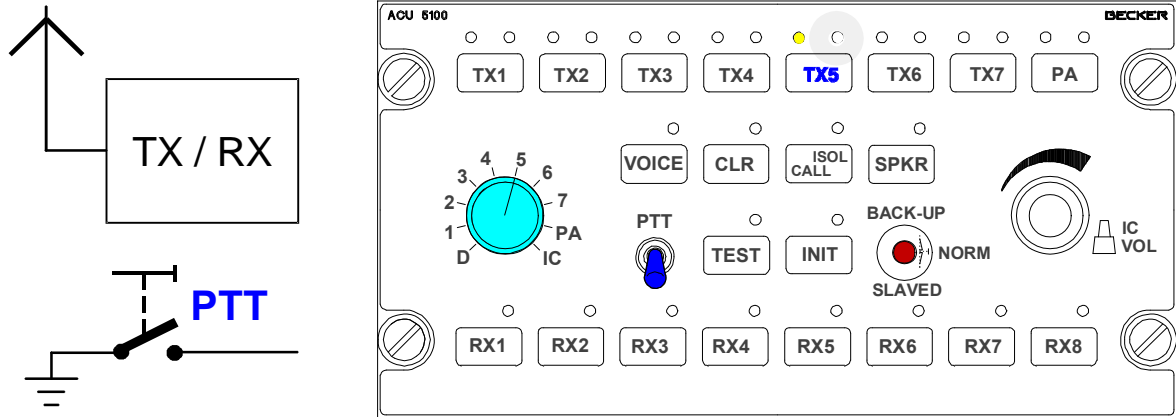
1. Press PTT switch → transmitter will be keyed, the green LED above associated monitoring key goes off. During transmission, all received signals possibly selected are cut off as well as signals originating from aircraft intercommunication.

   Only those warning tones which have been programmed as essential during installation setup, are still audible when transmitting. If loudspeakers are provided, and if the one related to the individual control unit (cockpit or cabin) had been switched on prior to transmitting, it will be muted to avoid acoustic feedback to the microphone.

2. Speak into microphone → transmitter is modulated, sidetone is audible with the sidetone volume set-up according to installation setup.

3. Release PTT switch → transceiver turns back to reception, green LED goes on. All previously selected signals, intercom, and warning tones are resumed.

4. If the loudspeaker was activated before pressing PTT, it is switched on again.

If a public address amplifier is connected instead of an eighth transceiver, it is regarded as a transmitter. Its monitoring key is solely used to adjust sidetone volume in conjunction with the VOL sensor.

The TX indications (green LEDs off) assigned to an individual transmitter will be seen on all ACUs when keyed by any operator.

Any transmitter can be modulated by different operators simultaneously.

3.3.3.4   Dual transmission
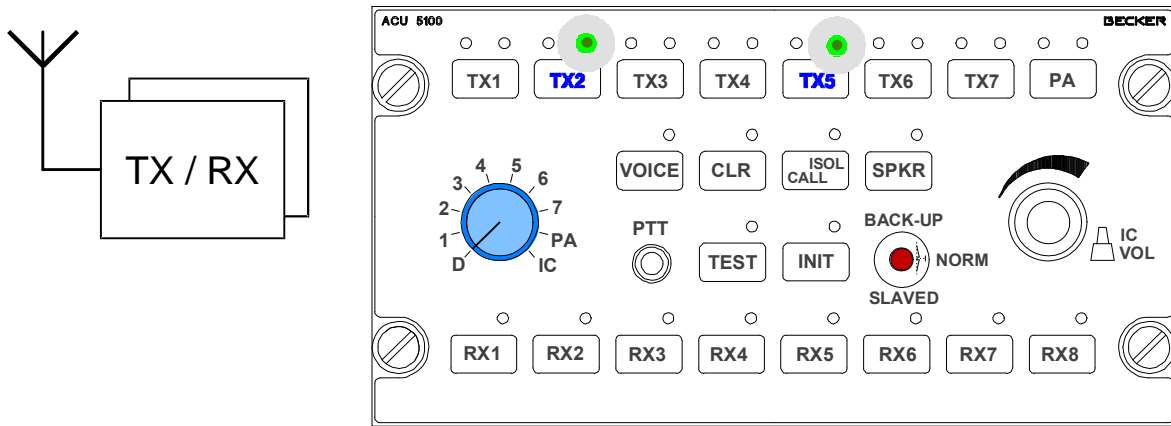
1. In position D (dual transmission) of the TX rotary switch, an operator can pre-select to key and modulate two radios at the same time.

2. Forced monitoring covers then both transceivers.

3. The choice of the two radios for dual TX is permitted during installation setup of the Audio Control Unit but can be altered by the user as described below.
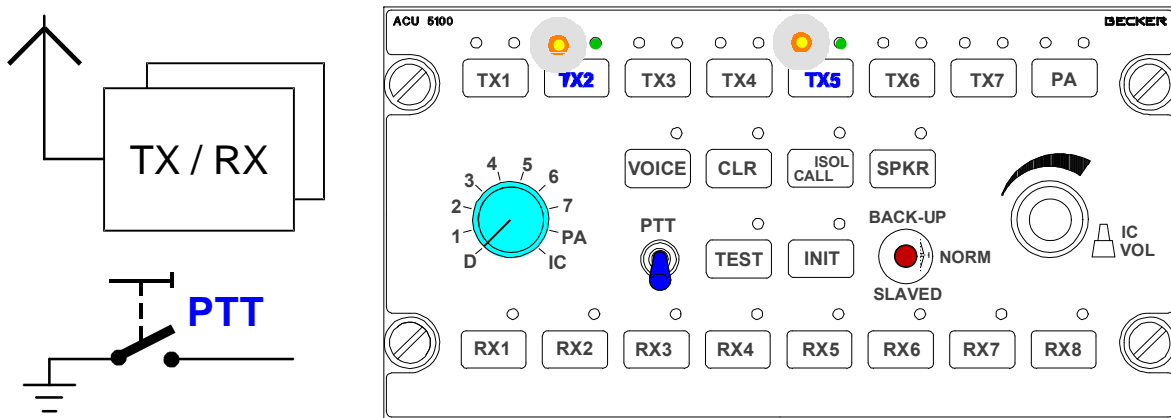
4. Transmission is indicated by switching off the two corresponding green LED's as long as the PTT switch is held.

5. Dual transmission feature can be disabled in installation setup.

3.3.3.5 Dual transmission configuration
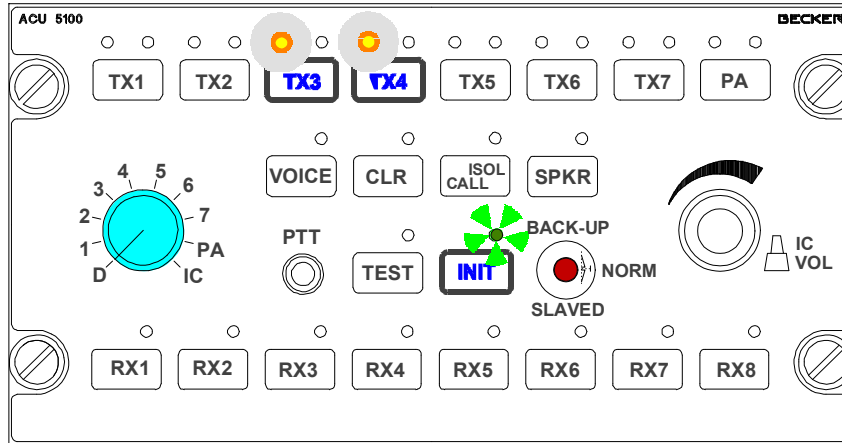
The two radios used for double transmission can be pre-selected by the user by pressing the INIT button when the rotating switch is in D position and then selecting the two radios by pressing the corresponding buttons while the INIT LED is flashing.

3.3.4 Receiver

3.3.4.1 Receiver monitoring
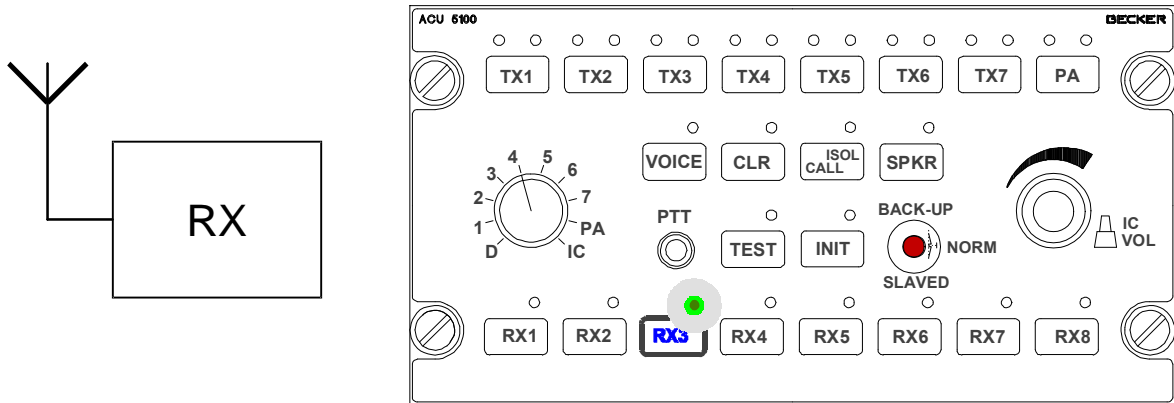
For navigation receiver monitoring, the receiver is selected by means of the respective monitoring button :

1. Press key briefly → monitoring ON , associated green LED lights up.

2. Press key briefly once more → monitoring OFF , LED goes off.

Several receivers may be selected for monitoring at the same time.

3.3.4.2   Individual volume adjustment
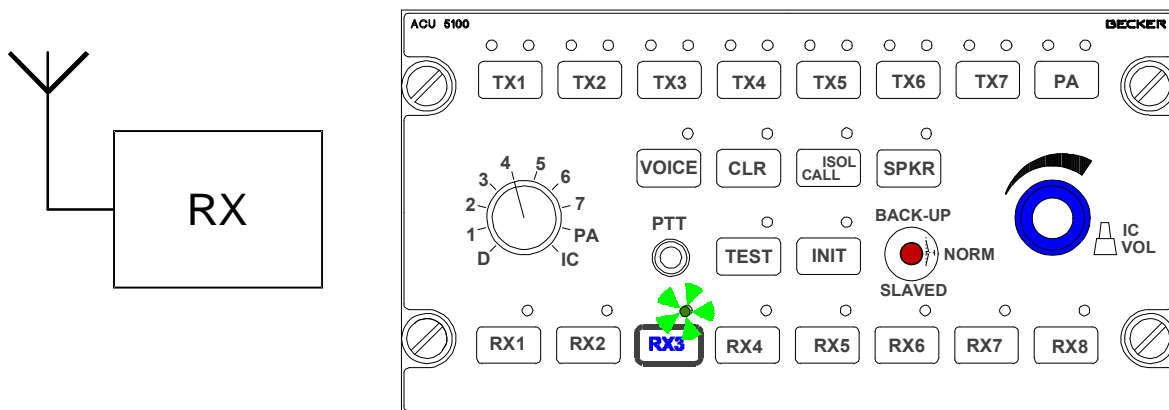
1. Press monitoring key somewhat longer, either in OFF state or during monitoring → reception volume can be adjusted using the VOL incremental sensor as long as the green LED above the button is flashing.

2. The LED is flashing after keyhold or VOL sensor action. Flashing can be stopped manually by pressing the monitoring key.

3. The LED stops flashing if any other key is actioned, and the corresponding channel remains activated for monitoring.

3.3.4.3   Main volume adjustment

Main volume can be adjusted at any time by turning just the VOL sensor. This action adjusts the sum volume of all channels.

3.3.5 Voice / Ident filter
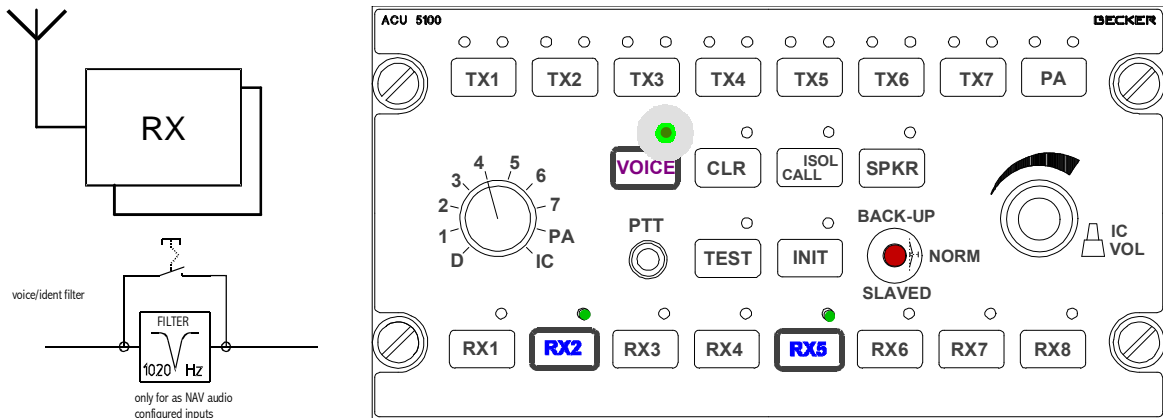
1. The Navigation receiver inputs (RX1...RX8) have a switchable ident frequency cut-off Filter.

2. Pressing the VOICE button, the Morse-coded station identification message (1020 Hz) is filtered out so that e.g. meteorological information may be listened to undisturbed. The green LED above the button indicates Voice/Ident Mode.

3. On pressing the key once again, the unit reverts to Ident mode and the LED goes off.

3.3.6 Loudspeaker operation
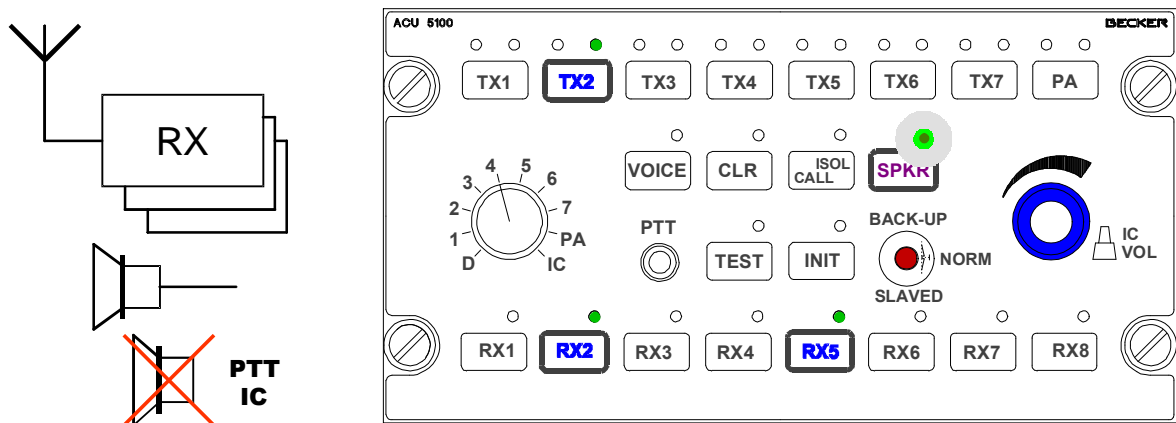
1. Pressing the SPKR button briefly switches on the loudspeaker that is related to the control unit. All selected receiver signals, incoming intercom audio, and warnings are reproduced through the loud-speaker. The green LED above the button indicates Speaker Mode.

2. Upon pressing the key once again, the speaker is switched off and the LED goes off.

3. When speaker mode is active with an individual ACU , voice controlled intercommunication (VOX) is disabled.

4. Intercom is still possible by activating the external IC button or by pressing the PTT button while the TX selector rotary switch is in Pos. IC. In both cases, the loudspeaker is muted to avoid feedback.

3.3.7 Intercommunication
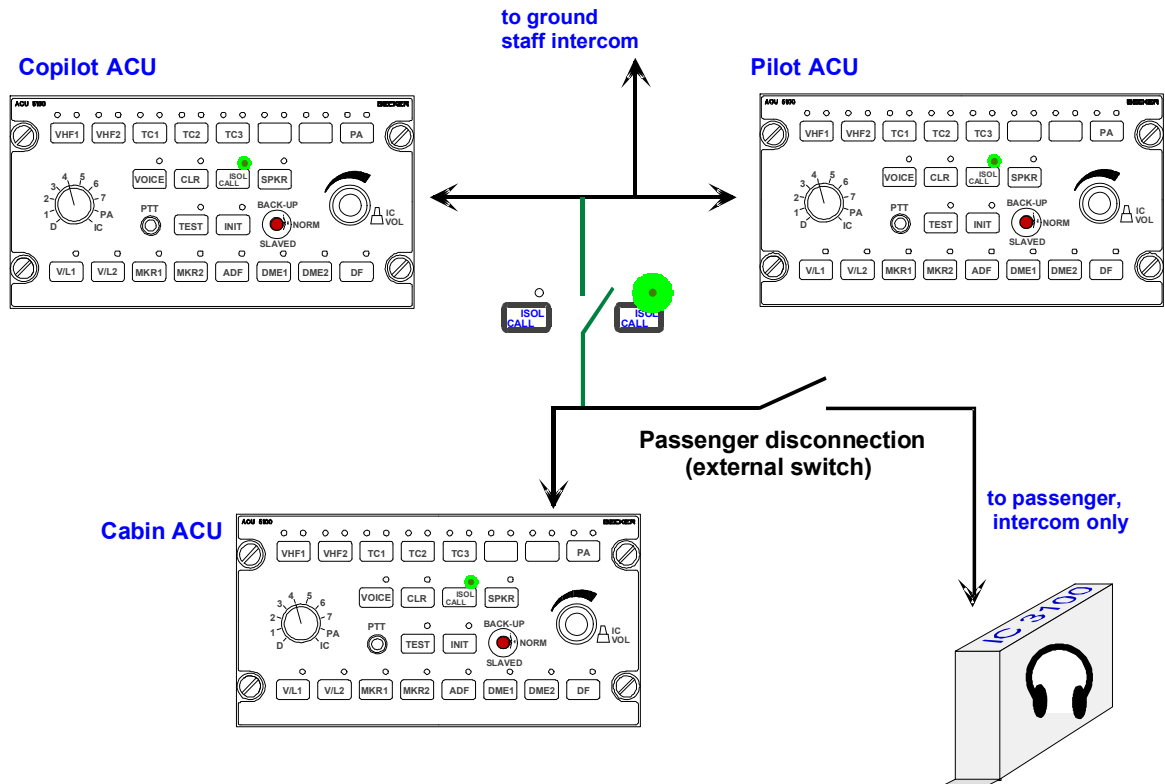
There are two virtual intercom circuits which are separated after initialisation :

1. Pilot <-> Copilot (Cockpit circuit)
2. Cabin <-> Passenger IC (Cabin circuit), Passenger can be disconnected via external switch.

The intercom circuit between Pilot and Copilot can not be interrupted.

In Back-up mode intercom between pilot and copilot is still possible if the Back-up power supply is provided.

3.3.8 Cabin circuit connection

1. Pressing the ISOL/CALL button on one of the cockpits ACU's, connects the cockpit and cabin intercom circuits.

2. The corresponding green LED is switched off, to indicate that the Cabin is not isolated anymore.

3. Pressing again disconnects the circuits, the LED goes on again.

4. ISOL/CALL buttons on pilot's and copilot's control unit have the same functionality and priority.

5. The ISOL/CALL LED on flightdeck ACU's and the ISOL/CALL LED on the Cabin ACU indicate the state of the intercom connection.

3.3.9 Cabin intercom request

Cabin ACU

Flightdeck ACU
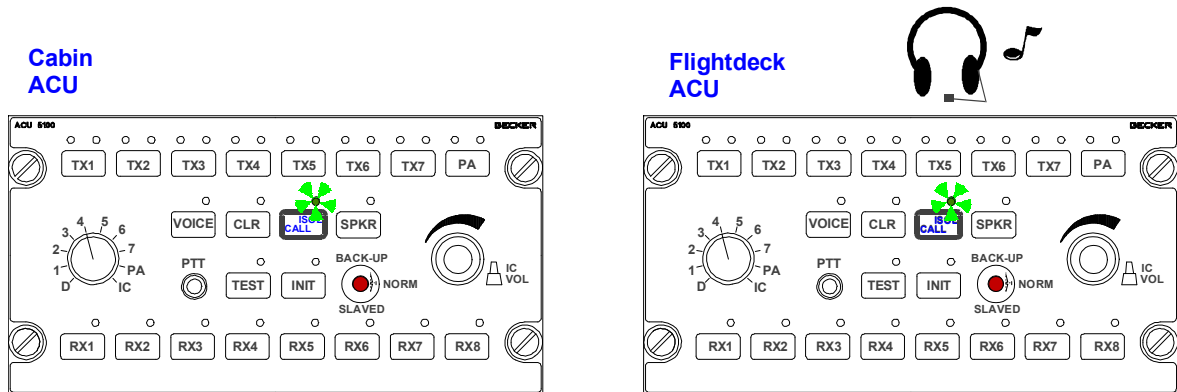
1. Pressing the ISOL/CALL button on the cabin ACU initiates an Intercom Request Call on both cockpit control units if the IC circuits were previously separated.

2. Both ACU's ISOL/CALL LEDs flash and a single chime is generated Via configuration software. The single chime is setable for enable or disable.

3. Either of the pilots may press their ISOL/CALL button to accept the call and at the same time establish IC connection between cockpit and cabin.

4. Once the circuits are connected, the cabin ACU's ISOL/CALL button has no function.

3.3.10 Winchman intercom

The headset of the winchman is parallel connected to the copilots headset. Intercom is possible between Pilot or Copilot/Winchman in normal-, slave- and backup mode.

The Vox level and Volume level are adjustable via discrete input lines (Vox-level, Volume adjust). Two external push-buttons are required.

Function description Vox-level :
If the Vox-level push-button is pressed a short time, the Vox-level is increased to a max. value by steps. If the Vox-level push-button is pressed for a longer time (>3s), the Vox-level will be reset to the value set before.

Function description Volume-level :
If the Volume-level push-button is pressed a short time, the Volume-level increases to a max. value by steps. If the Volume-level push-button is pressed for a longer time (>3s), the Volume-level will be reset to the value set before.

3.3.11   Intercom activation

Intercommunication between the different users can be activated in three ways :
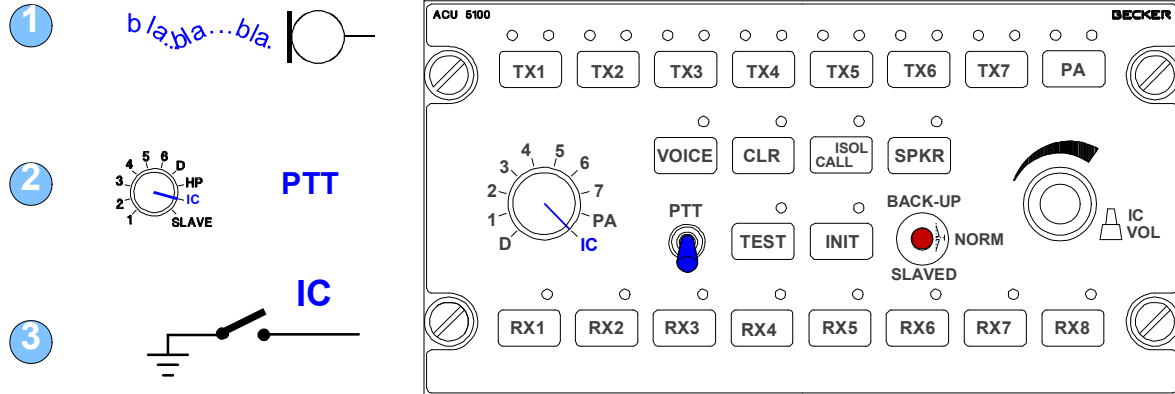

3.3.11.1   Voice controlled intercom

In positions 1 through 7, PA and D of the TX selector switch, voice controlled intercommunication (VOX) is established without the need for any further action – provided no transmitter is keyed. Should, however, the loudspeaker be active with an ACU, no VOX intercom is possible due to acoustic feed-back reasons.

3.3.11.2   VOX level adjustment

The VOX level of the microphones associated with each ACU can be adjusted independently for each ACU in following way:
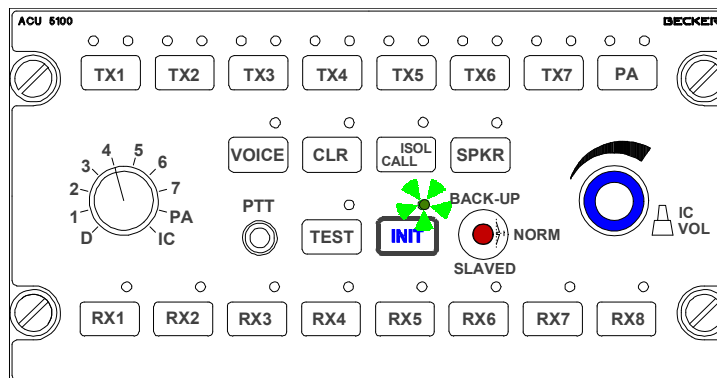
1. Press INIT key briefly, the LED is flashing

2. Turn VOL volume sensor to adjust the VOX level within the allowed range (VOX_range).

3. The LED is flashing for $t_{flash-duration-for\ -vox}$ after INIT key pressed briefly, or VOL sensor action

4. The LED stops flashing if any other key is actioned.

3.3.11.3   Intercom using PTT button

Setting the TX selector to position IC, enables intercom by using the PTT button, i.e. mike signal is only forwarded to the IC amplifier when the switch is pressed.
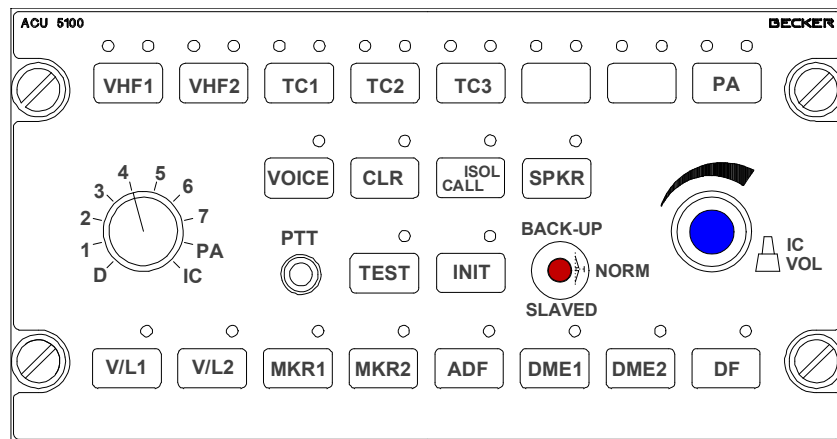

3.3.11.4 Hot Mike intercom

If a dedicated IC button/switch is externally connected (separately for each control unit), the mike signal can be fed permanently to the system (Hot Mike mode).

3.3.12   Volume adjustment

Turning the IC VOL incremental sensor, intercommunication volume can readily be adjusted from 0 to – 40 dB, independent of the main (receiver) volume.

Transmission always takes priority over intercommunication. If an operator has set his ACU TX selec-

tor to 1 through 7, PA or D and presses the PTT switch, his ACU stops its VOX or HOT MIKE mode and turns to transmit mode.

The other control units are not affected and their operators may continue intercommunication.

3.3.13   Transmit clearence

|	
VHF 1	✓
VHF 2	
UHF	✓
FM	✓
...	
NAV 1	✓
NAV 2	✓
MKR	
ADF	
DME	✓
...	
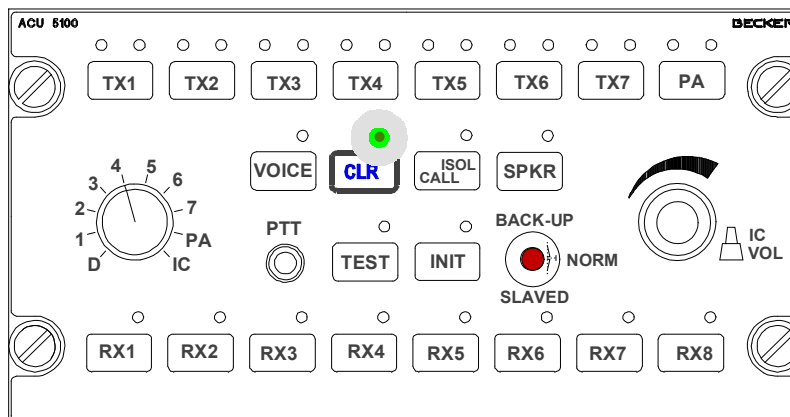
1. On the cabin ACU the radios and receivers can be selected for monitoring as described in sections 3.3.2.1 and 3.3.4.1 respectively.

2. Nevertheless, monitoring of certain receivers and radios can be inhibited during IS (Installation Setup). See also example above on the left.

3. Pressing the CLR button on one of the pilots' ACUs enables the cabin ACU(s) to transmit on radios which have been allowed during installation setup (see example above on the left).

4. Clearance to transmit is indicated by the CLR LED on all ACU's. Pressing the CLR button again cancels the clearance and the LED goes off.

5. The CLR button on the Cabin ACU has no function but is used to indicate, with the associated LED, the state of the clearance.

6. During SLAVED mode, the CLR key of the slaved unit is not functional.

3.3.14 ACU Initialization

After every power-on the previously used user setup (US) is restored.

Nevertheless, and to get a predefined configuration, the ACU can be initialised to the values which have been set during installation setup (IS).
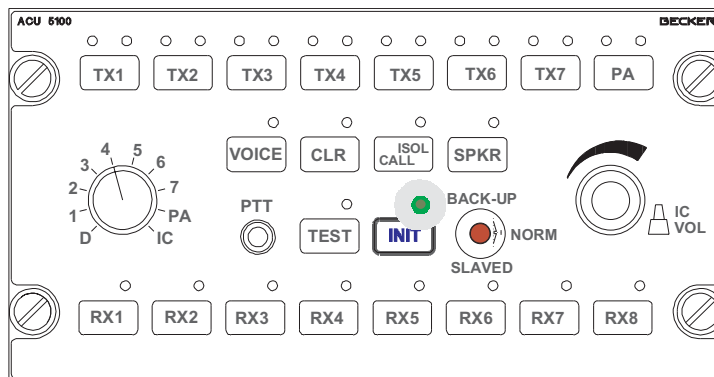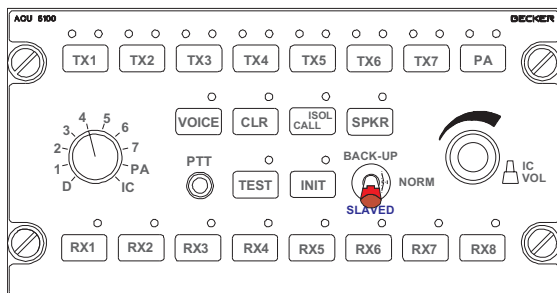

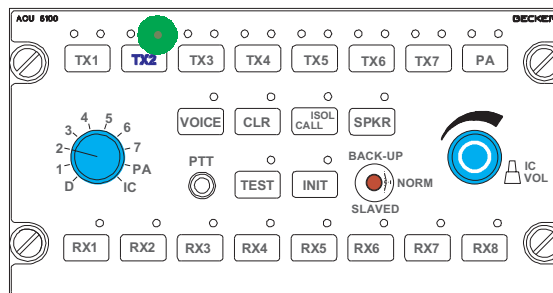To initialise the ACU press the INIT key for longer than 5 seconds.

The associated LED is lighted for $t_{on\text{-}duration\text{-}for\text{-}init}$ to indicate that this ACU is reset to the init values which have been set during installation setup.

3.3.15 Slave operation

Copilot

Pilot

When switching the emergency toggle switch to position SLAVED on one of the cockpits control units, the according headset is disconnected from its audio processing circuits in the remote electronic unit and its mike and phone capsules are directly paralleled to the headset of the remaining ACU.

No further action is possible on the slaved Audio Control Unit.

SLAVED mode is a first step of security in the case where one of the control panels appears to be defective or not working.

Note :
Only one user may switch to the "Slaved" position. If 2 user do that, the system remains in "Normal" mode.

### 3.3.16   Emergency operation

3.3.16.1   Automatic activation

When the two main power supply busses fail or if a fatal defect occurs within the unit's internal supply, the security logic falls back to Back-up operation even if the BACK-UP switch had not been activated.

The microphone and headphone amplifier is powered via an external emergency battery supply.

All actions take place as described below.

3.3.16.2   Back-up switch activated
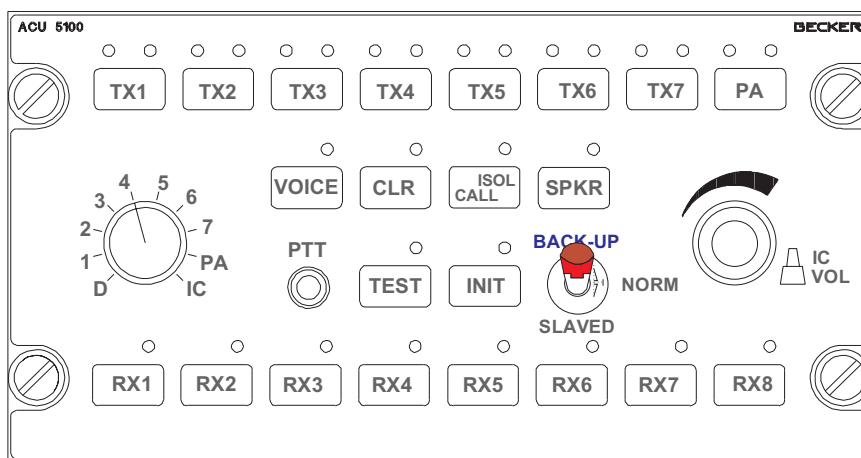
Switching over the Emergency toggle switch (after unlocking by pulling its lever in position Back-up) on one of the cockpits ACU will activate a security circuit to assign radio transceivers, receivers and fixed inputs to the individual operator.

The signals are distributed as follows :

ACU 1 - TX1 & RX2 & FIX1,
ACU 2 - TX2 & RX1 & FIX2.

During Back-up operation, no actions are possible on the ACUs, any adjustments (e.g. reception volume) must be input directly at the respective radio transceivers or navigation receivers.

Intercom capability between pilot and copilot/winchman is given as long as the external emergency battery power supply is available. (audio level is fix at 50%, no adjustment possible)

3.3.17   Test functions
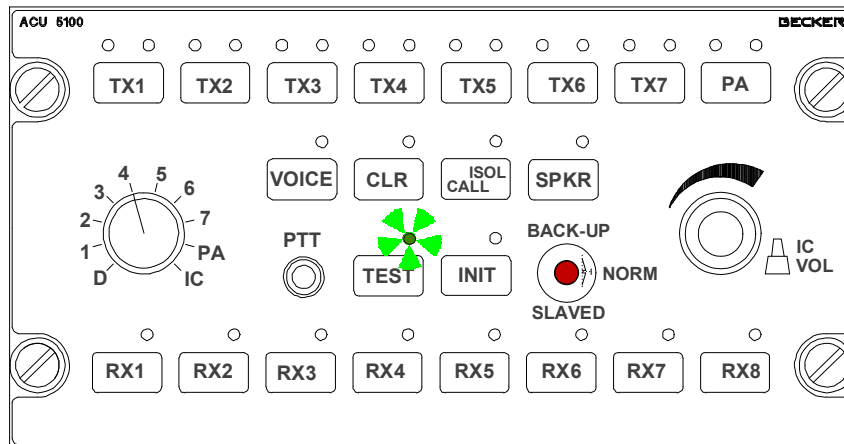
3.3.17.1 Power-up test (P-BIT)
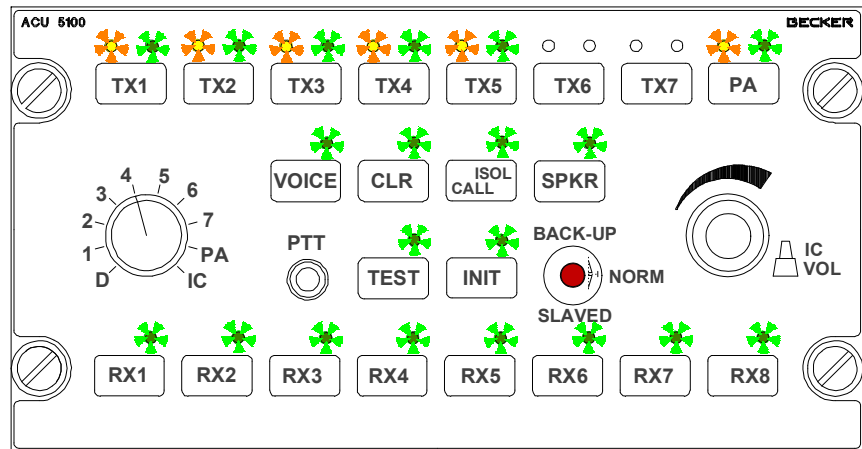
Every time the system is powered, the devices are tested automatically (P-BIT , Power-up Built-In Test).

While the test is running, the green Test-LED is lit. If the test result is "GO", the green Test-LED goes off.

If the test result is "NOGO", the green Test-LED flashes. The system is then operational.

3.3.17.2 Continuous test (C-BIT)

During normal operation of the Unit, the system circuits are tested continuously in the back-ground ("C-BIT" , Continuous Built-In Test).

If an error is detected, the TEST LED commences flashing with a rate of 2 Hz. It can be reset by pressing the TEST button, if no total error.

In case there is a notable degradation in Unit performance, the operators should turn to emergency operation; either SLAVED or BACK-UP.
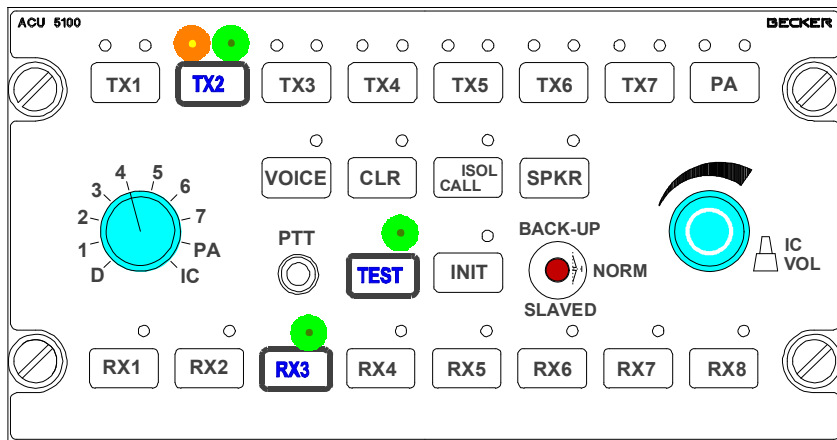
3.3.17.3 Initiated test (I-BIT)

A manual test sequence ("I-BIT" , Initiated Built-In Test) may be activated at any time by pressing the TEST button, except during transmit operation :

Activating the test :
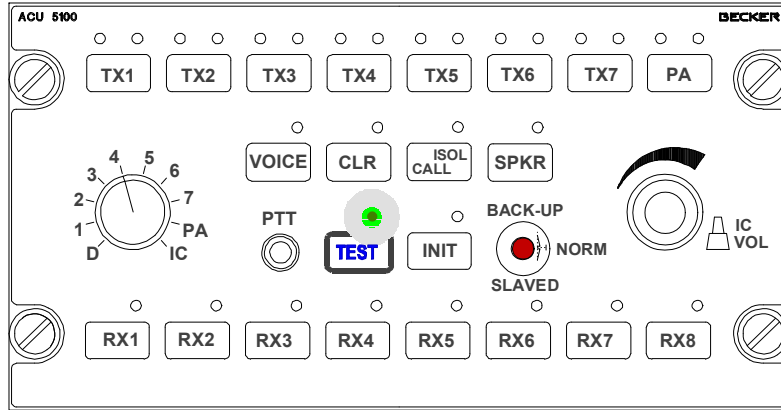
Press the TEST button → TEST LED lights up, reception or IC mode resp. is interrupted.

Manual Test performance during test is running :

Every action on the receiver or function keys, except the test button, makes the associated Green-LED light up and the TIMEOUT – Counter will be restarted.

Otherwise the test is stopped automatically after a timeout ($t_{IBIT-timeout}$ = 5 sec.), if no button is pressed. During SLAVED mode, the TEST key of the slaved unit is not functional.

3.3.17.4 Test result and Diagnostic

If the test is ready and the test result is :

GO   Test LED goes off. The system starts to work as before the test was activated.

NOGO   The Test LED flashes. A short press of the Test key resets the NOGO indication,
        the test LED goes off. The system starts to work, set as before the test
        was activated.

By presssing the test button >2 s, a error code on the TX/RX LED's will be displayed.

The RX LED-Line shows the failure code of the affected LRU.

The TX LED-Line shows the failure code of the affected LRU-Function.

Error-Code Table

LED	ERROR	LED	LRU
TX1	No Answer	RX1	ACU 1
TX2	DSP	RX2	ACU 2
TX3	Not defined	RX3	ACU 3
TX4	Power Voltage	RX4	ACU 4
TX5	NOVRAM	RX5	ACU 5
TX6	ROM	RX6	ACU 6
TX7	RAM	RX7	Not defined
TX8	BUS	RX8	REU

Pressing the test button once more resets the displayed LED's and the system works as
before test was activated, or the failure code of the second affected LRU will be displayed.

Blank