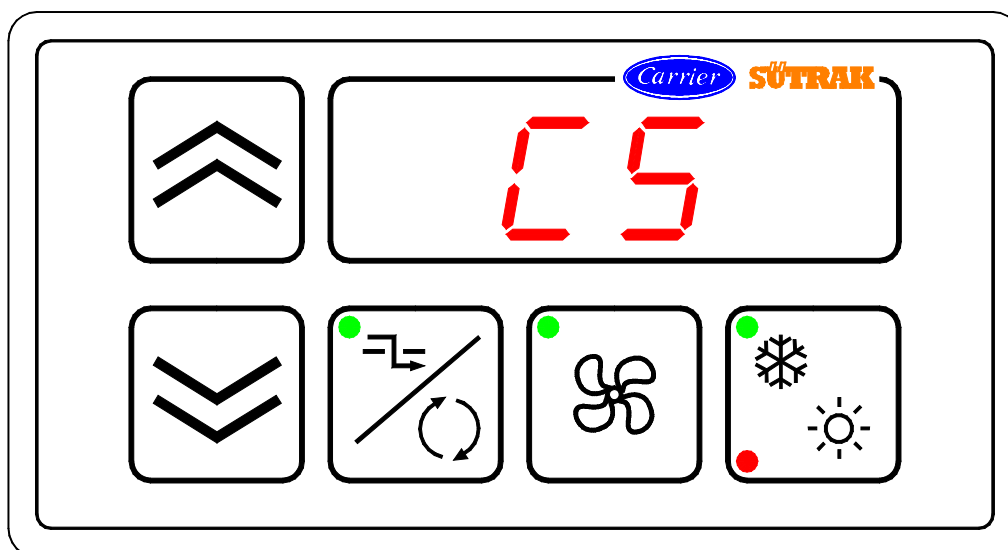# OPERATING INSTRUCTIONS

AIR CONDITIONING CONTROL
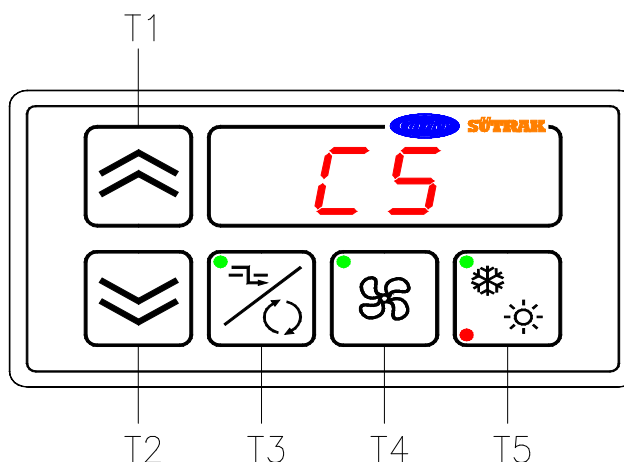# BT-324

(0324.2.A00 / 0324.2.B00)

26,09,03,048 - 26,09,03,049

**As of June 2004
(as of version V1.09-r2)**

1 Driver's Display Key Description

1.1 Function of Keys when "Ignition On" and "Engine Off"

Key T1:	Plus Key	w/o function
Key T2:	Minus Key	w/o function
Key T3:	Recirculation Air/Fresh Air	w/o function
Key T4:	Blower Control	w/o function
Key T5:	Automatic Climate Control	w/o function
Key T1+T2:	Test Mode	starts code inquiry for test mode

1.2 Function of Keys when „Engine On" and Controller Active

 increases room setpoint by 1 degree per stroke or increases manual blower speed, depending on displayed mode

 decreases room setpoint by 1 degree per stroke or decreases manual blower speed, depending on displayed mode

 switches from recirculation air to fresh air and vice versa

| [fan icon] | switches on the manual blower control. |

Press to select the following speeds: *1*$^{*)}$*-2-3-4-5*

    1$^{*)}$ *to 5:* adjusts the blowers to speeds20%,40%,60%,80%,100%

    Off$^{*)}$*:* Switches off the blowers or switches to automatic.

Automatic: The blowers are controlled automatically based on the

                   interior temperature.

$^{*)}$ The following blower steps are disabled when the automatic climate control is on:
    2 step blower: *Off*
    continuously adjustable blower: *Off, 1*

| [snowflake/sun icon] | Switches on the automatic temperature control |

| [down arrow icon] + [temperature icon] | shows the inside temperature for 10 seconds, if pressed a second time shows the outside temperature for 10 seconds (optional) |

| [temperature icon] + [snowflake/sun icon] | starts Reheat mode for 3 minutes (duration adjustable) |

| [temperature icon] + [fan icon] | switches off all control functions and the display. |

2 Luminous Indication
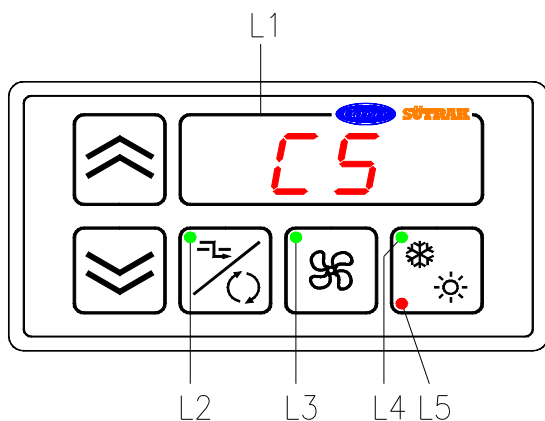
Display	Typ	Description
CS	0324.2.A00	24V with stepless blowers (Standard)
CS =	0324.2.A00	24V two step blowers
CS .	0324.2.B00	12V with stepless blowers
CS = .	0324.2.B00	12V two step blowers (Standard)

2.1 Function of Indication when "Ignition On" and "Engine Off"

LED Field L1:   after turning the ignition on, it shows briefly the controller version (see chart)

                     dark

                     Programming functions during test mode

LED   L2:   w/o function

LED   L3:   w/o function

LED   L4:   w/o function

LED   L5:   w/o function

2.2 Function of Indication when „Engine On" and Controller Active

LED Field L1:   Standard indication is the setpoint temperature

LED   L2:   Fresh air open (green)

LED   L3:   Manual blower control "ON" (green)

LED   L4:   Cooling / Heating mode (green)

LED   L5:   Malfunction cooling unit (red)

3 Operating Instructions (Short version)

The following operating instructions shall give you an overview of the various functions of the Air Conditioning Control BT-324.

When the engine is running, press any key to activate the Air Conditioning Control Unit.

All previously set functions are reactivated.

3.1 Display

When the unit is ON, the display shows the interior setpoint temperature or the room temperature (to be selected with program -10-).

When selecting individual functions, the display shows the corresponding information for a short period of time. The display is dark when engine or control unit are OFF.

During some operating modes as calibration, test and programming mode, the display shows the corresponding information.

3.2 Interior Temperature Control

When the unit is ON, select Automatic Climate Control ⬚ to start interior temperature control.

Press the Plus ⬚ or Minus ⬚ keys to set the required interior temperature.

The temperature can be adjusted between 18° und 28°C. (Can be modified with program -11-)

When outside temperatures are below 2°C (adjustable parameter), the cooling function remains disabled. (Optional ambient sensor is needed)

3.3 Ventilation

When the unit is operating in Automatic Climate Control mode, the roof blower speed is controlled based on the room temperature.

However, the blowers may be switched to manual mode of operation by pressing the blower key.

Press the Plus ⬚ or Minus ⬚ keys to define one of 5 different blower steps.(Units with stepless blower control)

The blowers can not be switched OFF when Automatic Climate Control ⬚ is ON.

When Automatic Climate Control is OFF, the blowers stop when as the manual blower control is turned to zero.

3.4 Reheat (optional)

The Reheat mode is used to remove the air humidity and to help defoging the windshields. Press ⬚ and ⬚

at the same time to activate Reheat. Heating and cooling will be energized for 3 minutes (duration adjustable

with test program –20-). In addition, the blowers are switched to maximum speed and the fresh air flap is closed.

At the end of the pre-set duration time, the functions return to the previously selected settings.

Reheat is disabled with outside temperatures below 2°C (adjustable parameter) or when the ambient sensor is not installed or has a failure.

3.5 Temperature Indication

Press ⬚ and ⬚ at the same time to display the interior temperature, e.g. "i 22" for 10 seconds.

Optional, the outside temperature, e.g. "o 19", may be displayed when pressing the keys a second time.
A sensor malfunction is displayed by "i - -" or. "o - -".

4   System Self-Test

The Self-Test function of the BT-324 is a special mode which serves to test all local mode functions as well as the functions of the connected elements.

CONDITION: Engine off, ignition on!!

Press keys ⟨∧⟩ and ⟨∨⟩ at the same time to start the self-test. The display shows "CodE". Enter the correct access code within 5 seconds.

The code for BT-324 is   ⟨∧⟩, ⟨∧⟩, ⟨∧⟩.

If you do not enter the code or if you enter the wrong code, the unit returns to its initial state after 5 seconds.

After having entered the correct code, the display shortly shows the software version before it switches to test program – 1 -.

Press ⟨∧⟩ or ⟨∨⟩ to select the required test program.

Press key T5 to start or end the displayed test program (except for keyboard test.)

The display shows "----" if a selected test program is not available.

Press keys T1 and T2 at the same time to end the self-test.

4.1   Test Programs

- 1- : LED-Test

This program serves to test the key LEDs of the control panel. All key LEDs have to light up subsequently.

Press any key to end the test.

- 2- : Display-Test

This program serves to test the function of the 7-segment-display. Each segment is turned ON and OFF subsequently. The test starts again after all segments have been selected. During the test all segments have to be illuminated.

Press ⬚ to end the test.

- 3- : Keyboard-Test

This program serves to test the keys of the control panel. Press a key to display the corresponding key code.

Press ⬚ and ⬚ at the same time to end the test.

- 4- : Not available

- 5-:   Not available

- 6-: Analog Input-Test

This program serves to display all analog inputs of the system.

Press ⬚ or ⬚ to select analog inputs 1-5.

Display: "*Number of input*", e.g. " 1 "

Press   ⬚   to display the corresponding value.

Allocation of analog inputs:

Number	Description	Pin
1	Sensor outside temperature [°] (optional)	3 / 7
2	Sensor room temperature [°]	11 / 15
3	Blank	19 / 23
4	Blank	12/16/20
5	Low-voltage input [HEX]	internal

[°]   - Specified in °C of °F   -33°: sensor possibly not connected
                                                  69°: sensor possibly short-connected

[HEX]   - Specified hex decimally

Press   ⬚   to end the test.

- 7- : Digital Output- Test

WARNING:

Inappropriate operation of this test may damage the air conditioning unit. This may also cause injuries.

This program serves to control all digital outputs of the system.

Press ⬇ or ⬆ to select digital outputs 1-5.

Display: "o *Number of output*", e.g. "o 2"

Press ⊞ to set or erase the actual digital output. The state of the output is signalized by the LED L5 of this key ⊞

LED on: output active   24V
LED off: output not active   0V or testing voltage

Number	BT-324 with continuously adjustable blower (24VDC)	BT-324 with multistage blower (12VDC)	Pin
1	Blower enabled	Blower step 1	4
2	Valve fresh air flap	Valve fresh air flap	8
3	Relay air conditioning unit	Relay air conditioning unit	6
4	Relay heating	Relay heating	10
5	Not in use	Blower step 2	18

Press ⊞ to end the test.

When leaving this program, all outputs are switched off.

- 8- : Digital Input-Test

This program serves to display all digital inputs of the system.

Press ⬆ or ⬇ to select digital inputs 1-3.

Display: "i *Number of input*" e.g. "i 3"

The state of the input is signalized by the LED L5 of this key ⊞

LED on: input signal existing   24V
LED off: input signal not existing   0V or testing voltage

Number	Description	Pin
1	Engine on	9
2	Feedback pressure switches	13

Press ⊞ to end the test.

- 9- : Control Voltage-Test (Analog Output-Test)

This program serves to test the control voltage output.

Display: "r *%-value*" e.g. "r 32"

Press ⊼ or ⊻ to adjust control voltage between 0% and 99%.

Number	Description	Pin
1	Control voltage (optional)	17

The following voltages may be metered at non-loaded output:

Percent	Voltage
0% (minimal speed)	approx. 21,9 V
25%	approx. 18,6 V
50%	approx. 12,4 V
75%	approx. 6,2 V
99% (maximum speed)	approx. 0,3 V

Press ✳ to end the test.

-10- : Change display Setpoint or Interior temperature

The program allows to change the standard display of the setpoint to the interior temperature.

The standard display is shown with the modus " –" for the set point.

The display of the interior temperature is shown with the modus "ANZ".

Press ⊻ or ⊼ to select the modus.

Press ✳ to end the setting.

-11- : Change the set point limits

The program allows the setting of the limits for the interior setpoint temperature in the different

Temperature modus display (Celsius or Fahrenheit)

Number	Description	Setting limits	Standard
_	Low limit	18°C…28°C / 65°F…82°F	18°C / 65°F
--	Up limit	18°C…28°C / 65°F…82°F	18°C / 65°F

Press ⊻ or ⊼ to modify the value.

Press ✳ to change the number or to end the setting.

-12- : not available

-13- : not available

-14- : Automatic reheat

The program allows the setting of the temperature threshold for the automatic reheat function.
In this case the off thrteshold of the cooling mode is moved in a way that it can work parallel to
the heating mode.

Press ⌄ or ⌃ to modify the value of the threshold.

Possible selection: AUS (off), 1K, 2K or 3K   (Standard: AUS)

Press ❄ to end the setting.

-15- : Different blowers

The program allows you the selection of the different installed blowers.

Possible selection:

rSP   **:** blower with stepless controller

=   **:** two step blower

Standard:

24VDC   **rSP**

12VDC   **=**

Press ⌄ or ⌃ to modify the setting.

Press ❄ to end the setting.

-16- : Changing between Celsius / Fahrenheit

This program serves to change between the temperature indication modes.

Mode "Cel" shows temperatures in °C, mode "Fah" shows temperatures in °F

Press ⌄ or ⌃ to change te temperature indication mode.

Press ❄ to end the program.

4.2   Extended Test Programs

The **access code** for all extended test programs of BT-324 is ⬚, ⬚, ⬚.
Enter this code instead of the standard code when starting the test mode.

-19- : Programming EEPROM Standard Values

When starting this test program, all values stored in the EEPROM are subsequently reset the factory-set standard values.

Display: "E-*Storage position*"

-20- : Setting Parameters

Inappropriate setting of the values may lead to malfunctions and destruction of the air conditioning unit!

This program serves to set the system parameters.

Display: "P Number" or "= *Value*" e.g. "P 1" or "= 1"

Press ⬚ or ⬚ to change parameter number or value.

Press ⬚ to change between parameter number and value.

| Number	Information	Standard Value
P 1	KP factor room	1
P 2	KI factor room	0
P 3	Not in use	4
P 4	Not in use	99
P 5	manipulated variable for heating on	5 (0,5K)
P 6	manipulated variable for heating off	0
P 7	manipulated variable for cooling on	-5 (-0,5K)
P 8	manipulated variable for cooling off	0
P 9	outside temperature Reheat lock	2°C
P 10	outside temperature air conditioning lock	2°C
P 11	Not in use	2
P 12	Not in use	0
P 13	Not in use	-6
P 14	Not in use	106
P 15	control voltage inverse(0V = min)	AUS
P 16	control voltage minimum speed manipulated variable 1	-5
P 17	control voltage minimum speed manipulated variable 2	3
P 18	control voltage rise cooling	5
P 19	control voltage rise heating	0
P 20	RSP minimum speed	95 (37%)
P 21	RSP maximum speed	255 (100%)
P 22	control voltage step 1	75
P 23	control voltage step 2	120
P 24	control voltage step 3	165
P 25	control voltage step 4	210
P 26	control voltage step 5	255
P 27	blower type (0=RSP, 1=2-step, 2=3-step)	(24V:0 ; 12V:1)
P 28	desired interior temperature	22
P 29	blower step	1
P 30	active functions	0
P 31	duration Reheat	3 (min)
P 32	Temperature reheat	0
P 33	Display in Celsius	EIN
P 34	Display room temperature	AUS
P 35	Low set limit Celsius mode	18
P 36	High set limit Celsius mode	28
P 37	Low set limit Fahrenheit mode	65
P 38	High set limit Fahrenheit mode	82
P 39	Error storage 1	0
P 40	Error storage 2	0

Press ⬚ to end the program.

Automatic climate control

After selecting the automatic climate control the different cooling and heating units will be governed in relationship to the room and set point temperature.

To do so a PI-control calculates each second the room variables

- Positive Variable means: Heating mode

- Negative Variable means: Cooling mode
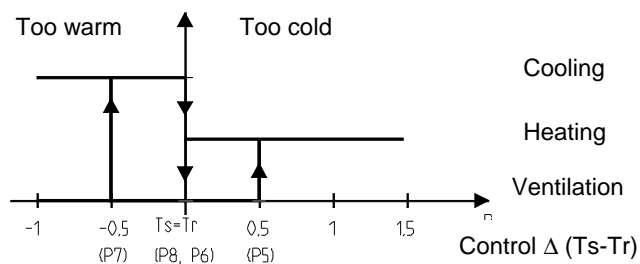
Heating: If the room temperature drops more than 0,5K below the set point temperature, the control switches on the heating. If the room temperature reaches the set point the heating is switched off.

Cooling: if the room temperature rises more than 0,5K above the set point temperature, the control switches on the load relais for the compressor clutch. If the room temperature drops again towards the set point temperature the load relais is switched off. If an ambient sensor is installed the cooling mode will be active with with ambient temperatures> 2°C (variable with parameter P8)

Blower automatic:

The blower automatic is off if the automatic control is not selected .

If the automatic control is active the blower rpm is driven in relationship to the present room temperature and set point temperature (see diagram)
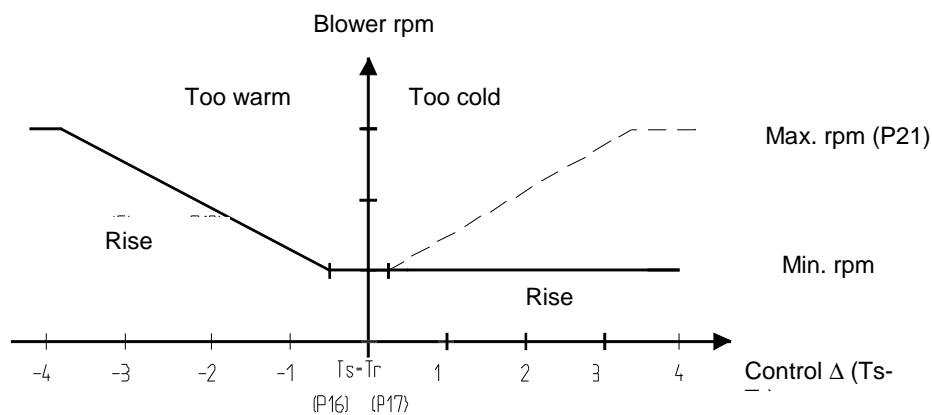
All the positions like (Px) are manipulated variables <Parameters>

4.3 EEPROM-Storage

The control unit BT-324 has a non-volatile storage which memorizes the parameters set by means of test program -20-. This means that the values remain stored even if the control unit is disconnected.

Do not change the values without expert instruction. Wrong set values may lead to malfunctions.

Start test program -19- to reactivate the standard values which guarantee safe operation of the air conditioning unit.

5. Part Numbers

Description	CS-Ident.-No.
BT-324 24VDC	26.09.03.048
BT-324 12VDC	26.09.03.049
Connector shell 24pol.	26.17.12.038
Strain relief	26.17.12.039
Pin contact	26.33.03.209
Sensor (interior temp.)	26.09.03.816
Sensor (exterior temp.)	26.09.03.815

6. Dimensions:

Subject to alterations!
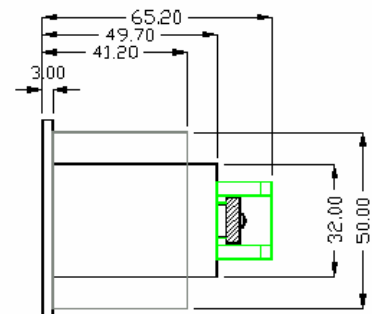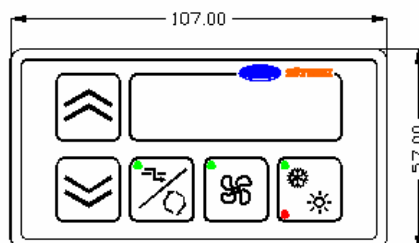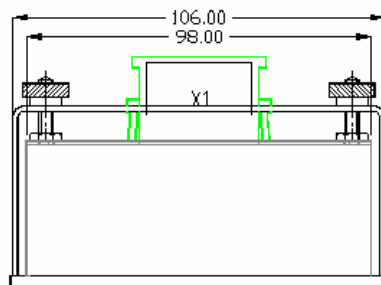
BT-324
(HW 0324)

Option Gebläsesteuerung a) Regelspannung
b) stufige Gebläse
über Software einstellbar

Stufe	Gebläsestufe2	Gebläsestufe1
0	Aus	Aus
1	Aus	Ein
2	Ein	Aus
3	Ein	Ein

KL 15 / Regler ein (Betriebspannung)   3A
KL 31 / Masse , GND
KL 58   Nachtbeleuchtung   2A
D+61 geschaltet (Automatik ein)   2A
Rückmeldung Klima (Optional)

Freilauf-diode
a) Gebläsefreigabe
b) Gebläsestufe1
Ventil Umluftklappe

KL 15
Pressostate   Lastrelais
Freilauf-diode
Klima-kupplung

Regelspannung Dachgebläse
DRM
Dachgebläse   M
Gebläsestufe2

Aussenfühler (optional)   NTC
Roumfühler   NTC

Relais Heizung
Freilauf-diode

Alle Ausgänge 0,5A max!

Pin-Nummern: 1 2 5 9 13 6 4 8 12 16 20 17 18 3 7 11 15 19 23 21 22 10 14 24

Kabel für Fühler 2-adrig geschirmt: LIYCY 2x0,25qmm

alle anderen Kabel Querschnitt 0,5qmm bis 1,5qmm: H05V-K 0,5/1,5qmm
erforderlicher Gegenstecker ITT Canon 24-polig:
Steckergehäuse 24-polig   Nr.192329-5950
Stiftkontakte 0,5-1,5qmm   Nr.192990-0060