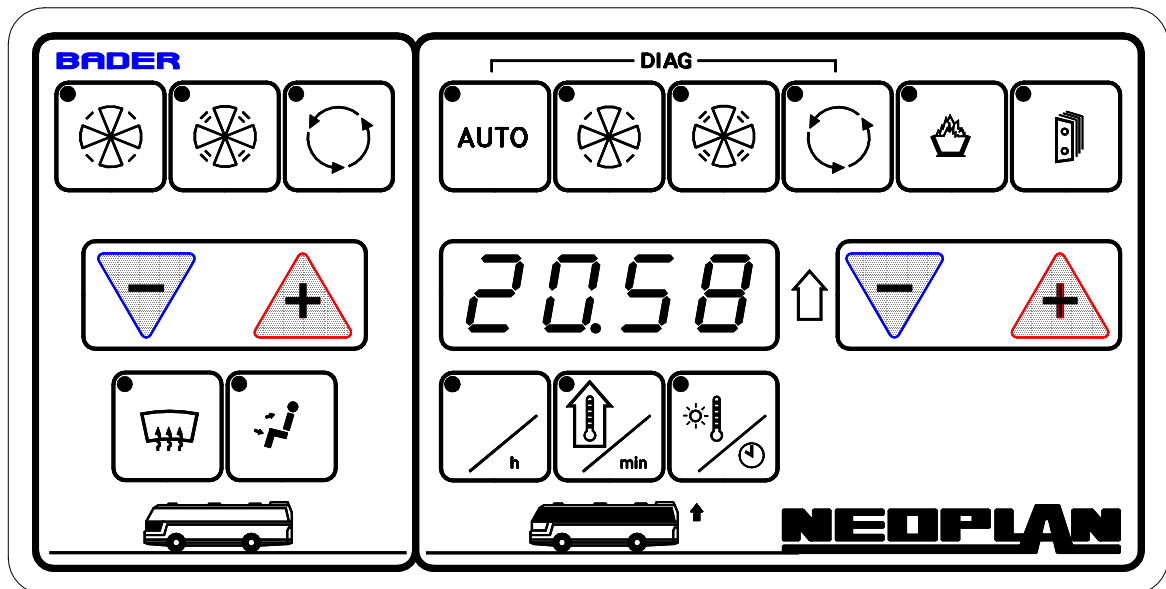


Digital air- conditioner controller KR- 451

OPERATING INSTRUCTIONS

NEOPLAN

AIR- CONDITIONER- CONTROLLER KR-451



October 1998

Version 1.14

Digital air- conditioner controller KR- 451

CAUTION!

IMPORTANT SAFETY TIPS:

As a leader of a vehicle you must dedicate full attention to the traffic.

Always operate with your controller in a way that you are equal to the current traffic situation.

In critical situations we advise against operating.

Please consider that already at a rate of 50 k.p.h the vehicle will go about a distance of 14 m / sec.

In the event of occurrence of a trouble please look for the next car park and try to overcome the error with the use of the manual.

IMPORTANT INFORMATION FOR THE USER:

Unplug the air-conditioner centre before carrying out welding work on the vehicle.

Errors and faults which have not actually occurred in the vehicle may be indicated if you attempt to start the engine with a partially discharged vehicle battery.

All internal memories of the computer are reset by briefly interrupting the air-conditioner centre's power supply (wait approx. 30 sec.) or by pressing the "RESET" keys.

(Then please wait for the air-conditioner centre to conduct its self-test approx. 3 min.)

Always keep the air-conditioner controller dry!

Please clean the surface of the control panel only with a damp cloth!

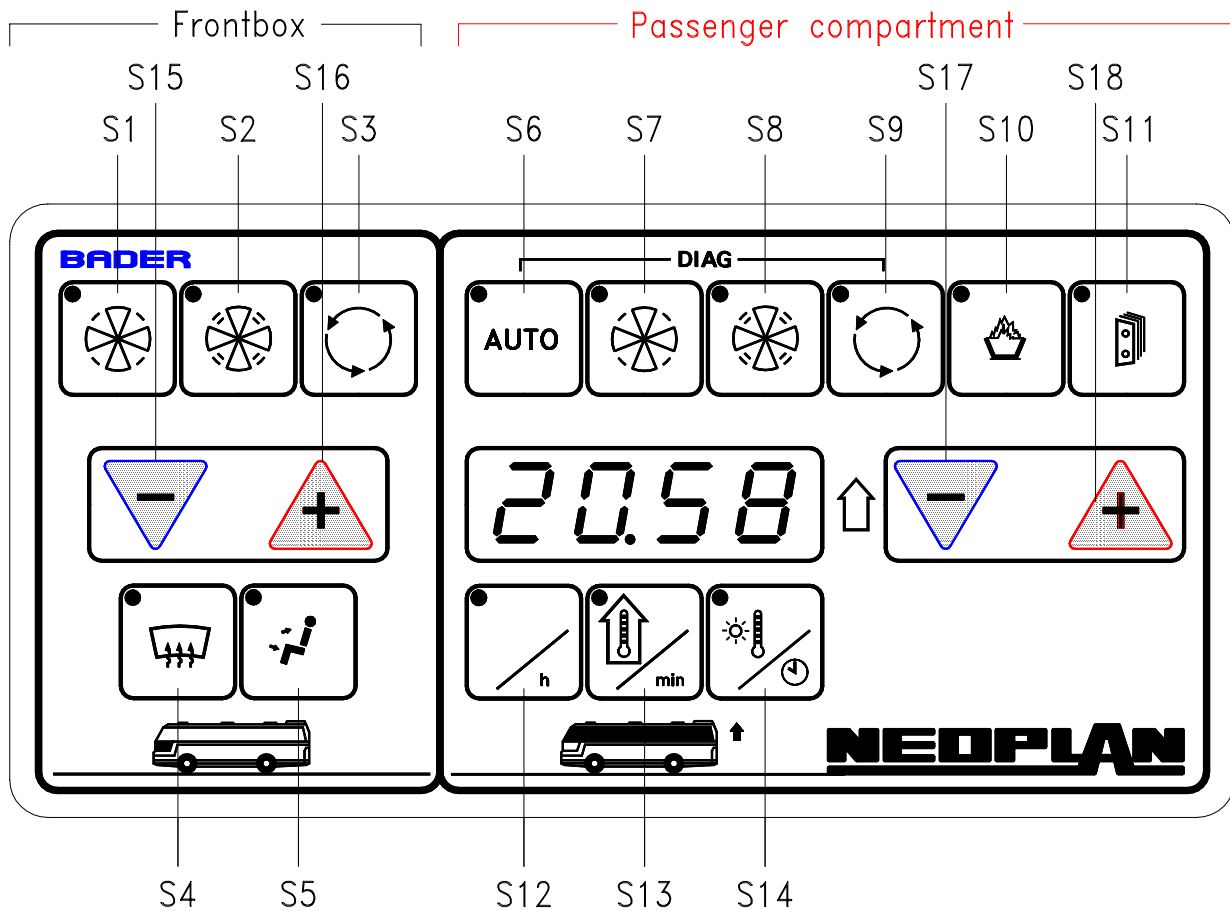
BADER INDUSTRIE-ELEKTRONIK	Control and regulating systems for vehicle air conditioning	page: 2
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Digital air- conditioner controller KR- 451

CONTENTS:	PAGE
1.....KEY ASSIGNMENT ON THE FRONT PANEL	4
Key assignment air-cond. controller passenger compartment	5
.....LED-Display	5
2.....QUICK-START OPERATING INSTRUCTIONS	6
3.....DESCRIPTION OF KEY FUNCTION	7
3.1. .Operation driver's cockpit (front box)	7
3.2. .Operation of air-cond. controller passenger compartment	8
3.3. .Setting the time	11
3.4. .Programming the auxiliary heating system	12
4.....FAULTS AND ERRORS - DIAGNOSIS	13
4.1. .Error memory function	14
4.2. .Calling and clearing the contents of the error memory	14
4.3. .List of error messages - single-decker coach	15
5.....SPECIAL FUNCTIONS	17
5.1. .Intensity control of the LED-display	17
5.2. .Max. -/Min.-setting of the setpoint controls pass. compartmenttemperature (Override-mode)	18
5.3. .Minimum speed setting of the roof duct fans	18
5.4. .Reset of the internal memory	19
5.5..Deactivating the auto start function (Automatic-mode)	19
5.6..Encoding with vehicles without air-conditioning	20
5.7..Special functions of the display - roof duct temperature	20
6.....ACCESSORY UNITS	21
6.1. .Emergency ventilation switch and RS-232 interface	21
7.....SYSTEM-SELF-TEST	22
7.1..The test programs in detail	22
8.....CONNECTING DIAGRAM KR- 451	28
8.1. .Emergency switch module	29
9.....SERVICE INFORMATION KR- 451	30
10...BLOCK SCHEMA OF CONTROL	31
11.. .TECHNICAL DATA	32
12.. .LIST OF ERRORS WITH REMEDIAL MEASURES	33

Digital air- conditioner controller KR- 451

1. KEY ASSIGNMENT ON THE FRONT PANEL



Key assignment, temperature, driver's cockpit (Front box)

Key S1:	Front box fan, stage I
Key S2:	Front box fan, stage II
Key S3:	Flap, fresh air/circulating air
Key S4:	Flap, screen + screen defrost
Key S5:	Flap, driver's cockpit/centre aisle
Keys S4+S5:	Lamp test with ignition switched on
Key S15:	Setpoint key (-) for valve position at the driver's cockpit (front box)
Key S16:	Setpoint key (+) for valve position at the driver's cockpit (front box).

Digital air- conditioner controller KR- 451

Key assignment, air-conditioner control system, passenger compartment

Key S6:	-Automatic mode with engine on
Key S6 + S9	-Diagnostic mode with engine off
Key S7:	-Ventilation mode, stage I
Key S8:	-Ventilation mode, stage II
Key S9:	-Flap, fresh air/circulating air
Key S10:	-Auxiliary heating system
Key S11:	-Convectors on/off
Key S12:	-Setting time or time switch (h) with "ignition off" -Increment test mode -LED-display reduce intensity on/off
Key S13:	-Setting time or time switch (min) with "ignition off" -Decrement test mode -Passenger compartment temperature with "igniton on"
Key S14:	-Activating time setting mode and time switch for auxiliary heating system with "ignition off" -Confirm key for new time entered -Outside temperature display
Key S17:	-Setpoint key (-) for passenger compartment temperature
Key S18:	-Setpoint key (+) for passenger compartment temperature

LED DISPLAY

The following information is shown on the LED display:

- 1) With the ignition switched off:
 - Setting the time and time switch for the auxiliary heating system
 - Diagnosis
 - Dot display (blinks as tell-tale indicator for processor function)
- 2) With ignition switched on:
 - Passenger compartment and outside temperature display with
 - Frost warning
 - Time
 - Error message

Digital air- conditioner controller KR- 451

2. QUICK-START OPERATING INSTRUCTIONS

These instructions provide you with general information on the individual functions of the KR-451 air-conditioner controller.

DISPLAY

The outside temperature is always displayed as the basic display with the ignition switched on.

If the ignition is switched off, the decimal point between the minutes and hours display blinks as a tell-tale indication of the function of the microprocessor. The display is used to show the data for error detection in test mode.

AUTO

The normal mode of operation of the air-conditioner controller is Automatic mode. This mode is activated automatically with the engine running. Both the LED-display "Auto" (**S6**) and the "Convactor" (**S11**) are flashing. You can now set the required passenger compartment temperature for the passenger compartment with the setpoint keys **S17** or **S18**. You can set a temperature between 18°and 28°C.

VENTILATION

The roof duct fans can be switched on manually with keys **S7** and **S8**. This closes the motor valves for the roof duct heaters and ventilates at 40 % or 100 % of the fan capacity. You can fix the fan speed to 40% or 100% by pressing keys **S7** or **S8** in Automatic mode. (**Caution:** The automatic passenger compartment control is obstructed by that.)

CONVECTORS

The convectors are switched on automatically and control their temperature as preset on the setpoint passenger compartment in Automatic mode. The value sensed by the convector sensor serves as the actual value, and the passenger compartment temperature sensor limits heating of the passenger compartment.

The convectors can also be switched on during Ventilation- and Stationery heating mode and are controlled as in Automatic mode.

FRONT BOX

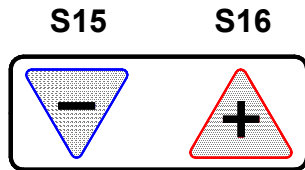
The air-conditioner controller includes a front box control system for the driver's cockpit accommodated in the left-hand part of the unit. You enter the temperature with the setpoint keys **S15** or **S16**. Various keys permit you to operate the flaps and the 2-stage fan.

3. DESCRIPTION OF KEY FUNCTIONS

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	Phone: +49 7141 / 68877 - 0	04511530.SDW
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Digital air- conditioner controller KR- 451

3.1. OPERATION, DRIVER'S COCKPIT (FRONT BOX)



Setting the setpoint for the temperature of the driver's cockpit

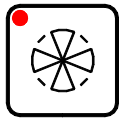
Setting- and display range 0-100 in 1-step-intervals.

The actual setpoint of the driver's cockpit is displayed by a short pressing (press and release) of keys **S15** or **S16**. Display f.ex. "F50".

You can change the setpoint in 1-step-intervals per key pressure with keys **S15** and **S16**. If you press any key for more than 2 seconds the setpoint is changed at a high speed.

If you don't press any of these keys the actual setpoint is stored and displayed. The display goes back to its former status after 5 seconds.

S1:



Front box fan 40%

Also functions without the engine running

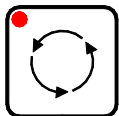
S2:



Front box fan 100%

Functions only when the engine is running

S3:



Flap "Fresh air/circulating air", driver's cockpit

Basic setting: Fresh air

S4

Flap "Screen defrost"

Basic setting: flap open

Digital air- conditioner controller KR- 451



The flap is opened or closed if you press the key shorter than 2 seconds. The key - LED S4 flashes with open flap.

The defrost function is initiated if you press the key longer than 2 seconds. That means:

- Flap screen opens, key - LED S4 blinks
 - Flap centre aisle closes, key - LED S5 goes out
 - Flap circulating air closes (fresh air), key- LED S3 goes out
 - Front box fan 100%, key - LED S2 flashes
 - Front box valve opens, LED - display f.ex. "F100" for 5 sec.
- You can reset the defrost function by pressing alternatively keys **S1** , **S2** , **S3** , **S4** , **S5** , **S15** or **S16** .

S5



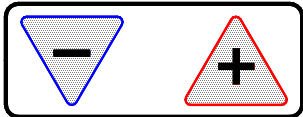
Flap "Driver's cockpit/centre aisle"

The flap opens when you press the key. In this setting a part of the air stream is directed towards the driver and into the centre aisle.

3.2 OPERATION OF AIR-CONDITIONER CONTROL SYSTEM, PASSENGER COMPARTMENT

S17

S18



Setting the setpoint for passenger compartment temperature

Setting- and display range from 18°-28° C

The actual setpoint of the passenger compartment is displayed by a short pressing (press and release) of keys **S17** or **S18**.

Display => f.ex. " 20 "

You can change the setpoint with keys **S17** and **S18** in 1°C -steps per key pressure.

The actual setpoint is displayed after releasing the corresponding key.

If you don't press the keys for further 5 sec. the value is stored and the display goes back to its former status.

S6



AUTOMATIC MODE

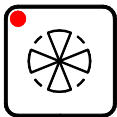
The temperature control system of the passenger compartment is switched on automatically after starting the engine. The LED of key **S6** flashes. You can switch off the Automatic mode by

Digital air- conditioner controller KR- 451

pressing key **S6**. Automatic control is only possible with the engine running. The fan and the air- conditioner are always switched off when you switch off the ignition. The motor valves and flaps remain in position. In Automatic mode the passenger compartment temperature is automatically regulated to the temperatures set with the setpoint keys using the components of the system (fan, air-conditioner, heater).

As a special function, you can switch off automatic speed control of the roof duct fans with the ventilation keys (**S7/S8**). The fan speed is then permanently set to 40 % (stage I - **S7**) or 100 % (stage II - **S8**) as is the case in Ventilation mode (f.ex. to vent the vehicle quickly).

S7



VENTILATION MODE, stage I

When you press key **S7**, the motor valves of the roof duct heater close and the roof duct fans are switched on to stage I (approx. 40 %). This ventilation mode is possible even without the engine running and only with the ignition switched on. The incorporated undervoltage protection

facility in the unit avoids exhaustive discharge of the vehicle battery.

S8

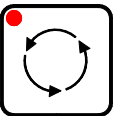


VENTILATION MODE, stage II

Function as with key S7, but ventilation capacity 100 %. This key operates only with the engine running (alternator).

NOTE: The fans are increased slowly and in controlled manner to 100% fan capacity in order to avoid a high making current! (this takes approx. 15 sec.!)

S9



Flap "Fresh air/circulating air" passenger compartment

You can use this key when on the move to switch the ventilation system to circulating air, and an automatic function switches back to fresh air after 10 min.

In addition, the system switches over automatically to circulating air at temperatures above 28°C and below -20°C (according to the function chart).

S10



AUXILIARY HEATING SYSTEM

The auxiliary heating system is started up when you press this key. Operation of the auxiliary heating system is indicated by the LED in the key.

Digital air- conditioner controller KR- 451

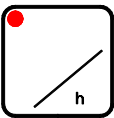
S11



CONVECTORS

This key can be used to switch the convectors on and off. They are also controlled via their own sensor in Ventilation mode, dependent on the set temperature (setpoint keys **S17**, **S18**). The measured passenger compartment temperature is used as the basis for limiting the temperature for convector control.

S12



SETTING THE TIME AND DISPLAY DIMMER

When setting the time and the time switch, this key is used to increment (count up) the hours display. In Diagnostic mode, this key is used to increment the diagnostic steps.

S13



PASSENGER COMPARTMENT TEMPERATURE

When setting the time and the time switch, this key is used to increment (count up) the minute display. In Diagnostic mode, this key is used to decrement (count down) the diagnostic steps.

S14



OUTSIDE TEMPERATURE

With ignition switched on:

- The outside temperature is displayed.
- The current time is displayed after you press the function key.

With ignition switched off:

- Activating Clock-set mode
- Confirm key for new time entered.

3.3 SETTING THE TIME

S14

OUTSIDE TEMPERATURE/TIME

Digital air- conditioner controller KR- 451

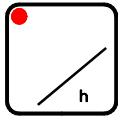


PRECONDITION: Engine off, ignition off!

You can call Clock-set mode with key **S14**. Keys **S12** and **S13** light. The current system time is displayed on the display. If you do not press any other key, the display disappears after approx. 5 seconds and the previously set system time is retained.

After you press key **S14**, you can then press key **S12**

S12



to increment the hours display. If you keep the key pressed, the display counts up in 1/2 second steps.

You can set the minute display with key **S13**

S13



and the same operating steps apply as for key **S12**.



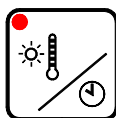
After you set the hours and minutes display, you can confirm the new time entered with key **S14**. If you do not confirm within approx. 5 seconds, the unit retains the previously set system time.

3.4 PROGRAMMING THE AUXILIARY HEATING SYSTEM

S14

The same operating steps as for setting the time apply to programming the time switch for the auxiliary heating system.

Digital air- conditioner controller KR- 451



However, after you press key **S14** (Setting mode), you must then, within approx. 5 sec press **S10 (AUXILIARY HEATING SYSTEM)**

S10



Then, as when setting the time, you must program the required switch-on time for the auxiliary heating system and confirm this with key **S14** (Key-LED **S10** blinks in 2-second-steps).

If the auxiliary heating system has been started automatically, it can be switched off again with key **S10**. Otherwise, the heating system switches off again automatically after 1 hour. The convectors are also switched on and the temperature is controlled together with the auxiliary heating system.

The temperature value of the setpoint control is used as is the case with passenger compartment temperature control. Set the relevant setpoint to **"C"** if you do not wish to pre-heat the passenger compartment.

The current switch-on time can be checked with the Automatic key **S6** with the ignition off. If the auxiliary heating system has been programmed, you will see the switch-on time on the display. You will see display **"OFF"** if no times have been programmed.

This check display is cleared again after approx. 5 seconds.

If you want to reset a programmed switch-on-time call the starting time as when programming; but **don't** confirm it with key **S14**.

4. FAULTS AND ERRORS - DIAGNOSIS

The KR-451 air-conditioner controller features a sophisticated error and fault diagnosis program.

BADER INDUSTRIE-ELEKTRONIK	Control and regulating systems for vehicle air conditioning	page: 12
	D-71691 Freiberg a.N., Siemensstr.21	of: 37
	Phone: +49 7141 / 68877 - 0	Fax: +49 7141 / 68877 - 39
		04511530.SDW

Digital air- conditioner controller KR- 451

This error and fault diagnosis program runs, as it were, "in the background" during normal air-conditioner operation and monitors the sensors, setpoint potentiometers and valve potentiometers and the switched outputs of the valve motors and other loads for discontinuity and short circuit. If one or more faults or errors occur when on the move, the time display is cleared and the relevant malfunction is displayed in the form of a consecutive number. An "E" for ERROR in front of the number signals the error.

S14



The LED in key **S14** blinks simultaneously.

You must then "acknowledge" the fault with this key. The air-conditioner centre then continues to operate in Emergency mode, and the sensor values are simulated for instance, dependent on the operating state. This Emergency mode can be seen from a dot at the far right on the display. The time is displayed once again after you acknowledge the error.

If there is a valve potentiometer error, the air-conditioner controller attempts to operate the valves even without a check-back signal so as to permit it to regulate the system, even if not precisely.

If an output has a short circuit, this output is disconnected and the relevant error is shown on the display. The system attempts to reactivate the output each time you switch the ignition off and on.

4.1 ERROR MEMORY FUNCTION

If an error occurs when on the move and if this error is acknowledged, the error number is stored in the so called unit's error memory.

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	D-71691 Freiberg a.N., Siemensstr.21	of: 37
	Phone: +49 7141 / 68877 - 0	Fax: +49 7141 / 68877 - 39
		04511530.SDW

Digital air- conditioner controller KR- 451

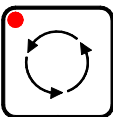
These errors are displayed again each time you switch on the ignition in order to indicate the defect to you. The contents of the error memory must be cleared manually when the error has been rectified.

4.2 CALLING AND CLEARING THE CONTENTS OF THE ERROR MEMORY

S6



S9



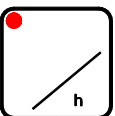
The contents of the error memory can be called by pressing keys **S6** and **S9** simultaneously with the ignition switched off.

You will first see the program version of the unit on the display (e.g. 1.10).

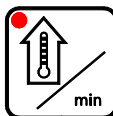


You will then see the number of errors detected, shown by an "A" and a consecutive number.

S12



S13



You can then page forward and backward in the error memory with keys **S12** and **S13**.

You can clear the contents of the error memory by pressing both keys simultaneously.

You will then see "A 00" on the display.

If there is still an error in the system (e.g. sensor discontinuity), this error message will be displayed again immediately.

4.3 LIST OF ERROR MESSAGES - SINGLE-DECKER-COACH

Error	1	Working-hour meter not set at 0
Error	3	Short circuit, outside sensor
Error	4	Discontinuity, -"
Error	5	Short circuit, passenger compartment sensor

Digital air- conditioner controller KR- 451

Error 6	Discontinuity, -"-
Error 7	Short circuit, roof duct sensor
Error 8	Discontinuity, -"-
Error 9	Short circuit, convector sensor, front
Error 10	Discontinuity, -"-
Error 11	Short circuit, convector sensor, rear
Error 12	Discontinuity, -"-

Error messages: Input/output errors

Error 33	No air-conditioner compressor check-back signal
Error 34	No auxiliary heating system (WEBASTO) check-back signal
Error 35	Prop valve, roof duct, potentiometer defective
Error 36	Prop valve, driver's cockpit, potentiometer defective
Error 37	Prop valve, convector, front, potentiometer defective
Error 38	Prop valve, convector, rear, potentiometer defective
Error 43	Setpoint potentiometer, upper deck, discontinuity (SPACELINER)

Error messages: voltage errors

Error 80	No valve potentiometer voltage
Error 81	Outputs valve motors or servo motors of front box overloaded
Error 82	Valve assignment (valve-potentiometer) error
Error 84	Outputs overloaded (total current)
Error 85	Front box stage 1 overcurrent
Error 86	Front box stage 2 overcurrent

5. SPECIAL FUNCTIONS

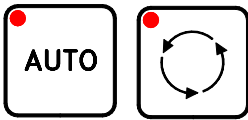
5.1 INTENSITY CONTROL OF THE LED-DISPLAYS

The KR-451 air-conditioner controller features an intensity control

Digital air- conditioner controller KR- 451

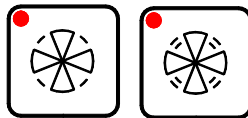
which dims the display when the vehicle's headlights are on. The driver himself can set the intensity in 2 stages.

The intensity can be set in "DIAGNOSTIC MODE" with the ignition switched off:



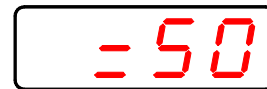
Press keys **S6** and **S9** simultaneously.

After the program version and the contents of the error memory have been shown on the display

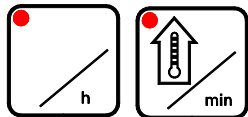


you can call the intensity control by pressing **S1** und **S2** simultaneously.

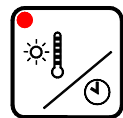
You will now see the following f.ex. on the display



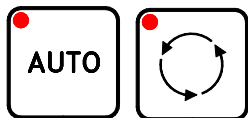
This display means intensity set to 50%.



This value can be varied from 50% to 100% with keys **S12** and **S13**.



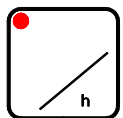
You can store this value with key **S14** after setting the intensity.



You quit DIAGNOSTIC-MODE again by pressing keys **S6** / **S9**.

If you now drive with your headlights on, the display is dimmed to the set intensity value.

If you intend to drive with your headlights on under daylight conditions (e.g. in Sweden), you will not want the display dimmed.



You can switch the intensity control on and off even when on the move by pressing key **S12** (or by pressing keys **S1** and **S2** simultaneously).

5.2 MAXIMUM/ MINIMUM SETTING OF THE SETPOINT CONTROLS, PASSENGER COMPARTMENT TEMPERATURE (OVERRIDE-MODE)

S17

S18

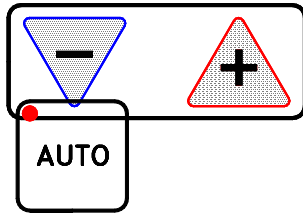
Override - mode heating (uncontrolled heating)

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page: 16
of: 37
04511530.SDW

Digital air- conditioner controller KR- 451



Set setpoint temperature to max. 28°C with key **S18** and release it. Then press key **S18** longer than 2 seconds; you can then see an “H” on the display - the system heats in an uncontrolled manner. All actuators of the heating system (motor valves and convector valves) are fully opened. This operating mode is used for bleeding the water circuit for instance.

Override - Mode cooling (uncontrolled cooling)

Set setpoint temperature to minimum 18°C with key **S17** and release it. Then press key **S17** longer than 2 seconds; you can see a “C” on the display - the system cools in an uncontrolled manner. In this operating mode the air-conditioning system is switched on continuously and no regulation function is performed (e.g. in order to fill the system).

You leave the automatic control range of the unit in Override-mode. In this case the red LED in the auto- and convector key blinks.

If you want to finish the Override-mode you can set the temperature to normal with keys **S17** or **S18**.

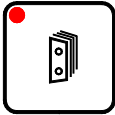
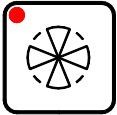
5.3 Minimum speed setting of the roof duct fans

-see service-/ test program No. 11 and 12

5.4. RESET OF THE INTERNAL MEMORY

In case of an error the internal memories of the air-conditioner controller KR-451 can be reset by interrupting the air-conditioner centre's power supply, by pressing the emergency switch module or by a RESET with the keys of the air-conditioner controller.

Digital air- conditioner controller KR- 451



RESET is started by simultaneously pressing keys **S1** and **S11**. Press the keys for about 5 sec. . You can see a "5" on the LED-display. The "5" decrements to "0" in one-second-steps. Then the air-conditioner controller conducts its self-test. All memory data are cleared, the internal clock of the unit must be reset. This measure is necessary in case of electric errors in the air-conditioner (short-circuit, discharged batteries, etc.)

5.5. DEACTIVATTHE AUTOSTARING OF T-FUNCTION (AUTOMATIC MODE)



After starting the engine the air-conditioner KR-451 automatically switches to Automatic mode (AUTO). If not desired - this function can be cleared:

1. engine off, ignition off.
2. press automatic key **S6**, you can see "OFF" on the display or the switch-on time in case of a programmed stationary heating. Keep key **S6** pressed and start the ignition simultaneously till the time can be seen on the display.



The autostart function is deactivated. At every engine start you must switch on the automatic function manually by pressing AUTO-key **S6**.

Use the same procedure to activate it again.

5.6. ENCODING WITH VEHICLES WITHOUT AIR-CONDITIONING

If the vehicle has no air-conditioning the air-conditioner must be encoded accordingly. To do this fix a 24V-signal terminal 15 (ignition) to the control input air-conditioner check-back (plug X2 Pin 9) tightly.

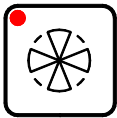
Digital air- conditioner controller KR- 451

(e.g. wire bridge X10 Pin 2/5)

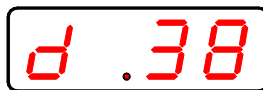
With its system check the air-conditioner controller recognizes automatically if it's any special model without roof duct heating or convector heating. The controller finds f. ex. the connected roof duct sensor and looks for the corresponding roof duct valve. If there is no valve the controller gives an error message. If there is no sensor **and** valve the unit realizes and stores the control circuit as not existing. (Analogous the convector control circuit). The convector key is without any function if the unit has recognized that the convector control circuit system is not existing (no sensor **and** no valve).

That is why you can equip either the front or the rear convector control circuit without changing or setting the unit.

5.7 SPECIAL FUNCTIONS OF THE DISPLAY



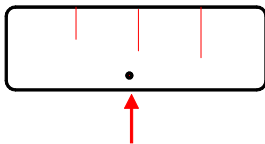
If you press key **S7** within 5 seconds after pressing key **S13** (passenger compartment temperature) the current roof duct temperature is displayed for a short period of time. You can see a "d" on the left side of the display with the temperature value in °C next to it.



If you press the convector key equally, you can see the current convector temperature "c" in °C on the display.

The display switches back to the basic function outside temperature after 5 seconds.

By lighting up individual decimal dots on the LED-display the air-conditioner controller informs about different operating modes of the air-conditioning.



With ignition on the decimal dot of the second digit blinks. This dot also blinks at **undervoltage** (< 22,5V), however with short blink pulses. If you press any key at undervoltage you can see a "U" on the display.

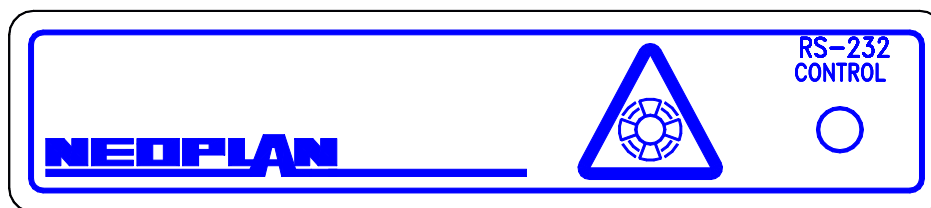
6. ACCESSORY UNITS

6.1. EMERGENCY VENTILATION SWITCH AND RS-232 COMPUTER INTERFACE

The emergency switch module NSM-450 features an emergency switch for the roof duct fans and a separate socket for the computer interface to diagnose the air-conditioning system.

BADER INDUSTRIE-ELEKTRONIK	Control and regulating systems for vehicle air conditioning	page: 19
	D-71691 Freiberg a.N., Siemensstr.21	of: 37
	Phone: +49 7141 / 68877 - 0	Fax: +49 7141 / 68877 - 39
		04511530.SDW

Digital air- conditioner controller KR- 451



emergency switch interface

Function:

If a total failure of the AIR-CONDITIONER CONTROLLER should occur, you can use a ball-point pen, pencil or other sharp implement to press the switch located in the triangle symbol. This switches off the air-conditioner controller and increases the speed of the roof duct fans to maximum speed with no regulation function. This function is indicated by a red LED in the emergency switch.

By pressing the switch again this function can be reset. The air-conditioner controller is switched back on and then runs through its test cycle (which takes approx. 3 minutes).

6.2 COMPUTER INTERFACE

There is a socket for the test computer (e.g. laptop) on the right-hand side of the NSM-450 for test purposes.

Only systems of Messrs. NEOPLAN or BADER GmbH may be connected!

Connecting circuit diagrams: see appendix

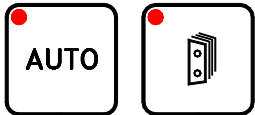
7. SYSTEM SELF-TEST

The KR-451 air-conditioner controller features a special operating mode which can be used to check the individual control circuits and monitoring elements, this is referred to below as the self-test. This operating mode is practical only with the ignition switched on.

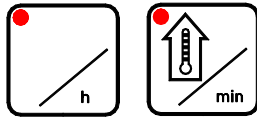
The self-test is activated by simultaneously pressing keys **S6** and

BADER INDUSTRIE-ELEKTRONIK	Control and regulating systems for vehicle air conditioning	page: 20
	D-71691 Freiberg a.N., Siemensstr.21	of: 37
	Phone: +49 7141 / 68877 - 0	04511530.SDW
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Digital air- conditioner controller KR- 451



S11. You will then see "-01" on the display, i.e. test program 1.



You can select test programs 1 to 10 with keys **S12** and **S13**.



You start the relevant test program by pressing key **S14**.



You can quit the self-test again by pressing key **S6** (AUTO).

7.1. THE TEST PROGRAMS IN DETAIL

PROGRAM 1:

This test program tests the key lighting on the control section. The LEDs in the keys light one after the other. You will see "LED" on the display.

You can quit the test program by pressing key **S6** (AUTO).

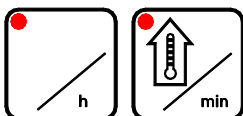
PROGRAM 2:

This program is used to test the 7-segment display. All segments are activated at all four digits one after the other.

You can quit the test program again by pressing key **S6** (AUTO).

PROGRAM 3:

This program tests the keys on the control section. When you press a key, the related LED in the key lights providing the control section is operating correctly. You will also see the key number 1...18 on the display



You can quit this test by pressing keys **S12** and **S13** simultaneously.

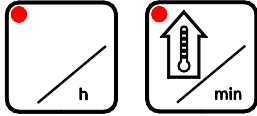
Digital air- conditioner controller KR- 451

PROGRAM 4: Not available in the KR-451!

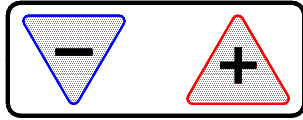
Digital air- conditioner controller KR- 451

PROGRAM 5:

This test program is used to test the valves.



You can select valves 1...6 with keys **S12** and **S13**. The valve number is displayed on the left on the display, and the valve setting from 0% to 100% is displayed on the right.



You open or close each of the selected valves by pressing keys **S15** and **S16** (driver's cockpit temperature).

(Normal angle: about 7%-87% >80% old BÜRKERT-series
about 15% - 65% >50% new BÜRKERT-series)

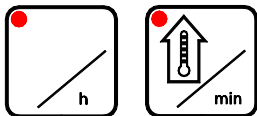
Assignment of the valves:

- 1: roof valve
- 2: driver's cockpit valve front box
- 3: convector front (series production 1 convector circuit)
- 4: convector rear City / front box UD SPACELINER

You can quit the test program by pressing key **S6** (AUTO).

PROGRAM 6:

This displays the temperatures of all sensors.



You can select the sensors 1...11 with keys **S12** and **S13**. The number of the sensor is displayed on the left on the display. The sensor temperature is displayed on the right.

Assignment of the sensors:

- sensor 1: outside temperature
- sensor 2: passenger compartment
- sensor 3: roof duct
- sensor 4: convector front (standard)
- sensor 5: convector rear **CITYLINER (option Sweden) / SPACELINER setpoint front box upper deck**

You can quit the test program by pressing key **S6** (AUTO).

Digital air- conditioner controller KR- 451

PROGRAM 7:

You can select the outputs **1...16** with this test program. The number is displayed on the right onth display. You quit the test program by pressing key **S6** (AUTO).

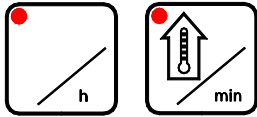
By pressing key **S14** "time" you can switch the outputs on and off.

Assignment of the outputs:

output 1:	front box 40%
output 2:	front box 100%
output 3:	auxiliary water pump convector front
output 4:	auxiliary water pump convector rear
output 5:	auxiliary water pump roof duct
output 6:	roof duct fan
output 7:	compressor clutch
output 8:	air-conditioning 50/100%
output 9:	circulating air flap
output 10:	stationary heating (Webasto)
output 11:	water pump
output 12:	frost warning
output 13:	reserve
output 14:	reserve

Digital air- conditioner controller KR- 451

PROGRAM 8:

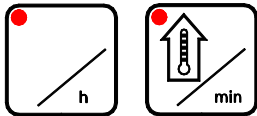


This program tests the valve- and servo motor outputs I/1...8 . You will see "v1" on the left on the display. You can select the outputs 1...8 with keys **S12** and **S13**. The number is displayed on the right. You quit the test program by pressing key **S6** (AUTO).

Assignment of the outputs:

output 1:	circulating air driver's cockpit open
output 2:	circulating air driver's cockpit closed
output 3:	screen defrost open
output 4:	screen defrost closed
output 5:	driver/centre aisle open
output 6:	driver/centre aisle closed
output 7:	front box valve driver's cockpit closed
output 8:	front box valve driver's cockpit open

PROGRAM 9:



This program tests the valve outputs II/1...8 . You will see "v2" on the left on the display. You can select the outputs 1...8 with keys **S12** and **S13**. The number is displayed on the right.

Assignment of the outputs:

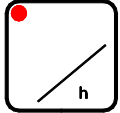
output 1:	convector valve front closed	
output 2:	convector valve front open	
output 3:	roof duct valve closed	
output 4:	roof duct valve open	
output 5:	convector CITY rear closed	SPACELINER front box UD
output 6:	convector CITY rear open	SPACELINER front box UD
output 7:	not connected	
output 8:	not connected	

You quit the test program by pressing key **S6** (AUTO).

Digital air- conditioner controller KR- 451

PROGRAM 10:

This tests the control voltage outputs. The number of the output 1/2 is displayed on the left-hand display position.



You can select output 1/2 with key **S14**. The output voltage from 0% to 100% is displayed on the right.

You can set the output voltage from 0% to 100% with keys **S12** and **S13**.

An output voltage of 0% corresponds to maximum speed (0V - control voltage) and an output voltage of 100% corresponds to minimum speed (about 22V control voltage). The keys have a repeat function if you keep them pressed.

Measuring with voltmeter with disconnected outputs!!!

You quit the test program by pressing key **S6** (AUTO).

PROGRAM 11:

Here the characteristic curve of the front box valve is adjusted to the setpoint display. You can adjust the 0-position of the valve to the real water cut-off. So, in order to open the front box valve, the driver need not enter f.ex. 10 or 20 steps till water actually flows through the valve.

Danger:

If the entered value is too high the valve doesn't close completely any more!

Minimal angle: display 0 - 100

(100: valve at min. almost open !!)

Practical: max. about 15; setting at delivery: 0

You quit the test program by pressing key **S6** (AUTO).

PROGRAM 12:

This features the minimum speed of the roof duct fan for heating and ventilation.

Display: 0 - 255 with:

0 = maximum speed (not advisable !!) and

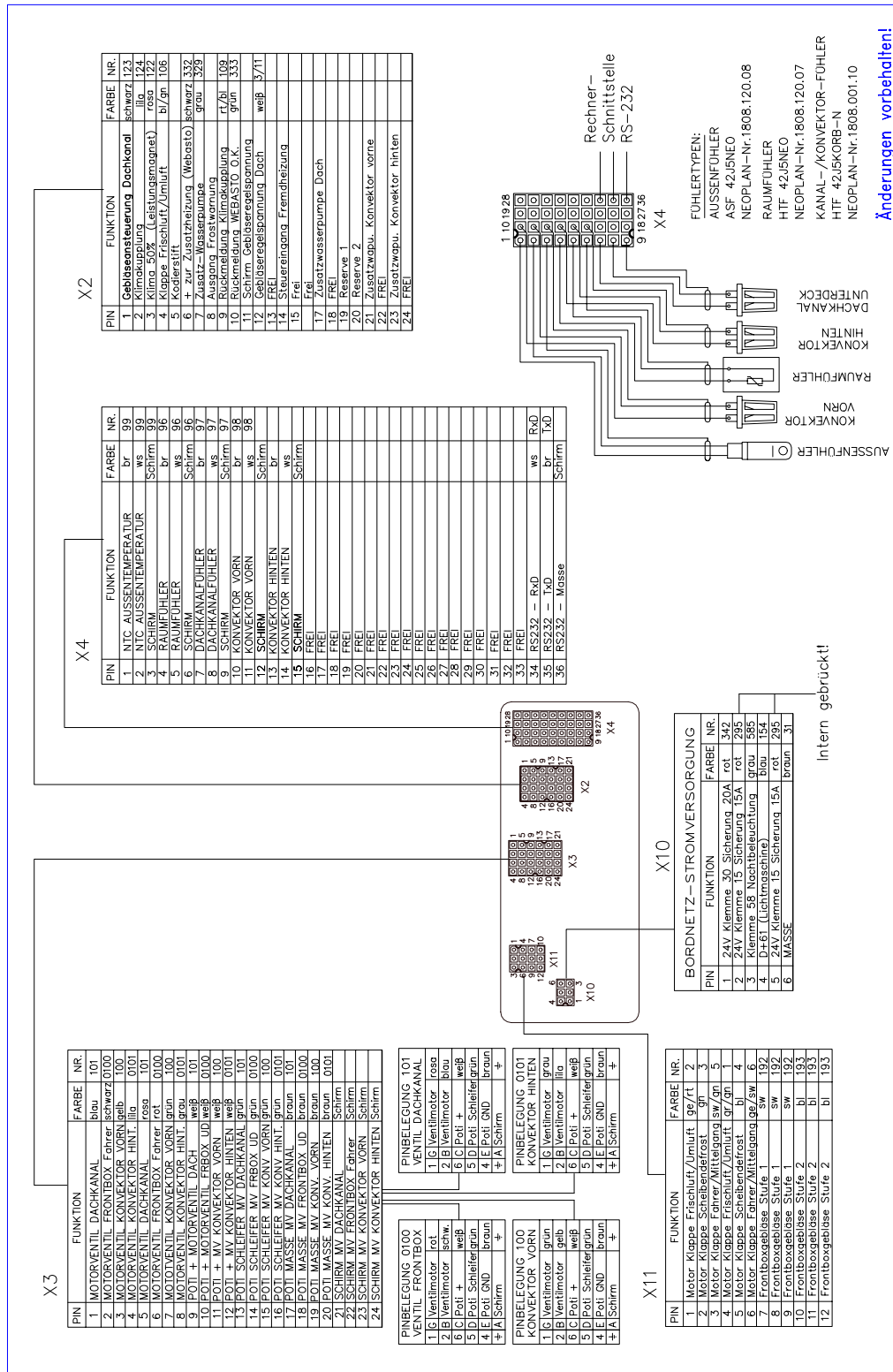
255 = minimum speed (not advisable!!)

Basic setting (delivery): 127 > about 12V control voltage

You quit the test program by pressing key **S6** (AUTO)

Digital air- conditioner controller KR- 451

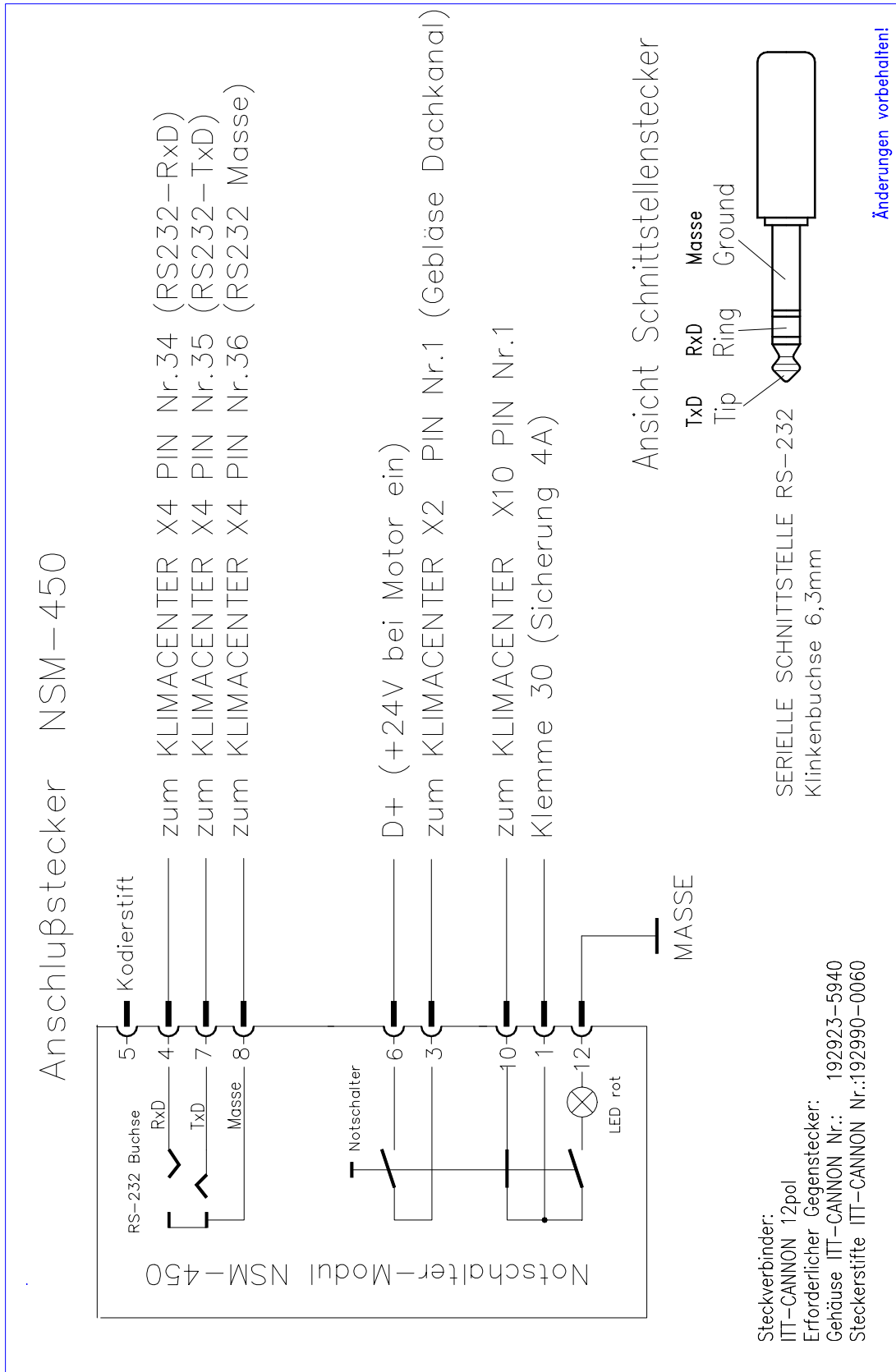
8. Total connecting circuit diagram KR-451



8.1 Connecting diagram emergency switch module NSM-450

Digital air- conditioner controller KR- 451

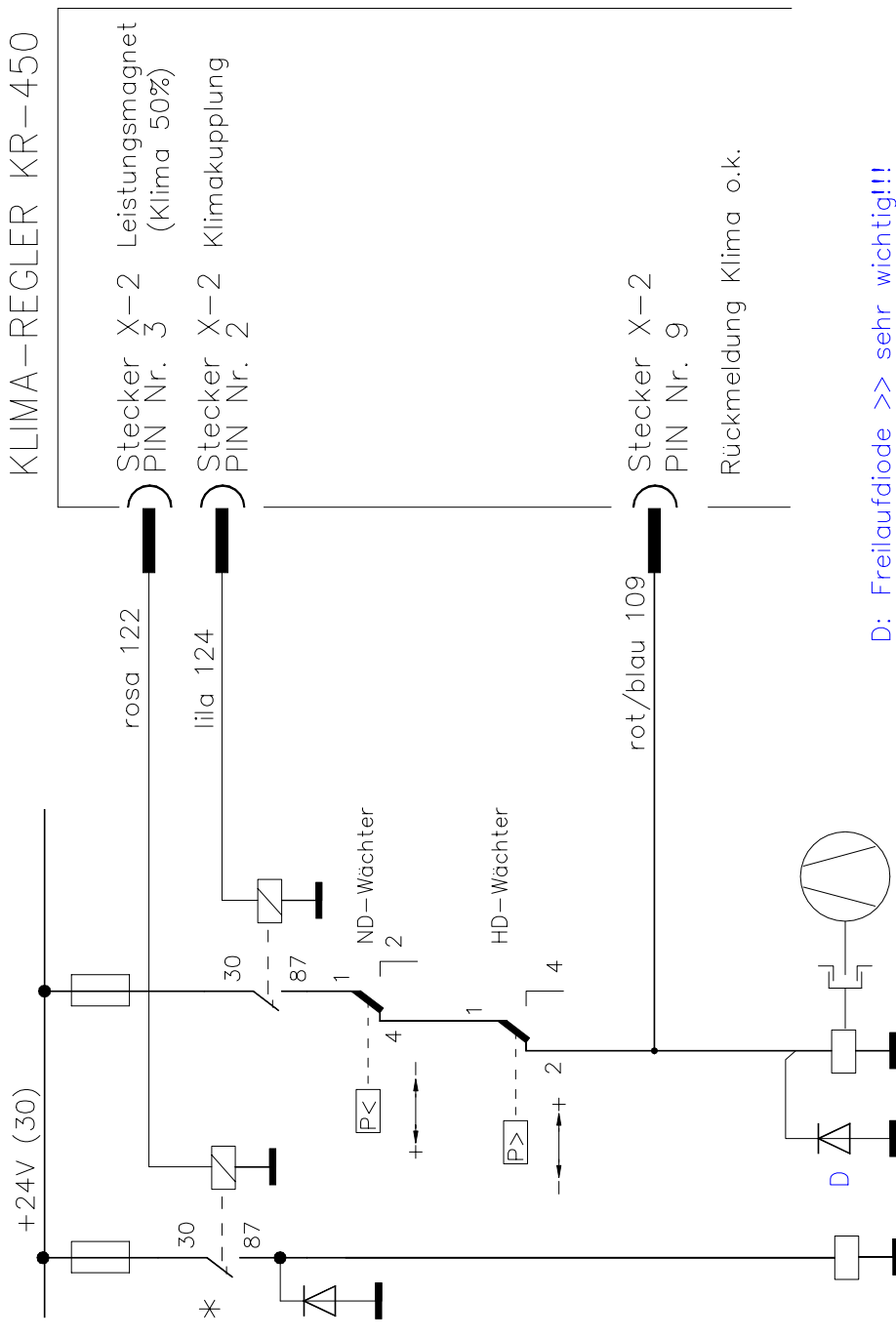
9. Service-



Digital air- conditioner controller KR- 451

Information KR-451

Basic circuit diagram

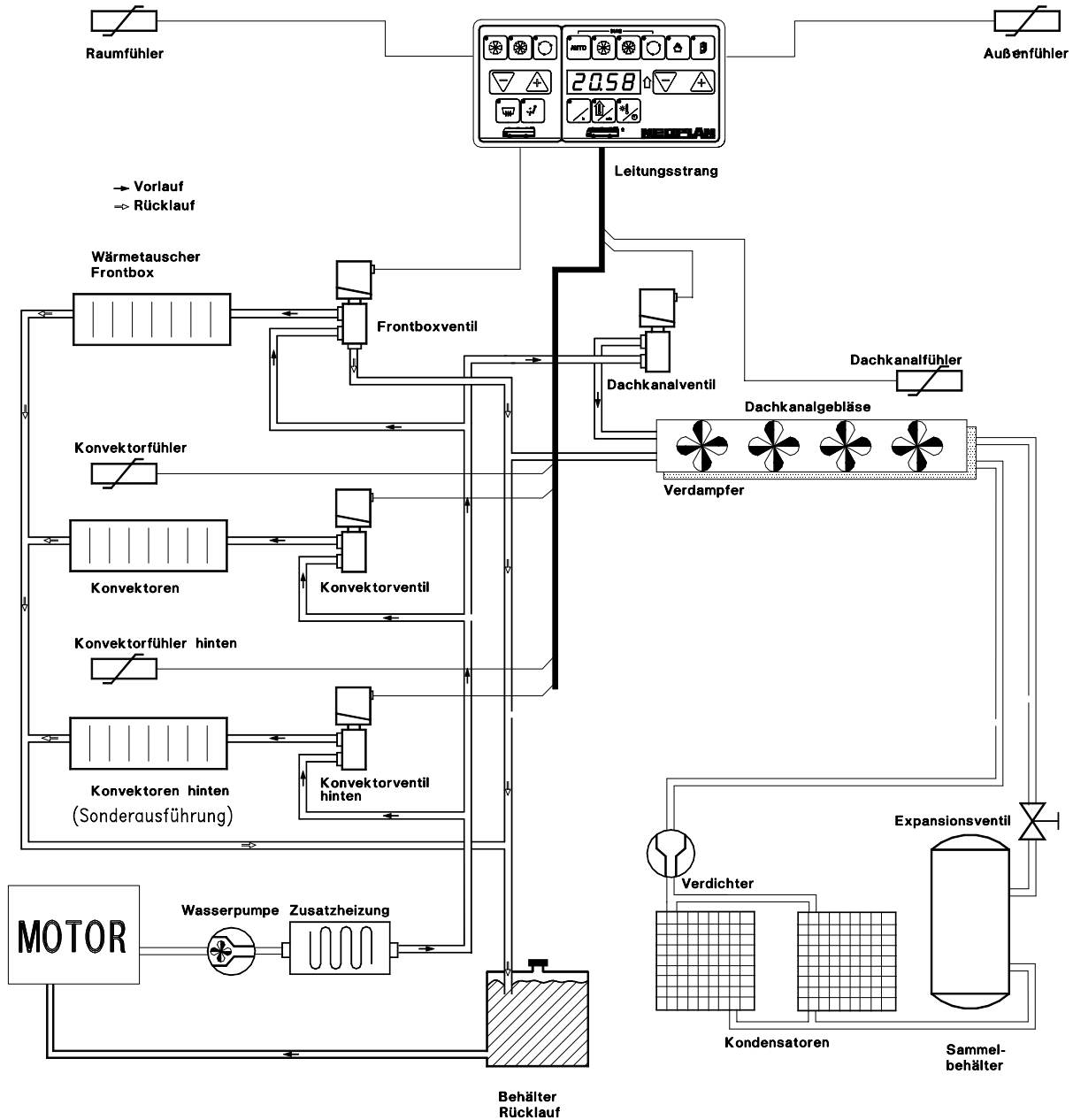


D: Freilaufdiode >> sehr wichtig!!!

* Kontakt 30/87 (Schließer) : CITYLINER etc.
Kontakt 30/87a (Öffner) : SKYLINER (Doppelstockgerät)

Digital air- conditioner controller KR- 451

10. BLOCK SCHEMA OF CONTROL IN SINGLE-DECKER-COACH



Digital air- conditioner controller KR- 451

11. Technical Data

Inputs:	6 Analog inputs to connect temperature- or other sensors	
	5 Digital inputs optically uncoupled	
	4 valve check-backs for prop. valves (s.full-bridge outputs)	
Outputs:	2 Power outputs	15A
	Max. load current of all power outputs	15A
	9 Small power outputs	200mA
	Max. load current of all small power relay outputs	2A
	8 Full-bridge or 16 semi-conductor outputs,short circuit proof	1,5A
	Max. load current of all semi-conductor outputs	2A
	1 Analog output	0-22V/ 100mA
	1 serial interface RS232	

Operating- and display elements:

4 - figure 7-segment display
18 keys
14 Display-LEDs

Current supply:

Power supply (distribution voltage):	20-30V
Drawing of current: at 24V no-load operation, not lightened	50 mA
Drawing of current: at 24V load operation, lightened	175 mA

Weight: about 1000g

Plug connectors: 5 or 6 ITT-plug connectors 6 to 36 pins

Installment: as you like, ensure sufficient ventilation!
Always keep the unit dry!

Subject to technical alterations!

12. List of errors with remedial measures

BADER INDUSTRIE-ELEKTRONIK	Control and regulating systems for vehicle air conditioning	page: 31
	D-71691 Freiberg a.N., Siemensstr.21	of: 37
	Phone: +49 7141 / 68877 - 0	Fax: +49 7141 / 68877 - 39
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Digital air- conditioner controller KR- 451

E1 *Working-hour-meter not set to "0"*

Position: Integrated in the unit
Reason : First operation or exchanging the program
Measure: Acknowledge display, switch ignition off and on

E3 *Short circuit outdoor sensor*

Position: Under the bumper, front, left
Reason : Sensor cable defective
Measure: Isolate or exchange cable (No.1808.001.13)

E4 *Discontinuity outdoor sensor*

Position: Under the bumper, front, left
Reason : A wire of the sensor is disconnected
Plug connection broken
Cable cut off or broken
Measure: Check connection at the air-conditioner controller or sensor
Check cable in its full length

E5 *Short circuit sensor passenger compartment*

Position: Under the luggage rack on the left side in the lower deck, 3.-4. seat row
Reason : Sensor cable defective
Measure: Isolate or exchange cable (No.1808.120.07)

E7 *Short circuit sensor roof duct*

Position: In the air duct on the right side, 12.-13. seat row
Reason : Sensor cable defective
Measure: Isolate or exchange cable (No.1808.001.10)

E8 *Discontinuity sensor roof duct*

Position: In the air duct on the right side, 12.-13. seat row
Reason : A wire of the sensor is disconnected
Plug connection broken, Cable cut off or broken
Measure: Check connection at the air-conditioner controller or sensor
Check cable in its full length

E9 *Short circuit convector sensor front*

Position: Above the convector on the right side, 13.-14. seat row
Reason : Sensor cable defective
Measure: Isolate or exchange cable (No.1808.001.10)

E10 *Discontinuity convector sensor front*

Position: Above the convector on the right side, 8.-9. seat row

Digital air- conditioner controller KR- 451

Reason : A wire of the sensor is disconnected
Plug connection broken
Cable cut off or broken

Measure: Check connection at the air-conditioner controller or sensor
Check cable in its full length

E11 *Short circuit convector sensor rear (only Sweden)*

Position: Above the convector on the right side at the rear, 13.-14. seat row

Reason : Sensor cable defective

Measure: Isolate or exchange cable (No.1808.001.10)

E12 *Discontinuity convector sensor rear (only Sweden)*

Position: Above the convector on the right side at the rear, 13.-14. seat row

Reason : A wire of the sensor is disconnected
Plug connection broken
Cable cut off or broken

Measure: Check connection at the air-conditioner controller or sensor
Check cable in its full length

E33 *Air-conditioner compressor no check-back*

Position: Engine compartment, facing the front right, at the side of the engine

Reason : Maximum- and minimum pressure switch defective; plug connection loose or defective
Fuse air-conditioner compressor defective
Danger of icing
Air-flow rate too little
Vaporizer fan failed
Heat exchanger fan failed
Heat exchanger fan connected wrongly
No recovery diode at the compressor clutch
Flap circulating/fresh air not connected properly
Ceck-back compressor clutch to air-conditioner controller interrupted
Control relay of compressor clutch defective
No V-belt to the compressor clutch

Measure: Check maximum- and minimum pressure switch
Check fuse compressor and replace it if necessary
Check cable connections
Check compressor level indicator
Check vaporizer- and heat exchanger fan and replace it if necessary
Check filter cloth, clean or replace it if necessary
Check compressor clutch (recovery diode, control relay)
Check flap circulating/fresh air
Check V-belt to the compressor clutch

E34 *Stationary heating (Webasto) no check-back*

Position: The stationary heating is located at the water station in the engine

Digital air- conditioner controller KR- 451

compartment or in a separate compartment very close to the engine compartment.

Reason: Control unit failed
Fuel supply interrupted
Burner head defective

Measure: Check level indicator with separate diesel oil tank
Check fuel shut-off
Check burner head
If there is no stationary heating check bridge between stationary heating control and stationary heating
Check check-back at the air-conditioner controller

E35 Prop valve roof duct potentiometer defective

Position: In the air intake duct right of the air-conditioner

Reason : Plug connection not plugged correctly
Valve defective
Cable squeezed or broken
Opening angle of motor valve too small

Measure: Check plug connection, valve and cable
Replace motor valve if necessary (No.1808.001.11)

E36 Prop valve driver's cockpit potentiometer defective

Position: In the double-decker the water valve is located under the driver's cockpit. In the single-decker the valve is in the water station.
It is a 3-way-valve

Reason : Plug connection not plugged correctly
Valve defective
Cable squeezed or broken
Opening angle of motor valve too small

Measure: Check plug connection, valve and cable
Replace motor valve if necessary (No.1808.001.12)

E37 Prop valve convector front potentiometer defective

Position: The water valve is located behind the first step in the staircase central entrance

Reason : Plug connection not plugged correctly
Valve defective
Cable squeezed or broken
Opening angle of motor valve too small

Measure: Check plug connection, valve and cable
Replace motor valve if necessary (No.1808.001.11)

E38 Prop valve convector rear potentiometer defective (Space: front box on the top)

Position: The water valve is located behind the first step in the staircase central

Digital air- conditioner controller KR- 451

entrance
Reason : Plug connection not plugged correctly
Valve defective
Cable squeezed or broken
Opening angle of motor valve too small
Measure: Check plug connection, valve and cable
Replace motor valve if necessary (No.1808.001.11)

E43 *Setpoint potentiometer front box upper deck discontinuity*

Position: FBS in the instrument panel above the air-conditioner controller
Reason : Cable broken or unit defective
Measure: Check cable course
Check soldering joint
Exchange unit

Digital air- conditioner controller KR- 451

E80 No valve potentiometer voltage (+5V)

Position: Possible at all valves
Reason : Ground contact at a valve potentiometer
Measure: Unplug all valves, ignition on, clear all errors, plug on the valves one after the other and find out the defective valve

E81 No valve potentiometer voltage (+24V)

Position: Possible at all valves
Reason : Valve outputs overloaded f.ex. if several valves are stiff or servo motors are stiff or defective (flap fresh air/circulating air, etc.)
Measure: Check all valves and replace them if necessary
Unplug plug connection X11 and check if front box errors still occur

E82 Valve assignment (valve potentiometer) error

Position: Possible at all valves
Reason : Cabling error, valve motor and valve potentiometer interchanged
Measure: Check cabling in general

E84 Outputs (total current) overloaded

Position: All loads connected to the air-conditioner controller (motor valves, relays, Webasto, etc.)
Reason : Drawing of total current at the relay outputs more than 2A
Loads without auxiliary relays connected directly to the air-conditioner controller
Measure: Check all outputs connected by relays (measure drawing of current at nal 15 - X10, Pin 2)

E85 Front box stage 1 overcurrent

Position: Front box driver's cockpit
Reason : Motor stiff (ball bearing damage, foreign substances)
Measure: Check and clean fan

E86 Front box stage 2 overcurrent

Position: Front box driver's cockpit
Reason : Motor stiff (ball bearing damage, foreign substances)
Measure: Check and clean fan

Digital air- conditioner controller KR- 451

Note:

All shields of the sensor cables and the cables for the potentiometer check-back of the water valves as well as the control cable of the roof duct fans may only be connected to the air-conditioner controller with vehicle-ground. Ground connections within the vehicle (frame) may lead to uncontrolled error messages or to error functions of the air-conditioner controller!

Notes: