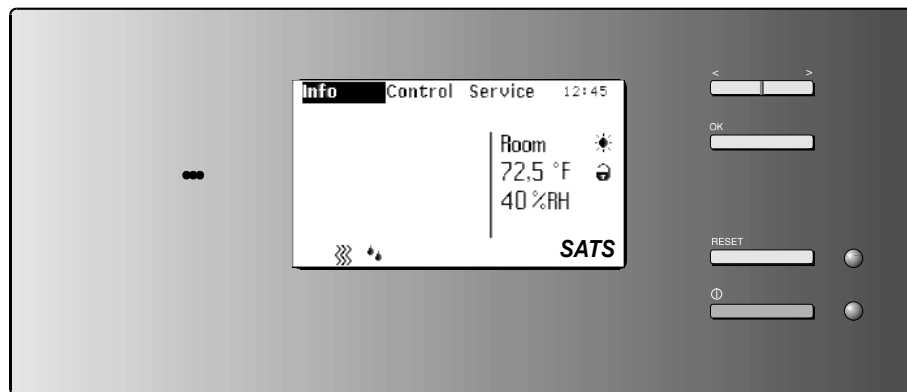


# C6000™

## Microprocessor Controller



**Installation, Operation  
& Maintenance Manual**



**QUICK START**  
**INSTRUCTIONS**  
**FOR INITIAL START-UP**  
**SEE SECTION 2.4**



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07/08 Stulz Air Technology Systems, Inc.  
1572 Tilco Drive  
Frederick, MD 21704  
USA

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### **-Glossary-**

Definition of Terms and Abbreviations

## **1.0 GENERAL INFORMATION**

### **1.1 Forward**

Congratulations, the C6000™ microprocessor based A/C system controller covered by this manual is designed and manufactured by Stulz Air Technology Systems, Inc. (SATS) using the latest, state-of-the-art control technology. Recognized as a world leader, SATS provides precision cooling systems and controls with the highest quality craftsmanship using the finest materials available in the industry. The controller will provide years of trouble free service if installed and maintained in accordance with this manual. Damage to the unit from improper installation, operation or maintenance is not covered by the warranty.

This manual contains information for operation, maintenance, troubleshooting and repair of the controller. STUDY the instructions contained in this manual. They must be followed to avoid difficulties. Spare parts are available from SATS to insure continuous operation. Using substitute parts or bypassing electrical components in order to continue operation is not recommended and will VOID THE WARRANTY. Due to technological advancements, components are subject to change without notice.

C6000 controllers are designed primarily to precisely operate, control and monitor SATS precision air conditioning systems. The controller provides the user interface to manage the A/C system. Any use beyond this is deemed to be not intended. SATS is not liable for any damage resulting from improper use. All C6000 controllers are designed for indoor use.

### **1.2 Safety Summary**

#### **1.2.1 General**

SATS uses **NOTES** along with **CAUTION** and **WARNING** symbols throughout this manual to draw your attention to important operational and safety information.

A bold text **NOTE** marks a short message in the information to alert you to an important detail.

A bold text **CAUTION** safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A bold text **WARNING** safety alert appears with information that is important for protecting you from harm and the equipment from damage. Pay very close attention to all warnings that apply to your application.

A safety alert symbol  accompanies a general **WARNING** or **CAUTION** safety statement.

A safety alert symbol  accompanies an electrical shock hazard **WARNING** or **CAUTION** safety statement.

#### **1.2.2 Safety Summary**

The following statements are general guidelines followed by warnings and cautions applicable throughout the manual.

#### **CAUTION**

Prior to operating the unit, read and understand all instructions, recommendations and guidelines contained within this manual.

#### **CAUTION**

All adjustments, maintenance and/or repairs must be performed by a qualified technician.

#### **NOTE**

We recommend contacting SATS Product Support Group for assistance with adjusting or servicing your A/C unit.

#### **WARNING**

If a fault occurs when operating the A/C unit or adjusting control parameters, it must be corrected immediately in accordance with the troubleshooting instructions for the A/C unit.

#### **CAUTION**

Equipment may contain components subject to Electrostatic Discharge (ESD). Before attempting to mount or service these electronic devices, ensure you have no charge built up by touching a ground source. When possible, use a wrist-grounding strap when working on or near electronic devices.

### **1.3 Product Warranty**

SATS offers a two year standard limited warranty as stated below.

#### **2-Year Standard Limited Warranty:**

Stulz Air Technology Systems, Inc., warrants to the original buyer of its products that the goods are free from defects in material and workmanship. Stulz Air Technology Systems, Inc.'s obligation under this warranty is to repair or replace, at its option, free of charge to the customer, any part or parts which are determined by Stulz Air Technology Systems Inc. to be defective for a period of 24 months from date of shipment when a completed start-up form has been submitted to Stulz Air Technology Systems, Inc. within 90 days from shipment. In the event that a completed start-up form is not received by Stulz Air Technology Systems, Inc. within 90 days from shipment, the company's obligation will be for a period of 12 months from date of shipment. Parts repaired or replaced under this warranty are shipped FOB Factory, and warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater.

Stulz Air Technology Systems, Inc.'s warranty does not cover failures caused by improper installation, abuse, misuse, misapplication, improper or lack of maintenance, negligence, accident, normal deterioration (including wear and tear), or the use of improper parts or improper repair.

Purchaser's remedies are limited to replacement or repair of non-conforming materials in accordance with the written warranty. This warranty does not include costs for transportation, costs for removal or reinstallation of equipment or labor for repairs or replacement made in the field.

If any sample was shown to the buyer, such sample was used merely to illustrate the general type and quality of the product, and not to represent that the equipment would necessarily conform to the sample.

This is the only warranty given by the seller, and such warranty is only given to buyers for commercial or industrial purposes. This warranty is not enforceable until the invoice(s) is paid in full.

THE FOREGOING SHALL CONSTITUTE SATS'S ENTIRE LIABILITY AND YOUR EXCLUSIVE REMEDY. IN NO EVENT SHALL SATS BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES, INCLUDING LOST PROFITS (EVEN IF ADVISED OF THE POSSIBILITY THEREOF) ARISING IN ANY WAY OUT OF THE INSTALLATION, USE OR MAINTENANCE OF THE EQUIPMENT. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

## 2.0 DESCRIPTION

C6000 controllers are equipped with software to meet the needs and technical requirements of the application. The controller is factory pre-programmed and therefore, most applications require no field setup. The setpoints and ranges are easily adjusted from the user interface. The program and operating parameters are permanently stored on FLASH MEMORY in case of a power failure. A complete air conditioning system consisting of multiple A/C units may be controlled and monitored via the C6000 controller.

### 2.1 Capabilities and Features

- Input/Output Monitoring Status
- Full Integrated Control of Temperature and Humidity Levels
- Multi-unit Control and Remote Communication with Building Management Systems
- Optional Remote Mounting to a Wall or Control Panel.

#### 2.2.1 Controlling Multiple A/C Units

As a standard feature for controlling multiple A/C units, a master A/C may be fitted with a C6000 controller, and each additional A/C module may be fitted with an I/O board. The I/O board is equipped with a separate power supply. The controller and I/O board(s) are connected together via a RS485 bus. Figure 1 shows the basic configuration for a 3 module air conditioning system as an example. Up to 6 A/C modules may be controlled by a single C6000 controller.

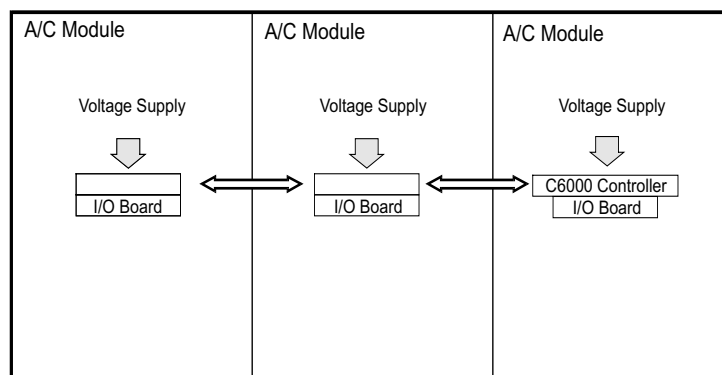


Figure 1- Multiple A/C Units

#### 2.2.2 Supervisor Controller

The air conditioning system may also be equipped with an additional controller (supervisor). If the master controller fails, the supervisor takes over control and monitoring functions of the complete air conditioning system.

## 2.2 General Design

The controller includes a main printed circuit board with voltage processing unit. The following functional components are provided with the C6000 controller:

- Microprocessor for controlling and monitoring the A/C unit.
- RS485 interface for building management system, (BMS), options and for connecting decentralized I/O boards.
- Serial PC/RS232 printer interface.
- Controller handshake for linking a supervisor (second controller).
- Backlit LCD display and LED's for monitoring operating conditions of the controller (A/C unit).
- Buttons for operating the controller
- Various plug connections

#### 2.2.3 Expansion I/O board

The expansion I/O board enables the A/C unit to be equipped with further options.

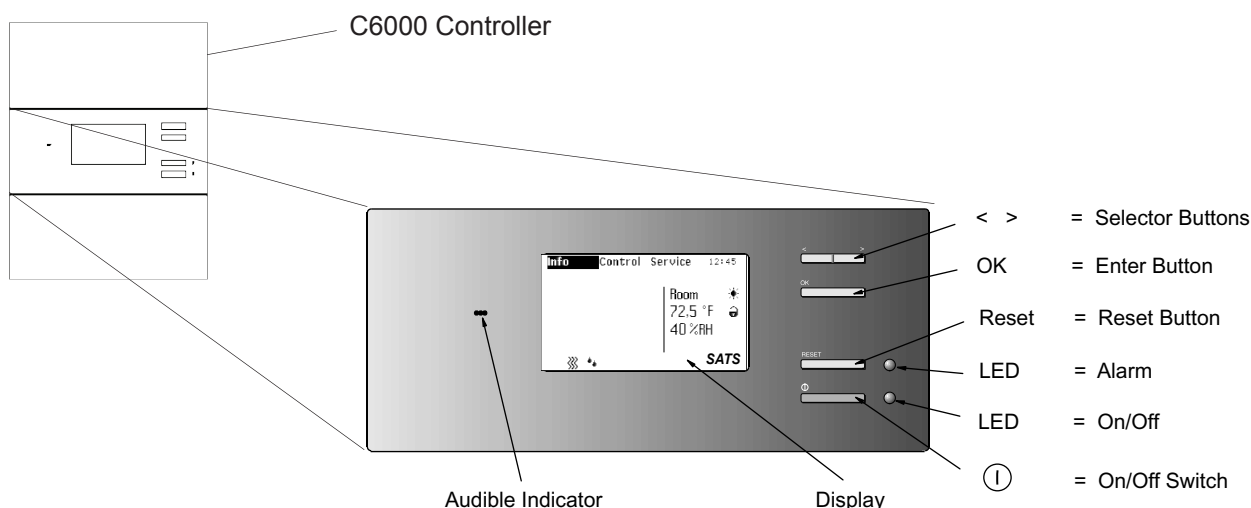
**2.2.4 Remote Display**

As an option, the controller may be factory supplied for remote mounting. The remote mounted controller is designed to be located directly on a wall or a control panel. Install the unit in a secure location where it cannot be tampered with. Refer to the installation drawing sent in the data package with your unit for the dimensions and mounting layout.

A six-conductor cable harness is provided for interconnect wiring. Additional control conductors may be required depending on the options purchased with the equipment. It is important to identify the options that were purchased with the unit in order to confirm which field connections are required. Refer to the electrical drawing supplied with your unit for details on interconnecting field wiring.

**2.3 Operator Interface**

The C6000 controller is typically installed in the control section of the A/C unit and is accessed from the front of the unit. Figure 2 depicts the layout of the controller display panel and the location and description of the interface buttons.



**Figure 2- Controller Display Panel**

- Selector Button-** Select menus and change parameters.
- Enter Button-** Accept function/parameter selections.
- Reset Button-** Accept function/parameter selections.
- Alarm LED-** Illuminates in event of an alarm.

- On/Off LED-** Illuminates when A/C unit is switched on and operating.
- On/Off Switch-** Turns A/C unit on and off.
- Audible Indicator-** Audible Alarm.
- Display-** Shows data, operating conditions and status information.



## 2.4 Initial Starting Instructions

1. Before applying power to the unit ensure the operating voltage is correct as shown in the electrical drawing provided with your unit. Verify all wiring connections are correct and that all electrical connections are tight.
2. Apply power to the unit. The “Start-up Window” is displayed (shown in Section 2.5.1), and the controller goes through an internal initialization period (approximately 10 seconds). Once the initialization period is over, the “Standard Window” (shown below) is displayed showing the current temperature and humidity conditions.
3. Press the “On/Off” button (shown in Figure 2). The LED next to the button illuminates green indicating the unit is turned on.
4. The A/C unit(s) will begin operating in accordance with the configuration and setpoint parameters as programmed by SATS. If Cooling, Heating, Humidification or Dehumidification are called for, a status symbol appears in the bottom of the display window indicating which functions are currently operating. A C6000 Factory Set-up Sheet, provided with your unit, shows all the programmed settings. The initial temperature and humidity setpoints may be viewed and changed in the **Control > Temperature** and **Control > Humidity** menu window as described in Section 3.3 of this manual.

## 2.5 Operating The Controller

The controller is operated in three function levels (**Info**, **Control** and **Service**) which are shown in the menu line of the display. The display windows are selected from the Menu line using the “< >” selector buttons. Depending on the configuration of the A/C unit, the controller only displays information that is applicable to that configuration. Access to “Control” and “Service” function levels are managed by a security protocol and requires the use of a password to gain access. Once access is gained to the function level, you may access sub-menu categories using the “< >” selector buttons.

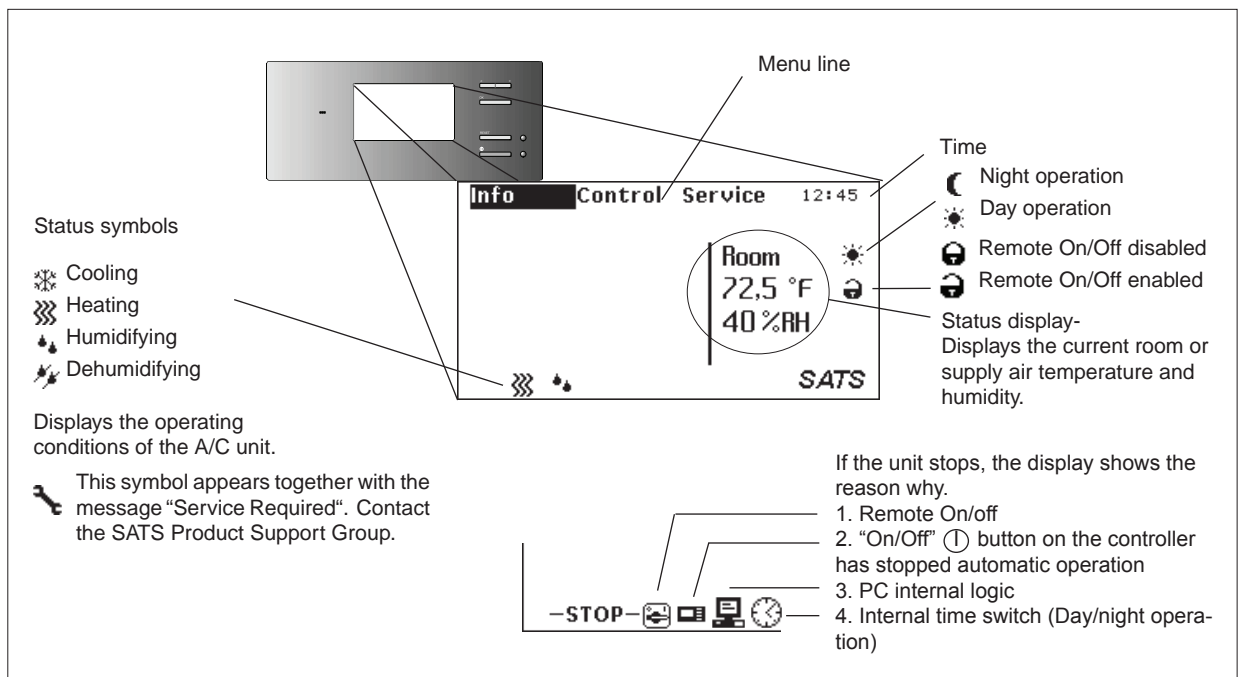
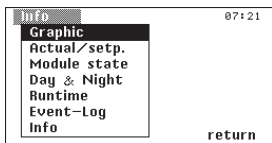


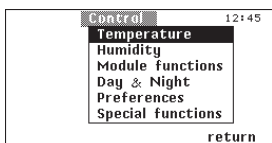
Figure 3- Controller Display Screen

**2.5.1 Info Menu**



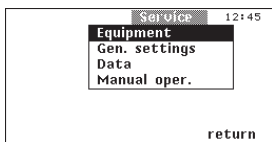
All set parameters and function modes of the A/C unit can be called up in the **Info** menu by the operator. This menu is basically only intended for displaying all values and parameters. However, it is possible to select and change parameters after entering a password in the **Info > Graphic > picture** “change” window and in the **Info > Day & Night** “change” window.

**2.5.2 Control Menu**



The parameters of the A/C unit such as specified temperature, specified humidity and on/off switching values of the individual components can be changed and entered in the **Control** menu.

**2.5.3 Service Menu**



The **Service** menu is used to configure the A/C unit and should only be accessed by experienced customer service staff.

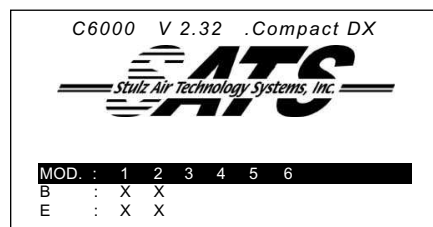
You will find the following parameter settings in the **Service** dialog windows:

- S** = Constant actuation (0 - 10V)
- 0** = Off
- ½** = 1-Single stage / 2-Two stage
- 0-99** = Degree of opening of a valve
- = Components not fitted
- ✓** = Option selected
- x** = Components currently active.

**2.6 Navigating Menus, Dialog Windows and Parameter Fields**

When the A/C unit is switched on, the Start-up Window appears on the display and then after a short period, the Standard Window appears from which you can enter all the sub menus and dialog windows (see Section 3.1).

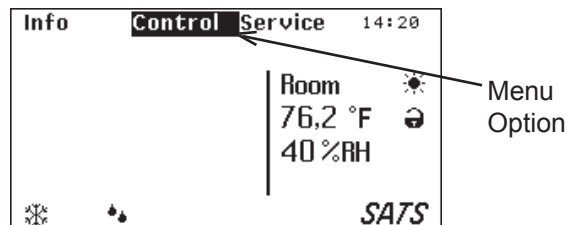
**2.6.1 Start up window**



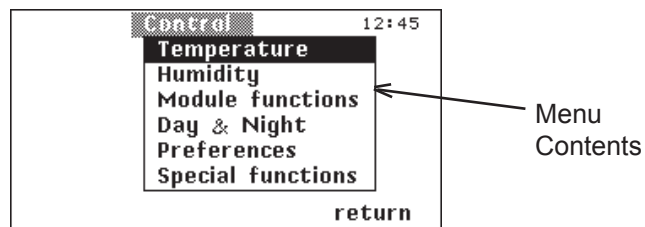
The start up window displays the version number of the software and the type of the A/C unit being controlled. The information in this window is needed whenever contacting the factory for service. The configuration of modules 1-6 (MOD) is also displayed.

- B = Basic I/O board
- E = Expansion I/O board

**2.6.2 Selecting Menu Contents**

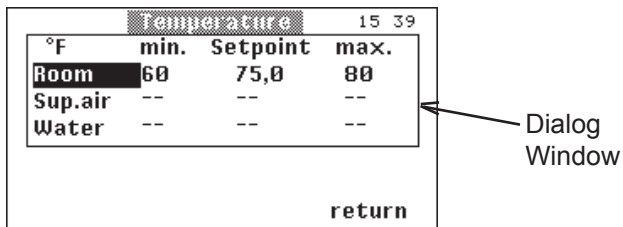


You select the menu contents by highlighting the desired category in the menu line (shown with a dark background) using the “< >” selector buttons, and then press the “OK” button.



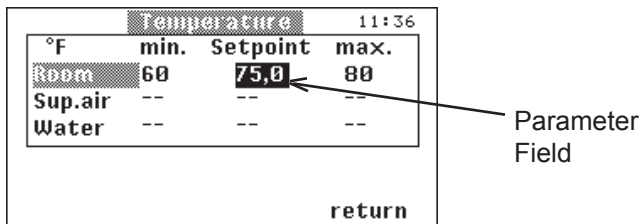
The menu contents are then shown in the display.

## 2.6.3 Opening Dialog Windows



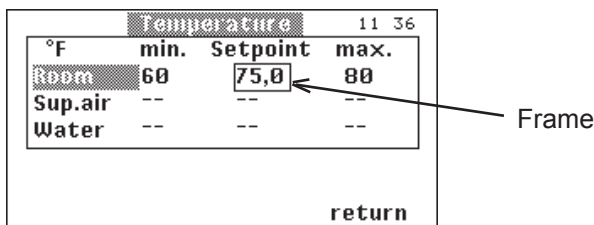
You open a dialog window by selecting an option from the menu contents with the “< >” selector buttons and then press the “OK” button. The dialog window now appears on the display.

## 2.6.4 Selecting Modifiable Parameters



Select the desired parameter field in the dialog window using the “< >” selector buttons to highlight the field and press “OK”.

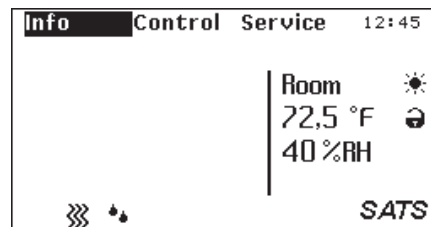
## 2.6.5 Changing Parameters



The parameter field is now provided with a frame around it. Change the value shown using the “< >” selector buttons. When you press “OK”, the revised value is entered and the frame of the parameter field disappears. You can then select other parameter fields to change with the “< >” selector buttons.

## 3.0 MENU WINDOWS

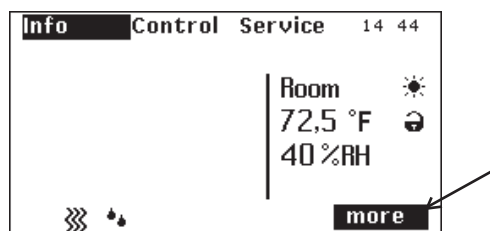
### 3.1 Standard Window



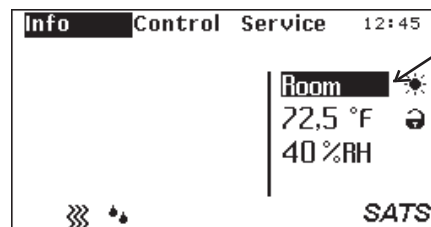
The standard window is continuously displayed when the A/C unit is operating. In the Standard Window you can adjust the time, changeover between the room and the supply air display, changeover from day to night operation and lock or release Remote On/Off.

You may also access the three sub menus from this window by scrolling through the menu categories (**Info**, **Control** and **Service**) using the “< >” selector buttons. When the desired sub menu is highlighted with a dark background, pressing the “OK” button allows access to the display/dialog windows of that menu.

You enter the Standard Window parameter fields by pressing the “OK” button while “Info” is highlighted. The word “more” appears in the bottom right corner of the window.



When the “>” selector button is pressed, you enter the first dialog display of the Standard Window where the first parameter field highlighted is “Room”.

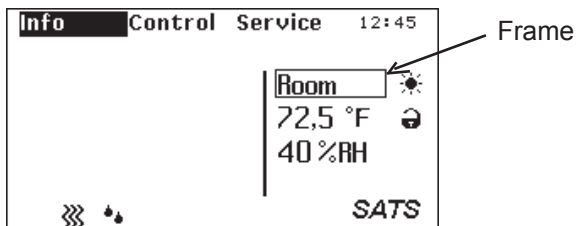


**NOTE**

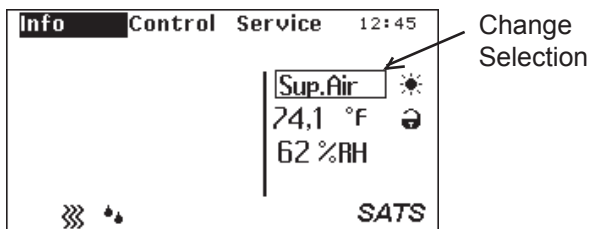
If you press the “OK” button instead, you enter the “Info” menu which displays the “Info” menu categories (see Section 3.2).

You can change the display from showing room air conditions to showing supply air conditions in this window.

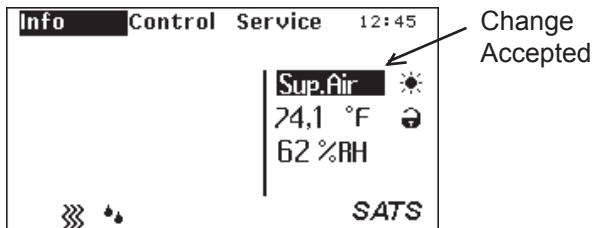
When the “OK” button is pressed, a frame appears around the field to be changed.



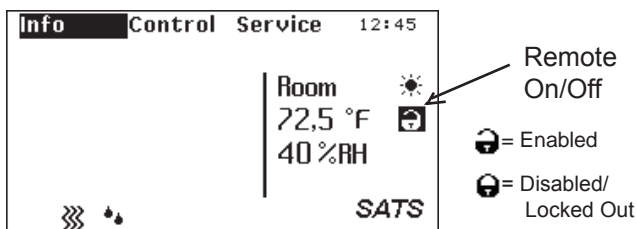
You may change the display from “Room” to “Sup. Air” sensor control with “< >” selector button.



The change is accepted by pressing the “OK” button.

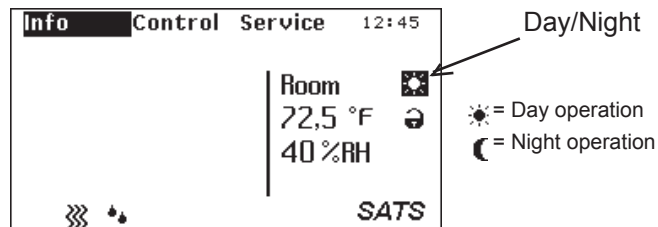


Using the “>” selector button you access the next dialog field in which you can enable/disable “Remote On/Off” switching.



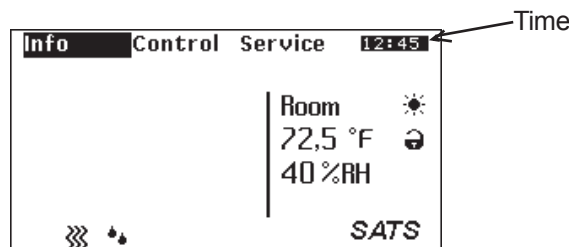
The button operation is based on the same sequence as just outlined.

You proceed to the following dialog field by using the “>” selector button where you can change over from day to night operation.



Day operation corresponds to operation at the initial setpoint temperature. Night operation corresponds to operation at the second setpoint. (See Section 3.3.4)

The final item which you can change in the Standard Window is the “Time” field, which you can access using the “>” selector button and pressing “OK”.



The following can be adjusted in sequence using the “< >” buttons:

- Year ..... **Y: 95**  
press “OK”
- Month ..... **MO: 8**  
press “OK”
- Day ..... **J: 28**  
press “OK”
- Hour ..... **H: 15**  
press “OK”
- Minute ..... **MI: 45**

# INFO MENU

NOTE: The section numbers which appear in parenthesis above each window may be referenced in this manual for a functional description of the window.

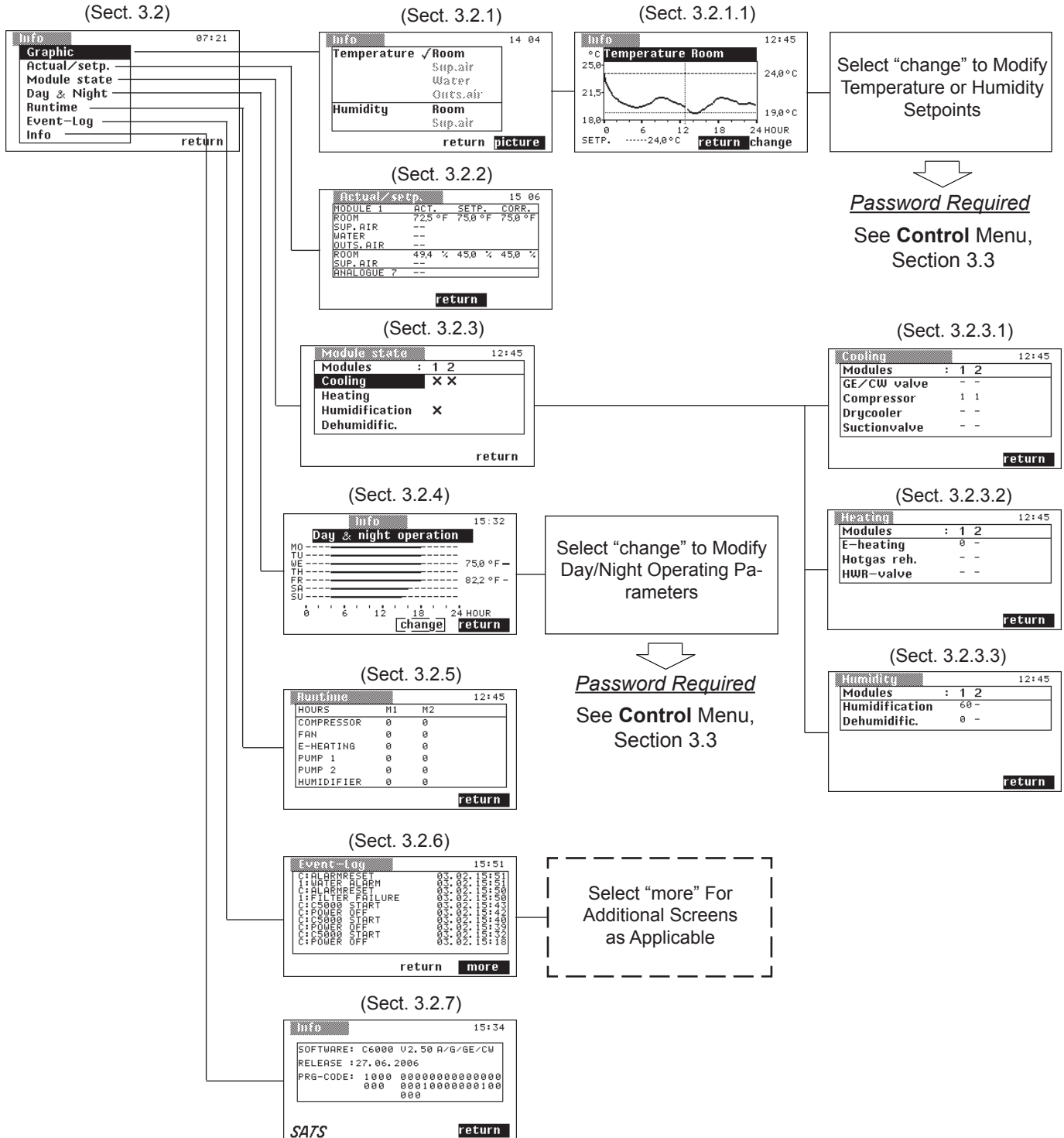
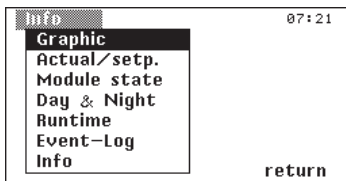


Figure 4- Info Menu Windows

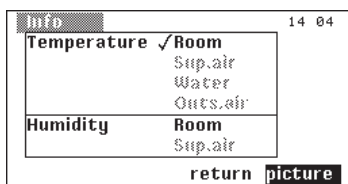
### 3.2 Info Menu

Various data and operating states of the individual modules and components of the A/C unit are displayed in the **Info** menu. Certain parameters can be changed in the **Info** menu with the use of a password.



In this menu level you obtain information about the room climate, about the A/C unit modules about the day/night operation and about the unit run times.

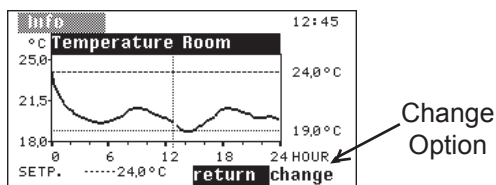
#### 3.2.1 Graphic Window (Info > Graphic)



In this dialog window you select the desired information, (✓ = option selected), and call up the “picture” display window. Not all combinations are possible. Only the values which are provided with sensors can be selected. Non-assigned values are shown in grey.

##### 3.2.1.1 Picture Window (Info > Graphic > picture)

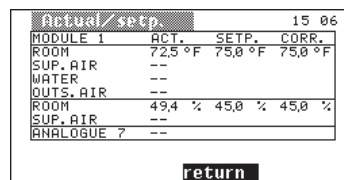
The temperature and/or air humidity of the last 24 hours are shown in this dialog window. The vertical line identifies the current time. To the right of the line yesterday is shown and left of the line today is shown.



The “change” option is only available when an individual condition (Temperature or Humidity) is selected in the previous dialog window. (✓ = option selected.) The outside air limit values cannot be changed.

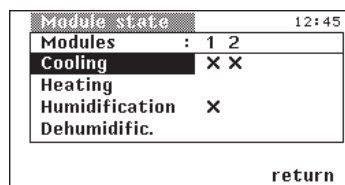
You can change the room temperature and air humidity from this dialog window with the use of a password. The password and description of the “change” dialog window can be found in the **Control** menu Section 3.3 of this manual.

#### 3.2.2 Actual/setp. Window (Info > Actual/setp)



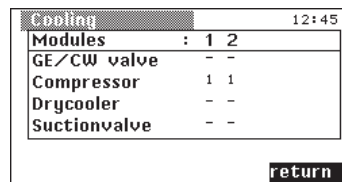
This dialog window shows the current values of the sensors connected to the I/O boards as well as the setpoints entered in the controller. Furthermore, the setpoints shifted by the controller (CORR.) are displayed. These setpoints are due to the weekly “Day/night” cycle program (see Section 3.2.4) or by the sensor limitation control (see Section 3.4.2.1.2). The shifted setpoints are priority setpoints.

#### 3.2.3 Module State Window (Info > Module state)



This dialog window displays how many modules your A/C unit is comprised of. An “X” shows which function of the module is currently active. An “S” indicates a stand-by module.

##### 3.2.3.1 Cooling Window (Info > Module state > Cooling)



The operating state of the components of the refrigerant circuit of each individual module is displayed in this dialog window.

- “0” = The component is currently off.
- “1” = A single stage is currently active.
- “--” = Component is not furnished.

## Info Menu (cont.)

### 3.2.3.2 Heating Window (Info > Module state > Heating)

Heating		12:45
Modules	: 1 2	
E-heating	0 -	
Hotgas reh.	- -	
HWR-valve	- -	
		<b>return</b>

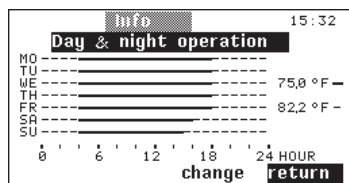
If the individual modules of your A/C unit are equipped with a heater, the operating state is displayed in this dialog window.

### 3.2.3.3 Humidity Window (Info > Module state > Humidification)

Humidity		12:45
Modules	: 1 2	
Humidification	60 -	
Dehumidific.	0 -	
		<b>return</b>

If individual modules of your A/C unit are equipped with a humidifier, the operating state of the humidifier is displayed in this dialog window. In addition the display indicates whether the dehumidification circuit is switched on or off.

### 3.2.4 Day & Night Window (Info > Day & Night)



The daily operating time, and the specified day and night room temperature setpoints are shown on a weekly basis in this dialog window.

You can change the operating schedule from this dialog window with the use of a password. After entering the correct password, you have the ability to specify the operating time or change one of the setpoints. The password and description of the "Day & Night" dialog window can be found in the **Control** menu section 3.3 of this manual.

### 3.2.5 Runtime Window (Info > Runtime)

Runtime			12:45
HOURS	M1	M2	
COMPRESSOR	0	0	
FAN	0	0	
E-HEATING	0	0	
PUMP 1	0	0	
PUMP 2	0	0	
HUMIDIFIER	0	0	
			<b>return</b>

The runtimes of the listed components of the A/C unit are shown in hours in this dialog window. Additional modules (M3 - 6) of the A/C unit are displayed by selecting "more". You go back to the **Info** menu by selecting "return".

### 3.2.6 Event Log Window (Info > Event-Log)

Event-log			15:51
C:ALARM RESET	03.02.10	10:05	
I:WATER ALARM	03.02.10	10:05	
I:ALARM RESET	03.02.10	10:05	
I:FILTER FAILURE	03.02.10	10:05	
C:C6000 START	03.02.10	10:05	
C:POWER OFF	03.02.10	10:05	
C:C6000 START	03.02.10	10:05	
C:POWER OFF	03.02.10	10:05	
C:C6000 START	03.02.10	10:05	
C:POWER OFF	03.02.10	10:05	
			<b>return</b> <b>more</b>

All alarm signals of the A/C unit are listed in this dialog window. The signals contain the following information: Module, alarm report, day and time. This window also displays when the unit was started and stopped. Up to 20 event windows can be displayed by selecting "more". The alarm memory may be erased by switching the power off then, simultaneously press and hold the "RESET" and "OK" buttons (until the standard window is visible) while switching the power back on.

### 3.2.7 Info Window (Info > Info)

Info		15:34
SOFTWARE: C6000 V2.50 A/G/GE/CW		
RELEASE : 27.06.2006		
PRG-CODE:	1000 00000000000000	
	000 00010000000100	
	000	
<b>SATS</b>		<b>return</b>

In this window the software version and the date of issue is displayed.

# CONTROL MENU

NOTE: The section numbers which appear in parenthesis above each window may be referenced in this manual for a functional description of the window.

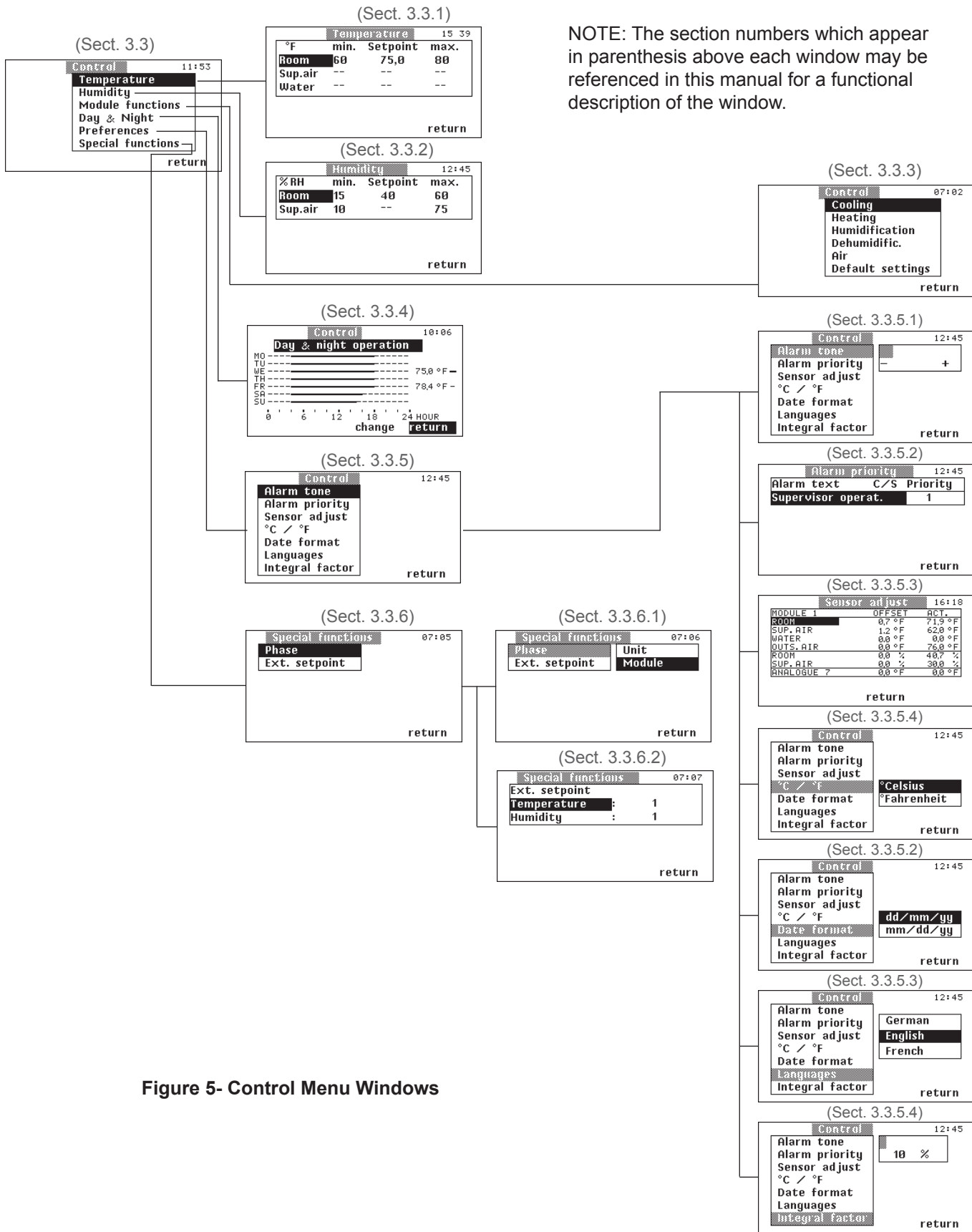
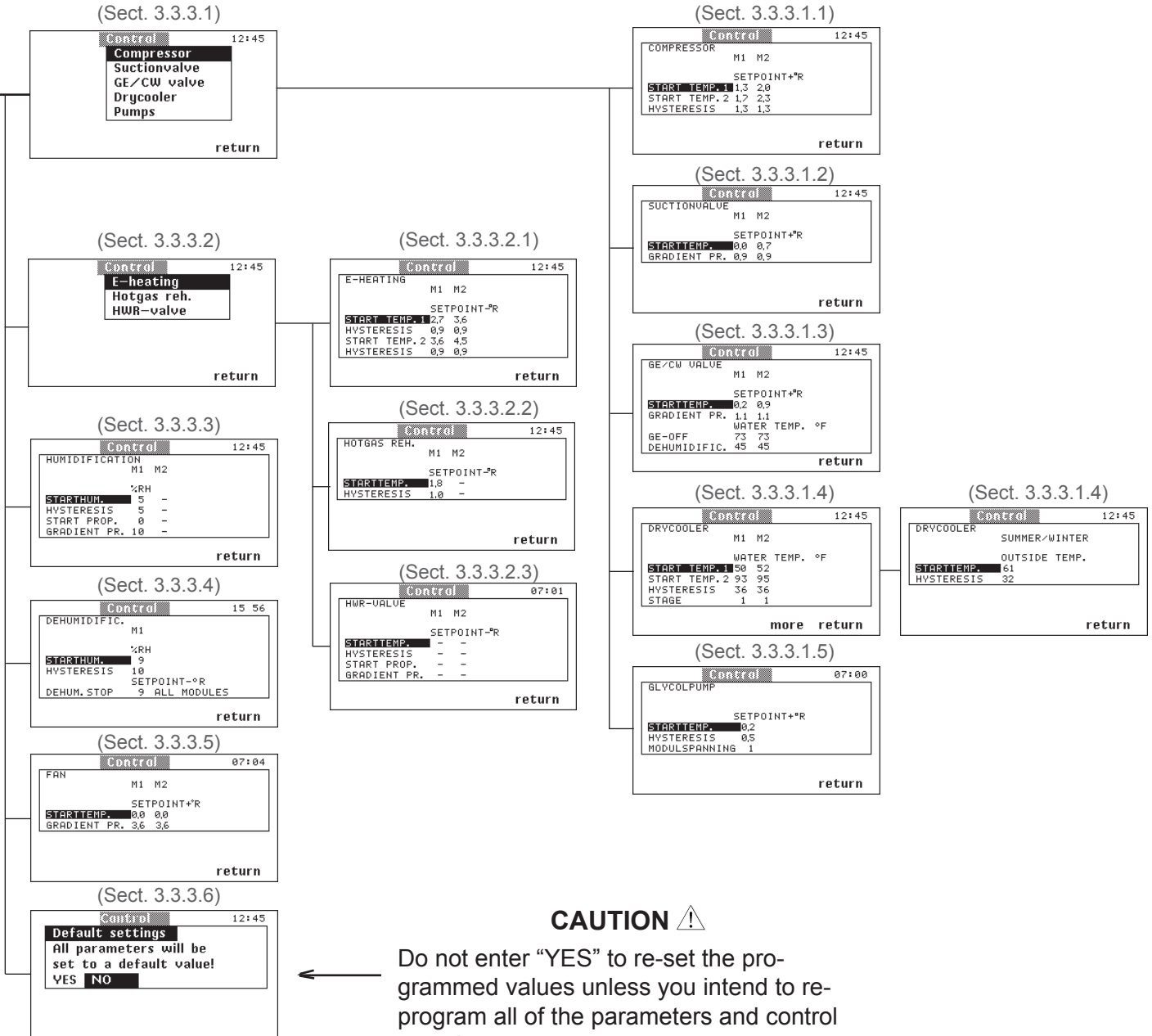


Figure 5- Control Menu Windows



# CONTROL MENU (cont.)



**CAUTION** ⚠

Do not enter "YES" to re-set the programmed values unless you intend to re-program all of the parameters and control setpoints.

### 3.3 Control Menu

In the **Control** menu you have the ability to change various parameters and operating states of individual modules and components of the A/C unit.

**NOTE**

A password is required to enter this menu.

The password is entered using the selector buttons and the confirmation buttons.

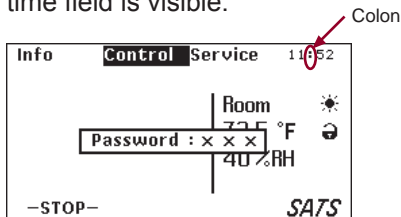
The password is:

“<” (Left selector button)

“OK” (OK button)

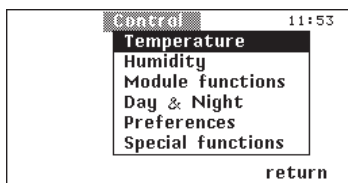
“>” (Right selector button)

The first two buttons, (“<” and “OK”), must be pressed in sequence, at the same time the flashing colon in the time field is visible.

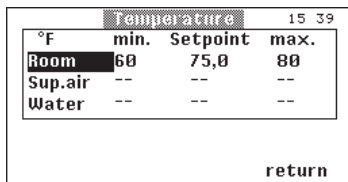


**NOTE**

You may only enter the control menu after entering the correct password.



### 3.3.1 Temperature Window (Control > Temperature)

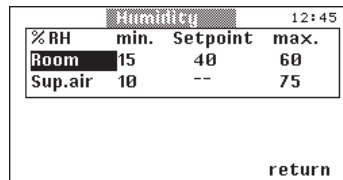


Limit values and setpoints for the required room temperature are to be entered in this dialog window. The specified limits can be changed for the room or supply air temperature and the water temperature.

**NOTE**

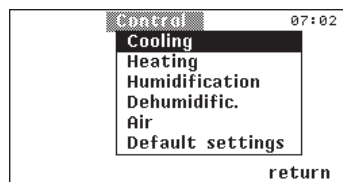
The “min” & “max” values are the alarm setpoints.

### 3.3.2 Humidity Window (Control > Humidity)



The limit values and setpoints for the required room humidity are to be entered in this dialog window. Specified limit values can be changed for the supply air humidity if an optional supply air sensor is installed.

### 3.3.3 Module Functions Windows (Control > Module functions)

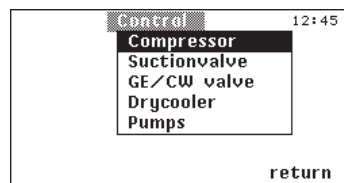


Further dialog windows can be selected from this menu in which the limit parameters and setpoint parameters of the individual A/C unit components can be changed.

**WARNING**

Changing the **Control > Module functions** menu parameters requires a high level of experience with refrigeration systems and must be performed by an authorized refrigeration mechanic or air conditioning technician.

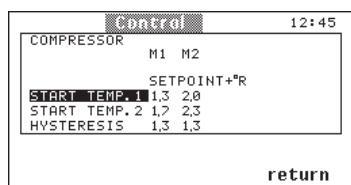
### 3.3.3.1 Cooling (Control > Module functions > Cooling)



Dialog windows applicable to your unit may be selected from the “Cooling” menu window.

**Control Menu (cont.)**

**3.3.3.1.1 Compressor** *(Control > Module functions > Cooling > Compressor)*



The start temperature for the first and second compressor (for compressor based units only) can be adjusted in this dialog window. The hysteresis can be adjusted in °Rankine, (°R). The setpoint temperature is established in the **Control > Temperature** dialog window, (Section 3.3.1).

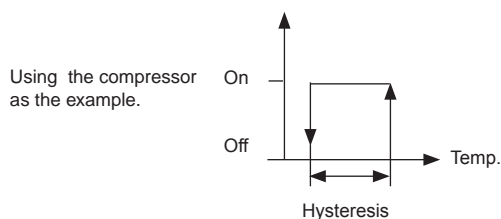
**NOTE**

$$\Delta T. \text{ °Fahrenheit} = \Delta T. \text{ °Rankine}$$

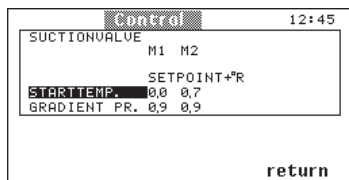
**NOTE**

All “Start Temp.” and “Hysteresis” values are entered as the difference from the setpoint in °R.

Hysteresis: Margin between the cut-in and cut-out point.

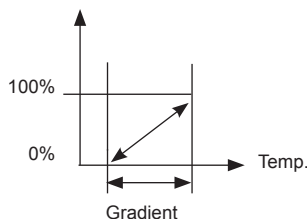


**3.3.3.1.2 Suction Valve** *(Control > Module functions > Cooling > Suctionvalve)*

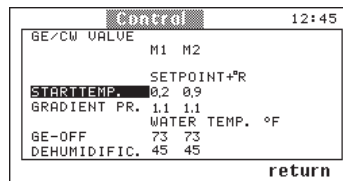


If your A/C unit is fitted with a suction valve you can adjust the start temperature (suction valve opens) and the gradient of the suction valve in this dialog field.

Gradient: Increase in the valve opening depending on temperature.



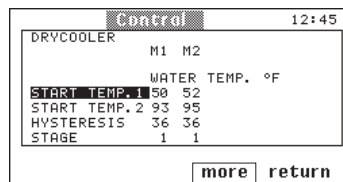
**3.3.3.1.3 GE/CW Valve** *(Control > Module functions > Cooling > GE/CW Valve)*



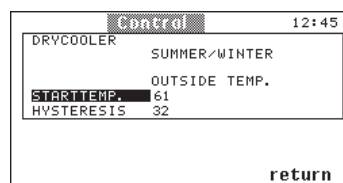
If your A/C unit is equipped with a GE/CW control valve, you can determine the start temperature and the proportional gradient of the GE/CW control valve. “GE-OFF” closes the GE/CW valve when the entered temperature is exceeded. GE dehumidification ends when the entered temperature is not achieved since the GE/CW valve is completely closed. Also refer to Section 4.2 for a detailed description of GE/CW system operation.

**3.3.3.1.4 Drycooler** *(Control > Module functions > Cooling > Drycooler)*

If your A/C unit is connected to a Drycooler, you can determine the cut-in temperature of the Drycooler for winter and summer operation, the hysteresis and the stages for the sequential shifting in this dialog window. A detailed description of the Drycooler operation can be found in Section 4.3.



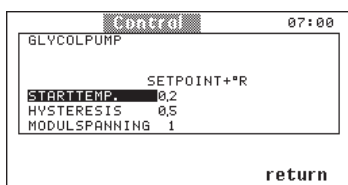
To access the next “Drycooler” submenu, select “more” and press “OK”.



Here you can set the shift point for the summer/winter operation. When above the adjusted outside temperature, the unit is shifted to the summer operation mode. When below the adjusted outside temperature, the unit functions in the winter operation mode.

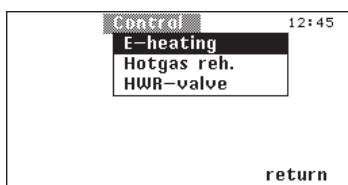
**Control Menu (cont.)**

**3.3.3.1.5 Pumps** (Control > Module functions > Pumps)

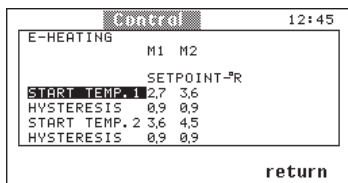


The optional glycol pump (2 maximum) is only installed in the pump section on GE units. You determine the cut-in temperature and the hysteresis of the glycol pump in this dialog window. Additionally you can adjust whether a sequencing based on time and malfunction between pumps of different modules shall take place (1= yes, 0= no). See Section 4.2.1.

**3.3.3.2 Heating Windows** (Control > Module functions > Heating)

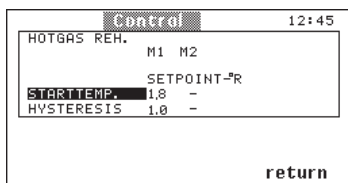


**3.3.3.2.1 E-Heating** (Control > Module functions > Heating > E-heating)



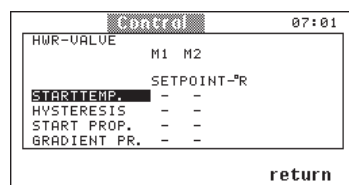
You can establish the start temperature and the hysteresis for the optional electrical heaters installed in your A/C unit in this dialog window.

**3.3.3.2.2 Hot Gas Reheat** (Control > Module functions > Heating > Hotgas reh.)

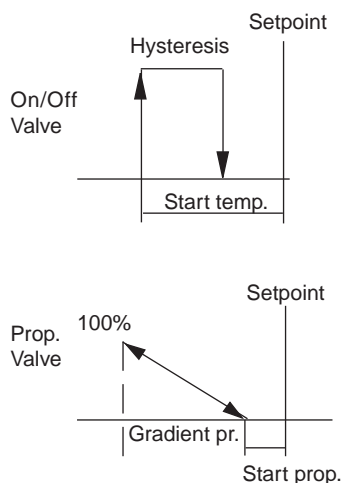


If your A/C unit is equipped with a refrigerant heater you can establish the start temperature and the hysteresis.

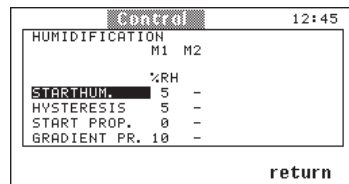
**3.3.3.2.3 HWR-Valve** (Control > Module functions > Heating > HWR-valve)



If your A/C unit is equipped with a LPHW heater, you can control this via the proportional LPHW valve. The upper two lines relate to an On/off-valve, the two lines below refer to a proportional valve. By "Start temp." or "Start prop." you set the temperature difference to the setpoint, at which the valve shall open.



**3.3.3.3 Humidification Window** (Control > Module functions > Humidification)



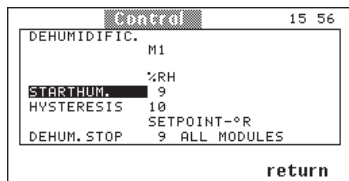
If your A/C unit is equipped with an optional humidifier, you have the ability in this dialog window to determine the start humidity, the hysteresis of the humidifier as well as the starting humidity and the gradient of the associated proportioning valve.

**NOTE**

All start values are entered as the difference from the setpoint in % Relative Humidity.

**Control Menu (cont.)**

**3.3.3.4 Dehumidific. Window** *(Control > Module functions > Dehumidif.)*

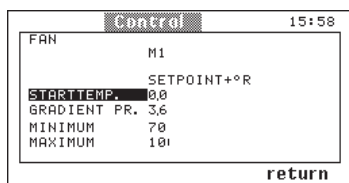


You can define the start point of the dehumidifying circuit as well as the hysteresis in this dialog window. If the humidity exceeds the entered value, the solenoid valve upstream of the evaporator closes and humidity is removed from the air flowing through.

**NOTE**

“Dehumid. Stop” function. If the temperature drops below the setpoint temperature by 3° when dehumidifying, dehumidification is interrupted with a hysteresis of 2°Rankine.

**3.3.3.5 Air Window** *(Control > Module functions > Air)*

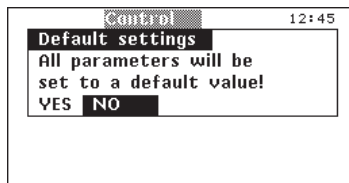


This window is only relevant if the A/C unit is equipped with a speed controlled fan. The fan speed is modified by means of a frequency converter. Here you adjust the start temperature for the frequency converter to energize the fan. By the gradient you can set the range in which the fan reaches its maximum speed.

**3.3.3.6 Default Settings Window** *(Control > Module functions > Default settings)*

**CAUTION**

Do not enter “YES” to re-set the programmed values unless you intend to re-program all the control parameters and setpoints.



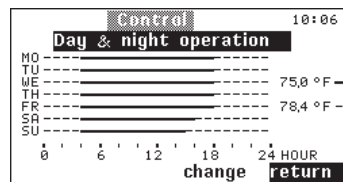
If you select “YES” in this dialog window, all the set control parameters of the A/C unit are re-set to the

basic settings established at the factory. The default settings can be found in Section 4.10.

The same effect is achieved by switching off the voltage and then simultaneously pressing the “ON/OFF” button and the “RESET” button (until the standard window is visible) while switching the voltage back on again.

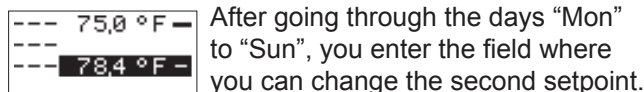
**3.3.4 Day & Night Window** *(Control > Day & Night)*

The operating time and the room temperature setpoint are displayed in this dialog field. The A/C unit then works in a weekly cycle according to the set values.



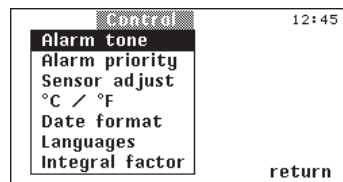
If you select “change” you have the ability to establish the operating time and the setpoint of room temperature.

Thick line (—): setpoint, day operation  
Dashed line (----): 2nd setpoint, night operation  
No line ( ): A/C unit off; ☺ appears in the display



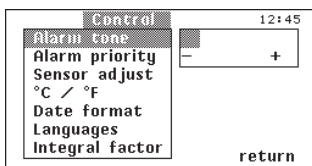
**3.3.5 Preferences Window** *(Control > Preferences)*

Further dialog windows can be selected in this menu, in which the values shown can be changed.



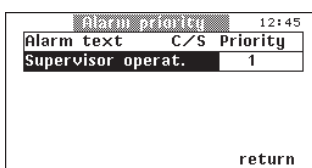
**Control Menu (cont.)**

**3.3.5.1 Alarm Tone Window** (Control > Preferences > Alarm tone)



You can adjust the volume of the alarm tone in this dialog window.

**3.3.5.2 Alarm priority Window** (Control > Preferences > Alarm priority)



You can assign the alarm signals to the alarm relay in this dialog window. External alarm signal systems can be connected to the alarm relay. Depending on the unit type, up to 10 BMS messages per module are available from alarm relays (here called "Priority").

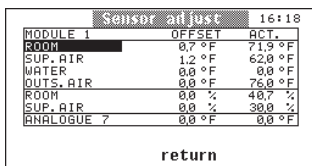
Alarm relay 1 can not be reconfigured. It is reserved for the common alarm. In the headline "Alarm text/ Priority", the alarm origin is defined as either C/S (Controller/Supervisor) or the module number 1 to 6.

For further information about BMS alarm assignments see Section 4.6.

Alarm Relay Assignment

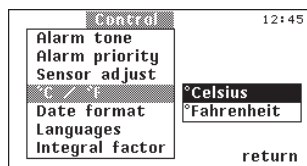
Module	1	2	3	4	5	6
Basic I/O-Board	1-2	11-12	21-22	31-32	41-42	51-52
Expansion-I/O Board	3-10	13-20	23-30	33-40	43-50	53-60

**3.3.5.3 Sensor Adjust Window** (Control > Preferences > Sensor adjust)



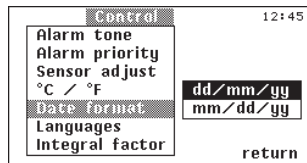
You can have the actual values of the connected sensors displayed in this dialog window and compared with the values of external measuring devices. The measured values displayed can be adjusted here. The difference to the actual measured value is displayed as an offset.

**3.3.5.4 °C/°F Window** (Control > Preferences > °C/°F)



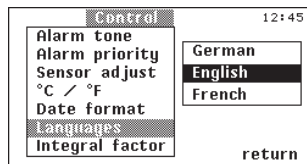
The temperature display of all dialog windows can be changed to °C or °F in this dialog window.

**3.3.5.5 Date Format Window** (Control > Preferences > Date format)



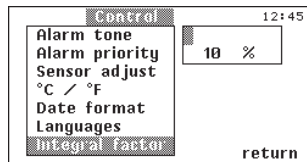
The date display can be changed over to dd/mm/yy or mm/dd/yy in this dialog window.

**3.3.5.6 Languages Window** (Control > Preferences > Languages)



You can select the language in which the messages are displayed in the dialog windows in this dialog window. The illustration only shows a selection of possible languages.

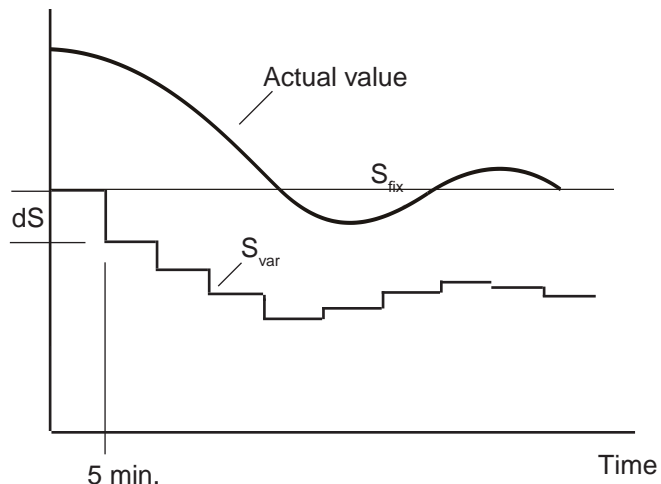
**3.3.5.7 Integral Factor Window** (Control > Preferences > Integral factor)



In this window you can set the I-proportion of the PI-controller. In this case there is a fixed setpoint Sfix (adjusted in the **Control > Temperature** menu) and a variable setpoint Svar, which is recalculated every 5 minutes and which is decisive for the control. This variable setpoint is calculated by adding the setpoint alteration "dS" to the previous setpoint. Svar = Sprev. + dS with dS = (Sfix - actual value) x Integral factor.

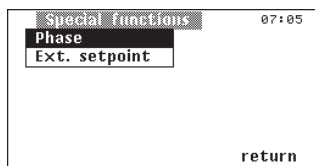
**Control Menu (cont.)**

The values for the integral factor can be varied between 0 and 80%. A low value should be used to start with in order to prevent the control system from oscillating.



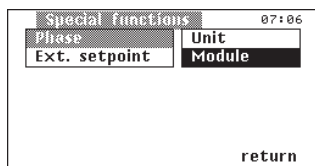
It is recommended that this value be increased in 10% steps to find out the limit of safe control.

**3.3.6 Special Functions Window** (Control > Special functions)



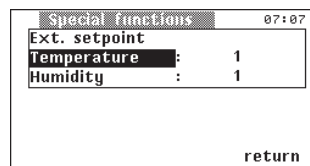
Further dialog windows with special functions (depending on special software versions) can be displayed in this menu.

**3.3.6.1 Phase Window** (Control > Special functions > Phase)



In this window you can select whether the entire unit or just one module shall be switched off in case of a phase failure or a wrong phase rotation.

**3.3.6.2 Ext. Setpoint Window** (Control > Special functions > Ext. setpoint)



In this menu you can choose whether the setpoint shall be given externally. This can be individually adjusted for temperature and humidity by selecting "1". Selecting "0" disables the external setpoint.

If the external setpoint simulation for temperature in the **Control > Special functions > Ext. setpoint** menu is enabled, a setpoint simulator (e.g. potentiometer) must be connected to analog input 6 (Ain 6). This can simulate either the voltage 0 - 10 V or the current 0 - 20 mA at the input. In the **Service > Equipment > Sensor > extra** menu (previously "Outside Air"), a sensor type must be configured.

If the external setpoint simulation for humidity in the **Control > Special functions > Ext. setpoint** menu is enabled, a setpoint simulator must be connected to the analog input 7 (e.g. potentiometer). This can simulate either the voltage 0 - 10 V or the current 0 - 20 mA at the input. In the **Service > Equipment > sensor > extra** menu (previously "ANALOG 7"), a sensor type must be configured.

# SERVICE MENU

NOTE: The section numbers which appear in parenthesis above each window may be referenced in this manual for a functional description of the window.

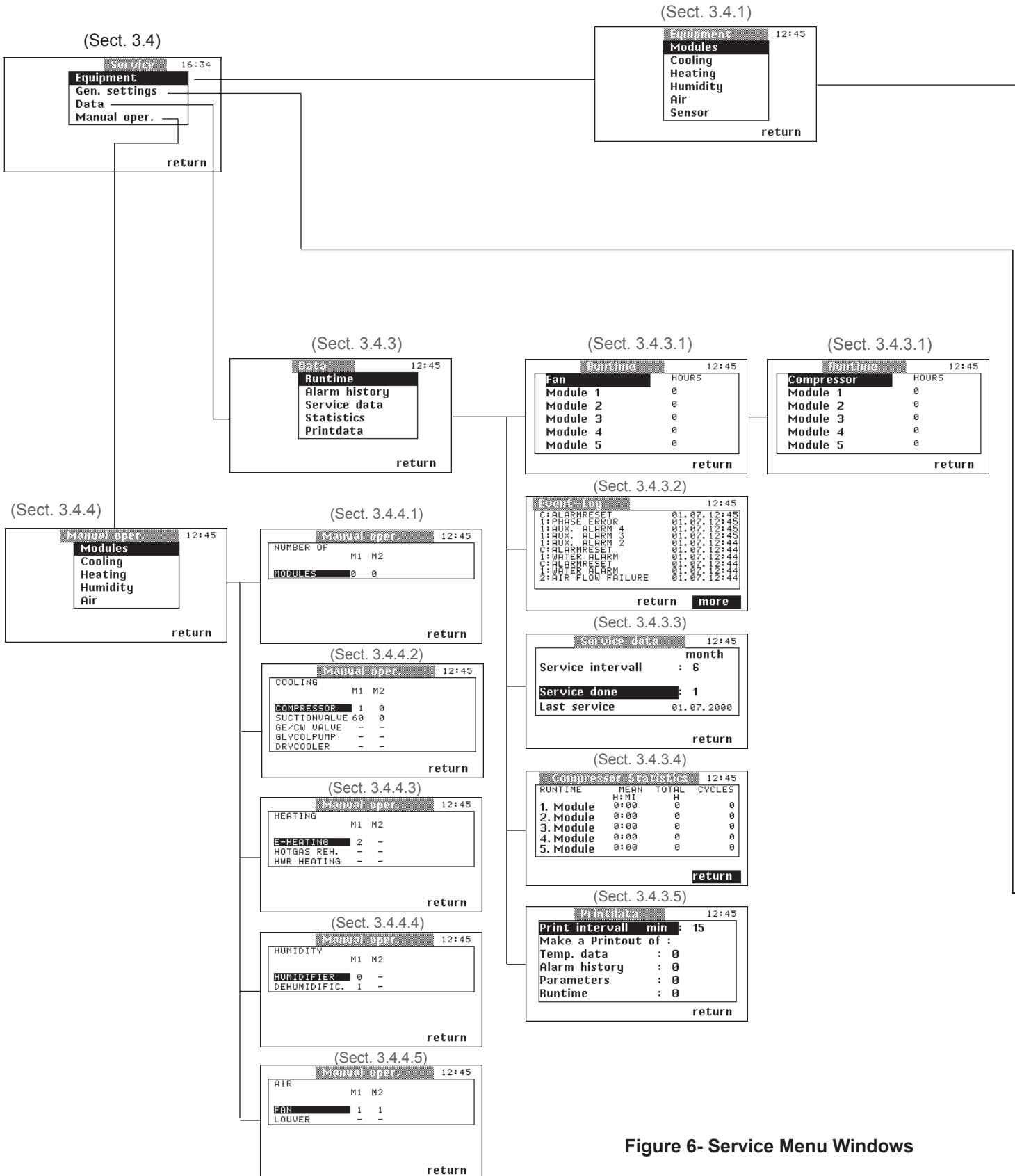


Figure 6- Service Menu Windows



# SERVICE MENU (cont.)

(Sect. 3.4.1.1)

Equipment		12:45
<b>Number of Modules</b> 2		
return		

(Sect. 3.4.1.2)

Equipment		12:45
COOLING	M1 M2	
COMPRESSOR	1 1	
SUCTIONVALVE	0 0	
GE/CU VALVE	0 0	
GLYCOLPUMP	0 0	
DRYCOOLER	0 0	
return		

(Sect. 3.4.1.3)

Equipment		12:45
HEATING	M1 M2	
E-HEATING	2 0	
HOTGAS REH.	0 0	
HWR HEATING	0 0	
return		

(Sect. 3.4.1.4)

Equipment		12:45
HUMIDITY	M1 M2	
HUMIDIFIER	5 0	
CONDUCTIVITY	0 0	
DEHUMIDIFIC.	1 0	
return		

(Sect. 3.4.1.5)

Equipment		12:45
AIR	M1 M2	
LOUVER	0 0	
return		

(Sect. 3.4.1.6)

Equipment		12:45
SENSOR	M1 M2	
ROOM TEMP.	S1 0	
SUP. TEMP.	S1 0	
WATER TEMP.	0 0	
OUTSIDE AIR	0 0	
ROOM HUM.	S2 0	
SUP. HUM.	S2 0	
ANALOGUE	7 0 0	
return		

(Sect. 3.4.2)

Gen. settings		12:45
<b>Control</b>		
Time delay		
Function		
Interfaces		
Options text		
Sequencing		
return		

(Sect. 3.4.2.1)

Gen. settings		12:45
<b>Control type</b>		
Parameters		
return		

(Sect. 3.4.2.1.1)

Control type		12:45
Room		
Sup.air		
Room, supply air lim		
Supply air, room lim		
return		

(Sect. 3.4.2.1.2)

Parameters		12:45
R		
Starttemp.	: 26,0	
Gradient	: 0,5	
Starthum.	: 70	
Gradient	: 0,5	
return		

(Sect. 3.4.2.2)

Time delay		12:45
Unit Seconds		
Unit	: 0	
Module	: 2	
Stage	: 5	
Temp./humidit.al.	: 40	
All alarms	: 0	
more return		

(Sect. 3.4.2.2)

Time delay		12:45
Compressor hold Seconds		
Compressor hold	: 240	
Fan	: 60	
Louver	: 90	
Winter start	: 180	
return		

(Sect. 3.4.2.3)

Function		12:45
Gen. settings		
Supervisor	: 0	
StandBy-Module	: 0	
Auto start	: 1	
Seq.type	: 0	
return		

(Sect. 3.4.2.4)

Interfaces		12:45
Port RS232		
Baudrate	: 9,6	
Parity	: N	
Stopbits	: 1	
Flow cont.	: RTS	
CPU-addr.	: 1	
return		

(Sect. 3.4.2.5)

Options text		12:45
Aux. alarm Alarm text		
Aux. alarm 1	CO2-Alarm	
Aux. alarm 2	UPS-Alarm	
Aux. alarm 3	Aux. alarm 3	
Aux. alarm 4	Aux. alarm 4	
return		

(Sect. 3.4.2.6)

Sequencing		07:24
Gen. settings		
Seq.units	: 0	
St.-By-Units	: 0	
Seq.time	: 0	
Seq.temp.	: 0	
more return		

(Sect. 3.4.2.6)

Sequencing		07:24
Gen. settings		
St-By min Temp	: 0	
St-By max Temp	: 0	
CW priority	: 0	
return		

### 3.4 Service Menu

In the **Service** menu you have the ability to change the configuration of the A/C unit. Additionally, you can change the settings for the types of control and other parameters, as well as scan further data and operate the A/C unit in the manual operation level without having to use the controller as a control unit.

Alarm signals do not appear in the **Service** level in the dialog window. Alarms are only indicated by means of an audible signal and the alarm LED. If you want to know which alarm has occurred, you must return to the main menu.

When you are in the **Service** level, control of the A/C unit is continued. The module which you control in manual operation is taken out of the control of the system controller only when in manual operation.

**NOT**

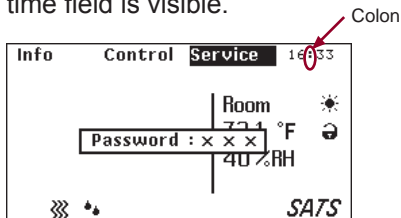
A password is required to enter this menu.

The password is entered using the selector buttons and the confirmation buttons.

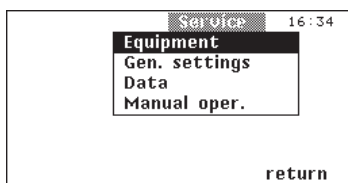
The password is:

- ">" (Right selector button)
- "OK" (OK button)
- "<" (Left selector button)

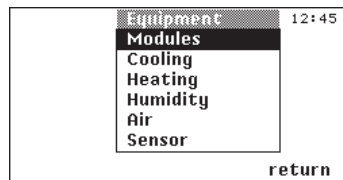
The first two buttons, (">" and "OK"), must be pressed in sequence, at the same time the flashing colon in the time field is visible.



You enter the "Service" level only after entering the correct password.

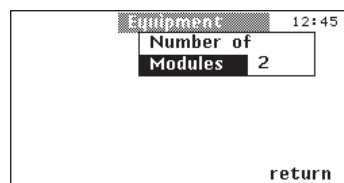


### 3.4.1 Equipment Window (Service > Equipment)



The equipment of the A/C unit is divided up into six areas. In this dialog window you select the area in which you wish to configure the unit.

#### 3.4.1.1 Modules Window (Service > Equipment > Modules)



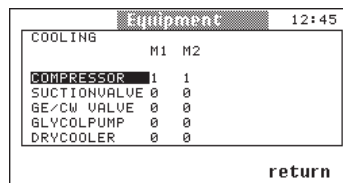
You enter the number of the modules (1-6) which are to be controlled in this dialog window. If you enter more modules than are actually present, the "Transmission error" alarm appears.

**NOTE**

The applicable values for the equipment of the modules have the following significance:

- = Not furnished
- 1 = 1 or 1st stage
- 2 = 2 or 2nd stage
- S = Components are controlled proportionally

#### 3.4.1.2 Cooling Window (Service > Equipment > Cooling)



In this window you specify which module is equipped with a suction valve, with a GE/CW valve, with a glycol pump and with a dry cooler. With the compressor you can choose between "-" (no compressor = CW version) "1" and "2" for the 2nd compressor. The suction valve is actuated analogically, the control is (S) constant. Dry coolers can be configured from 0 - 4 stages. "0" means no dry cooler is furnished.

## Service Menu (cont.)

### 3.4.1.3 Heating Window (Service > Equipment > Heating)

```

Equipment 12:45
HEATING   M1 M2
E-HEATING 2  0
HOTGAS REH. 0 0
HWR HEATING 0 0

return
    
```

In this window you specify which module is equipped with an electrical heater, with a hot gas heater and with a LPHW heater. With the electric heater you can also choose “2” for the 2-stage electrical heater. The valve for the LPHW heater is actuated analogically, the control is (S) constant.

### 3.4.1.4 Humidity Window (Service > Equipment > Humidity)

```

Equipment 12:45
HUMIDITY  M1 M2
HUMIDIFIER 5  0
CONDUCTIVITY 0 0
DEHUMIDIFIC. 1 0

return
    
```

In this window you specify which module is equipped with a humidifier (steam humidifier or ultrasonic), with a conductivity measuring instrument (for ultrasonic only) and with a dehumidifying valve. With the humidifier you can choose between constant control (S) and 2-point control (1) depending on the actual equipment used with your unit.

### 3.4.1.5 Air Window (Service > Equipment > Air)

```

Equipment 12:45
AIR       M1 M2
LOUWER   0  0

return
    
```

In this window you select which module is equipped with a louver. This activates a time delay for the module to allow the louver to fully open before the blower starts. (The controller does not operate the louver, it just builds in a time delay before the blower is called to operate.)

### 3.4.1.6 Sensor Window (Service > Equipment > Sensor)

```

Equipment 12:45
SENSOR   M1 M2
ROOM TEMP. S1 0
SUP. TEMP. S1 0
WATER TEMP. 0 0
OUTSIDE AIR 0 0
ROOM HUM.  S2 0
SUP. HUM.  S2 0
ANALOGUE 7  0

return
    
```

In this window you select the type of sensor in each module. If there is more than one sensor of the same kind, a mean value is calculated. In the main menu only the mean value is displayed. e.g.: Room temperature sensor in module 1, 2, 3

$$\text{Value} = \frac{\text{Sensor 1} + \text{Sensor 2} + \text{Sensor 3}}{3}$$

Only the mean value is used for the control.

#### Sensor Values

	Sensor type *	Output	Range
S1	Current	4 ... 20 mA	0 ... 50.0
S2	Current	4 ... 20 mA	0 ... 100.0
S3	Current	4 ... 20 mA	0 ... 50.0
S4	Current	4 ... 20 mA	0 ... 100.0 **
S5	Voltage	0 ... 10 V	0 ... 50.0
S6	Voltage	0 ... 10 V	0 ... 100.0
H ***	N/A	0	0

\* Ensure the jumpers on the I/O board are in the correct position!

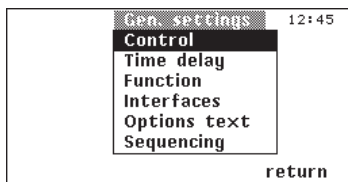
\*\* Exception: -58 ... 122°F for outside temperature and water temperature.

\*\*\* H- Is entered in **Service > Equipment > Sensor > Water Temp** for using On/Off control on water/glycol systems. (Voids sensor when proportional control is not used.)

The transmitted values of the different sensors can be read in the **Info > Actual/Setp.** menu.

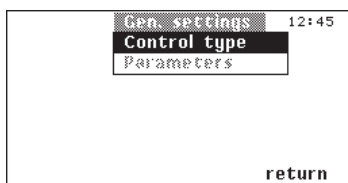
Service Menu (cont.)

**3.4.2 Gen. Settings Window** (Service > Gen. settings)



You select the area in which you wish to make further adjustments in this dialog window. The “Function” sub-menu is important during supervisor operation, for the configuration of stand-by modules and for the selection of the sequencing module.

**3.4.2.1 Control Window** (Service > Gen. settings > Control)

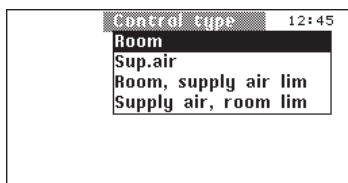


You can select the type of control in this dialog window. The parameters field can only be selected if you have selected “Room, supply air lim” or “Supply air, room lim” types of control below.

**3.4.2.1.1 Control type** (Service > Gen. settings > Control > Control type)

Changing values using the example of the **Service > Equipment > Control type** dialog window.

After you have pressed the “OK” button, the following dialog window appears.



Using the “< >” button you can now choose between the types of control. The actual values displayed change corresponding to the above selected type of control (Room or Sup. Air). Pressing “OK” accepts the entry and returns you again to the “Gen settings” dialog window.

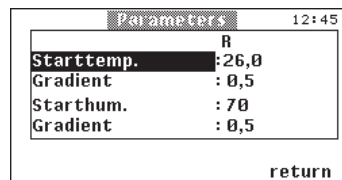
**Room Air Control** is the standard type of control. The temperature/humidity sensor is placed in the

return air intake and the C6000 controls operation in accordance with the setpoints set in the **Control > Temperature** or **Control > Humidity** menu. The limit values of the room air are monitored.

With **Supply Air Control**, an external T/H sensor is required. Control takes place for the room in accordance with setpoints for the supply air, set in the **Control > Temperature** or **Control > Humidity** menu. The limit values of the supply air are monitored.

**3.4.2.1.2 Parameters** (Service > Gen. settings > Control > Parameters)

You can select the “Parameters” field and then access the dialog window shown below for the “Room, supply air limited” and “Supply air, room limited” types of control.

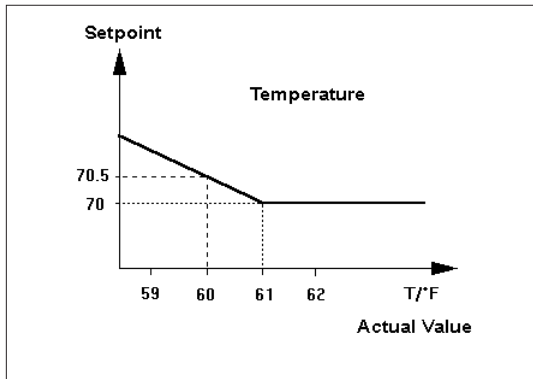


The start temperature can be adjusted between 0 and 72°R, in 0.2°R stages. The gradient can be adjusted between 0 and 2 in increments of 0.1. The start humidity can be adjusted between 0 and 90% in 1% increments.

With “Room, supply air lim”, (**room control with supply air limitation**), control takes place via the T/H sensor in the return air intake and a second T/H sensor in the supply air. Primarily control takes place as for room air control. An increase in setpoint occurs only if the measured supply air temperature exceeds a specific temperature which is set in the **Service > Gen. settings > Control > Parameters > Start temp.** menu. The extent of the setpoint increase is

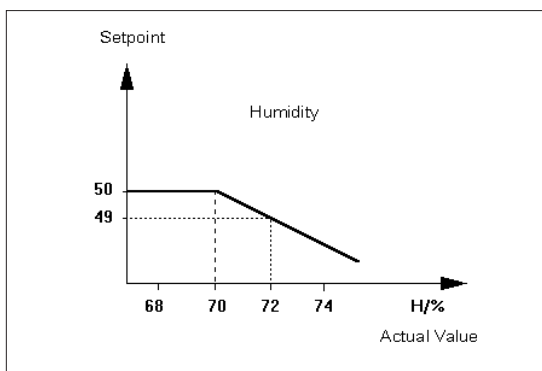
**Service Menu (cont.)**

determined by a factor which is entered as a gradient in the **Service > Control > Parameters > Gradient** menu. The relationship according to which this happens is illustrated by the following graph:



A steep gradient drastically corrects the failure to meet the supply air temperature, but has the risk that the control circuit starts to hunt.

With humidity control the setpoint shift takes place in the opposite direction. If the adjusted starting humidity is exceeded by the measured supply air humidity, the setpoint is reduced. You can also enter a gradient factor for this. The relationship is shown in the following graph:



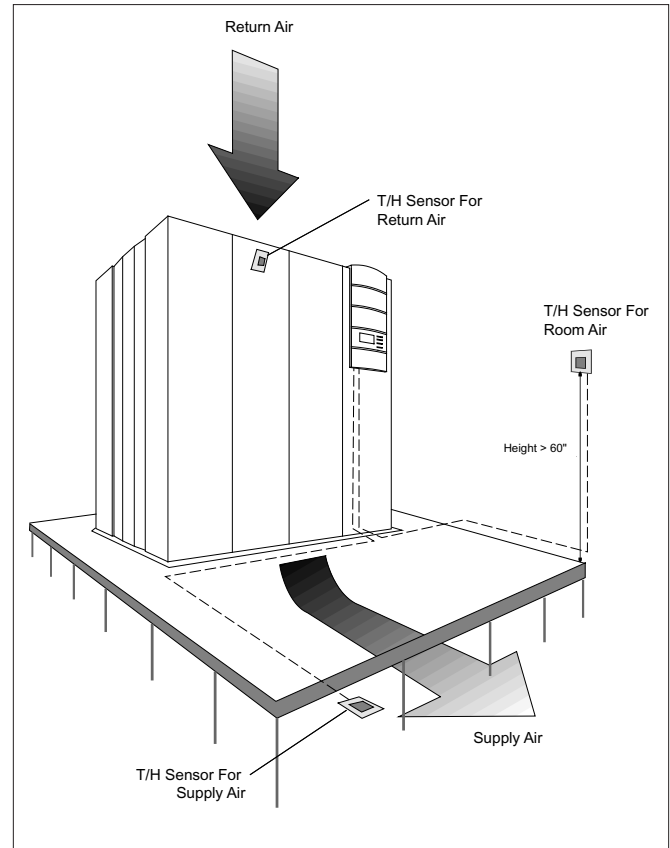
***New setpoint = old setpoint + gradient • (start value - actual value)***

Example (temperature):  $70.5 = 70 + 0.5 \times (61 - 60)$

Example (humidity):  $49 = 50 + 0.5 \times (70 - 72)$

The “Supply air, room lim”, (**supply air control with room air limitation**), is based on the same control principle as the “Room, supply air lim.” air control only, here the setpoint shift works in the opposite direction on the basis that the supply air is colder than the return air.

If the room temperature exceeds the start temperature entered, the temperature setpoint is reduced. If the room humidity drops below the starting humidity entered, the humidity setpoint is increased.



**Figure 7- Temperature/Humidity Sensor Location**

The limit values of all four input variables are monitored for room air control with supply air limitation and for supply air control with room air limitation.

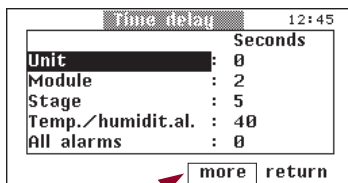
- Room air temperature
- Room humidity
- Supply air temperature
- Supply air humidity

The sensor should be positioned depending on the space available, the thermal load distribution and the selected type of control.

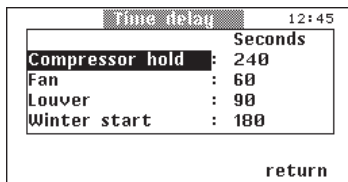
**Service Menu (cont.)**

**3.4.2.2 Time Delay Window** (Service > Gen. settings > Time delay)

In this window you can adjust the time delays, with which certain components are switched on or when alarms are displayed. This prevents all the equipment from being switched on at the same time causing in a mains overload.



Highlight the word "more" and press "OK" to access the additional "Time delay" dialog window shown next.



**3.4.2.2.1 Unit**

The switch-on delay for the system can be adjusted in 10 second increments between 0 and 2,550 seconds (approx. 42 minutes). With several units installed, different switch-on delays are recommended so that you avoid a mains overload after a power failure if all units restart automatically.

**3.4.2.2.2 Module**

The switch-on delay of a module prevents the simultaneous start of the modules of a unit. The time can be adjusted between 0 and 255 seconds.

**3.4.2.2.3 Stage**

The switch-on delay of a control stage (e.g. heating, humidifying, cooling) can be varied between 2 and 255 seconds within a module.

**3.4.2.2.4 Temp./humidity.al.**

The alarm signals for all exceeded temperature and humidity limit values can be delayed by 0 to 2,550 seconds in 10 second increments.

**3.4.2.2.5 All Alarms**

A time delay of 0 to 255 seconds can be set for all alarms. This is appropriate after a power failure in rooms under extreme conditions. If the unit starts automatically, a series of alarm signals does not immediately result.

**3.4.2.2.6 Compressor hold**

The compressor delay, which is used to increase the service life of the compressor, by delaying the restart by the set value, can be adjusted between 1 and 255 seconds.

**3.4.2.2.7 Fan**

The fan post operation run time can be varied between 1 and 255 seconds and applies to all modules.

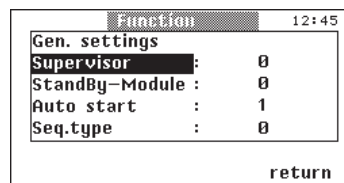
**3.4.2.2.8 Louver**

The louver start delay applies to the fan in the first module, if the unit is fitted with louvers. These are opened simultaneously after the system starts (except the louver of the stand-by module), and then the first fan runs with the set time delay (10 - 2,550 seconds).

**3.4.2.2.9 Winter start**

The low pressure switch is temporarily bypassed for the winter start. The bypass time can be adjusted between 0 and 255 seconds. There will be no "low pressure fault" alarm within this time.

**3.4.2.3 Function Window** (Service > Gen. settings > Function)



In this window you set whether the controller is to work as a supervisor (0= Controller Operation, 1= Supervisor Operation). See Section 4.0. You select which module (0 - 6) is to be operated as a Stand-by Module. If 0 is selected there is no stand-by mode. See Section 4.7. If you set the "Auto start" function to "1", the unit is started automatically after a power failure.

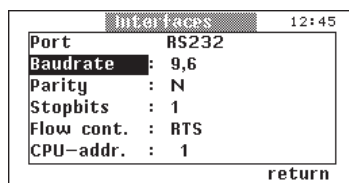
If the unit was switched off before the power failure (local, remote, PC or time switch), it also remains switched off after the power is restored.

The "Seq type" can be set between 0 and 2. The meaning of the numbers are as follows:

- 0** = No sequencing
- 1** = Internal sequencing between two units
- 2** = Bus sequencing between 6 units. Refer to Section 4.4.

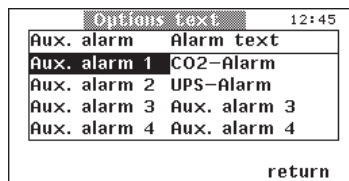
## Service Menu (cont.)

### 3.4.2.4 Interfaces Window (Service > Gen. settings > Interfaces)



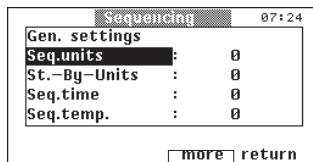
The Baud rate can be set between 0.3 and 19.2 k Baud. Refer to the printer/computer connection Section 6.2 for further settings. The CPU address can be varied between 1 and 255 and gives the unit (controller) a name in the data exchange with other systems, (e.g. Building Magement System).

### 3.4.2.5 Options text Window (Service > Gen. settings > Options text)

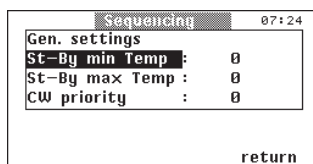


In this window you enter custom texts for the auxiliary alarms. Pressing “OK” moves the cursor letter for letter through the text. The letters are changed using “<” and “>”. All upper and lower case letters can be used as well as numbers and some special symbols.

### 3.4.2.6 Sequencing Window (Service > Gen. settings > Sequencing)



In this window you enter the number of units which take part in the sequencing (0 - 6), the number of stand-by units, the sequencing time (0 - 255 hours) and the sequencing temperature. Highlight the word “more” and press “OK” to access the additional “Sequencing” dialog window shown next.



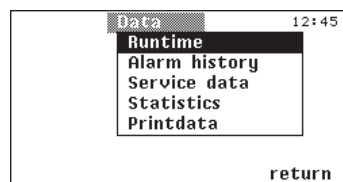
In this window you can set two outside temperatures, between which all stand-by units are switched on.

If the outside temperature is lower than “St-By min Temp” or higher than “St-By max Temp” the stand-by units are switched off. Conditions for this additional stand-by unit operation besides this are:

- An outside temperature sensor, which is configured and connected.
- The values for “St-By min Temp” and “St-By max Temp” are unequal to zero.
- The bus sequencing (sequencing mode 2) is enabled.

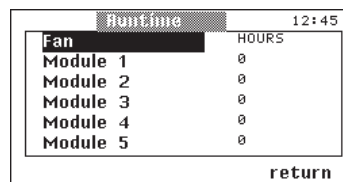
The setting “CW priority” is relevant only for the bus sequencing and is described in Section 4.5.

### 3.4.3 Data Window (Service > Data)



Predominantly, sub-items in which you can view data are in this menu. You should call up the sub-item “Service data” after service is complete. You need the sub-item “Print data” to select the values which are to be printed and to start printing.

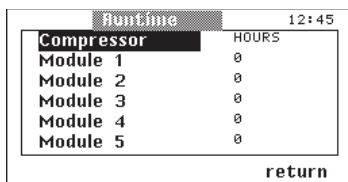
#### 3.4.3.1 Run time Window (Service > Data > Runtime)



You can view the operating hours per module for the components shown below in the “Runtime” menu:

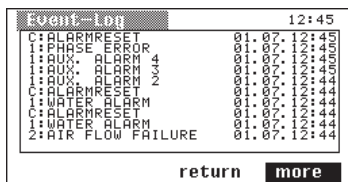
- Fan
- Compressor(s)
- Electrical heater
- Pump 1
- Pump 2
- Humidifier

**Service Menu (cont.)**



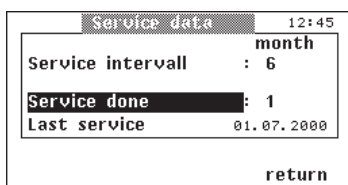
Using the “OK” button you change to the numerical field, and can select a module with the “< >” button and reset the counter status to 0 by pressing “OK”. If you do not wish to change anything, you may exit the numerical field using the “< >” button.

**3.4.3.2 Alarm History Window** (Service > Data > Alarm history)



The last 80 alarms which occurred are listed in the menu item “Alarm history”. The number in front of the colon specifies the defective module. The letter “C” stands for controller. A summary of all potential signals can be found in Section 4.9.2. The alarm memory is erased by pressing and holding the “RE-SET” and “OK” buttons, (until the standard window is visible), while switching on the voltage.

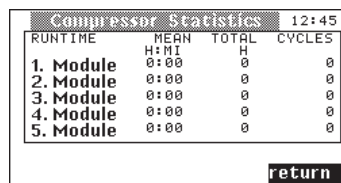
**3.4.3.3 Service Data Window** (Service > Data > Service data)



The “Service data” menu item represents a control device. If the service interval entered is exceeded, the message “Service” appears on the controller.

You can vary the service interval between 0 and 12 months. You bypass the service message by entering zero. After the unit has been serviced, set the 0 in the “Service done” row to 1 and the current date appears in the row under it.

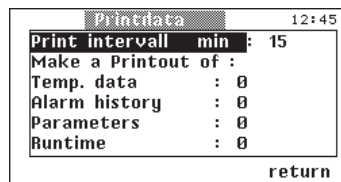
**3.4.3.4 Statistics Window** (Service > Data > Statistics)



The compressor statistics show the runtime of the compressor for each module, the number of cut-ins (cycles) and the mean runtime which can be calculated as follows:

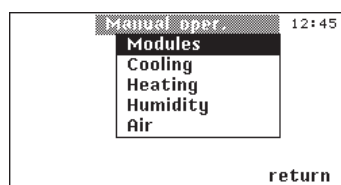
$$\frac{\text{Old mean value} + \text{new runtime}}{2}$$

**3.4.3.5 Printdata Window** (Service > Data > Print data)



In the “Print data” window you can select which data you wish to print out, by setting the “0” to “1”. Printing is initiated by this operation and the “1” changes back to “0” again. A print command must be triggered separately for each data area (Temp. data, Alarm history etc). All print-outs contain the CPU address.

**3.4.4 Manual Oper. Window** (Service > Manual oper.)



Manual control of operation is possible in this menu. Only those components which are configured in the **Service > Equipment** menu or are actually furnished (e.g. the louver) can be put into operation.

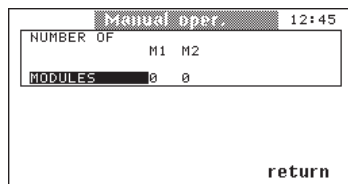
**NOTE**

When exiting the manual operating level, manual operation is ended and the unit is returned to automatic operation.



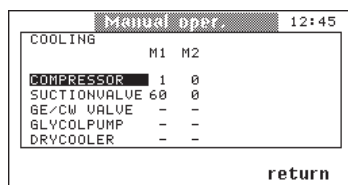
## Service Menu (cont.)

### 3.4.4.1 Modules Window (Service > Manual oper. > Module)



In this dialog window you can select which modules to operate manually.

### 3.4.4.2 Cooling Window (Service > Manual oper. > Cooling)



You can start the compressor(s), the glycol pump, the dry cooler and the operation of the suction valve and the GE valve in this dialog window.

A percentage value appears in the display on components which are controlled analogically such as:

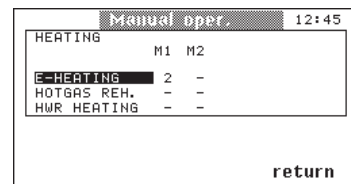
- LPHW heater
- Humidifying (2-point control also possible)
- Suction throttle valve
- GE/CW valve

For valves the number indicates the degree of opening of the valves. For the LPHW heater the number indicates the degree of opening of the LPHW valve. For humidifying, the number represents a percentage output indication.

The applicable values for the equipment of the modules have the following significance:

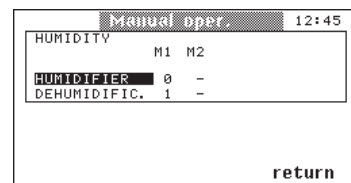
- = Not furnished or off
- 0 = Furnished but off
- 1 = 1st stage switched on
- 2 = 2nd stage switched on
- 0-99 = 0-99% output

### 3.4.4.3 Heating Window (Service > Manual oper. > Heating)



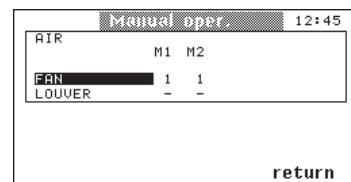
You can start the operation of the electrical heater, the hot gas heater and the LPHW heater in this dialog window. The symbols in the table have the same meaning as for the configuration of the unit in the **Service > Equipment** menu, (see Section 3.4.1).

### 3.4.4.4 Humidity Window (Service > Manual oper. > Humidity)



You can start the humidifier and the operation of the dehumidifying valve in this dialog window. The compressor can also be put into operation with the “Dehumidification” function. The symbols in the table have the same meaning as for the configuration of the unit in the **Service > Equipment** menu, (see Section 3.4.1).

### 3.4.4.5 Air Window (Service > Manual oper. > Air)



You can start the fan and open or close the louver in this dialog window. (- = open, 1 = closed.) The symbols in the table have the same meaning as for the configuration of the unit in the **Service > Equipment** menu, (see Section 3.4.1).

## CAUTION

If the fan is switched off, all the other components are locked electrically and cannot be started. If the module is switched off again in manual operation, all adjustments in the cooling, heating etc. menus are reset to zero and the controller takes over the control again.

**4.0 OPERATION**

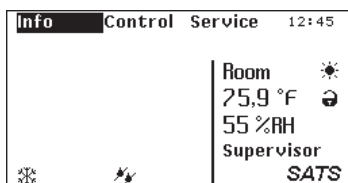
**4.1 Supervisor Operation**

The supervisor takes over the control of the system if no data transmission to the I/O board has been registered for at least 15 seconds. All the previously adjusted parameters of the first controller are automatically transferred to the supervisor.

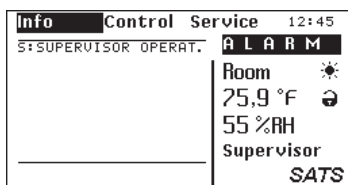
In addition to the current parameters the controller transmits the “Start/stop” condition to the supervisor.

The controller and the supervisor have the same CPU address. In case of a request by the RS485 monitoring interface, the supervisor responds only if the controller does not work.

In normal operation of the first controller the supervisor shows the following display.



If the first controller fails, the supervisor takes over the control and displays the following alarm signal window. In addition there is an alarm tone which can be acknowledged using the reset button.



If the fault is eliminated and the first controller is required to take over the control, the supervisor must be de-energized. The unit must be switched off briefly for this purpose. After replacing a controller, which is to act as a supervisor, proceed as follows:

1. Disconnect the controller, which controls in the normal case, from the mains (disconnect 24 V at terminal 1). If the controller and the supervisor are installed in different modules, it is sufficient to switch off the module, in which the controller is located, at the master switch.

2. Switch on unit.
3. Configure supervisor as supervisor (See Section 3.4.2.3).
4. Disconnect supervisor from the supply voltage (refer to step 1).
5. Connect controller (connect voltage or switch on the module concerned).
6. Connect supervisor (refer to step 5).

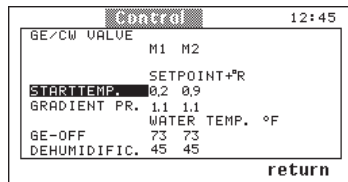
## 4.2 GE (Water/Glycol) System Operation

Various adjustments can be made during GE operation to the two major components of the GE unit; The GE valve and the pump(s) (if furnished). You must call up the **Control > Module functions > Cooling** menu window to make adjustments.

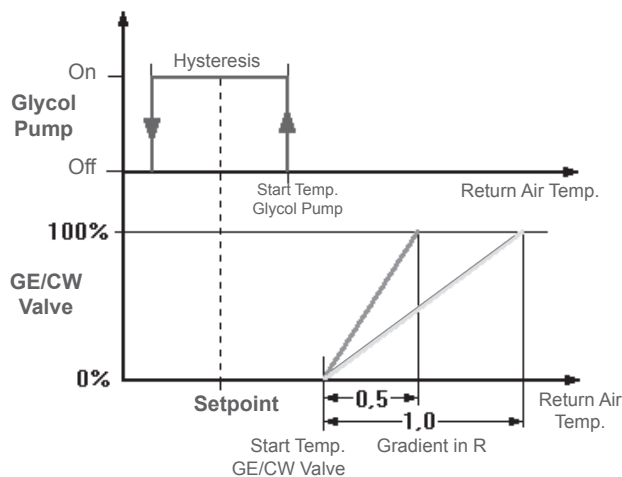
### NOTE

In the **Service > Equipment > Sensor** menu at least one water temperature sensor must be configured. If no water temperature sensor exists for a CW unit, the setting “H” can be selected. As a result a sensor is simulated with the value 10%.

You can enter the start temperature in the form of a positive difference to the setpoint of air temperature in this window.

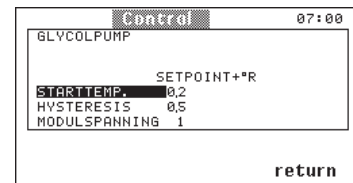


With the aid of the gradient you determine to what extent a setpoint deviation is to be counteracted. The smaller the gradient the more the GE/CW valve is opened at a particular temperature difference to the start temperature. The term “gradient” is used here in the sense of a “proportional band”.



Enter the water temperature, in the “GE OFF” field, at which GE operation is to cease because the water is too hot and may contribute to the air heating up. The GE/CW valve is fully open for dehumidifying in GE operation. In the “GE dehumidification” field you enter the water temperature setpoint below which dehumidifying is to cease (in which the GE/CW valve is fully closed).

If you have selected a GE piping system with one or two pumps for the A/C unit equipment, you can enter the start temperature of the pump(s) in the form of a positive temperature difference to the setpoint in an additional window.



A pump switch-over occurs after 20 operating hours, provided 2 pumps are configured (Refer to **Service > Equipment > Cooling**, Section 3.4.1.2). If only one pump is configured, no changeover takes place.

### 4.2.1 Glycol Pump Control

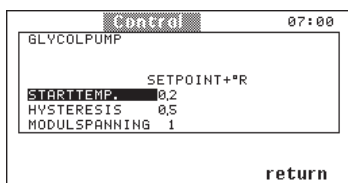
The pump control is limited on the modules 1 and 2. Up to 2 glycol pumps can be configured in each of the 2 modules. Even if a module executes stand-by operation, the corresponding pump continues to operate. If 2 glycol pumps are configured in a module, a sequencing based on time and failure takes place between these modules (see note below). In this case the setting “Modulspanning = 1” is only effective if one of the pumps fails.

#### NOTE

Sequencing based on time and failure means pump duty will switch between pump #1 and pump #2 in 10 hour cycles. If one pump is defective, the other pump will operate instead.

#### 4.2.1.1 Alarms

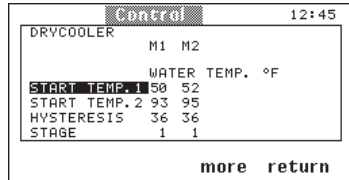
Pumps with an alarm are always switched off. If both pumps of a module are defective and if no other glycol pump is configured, all pumps and compressors are switched off. If at least one glycol pump is configured in the other module, only the defective glycol pumps and the compressor of the corresponding module are switched off.



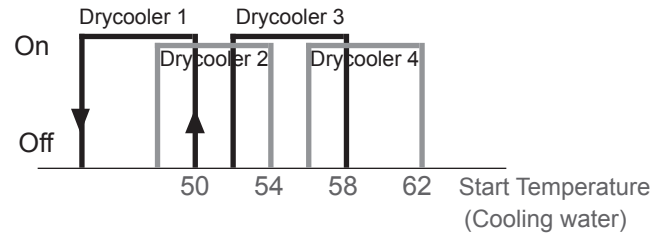
A special condition exists if one glycol pump in module 1 and one pump in module 2 is configured. Between these two pumps a sequencing based on time and failure begins if the menu point “Modulspanning” is set to “1”. If both pumps are defective, all compressors are switched off. If the menu point “Modulespanning” is set to “0”, both pumps will operate simultaneously. No sequencing will take place. If a pump is defective, the defective glycol pump and the compressor of the corresponding module are switched off.

## 4.3 Dry Cooler Operation

Dry cooler operation depends on water temperature, the temperature setpoint of the return air and on the outside air temperature. For this at least one outside temperature sensor must be configured in the menu **Service > Equipment > Sensor**. A distinction is made between summer and winter operating methods.

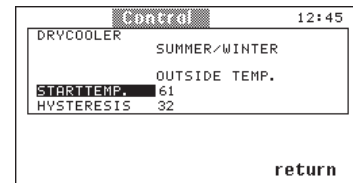


In this dialog window the start temperatures for winter operation, (Start Temp. 1) and for summer operation, (Start Temp. 2) can be entered. The hysteresis can be modified between 0 and 36°F. To avoid the simultaneous start of all modules, the start values can be shifted by adjusting "STAGE".

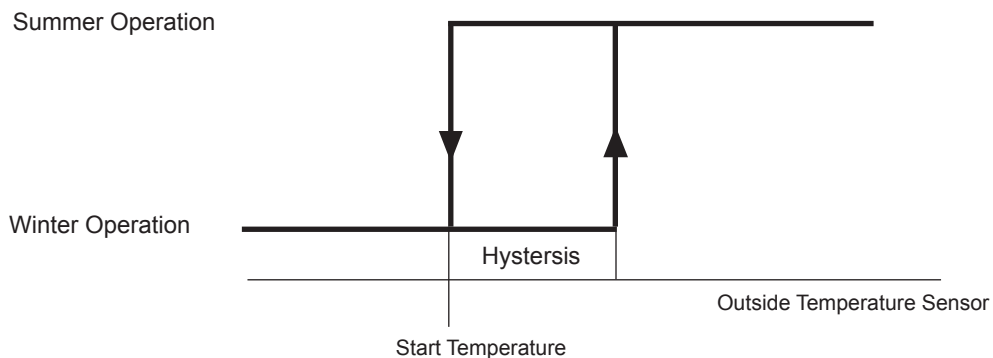


Example: Start temperature 1: 50°F  
Hysteresis: 4  
Stage: 2

For the changeover between summer/winter operation the shift point and the hysteresis can be entered in the following dialog window.



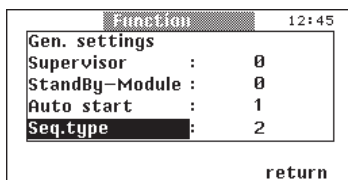
The winter operation mode is disabled when the outside temperature falls below -22°F or if there is a sensor failure at the outside temperature sensor. The "Outside Temperature Sensor Failure" alarm is disabled.



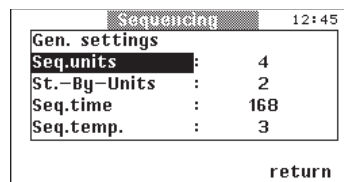
**4.4 Bus Sequencing**

-6 units maximum can take part in the bus sequencing.

-For all units the menu point “Seq.type” in the **Service > Gen. Settings > Function** menu must be “2”.



-One unit is selected as the sequencing master. This must be the unit with the CPU address “1” with preference. Adjustments may be made in the **Service > Gen. Settings > Sequencing** menu for this unit only.

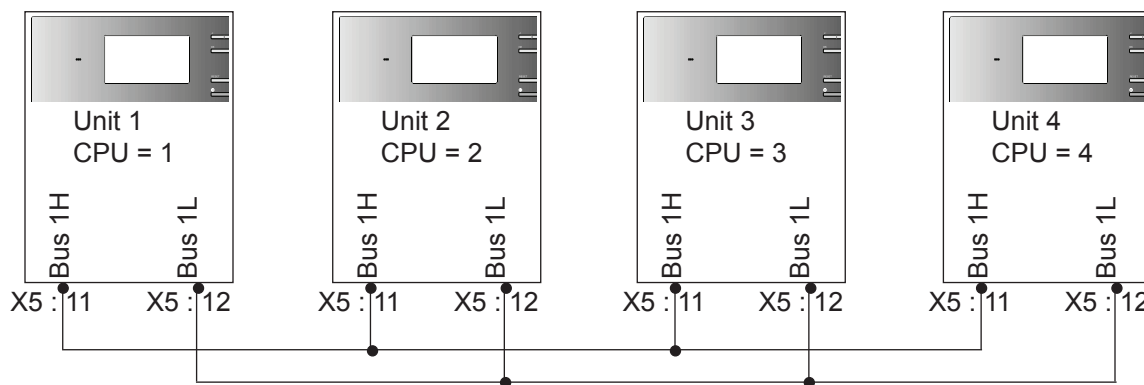


-The different menu points have the following significance:

- **Seq. units:** The number of units taking part in the bus sequencing. The units must have CPU addresses correspondingly from 1 to 6 maximum.
- **St.-By-Units:** The number units designated as “stand-by” during normal operation.
- **Seq. time:** Adjustable between 1 and 255 hours. 0 hours causes the deactivation of the sequencing function.
- **Seq. temp.:** Temperature of deadband in °R before bringing the standby unit into operation.

**NOTE**

$$\Delta T \text{ °Fahrenheit} = \Delta T \text{ °Rankine}$$



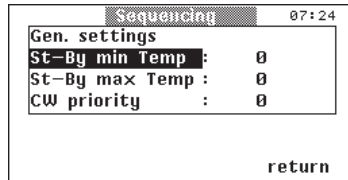
**Figure 8- Bus Sequencing Diagram**

**RESTRICTIONS FOR BUS SEQUENCING:**

If the units are to be directly connected to a BMS or by a MIB, contact SATS Product Support Group, (see Section 8.0.).

## 4.5 Setting CW Priority

The CW-priority setting represents a measure for saving energy on dual-circuit units (option VFS/CCD/CCU).



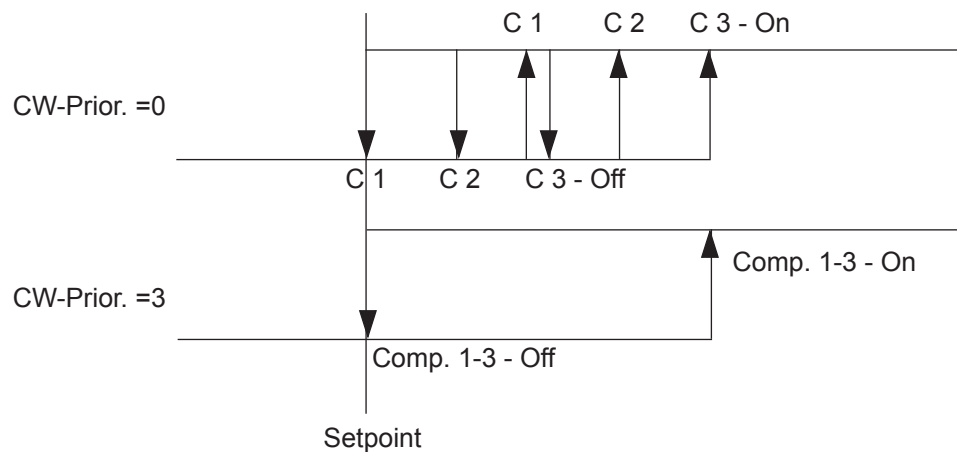
By preventing compressor operation until an adjustable threshold is reached, the cooling load is exclusively handled by chilled water operation and the additional operation of stand-by units.

For this purpose it's necessary to set the menu point "CW priority" to a value which is unequal to zero and which is the same for all units within the sequencing circle.

When the sequencing is enabled and no unit within the sequencing circle requests compressor operation, the master unit disables compressor operation for all units. As a result, no unit can start its compressor. Instead, a stand-by unit is started when an operating unit would start the compressor due to the room temperature exceeding the configured compressor start value.

The compressors of all units are enabled when the number of units, which is adjusted in the menu point "CW priority", would start their compressors as a result of a rising room temperature. The system returns to a sequencing mode with the compressors disabled if no unit started its compressor because the room temperature has decreased accordingly.

This control is independent of the water temperature and the menu point "GE - OFF". As a result the sequencing is not interrupted, but continues with the available units to attain an equal and constant operation of the units, even in the case of additional units operating due to alarms.



**4.6 BMS Messages**

An expansion I/O board provides the capability of supplying up to 8 BMS (Building Management System) signals (individual fault signals). The assignment of the outputs can be configured in the C6000 according to customer requirements in the **Control > Preferences > Alarm priority** menu if these outputs are not used by other functions.

**4.6.1 Alarm Number setting (priority) for COS/VFS/CCD/CCU- Basic**

The horizontal scale corresponds to module number; vertical scale corresponds to number of alarm.

Module No. →

Number of Alarm ↓		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	
	1	1	11	21	31	41	51	Basic I/O Board
	2	2	12	22	32	42	52	
	3	3	13	23	33	43	53	Expansion I/O Board
	4	4	14	24	34	44	54	
	5	5	15	25	35	45	55	
	6	6	16	26	36	46	56	
	7	7	17	27	37	47	57	
	8	8	18	28	38	48	58	
	9	9	19	29	39	49	59	
10	10	20	30	40	50	60		

This table shows the maximum number of alarms, their assignment to the modules and their location on the I/O boards (basic or expansion).



**4.6.2 BMS alarms which can be occupied by module alarms**

	A	G	GE	DX	CW	A/G-Basic
Common Alarm	1	1	1	1	1	1
Compressor 2	n.a.	n.a.	n.a.	2	n.a.	n.a.
Humidifier	2/12/22/32/42/52	2/12/22/32/42/52	2/12/22/32/42/52	n.a.	2	2
Enable Pump	n.a.	n.a.	3/13/23/33/43/53	n.a.	n.a.	n.a.
Pump ½	n.a.	n.a.	4/14/24/34/44/54	n.a.	n.a.	n.a.
Dry Cooler 1	n.a.	5/15/25/35/45/55	5/15/25/35/45/55	5/15/25/35/45/55	n.a.	n.a.
Dry Cooler 2	n.a.	6/16/26/36/46/56	6/16/26/36/46/56	6/16/26/36/46/56	n.a.	n.a.
Dry Cooler 3	n.a.	7/17/27/37/47/57	7/17/27/37/47/57	7/17/27/37/47/57	n.a.	n.a.
Dry Cooler 4	n.a.	8/18/28/38/48/58	8/18/28/38/48/58	8/18/28/38/48/58	n.a.	n.a.
Sequencing	9 and 10	9 and 10	9 and 10	9 and 10	9 and 10	n.a.
Louver 1	n.a.	n.a.	n.a.	n.a.	n.a.	3
Louver 2	n.a.	n.a.	n.a.	n.a.	6	9
Louver 3	n.a.	n.a.	n.a.	n.a.	7	10
Compressor 3	n.a.	n.a.	n.a.	n.a.	n.a.	6
Dehumidify 2	n.a.	n.a.	n.a.	n.a.	n.a.	4
Fan 3	n.a.	n.a.	n.a.	n.a.	n.a.	5
Heater 3	n.a.	n.a.	n.a.	n.a.	3	7
Heater 4	n.a.	n.a.	n.a.	n.a.	4	8
Humidifier	n.a.	n.a.	n.a.	n.a.	5	n.a.

Certain alarms can be assigned to specific alarm relays on either the basic or expansion I/O-board. If they are needed, they occupy normally available BMS alarm slots.

Example:

The humidifier alarm in the first module of an A-unit is assigned to alarm relay 2. If additionally a sequencing is used, it occupies the alarm relay 9 and 10. In this case the alarm relays 3 through 8 are free for other BMS alarm assignments.

## 4.7 Standby Operation

Only one module can be configured as a stand-by module in a unit. The stand-by module is not started when the unit is started. If the stand-by module is equipped with louvers, these remain closed when the unit starts. The stand-by module runs with its own parameters and is only started by one of the following alternatives:

1. False start
2. Alarm start
3. Sequencing
4. Manual start

It is possible to switch off the stand-by module by entering a "0" in the "Stand-by module" field in the **Service > Gen. Settings > Function** dialog window. In this case the module which failed previously starts again.

### 4.7.1 False start (highest priority)

The stand-by module is started if one of the following conditions occur in a module:

- Air flow failure
- Compressor HP fault
- Compressor LP fault- Heater fault
- Humidifier defective
- Ultrasonic defective

The defective module is switched off and the louvers (if furnished) are closed.

### 4.7.2 Alarm start (average priority)

The stand-by module is switched on at 2.7°Rankine or 3% rel. humidity before reaching the limit values of the main type of control. The hysteresis is 1.8°Rankine and 3% rel. humidity.

### 4.7.3 Sequencing (lowest priority)

Redesignating the stand-by module within a unit, is carried out once a week. The stand-by module exchanges with modules which are identically equipped in sequence through the unit. The same equipment relates to:

- Cooling (compressor)
- Heating (electrical heater 1+2, refrigerant heater)
- Humidifying
- Dehumidifying

The parameters between the old and the new stand-by module are replaced in the process.

If the stand-by module is already started (due to false start, alarm start or manual start), the sequencing between the modules is suspended for this time. The weekly redesignation time shifts accordingly.

The weekly redesignation time can be reduced to 5 minutes for test purposes.

1. Switch off the voltage.
2. Simultaneously press and hold the ">" button and the "RESET" button.
3. Switch on the voltage.
4. Release the buttons when the standard window is visible.

Switching the voltage "On" and "Off" sets the redesignation time back to 1 week.

### 4.7.4 Manual start

The stand-by module can be started and stopped manually. This may be done in the **Service > Manual oper.** menu. Refer to Section 3.4.4.

## 4.8 Sensor Broken

Valid value range of sensors. (values measured by the sensor without readjustment)

Return air temperature .....	35 to 122°F
Return air humidity .....	2 to 100 % R.H.
Supply air temperature .....	35 to 122°F
Supply air humidity .....	2 to 100 % R.H.
Water temperature.....	-52 to +122°F

If one of the measured values is outside the specified range, the sensor is recorded as defective.

If only part of the sensor (temperature or humidity) fails, the operative part continues to be used for the control. The defective part is ignored and no longer contributes to the control.

If sensors for return air and supply air are furnished, the defective sensor is switched off and the appropriate type of control for the operative sensor is selected. For example, if the return air sensor fails during return air control with supply air limitation, the Room temperature display in the Standard window defaults to 32°F and the controller changes over to Supply Air Control.

### CAUTION

In this case, the new setpoint values are the supply air setpoint values, which can be adjusted in advance by switching over to supply air control in the **Service > Gen. settings > Control > Control type** menu.

If a water sensor fails, the pumps and the dry cooler are switched on permanently if cooling or dehumidification is required.

## 4.9 Fault Signals

### 4.9.1 General Definition

A signal always appears on the display if the entered setpoint limit values are exceeded or if any components of the A/C unit do not work satisfactorily. A distinction is made between four types of signals.

**Limit value alarms** - Occur if the entered limit values of the control of the A/C unit are not achieved or are exceeded. Limit value alarms are also evaluated in stop-mode.

**Unit faults** - Occur if components of the A/C unit are defective or do not work satisfactorily. If a component is not configured, the corresponding alarm is passive. Example: If no electrical heater in the 2nd module is configured, the alarm input "electrical heater fault" in the 2nd module has no function. The "Fire Alarm" and "Water Alarm" are also evaluated in stop-mode. Other alarms are only evaluated in start-mode.

**Internal faults** - Occur when there is a controller or peripheral components which are defective or do not work satisfactorily.

**Information texts** - Occur if service intervals have expired.

An alarm is indicated by a text output on the display of the controller, an audible signal and by the alarm lamp (LED) lighting-up. If you press the "RESET" button, the alarm tone stops. Pressing the "RESET" button again cancels the alarm however, the alarm occurs again if the cause of the fault has not been eliminated. When an alarm signal is activated, the cause of the fault must be eliminated according to the troubleshooting instructions for the A/C unit.

### CAUTION

If an alarm input is provided with +24V, no alarm is displayed. If voltage is interrupted (i.e. broken cable), the alarm is displayed.

**4.9.2 Possible Fault Signals on Display**

<b>Display</b>	<b>Delay</b>	<b>Cause</b>	
<b>Limit value alarms</b>			
Room temp. too high	Adjustable between 0 - 2550s	Actual value greater than limit value	
Room temp. too low		Actual value less than limit value	
Supply air temp. too high		Actual value greater than limit value	
Supply air temp. too low		Actual value less than limit value	
Water temp. too high		Actual value greater than limit value	
Water temp. too low		Actual value less than limit value	
Room humidity too high		Actual value greater than limit value	
Room humidity too low		Actual value less than limit value	
Supply air hum. too high		Actual value greater than limit value	
Supply air hum. too low		Actual value less than limit value	
<b>Unit faults</b>			
Air flow failure		D (15s after US)	Fan failure/V-belt defective
Compressor LP fault		0-255s after CS	Insufficient refrigerant
Compressor HP fault	3s + D	Compressor defective	
Electrical heater fault	3s + D	Heater has over-heated	
Humidity defective	3s + D	Steam humidifier defective	
Filter fault	D (15s after US)	Filter contaminated	
Supervisor alarm	D	Actual value > or < limit value	
Conductivity failure	30 min. + D	Conductivity > 5µ S	
Ultrasonic fault	30 min. + D	Conductivity > 20µ S	
Pump 1 fault	3s + D	Glycol pump (GE) defective	
Pump 2 fault	3s + D	Glycol pump (GE) defective	
Dry cooler fault	3s + D	Dry cooler defective	
Water alarm	D (10s after US)	Water in raised floor	
Auxiliary alarm	1D (10s after US)	(Freely assignable)	
Auxiliary alarm	2D (10s after US)	(Freely assignable)	
Auxiliary alarm	3D (10s after US)	(Freely assignable)	
Auxiliary alarm	4D (10s after US)	(Freely assignable)	

**Legend:**

- D: Adjustable delay 0-255s (as set in the **Service > Gen. settings > Time delay** menu)
- US: Unit start
- CS: Compressor start

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<b>Display</b>	<b>Delay</b>	<b>Cause</b>
Fire alarm	0s	Fire/Fire alarm system
RT sensor broken		Room temp. sensor cable broken
RH sensor broken		Room humidity sensor cable broken
ST sensor broken	5s	Supply air temp. sensor cable broken
SH sensor broken		Supply air humidity sensor cable broken
WT sensor broken		Water temp. sensor cable broken
E1 sensor broken		External sensor 1 cable broken
<b>Internal faults</b>		
I/O transmission fault	0s	Connection or I/O board defective
<b>Information texts</b>		
Maintenance required	8 o'clock*	Service interval expired
Supervisor	0s	Controller works as supervisor
Supervisor failure	0s	Supervisor defective
Supervisor operation	30s	Controller defective
Stand-by module active	0s	Main module defective/limit value exceeded
UPS	0s	Uninterrupted power supply

\*The information/alarm is delayed until 8 o'clock the next day.

**4.10 Factory Default Settings**

Temperature	Min	Setpoint	Max °C	Menu
Room	5	24.0	35	<b>Control &gt; Temperature</b>
Supply air	5	—	35	
Water	-20	—	45	

Humidity	Min	Setpoint	Max %R.H.	Menu
Room	5	45	90	<b>Control &gt; Humidity</b>
Supply air	5	—	90	

	Setpoint + Kelvin						Menu
	M1	M2	M3	M4	M5	M6	
<b>Compressor</b>							<b>Control &gt; Module functions &gt; Cooling &gt; Compressor</b>
Start temp. 1	0.7	1.1	1.5	1.9	2.3	2.7	
Start temp. 2	0.9	1.3	1.7	2.1	2.5	2.9	
Hysteresis	0.7	0.7	0.7	0.7	0.7	0.7	
<b>Suction valve</b>							<b>Control &gt; Module functions &gt; Cooling &gt; Suction valve</b>
Start temperature	0.0	0.4	0.8	1.2	1.6	2.0	
Gradient, proportional	0.5	0.5	0.5	0.5	0.5	0.5	
<b>GE/CW valve</b>							<b>Control &gt; Module functions &gt; Cooling &gt; GE/CW valve</b>
Start temperature	0.1	0.5	0.9	1.3	1.7	1.9	
Gradient, proportional	0.6	0.6	0.6	0.6	0.6	0.6	
GE off	23	23	23	23	23	23	
GE dehumidification	7	7	7	7	7	7	
<b>Glycol pump</b>							<b>Control &gt; Module functions &gt; Cooling &gt; Pumps</b>
Start temperature	0.1	0.1	0.1	0.1	0.1	0.1	
Hysteresis	0.3	0.3	0.3	0.3	0.3	0.3	
	Water temperature						
<b>Drycooler</b>							<b>Control &gt; Module functions &gt; Cooling &gt; Drycooler</b>
Start temperature 1	10	11	12	13	14	15	
Start temperature 2	34	35	36	37	38	39	
Hysteresis	2	2	2	2	2	2	
Stage	1	1	1	1	1	1	
	Outside temperature (Changeover summer/winter)						
Start temperature	16	16	16	16	16	16	
Hysteresis	2	2	2	2	2	2	

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	Setpoint – Kelvin						Menu
	M1	M2	M3	M4	M5	M6	
<b>Electrical heater</b>							<b>Control &gt; Module functions &gt; Heating &gt; E-heating</b>
Start temperature 1	1.5	2.0	2.5	3.0	3.5	4.0	
Hysteresis 1	0.5	0.5	0.5	0.5	0.5	0.5	
Start temperature 2	2.0	2.5	3.0	3.5	3.5	3.5	
Hysteresis 2	0.5	0.5	0.5	0.5	0.5	0.5	
Hotgas reheat							<b>Control &gt; Module functions &gt; Heating &gt; Hotgas reh.</b>
Start temperature	1.0	1.5	2.0	2.5	3.0	3.5	
Hysteresis	0.5	0.5	0.5	0.5	0.5	0.5	
<b>LPHW valve</b>							<b>Control &gt; Module functions &gt; Heating &gt; HWR-valve</b>
Start temperature	1.5	2.0	2.5	3.0	3.5	4.0	
Hysteresis	0.5	0.5	0.5	0.5	0.5	0.5	
Start proportional	1.5	2.0	2.5	3.0	3.5	4.0	
Gradient, proportional	0.5	0.5	0.5	0.5	0.5	0.5	
Setpoint - % rel. humidity							
<b>Humidification</b>							<b>Control &gt; Module functions &gt; Humidification</b>
Start humidity	5	10	10	10	10	10	
Hysteresis	5	5	5	5	5	5	
Start, proportional	0	0	0	0	0	0	
Gradient, proportional	10	10	10	10	10	10	
Setpoint + % rel. humidity							
<b>Dehumidification</b>							<b>Control &gt; Module functions &gt; Dehumidification</b>
Start temperature	10	15	20	25	30	35	
Hysteresis	10	10	10	10	10	10	
Setpoint - Kelvin							
Dehumidifying stop	5	5	5	5	5	5	
<b>Fan</b>							<b>Control &gt; Module functions &gt; Air</b>
Start temperature	0	0	0	0	0	0	
Gradient, proportional	1.0	1.0	1.0	1.0	1.0	1.0	

### **Settings**

Type of control	Room
<b><u>Time Delays</u> (in Seconds)</b>	
System	0
Module	2
Stage	5
Temp./humidity alarm	40
All alarms	0
Compressor interval	240
Fan	60
Louver	90
Winter start	180

### **Function**

Supervisor	0
Stand-by module	0
Autostart	1
Seq. type	0

### **Interfaces**

Baud rate	9,6
Parity	N
Stop bit	1
Data flow	RTS
CPU address	1

4.11 Control Diagrams

4.11.1 Temperature Control

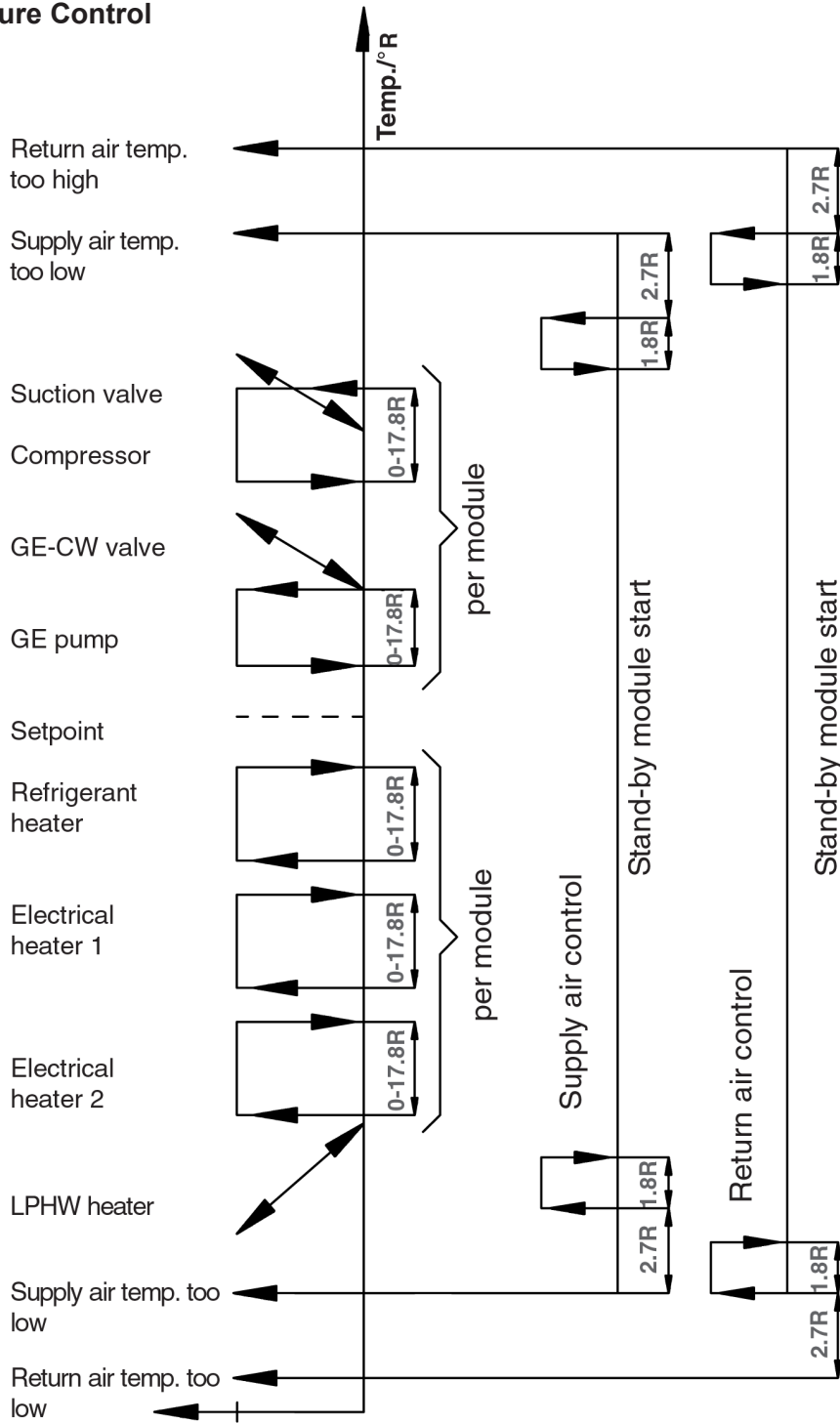
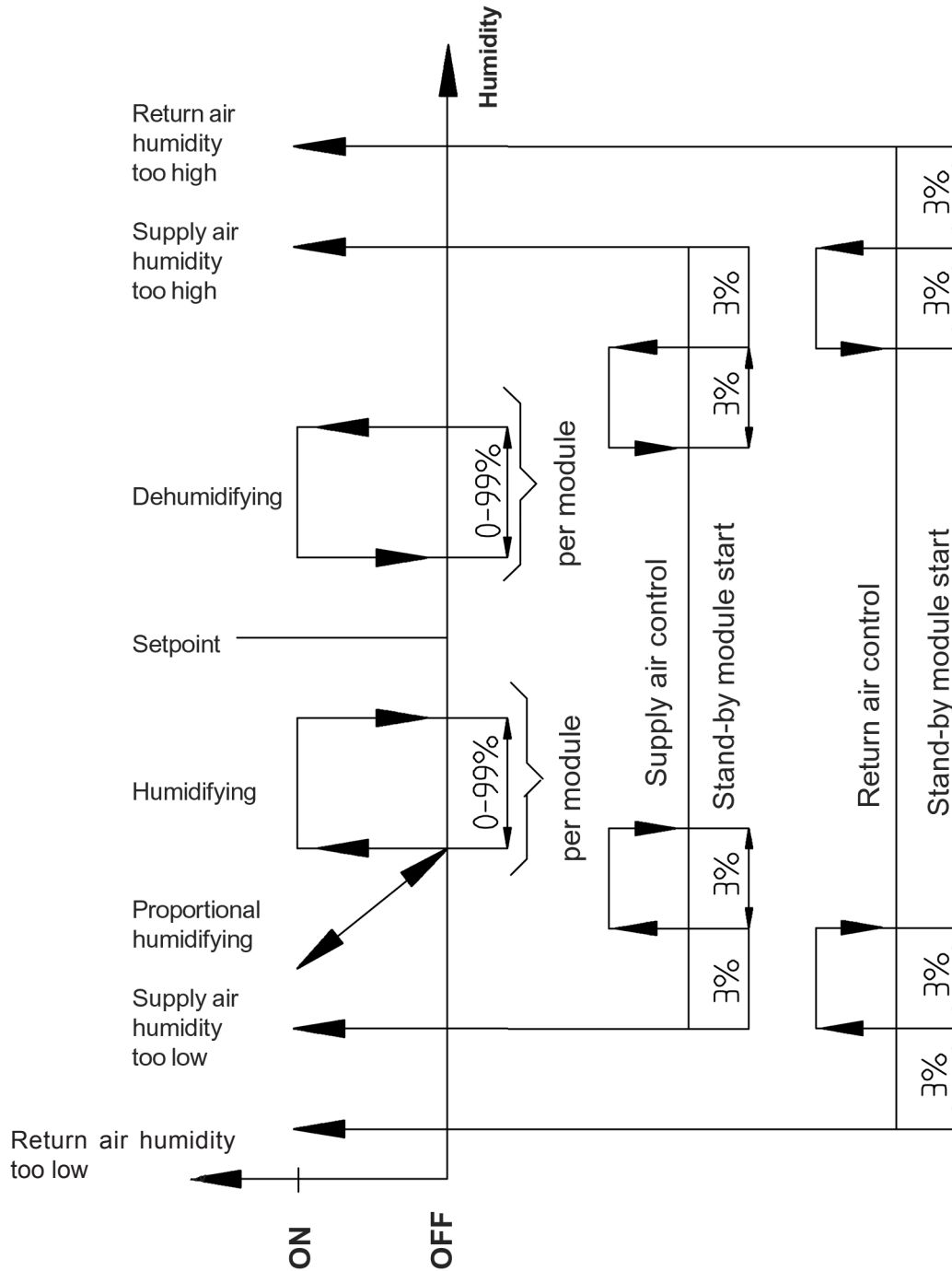


Figure 9- Temperature Control Diagram



**4.11.2 Humidity Control**



**Figure 10- Humidity Control Diagram**

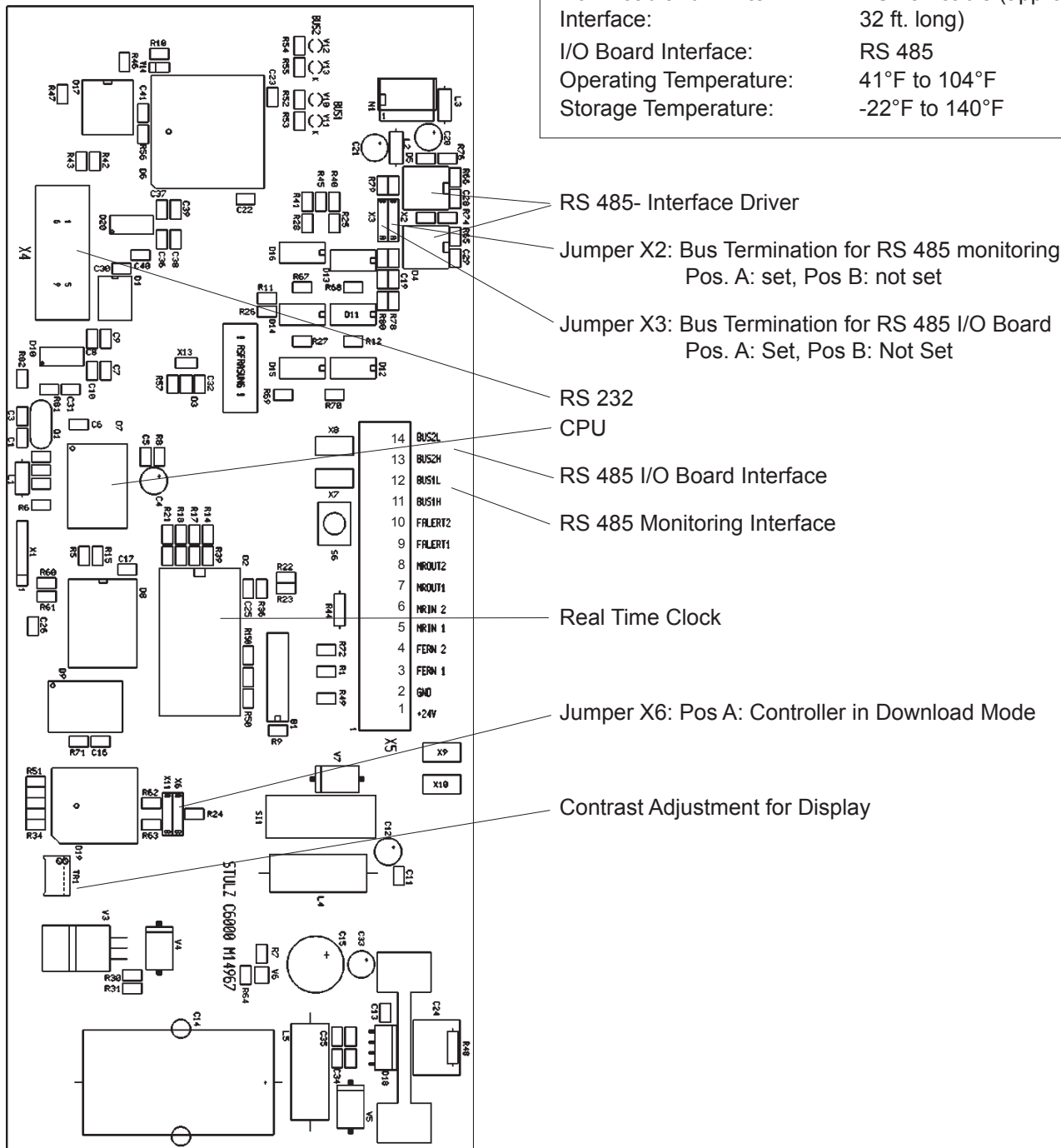
**5.0 HARDWARE DESCRIPTION**

**5.1 Controller**

**5.1.1 Controller PC Board**

**5.1.2 Control Board Technical Data**

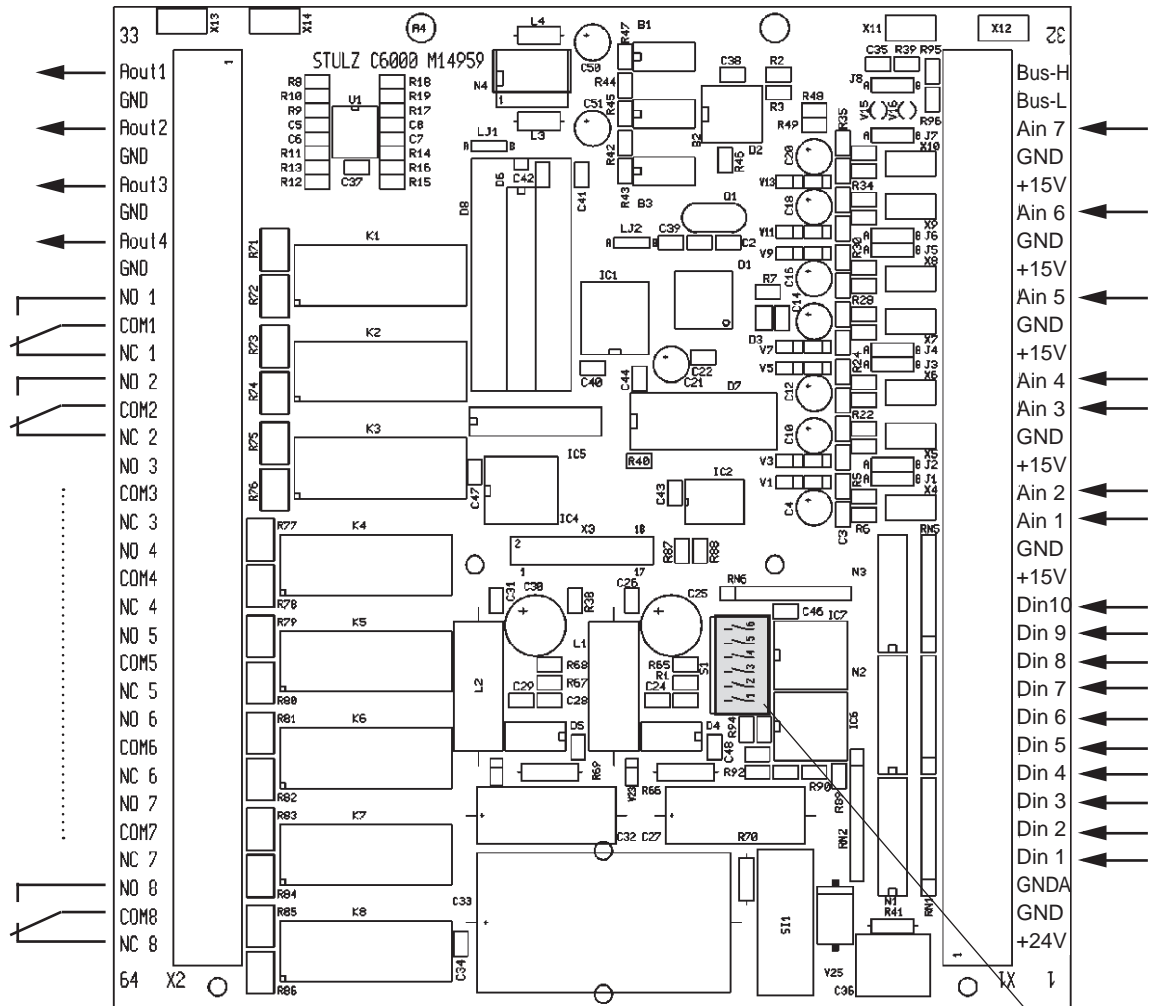
Dimensions:	10.6 x 4.3 x 1.6 in.
Voltage Supply:	24 (+/- 15%) VAC
Power Consumption:	14 VA
Fuse:	1 Amp, time delay
Download and Printer Interface:	RS 232 cable (approx. 32 ft. long)
I/O Board Interface:	RS 485
Operating Temperature:	41°F to 104°F
Storage Temperature:	-22°F to 140°F



**Figure 11- C6000 Control Board Layout**

**5.2 Standard I/O Board**

**5.2.1 Standard I/O Board Connection Assignments**



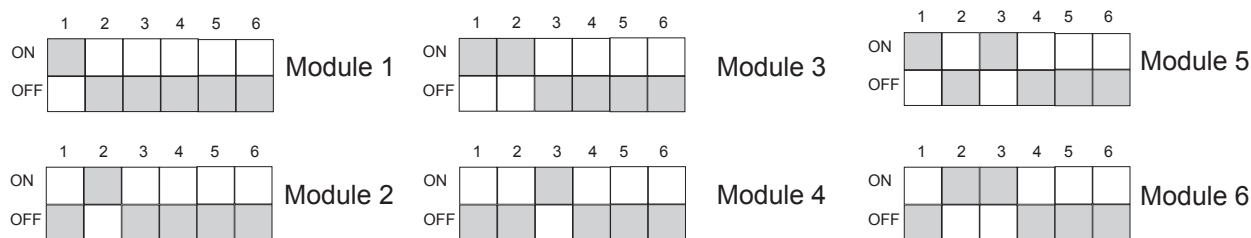
**Figure 12- Standard I/O Board Layout**

Address Switches

**5.2.2 Standard I/O Board Technical Data**

Dimensions:	6.7 x 7.0 x 1.2 inches
Voltage supply:	24 (+20%/-15%) VAC
Power consumption:	17 VA (I/O Board + Exp. I/O Board)
Fuse:	2A time-lag
Sensor input:	7 (0-20mA), (4-20mA), (0-10V)
Alarm inputs:	10 (24 VAC/DC) 24V = no alarm
Outputs:	4 analog 0-10 VDC load rating: 20 mA 8 digital 24 VAC max. 6 A
I/O board interface:	RS485
Adjustable addresses:	1 to 6
Operating temperature:	41°F - 104°F
Storage temperature:	-22°F - 140°F

**5.2.3 Address Switch Positions**



**5.2.4 Connection Assignment by A/C Unit Type**

Pin	Design.	COS/VFS	CCD/CCU
33	Aout 1	GE/CW-valve	GE/CW-valve 1
34	GND	or actual	or actual
X13	Screen	temperature	temperature
35	Aout 2	Humidifier	Humidifier
36	GND	or actual	or actual
X14	Screen	temperature	temperature
37	Aout 3	Suction valve	Suction valve,
38	GND	or	CW-valve 2 or
X10	Screen	actual humidity	actual humidity
39	Aout 4	LPHW-valve, SCR	LPHW-valve, SCR
40	GND	Reheat, Fan	Reheat, Fan
X9	Screen	Frequency Converter	Frequency Converter
41	Dout 1	Fan 1	Fan 1
42	Dout 1		
43	Dout 1		
44	Dout 2	Compressor 1	Fan 2
45	Dout 2		
46	Dout 2		
47	Dout 3	E-reheat 1	E-reheat 1
48	Dout 3		
49	Dout 3		
50	Dout 4	E-reheat 2 Hotgas reheat LPHW reheat	E-reheat 2 Hotgas reheat LPHW reheat
51	Dout 4		
52	Dout 4		
53	Dout 5	Pump Down	Pump Down
54	Dout 5		
55	Dout 5		
56	Dout 6	Alarm 1	Alarm 1
57	Dout 6		
58	Dout 6		
59	Dout 7	Humidifier or Alarm 2	Humidifier or Alarm 2
60	Dout 7		
61	Dout 7		
62	Dout 8	Compressor 2	Fan 3
63	Dout 8		
64	Dout 8		

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### 5.2.4 Connection Assignment by A/C Unit Type (cont.)

Pin	Design.	COS/VFS	CCD/CCU
1 2 3	24V+ GND GNDA	I/O-Board supply	I/O-Board supply
4 5 6	Din 1 Din 2 Din 3	Airflow 1 High pressure 1 LP 1	Fan 1 Fail CW-valve selector Fan 2 Fail
7 8 9 10	Din 4 Din 5 Din 6 Din 7	E-reheat fail 1/2/3 Filter alarm Humidifier failure Water detector	E-reheat fail 1/2/3 Filter alarm Humidifier failure Water detector
11 12 13	Din 8 Din 9 Din 10	High pressure 2 LP 2 UPS	CW-valve 1/2 Selector Fan 3 Fail UPS
14 15 16 17 X4	15V+ GND Temp. Humidity Screen	T/H sensor 1  Room/Return Air Room/Return Air	T/H sensor 1  Room/Return Air Room/Return Air
18 19 20 21 X5	15V+ GND Temp. Humidity Screen	T/H sensor 2  Supply Air Supply Air	T/H sensor 2  Supply Air Supply Air
22 23 24 X6	15V+ GND Ain 5 Screen	Water temp.sensor	Water temp.sensor
25 26 27 X7	15V+ GND Ain 6 Screen	Outside temp.sensor or Set temperature	Outside temp.sensor or Set temperature
28 29 30 X8	15V+ GND Ain 7 Screen	Set humidity	Set humidity
31 32 X12	Low High Screen	Bus 2	Bus 2

5.2.5 Jumper Positions

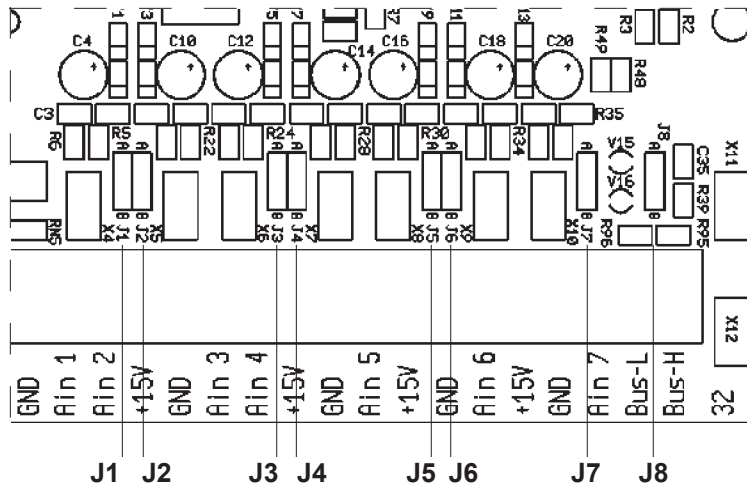
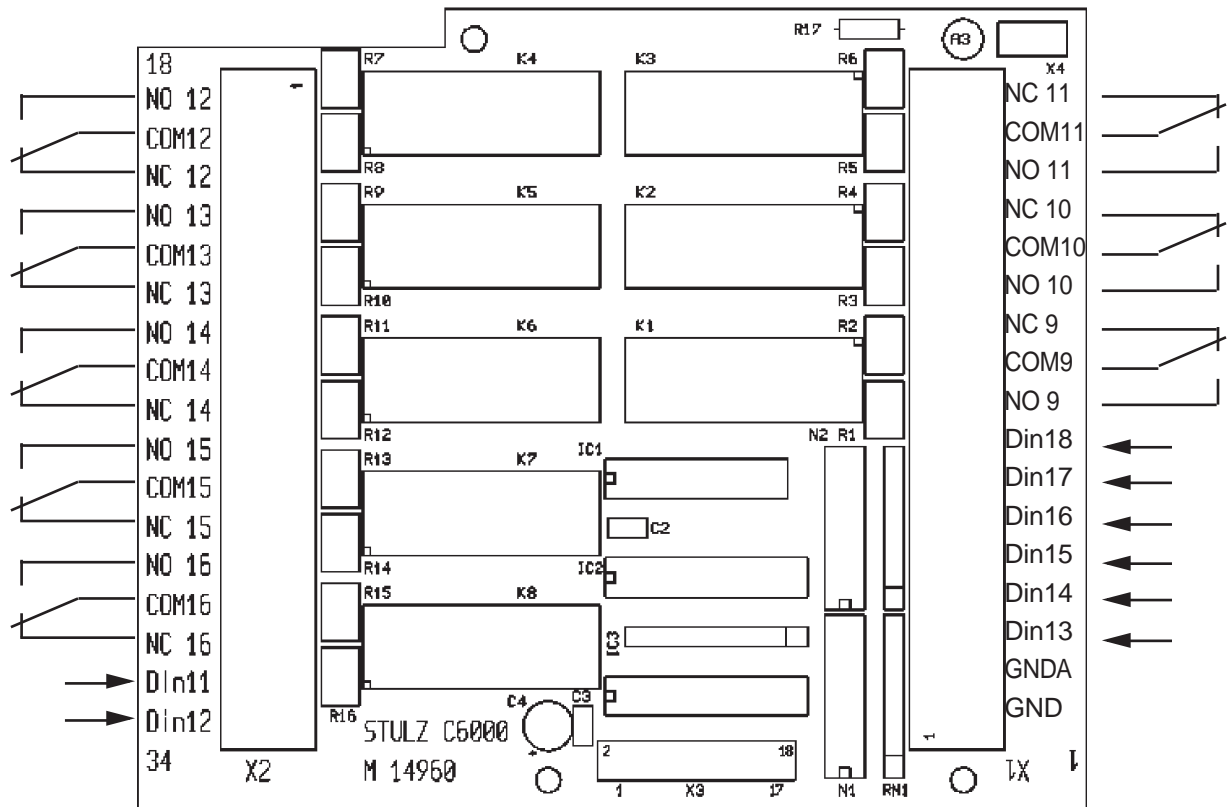


Figure 13- I/O Board Jumper Positions

Jumper Assignment	Position A	Position B
J1 : Return Air Temperature	Voltage	Current
J2 : Return Air Humidity		
J3 : Supply Air Temperature		
J4 : Supply Air Humidity		
J5 : Water Temperature		
J6 : Outside Air Temperature		
J7 : External Analog 7	Enabled	Disabled
J8 : Bus Termination		

**5.3 Expansion I/O Board**

**5.3.1 Expansion I/O Board Connection Assignments**



**Figure 14- Expansion I/O Board Layout**

**5.3.2 Expansion I/O Board Technical Data**

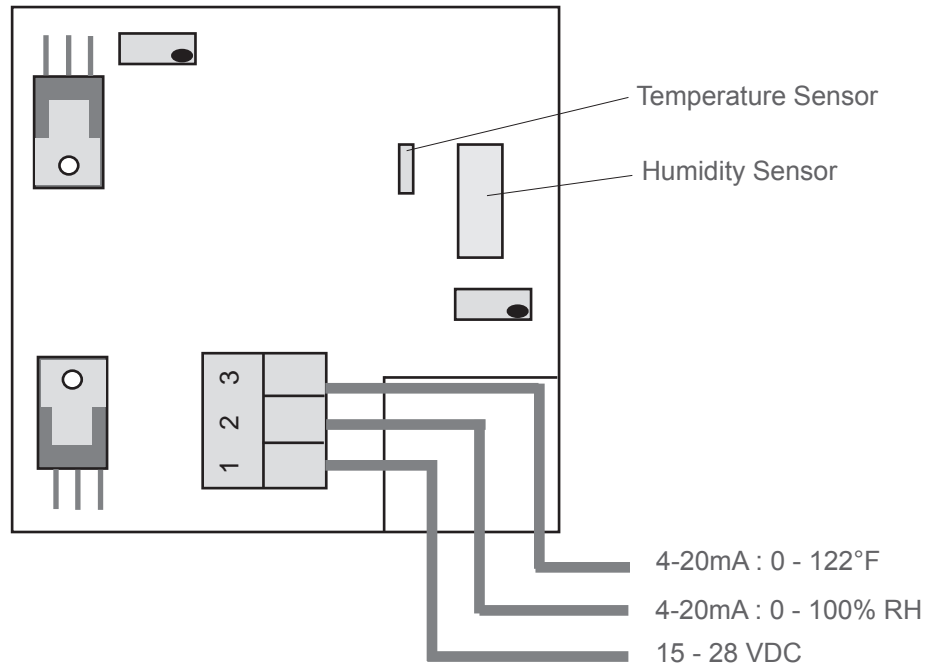
Dimensions:	4.1 x 4.0 x 1.2 inches
Power Consumption:	17 VA (I/O Board + Ext. I/O Board)
Alarm Inputs:	8 (24 VAC/DC) 24V = no alarm
Outputs:	8 digital 24 VAC max. 6 A
Operating Temperature:	41°F - 104°F
Storage Temperature:	-22°F - 140°F

**5.3.3 Expansion I/O Board Connection Assignment According to Unit Type**

<b>Pin</b>	<b>Design.</b>	<b>COS/VFS</b>	<b>CCD/CCU</b>
1	GND	I/O-Board supply	I/O-Board supply
2	GNDA		
33	Din 11	Pump 1 Failure Pump 2 Failure Dry Cooler Failure Sequencing	Pump 1 Failure Pump 2 Failure Dry Cooler Failure Sequencing
34	Din 12		
3	Din 13		
4	Din 14		
5	Din 15	External Alarm 1 Compressor Lockout Phase Failure Remote On/Off	Power A Failure Power B Failure Phase Failure Remote On/Off
6	Din 16		
7	Din 17		
8	Din 18		
9	Dout 9	Pump Enable or Alarm 3	Pump Enable or Alarm 3
10	Dout 9		
11	Dout 9		
12	Dout 10	Pump 1/2 or Alarm 4	Pump 1/2 or Alarm 4
13	Dout 10		
14	Dout 10		
15	Dout 11	Dry Cooler 1 / Alarm 5	Dry Cooler 1 / Alarm 5
16	Dout 11		
17	Dout 11		
18	Dout 12	Louver 1	Louver 1
19	Dout 12		
20	Dout 12		
21	Dout 13	E-reheat 3	E-reheat 3
22	Dout 13		
23	Dout 13		
24	Dout 14	Alarm 2	Alarm 2
25	Dout 14		
26	Dout 14		
27	Dout 15	Alarm 9 / with Sequenc. copy Alarm 1	Alarm 9 / with Sequenc. copy Alarm 1
28	Dout 15		
29	Dout 15		
30	Dout 16	Sequencing relay / Alarm 10	Sequencing relay / Alarm 10
31	Dout 16		
32	Dout 16		



## 5.4 Temperature/Humidity Sensor



**Figure 15- Temperature/Humidity Sensor Layout**

### 5.4.1 Sensor Calibration

#### 1. Temperature

The fine tune adjustment takes place in the **Control > Preferences > Sensor adjust** menu.

#### 2. Humidity (R2)

The fine tune adjustment takes place in the **Control > Preferences > Sensor adjust** menu.

### CAUTION

The re-adjustment of the resistors is not necessary. Damaging the seal will void the warranty.

**6.0 SYSTEM CONFIGURATION**

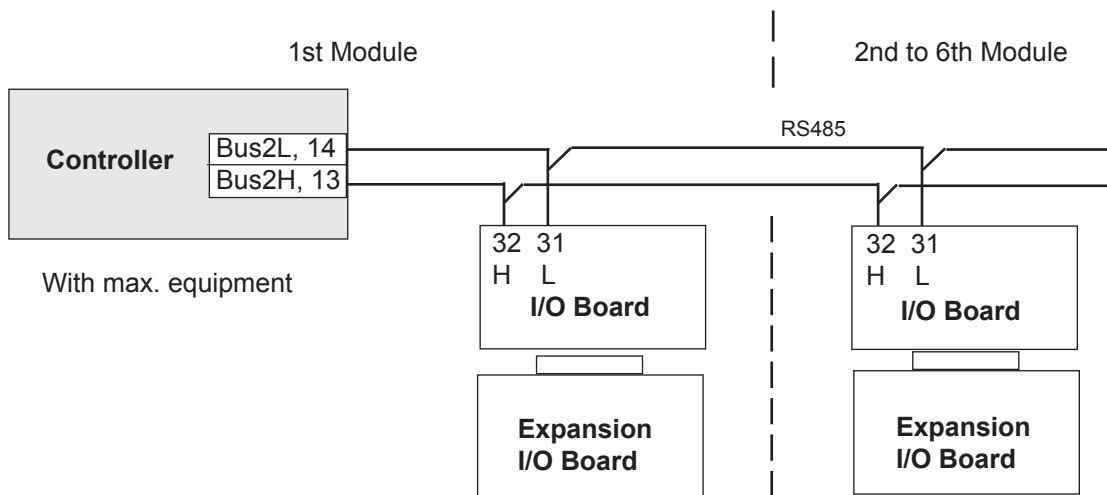
**6.1 Wiring Diagrams**

The following Diagrams are for reference only. For detailed wiring information specific to your system, refer to the electrical drawing(s) provided with your unit.

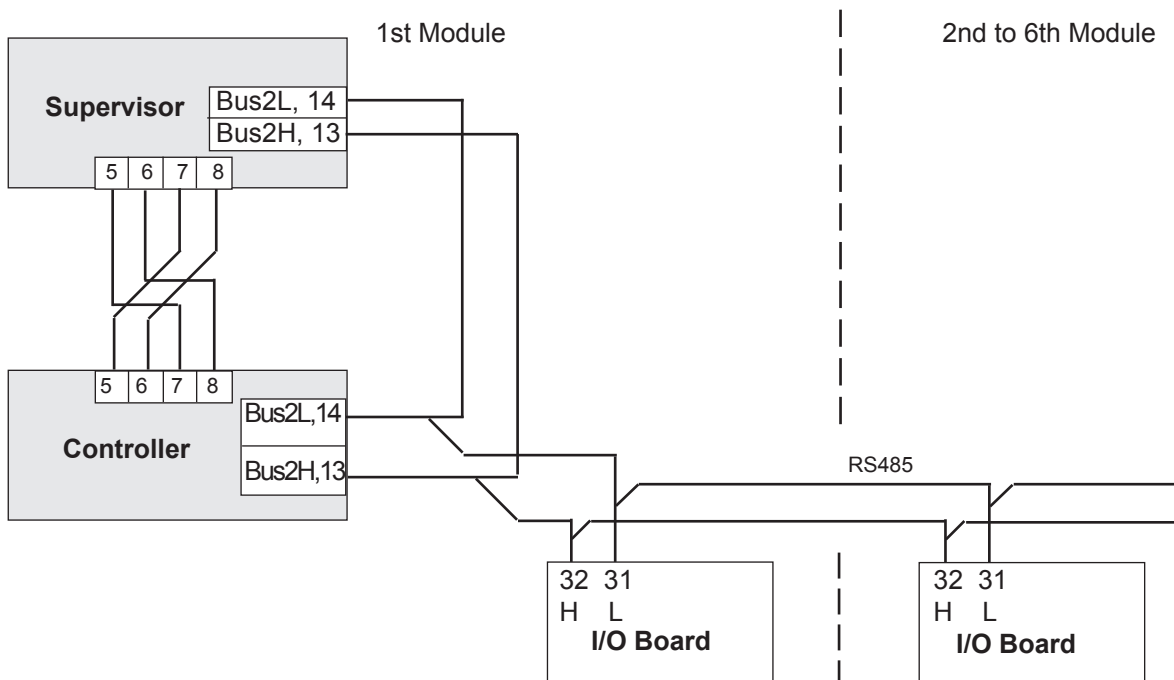
**CAUTION** 

With separate installation of modules, the maximum permitted cable length between the controller and I/O board is 490 feet. The maximum allowable cable length between two I/O boards is 160 feet. For this a special data cable must be used.

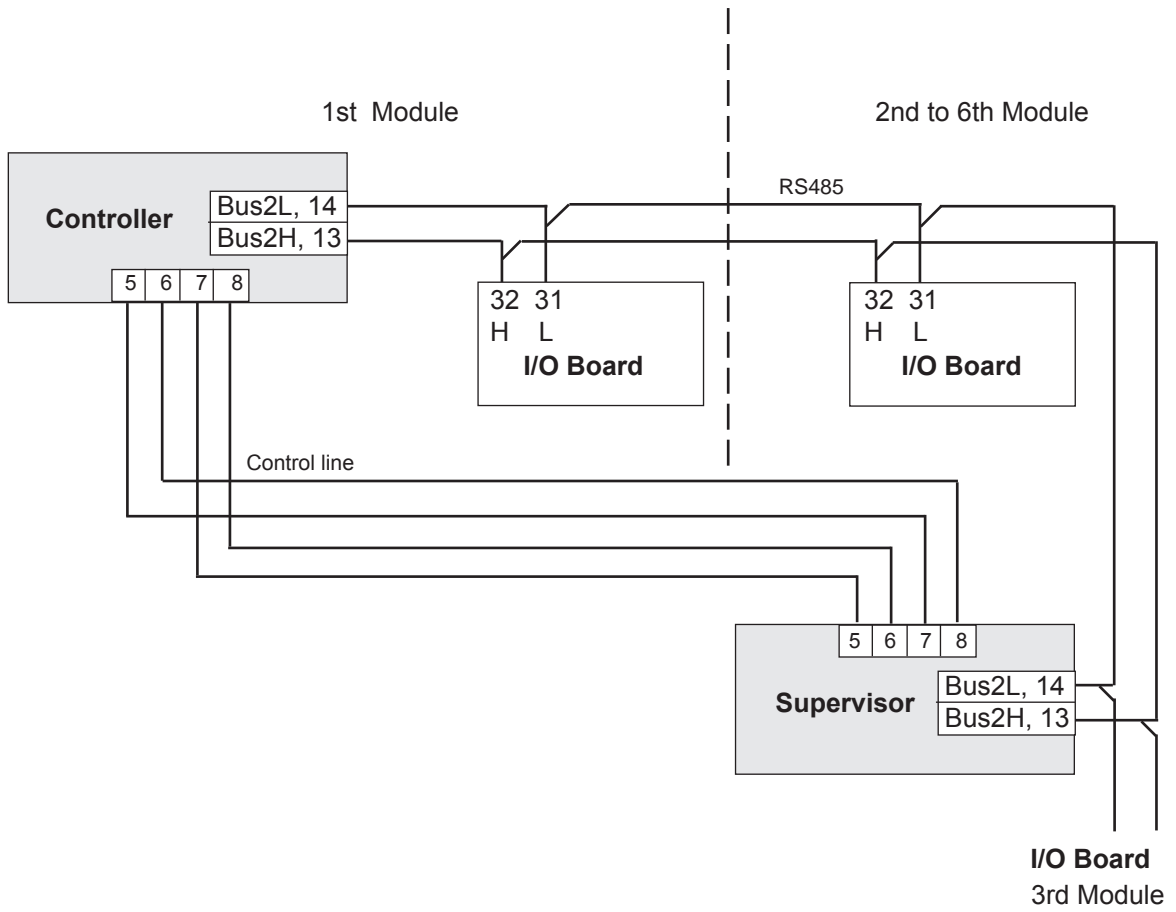
**6.1.1 Wiring C6000 with I/O Boards**



**6.1.2 Wiring C6000 with Supervisor in 1st Module**

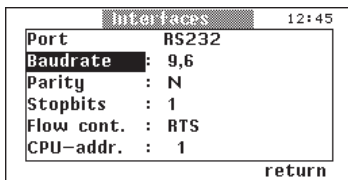


**6.1.3 Wiring C6000 with Supervisor in 2nd Module**



## 6.2 Printer Connection

A printer with a RS232 serial interface is required for connection to the C6000 controller. The printer is connected to the Sub-D-plug (X4) of the controller printed circuit board (See Figure 11 and 12). Further adjustments can be made in the **Service > Gen. settings > Interfaces** dialog window, corresponding to the technical data on the printer.



A wide range of adjustments under port 0 may be selected here.

The following adjustments are possible:

Baud rate (in k Baud)	Parity	Stop bit	Data flow
1.2	N	1	RTS
2.4			
4.8			
9.6	N: None		
19.2			

**NOTE**

The settings at the C6000 must agree with the settings on the printer.

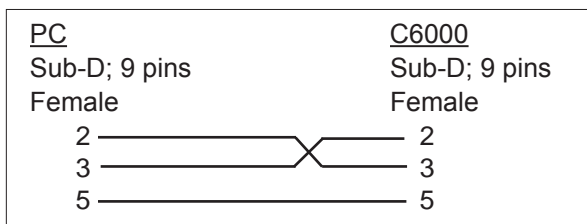
Printer cable (minimum assignment):

Printer	C6000
Sub-D; 25 pins	Sub-D; 9 pins
Male	Female
2 _____	2
3 _____	3
7 _____	5

## 6.3 Computer Connection

You can also print the data to a file and have it displayed on a screen. For this you use the same RS232 modem connection cable you use for loading new software (see Figure 12).

Assignment:



## 6.4 Loading New Software

Before you start loading new software, it is wise to note or print out the parameters set, as all parameters must be re-entered after loading the software. For loading software in the flash-EPROM of the C6000, you must connect the C6000 to your PC/laptop by means of a RS232 modem connection. After this the jumper X6 must be moved to position A. Power to the C6000 controller must then be switched "Off" and then "On" again. The C6000 is now in the download mode. Start the software "Service C6000" on your PC. A window will appear describing how to operate the software. If you don't possess the software "Service C6000" or "Service C7000", you can order it via e-mail.

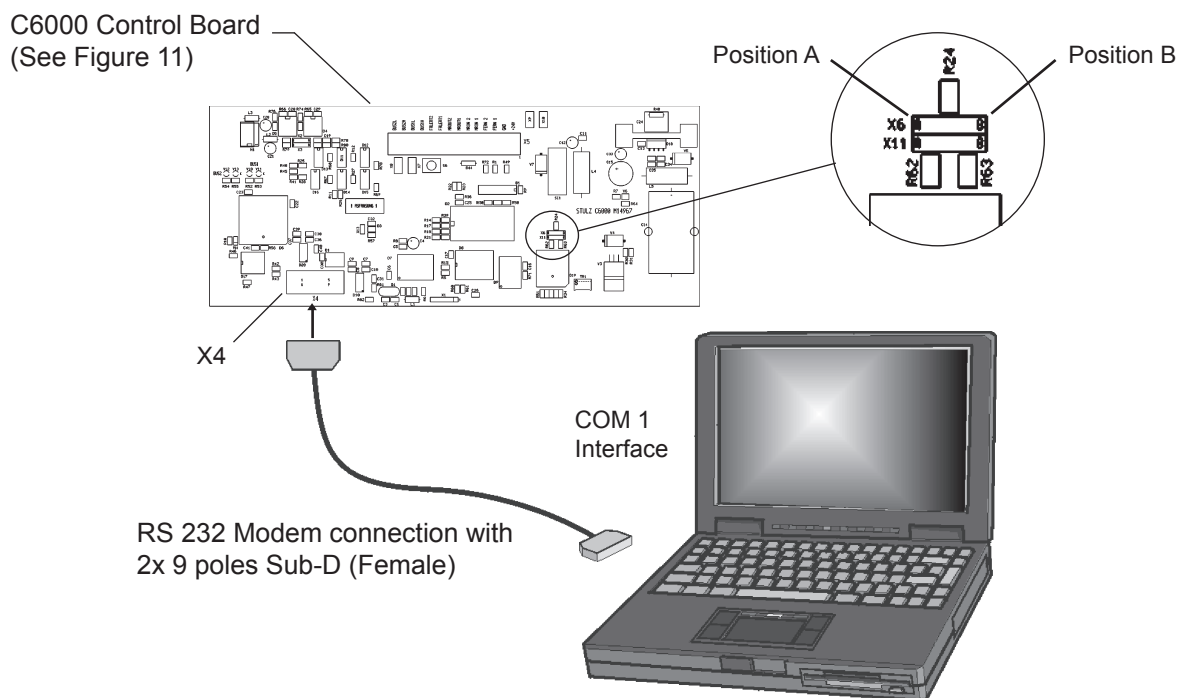


Figure 16- Software Loading Diagram

\*system requirements: Windows 95/98/NT/2000

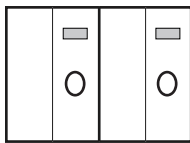
After the new software has been loaded, the jumper X6 must be moved back in position B. After this power to the C6000 controller must be switched "Off" and "On" again. When switching on, ensure that the new version number as well as the connected I/O cards is correctly displayed.

In the next step, all parameters must be readjusted if they deviate from the default settings. The default language is English. If you require another language, you can change this in the **Control > Preferences > Languages** menu.

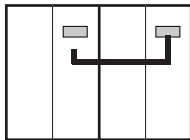
**6.4.1 Installation of New Software While Keeping the Parameters**

The installation of new software without losing the parameters is only possible with the presence of a supervisor. The following description is based on a 2-module unit with the controller in the first module and the supervisor in the second module.

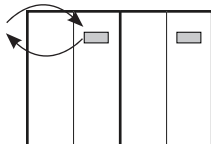
1. Switch off all modules at the main switch (if applicable) or disconnect the 24V supply voltage from the controllers.



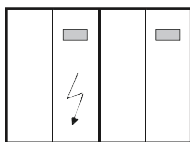
2. Disconnect the cable between the controller and the supervisor (pin 5 to 8 on the C6000).



3. Load the supervisor software.

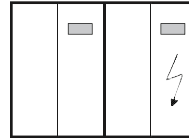


4. Switch on only the module with the supervisor (mod. 2). The new software is reset from supervisor mode back to controller mode. Set the supervisor function to "1" in the **Service > Gen. settings > Function** menu.

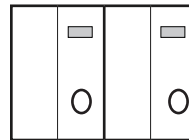


Transmission  
←

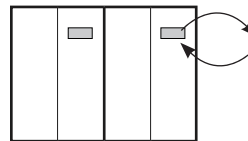
5. Switch on the module with the controller also (mod. 1). The parameters will now be transmitted from the controller to the supervisor. When the beeping stops, the transmission is completed (approx. 1 min.).



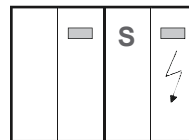
6. Switch off all modules.



7. Load the controller software.



8. Switch on module 1 only. Set the supervisor function to "1" in the **Service > Gen. settings > Function** menu. The C6000 in module 1 is now in supervisor operation mode also.

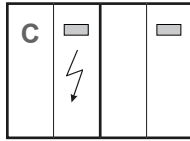


9. Switch off module 1.

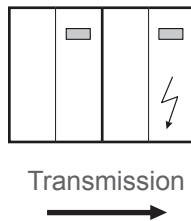


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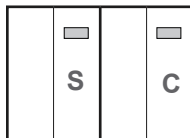
10. Switch on module 2 only. Set the supervisor function to "0" in **Service > Gen. settings > Function** menu. The C6000 in module 2 is now in controller operation mode.



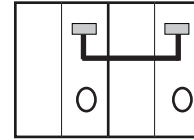
11. Switch on module 1. The parameters will now be transmitted from the controller (now module 2) to the supervisor (now module 1). When the beeping stops, the transmission is completed (approx. 1 min.).





12. To restore the original configuration, set the supervisor function to "0" in module 1 and set the supervisor function to "1" in module 2 in the **Service > Gen. settings > Function** menu.



13. Switch off all modules and replace the cable between the controller and the supervisor, (pin 5 to 8 on the C6000). The changes will take effect after switching on all modules.



Legend:

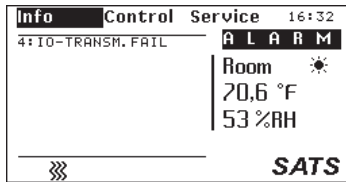
-  = Switch on the voltage.
-  = Switch off the voltage.

## **7.0 TROUBLESHOOTING**

### **7.1 Alarm Windows**

The following is typical display for an alarm condition. (Example: I/O Transmission Failure). The word "ALARM" appears highlighted in black and a message describing the reason for the alarm is displayed in the window.

#### **Signal in display**



1-6: I/O transmission failure

#### **Cause/Elimination**

The data transmission with an I/O board is no longer operative. The number before the colon shows in which module the fault has occurred.

1. First check whether the configuration of the A/C unit agrees with the actual equipment in the **Service > Equipment > Modules** menu.
2. Check the settings on the address switches on the Standard I/O board, (see Section 5.3.3).
3. Ensure the cable connections are in accordance with the appropriate wiring diagram, (see Section 6.1).
4. If the fault still occurs after these checks and is continuous from a particular module onwards, the cable connection between the last operative module and the first defective module may be defective. Otherwise the I/O board is defective and must be replaced.



### **8.0 PRODUCT SUPPORT GROUP**

SATS provides to its customers a Product Support Group (PSG) which not only provides technical support and parts but the following additional services, as requested: performance evaluations, start-up assistance and training.

#### **8.1 Technical Support**

The SATS Product Support Group is dedicated to the prompt reply and solution to any problem encountered with a unit. Should a problem develop that cannot be resolved using this manual, you may contact PSG at (240) 529-1399 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. If a problem occurs after business hours, dial the page number (301) 414-4514 and follow the steps below:

1. Wait for the dial tone.
2. Dial your telephone number (including area code).
3. Press the pound (#) key.
4. Wait for a busy signal.
5. Hang up the telephone.

One of our service technicians will return your call. When calling to obtain support, it is vital to have the following information readily available, (information is found on unit's nameplate):

- Unit Model Number
- SATS Item Number
- Unit Serial Number
- Description of Problem

#### **8.2 Obtaining Warranty Parts**

Warranty inquiries are to be made through the Product Support Group at (240) 529-1399 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. A service technician at SATS will troubleshoot the system over the telephone with a field service technician to determine the defect of the part. If it is determined that the part may be defective a replacement part will be sent UPS ground. If the customer requests that warranty part(s) be sent by any other method than UPS ground the customer is responsible for the shipping charges. If you do not have established credit with SATS you must provide a freight carrier account number.

A written (or faxed) purchase order is required on warranty parts and must be received prior to 12:00

p.m. for same day shipment. The purchase order must contain the following items:

- Purchase Order Number
- Date of Order
- SATS Stated Part Price (obtained from PSG)
- Customer Billing Address
- Shipping Address
- Customer's Telephone and Fax Numbers
- Contact Name
- Unit Model No., Serial No. & SATS Item No.

The customer is responsible for the shipping cost incurred for shipping the defective part(s) back to SATS. Return of defective part(s) must be within 30 days at which time an evaluation of the part(s) is conducted and if the part is found to have a manufacturing defect a credit will be issued.

When returning defective part(s) complete the Return Material Authorization Tag and the address label received with the replacement part.

See SATS Standard Warranty located in section one of this manual.

#### **8.3 Obtaining Spare/Replacement Parts**

Spare and replacement parts requests are to be made through the Product Support Group by fax (301) 620-1396, telephone (240) 529-1399 or E-mail (parts@stulz-ats.com). Quotes are given for specified listed parts for a specific unit.

SATS accepts Visa and MasterCard. SATS may extend credit to its customers; a credit application must be prepared and approved (this process could take one week).

A 25% minimum restocking charge will be applied on returned stocked parts that were sold as spare/replacement parts. If the returned part is not a stocked item, a 50% restocking charge may be applied. Additionally a Return Material Authorization Number is required when returning parts. To receive credit for returned repair/replacement parts, the parts must be returned to SATS within 30 days of the purchase date. Spare part sales over 30 days old will be considered final and the parts will remain the sole property of the ordering party.



## **Glossary**

### **Definition of Terms and Abbreviations**

<b>A/C-</b>	Air Conditioner	<b>MIB -</b>	Multi Interface Board
<b>BMS -</b>	Building Management System	<b>PSG -</b>	Product Support Group
<b>BTU/Hr -</b>	British Thermal Units Per Hour	<b>PSI -</b>	Pounds per Square Inch
<b>°C -</b>	Degrees Centigrade	<b>PSIG -</b>	Pounds per Square Inch Gauge
<b>CW -</b>	Chilled Water	<b>°R -</b>	Degrees Rankine
<b>DX -</b>	Direct Expansion	<b>R.H.-</b>	Relative Humidity
<b>ESD -</b>	Electrostatic Discharge	<b>SATS -</b>	Stulz Air Technology Systems, Inc.
<b>°F -</b>	Degrees Fahrenheit	<b>V -</b>	Volt
<b>FOB -</b>	Freight on Board	<b>VAC -</b>	Volt, Alternating Current
<b>ft. -</b>	Feet	<b>W/G -</b>	Water Glycol (GE)
<b>GE -</b>	Water Glycol (WG)		
<b>in. -</b>	Inches		
<b>°K -</b>	Degrees Kelvin		

# Globally close to you

Stulz-ATS, located in Frederick, MD USA, is part of The STULZ Group with headquarters in Hamburg, Germany and production facilities world wide. Our network of manufacturer's representatives and sales partners span the globe, providing innovative solutions to your unique environmental control needs.

[www.stulz-ats.com](http://www.stulz-ats.com)



Air Technology Systems, Inc.

Stulz Air Technology Systems, Inc.  
1572 Tilco Drive, Frederick, Maryland 21704  
Phone: (301) 620-2033, Fax: (301) 662-5487  
Email: [info@stulz-ats.com](mailto:info@stulz-ats.com)  
[www.stulz-ats.com](http://www.stulz-ats.com)



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