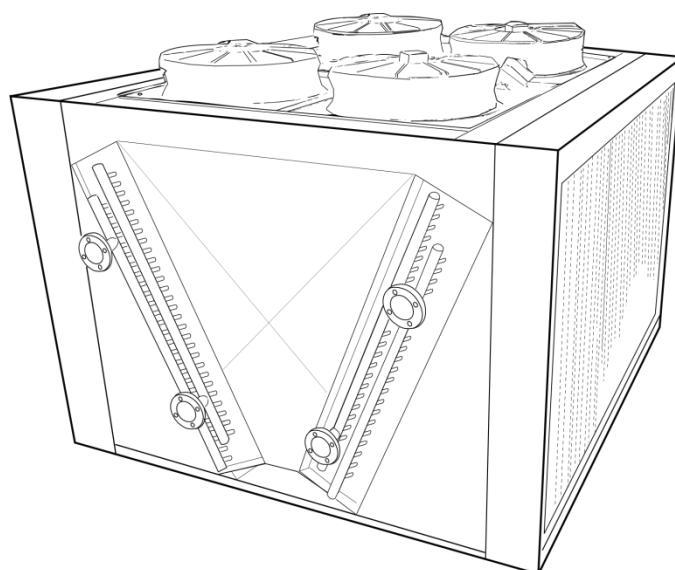


ADIABATIC COOLING SOLUTION

**Dry coolers and air cooled condensers
fitted with EC fans and FlexPad/FlexSpray wet systems**

PREMIUM CONTROLLER USER MANUAL



PREMIUM CONTROLLER USER MANUAL

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1. Foreword

This document is a user manual for the control system on the EVAPCO Europe FlexPad / FlexSpray units, equipped with a Premium controller.

2. System Layout

The system (later referred as a Cooling Unit) can comprise.. a dry cooler (DAC) or air cooled condenser (ACC) with up to 20 variable speed AC or EC fans, plus an optional adiabatic FlexPad or FlexSpray system supporting up to 4 water valves. A temperature sensor (outlet) or pressure sensor (inlet) provides feedback to the controller which in turn, governs the fans and water system.

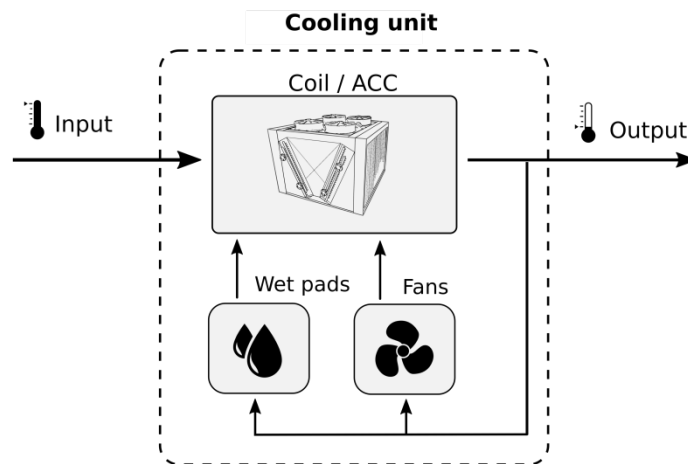


Figure 1

2.1 Fans

For an overview, the fan speed is influenced by the following inputs:

- In normal operation the fans are controlled by the P- or PID-regulator, based on the outlet temperature compared against the current Set point temperature (SP1 or SP1)
 - The choice between SP1 and SP2 can be triggered by the Scheduler, a Digital Input or an ambient temperature condition, (see section 15.2.9)
 - The fan control signal can be either a 0-10V DC signal or via. Modbus (EC fans only.)
- The fan speed can be bound within a Min / Max allowable speed limit, set in the Service menu. (See section 15.2.3)
- Quiet Mode: The fan speed can be restricted to a reduced speed at certain times of the day. The reduced speed is set in the Service menu and triggered by the Scheduler. (See sec. 15.2.3 and 11.3 respectively.)

- **Energy Saving Mode:** If the Energy saving mode is enabled, once a certain fan speed is reached, the controller will first attempt to keep the outlet temperature down using the wet stages, before ramping the fan speed up to the maximum allowable fan speed. For further explanation see section 2.2
- **Failsafe Mode (EC fans only):** If the main controller fails and the Modbus signal is lost, the EC fans will operate at a pre-set speed, chosen in the Service menu. (See section 15.2.8)
- **Manual override:** The manual override feature allows the manual override of the fan speed or operation of the fans (EC only) to run backwards. (See section 15.3.1)

In addition, the fans feature fault indication via motor thermal contact, (AC and EC) or via Modbus (EC fans only.) - For instructions on fan replacement see section 15.8

2.2 Adiabatic / Pad activation

The unit can be equipped with an adiabatic system, either FlexPad or FlexSpray. The operation of the two wet systems is almost identical, the only difference being the flushing cycle available for the FlexPad system. Therefore, most of the information referring to the pad system applies to both adiabatic solutions.

The 4 stage wet system is activated in the following manner :

- The wet system will only operate within the allowable period of the year, set in the Scheduler menu. (See section 11.4)
- To prevent freezing, no activation is possible if the ambient temperature is below the minimum allowable temp, (factory setting: +5°C) set in the Service Menu (See section 15.2.6)
- No activation of a given stage is possible if the ambient temperature is below the applicable Stage Switch Point, set in the Service Menu. (There are 4 switch points, serving as temperature thresholds for the stages 1-4) (See Section 15.2.4)

Energy Saving mode

If the outlet temperature rises above the current set point, the controller will speed up the fans in order to increase cooling. Once the fans have reached a pre-set Energy Saving speed, in order to save electricity, the wet stages will be activated.

Activation logic (for 1st and each subsequent stage):

- If ambient temp. > Min. allowable temperature and ..
- If fans have reached the Energy Saving Speed and ..
- The Switch Point ambient temp is reached and ..
- The fluid temp. > Temperature Set point (SP1 or SP2)

If all above criteria are met, a delay timer (Inc. time) starts to count down to commence stage activation. After the timer has terminated, the stage activates. (See Figure 2)

After a stage is activated, it will run for the specified minimum operation time, set in the Service Menu. (See section 15.2.5).

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Wet mode will increase cooling efficiency and the fluid temperature may drop below the set point. If so, the fans will reduce in speed to match the set point (while pads still operate wet for at least minimum operation time.)

If all stages are not enough to keep the fluid temperature down, the fans will compensate by ramping up, all the way till the Max. Allowable speed.

When the set point temperature is reached again and the fans are running below the Energy Saving speed, the stages will sequentially shut off, with the decremental timer (Dec. time) dictating the minimum time between each stage cut-off.
(For setting Inc./Dec. times, see section 15.2.7)

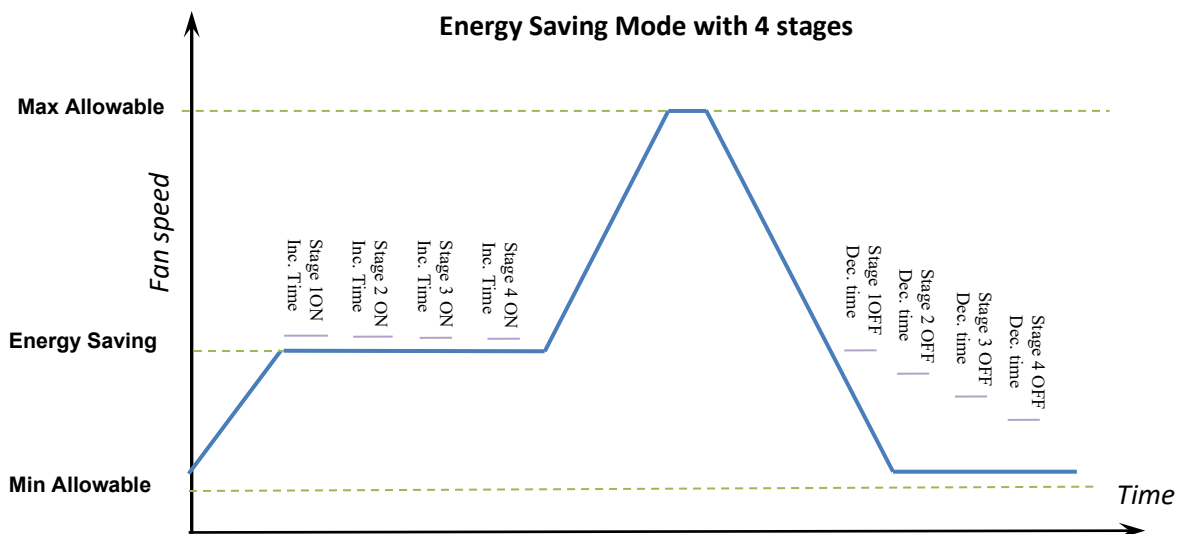


Figure 2

The controller keeps an activation history of the pads, and uses this to rotate the pads to achieve equal usage.

During the allowable period of the year the pads can have a daily flushing cycle, as configured in the Scheduler. (See section 11.5 and 11.6)

NB: During the flushing cycle the set outlet temperature will be ignored by the regulator.

3. General operation

The controller has a built-in display where all necessary parameters are represented.



	Active alarms, direct shortcut
	PRG button (Program). Direct shortcut to Main menu
	ESC button (escape). Leave a menu or to leave an entry field without changing the value.
	DOWN button. Scroll down of the menu or count a value down
	UP button. Scroll up in the menu or count up a value
	ENT button (Enter). Go to the selected submenu, or accept the new value

3.1 Modification of values

Once at the desired screen, use the **ENT** button to enable the fields to be changed.

If there are multiple fields on the same page, **ENT** will jump to next field each time.

When the cursor is at the correct field, you can change the value with the **UP & DOWN** arrow keys. Accept the new value with **ENT**.

4. Getting Started

This section is a basic quick reference guide to which settings to go through when first time setting up your Evapco cooler unit.

This shortlist only covers the basic features. We recommend that the User still reads through the full manual in order to get a full understanding of the controller's capabilities.

- **Power up and Language selection:**

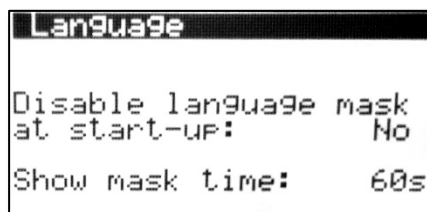
After making sure all fluid and electrical systems are properly connected, power up the unit using the main power switch on the controller casing.

The first screen to appear after the boot sequence will prompt you to choose the Operating System language: (EN / FR currently available)



Change by pressing ENT and once on the desired language, **let the timer in the bottom of the screen run out.**

To disable the language selection prompted at the beginning of every reboot, press UP/DOWN to go the second language screen. Select "Yes" to disable.:



- **Set time and date**

Once at the first menu screen go to the Main menu (Press PRG) →

Clock/Scheduler → CL6 – CL7, To set the time and date.

(For detailed information see section 11.7)

- **Service menu login, set new password**

To access all the settings and set points go to Main menu (Press PRG) →

Service

You will be presented with a login screen:

PREMIUM CONTROLLER USER MANUAL



The Service User password (PW1) is **1234**.

We recommend this password be changed as soon as possible.

To input a new password go to:

Main menu → Service → Service settings → Clear Log /Change PW1
(For detailed information see section 15.12)

- **Setup temperature**

While still in the Service menu, go to the Set points submenu:
(Main menu → Service menu → Set points)

If the unit is an air cooled condenser (ACC) setup the refrigerant properties on the screens SP2- SP4 (see sections 15.2.2 to 15.2.1.1)

Then, while in the same submenu, choose the desired fluid set point temperatures on screen SP6 (*P-regulator*) or SP7 (*PID –regulator*)
(See sections 15.2.2.1 or 15.2.2.2)

- **Setup Fan speed limits**

If the site has a noise level restriction, go to the Manual override submenu in the Service menu. (Main menu → Service menu → Manual management)
By using the manual override to control the fan speed (check sec. 15.3.1) , decide if there should be an upper fan speed limit (Max. allowable) or Quiet Mode Speed for reducing the noise at nighttime or critical periods.

While in the manual management menu, test that the water system valves are functioning correctly. (See section 15.3.2 on wet stage override)

Return to Service menu → Set points → SP8, and set the desired fan speed limits. (See sec. 15.2.3)

If Quiet mode is used, set the Quiet mode periods in the Scheduler menu.
(See sec. 11.3)

Depending upon how critical the fluid outlet temp is for the process, the Failsafe Fan speed can be setup on screen SP13. (See sec. 15.2.8) .

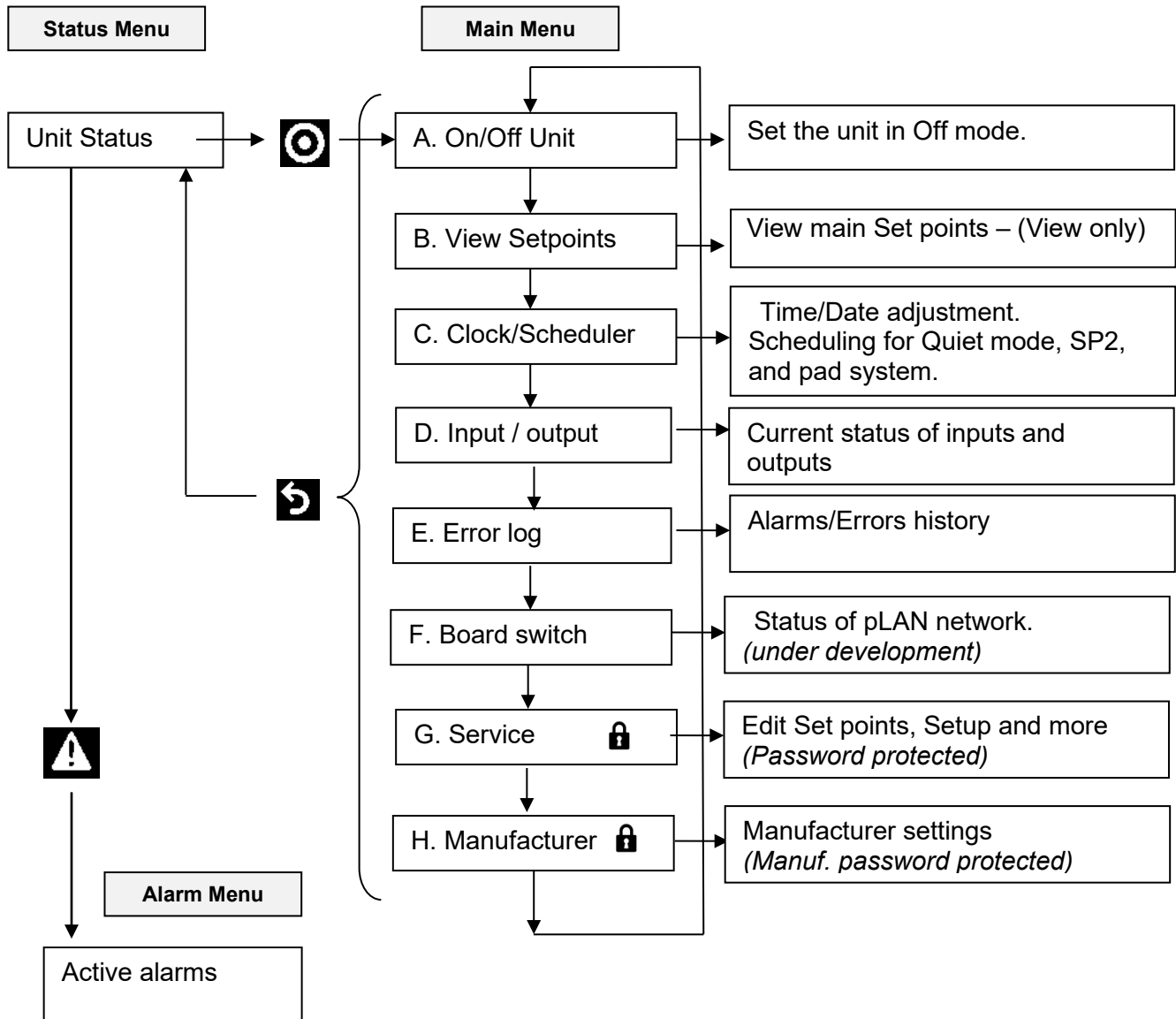
- **Setup wet system**

Go to the Scheduler menu, (Main menu → Scheduler/Clock)

Depending upon the operating environment of the unit, select an appropriate operating period for the wet system and flushing schedule. (See section 11.4 and 11.5 respectively.)

After a certain operating period, it is recommended to check the pads for scaling/clogging in order to reassess if the current flushing schedules are sufficient. It is also possible, in the working hours menu, to see the working hours of the valves in order to keep track of how much the wet system is used. (Reassess energy saving settings if necessary)

5. Controller screen hierarchy

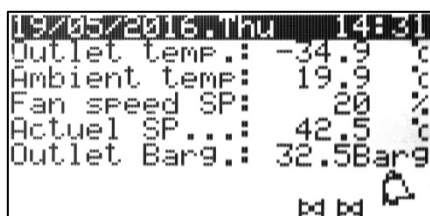


6. Status menu

The Status Menu screens allow a real-time view (but no adjustment) of the main parameters of the cooling unit: current probe values, Set points, timer values and fans online.

To scroll between screens, use the **UP/DOWN** keys, press **ESC** to return to the Standby screen.

6.1 Standby screen



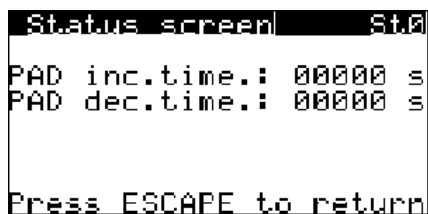
Field	Description
Outlet temp.	Fluid Outlet temperature (or pressure converted to condensing temp. for ACC's)
Ambient temp.	Ambient temperature
Fan speed	Current speed of the fans
Actual SP	Current set point for the regulator.
Inlet Barg.	Pressure at inlet (bar gauge pressure) (Only visible for ACC's)

The symbols below represent the wet system valves:

	Valve closed
	Valve open (wet stage active)

The bell icon, indicates that an alarm is active. Press the Alarm button to go directly to the alarm menu.

6.2 St0 – Pad Inc/Dec timers



Field	Description
PAD inc.time	Timer value (time left) to increase number of activated stages.
PAD dec.time	Timer value (time left) to decrease number of activated stages.

6.3 St1 – Stage min. On time

```

Status screen St1
Stage. min. On time:

Stage 1.....: 00000 s
Stage 2.....: 00000 s
Stage 3.....: 00000 s
Stage 4.....: 00000 s
Press ESCAPE to return
    
```

Field	Description
Stage 1-4	Minimum On time timer. Displays time left for valve before it can shut off again.

6.4 St2 – Flush timers

```

Status screen St2
Flush timers:

Flushing time: 00000 s
Drying time..: 00000 s

Press ESCAPE to return
    
```

Field	Description
Flushing time	Time left for flushing cycle to complete, if in operation.
Drying time	Time left for drying cycle to complete (fans running backwards) after flushing.

6.5 St3 / St4 – Fans online

```

Fan's online EBM St3
1 2 3 4 5
% % % % %
6 7 8 9 10
% % % % %
Press ESCAPE to return
    
```

```

Fan's online EBM St4
11 12 13 14 15
% % % % %
16 17 18 19 20
% % % % %
Press ESCAPE to return
    
```

Field	Description
XX	Fan not online
XX	Fan online

6.6 St7 – Stage rotation

```
Status screen St7
Stage rotation

Stage 1 Open Seq.:00
Stage 2 Open seq.:00
Stage 3 Open seq.:00
Stage 4 Open seq.:00
Press ESCAPE to return
```

Field	Description
Stage rotation for stage 1-4	Start sequence for stages. The sequence changes for every time all stages are switched off.

7. Alarms menu

At any time pressing the Alarm button () will shortcut you to the Alarm menu, displaying all active alarms. (example below)

The alarms can be dismissed by holding down the Alarm button. All alarms are logged and available in the Error log (Main menu → Error log, - See section 13).

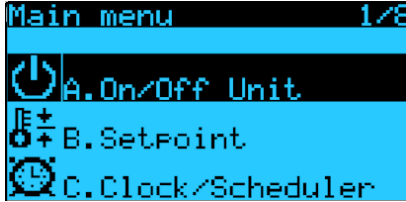
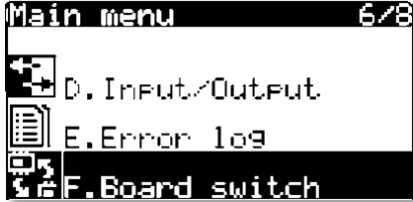
```
Alarms
Electrical fault valve
```

```
Alarms
No active alarm
Press ENTER
to DATA LOGGER
```

8. Main menu

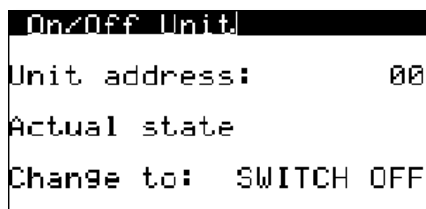
Status menu →  → Main menu

From this drop-down menu, all settings can be accessed. (See hierarchy diagram in section 5). To navigate between the different menu items, use the arrow keys. Place the black "bar" on top of the menu that has to be opened and press "ENT", to go to the selected submenu.

- 1) 
- 2) 
- 3) 

9. On/Off Unit

Main menu → On/Off Unit



This option allows the unit to be switched off. (The controller will still be active, with all parameters displayed on the Standby Screen, but fans and wet stages will stop and controller's functionality disabled.)

When the Unit is in Off mode, a notification "Unit off by keyboard" will be shown in the Standby Screen.

The Off mode unblocks the "IO test" option in the Service menu, which allows the testing of all Digital Inputs and Outputs. (See section 15.7)

–During Off mode, all I/O communication is shut off. The fans will switch to Failsafe mode (See section 15.2.8), if enabled. (EC Fans only)

Manual overrides are still available in Off mode.

If the supply voltage is applied again after an interruption, the controller will restart, and the Unit will return to whatever state it was in before the outage. (ie. a unit in Off mode go to Off mode after reboot.)

10. View Set points

Main menu → View Set points

This menu allows viewing (but not editing) of all current Set point parameters and options defined in the Service menu.

Since the screens displayed mirror the enabled options in the Service menu, for detailed descriptions, refer to Section 15.2.

11. Clock/Scheduler

Main menu → Clock/Scheduler

In this menu it is possible to program schedulers for the features that can be activated by a schedule: Switching to SP2, Quiet mode (reduced fan speed), allowable period of the year (for the wet system) and the daily pad flush cycle.

The choice of the trigger (Scheduler, Digital input, Ambient temp. set point) for the above mentioned parameters can be set in the Service menu (see Section 15.9)

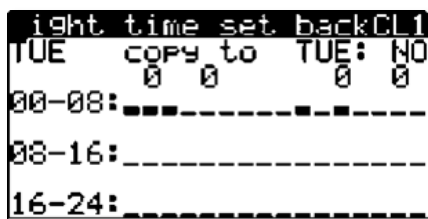
The menu also sets the time and date for the real-time clock and the flushing cycle parameters.

11.1 Navigating the Schedulers

Once on the given parameter screen, press ENT to enable the fields to be changed, keep pressing ENT to scroll forward through the schedule. To change a value (day of the week, active / deactivated) use the UP/DOWN keys.

To quickly return to the top bar, use ESC.

Each schedule enables to set the activation of a given feature in half-hour intervals :



- Select the day of the week.
- Scroll through the time bands using ENT. Select using UP/DOWN. A black rectangle marks that the feature will be enabled during that interval.
- Using "copy to:" you can copy one day's schedule to another. Select the day, select "YES" and press ENT. The schedule will be copied to the given day and the screen will return to "NO". Copying again will overwrite the previous settings.

11.2 CL1 - Setpoint 2

Main menu → Clock/Scheduler → CL1

```
right time set. backCL1
TUE copy to TUE: NO
  0  0      0  0
00-08:-----
08-16:-----
16-24:-----
```

When this time band is active, the value from SP2 is used as outlet temp. [To change the Set point value, see Section 15.2.2.1 (if P-regulator chosen) or Section 15.2.2.2 (if PID-regulator chosen)]

Note: The Screen is only available, if the Scheduler is chosen as SP2 trigger, (see Section 15.2.9)

11.3 CL2 – Quiet fan speed

Main menu → Clock/Scheduler → CL2

```
Quiet.fan speed CL2
TUE copy to TUE: NO
  0  0      0  0
00-08:-----
08-16:-----
16-24:-----
```

When this time band is active, the value from Quiet operation is used.
(To change value, see Section 15.2.3)

11.4 CL4 – Operating period

Main menu → Clock/Scheduler → CL2

```
WET System CL4
Operation period:

Scheduler...:Disabled
Period start: 01/01
Period stop.: 01/01
```

When this feature is enabled, you can set an allowable period of the year for the wet system to operate. Outside of the allowable period, the wet system won't operate in order to prevent freezing.

11.5 Pad flushing schedule

Main menu → Clock/Scheduler → Daily scheduler Flush

```

Daily scheduler Flush
TUE copy to TUE: NO
  0  0      0  0
00-08:-----
08-16:-----
16-24:-----
    
```

The Pad flushing cycle is activated at the start of a set point rectangle.

NB: During the flush cycle the controlled will not regulate against any set point condition.

11.6 CL5 – Pad Flush set points

Main menu → Clock/Scheduler → CL5

```

Pad Flush setpoints CL5
Flushing time.: 0000m
Drying time...: 0000m
Fan Speed.....: 000 %
    
```

This screen allows the setting of the parameters for a flushing cycle, to match the demands of the operating environment.

Field	Description	Factory setting
Flushing time	Sp. for how long the flushing of the Pad is active	0 min
Drying time	Sp. for how long time the fan is running in reverse, after the flushing cycle is finished.	0 min
Fan Speed	Maximum allowable fan speed during drying cycle. (NB: the fan can be significantly louder when running reverse.)	0 %

11.7 CL6 / CL7 - Setting of time & date

The current time is used for time stamping alarms and time management of functions. It is therefore important that the clock is adjusted to local time.

```
Clock adjust      CL6
Day:              Tuesday
Date:             26/04/16
Hour:             10:08
```

```
Clock             CL7
DST:              ENABLE
Transition time:  60min
Start:            LAST SUNDAY
in MARCH          at 2.00
End:              LAST SUNDAY
in OCTOBER        at 3.00
```

12. Input / output status

Main menu → Input/output

This submenu shows the current state of all inputs and outputs.

1)

```
Digital input
Remote on/off...: No
Valves fault...: No
DI 3 , E-fault...: No
DI 4 , E-fault...: No
DI 5 , E-fault...: No
DI 6 , E-fault...: No
```

2)

```
Digital input
Setpoint 2 trig...: No
Nighttime Setback: No
```

2)

```
Digital output
Valve 1.....: No
Valve 2.....: No
Valve 3.....: No
Valve 4.....: No
Common error...: No
```

4)

```
Analog output
Fan speed...: 000.0 %
```

13. Error log

Main menu → Error log

```
Data logger      E01
N°001 12:34 26/04/16
Alarm no. 13
Elec.fault, valves
```

This menu displays all historical errors that have been logged. Press UP/DOWN to scroll up and down in the log.

To erase the Log, go to: Main menu → Service → Service settings → Clear Logs
(See Section 15.12)

14. Board switch

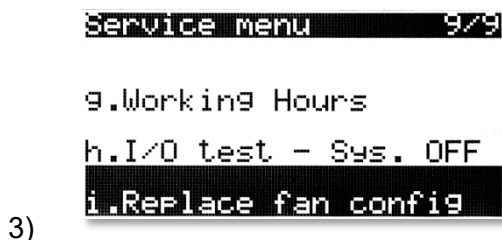
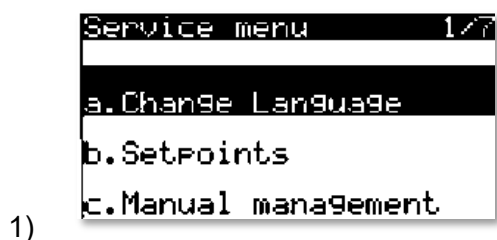
Main menu → Board switch



Shows the status of the pLAN network. (Networking multiple CAREL controllers together)
- Feature under development, to be implemented in future software releases.

15. Service menu

Main menu → Service



From this submenu, you can access to all service settings used to set up and maintain the Unit.
To switch between the different menu items, use the arrow keys (UP/DOWN). Place the black "bar" on top of the menu that has to be opened and press ENT.



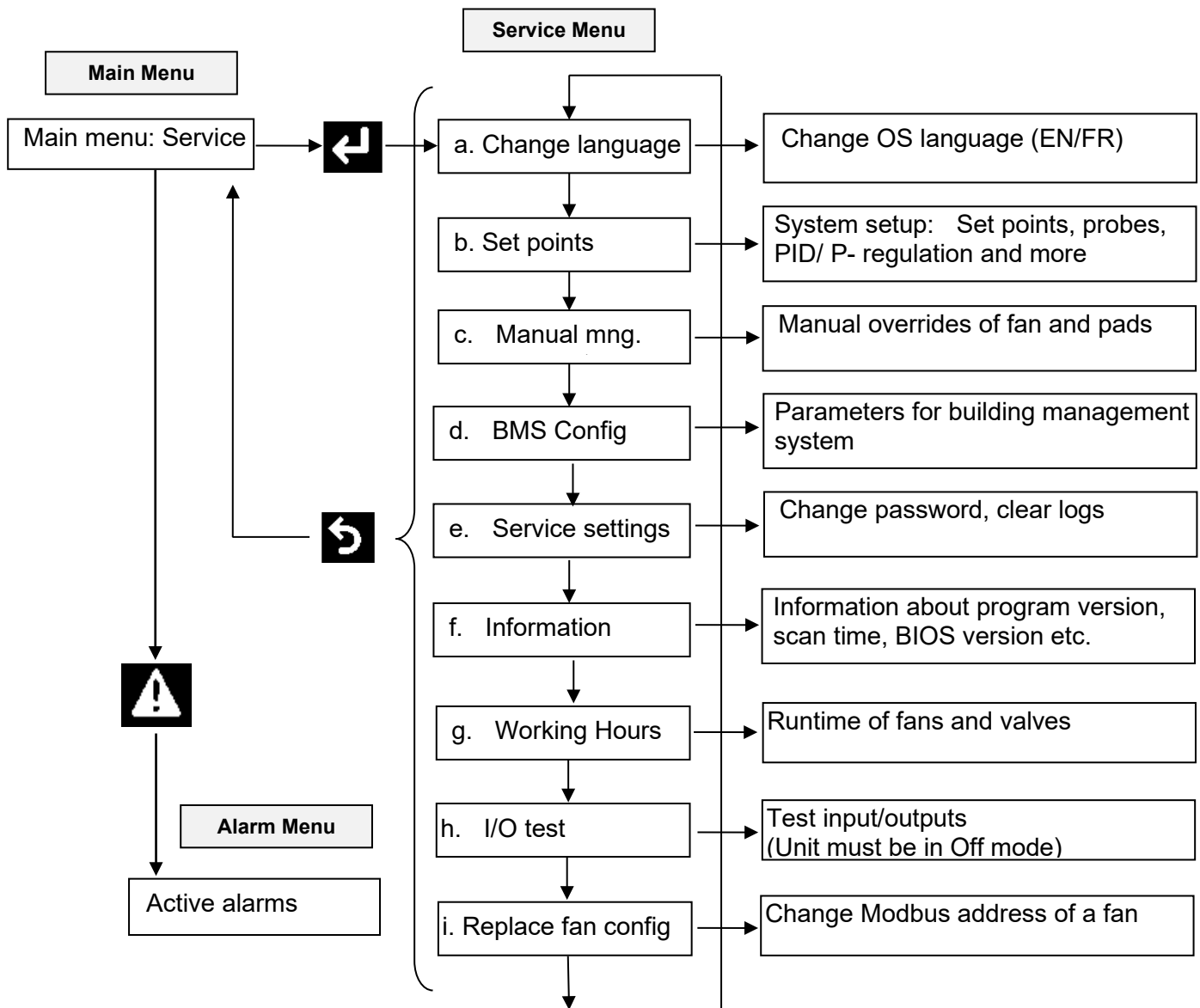
The menu is password protected to prevent unauthorized entry.
The factory user password (PW1) is **1234**.

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To input own password go to:

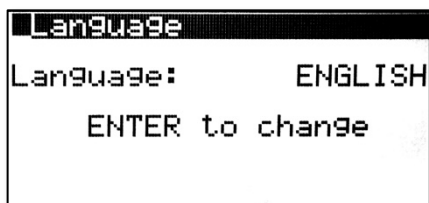
Main menu → Service → Service settings → Clear Log /Change PW1
(See section 15.12)

Service menu screen hierarchy:



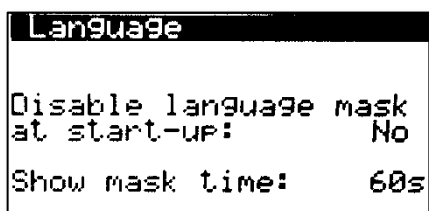
15.1 Change language

Main menu → Service menu → Change language



In this submenu it is possible to change the language. (Languages available: EN, FR.) Change by pressing ENT and then ESC, to return from the menu. The software should then be in the chosen language.

By pressing UP/DOWN you come to the second language screen:



Field	Description	Factory setting
Disable language mask at start-up	If "No" selected the language selection screen will appear every time the unit is rebooted. Select "Yes" to disable.	No
Show mask time	Time before the displayed language is chosen, at the startup language screen.	60s

15.2 Set points

Main menu → Service menu → Set points

This submenu contains all major parameters regarding fan speed and temperature set points, pad system and probes:

15.2.1 SP1 - Analog input B01 (For outlet temperature/pressure sensor)

Main menu → Service menu → Set points → SP1

```

Setpoints SP1
Analog input B00
Probe type: NTC
0000.0
1000.0
Alarm delay: 00060s
    
```

Field	Description	Factory setting
Probe type	Choose probe type: - NTC - NTC HT - 0,5 – 4,5 volt - 0 – 5 volt - ON/OFF - 4 - 20 mA - 0 – 20 mA - 0 -10 volt - 0 – 1 volt - PT1000	NTC
Min. value	Minimum output from the probe	0,0
Max. value	Maximum output from the probe	0,0
Alarm delay	Delay probe alarm	60

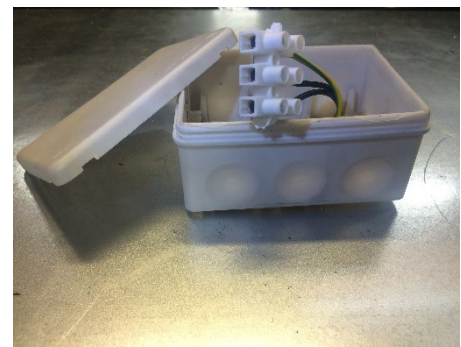
For correct wiring of probes, we recommend consulting CAREL's pCO5+® User manual, section 5. (available online.)

If the control panel is placed at the opposite end to the headers/connections, a terminal box will be placed at the headers/connections end of the unit where the temperature/pressure sensor must be connected. See picture

Note :

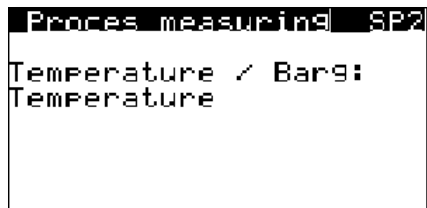
For Vee type products, the temperature sensor (*plus dry pocket*) or pressure transducer is not fitted, but is supplied loose and located in the control panel for safe keeping.

- Dry coolers : the supplied dry pocket must always be fitted to the 'common' fluid outlet interconnecting pipeline returning to the process, at a convenient location close to the dry cooler.
- Condensers : the pressure transducer must always be fitted to the common hot gas inlet pipeline feeding the condenser, at a convenient location close to the condenser.



15.2.2 SP2 - Process measuring

Main menu → Service menu → Set points → SP2



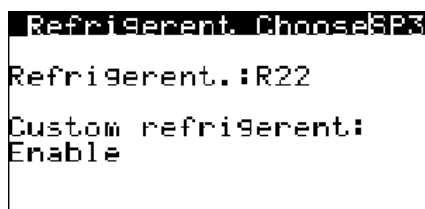
Field	Description	Factory setting
Temperature / Barg	Choose between temperature or pressure for fluid outlet.	Temperature

This screen relates to the previous probe choice. If pressure is chosen, (for ACC's) the outlet set points, set in degrees (°C), will be converted from the measured gauge pressure to condensing temperature, using the refrigerant properties chosen in SP3 or SP4.

If "Barg" (Bar gauge pressure) is chosen, the Standby Screen will, as extra information, display the gauge pressure measured at the hot gas inlet of the condenser.

15.2.1 SP3 - Refrigerant Chosen

Main menu → Service menu → Setpoints → SP3



If pressure is chosen in SP 2, this screen will be visible. It is possible to choose a refrigerant from the common refrigerants lookup list, or input your own data, by using the custom refrigerant option. (See more in next section)

Field	Description		Factory setting
Refrigerant	R22	CHCF ₂ - Chlorodifluoromethane	R22
	R134a	CH ₂ FCF ₃ - 1,1,1,2-Tetrafluoroethane	
	R404A	mixture of R125/143a/134a	
	R407C	mixture of R32/125/134a	
	R410A	mixture of R32/125	

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	R507	mixture of R125/143a	
	R290	CH ₂ CH ₃ CH ₂ - Propane	
	R600	CH ₃ CH ₂ CH ₂ CH ₃ - Butane	
	R600a	CH(CH ₃) ₃ - 2-methylpropane (isobutane)	
	R717	NH ₃ - Ammonia	
	R744	CO ₂ - Carbon dioxide	
	R728	N - Nitrogen	
	R1270	C ₃ H ₆ - Propylene	
	R417A	DuPont ISCEON MO59	
	R422d	Isceon MO29	
	R413A	Isceon MO49	
	R422A	Isceon MO79	
	R423A	Isceon 39TC	
	R407A	Mixture of R32, R125 and R134a	
	R427A	Forane FX100	
	R245Fa	Pentafluoropropane	
	R407F	Mixture of R32, R125 and R134a	

15.2.1.1 SP4 - Custom refrigerant chosen

Main menu → Service menu → Set points → SP4



If the "Custom refrigerant" field is enabled on the SP3 screen (previous section) this screen becomes unlocked.

Here, it is possible to input up to 7 data points (temperature, pressure) that describe the characteristics of the refrigerant.

The program then does a piecewise linear interpolation between the points, (see Figure 3), and uses the resulting graph to convert the outlet pressure to condensation temperature.

Field(s)	Description	Factory setting
1-7 X/Y	Data points for the refrigerant: Temperature (°C), / Pressure (Bar gauge pressure)	0

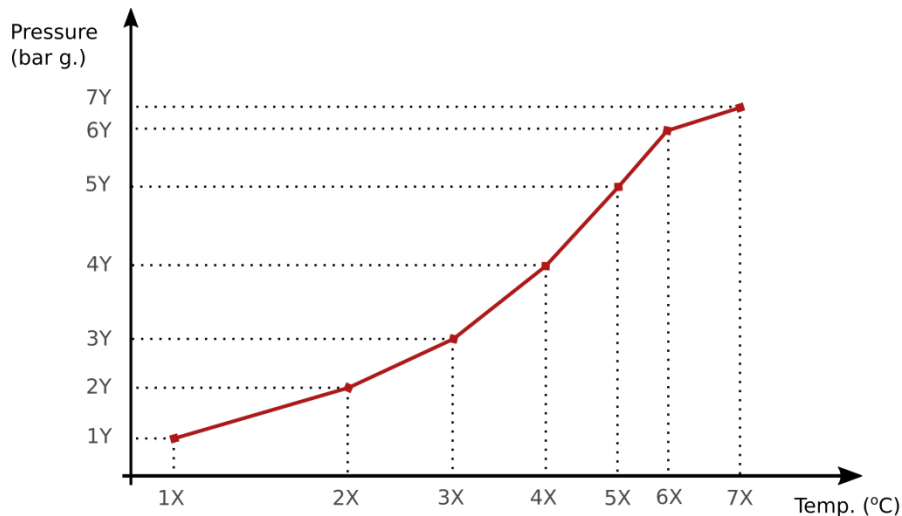


Figure 3

15.2.2 SP5 - Regulator

Main menu → Service menu → Set points → SP5

```
Regulator SP5
The fan speed can be
controlled with a P
or PID regulator
Mode....: P reg.
```

In this screen, it is possible to choose which control strategy to use for controlling the fan speed.

Field	Description	Factory setting
Mode	Choose between P or PID regulator	P

15.2.2.1 SP6 - P- regulator parameters

Main menu → Service menu → Set points → SP6

```
Fan Speed SP6
SP1.m.spd(day)...:10.0%
SP2.m.spd(day)...:10.0%
SP.m.spd(night)..:12.0%
Temp. reg.band...:03.0%
```

This screen is only visible if a P-regulator is chosen.

The P-regulator calculates the error by subtracting the current outlet temperature from the setpoint temp (SP1 or SP2). The fan speed is then linearly ramped up, proportional to the error where 100% (or, the max allowed speed, set in Section 15.2.3), is reached when the error is equal to the set temperature regulation band.

Field	Description	Factory setting
SP1 m. spd	Set point 1 for the fluid outlet temperature.	10
SP2 m. spd	Set point 2 for the fluid outlet temperature. Activated via. the Scheduler, Ambient temp. or a digital input. (See sec. 15.2.9)	10
Temp.reg band	Regulation band between min. Speed and max. Speed.	3

Example:

As shown in Figure 4 , the current set point is 24°C. The regulation band is set to 3°C. If the fluid outlet temperature is below 24°C, the fan will run at the set minimum speed. (here 10%). As the temperature rises, the fans speed up linearly. Once the max temperature is reached, (setpoint + reg. band = 27°C) the fans will run at the max. allowable speed (here restricted to 90%)

If Energy Saving mode is enabled, the wet stages will enable once the Energy saving speed is reached, as described in section 2.2 .

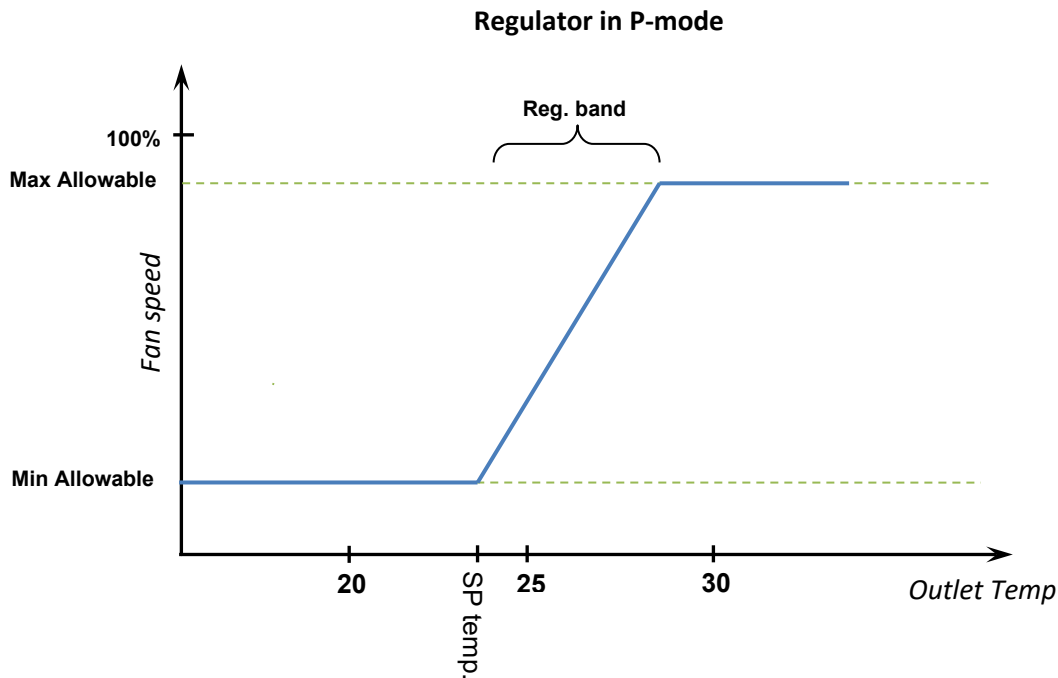


Figure 4

15.2.2.2 SP7 - PID parameters

Main menu → Service menu → Set points → SP7

```
Fan Speed SP7
SP temp.(day)...:10.0%
SP2 temp.(day)...: 5.0%
SP tmp.(night)...:12.0%
Gain.....: 4.0g
Ti.....: 20 s
Td.....: 0 s
```

This screen is only visible if a PID-regulator is chosen.

Field	Description	Factory setting	User setting
SP1 temp.	Temperature set point 1	10 °C	
SP2 temp.	Temperature set point 2	5 °C	
Gain	Proportional gain	3	
Ti	Integral time (0 => disabled)	100 s	
Td	Differential time (0 => disabled)	0 s	

15.2.3 SP8 - Fan speed

Main menu → Service menu → Set points → SP8

```
Fan speeds SP8
Max. Allowed...: 100 %
Quiet operation: 90 %
Energy Saving...: 75 %
Min. Allowed...: 20 %
```

In this screen it is possible to set the bounds for the fan speed and set the Energy Saving and Quiet mode speeds. The values are expressed as percentages, where 100% equals to the motors nameplate rpm.

If you wish to disable Energy Saving mode (see sec 2.2), the Energy Saving speed should be set equal to the Max. Allowed. The wet system will then only activate after the fans have ramped up to their full speed.

Field	Description	Factory setting
Max. Allowed	Maximum allowable speed for the fans.	100 %
Quiet. Operation	Maximum allowable speed for the fans. (Active when scheduler is the in the time band, see sec.11.3)	90 %
Energy Saving	Energy Saving speed (See sec. 2.2)	75 %
Min. Allowed	Minimum allowable speed for the fans	20 %

15.2.4 SP9 - Stage Switch point temperature

Main menu → Service menu → Set points → SP9

Stage Switch Point SP9		
Stage 1.....:	13.0	°C
Stage 2.....:	14.0	°C
Stage 3.....:	15.0	°C
Stage 4.....:	16.0	°C

Since the adiabatic cooling is less effective at lower temperatures, (assuming const. humidity,) it is possible to set an ambient temperature threshold for the wet stages to activate.

The temperature switch points add an extra condition for the activation logic of the wet system, so the fans have now to reach Energy saving speed **and** the ambient temperature has to be sufficient. (See more in section 2.2)

The temperature have to be at least 0,1°C before the wet system can activate.

Field	Description	Factory setting
Stage 1	When the ambient temp. is above set point, activation of 1 st stage is possible .	13.0 °C
Stage 2	When the ambient temp. is above set point, activation of 2 nd stage is possible .	14.0 °C
Stage 3	When the ambient temp. is above set point, activation of 3 rd stage is possible .	15.0 °C
Stage 4	When the ambient temp. is above set point, activation of 4 th stage is possible .	16.0 °C

15.2.5 SP10 - Stage min. On time

Main menu → Service menu → Set points → SP10

```

Stage On time SP10
Enable stage On time:
No
Stage 1.....: 1 s
Stage 2.....: 1 s
Stage 3.....: 1 s
Stage 4.....: 1 s
Press ESCAPE to return
    
```

Since it takes a few minutes for the FlexPads to get properly soaked, it is possible to set a minimum time for a wet stage to be active before it can be switched off again. Furthermore, depending upon the reaction time of the process to which the DAC or ACC is connected, a minimum pad activation time may be desirable to minimize hysteresis.

The feature is not necessary if operating with the FlexSpray system.

Field	Description	Factory setting
Enable stage On time	Enable/disable min. on time for stages	No (disabled)
Stage 1-4	When the stage has been activated, it cannot deactivate before this time has elapsed	1s

15.2.6 SP11 - PAD minimum allowable ambient temperature

Main menu → Service menu → Set points → SP11

```

PAD ambient temp. SP11
Minimum allowable
temperature.
Set point.....: 05.0 °C
Differens.....: 01.0 °C
    
```

To safeguard the wet system against frost damage, a minimum operating temperature can be set. The wet system will not activate if the ambient temperature is below the set point and the Unit will operate in dry mode only.

Field	Description	Factory setting
Set point	If the ambient temperature goes below the set point, the wet system cannot be activated	5 °C
Difference	If the ambient temperature rises above "Set point" + "Difference" the wet stages are released again.	1 °C

15.2.7 SP12 - Pad Inc. / Dec. time

Main menu → Service menu → Set points → SP12

```

PAD regulation SP12
Increase time:
Stage 1:      00020 s
Stage 2-4:    00020 s
Decrease time:
Stage 1:      00030 s
Stage 2-4:    00030 s
    
```

The controls can handle up to 4 valves. The management is structured as a step coupler on 4 steps. If the conditions are met the cut-in timer starts. When the timer is expired the step is counted 1 up. This can continue until all steps are on. The step is counted down every time the cut-out timer has expired.

Field	Description	Factory setting
Increase time Stage 1	Time before activating the first PAD	15
Decrease time Stage 1	Time for deactivating the last PAD in the sequence. When the outlet temperature goes below energy saving speed set point, the timer starts to run.	15
Increase time Stage 2-4	Time before activating the second to fourth PAD	15
Decrease time Stage 2-4	Time for deactivating the first and up to third PAD. When the outlet temperature goes below energy saving speed set point, the timer starts to run.	15

15.2.8 SP13 - EC fan fail safe

Main menu → Service menu → Set points → SP13

```

EC Fan Fail Safe SP13
Enbl. Fail Safe: No
Delay time....: 0000 s
Speed.....: 000 %
    
```

If the EC fans loose the controller signal (e.g. in case of controller failure) the fans can be set to run at a predetermined speed to ensure continuous capacity.

Field	Description	Factory setting
-------	-------------	-----------------

Enbl. Fail safe	Enable Fail safe function for EC fans	No
Delay time	Time from controller signal loss till fans start to run at Fail safe Speed.	5 s
Speed	Fail safe Fan speed	0 %

Note: In Modbus mode for EC fans only, the controller pings the fans at regular intervals. It is therefore not recommended to set the Delay time below 1s, as the fans will interpret the interval time as signal loss and may switch to Failsafe mode with the controller still operational.

15.2.9 SP14 – Set point 2 trigger

Main menu → Service menu → Set points → SP14

```
Setpoint 2 trigger SP14
Choice of setpoint 2
trigger.:
Digital input 7
```

The Set point 2 for the outlet temperature can be activated by either the Scheduler, an ambient temperature condition, or a digital input on ID7.

Field	Description	Factory setting
Choice of Set point 2 trigger	Choices: Disable, By digital input 7, Scheduler, Ambient temperature	Disable

15.2.10 SP16 - Common control - Unit activation

Main menu → Service menu → Set points → SP16

```
Unit activation SP16
Enable unit OnOff

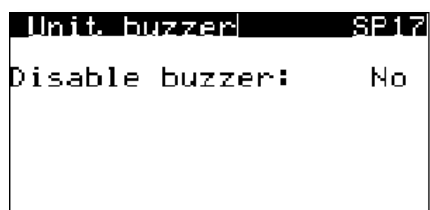
By digit input: No
By supervisor: No
```

The Unit can be set in Off mode remotely by a digital input or BMS system.

Field	Description	Factory setting
By digit input	Turning the unit on/off by the digital input	No
By supervisor	Turning the unit on/off by building management system.	No

15.2.11 SP17 - Buzzer

Main menu → Service menu → Set points → SP17



Field	Description	Factory setting
Disable buzzer	Disabling the alarm buzzer in the controller	Yes

15.3 Manual management

Main menu → Service menu → Manual management

In this submenu it is possible to manually override the fans and wet systems.

15.3.1 Fans override

```
Analog output of fans
Manual mn9...:Disable
Manual speed.....: 0%
```

Over-riding the fans ignores any fan speed bounds set in sec. 15.2.3

Field	Description	Factory setting
Manual mng.	Enable / Disable override at set ovrr. speed	Disable
Manual speed	Override speed.	0%

15.3.2 Wet stages override

```
SOVERRIDE Stages
Force Open of stages
Stage 1...: OPEN
Stage 2...: OPEN
Stage 3...: OPEN
Stage 4...: OPEN
```

Over-riding the wet stage valves. Ignores any wet system restrictions (min. ambient temp, allowable period etc.)

Field	Description	Factory setting
Stage 1-4	Manual valve override	Open

15.3.3 Manual Overrides, other

```
$Manue Overrides
Force Run at Max-
allowed speed:Disable
Force Flush / Clean-
cycle .....:Disable
Force reverse of EC-
fan direktion:Disable
```

Field	Description	Factory setting
Force run at max allowed speed	Jump to currently set Max. Allowed speed	Disable
Force Flush / Clean cycle	Invoke flushing cycle. (Parameters set in Section 11.6)	Disable
Force reverse of EC fan direction	Run fans in reverse direction at the set manual override speed. (EC fans only) (This sets the direction. To start them, use the man. override from sec. 15.3.1)	Disable

15.4 BMS Config

Main menu → Service menu → BMS Config

```

Bms2 confi2.
Protocol:
Modbus slave ext. 2

Baudrate    19200
Address      1
Parity       NONE
Stop bit     2
    
```

This submenu contains all settings for setting up communication with the unit via a BMS system (Building Management System)

Field	Description	Factory setting
Protocol	Choose protocol type: - Carel Slave - Carel modem - Modbus slave - Winload - Modbus slave extended - Modbus slave ext. 2	Modbus slave ext. 2
Baudrate	Choose baudrate: - 1200 - 2400 - 4800 - 9600 - 19200 - 38400	19200
Address	Address from 1 to 207	1
Parity	Choose parity: - NONE - EVEN - ODD - 9600 - 19200	NONE
Stop bit	Choose stop bit: - 1 - 2	2

15.5 Information

Main menu → Service menu → Information

```
Information
Version: 2.4.000
Date: 01/04/16
Bios: 6.24 25/02/14
Boot: 5.01 04/02/13
```

```
Information
Board type: FC05+
Board size: Small
Total flash: 2048KB
RAM: 1024KB
Built-In type:
Main cycle: 9.9cycle/s 101ms
```

Information about the controller software version and hardware type. (View only)

Field	Description
Version:	Current controller software version and date
Bios	Bios version and date
Boot	Boot version and date
Board type /size	Type of CAREL hardware
Total flash	Total flash ram of the controller
Ram	Total RAM of the controller
Built in type	Type of operator panel
Main cycle	Time for execution of the program

15.6 Working Hours

Main menu → Service menu → Working Hours

```
Working hours
Fan....: 000000 h
Valve 1: 000000 h
Valve 2: 000000 h
Valve 3: 000000 h
Valve 4: 000000 h
```

This submenu tracks the amount of duty hours of the various components ... run time for the fans and for valves, the amount of time spent open.

If a component is replaced, the time can be reset in the Service/Service settings submenu, see section 15.10.

15.7 I/O test – Sys. Off

This submenu allows the testing of all controller inputs and outputs. In order to access this function, the unit needs to be set to Off mode. (See section 9)



Field	Description	Factory setting
Enable test	Enables the testing function	Off
Test ID1-5	Tests the digital inputs	Open
Test NO1-5	Tests the digital outputs	Open

15.8 Replace fan config. (EC fans only)

This submenu allows the change of the Modbus address of a fan.



In the case when an EC fan needs to be replaced, the new fan will have a default Modbus address from the manufacturer:

Manufacturer	Factory Modbus address
ebm-papst	1
Ziehl-Abegg	247

The fan addresses the controller is communicating with are: 101 for fan no. 1, 102 for fan no. 2, 103 for fan no. 3 ... etc.

After replacing the fan, you will be able to see in the Alarm menu, the number of the fan which now is offline, because the controller doesn't recognize the factory address

Go to the Replace fan config. Menu. and scroll through the menu screens until you find the matching fan number.

Set the “Current address” to the Factory Modbus address. The “new address” should be corresponding to the fan number (10-“no.”)

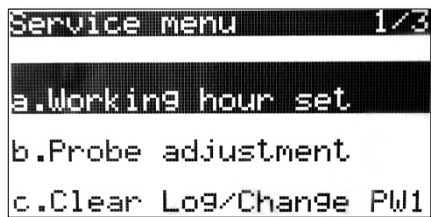
Select “start procedure:” and set it to “Yes” and press ENT. The screen will then display various messages through the process:

Message	Action
“Reboot FW”	Rebooting fan firmware
“Wait offline”	Fan rebooting
“Wait online”	Reconnecting
“End procedure”	Procedure ended

The procedure can take a few minutes. After the procedure, repower the fan and controller. The working hours for the fans (all together) can be reset in the Service ➡ Service settings menu, see more in section 15.10

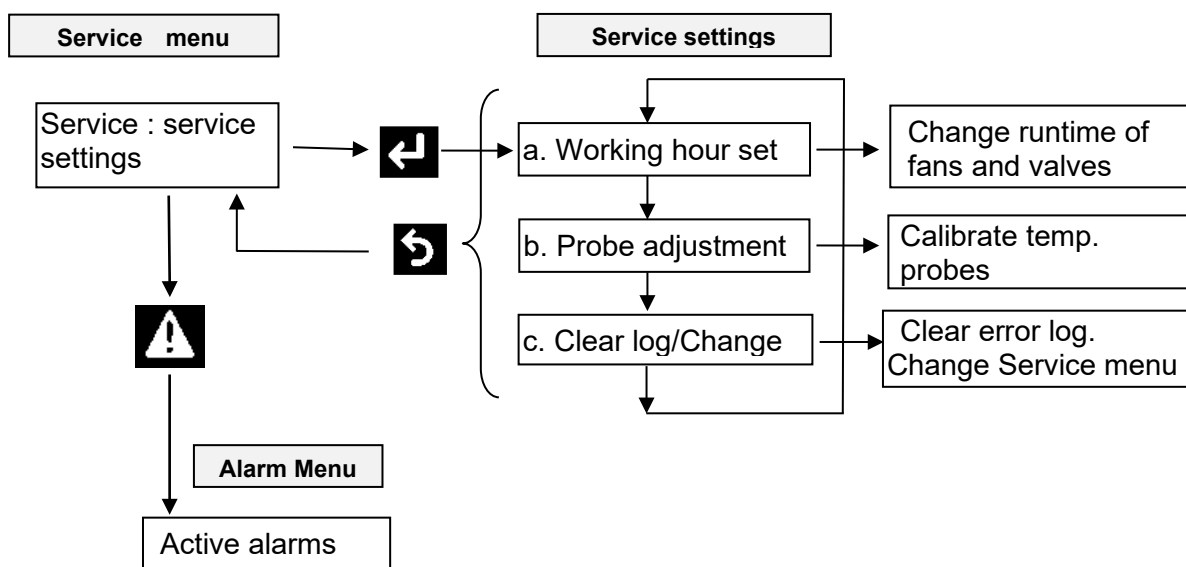
15.9 Service settings submenu

Main menu → Service menu → Service settings



In this submenu there is access to the less frequently used settings: resetting the working hours of components, calibrating probes, clearing the error log and changing the PW1.

Service settings submenu screen hierarchy:



15.10 Working hours adjustment

Main menu → Service menu → Service settings → Working hours set

The screen tracks the amount of duty hours of the various components.

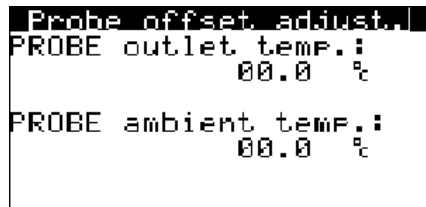
Here, unlike in section 15.1015.6 the runtime of a component can be adjusted, eg. set to 0 after a replacement.



15.11 Probe adjustment

Main menu → Service menu → Service settings → Probe adjustment

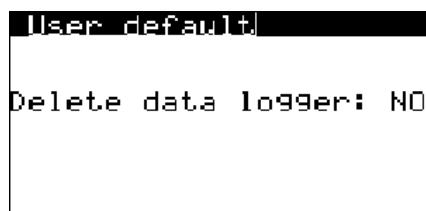
To calibrate the probes, it is possible to give each probe an offset.



15.12 Clear error log / Change service password

Main menu → Service menu → Service settings → Clear log / Change PW1

In these two screens it is possible to clear the error log from the Error menu, (See sec. 13) and set a new password for the Service menu (PW1).



16. Manufacturer menu

Main menu ➔ Manufacturer

This menu is intended for the initial factory set-up only. It allows the pre-programming of the controller according to the product type, motors and components fitted and allows the configuration the applicable parameters.

To see the details of this menu, consult the FlexPad manufacturer manual.

17. Alarm list

No.	Description	Activated from	Action
1	Outlet temperature fault	AI	Alarm relay, fans to max. RPM
2	Ambient temperature	AI	Alarm relay, PADs disabled
3	Clock board fault or not connected	System	None
4	Extended memory fault	System	None
5	Electrical fault on digital input 3	DI	Alarm relay
6	Electrical fault on digital input 4	DI	Alarm relay
7	Electrical fault on digital input 5	DI	Alarm relay
8	Electrical fault on digital input 6	DI	Alarm relay
9	Electrical fault valves input 2	DI	Alarm relay
10	EBM papst Modbus fan 1 error	Modbus	Alarm relay
11	EBM papst Modbus fan 2 error	Modbus	Alarm relay
12	EBM papst Modbus fan 3 error	Modbus	Alarm relay
13	EBM papst Modbus fan 4 error	Modbus	Alarm relay
14	EBM papst Modbus fan 5 error	Modbus	Alarm relay
15	EBM papst Modbus fan 6 error	Modbus	Alarm relay
16	EBM papst Modbus fan 7 error	Modbus	Alarm relay
17	EBM papst Modbus fan 8 error	Modbus	Alarm relay
18	EBM papst Modbus fan 9 error	Modbus	Alarm relay
19	EBM papst Modbus fan 10 error	Modbus	Alarm relay
20	EBM papst Modbus fan 11 error	Modbus	Alarm relay
21	EBM papst Modbus fan 12 error	Modbus	Alarm relay
22	EBM papst Modbus fan 13 error	Modbus	Alarm relay
23	EBM papst Modbus fan 14 error	Modbus	Alarm relay
24	EBM papst Modbus fan 15 error	Modbus	Alarm relay
25	EBM papst Modbus fan 16 error	Modbus	Alarm relay
26	EBM papst Modbus fan 17 error	Modbus	Alarm relay
27	EBM papst Modbus fan 18 error	Modbus	Alarm relay
28	EBM papst Modbus fan 19 error	Modbus	Alarm relay
29	EBM papst Modbus fan 20 error	Modbus	Alarm relay
30	ZiehlAbegg Modbus fan 1 error	Modbus	Alarm relay
31	ZiehlAbegg Modbus fan 2 error	Modbus	Alarm relay
32	ZiehlAbegg Modbus fan 3 error	Modbus	Alarm relay
33	ZiehlAbegg Modbus fan 4 error	Modbus	Alarm relay
34	ZiehlAbegg Modbus fan 5 error	Modbus	Alarm relay
35	ZiehlAbegg Modbus fan 6 error	Modbus	Alarm relay
36	ZiehlAbegg Modbus fan 7 error	Modbus	Alarm relay
37	ZiehlAbegg Modbus fan 8 error	Modbus	Alarm relay
38	ZiehlAbegg Modbus fan 9 error	Modbus	Alarm relay
39	ZiehlAbegg Modbus fan 10 error	Modbus	Alarm relay
40	ZiehlAbegg Modbus fan 11 error	Modbus	Alarm relay
41	ZiehlAbegg Modbus fan 12 error	Modbus	Alarm relay
42	ZiehlAbegg Modbus fan 13 error	Modbus	Alarm relay
43	ZiehlAbegg Modbus fan 14 error	Modbus	Alarm relay
44	ZiehlAbegg Modbus fan 15 error	Modbus	Alarm relay
45	ZiehlAbegg Modbus fan 16 error	Modbus	Alarm relay
46	ZiehlAbegg Modbus fan 17 error	Modbus	Alarm relay
47	ZiehlAbegg Modbus fan 18 error	Modbus	Alarm relay

48	ZiehlAbegg Modbus fan 19 error	Modbus	Alarm relay
49	ZiehlAbegg Modbus fan 20 error	Modbus	Alarm relay
50	Antifreeze water outlet	System	

18. Credits

Figure 1 utilizing icons from Ashley Worobec and Paulo Sa Ferreira.
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Numbering sequence for the fans is shown below.

