AK2-SC 255
Reference Manual

Users Manual

AK2-SC 255 Rack Controller
System Reference Manual

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What this manual covers

This manual covers configuration and operation of the Danfoss AK2-SC 255 Rack Controller and systems based upon it. In this manual we very often refer to the controller as "SC 255,' a shortened version of its official name.

This manual is intended for the user who requires detailed information about any aspect of the controller's operation and software.

Although the manual does not at this time have an index, the Table of Contents that follows this page is quite extensive and should be a useful guide to the text.

Other manuals for this system

Other Danfoss manuals that you should have are the *On Site Guide* for the AK2-SC 255, which covers installation and start-up of the controller, and the AK2 I/O Module manual, which details installation and operation of the I/O modules and their software interface using the AK2-SC 255 and earlier controllers.

If you can, you should check the Danfoss web site at www.acr.danfoss.com and select the menu item for product literature. The AK2-SC 255 literature will be in the Supermarket electronics section.

DISCLAIMER

Where this manual discusses control and monitoring of equipment not manufactured by Danfoss, or discusses interface to software not published by Danfoss, the accuracy of the text is in some cases dependent upon information furnished by the manufacturers of such non-Danfoss products, and Danfoss cannot be held responsible for the accuracy of lthe information. Nevertheless, we have made every effort to ascertain correct information from all parties invol

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PART ONE
Configuration

1 - 1. Initial Configuration

Note: We use the formal type designation "AK2-SC 255" occasionally in this manual, but most often you will see the short form of the name: "SC 255."

Configuration of an AK2-SC 255 is easy using the keypad and display, and even easier using Danfoss AKA 65 Network Interface software running opn a PC connected to the controller. This chapter describes configuration from the AK2-SC 255 keypad. You can easily adapt these instructions for the PC keyboard and mouse after reading Chapter 3, "Using AKA 65 Software on Your PC."

We will address configuration of each area of a supermarket control system in this section of the manual. Initial configuration for equipment start-up may be limited to such items as are necessary to check out the mechanical equipment or provide basic service. The configuration can be changed or added to at any time later.

Battery

The unit's backup battery power is automatically enabled when the unit is first externally powered. Note that if you receive the unit partially configured, the battery will have been enabled. Normal battery life is a minimum of ten months, but the battery is only used when main power is interrupted. In a unit which rarely experiences power interruptions, the battery can last as long as eight years.

If the battery is disabled (by removing it, or when it ultimately discharges completely) any information stored in the unit (set points, schedules, etc.) will be lost. Do not remove the battery.

Authorization codes

When the SC 255 is turned on for the first time, the Main Menu will appear as at left below:
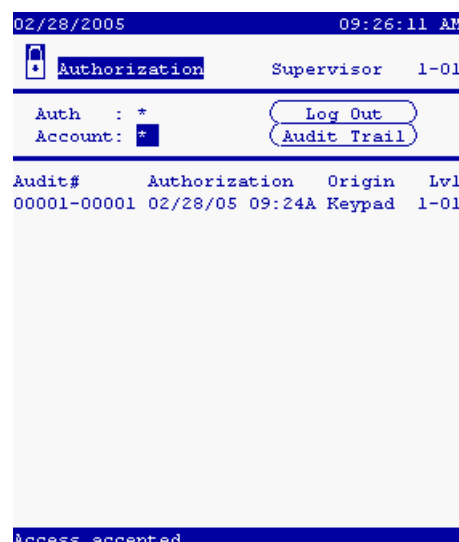
Before you can enter configuration information, you must select **Authorization** and

enter a valid authorization code and account code. Using the right arrow, move the cursor to **Authorization** and press ENTER. The Authorization Menu will appear as at right above, with the cursor in the **Auth** field.

When you have entered the access code and account number given to you by the system owner, you will see the words **Authorization accepted** appear briefly in reverse video at the very bottom of the screen. In the upper right, the screen will show what the authorization level is.

After initial configuration, you will be able to make changes by several different avenues, which are discussed in Chapter 5, "Using the System."

Using menus

To select from any SC 255 menu, first use the arrow keys to move the cursor to the item you want, then press the ENTER key.   You can use the EXIT key to retrace your steps level by level.

Selection of Units
and Language

Before using the system, you may wish to change the language used on the screens, the units used for pressure and temperature, or the date and time format. These settings will be for the local PC only, and will not affect the displays of any SC 255 in the system. To change the displayed units, select **Store Information** from the main menu and then choose **Units/Languages**. In the Configuration Units/Languages screen, select the language you want to see in the controller screens, then select either **psi** or **bar** for pressure; either °**F** or °**C** for temperature; and either % or fc (footcandles) for light level.

1 - 2. Configuring Refrigeration

There are two "routes" you may need to navigate to begin configuring refrigeration. One begins by selecting **Refrigeration** from the Main menu, and the other by selecting **Configuration**.

Starting with a
Partially Configured
AK2-SC 255

If the AK2-SC 255 you are working with was supplied with a rack, the controller may have been partially configured by the rack manufacturer. In that case, when you select **Refrigeration** from the Main Menu, the SC 255 will display the Refrigeration Menu (left). It lists the rack or racks that are partly configured. If you want to change or add to the configuration of one of these racks, move the cursor to the rack name and press ENTER. The Rack menu (right) will appear. In this example, only one rack has been previously configured.

10/01/2002			11:24:30 AM
Refrigeration Menu			
Rack	Suction	Current	Target
Rack A	Suction AA	0.0psi	0.0psi

10/01/2002	11:32:08 AM
Rack A Menu	
Suction Groups	Alarms
Evaporators	Rack Overview
Condenser	Rack Service
Heat Reclaim	Configure Rack
Receiver	

Select **Configure Rack** and the Configure Rack menu appears.

10/01/2002	11:36:33 AM
Configure Rack A	
Rack Info	Receiver
Suction Info	Heat Reclaim
Compressors	Alarms
Evaporators	Board & Points
Condensers	
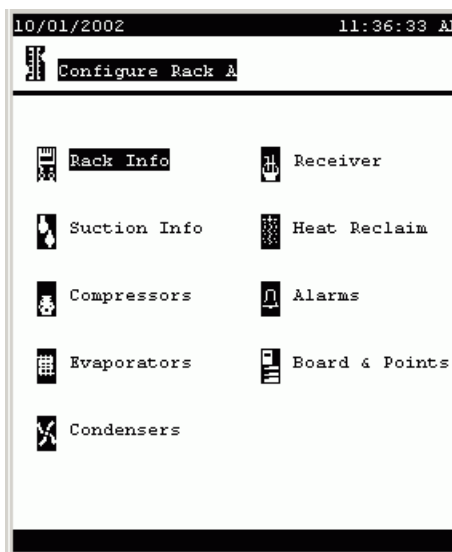
Now select the type of information you want to supply. We'll cover a typical cat-

egory right after we talk briefly about the other "route" configuration may take.

Starting with a Completely Un-configured AK2-SC 255

If the AK2-SC 255 you are working with has no refrigeration configuration at all, select **Refrigeration** from the Main menu, and the Rack Configuration menu will appear (left). The only selection which can be made from this screen is **Add Rack**. Selecting **Add Rack** takes you to the Configure Rack, Rack Info screen (right).

```
10/01/2002              12:05:34 PM
▓ Rack Configuration



         >> Add Rack <<
```

```
10/01/2002              12:06:50 PM
▓ Configure Rack A

          ▣ Rack Info

Rack label..............?A
2 stage system..........?No
No of suction groups....?0
Refrig type.............?R22
Oil type................?
Monitor phase loss......?Yes
Generate input for each.?Rack
Shutdown phase loss.....?Yes



User Authorized
```
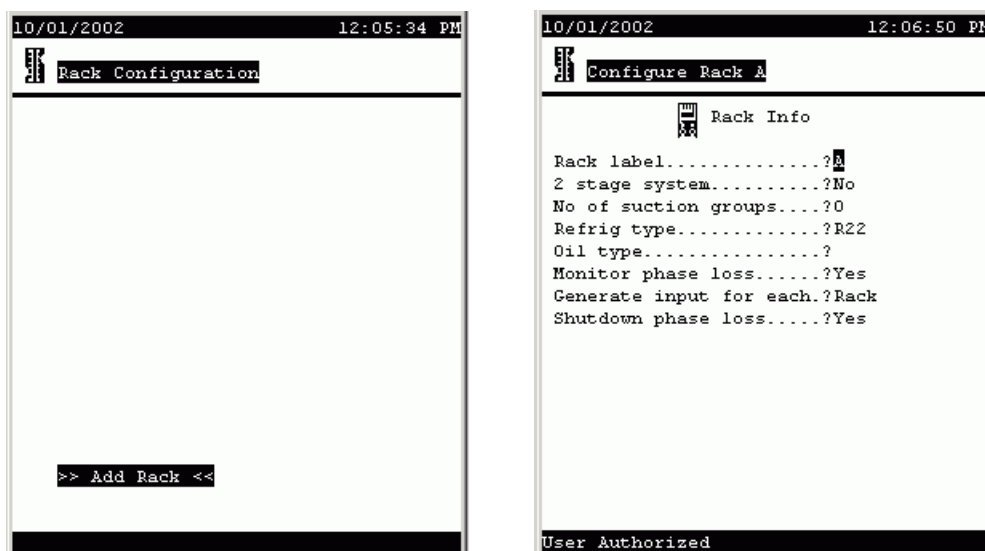
Navigation and making changes

The Configure Rack A screen shown at right above has information fields that can be changed by any user with a proper authorization code. To make changes, use the arrow keys to move the cursor to the field you want to change

Entering numerals

To enter numerals for a field like **No of suction groups**, use the numeral keys on the controller keypad., then press ENTER.

Entering labels

Labels are entries that you need to spell out. The **Rack label** field contains a label one character in length. The **Oil type** field is also a label field, but it is 9 characters long, allowing you to spell out a word or words indicating the oil type, for example, "Mineral."

To enter a label, place the cursor on the field, then press the +/- key. This action toggles the function of the arrow keys so that the UP and DOWN arrows scroll through the alphabet and all the other possible characters. Once the character you want in that space appears, use the RIGHT arrow to move to the next space (when the field has more than one space). Again, use the UP and DOWN arrows to reach the character you want. When all the characters in the field are as you want them, press ENTER to save the entry.

Constrained fields

The Rack label field is a *constrained* field. It will only accept an upper case letter, even though lower case letters appear as you scroll through the characters. The **No of suction groups** field is also constrained. It will only accept a single numeric character from 0 to 5, because a single AK2-SC 255 can control up to 5 suction

groups. Note that in the case of this particular field, entering a 0 (zero) will pop up a warning box letting you know that a zero response here will eliminate the suction groups already configured and will delete all information stored for the rack; you will be asked to confirm the entry.

Selecting from list boxes

The next pair of illustrations shows how the controller uses list boxes.
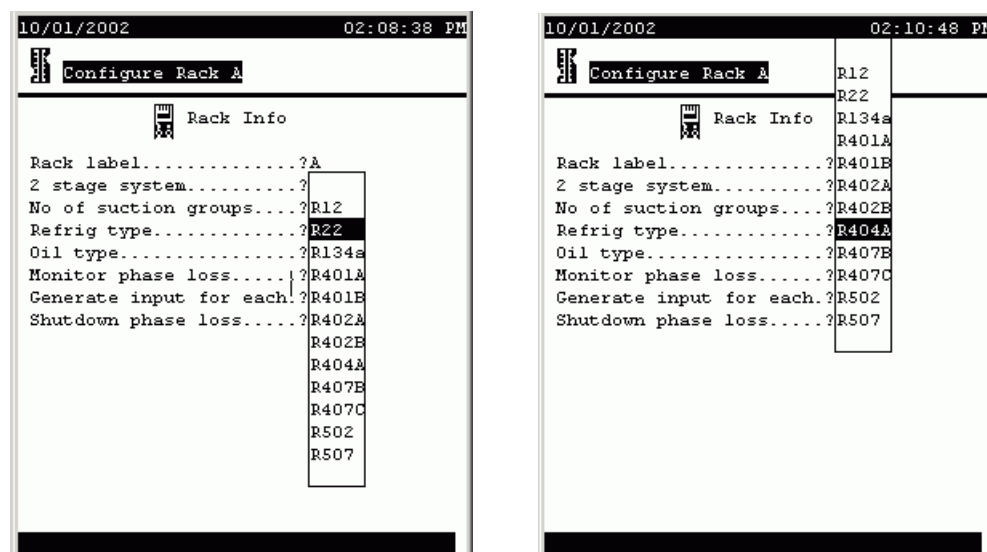
The list box appears, as shown at left above, when you move the cursor to the field and then press the +/- key (or, at your PC, right click). Then, using the UP and DOWN arrow keys, you can move the cursor to make a selection. In the example at right, R404A has been chosen. The cursor actually stayed in the same position, but the "window" moved.

When you have put the list box's cursor on the selection you want, press ENTER to save your selection.

Some list boxes contain only two choices (for example, Yes and No in the Monitor phase loss field). Some may contain many choices. When that is the case, one of the lines in the box will contain three dots. When the cursor is moved to the three dots, additional choices appear.

Now that we understand navigation and making changes, we can go on to a discussion of each of the configuration screens.

Configuring Rack Info   In the rack Info screens, the following are the fields, and their possible contents:

Rack label	(Upper case letters, A to Z) The "name" of the rack.
2 stage system	(List box: Yes, No)
No of suction groups	(0 to 5) Note that for a rack with existing configuration, entering and confirming a 0 will cause deletion of all existing rack information.
Refrig type	(List box) The kind of refrigerant.
Oil type	(9 characters, not constrained)
Monitor phase loss	(List box: Yes, No) Whether or not there will be a

digital input from a phase loss monitor.

Generate input for each [appears only after a Yes answer to the preceding question] (List box) Whether there is a phase loss input for each rack or each suction group.

Shutdown phase loss [appears only after a Yes answer to the Monitor phase loss question] (List box: Yes, No)

When all of the items on the Rack Info screen have been configured, press MENU to return to the Main Menu.

Adding a Rack
There is only one way to add a rack. From the Main Menu select **Configuration**, then **Refrigeration**, and the Rack Configuration screen appears. At the bottom left of the screen are the words **>> Add Rack<<**. Move the cursor there and press ENTER. A new Rack Info screen will appear.

```
10/02/2002                09:10:33 AM
   Rack Configuration

   Rack A Suctions :2   Compressors:2
          Circuits :0   Condensers :0









   >> Add Rack <<
```

```
10/02/2002                09:11:25 AM
   Configure Rack B

              Rack Info

Rack label..............?B
2 stage system..........?No
No of suction groups....?0
Refrig type.............?R22
Oil type................?
Monitor phase loss......?Yes
Generate input for each.?Rack
Shutdown phase loss.....?Yes
```
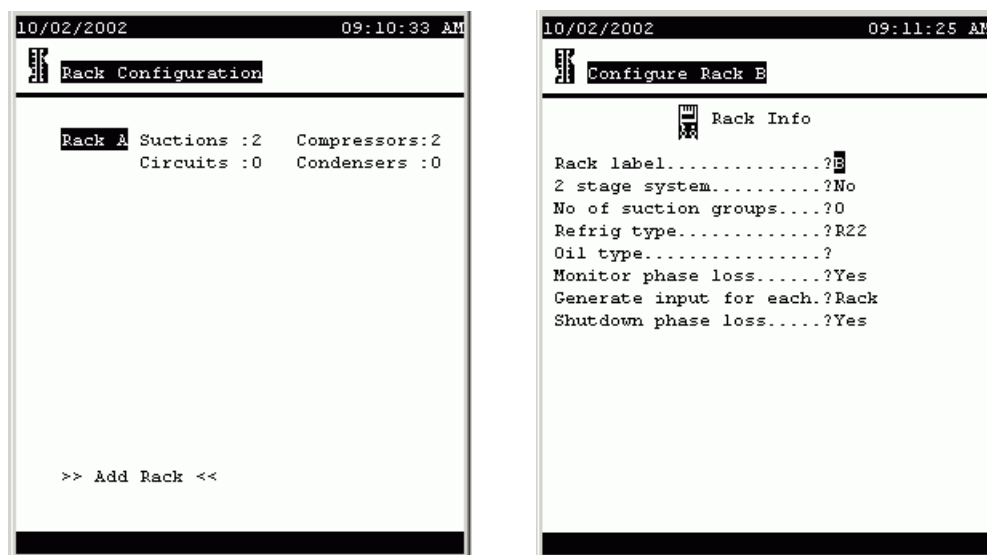
Notice that the **Rack Label** field contains the letter **B** by default, since the previously configured rack was rack A. You can change the default label if you want.

Configuring
Suction Info
To configure a suction group, press MENU to return to the Main Menu, then select **Configuration**, then **Refrigeration**. The Rack Configuration screen appears as at left above. Select the rack and a Configure Rack menu appears (as at left below) .
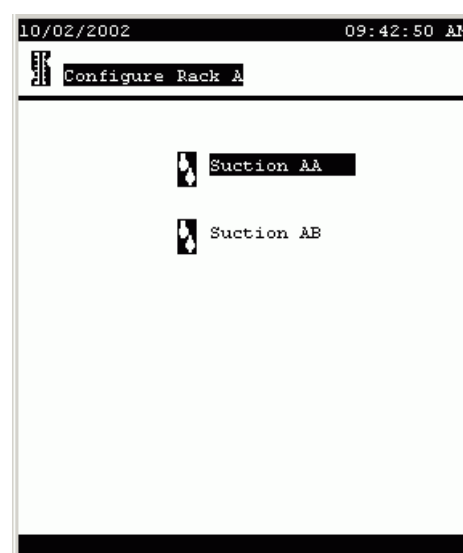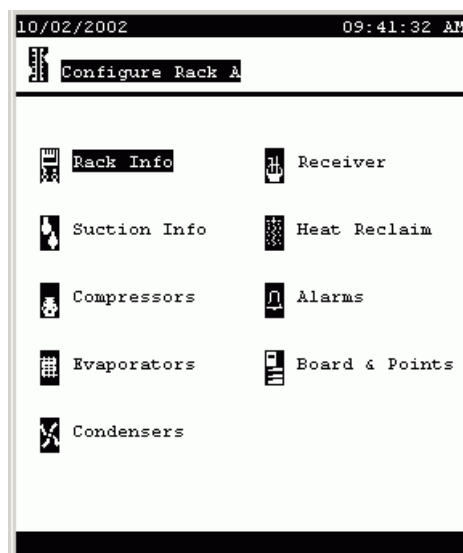
Once at suction configuration menu shown at right above, select the suction group you want to configure and press ENTER. The Suction Info screen for that group will appear as at right below. As you configure, questions may appear that are not included on the default screen. The screen at left below shows all the possible lines revealed.
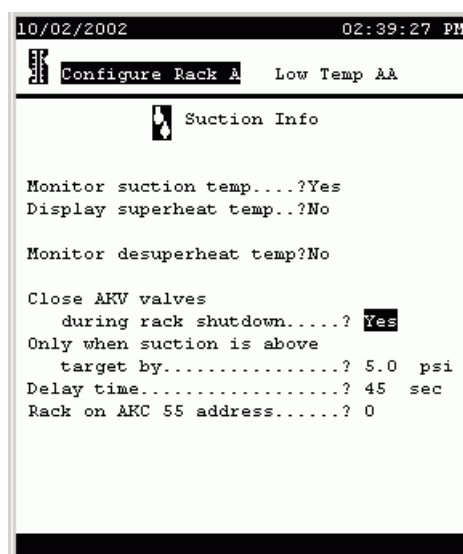
The fields and their contents are as follows:

Suction I.D.	(2 label fields: the first is a list box: A to Z; the second is 9 characters not constrained) This is the identification you wish to assign to the suction group. The entry will modify the screen title. For example, if you enter a **B** in the first field and **Low Temp** in the second, the right portion of the screen title for the configuration and status screens for this group will read **Low Temp AB**.
PSIG target	(-50.0 to 500.0) The pressure that the controller will maintain, subject to capabilities of mechanical equip-

	ment, for this suction group.
PSIG Safety cutout	(-50.0 to 150.0) The gauge pressure at which the controller will stop the compressors in this suction group.
Adaptive suction control	(List box) **None**: No adaptive suction control. **AK2-SC 255**: Target pressure is adjusted based on discharge temperature of a single fixture. **AKC 16x**: Adaptive control of individual evaporators by an AKC 164 or AKC 161 Smart Case Controller. **Sensor**: Target pressure is adjusted based on any sensor on the AKC 55 I/O network **Dynamic**: The SC 255 analyzes the performance of every case on each individual circuit, and adjusts target pressure intelligently by using the case sensor that varies most from the setpoint.
Bd-Pt	(For the first group, to the left of the hyphen, 01 to 99; for the second group, to the right of the hyphen, 1 to 8). The board and point address of the fixture sensor used by the adaptive control algorithm. (Does not appear when dynamic adaptive control is selected.) Note that board and point numbers use a different format with AK2 modules. See the AK2 I/O user manual for more information.
Temp target	(-50.0 to 100.0) The temperature that the adaptive control algorithm will seek to maintain in the fixture. (Does not appear when dynamic adaptive control is selected.)
Range +/-	(0.0 to 100.0) The dead band around the temperature target. As long as the fixture temperature remains in this range, the suction pressure target will not be modified. (Does not appear when dynamic adaptive control is selected.)
Maximum pressure float	(0 to 99.9) The number of psig that the adaptive algorithm will be allowed to cumulatively add or subtract from the suction pressure target.
Post defrost delay	(0 to 60) The number of minutes after termination of defrost during which there will be no target adjustment. (Does not appear when **Sensor** is selected as the type of adaptive control.)
Allow float below target	(List box: Yes, No) Determines whether or not the adaptive algorithm will be allowed to adjust suction pressure below the target if fixture temperature is above target temperature + range.
Night setback	(List box: Yes, No) Determines whether or not suction pressure will be offset according to a schedule to be specified in the following lines.
Setback from time	(Time field) The start time for night setback.
Setback to time	(Time field) The ending time for night setback.
Setback days	(Days selection field) The days on which night setback will be effective.

Setback holidays (Holidays selection field) The holiday numbers on which night setback will occur. Holiday numbers are defined in Store Info configuration.

At the bottom right of the Suction Info screen are the words **"PG DN" for more**. Use the controller's PG DN key to reach the next screen; shown at left is the default screen in which not all the questions and fields appear; the screen on the right shows all the fields.
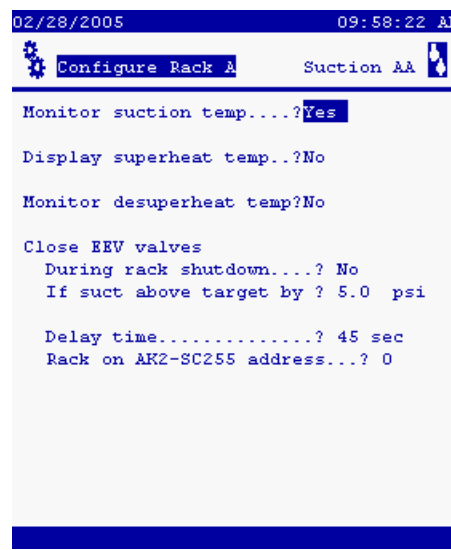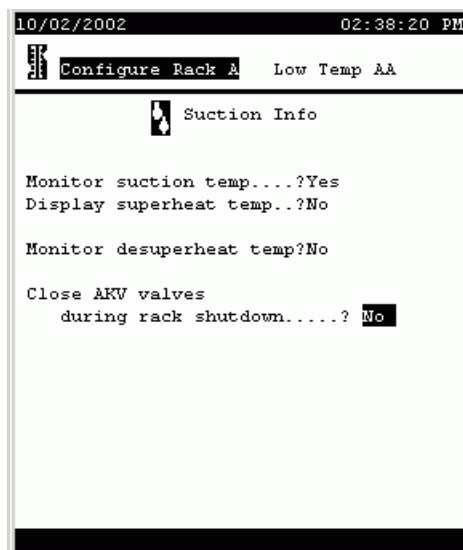
The fields and their contents are as follows:

Monitor suction temp (List box: Yes, No)
Display superheat temp (List box: Yes, No)
Monitor desuperheat temp (List box: Yes, No)
Close EEV valves during
   rack shutdown (List box: Yes, No)
If suct above target by (0 to 999.9) Number of psig above target when AKV valves will be closed during rack shutdown.
Delay time (0 to 45) Number of seconds after suction pressure reaches target + the number specified in the preceding field that AKV valves will be closed.
Rack on AK2-SC 255 address
   (0 to 15) The address of the SC 255 controlling the rack that serves these EEVs.

Press EXIT to return to the Configure Rack Menu and continue refrigeration configuration.

Configuring
two-stage systems

and de-superheaters If (and only if) a rack is configured as a two-stage system, the suction configuration for each suction group will include a special page for the low side. The screen looks like this:

The fields and their contents are as follows:

Is this 2-stage low side	(List box: Yes, No) Is this the low side of the two?
Low side shutdown:	
Shutdown on hi suct PSI	(List box: Yes, No) Whether or not to shut down the low side compressors when high side reaches a specified suction pressure.
High side suct. PSI	(-99.0 to 200.0) The high side suction pressure at which the low side will be shut down.
Control desuperheater	(List box: Yes, No) Whether or not de-superheater control is implemented on this rack.
Controlling sensor	(List box:)
	Desuper In AA: Control is based on a sensor monitoring the liquid in temperature at the de-superheater.
	Desuper Out AA: Control is based on a sensor monitoring the liquid out temperature at the de-superheater.
	Suction Temp AA: Control is based on a sensor monitoring suction temperature.
Desuperheating temp	(-50.0 to 200.0)
Range +/-	(1.0 TO 10.0)

Configuring
compressors

To begin configuring compressors, select **Compressors** from the Configure Rack menu. The first page of the screen looks like this:

```
10/02/2002                    03:30:09 PM

▐█ Configure Rack A   Low Temp AA

          █ Compressors

No. of compressors......?█
Compressor type.........?Reciprocating
Proof type..............?Bitzer
Reset Bitzer with RO....?No
Compressor 1 size.......? 20.0
No. of unloaders........?4
Unloader capacity %:
#1: 20   #2: 20   #3: 20   #4: 20

Inverter control........?VO
Inverter min. speed.....? 50.0
Inverter max speed......?100.0
RPM at max speed........?1000
Inverter max resets.....? 3
Inverter proof delay....?10 sec
Min time between resets.?30 sec
                        "PG DN" for more
```

The fields and their contents are as follows:

No. of compressors	(0 to 9)
Proof type	(List box:) The means by which proof of compressor operation is monitored. **None**: No proof **OI**: A digital input (on-off input) is used for proof. **CT**: A current transformer is used for proof. **Bitzer**: Proof is obtained from a Bitzer electronic module.
Reset Bitzer with RO	(List box: Yes, No) Whether or not Bitzer compressors are reset by a digital output (relay output).
Compressor size	(1 to 500) The capacity of the compressor.
No. of unloaders	(0 to 4) The number of compressor unloader stages.
Unloader capacity %	(1 field per unloader: 0-99) The percent of capacity shed by the respective unloader.
Inverter control	(List box:) Type of variable speed control. **None**: No inverter control **VO**: An inverter is controlled by an analog output (variable output). **VLT**: A Danfoss VLT adjustable frequency drive is used.
Inverter min. speed	(1.0 to 150.0) The minimum percentage of rated speed at which the inverter will run the compressor.
Inverter max speed	(1.0 to 150.0) The maximum percentage of rated speed at which the inverter will run the compressor.
RPM at max speed	(1 to 9999) The RPM that will be displayed at maximum percentage.
Inverter max resets	(0 to 10) The number of resets after which the inverter will be put in override.
Inverter proof delay	(0-99) The number of seconds without proof that must elapse before an inverter reset occurs.
Min time between resets	(0 to 99) The number of seconds that must elapse before second and subsequent inverter resets.

Configuring other
compressors in the
suction group

Paging down, you will find a page for each compressor in the suction group. These
subsequent screens will have only questions pertaining to the individual compressors,
not the rack questions found at the top of the screen for compressor number one.

Compressor oil and
safety information

After basic operating data has been entered for all compressors, paging down will
produce this screen:

```
10/02/2002                03:31:23 PM
▐▌ Configure Rack A    Low Temp AA

              ▐▌ Compressors

Oil control.............?Yes
Type of oil monitor.....?Sensor Input
Lockout comp on oil fail?Yes
Low oil pressure diff...? 5.0psi
Oil pressure delay......?60  sec
No of oil reset attempts? 3
Min time between resets.? 5  min
Monitor comp disch temp.?Yes
Stop comps on high temp.?Yes
 Cutout: 240.0°F  Cutin : 230.0°F
Stop comps on low temp..?Yes
 Lockout:90 min  below  40.0°F for 1min
Disch pressure safety...?Yes
 Cutout: 325.0psi Cutin : 275.0psi
Unload before cutout....?Yes
```

The fields and their contents are as follows:

Oil control   (List box: Yes, No) Whether or not oil control is
                             implemented.

Type of oil monitor   (List box:)
                             Sensor Input: An analog input (sensor input) is used
                             to monitor oil pressure.
                             On/Off: A digital input (on-off input) is used to monitor
                             an oil pressure switch.
                             Copeland: A Copeland oil monitor is used.

Lockout comp on oil fail (List box: Yes, No) Whether or not compressors will
                             be locked out when an oil failure is detected.

Low oil pressure diff   (0 to 50) The oil pressure differential, when an analog
                             sensor input is used, that will cause compressor
                             shutdown.

Oil pressure delay   (0 to 255) When an analog sensor is used, the number
                             of seconds after oil failure is detected before compres-
                             sors are reset.

No of oil reset attempts (0 to 10) After oil failure is detected, the number of
                             reset attempts before compressors are locked out.

Min time between resets (0 to 60) After a reset (whether successful or not) the
                             number of minutes that must elapse before another
                             reset attempt.

Monitor comp disch temp (List box: Yes, No) Whether or not compressor
                             discharge temperature is monitored.

Stop comps on high temp	(List box: Yes, No) Whether or not compressors are to be shut down on high discharge temperature.
Cutout	(0.0 to 300.0) The discharge temperature at which compressors are to be cut out.
Cutin	(0.0 to 300.0) After a cut-out on high discharge temperature, the discharge temperature at which compressors are to be cut in.
Stop comps on low temp	(List box: Yes, No) Whether or not comrpessors are to be cut out on low discharge temperature.
Lockout	(0 to 255) The number of minutes that must elapse before a lockout on low discharge temperature. (See note on next field).
below	(0 to 300) The temperature that discharge must be below for the time specified in the preceding field before lockout on low discharge temperature occurs. *Note: If discharge temperature rises above the setpoint, the time for lockout will restart from zero.*
Disch pressure safety	(List box: Yes, No) Whether or not comrpessors are to be cut out on high discharge pressure.
Cutout	(0.0 to 500.0) The discharge pressure at which compressors are to be cut out.
Cutin	(0.0 to 500.0) After a cut-out on high discharge pressure, the discharge pressure at which compressors are to be cut in.
Unload before cutout	(List box: Yes, No) Whether or not comrpessors are to be unloaded before being cut out.

Neutral Zone
control

The next page of compressor configuration deals with neutral zone control. Basically, neutral zone control acts to bring the current pressure toward target pressure more quickly the greater the difference between the two. The screen looks like this:
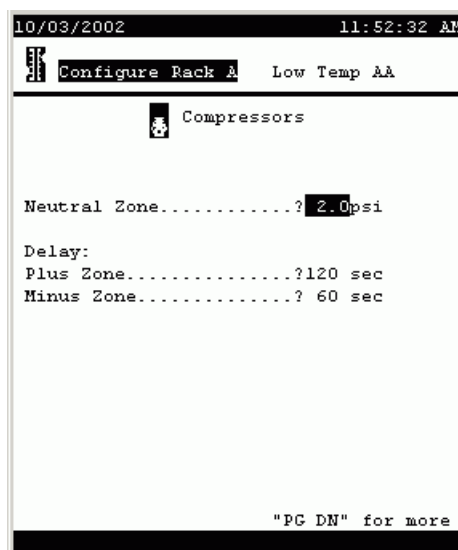
The default settings are as shown in the screen above. It is recommended that the values not be changed without a thorough understanding of the algorithm. A thorough explanation of neutral zone control is available as an appendix to this manual.

Compressor capacity
staging patterns

Paging down from the neutral zone screen reveals the compressor staging pattern screen:
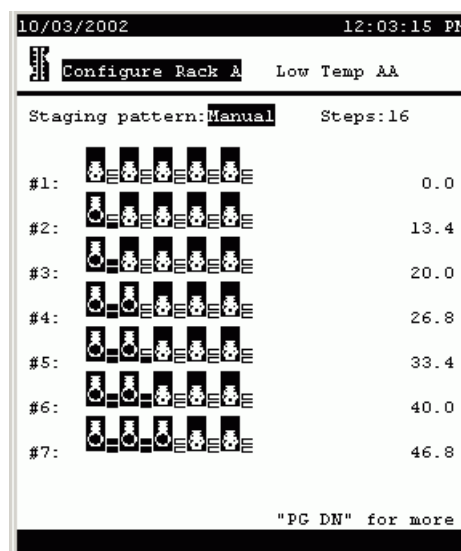
In the default screen, the staging pattern is **Auto**, for automatic staging, and there is no selection for **Steps**. The controller will stage rack capacity in the smallest steps possible from lowest total capacity to highest, automatically selecting the compressors combination to run for each stage (based on the the configured compressor capacities available on the rack).

When there are a large number of steps, manual staging can be used to eliminate needlessly small steps and compressor cycling.

To use manual staging, select Manual from the pattern list box, then specify the number of steps you want. The display that results will show a row compressor icons for each stage. A compressor's unloaders are represented by the small rectangles to the right of the compressor icon.

In the sample screen, compressors are all 20 HP and each has 2 unloaders. Each unloader is 33% of compressor capacity. These settings were determined on the configuration page for each compressor.

Stage #1 is fixed at zero capacity and cannot be changed.

To change stage #2 or any higher stage, move the cursor to a compressor icon and press enter. You will notice that the "piston" in the icon moves. When it is up, the compressor is on. If there are unloaders on a compressor, subsequent clicks on the compressor icon will turn the unloader steps on, one at a time. The small rectangles will change color to indicate that the step is on. When all steps are on for a compressor, the next click on the icon will turn everything off.

As you change a stage's capacity, the number in the right column of the screen will

change for that stage, giving the total horsepower you have selected for that stage. You can change the number of steps at any time.

Configuring
evaporators

To begin configuration of evaporators, return to the Configure Rack menu and select **Evaporators**. Or, from the Main Menu (which you can always reach with the MENU key) select Configuration, Refrigeration, the particular rack, and Evaporators. The evaporator menu will initially look like as on the left below, with no evaporators listed, but as soon as you enter a number in answer to the top question, and select from the **Type** list box for some of the evaporators, the screen will look something like the one at right:

There are six kinds of evaporator control shown. In this manual, we will discuss the configuration of SC 255 circuits and AKC 16x circuits. For the other types of evaporators, please see the manuals on the individual controllers. In the future, when a Danfoss Case Control manual is created, we will remove the AKC 16x material from this manual.

First, the changeable fields in the Evaporator Menu (shown above on the right) are as follows:

Number of circuits	(1 to 40) The number of circuits in the suction group.
Dewpoint method	(List box:)
	Dewpoint: A dewpoint sensor or sensors will be used for anti-sweat control.
	Calc Dewpoint: Dewpoint for anti-sweat control will be calculated using the values of relative humidity and temperature sensors.
Dewpoint sensor to use	[If **Dewpoint** has been selected](List box:) How anti-sweat control dewpoint will be determined if a dewpoint sensor is used.
	Min Dewpoint: The lowest-reading of a number of dewpoint sensors will be used.
	Max Dewpoint: The highest-reading of a number of

dewpoint sensors will be used.

Average: The average of a number of dewpoint sensors will be used.

Dewpoint 1: A single dewpoint sensor will be used for control.

[others]: Other dewpoint sensors, if they exist, will be listed also.

Humidity sensor to use:	[If Calc Dewpoint has been selected](List box:) How dewpoint will be determined if a humidity sensor is used.

Min Humidity: The lowest-reading of a number of humidity sensors will be used.

Max Humidity: The highest-reading of a number of humidity sensors will be used.

Average: The average of a number of humidity sensors will be used.

Inside RH 1: A single humidity sensor will be used for control.

[others]: Other humidity sensors, if they exist, will be listed also.

Auto defrost schedules	(List box: Disabled, Enabled) Enabling this option will cause the controller to suggest a defrost schedule based on the following two additional questions.
Maximum concurrent electric defrosts	[Appears only if **Auto defrost schedules** is enabled] (0 to 20) The number of electric defrosts that can be underway concurrently.
Include dripdown time	[Appears only if **Auto defrost schedules** is enabled] (List box: Yes, No) Answering "Yes" will cause a drip down period to follow defrost before refrigeration is allowed. The length of the drip down period will be that specified by the user when defrost schedules are auto-configured.
Type	(List box:) [for each individual evaporator] the type of evaporator control.

AK2-SC 255/SUBC: A subcooler controlled as an SC 255 circuit.

AK2-SC 255: The circuit is controlled by the SC 255's algorithms.

AKC 16x: Control is at the fixture by AKC 161 or AKC 164 Smart Case Controllers.

EKC: Control is at the fixture by EKC 201 controllers.

Deg Master: Control is at the fixture by Hill/PHOE-NIX Degree Master controllers.

DCU: Control is at the fixture by DCU case controllers.

Case lights button	In the lower left corner of the screen body is a button, CASE LIGHTS. Selecting this button and pressing ENTER will open the configuration screen for a case lights

override switch. The screen at left below appears (with the list box closed) when the CASE LIGHTS button is activated. The fields on the screen and their meanings are as follows:

Type of override switch   (List box)
> **Disabled**: There is no override switch configured.
> **On/Off**: A two-position override switch allows the lights to be switched on or off.
> **On/Auto**: Choices are ON or automatic operation.
> **Off/Auto:** Choices are OFF or automatic operation.
> **On/Auto/Off:** All three choices are available with a three position switch being installed.
>
> Depending upon configuration and the equipment present, dewpoint for anti-sweat control can be read from a dewpoint sensor, or it can be calculated using the values of relative humidity and temperature sensors.

Configuring AK2-SC 255
subcooling circuits   When subcooler valves are controlled directly by the SC 255 (that is, when an AKC

165 Subcooling Controller is not used) configuration begins by selecting AK2-SC 255/ SUBC in the **Type** column for the circuit on the Evaporator Menu, then moving the cursor to the word **Setup** for that evaporator and pressing ENTER. A screen like the one at left below will appear. The same screen with all its fields revealed appears as at right.

```
05/30/2003              04:07:55 PM
░ Configure Rack A   Low Temp AA

         ▦ Evaporators

Number of valves........?█

Stage 1:
Cutin setpoint..........?50.0 °F
Cutout setpoint.........?45.0 °F




Minimum ON time.........?  0 min
Minimum OFF time........?  0 min
```

```
05/30/2003     Alarm!   04:21:56 PM
░ Configure Rack A   Low Temp AA

         ▦ Evaporators

Number of valves........?█
Number of stages........?3
Stage 1:
Cutin setpoint..........?120.0°F
Cutout setpoint.........?110.0°F
Stage 2:
Cutin setpoint..........?50.0 °F
Cutout setpoint.........?45.0 °F
Stage 3:
Cutin setpoint..........?50.0 °F
Cutout setpoint.........?45.0 °F

Minimum ON time.........?222 min
Minimum OFF time........?255 min
```

The fields are as follows:

Number of valves	(0 to 2) The number of valves used for subcooling.
Number of stages	(1 to 3) With one valve, there can be only 1 stage of subcooling. With two valves, there can be two stages (one valve open or two). If there are two valves feeding subcoolers of different capacities, then there can be three stages (only valve 1 open, only valve 2 open, or both valves open).
Cutin setpoint	(0.0 to 120.0, each stage has a separate setpoint) The temperature at which the subcooling stage will become active. Temperature is measured by a sensor at the liquid outlet of the subcooler.
Cutout setpoint:	(0.0 to 110.0, each stage has a separate setpoint) The temperature at which the subcooling stage will shut down.
Minimum ON time	(0 to 255) The minimum time in minutes each stage must remain active after being cut in.
Minimum OFF time	(0 to 255) The minimum time in minutes each stage must remain off after being cut out.

Configuring
AK2-SC 255
refrigeration circuits

If there is not a distributed controller at the fixture (AKC 161, AKC 164, Degree Master, or DCU), refrigeration can be controlled directly by the AK2-SC 255. Configuration of such circuits starts by selecting **AK2-SC 255** in the **Type** column for the circuit on the Evaporator menu, then moving the cursor to the word **Setup** for that evaporator and pressing ENTER. A screen like the one at left below will appear. The

same screen with all its fields revealed appears as at right.

```
10/04/2002              03:41:57 PM
▓ Configure Rack A   Low Temp AA

        ▓ Evaporators

Fixture Type............?Box
Fixture Name............?User Def.
Enter user defined name.?Circuit
Monitor box door........?No

No case/box sensors.....? 1
Temperature control.....?Yes

  Target:    35.0°F +/- 2.0°F
Type of defrost.........?None




              "PG DN" for more
```

```
10/07/2002              09:47:41 AM
▓ Configure Rack A   Low Temp AA

        ▓ Evaporators

Fixture Type............?Box
Fixture Name............?User Def.
Enter user defined name.?Circuit
Monitor box door........?Yes
Shutdown when door open.?No
No case/box sensors.....? 2
Temperature control.....?Yes
Controlling sensor......?Min Temp
  Target:    35.0°F +/- 2.0°F
Type of defrost.........?Electric
Drip down delay.........?  60 sec
Termination type........?Defrost sensor
Termination temp........?   0.0°F
Term.relay for each case?Yes
Term.input for each case?Yes

              "PG DN" for more
```

The fields are as follows:

Fixture Type — (List box) Various types of fixture can be selected: box, multi-deck, single deck, service, etc.

Fixture Name — (List box) There is a large selection of common fixture names for each of the fixture types that can be selected above, and there is a selection **User Def.** After making that selection, you will be able to spell out your own name on the following line.

Enter user defined name — (Label) The name of a user-defined fixture. Any of the characters in the AK2-SC 255 character set can be used, including upper and lower case letters and symbols.

Monitor box door — (List box: Yes, No) Whether or not a box door switch will be monitored (appears for boxes only).

Shutdown when door open — (List box: Yes, No) Whether or not to shut down refrigeration when the box door is open.

No case/box sensors — (0 to 15) The number of sensors in this fixture or circuit.

Temperature control — (List box: Yes, No) Whether or not temperature contol will be used.

Controlling sensor — (List box:)
Min Temp The lowest of the sensors in the fixture or on the circuit will be used for temperature control.
Max Temp The highest of the sensors in the fixture or on the circuit will be used for temperature control.
Average The average of all the sensors in the fixture or on the circuit will be used for temperature control.
[circuit names] The name of each sensor will be listed, and any can be selected. That sensor, then, will be used for temperature control.

Target: — (-99.0 to 150.0 [target] 1.0 to 20.0 [range] The target

temperature and the range about the target, used in temperature control. The range is the amount above or below target that the actual sensor temperature is allowed to change before a control action is taken.

Type of defrost (List box) Various types of defrost can be chosen: **None**, **Hot Gas**, **Time Off**, **Air**, or **Electric**.

Drip down delay (1 to 600) The number of seconds that refrigeration will remain off after termination of defrost.

Termination type *[Defrost time settings made on the pages that follow must also be considered. If a minimum defrost time is used, that time must elapse regardless of the settings made on this page. If a defrost duration is specified, either that time must elapse OR the requirements set on this page must be satisfied for defrost to terminate.]*

(List box) Various termination strategies are listed.
Defrost sensor There is a dedicated defrost temperature sensor that will be used to terminate defrost.
Disch air snsr The fixture discharge air sensor will be used to terminate defrost at a set temperature.
On/Off Input An electrical switch (such as a Klixon® is wired to a digital input (on-off input) and will be used to terminate defrost.
None: Defrost is terminated strictly on time.
Hot gas return: Hot gas defrost is terminated when a return air sensor reaches a setpoint.

Termination temp (-99.0 to 200.0) The defrost temperature sensor value at which defrost will terminate.

Term.relay for each case (List box: Yes, No) Whether or not there is a termination relay for each case.

Term.relay for each case (List box: Yes, No) Whether or not there is a termination input each case.

Paging down produces the next page:

```
10/07/2002                    01:00:16 PM

 ▓ Configure Rack A    Low Temp AA

            ▓ Evaporators

Use min defrost time....?Yes
Minimum defrost time....?30
Antisweat control.......?Yes
ON when dewpoint above..? 40.0"F
Cycle above dewpoint....? 30.0"F
Antisweat cycle time....? 20 min
Fan control.............?Yes
Fans on during defrost..?Yes
Stop fan on high temp...?Yes
Fan stop temp...........? 50.0"F
Fan delay control.......?Yes
Start fan on time.......?Yes
Delay time.............. 15 min

Monitor door position...?Yes

                    "PG DN" for more
```

[Defrost time settings made on this and the following pages work with the termination settings on the preceding page. If a minimum defrost time is used, that time must elapse AND the settings for defrost termination temperature or switch must be satisfied. If a defrost duration is specified, either that time must elapse OR the requirements set on this page must be satisfied for defrost to terminate.]

The fields are as follows:

Use min defrost time   (List box: Yes, No) Whether or not minimum defrost time will be used.

Minimum defrost time   (1 to 180) The number of minutes defrost must be on before termination.

Antisweat control   (List box: Yes, No) Whether or not anti-sweat heaters will be controlled by the AK2-SC 255. When you configure an evaporator and answer Yes to the anti-sweat control question, a relay output is created which is then wired to a relay controlling the anti-sweat heaters. The name of the relay output will be "Antisweat" + the name of the evaporator or circuit, then the rack, suction group, and circuit number (for example, Produce AA3).

ON when dewpoint above   (0.0 to 100.0) The dewpoint above which anti-sweat heaters will be on constantly.

Cycle above dewpoint   (0.0 to 100.0) The dewpoint above which anti-sweat heaters will be cycled. Cycling will occur unless the dewpoint rises above the setpoint.specified in the previous line.

Antisweat cycle time   (2 to 999) The time interval on which anti-sweat cycling is based.

Fan control   (List box: Yes, No) Answer **Yes** if fans are to be controlled during and after defrost. If you answer **No**, fans will run continuously during both refrigeration and defrost.

Fans on during defrost   (List box: Yes, No) The answer determines whether or not fans will run during defrost.

Stop fan on high temp   (List box: Yes, No) Whether or not fans are to be stopped when temperature rises above a setpoint to be specified in the next line.

Fan stop temp   (-58.0 to 99.9) The temperature at which fans will be stopped.

Fan delay control   (List box: Yes, No) A **Yes** answer will cause fans to remain off after defrost termination for a specified period of time or until a specified temperature is reached. The time or temperature is determined by the next two questions.

Start fan on time   (List box: Yes, No) The answer determines whether or not fan delay ends after a specified time.

Delay time   (0 to 20) The number of minutes before fans start after defrost terminates.

Fan starting temp	(-58.0 to 99.9) The temperature at which fans will be started after fan delay, if fans are not started on time.
Monitor door position	(List box: Yes, No) Whether or not an alalog sensor input is created to monitor the position of the door. This sensor reads in percent and will be seen on the status screen for the circuit. An alarm can be based on it.

Configuring Defrost Defrost configuration begins on the next setup page for an evaporator circuit.

```
10/07/2002              01:02:39 PM
▓ Configure Rack A   Low Temp AA

         ▦ Evaporators

No of defrosts per day..?12
Defrost duration........? 30 min
Defrost start time:
#1: 12:00 AM #2: 12:00 AM #3: 12:00 AM
#4: 12:00 AM #5: 12:00 AM #6: 12:00 AM
#7: 12:00 AM #8: 12:00 AM #9: 12:00 AM
#10:12:00 AM #11:12:00 AM #12:12:00 AM
Allow defrost skip......?Yes
Min time between defrost?  1 hours
Override on dewpoint....?Yes
Don't skip when DP above? 50.0°F
Dual Temp control.......?Yes
 Alt target: 35.0°F  Range: 2.0°F
Dual Temp relay needed..?Yes
Num of shutdn schedules.?0
Generate shutdown OI....?Yes
                   "PG DN" for more
```

The fields are as follows:

No of defrosts per day	(0 to 12) The number of defrosts each day.
Defrost duration	(1 to 180) The number of minutes after which defrost will terminate, if termination has not occurred on a setting configured in the previous screen. Often called "fail-safe" defrost time.
Defrost start time	(time of day; one field for each of the number of defrosts configured in the first line of the screen) The time each defrost will initiate.
Allow defrost skip	(List box: Yes, No) When Yes is selected, The SC 255 has the ability to determine, based on analysis of current and accumulated data, to determine if each defrost is needed. When a defrost is not needed, it is not initiated, thus reducing energy cost and enhancing product life.
Min time between defrost	(1 to 255) Minimum number of hours between defrosts.
Override on dewpoint	(List box: Yes, No) Whether or not to override defrost skipping on a dewpoint setting (next question).
Don't skip when DP above	(1.0 to 3276.0) Defrost will occur regardless of skipping calculations whenever dewpoint is above this setting.

Dual Temp control	(List box: Yes, No) A **Yes** answer allows the circuit to be used in two temperature ranges and creates a digital input for changeover of temperature range.
Alt target, Range	(-50.0 to 150.0, 1.0 to 20.0) The second temperature and range for a dual temperature evaporator.
Dual Temp relay needed	(List box: Yes, No)
Alt target, Range	(-50.0 to 150.0, 1.0 to 20.0) The second temperature and range for a dual temperature evaporator.
Num of shutdn schedules	(0 to 8) The number of shutdown schedules that will be entered on the page(s) immediately following this one.
Generate shutdown OI	(List box: Yes, No) Whether or not a digital input (on-off input) will be configured by which refrigeration can be shut down for cleaning or other service.

Shutdown schedules   Paging down, we reach the shutdown page(s):


```
10/07/2002                 03:40:33 PM

  Configure Rack A   Low Temp AA

           Evaporators

          Shutdown Schedules


Sched 1 time on.........? 12:00 AM
Sched 1 time off........? 12:00 AM
Sched 1 days............?
Sched 1 holidays........? 12345678

Sched 2 time on.........? 12:00 AM
Sched 2 time off........? 12:00 AM
Sched 2 days............?
Sched 2 holidays........? 12345678



                   "PG DN" for more
```

There are two schedules per page. Each schedule has a field for time on, time off, days (of the week) and holidays. **AM** and **PM** are entered by selecting the first character, using the +/- key to toggle the arrow keys to edit mode, then using the up or down arrow to change the character to **A** or **P** as needed. The same means is used to select the days of the week (once the cursor is placed in the space to the right of the question) and holidays.

Holidays are given dates when Store Info is configured.

Configuring
evaporator alarms   Evaporator alarms are configured on the last page for each evaporator. The right illustration shows the screen when it is opened for the first time. The right illustration shows the screen with all of its fields revealed. Additional information will be found in section (Chapter 4-5) on alarms.

Each alarm has three fields:

[Alarm level]   (List box)

Disabled: The alarm is deactivated, but any settings remain in memory, so that they will be at hand when the alarm is reactivated.

Log only: When the alarm occurs, the fact will be recorded in memory, but the alarm will not be communicated beyond the SC 255 (over telephone line or network).

Normal: When the alarm occurs, it will be communicated beyond the SC 255 one time over telephone line or network, to the locations specified in the alarm routing screen.

Critical: When the alarm occurs, it will be communicated beyond the SC 255 multiple times to each destination defined in the alarm routing screen at the interval set in the alarm routing screen (from 10 to 99 minutes; the default is every 10 minutes).

<Delete>: The alarm settings will no longer appear on the screen.

[Trip value]   (for temperatures, -999.9 to 999.9; for %, 0 to 999.9) The level at which the alarm timer begins. As long as the value remains beyond the alarm limit, the timer will continue to accumulate. Whenever the value falls within the alarm limit, the timer will be reset to zero.

[Trip time]   (0 to 999) The number of minutes that must expire (with the alarm value beyond the trip value) before an alarm occurs. Whenever the value falls within the alarm limit, the timer will be reset to zero.

Configuring condensers

Note: The contents of the second page of the condenser configuration screen will depend on what type of condenser control is chosen on the first page.

Condensers are configured by selecting **Condensers** on the Configure Rack menu, and can be either air-cooled or evaporative; the two types have very different screens. At top center below is shown the condenser screen when you first open it, and at lower left is shown the same screen after **Air Cooled** has been selected as the type, and before changes; finally, at lower right below is shown the configuration screen for air-cooled condensers when **Sat Cond Temp** is selected as the **Control sensor**. The change to saturated condensing temperature control strategy causes several of the following questions to be replaced by new questions. Not all the fields discussed in the following explanation occur on the screen at one time.

```
10/08/2002                02:57:49 PM
  Configure Rack A

              Condensers

Condenser type..........?None
```

```
10/08/2002           03:34:24 PM
  Configure Rack A

           Condensers

Condenser type..........?Air Cooled
Number of fans..........? 6
Fan staging.............?Individual
Monitor stages..........?Individual

Control sensor..........?Pressure
Monitor dropleg temp....?Yes
Control method..........?Target
Target control type.....?Ramp together
Ramp stages if ambient <   0.0°F +/-1.0




Target..................? 150.0psi

                    "PG DN" for more
```

```
10/11/2002           10:52:12 AM
  Configure Rack A

           Condensers

Condenser type..........?Air Cooled
Number of fans..........? 6
Fan staging.............?Individual
Monitor stages..........?Individual

Control sensor..........?Sat Cond Temp
Monitor dropleg temp....?Yes

Target control type.....?Ramp together
Ramp stages if ambient <   0.0°F +/-1.0
Min sat. cond temp......?  60.0°F
Max sat. cond temp......? 117.0°F
Condenser Delta T.......?  15.0°F


Heat reclaim offset.....?Yes    20.0psi
                    "PG DN" for more
```

Aircooled condensers — There are five configuration pages for aircooled condensers. In the first page are the following fields (refer to the illustration at right, above):

Condenser type — (List box:) This section deals with condenser configuration when the selection **Air Cooled** is made in this field.

	None: There is to be no condenser control by the SC 255.
	Evaporative: There are evaporative condensers that are controlled by the AKC 55. Discussed in the next section of the manual..
	Air Cooled: The AKC 55 is controlling air-cooled condensers. The remainder of this section (this screen and the next four) pertains to this selection.
Fan type	**(List box)**
	Single Fan: The condenser has a single fan.
	Multi. Fan: The condenser has multiple fans.
	2-Speed: The condenser has a single 2-speed fan.
Number of fans	(0 to 12) The number of condenser fans.
Fan staging	(List box:)
	Individual: Fans will be turned on and off individually to create a number of stages equal to the number of fans.
	Paired: Fans will be turned on and off in pairs to create a number of stages equal to half the number of fans.
Monitor stages	(List box:)
	Individual: Fans will be monitored individually with a digital input (on-off input) created for each fan.
	Paired: Fans will be monitored in pairs with a digital input created for each pair.
Control sensor	(List box)
	Pressure: A pressure sensor will be used to control the condenser fans. An analog input (sensor input) will be created for the sensor.
	Dropleg Temp: A temperature sensor placed on the dropleg will be used to control the condenser fans. An analog input (sensor input) will be created for the sensor.
	Sat Cond Temp: Control will be based on saturated condensing temperature as computed from a pressure sensor on the discharge header or drop leg. An analog input (sensor input) was automatically created for the suction group.
	Avg Cond Temp: This option is provided to allow for the control of a condenser that is being fed from multiple racks controlled by the same AK2-SC 255. Either dedicated pressure and temperature sensors can be installed and configured, or clones of existing discharge pressure sensors can be created in Miscella-neous Calculations, and the clones used for average condensing temperature control.
	Number of sensors: (0 to 8) [appears only if **Avg Cond Temp** is selected] The number of temperature sensors being averaged.
	Monitor dropleg temp (List box: Yes, No) Whether the drop leg temperature will be monitored. A

Control method	Yes answer here will create an analog input (sensor input) for the drop leg temperature sensor. (Appears only if control is not by dropleg temperature.) (List box:) **Target**: The condenser fans will be controlled to maintain a target pressure, dropleg temperature, or saturated condensing temperature, depending on which strategy is selected by the answer to the **Control sensor** question above. **Cutin Cutout**: The condenser will be controlled by cut-in and cut-out based on target pressure, dropleg temperature, or saturated condensing temperature, depending on which strategy is selected by the answer to the **Control sensor** question above. If **Cutin Cutout** is selected, the next page will provide for selection of cut-in and cut-out setpoints. The page is not shown here, but is straightforward.
Target control type	*[Please read about all of the possible answers:]* (List box:) **Ramp together**: Where there is variable speed fan motor control, fans will come on in stages at minimum speed, then all will be ramped up together. **Ramp stages**: Where there is variable speed fan motor control, each stage will be brought on and ramped up. When a stage is at maximum speed and additional fan capacity is needed, the stage will be dropped to minimum speed and the next stage brought on at minimum speed, then ramped up as required. **Neutral Zone**: Danfoss Neutral Zone control will be used. This is a strategy that operates to move current value closer to target more rapidly the farther away the current value is from target. If you select **Neutral Zone** here, you will cause the next page answer on inverter control to change to **None**. That will in turn lock this selection to one between **Rate of change** and **Neutral Zone**, since those strategies apply to installations without variable speed fans. If you change equipment strategies, or select **Neutral Zone** in error, first change the **Target control type** here to **Rate of Change**, then go to the next page and change **Fan inverter control** to the appropriate variable speed control, either **VO** or **VLT**, to restore the variable speed choices here. **Rate of change**: An algorithm of an earlier generation that approximates PID control by causing slower capacity change as the current pressure approaches target, and larger changes when current pressure is more distant from target pressure.
Ramp stages if ambient	(-99.0 to 150.0, +/- 0.0 to 9.9) If Ramp together is selected, the strategy will change to ramp stages if the ambient temperature is less than this setpoint.

Min sat. cond temp	(0.0 to 200.0) The target minimum saturated condensing temperature that the controller will strive to maintain. Target is calculated by adding outside temperature and the condenser's design temperature differential.
Max sat. cond temp	(0.0 to 200.0) The target maximum saturated condensing temperature that the controller will strive to maintain. Target is calaculated by adding outside temperature and the condenser's design temperature differential.
Condenser Delta T	(0.0 to 25.0) The condenser delta-T furnished by the condenser manufacturer.
Target	(0.0 to 500.0 for pressure sensors; 0.0 to 200.0 for temperature sensors) The value that the control algorithm will seek to maintain with the selected strategy.

The next page has settings for high pressure bypass and for inverter control, if used. The page is reached by using PG DN.

The screen looks like this:
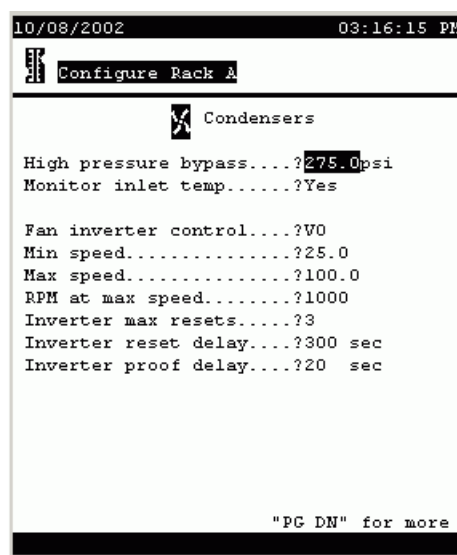
The field information is as follows:

High pressure bypass	(0.0 to 500.0) The pressure at and above which all fans will be run, and at full speed if variable speed motor control is used. (When high pressure bypass occurs, a service technician is required to clear the bypass by using the appropriate button in the status screen.)
Monitor inlet temp	(List box: Yes, No) Whether the condenser inlet temperature is to be monitored.
Fan inverter control	*[Please see notes on Neutral Zone selection in the section on the first condenser configuration screen.]* (List box:) **None**: No variable speed drive is controlled.

VO: An analog output, also known as a VO (variable output) point on a Danfoss I/O module will control the variable speed drive.

VLT: A Danfoss VLT or AKD variable frequency drive will be used for motor control. These devices are connected by means of a 2-wire TP-78 LonWorks card.

Min speed — (1.0 to 150.0) The minimum percentage of the maximum RPM that the fan motors will be run. Insure that the entries on this screen are within the manufacturer's specifications.

Max speed — (1.0 to 150.0) The maximum percentage of the maximum RPM that the fan motors will be run. Insure that the entries on this screen are within the manufacturer's specifications.

RPM at max speed — (1 to 6000) The RPM at the maximum percentage specified in the previous setting.

Inverter max resets — (10 to 10) The maximum number of inverter resets, after which a subsequent reset condition will place the inverter in override.

Inverter reset delay — (1 to 600) The number of seconds that must elapse between inverter reset attempts.

Inverter proof delay — (1 to 600) The number of seconds without proof before an inverter reset is attempted.

Split condenser control

Split condenser configuration is done on the next page of the Configure Condenser screens. When there is one valve and one split, the screen appears as at left below; when there are two or three valves, the screen at right appears (with the appropriate number of setpoints).

Split condenser — (List box: Yes, No) Whether the condenser is split.
Split based on — (List box:)

		Ambient: Control is based on ambient temperature.
	Control method	**Discharge**: Control is based on discharge pressure.
		(List box:)
		1valve/1split: A single valve, when closed, limits refrigerant flow to a part of the condenser, providing two stages (usually 50%-100%).
		2valve/2split: Two valves are used to provide three stages (usually 50%-75%-100%).
		2valve/3split: Two valves are used to provide four stages (usually 25%-50%-75%-100%).
		3valve/3split: Three valves are used to provide four stages (usually 25%-50%-75%-100%).
	Split when below	(0.0 to 100.0) (Only with single split valves) The temperature below which the condenser will be split.
	Split deadband	(0.0 to 25) (Only with single split valves) The deadband above the previous setpoint in which "unsplitting" cannot occur.
	Drop fans	(List box: Even, Odd) (Only with single split valves) Which fans are dropped when condenser is split.
	Split on heat reclaim:	(List box: Yes, No) (Only with single split valves) Whether or not condenser will be split when heat reclaim is on.
	Split pressure override	(List box: Yes, No) Whether or not split function will be overridden based on high discharge pressure.
	Cut in	(0.0 to 500.0) The pressure below which split condenser operation is allowed.
	Cutout	(0.0 to 500.0) The pressure above which split condenser operation is disallowed.

Reaction zone
and time

If control method is Target, the next page of condenser configuration has neutral zone control parameters for the PI control algorithm.

The fields are as follows:

[Informed adjustment of these settings is best done by Danfoss-trained technicians.]

Normal Reaction Zone (0.1 to 60.0) The range of pressure on either side of the target in which the condenser control algorithm reacts with normal sensitivity.

Plus Zone (10 to 900) The PI algorithm sensitivity when current control sensor value is above the normal reaction zone.

Minus Zone (10 to 900) (10 to 900) The PI algorithm sensitivity when current control sensor value is above the normal reaction zone.

Enviroguard systems   The next page is for setpoints that will be used with a Tyler Enviroguard® system:

The fields and contents are as follows:

Enviroguard	(List box: Yes, No) Whether or not an Enviroguard system is being used.
Subcooling target	(0.0 to 100.0) The desired number of degrees of subcooling.
Deadband	(0.0 to 100.0) The deadband above the target and below the target in which there will be no control actions.
Min sat. cond temp	(0.0 to 100.0) The saturated condensing temperatuare below which the system pressure regulator will be off.
Min subcooling temp	(-99.9 to 99.9) The subcooling temperature below which the system pressure regulator will be off.
Elevation (rack to cond)	(0 to 3000) The total drop distance from condenser to the rack.
Open SPR if discharge	(0.0 to 200.0) The pressure differential above target at which the system pressure regulator will open.
Bleed valve	(List box: Yes, No) Whether or not there is a bleed valve.
Delay after SPR	(0 to 10) The number of minutes that must elapse after the system pressure regulator is turned on before the bleed relay is energized.

Evaporative
condensers

Returning to the first page of condenser configuration (from the Main Menu: Configuration, Refrigeration, (select the rack), Condensers. Select Evaporative for the condenser type. The screen will appear as shown below.


```
10/08/2002                03:02:56 PM

    Configure Rack A

           Condensers

Condenser type..........?Evaporative
No of pumps.............?2
Daily rotation..........?Yes
Monitor stages..........?None
Control sensor..........?Pressure

Monitor dropleg temp....?Yes
Control method..........?Target
Target control type.....?Ramp stages




Target..................? 150.0psi


                        "PG DN" for more
```

The fields are as follows:

Condenser type	(List box:) This section deals with condenser configuration when the selection **Evaporative** is made in this field.
	None: There is to be no condenser control by the SC

255.

Evaporative: There are evaporative condensers that are controlled by the SC 255. The remainder of this section (this screen and the next four) pertain to this selection.

Air Cooled: The SC 255 is controlling air-cooled condensers. The configuration of air-cooled condensers is covered in the preceding section of this manual.

Number of pumps (0 to 2) The number of coolant pumps.

Daily rotation (List box: Yes, No) Whether or not pumps will rotate.

Monitor stages (List box:)

Individual: Fans will be monitored individually with a digital input (on-off input) created for each fan.

Paired: Fans will be monitored in pairs with a digital input created for each pair.

None: Fans will not be monitored.

Control sensor (List box)

Pressure: A pressure sensor will be used to control the condenser fans. An analog input (sensor input) will be created for the sensor.

Dropleg Temp: A temperature sensor on the drop leg will be used to control the condenser fans. An analog input (sensor input) will be created for the sensor.

Monitor dropleg temp (List box: Yes, No) (Appears if control is by pressure) Whether the drop leg temperature will be monitored. A Yes answer here will create an analog input (sensor input) for the drop leg temperature sensor.

Control method (List box:)

Target: The condenser fans will be controlled to maintain a target pressure or dropleg temperature, depending on which strategy is selected by the answer to the **Control sensor** question above.

Cutin Cutout: The condenser will be controlled by cut-in and cut-out based on target pressure or saturated condensing temperature, depending on which strategy is selected by the answer to the **Control sensor** question above. If **Cutin Cutout** is selected, the next page will provide for selection of cut-in and cut-out setpoints. The page is not shown here, but is straightforward.

Target control type *[Please read about all of the possible answers:]*
(List box:)

Ramp together: Where there is variable speed fan motor control, all fans will be brought on in stages at minimum speed, then ramped up in speed as a group.

Ramp stages: Where there is variable speed fan motor control, each stage will be brought on and ramped up to maximum speed. When additional capacity is required, fans will be reduced to minimum speed and an additional stage brought on, then all will be ramped up together, and so on.

Neutral Zone: Danfoss Neutral Zone control will be used. This is a strategy that operates to move current value closer to target more rapidly the farther away the current value is from target. If you select **Neutral Zone** here, you will cause answer on inverter control on the second page following to change to **None**. That will in turn lock this selection to one between **Rate of change** and **Neutral Zone**, since those strategies apply to installations without variable speed fans. If you change equipment strategies, or select **Neutral Zone** in error, first select **Rate of Change** here, then go to the second page following and change **Fan inverter control** to the appropriate variable speed control, either **VO** or **VLT**, to restore the variable speed choices here.

Rate of change: A control strategy that simulates PID control.

Ramp stages if ambient (-99.0 to 150.0, +/- 0.0 to 9.9) If the ambient temperature is below setpoint minus range, ramping will be by stages. When ambient reaches setpoint plus range, all fans will ramp together.

Target (0.0 to 500.0 for pressure sensors; 0.0 to 200.0 for temperature sensors) The value that the control algorithm will seek to maintain with the selected strategy.

Pump, louver, and sump settings

The next page has settings for pump, louver, and sump control:


```
10/08/2002                  03:05:16 PM
  ▓  Configure Rack A

          ▓  Condensers

Pump cutin...............?140.0psi
Pump cutout.............?120.0psi



Louver control enabled..?Yes
Louver cutin...........?115.0psi
Louver cutout..........?105.0psi
Enable sump control.....?Yes
Sump level empty........? 20.0%
Sump level full.........? 90.0%
Sump level top off......? 50.0%
Fill Valve..............?Yes

Monitor inlet temp......?Yes

                      "PG DN" for more
```

Pump cutin (0.0 to 500.0) The pressure at which the pump will be turned on.

Pump cutout (0.0 to 500.0) The pressure at which the pump will be turned off.

Louver control enabled	(List box: Yes, No) Whether or not louvers are to be controlled.	
Louver cutin	(0.0 to 500.0) The pressure at which louvers will be opened.	
Louver cutout	(0.0 to 500.0) The pressure at which louvers will be closed.	
Enable sump control	(List box: Yes, No) Whether or not the sump is controlled.	
Sump level empty	(0.0 to 100.0) The percentage of fill at which the sump is considered empty.	
Sump level full	(0.0 to 100.0) The percentage of fill at which the sump is considered full.	
Sump level top off	(0.0 to 100.0) (Requires fill valve control) The percentage of fill at which the fill valve will open and top off will begin.	
Fill valve	(List box: Yes, No) Whether or not the sump fill valve is controlled.	
Monitor inlet temp	(List box: Yes, No) Whether or not the inlet temperature is monitored.	

Inverter settings;
Freeze protection;
Dump valve

The next page deals with inverter settings, if the condenser fans are variable speed, and with freeze protection and dump valve operation.

```
10/10/2002                    11:35:36 AM

  Configure Rack C

           Condensers

Fan inverter control....?VO
Min Speed:150.0Max Speed:150.0
RPM at max speed........?6000
Max no. resets..........?10
Inverter reset delay....?600 sec
Inverter proof delay....?600 sec
High pressure bypass....?275.0psi
Freeze Protection.......?Yes
Freeze prot temp cutout.? 99.9°F
Freeze prot temp cutin..? 99.9°F
Dump Valve..............?Yes
Dump on schedule........?Yes
Num of dump schedules...?8
Dump on freeze protect..?No
Overide pump on frz prot?No
Water flow monitor......?No
                  "PG DN" for more
```

Fan inverter control   *[Please see notes on Neutral Zone selection in the first evaporative condenser configuration screen.]*
(List box:)
None: No variable speed drive is controlled.
VO: An analog output, also known as a VO (variable output) point on a Danfoss I/O module will control the variable speed drive.
VLT: A Danfoss VLT or AKD variable frequency drive will be used for motor control. These devices are

	connected by means of a 2-wire TP-78 LonWorks card.
Min speed	(1.0 to 150.0) The minimum percentage of the maximum RPM that the fan motors will be run. Insure that the entries on this screen are within the manufacturer's specifications.
Max speed	(1.0 to 150.0) The maximum percentage of the maximum RPM that the fan motors will be run. Insure that the entries on this screen are within the manufacturer's specifications.
RPM at max speed	(1 to 6000) The number of RPM at the maximum speed specified in the preceding setting.
Inverter max resets	(10 to 10) The maximum number of inverter resets, after which a subsequent reset condition will place the inverter in override.
Inverter reset delay	(1 to 600) The number of seconds that must elapse between inverter reset attempts.
Inverter proof delay	(1 to 600) The number of seconds without proof before an inverter reset is attempted.
High pressure bypass	(0.0 to 500.0) The pressure at and above which all fans will be run, and at full speed if variable speed motor control is used. (When high pressure bypass occurs, a service technician is required to clear the bypass by using the appropriate button in the status screen.)
Freeze Protection	(List box: Yes, No) Whether or not freeze protection control is implemented.
Freeze prot temp cutout	(-99.0 to 99.9) The outside ambient temperature at and below which evaporative cooling will be locked out.
Freeze prot temp cutin	(-99.0 to 99.9) The outside ambient temperature at and above which evaporative cooling will be allowed to run.
Dump Valve	(List box: Yes, No) Whether or not a dump valve is controlled.
Dump on schedule	(List box: Yes, No) Whether or not the dump valve will be controlled by a schedule to be entered on the following page(s).
Num of dump schedules	(1 to 8) The number of effective dump schedules to be entered on the following page(s).
Dump on freeze protect	(List box: Yes, No) Whether or not the dump valve will be activated at the freeze protect setpoint.
Overide pump on frz prot	(List box: Yes, No) When the pump is on because of high discharge pressure, whether or not to shut down the the pump at the freeze protect setpoint.
Water flow monitor	(List box: Yes, No) Whether or not there is a water flow monitor.

Dump schedules   The next page allows entry of the first four dump schedule. A subsequent page will be added if there are more than for schedules. Schedules have been explained in the

earlier section on evaporator (defrost) configuration. The screen is not shown here.

Receiver
configuration

To configure the receiver, return to the Configure Rack menu, put the cursor on **Receiver**, and press ENTER. The screen is as shown below.

```
10/10/2002                    01:05:57 PM
  ▐▌ Configure Rack A

            ▐▌  Receiver

Surge control...........?Yes
Cutin...................?65.0 °F
Cutout..................?70.0 °F
Liquid level sensor type?Sensor Input




```

Surge control	(List box: Yes, No) Whether or not surge control will be implemented.
Cutin	(0.0 to 100.0) The temperature at which the surge valve opens.
Cutout	(0.00 to 100.0) The temperature at which the surge valve closes.
Liquid level sensor type	(List box:)
	Sensor input: An analog sensor is used for liquid level.
	On/Off input: A digital sensor is used for liquid level.
	None: There is no liquid level sensor monitored.

Heat reclaim
configuration

To configure heat reclaim, return to the Configure Rack menu, put the cursor on **Heat Reclaim**, and press ENTER. The screen is as shown below.

```
10/10/2002                01:37:23 PM
▓ Configure Rack A

        ▓  Heat Reclaim

Heat reclaim............?Yes
Num of stages...........?2
Stage 1 type............?Water Ht
Cutin setpoint..........? 120.0°F
Cutout setpoint.........? 140.0°F
Stage 2 type............?Water Ht
Cutin setpoint..........? 120.0°F
Cutout setpoint.........? 140.0°F
Flush Cycle.............?Yes
Flush Cycle Start Time..?12:00 AM
Flush Cycle Duration....?10 min
Lockout on low head pres?Yes
Lockout Pressure........? 100.0psi
Lockout on liquid level.?Yes
Liquid level sensor type?Sensor Input
Liquid %................? 20.0
```

Heat reclaim	(List box: Yes, No) Whether or not heat reclaim is present and controlled.
Num of stages	(1 or 2) The number of stages of heat reclaim.
Stage 1 type	(List box:) **Water Ht**: The stage is used for heating water. **HVAC**: The stage heats HVAC supply air. **On/Off Input**: The stage is turned on or off by an on-off input from the the I/O network.
HVAC-Refrig link method	(list box) **Bd-Pt**: **Network**: `
Cutin setpoint	(-99.0 to 200.0) The tank water temperature at which the stage will be turned on.
Cutout setpoint	(-99.0 to 200.0) The tank water temperature at which the stage will be turned off.
Stage 2 type	*[The same choices as for* **Stage 1 type** *and setpoints are offered.]*
Flush Cycle	(List box: Yes, No) Whether or not there is to be a flush cycle.
Flush Cycle Start Time	(Time of day) The time at which the flush cycle will be initiated.
Flush Cycle Duration	(10 to 20) The number of minutes the flush cycle will run.
Lockout on low head pres	(List box: Yes, No) Whether or not heat reclaim will be locked out when head pressure is below a setpoint to be entered on the next line.
Lockout Pressure	(-99.0 to 500.0) The low head pressure at which heat reclaim will be locked out.
Lockout on liquid level	(List box: Yes, No) Whether or not heat reclaim will be locked out on low refrigerant level.
Liquid level sensor type	(List box:) **Sensor input**: An analog sensor is used for liquid level..

| | **On/Off input**: A digital sensor is used for liquid level.
None: There is no liquid level sensor monitored. |
| **Liquid %** | (-99.0 to 99.9) The liquid level, as a percentage of receiver volume, at and below which heat reclaim will be locked out. |

Refrigeration alarms configuration

As refrigeration configuration changes, alarms are automatically created (but not enabled) for the analog and digital inputs created. Trip levels and time limits can be set for these alarms by selecting Alarms from the Configure Rack menu and pressing ENTER.

The Configure Rack Alarms menu looks like the illustration at left below:
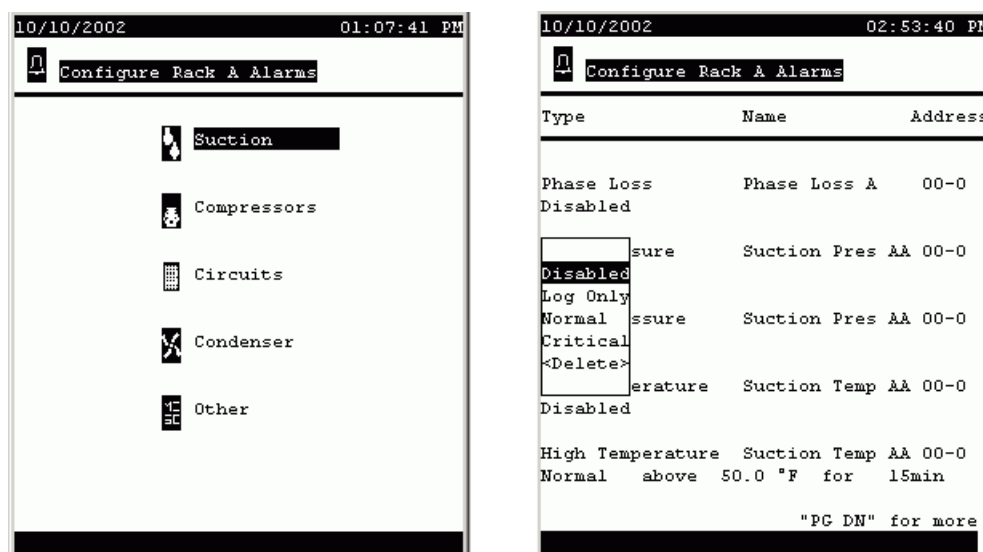
The set of alarms that are created automatically as you proceed with configuration of a rack is shown in the menu; by selecting one of the menu items (in this case **Suction**), the alarms for that part of the rack are presented. The first page of suction alarms is shown at right above. One of the list boxes has been opened to reveal its options.

For each alarm, the first line contains an alarm type, the name of the point the alarm is based on, and the point's address. The second line contains the alarm action setting (**Critical**, **Normal**, **Log only**, or **Disabled**), the trip level setting (if based on an analog (sensor) input, and the time setting. If the action is set to **Disabled**, the level and time settings will not appear (but are retained in memory), as is the case with all in the example screen except the last alarm (High Temperatuare Suction Temp AA).

There are five times when alarms are ***not*** generated for refrigeration temperatures: (1) during keyswitch overrides; (2) during the delay after override; (3) during defrost; (4) during the delay after defrost; and (5) when alarms have been suspended. The two delay periods are defined in the refrigeration configuration screen for the each circuit

The meanings of the alarm action settings are as follows:

Alarm Levels	**Critical**	When conditions have been at or have gone beyond the alarm's trip level for the set time, the alarm will occur. The alarm will dial out repeatedly at the interval set in the routing screen (from 10 to 99 minutes with a default value of 10 minutes).
	Normal	When conditions have been at or have or have gone beyond the alarm's trip level for the set time, the alarm will occur. The alarm will dial out once.
	Log Only	When conditions have been at or have gone beyond the alarm's trip level for the set time, the alarm will occur. There will be no dialout, but the occurrence will be logged in the system as an active alarm.
	Disabled	The alarm is deactivated and will not occur or dial out; its configuration, if any, will remain in memory, so that if it is set to Critical, Normal, or Log Only, the same trip level and time will appear in the screen.
	Delete	The alarm's configuration will be deleted from memory.

You can change the alarm action setting by selecting the field and scrolling to the action you want (move the cursor to the field, then press the +/- key, then use the arrow keys to scroll through the settings, then press ENTER).

What You Can Change in a Standard Alarm

Standard alarms are the alarms that are automatically created during configuration of refrigeration, HVAC, and other parts of the control and monitoring network. (You can also custom configure up to three miscellaneous alarms on any point in the network. Miscellaneous alarms are covered later in this section.)

If a standard alarm is based on an on/off input, you can change the alarm action setting and the time setting. The time setting can range from 1-255 seconds, minutes, or hours.

For an alarm based on a sensor input, in addition to the action setting and time setting, you can change the sensor level. For the second alarm in the screen shown, the sensor level could be anywhere in the range from -999.9 to 999.9 psi.

System alarms

Configuration of system alarms, which concern operation of the controller and network, will be covered in a later section of this manual.

Board & Points configuration

To configure board & points information for refrigeration, return to the Configure Rack menu, put the cursor on **Board & Points**, and press ENTER. The screen is as shown below. For AK2 module board & point configuration, refer also to the *AK2 I/O user manual.*

Navigation   Notice that at the bottom of each of the Board & Points screens there is a row of icons. Select one of these and you will be taken to the Board & Point configuration page for a particular type of input or output. From left to right, the icons represent the following:

Digital outputs (relay outputs)
Analog inputs (sensor inputs)
Digital inputs (on-off inputs)
Analog outputs (variable outputs)
Other controllers (AKC 16x, EKC, Degree Master, and DCU case controllers; VLT drives and Bitzer compressor interface)

```
10/10/2002                    01:11:18 PM

     Configure Rack A Board & Points

          Relay Outputs


Name              Bcast Bd-Pt  On

Fan Inv Reset A No    00-0  N-Closed
Fan Inv Bpass A No    00-0  N-Closed
Louvers Cond A  No    00-0  N-Closed
Fan Fwrd Run A  No    00-0  N-Closed
Cond Fill Vlv A No    00-0  N-Closed
Surge Valve A   No    00-0  N-Closed
Cond Dump Vlv A No    00-0  N-Closed
Cond Fan A1     No    00-0  N-Closed

   SORT:On            "PG DN" for more
```
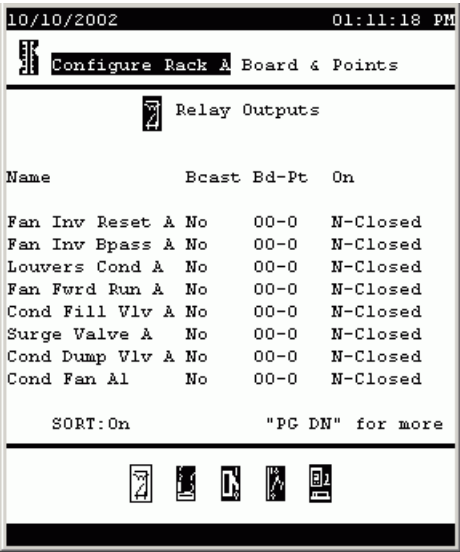
Board & Points
Relay outputs
(Digital outputs)   **Name**   (15 characters, any) The name of the load connected to the digital output (relay output). The default names for the outputs automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to enter edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press ENTER).

Bcast   (List box:)
No: The value of the point will not be broadcast to be used in logic on other controllers.
Send: The value of the point (whether it is ON or OFF) will be available on the host network for use by other controllers. Be sure that each sending Board-Point combination is unique throughout the system. (If the controller at address #01 is sending from its Bd-Pt address 1-02, then no other controller can have an output at its Bd-Pt address 1-02 sending.

Rec: The value of the point is being received from another controller on the host network. You must enter, in the Bd-Pt fields, the Bd-Pt address of the sending point.

Bd-Pt First enter the address of the RO board and point to which the load is wired, or, in the case of a received broadcast point, enter the board and point address of the sending point.

On (List box:)

N-Closed The load on this point is wired through its normally closed contacts.

N-Open The load on this point is wired through its normally open contacts.

SORT At the bottom of the body of the screen (above the icons, on the same line as **"PG DN" for more** is the **SORT** field. By default, sort mode is on, and entries will be sorted by Bd-Pt address; if sort mode is turned off, points from then on will be listed in order of creation. The sorting occurs when you press EXIT and will be apparent the next time you enter the screen.

Board & Points
Sensor inputs
(Analog inputs)

```
10/10/2002        Alarm!         04:17:07 PM
 ▓ Configure Rack A Board & Points

        ▓ Sensor Inputs


Name            Bcast Bd-Pt  Type

Inside Temp      No    00-0   PT1000
Disch Press A    No    00-0   AKS32-500
Dropleg Temp A   No    00-0   PT1000
Cond Sump Lvl A  No    00-0   EMHS3
Inlet Temp A     No    00-0   PT1000
Liquid Lvl % A   No    00-0   0-5 Volts
Hotwater A1      No    00-0   PT1000
Hotwater A2      No    00-0   PT1000

    SORT:On             "PG DN" for more

        ▓  ▓  ▓  ▓  ▓
```

Name (Label field; any 15 characters) The name of what is being measured by the analog input (sensor input). The default names for the sensors automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, and press +/- to enter edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that

		space. When the name appears as you want it, press ENTER).
Bcast		(List box:)
		No: The value of the point will not be broadcast to be used in logic on other controllers.
		Send: The value of the point will be available on the host network for use by other controllers. Be sure that each sending Board-Point combination is unique throughout the system. (If the controller at address #01 is sending from its Bd-Pt address 1-02, then no other controller can have an output at its Bd-Pt address 1-02 sending.
		Rec: The value of the point is being received from another controller on the host network. You must enter, in the Bd-Pt fields, the Bd-Pt address of the sending point.
Bd-Pt		Enter the Bd-Pt address to which the sensor is wired, or, in the case of a received broadcast point, enter the board and point address of the sending point.
Type		(List box:)

Bcast

(List box:)

No: The value of the point will not be broadcast to be used in logic on other controllers.

Send: The value of the point will be available on the host network for use by other controllers. Be sure that each sending Board-Point combination is unique throughout the system. (If the controller at address #01 is sending from its Bd-Pt address 1-02, then no other controller can have an output at its Bd-Pt address 1-02 sending.

Rec: The value of the point is being received from another controller on the host network. You must enter, in the Bd-Pt fields, the Bd-Pt address of the sending point.

Bd-Pt

Enter the Bd-Pt address to which the sensor is wired, or, in the case of a received broadcast point, enter the board and point address of the sending point.

Type

(List box:)

AKS 32-100 Danfoss pressure sensor, 0 to 100 psig.

AKS 32-200 Danfoss pressure sensor, 0 to 200 psig.

AKS 32-500 Danfoss pressure sensor, 0 to 500 psig.

PHOTO-OD-1 Danfoss indoor-outdoor photocell with type AKS 21 temperataure sensor.

PHOTO-ID Danfoss indoor photocell.

PT1000 Danfoss temperature sensor.

DPS100 Danfoss dew point sensor.

ECI TP-1 ECI temperature sensor type TP-1.

ECI TP-2 ECI temperature sensor type TP-2.

NOVAR Novar temperature sensor.

THERM3 Danfoss THERM3 low and medium range temperature sensor.

THERM3-HT Danfoss high range THERM3 temperature sensor.

EMHS3 Danfoss humidity sensor, indoor, with temperature sensor.

EMHS4 Danfoss humidity sensor, outdoor.

1-6 Volts A user-supplied linear-response sensor with 1 to 6 Volt output.

0-5 Volts A user-supplied linear-response sensor with 0 to 5 Volt output.

1-2 Volts A user-supplied linear-response sensor with 1 to 2 Volt output.

CTTS Com-Trol temperature sensor.

CPC501-1121 CPC type 501-1121 temperature sensor.
Elm Elm temperature sensor.
HGM CHAN Provides channel information for a multi-zone Yokogawa leak detector.
HGM LEAK Provides refrigerant ppm for the channel given by HGM CHAN.
10A CT Danfoss 10A current transformer.
150A CT Danfoss 150A current transformer.
200A CT Danfoss 200A current transformer.
Percent Any 1 to 10 Vdc sensor (readout 0 to 100%).
Leak Danfoss leak sensor.

SORT At the bottom of the body of the screen (above the icons, on the same line as **"PG DN" for more** is the **SORT** field. By default, sort mode is on, and entries will be sorted by Bd-Pt address; if sort mode is turned off, points will be listed from then on in the order in which they were created. The sorting occurs when you press EXIT and will be apparent the next time you enter the screen.

Board & Points
On-off inputs
(Digital inputs)
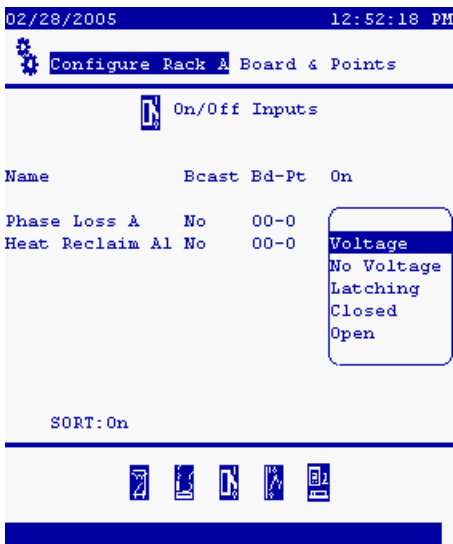
Name (Label field; any 15 characters) The name of the load sensed by the digital input (on-off input). The default names for the inputs automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to change to edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it,

	press ENTER).
Bcast	(List box:)
	No: The value of the point will not be broadcast to be used in logic on other controllers.
	Send: The value of the point (whether it is ON or OFF) will be available on the host network for use by other controllers. Be sure that each sending Board-Point combination is unique throughout the system. (If the controller at address #01 is sending from its Bd-Pt address 1-02, then no other controller can have an output at its Bd-Pt address 1-02 sending.
	Rec: The value of the point is being received from another controller on the host network. You must enter, in the Bd-Pt fields, the Bd-Pt address of the sending point.
Bd-Pt	First enter the address of the RO board and point to which the load is wired, or, in the case of a received broadcast point, enter the board and point address of the sending point.
On	(List box:)
	Voltage: The point will be read as ON if it senses a voltage. It will read OFF when it senses no voltage.
	No Voltage: The point will be read as ON if it senses no voltage. It will read OFF when it senses voltage.
	Latching: The point will be read as ON when it first senses a momentary voltage. It will continue to read on when the voltage is no longer present. The point will read OFF after voltage is applied again. This setting is often used for push-button or other momentary-contact sensing.
	Closed: The input is on an AK2 I/O module, based on a universal input. The input is on when continuity is sensed at the universal input's terminals. This is similar to the reading of a closed dry contact input.
	Open: The input is on an AK2 I/O module, based on a universal input. The input is on when no continuity is sensed at the universal input's terminals. This is similar to the reading of an open dry contact input.
SORT	At the bottom of the body of the screen (above the icons, on the same line as **"PG DN" for more** is the **SORT** field. By default, sort mode is on, and entries will be sorted by Bd-Pt address; if sort mode is turned off, points will be listed from then on in the order in which they were created. The sorting occurs when you press EXIT and will be apparent the next time you enter the screen.

Board & Points
Variable outputs
(Analog outputs)

Name		(Label field; any 15 characters) The name of the load being driven by the variable output. The default names for the variable outputs automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to enter edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press ENTER).
Bd-Pt		Enter the Bd-Pt address to which the load is wired.
Range		(List box; two variable output ranges are available, depending on the drive requirements:)
		0-10 Volts
		0-5 Volts
SORT		At the bottom of the body of the screen (above the icons, on the same line as **"PG DN" for more** is the **SORT** field. By default, sort mode is on, and entries will be sorted by Bd-Pt address; if sort mode is turned off, points will be listed from then on in the order in which they were created. The sorting occurs when you press EXIT and will be apparent the next time you enter the screen.

Board & Points
Other controllers

When you select the "Other Controllers" icon and press ENTER, a menu is presented that allows selection of any of six types of other controllers that can be nodes on the control system I/O network.
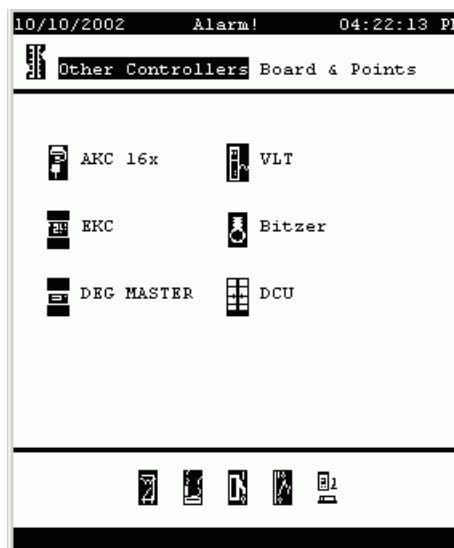
AKC 16x circuits
Board & Points

You will also see these icons at the bottom of any of the Other Controllers screens. Selecting the first one, whether from the menu or from the bottom of the screen, produces the related configuration screen. Here's the one for AKC 16x Smart Case Controllers:
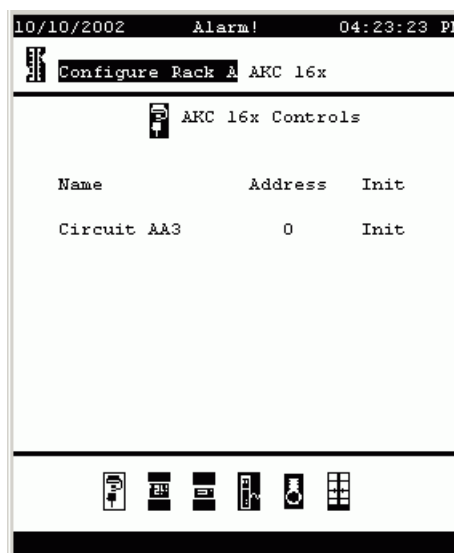
The fields and contents are:

Name   (Label field; any 15 characters) The name of the evaporator being controlled by the AKC 16x. (AKC 16x refers to AKC 161, AKC 164, or AKC 165 controllers, whichever is configured on each node.) The default names for the AKC 16x circuits automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to change to edit mode; then use the left

	and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press ENTER).
Address	(0 to 99) The address set on the rotary address switches on the Smart Case Controller. The installer should provide a list with the address for each fixture. If such information is not available, obtain the address by removing the waterproof rubber plugs over the address switches and reading the address. Consult section 3-8 in chapter 3 of this manual for location of the switches.
Init	(Init button field) Use in accordance with the following explanation of network re-scan and initialization.

Network Re-scan
and Initialization

After the Smart Case Controllers have been configured and addressed, you need to re-scan the network so that they are recognized, then initialize them. You must perform the following steps:

1. From the Main Menu, select **Communications**.
2. From the Communications Menu, select **I/O Network**.
3. From the I/O Network Menu, select **Re-scan**.   Re-scanning the network can take several minutes. After the re-secan, return (via the Main Menu) to the AKC 16x Board & Points Configuration Screen, and
4. Put the cursor on the **Init** field and press ENTER. This action sends the configuration settings from the AK2-SC 255 to the Danfoss Smart Case Controller.

Navigation

Notice that at the bottom of each of the Other Controllers screens there is a row of icons. Select one of these and you will be taken to that type of "other controller." From left to right, the icons represent the following:

> AKC 16x Smart Case Controllers
> EKC fixture controllers and monitors
> Degree Master case controllers
> VLT adjustable frequency drives
> Bitzer variable speed compressor control modules
> DCU case controllers

EKC circuits
Board & Points

Board & Points configuration for EKC controllers begins by selecting EKC from the Configuration Board & Points menu. Our example shown below has only one circuit. If EKC has been selected as the circuit type for more than one circuit in the suction group, this screen will show a list of all of those EKC circuits.

```
10/10/2002              04:26:33 PM

  ▐▌ Configure Rack A EKC
─────────────────────────────────
           ▄▄ EKC Controls
           ██

  Name           Addr

  Circuit AA4     88 Init Upload Wink




─────────────────────────────────
        ▐▌ ▄▄ ▐▌ ▐▌ ▐▌ ▐▌


███████████████████████████████
```

The fields and contents are:

Name	(Label field, any 15 characters) The name of the evaporator being controlled by the EKC. The default names for the EKC circuits automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to change to edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press ENTER).
Address	(0 to 99) The address set on the EKC. EKC addresses are set using the buttons on the EKC. The installer should provide a list with the address for each fixture. If such information is not available, obtain the address at the fixture from the EKC by using the buttons.
Init	(Init button field) Use in accordance with the following explanation of network re-scan and initialization.

Network Re-scan
and Initialization

After the EKCs have been configured and addressed, you need to re-scan the network so that they are recognized, then initialize them. You must perform the following steps:

1. From the Main Menu, select **Communications**.
2. From the Communications Menu, select **I/O Network**.
3. From the I/O Network Menu, select **Re-scan**.   Re-scanning the network can take several minutes. After the re-secan, return (via the Main Menu) to the EKC Board & Points Configuration Screen, and
4. Put the cursor on the **Init** field and press ENTER.

| | **Upload** | (Button field) Placing the cursor on this field and pressing ENTER will cause information programmed at the fixture on the EKC to be uploaded to the AKC 55 controller. |
| Wink (EKC) | **Wink** | (Button field) Placing the cursor on this field and pressing ENTER will cause this individual EKC to blink its display for a short time so that its fixture can be identified. |

Degree Master
Board & Points

After Degree Master controllers have been configured and addressed (in accordance with the Danfoss manual *Degree Master in AKC 55 Systems* (literature number RS.8B.F1.22 (or update), code number 084R9897) you need to re-scan the network so that they are recognized, then initialize them. This is done from the Degree Master Controls Board & Points screen. From any Configuration Board & Points, Other Controllers screen, select the Degree Master Icon and press ENTER. This screen appears. Our example shows only one circuit, but every configured Degree Master circuit will be listed.

```
10/14/2002      Alarm!        09:53:01 AM

   Configure Rack A DEG MASTER
   ─────────────────────────────────────

            ▣  Deg Master Controls

                Wink All Degree Master

   Name            Addr
   Circuit AA5      0  Locate Init Upload




   ─────────────────────────────────────

         ▤  ▦  ▭  ▥  ▮  ▦

   ─────────────────────────────────────
```

The fields and contents are:

Name		(Label field: any 15 characters) The name of the evaporator being controlled by the Degree Master. The default names for the Degree Master circuits automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to change to edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press ENTER).
Address		(0 to 99) Enter an address from 1 to 99 that is unique

	among the Degree Masters in the system.
Locate	(Locate button field) See the explanation "Locate and Init" below.
Init	(Init button field) See the explanation "Locate and Init" below.

Locate Procedure

When a new Degree Master is added to the SC 255 system, or when there has been a service replacement, you must use the "Locate Procedure" so that the SC 255 will recognize the Degree Master.

Follow this procedure:
1) Enter an address from 1 to 99 that is unique among the Degree Masters in the system.
2) Select Locate and press ENTER or click with your mouse.
3) A message will appear requesting that you press the service pin.
4) You have 10 minutes to go to the particular Degree Master you are working with and depress the service pin. The service pin (or button) is located beneath the upper right corner of the square white label on the Degree Master.
5) Use a pencil (or other instrument that will fit through the access hole) to depress the service button and keep it depressed for five seconds.

It will take the SC 255 from 10 to 15 seconds to complete the location process, after which a message box will appear on the SC 255 telling you that the process has been successful. This process must be repeated for each new or replacement Degree Master.

Activating the service pin from the display

After starting the locate procedure from the SC 255 keypad, it is possible to activate the service pin from the Degree Master's display. Press and hold both buttons for 3 seconds. When the Degree Master enters the service mode, the display will change to "RS" with an up arrow on the left and a down arrow on the left. Pressing the lower button will now activate the service pin. The down arrow will change to an asterisk as confirmation. Be careful not to press the upper button. Doing so will reset the Degree Master.

Initialization

After the Locate procedure, Select Init and press ENTER or click with your mouse. The initialization procedure, during which configuration data is copied from the AKC 55 to the Degree Master, will take about 10-15 seconds.

Wink

Wink All Degree Master is a toggle (first ENTER turns on, second turns OFF) that will cause all the Degree Masters on the network to flash their node numbers repeatedly. If a unit does not wink its number, test its function with the handheld remote control (in accordance with the Degree Master manual). If the unit is functioning to control the fixture, troubleshoot its network connection and addressing.

VLT and AKD drives Board & Points

To configure Board & Points for Danfoss VLT and AKD variable frequency drives, select the variable speed drive icon (fourth from the left) on any Configure Board & Points Other Controllers screen and press ENTER. The screen looks like this (though you see only one here, all configured VLT drives will be listed.)

The fields and contents are:

Name (Label field: any 15 characters) The name of the compressor being controlled by the VLT. The default names for the system's VLTs that were automatically added during configuration of refrigeration are shown, and will suffice in many applications. They can be edited character by character (put the cursor on the field, press +/- to change to edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press ENTER).

Locate (Button field) Each VLT must be located by the SC 255. Place the cursor on the **Locate** field and press ENTER. Then, when instructed by a pop-up box on the SC 255 screen, go to the VLT and press the service pin. The SC 255 will then read the VLT address, which will appear on the screen to the right of the **Locate** field.

DCU circuits
Board & Points   Section to be added.

1- 3.   Configuring HVAC

To begin configuring HVAC, select **Configuration** from the Main Menu, then **HVAC**. If there are no units configured, the screen looks as at left below. If one or more units are already configured, a "menu" screen will appear that lists all the units, as at right below. In the example, one unit of each possible type has been added. In practice, this would be a very unlikely store.

To add a new unit, simply put the cursor on the **No. of HVAC Units** field and increase the number by one. A new unit will appear with a default name, which will at least temporarily be "Unit n", where n is the new total number of units up to that line. There are instructions below on how to change the name.

The fields in the HVAC Configuration Menu Evaporator Menu (shown above on the right) are as follows:

No. of HVAC Units	(0 to 45) The number of controlled HVAC units of all types in the store.
No. of phase loss monitors:	(0 to 45) The number of phase loss monitors available for use by HVAC control. A phase loss monitor can be used more than once.
No. of humidity sensors:	(0 to 5, except that the combined number of humidity and dewpoint sensors cannot exceed 5). The number of humidity sensors used for control.
No. of dewpoint sensors:	(0 to 5, except that the combined number of humidity and dewpoint sensors cannot exceed 5). The number of dewpoint sensors used for control.
Name	(Label field, any 15 characters) The name of the HVAC unit. The field can be edited character by character (put the cursor on the field, press +/- to change to edit mode; then use the left and right arrow keys to move from space to space and the up and down arrow keys to select the character for that space. When the name appears as you want it, press

	ENTER).
Type	[for each individual listed HVAC unit] (List box:)
	Note: a section explaining configuration of each of the following types follows this section in the order in which the types are given here.
	RTU: The unit is a packaged rooftop unit.
	AHU: The unit is a built-up system with an air handling unit.
	RTC: The unit is controlled by a Danfoss RTC board.
	SC4: The unit is a Seasons 4 Smart Coil packaged rooftop system.
	CT-65: The unit is controlled by a Danfoss or ECI ClimaTECH 65 controller.
	CT-1024: The unit is controlled by a Danfoss or ECI ClimaTECH 1024 controller.
	Carrier: The HVAC unit is a Carrier Centurion or Carrier Premier Link.
\<Setup\>	(Button field) Used to enter the configuration screens for the individual HVAC units. You must ensuire that you have selected the appropriate entry in the **Type** column first.

RTU Configuration

When you press the **\<Setup\>** button for an RTU unit, the menu that appears looks like this:
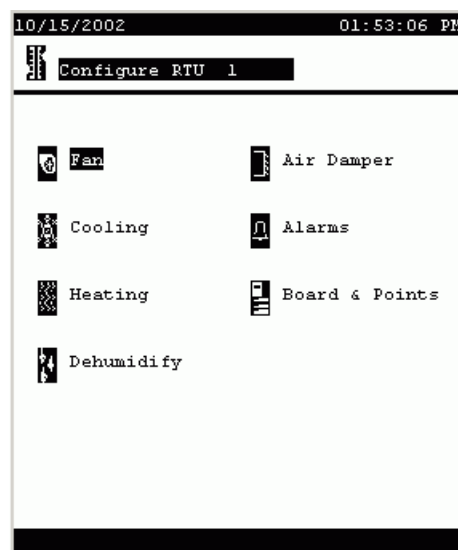
From this menu, you can enter the configuration screens for each of the components of the HVAC unit.

RTU fan configuration

There are two pages for fan configuration:

Fan type	(List box:)
	1-Speed: The unit has a single-speed fan.
	2-Speed: The unit has a two-speed fan.
Fan control OPEN hours	(List box:)
	Continuous: The fan will run continuously during open hours. Store open hours are defined in the Store Info screens.
	On demand: The fan will run on demand during open hours. "On demand" means that the fan will run whenever conditions calling for heating, heat reclaim, cooling, dehumidification, or venting are met.
Fan control CLOSED hours	(List box:)
	Continuous: The fan will run continuously during closed hours. Store closed hours are defined in the Store Info screens.
	On demand: The fan will run on demand during closed hours. "On demand" means that the fan will run whenever conditions calling for heating, heat reclaim, cooling, dehumidification, or venting are met.
Post delay	(0 to 60) The number of minutes that the fan will run after the last stage of heating, cooling, etc. is turned off.

RTU Fan
configuration , page 2

Monitor phase loss	(List box: Yes, No) Whether or not a phase loss monitor will be monitored.
Shutdown on phase loss	(List box: Yes, No) Whether or not the unit is to be shut down when its phase loss detector input is on.
Which phase loss	(List box:) All available phase loss monitors are shown.
Shutdown on smoke detect	(List box: Yes, No) Whether or not the unit is to be shut down when its smoke detector is on.
Shutdown on fire alarm	(List box: Yes, No) Whether or not the unit is to be shut down when a monitored fire alarm is detected.

No of return sensors	(0 to 5) The number return air temperature sensors.
Controlling sensor	(List box:)
	Min Temp: Display will be based on the lowest value of all of the return air temperature sensors (if there are more than one).
	Max Temp: Display will be based on the highest value of all of the return air temperature sensors (if there are more than one).
	Average: Display will be based on the average of all the return air sensors (if there are more than one).
	Return Air 1-1 (etc.): (each return air temperature sensor will be available as a choice in the list) Display will be based on the single selected sensor.
No of supply sensors	(0 to 5) The number supply air temperature sensors.
Controlling sensor	(List box:)
	Min Temp: Display will be based on the lowest value of all of the supply air temperature sensors.
	Max Temp: Display will be based on the highest value of all of the supply air temperature sensors.
	Average: Display will be based on the average of all the supply air sensors.
	Supply Air 1-1 (etc.): (each supply air temperature sensor will be available as a choice in the list) Display will be based on the single selected sensor.
Lockout on proof failure	(list box: yes, no)
	Yes: The fan will be locked out if fan proof is lost for five minutes. Human intervention will be needed to restart the fan by using the "Clear" button on the status screen. Evidence of the locked out condition, and the means of ending the lockout, are found on the status screen for cooling or heating function. Status screens are covered in seciton II of this manual.
	No: The fan will not be locked out on proof failure.

RTU cooling
configuration   RTU cooling is configured after selecting cooling from the RTU configuration menu.

```
10/15/2002                09:02:44 AM

░▓ Configure RTU  l        Cooling ▓

Number of zone sensors..?2
Controlling sensor......?Zone Temp 1-1
Num of cooling stages...?2




Target temp. for stage:
 #1: 74.0°F  #2: 74.0°F

Range +/-...............?  1.0°F
Pre delay for stage:
 #1: 1 min   #2: 1 min

Post delay for stage:
 #1: 1 min   #2: 1 min

                  "PG DN" for more
```

Number of zone sensors	(0 to 5) The number of zone sensors in the area of the store served by this HVAC unit.
Controlling sensor	(List box)
	Min Temp: Control will be based on the lowest value of all temperature sensors in the unit's zone.
	Max Temp: Control will be based on the highest value of all of the temperature sensors in the unit's zone.
	Average: Control will be based on the average of all the temperature sensors in the unit's zone.
	Zone Temp 1-1 (etc.): (each zone temperature sensor will be available as a choice in the list) Control will be based on the single selected temperature sensor.
Num of cooling stages	(0 to 6) The number of cooling stages in this HVAC unit.
Target temp. for stage	(0.0 to 99.9) A separate field for each of the stages in the unit.
Range +/-	(0.0 to 9.9) The range selected creates a dead band. For example, if the target is 72 and the range is 2, the stage will come on at 74, and will not be turned off until the temperature reaches 70.
Pre delay for stage	(0 to 60) The number of minutes that must elapse after target plus range is reached before the stage will come on. There is one field for each stage.
Post delay for stage	(0 to 60) The number of minutes that must elapse after target - range is reached before the stage will be turned off. There is one field for each stage.

```
10/16/2002                    08:38:57 AM
▌ Configure RTU  1          Cooling ▐

Ambient temp lockout....?Yes
No cooling below........?  40.0°F
Range +/-...............?   2.0°F
Default fan speed.......?High Speed
Max suction press safety?Suction Pres AA
No cooling above........?  85.0psi
Freeze Protection.......?Sensor Input
Setpoint................?  35.0°F

Night setback...........?  Yes
Night setback offset....?   5.0°F
Override switch.........?  Yes
Override duration.......?   60 min
Num of schedules........?    1




                         "PG DN" for more
```

RTU cooling configuration, page 2   Refer to the screen above.

Ambient temp lockout:	(List box: Yes, No) Whether or not there is to be a lockout based on low outside ambient temperature.
No cooling below	(0.0 to 100.0) The ambient temperature below which cooling will be locked out.
Range +/-	(0.0 to 9.9) The range selected creates a dead band. For example, if the lockout is 50 and the range is 2, cooling will be locked out at 48 and will be allowed on at 52.
Default fan Speed	(List box: High Speed, Low Speed) The fan speed for cooling. A different fan speed can be chosen for dehumidification when it is configured.
Max suction press safety	(List box:) Lists every configured pressure sensor. Any may be selected. Only the suction pressure for the cooling compressors in this rooftop should be used.
No cooling above	(0.0 to 100.0) The pressure value of the sensor selected on the previous line at and above which cooling will be cut out. Cooling will not cut in again until the pressure falls below this value and the pre delay specified on the preceding page has elapsed.
Freeze protection	(List box:)
	Sensor Input: There is a leaving air temperature for each stage of cooling, near the coil. At and below the setpoint (next line), the cooling stage will be turned off.
	On/Off Input: A single digital input that when ON will turn off all stages of cooling in the RTU.
	None: There is no freeze protection to configure.
Setpoint	(0.0 to 50.0) The temperature, as measured by the sensor input indicated above, at and below which a stage of cooling will be turned off.
Night setback	(List box: Yes, No) Whether or not the cooling setpoints are to be raised by an offset (next line) during

scheduled times (next page) when cooling requirements are not as critical; for example, when the building is closed.

Night setback offset   (0.0 to 50.0) The amount by which the cooling setpoint (set on previous page) is to be raised when night setback schedules (next page) are in effect.

Override switch   (List box: Yes, No) Whether or not there is a switch to override night setback.

Override duration   (0 to 1439) The number of minutes after, activation of the override switch, that night setback will be overridden.

Num of schedules   (0 to 8) The number of cooling night setback schedules. Schedules are entered on the following page(s) reached by using the PG DN key.

RTU Heating configuration

Heating configuration for rooftop units begins with selection of **Heating** from the rooftop configuration menu.

```
10/15/2002                    09:04:56 AM

  🖳 Configure RTU  1          Heating 🖳

Number of zone sensors..?2
Controlling sensor......?Zone Temp 1-1
Num of heat rclm stages.?1
Target temp. stage 1....? 72.0°F
 Pre delay: 0min Post delay: 0min


Range +/-...............?  1.0°F
Auxiliary Heat type.....?Staging
Fan speed...............?High Speed
Night setback...........?Yes
Night setback offset....?  5.0°F
Override switch.........?Yes
Override duration.......?  60 min
Num of schedules........?   1
High supply temp lockout?Yes
Lockout above:150.0°F Deadband:  2.0°F

                        "PG DN" for more

```

Number of zone sensors   (0 to 5) The number of zone sensors for the rooftop. Changing this number will also change the number of zone sensors in the first line of the first cooling configuration screen.

Controlling sensor   (List box:)
    Min Temp: Control will be based on the lowest value of all temperature sensors in the unit's zone.
    Max Temp: Control will be based on the highest value of all of the temperature sensors in the unit's zone.
    Average: Control will be based on the average of all the temperature sensors in the unit's zone.
    Zone Temp 1-1 (etc.): (each zone temperature sensor will be available as a choice in the list) Control will be based on the single selected temperature

	sensor.
Num of heat rclm stages	(0 to 2) The number of stages of heat reclaim in the rooftop.
Target temp. stage 1	[There will be a target and delays for each stage configured] (0.0 to 100.0) The target temperature for the heat reclaim stage.
Pre delay:	(0 to 60) The number of minutes after target minus range is reached before the stage will be turned on.
Post delay:	(0 to 60) The number of minutes after target plus range is reached that the stage will be turned off.
Range +/-	(0.0 to 9.9) The range applied to target prior for control actions. See preceding two settings.
Auxiliary Heat type	(List box:) **Staging**: Auxiliary heat is staged. **None**: There is no auxiliary heat. **Analog valve**: Auxiliary heat is regulated by a modula ting valve.
Fan speed	(List box: High Speed, Low Speed) The fan speed for heating.
Night setback	(List box: Yes, No) Whether or not there is to be a night setback for heat.
Night setback offset	(0.0 to 50.0) The amount by which the heating setpoint (set on previous page) is to be lowered during times when night setback is scheduled.
Override switch	(List box: Yes, No) Whether or not there is a night setback override switch.
Override duration	(0 to 1439) The number of minutes after operation of the override switch that night setback will be overrid-den.
Num of schedules	(0 to 8) The number of night setback schedules. Schedules are entered on thelast page(s) reached by using the PG DN key.
High supply temp lockout	(List box: Yes, No) Whether or not heating is to be locked out above a supply air temperature to be specified on the following line.
Lockout above	(0.0 to 999.9) Above this temperature plus deadband (next field) heating will be shut down.
Deadband	(0.0 to 50.0) The number of degrees above the lockout setting where heating will be shut down. Also, the number of degrees below the lockout setpoint where heating will be allowed after being locked out.

RTU Heating auxiliary
heat configuration, p2:
 staging strategy

```
10/15/2002                09:05:44 AM

    Configure RTU  1        Heating


Num of aux heat stages..? 2
Target temp. for stage:
  #1: 69.0°F  #2: 69.0°F

Range +/-...............?  1.0°F

Pre delay for stage:
  #1: 0 min   #2: 0 min

Post delay for stage:
  #1: 0 min   #2: 0 min


Lockout aux ht. in setbk? Yes
Ambient heat lockout....? Yes
No heat above...........?  70.0°F
Range +/-...............?   2.0°F
                   "PG DN" for more
```

Num of aux heat stages	(0 to 5) The number of auxiliary heating stages in this HVAC unit.
Target temp. for stage	(0.0 to 99.9) A separate field for each of the stages in the unit.
Range +/-	(0.0 to 9.9) The range selected creates a dead band. Heat will cut in at target minus range, and cut out at target plus range.
Pre delay for stage	(0 to 60) The number of minutes that must elapse after target plus range is reached before the stage will come on. There is one field for each stage.
Post delay for stage	(0 to 60) The number of minutes that must elapse after target minus range is reached before the stage will be turned off. There is one field for each stage.
Lockout aux ht. in setbk	(List box: Yes, No) Whether or not auxiliary heat is to be locked out during hours when setback is effective.
Ambient heat lockout	(List box: Yes, No) Whether or not heat is to be locked out based on ambient temperature.
No heat above	(0.0 to 100.0) Auxiliary heat will be locked out above this temperature plus range (next line). Heat will be allowed on again when ambient temperature has fallen to lockout minus range.
Range +/-	(0.0 to 9.9) The range selected creates a dead band around the lockout temperature. Heat will be locked out at lockout temperature plus range, and once locked out will be allowed on at ambient lockout minus range.

RTU Heating auxiliary heat configuration, p2: analog valve strategy

With an analog gas valve selected, the second heating page looks instead like this:

```
10/29/2002              11:00:24 AM
┇  Configure RTU  1        Heating ▨


Aux Heat target temp....?  -50.0 °F
Pre delay...............? 60 min
Post delay..............? 60 min

Lockout aux ht. in setbk? Yes
Ambient heat lockout....? Yes
No heat above...........?    0.0 °F
Range +/-...............?    2.0 °F
Low Fire Position.......?   0.0 %
Low Fire Duration.......?  3 min
Max valve opening.......?  95.0 %
Min valve opening.......?  25.0 %
Degrees to max opening..?  4 °F



                  "PG DN" for more
```

Aux heat target temp	(-50.0 to 100.0) The temperature you want to maintain at the zone sensor.
Pre delay	(0 to 60) The number of minutes that must elapse after target plus range is reached before the analog valve will open.
Post delay	(0 to 60) The number of minutes that must elapse after target minus range is reached before the analog valve will be closed.
Lockout aux ht. in setbk	(List box: Yes, No) Whether or not auxiliary heat is to be locked out during hours when setback is effective.
Ambient heat lockout	(List box: Yes, No) Whether or not heat is to be locked out based on ambient temperature.
No heat above	(0.0 to 100.0) Auxiliary heat will be locked out above this temperature plus range (next line). Heat will be allowed on again when ambient temperature has fallen to lockout minus range.
Range +/-	(0.0 to 999.9) The range selected creates a dead band around the lockout temperature. Heat will be locked out at lockout temperature plus range, and once locked out will be allowed on at ambient lockout minus range.
Low Fire Position	(0.0 to 100.0) The percentage of valve opening when ignition occurs.
Low Fire Duration	(1 to 20) The number of minutes the valve will be maintained at low fire duration before beginning to modulate.
Max valve opening	(50.0 to 100.0) Sets the maximum valve opening allowed.
Min valve opening	(0.0 to 75.0) Sets the maximum valve opening allowed.
Degrees to max opening	(0 to 6) The number of degrees of rotation of the valve spindle from minimum to maximum percentage.

RTU dehumidification
configuration

Begin by selecting **Dehumidify** from the Configure RTU menu.

```
10/15/2002                    09:07:37 AM

  🔧  Configure RTU  1      Dehumidify  🔧

Dehumidification type...?Cooling
Rclm heat during dehumid?No
Aux heat during dehumid.?No


Control dehumid. on.....?Calc Dewpt

Control humidity sensor.?Average
Control temp sensor.....?Average
Target.................? 50.0°F
Target differential.....? 2.0°F
Pre delay for stage:
  #1:  1 min  #2:  1 min

Post delay for stage:
  #1:  2 min  #2:  2 min

Cooling low limit.......?  68.0°F
                        "PG DN" for more

```

Dehumidification type	(List box: None, Cooling, Dessicant Whl) The type of dehumidification used.
Rclm heat during dehumid	(List box: Yes, No) Whether or not heat reclaim is allowed during dehumidification.
Aux heat during dehumid	(List box: Yes, No) Whether or not auxiliary heat is allowed during dehumidification.
Control dehumid. on	(List box:)

Humidity: Dehumidification will be controlled based on a specified humidity target. A humidity sensor is required.

Calc InDew: Dehumidification will be controlled based on a specified dewpoint target, which will be compared with a dewpoint calculated from inside zone temperatuare and humidity. Both zone temperature and humidity sensors must be installed.

Inside Dew: Dehumidification will be controlled based on a specified inside dewpoint target. An inside dewpoint sensor is required.

Calc OutDew: Dehumidification will be controlled based on a specified dewpoint target, which will be compared with a dewpoint calculated from outside temperatuare and humidity. Outside temperature and humidity sensors must be installed.

Outside Dew: Dehumidification will be controlled based on a specified outside dewpoint target. An outside dewpoint sensor is required.

Control sensor (List box, if controlled by dewpoint or humidity only, and if there are multiple sensors:)

Min Humidity or **Min dewpoint**: Control will be based on the lowest-reading of a group of sensors.

Max Humidity or **Max dewpoint**: Control will be based on the highest-reading of a group of sensors.

Average: Control will be based on the average of a group of sensors.

Dewpoint 1-1 (etc.) Any single dewpoint sensor can be selected.

Humidity 1-1 (etc.) Any single humidity sensor can be selected.

Control humidity sensor	(List box similar to the preceding; appears only when using Calc Dewpt as the control strategy.)
Control temp sensor	(List box similar to the preceding; appears only when using Calc Dewpt as the control strategy.)
Target	(0.0 to 100.0) The control target in percent relative humidity or dewpoint degrees depending on the strategy chosen above.
Target differential	(0.1 to 15.0) The differential forms a deadband above and below the target in which no control actions are taken. Dehumidification will be turned on at target plus differential and turned off at target minus differential.
Pre delay for stage	(0 to 60) (Not present when dessicant wheel is configured) The number of minutes that must elapse after target plus range is reached before the stage will come on. There is one field for each stage.
Post delay for stage	(0 to 60) (Not present when dessicant wheel is configured) The number of minutes that must elapse after target minus range is reached before the stage will be turned off. There is one field for each stage.
Cooling low limit	(0.0 to 100.0) If zone temperature is below this limit, dehumidification will be disallowed.

RTU dehumidification configuration, page 2


```
10/15/2002                    09:08:32 AM
┃║┃ Configure RTU  1      Dehumidify ┃


Fan speed..............? Low Speed

Monitor outside humidity? Yes



Night setback..........? Yes
Night setback offset....? 2.0   °F
Override switch.........? No

Num of schedules........? 1







                          "PG DN" for more
```

Fan speed	(List box: Low Speed, High Speed) The fan speed

during dehumidification.

Monitor outside humidity   (List box: Yes, No) Whether or not to monitor outside humidity on status screens for this RTU.

Monitor wheel rotation   (List box: Yes, No) (Present only when dessicant wheel is configured) Whether or not the dehumidification target is to be raised by an offset (next line)

Night setback   (List box: Yes, No) Whether or not the dehumidification target is to be raised by an offset (next line) according to a schedule or schedules on the next page(s).

Night setback offset   (0.0 to 100.0) The amount by which the dehumidification setpoint (set on previous page) is to be raised during night setback hours (as set on the following schedule page).

Num of schedules   (0 to 8) The number of night setback schedules desired on the following schedule page(s).

RTU Air Damper configuration

For air damper configuration, select Air Damper from the Configure RTU menu.

```
10/29/2002                 03:59:15 PM

 ▓┃  Configure RTU  1      Air Damper ▓

 Air Damper..............? Yes

 Ambient temp lockout....? Yes
 No air damper below.....? 45.0 °F
 Range +/-...............?  4.0 °F

 Num of schedules........? 2
 Sched 1 type............? Standard
 Sched 1 time on.........? 12:00 AM
 Sched 1 time off........? 12:00 AM
 Sched 1 days............? SMTWRFA
 Sched 1 holidays........? 12345678
 Sched 2 type............? Standard
 Sched 2 time on.........? 12:00 AM
 Sched 2 time off........? 12:00 AM
 Sched 2 days............? SMTWRFA
 Sched 2 holidays........? 12345678
```

Air Damper   (List box: Yes, No) Whether or not there is a controlled air damper.

Ambient temp lockout   (List box: Yes, No) Whether or not the air damper is to be locked out based on ambient temperatuare.

No air damper below   (0.0 to 100.0) The air damper will be locked out below this temperature minus range (next line). The air damper will be allowed to open again again when ambient temperature has risen to lockout plus range.

Range +/-   (0.0 to 9.9) The range selected creates a dead band around the lockout temperature. The air damper will be locked out at lockout temperature minus range, and once locked out will be allowed to open at ambient lockout plus range.

Num of schedules   (0 to 8) The number of schedules that will be created (below, and on following pages if needed) for air

damper operation.

RTU Alarms
configuration   Alarms can be for any of the following, in accordance with the Appendix on alarms.
High zone temp   for each configured zone
Low zone temp   for each configured zone
High humidity   for each configured RH sensor
High supply temp   for each configured supply air sensor
HVAC fan down   for each fan speed
HVAC phase loss   for this unit's phase loss detector
HVAC smoke   for this unit's smoke detector
HVAC fire   for this unit's fire detector

RTU Board & Points
configuration   See the Appendix on Board & Points

**AHU
Configuration**   When you press the **<Setup>** button for an AHU unit, the menu that appears looks
                             like this:
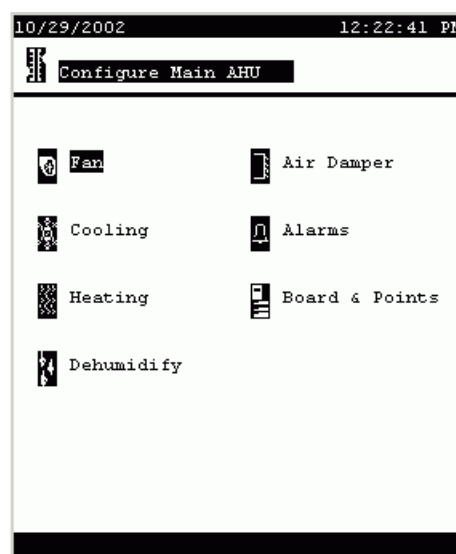
                             Only the fan and outside air coil configuration for AHUs is different from configura-
                             tion for RTUs that was spresented in the previous section.

AHU fan
configuration   There are two pages for AHU fan configuration:

```
10/15/2002                01:41:50 PM
⫴ Configure Main AHU           Fan ◐

Fan type...............?Variable VO
Fan control OPEN hours..?Continuous

Fan control CLOSED hours?Continuous

Post delay..............? 2 min

Heat ramp up     if LAT > 75.0°F
Cool ramp up     if LAT < 54.5°F
Dehm ramp up     if LAT < 44.5°F
Speed:                 Min:   Max:
  Inverter             50.0% 100.0%
  Heating              50.0% 100.0%
  Cooling              50.0% 100.0%
  Dehumidification     50.0%  75.0%

RPM at max speed........?1000

                  "PG DN" for more
```

```
10/16/2002                03:39:43 PM
⫴ Configure Main AHU           Fan ◐

Reaction Time...........?5
Algorithm Interval......?10
Inverter max resets.....? 3
Inverter reset delay....?300 sec
Inverter proof delay....?15  sec

Monitor phase loss......?Yes
Which phase loss monitor?Not configured
Shutdown phase loss.....?Yes
Shutdown on smoke detect?Yes
Shutdown on fire alarm..?Yes

No. of return sensors...?2
Controlling sensor......?Return Air 2-1

No. of supply sensors...?2
Controlling sensor......?Supply Air 2-1
```

Fan type   (List box:)
1-Speed: The unit has a single-speed fan.
2-Speed: The unit has a two-speed fan.
Variable VO: Fan speed is variable, with a drive controlled by an analog output board (variable output board).
Variable VLT: A variable speed fan is controlled by a Danfoss VLT adjustable frequency drive.

Fan control OPEN hours   (List box:)
Continuous: The fan will run continuously during open hours. Store open hours are defined in the Store Info screens.
On demand: The fan will run on demand during open hours, whenever heating, cooling, dehumidification, or venting is called for.

Fan control CLOSED hours (List box:)
Continuous: The fan will run continuously during hours when the store is not open. Store open hours are defined in the Store Info screens.
On demand: The fan will run on demand during hours when the store is not open., whenever heating, cooling, dehumidification, or venting is called for.

Post delay   (0 to 60) The number of minutes the fan will run after the last stage of heating, cooling, dehumidification, or venting is turned off.

Heat ramp up if LAT >   (40.0 to 150.0) When heating is on, fan speed will be ramped up when LAT (leaving air temperature) is greater than this setpoint.

Cool ramp up if LAT <   (40.0 to 70.0) When cooling is on, fan speed will be ramped up when LAT (leaving air temperature) is less than this setpoint.

Dehm ramp up if LAT <   (30.0 to 60.0) When dehumidification is on, fan speed will be ramped up when LAT (leaving air temperature)

is less than this setpoint.

Speed:

Inverter	Min: (0.0 to 70.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed (last line on the screen) that the inverter will be allowed to drive the fan motor.
Heating	Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed (last line on the screen) that the inverter will be allowed to drive the fan motor when heating is on.
Cooling	Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed (last line on the screen) that the inverter will be allowed to drive the fan motor when cooling is on.
Dehumidification	Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed (last line on the screen) that the inverter will be allowed to drive the fan motor when dehumidification is on.

Heat Reclaim in Dehum.

Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed (last line on the screen) that the inverter will be allowed to drive the fan motor when dehumidification is being used for dehumidification

Rpm at max speed   (1 to 9999) The rated maximum speed of the fan motor, from the data plate.

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Second page
AHU Fan
Configuration

Reaction Time	(1 to 20) This setting together with the next regulate the sensitivity of speed control. These should be left at the default settings and should only changed by a Danfoss-trained technician.
Algorithm Interval	(1 to 15) This setting together with the preceding one regulate the sensitivity of speed control. These should be left at the default settings and should only changed by a Danfoss-trained technician.
Inverter max resets	(0 to 10) The number of reset attempts, when proof is not detected, before the variable speed drive will be placed in override.
Inverter reset delay	(0 to 600) The number of seconds that must elapse between resets.
Inverter proof delay	(0 to 600) The number of seconds that must elapse after proof is not detected, before a reset attempt.
Monitor phase loss	(List box: Yes, No) Whether or not phase loss will be monitored.
Shutdown on phase loss	(List box: Yes, No) Whether or not the unit is to be shut down when its phase loss detector input is on.
Shutdown on smoke detect	(List box: Yes, No) Whether or not the unit is to be shut down when its smoke detector is on.
Shutdown on fire alarm	(List box: Yes, No) Whether or not the unit is to be shut down when a monitored fire alarm occurs.

No of return sensors	(0 to 5) The number of return air temperature sensors.
Controlling sensor	(List box:)
	Min Temp: Control will be based on the lowest value of all of the return air temperature sensors.
	Max Temp: Control will be based on the highest value of all of the return air temperature sensors.
	Average: Control will be based on the average of all the return air sensors.
	Return Air 1-1 (etc.): (each return air temperature sensor will be available as a choice in the list) Control will be based on the single selected sensor.
No of supply sensors	(0 to 5) The number of supply air temperature sensors.
Controlling sensor	(List box:)
	Min Temp: Control will be based on the lowest value of all of the supply air temperature sensors.
	Max Temp: Control will be based on the highest value of all of the supply air temperature sensors.
	Average: Control will be based on the average of all the supply air sensors.
	Supply Air 1-1 (etc.): (each supply air temperature sensor will be available as a choice in the list) Control will be based on the single selected sensor.

AHU outside air coil configuration

When outside air coils are configured, the first cooling screen looks like this:

```
10/30/2002                01:33:46 PM

   Configure Main AHU      Cooling

Number of zone sensors..?2
Controlling sensor......?Average
Num of cooling stages...?4
Num of outside air coils?2
Consider dewpoint.......?No
OA Coil LAT low limit...?40.0°F
Enable OA Coil #1 above.?50.0°F
Enable OA Coil #2 above.?70.0°F
Target temp. for stage:
 #1: 74.0°F  #2: 74.0°F

Range +/-...............?  1.0°F
Pre delay for stage:
 #1: 1 min   #2: 1 min  OA1: 1 min
OA2: 1 min
Post delay for stage:
 #1: 1 min   #2: 1 min  OA1: 1 min
OA2: 1 min
                    "PG DN" for more
```

Number of zone sensors	(0 to 5) The number of zone sensors in the area of the store served by this HVAC unit.
Controlling sensor	(List box)
	Min Temp: Control will be based on the lowest value of all temperature sensors in the unit's zone.
	Max Temp: Control will be based on the highest value of all of the temperature sensors in the unit's zone.

	Average: Control will be based on the average of all the temperature sensors in the unit's zone.
	Zone Temp 1-1 (etc.): (each zone temperature sensor will be available as a choice in the list) Control will be based on the single selected temperature sensor.
Num of cooling stages	(0 to 6) The number of cooling stages in this HVAC unit. Includes the number of outside air coils.
Num of outside air coils	(0 to 2) The number of outside air coils in this HVAC unit.
Consider dewpoint	(List box: Yes, No) If Yes is chosen, the leaving air temperature at the outside air coil needs to be less than outside dewpoint for the coil to be active.
OA Coil LAT low limit	(20.0 to 60.0) The leaving air temperature at and above which outside air coils are enabled.
Enable OA Coil #1 above	(40.0 to 95.0) (Question is repeated for OA coil #2, if present) The leaving air temperature at and above which the named outside air coil 1is enabled.
Target temp. for stage	(0.0 to 100.0) (One target per cooling stage excluding outside air coil stages) The target temperature that you want the first stage to maintain at the zone sensor.
Range +/-	(0.0 to 9.9) The range selected creates a dead band. For example, if the target is 72 and the range is 2, the stage will come on at 74, and will not be turned off until the temperature reaches 70.
Pre delay for stage	(0 to 60) (One setting per cooling stage.) The number of minutes that must elapse after target plus range is reached before the stage will come on.
Post delay for stage	(0 to 60) (One setting per cooling stage.)The number of minutes that must elapse after target - range is reached before the stage will be turned off. There is one field for each stage.

RTC configuration

The Danfoss RTC control board can function as a stand-alone or as a node on the I/O network of an SC 255 system. To begin configuration, select **RTC** as the type of unit in the Configure HVAC menu. A menu for the unit is then presented by the system. Selecting **Fan** from the unit brings up the first fan configuration page, shown on the left below; the second page is shown at the right.

Fan type	(List box:)
	1-Speed: Single-speed fan.
	Variable VO: Fan speed is variable, with a drive controlled by the RTC board's analog output (variable output).
Fan control OPEN hours	(List box:)
	Continuous: The fan will run continuously during open hours. Store open hours are defined in the Store Info screens.
	On demand: The fan will run on demand during open hours, whenever heating, cooling, dehumidification, or venting is called for.
Fan control CLOSED hours	(List box:)
	Continuous: The fan will run continuously during hours when the store is not open. Store open hours are defined in the Store Info screens.
	On demand: The fan will run on demand during hours when the store is not open., whenever heating, cooling, dehumidification, or venting is called for.
Post delay	(0 to 60) The number of minutes the fan will run after the last stage of heating, cooling, dehumidification, or venting is turned off.
Heat ramp up if LAT >	(40.0 to 150.0) When heating is on, fan speed will be ramped up when LAT (leaving air temperature) is greater than this setpoint.
Cool ramp up if LAT <	(40.0 to 70.0) When cooling is on, fan speed will be ramped up when LAT (leaving air temperature) is less than this setpoint.
Dehm ramp up if LAT <	(30.0 to 60.0) When dehumidification is on, fan speed will be ramped up when LAT (leaving air temperature) is less than this setpoint.
Aux Heat ramp up if LAT >	(0.0 to 100.0) When heating is on, fan speed will be ramped up when LAT (leaving air temperature) is

		greater than this setpoint
	Speed:	
	Inverter	Min: (0.0 to 70.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed that the inverter will be allowed to drive the fan motor.
	Heating	Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed that the inverter will be allowed to drive the fan motor when heating is on.
	Cooling	Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed that the inverter will be allowed to drive the fan motor when cooling is on.
	Dehumidification	Min: (10.0 to 100.0) Max: (50.0 to 130.0) The highest and lowest percent of rated maximum speed that the inverter will be allowed to drive the fan motor when dehumidification is on.
	Speed control increment	(0.0 to 20.0) The increment, in percent, by which variable speed is increased when called for by an increase in load.
	Speed control decrement	(0.0 to 20.0) The decrement, in percent, by which variable speed is decreased when called for by an decrease in load..
	Variable Output range	(List box:) **0-5 Volts**: Sets the RTC board's analog output for a variable speed drive requiring 0-5 volts. **0-10 Volts**: Sets the RTC board's analog output for a variable speed drive requiring 0-10 volts.
RTC fan, page 2	**Reaction Time**	(1 to 20) This setting together with the next regulates the sensitivity of speed control. These should be left at the default settings and should only changed by a Danfoss-trained technician.
	Algorithm Interval	(1 to 15) This setting together with the preceding one regulate the sensitivity of speed control. These should be left at the default settings and should only changed by a Danfoss-trained technician.
	Inverter max resets	(0 to 10) The number of reset attempts, when proof is not detected, before the variable speed drive will be placed in override.
	Inverter reset delay	(0 to 600) The number of seconds that must elapse between resets.
	Inverter proof delay	(0 to 600) The number of seconds that must elapse after proof is not detected, before a reset attempt.
	Monitor phase loss	(List box: Yes, No) Whether or not phase loss will be monitored.
	Shutdown on phase loss	(List box: Yes, No) Whether or not the unit is to be shut down when its phase loss detector input is on.

Shutdown on smoke detect (List box: Yes, No) Whether or not the unit is to be shut down when its smoke detector is on.

Shutdown on fire alarm (List box: Yes, No) Whether or not the unit is to be shut down when a monitored fire alarm occurs.

RTC Cooling configuration

Select **Cooling** from the configuration menu for an HVAC unit of type RTC:

```
10/15/2002                    09:46:40 AM

 📱 Configure RTU  2          Cooling 🔋

Num of cooling stages...? 2
Control cooling using...? Return Air
Target differential.....? 1.0  °F
Target temp. for stage:
 #1: 74.0°F  #2: 74.0°F
Pre delay for stage:
 #1: 1 min   #2: 1 min
Post delay for stage:
 #1: 1 min   #2: 1 min
Humidity adjusts target.? Yes
Humidity sensor.........? Average
Dynamic offset..........?   0.0°F
No offset <  45.0% full >  55.0%
Ambient temp lockout....? Yes
No cooling below........?  40.0°F
Night setback...........? Yes
Night setback offset....?   5.0°F
Minimum ON time.........:  0 min
Minimum OFF time........:  0 min
```

Num of cooling stages (0 to 3) The number of cooling stages in this HVAC unit.

Control cooling using (List box:)
Return Air: Cooling will be controlled to satisfy a return air target temperature.
Average: Cooling will be controlled to satisfy an average zone temperature target.
High: Cooling will be controlled to satisfy a zone target temperature for the highest of a number of zone temperature sensors.
Zone 1(etc.): (each supply zone temperature sensor will be available as a choice in the list) Control will be based on the single selected sensor.

Target differential (0.1 to 100.0) The differential selected creates a control dead band around the target temperature. For example, if the target is 72 and the range is 2, the stage will come on at 74, and will not be turned off until the temperature reaches 70.

Target temp. for stage: (0.0 to 99.9) A separate field for each of the stages in the unit.

Pre delay for stage (0 to 15) The number of minutes that must elapse after target plus range is reached before the stage will come on. There is one field for each stage.

Post delay for stage (0 to 15) The number of minutes that must elapse after target minus range is reached before the stage will be turned off. There is one field for each stage.

Humidity adjusts target:	(List box: Yes, No) Whether or not humidity will adjust the cooling target temperature.
Humidity sensor	(List box:)
	Average: Cooling target modification will be based on an average of two humidity sensors.
	High: Cooling target modification will be based on the highest of two humidity sensors.
	Zone 1(etc.): (each zone humidty sensor will be available as a choice in the list) Cooling target modification will be based on the single selected sensor.
Dynamic offset	(-99.9 to 99.9) The number of degrees by which humidity can adjust the target temperatures. Within the range of humidity limiting the offset, a linear relationship will exist between humidity and offset. (see also next two parameters).
No offset <	(-99.9 to 99.9) The relative humidity below which there will be no offset of target temperature.
Full >	(-99.9 to 99.9) The relative humidity above which the maximum offset of target temperature by humidity will be applied.
Ambient temp lockout	(List box: Yes, No) Whether or not cooling is to be locked out below a set ambient temperature (next line).
No cooling below	(0.0 to 100.0) The ambient temperature below which cooling will be locked out.
Night setback	(List box: Yes, No) Whether or not the cooling setpoints are to be raised by an offset (next line) when the store is closed according to a schedule or schedules configured in the Store Info screens.
Night setback offset	(-50.0 to 50.0) The amount by which the cooling setpoint (set on previous page) is to be raised during store closed hours (as set in the Store Info screen.
Minimum ON time	(0 to 60) The minimum number of minutes cooling must run after being turned on before being turned off.
Minimum OFF time	(0 to 60) The minimum number of minutes cooling must remain off after being turned off before being turned on.

RTC Heating
configuration

```
10/15/2002                09:47:45 AM

█  Configure RTU  2        Heating ▓

Num of heating stages...? 2
Control heating using...? Return Air
Target differential.....? 1.0  °F

Target temp. for stage:
 #1: 69.0°F  #2: 69.0°F
Pre delay for stage:
 #1: 0 min    #2: 0 min
Post delay for stage:
 #1: 0 min    #2: 0 min

Ambient heat lockout....? Yes
No heat above...........?  70.0°F
Night setback...........? Yes
Night setback offset....?   5.0°F


Minimum ON time.........:  0 min
Minimum OFF time........:  0 min
```

Num of heating stages	(0 to 3) The number of stages of heat in the unit.
Control heating using	(List box:)
	Return Air: Heating will be controlled to satisfy a return air target temperature.
	Average: Heating will be controlled to satisfy an average zone temperature target.
	Low: Heating will be controlled to satisfy a zone target temperature for the lowest of a number of zone temperature sensors.
	Zone 1(etc.): (each supply zone temperature sensor will be available as a choice in the list) Control will be based on the single selected sensor.
Target differential	(0.1 to 100.0) The differential selected creates a control dead band around the target temperature. For example, if the target is 72 and the range is 2, the stage will come on at 70, and will not be turned off until the temperature reaches 72. The pre-delay and post-delay must also be satisfied.
Target temp. for stage:	(-50.0 to 99.9) A separate field for each of the stages in the unit.
Pre delay for stage	(0 to 15) The number of minutes that must elapse after target plus range is reached before the stage will come on. There is one field for each stage.
Post delay for stage	(0 to 15) The number of minutes that must elapse after target minus range is reached before the stage will be turned off. There is one field for each stage.
Ambient temp lockout	(List box: Yes, No) Whether or not heating is to be locked out above a set ambient temperature (next line).
No heat above	(0.0 to 100.0) The ambient temperature above which heating will be locked out.
Night setback	(List box: Yes, No) Whether or not the heating setpoints are to be lowered by an offset (next line)

when the store is closed according to a schedule or schedules configured in the Store Info screens.

Night setback offset (-50.0 to 50.0) The amount by which the heating setpoint (set on previous page) is to be lowered during non-scheduled hours (as set in the Store Info screens).

Minimum ON time (0 to 60) The minimum number of minutes heating must run after being turned on before being turned off.

Minimum OFF time (0 to 60) The minimum number of minutes heating must remain off after being turned off before being turned on.control actions. See preceding two settings.

RTC dehumidification configuration

There are two pages of dehumidification configuration settings:

```
10/15/2002              09:50:26 AM
  Configure RTU  2      Dehumidify

Dehumidification type...?Cooling

Aux heat during dehumid.?No
Control dehumid. on.....?Calc Dewpt
Control dehumid. using..?Average




Target..................? 50.0°F
Target differential.....?  2.0°F
Pre delay for stage:
  #1:  1 min  #2:  1 min

Post delay for stage:
  #1:  2 min  #2:  2 min

Cooling low limit.......?  68.0°F
                   "PG DN" for more
```

```
10/15/2002              09:50:58 AM
  Configure RTU  2      Dehumidify






Night setback...........? Yes
Night setback offset....? 2.0   °F
```

Dehumidification type (List box: None, Cooling) The type of dehumidification used.

Aux heat during dehumid (List box: Yes, No) Whether or not auxiliary heat is allowed during dehumidification.

Control dehumid. on (List box:)
Humidity: Dehumidification will be controlled based on a specified humidity target. A humidity sensor is required.
Calc Dewpt: Dehumidification will be controlled based on a specified dewpoint target, which will be compared with a dewpoint calculated from zone temperatuare and humidity. Both zone temperature and humidity sensors must be installed.

Control dehumid. using (List box, if controlled by dewpoint or humidity only, and if there are multiple sensors:)
Average: Control will be based on the average of a group of sensors.
High: The high value of a group of sensors will be used.

Zone 1 (etc.): Any single humidity sensor or combination of sensors will be used.

Target

(0.0 to 100.0) The humidity or dewpoint value desired at the controlling sensor or combination specified above.

Target differential

(0.1 to 15.0) The differential forms a deadband above and below the target in which no control actions are taken. Dehumidification will be turned on at target plus differential and turned off at target minus differential.

Pre delay for stage

(0 to 60) The number of minutes that must elapse after target plus range is reached before the stage will come on. There is one field for each stage.

Post delay for stage

(0 to 60) The number of minutes that must elapse after target minus range is reached before the stage will be turned off. There is one field for each stage.

Cooling low limit

(0.0 to 100.0) The temperature at and below which dehumidification is disallowed.

Night setback

(List box: Yes, No) Whether or not the dehumidification target is to be raised by an offset (next line) during store closed hours according to a schedule or schedules in the Store Info screens.

Night setback offset

(0.0 to 100.0) The amount by which the dehumidification setpoint (set on previous page) is to be raised during store closed hours according to a schedule or schedules in the Store Info screens.

RTC Air Damper
configuration

You will use one of two pages, depending on whether economizer control is used:

```
10/15/2002              09:59:31 AM
▓ Configure RTU  2      Air Damper ▓

Air Damper..............? Yes
Control method..........? Fan ON
Ambient temp lockout....? Yes
No air damper below.....? 35.0 °F




Use CO2 override........? Yes
Target CO2 Amount.......? 1000 ppm
Damper Controlled by....? Relay Output
```

```
10/29/2002              04:00:18 PM
▓ Configure RTU  2      Air Damper ▓

Air Damper..............? Yes
Control method..........? Economizer


Control economizer on...? Enthalpy
Humidity sensor to use  ? Average

Enthalpy differential...? 0.0  BTU/lb
Use CO2 override........? Yes
Target CO2 Amount.......? 1000 ppm
Damper Controlled by....? Variable Out
Min Damper Position.....? 10.0  %
Max Damper Position.....? 100.0 %
Variable Output range...? 0-10 Volts
Reaction Time...........? 8
Algorithm Interval......? 10
```

Air Damper

(List box: Yes, No) Whether or not there is a controlled air damper.

Control method

(List box:)

Fan ON: The damper will be open whenever the fan

is on.
Economizer: Economizer control will be used, based on either humidity or enthalpy.
Schedule: The air damper will be operated according to a schedule or schedules (entered on the next page).
CO2 Ctrl: The air damper will be operated based on the CO2 level in the HVAC unit's zone.

Ambient temp lockout
[appears when any control method except economizer is used] (List box: Yes, No) Whether or not the air damper is to be locked out based on ambient temperature.

No air damper below
[appears when any control method except economizer is used and question above is answered Yes](0.0 to 100.0) The air damper will be locked out below this temperature.

Control economizer on
(List box:) (appears only if economizer control is selected)
Humidity: The air damper will be controlled based on humidity.
Enthalpy: The air damper will be controlled based on calculated enthalpy.

Humidity sensor to use
(List box:)
Average: Enthalpy or humidity control will be based on the average of two zone humidity sensors.
High: Enthalpy or humidity control will be based on the highest of two humidity sensors.
Zone 1(etc.): (each zone humidty sensor will be available as a choice in the list) Enthalpy or humidity control will be based on the single selected humidity sensor.

Lockout if outside above
(0.0 to 100.0) The air damper will be locked out (shut) if the outside temperature is above this setting.

Enthalpy differential
(-99.9 to 99.9) In enthalpy control, when outside enthalpy is less than inside enthalpy by this differential, the damper will be allowed to open.

Use CO2 override
(List box: Yes, No) Whether or not damper control is to be overriden based on CO2 content of inside air.

Target CO2 amount
(0 to 2000) When CO2 override is enabled, the CO2 level at which the damper is allowed open to bring in fresh air.

Damper Controlled by
(List box:)
Variable Out: The damper is modulated by the RTCs analog output (variable output).
Relay Output: The damper is opened by a digital output (relay output).

Min Damper Position
(0.0 to 100.0) When a variable out is controlling, the minimum percentage of damper opening allowed.

Max Damper Position
(0.0 to 100.0) When a variable out is controlling, the maximum percentage of damper opening allowed.

Variable Output range
(List box:) When a variable out is controlling, the

minimum percentage of damper opening allowed.

0-5 Volts: Sets the RTC board's analog output for an output over the range 0-5 volts.

0-10 Volts: Sets the RTC board's analog output for an output over the range 0-10 volts.

Reaction Time   (1 to 99) This setting, together with the next, determines the sensitivity of variable output control. It should be adjusted only by a Danfoss-trained technician.

Algorithm Interval   (1 to 15) This setting, together with the previous one, determines the sensitivity of variable output control. It should be adjusted only by a Danfoss-trained technician.

RTC schedules   The RTC schedules screen(s) allow entry of schedules for operation of the rooftop.

RTC alarm configuration

Alarms can be for any of the following, in accordance with the Appendix on alarms.

Sensor discard
Power failure
Filter (elapsed)
Filter (runtime)
HVAC smoke   for this unit's smoke detector
HVAC fire   for this unit's fire detector

Sensor alarms can be set for any of the zone or humidity sensors, for any relay output, or for any digital input (on-off input).

RTC I/O Points configuration

These are configured in a manner unlike the Board & Points entries for other devices. Select RTC I/O Points from the RTC configuration menu and the first screen, Relay Outputs, appears.


```
10/29/2002                    04:47:21 PM

   Configure RTU  2          I/O Points

              Relay Outputs


   Point    Name                On

     1      Fan                 N-Open
     2      Economizer          N-Open
     3      Cool 1              N-Open
     4      Cool 2              N-Open
     5      Cool 3              N-Open
     6      Heat 1              N-Open
     7      Heat 2              N-Open
     8      Heat 3              N-Open
```
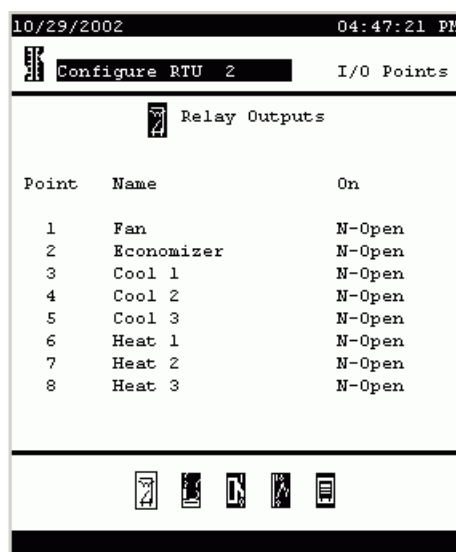
Notice the set of icons across the bottom of the screen. These will allow you to reach

the other configuration screens and to initialize the RTC. From left to right, the icons represent Relay Outputs (digital outputs), Sensor Inputs (analog inputs), On-off Inputs (digital inputs), Variable Outputs (analog outputs), and finally, RTC Controls (RTC Address and Init).
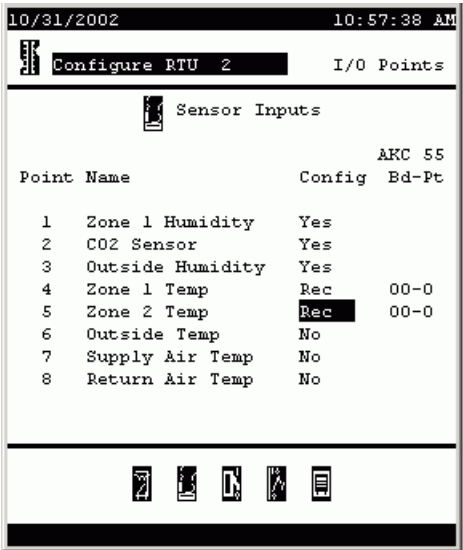
Configuring RTC I/O
Relay Outputs

Here are the fields for Relay Outputs:

Point   (1 to 8) The number of the point.
Name   (Label field, contents depend on system configuration)
                  The name of the point. The names are fixed, since the hardware points on the RTC board are dedicated, and can control only a single type of device as follows:
                  Point 1: Fan
                  Point 2: Economizer
                  Point 3: Cool 1
                  Point 4: Cool 2
                  Point 5: Cool 3
                  Point 6: Heat 1
                  Point 7: Heat 2
                  Point 8: Heat 3
On   (List field:)
                  N-Open: The point is wired through normally open contacts.
                  N-Open: The point is wired through normally open contacts.

Configuring RTC I/O
Sensor Inputs

Here is the screen for sensor inputs, reached with the second icon from left:

```
10/31/2002                    10:57:38 AM

    Configure RTU  2          I/O Points

              Sensor Inputs

                                    AKC 55
   Point Name              Config  Bd-Pt

     1    Zone 1 Humidity    Yes
     2    CO2 Sensor         Yes
     3    Outside Humidity   Yes
     4    Zone 1 Temp        Rec     00-0
     5    Zone 2 Temp        Rec     00-0
     6    Outside Temp       No
     7    Supply Air Temp    No
     8    Return Air Temp    No
```

Point   (1 to 8) The number of the point.
Name   (Label field, contents depend on system configuration)
                  The name of the point. The names are fixed, since the hardware points on the RTC board are dedicated, and

can serve only for the listed devices. The names
always appear as in the illustration above, whether the
sensor is used or not.

Config   (List field, one for each point:)
Yes: The sensor is configured. It should be installed if
this answer is given, or the configuration should be
changed.
No: The sensor is not configured. Its value can not be
used by the controller.
Rec: The sensor value is to be received from another
node (other than this RTC board) on the I/O network.
The board and point that is broadcasting the value must
be given in the next column.

AKC 55 Bd-Pt   (Address field) If the sensor value is received from
another node on the I/O network, enter here the
address of the point that is to be received.

Configuring RTC I/O
on-off inputs

Here is the screen for on-off (digital) inputs, reached with the third icon from left.
Note that the screen is divided in two parts: the upper half deals with inputs available
on the RTC board, and the lower half shows inputs that can be received from other
nodes on the I/O network. The names appear whether or not the points are config-
ured or used.

```
10/31/2002                      10:59:22 AM

   Configure RTU  2        I/O Points

              On/Off Inputs

RTC Inputs:                       AKC 55
Pt# Name          Config   On        Bd-Pt
 1  Fan           Yes    Voltage
 2  Cool 1        No     Voltage
 3  Cool 2        No     Voltage
 4  Smoke Det     Rec    No Voltage 00-0

AKC 55 Inputs:
Name              Bcast   On        Bd-Pt
Override          Rec    Voltage    00-0
Smoke Stat 3      No     No Voltage 00-0
Phase Loss 3      Rec    Voltage    00-0
```
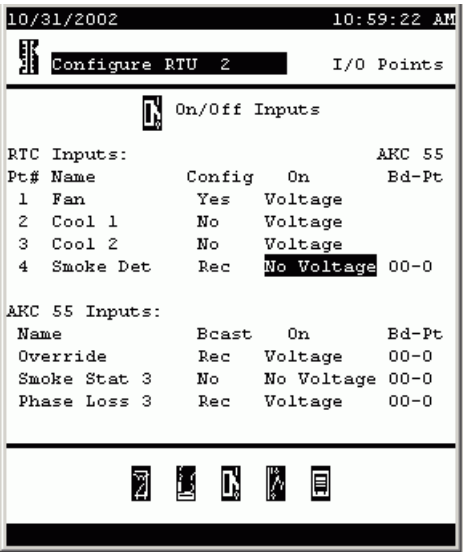
First, the RTC Inputs:
Pt#   (1 to 8) The number of the point.
Name   (Label field, not changeable) The name of the point.
The names are fixed, since the hardware points on the
RTC board are dedicated, and can serve only for the
listed devices. The names always appear as in the
illustration above, whether the input is used or not.
Config   (List field, one for each point:)
Yes: The input is configured. It should be wired if this
answer is given, or the configuration should be

changed.

No: The input is not configured. Its state can not be used by the controller.

**Rec**: The input value is to be received from another node (other than this RTC board) on the I/O network. The board and point that is broadcasting the state of the input must be given in the next column.

AK2-SC 2 55 Bd-Pt (Address field) If the input state is received from another node on the I/O network, enter here the address of the point that is to be received.

In the lower half of the screen, the SC 255 Inputs:

Name (Label field, not changeable) The name of the point. The RTC board's software can only use the listed inputs from the I/O network. The names always appear as in the illustration above, whether the input is used or not.

Bcast (List field, one for each point:)

No: The input is not configured or its state is not to be used by the controller.

Rec: The input value is to be received from another node (other than this RTC board) on the I/O network. The board and point that is broadcasting the state of the input must be given in the next column.

On (List field:)

Voltage: The input state will read ON when the point senses voltage.

No Voltage: The input state will read ON when the point senses no voltage.

Bd-Pt (Address field) If the input state is received from another node on the I/O network, enter here the address of the point that is to be received.

Configuring RTC I/O variable outputs

Here is the screen for variable (analog) outputs, reached with the fourth icon from left. The names appear if the points are configured.
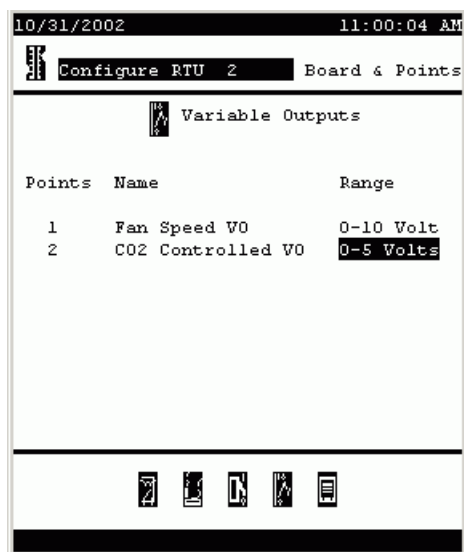
Pt#	(1or 2) The number of the point.
Name	(Label field, not changeable) The name of the point. The names are fixed, since the hardware points on the RTC board are dedicated, and can serve only for the listed outputs. The names always appear as in the illustration above, whether the input is used or not.
Range	(List field, one for each point:)
	0-10 Volt: The output will supply 0-10 Volts.
	0-5 Volts: The output will supply The input is configured. It should be wired if this

RTC Address
and Init   Select the right-most icon on the Configure RTC I/O points screen, and you will see
                  this screen:
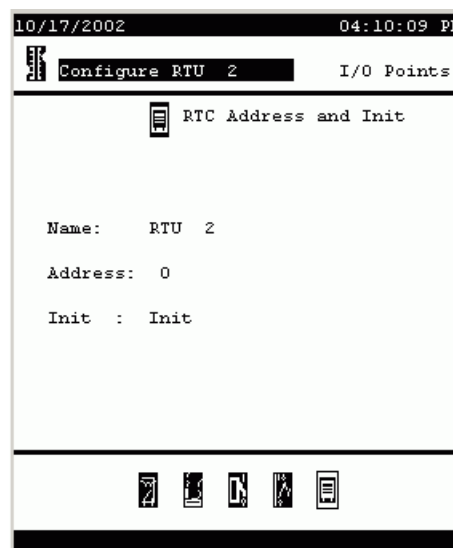
In the field labeled address, give the RTC an address from 0 to 99 that is unique among all the RTC nodes on the I/O network for this SC 255. Remember that there can be only 45 HVAC units per SC 255.

Any time an RTC node is changed or added, the network must be re-scanned and re-initialized.

After addressing and re-scanning, put the cursor on the Init field and press ENTER. The initialization process will take a few seconds, with a success or failure confirmation message appearing briefly across the bottom of the screen. When successful, configuration is complete.

Seasons 4 Smart Coil HVAC Unit configuration

Smart Coil® packaged HVAC systems (manufactured by Seasons 4, Inc.) have some unique configuration requirements. For these units, select **SC4** as the type on the Configure HVAC menu. At left below is the **SC4** menu. At right is the screen for fan configuration.
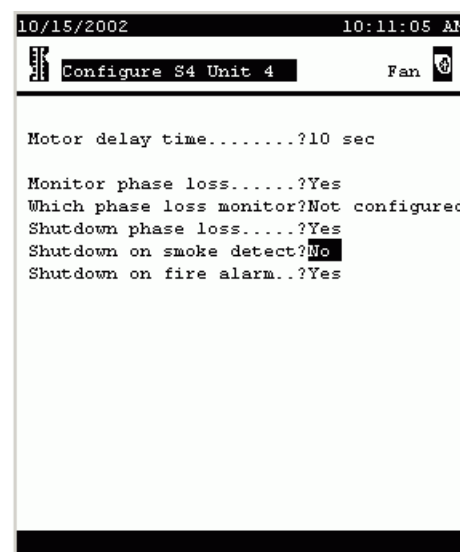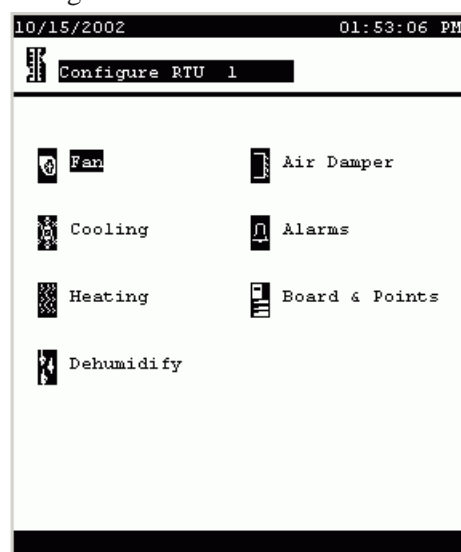
Motor delay time	(5 to 255) The fan motor runs continuously at low speed. When there is a call for cooling, heating, or dehumidification, the fan switches to high speed after the motor delay set here elapses.
Monitor phase loss	(List box: Yes, No) Whether or not a phase loss detector is to be monitored.
Which phase loss monitor	(List box) Select from any of the configured phase loss monitors.
Shutdown phase loss	(List box: Yes, No) Whether or not the fan is to be shut down on detection of a phase loss.
Shutdown on smoke detect	(List box: Yes, No) Whether or not the unit is to be shut down when its smoke detector is on.
Shutdown on fire alarm	(List box: Yes, No) Whether or not the unit is to be shut down when a fire alarm monitor detects a fire

alarm.

SC4 cooling
configuration

```
10/15/2002                  10:12:56 AM

⊞  Configure S4 Unit 4       Cooling  ⊟

Number of zone sensors..?3
Controlling sensor......?Zone Temp 4-1
Num of cooling stages...?Four
Setpoint................? 74.0°F
Range +/-...............?  1.0°F

Ambient temp lockout....?Yes
No cooling below........? 40.0°F
Range +/-...............?  2.0°F
Minimum run time........?2 min
Delay between stages....?3 min
Night setback...........?Yes
Night setback offset....?  5.0°F
Override switch.........?Yes
Override duration.......?60  min
Num of schedules........?1


                    "PG DN" for more

```

No of zone sensors	(0 to 5) The number of zone temperature sensors.
Controlling sensor	(List box:)
	Min Temp: Control will be based on the lowest value of all of the zone temperature sensors.
	Max Temp: Control will be based on the highest value of all of the zone temperature sensors.
	Average: Control will be based on the average of all the zone temperature sensors.
	Zone Temp 4-1 (etc.): (each zone temperature sensor will be available as a choice in the list) Control will be based on the single selected sensor.
Num of cooling stages	(List box: None, Four) Of the four cooling stages in the unit, the number to be controlled by the AKC 55. Either all units are controlled or none are controlled.
Setpoint	(0.0 to 100.0) The desired temperature at the controlling sensor.
Range +/-	(-9.9 to 9.9) The range selected creates a dead band. For example, if the target is 72 and the range is 2, the stage will come on at 74, and will not be turned off

until the temperature reaches 70.

Ambient temp lockout: (List box: Yes, No) Whether or not there is to be a lockout based on low ambient temperature.

No cooling below (0.0 to 100.0) The ambient temperature below which cooling will be locked out.

Range +/- (0.0 to 9.9) The range for the lockout. Cooling will be locked out at lockout minus range, and when locked out will be allowed on at lockout plus range.

Minimum run time (0 to 20) The number of minutes that a stage must run before being turned off.

Delay between stages (0 to 20) The number of minutes that must elapse after a stage is turned on before the next stage can be turned on.

SC4 heating
configuration

```
10/15/2002                    10:14:56 AM

 ▒▌ Configure S4 Unit 4      Heating ▒

Number of zone sensors..?3
Controlling sensor......?Zone Temp 4-1
Num of heat rclm stages.?2
Setpoint................? 72.0°F
Range +/-...............?  1.0°F
Num of aux heat stages..?4
Setpoint................? 69.0°F
Range +/-...............?  1.0°F
Ambient temp lockout....?Yes
No heat above...........? 70.0°F
Range +/-...............?  2.0°F
Minimum run time........?2 min
Delay between stages....?3 min
Night setback...........?Yes
Night setback offset....?  5.0°F
Override switch.........?Yes
Override duration.......?60  min
Num of schedules........?1
                    "PG DN" for more
```

No of zone sensors (0 to 5) The number of zone temperature sensors.

Controlling sensor (List box:)

Min Temp: Control will be based on the lowest value of all of the zone temperature sensors.

Max Temp: Control will be based on the highest value of all of the zone temperature sensors.

Average: Control will be based on the average of all the zone temperature sensors.

Zone Temp 4-1 (etc.): (each zone temperature sensor will be available as a choice in the list) Control will be based on the single selected sensor.

Num of ht rclm stages (0 to 4) The number of heat reclaim stages in the SC4 unit.

Setpoint (0.0 to 100.0) The desired temperature at the controlling sensor when heat reclaim is being used.

Range +/- (0.0 to 9.9) The range selected creates a dead band.

For example, if the target is 68 and the range is 2, the stage will come on at 66, and will not be turned off until the temperature reaches 70.

Num of aux heat stages (0 to 4) The number of auxiliary heat stages in the SC4 unit.

Setpoint (0.0 to 100.0) The desired temperature at the controlling sensor when auxiliary heat is being used.

Range +/- (0.0 to 9.9) The range selected creates a dead band. For example, if the target is 68 and the range is 2, the stage will come on at 66, and will not be turned off until the temperature reaches 70.

Ambient temp lockout: (List box: Yes, No) Whether or not there is to be a lockout based on low ambient temperature.

No heat above (0.0 to 100.0) The ambient temperature above which heating will be locked out.

Range +/- (0.0 to 9.9) The range for the lockout. Heating will be locked out at lockout plus range, and when locked out will be allowed on at lockout minus range.

Minimum run time (0 to 20) The number of minutes that a stage must run before being turned off.

Delay between stages (0 to 20) The number of minutes that must elapse after a stage is turned on before the next stage can be turned on.

Night setback (List box: Yes, No) Whether or not the heating setpoints are to be raised by an offset (next line) during the times when cooling is not scheduled to be on according to a schedule or schedules (next page).

Night setback offset (0.0 to 50.0) The amount by which the heating setpoints are to be raised during night setback.

Override switch (List box: Yes, No) Whether or not there is an override switch wired to a digital input.

Override duration (0 to 1439) The number of minutes that control will be overridden after operation of the override switch.

Num of schedules (0 to 8) The number of operating schedules entered on the following page(s).

SC4 dehumidification
configuration


```
10/15/2002              10:15:45 AM

[] Configure S4 Unit 4  Dehumidify []

Num of stages..........?Four
Setpoint................?45%
Range +/-...............? 2%
Cooling low limit.......? 68.0°F

Ambient temp lockout....?Yes
No dehum below..........? 40.0°F
Range +/-...............?  2.0°F
Minimum run time........?2 min
Delay between stages....?3 min
Night setback...........?Yes
Night setback offset....? 2%
Override switch.........?Yes
Override duration.......?60  min
Num of schedules........?1
Seasons 4 password......?*****


                    "PG DN" for more
```

Num of stages	(List box: None, Four) Whether or not dehumidification is controlled in the SC4 unit. All SC4 units have four stages of dehumidification.
Setpoint	(0 to 99) The percent desired relative humidity in the zone.
Range +/-	(1 to 15) The range selected creates a dead band. For example, if the target is 45% and the range is 2, dehumidification will come on at 47, and will not be turned off until humidity reaches 43%.
Cooling low limit	(0.0 to 100.0) The zone temperature below which mechanical cooling configured for dehumidification will be disallowed.
Ambient temp lockout:	(List box: Yes, No) Whether or not there is to be a lockout based on low ambient temperature.
No dehum below	(0.0 to 100.0) The ambient temperature below which dehumidification will be locked out.
Range +/-	(0.0 to 9.9) The range for the lockout. Dehumidification will be locked out at lockout minus range, and when locked out will be allowed on at lockout plus range.
Minimum run time	(0 to 20) The number of minutes that a stage must run before being turned off.
Delay between stages	(0 to 20) The number of minutes that must elapse after a stage is turned on before the next stage can be turned on.
Night setback	(List box: Yes, No) Whether or not the dehumidification setpoint is to be raised by an offset (next line) when dehumidification is not scheduled to be on according to a schedule or schedules (next page).
Night setback offset	(0 to 99) The number of % by which the dehumidification setpoint is to be raised during night setback.

Override switch	(List box: Yes, No) Whether or not there is an override switch wired to a digital input.
Override duration	(0 to 1439) The number of minutes that control will be overridden after operation of the override switch.
Num of schedules	(0 to 8) The number of operating schedules entered on the following page(s).
Seasons 4 password	(5-character auth code) The password given by Seasons 4 to the equipment owner.

SC4condenser
configuration

```
10/15/2002                   10:22:13 AM

    Configure S4 Unit 4    Condenser


Number of fans..........?Six

Minimum run time........?2 min

Liquid Temp Setpoint
 Stage 1:   60.0°F
 Stage 2:   75.0°F
 Stage 3:   90.0°F

 Range   :    1.0°F
```

Number of fans	(List box: None, Six, Eight) The number of HVAC condenser fans controlled in this unit.
Minimum run time	(0 to 60) The number of minutes that a stage must run before being turned off.
Liquid Temp Setpoint	(0.0 to 150.0, one setpoint per stage) The stage will be turned on at setpoint plus range and turned off after the stage above is turned off, at setpoint minus range.
Range	(0.0 to 150.0, one setpoint per stage) The stage will be turned on at setpoint plus range and turned off after the stage above is turned off, at setpoint minus range.

SC4 alarms
configuration

SC4 alarms are configured as are RTU alarms.

SC4 board & points
configuration

SC4 board & points are configured as are RTU board & points.

ClimaTECH configuration

Danfoss supplies two models of ClimaTECH HVAC controller, the ClimaTECH 65 and the ClimaTECH 1024. Configuration of these two controllers proceeds in the same way. The ClimaTECH 1024 has a larger control capacity.

The ClimaTECH configuration menu appears below:
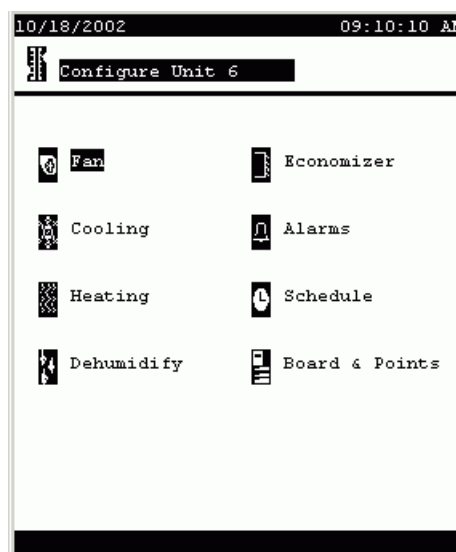
There are two fan configuration screens, depending on whether the fan is fixed speed or variable speed.
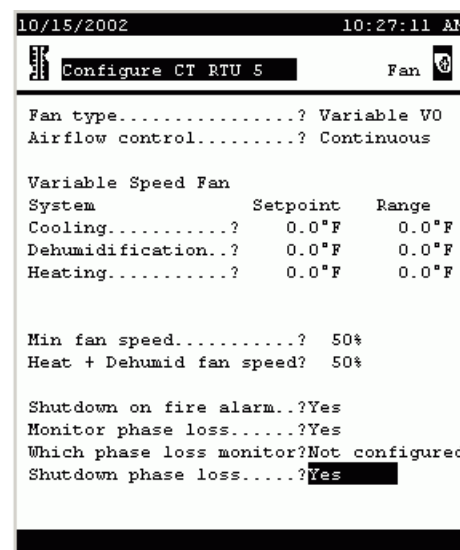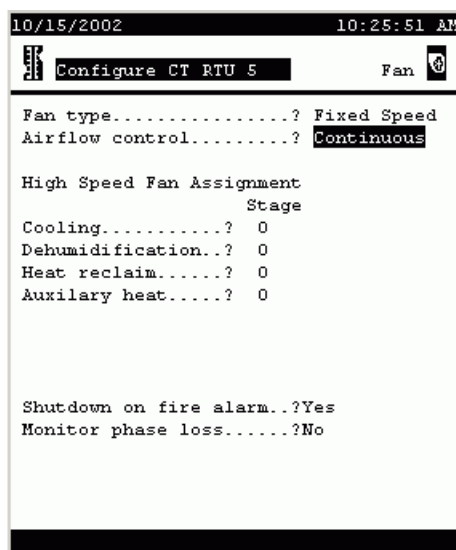
Fan type   (List box: Fixed Speed, Variable VO) Fans can be single or 2-speed fixed, or variable speed. ClimaTECH controllers have only one analog (variable) output. If you select variable speed here, you will not be able to control an analog gas valve, if any, as a modulating valve.

Airflow control   (List box:)

Continuous: The fan will run continuously.
On Demand: The fan will run only when cooling, heating, or dehumidification is called for.

High Speed Fan Assignment

Fixed speed fans may be 2-speed. Enter, in the **Stage** field for cooling, dehumidification, heat reclaim, and auxiliary heat, the stage at which you want fan operation to change to high speed.

Variable Speed Fan
A setpoint and range are configured for cooling, dehumidification, and heating. The range defines a deadband on either side of the setpoint in which no control action is taken.
Setpoint: (-40.0 to 150.0)
Range: (-40.0 to 150.0)

Min fan speed
(0.0 to 100.0) The minimum percentage of rated fan speed allowed.

Heat + Dehumid fan speed
(0.0 to 100.0) The percentage of rated fan speed during dehumidification or heating.

Shutdown on fire alarm
(List box: Yes, No) [Functional only if the fire alarm has dry contacts wired to a digital input on the ClimaTECH controller or is being broadcast by the AKC 55. The fan will be shut down on occurrence of a fire alarm.

Monitor phase loss
(List box: Yes, No) Whether or not a phase loss detector is monitored.

Which phase loss monitor
(List box: All configured phase loss detectors) Select the phase loss detector to monitor.

Shutdown on phase loss
(List box: Yes, No) Whether or not the fan is to be shut down on detection of a phase loss by the monitored detector.

ClimaTECH
cooling configuration


```
04/25/2002                    14:16:14

  Configure Unit 1        Cooling


Num of cooling stages...? 4

Occupied setpoint.......?    0.0°F
Unoccupied setpoint.....?    0.0°F

Lockout below ambient...?    0.0°F

Delay between stages....? 1  min
```

Num of cooling stages
(0-6) The number of cooling stages in the HVAC unit.

Occupied setpoint
(0.0 to 150.0) The cooling setpoint during operating

	hours as configured in the Store Info screen.
Unoccupied setpoint	(0.0 to 150.0) The cooling setpoint during store closed hours as configured in the Store Info screen.
Lockout below ambient	(0.0 to 150.0) The outside ambient temperature below which cooling will be locked out.
Delay between stages	(0 to 99) The number of minutes after the start of a cooling stage before the next stage can start. Also, the minimum on time for every stage.

ClimaTECH
heating configuration

There are two pages of settings for heating configuration:

```
10/15/2002              10:29:14 AM
   Configure CT RTU 5      Heating

Num of heat rclm stages.? 2

Occupied setpoint.......?   0.0°F
Unoccupied setpoint.....?   0.0°F

Lockout above ambient...?   0.0°F

Delay between stages....? 1   min



Heat reclaim flush start? 01:00 AM
Flush duration..........? 10   min




                    "PG DN" for more
```

```
10/18/2002              01:52:39 PM
   Configure CT RTU 5      Heating

Num of aux heat stages..? 1

Occupied setpoint.......?   0.0°F
Unoccupied setpoint.....?   0.0°F

Lockout above ambient...?   0.0°F

Delay between stages....? 1   min


Analog gas valve........? Yes
Temperature difference..?   0.0°F
Min valve opening.......?   0%
Valve delay.............?   0 sec
```

Num of heat rclm stages	(0 to 4) The number of heat reclaim stages.
Occupied setpoint	(0.0 to 150.0) The heat reclaim setpoint during operating hours as configured in the Store Info screen.
Unoccupied setpoint	(0.0 to 150.0) The heat reclaim setpoint during store closed hours as configured in the Store Info screen.
Lockout above ambient	(0.0 to 150.0) The outside ambient temperature above which heat reclaim will be locked out.
Delay between stages	(0 to 99) The number of minutes after the start of a heat reclaim stage before the next stage can start. Also, the minimum on time for every stage.
Heat reclaim flush start	(Time of day field) The time for heat reclaim flush to begin each day.
Flush duration	(0 to 99) The number of minutes' duration for each heat reclaim flush.
Number of aux heat stages	(0 to 4) The number of configured auxiliary heat stages in the HVAC unit.
Occupied setpoint	(0.0 to 150.0) The zone temperature setpoint for auxiliary heat during operating hours as configured in the Store Info screen.
Unoccupied setpoint	(0.0 to 150.0) The zone temperature setpoint for auxiliary heat during store closed hours as configured in the Store Info screen.

Lockout above ambient	(0.0 to 150.0) The outside ambient temperature above which auxiliary heat will be locked out.
Delay between stages	(0 to 99) The number of minutes after the start of an auxiliary heat stage before the next stage can start. Also, the minimum on time for every stage.
Analog gas valve	(List box: Yes, No) Whether or not the HVAC unit has a controlled analog gas valve. [ClimaTECH controllers have only one analog (variable) output. If a variable speed fan is configured, an analog gas valve cannot be, and vice versa.]
Temperature difference	(-40.0 to 150.0) the difference between supply air temperature and zone temperature.
Min valve opening	(0 to 100) The minimum percentage of valve opening when auxiliary heat is on.
Valve delay	(0 to 99) The number of seconds after the enabling relay turns on before the analog valve can open.

ClimaTECH
dehumidification
configuration


```
10/15/2002                 10:31:23 AM

⫿ Configure CT RTU 5   Dehumidify ⫿


Num of stages...........? 2

Occupied setpoint.......?    0.0°F
Unoccupied setpoint.....?    0.0°F

Lockout below ambient...?    0.0°F

Delay between stages....? 1   min

Aux heat/dehumid lockout? No
```

Num of stages	(0 to 6) The number of dehumidification stages.
Occupied setpoint	(-40.0 to 150.0) The dehumidification setpoint during operating hours as configured in the Store Info screen.
Unoccupied setpoint	(-40.0 to 150.0) The dehumidification setpoint during store closed hours as configured in the Store Info screen.
Lockout below ambient	(-40.0 to 150.0) The outside ambient temperature below which dehumidification will be locked out.
Delay between stages	(0 to 99) The number of minutes after the start of a dehumidification stage that must elapse before the next stage can start. Also, the minimum time each stage must run before being turned off.
Aux heat/dehumid lockout	(List field: Yes, No) Whether or not auxiliary heat is to be locked out when dehumidification is running. A yes

answer here means that only heat reclaim can be used for reheating during dehumidification.

ClimaTECH
economizer
configuration


```
10/15/2002                10:32:15 AM
│ Configure CT RTU 5    Economizer │

Economizer.............? Yes

Outside ambient target..? 0.0    °F

Outside dewpoint target.? 0.0    °F
```

Economizer (List box: Yes, No) Whether or not there is an econo-mizer function in the HVAC unit.

Outside ambient target (-40.0 to 150.0) The target The number of stages of auxiliary heat in the HVAC unit.

Outside dewpoint target (0.0 to 150.0) The heat reclaim setpoint during store closed hours as configured in the Store Info screen.

ClimaTECH
alarm configuration   ClimaTECH alarms are presented differently than most other alarms.

Alarm delay   (0 to 100) The number of minutes after an input
                             reaches trip level that an alarm will be generated. All
                             ClimaTECH alarms have a common alarm delay.
Each alarm has a setting (Normal, Critical, etc.) as explained in the Alarms appendix.
A trip level (a temperature, pressure, etc., or on-off state) can be set for each alarm.

ClimaTECH
schedule
configuration   Because the ClimaTECH can function as a stand-alone, it contains its own schedules.
                           They are set for each day and holiday in the same manner as lighting schedules.
                           Refer to the lighting schedule section for information on setting. If all schedules are
                           set to **Relative**, and the default zero settings are left for all schedules, then the
                           HVAC unit will operate based on the store open hours set in the Store Info screens.

ClimaTECH I/O
configuration   A ClimaTECH unit's points must be allocated and assigned using the I/O points
                           screens.

ClimaTECH
relay outputs

```
10/15/2002                    10:38:25 AM
▉ Configure CT RTU 5      I/O Points

            ▉ Relay Outputs

                         Stage
Name               1  2  3  4  5  6


Fan                0
Economizer         0
Cooling            0  0
Dehumidify         0  0
Heat Reclaim       0  0
Aux Heat           0  0



           ▣  ▣  ▣  ▣
```

A ClimaTECH 65 can have up to six analog (sensor) inputs, up to six digital (on-off) inputs, and up to five relay outputs. For a ClimaTECH 1024, these capacities are increased to 10, 10, and 24 respectively. It is the purpose of the I/O Points screens to allocate these. An input or output number, from 1 up to the limit of the controller, is entered under the stage number in the case of relay outputs.

ClimaTECH
sensor inputs

```
10/15/2002                    10:39:56 AM
▉ Configure CT RTU 5      I/O Points

           ▉ Sensor Inputs

Zone temp group #.......?  1
Inside dewpt group #....?  1
Humidity sensor.........?  DP

        Point     Type       Function
Zone 1   0        None       Control
Zone 2   0        None       Control
Zone 3   0        None       Control
Zone 4   0        None       Control
Alarm 1  0        None
Alarm 2  0        None
Alarm 3  0        None
Alarm 4  0        None      "PG DN" for more


           ▣  ▣  ▣  ▣
```

Zone temp group #

(0 to 99) The group to which this ClimaTECH unit belongs for zone temperature. Several ClimaTECH units in a network can be controlled by a single sensor wired to one of them. If this feature is not used, leave group number set to 0.

Inside dewpt group #

(0 to 99) The group to which this ClimaTECH unit belongs for

dewpoint. Several ClimaTECH units in a network can use a single sensor wired to one of them. If this feature is not used, leave group number set to 0.

Humidity sensor	(0.0 to 150.0) The heat reclaim setpoint during store closed hours as configured in the Store Info screen.
Humidity sensor	(List box: RH, DP) Whether a relative humidity or dewpoint sensor is used.
Point	The sensor wired to each point. If the sensor is not used, leave the Point field set to 0.
Type	(List box:) The type of input.
	None
	TP2
	TP1
	OI The input is an on-off input.
	0-10 Volts This type can be used for any sensor whose output is linear from 0-10 Volts.
Function	(List box: Control, Monitor) For zone sensors only, whether the point is being used for control or purely for monitoring.

ClimaTECH
on-off input
configuration
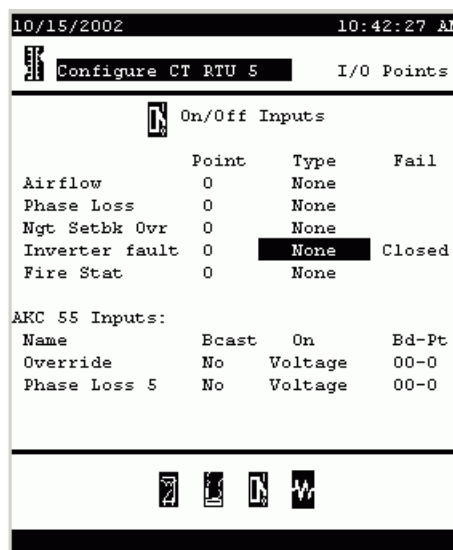
The third icon from the left at the bottom of any ClimaTECH board & points screen brings up configuration for on-off inputs. At the top of the screen are inputs that may be wired to the ClimaTECH unit itself, and in the lower half are pertinent inputs wired to to an SC 255.

Point	The point assigned to each functional input. If the input is not used, leave the Point field set to 0.
Type	(List box:) The type of input. Only OI is a valid choice.
	None
	TP2
	TP1

OI	The input is an on-off input.
0-10 Volts	This type can be used for any sensor whose output is linear from 0-10 Volts.
Fail	(List box: Closed, Open) The type of signal that will be received if the drive has a fault.

ClimaTECH Address and Init

Select the rightmost icon on the Configure CT I/O points screen, and you will see this screen:

In the field labeled address, give the ClimaTECH node an address from 0 to 99 that is unique among all the ClimaTECH nodes on the I/O network for this SC 255. Remember that there can be only 45 HVAC units per SC 255.

After addressing, place the cursor on the **Locate** field and press ENTER. A message will appear asking you to press the service pin on the ClimaTECH controller. Go to the controller and depress the service pin.

After completing the Locate procedure, place the cursor on the **Init** field and press ENTER.

Uploading to the AK2-SC 255

If the ClimaTECH controller is configured with a handheld remote control, the configuration data is stored locally. It is not stored in the SC 255 until uploaded. This is accomplished by placing the cursor on the **Upload** field and pressing ENTER.

Night setback	(List box: Yes, No) Whether or not the cooling setpoints are to be raised by an offset (next line) during the times when cooling is not scheduled to be on according to a schedule or schedules (next page).
Night setback offset	(-50.0 to 50.0) The amount by which the cooling setpoint is to be raised during night setback.
Override switch	(List box: Yes, No) Whether or not there is an override switch wired to a digital input.
Override duration	(0 to 1439) The number of minutes that control will be

	overridden after operation of the override switch.
Num of schedules	(0 to 8) The number of operating schedules entered on the following page(s).

Config

(List box: No, Rec)

No: The sensor is not used.

Rec: A sensor value is received from the system's I/O network.

AK2-SC 255 Bd-Pt   Enter the board and point from which the sensor value is to be received.

1.4 Lighting Configuration

Lighting configuration starts with selection of Configuration from the Main Menu. A simple lighting menu appears as at left below. First, select Lighting zones from the menu, and the screen at right is presented.

```
11/05/2002              01:25:42 PM
┇ Configure Lighting Zones

   No. of Zones:30
   No. of Powerlink Panels    :5
   No. of Cutler-Hammer Panels:5
   Zones share photocells     :Yes
   Number of photocells       :8

   Name            Type
   50% Sales       AKC55 >Setup<
   Zone 2          PWRLK >Setup<
   Zone 3          AKC55 >Setup<
   Zone 4          AKC55 >Setup<
   Zone 5          AKC55 >Setup<
   Zone 6          AKC55 >Setup<
   Zone 7          AKC55 >Setup<
   Zone 8          AKC55 >Setup<
   Zone 9          AKC55 >Setup<
   Zone 10         AKC55 >Setup<

                      "PG DN" for more
```

```
10/23/2002              11:52:33 AM
┇ Configure Lighting Zones

   No. of Zones:12
   No. of Powerlink Panels    :1
   No. of Cutler-Hammer Panels:1
   Zones share photocells     :No

   Name            Type
   50% Sales       AKC55 >Setup<
   Zone 2          PWRLK >Setup<
   Zone 3          CUTLR >Setup<
   Zone 4          AKC55 >Setup<
   Zone 5          AKC55 >Setup<
   Zone 6          AKC55 >Setup<
   Zone 7          AKC55 >Setup<
   Zone 8          AKC55 >Setup<
   Zone 9          AKC55 >Setup<
   Zone 10         AKC55 >Setup<

                      "PG DN" for more
```

No. of Zones (0 to 30) The number of lighting zones to be configured on this AKC 55.

No. of Powerlink Panels (0 to 5) The number of Square D Powerlink® lighting panels to be configured. The SC 255 currently supports both AS and G3 versions of Square D Powerlink panels.

No. of Cutler-Hammer Panels

(0 to 5) The number of Cutler-Hammer Pow-R-Line C™ Switchboard lighting panels to be configured.

Zones share photocells (List box: Yes, No) Whether or not multiple photocells are to be shared.

Number of photocells (0 to 8) The number of photocells. (Appears only if photocell sharing is enabled by a Yes answer to the previous question.

Name (Label) The name of the zone as established on its first setup page.

Type (List box:)

AK2-SC 255: The zone is controlled by a relay output (digital output) on the I/O network.

PWRLK: The zone is controlled by a breaker or group of breakers in a Square D Powerlink® lighting panel.

CUTLR: The zone is controlled by a breaker or group of breakers in a Cutler-Hammer Pow-R-Line C™

AK2-SC 255 lighting
zone setup To begin configuration of an SC 255 lighting zone, put the cursor on **>Setup<** and

press enter. The first page of the setup screen is shown in the illustrations below: on the left for an inside photocell, and on the right for an outside photocell. In the screen on the left, a user-defined zone name has been chosen. On the right, one of the listed zone names has been chosen.

Zone name	(List box:) A great variety of typical names are included in the box that pops up, plus "User Def." that allows the next line.
User defined name	(Label box; any 11 characters)
Num of control relays	(0 to 6) The number of relays controlled by the lighting point.
Num of schedules	(0 to 8) The number of schedules for this point.
Photocell	(List box:)
	Inside: The point's photocell(s) are indoors.
	Outside: A single photocell is located outdoors.
	None: This point has no photocell.
Control sensor	(List box:)
	Min: The lowest-reading photocell at any given time will be used as the control sensor.
	Max: The highest-reading photocell at any given timewill be used as the control sensor.
	Average: All photocells are averaged, and the average value is used as the control sensor value.
	Photocell ID#1 (etc.): If any specific photocell is selected , its value alone will be used as the control sensor value.
Control method	(List box:)
	Schd and photo: For this point to be on, two conditions have to be satisfied: (1) the schedule must be true; and (2) the photocell must be above trip level. Once those two conditions are satisfied, the pre-delay

timer will start.

Schd or photo: For this point to be on, either of two conditions must be satisfied: (1) the schedule must be true; or (2) the photocell must be above trip level. Once one of those two conditions is satisfied, the pre-delay timer will start.

Enable failsafe schedule	(List box: Yes, No) Whether or not a schedule will "back up" in case the photocell fails.
Time on	(Time of day field) The time at which the pre-delay timer for outside lights will start without the photocell having tripped.
Time off	(Time of day field) The time at which the post-delay timer for the outside lights will start without the photo-cell rising above trip level.
Photocell range +/-	(0 to100) The number of percent from night to day.
Trip Level	(0 to100) The level at which the photocell condition will be true and act to turn the lights on. (If multiple relays are configured, there will be one trip level per relay.)
Always keep 1 relay on	(List box: Yes, No) (Appears only when there is more than one control relay) Whether or not one relay will always be on.
Auto rotate selection	(List box: Yes, No) Whether or not the one relay kept on will rotate among all the relays configured. Rotation takes place so that the same relay is not used when the zone cycles off.

Lighting configuration
page 2

```
11/06/2002                    09:43:39 AM
 ▓  Configure Lights


Pre delay...............?  2 min
Post delay..............?  2 min
Minimum ON time.........?120 min
Minimum OFF time........? 10 min

Enable dimmer output....?Yes
Target..................? 80 %
Minimum output..........?  0 %
Reaction Time...........?Normal
Override switch.........?Yes
Override duration.......?+00:02
Burglar override........?Yes
Pre delay...............?  0 min
Fire override...........?Yes



                       "PG DN" for more
```

Pre delay	(0 to 120) When lights are off, the number of minutes that the lighting condition must be satisfied before lights will be turned on.
Post delay	(0 to 120) When lights are on, the number of minutes that the lighting condition must be false before lights

will be turned off.

Minimum ON time   (0 to 255) When lights are turned on, the number of minutes that they must remain on before being turned off.

Minimum OFF time   (0 to 255) When lights are turned off, the number of minutes that they must remain off before being turned on.

Enable dimmer output   (List box: Yes, No) Whether or not a dimmer variable output will be controlled.

Target   (0 to 100) The photocell level that the controller will seek to maintain by operation of the dimmer.

Minimum output   (0 to 100) The minimum dimmer level.

Reaction time   (List box: Slowest, Slow, Normal, Fast, Fastest) The relative sensitivity of control to changes in photocell level.

Override switch   (List box: Yes, No) Whether or not there is an override switch assigned to the zone.

Override duration   (Time field: 00:00 to 23:59) The duration of an override when the override switch is used.

Burglar override   (List box: Yes, No) When this zone's lights are turned off, whether they are to be turned on when a monitored burglar alarm is sensed.

Pre delay   (0 to 600) When this zone's lights are off and a burglar override is called for, the number of minutes delay before the zone is turned on.

Fire override   (List box: Yes, No) When this zone's lights are turned off, whether they are to be turned on when a monitored fire alarm is sensed. There is no pre-delay for fire alarms.

Lighting schedules are found on the next page(s).

Board & points configuration (lighting)

Board and points configuration must be completed for all types of points. Do this in accordance with the appendix on board & point configuration.

Powerlink configuration

Configuration of Powerlink lighting zones configuration is the same as for the SC 255 zones just discussed, except that the question **Number of control relays** is replaced with **Number of control points**. These panels also require board and point setup and initialization (see below).

Cutler-Hammer configuration

Configuration of Powerlink lighting zones configuration is the same as for the SC 255 zones just discussed, except that the question **Number of control relays** is replaced with **Number of control points**. These panels also require board and point setup and initialization (see below).

Powerlink and
Cutler-Hammer
board & point
configuration

Starting at the lighting configuration menu, select Board & Points, press ENTER, and when the Board & Points Relay Outputs configuration screen appears, select the rightmost icon at the bottom of the screen, and press ENTER. A menu will appear, like the one in the left illustration below.
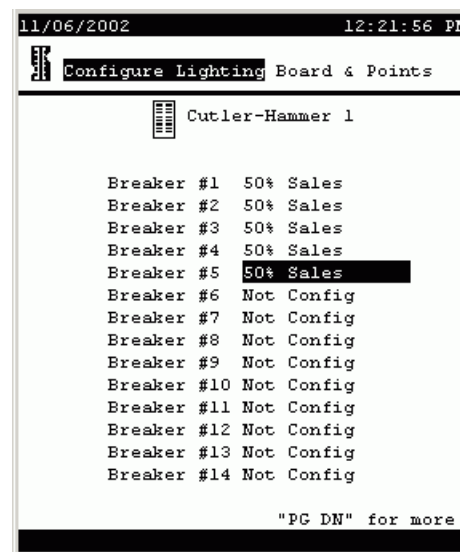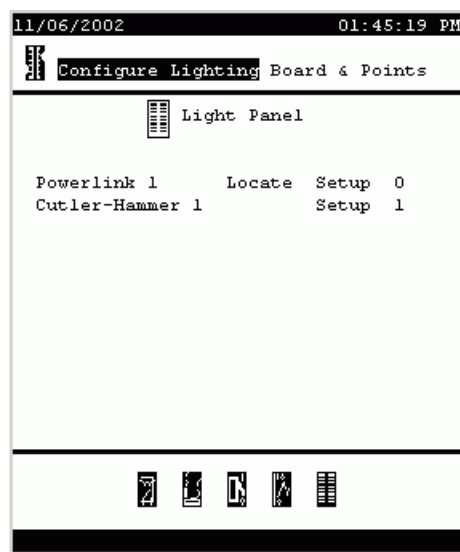
Place the cursor on the **Setup** field and pres ENTER, and the setup screen will appear as at right above. For each breaker, there is a list box with the names of the zone names that can be assigned to that breaker. Select the appropriate zone name for each configured breaker, and setup is complete.

Locate procedure

Powerlink panels require that you put the cursor on the **Locate** field and press enter. A popup box will appear on the screen instructing you to press the service pin on the breaker panel. You will have a few minutes to do this. Successful location will be indicated by a message in the bar at the bottom of the screen.

Cutler-Hammer panels do not require the locate procedure.

1.5   Energy Meter Configuration

An AK2-SC 255 system can monitor Danfoss-approved energy meters which have an Echelon interface. Each AKC 55 can monitor up to five meters. Each current source must have a dedicated meter.

Installation

After installing the energy meter and current transformers according to instructions provided by their manufacturer, the meter is connected to the I/O network and becomes a node on the network after configuration. Only one of the meters connected to an SC 255 can be used for demand limiting.

Configuration

To begin configuration of utility meters, select **Energy** from the main menu and press ENTER. The Energy Menu appears as at left below. Select **Utility Meter** and press ENTER, and the Utility Meter Menu appears as at right below.

Continuing, select **Configure** from the Utility Meter Menu and press ENTER. Now the Utility Meter Configuration menu appears as shown below.
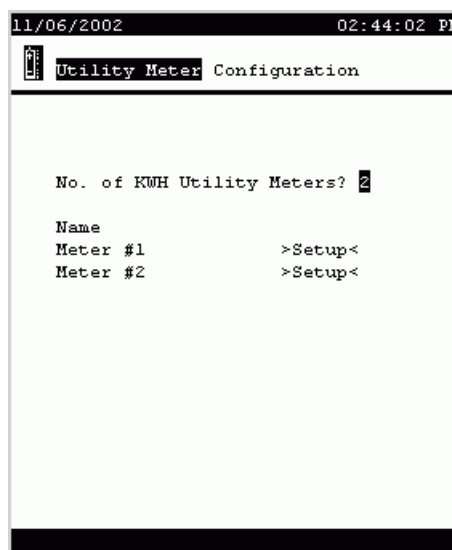
Enter the number of meters to be configured, and a list will appear. These are the fields:

No of KWH Utility Meters (0 to 16) The number of meters being configured
Name (Label field, any 11 characters) Enter the name of the meter being configured.
Type (List box) The AK2-SC 255 currently supports the following energy meter models:

EMON (although no longer marketed by Danfoss)
Wattnode
Wn Plus Wattnode plus. Configuration of Wattnode Plus is covered in this manual on the third page following this one.
Pulse: Pulse metering via an AK2 I/O module.

>Setup< (button field) Put the cursor here and press ENTER to begin setup.

When the setup button is pressed, the Configure Meter menu appears as at left below. When Meter Setup is selected from the menu, the first page of the Meter Setup screen appears as at right:


```
11/06/2002          02:45:22 PM

 Configure Meter #1




            Meter Setup


            Board & Points


```

```
11/06/2002          02:46:23 PM

 Meter Setup Meter #1

Number of CT sets.......?1
Amperage................?25A
Voltage (num phases)....?120/208(3)
Collect History.........?Yes
Use unit for demand lim.?Yes
Window size.............?15 min
Normal load 00 HRS......? 1000
Normal load 01 HRS......? 1000
Normal load 02 HRS......? 1000
Normal load 03 HRS......? 1000
Normal load 04 HRS......? 1000
Normal load 05 HRS......? 1000
Normal load 06 HRS......? 1000
Normal load 07 HRS......? 1000
Normal load 08 HRS......? 1000
Normal load 09 HRS......? 1000
Normal load 10 HRS......? 1000
Normal load 11 HRS......? 1000
               "PG DN" for more
```

In the Setup screen, these are the fields. Note that with each answer, a box will appear in the center of the screen cautioning that proper meter function requires that the values entered here are the same as the values entered at the meter.

Number of CT sets [EMON only] (0 to 5) The number of meters sets of current transformers connected to this meter. Wattnode assumes a single set of CTs.

Amperage (either List box [EMON] or Label field [Wattnode] In the list box, entries range from 25 to 3100 A); Select the amperage of the CTs. For Wattnode, enter the amperage directly into the label field.

Voltage (num phases) (List box: a complete selection of supermarket voltages with number of phases following each in parentheses. Pick the correct combination for this meter. inbutton field) Put the cursor here and press ENTER to begin setup.

Collect History (List box: Yes, No) Whether or not history is to be collected from this meter.

Use unit for demand lim (List box: Yes, No) Whether or not this meter is to be used for demand limiting.

Window size [Appears only if Yes is selected in the previous

question](List box: 15, 20, or 30 minutes) The window width is set to 15, 20, or 30 minutes. Every minute, the window "slides" forward so that it always contains the most recent period of time. Each minute the accumulated KW during that minute is recorded.

Normal load nn **HRS**　[Emergency generator control](0 to 99999) Enter the upper demand limit you do not wish to exceed for the given hour of the day under normal operating conditions (when using normal power). There is one field for each hour of the day, from 00 to 23.　　　This screen has two pages in order to list all the hours of the day.

Meter setup, demand limiting, continued (p3)　Page down after entering normal load for every hour to finish configuration of the meter. The page looks like this:

The fields in the screen are these:

Maximum emergency load　[Demand limiting only](0 to 99999) Enter the upper demand limit that you do not wish to exceed when the emergency generator is running.

Start shedding at　[Demand limiting only](0 to 100) Enter the percent of maximum load at which you want to start shedding loads.

Start restoring at　[Demand limiting only](10 to 80) Enter the percent of maximum load at which you want to start restoring loads which have been shed.

Enable coupling switch　[Demand limiting only](List box: Yes, No) In installations where there are two transformers and/or two emergency generators, a coupling switch can be used to connect both loads to one source in case the other source fails.

Number of normal steps　[Demand limiting only](0 to 10) The number of steps (levels) which you will allow to be shed under normal conditions.

Num of emergency steps　[Demand limiting only](0 to 10) The number of steps

(levels) which you will allow to be shed when the emergency generator is running.

Normal soft start begin level

[Demand limiting only](0 to the number of normal steps set above, up to 10; if 8 normal steps are configured, for example, the upper limit of this entry is 8) This entry specifies the level down to which loads will be turned on when the emergency generator starts. A level will be added each minute unless the specified emergency load for shedding to start is reached.

Coupling begin level [Emergency generator control](0 to 99999) Enter the upper demand limit you do not wish to exceed for the given hour of the day under normal operating conditions (when using normal power). There is one field for each hour of the day, from 00 to 23.   This screen has two pages in order to list all the hours of the day.

Emergency
Soft start begin level [Emergency generator control](0 to the number of emergency steps set above, up to 10; if 8 emergency steps are configured, for example, the upper limit of this entry is 8) This entry specifies the level down to which loads will be turned on when the emergency generator starts. A level will be added each minute unless the specified emergency load for shedding to start is reached.

Coupling begin level [Emergency generator control](0 to 99999) Enter the upper demand limit you do not wish to exceed for the given hour of the day under normal operating conditions (when using normal power). There is one field for each hour of the day, from 00 to 23. This screen has two pages in order to list all the hours of the day.

Wattnode Plus
configuration

When the meter being set up is a Wattnode Plus (Wn Plus), there there is a second page to the setup screen. Clicking on '"PG DN" for more' at the bottom of the first setup page will display the second page. On that page, you will find the following additional fields to be entered:

Power update: (0-60, default 5) The interval at which power is measured.

Energy update: (0-60, default 5) The interval over which energy (the integral of power over time) is calculated.

Reactive update: (0-60, default 5) The interval over which reactive components are recalculated.

Demand period: (5-720, default 15) The interval over which demand is calculated. Demand is defined as average power over a specified time interval.

Demand subintervals: (1-8, default 1) The number of divisions of the demand period used when calculating a

"rolling demand" using a "sliding window."

About soft starts   The effect of a soft start is to slowly add load to the generator after it starts. If, for instance, soft start begin level is set to 6, when the generator starts only refrigeration loads and loads assigned level 7 through 11 will be on. After one minute, if the load is below the "start shedding at" percentage of maximum emergency load, level 6 will be turned on. After another minute, the same decision will be made for level 5, and so on down to level one. If at any time the load reaches the "start shedding at" percentage, load shedding will begin again until the system reaches the "start restoring at" percentage.

Configuring demand limiting   One utility meter per AKC 55 will allow configuration for demand limiting. Configuring demand limiting strategy is a two-step process. First you select the meter to be used for demand limiting and enter the parameters; then select the loads to be shed for limiting demand and give each a priority.

In order to use demand limiting, you must have a Danfoss-approved utility meter with Echelon interface and, if you are going to establish both normal and emergency load limits, you must wire and configure an on/off input for the automatic transfer switch. In addition, if the site has a coupling switch, you must wire and configure an on/off input for the coupling switch.

You may wish to read the section "How demand limiting works" that follows the section "Lighting demand limiting," before you start configuration. Now return to the Energy menu (one good way is to return to the Main Menu (menu key), select Energy, then select **Demand Limiting.** From the Demand Limiting menu, select **Configure**. These two screens look like this:
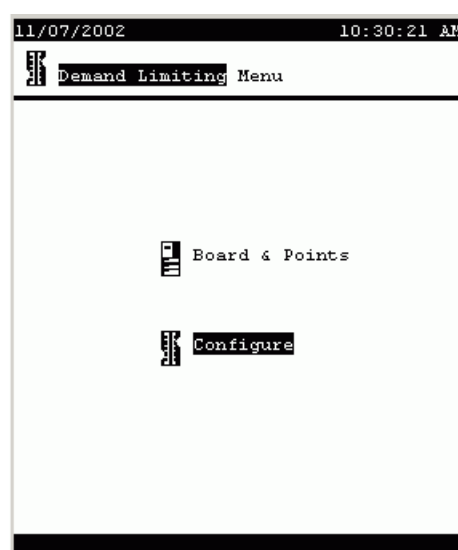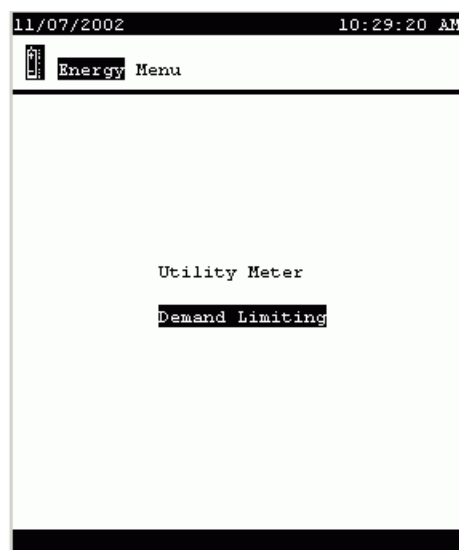
HVAC demand limiting   When you put the cursor on **Configure**, the second page of the Demand Limiting Menu appears as at left below, offering two choices: **Select Units** (for HVAC) and **Select Zones** (for lighting). Choose **Select Units** and the screen at right (below)

appears, and you can begin configuring HVAC demand limiting.
beis screen appears:
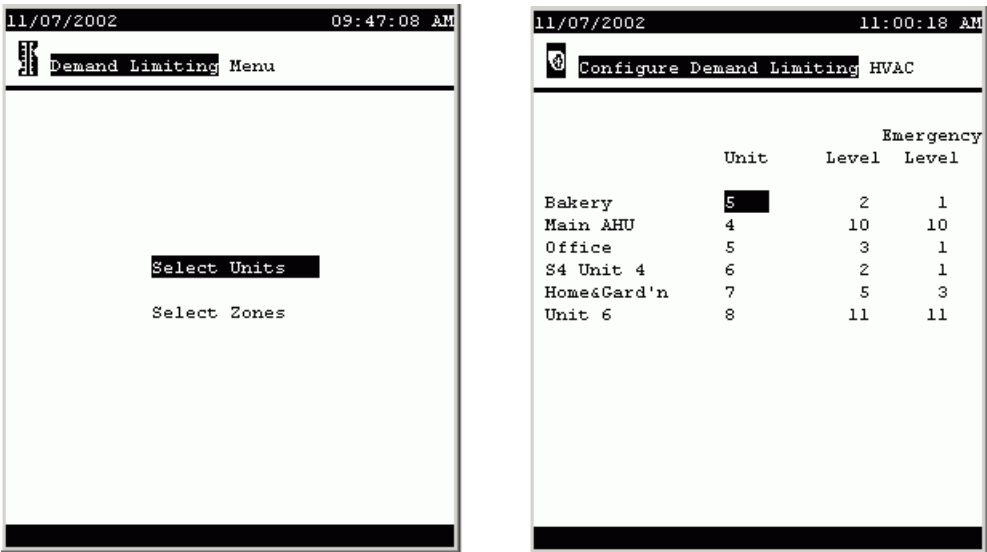
The fields on the demand configuration screen for HVAC (right) are:

[Name -- first column]	The name of the unit as it was assigned during configuration. Every configured HVAC unit will be listed.
Unit	The address of the SC 255 which has the demand meter that will be used for demand limiting. This can be any SC 255 in the network that has a meter configured for demand limiting.
Level	The priority for shedding under normal conditions. Levels are shed in ascending order: level 1, then level 2, and so on up to the highest level configured, limited by the number of steps allowed. Levels above the number of steps configured will not be shed unless the meter configuration is changed. Since there are only up to ten steps, loads assigned level 11 will never be shed. It is recommended that loads which are not to be shed are left at level 11, the default value.
Emergency level	The priority for shedding when the emergency generator is running.

If a load is assigned level 0 (zero) for either normal or emergency conditions, the load will never come on under those conditions.

Lighting demand
limiting

For lighting zones, the screen entries are the same, except that each relay will have its own level, so there is first a setup menu listing each zone, then a page for each zone listing all the relays for that zone.

How demand
limiting works

Utility demand is monitored every minute. Every minute, the most recent *n* minutes

are averaged (where *n* is the width of the configured window, 15, 20, or 30 minutes). If the average reaches the configured "start shedding at" percentage of configured maximum demand, step one (all lighting zones and HVAC units assigned to level 1) will be turned off. After one minute, when the average is calculated again, if the demand is still above the configured percentage of configured maximum demand, level two will be shed, and so on.

When demand has dropped to the "start restoring at" level, the last level shed will be restored, and then the others in descending order, so that the last load restored will be the one which was shed first. Restoration will continue as long as the load remains below the "start shedding at" percentage.

1-5   Configuring Alarms

Whenever you enter configuration information to program a given SC 255 system, standard alarms are automatically created in the program. These alarms are "skeleton" in nature. This means that the alarms are now allocated in the program, but you should inspect the alarm actions , trip levels, and time limits for each alarm and adjust them accordingly to meet your unique requirements.

We will discuss, in detail, how to configure alarms for Refrigeration, HVAC, and other points and sensors; then we will see how these alarms are "routed " through the system.

The Configure
Alarms menu

First, become authorized; then, from the main menu (below left) select **Configuration** and then from the Configuration menu, select **Alarms**. You will reach the Alarm Configuration Menu, shown below. There are other ways to reach an alarm configuration screen, and as you become experienced with the system, you will learn them. For instance, if you are configuring refrigeration, alarm configuration for the particular rack you that you are working with will be available from the Configure Rack menu; likewise, HVAC and other configuration screens will present an alarm selection. Using the method just described, though, you will be able to reach the entire "world" of alarms from one menu. The Alarm Configuration menu looks like this:
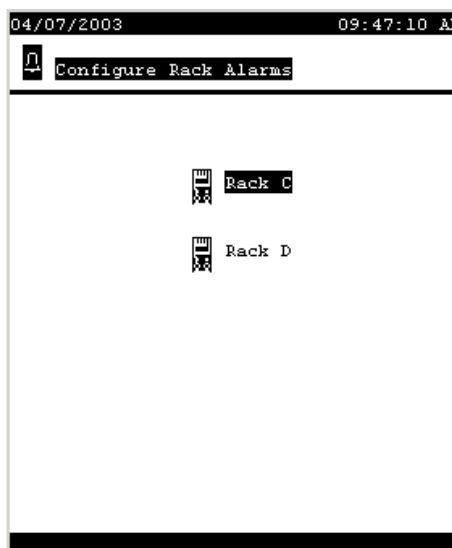
Configuring
Refrigeration Alarms   If you select Refrigeration from the Configure Alarms menu, you will be presented
with a screen listing each configured racks as at left below. Select one of the racks,
and the alarms menu for that rack will appear, as at right below.
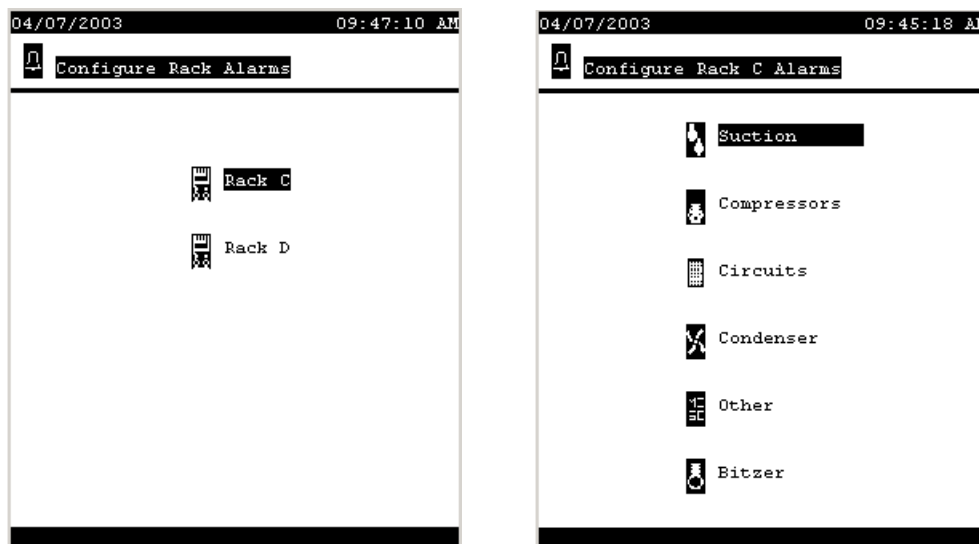
We will select Rack C, and another submenu will appear listing all the different parts
of the system for which we can configure alarms. Note the last item on the menu at
right above, "Bitzer." This appears only because when the compressor data was
configured, Bitzer was selected as the answer to the proofing type question. Keep in
mind that as we proceed through alarm configuration, the items that present them-
selves depend upon the configuration for the mechanical devices.

Select **Suction** and the first page of configuration for actual alarms appears:

The fields and their meanings are as follows:

Type
(Label field) In the top line for each alarm, the leftmost column shows the type of alarm.

Name
(Label field) The name of input, either digital or analog, that trips the alarm. (See note at the end of the discussion of this screen about "Alarms Suspended" alarms.)

Address
(Label field) The board and point assignment of the input given under **Name**. This is where the input is physically wired. For example, the phase loss digital input, the second alarm in the screen shown above, is wired to point 1 on board 8. The suction pressure sensor (an analog input) for rack C is wired to point 1 on board 6.

Alarm Action
(List box) In the Type column, in the second line for each alarm, is the current alarm action setting. Initially, as shown above, all alarms are set to disabled as they are automatically created during configuration of refrigeration. The same is true of the alarms created for HVAC and other store systems. We can use this screen to change the alarm action levels. The choices in the list box are these:

Disabled: The alarm is deactivated and will not occur or dial out. Its configuration settings, if any, will remain in memory for future activation. All alarms are in this state initially until you change them. A description of each enabled alarm action follows....

Log Only: The occurrence of the alarm will only be logged by the system. There will be no dial out. The alarm will not retrip until its causative condition has returned to normal and then occurred again.

Normal: The alarm will occur when its causative condition has been true for the set time limit. At this action level, the alarm will dial out once. It will not dial out again until its causative condition has become false and then become true again for the set time limit.

Critical: When the alarm's causative condition has been true for the set time limit, the critical alarm will occur and dial out, and it will continue to dial out repeatedly as long as the causative condition remains true. Repetitive dialouts will occur at the interval specified in the Alarm Routing screen. (See also the section on Alarm Routing.)

Delete: The alarm and its settings are removed from memory. Restoration of the alarm requires manual re-entry.

Alarms Suspended   The first alarm on the first page of every rack alarms screen is an **Alarms Suspended** alarm. This alarm occurs whenever alarms have been suspended by an operator using the Rack Service screen. When alarms are suspended, if the level of

the Alarms Suspended alarm is set to an action other than **Disabled**, a single alarm will occur (and if the level is **Critical** or **Normal**, it will dial out) to indicate that the suspension has occurred. The number of minutes for the suspension can be set.

Suspending rack
alarms

One common reason for suspending rack alarms is rack service requiring a partial or complete equipment shutdown. In such a case, pressures and temperatures could reach elevated levels, giving rise to many alarms. A technician would suspend alarms to forestall unneccessary communications to the store by monitoring personnel. An operator who wants to suspend alarms does not enter configuration screens to do so. To suspend alarms, it is only necessary to be authorized for refrigeration functions (or the higher Supervisor level). To suspend rack alarms, select Refrigeration from the Main Menu, then select the rack being serviced from the refrigeration menu, and then select Rack Service from the Rack menu. The Rack Service menu looks as at left below.
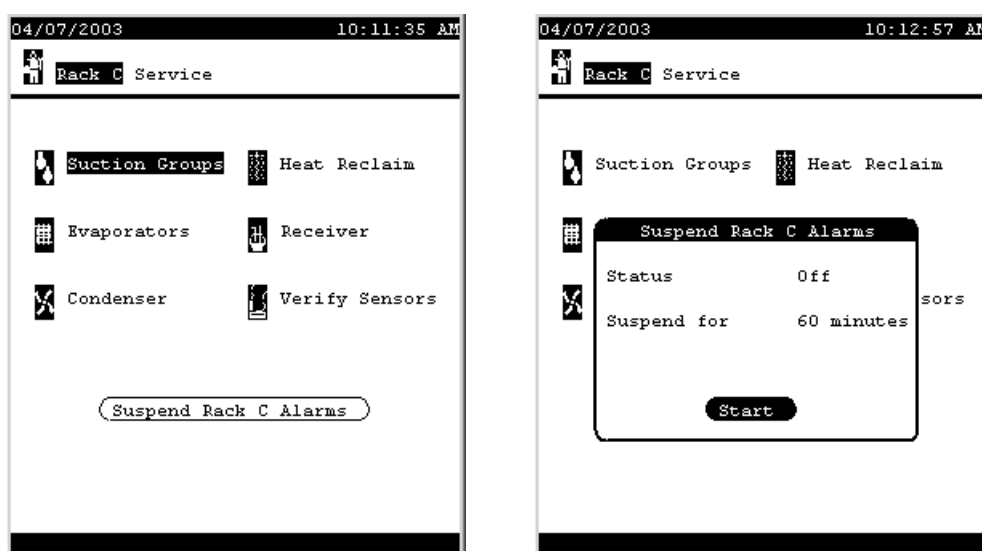
When the **Suspend Rack C Alarms** button is selected, a pop-up window appears as in the screen at right above. The only changeable field is the **Suspend for** field, which can be set to any value from 0 to 9999. A full description of the alarm suspension function will be found in chapter 5-2, "Using the Service Screens."

Configuring
Alarm settings

Let's return to the Configure Rack C Alarms screen (shown at left below) and configure an actual alarm. Move the cursor down to the level field for the **Phase Loss** alarm. It currently reads **Disabled**. When you select the field, a list box appears showing all the levels that can be chosen for the alarm, as shown at right below.

Notice that in the screen at right (above), we have moved the cursor to **Normal** in the list box. When we press ENTER, the level selection is complete, and a condition appears under the name of the alarm, as seen at left below.

After choosing an action level for the alarm, move the cursor to the next changeable field. Because we are configuring a digital alarm that is constrained to a value of **On**, the only remaining fields we can change are for the time. The numeric value can be set to any number from 1 to 9999, and in our example we have entered 1. The field for the time units has a list box (as seen below) from which you can choose **sec**, **min**, or **hour**. For the Phase Loss alarm, 1 minute is an appropriate setting, so we leave the field reading **min**.

```
04/07/2003                04:27:19 PM
  ⌂ Configure Rack C Alarms

Type              Name          Address


Alarms Suspended  Rack C          0
Disabled

Phase Loss        Phase Loss C  ┌─────┐
Normal                On   for  1│sec  │
                                │min  │
                                │hour │
Low Pressure      Suction Pres C└─────┘
Disabled

High Pressure     Suction Pres C  06-1
Disabled

Low Temperature   Suction Temp C  06-5
Disabled

                          "PG DN" for more
```

Analog alarms

Let's now configure the Low Pressure alarm, which is an alarm for an analog value. Move the cursor to the action level field under the type description **Low Pressure**, open the list box, and select **Normal**. As with the Phase Loss alarm whose configuration was just described, a line of settings appears to the right of the action level, as shown in the screens shown below:


```
04/08/2003                11:48:22 AM
  ⌂ Configure Rack C Alarms

Type              Name          Address


Alarms Suspended  Rack C          0
Disabled

Phase Loss        Phase Loss C    08-1
Normal                On   for    1min

Low Pressure      Suction Pres C  06-1
Normal    below  50.0 psi for    30min

High Pressure     Suction Pres C  06-1
Disabled

Low Temperature   Suction Temp C  06-5
Disabled

                          "PG DN" for more
```

```
04/08/2003                11:54:20 AM
  ⌂ Configure Rack C Alarms

Type              Name          Address


Alarms Suspended  Rack C          0
Disabled

Phase Loss        Phase Loss C    08-1
Normal                On   for    1min

Low Pressure      Suction Pres C  06-1
Normal    below   3.0 psi for    30min

High Pressure     Suction Pres C  06-1
Disabled

Low Temperature   Suction Temp C  06-5
Disabled

                          "PG DN" for more
```

The screen at left above shows the default alarm pressure and time settings that appear as soon as the alarm action level is changed to something other than disabled. In the screen at right above we have moved cursor first to the pressure setting, where we changed the pressure to **3.0 psi** from 50.0, and then to the time setting, where we raised the time to **30** minutes. The low pressure alarm will now occur whenever the suction pressure sensor for rack C reads below 3.0 psi for 30 minutes. Since it is set for an action of **Normal**, the alarm will dial out only once. The timer will reset to 0 any time the pressure rises above 3.0 psi; only after the timer has reset in this manner can the alarm occur again.

Field limits and units for analog alarms

The numeric value field for an alarm based on an analog sensor (for instance, pressure, temperature, humidity, and light level) will accept values from -999.9 to 999.9. The units, which are selected in the Store Info configuration screen for Units/Languages, can be in either psi or bar for pressures, in either celsius or fahrenheit degrees for temperature, and in either footcandles or percentage for fotocells.

The time value field will accept any numberal from 0 to 9999, and the time unit can be seconds, minutes, or hours.

Disabling

If you wish, try disabling one of the alarms just configured, or any alarm you have set up. Then restore the alarm to the Log Only, Normal, or Critical action level. The default settings will not appear, but rather the settings you configured. This feature can be useful when you need to suspend only a few alarms on a rack. Remember, though, that the alarms will not automatically return to enabled status as do alarms suspended with the Suspend Alarms function on the service screen. (see chapter 5-2).

What alarms are needed?

The configuration process for refrigeration, HVAC, and lighting allocates alarms for every configured digital and analog sensor, and for each control output. Depending on your needs, not all alarms will be useful.

Frequently
Asked
Questions

FAQ #1   How do I determine what trip levels to use for high and low suction pressure alarms?

Start by considering the target pressure that is configured for the rack. Know the range of pressures that the rack will operate in when loads, product temperatures, defrosts, and other factors are working correctly. Then set the alarms at the upper (high pressure) and lower (low pressure) limits of that range. Start with conservative settings. If your settings are too tight on one end or both, and you are getting a large number of false alarms, make sure the system is operating safely for the product and equipment, then extend the alarm range gradually. If you don't ever get any false alarms, the alarm parameters are probably too loose.

Remember that more or less temporary factors such as overloading, service, and cleaning can cause alarms to occur. Be careful to investigate any suspicious alarm that occurs when causative activities are going on in the store.

FAQ #2   Can you be more specific and perhaps give "thumb rules" for alarm settings?

OK, let's assume that this particular rack is set for a target of 14 psi and is operating to your satisfaction with that setting. Typically we find that adding 10 psi to the target and setting the trip level for high suction pressure at 24 psi for 30 minutes is a good starting setting. If the suction pressure is more than 10 psi above target for a half hour, we should suspect that something is keeping the rack from making target pressure. One possible cause is an off-line compressor.

For the low suction pressure alarm, first look at the cut-out setpoint that has been configured for the rack. With a target of 14 psi, perhaps the cut-out is set at 2 or 3. If

this is so, then a good setting for the low suction pressure alarm might be at the cut-out for 10 to 15 minutes.

Types of suction
alarms, listed

The alarm types depend to some extent on the way rack configuration questions were answered. Listing all the types of suction group alarms, they are:

Alarms Suspended
As explained above, when this alarm is enabled, it will occur whenever alarm suspension for the suction group is activated in the service screen (see chapter 5-2). There is no time delay.

Phase Loss (if a phase loss sensor is configured)
A digital alarm that can be enabled to occur when the phase loss sensor is on for a specified time period (1-9999 seconds, minutes, or hours).

Low Pressure (if a suction pressure sensor is configured)
An analog alarm, set for a pressure from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.

High Pressure (if a suction pressure sensor is configured)
An analog alarm, set for a pressure from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.

Low Temperature (if a suction temperature sensor is configured)
An analog alarm, set for a temperature from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.

**High Temperature (if a suction temperature sensor is configured)**
An analog alarm, set for a pressure from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.

High desuperheat (if a suction temperature sensor is configured)
An analog alarm, set for a pressure from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.

Configuring
Compressor Alarms

We will return now to the configuration screen for rack C alarms, and select **Compressors**.
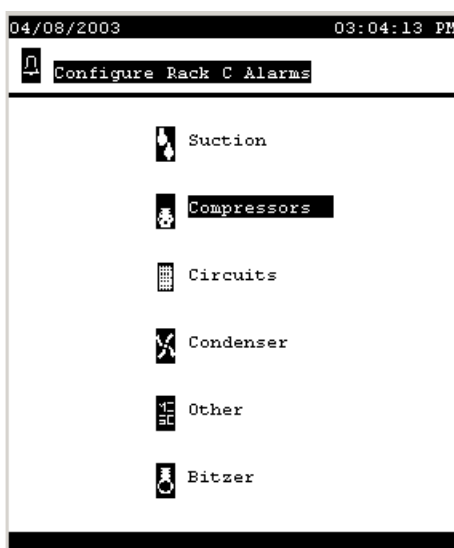
The first page of the compressor alarms screen appears as at right above. For a multi-compressor rack there will be several pages of alarms. The alarm types depend

to some extent on the way rack configuration questions were answered. The alarms for the lead compressor will be listed first, and similar alarms will follow for the other compressors on the rack. Listing all the types of alarms, they are:

High Pressure (discharge pressure sensor)
An analog alarm, set for a pressure from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.

Comp. short cycle (compressor digital sensor)
A cycle digital alarm, with the trip level a number of cycles (0-9) in a specified time period (1 to 9999 seconds, minutes, or hours).

Comp. oil failure (if an oil failure digital is configured)
A digital alarm that can be enabled to occur when the oil failure sensor is on for a specified time period (1-9999 seconds, minutes, or hours).

High oil resets (if an oil reset switch monitor is configured)
A cycle digital alarm, with the trip level a number of cycles in a specified time period (1-9999 seconds, minutes, or hours).

High Temperature (if a discharge temperature sensor is configured)
An analog alarm set for a temperature from -999.9 to 999.9 degrees with a time limit from 1 to 9999 seconds, minutes, or hours).

High inverter resets (if variable speed is configured and the reset is monitored)
A cycle digital alarm, with the trip level a number of cycles (0-9) in a specified time period (1-9999 seconds, minutes, or hours).

Inverter failure (if variable speed is configured and the inverter bypass is monitored)
A digital alarm that can be enabled to occur when the inverter is in bypass for a specified time period (0-9999 seconds, minutes, or hours).

Configuring
Circuit alarms

The third selection on the rack alarm configuration menu is **Circuits**. The types of alarms that present themselves depend upon whether the circuit is directly controlled by SC 255 I/O, or by one of the various types of Danfoss case controllers.After selecting Circuits from the rack alarms menu (shown once again at left) you will be presented with a list of configured evaporator circuits (which will vary greatly depending on what circuits you have configured). A list of typical circuits is shown at right.
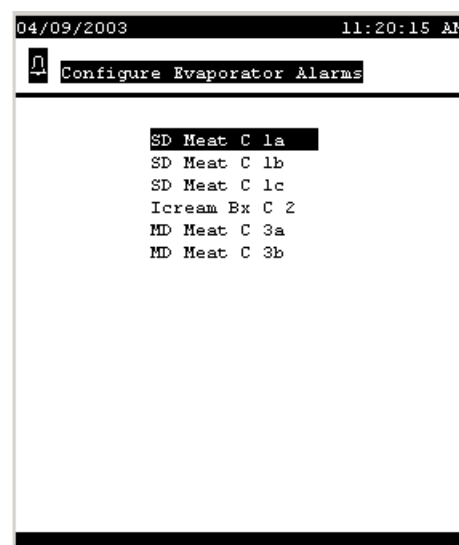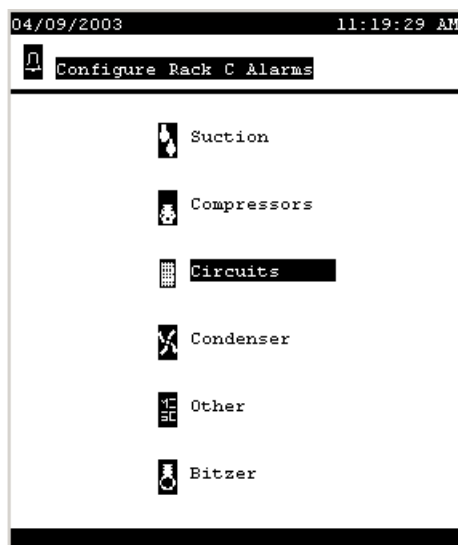
Alarms for
AK2-SC 255 circuits   Select the first circuit on the list above. It turns out to be typical for circuits controlled
directly by the SC 255. Initially, the alarm screen looks as at left below.
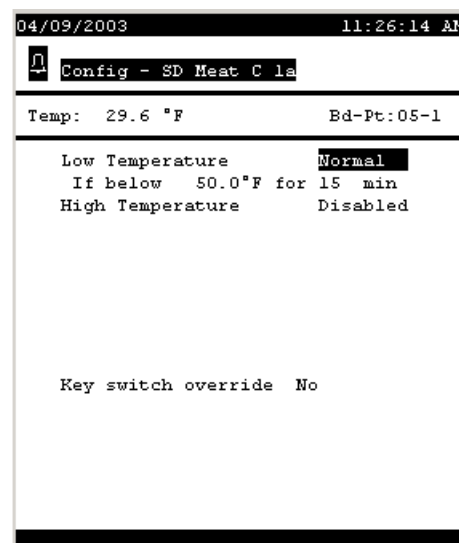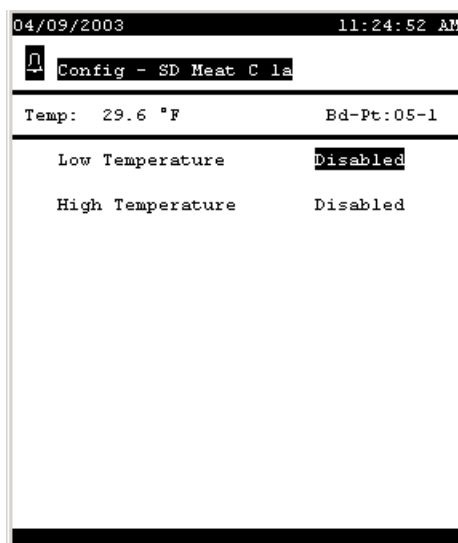
Notice that the name of the circuit appears in the heading of the screen. Then there is
an area where the current sensor temperature appears, along with the number of the
I/O board and point to which the case temperature sensor is wired. At first, you see
two alarms, both disabled.

In the screen at right above, we have enabled one of the alarms by changing its level
to **Normal**. We have changed the default settings, 50° and 30 min, to more reasonable
settings for the fixture. Enabling the alarm also caused the appearance further down
the screen of a question about a **Key switch override**.

The following screens show the second alarm configured, and the key switch override

answer has been changed to **Yes**:

Note that the second alarm is a high temperature alarm, and that it has an extra line in its configuration, **Delay after defrost**. If a delay other than zero is entered, the high temperature alarm will be disallowed following termination of defrost (provided defrost is monitored).for the specified number of minutes. The time unit can not changed. The time is always in minutes.

The key switch override is made functional by having a physical switch (usually operated by a key to prevent inadvertent operation or tampering) and by having configured a miscellaneous point for the switch, which is then wired to that point. The logic written for the miscellaneous point will prevent alarms, after the switch is operated, for the time specified as **Delay after override**. Such an override might be used for case cleaning, extensive re-stocking, or service.

Configuring
AKC 164 alarms

For circuits controlled by AKC 164 Smart Case Controllers, there are, in addition to the high and low temperature alarms discussed in the preceding section, a number of alarms embedded in the case controller that are received and processed by the SC 255. The alarms are enabled and disabled through the SC 255 and if enabled, will be dialed out by the SC 255 when they occur. The alarm configuration screen for an AKC 164 circuit looks like this:

```
04/09/2003                    03:18:28 PM
                                      Addr:
   ⏻ Config - Icream Bx C 2              1

      Case Type: AKC 164     Temp:   0.0°F

        Low case temp        Disabled

        High case temp       Disabled


        Low Superheat        Disabled
        Defrost exceeded     Disabled
        Fan start timeout    Disabled
        Drip pan clogged     Disabled
        Box door open        Disabled
        Power failure        Disabled
        Hardware failure     Disabled
        Sensor fail alarms   Disabled
        Key switch override  No


       Send to controller
```

The embedded alarms and their meanings are as follows:

Low Superheat

Occurs when the difference between the inlet (liquid in) and outlet (gas out) temperatures sensors is too low. This could be caused by the evaporator being overfilled with liquid refrigerant. In response to this condition, the AKC 164 will tend to close the AKV electronic expansion valve.

Defrost exceeded

Occurs if an evaporator is configured to terminate defrost at a set temperature if the termination temperature was not reached before the specified time expired.

Fan start timeout

Occurs when the fan is configured to start at a specified temperature after termination of defrost, and the specified temperature is not reached before the time set for fan delay expires.

Drip pan clogged

Occurs when a clogged drain is sensed due to standing water in the fixture drip pan.

Box door open

(a door switch must be installed and connected to the AKC 164 for this alarm)
Occurs when the box door is open past the specified delay time.

Power failure

Occurs when the AKC 164 resumes operation following interruption of power.

Hardware failure

Occurs upon detection of one or more internal AKC 164 hardware failures. Replacement of the AKC 164 may be necessary.

Sensor fail alarms

Occur when the AKC 164 detects failure of one or more of its sensors.

Alarms for EKC, DCU
Degree Master,
and AKC 165 Subcooling
controllers

Configuration of alarms for these controllers is not covered in this manual, but in the separate literature for the individual controllers.

Configuration of
condenser alarms

The fourth selection on the rack alarm configuration menu is **Condensers**. Before configuring condenser alarms, if you are implementing condenser control, finish answering the condenser configuration questions. Depending on the type of condenser configuration, the alarms presented will differ.

For the most part, the alarms presented in this section will be similar to those already covered in the preceding sections on suction and compressor alarms. We have configured condenser control, including variable speed, so as to describe almost all the alarm types.

After selecting **Condensers** from the rack alarms menu (shown once again below left) you will be presented with the first page of a list of alarms for rack C's condenser, as at right below.

```
04/10/2003              08:36:42 AM
 ⏻ Configure Rack C Alarms

        ▓  Suction

        ▓  Compressors

        ▓  Circuits

        ▓  Condenser

        ▓  Other

        ▓  Bitzer

```

```
04/10/2003              09:30:54 AM
 ⏻ Configure Rack C Alarms

Type              Name          Address

High Pressure     Disch Press C   06-2
Normal    above  50.0 psi for    15min

Hi Invert. resets Fan Inv Reset C 09-1
Normal    above  3   Cyc in      15min

Inverter failure  Fan Inv Bpass C 08-7
Normal                 On  for    15min

Cond fan failure  Cond Fan C1&2   09-1
Normal                 Off for    15min

Cond fan failure  Cond Fan C3&4   09-2
Normal                 Off for    15min

                        "PG DN" for more
```

We have shown above only the first page of alarms. Depending on the number of fans, there may be additional condenser fan failure alarms on a second page.

High Pressure (discharge pressure sensor)
This same alarm appears on the compressor alarms page, and you may have set it up already. It is an analog alarm, set for a pressure from -999.9 to 999.9 psi or bar and a time limit of from 1 to 9999 seconds, minutes, or hours.
Hi Invert. resets (if variable speed is configured)
A cycle digital alarm, with the trip level a number of cycles (0-9) in a specified time period (1 to 9999 seconds, minutes, or hours).
Inverter failure (if variable speed is configured and the inverter bypass is monitored)
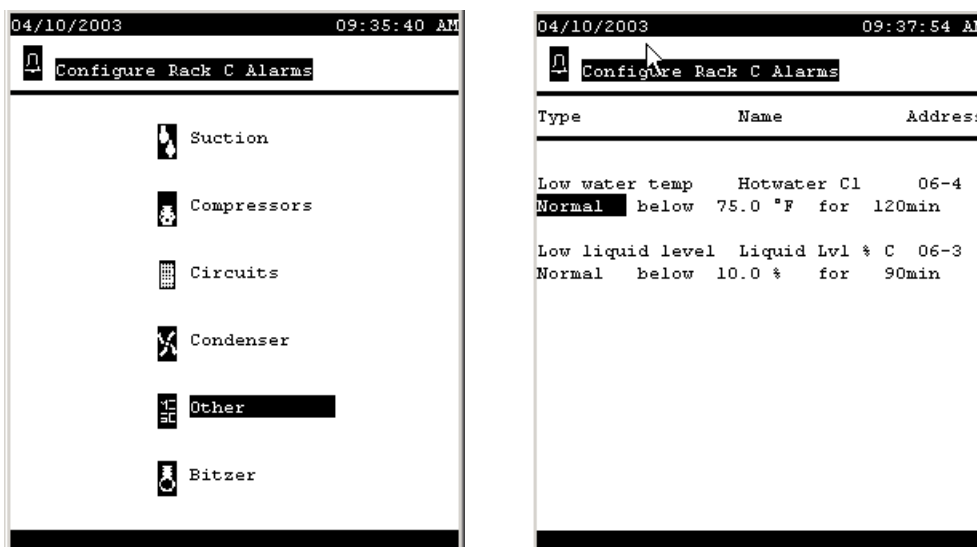A digital alarm that can be enabled to occur when the inverter is in bypass for a specified time period (0-9999 seconds, minutes, or hours).
Cond fan failure
A digital alarm that can be enabled to occur when a condenser fan is called to run and fails to show proof (digital monitor fails to read ON) within the time period specified in the alarm (1-9999 seconds, minutes, or hours).

Configuring "**Other**"
rack alarms

Unless there are Bitzer compressors on the rack, the final selection on the rack alarms menu is **Other**. As is the case with other alarm configuration pages, the alarm must be enabled (its action level changed from **Disabled** to **Log Only**, **Normal**, or **Critical**) before the parameters are visible. The alarms are as listed below the screen illustrations:

<table>
<tr>
<td>

04/10/2003   09:35:40 AM

   🔔 Configure Rack C Alarms

        🝖 Suction

        🝖 Compressors

        ▦ Circuits

        🗲 Condenser

        ▦ **Other**

        🝖 Bitzer

</td>
<td>

04/10/2003   09:37:54 AM

   🔔 Configure Rack C Alarms

Type   Name   Address

Low water temp   Hotwater C1   06-4
Normal below 75.0 °F for 120min

Low liquid level Liquid Lvl % C 06-3
Normal   below 10.0 % for   90min

</td>
</tr>
</table>

Low water temp (if hot water heat reclaim is configured)
An analog alarm that occurs when water temperature is below a set temperature from -999.9 to 999.9 degrees for a period of 1 to 9999 seconds, minutes, or hours).
Low liquid level (if a liquid level sensor is configured)
An analog alarm that occurs when receiver liquid level has fallen below water temperature is below a set percentage (but values from -999.9 to 999.9 are allowed) degrees for a period of 1 to 9999 seconds, minutes, or hours).

Configuring **Bitzer**
rack alarms

If the rack has Bitzer compressors with electronic interface, and the AKC 55 is configured to control the compressors, there will be a menu selection for **Bitzer** alarms. All special Bitzer alarms are embedded in the Bitzer compressor electronics. After selecting Bitzer from the rack alarms menu, it it is then necessary to select the individual compressor. We have omitted the screen that lists the compressors from the illustrations below. The alarm types are shown below the screen illustrations:

```
04/10/2003          10:28:06 AM
  Configure Rack C Alarms


            Suction

            Compressors

            Circuits

            Condenser

            Other

            Bitzer
```

```
04/10/2003          10:29:03 AM
  Config - Bitzer C 1


    Dirty oil filter      Disabled
    Motor overload        Disabled
    Oil flow              Disabled
    Oil level             Disabled
    Discharge temp        Disabled
    Phase fail            Disabled
    Rotation fail         Disabled
    Run proof fail        Disabled
```
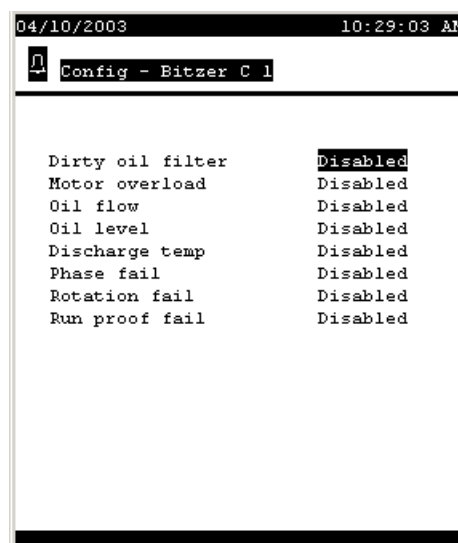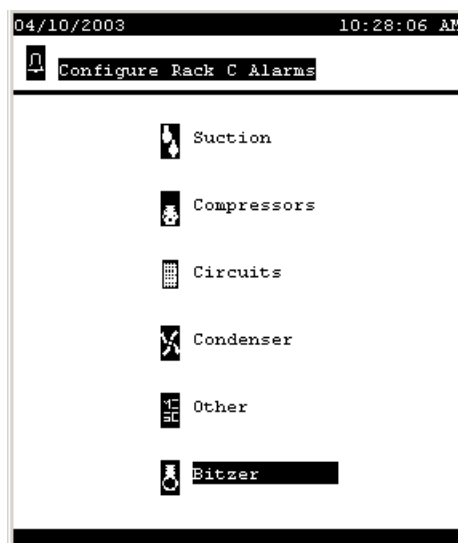
The setpoints for the embedded Bitzer alarms are fixed in the compressor electronics and are only monitored for occurrence by the SC 255. The alarms are virtually self-explanatory. For further information, consult literature supplied by the compressor manufacturer.

HVAC alarm configuration

The navigational route to HVAC alarm configuration is as follows: from the Main Menu, select **Configuration**, then **Alarms**, then **HVAC**. The alarm configuration menu is shown at left below. When you select **HVAC** from the alarm configuration menu, a list menu headed **Configure HVAC Alarms** will appear. It will list every HVAC unit that you have configured. Such a list screen appears at right below. For this very unlikely store we have configured one unit of every type.

```
04/10/2003          11:09:26 AM
  Alarm Configuration


    Refrigeration     Routing

    HVAC              Phone Numbers

    Miscellaneous     IP Network

    System            Printer

    Service           Modem
```

```
04/10/2003          11:20:54 AM
  Configure HVAC Alarms


            AHU:   Unit 1
            RTU:   Unit 2
            RTC:   Unit 3
            RTC:   Unit 4
          CT-65:   Unit 5
         CT-1024:  Unit 6
```
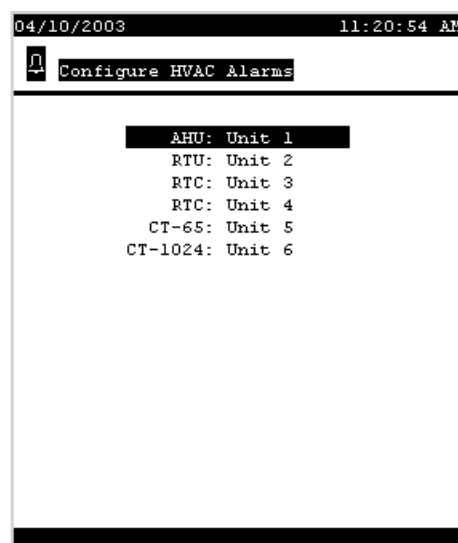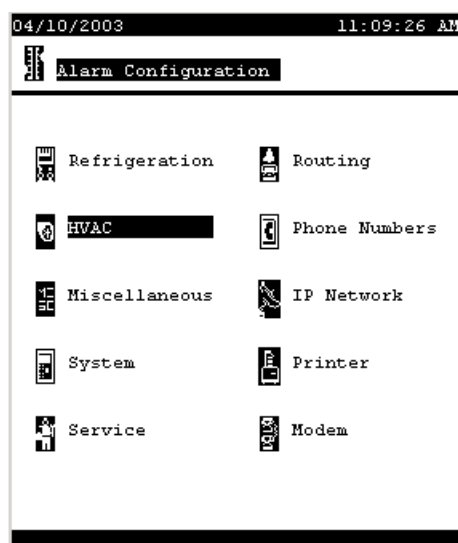
The unit types listed are as follows:

AHU	Air handling unit. A built-up system.
RTU	Rooftop unit. A packaged rooftop unit.
RTC	Rooftop controller. Any HVAC system controlled by a Danfoss (networked or standalone) RTC board.

SC4   Smart Coil (Seasons4) unit.
CT65   ClimaTECH 65 HVAC controller.
CT1024   ClimaTECH 1024 controller
Carrier   Carrier Centurion or Premier Link unit.

We will review each of the alarm types for AHU, RTU, and SC4 systems, which have almost identical alarm sets. Then we will discuss the alarms that appear only for RTC and ClimaTECH systems.

AHU, RTU, and SC4 alarms

These are typical alarms screens. None of the default parameters have been changed. In an actual store, you would probably adjust them.

```
04/10/2003                    11:42:29 AM
  🔔 Configure Unit 1 Alarms

Type              Name          Address


High zone temp    Zone Temp 1-1   00-0
Normal   above  50.0 °F  for   15min

Low zone temp     Zone Temp 1-1   00-0
Normal   below  50.0 °F  for   15min

High humidity     Inside Humidity 20-1
Normal   above  50.0 %   for   15min

High supply temp  Supply Air 1-1  00-0
Normal   above  50.0 °F  for   15min

HVAC fan down     Fan AHU 1       00-0
Normal            Off for   15min

                     "PG DN" for more
```

```
04/10/2003                    11:46:11 AM
  🔔 Configure Unit 1 Alarms

Type              Name          Address


HVAC smoke        Smoke Stat 1    00-0
Normal            On   for   15min

HVAC fire         Fire Stat       00-0
Normal            On   for   15min
```

High zone temp
Occurs when zone temperature is above a set temperature -999.9° to 999.9° for a period of from 1 to 9999 seconds, minutes, or hours.
Low zone temp
Occurs when zone temperature is below a set temperature -999.9° to 999.9° for a period of from 1 to 9999 seconds, minutes, or hours.
High humidity
Occurs when zone humidity is above a set percentage (the field takes values from -999.9 to 999.9) for a period of from 1 to 9999 seconds, minutes, or hours.
High supply temp
Occurs when supply temperature is above a set temperature -999.9° to 999.9° for a period of from 1 to 9999 seconds, minutes, or hours.
HVAC fan down
A digital alarm that can be enabled to occur when the system fan is called to run and fails to show proof (digital monitor fails to read ON) within the time period specified in the alarm (1-9999 seconds, minutes, or hours).
HVAC smoke (if a smoke detector is configured)
A digital alarm that can be enabled to occur when a smoke detector reads ON for a specified time period (1 to 9999 seconds, minutes, or hours).
**HVAC fire (if an HVAC fire stat is configured)**
A digital alarm that can be enabled to occur when a fire stat monitor reads on for a specified time period (0-9999 seconds, minutes, or hours).

RTC alarms

The following are alarms that appear uniquely for RTC systems, which also have alarms similar to those just presented:

Zone hum fail
A digital alarm that can be enabled to occur when a zone humidity sensor failure is detected by the RTC for a time period specified in the alarm (1-9999 seconds, minutes, or hours).

Zone temp fail
A digital alarm that can be enabled to occur when a zone temperature sensor failure is detected by the RTC for a time period specified in the alarm (1-9999 seconds, minutes, or hours).

Supply temp fail
Similar to the preceding alarm.

Sensor discard (if control based on two or more zone sensors)
Occurs at the specified time after one of the controlling sensors fails and the controller logic stops using the value of that sensor. The time setting can be from 1 to 9999 seconds, minutes, or hours. NOTE: if all zone sensors fail, control will be based on the return air sensor.

Power failure
A digital alarm that can be enabled to occur whenever power is restored (after being interrupted); the specified time period is (0-9999 seconds, minutes, or hours).

Filter (elapsed)
Occurs when the set number from 1 to 9999 seconds, minutes, or hours have elapsed. Useful when set for the system air filter life as a reminder to change the filter.

Filter (runtime)
Occurs when the set number from 1 to 9999 seconds, minutes, or hours have elapsed. Usually used Useful when set for the system air filter life as a reminder to change the filter.

Sensor discard (if control based on two or more zone sensors)
Occurs at the specified time after one of the controlling sensors fails and the controller logic stops using the value of that sensor. The time setting can be from 1 to 9999 seconds, minutes, or hours. NOTE: if all zone sensors fail, control will be based on the return air sensor.

Power failure
A digital alarm that can be enabled to occur whenever power is restored (after being interrupted) interrupted the inverter is in bypass for a specified time period (0-9999 seconds, minutes, or hours).

ClimaTECH alarm configuration

Alarm types for the two ClimaTECH HVAC controllers are the same, and all are embedded with a common time delay (which you can change) except the fire stat alarm (the fire stat is wired to an AKC 55 digital input board, not to the ClimaTECH controller; it is broadcast to the ClimaTECH over the AKC 55's I/O network. The alarm configuration screen for a ClimaTECH controller is shown below:

```
04/10/2003        Alarm!        03:09:03 PM

  ⌐┘ Configure Unit 5 Alarms

Type

Alarm delay.............? 15   min

High zone temp  Normal    above  85.0 °F
Low zone temp   Normal    below  40.0 °F

No Airflow              Normal
Phase Loss              Normal
Inverter failure        Normal
Fire                    Normal

AKC 55 Inputs:
HVAC fire       Fire Stat        00-0
Normal              On    for   15min
```
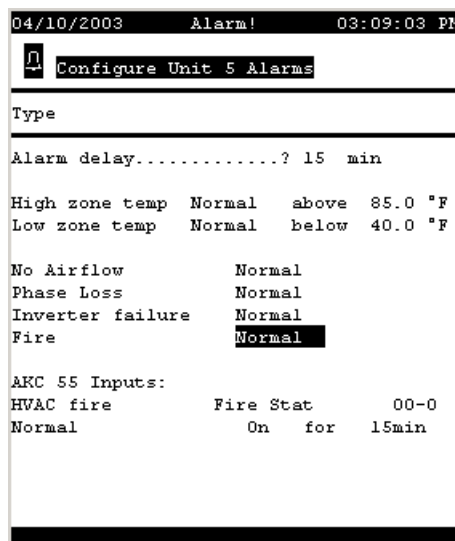
Notice the common alarm delay at the top of the screen. It can be set to any number from 0 to 100. The units, minutes, can not be changed. The alarm types are:

High zone temp
Occurs when zone temperature is above a set temperature -999.9° to 999.9° for the specified alarm delay.

Low zone temp
Occurs when zone temperature is below a set temperature -999.9° to 999.9° for the specified alarm delay.

No Airflow
Occurs when zone humidity is above a set percentage (the field takes values from -999.9 to 999.9) for a period of from 1 to 9999 seconds, minutes, or hours.

Phase Loss
The ClimaTECH controller has a digital input to sense signals from the HVAC system's phase loss detector. This alarm occurs when the phase loss input has sensed a phase loss for the specified alarm delay. of from 0 to 100 minutes.

Inverter failure
The ClimaTECH controller has a digital input to detect failure of the HVAC system's inverter, if the system is a variable speed unit. This alarm occurs when the inverter has been called for for the specified alarm delay of from 0 to 100 minutes, and proof has not been sensed.

Fire
The ClimaTECH controller has a digital input to detect the HVAC system's fire alarm. This alarm occurs when the fire input has been ON for the specified alarm delay. of from 0 to 100 minutes.

HVAC fire (if an HVAC fire stat is configured)
A digital alarm from the AKC 55 that can be enabled to occur when a fire stat monitor reads on for a specified time period (0-9999 seconds, minutes, or hours). This alarm is separate and distinct from the preceding one in that it does not originate from the ClimaTECH controller. It is presented on this screen because it pertains to the system whose alarms are being configured.

Configuring
Miscellaneous
alarms

Returning now to the main Alarm Configuration Menu, the next item after HVAC is **Miscellaneous**. Using the the miscellaneous alarms screens, you can create custom

alarms to add to those automatically created as you configure the controller. This is a powerful feature of the SC 255 with great flexibility. Every relay output and sensor will be listed in the miscellaneous alarm screens. Alarms can be configured here to be active on only specified days, too. You can also create multiple alarms for the same relay or sensor, with different time delays and action levels.

After you select Miscellaneous from the main Alarm Configuration Menu, you will see the first page of the first of five miscellaneous alarm list screens. It lists all the relay outputs in the system. The Alarm Configuration Menu and the Misc Alarms - Relay Output list screen are shown below:
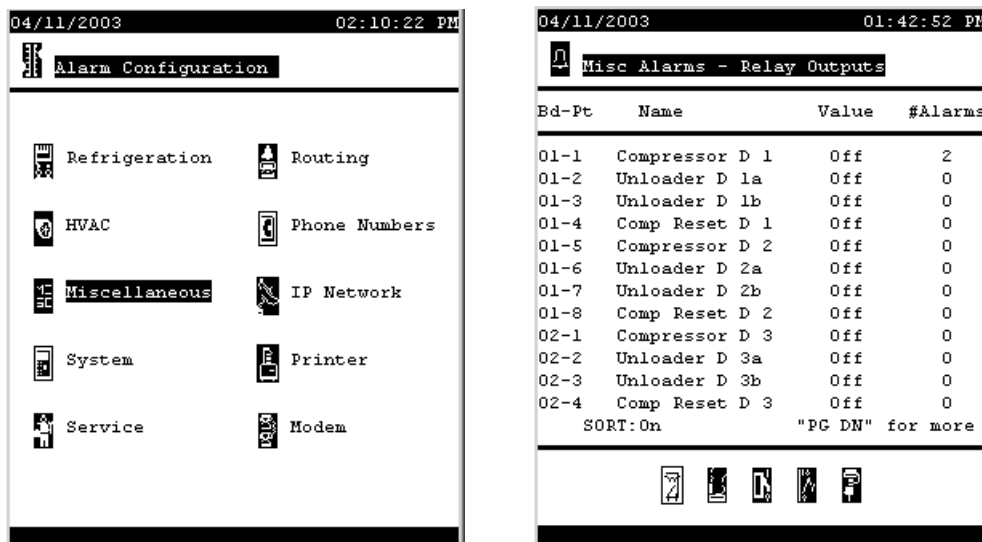
Before we go on to discuss configuring miscellaneous alarms for relay outputs, observe the icons at the bottom of the screen above right. The first icon represents relay outputs, the current screen. The others, from left to right, are in reverse video (unselected) and represent analog inputs, digital inputs, analog outputs, and casc controllers respectively. Selecting any one of these icons will take you directly to that area of configuration.

For each point selected, whether an output or input, up to 3 different alarm satements can be used, and each can be active on a time schedule. As an example, a meat prep room may be occupied only during certain hours; therefore, different alarm levels might be useful. An example follows for such a prep room controlled by an AKC 164 Smart Case Controller. The principles discussed here can also be applied to digital outputs, analog inputs, or any other kind of input or output.

Example
Misc. alarm.

In this example, the meat prep room is controlled by a Smart Case Controller. To find the temperature sensor, we must select the case controller icon once we have arrived at the first miscellaneous alarms screen shown at right above. The screen might appear as at left below.

Number of
alarms field

In the first screen above, you can see by the highlight that we have already moved the cursor to the sensor we want to configure an alarm for. With the cursor there, when we press ENTER, the screen at right (above) appears. The cursor is by default on the Number of alarms field. We can enter any number from 0 to 3. We want to configure only one alarm. Entering 1 in the Number of alarms field produces the screen at left below.

Before proceeding, we must change the action level of the alarm from **Disabled** to one of the other levels. In the example at right above, we're changing the level to **Normal**.

1.7 Miscellaneous Points Configuration

Whenever you need to create a custom control strategy, or define an on/off input or

sensor input not available through refrigeration, HVAC, or lighting configuration, you will need to configure one or more miscellaneous points.

You might use a miscellaneous relay output point for an exhaust fan, a dispenser that adds chemicals to an evaporative condenser, an oven, a produce fogger, or any other device that can't or shouldn't be treated like an ordinary refrigeration, HVAC, or lighting point.

Miscellaneous on/off inputs and sensor inputs can be used in defining the strategy for miscellaneous relay outputs. They may be monitored for history, and may be configured strictly for that purpose, or for alarms. Alarms can be created for any miscellaneous point. For sensor inputs, the AK2 system allows custom conversion for non-Danfoss sensors that have a linear response.

Starting Configuration
The way you begin configuration of a miscellaneous point depends on whether there are any miscellaneous points already configured.

First, select **Miscellaneous** from the Main Menu. Select **Configuration**, and the Configure Miscellaneous Menu appears.
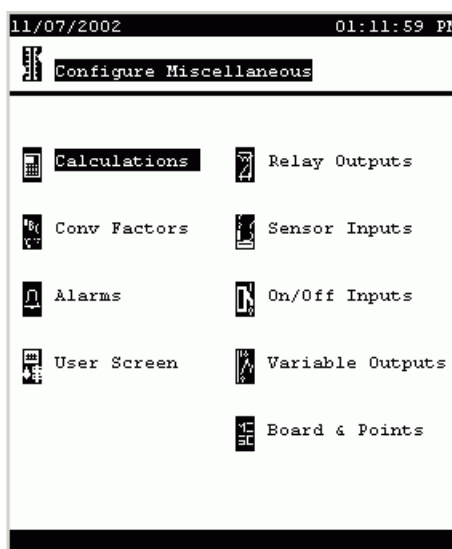
The calculated points feature of SC 255 versions 1.00 and higher, first on the menu above, is a rich and very powerful set of tools. We will discuss it later in this section. The menu items will not be taken up in the order that they appear on the menu.

Plan strategy first
Before beginning configuration, plan your strategy. What types of points will you need to define? How many? If you need to develop a control strategy involving several inputs, outputs, and schedules, you may wish to look at the examples at the end of this section first, because it shows how on/off inputs, sensor inputs, schedules, and even other relay outputs, are used to create a custom control strategy for a relay output.

Miscellaneous
relay outputs
You can configure up to 48 miscellaneous relay outputs per SC 255. To configure a miscellaneous relay output, select **Relay Outputs** from the Configure Miscellaneous menu. When the Configure Misc. Relay Outputs screen appears increase the number

of relay outputs in the first line by 1 (or a higher number to match the number of outputs you want to configure). Edit the name of the input, then complete configuration by making a selection for each field for each new input. the enter the number of on/off inputs you want to configure.

A step-by-step configuration example for a miscellaneous relay output appears in the first example in the miscellaneous calculations section, which follows in a few pages.

Miscellaneous Sensor Inputs

You can configure up to 64 miscellaneous sensor inputs per SC 255. To configure a miscellaneous sensor input, select **Sensor Inputs** from the Configure Miscellaneous menu. When the Configure Misc. Sensor Inputs screen appears increase the number of sensor inputs in the first line by 1 (or a higher number to match the number of inputs you want to configure). Edit the name of the input, then complete configuration by making a selection for each field for each new input. the enter the number of on/off inputs you want to configure.

A step-by-step configuration example for a miscellaneous sensor output appears in the first example in the miscellaneous calculations section, which follows in a few pages.

Miscellaneous on/off inputs

You can configure up to 64 miscellaneous on/off inputs per SC 255. To configure miscellaneous on/off inputs, select **On/Off inputs** from the Configure Miscellaneous menu. When the Configure Misc. On/Off Inputs screen appears, increase the number of on/off inputs in the first line by 1 (or a higher number to match the number of inputs you want to configure). Edit the name of the input, then complete configuration by making a selection for each field for each new input. the enter the number of on/off inputs you want to configure.

A step-by-step configuration example for a miscellaneous on/off input appears in the second example in the miscellaneous calculations section, which follows in a few pages.

Specifying Miscellaneous Conversions

Miscellaneous conversions are used for sensors that have an output range or range-to-value relationship not already defined as one of the named "types" in the sensor input configuration list box. To configure a miscellaneous conversion, select **Conv. Factors** from the Configure Miscellaneous menu. The Configure Conversion Factors screen appears:

The field contents which may be selected, and the range of values for each, are as follows:

Units:	psi, (bar), °F, (°C), ppm, V, Amp, kw, kwh, Hz, gpm, fps, pH%
Min input:	0.0 - 10.0
Max input:	0.0 - 10.0
Min output:	0 - 3276.7

Max output: 0 - 3276.7

Select the units for the sensor reading, then, from data supplied by the manufacturer, enter the minimum and maximum input voltage and the values which correspond to each. Remember that the custom conversion factor must be selected from the list box for the **Sensor Type** field during configuration of the sensor input that uses the conversion.

Miscellaneous calculations

Miscellaneous calculations are used to create custom logic. A calculated point created here can be used anywhere a board & point address can be referenced. The calculated points processor is a true boolean processor, with a full complement of argument types and operators. Examples follow this section. Right now, let's investigate the screens one by one, as far as we can., in general.

If there are no calculations configured when you select Calculations from the Configure Miscellaneous menu, the seemingly unassuming screen below at left appears; when one or more calculated points have been configured, the screen is a list screen as at right below:

Every configured calculated point will be listed. The fields are as follows:

Point	(Ca-01 to Ca-96) The name of the calculated point.
Description	The type of point (OI or SI). If an SI, the description will usually include the units.
Value	The current value or state of the point. This will be on or off for OI points, and a value for SI points.
Status	(Online, Offline, Error)
New Calc	At the bottom left of the screen is a field with the

number of the next unconfigured calculated point. To configure a new point, select this field and press ENTER.

Point creation — When you press ENTER with the cursor on the name of the next new calculated point, the configuration screen for that point opens, and looks like this:

The list box for the Units field is already open when the screen first displays, showing all the types of points that can be created, and for SI points, units. For the purpose of discussing the screen, let's assume that we are creating an OI (a digital input). We select OI, the first item, from the list box. Now the screen looks like this:

The screen is divided into four areas, which from top to bottom are the following:

Title area	The date and time at the very top, then the settings icon and screen title, in this case **Configure Ca-01 (OI).**
Heading area	The heading of the screen tells what type and style of point will be created. The fields are as follows:

	Units
	Style
	Undo (button)
	Cancel (button)
Data definitions area	This area contains information that identifies points that will be used in the logical statements in the next area, and the current value of each. The area by default has lines for two definitions, but it can be enlarged by selecting the horizontal divider line between it and the next field, pressing ENTER, and then selecting **Insert** from a popup box. You will see this done in a few pages during the presentation of our first example.
Rules area	This is the area that will contain the logical statements that determine whether the point is on or off (OI) or the value (SI) that is used. At the bottom of the area is the current value of the result.

Let's create a point now. Afterwards we will discuss each area and field in detail. It is important to plan the strategy first.

Custom strategy example

We want to control a compressor room exhaust fan. We want the fan to run whenever the compressor room temperature is 90°F or higher; we also want it to run in case of a refrigerant leak of 500 ppm or more. So let's list the types and values we will need:

OI calculated point	to control the RO
SI °F misc SI	compressor room temperature
Num	90 (the temperature setpoint)
SI ppm misc SI	leak detector sensor [see note]
Num	500 (the leak ppm level)
RO	to control the fan

[Note: the leak sensor may not need to be configured as a miscellaneous sensor if there is a standard leak detector configured. Instead, we will just select SI ppm as the sensor type and then pick the sensor from the list that appears under data definitions.]

It is important to understand that only the OI will be created in the calculated points screen. The state of the OI will depend on the evaluation, at any time, of the logical statements that we are going to write. The other points (the RO and the two SIs) will be created as miscellaneous points.

Creating the miscellaneous points
Sensor inputs

Now we will create the first of the sensor inputs we will need, that for the leak detector. Exit to the Configure Miscellaneous menu and select **Sensor Inputs**. The configuration is straightforward for both of the sensors we need:

```
11/12/2002   11-0103 (CFG)   11:43:37 AM
```

Configure Misc. Sensor Inputs

```
No. of sensor inputs: 1

Name              Bcast Bd-Pt  Type

Compr Rm Leak     No    05-1   Leak
```

```
11/12/2002   11-0103 (CFG)   11:45:05 AM
```

Configure Misc. Sensor Inputs

```
No. of sensor inputs: 2

Name              Bcast Bd-Pt  Type

Compr Rm Leak     No    05-1   Leak
Compr Rm Temp     No    05-2   PT1000
```

Writing the custom strategy

Navigate back to the Configure Ca-01 [or whatever number] screen now, which we will repeat on the left as it looks when it first comes up. After selecting OI as the type, the screen looks as shown at right. The type cannot be changed from OI unless Ca-01 is removed as the controlling point for the miscellaneous RO we created.

```
11/07/2002              01:13:45 PM
```

Con   a-01 (OI)
            <Delete>
Units: OI   [Undo] [Cancel]
Style: SI
       SI psi
Name Da SI °F ition | Value
RO1   SI %   configured | ?(error)
        SI ppm
        SI V
if (fir SI Amp line) |Result| Value
  RO1   SI kw | Off | ?(error)
        SI kwh
  True SI Hz | On | On
        SI gpm
        SI fps
        SI pH

    Current Value (? = Error): ?   On
```

```
11/08/2002              11:09:08 AM
```

Configure Ca-01 (OI)

```
Units: OI                [Undo]  [Cancel]
Style: Generic

Name Data Definition        |  Value
RO1        Not configured   | ?(error)

if (first True line)  |Result| Value
  RO1  __ ___ __ ____  |  Off | ?(error)

  True                 |  On  |   On

    Current Value (? = Error): ?   On
```

Notice the **Undo** and **Cancel** button fields in the heading of the screen. Undo will erase your last step if you make a mistake; Cancel will undo all changes, leaving the point as it was before you started to edit it.

In the Style field, select **Generic**.

Data definitions
Name

Move to the data definitions area of the screen, and put the cursor over the first name, which by default says **RO1**. Toggle to edit mode and open the list box, and the screen will look as at left below. Select SI °F from the list box and press ENTER.

Now the screen looks like the one at right below.

Move (right) to the next field and select the compressor room temperature (which we called **Comp Rm Temp** and assigned to Bd-Pt 05-2. Now the screen will appear as below:

Notice that after the selection is made, the value field for the sensor changes from **? (error)** to **0.0°F**.

Still in the data definitions area, select the blank in the second line under Name and open the list box. This time, select **Number °F** from the list (be careful, there are several Number items). The screen will look as at left below. Move right to the data definition and change 0.0°F to 90.0°F, which is the temperature setpoint in the strategy we are creating, and the screen will appear as at right. Again, the value field has changed to reflect the value of the defined point.

```
11/12/2002   11-0502 (CFG)    02:47:01 PM
  Configure Ca-01 (OI)

Units: OI              Undo    Cancel
Style: Generic

Name Data Definition           Value
SI1  05-2   Compr Rm Temp      0.0°F
Num2     0.0°F                 0.0°F

if (first True line)   Result  Value
  SI1  __ __ __ __      Off    ?(error)
                        ____
  True                  On     On




     Current Value (? = Error): ?  On
```

```
11/12/2002   11-0502 (CFG)    02:59:51 PM
  Configure Ca-01 (OI)

Units: OI              Undo    Cancel
Style: Generic

Name Data Definition           Value
SI1  05-2   Compr Rm Temp      0.0°F
Num2    90.0°F                90.0°F

if (first True line)   Result  Value
  SI1  __ __ __ __      Off    ?(error)
  True                  On     On




     Current Value (? = Error): ?  On
```

In the same manner, we want now to define a sensor argument (SI ppm) for the leak sensor and a number argument (Number ppm) for the setpoint (500). It does not appear that there is any room left in the data definitions area, but we can easily expand it.

Select the heavy horizontal line at the bottom of the data definitions area, and it will appear as at left below. Toggle to edit mode, and as you can see at right, the opportunity to insert a new line presents itself.

```
11/12/2002   11-0502 (CFG)    03:27:15 PM
  Configure Ca-01 (OI)

Units: OI              Undo    Cancel
Style: Generic

Name Data Definition           Value
SI1  05-2   Compr Rm Temp      0.0°F
Num2    90.0°F                90.0°F

if (first True line)   Result  Value
  SI1  __ __ __ __      Off    ?(error)
  True                  On     On




     Current Value (? = Error): ?  On
```

```
11/12/2002   11-0502 (CFG)    03:27:46 PM
  Configure Ca-01 (OI)

Units: OI              Undo    Cancel
Style: Generic

Name Data Definition           Value
SI1  05-2   Compr Rm Temp      0.0°F

<Insert>

  SI1  __ __ __ __      Off    ?(error)
  True                  On     On




     Current Value (? = Error): ?  On
```

Now press ENTER, and the new line appears. On the new line, create argument SI3, (an SI ppm) and define it by selecting the second miscellaneous SI we created, **Compr Rm Leak**. Finally, insert another new line and create argument NUM4 for the 500 ppm leak setpoint, and data definitions are complete.

The rules area

When evaluating the logic in the rules area, the controller will go line by line in the rules area, and stop at the first statement that it finds true. We want the OI to be

normally off, but to be on whenever the temperature (SI1) is equal to or greater than 90°F (Num2) OR whenever the leak sensor (SI3) is equal to or greater than 500 ppm (Num4).

Writing rules

Notice that **SI1** already appears in the rules area on the first line. We could change it, if we wanted, to any of the other three arguments we have defined, but it is exactly where we need it.

Notice that there are several blank spaces to the right of **SI1**. These alternate between arguments and operators. Put the cursor on the first blank to the right of **SI1** and open the list box.

These are all mathematical operators appropriate to sensor inputs. We will select >= as the operator for this statement. Having done that, move one field to the right and select Num2 as the argument to complete the statement. The complete statement appears in the screen at right above (the statement is **SI1 >= Num2**).

The list box is open in the Result column because if the statement is true, we want the OI (which in turn controls the RO for the EXFAN) to be On, and the default result (as seen in the screen at left above) is Off. Now we change the result to On, and the entire line effectively says: **If SI1 >= Num2, Ca-01 (OI) will be On**.

The controller's logic processor will stop at the first true statement and produce whatever result is in that statement's result column.

The screen, with the first line complete in the rules area, looks like this:

```
11/12/2002   11-0502 (CFG)    04:09:10 PM

   ⵊ Configure Ca-01 (OI)

Units: OI                   Undo      Cancel
Style: Generic

Name Data Definition                  Value
SI1  05-2    Compr Rm Temp           0.0°F
Num2    90.0°F                       90.0°F
SI3  05-1    Compr Rm Leak           0.0ppm
Num4  500.0                          500.0

if (first True line)       Result    Value
 SI1   >=   Num2 ___ ____    On      (false)
 True                        On       On




              Current Value:      On
```

Now go to the result column on the line with the word **True**, open the list box, select **<Insert>**, and press ENTER to add a line for the second statement, then add the condition for the leak detector. When you are finished, the screen will look like this:

```
11/12/2002   11-0502 (CFG)    04:21:12 PM

   ⵊ Configure Ca-01 (OI)

Units: OI                   Undo      Cancel
Style: Generic

Name Data Definition                  Value
SI1  05-2    Compr Rm Temp           0.0°F
Num2    90.0°F                       90.0°F
SI3  05-1    Compr Rm Leak           0.0ppm
Num4  500.0                          500.0

if (first True line)       Result    Value
 SI1   >=   Num2 ___ ____    On      (false)
 SI3   >=   Num4 ___ ____    On      (false)
 True                        Off      Off




              Current Value:      Off
```

The last statement effectively reads IF True, Off. This may seem strange at first, but remember that the controller is evaluating line by line. There must be one true statement (called the "else" statement by logicians). So the last line always states True with the result set to whatever state we want when none of the other conditions is true.

To summarize, the conditions read: "If SI1 is greater than or equal to Num2, turn on the OI. If SI3 is greater than or equal to Num4, turn on the OI. Under any other conditions, leave the fan off." Another way to state the effect of this logic is: "If compressor room temperature is equal to or greater than 90, or refrigerant is sensed at 500 ppm or more, turn on the fan; else, turn off the fan." This is exactly what we set out to do.

Creating the
miscellaneous points
relay output

Exit to the Configure Miscellaneous menu, and from there select **Relay Outputs** and
press ENTER. The configuration screen for a relay output appears:

```
11/12/2002   11-0102 (CFG)   10:36:30 AM

   Configure Misc. Relay Outputs
   _____

No. of relay outputs: 1

Name            Bcast Bd-Pt  On

Compr Rm EXFAN  No    04-7   N-Open    >
```

The first step in configuring a miscellaneous RO is to increase the field No. of relay
outputs by 1. In this example, we're increasing 0 to 1 because this is the first miscella-
neous RO to be configured. Here's what to do and where to do it:

Name	(Label, any 15 characters) Edit the field to read appropriately to the purpose.
Bcast	(List box: No, Send, Rec) Leave the Bcast field set to No. We are not going to use the point elsewhere on the network.
Bd-Pt	(Bd-Pt label) In the Bd-Pt field, enter the number of the board and terminals where the RO will be wired.
On	(List box: N-Closed, N-Open) Because the normal state of the fan will be off, we will wire through the normally open contacts for the output relay.

Notice the character **>** that is in reverse video in our example above. This is a button
field, and when it is selected, ENTER will take you to the next page. Initially, the
second page of this screen appears as at left below.

It is not necessary to change anything in the top half of this screen, which repeats the configuration we entered on the previous page (though we *could* change it here if we wanted). There are two things to add to configuration here.

Control Input (List box: all configured OIs) Our new calculated OI is found at the bottom of the list. (Use the three dots at the top or bottom to move up or down the list.) a page at a time.

The other fields on the screen are timers. To keep the exhaust fan from cycling too rapidly when the temperature is hovering near the setpoint, we will set a 10 minute post delay. The finished screen looks like this:

```
11/12/2002    11-0107 (CFG)    10:48:28 AM

  Configure Misc. Relay Outputs



           Name  : Compr Rm EXFAN
           Bd-Pt : 04-7
           Bcast : No
           On    : N-Open


Control Input : Ca-01 (OI)
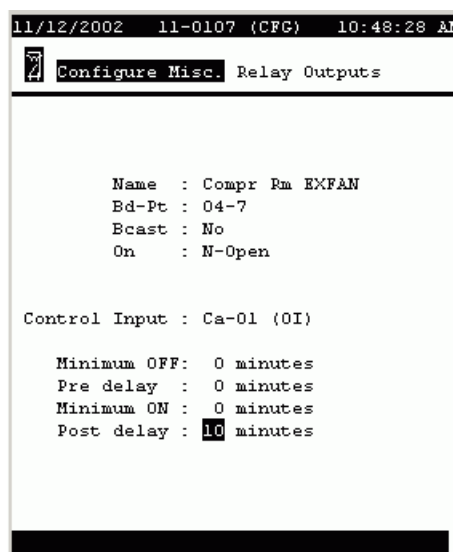
   Minimum OFF:  0 minutes
   Pre delay  :  0 minutes
   Minimum ON :  0 minutes
   Post delay : 10 minutes
```

Completing that working example hopefully increased your comfort with calculated points. Now we will go through each of the fields and functions in order.

The heading fields   Here is the heading area of the calculated points screen:


```
Units: OI           Undo    Cancel
Style: Generic    |  Redo
```

Units   We've discussed the Units field and its contents earlier. The contents specify the type of point being created, whether an OI or SI. The 13 kinds of SI are differentiated by the units in which their values are presented. There is one special selection you can make from the Units list box:

<Delete>   Use this button in the style box to delete the calculated point. Higher numbered points will remain in place. The deleted point will be the next new point made available for configuration.

Style   To understand the various styles of Calculated SI and OI points, we will give use the initial framework screens that display when each combination of Units and Style is selected. We will present them by style.

<Clear>   This button clears the configuration for the selection of a new style.

Generic   (OI, SI) The style we used for the example just completed.

Clone   (OI, SI) Offers a means of cloning any physical board & point to be used elsewhere in the system.

Schedule   (OI only) Used to create an OI that will be on or off according to a schedule.

Cut In/Out   (OI only)

Latch   (OI, SI) Once turned on by a true rule, the point will remain on until a physical switch (wired to an OI) is operated to turn it off.

Receive	(OI, SI)
Minimum	(SI only) The value will be the minimum of up to 5 SIs.
Maximum	(SI only) The value will be the maximum of a number of up to 5 SIs.
Average	(SI only) The value will be the average of up to 5 SIs.

Undo	The undo button will undo the last change you made before you pressed ENTER.
Cancel	The cancel button will clear all changes since you began editing the point.
Redo	The redo button appears after any undo or cancel, and reverses that action.

Configuring Authorization

Only users authorized at the Supervisor level have sufficient access to configure authorization. Supervisors can select Authroization from the Main Menu to reach the following screen:

```
03/01/05                      02:10:18 PM
  ⚙ Authorization Configuration

    Access       Auth       Account
    Level        Code   1   2  3  4  5  6

1 Supervisor    12345  50   0  0  0  0  0
2 Complete Sys. 12345  50   0  0  0  0  0
3 Refrig All    12345  50   0  0  0  0  0
4 Refrig Set    12345  50   0  0  0  0  0
5 HVAC All      12345  50   0  0  0  0  0
6 HVAC Set      12345  50   0  0  0  0  0
7 Alarms        12345  50   0  0  0  0  0
              (Clear)

   Require view access code:No

   Audit Trail: English  :Yes
                Español  :No
                Português:No
                Deutsch  :No
                "PG DN" for more
```

Note that there are 7 Access levels. Auth codes are assigned individually to each level,. Each level can have from 1 to 66 accounts.

When you inspect the audit trail (discussed in Section II, "Using the Ssystem"),, you will be able to determine, for each system access, which specific account was used for access and exactly what changes, if any, were made.

Notice that you can also set the language(s) for the audit trail.

Configuring units and languages

The units for pressure, temperature, etc. are configured by selecting Store Info from the Main Menu, then Units/Languages. This is the screen that displays:

```
03/01/05                    02:12:40 PM
ABC
C°F  Units/Languages

      Pressure     :psi

      Temperature : °F

      Date         :MM/DD/YY

      Time         :12 Hour

      Language     :English

      Light Level  :percentage
```

The fields are these:

Pressure	(List box: PSI, bar)
Temperature:	(List box: °F, °C)
Date:	(List box: four date formats are offered)
Time:	(List box: 12-hour, 24-hour)
Language:	(List box: English, Spanish, Portuguese, German, Chinese, Japanese)
Light level:	(List box: percentage, foot-candles)

PART TWO
Using the Status Screens and Service Functions

Using an AK2-SC 255 system is simple and is best learned at the controller or by using AKA 65 Network Supervisor software to examine a real system. Everything starts at the Main Menu. You can get the Main Menu, if it isn't the screen you see on the controller, by pressing the MENU key.

Here's the Main Menu:

Authorization –
"Just Looking"

If you are just looking at information in the system, you may not need to enter an authorization code before moving on, depending upon the system owner's wishes. The system may allow you to browse and look at the status screens, or it may require an authorization code just to look. If the owner has decided to tightly limit access to the system's information, you will se a screen like this:

You will need to enter the authorization code that theowner has given you in the space where you see the asterisk.

Getting Authorized To Make Changes

screensconfiguration by the system owner has

If you're going to be making changes, you need to enter a valid authorization code for the part of the system you'll be working with. Valid codes should be obtained from the system owner.

Only one authorized user can have access to an SC 255 at a time.

Authorization has a number of levels; an authorization code can be for the entire system or for refrigeration or HVAC alone. To begin the authorization process, select Authorization from the Main Menu. This is the screen that will appear:

```
03/02/05                    09:40:04 AM
 🔒 Authorization        View Only
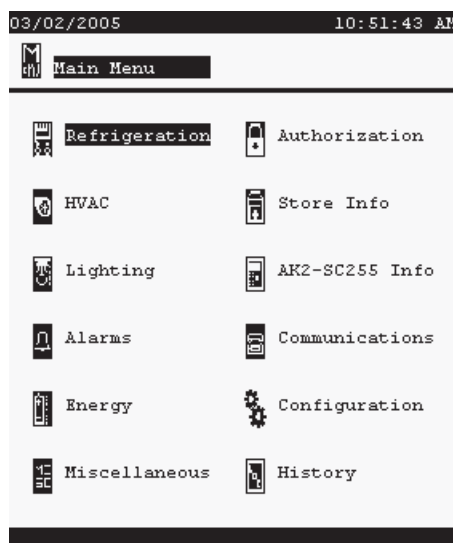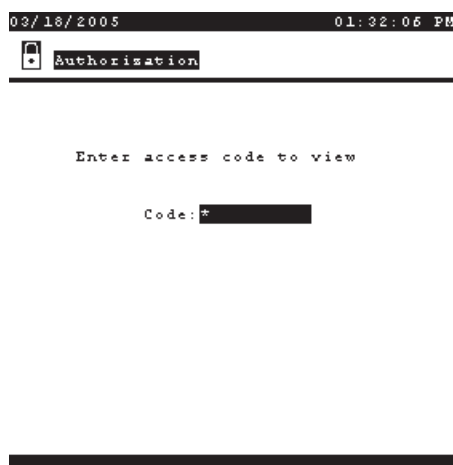
  Auth   : *              ( Log Out  )
  Account: *              (Audit Trail)

Audit#       Authorization   Origin   Lvl
00125-00068 02/25/05 09:44A Keypad   1-01
00067-00067 02/24/05 12:41P Keypad   1-01
00066-00043 02/24/05 10:28A Keypad   1-01
00042-00042 02/24/05 10:28A Keypad   1-01
00041-00001 02/23/05 09:50A Keypad   1-01
```

Notice that the current level of access (probably **View only** will be seen at the top of the screen. The cursor will be in the **Auth** field. To become authorized at a higher level,
       enter your Auth code, given to you by the system owner
       press ENTER; the cursor moves to the Account field.
       enter your Account code
       press ENTER

If you have correctly entered a valid code and account number, the bar at the very bottom of the display will read "**Access accepted**"in reverse video. You are now authorized at the level that appears in the screen title area.

After several minutes of inactivity, the access level will revert to "view only." If you want to log off and immediately prevent access by others without authorization, go to the Authorization screen, put the cursor on the <Log Out> button, and press ENTER.

The authorization level will revert to **View Only.**

To assign authorization codes and account numbers, you must be at the supervisor level. Use the procedures found in section I.

Selection of Units
and Language

Before using the system, you may wish to change the language used on the screens, the units used for pressure and temperature, and the date and time format. These settings will be for the local PC only, and will not affect the display at the SC 255's in the system. To change the displayed units, or to select a language for the screens, choose **Store Information** from the main menu, then choose **Units/Languages**. You will be presented with the Units/Languages screen, which looks like this:

```
03/02/05                      09:50:48 AM
ABc
°CF   Units/Languages

        Pressure      :psi

        Temperature  :°F

        Date          :MM/DD/YY

        Time          :12 Hour

        Language      :English

        Light Level  :percentage


```

The fields in the screen are these. The selections are self-explanatory.

Pressure	(List box: psi, bar)
Temperature:	(List box: °F, °C)
Date	(List box: a choice of 4 date formats)
Time	(List box: choose either 12 or 24 hour format)
Language:	(List box: English, Español, Portugues, Deutsch, Chinese, Japanese)
Light Level:	(List box: percentage, footcandles)

2 - 1.   Navigation and Making Changes

No matter what type of system you are working with, whether refrigeration, HVAC, or lighting, moving around the screens and menus in an SC 255 is the same. We will use a series of refrigeration menus and screens as examples in this section, but the same principles will apply to any other part of an installation.

On the Main Menu, notice that one of the menu items is in reverse video – that instead of the text being dark on white background, it is white on a dark background.

Press one of the arrow keys, and you will see that this condition moves from item to item on the menu. You are moving the SC 255's cursor.

To select from any SC 255 menu, first use the arrow keys to move the cursor to the item you want (the cursor will only land on areas where action is possible), then press the ENTER key. You can use the EXIT key to reverse your steps one at a time.

Let's assume that you press ENTER with the cursor on **Refrigeration**. You will move to the next level, which is the Refrigeration menu, where all of the configured racks are listed. At right, below, is the refrigeration menu. Depending on the installation, your refrigeration menu many be different.

In this menu, there is some status information displayed (the current suction pressure and, for reference, the target suction pressure). Since there is more than one rack being controlled by this SC 255, the cursor can be moved between racks. If there were only one rack, only one selection that could be made. After selecting a rack, press ENTER and the rack Menu appears as at right above:

Each Rack subsystem is shown on the menu with a corresponding icon. There are also menu items for system functions like **Alarms.** There's a **Rack Service** item that offers special functions for maintenance technicians, and a **Configure Rack** selection for adding or modifying configuration, either of equipment or of control strategy.

Now, let's look at one of these items. With the cursor on Suction Groups, pressing ENTER brings up a screen that lists the suction groups on the rack.

```
03/02/2005                11:00:46 AM
  Suction Groups

       Name        Current   Target
   Suction AA      13.1psi   12.0psi
   Suction AB       6.8psi    7.0psi
```

We've already seen the information on this screen (current and target pressures) in the Refrigeration menu. The difference is that here we can select one of the suction groups. If we press ENTER while the cursor is on **Suction AA**, we'll see our first detailed status screen:


```
03/02/2005                11:45:36 AM
  Suction AA       Status

Maintaining Capacity
     Actual Target
Suct 13.2  12.0psi  Ctrl Temp:  0.0°F
      8.1 -17.0°F   Trgt Temp:  0.0°F
Float    :  0.0psi
Reference: 12.0psi
Discharge:132.3°F

Capacity :  3.1hp

Compressor AA1  :On
Inverter        : 77.0%  770 RPM
Oil Pressure    :  0.0psi
```

Notice that there is a row of icons across the bottom of the screen. The cursor is on the third icon, "suction," which is shown in reverse video. From left to right, the icons represent:

> History
> User Screen
> Suction
> Settings
> Schedules
> Alarms
> Service
> Authorization

You can move the cursor from icon to icon with the left and right arrow keys. Once the cursor is positioned, pressing ENTER will take you to a screen for the function

represented by the icon.

Before we travel using some of the icons, let's look at the navigation possible from the rest of the screen.

To move off of the bottom icon menu, press the UP ARROW. One of the compressors is now selected. In this particular screen, the information above the compressor icons pertains to the whole rack, and the information below the icons applies to the compressor that is highlighted. If you press the right arrow key you will move the cursor to the next compressor; as before, the information at the bottom of the screen will pertain to the highlighted compressor. If you press ENTER with a particular compressor highlighted, you will get a screen with run times and other available information about the compressor. EXIT will return you to the previous screen.

Getting back to
The Icon Menu

When you are working with a screen that has an icon menu at the bottom, and you have left the menu to enter the main body of the screen, you can return to the icon menu by pressing the MENU key. When using a PC, you can back up one screen by clicking in the screen title area.

Viewing and
Changing Settings

Back at the Suction Status screen, select the "Settings" icon (the fourth one from the left), and we'll see how settings are changed.

Here is the Suction Settings screen:

Notice that on the icon menu, the suction icon is no longer in reverse video, but the settings icon is. As we did to see the compressor screen, we leave the menu by pressing the UP ARROW, which moves the cursor to the topmost changeable field on the screen, the **Setpoint** field. Now, if you are authorized at the "Refrigeration Settings" or "Refrigeration – All" level or above, you can change the values of the settings.

Changing
Numeric Values

To change a numeric value, press the EDIT +/- key to toggle to edit mode, then simply key in the new value from the keypad. At your PC, right click on the field, and type from the keyboard. ***Remember that if a field has a decimal point, you must enter a digit (even a zero) for each place to the right of the decimal point.*** When

you have entered the correct value, press ENTER.

**Changing
List Fields**

List fields are ones like the field in this screen (about midway down the left side) called Float Suction On. To change the contents of list fields, put the cursor on the field and then press the EDIT +/- key. This toggles the function of the arrow keys from their navigation mode to their selection mode. Next, press one of the arrow keys and you will see the field contents change (again, only if you are authorized). At a PC, move the cursor to the field with the arrow keys, then right click to enter edit mode, and select from the box using the UP ARROW and DOWN ARROW keys or your mouse. When the contents are what you want, press ENTER (or left click) to save the selection and return the arrow keys to their navigation mode.

Now, let's leave the Suction Settings screen and use the icon menu to enter the Suction Schedules screen. Press MENU to return to the icon menu at the bottom of the screen.

Move the cursor to the schedules icon (which looks like a clock face with the first quarter hour sliced out). Press ENTER.

From the menu, pressing the UP ARROW will put the cursor on the number of schedules. Notice that right now the screen shows 1 schedule. If you raise the number of schedules, additional schedules will appear on the screen and on additional pages. If you reduce the number of schedules, schedules are erased beginning with the highest-numbered schedule until only the number you have entered remains.

**Changing the "From"
and "To" times**

To change the time for a schedule's start or stop, place the cursor on the field. To change the time of day, toggle to edit mode and key in the new time from the keypad. To change from AM to PM after entering the new time of day, open AM-PM list box and select the one you want. When the entry reads as you want it, press ENTER to save the new time and to restore the arrow keys to their navigation mode.

Changing the
days of the week
and holidays

To select the active days of the week for the schedule, put the cursor on the field, then press the EDIT +/- key. Now, the left and right arrow keys move you back and forth through the weekdays, and the up and down arrow keys toggle the individual days on and off. When you have finished selecting the weekdays, press ENTER, which saves your change and restores the function of the arrow keys to their navigation mode. The holidays for which the schedule is active are selected in the same manner.

Changing label
fields

A label field is one in which you can use alphabetic characters and certain symbols to create a name or a message. To see an example of such a field and describe how to change it, we will go back to the Main Menu and select **Store Info**, then **Holidays**. Changing names was covered in Chapter 5-7, but we'll repeat the information here.

The Holiday screen looks like this:

First, some number of holidays other than 0 has to be entered in the **Holidays** field.

The holidays are numbered, and the numbers correspond to the numbers used in schedules, which we just talked about. To the right of each holiday number is a space which you can use to enter a name for the holiday.

To enter or change a holiday name (or any other name) move the cursor to the name field and press the EDIT +/- key. Now the left and right arrow keys move you through the letter spaces in the name field, and the up and down arrow keys change the character. When all the characters have been entered in the way you want them, press ENTER to save the change and restore the arrow keys to their navigation function.

2- 2 Using the Service Screens

Service screens for Smart Case Controllers are discussed in Section 2-3, which follows this one.

The service screens for refrigeration, HVAC, and lighting have special functions for system diagnostics and maintenance. Typical is the Suction Service menu, reached by selecting the service icon from a Suction Status menu:

```
03/02/2005                    10:51:43 AM
 M
 ⊞ Main Menu

  ⊞ Refrigeration      🔒 Authorization

  ❄ HVAC               📇 Store Info

  💡 Lighting           📟 AK2-SC255 Info

  🔔 Alarms            📋 Communications

  🔋 Energy            ⚙ Configuration

  📑 Miscellaneous      📱 History

```

Auto/Manual Relays

The first two selections are similar. Select **Auto/Manual Relays** and a service screen will appear listing all the relay-controlled devices in the suction group.

```
03/02/2005                    11:49:44 AM
 🔧
 ⊞ Suction AA      Service


        Manual Operation-Relays

    Compressor AA1 :Auto-On
    Unloader AA1a  :Auto-Off
    Unloader AA1b  :Auto-Off
    Unloader AA1c  :Auto-Off
    Unloader AA1d  :Auto-Off
    Oil Reset AA1  :Auto-Off
    Inv Reset AA1  :Auto-Off
    Inv Bypass AA1 :Auto-Off
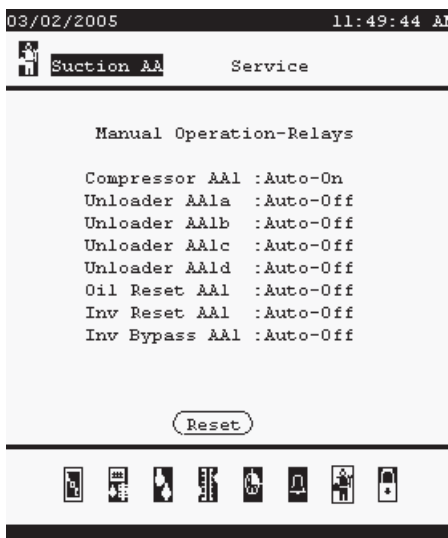



          ( Reset )

   📟 📑 🔧 🎚 🔋 🔔 👷 🔒
```

Next to the name of each one is a control status field. You can select:

Auto	The AKC 55 is controlling the on-off relay output.
Manual On	The relay output is in override and will remain ON

until reset.

Manual Off The relay output is in override and will remain OFF until reset.

To change the control status of a single relay output, simply place the cursor on the status (Auto, Manual On, or Manual Off), toggle with the +/- key, use the arrow keys to change the field, and then press ENTER.

<Reset> In the center at the bottom of the screen is a **<Reset>** field. If you place the cursor on this field and press ENTER, all relay outputs will be reset to Auto (SC 255 control).

Sensor Adjustment Select **Sensor Adjustment** from the Suction Service menu, and this screen appears:

```
03/02/2005                    11:54:49 AM

  Suction AA        Service


             Sensor Adjustment

  Name            Man Current Offset Input

  Suction Pres AA     13.2psi  0.0 0000.0V
  Disch Press A      160.0psi  0.0 0000.0V
  Suction Temp AA      8.1°F   0.0 0000.0R
  Disch Temp AA1     132.3°F   0.0 0000.0R
  Oil Press AA1       30.0psi  0.0 0000.0V
  Disch Temp AA2     131.7°F   0.0 0000.0R
  Oil Press AA2       30.0psi  0.0 0000.0V
```

Each sensor's current reading appears next to its name. There are three additional columns:

Man (List box: M, blank) This field allows you to set a the

sensor to a fixed value if for instance, a sensor has failed and you are awaiting a service replacement. To set a manual value, select the M from the list box, then enter the desired value in the Current field, which becomes a label field as soon as the M is entered. At the same time, when the M is entered, the Offset and Input fields no longer appear.

Offset   (Label field) A field where you can enter an offset to adjust the sensor's reading when calibrating with actual temperature as read from a refrigeration thermometer.

If you change an offset from a negative to a positive value, the sign will not change until you enter the first numeral from the keypad.

You can only offset a real sensor; you cannot enter an offset for a reading being received from another controller. And you cannot use a large offset to "fake" a missing sensor.

Input   The sensor's current electrical value in volts or ohms, for comparison with a table of standard values.

Maintenance Hours   The Maintenance hours service screen maintains **Total Run Hours** for each device or lighting zone (since its first start after configuration), and **Maintenance Hours**, a counter that you can reset to zero using the **<Clear>** button at the bottom of the screen. The date of last clearing is also displayed.

Bd/Pt Locations   This screen is identical in function to the Board & Points screens described in Part I, Section 1.2, "Configuring Board & Points."

2-3 Using the Smart Case Controller Screens

The AK2-SC 255 has special screens which allow you to examine many functions in each of the fixtures where Danfoss Smart Case Controllers are installed. Begin at the status screen for a Smart Case fixture:

```
03/02/2005                09:53:20 AM
▦ SDFZ Food AA1  Status      Addr: 1
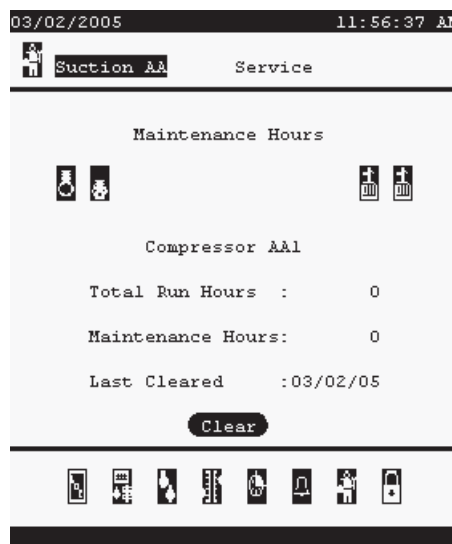

AKC 164  :Normal Operation      v5.05

Case     : -5.0°F  Valve :KVQ
Target   :-10.0°F  Fans  :Auto-On
                   Lights:Auto-On
                   Drain :Open

Disch A  : -5.1°F  Defrost  :  2.1°F
                   Terminate: 50.0°F
                   Sched Def:  3



Time:Wed 09:53 AM    "PG DN" for more

     ▯ ▦ ▦ ▦ ▮ ▯ ▯ ▯
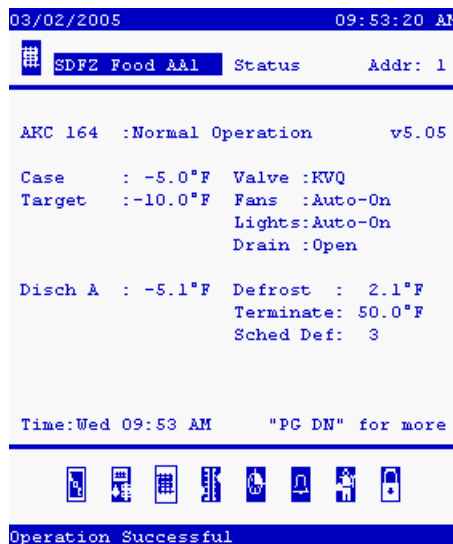
Operation Successful
```

The first line of the screen body shows the fixture's current status. This field may contain any one of the following:

Normal Operation:

The Smart Case Controller is operating the fixture normally in response to load conditions

Cut-out: (AKV valves) Fixture temperature is below target range minimum. The valve percentage will hold at zero (closed). The evaporator will remain in this status until fixture temperature rises to target, when the status will change to Start-up.

Start-up: (AKV valves) The evaporator enters this status following any state when the valve has been closed, including **Cut-out**, **Defrost**, **Low superheat**, and any manual shutdown.

During **Start-up**, the valve opens a predetermined percentage for a maximum of 2 minutes to establish minimum superheat (a minimum positive temperature differential between evaporator inlet and outlet). When minimum superheat is reached, the status will change to **Cut-in**.

Cut-in: (AKV valves) This status always follows Start-up; it

also exists whenever the evaporator is refrigerating and the fixture temperature is more than 5.5 °F above target range maximum.

In **Cut-in** status, the valve will be regulated to search for and maintain the minimum stable super-heat which for the current load conditions will become the target superheat.

The Smart Case Controller continually adapts its superheat target to changes in load on the evaporator so that refrigerant flow is adjusted accordingly.

When target fixture temperature is achieved, the evaporator status will change to **Normal operation** or **Area control**.

Area Control: (AKV valves) (Occurs only when modulating control has been selected during configuration.) The Smart Case Controller is supplying sufficient refrigerant to maintain the target fixture temperature. When Area Control status begins, the Smart Case Controller learns the dynamics of the evaporator and optimizes internal parameters for the modulated control function.

After fixture temperature reaches its target (if that target is between 23 °F and 50 °F), and after a user-definable period (default is 60 minutes), the status will change to **Coil conditioning**.

Coil conditioning:
(AKV valves.Occurs only when modulating control has been selected during configuration, and only when target fixture temperature is between 23°F and 50°F.) Once each hour, the valve is closed for 3 minutes to eliminate uneven frost build-up on the evaporator. After 3 minutes, control reverts to normal modulating control.

Low superheat
(AKV valves) The Smart Case Controller has detected a negative superheat for more than two minutes, and is reducing refrigerant flow to correct the situation. The electronic expansion valve will close for ten minutes, then enter **Start-up** status. This cycle will be repeated until a positive superheat is established. After thirty minutes in **Low super-heat** status, an alarm will be generated.

Defrost: A scheduled or manually initiated defrost is in

progress.

For fixtures with AKV valves, the valve is closed and the defrost control relay is ON. For fixtures with KVQ valves, the valve is open or closed (according to configuration by the user). **Make sure that the KVQ is configured to remain open during gas defrost.** *The KVQ valve may not be used as a suction stop.*

Terminated defrost:

The Smart Case Controller has terminated defrost and is waiting for other coordinated controllers (if any) to terminate. The valve remains in the state it was in during defrost. Refrigeration will not resume until all coordinated defrosts have been terminated.

Start after defrost:

A transitional status following termination of defrost, including drip down and fan delays.

After drip down, AKV valves begin to open at a predetermined percentage for a maximum of two minutes to establish minimum superheat. When fan delay is finished and minimum superheat is reached, status will change to **Cut-in**.

After drip down, KVQ valves operate normally until the completion of fan delay, when status changes to **Normal Operation**.

Valve in manual:

The valve has been set to a manual percentage by override. Auto operation is suspended. When the valve has been returned to Auto mode, the status will change to **Start-up** for AKV valves, and to **Normal Operation** for KVQ valves.

Box door shutdown:

Operation has been interrupted by opening of a box door. When the door is closed, status will change to **Start-up**.

External shutdown:

The fixture has been shut down using an external switch attached to one of the Smart Case Controller's auxiliary on-off inputs. The input must be configured using the AKC 16x Settings screen.

Sensor failure:

The Smart Case Controller has detected a failure of one of the sensors configured for the fixture, either Liquid In, Gas Out, Case/Box, or Defrost tempera-

ture. For fixtures with a KVQ electronic evaporator pressure regulating valve, **Sensor failure** can indicate a problem with the NTC sensor in the valve actuator.

When in **Sensor failure** status, an AKV valve will operate at the mean percentage used during its most recent period in **Normal operation** status. A KVQ valve will open fully in sensor failure mode.

To determine which sensor has failed, go to the alarms screen.

Service shutdown;
The Smart Case Controller has been shut down using the service screen, either for case cleaning or other service.

The screen at left below is the second page of an evaporator status screen.

Evaporator Settings
(Smart Case Control)

If you select the settings icon (second from the left on the menu bar at the bottom of any evaporator screen), an evaporator settings screen like the one at right above appears. To the right in the body of the screen are fields related to defrost.

Terminate: The termination set point.

Coord: If "**Yes,**" then defrost for all fixtures in this group is coordinated.

Drip Down: The time in seconds allowed after defrost for the fixture to drain before refrigeration begins.

Fan Delay: The time in minutes after defrost during which case

fans remain off to avoid discharging humid air into the product storage area.

Intel. Def: (AKV valves) Indicates whether or not Intelligent Defrost is activated for this evaporator.

Max Skips: (AKV valves) The maximum number of successive defrosts which can be skipped by Intelligent Defrost.

Max Time: (AKV valves) A percentage from 0-95%. In Intelligent Defrost, as time for a scheduled defrost nears, the Smart Case controller calculates its duration. If the calculated duration is less than the Max Time percentage of the defrost duration chosen during evaporator configuration, the defrost will be skipped.

Evaporator Schedules
(Smart Case Control)

The schedules screen for an evaporator shows the number of defrost scheduled per day, the duration, and the start time for each defrost. All can be changed from the screen.

Evaporator Service
(Smart Case Control)

There are three selections possible from the evaporator service menu for Smart Case Controllers: **Manual Operation**, **AKC 16x Shutdown**, and Case **Cleaning Shutdown**.

Evaporator Service
Manual Operation
(Smart Case Control)

Selecting Manual Operation from the Evaporator Service menu brings up this screen:

There are four fields in which the operating mode for Defrost, Antisweat, Lighting, and Fans can be selected.
The modes which can be selected are:

Auto: The function is controlled by the normal operation of the Smart Case Controller.

Manual On: The function will remain on until the mode is changed in this service screen, except in the case of defrost, which if configured for termination on temperature will terminate on either reaching the termination temperature, or the maximum time, or until the mode is changed in this service screen, whichever occurs first.

If defrost is set to Manual On, the system will remain in defrost until it reaches termination temperature or until maximum defrost time is reached. The defrost setting will then return to **Auto**.

Manual Off: The function will remain off until the mode is changed in this service screen.

Manual On Time:
(Defrost Only) Defrost will remain on for the **Maximum Time** specified in this screen regardless of the defrost temperature.

Associated with the defrost field is a field for Maximum Time, which is the maximum time a system can remain in defrost, whether or not a selected termination temperature has been reached.

There are two fields which control the mode of the fixture's refrigeration valve:

Valve: The valve mode, either **Manual** or **Auto**. If manual, the valve will remain at the percentage specified on the following line. To turn off refrigeration, select **Manual** and enter **0**% as the manual valve percentage.

Manual Value:
For AKV electronic expansion valves, the percentage (0-100) of valve opening which will be held while the valve is in Manual mode.

Evaporator Service
AKC 16x Shutdown
(Smart Case Controllers)

The Smart Case Controller Shutdown screen allows one or more fixtures on a rack to be shut down. The anti-sweat heaters, lights, and fans can be put in an override status from the screen also.

Evaporator service
Case Cleaning (Smart
Case Controllers)

The Case Cleaning screen for Smart Case Controllers offers a quick way to shut down individual fixtures for cleaning. When the Case Cleaning status is changed

form **Normal Refrigeration** to **Cleaning Shutdown**, the status of the lights, fans, and anti-sweat heaters is automatically changed so that lights and fans are kept on and anti-sweats are kept off until the fixture is returned to the normal refrigeration mode.

2 - 4. Using the Refrigeration Screens for Refrigeration Circuits Controlled directly from AK2-SC 255's

The status screens for refrigeration circuits controlled directly from SC 255's contain different information than those for circuits with Smart Case Controllers.

Evaporator Status
Screen

The status screen for an SC 255 circuit is reached from the main menu by selecting **Refrigeration**, then the Rack, then **Evaporators**, then the evaporator. Here's the status screen for an SC 255 circuit:

The status of the circuit is given in the first line. Possible contents are:

Thermostat Cutin:
> The circuit is being refrigerated. Refrigeration is on because the discharge air temperature reached target temperature plus the temperature range.

Thermostat Cutout:
> Refrigeration is off because the discharge air temperature has reached target temperature minus the temperature range.

Terminated Defrost:
> Defrost has terminated and the circuit is in its drip down period (if any).

Defrost: The circuit is undergoing a scheduled defrost.

Manual: The circuit has been set manually on or manually off by means of the service screen.

Shutdown: The circuit is in a scheduled shutdown.

The remaining fields are self-explanatory.

Evaporator Settings
Screen
The settings screen, reached by selecting the settings icon at the bottom of the screen, shows and allows changes to settings for refrigeration and defrost:

Evaporator Schedules
Screen
The evaporator schedules screen shows defrost schedule information and allows changes to number of defrosts, duration, and start times.

Evaporator Alarms
Screen
The evaporator alarms screen lists all active alarms for the circuit.

Evaporator Service
Screen
The evaporator service screen is covered in

2-5 Using the Communications Screens

Select **Communications** from the Main Menu and the Communications menu will appear:

Host Network
Screen

The Host Network screen shows the address of the current 255, the number on the network, and the status (Online or Offline) of each. Our example below shows o0nly one 255 on the network, but there may be more in the system you are working with.

I/O Network
Status Menu

The I/O Network Status menu looks like this:

The Rescan Network button is used when nodes have been added to the network or re-addressed. Until the network is rescanned, the new configuration will not be recognized. After using the rescan button, the screen at right above appears.

List Points

Select **List Points** from the I/O Network Status Screen, and this is the screen that appears:

The fields and their contents are as follows:

Bd-Pt The address of the RO point to which the load is wired, or, in the case of a received broadcast point, the board and point address of the sending point.

The addresses may be in the form nn-n, or in the form nn-n.n. These formats indicate, respectively,

points on prior generation AKCESS I/O boards, and points on second generation ADAP-KOOL modules (AK2 modules).

Name (label field; 15 characters, any) The name of the load connected to the point, in this case a digital output (relay output).

Value (On, Off) The current value of the point.

Status (label) Indicates whether or not the point is in communication with the SC 255.
Online: The point is communicating.
Offline: The point is not communicating.
Send [Relay outputs, sensor inputs, and on-off inputs only]: The point is sending its status.
Receive [Relay outputs, sensor inputs, and on-off inputs only]: The point is receiving its status

SORT (List box; On, Off) At the bottom left of the body of the screen (above the icons, on the same line as **"PG DN" for more** is the **SORT** field. By default, sort mode is **On**, and entries will be sorted by Bd-Pt address. If sort mode is turned **Off**, points from will be listed in order of creation. Sorting is instantaneous when the field contents are changed.

The screens for the various types of I/O points are very similar. The screen that appears initially is that for relay outputs. Screens for other types of points are reached via the icons at the bottom of the screen, which are, from left to right,

Digital outputs (relay outputs)
Analog inputs (sensor inputs)
Digital inputs (On-Off inputs)
Analog outputs (variable outputs)
Other controllers

The Other Controllers selection includes a number of diverse kinds of network nodes that can be appreciated from the menu that appears when the Other Controllers icon is selected. The menu is shown below:

The information shown for the controllers similar to that shown above for relay outputs. Section I of the manual (Configuration) covers parameters used in the various controllers.

List Nodes

The List nodes screen, reached from the I/O Network Status menu, looks like this:

The list nodes screen shows the type, address, and status of every node on the I/O network. In the sample screen, we have chosen to accept the default view, "All." Using the list box in the **View** field, you can choose to display initialization and version information as well. These options are shown at left and right below.

```
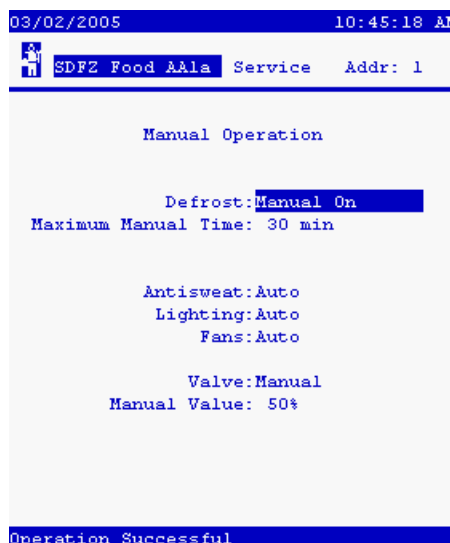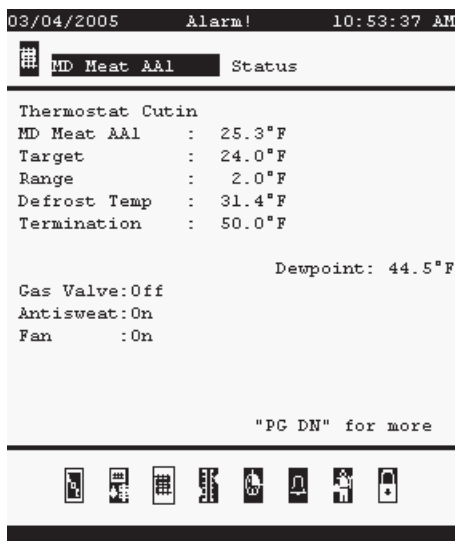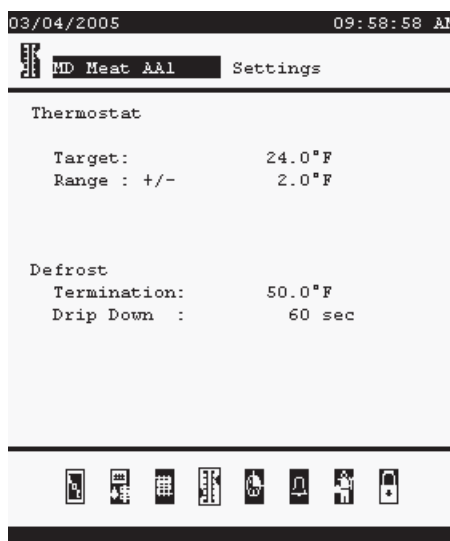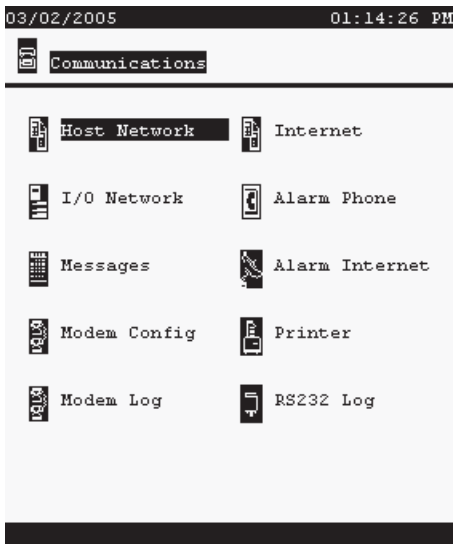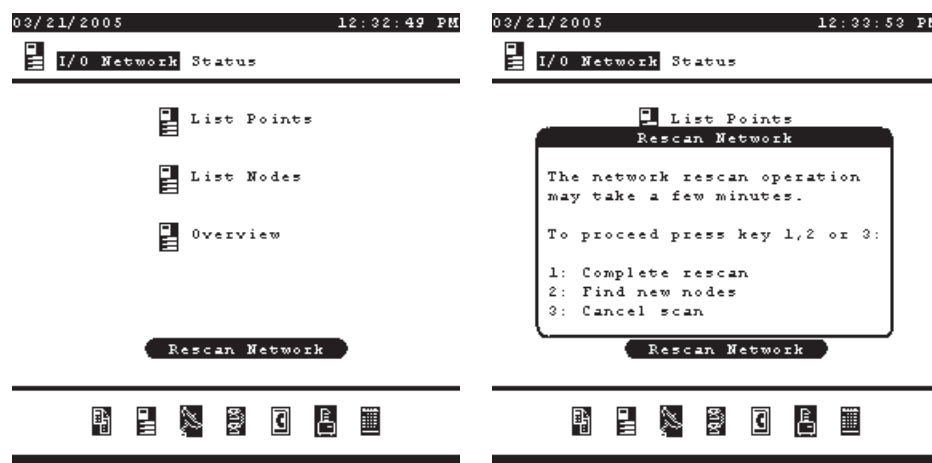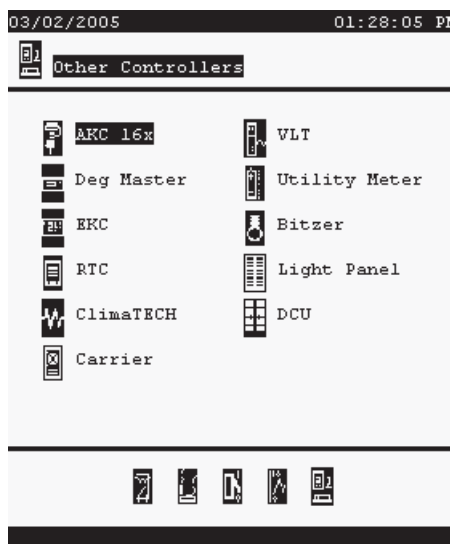03/02/2005              01:55:47 PM        03/02/2005              02:45:55 PM
  I/O Network Initialization                 I/O Network Version

  Type   Address Status Time                 Type    Address  SW Version   Hdwr

       VO    1    N/A                             VO    1    4102xxxx       N/A
       SC    1    Pass   03/02/05 10:34A          SC    1    v5.05          N/A
       SC    2    Pass   03/02/05 10:34A          SC    2    v4.00          N/A
    RO SI   1-1.. N/A                          RO SI   1-1.. RC0104xx\01.08  0.3
    RO SI   1-2.. N/A                          RO SI   1-2.. RC0104xx\01.08  0.3
       OI   1-3.. N/A                             OI   1-3.. RC0104xx\01.08  0.3
       SI  Ca-01  N/A                             SI  Ca-01                 N/A




View:All                                   View:All
       Initialization                             Version
```

IP Network
(Ethernet)

Before theintroduction of the AK2-SC 255, theDanfoss AKC 55 systems used third party Ethernet adapters. In the 255, Ethernet communications is supplied on board the controller and no outboard equipment is required. The Ethernet configudration screen is shown below.

```
07/13/98                  01:34:54 PM
    Network Connection 1

Name    :Maintenance Net   Baud :AUTO
Address:172.27.208.45      Delay:0   min


   Schedule 1: Standard
    From: 12:00 AM  Days     : SMTWRFA
    To  : 12:00 AM  Holidays: 1234567
   Schedule 2: Not Used


   Schedule 3: Not Used



                   "PG DN" for more
```

The address required is an IP address, and is the address of the ethernet node to which alarms are to be sent. The IP address is assigned by your network administrator. The address is composed of four one-, two-, or three-digit numerals separated by periods. None of the groups can be a number greater than 254 or less than 1.

The address required is an IP address, and is the address of the ethernet node to which alarms are to be sent. The IP address is assigned by your network administrator. The address is composed of four one-, two-, or three-digit numerals separated by

periods. None of the groups can be a number greater than 254 or less than 1.

The **Delay** is the amount of time between attempts to dial out an alarm.

Before any alarm will be dialed out, a schedule must be active. Note also that holidays must be specified in the schedule (1, 2, 3, etc.) **and** defined in the Store Info Holidays screen or they will not be an effective part of the schedule.

Alarm Routing
for Ethernet

It is also necessary to set up alarm routing for alarms to an ethernet node. From the Main Menu, select Configuration, Alarms, Routing, then enter the applicable information.

```
03/02/2005                    12:17:51 PM

  📠  Alarm Routing

Class            Network    Phone     Local

                 1 2 3 4    1 2 3    OAB PRN
System           X - - -    X X -     1   -
Rack     psi     X - - -    - - -     -   -
Rack     Other   X - - -    - - -     -   -
Case             X - - -    X X -     2   -
HVAC             X - - -    X X -     1   -
Misc.            X - - -    X X -     1   -
Burglar          - X - -    X X -     3   -
Fire             - X - -    X X -     3   -

     ( Network )          ( Phone Numbers )
  1)Maintenance Net     1)Danfoss Mntrng
  2)Ace Security        2)Division Office
  3)                    3)
  4)

                        "PG DN" for more
```

Alarm destinations are chosen by classes. Each class can be sent to one or more of the phone numbers;   one or both of the IP network addresses; to one of up to three OAB's; to a local printer; or to any combination of destinations. The destinations are indicated by the column heads and subheads as follows:

IP Net: 1, 2, 3, 4
Phone Numbers: 1, 2, 3
Local: OAB, Print

Any class of alarm, then, can have from 0 to 9 destinations.

The bottom panel of the screen shows the phone numbers and the IP network adddresses. Each active phone number and each IP network address should be given a name. Names can be assigned in the Phone Numbers screen and in the IP Network screen, respectively. Reach these screens by placing the cursor over the boxed words "Phone Numbers" or "IP Network" and clicking.

The numerals that appear to the right of the listed telephone numbers and IP addresses correspond to the numerals that head the columns in the upper part of the screen.

Paging down shows additional information in the bottom panel:

```
04/14/99                    10:27:05 AM
  🔲 Alarm Routing

Class      Phone Numbers  IP Net  Local

           1  2  3  4  5   1  2   OAB PRN
System     X  X  -  -  -   X  -    1   -
Rack psi   -  -  -  -  -   X  -    1   -
Rack temp  X  X  -  -  -   X  -    1   -
Case       X  X  -  -  -   X  -    1   -
HVAC       X  X  -  -  -   X  -    1   -
Misc.      X  X  -  -  -   X  -    1   -
Burglar    X  X  -  -  -   -  X    -   -
Fire       X  X  -  -  -   -  X    -   -

Send critical alarms every 99 minutes

Unit address of AKC55 with...
Modem     :0  Alarm Box 1:4
IP Network:4  Alarm Box 2:0
Printer   :0  Alarm Box 3:0
```

You can change the interval at which critical alarms are sent by placing the cursor over the number and entering a new interval from 10 to 99.

Make sure that the address entries for **Modem**, **IP Network**, **Printer**, and each **Alarm Box** are correct. For alarm boxes, the SC 255 where the alarm box is installed must have a relay output board and point assigned for the box.

Printer Settings Screen

To receive alarms, a serial printer can be connected to one of the AKC 55's in the host network. The printer is attached to the RS232 port.

To configure the port for the local printer, from the Main Menu select **Communications**, **Printer**. The Printer Settings screen will appear:

```
03/02/2005                  03:39:30 PM
  🔲 Printer Settings

Baud  :Auto          Delay :5  min
Date  :MM/DD/YY      Time  :12 Hour
Lang. :English
Send alarms when cleared:No

  Schedule 1: Not Used

  Schedule 2: Not Used

  Schedule 3: Not Used
```

Fields in this screen are as follows:

Baud   The transmission speed (300-28800) from the AKC
              55 to the printer. Should be set at the speed of the
              printer's serial port as given for the printer in the
              printer user documentation.

Delay   The minimum time (from 1 to 10 minutes) between
              alarm transmissions.

Schedules   Alarms will only print when one of these schedules is
              true. Up to three standard schedules can be set up.
              In order to activate the schedule, it is necessary to
              toggle the field reading "Not Used" to "Standard."
              Then the schedule settings will appear and can be
              changed as needed.

> If you don't enter a schedule for the printer, NOTHING will print !!

Now go back to the main menu and select **Alarms**, **Configuration**, **Routing**, then select the categories of alarms you want to go to the printer. You must also go to the field labeled "Printer" in the lower half of the screen and enter the address of the AK2-SC 255 to which the printer is attached.

Modem Configuration From the main menu, select **Alarms**, **Configuration**, **Modem.** Answer Yes where the screen asks if you want to configure a modem for the unit, and the modem configuration fields appear as in the screen below::


```
03/21/2005                    09:44:47 AM
  Modem Config


Configure modem on this unit : Yes
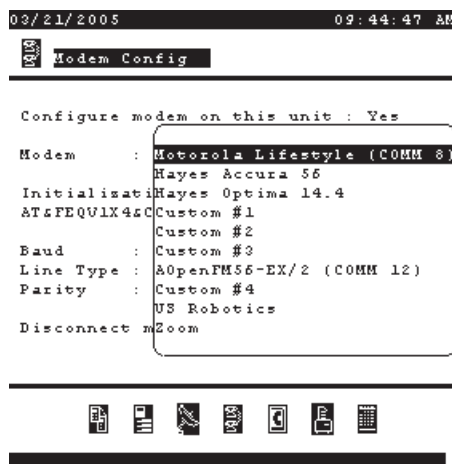
Modem      : Motorola Lifestyle (COMM 8)
             Hayes Accura 56
Initializati Hayes Optima 14.4
AT&FEQV1X4&C Custom #1
             Custom #2
Baud       : Custom #3
Line Type  : AOpenFM56-EX/2 (COMM 12)
Parity     : Custom #4
             US Robotics
Disconnect m Zoom
```

Any of the modem settings can be changed from this screen. Make changes with care, because incorrect modem settings can keep the system from communicating.

The individual fields are as follows:

Modem: — The type of modem. All supported options are listed.

When you select one of the custom modem types a field will appear allowing you to enter an initialization string. The initialization string is a sequence of characters which set up the modem. Consult the modem manual for the proper commands. If the modem was supplied by Danfoss, instructions will accompany it, or you may call Danfoss Technical Support for assistance.

Baud — Enter the transmission speed in "baud" or bits per second, for the modem being configured.

Line Type: — If the telephone line being used is touch tone, use **Tone**. If the line is only for dial telephones, use Pulse. Default is **Tone**.

Parity: — A setting used in error-checking. Possible settings are **odd**, **even**, and **none**. Default is **none**.

Data Bit: — The number of data bits (7 or 8) in each transmited or received byte. Default is 8.

Stop Bit: — The number of stop bits (1 or 2) in each transmitted or received byte. Default is 1.

Use Modem on AKC 55 Address — The address of the AKC 55 which is equipped with a modem and which is to be used for communications.

Disconnect Method — The means by which the telephone connection will be broken by the modem. Choices are **AT Commands** and **Power Down**. Default is **Power Down**.

Phone Numbers

The Phone Numbers screen can contain up to 5 phone numbers for alarm dialout locations. Each number has its own screen page, which you travel to using the PG DN key. To reach the Phone Numbers screen, select **Phone Numbers** from the Communications menu.

```
03/30/99                    04:49:20 PM

  C   Phone Number 1

Name   :Danfoss Mntrng     Baud:AUTO
Number:1800xxx2563         Type:Printer
Delay :10 min              Init:AT
Date   :MM/DD/YY           Time:24 HOUR

   Schedule 1: Standard
    From: 12:00 AM  Days    : SMTWRFA
    To  : 12:00 AM  Holidays: 1234567
   Schedule 2: Not Used


   Schedule 3: Not Used


                       "PG DN" for more
```

The fields in the screen are these:

Name: — The name associated with the phone number. Names are optional, but it is a good idea to give each location a name for reference in other screens.

Number: — The number itself, including any dialing prefixes required by the line being used. This is the number you would dial on this line, using a telephone instrument, to reach the destination.

Up to twenty characters can be entered. The following special characters have the effects indicated:

W WAIT FOR SECOND DIAL TONE. This character is useful when the phone line for the AKCESS system is connected through a PBX system.

@ WAIT FOR QUIET. Before transmitting the alarm, the SC 255 will wait for the receiving modem to be idle and the line quiet

, (comma) PAUSE. Use the comma when the dialout telephone line goes through a switch-board or PBX which makes it necessary to wait momentarily, after dialing a prefix, for an outside line dial tone. Multiple commas can be used for longer waits.

Delay: — The delay (from 0-99 minutes) imposed by the

AKC 55 between dialouts to this number. Default is 10 minutes. This value should not be set to less than 3 minutes except by a service technician on site with the AKC 55 for diagnostic purposes. *If the delay is too short, there are situations when the AKCESS system may dial out alarms so frequently that it is not possible to dial IN to the system.*

Baud: — The baud rate of the receiving station. The rate can be set to 300, 1200, 2400, 9600, 14400, 28800, or AUTO. The default is AUTO, which will auto-detect the receiving station modem rate. For most purposes it is best to set the **Baud** field to **Auto**.

Type: — The type of receiving device, either **Printer** or **AKA 65**.

Init: — An extra initialization string which may be needed for some modes of communication. Default is AT. The entry is user-editable.

Date: — The date format: DD/MM/YY, DD/MM/YYYY, MM/DD/YY, or MM/DD/YYYY.

Time: — The time format, either 12 hour or 24 hour.

Schedules: — The schedule for dialouts to this phone number.

Date: — The date format: DD/MM/YY, DD/MM/YYYY, MM/DD/YY, or MM/DD/YYYY.

Language --- (List box) Allows language selection for transmited alarms.

Send alarms when cleared? (List box, Yes, No. Default: No) If "Yes" is selected, The designated monitoring station will be sent alarms when a previously reported alarm has cleared.

Time: — The time format, either 12 hour or 24 hour.

Schedules: — The schedule for dialouts to this phone number.

Messages   By selecting Messages from the Communications menu, a messages screen appears:

Instructions for use of the message screen are shown in the illustration above. Remember to toggle edit mode for each line by pressing the +/- key, and press ENTER at the end of each line.

2.6   Using the History Screens (for History Retrieval)

To view history, select History from the Main Menu, and the History Menu appears:

Next, select **Retrieve History**, and you will see the Configure History Display screen

```
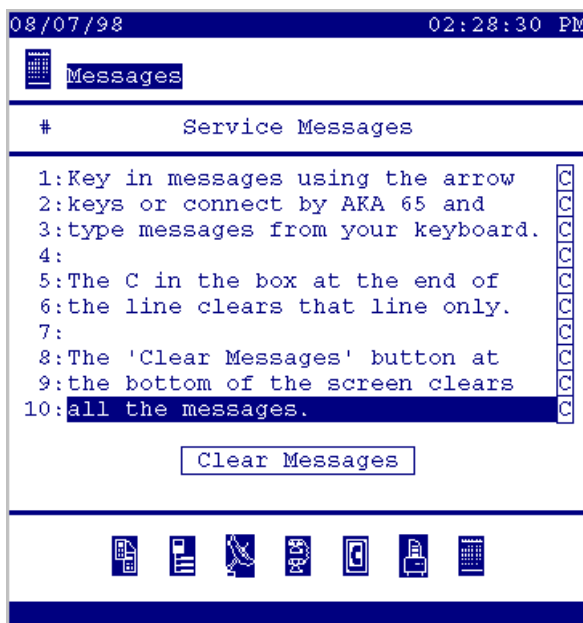07/23/98                    04:41:30 PM
 ┌─┐                                ┌─┐
 │ │Configure History Display       │ │
 └─┘                                └─┘
───────────────────────────────────────
1     ---        Not configured
2     ---        Not configured
3     ---        Not configured
4     ---        Not configured
5     ---        Not configured
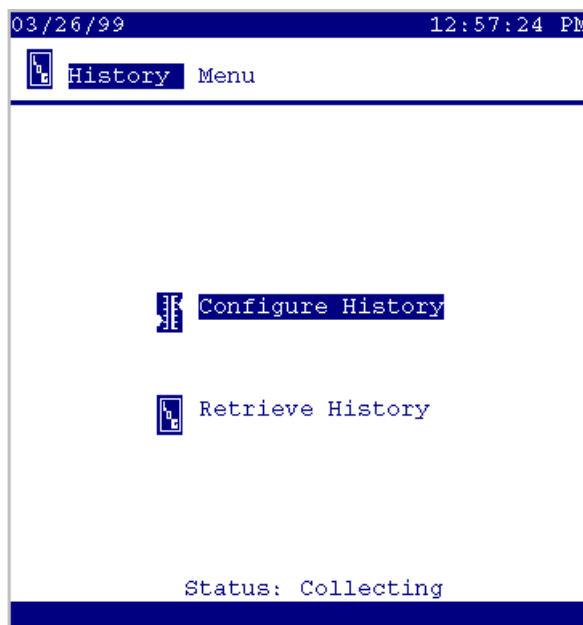
View Sam Units Sensor Inputs
 No   01m  psi   Suction Pres AA
 No   01m  psi   Suction Pres AB
 No   01m  °F    Suction Temp AA
 No   01m  °F    Suction Temp AB
 No   01m  psi   Oil Press AB1
 No   01m  psi   Oil Press AA1

┌────┐┌─────────┐┌─────┐
│View││Auto View││Clear│  "PG DN" for more
└────┘└─────────┘└─────┘

     🗔  🗕  🗔  🗔  ○  🗔
```

Once the points to be displayed (up to five at one time) are selected, the top portion of the screen will show their names, sample intervals, and their respective SC 255's. The body of the screen lists all the points of the selected type (in the example, relay outputs). There may be several or many pages of points to choose from for a given type in a particular AKCESS system.

Selecting points to View

To select a point as one of the five to view, place the cursor on the word **No** in the column headed "**View**," press the +/- key, then use one of the arrow keys to toggle the field to "**Yes**," and press ENTER. Note that this can only be done if there are not five points already selected and shown in the upper portion of the screen. If all five positions in the upper portion of the screen have been selected, you must either clear the display configuration (by using the **Clear** button at the bottom of the screen) or turn off one or more points first. No history is lost by removing a point from the display configuration.

The five datapoints to be viewed can be any combination of relay outputs, sensor inputs, on/off inputs, variable outputs, or Smart Case Controller points. A list of each type can be seen by selecting the appropriate icon at the bottom of the screen and pressing ENTER. Here's how a screen would look with five datapoints (two relay outputs and three sensor inputs) selected:

```
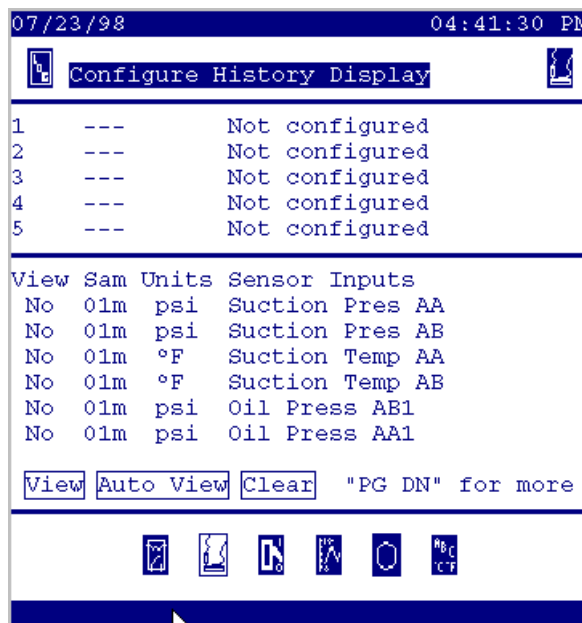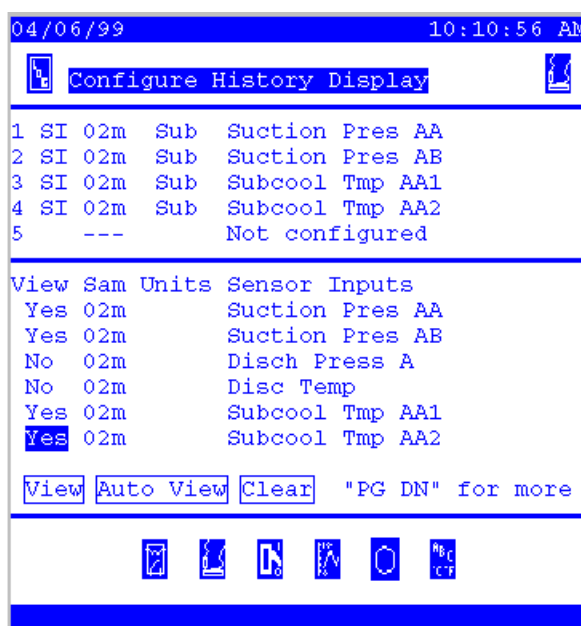04/06/99                    10:10:56 AM

    Configure History Display

1 SI 02m  Sub   Suction Pres AA
2 SI 02m  Sub   Suction Pres AB
3 SI 02m  Sub   Subcool Tmp AA1
4 SI 02m  Sub   Subcool Tmp AA2
5    ---        Not configured

View Sam Units Sensor Inputs
  Yes 02m        Suction Pres AA
  Yes 02m        Suction Pres AB
  No  02m        Disch Press A
  No  02m        Disc Temp
  Yes 02m        Subcool Tmp AA1
  Yes 02m        Subcool Tmp AA2

View Auto View Clear  "PG DN" for more
```

Displaying History   Just above the icon menu bar at the bottom of the screen are three "buttons": **View**, **Auto View**, and **Clear**. Their functions are as follows:

View   Displays history for the datapoints shown at the top of the screen.

Auto View   Displays history for the first five points in the body of the current screen regardless of the points selected in the upper portion of the screen. The points selected in the top of the screen remain unaffected. (Also see the paragraph on Auto View following the next illustration.)

Clear   Clears the column labeled view in all the Configure History Display screens (for all the points represented by the icons on the menu at the bottom of the screen). No history is lost by using the **Clear** button. Only the setup for display is cleared. The point names at the top of the screen will change to "Not configured."

Most of the time, when viewing history on the SC 255's display, you'll want to select the datapoints from the various I/O screens and use the **View** button. Doing so (having made the selections shown in the illustration above) will result in a history display like this:

```
04/06/99                    10:12:33 AM
1 SI 02m    02m   Suction Pres AA
2 SI 02m    02m   Suction Pres AB
3 SI 02m    02m   Subcool Tmp AA1
4 SI 02m    02m   Subcool Tmp AA2
5 SI 02m    02m   Suction Temp AA

10:01 AM      8.9    8.0   40.3   44.1   30.4
10:02 AM      6.3    8.0   43.5   41.1   29.9
10:03 AM      6.3    8.0   43.5   41.1   29.9
10:04 AM      5.2    8.0   38.2   42.3   29.4
10:05 AM      5.2    8.0   38.2   42.3   29.4
10:06 AM      9.5    8.0   44.3   42.3   29.4
10:07 AM      9.5    8.0   44.3   42.3   29.4
10:08 AM      7.8    8.0   33.8   39.7   29.9
10:09 AM      7.8    8.0   33.8   39.7   29.9
10:10 AM      7.8    8.0   40.4   42.9   30.4
10:11 AM      7.8    8.0   40.4   42.9   30.4
10:12 AM      8.5    8.0   43.4   41.8   30.9

04/06/99 10:01:00A to 04/06/99 10:12:00A
Rate:01 Min          Scroll:Full Screen
 Graph Stat      < Snapshot >
```

The five selected datapoints are listed at the top of the screen. Next, the start date and time for the display are shown. You can change the start date and time as you would any other numeric field.

The last line in the screen heading contains the display interval and the scroll setting.

Rate
The **Rate** determines the interval between displayed lines of data in the body of the screen. It is important to remember that the display rate is not necessarily the sample rate, which is set during history configuration (see Chapter 4-9). Often the display rate and the sample rate may not be the same. If not, the displayed value for a given datapoint will be the most recent as of the display rate time.

Scroll
The **Scroll** field regulates how much of the screen will be scrolled when you press one of the small arrow buttons in center bottom of the screen. The selections possible are Full (for full screen scroll), Half, one sample, or any of 9 time periods ranging from 2 minutes to 1 day.

Mode: **Latest**
or **Snapshot**
There are two modes, **Latest** and **Snapshot**, in which history data can be displayed, applying to both the columnar display as seen in the example above and to graphing. In **Latest** mode, the display shows the most recent history, ending with the value of the most recent sample; the display is updated as each new sample is recorded, constantly moving forward. In **Snapshot** mode, you can display any stored history for the selected points, from the oldest data to the present.

Graph
The **Graph** button will present a graph of the displayed data. If the display is in **Latest** mode, the graph will plot as each new sample is collected.   A typical graph screen looks like this one::

When viewing graphs with AKA 65 software on a PC with a color monitor, the graph traces will be in color, and their colors will match the key given at the left side of the upper portion of the screen.
[Due to the mode of reproduction used for this manual, not all the color traces are visible here.]

Realtime
The pictured graph shows four sensor inputs (suction pressures and suction temperatures) and a variable output (the second trace from the top). To exit the graph screen, press EXIT or click with your mouse in the title bar or gray border above the graph display. Let's tour the screen...

Scale
The scale of the graph appears on left edge of the display. The scale displayed is governed by the **Min** and **Max** settings on the bottom line of the display. Min can be any multiple of 10 from -90 to 90. Max can be any multiple of 10 from -80 to 500.

Time
The times given at left and right below the graph are the beginning and ending time of the time period for which data is displayed. These will change as the number of samples and display rate change.

Sam
The number (from 5 to 60) entered in the **Sam** field specifies the number of samples to appear in the displayed graph. Changing the number of samples will also change the time scale under the graph.

Rate
The display interval of the graph. Note that the display interval need not be the same as the sampling interval. When the display interval is larger, not every point will be plotted; when the display interval is smaller, data will be created to form a smooth path between real measurements.

Realtime/Snapshot
Viewing is in one of two modes. In realtime mode, the history is graphed as it is collected. In snapshot mode, any of the collected history can be examined. The "<"

and ">" buttons on either side of the mode indicator allow you to scroll through the collected history when in snapshot mode.

Stat
The **Stat** button at the bottom left of tabular History Display screen body brings up a display of statistics for the four points selected. The statistics given depend on the type of point, whether on/off (relay outputs, on/off inputs) or variable (sensor inputs, variable outputs, calculated values). Here is a sample statistics screen:

```
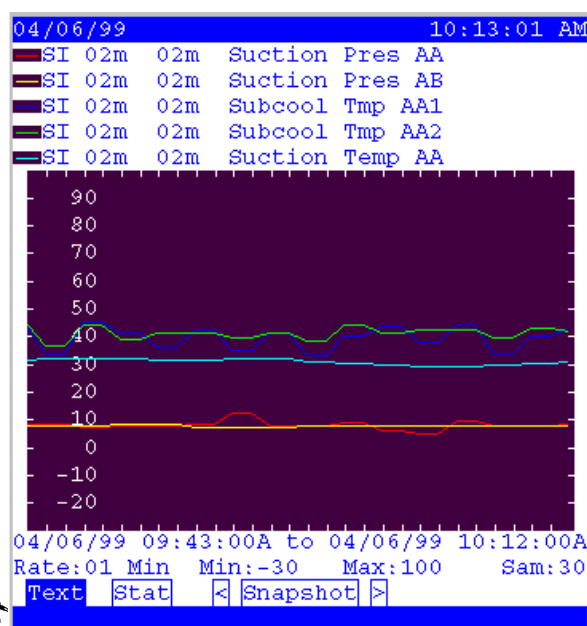04/06/99                    10:13:45 AM
  [icon] Datapoint Statistics

      Rate       Datapoint
DP1: 02 Mins    Suction Pres AA
DP2: 02 Mins    Suction Pres AB
DP3: 02 Mins    Subcool Tmp AA1
DP4: 02 Mins    Subcool Tmp AA2
DP5: 02 Mins    Suction Temp AA

24 Hour Stats thru 04/06/99 10:12:00 AM

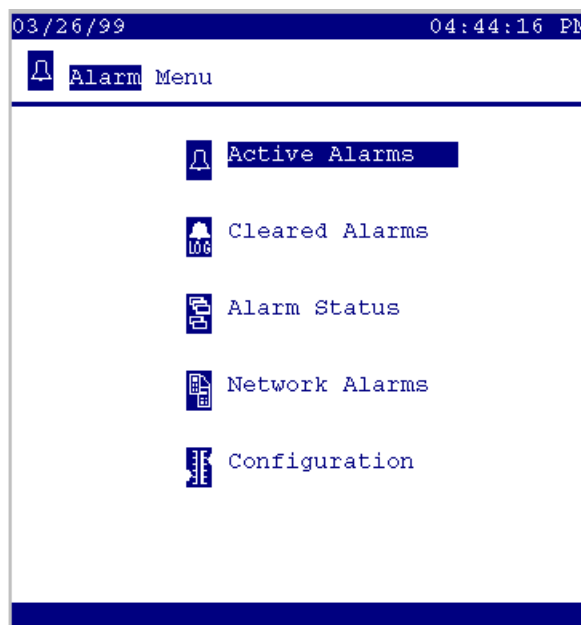            DP 1  DP 2  DP 3  DP 4   DP 5
Minimum :    4.4   5.8  31.1  36.0 -22.8
Maximum :   14.1  11.2  46.6  45.7  39.7
Average :    8.1   8.0  40.0  40.9  27.2
```

To change the twenty-four hour period covered by the statistics report, return to the History display screen and scroll until the last line on the page is the ending time you want for the statistics report; then press **Stat** again.

2.7 Using the Alarms Screens

The Alarms Menu   From the main menu, select **Alarms** and the Alarm Menu appears:

```
03/26/99                    04:44:16 PM
 🔔 Alarm Menu
_____

          🔔  Active Alarms

          🔔  Cleared Alarms

          🔲  Alarm Status

          🔲  Network Alarms

          🔲  Configuration


_____
```

The menu items are as follows:

Active Alarms An *active alarm* is any alarm whose condition is still out of bounds, whether or not the alarm has been acknowledged. Any active alarms among the most recent 100 alarms will be displayed in the Active Alarms screen.

Cleared Alarms

A *cleared alarm* is any alarm which has occurred but whose condition is no longer out of bounds, whether or not the alarm has been acknowledged. Any cleared alarms among the most recent 100 alarms will be displayed in the Cleared Alarms screen.

Alarm Status Alarm status lists every configured alarm, and its current state, for this SC 255.

Network Alarms

Network alarms lists every alarm in the system (the entire network of SC 255's) which is active or cleared. Up to 100 alarms will be listed in chronological order with the most recent alarm first. Alarms which reoccur can appear more than once.

Configuration Configuration takes you to the Alarm Configuration Menu. Alarm configuration is covered in Part One of this manual.

The Active Alarms
Screen

The Active Alarms screen shows up to 100 active alarms for an SC 255. For each alarm, there are three lines of information giving the type of alarm, the name of the point the alarm is based on and its address, the date and time that the alarm occurred, and the condition that caused the alarm.


```
07/24/98          Alarm!          01:41:07 PM

 🔔  Active Alarms

Type                   Name              Addr
Low oil diff           Oil Press AA1     01-7
 07/24/98 01:40PM at 42.4psi   Now:42.4
 below 50.0psi for 5 minutes   Ack: No

Low oil pressure       Oil Press AA1     01-7
 07/24/98 01:40PM at 42.4psi   Now:42.4
 below 50.0psi for 5 minutes   Ack: No
```

Two fields on the right of the screen deserve special explanation:

Now: The present status of the alarm condition. For system alarms (modem, I/O comm, Test Alarms, etc) the field will read **Trip**. For alarms based on hardware points (on/off inputs, sensor inputs, etc.) the field will contain a value (on, off, or the current sensor reading). The value will always be outside the alarm limits.

Ack: Indicates, by **Yes** or **No** whether the alarm has been acknowledged or not.

If you select one of the alarms, a screen with additional information for the alarm will appear:

```
07/24/98                    02:04:11 PM
  🔔 Active Alarms

Type                 Name            Addr

Low oil diff         Oil Press AA1   01-7
 Settings: below 50.0psi for 5 minutes
 Occurred: 07/24/98 01:55PM at 47.5psi
 Cleared :
 Current Value: 47.5 psi
                  Acknowledge

Routing                  Status

Ph1)Danfoss Mntrng       07/24/98 01:55PM
Ph2)Division Office      Not Sent
Ph3)                     Not selected
Ph4)                     Not selected
Ph5)                     Not selected
IP1)                     Not selected
IP2)                     Not selected
Printer)                 Not selected
```

The type, name, time of occurrence, settings, and current value are repeated, but in addition there is an **Acknowledge** button and a list of the dialout phone numbers. The **Acknowledge** button marks the alarm as acknowledged. Acknowledgment has the following effects:

1. An acknowledged critical alarm will stop dialing out. If a critical alarm is acknowledged before it has dialed out the first time, it will still dial out once.
2. A normal alarm which is acknowledged before dialing out will *not* dial out.
3. When all active alarms have been acknowledged, the flashing "Alarm!" notification that appears in the top blue border of every SC 255 screen will be turned off.
4. The **Ack** field in the Active Alarms screen or the Cleared Alarms screen will be changed to **Yes**.
5. In the detailed alarm screen, in place of the **Acknowledge** button, will appear the level and account number of the person who acknowledged the alarm.

The Cleared Alarms Screen

The cleared alarms screen shows up to 100 alarms which have occurred but whose conditions are no longer out of bounds. The alarms may or may not have been acknowledged. The screen is otherwise identical to the Active Alarms screen discussed above, and has a detail screen for each alarm just like the Active Alarms screen.

The Alarm Status Screen

The Alarm Status screen lists every alarm configured for the SC 255, giving its name, type, status, and alarm conditions:

```
07/24/98                    01:30:53 PM
  🔔 Alarm Status

Type               Name          State

Low oil diff       Oil Press AA1    869
 Alarm if below 50.0psi for 15 minutes

High oil pressure  Oil Press AA1    OK
 Alarm if above 50.0psi for 15 minutes

Low oil pressure   Oil Press AA1    864
 Alarm if below 50.0psi for 15 minutes

Comp. short cycle  Compressor AA1   OK
 Alarm if above 3 Cycles in 15 minutes

High Pressure      Disch Press A    OK
 Alarm if above 50.0psi for 15 minutes


                     "PG DN" for more
```

The Network Alarms Screen

The Network Alarms screen lists the most recent 100 active and cleared alarms for all the SC 255's in the network. The format of the screen is the same as the format of the Active Alarms screen and the Cleared Alarms screen which are discussed above.

The Alarm Service Screen

The Alarm Service screen is reached by selecting **Service** from the Alarm Configuration menu.

```
07/24/98                    02:29:31 PM
   Alarm Service

            Clear Alarm Logs
            Clear Network Log
           Clear All AKC 55 Logs
            Delete Alarm Config
             Send Test Alarm


   Generate system test alarm: Normal
       Send on days SMTWRFA at 09:00 AM

        Suspend alarm generation: No
```

The fields in this screen and their uses are as follows:

Clear Alarm Logs   In this SC 255 only, both the Active Alarms log and the Cleared Alarms log will be cleared of entries.

Clear Network Log   Clears the Network alarms log (for the entire AKCESS network).

Clear All SC 255 Logs   Clears Active Alarms logs and Cleared Alarms logs in all SC 255's in the system.

Delete Alarm Config   Deletes the entire alarm configuration in this SC 255 only.

Send Test Alarm   Sends a single test alarm. The **Generate system test alarm** function (see below) must be enabled.

Generate system test alarm   Provides a means of generating a test alarm on a regular schedule. You can select the days of the week, the time of generation, and the alarm action level. This function must be enabled with a schedule which is true for the **Send Test Alarm** function to operate.

Suspend alarm generation   Suspends alarms. When you answer yes to this question, another line will appear beneath it asking you to specify a time period (from 1 to 255 hours) during which no alarms will occur (effectively, all alarms are disabled).

Danfoss

2.8   Overrides

An AK2-SC 255 system provides for overrides through service screens, the reset switches on RO8S boards, the Manager's Override box, and the keyswitch override.

Overrides Using
Service Screens

A typical service screen is the one for relay output boards. There is a similar screen for on/off input boards:

```
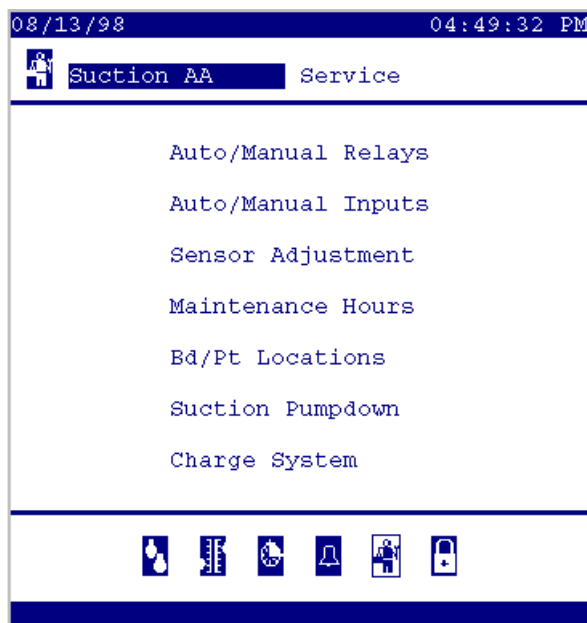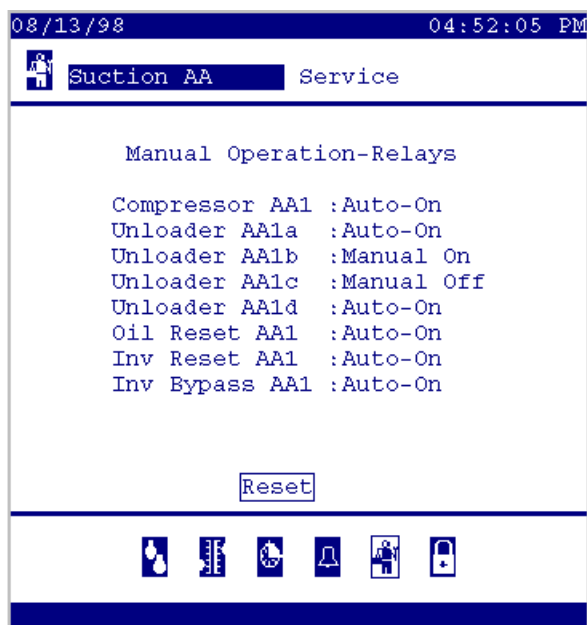08/13/98                    04:49:32 PM
  Suction AA      Service

         Auto/Manual Relays

         Auto/Manual Inputs

         Sensor Adjustment

         Maintenance Hours

         Bd/Pt Locations

         Suction Pumpdown

         Charge System
```

The first three menu items can be used to override control. The Auto/Manual Relays screen might look like this:

```
08/13/98                    04:52:05 PM
  Suction AA      Service

      Manual Operation-Relays

    Compressor AA1 :Auto-On
    Unloader AA1a  :Auto-On
    Unloader AA1b  :Manual On
    Unloader AA1c  :Manual Off
    Unloader AA1d  :Auto-On
    Oil Reset AA1  :Auto-On
    Inv Reset AA1  :Auto-On
    Inv Bypass AA1 :Auto-On


            Reset
```

Each relay output shows a mode, either Auto, Manual On, or Manual Off. All the relay outputs in Auto mode also show what the state of the relay is, either –**On** or –**Off**. You can change the mode of any single relay by toggling the mode field (use the +/- key or your right mouse button), then using the arrow keys to select either **Auto**, **Manual On**, or **Manual Off**. Finally, use press **ENTER** (or use your left mouse button) to save your change.

The **Reset** button at the bottom center of the screen can be used to restore all the relay outputs to **Auto**.

Overriding Sensor
Values

A sensor can be given an "override value" by entering an offset in its service screen.

Overrides Using
RO8S switches

The RO8S board is a relay output board with override switches. The board provides 8 relay outputs for control of a variety of loads. An override switch and two LED's are mounted on the board for each relay output. Installation of the RO8S board is covered in section III-3 of this manual. As with RO8 boards, each output has normally open, normally closed, and common terminals

Output LED's

Each output has a pair of LED's" one red and one green. The red LED lights whenever its relay output is overridden. The green LED lights whenever the relay coil is energized. The possible combinations and their meanings are shown in the following table:

LED Status		Override Condition	Relay Coil Condition
RED	GREEN		
Off	Off	Automatic	de-energized
Off	On	Automatic	energized
On	Off	Override	de-energized
On	On	Override	energized

Overrides Using the
Manager's Override Box

Configuration Manager's Override Box is covered in Chapter 4-8, Configuring Store Information.

To activate override of a point, operate the switch for that point. The green light will blink until the SC 255 has recognized the override (this may take up to fifteen seconds); then the override will take effect.

Interrupting the
Override

A timed override point can be configured with interrupt enabled or disabled. When interrupt is enabled, operating the switch a second time will terminate the override. The green light will blink for up to fifteen seconds until the SC 255 recognizes the switch; then the light will go off and the override will end.

If the override point is timed and does not have interrupt enabled, the green light will blink for up to fifteen seconds, then remain on, and the override will time out as configured.

If the override point is not timed, a second operation of the switch will terminate the override. The green light will blink until the SC 255 recognizes the switch, then the override will end and the green light will go off.

Keyswitch Override for Refrigeration High Temperature Alarms

Configuration of the keyswitch alarm feature is covered in Chapter 4-5, Configuring Alarms. The keyswitch allows store personnel to disable high temperature alarms when cleaning or servicing a case or box. The alarms are re-enabled (after a delay which allows the fixture to reach normal operating temperature) by restoring the switch to normal position.

2.9   Using the Audit Trail

The SC 255 audit trail is a log that shows each system access together with any changes to configuration or settings that were made during the access. The audit trail "log" shows every system access whether from an SC 255 keypad, from a local terminal, or from a remote location via modem.

Whenever someone gains entry to an AK2-SC 255 system, the system keeps a record of the date and time of entry, the point of entry, and the authorization level and account code used. Up to 4000 entries are stored, with the number reduced when languages additional to English are selected. Each change in settings is documented. Points of entry that can appear are keypad, local, and remote. Local means that a user has connected a PC (such as a laptop) to one of the SC 255's on the host network and gained access to the system. Remote means that access has been via modem communications.

A summary of the audit trail is shown in the authorization screen. To view details, move the cursor to the **Audit Trail** box and press ENTER. The next screen shows the record of a number of actions.

```
09/20/2001                    10:40:28

  🔒 Audit Trail

 00028        09/20/01 10:40    Keypad  3-5

 00027        09/20/01 10:22    Keypad  1-1
 Authorization Configuration
 Audit Trail:  English  :Yes
               Español  :No
                         Yes

 00026        09/20/01 10:22    Keypad  1-1
 Authorization Configuration
  Level           Auth  Account
                        1  2  3  4  5
 4 HVAC All      ----- -- ** -- -- --




 *00028..<< <   00028..00026  > >>..00001
```

The actions are serially numbered and listed in reverse chronological order (here from 00028 back to 00026). The entries you will see in your system will not be the same as those shown here.

As shown in the sample screen, the three most recent entries have been from the keypad. The earliest (# 00026) was made by a supervisor (1-1) level and shows that a change was made in Authorization Configuration. The second account code for the HVAC All level was changed. Although the audit trail generally shows exactly what change was made by giving pre-change and post-change values, in the case of authorization, the actual values are hidden, because all levels have access to the audit trail and only the supervisor level should see authorization codes. If a supervisor wants to see the codes, the authorization configuration screen, to which no one else has access, will show them all.

At the same time, the supervisor changed the audit trail language settings so that the trail would be recorded in Spanish as well as English. Notice that the pre-change value, No, is shown before the post-change value, Yes. All changes except authorization changes will be shown in this manner.

At the bottom of the screen are some navigational aids:

*	—	the asterisk indicates that this is the most recent page and that 00028 is the most recent entry in the audit trail.
00028	—	shows the number of the most recent entry in the audit trail database.
<<	—	an operator that moves the screen one page forward in time.
<	—	an operator that moves the screen one entry forward in time.
00028..00026	—	shows the range of entries displayed on the current page.

>	—	an operator that moves the screen one entry backward in time.
>>	—	an operator that moves the screen one page backward in time.
00001	—	shows the oldest entry in the audit trail database. When the database is filled to capacity, the next entry will cause the oldest to be deleted, so this number can be other than 00001.