User Manual

AKCESS 25 Rack Controller NC25-4

(with notes pertaining to the NC25-3)

November 11, 1993

This User Manual introduces you to the NC25 and should provide all the information you need to operate it. An NC25 Installation Manual is also available; it includes material useful during planning, specifying, ordering, installing, and checking out a system containing one or more NC25's.

Use this manual as a reference resource to get the information you need right now -- the Table of Contents will help you find the right section -- but we urge you to take time, when you can, to read through the whole manual; in doing so, you may discover new ways to benefit from your AKCESS system.

We recommend that you store a copy of this manual in a secure place near the equipment for reference when working at the controller site.

To Danfoss, continued improvement to documentation goes hand-in-hand with the product refinement and quality for which Danfoss is world famous. We welcome your suggestions for additions or improvements to any of our manuals or other literature. Please address your comments to:

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For Additional Information -- Other Relevant Danfoss Automatic Controls Publications:

NC25-4 Rack Controller Installation Manual	
Database Preparation Manual (BUILD)	(for those who have taken Course 301)
AKC16 User Manual	(available printed and on disk)
AKC16 Technical Brochure	
AKC16 Sales Brochure	
Version 10 Software Manual	
COMM Plus Software Manual	

1.0 INTRODUCTION

1.01 About the NC25....

The NC25, designed as a primary control system for refrigeration racks and HVAC systems, can serve as a stand-alone controller (with or without a modem for communications outside the site) or as a node (member) in a network of controllers. An NC25 installed as a stand-alone can later be included in a networked system.

The features and functions of the NC25 are detailed in its specification sheet, a copy of which will be found as the last page in this manual, following the Appendices.

The NC25 is a ***N***etwork ***C***ontroller, meaning that it can serve as a member of a control network. But an NC25 can also act as a stand-alone controller, with local and remote (modem) communications capability.

The NC25 is a Rack Controller, meaning that its primary design criteria were focused on control of today's refrigeration. But an NC25 is also quite at home controlling built-up or packaged HVAC systems, (including all types of chiller equipment), or providing total control of all the loads in a convenience store or fast food restaurant.

1.02 Control System Levels

The NC25 is a level three controller, meaning that it is found at level three of a networked Danfoss control system. We'll now briefly look at the four ***levels*** possible in the architecture of a networked system, so that you will understand the components at each level and their capabilities.

Level 1:
Local or Remote Host PC

A personal computer with disk storage, printer, and modem.

Typical Applications: Inspection, monitoring, and tuning of control systems; color graphic representation of the controlled site; collection, processing, and graphing of sensor data from the control system.

Software: For full applications functionality, Danfoss COMM PLUS software; for database generation and maintenance, Danfoss BUILD PLUS software.

Level 2:
Danfoss ZX Network Manager (with modem)

Typical Applications: Supervisory control (management) of a network including NC25 Rack Controllers, NC10 Network Controllers, or both; also, in non-network (star-wired) installations, a Danfoss Network Manager can perform complete control and monitoring of a site by itself.

ZX Network Manager Software: The ZX Network Manager is shipped with Danfoss version 10 software.

If NC25 Rack Controllers are used with a ZX Network Manager, version 9 or 10 software may be found in existing ZX Network Managers. If no NC25 Rack controllers are planned, but NC10 Network controllers are used, version 5, 8, 9 or 10 may be found.

Versions 2 and 3 may be found in ZX Network Managers only if neither NC25 Rack Controllers nor NC10 Network Controllers are present.

Danfoss highly recommends that older ZX Network Manager software be upgraded to version 10 whenever possible. The upgrade will, however, require changes to the system database, and may require changes in hardware to be made at the installation site.

For **AKCESS Network Managers**, software selection is not an issue, since standard software adapts to any network configuration.

Level 3:
NC25 Rack Controller

As stand-alone, modem is optional. When networked to a Danfoss Network Manager (level 2), no modem is required.

Typical Applications: Control and monitoring of refrigeration racks, HVAC systems, convenience stores, and fast food restaurants.

Level 4:
NC10 Network Controller; AKC 16 Smart Case Controller

NC10's must be networked to an NC25 Rack Controller or directly to a ZX Network Manager; in other words, an NC10 can never be a stand-alone controller.

Typical Applications: Control and monitoring of devices at some distance from the Rack Controller (or Network Manager, in the case of NC10's). The controlled devices can be

Level 4 (cont'd)

compressors, remote condensers, lights, etc. NC10's also serve to collect information from an area remote from a ZX or NC25 and forward the information over a single cable.

Software: The ZX Network Manager software must be version 5, 8, 9, or 10 if NC10's are directly connected to it; if the system includes NC25's, the ZX Network Manager must have version 9 or 10 software.

Physical Location of Levels

Levels two, three, and four are found at the controlled site. Level one equipment and activity may be found on site or at one or more remote locations such as a servicing contractor's office, a regional maintenance office, a monitoring service, or a corporate engineering office. Level four activity can also occur when a portable computer is used at the controlled site. Figure 1 shows the capabilities and equipment involved at all four levels.

Communications within the network

Communications between components in a Danfoss network take place on an RS-485 bus; the RS-485 protocol requires two wires for exchange of data and one ground wire between components. Because the third wire is simply a ground, the term "two-wire bus" is often used.

1.1 COMMUNICATING WITH THE NETWORK

At the Controller Site

A terminal or a portable PC in terminal mode can be directly can be directly connected to the RS232 port on an NC25 Rack Rack Controller for communication with that NC25 and all parts of the network at lower levels (NC10's or AKC 16 Smart Case Controllers. The NC25 to which the terminal is connected must be at address 0 (zero).

In installations with a ZX Network Manager, it is also possible to connect a terminal to the RS232 port on the ZX for communication with all parts of the Network.

Remote or On-Site

Any number of remote locations can have Level 4 communication capability with a control network. In addition, Level 4 communications are possible on-sitewhen the user has a portable PC and Danfoss COMM PLUS software.

Some examples of remote Level 4 locations are corporate engineering and maintenance offices, monitoring services, regional and divisional offices, and service personnel collecting

data or making adjustments.

1.1.1 COMM PLUS

With COMM PLUS, you can access all the data screens in a control system, make changes to control settings, respond to alarms, retrieve stored history and other performance data, and send and retrieve controller database files. But COMM PLUS also has full-function color graphics and graphing capabilities. To make best use of these functions, you'll need a VGA monitor and a mouse. A mouse is included with each copy of the COMM PLUS package purchased.

COMM PLUS includes drawing libraries and a screen editor, and can be used to create custom drawings, most often pictorial diagrams of the facility and its mechanical equipment. In the graphics mode, actual real-time control and environmental data are displayed on graphic screens designed by the user; as conditions change in the controlled environment, the values on the graphic display are updated.

1.1.2 Database Generation Software --

The database defines the unique characteristics of the facility being controlled and provides information to system's software routines. Specific control outputs, digital and analog inputs, schedules, building standards, and control strategy statements are some of the items defined in the system's database.

AKCESS BUILD

AKCESS BUILD database generation software is a PC program designed to lead the user intuitively through the steps necessary to create a complete database for an NC25. The user is presented with a series of questions and fills in information as requested. **AKCESS BUILD** has comprehensive on-line "Help Screens."

With **AKCESS BUILD**, you need only have knowledge of the refrigeration system to be controlled. When configuration is complete, **AKCESS BUILD** will give you a printout of the physical wiring locations for all control inputs and outputs along with a complete parts list.

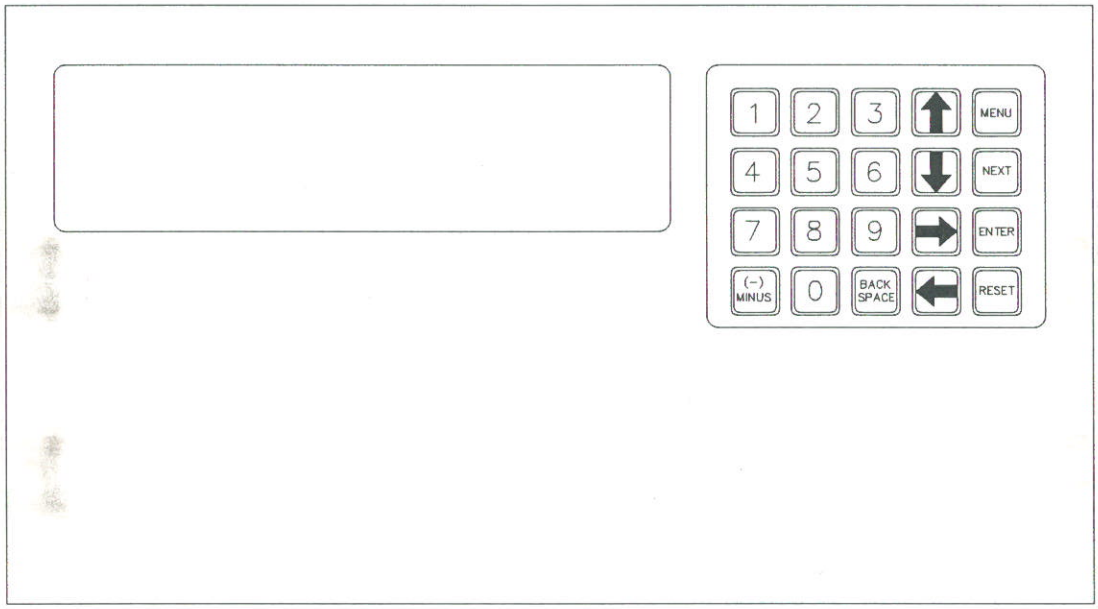
BUILD

Danfoss **BUILD** is a PC program package for preparing and editing database (configuration) files for ZX Network Managers and NC25 Network Controllers. **BUILD** is a comprehensive tool for users who regularly and frequently need to create and edit databases. A formal course of instruction, Danfoss Automatic Controls Course 301, is essential for BUILD users.

2.0 RACK CONTROLLER DESCRIPTIONS

2.1 NC25-3

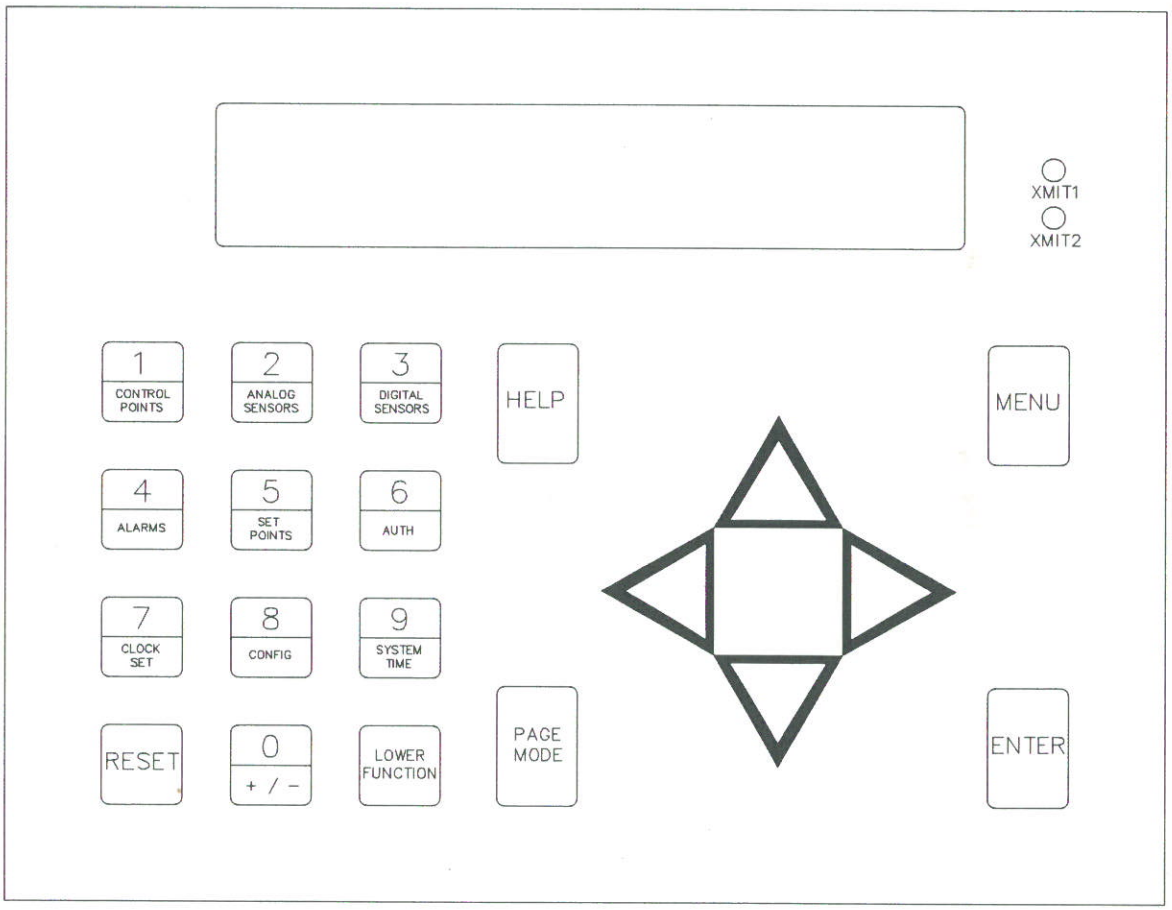
The NC25-3 is completely self-contained and has a built-in user interface consisting of 1 line x 24 character LED display and a keypad. The NC25-3 Keypad Quick Reference Guide in Appendix E of this manual explains the use of the keypad for viewing, or, with proper authorization, making changes to programmed settings.



2.0 RACK CONTROLLER DESCRIPTIONS (cont'd)

2.2 NC25-4

The NC25-4 is completely self-contained and has a built-in user interface consisting of either a 2 line x 40 character or 4 line x 40 character LCD display and a keypad. The NC25-4 Quick Reference Guide in Appendix D of this manual explains the use of the keypad for viewing, or, with proper authorization, making changes to programmed settings.



3.0 NAVIGATING AROUND THE SYSTEM
Using a local or remote PC with the NC25

3.1 Abbreviations Used in this Manual

In this manual, we will use conventional abbreviations for certain terminal keys, such as <RTN> for the RETURN or ENTER key, <ESC> for the ESCAPE key, and so forth. Where the names of two or more keys are connected with a hyphen, as in <CTRL-F>, the first key (in this case the <CTRL> key) is depressed and held down while the second (in this case the F key) is depressed.

3.2 NC25 Screen Types

There are two types of screens in the NC25, DATA screens and CHANGE screens. DATA SCREENS allow the operator to observe how the NC25 is performing and what information it is using to determine its control actions. CHANGE SCREENS allow the operator to alter selected portions of the NC25 database in order to permit tuning of the system and to allow for changing needs in the building.

Auth levels

Changes can only be made if you have gained access to the NC25 with an **Auth** code of the correct level.

The number of spaces shown in a CHANGE screen prompt indicates the maximum number of characters that can be entered; all of these spaces will not necessarily be needed for a particular entry.

Any entry you make in communicating with the controller from a keyboard (remember, we aren't talking about the keypad on the controller) is finished by pressing either <RTN> or <ESC>. Until you have pressed one of these keys, the controller will patiently wait for additional input from you; but after 15 minutes, if you have not entered any keystroke, the NC25 will "time out" (see section 3.10).

At the bottom of each screen, there will be a prompt asking the operator for further direction - whether to review a point in greater detail, add or change a value, move on to the next page, or return to the ACTION MENU.

If an entry error is made before pressing <RTN>, the operator may backspace and enter the correct information. The space bar will also erase incorrect information. If an entry error was made and <RTN> has been entered, it is better to answer N to the "CORRECT? (Y/N)" or "SURE? (Y/N)" questions and use the <ESC> key to go back around again.

By convention, only Upper Case letters are used in the NC25 for operator input. Be sure the <CAPS LOCK> is on. Lower case input is sometimes ignored by the system.

3.3 **Return Key**

Pressing the <RTN> key alone has two functions. One is to retreat to a previous screen and the other is to advance within a screen or one whole screen. The guidelines concerning these functions are as follows: In a DATA screen, pressing <RTN> without entering any data at the prompt will retreat the screen one step to a former screen, e.g., from PHONE NUMBERS to ACTION MENU or ACTION MENU to AUTH, or will advance the screen to the next page if so stated in a prompt such as RETURN FOR NEXT PAGE. However, the <RTN> key will advance from question to question in a CHANGE screen until a prompt occurs asking if the correct data has been entered.

3.4 **Escape key**

The Escape key has a function similar to the <RTN> key. In a DATA screen, if no data has been entered at the prompt and <ESC> is pressed, the system will go back one screen. If data is entered and <ESC> is pressed, it functions as the <RTN> key and enters the data. In a CHANGE screen, however, hitting <ESC> will skip any remaining questions and take the operator directly to the prompt asking if the correct data has been entered. Pressing <ESC> again repeats the change screen from the beginning. This allows an opportunity to verify any changes made or to make additional changes, if so desired, without changing screens.

3.5 **Space when Needed....** The operator must space between elements of data being entered as a single string.

Examples:

1<space>15<RTN> or
@1<space>15<space>15<RTN>

It is not necessary to space before pressing <RTN> or <ESC> at the end of a response.

3.6 Using "@" to Move Around Faster

At any screen prompt, you have the option of beginning your response with the "@" character, most often found above the "2" on terminal and computer keyboards. Using an "@" can save many keystrokes in navigating around the screens, especially when you begin to learn the menu numbers and their associated functions.

Whenever the @ symbol is entered, the controller executes as if from the ACTION MENU prompt. By chaining commands (separated by <space>, you can move immediately from any prompt to any other screen in the system.

You'll appreciate the value of this feature more and more as you become familiar with the controller and its software.

Example:

@n<RTN>

where n is the number of the ACTION MENU item desired.

3.7 Chaining Commands

You may enter up to four levels of destination commands in a chain, either from the action menu or following "@" before <RTN>.

Example:

@1<space>1<space>1<space>Y<RTN>

Which will take the operator directly to the CHANGE screen for CONTROL POINT #1. Reading the command symbol-by symbol,

@	"from the action menu,"
1	"select menu item 1 (control point status),"
1	"start with control point number 1"
1	"respond to prompt at the bottom of the control point status screen that you want the expanded status of control point 1,"
Y	"respond to the prompt of control point 1's expanded status screen: 'yes, I want to make a change.' "

3.8 24-Hour Clock Time (aka "military time")

The time shown in the heading of each screen you see is given in the 24-hour system, where each day starts at 0000 (midnight). The first two digits of the time tell the hour, from 00 to 23. The right pair of digits tell the minute, from 00 to 59.

Examples:

0135	1:35 AM	2019	8:19 PM
1123	11:23 AM	2222	10:22 PM
1355	1:55 PM	2347	11:47 PM

It may help to remember that you can always translate quickly back to the 12-hour system (AM/PM) by subtracting 12 from the first two digits of any number over 1200; that will give you the corresponding AM or PM hour.

3.9 NC25 Time Out (Log Off)

If you do not send any commands to the NC25 for a period of 15 minutes, it will automatically "log you off," which means that you must re-enter an authorization code if you wish to continue your session. If your session was not local, but over a telephone line, the NC25 will break the telephone connection, and the unit must be dialed up again to restore communications.

3.10 The "@17" Feature: How to Override a Group of Control Points

From the ACTION MENU, (or from any prompt, using the "@" feature, as in **@17....**), you have the ability to override or restore to computer control any group of sequential control points. After using a "17" command, you are always returned to the ACTION MENU, regardless of your position when you executed the command.

The "17" command is very powerful, and you should always check the effects of your change after using it. Study the examples in this section to appreciate the danger of treating this command with less than full respect.

The format of a "17" command is:

@17<space> s <space> m <space> n <RTN>

where 's' is the status to which you wish to set the points:
- 0 = computer control
- 1 = override ON
- 2 = override OFF

'm' is the number of the first control point in the series whose status you want to change.

'n' is the number of the second control point in the series whose status you want to change.

Once again, study the examples on the next page; note especially that the "m" and "n" are optional, and the effect of not using them.

Examples (the <space> is assumed where actual spaces are shown):

@17 1 11 17<RTN>	sets control points 11 through 17 to override status ON.
@17 1 11<RTN>	sets all points from 11 up to override status ON.
@17 1<RTN>	sets all points to override status ON.
@17 2 6 9<RTN>	sets control points 6 through 9 to override status OFF.
@17 0 10 15<RTN>	sets control points 10 through 15 to computer control.
@17 0	sets all points to computer control.
@17 1 12 12<RTN>	sets only control point 12 to override status ON.

4.0 GETTING READY TO COMMUNICATE

There are four ways, to communicate with an NC25 using a terminal or computer:

1. Over a telephone line from a remote location, if the NC25 is equipped with the optional expander board and optional modem.
2. At the controller site, through a ZX network manager, by connecting to the RS-232 port on the ZX.
3. At the controller site, directly, by connecting to the RS-232 port on the NC25.
4. At the controller site, by using an AKCESS network manager.

We'll examine each of these ways in the paragraphs that follow.

4.1 By Telephone Line

If you have a computer with hard disk storage, use the Danfoss COMM Plus program to get the full benefit of graphics. If graphics are not important, use Danfoss COMM or, in a pinch, any communications software with a terminal emulation mode; in a real pinch, you can use a non-computing or "dumb" terminal.

Port selection:
If you are already using your computer modem for communications with other systems -- for faxing, for connection to an on-line service, or for communication with other systems successfully, port selection has already been made correctly. If you have just installed the modem, or

if you have never used it, you may have to tell the communications software which COM port (COM1, COM2, etc) the modem is on. Consult your computer and modem manuals to determine this if it is causing a problem.

Line settings:
Line settings are 1200, 8, 1, None. That means:

1200 bps (or baud) communication speed
8 data bits
1 stop bit
No parity

Explaining the meanings of those terms is beyond the scope of this manual. Your modem manual or a book on serial communications will provide the information.

Telephone number:
Make sure that you have the correct telephone number of the unit you want to call; include the area code if needed and if your telephone line goes through a PBX, include the prefix code number, if any, needed to access an outside line.

Enter the telephone number in your COMM Plus, COMM, or other program's telephone directory if you might be calling the unit several times.

Making the Connection:
Enter the appropriate command to call the unit.

When the C ontrol System Answers:
If initial contact is through a ZX or AKCESS network manager, after entering your authorization code, select NC25 communications from the menu and specify the NC25 you want to communicate with.

4.2 At the Controller Site: through a ZX Network Manager

When you are at a site which has NC25's networked to a ZX Network Manager, you can connect your computer (with Danfoss COMM Plus, COMM, or another suitable communications program) or terminal to the 25-pin female serial connector on the underside of the ZX cabinet. You will need a common serial cable (and possibly a nine pin to twenty-five pin adapter) to make the connection to your computer's serial port.

Port selection:
You'll need to tell the communications program what serial port you're using for the connection to the ZX. If you have an internal modem this will be a different port than you use to call the system by telephone.

Line settings:
Because there is no modem limitation, communication is faster at the controller site. Line settings are 9600, 8, 1, None. That means:

9600 baud or bps communication speed
8 data bits
1 stop bit
No parity

Explaining the meanings of those terms is beyond the scope of this manual. Your modem manual or a book on serial communications will provide the information.

Making the Connection:
Attach a serial cable from your computer's selected serial port to the serial connector on the underside of the ZX cabinet.

From your keyboard, enter a <RTN> or two. An **Auth** prompt should appear. If not, check settings and connection and try again.

When the ZX Responds:
Select the menu item number for NC25 communications, and specify the number of the NC25 you want to communicate with.

4.3 At the Controller Site: by Direct Connection to an NC25

You can at any time connect a terminal or computer directly to an NC25's user serial port.

Standard Factory Cabinet:
An NC25 mounted in the factory-supplied steel box with locking door has a 25-pin female serial connector mounted through the lower right edge of the door. You will need a standard serial cable with a 25-pin male connector on the NC25 end and depending on your computer or terminal, either a 25-pin or 9-pin serial connector on the other end.

OEM or Panel-mount:
Many equipment manufacturers install the NC25 without the wall-mount box. In this type of installation, the equipment manufacturer may have provided the serial connector somewhere close to the NC25 keypad. If the connector is not present, contact the equipment manufacturer. A cable and connector are shipped with each NC25 from the Danfoss Automatic Controls plant.

Port selection:
If you are connecting a computer to the NC25, you will need to tell COMM Plus (or whatever communications software is running on your computer), the identity of the COM port you are using. If you

have an internal modem, this will be a different port than you use to communicate by telephone.

Line settings:
For NC25-3's, Line settings are 1200, 8, 1, None.
For NC25-4's, Line settings are 9600, 8, 1, None.
That means:

1200 (or 9600) bps (baud) communication speed
8 data bits
1 stop bit
No parity

Explaining the meanings of those terms is beyond the scope of this manual. Your modem manual or a book on serial communications will provide the information.

Making the Connection:
Press <RTN> on your terminal. The NC25 should respond with an **Auth** prompt.

5. MENU, DATA, DATA, AND CHANGE SCREENS

5.1 The Danfoss Action Menus

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 0625:17                    ACTION MENU                    Ace Market A
                 COPYRIGHT 1992 Danfoss Automatic Controls


SELECT 1 THRU 16 :
```

1. The (abbreviated) ACTION MENU. Until you memorize the item numbers you use the most, just enter 0<RTN> to see the items listed by number with an explanation.

The abbreviated, or "expert mode" ACTION MENU shown in *figure 1* is the first screen the user sees after entering a correct authorization code. The PROMPT,

```
SELECT 1 THRU 16:
```

allows the user to select any data screen. If you are not familiar with the numbers of the data screens, enter

```
0<RTN>
```

and you will be presented with the full menu:

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM   25-01-40-04-02
TIME 0625:28                    ACTION MENU                 Ace Market A
                 COPYRIGHT 1992 Danfoss Automatic Controls

        1.   CONTROL POINT STATUS        2.   CASE/BOX STATUS REPORT

        3.   CONTROL ALARMS REPORT       4.   NOT IMPLEMENTED

        5.   KWH STORAGE DISPLAY         6.   CONDITION CODE LISTING

        7.   TODAYS AVERAGES             8.   YESTERDAYS AVERAGES

        9.   SCHED GROUP/CONTROL PT      10.  PHONE NUMBERS REPORT

        11.  HOLIDAY DATE RANGES         12.  HISTORY POINTER

        13.  DIGITAL SENSOR REPORT       14.  ANALOG SENSOR REPORT

        15.  SENSOR ALARM REPORT         16.  STANDARDS/SETPOINTS

SELECT 1 THRU 16:
```

2. The full NC25 ACTION MENU.

With the full action menu displayed, there is a screen title and number to explain what information each menu selection will present. This menu can be displayed from any prompt by entering

@0<RTN>

whenever you need a reminder. Even users who have years of experience may need to jog their memory for the numbers of screens they do not frequently use. On the other hand, displaying the full user menu when you know exactly how to get the information you need can be tiresome. You will find that you return to the full menu less and less as you gain familiarity with the system.

5.11 The Screen Heading

Note that both of the screens shown so far have the same heading; most of the same heading information will appear on every other screen displayed by the NC25.

The first line contains the day of the week and date, and immediately below the date is the time given in the 24-hour system (which is explained in section 3.10 of this manual). You

should note whether this information is correct each time you enter the system. Any schedules entered as control parameters refer to this system date and time, so you want it to be within five minutes of the correct time. Later, we'll discuss how to set the time.

Also on the first line of the display, at the right, is a string of data separated by hyphens into five two-character fields:

25-01-40-04-02

The first field, 25, indicates an NC25; the second, 01, is the address of the NC25 (01 indicates that the NC25 is the first Rack Controller in a network. Together, the third and fourth, 40-04 reveal the software version. The fifth, 02, is the revision number of the database. This one has been revised once.

5.111 Screen Title

The screen title (in this case, the words ACTION MENU) appears on the second line in the center.

5.112 NC25 Unit Name

The identity of the NC25 is found at the right on the second line of every screen. Our example NC25 is installed at Ace Market. The A ending the unit name indicates that this NC25 is controlling Rack A.

5.113 Copyright Notice

The copyright notice appears only in the ACTION MENU screens, on the third line.

5.2 Selecting from the ACTION MENU

To display a data screen from the ACTION MENU, enter its number followed by <RTN> . You can, of course, enter the @ character first, and many users get into the habit of doing so from all prompts; but from the ACTION MENU it is really not needed.

Exception: Schedules

To inspect a schedule, you must enter

@9<space>n<RTN>

where n from 1-96 will display the schedule for a control point with that number, and n from 97-125 will display the schedules used for conditions and for activating call-to telephone numbers for alarms. If you do not enter a schedule number, but only the "9," you will be returned to the ACTION MENU.

5.3 DATA SCREENS AND CHANGE SCREENS

5.311 CONTROL POINT STATUS

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1622:19                  CONTROL POINT STATUS              Ace Market A

CP    NAME            STATUS    CURR   TARG/  CUT   SYSTEM   COND        RUN
 #                              VAL   CUTIN  OUT    TYPE     #          HOURS
 1   RACK A1I    ON             6.0P    5.0   1.0   UR(A)-R # 32 T       677
     SPEED A1 106.1     RPM'S A1  3840     INVPRFA1 ON        INVFLTA1 OFF
 2   UNLD A 1    ON   X                                      # 32 T       427
 3   RACK A 2    ON                                                       689
 4   NISUNLDR    OFF  X (OFF)                                              40
 5   RACK A 3    ON                                                       339
 6   NISUNLDR    OFF  X                                                    17
 7   OILPMP A    OFF          161.5P                LITE    # 53 F        11
 8   OILFAN A    ON           209.8F                LITE    # 54 T      1357
 9   OILVLV A    OFF  X       171.0F                LITE    # 55 F       401
10   INVRTRA1    ON   X                             HVAC                1240
11   INVRSTA1    OFF  X                             HVAC    # 38 F         2
12   SUBCL 1A    ON   X        39.4F                HVAC    # 41 T      1189
13   SUBCL 2A    ON   X        39.4F                HVAC    # 43 T      1347
14   OILRSTA1    OFF  X                             HVAC    #  3 F        15
15   OILRSTA2    OFF  X                             HVAC    #  4 F         0

ENTER CP #, RTN FOR NEXT PAGE, OR 0 FOR MENU : 1 Y
```

3. The NC25 CONTROL POINT STATUS screen. Control points numbered above 15 will be on subsequent pages, as the prompt indicates.

The CONTROL POINT STATUS shows each control point by number and name, its current ON/OFF status, whether or not it has an associated digital input (monitor point), its override status, the value of its principal associated analog sensor, key refrigeration parameters, the control point type, and the number and state of its key logical condition. The CONTROL POINT STATUS screen is divided, for each control point, into the following fields and sub-fields:

CP# — The number of the Control Point.

NAME — The 8 character, alpha-numeric designation for the Control Point.

STATUS — Status includes three sub-fields:

ON/OFF field -- status of the control point. If there is an associated digital input (monitor) point, this field will indicate the sensed status of the controlled device. If this control point is

not monitored, the ON/OFF field will indicate the status the NC25 is calling for based on its programming, and anX will appear in the next sub-field.

X field -- an X will appear here for control points which are not monitored.

(ON/OFF) field, also called the "override" field. The contents of this field indicate that a user (you or another user authorized to make changes in the system) has put the control point in a manual override status, either through the change screen or with an "@17...." command (see section 3.12 of this manual for an explanation of the "@17" command). The field contents are always displayed in parentheses. In our example,*figure 3*, control point 4, NISUNLDR, has been put manually off. Since NISUNLDR is not monitored (there is an X in the X-sub-field, right?) the computer might be calling for the point to run, in which case the ON/OFF field could read ON while the override field read (OFF). The controlled device would still be in override, and would still be off.

CURR VAL — The reading from an associated Analog Input, if any.

TARG/CUTIN — The target suction pressure to be maintained by the Danfoss Rate-of-Change Refrigeration Algorithm (See Appendix B) or the cut-in pressure to be used in a standard cut-in/cut-out strategy.

CUT OUT — The cut-out suction pressure to be used in a standard cut-in/cut-out strategy or the safety cut-out if the Danfoss Rate-of-Change Refrigeration Algorithm is used.

SYSTEM TYPE — This is the System Type or Control Point Type. In our example *(figure 3)*, control point 1's type is UR(A)-R, indicating an uneven multiple rack (UR), which is called rack A, and is being controlled using the Rate-of-Change algorithm (R).

DEFR indicates a defrost point.
LITE indicates a lighting-type point.
HVAC indicates an HVAC-type point.

Assignment of the control point type is done when the database is written for the NC25, and the type is selected based on the control strategy needed. Both lighting and HVAC-type points are used in controlling parts of refrigeration systems as well as other types of loads, as they are in our example.

COND — The Condition field includes two sub-fields. The first references the NC25 logical condition (we will find the conditions listed in screen 6), if any, that must be true for the NC25 to turn this control point ON; the second indicates whether this condition is presently true or false (T/F).

RUN HRS — The total time, in hours, that this Control Point has been ON (or, if not monitored, has been called for) since this value was last cleared.

5.312 CONTROL POINT EXPANDED STATUS SCREEN

By entering a control point number at the CONTROL POINT STATUS screen's prompt, you will be asking the NC25 to display the EXPANDED STATUS of that control point. The EXPANDED STATUS CONTROL POINT screen contains further information specific to a control point and is also the point of entry to the CHANGE screen for that control point.

If the control point selected is set up as part of a rack, then its EXPANDED STATUS screen will show all control points on the rack.

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 1623:01            EXPANDED STATUS, C.P.#    1              Ace Market  A


RACK A1I      PSI:    CURR=  5.2   TARG  5.0  COUT  1.0     1 -3  0 36  1  6  1
SDFJTA12    TEMP:    CURR=-16.0   TARG-15.0   AVG-16.0                        I

    STATUS                     TIMING                  ACCUM RUN TIME
    OUT MON CODE  MODE         LST ON   LST OFF CYC  TODAY    YESTERDAY TOTAL
 1  ON   ON   5                1056:10  1055:58   5  1622:26  2358:38      677
     SPEED A1 110.0      RPM'S A1  4000      INVPRFA1 ON         INVFLTA1 OFF
 2  ON        5                1429:00  1401:18  56  0912:55  1040:10      427
 3  ON   ON   5                1100:07  1055:58   5  1602:00  2319:01      689
 4  OFF       1                0832:42  1055:58   0  0000:00  0000:00       40
 5  ON   ON   5                1401:18  1358:21  50  0852:48  1341:48      339
 6  OFF       1                1939:19  1055:58   0  0000:00  0000:00       17

BASE COND  # 32            VAR SPEED  # 57
SHUT DOWN  # 31            TM/DEF SKP #  8            SET UP CND # 30

ALARMS :

CHANGE  Y/N/S/M/C/A/D/CP # : Y
```

4. An EXPANDED STATUS CONTROL POINT screen shows more complete information for a single control point than the CONTROL POINT STATUS screen.

5.313 CONTROL POINT EXPANDED STATUS FIELDS

The number and types of fields in a control point'sEXPANDED STATUS screen will be different fordifferent types of control points. Our first example, in *figure 4*, is the expanded status of a refrigeration point. For refrigeration points, where a compressor is part of a multiple-compressor rack, all compressors on the rack are shown. You can examine the performance of the entire rack from this one screen. The parameters you can set will apply to the entire rack (except that satellite compressors are usually controlled by fixture temperature, and the rack target pressure and cut-out do not control them). Here are the fields:

RACK A1I	This is the name field, containing the 8-character name of the control point..
PSI: CURR= 5.2	The current suction pressure.
PSI: TARG 5.0	The target suction pressure, as set in the STANDARDS/SETPOINTS screen, plus or minus any variance allowed and added by the NC25 to modify the target in compensation for variation in fixture temperature (when temperature modified rate-of-change is being used).
PSI: COUT 1.0	When temperature modified rate-of-change is being used, this is the safety cut-out suction pressure. Whenever CURRent pressure is at or below this value, the NC25 will turn off one compressor per algorithm cycle.
1 -3 0 36 1 6 1	These fields, to the right of the cut-out setpoint, track the functioning of the refrigeration control algorithm. An explanation of these fields, and of the TMRC (temperature modified rate-of-change) algorithm will be found in the version 10 software manual.
SDFJTA12	The name of the temperature sensor used for feedback to modify the target pressure under temperature modified rate-of-change. (Conventional abbreviations have been used in this installation: the first four character indicate the product in the fixture -- the sensor is in a Single Deck Frozen Juice case; the next character indicates that the sensor is a Temperature sensor; the A indicates that the system is on rack A, and 12 is the system number, as assigned by the store engineer on his refrigeration schedule.)

TEMP: CURR= -16.0
The current temperature sensed in the fixture.

TEMP: TARG -15.0
The temperature target for the fixture as set in the STANDARDS/SETPOINTS screen.

TEMP: AVG -16.0
The average temperature of the fixture during the last hour.

I
This character, at the far right on the same line with the temperatures, indicates that the output of this control point is "inverted." When in the ON state, the NC25 control point relay will be closed.

Status and Run Time Fields

The next section of the screen gives the status and run timing for every control point in the "block;" in this case, all of the compressors on rack A. The data is arranged in columns, and there are two lines of column headings.

STATUS OUT
What the NC25 is calling for for this point.

STATUS MON
If there is an associated digital input, this is the actual state of the controlled device as sensed by the digital input.

STATUS CODE
A numerical representation of the state of the OUT and MON fields.

STATUS MODE
If this point were in override, (ON) or (OFF) would appear in this field.

TIMING LST ON
The last time the NC25 turned the control point ON.

TIMING LST OFF
The last time the NC25 turned the control point OFF.

TIMING CYC
The number of times the device has cycled since midnight, based on the digital input (monitor point), if one is wired, for the device.

ACCUM RUN TIME
Three fields which contain the accumulated run time for today,

yesterday, and a total since the last time the field was cleared.

Extra Print Line

Following the STATUS and TIMING lines for control point 1 is an "extra print line," which is used to give additional information about compressor A1, which is a variable speed compressor being driven by an inverter, and has a number of additional parameters.

SPEED A1 — The speed of the compressor, in per cent of rated maximum. In our example, the compressor is one for which the specifying engineer has requested a range greater than 100% of rating.

RPM'S A1 — The actual speed, in RPM, of compressor A1.

INVPRFA1 ON — The status of the inverter's "proof" output, testing whether the inverter is operating normally.

INVFLTA1 OFF — The status of the inverter's "fault" output, which comes on in case of an inverter malfunction.

Condition Fields

BASE COND — The number of the condition directly associated with the control point; in this case, the condition which causes normal variable speed operation or, in the event of an inverter failure, runs the rack as a multiple-compressor uneven rack without variable speed.

VAR SPEED — The number of the condition which contains the logic for "ramping" the variable speed compressor higher and lower in speed in response to load.

SHUT DOWN — The number of a "quick kill" condition, if any. The condition may reference a phase loss monitor, a high head pressure or low suction pressure sensor, etc., in any combination.

TM/DEF SKP — The number of the condition which causes suspension of the temperature-modified rate-of-change algorithm during defrost. Because the temperature rises well above target during defrost, the suction pressure target would be lowered for no good reason without such a condition.

SET UP COND — The number of the condition, if any, which allows the rack to operate at a higher target pressure during periods when there is little disturbance of the fixture, as when it is covered or the building is unoccupied.

Alarms Field

ALARMS: Generally contains a record of the most recent overrides of the control point, by action of the NC25 or an operator.

The Expanded Status Prompt

CHANGE Y/N/S/M/C/A/D/CP # :

Here you may enter:

Any "@" command.

Y: Will take you to the CHANGE Screen for this Control Point.

N: Will take you back to the Control Point Status screen.

S: Will take you to the Schedule Group, if any, associated with the control point.

M: Will set the Accumulated Run Time TOTAL field back to zero.

C: Will take you to the Base Condition, if any, listed on the condition line.

A: Will take you to the associated Analog Input, if any.

D: Will take you to the associated Digital Input, if any.

CP #: The number of another Control Point -- you will be taken to that control point's EXPANDED STATUS screen.

If you enter "0" here, you will go back to the ACTION MENU.

5.314 OTHER TYPES OF CONTROL POINTS

Refrigeration control points are usually the most complex in layout and in the number of fields they contain. Defrost, lighting, and HVAC points all usually contain schedules. The next figure shows the expanded status of a defrost control point:

```
TUE  01/12/93    Danfoss Automatic Controls NC25 SYSTEM        25-01-40-04-02
TIME 0627:03            EXPANDED STATUS, C.P.#    5             Ace Market A

HGDEFA11                                        DEFROST

    STATUS                      TIMING                  ACCUM RUN TIME
    OUT MON CODE  MODE          LST ON   LST OFF CYC  TODAY   YESTERDAY TOTAL
 5  OFF       0                 0020:08  0025:08   1  0005:00  0005:00       27

SCHEDULE GROUP #    5
      ON/OFF        DAYS      CYCLE          ON/OFF         DAYS       CYCLE
 1  0020  0044 *** ALL DAYS **

BASE COND  #  1



ALARMS :

CHANGE  Y/N/S/M/C/A/D/CP # :
```

5. The EXPANDED STATUS of a point operated by only a schedule and a condition. Quite a bit simpler than for a refrigeration point.

"Type" Field

Point types other than refrigeration include a field opposite the name of the point, which give its type (in this case,DEFROST).

Schedule Group Listing

If there is a schedule group (it's called a "group" even if it only contains one schedule) associated with the point, it will appear in the EXPANDED STATUS screen. In this case, the defrost point is scheduled to operate for 24 minutes each day, from 20 minutes after midnight until 44 minutes after midnight.

5.315 THE CONTROL POINT CHANGE SCREEN

When you answer "Y" to the prompt in an EXPANDED STATUS screen, first the heading lines display as always, then, each time you hit the <RTN> key, the succeeding prompt line appears. Here's a control point change screen:

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 1622:46            EXPANDED STATUS, C.P.#    1              Ace Market  A


NAME:      RACK A1I        CHANGE : ________
OFF TIME (MIN)    =   0    CHANGE : __
ON TIME (MIN)     =   0    CHANGE : ___
RATE OF CHNG(Y/N)=  Y      CHANGE : _
TEMP SENSOR #     =  28    CHANGE : __
TEMP VAR ALLOWED  =   0    CHANGE : _
PSI VAR ALLOWED   =   5    CHANGE : _
SENSITIVITY       =  10    CHANGE : __
MAN (COM/ON/OFF) = COM     CHANGE : ___
CORRECT? (Y/N):  _
```

6. The CHANGE SCREEN for a refrigeration control point.

Each prompt contains the current value of the parameter, followed by the word CHANGE, then a number of spaces for a new value. The number of spaces in each prompt is the maximum number of characters which can be used in the field.

Note that the target pressure for the rack and target temperature are set in the STANDARDS/SETPOINTS screen rather than here.

5.316 Fields in the Change Screen for a Refrigeration Control Point

NAME: RACK A1I
The name of the control point.

OFF TIME (MIN) This field and the next, ON TIME (MIN) must be zero if rate-of-

change control is to be used. The value of this parameter is the minimum off time which must expire after the compressor stops before it can be turned ON again by the refrigeration algorithm.

ON TIME (MIN) This field and OFF TIME (MIN) must be zero if rate-of-change control is used. The value is the minimum run time which must expire after the compressor is turned ON before the refrigeration algorithm can turn it OFF.

RATE OF CHANGE(Y/N)
Here choose whether you want rate-of-change control or not.

TEMP SENSOR # The number of the temperature sensor whose value will be used for feedback to the rate-of-change pressure control. This should be the target fixture temperature you are trying to maintain.

If a 0 (zero) is entered here, temperature modification of the pressure target will not occur; but the target pressure will still be maintained as an average.

TEMP VAR ALLOWED The variance, plus or minus, that is added to the target temperature to provide the limit at which the target pressure is modified.

PSI VAR ALLOWED The variance, plus or minus, that determines the limits within which the target pressure "float" due to the action of temperature modification.

SENSITIVITY A number from 1 to 10 which governs the speed at which the refrigeration algorithm reacts to changes in suction pressure. The lower the sensitivity number, the faster the algorithm will act to turn compressors on and off in response to changing pressure. It is useful to remember that a low sensitivity will result in tighter pressure control, but more machine cycling. The sensitivity function is not used for variable speed compressors.

MAN (COM/ON/OFF) This value provides the override status of the control point -- either COMputer control, override ON, or override OFF.

CORRECT? (Y/N) After you have made a change, it will not take effect until you enter Y<RTN> (and you must have a sufficient authorization level). If you enter N<RTN>, no entry you have made in the change screen will take effect.

Entering <CTRL>-J after responding "Y" to the final change screen prompt will take you to the first line of the change screen for the next control point.

5.317 Fields in the Change Screen for a non-Refrigeration Control Point

There are two fields which are different in this screen.

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM   25-01-40-04-02
TIME 0625:28             EXPANDED STATUS, C.P.#    5        Ace Market A


NAME:      HGDEFB11        CHANGE : ________
MIN HRS BTWN DEF =   1     CHANGE : __
MANUAL DELAY(MIN)=  20     CHANGE : __
MAN (COM/ON/OFF) = COM     CHANGE : __
CORRECT? (Y/N):  _
```

7. The change screen for a non-Refrigeration control point, in this case a defrost control point.

`MIN HRS BTWN DEF` The number of hours which must elapse after a defrost ends before another defrost (manual or computer) can occur.

`MAN DELAY(MIN)` (Defrost points only) The number of minutes duration of a manual defrost. For reasons of product safety, a defrost point overridden ON will return to computer control after expiration of the `MAN DELAY` time. (If there is a condition (e.g. temperature termination), it must be true for manual defrost to occur.)

5.32 CASE/ BOX STATUS SCREEN

This screen contains information about to Danfoss AKC16 Smart Case Controllers on the network. For complete information on AKC16's, see the Danfoss ***AKC16 User Manual***, which is available in printed and disk-based versions.

5.33 CONTROL ALARMS REPORT SCREEN

The CONTROL ALARMS REPORT displays two types of alarms: (1) system alarms and (2) control point alarms.

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-45
TIME 1625:08             CONTROL ALARMS REPORT                   Ace Market  A


SYSTEM ALARMS
   THU   0454  HI CASE TMP# 6B            WED   0805  POWER FAIL #16
   WED   0805  POWER FAIL #15             WED   0453  HI CASE TMP# 6B
   WED   0453  HI CASE TMP# 6A            TUE   0452  HI CASE TMP# 6C
   TUE   0452  HI CASE TMP# 6B            TUE   0452  HI CASE TMP# 6A
   MON   1837  HI CASE TMP# 6A            MON   0450  HI CASE TMP# 6C
   MON   0450  HI CASE TMP# 6B            SUN   0053  HI CASE TMP#16B
CP #10  INVRTRA1
   MON   0848  RESET(COM)                 SAT   1505  MAN OFF(COM)
CP #37  ELDEFA09
   FRI   1421  RESET(COM)                 FRI   1320  MAN ON(COM)
ENTER CP #, RTN FOR NEXT PAGE, OR 0 FOR MENU :
```

8. The CONTROL ALARMS REPORT screen.

5.331 System Alarms

SYSTEM ALARMS consist of the day of the week and time that an alarm occurred, the name of the Analog Input, Digital Input or Condition that was in an alarm state, and the Sensor Alarm Number. A Lockout type Control Point can also generate a DOWN Alarm, which indicates the number of the Control Point or Sensor Alarm which caused the lockout.

5.332 Control Point Alarms

Control Point ALARMS indicate that day of the week and time that a Control Point was overridden in software or returned to computer control.

5.34 KWH STORAGE DISPLAY SCREEN

The NC25 has four meter inputs, and each of these hasa dedicated KWH storage display screen. That means that with appropriate sensors (current transformers) and transducers (watt-hour transducers) power consumption at up to four points can be measured and recorded. It is not unusual to find a rack controller used without employing the meter inputs at all.

Five pages can be displayed in the KWH STORAGE DISPLAY screen: one for each meter input and one, the fifth page, giving the total of the other four pages. If less than four meter inputs are used, their respective pages will be blank.

```
TUE  01/12/93          Danfoss-EMC, Inc.  NC25 SYSTEM          25-00-40-04-32
TIME 0628:21              KWH STORAGE DISPLAY      1             Ace Market  A

          KWH                          KWH                          METER 1
HOUR TODAY  YESTERDAY    HOUR TODAY  YESTERDAY                  THIS       LAST
0000   72      72        1200   51      54                     MONTH      MONTH
0100   77      77        1300   54      56       KWH           2557      52721
0200   75      76        1400   34      53       PEAK DAY         1          7
0300   76      78        1500    0      52      PEAK TIME      1717       1728
0400   74      79        1600    0      54      PEAK 15 MIN      23         26
0500   77      77        1700    0      84       LAST 15 MIN     14
0600   75      75        1800    0      78                     THIS       LAST
0700   49      50        1900    0      80         DAILY       WEEK       WEEK
0800   55      56        2000    0      78          SUN        1617       1667
0900   57      59        2100    0      79          MON        1627       1698
1000   53      54        2200    0      78          TUE         930       1662
1100   51      55        2300    0      73          WED        1585       1702
                      TOTAL      930   1627          THU        1615       1688
PEAK 15 MIN                                           FRI        1659       1692
0546   22                                             SAT        1644       1708
1717           23                                                MULT:  1.400
RETURN FOR NEXT PAGE, OR 0 FOR MENU:
```

9. The KWH STORAGE DISPLAY screen.

Hourly totals for today and yesterday are accumulated into weekly and monthly totals and a record is kept of a Peak Window with the date and time it occurred.

5.35 CONDITION CODE LISTING SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-45
TIME 1625:28              CONDITION CODE LISTING                Ace Market  A

NUMBER  BOOLEAN  SENSOR OR SCHEDULE    VALUE              C.P. ASSOCIATION
  1        ^     INVRTRA1  CPT      [  ON ]                 NESTED

  2 F            OILFL A1  DIN      [ OFF ]                 OILRSTA1
      and ^      OILRSTA1  CPT      [ OFF ]

  3 F            OILFL A2  DIN      [ OFF ]                 OILRSTA2
      and ^      OILRSTA2  CPT      [ OFF ]

  4 F            OILFL A3  DIN      [ OFF ]                 OILRSTA3
      and ^      OILRSTA3  CPT      [ OFF ]

  5        (     DISCH A#  AIN      [166.2]                 NESTED
        -        RACK A #  AIN      [  4.7]          )
                 X -> VARIANCE

CHANGE Y/RTN/CONDITION # :
```

10. The CONDITION CODE LISTING screen.

Although the NC25 software is extensive and extremely flexible in the control and monitoring routines it provides, every application is unique in many respects. The conditions list for an NC25 allows programming for the needs of specific devices and situations. The CONDITION CODE LISTING SCREEN contains the logic statements unique to a particular controlled site. Each logical statement has either a truth value (TRUE or FALSE) or a numeric value; those values can be used as variables in the control application.

The most comprehensive treatment of condition structure and function is given in manuals for Danfoss BUILD software.

5.351 FIELDS IN THE CONDITION CODE LISTING SCREEN

NUMBER

The number of the condition. This number will appear in control point EXPANDED STATUS screens (see section 5.312). When this condition is part of another condition ("nested"), the number will be used in the other condition it forms a part of.

Status sub-field

After the condition number, if the condition is not "nested," a T or F will appear, indicating the current truth value of the condition.

BOOLEAN

The logical operator applying to the statement on the same line in the next field. It is called Boolean after George Boole, an 18th century mathematician who created the system and symbols for the algebra of logic.

In the example used in *figure 10,* the condition 1 uses the symbol "^" as a Boolean operator. That symbol means "NOT," so the condition will be true if the `INVRTRA1` control point is OFF.

There are several other Boolean operators; in addition, this field can contain the more familiar arithmetic operators `+`, `-`, `/` (for "divided by"), and `*n` (for "multiplied by", where `n` is a number of decimal places). Here are the possible Boolean operators and their meanings:

AND for the expression to be TRUE, both arguments (the expressions

separated by the AND) must be true.

^	means exactly what it says. for the expression to be TRUE, what follows must be OFF or FALSE.
OR	for the expression to be TRUE, one or both of the arguments must be TRUE.
>	is greater than
<	is less than
=	is equal to
>=	is greater than or equal to
<=	is less than or equal to
^=	is not equal to
+	plus
-	minus
*n	multiplied by, where n is a numeral indicating the number of places to the right of the decimal point in the product.
/	divided by
\	mod (the result of this operation is the remainder when the number preceding the operator is divided by the number following the operator.
( )	parentheses. Treat the enclosed expression as one number. Remember, in reading conditions, to evaluate expressions in parentheses first.

You will often see parentheses within parentheses. If so, evaluate expressions in order, solving the innermost expression first.

SENSOR OR SCHEDULE

The "argument," or value being operated on in the condition. In the example used in *figure 10*, condition 1 uses a control point, INVRTRA1, as the argument. A

control point is TRUE if it is ON.

The SENSOR OR SCHEDULE field may contain a sensor name or schedule number, but it may also contain (as does condition 1 in *figure 10*) the name of a control point; or a setpoint or the number of another condition. You get some help here, because there is a subfield following which specifies in cases where the "sensor or schedule" is a control point (CPT), a digital input (DIN), or an analog input (AIN).

In complex conditions, the need to have many arguments and operations requires several lines in the screen. This can make conditions difficult to read, especially if they have several levels of parentheses. Even very experienced users, when analyzing a complex condition, will often write it out on a single line in order to evaluate it.

VALUE

The current value, if any. For control points and digital inputs, the values will be either ON or OFF. For analog sensors or outputs, the value will be the output or sensed numerical value.

C.P. ASSOCIATION

The control point for which this condition is effective; or, the word NESTED. Nested conditions are those used as arguments in other conditions. Nesting can be several layers deep; that is, a condition can call a condition which can call another condition, and so on.

5.352 THE CONDITION CODE CHANGE SCREEN

The only variable that can be changed directly in a Condition is a CONSTANT. To make a change, from the prompt in the CONDITION CODE LISTING screen, type the number of the condition in which you wish to change a constant, then a <SPACE>, then Y<RTN>, like this:

You enter:	16 Y<RTN>
NC25 responds:	__

You will enter the new constant, which will overwrite the underline characters. Other changes to condition parameters can be made in the BUILDING STANDARDS screen or with the BUILD programs.

5.36 TODAYS AND YESTERDAYS . . . AVERAGES SCREENS

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1625:49             TODAYS AVERAGES          1             ACE Market  A

ANALOG CHANNEL       CURRENT       MAXIMUM            MINIMUM
   1  RACK A #         4.7P     1100    18.0P     0656     0.7P

 HOUR        MINUTES AFTER HOUR          HOUR        MINUTES AFTER HOUR
          00      15      30      45              00      15      30      45
 0000    7.8     7.6     7.9     8.3     0100    7.9     8.3     7.7     7.5
 0200    7.9     7.4     7.6     8.4     0300    8.0     6.2     7.6     6.8
 0400    7.5     7.7     8.1     8.9     0500    7.4     6.7     8.0     6.0
 0600    4.2     4.0     2.8     8.2     0700    8.5     8.0     5.1     3.9
 0800    6.5     7.1     7.2     5.2     0900    3.6     6.3     7.5     4.7
 1000    4.0     5.3     5.2     7.1     1100    7.7     4.1     6.0     4.5
 1200    5.6     5.3     6.3     4.9     1300    5.0     5.4     6.4     5.4
 1400    5.1     5.0     5.0     4.8     1500    4.9     5.2     5.8     5.7
 1600    5.3     0.0     0.0     0.0     1700    0.0     0.0     0.0     0.0
 1800    0.0     0.0     0.0     0.0     1900    0.0     0.0     0.0     0.0
 2000    0.0     0.0     0.0     0.0     2100    0.0     0.0     0.0     0.0
 2200    0.0     0.0     0.0     0.0     2300    0.0     0.0     0.0     0.0

RETURN FOR NEXT PAGE, OR 0 FOR MENU:
```

11. The TODAY'S AVERAGES screen. The YESTERDAY'S AVERAGES screen has the same fields.

The AVERAGES screens contain, for each analog sensor, its number and name, its current value, its maximum and minimum for the period displayed and the time at which the maximum or minimum value occurred, and the average sensor value for every fifteen minutes.

The "next page" referred to by the prompt will contain today's values for the next analog sensor. To see yesterday's averages for the same sensor you are now looking at, enter Y<RTN> from the TODAY"S AVERAGES screen.

In TODAY'S AVERAGES, sensor value averages are posted to the screen every quarter hour, but there is a quarter hour posting delay. Thus in our example (*figure 11*), the most recent average posted is for the period ended at 1600, even though the current time is past 1615. The average for the fifteen minutes ending at 1615 will be posted at 1630.

Averages for periods which have not yet occurred are shown as zeros.

The TODAY'S AVERAGES and YESTERDAY'S AVERAGES screen are identical in layout. Each day just after midnight, all

of the values are erased from the YESTERDAY'S AVERAGES screen and are replaced by the contents of TODAY'S AVERAGES.

5.37 SCHEDULE GROUP SCREEN

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM        25-01-40-04-02
TIME 0629:16             SCHED GROUP/CONTROL PT  6                Ace Market  A

LITE B11
SCHEDULE GROUP #   6
      ON/OFF        DAYS       CYCLE          ON/OFF        DAYS       CYCLE
 1  0600  2200 MTWRFAS 2345678        2  2200  2400 *** ALL DAYS ***
 3  0800  2000        1

SCHEDULE TO CHANGE                    CHANGE :
```

12. The NC25 SCHEDULE GROUP screen.

Schedules are used in three ways by the NC25. They can be attached to control points, or used as arguments in conditions, and used to select dial-out telephone numbers for alarms. An NC25 may have up to 80 schedules; they are used in groups, and even a single schedule in a control point or condition is called a group -- it is a group with only one member.

Each page of the SCHEDULE GROUP screen contains a single schedule group. If the schedule is part of a control point, the control point number will appear in the heading, and the name of the control point will appear in the body of the screen, as does LITE B11 in the screen shown in *figure 12*.

Each schedule has an ON time, an OFF time, and DAYS for which it is active. The active DAYS may be all days, any combination of days of the week, where

M	=	Monday
T	=	Tuesday
W	=	Wednesday

R	=	Thursday
F	=	Friday
A	=	Saturday
S	=	Sunday
1	=	holiday type 1
2	=	holiday type 2, etc., up to 8

The holiday types, 1-8, are defined in the HOLIDAY DATE RANGES screen, which will be covered later in this manual.

Remember that a schedule can only be accessed specifically; in other words, you must enter a particular schedule number when you use the "@" command. If you simply enter @9<RTN>, you will be returned to the "expert mode" ACTION MENU.

5.371 SCHEDULE GROUP CHANGE SCREEN

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 0629:16             SCHED GROUP/CONTROL PT  6               Ace Market  A

LITE B11
SCHEDULE GROUP #   6
      ON/OFF        DAYS      CYCLE         ON/OFF        DAYS      CYCLE
      ON/OFF        DAYS      CYCLE         ON/OFF        DAYS      CYCLE
 1  0600  2200 MTWRFAS 2345678        2  2200  2400 *** ALL DAYS ***
 3  0800  2000        1

SCHEDULE TO CHANGE                   CHANGE : 2


 TIME ON          =       2200        CHANGE : ____
 TIME OFF         =       2400        CHANGE : ____
 DAYS ON          =  ***ALL DAYS***   CHANGE : ______________
 CORRECT? (Y/N):  _
```

13. The SCHEDULE GROUP screen after you have asked to change a schedule. Note the addition of the change prompts.

When you enter a schedule number to change, the prompts appear one at a time each time you hit <RTN>. You enter the times you want and the days.

The "X" Days Shortcut

If you want a schedule to be active every day, you don't have to enter "SMTWRFA12345678," (remember, there are eight possible holiday types, and you would have to

enter the numbers of any you had defined if you wanted the schedule TRUE on "all days." Obviously, that's a task that should be simpler, so you can simply enter X<RTN> at the DAYS ON prompt.

5.38 PHONE NUMBERS REPORT SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-45
TIME 1627:11             PHONE NUMBERS REPORT                   Ace Market  A

1  13235768901
2
3

ENTER ITEM # TO ALTER :
```

14. The PHONE NUMBERS REPORT screen. Be sure to check your schedules periodically! Look at the change prompts to inspect them.

The PHONE NUMBERS REPORT screen contains the telephone numbers the NC25 (if address 0) will dial when there is a system or sensor alarm. ***An NC25 networked to a ZX network manager must have a dummy phone number (e.g. "123" in order for its alarms to be dialed out by the ZX.***

When an alarm becomes active, it will dial each number whose schedule is TRUE, starting with telephone number #1, every fifteen minutes until it connects and transmits the alarm. Five attempts will be made to dial out to telephone numbers #2 and #3; but the NC25 will continue to call telephone number #1 every fifteen minutes until it connects and transmits the alarm.

Check your schedules!

Dial-out will only occur to numbers with a valid schedule.

5.381 TELEPHONE NUMBERS CHANGE PROMPTS

When you enter a telephone number to change, you willalso be able to change the schedule for dialout to that telephone number. The prompts will appear as a continuation of the PHONE NUMBERS REPORT screen. Let's say you entered 1<RTN> at the prompt:

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-45
TIME 1627:11             PHONE NUMBERS REPORT                   Ace Market  A

1  13235768901
2
3

ENTER ITEM # TO ALTER :1

PHONE # = :  13235768901   CHANGE : __________

SCHEDULE GROUP #  123

      ON/OFF        DAYS      CYCLE         ON/OFF        DAYS      CYCLE
 1  0000  2400 *** ALL DAYS **

SCHEDULE TO CHANGE                    CHANGE : 1_
TIME ON          =       0000         CHANGE : ____
TIME OFF         =       2400         CHANGE : ____
DAYS ON          = *** ALL DAYS ***   CHANGE : ______________

CORRECT? (Y/N):  _
```

15. The PHONE NUMBERS REPORT screen with the change prompts displayed.

Change the telephone number as needed, remembering to use a "prefix 1" if needed and to use an area code if needed from the location of the NC25.

IMPORTANT:

If alarms defined in the NC25 are to be posted up to a Network Manager (ZX or AKCESS), there must be a number (by convention Danfoss engineers use 123) in telephone number slot #1, and a valid schedule for that telephone number)

When you enter changes, you should always check to insure that you entered (and the NC25 accepted) the exact data you wanted. The only way to do that is to re-display the change screen (you can inspect without making any changes, just hit @10 or any other "@ command" at the prompt, or a <RTN>.

5.39 HOLIDAY DATES RANGES SCREEN

Holiday date ranges are periods of one or more days for which you need schedules other than those for the regular weekdays.

On a holiday, the day of the week in the upper left of the screen will appear as H1, H2, etc., rather than the regular weekday name.

In scheduling, remember that ***ALL DAYS*** includes holidays. In order for the holiday schedule to be effective, the number of the holiday must be left out of the DAYS field in the schedule. Look back at *figure 12*, and you will see that holiday #1 has been left out of schedule #1, and that a special schedule for holiday range #1 has been entered.

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 0629:50              HOLIDAY DATE RANGES                   Ace Market  A

                BEGIN  MO DAY  END MO DAY                BEGIN  MO DAY  END MO DAY

  HOLIDAY RANGE # 1    1 01        1 02   HOLIDAY RANGE # 2   0 00        0 00
  HOLIDAY RANGE # 3    0 00        0 00   HOLIDAY RANGE # 4   0 00        0 00
  HOLIDAY RANGE # 5    0 00        0 00   HOLIDAY RANGE # 6   0 00        0 00
  HOLIDAY RANGE # 7    0 00        0 00   HOLIDAY RANGE # 8   0 00        0 00

ENTER ITEM # TO ALTER :1
```

16. The HOLIDAY DATE RANGES screen.

Each HOLIDAY RANGE has a beginning day and an ending day. Remember that days begin at 0000 and end at the following 2400.

Holiday ranges must not include the change from one year to the next.

5.391 HOLIDAY DATE RANGES CHANGE PROMPTS

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 0629:50              HOLIDAY DATE RANGES                   Ace Market  A

                BEGIN  MO DAY  END MO DAY              BEGIN  MO DAY  END MO DAY

  HOLIDAY RANGE # 1   1 01        1 02   HOLIDAY RANGE # 2   0 00        0 00
  HOLIDAY RANGE # 3   0 00        0 00   HOLIDAY RANGE # 4   0 00        0 00
  HOLIDAY RANGE # 5   0 00        0 00   HOLIDAY RANGE # 6   0 00        0 00
  HOLIDAY RANGE # 7   0 00        0 00   HOLIDAY RANGE # 8   0 00        0 00

ENTER ITEM # TO ALTER :1
BEG MONTH = 1  CHANGE : __
BEG DAY   = 1  CHANGE : __
END MONTH = 1  CHANGE : __
END DAY   = 2  CHANGE : __
CORRECT Y/N    CHANGE : _
```

17. The HOLIDAY DATE RANGES screen after you've entered an "ITEM # TO ALTER"

When you enter the number of a holiday date range to alter, the change prompts appear one at a time as a continuation of the HOLIDAY DATE RANGES screen. As usual, changes take effect only after you answer "Y" to the last prompt.

Holiday date ranges can extend over more than one month, but must begin and end in the same year.

5.40 HISTORY POINTERS SCREEN

The NC25 can store 180 samples from each of 20 points, which may be analog or digital inputs or control point outputs.

By default, history samples are stored in a "rolling window" where the oldest sample is lost when the newest is written. As an option, you can specify an alarm in the change screen, and when that alarm occurs, the history for that page will "lock," either immediately or after a specified further number of intervals. Locking after an alarm occurs insures retention of history for 180 intervals before the lock, and is a powerful troubleshooting tool.

When you look at a HISTORY POINTER screen after locking has occurred, you will find that one of the samples is followed by a *, and that is the interval at which locking occurred. If a number of COUNTS AFTER LOCK has been specified, there will be that many additional samples after the one with the *.

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 1628:14               HISTORY POINTER          1             Ace Market  A

SAMPLE INTERVAL IS   0 MINS, 12 SECS. ANALOG   RACK A #  RUNNING

  4.2    4.5    4.5    4.5    4.2    4.2    4.0    4.2    4.2    4.5
  4.7    5.0    4.7    5.0    5.2    5.0    5.0    5.2    5.2    5.2
  4.7    5.0    5.0    5.0    5.2    5.0    5.2    5.7    6.0    6.2
  6.5    6.2    6.0    6.0    5.5    5.2    5.0    5.0    5.0    5.0
  5.0    5.2    5.5    5.2    5.2    5.5    5.2    5.0    5.0    5.2
  5.0    5.2    5.2    5.0    5.0    5.2    5.2    4.7    5.0    5.0
  5.0    4.7    5.2    5.7    5.5    5.7    5.7    5.7    6.2    6.0
  5.7    6.0    6.0    5.7    5.2    5.5    5.5    5.2    5.2    5.0
  5.0    4.5    4.7    4.7    4.2    4.2    4.2    4.5    4.7    4.5
  4.5    5.0    4.7    5.0    5.5    5.7    5.7    6.0    5.7    6.0
  5.7    6.0    5.7    6.0    6.0    6.0    6.0    6.0    6.0    6.0
  6.0    5.7    5.7    5.5    5.7    6.2    6.2    6.0    6.2    6.2
  6.5    6.2    6.2    6.0    5.7    5.5    5.2    5.2    5.2    5.0
  5.0    4.7    4.7    4.7    4.7    4.7    4.7    4.7    4.7    5.0
  5.2    5.5    5.5    5.7    5.7    6.0    6.0    6.5    6.2    6.0
  6.0    5.2    4.7    4.5    4.2    4.2    4.0    4.2    4.2    4.0
  3.7    4.0    4.5    4.2    4.7    4.7    5.0    5.2    5.2    5.5
  5.7    5.7    6.2    6.2    6.0    6.2    6.0    5.7    5.7    6.0
```

18. The HISTORY POINTERS screen.

There are up to 20 pages of the HISTORY POINTER screen, one for each point defined in the change screen. *figure 18* shows history for this NC25's analog input 1, which is the suction pressure for rack A. The sampling interval has been set to 12 seconds. Any interval, in minutes and seconds up to 480 minutes, can be specified in the change screen.

A locked HISTORY POINTER page can only be "unlocked" by going into its change screen and responding "Y" to the last prompt (whether or not a change is made).

5.401 HISTORY POINTERS CHANGE SCREEN

The prompts appear one at a time. Most are explained in the preceding paragraphs. For the third prompt, you must enter the point number preceded by:

- P if you want history of a control point output;
- D if you want history of a digital input;
- A if you want history of an analog input.

Then enter the number of the point. The numbers of the analog and digital inputs are listed in the DIGITAL SENSOR REPORT (@13) and ANALOG SENSOR REPORT(@14), which are discussed in the following two sections. You can find the control points listed by number in the CONTROL POINT STATUS screen (@1).

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM   25-01-40-04-02
TIME 0625:28                HISTORY POINTER          1      Ace Market A


INTERVAL(MIN)        =       0  CHANGE : ___
INTERVAL(SEC)        =      15  CHANGE : ___
POINT/SENSOR(P/D/A)=     A  2  CHANGE : ___
ALARM # FOR LOCK     =       0  CHANGE : ___
COUNTS AFTER LOCK    =       0  CHANGE : ___
CORRECT? (Y/N):  _
```

20. The HISTORY POINTER change screen.

The response to the ALARM # FOR LOCK prompt should be a sensor alarm number taken from the SENSOR ALARM REPORT, which you will find in section 5.43 of this manual.

5.41 DIGITAL SENSOR REPORT SCREEN

The DIGITAL SENSOR REPORT screen displays the number, name, and value of all of the NC25's digital inputs.

There are two digital inputs, #49 and #50, which can only be displayed by entering @13 n, where n is some number greater than 2, or by entering 49<RTN> at the prompt. The normal "next page" action, entering a <RTN> at the prompt at the bottom of the page, will not display them. Inputs 49 and 50 give the status of the RS-485 communications bus and the NC25's hardware clock, and are used for programming and diagnostic purposes.

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 1628:59               DIGITAL SENSOR REPORT    1              Ace Market  A

 NO    NAME      VALUE      NO    NAME      VALUE      NO    NAME      VALUE
  1   RACK A1I     ON      17*  TOM          OFF      33*  9 DEFA09    OFF
  2   RACK A 2     ON      18*  SPARE        OFF      34*  10DFA10A    OFF
  3   RACK A 3     ON      19*  SPARE        OFF      35*  11DFA10B    OFF
  4   SPARE       OFF      20*  SPARE        OFF      36*  12DFA10C    OFF
  5   OILPMP A    OFF      21*  SPARE        OFF      37*  13DFA11A    OFF
  6   OILFAN A     ON      22*  SPARE        OFF      38*  14DFA11B    OFF
  7   SPARE       OFF      23*  SPARE        OFF      39*  15DFA11C    OFF
  8   INVPRFA1     ON      24*  SPARE        OFF      40*  16DEFA12    OFF
  9   INVFLTA1    OFF      25*  1 DEFA01     OFF      41*  CFAN A 1     ON
 10   PHLOSS A    OFF      26*  2 DEFA02     OFF      42*  CFAN A 2     ON
 11   OILLEV A    OFF      27*  3 DEFA03     OFF      43*  CFAN A 3     ON
 12   OILFL A1    OFF      28*  4 DEFA04     OFF      44*  CFAN A 5     ON
 13   OILFL A2    OFF      29*  5 DEFA05     OFF      45*  CFAN A 7     ON
 14   OILFL A3    OFF      30*  6 DEFA06     OFF      46*  CFAN A 9     ON
 15   SPLTVLVA    OFF      31*  7 DEFA07     OFF      47*  SPARE        ON
 16   HWHTRC A     ON      32*  8 DEFA08     OFF      48*  SPARE       OFF

CHANGE = Y/NEW #/NEXT PAGE = RTN/0 = MENU:1 Y
```

21. The DIGITAL SENSOR REPORT screen.

Override Indicator Any sensor which has been set (by change screen) to a manual value will display an M after its ON or OFF value.

Special character * An NC25, by hardware configuration, can have available 8, 16, 32, or 48 real digital inputs. All points which are not supported by hardware are shown with an asterisk (*) following their number in the DIGITAL SENSOR REPORT. Even if the hardware is not present, all of the digital input points exist in software, and are often used to record the LAST ON, LAST OFF, and RUN HRS times for control points as in our example *figure 21*.

5.411 DIGITAL SENSOR CHANGE SCREEN

From the DIGITAL SENSOR change screen, you can change the name of a digital input if the need arises; you can also override the point so that it will always read ON or OFF rather than reflect the true value of what it is monitoring.

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 1629:44             CHANGE DIGITAL SENSOR#   1              Ace Market  A

NAME:     RACK A1I          CHANGE : ________
MANUAL(Com/ON/OFf)= COM     CHANGE : ___
CORRECT? (Y/N):  _
```

22. The DIGITAL SENSOR change screen.

5.42 ANALOG SENSOR REPORT SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM       25-01-40-04-02
TIME 1630:19             ANALOG SENSOR REPORT     1              Ace Market  A

 NO    NAME      VALUE      NO    NAME      VALUE      NO    NAME      VALUE
  1   RACK A #    5.5P     17*  RIICTA01  -14.9F     33*  CASE TMP  -16.7F
  2   DISCH A#  164.3P     18*  RIICTA02  -12.5F     34*  SPAREAKC    0.0F
  3   SUCT   A   30.1F     19*  RIFFTA03   -8.8F     35*  SPAREAKC    0.0F
  4   DISCH  A  206.1F     20*  MDFFTA04   -7.0F     36*  SPAREAKC    0.0F
  5   DRPLEG A   84.2F     21*  MDFFTA05   -2.7F     37+  SPEED A1   79.9%
  6   SUBCL  A   38.6F     22*  RIFFTA06   -4.6F     38+  RPM'S A1   2880*
  7   LIQUID A   83.4F     23*  RIFFTA07   -1.7F     39+  DIF#CALC  158.2P
  8   SPARETMP    0.0FM    24*  RIFFTA08   -4.4F     40+  DISCH A#    163P
  9   OIL    A  168.3F     25*  SDFFTA09   -9.2F     41*  OTSD TMP   90.6*
 10   DISCH A1  100.0FM    26*  SDFFTA10   -5.6F     42*  DEWPOINT   45.3*
 11   DISCH A2  100.0FM    27*  SDFFTA11   -8.1F     43*  SPARE       0.0*
 12   DISCH A3  100.0FM    28*  SDFJTA12  -16.7F     44*  SPARE       0.0
 13   LIQLEV A   30.0%M    29*  SPAREAKC    0.0F     45*  SPARE       0.0
 14   LK RACKA     70p     30*  LIQ TMP   -21.5F     46*  SPARE       0.0
 15   LK DYPIT      0pM    31*  GAS OUT    -6.8F     47*  SPARE       0.0
 16   SPARETMP    0.0FM    32*  SUPERHT    14.7F     48*  SPARE       0.0

CHANGE = Y/NEW #/NEXT PAGE = RTN/0 = MENU:1 Y
```

23. The ANALOG SENSOR REPORT screen.

The ANALOG SENSOR REPORT displays the number, name, value, units of measure, and override status of each analog sensor.

Special character:

*

A * after the sensor number indicates analog information being received from another member of the control network rather than being from a sensor wired to this NC25. The * could also indicate a virtual point, such as one used to hold the result of a calculation rather than a measured (sensed) value.

Special character:

+

A + after the sensor number indicates that the value is being calculated by a condition rather than being read from physical sensor hardware.

INDICATORS FOR UNITS OF MEASURE

The units of measure are indicated immediately following the value of the sensor, and for reasons of compactness, a single character is used. When the NC25 database is written, a units-of-measure character is selected for each analog sensor. Here are some of the more common units of measure and their abbreviations:

P	(upper case) pressure in PSI
F	temperature in degrees Fahrenheit
p	(lower case) parts per million
%	per cent

Override Indicator:

M

As with digital sensors, an M after the value for a sensor indicates that the sensor is in override and has been manually set to that value.

5.421 ANALOG SENSOR CHANGE SCREEN

By entering @14 n Y, where n is the number of an analog sensor you want to change, you will display the change screen for that analog sensor. That is the most efficient way to get to the change screen from any prompt, but if you are looking at the ANALOG SENSOR REPORT screen, you can also enter n Y to display the change screen.

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1630:50             CHANGE ANALOG SENSOR #   1             Ace Market  A

NAME:      RACK A #          CHANGE : _______
ADJUSTMENT OFFSET=    0      CHANGE : ___
MANUAL (Com/Man) =  COM      CHANGE : ___
CORRECT? (Y/N):  _
```

24. The ANALOG SENSOR change screen.

From this change screen, you can change the name of the sensor, enter an offset (either plus or minus) which will be added to the value sensed, or override the value.

CAUTION (OFFSET)

If an analog sensor is offset, there will be no special character displayed with the value in any other screen. The only way to determine that an offset has been applied to a sensor value is to inspect the ANALOG SENSOR CHANGE screen -- something the casual operator is unlikely to do.

If you enter MAN to override a sensor, you will be prompted for a VALUE. In answer to the prompt, enter the value you want the sensor to read until it is restored to COMputer control. An analog sensor set to MANual mode will display an M following its value.

5.43 SENSOR ALARM REPORT SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1631:04             SENSOR ALARM REPORT      1             Ace Market  A

 #     SENSOR      CATEGORY  PROG VALUES   CURR VALUES  ACTION   OCCURRED
 1 CN  38 COND      CYC >        3/0020        0/0006    CRIT    SAT 1505

 2 CN   3 COND      CYC >        2/0020        0/0009    CRIT    SAT 2242

 3 CN   4 COND      CYC >        2/0020        0/0016    CRIT

 4 AI   1 RACK A # P   >      20.0/0020                  CRIT
                  P   <       2.0/0010                  CRIT

 5 DI  11 OILLEV A ON  >          0002                  CRIT    THU 1513


CHANGE = Y/NEW #/NEXT PAGE = RTN/0 = MENU:1 Y
```

25. The SENSOR ALARM REPORT screen.

Thirty-two Sensor Alarms can be defined in an NC25, for either Analog Sensors, Digital Sensors, or Conditions.

The first three alarms defined in *figure 25* are condition alarms. Look at alarm number 2. What it says is: "Generate an alarm if CONDITION 3 cycles (becomes true) two times in 20 minutes." To review CONDITION 3, you can enter @6 3<RTN>. (The condition is printed in this manual in *figure 10,* found in section 5.35 -- the condition becomes TRUE any time the oil failure sensor for compressor A1 is ON and the oil reset control point remains off.)

Alarm number 4 in *figure 25* is based on an analog sensor, number 1, RACK A #, which is the suction pressure on rack A. The alarm has two "levels:" if the pressure is greater than 20.0 PSI for 20 minutes, a CRIT or "critical" alarm will result; and a CRIT alarm will also result if the pressure is less than 2.0 PSI for 10 minutes. Just now, the pressure is 5.5 PSI (look at the ANALOG SENSOR REPORT in *figure 23,* section 5.42 of this manual). If the pressure were outside the safe range as defined by one of the alarm levels, its value would appear in theCURR VALUES field of the SENSOR ALARM REPORT. The out of

range value would be displayed like this:

22.3/0014

meaning that the pressure is now 22.3 PSI and the sensor reading has been above 20.0 PSI for 14 minutes. If the pressure remains greater than 20 PSI for another 6 minutes, an alarm will be generated, will be posted in the CONTROL ALARMS REPORT (section 5.33 of this manual) and will dial out if a telephone number in the PHONE NUMBERS REPORT (section 5.38 of this manual) has a TRUE schedule.

Alarm number 5 in *figure 25* is based on a digital sensor, number 11, OILLEV A, and will occur if the oil level sensor reads on for 2 minutes. The alarm occurred on Thursday at 1513.

The ACTION field

The example alarms we have presented above are all set to the CRIT level. There are several other actions which can be programmed. A full list follows:

LOG This type of sensor alarm will only log its day and time of occurrence in the OCCURRED; it will not initiate a dialout.

ALM This ACTION will log occurrence of the sensor alarm in the OCCURRED field and will initiate a dialout if the alarm flag is clear. When a sensor alarm set to ALM is dialed out, it sets a software flag; no other sensor alarm set to ALM will dial out until the alarm flag is cleared. The alarm flag is cleared by running a data retrieval (DAT) while communicating with the NC25. This requirement assumes that when you respond to a dialed-out alarm, you will inspect the system for other alarms that have occurred; multiple dialouts to what is usually a long distance number are avoided.

The alarm flag ...

CRIT This ACTION will post the alarm to the CONTROL ALARMS REPORT and will dial out regardless of the condition of the alarm flag. CRIT is the most-used type of alarm for serious alarm conditions.

No second alarm will be generated unless the value being alarmed returns within bounds and then again exceeds the alarm limits for value and time.

NONE This type of sensor alarm will post to the CONTROL ALARMS REPORT and will dial out regardless of the

condition of the alarm flag. CRIT is the most-used type of alarm for serious alarm conditions.

5.431 SENSOR ALARM CHANGE SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1631:19              SENSOR ALARM REPORT      1            Ace Market  A


TYPE SENSOR(A/D/C) CN      CHANGE : __
ON  LVL (N/L/A/C)= NONE    CHANGE : ___
OFF LVL (N/L/A/C)= NONE    CHANGE : ___
CYC LVL (N/L/A/C)= CRIT    CHANGE : ___
SENSOR NUMBER     =    38  CHANGE : ___
CYCLE TIME (HHMM)=     20  CHANGE : _____
CYCLE COUNT       =     3  CHANGE : _____
CORRECT? (Y/N):  _
```

26. The SENSOR ALARM CHANGE screen for a condition alarm or digital sensor alarm.

Figure 26 shows the change screen with all prompts for a condition alarm. The same prompts will be presented for a digital sensor alarm. As soon as you enter CN for condition or DI for digital input, the NC25 will automatically present the prompts you need for that type of alarm.

Notice that each level of the alarm, ON, OFF, and CYC has an independent level setting. It is often useful to one level of an alarm as CRIT and another as NONE.

The change screen for an analog sensor alarm is presented next.

```
TUE  01/12/93      Danfoss Automatic Controls NC25 SYSTEM   25-01-40-04-02
TIME 0625:28             SENSOR ALARM REPORT      11        Ace Market A


 TYPE SENSOR(A/D/C) AI      CHANGE : __
 ON  LVL (N/L/A/C)= CRIT    CHANGE : __
 OFF LVL (N/L/A/C)= CRIT    CHANGE : __
 SENSOR NUMBER    =     7   CHANGE : __
 HHMM > HI LIMIT  =   100   CHANGE : ____
 HHMM < LOW LIMIT =   130   CHANGE : ____
 HIGH LIMIT       =  10.0   CHANGE : _____
 LOW LIMIT        = -15.0   CHANGE : _____
 CORRECT? (Y/N):  _
```

27. The change screen for an analog SENSOR ALARM.

In *figure 27*, you see the prompts that are displayed when you specify that you are going to define or change an analog sensor alarm. Now you must enter a time for each limit, high and low, and you must also enter the limits.

5.44 THE STANDARDS/ SETPOINTS SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1631:48             STANDARDS/SETPOINTS                     Ace Market  A

    STANDARD        A STD  B STD            STANDARD        A STD  B STD
 18 SUBCL A 1       40.0F  30.0F         19 SUBCL 2A        30.0F  25.0F
 20 RK A MLT         1.0P   0.0P         21 DRIP DWN         5.0    0.0
 22 RK A STB         0.0P   2.0P         23 RK A PSI         8.0P   1.0P
 24 RK A TMP         0.0F -15.0F         25 HIHEAD A       300.0P 250.0P
 27 SPLTCNDA        65.0F  60.0F         28 CFAN PSI         140P   120P
 29 OILPMP A       120.0P 130.0P         30 OILFAN A       160.0F 150.0F
 31 OILVLV A       120.0F 130.0F         33 %AUTH            6.4    6.4


 ENTER ITEM # TO ALTER :18
```

28. The STANDARDS/SETPOINTS screen.

The STANDARDS/SETPOINTS screen is used to store variables that are used in conditions and in certain types of control points.

Standards and setpoints are stored as pairs of values. Some are used as cut-in and cut-out setpoints while others, such as PSI TARGT, store the suction pressure target value and the safety cut-out pressure value.

Standard/Setpoint #33, AUTH, is the numerical authorization code which must be entered to make changes from the NC25 keypad.

5.441 STANDARDS/ SETPOINTS CHANGE SCREEN

```
THU  06/24/93      Danfoss Automatic Controls NC25 SYSTEM      25-01-40-04-02
TIME 1631:48             STANDARDS/SETPOINTS                    Ace Market  A

    STANDARD        A STD  B STD            STANDARD        A STD  B STD
 18 SUBCL A 1       40.0F  30.0F        19 SUBCL 2A        30.0F  25.0F
 20 RK A MLT         1.0P   0.0P        21 DRIP DWN         5.0    0.0
 22 RK A STB         0.0P   2.0P        23 RK A PSI         8.0P   1.0P
 24 RK A TMP         0.0F -15.0F        25 HIHEAD A       300.0P 250.0P
 27 SPLTCNDA        65.0F  60.0F        28 CFAN PSI         140P   120P
 29 OILPMP A       120.0P 130.0P        30 OILFAN A       160.0F 150.0F
 31 OILVLV A       120.0F 130.0F        33 %AUTH            6.4    6.4


ENTER ITEM # TO ALTER :18
 18 SUBCL A 1       CHANGE : ________
 18 SUBCL A 1       40.0F  CHANGE : ____
 18 SUBCL A 1       30.0F  CHANGE : ____

CORRECT? (Y/N):  _
```

29. The STANDARDS/SETPOINTS screen showing the CHANGE prompts.

The change prompts appear one at a time when you enter the number of a standard to change. You can change the name of the standard and either or both of the setpoints (first A, then B for a given standard). The changes take effect only after you answer Y<RTN> to the CORRECT? prompt.

APPENDIX A: Special Key Summary

KEY	DESCRIPTION
<RTN>	normally labeled on a keyboard as "RETURN" or "ENTER," <RTN>) functions as the terminator for commands to the NC25. See section 3.4 for a more detailed explanation.
<ESC>	ESCAPE. Has the same function as the <RTN> key except inside a change screen. Here it will allow jumping directly to the "CORRECT? Y/N" prompt. If already at the "CORRECT? Y/N" prompt, <ESC> will take you back to the first change screen prompt. You can also enter Y<ESC> at the "CORRECT? Y/N" prompt, which will make your changes take effect, then return you to the first change screen prompt. See section 3.5 for additional information.
BACKSPACE	When used during response to a prompt, will erase the preceding character each time it is pressed.
<CTRL>-D	Causes NC25 to break a telephone connection.
<CTRL>-F	Stops automatic refresh of data screens (Scrolling).
<CTRL>-O	Starts automatic refresh of data screens (Scrolling).
<CTRL>-J	When at the "CORRECT? (Y/N)" question at the end of a CHANGE screen for Control Points, Digital Sensors, or Analog Sensors; after entering either Y/N use <CTRL>-J instead of <RTN> to get to the top of the CHANGE screen for the next point.
@	Used from any prompt, even from the middle of a change screen, a command beginning with @ is interpreted by the NC25 as a command issued from the ACTION MENU prompt. If @ is entered without any further commands, the NC25 will display an AUTH prompt.

APPENDIX B: Data Retrievals (DATS)

In addition to the information in the DATA Screens there is a report format called Data Retrieval, often simply called a DAT, that allows the operator to dump certain ACTION MENU items in bulk directly to a printer or disk file for storage.

DATs are done from the AUTH Prompt (unless at the start of a session, when the NC25 initially asks for an AUTH, just enter @<RTN> to display an AUTH prompt)

The command to generate a data retrieval is DATn<RTN>, where n is a number corresponding most often to an ACTION MENU item number. For a few DATs, additional arguments are used after the initial DATn.

DAT1	will retrieve Control Point information for every control point.
DAT2	will retrieve Communications and Alarm Status to/from AKC16's (This DAT is only active in version 40.xx software).
DAT3	will retrieve the complete Control Alarms Report.
DAT5	will retrieve all five KWH Storage Report screens.
DAT6	will retrieve the entire Conditions Code Listings.
DAT7	will retrieve the first four Today's and Yesterday's Averages screens. Entering DAT7 6<RTN> will retrieve four screens beginning with analog #6.
DAT8	does the same as DAT7
DATC	will retrieve the first four History Pointers screens. Entering DATC<space> 7<RTN> will retrieve four History Pointer screens beginning with History Pointer #7.
DATD	will retrieve the entire DIGITAL SENSOR REPORT.
DATE	will retrieve the entire ANALOG SENSOR REPORT.
DATF	will retrieve the entire SENSOR ALARM REPORT.
DATG	will retrieve the entire STANDARDS/SETPOINTS screen.

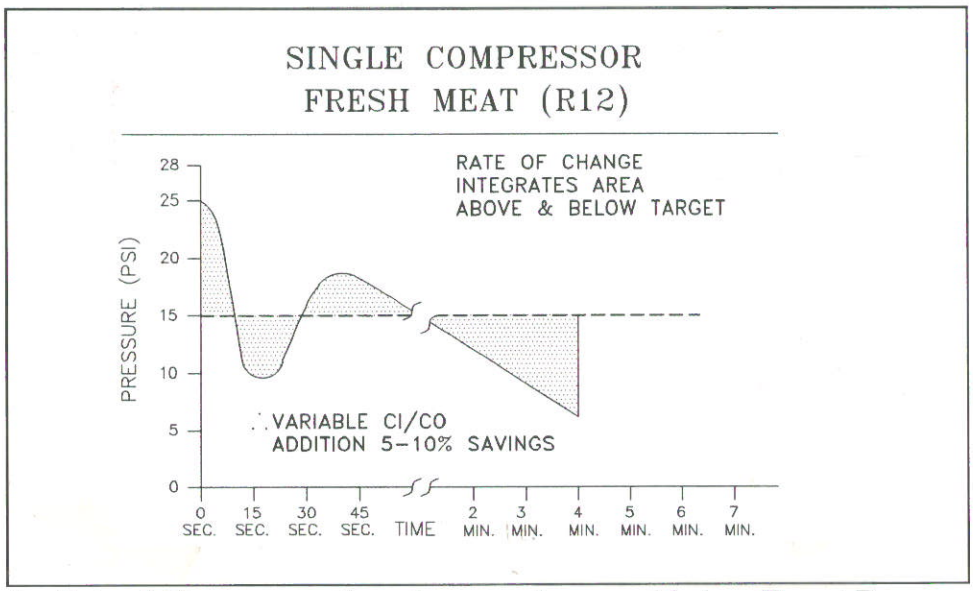
APPENDIX C:
The Danfoss Rate-of Change Refrigeration Algorithm

Rate-of-Change

Rate-of-Change is a control strategy in which the current suction pressure is compared at regular intervals of time to a target pressure. The results of the comparison are accumulated and the results applied to turn compressors or stages on or off, so that over time, the average actual pressure will equal target pressure, provided adequate rack capability.

Cut-in and cut-out are variable (but there is a fixed safety cut-out below the expected range of operation). If the average pressure is above target pressure, compressors are turned on. If the average pressure is below target pressure, compressors are turned off.

How quickly compressors are turned on or off depends on how far the average pressure is above or below target and for how long. The system can be made more or less sensitive to variations from target pressure.



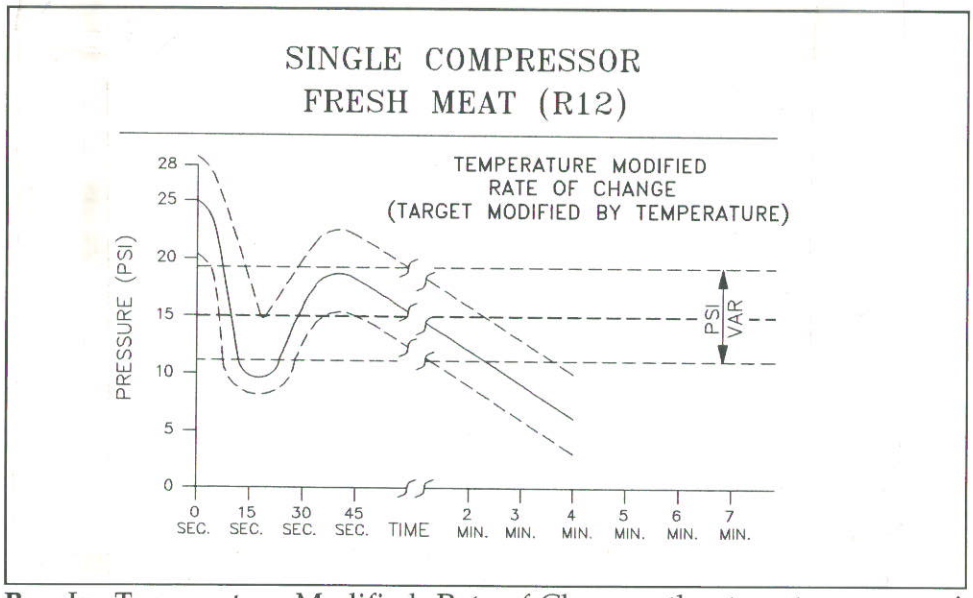
A. Rate-of-Change equalizes the area above and below Target Pressure.

Temperature-Modified Rate-of-Change

Temperature-Modified Rate-of-Change adds "feedback" to the Rate-of-Change strategy.

A temperature sensor, usually placed in the fixture with the lowest temperature in a line-up, provides the feedback. If the temperature average is on target, the target suction pressure is not changed; but if the average temperature (during an interval of minutes) is too high, target pressure is lowered by 1 PSI. Likewise, if the average fixture temperature is lower than target, the target suction pressure is raised by 1 PSI.

The objective of either Rate-of-Change strategy is to provide a product environment in the fixture that is as close to ideal (target) as possible at all times, but at the least expenditure of energy and machine wear.



B. In Temperature-Modified Rate-of-Change, the target pressure is adjusted in response to average fixture temperature.

Quick Reference Guide - NC25-4

Rack Controller Keypad & Display Instructions

To Display Data

1. MENU Key
Press to display main menu.

2. Main Menu Selection
Use arrow keys to position the blinking cursor at the desired menu item.

3. ENTER Key
Press to display a chosen sub-menu.

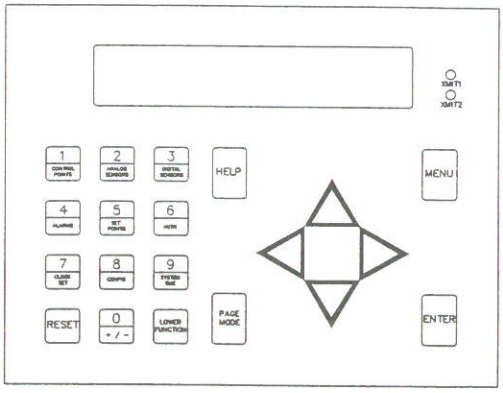
4. Sub-Menu Selection
Use arrow keys to position the blinking cursor at the desired menu item.

5. Detail Data
Move from field to field using the ENTER key.

Notes:

Before you press the MENU key, the Building Name, Date, and Time are displayed. After you press the MENU key, the display in *figure 1* appears. The main menu has 10 items (or 11 with AKC16 Smart Case Controllers). Use the down arrow to display the remaining items.

The lower function key can be used to move directly to a menu item named on a particular key.




```
07/06/93    DANFOSS --  NC25     1544:33
* CONTROL POINTS     * SETPOINTS A & B
* ANALOG SENSORS     * SYSTEM ALARMS
* DIGITAL SENSORS    * TRENDING
```

1. NC25 MENU, first six items. Press the down arrow to display the remaining menu items.

```
07/06/93    DANFOSS --  NC25     1544:38
* AUTHORIZATION      * USER DEFINABLE
* NC25 INFO SCREEN   * DATE & TIME SET
* CASE/BOX STATUS    *  << NOT USED >>
```

2. The final five itmes of the NC25 MENU display.

```
07/06/93    CONTROL POINTS       1544:43
     CP  1 RACK B 1:  SELECT OPTION
* RUN TIMES          * CURRENT-TARGET
* MAN STATUS CHNG    * SCHEDULE CHNG
```

3. After selecting CONTROL POINTS, then choosing a specific point, this sub-menu is displayed.

```
07/06/93    CONTROL POINTS       1544:48
* 1 RACK B 1   LAST ON/OFF -RUN T/Y- CYC
               1056  1347  1032 1916   3
               TOTAL RUN TIME HRS = 1851
```

4. This screen results when you select RUN TIMES from the preceding sub-menu.

TO BECOME AUTHORIZED
LOG ON

Action	Result
MENU	Displays MAIN MENU
◁ ▷ ▽ △	Use cursor keys to position at AUTHORIZATION
ENTER	Setects AUTHORIZATION at the LOG ON position
0 +/- / 9 SYSTEM TIME	Press authorization code using the number keys
ENTER	Enters code and displays "a" next to date and "PROG" next to current authorization. These indicate authorization to make changes
MENU	Returns to main menu (Note: small "a" next to date) When you are AUTHORIZED.

TO REMOVE AUTHORIZATION
LOG OFF

Action	Result
MENU	Displays MAIN MENU
◁ ▷ ▽ △	Use cursor keys to position at AUTHORIZATION
ENTER	Displays AUTHORIZATION sub–menu
▽	Selects LOG OFF
ENTER	Removes authorization PROG changes to VIEW for view only mode
MENU	Returns to the MAIN MENU

TO CHANGE CONTROL POINT STATUS
COM / man ON / man OFF
(Authorization Required)

Action	Result
MENU	Displays MAIN MENU
ENTER	Selects CONTROL POINTS
◁ ▷ ▽ △	Use arrow keys to select desired Control Point
ENTER	Displays sub–menu
▽	Selects MANUAL STATUS CHANGE
ENTER	Selects Control Point Change Screen
ENTER	Places flashing cursor on current mode
△ ▽	TOGGLES MODES (COM/ man ON / man OFF) Places in computer or manual on / off control
ENTER	Changes to new mode selected
◁	Returns to sub–menu

TO MODIFY A SCHEDULE
Authorization Required

Action	Result
MENU	Displays MAIN MENU
▲▼◀▶	Select CONTROL POINTS using arrow keys
ENTER	Displays CONTROL POINTS
▲▼◀▶	Selects desired control point using arrow keys
ENTER	Displays sub–menu
▶ ▼ ENTER	Displays first schedule – use right arrow key to display next schedule, etc.
ENTER	Moves flashing cursor to ON TIME (in military time)
0 +/– / 9 SYSTEM TIME	Use number keys to enter new time
ENTER	Moves flashing cursor to OFF TIME (in military time)
0 +/– / 9 SYSTEM TIME	Use number keys to enter time
ENTER	Moves cursor to days
1 CONTROL POINTS / 7 CLOCK SET	Use number keys 1–7 to select Sunday–Saturday; 1=Sunday, 2=Monday, etc.
ENTER	* Enter chosen days and move to holiday type
1 CONTROL POINTS / 8 CONFIG	* Use number keys 1–8 to select holiday date ranges
ENTER	* Enter holiday date ranges chosen
◀	Returns to sub–menu
MENU	Returns to MAIN MENU (* Not used on defrost)

TO ALTER ANALOGS
TO PLACE IN MANUAL

Action	Result
MENU	Displays MAIN MENU
▼	Selects ANALOG SENSORS
ENTER	Lists analog sensors
▲▼◀▶	Use arrow keys to select analog sensor to alter
ENTER	Displays current analog information
ENTER	Moves cursor to mode selection
▲▼	To switch between modes (manual or computer) Select MAN
ENTER	Moves cursor to current value
0 +/– / 9 SYSTEM TIME	Enter new value – remember to use one decimal place

TO ALTER ANALOGS
TO PLACE IN MANUAL(cont.)

Action	Result
ENTER	Move cursor to calibration value – this can be a plus or minus value
0 +/– / 9 SYSTEM TIME	Enter value of offset
LOWER FUNCTION	Press LOWER FUNCTION key to make offset a minus value if required
ENTER	Enters selected value
◁	Returns to ANALOG SENSORS
MENU	Returns to MAIN MENU

TO DISPLAY RUN TIMES
Authorization Required

Action	Result
MENU	Displays MAIN MENU
ENTER	Selects CONTROL POINTS
◁▷▽△	Use arrow keys to select control points
ENTER	Selects sub menu (on RUN TIMES)
ENTER	Display selected control point RUN TIMES
◁	Returns to sub–menu

TO ALTER ANALOG SENSORS
TO PLACE IN COMPUTER CONTROL

Action	Result
MENU	Displays MAIN MENU
▽	Selects ANALOG SENSORS
ENTER	Lists ANALOG SENSORS
◁▷▽△	Use arrow keys to select analog sensor to alter
ENTER	Displays current analog information
ENTER	Moves cursor to mode selection
△▽	Use up/down arrow to select COM (computer mode)
ENTER ENTER	Enters selected mode
MENU	Returns to Main Menu

TO ALTER DIGITAL SENSORS

Action	Result
MENU	Displays MAIN MENU
▽▽	Selects DIGITAL SENSORS from main menu
ENTER	Lists DIGITAL SENSORS
◁▷▽△	Use arrow keys to select sensor to alter

TO ALTER DIGITAL SENSORS (continued)

Action	Result
ENTER	Shows sensor status
ENTER	Moves cursor to mode (man/com)
△ ▽	To switch between modes (COM / man ON / man OFF) Select one
ENTER	Enters selection
◁	Returns to DIGITAL SENSORS
MENU	Returns to MAIN MENU

TO CHANGE SETPOINTS
Authorization Required

Action	Result
MENU	Displays MAIN MENU
▷	Selects SETPOINTS A & B
ENTER	Enters setpoint screen. Use arrow keys to select setpoint
ENTER	Moves flashing cursor to current setpoint "A" value
0 +/- 9 SYSTEM TIME	Enter new value (one decimal place)
ENTER	Accepts new value and moves to current setpoint "B" value
0 +/- 9 SYSTEM TIME	Enter new value
ENTER	Accepts new value
MENU	Returns to MAIN MENU

TO MODIFY DATE AND TIME
Authorization Required

Action	Result
MENU	Displays MAIN MENU
▽ ▽ ▽	Selects DATE AND TIME SET
ENTER	Displays current date and time
ENTER	Moves flashing cursor to the month
0 +/- 9 SYSTEM TIME	Enter a number (1–12) for month
ENTER	Moves cursor to day of month
0 +/- 9 SYSTEM TIME	Enter a number (1–31) for day
ENTER	Moves cursor to year
0 +/- 9 SYSTEM TIME	Enter numerals for last two digits of the year
ENTER	Moves cursor to day of week
1 CONTROL POINT 7 CLOCK SET	Enter numeral to represent the day of the week; 1–Sunday, 2–monday, etc.
ENTER	Moves cursor to the hour (military time)
0 +/- 9 SYSTEM TIME	Enter a number (00–24) for current hour
ENTER	Moves cursor to the minute
0 +/- 9 SYSTEM TIME	Enter a number (00–59) for current minute
ENTER	Sets clock
MENU	Returns to MAIN MENU

TO ALTER "USER DEFINABLE SCREEN"
A. TO ALTER TITLE

Action	Result
LOWER FUNCTION, B CONFIG, 3 DIGITAL SENSORS, ENTER	Displays current title (16 characters available)
△ ▽	Use up/down arrow keys to toggle through the alphabet (A–Z, space & 0–9)
◁ ▷	Use arrow keys to move right/left through field
ENTER	Accepts desired title

TO ALTER "USER DEFINABLE SCREEN"
B. TO SELECT DATA

Action	Result
LOWER FUNCTION, B CONFIG, 2 ANALOG SENSORS, ENTER	Displays setup data screen cursor on first position
1 CONTROL POINTS, 2 ANALOG SENSORS, 3 DIGITAL SENSORS, 4 ALARMS, 5 SET POINTS, 6 AUTH	Select 1–6 for category to display: 1 = Control Point 2 = Analog Sensor 3 = Digital Sensor 4 = Alarm 5 = Setpoint A 6 = Setpoint B
ENTER	Moves cursor to select the number of the category you wish to display
0 + / -, 9 SYSTEM TIME	Enter the number
◁ △ ▷ ▽	Use arrow keys to move to next position to be changed
ENTER	To accept change
ENTER	Return to MAIN MENU

TO VIEW TRENDING

Action	Result
MENU	Displays MAIN MENU
◁ △ ▷ ▽	Use arrow keys to select TRENDING
ENTER	Displays TRENDING
△ ▽	Use arrow keys to select Analog for Trending
ENTER	Selects Analog for Trend
◁ ▷	Use arrow keys to move forward/backward in time
MENU	Returns to MAIN MENU

TO ALTER AKC16 SETTINGS
(Authorization Required)
(Only available with AKC16, 40.xx, software)

Action	Result
MENU	Displays MAIN MENU
▽	Press down arrow key five times to CASE/BOX STATUS
ENTER	Selects CASE/BOX STATUS
△ ▽	Use up and down arrow keys to select desired AKC16 slave
ENTER	Selects AKC16 slave (one evaporator/valve function)
◁▷△▽	Use arrow keys to select item to view or change (if authorized)
ENTER	Selects item to view or change (Superheat cannot be changed from the keypad)
△▽	Use up and down arrow keys under CASE/BX TMP to select either cut-in or cut-out temperature
ENTER	Selects cut-in or cut-out temperature
0 +/- 9 SYSTEM TIME	Enter new value
ENTER	Accepts changes
ENTER	If VALVE OPEN % was selected, press Enter again
△▽	Use up and down arrow to select Computer Control or Manual valve opening
ENTER	Selects COM CTRL or MANUAL
0 +/- 9 SYSTEM TIME	iF MANUAL was selected, enter valve opening percent (Remember, you have taken the computer out of control and could damage a compress with liquid slugging)
ENTER	If DEFROST TMP was selected, press Enter again to initiate change
0 +/- 9 SYSTEM TIME	Enter new value for defrost temperature termination
ENTER	If either FAN STATUS or ANTISWEAT was selected, press Enter again to initiate change
△▽	Use up and down arrow keys to highlight either COM CTRL, MANUAL ON or MANUAL OFF
ENTER	Press enter to select
◁	NOTE: In the AKC16 change screens, the left arrow key may be used at any time to back up one screen at a time to the list of AKC16 slaves

The Defrost Control Point and Light Control Point can be turned Manually ON/OFF or Computer using the instructions on page #2, "To change control point status"

To view AKC Analog values, see page #1, "TO display data". These cannot be changed from the keypad display

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