Honeywell

Excel CARE and Live CARE

EXCEL 5000 OPEN™
S Y S T E M

GENERAL

The Excel CARE and Live CARE software packages are graphic tools to easily and quickly create and simulate application programs that run controllers in EXCEL 5000® Systems. Users can perform these functions without extensive knowledge of a programming language.

Users systematically select control system graphic elements such as lighting and Heating, Ventilating, and Air Conditioning (HVAC) equipment and create control sequences in a Microsoft® Windows® environment.

CARE software validates as the designer works, thus keeping the process free of errors. Work is completed quickly and efficiently.

As part of the design process, CARE automatically creates comprehensive documentation and materials listings.

FEATURES

- **Point-and-click programming**

- **Schematic drawing**

- **Control strategy**

- **Switching logic**

- **Time function**

- **Mathematical editor**

- **Standard library**

- **Documentation**

- **Control program simulation**

- **Applicable to EXCEL 5000 System controllers**

- **Password security**

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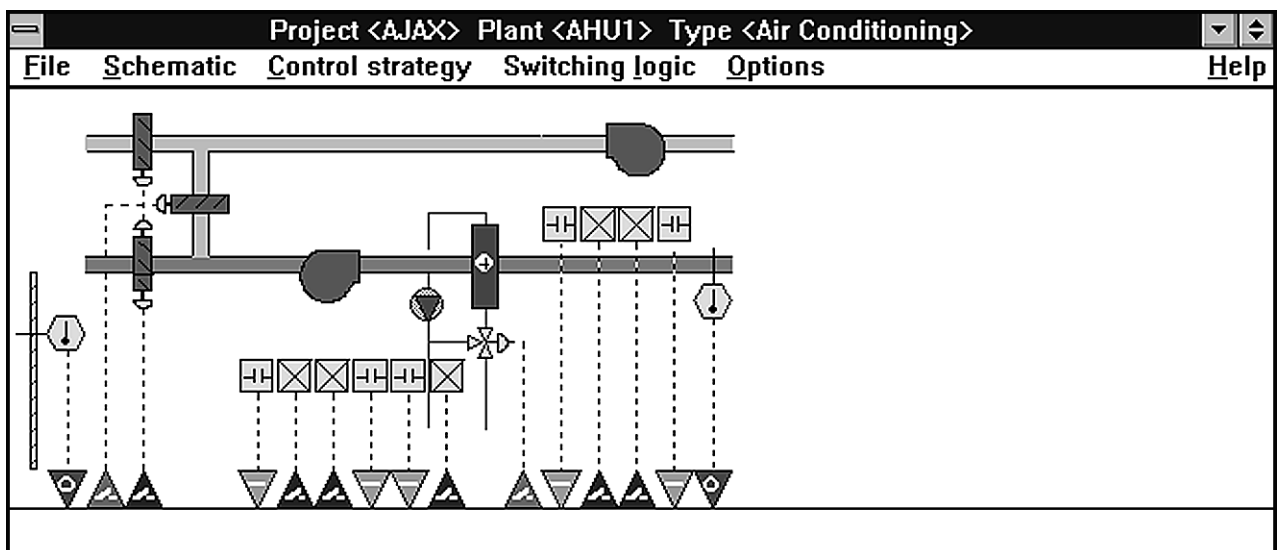
DESCRIPTION

The Excel CARE and Live CARE software packages enable users to generate graphic drawings to easily develop control programs, schematics, and documentation for the EXCEL 5000 System of controllers. Work can also be saved in the CARE library as macros that can be recalled and copied to other controllers and other plants. This feature saves the user from reinventing the wheel time and time again.

Point-and-click programming

The logical first step in developing Direct Digital Control (DDC) programs for HVAC applications is to generate system schematics that match project requirements. CARE makes it easy to do just that. It represents each application (HVAC, lighting, etc.) with a drawing resembling a schematic. This presentation gives users a recognizable, comfortable platform to work with and customize.

CARE uses a building block approach to define the equipment segments that belong in a plant schematic. Each schematic represents a system, for example, cooling, heating, or fan. Multiple systems can exist in each controller. For each type of system, there are standard equipment and variables that apply. The process is similar to searching a catalog and finding the product that fits project requirements.
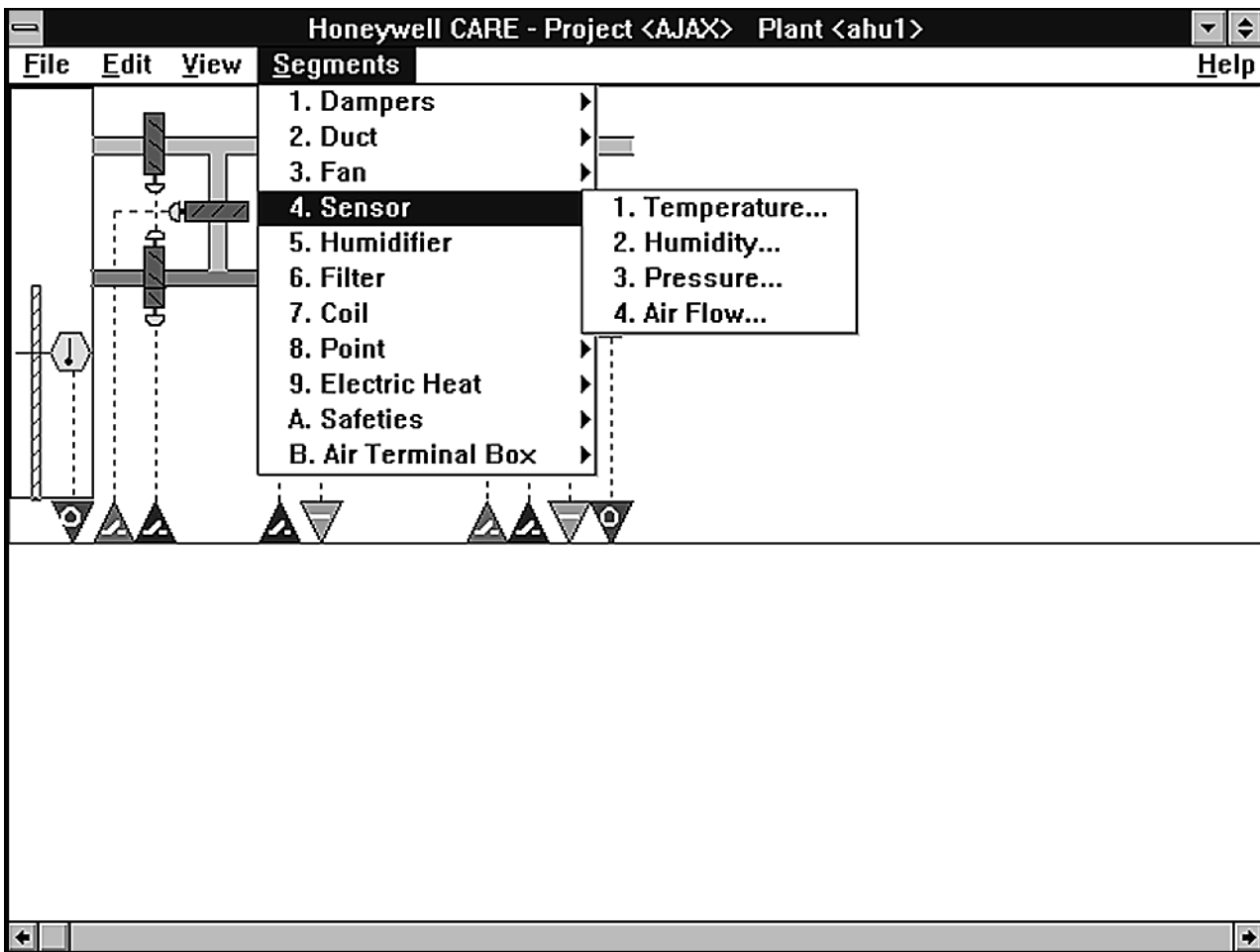
Plant schematics

The first step in the CARE process is the creation of a plant schematic. A plant schematic is a combination of segments that show the equipment in the plant and how it is arranged. Segments are elements of a control system, for example, boilers, pumps, and other devices. Elements include sensors, status points, valves, etc. Provided with CARE is a macro library that has predefined elements and plants.

Predefined segments appear in the dropdown list under the Segments menu bar item. When a user selects a segment, for example, 4. Sensor, CARE software prompts for additional information about the segment, for example, sensor type.

The user continues selection of equipment segments and hardware types from lists until a picture of the desired system displays in the schematic.

As selections are made, CARE software defines functions such as controller I/O, alarms, and other associated attributes. The CARE expert system eliminates the need for the user to be concerned with other details of creating the database. Default values and point descriptions are already defined in the CARE database. If there is a difference between the standard defaults and job requirements, the user can easily change the attributes. For example, if the alarm message associated with an analog input point does not match requirements, the user can display the default message and change it to a new message.

Plant Schematic with Air Handler Segment List.
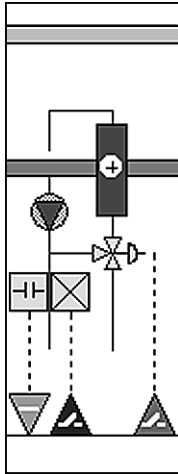
Coil Segment Example.

When the schematic is complete, the user can select menu items to check point count, user addresses, segment details, and extra text assignments.

Control strategy

The next step in creating a CARE database is the control strategy. The control strategy provides the controller with the intelligence to handle the system schematic. This strategy makes decisions based on conditions, mathematical calculations, or time-of-day schedules. Control can be based on analog points, digital points, or software points.

CARE provides a workspace with a side-bar of control icons to choose from and place in the workspace. See the Control Strategy Example for a typical window.

The user can create custom control strategies or use existing control strategy icons.

To create a control strategy, the user clicks a point in the schematic, then the desired control icon to connect the two. Software draws lines in the control work space to represent control flow.

See the Typical Control Icons box for descriptions of some of the CARE control icons.

MIN	MIN	Select the lowest value among analog inputs (2 through 6).
MAX	MAX	Select the highest value among analog inputs (2 through 6).
+	ADD	Sum multiple analog input values (2 through 6).
—	DIF	Determine the difference between multiple analog input values (2 to 6; X1 - (X2 + X3 + ... X6)).
AVR	AVR	Calculate the average of multiple analog inputs (2 through 6).
	PID	Proportional-Integral-Derivative controller that regulates an analog output based on two analog values (one is a controlled variable; the other, a reference variable.)
	CAS	Cascade controller that acts as a PI controller with a master and cascade controller.
	SEQ	Sequence from one to three analog outputs dependent on an analog input.
	RAMP	Limit the variation in room temperature over time ("ramp" function).
MAT	MAT	Mathematical editor to modify inputs to other control icons.
	CYC	Establish cyclical operation.
ZEB	ZEB	Determine setpoints to maintain a predetermined comfort band divided into heating, cooling, and zero energy bands.

Typical Control Icons.
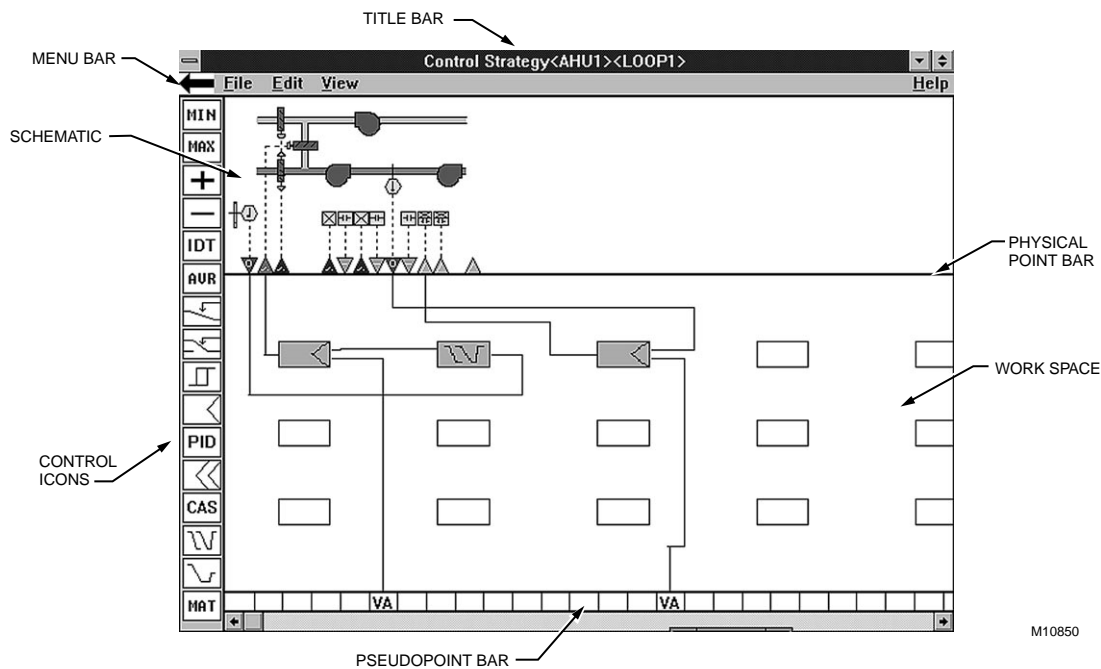
Control Strategy Example.

Switching logic

When digital control is required, CARE provides an easy-to-use logic table methodology. This technique is referred to as "switching logic". It minimizes the need for hard wiring to field-mounted switching devices. A switching table specifies the affected Excel controller outputs, determines switch status, and determines input conditions. When applicable switching conditions exist, the controller transmits the programmed signal to an output. Multiple switching logic tables can work in parallel (OR function) for a single controller. For example, an Exclusive OR table can be used to prevent software from transmitting more than one True condition to an output.

Users develop the switching logic on the schematic just as they do for the control strategy. A typical switching logic sequence might be to start the return fan 30 seconds after the supply fan starts. This sequence is very simple to set up. The user locates the return fan control point on the schematic, assigns the status of the supply fan, and adds a 30-second delay. CARE's switching logic function can also handle some very complex applications that may include combinations of Logical ANDs, Logical ORs, or Exclusive ORs. An example of a more complex sequence might be to start the return fan after the supply fan has been on for 30 seconds and the discharge air temperature is greater than or equal to 68F (20C). Also, there should be a differential on the discharge air temperature to keep the return fan from short cycling due to a change in temperature. The Switching Table Example diagram shows the logic table for this sequence. The CARE operator interface makes the sequence very easy to establish.

CARE can also provide a mathematical function that can be used along with the switching table. For example, switching logic can dictate that the return fan speed shall maintain 95% of the supply fan's speed.

Switching logic has a higher priority than control strategy. For example, if the control strategy determines that a heating circuit pump must be switched on, but switching logic at the same time turns it off; it stays off. CARE switching logic and control strategy functionality work together to give the control engineer a very powerful tool.
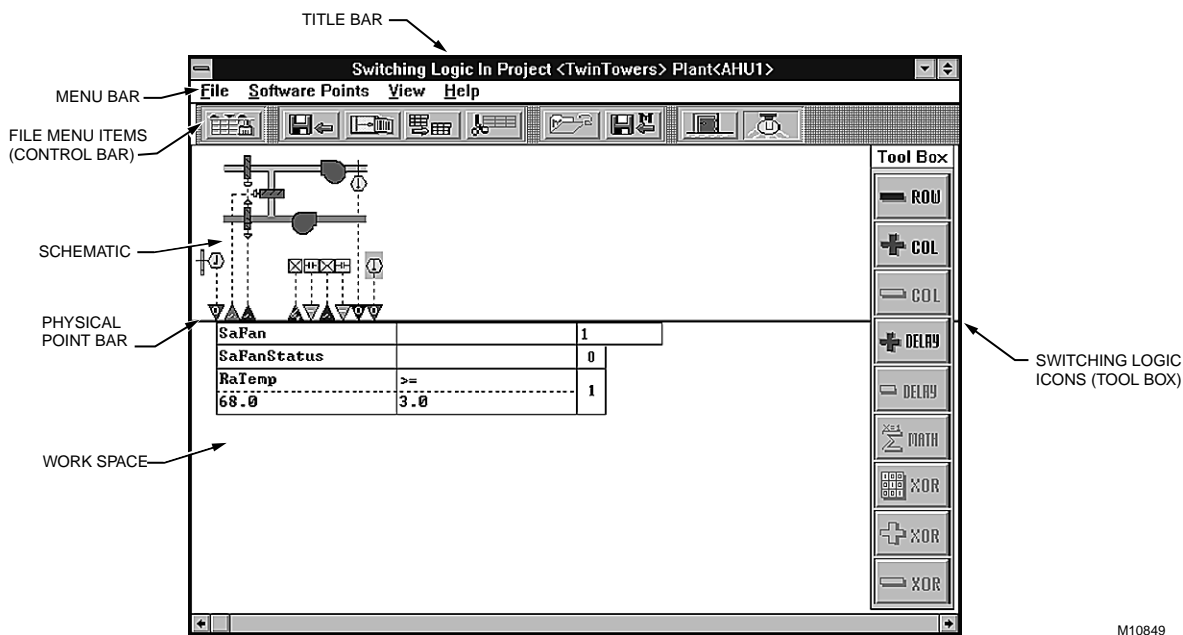
Time function

Control systems must also be able to function differently depending on the time of day. CARE provides an easy way to program the system so a scheduled operation can occur at different times of the day. For example, a classroom may have classes meet between 8:00 and 11:30 AM, again between 1:00 PM and 3:30 PM, and at night between 7:00 and 9:30 PM. The user can easily program the system to turn the ventilation system and lights off and on to meet these classroom schedules.

The time function is integrated with switching logic and control strategy to provide the ability to make programming decisions based on the time of day.

Mathematical editor

When one of the conditions required in the control strategy or the switching logic is not supplied directly from one Excel controller user address or, if a combination of more than one user address is required, this condition can be expressed using a formula. Formulas can include addition, subtraction, multiplication, division, left bracket, right bracket, square root, exponentials, integral, differential, linear equations, and polynomial equations.

TITLE BAR

MENU BAR

FILE MENU ITEMS
(CONTROL BAR)

SCHEMATIC

PHYSICAL
POINT BAR

WORK SPACE

SWITCHING LOGIC
ICONS (TOOL BOX)
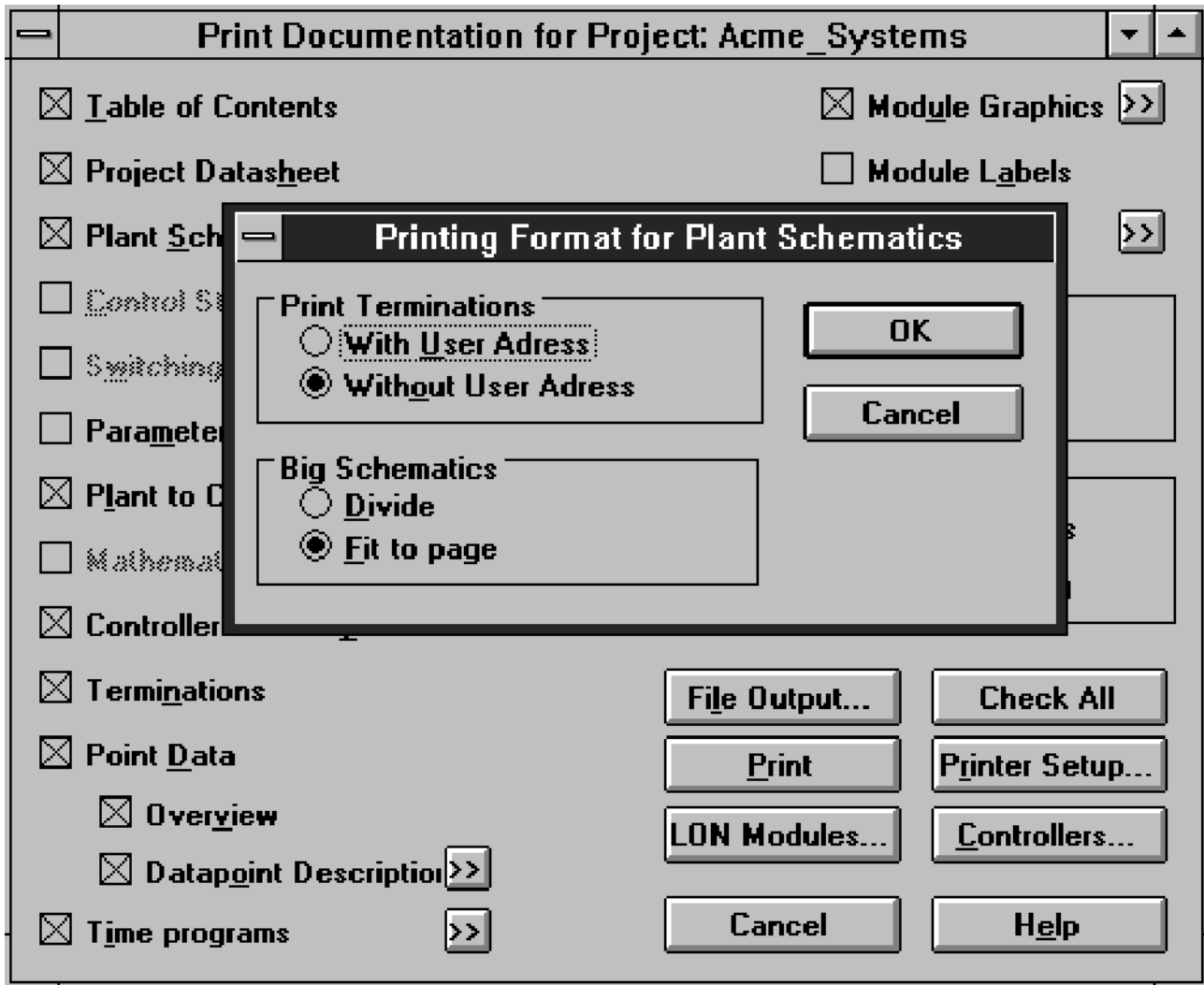
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Switching Table Example.

Documentation

CARE includes two disks for Enhanced CARE Printout. This enables users to print and save all documentation aspects of the project in a WinWord file.
Documents include:

Table of Contents — All chapters of the printed document and the corresponding page numbers.

Project Datasheet — Contains general information about the project.

Plant Schematic — Graphical representations plant with or without user addresses.

Enhanced CARE Printout Dialog Box Example.

Control Strategy Loops	Control loop drawings with all control icons with or without schematic and associated connections.
Switching Logic Tables	Switching tables with or without schematic.
Parameter List	Parameter list sorted by parameter or use.
Plant to Controller	All plants that belong to a specific controller, each plant type and all assigned control strategies for each plant.
Mathematical Function	Mathematical relationships used in the control strategies.
Controller Summary	Which module type is plugged into which housing, technical address of the module.
Terminations	I/O terminal assignments on the controller.
Point Data Overview	Quantity of each module and quantity of individual data points on the corresponding module.
Datapoint Description	Datapoint description of the selected controller.

Time Programs	Time programs of selected controller.
Module Graphics	Graphic printout of module showing which user address resides on which switch, or LED and setting of HEX address switch. May be put in cabinet for easy reference.
Module Labels	I/O user address for each terminal. Can be printed on self-adhesive stickers and put on the modules.
Text List	Default and controller specific text lists.
Excel 10 Reports	User addresses of the mapped points for each Excel 10.
Excel 10 Zone Manager Reports	Mapping report or commissioning report.

Live CARE

Live CARE is a software package that allows connection to a controller to check out its control strategy and switching logic. Live CARE operates in Windows just as CARE does. Live CARE's interface matches that of CARE to provide a link between design and implementation. Live CARE is selectable within CARE.

While using Live CARE, users can monitor and fix hardware and software points in the control strategy and switching logic environments. They can also view hardware and software point user addresses.
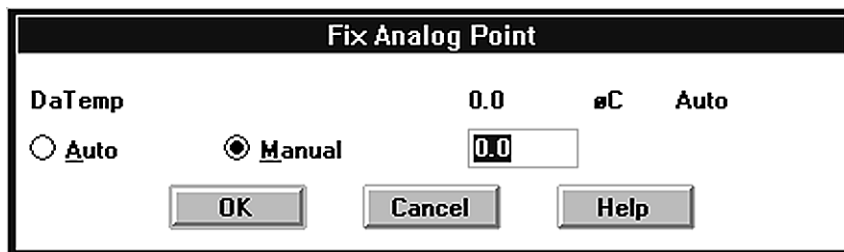
Live CARE Dialog Box Example.

Password security

Each project has its own password. To view or make any modifications to the project, the user must first enter the password.

Requirements

Hardware:
- Personal Computer (PC) with a 486-based microprocessor (Pentium-based recommended)
- 8 Megabytes (MB) RAM minimum (16 MB recommended),
- 40 MB free hard disk space (50 MB recommended)
- VGA monitor and board (Super VGA recommended)
- Microsoft-compatible mouse
- Serialized Software Protection Plug

Software:
- MS-DOS$^{®}$ 5.0, 6.21, or higher software with Microsoft Windows Version 3.1/3.11 (enhanced mode)
  OR
- Microsoft Windows 95
- Microsoft Word for Windows Version 6.0c or higher
- Serialized Software Protection Diskette

Licensing terms and coverage

CARE develops programs and documentation for Excel 80, Excel 100, Excel 500, and Excel 600 Controllers. It also provides a point mapping interface between the Excel Controllers and Excel MicroCel, Excel MacroCel, and Excel W7620 Controllers.

CARE and Live CARE tools are licensed through a lease arrangement to EXCEL 5000 System authorized end users.

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