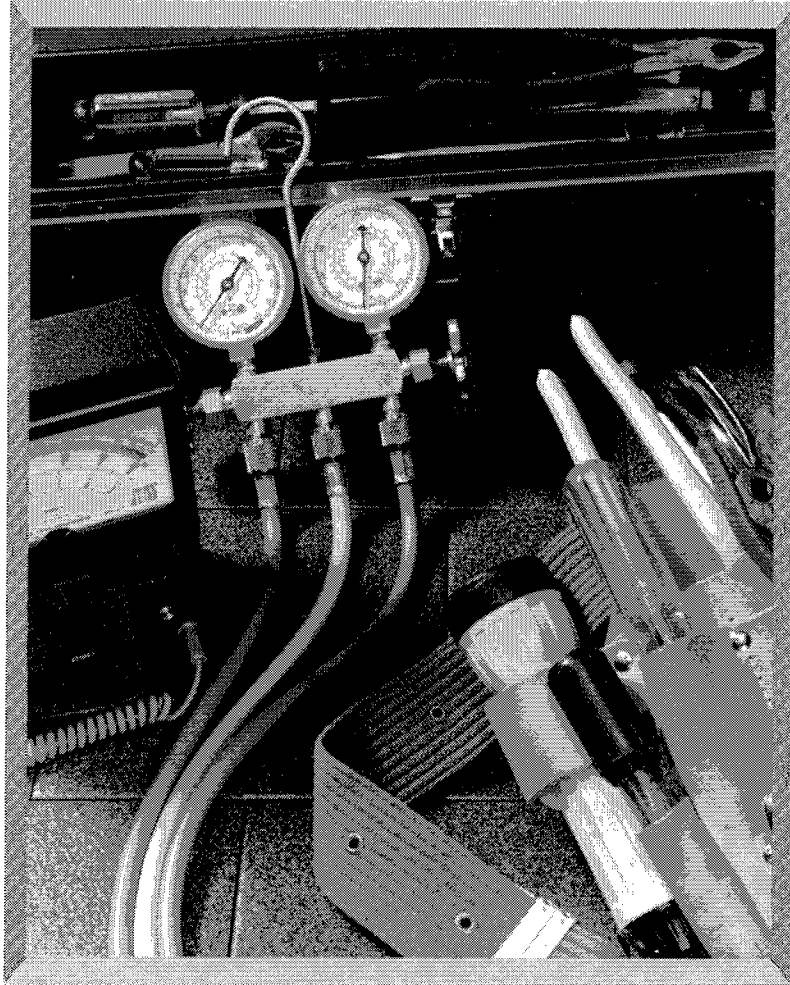


CARRIER

SERVICE

Training



3200MP-(ESP)

EXPANDED SERVICES PANEL II

APPLICATION • OPERATION

3200MP EXPANDED SERVICES PANEL II

The contents of the 32MP-06 Packaged Training Program (Catalog No. 021-014) are: (1) audio cassette, (113) 35mm slides and this workbook.

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Objectives -

Upon completion of this training program, you will be familiar with the 3200MP ESP II as well as basic operation and troubleshooting techniques.

Presentation Instructions -

1. Obtain necessary audio visual equipment, service tools, handout materials and program workbooks for each participant.
2. To run this slide/cassette program; project slide 1, focus, then start the tape. If your tape player does not have a built-in slide projector advance, there are audible "beeps" which signal that the slide should be advanced. Show slides section by section. Review, discuss and ask questions at the end of each section highlighting topics of importance.
3. Distribute and review handout materials (see suggested list of handout materials below).
4. Administer quiz, then review using Slide/Page references noted in the Quiz Key.
5. Certificates of Achievement are available through Literature Distribution.

Handout Materials/Additional Training Materials - (Available through Literature Distribution)

1. Service and Maintenance Instructions.
2. See Appendix for listings of additional training materials available.
3. Additional 3200MP workbooks (Catalog Number 021-013).

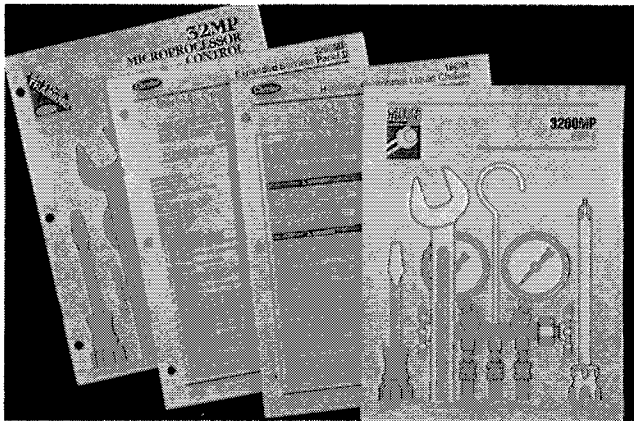
Self Instruction -

When using this program for self-instruction, read the workbook in its entirety and complete the quiz. The quiz is divided by section and may be completed by section or in its entirety upon completion. review the video tape, read the workbook in its entirety, and complete the quiz. Quiz answers with paragraph references are located in the Quiz Key.

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1. This program features the 3200MP Expanded Services Panel or ESP II. During this presentation we will point out the latest enhancements developed for the 3200MP software to provide better chiller operation and control. We will also describe the features of the ESP and the numerous revisions which have been made to warrant a name change to ESP II. Finally, we will cover how the ESP II is programmed to operate either single or dual compressor centrifugal chillers.



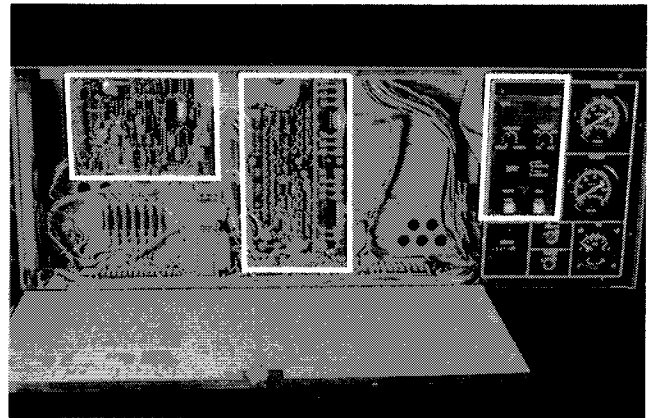
2. Before working on the ESP, read the following material and have it on hand.

- A. Centrifugal Chiller Start-up Operation and Maintenance Instructions
- B. 32MP Microprocessor Control Training Program (Parts I and II)

- C. ESP II Expanded Services Panel Start-up Operation and Maintenance Instructions
- D. The workbook for this program

It is important that item D, the program workbook, is available as the program is viewed.

FAMILIARIZATION

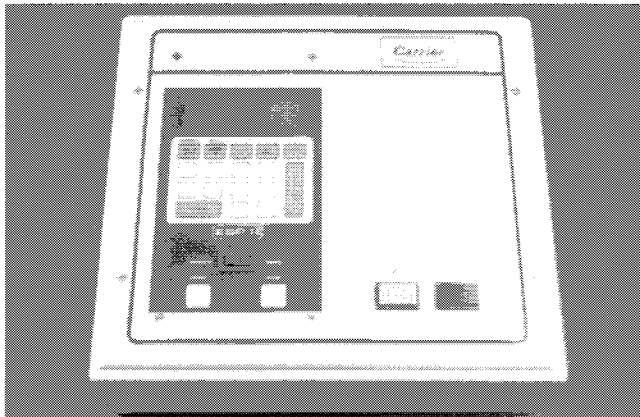


3. Let's start with the basic 3200MP and a panel with the original ESP before mentioning the ESP II's capabilities and programming. First, here is the basic 3200MP panel. It has a set point/display board, an input/output board, and a processor board.

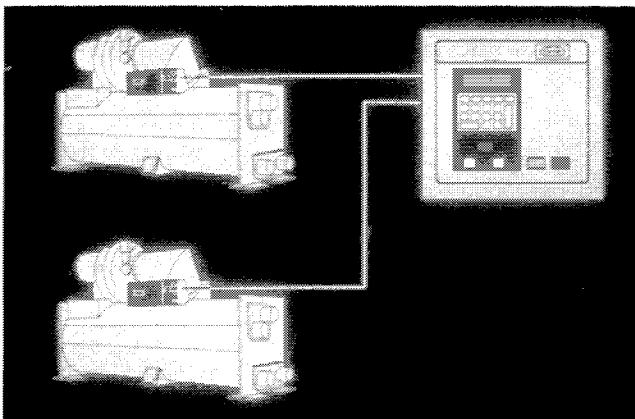


4. A 3200MP panel with a locally mounted ESP II includes the basic three components, but the set point/display board is relocated to inside the panel with the ESP occupying the display board's original space on the gauge panel. A memory expansion

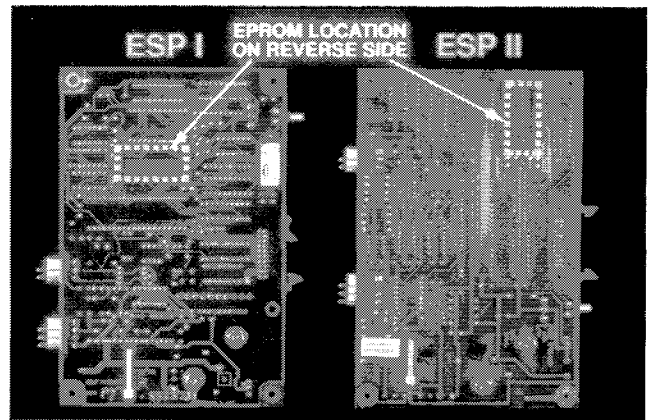
sion board, or MX, is also included in the panel, and is connected into the processor board with a short ribbon cable. A machine-mounted ESP II can be used with all single or dual compressor chillers.



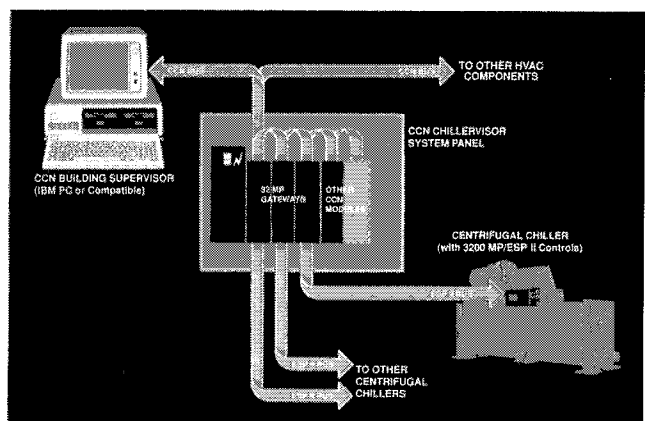
5. Let's look at a basic 3200MP panel with remote ESP II. It too can be used with all single and dual mounted compressors, but requires the memory expansion board and a K2 relay module. The K2 relay module is activated by any alarm signal from the I/O (Input/Output) board and relays the signal to the ESP for display.



6. The remote ESP II can also be applied with two independent single compressor chillers where the ESP II is used to integrate two basic controllers to provide a Lead/Lag option for control of a building's cooling demand. Each basic control in this system must contain its own set point/display board, input/output board, processor board, MX board, and K2 relay board.



7. To identify an ESP II panel, first look for the ESP II decal on its face, then look at the back of the ESP assembly. The ESP II EPROM is located in the upper right hand corner looking at the back side. The ESP II solder connections are in vertical rows. The ESP I EPROM is located in the upper center of the ESP, when viewed from the rear, and the solder connections are in horizontal rows. ESP I can be converted to ESP II by replacing the three EPROMs: one on the ESP board, one on the processor board and one on the Memory Expansion (MX) board. When doing this, the MX board must be modified by soldering a short jumper wire across the two terminals marked "W1". On dual compressor chillers this W1 jumper is already in place.



8. A new system called CHILLERVISOR allows the 3200MP control to be connected into the CCN (Carrier Comfort Network). The 32MP Gateway is a Communications Input/Output module (CIO)

with factory-installed software to perform the 3200MP-to-CCN translation task. The 3200MP Gateway will normally be mounted in a FID (Field Installed Device) enclosure. Three components are required to implement this system.

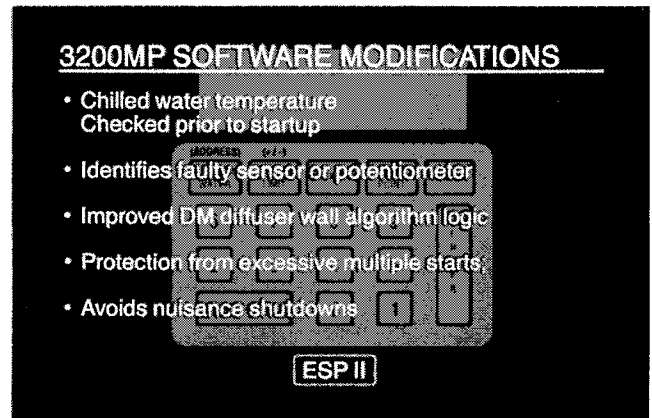
- A Centrifugal Chiller with 3200MP ESP II controls.
- The Gateway Module.
- The Building Supervisor (or the service tool). The building supervisor is needed to assign a CCN address number to the centrifugal chiller.

Additional support hardware would include the CCN wiring harness, a power supply and other miscellaneous items.

Once this system is in place, the following options will be available:

- Full access to chiller operational and service parameters.
- Issue Start/Stop commands for equipment.
- Adjust chilled water temperature and demand limit set points.
- Monitor and log operational data.
- Configure and enable machine control options.
- Coordinate chiller operation with other HVAC system components.

In a multiple chiller plant (of up to 8 chillers with 32MP Gateways in place) a CHILLERVISOR System Manager module and other CCN components can be added to provide supervisory control to the chillers and to the cooling towers, pumps and valves associated with a chilled water plant.



9. Before going any further on the ESP II's capabilities, it is important to note that there have been major changes to enhance performance of the basic 3200MP series. On all chillers, the control software has been modified so that:

- **Chilled water temperature is checked prior to chiller start-up.** If the chilled water temperature is less than the desired set point, plus deadband, the chiller is placed in an "enabled" mode. When the chilled water temperature rises above the set point plus deadband, the chiller will automatically start and control to the desired set point. This prevents the chiller from starting and then shutting down into a recycle mode when cooling is not required.
- If a **faulty sensor or potentiometer** is detected, it will specifically be identified with a display code which will reduce troubleshooting time.
- **Improved DM diffuser wall algorithm logic** is used to compensate for motor current and power factor variations as well as compressor selection zone factors.
- The permissible number of starts has been changed from 8 starts per 12 hour period to 4 starts per 6 hour period. This **protects the chiller from excessive starts** during a short time span.
- If a sensor out of range is detected for 3 seconds or less and corrects itself, a **nuisance shutdown is avoided**.

3200MP SOFTWARE MODIFICATIONS FOR DUAL COMPRESSORS

- Controls lead/lag operation on failure of lead compressor
- Surge protection
- Better guide vane control
- Better tracking of lag compressor
- Change lead/lag during operation

10. Additional software changes have been made to the 3200MP control which will enhance its performance when applied with dual compressor chillers. These changes include improvements that:

- Provide cooling on dual compressor DR chillers if either compressor is capable of operating. If the lead compressor encounters a safety shutdown, the lag compressor will assume lead status and start or remain on line if cooling is required. Once the fault is corrected and the compressor brought back on line, the lead/lag control will automatically revert back to a normal operating mode.
- Cause the anti-surge algorithm to react quickly when compressor surge is sensed to minimize repeated surging from occurring.
- Provide better guide vane control on dual compressor chillers to reduce the likelihood of overshooting the desired set point.
- Allow more precise tracking of the lag compressor to the lead compressor.
- Allow the lead/lag selector switch (A-B) to be toggled while the compressors are operating. The control responds to the switch change when both compressors are running, upon a Start request, or when a Power-On Reset (POR) is executed.

All new dual compressor DR chillers are shipped with the Memory Expansion (MX) board installed. This is required to expand the available memory of the 3200MP due to the added software.

YOU WILL BE ABLE TO READ

- Chilled water setpoint
- Demand limit setpoint
- Leaving chilled water temperature
- Refrigerant temperature
- Bearing temperature
- Operating status codes
- Shut down status codes

11. Now, let's get back to the ESP. The ESP provides expanded control capability by offering functions not included as part of the Basic 3200MP Controller.

What does this mean exactly? Starting with the display function, the keypad can be used to call up and read the chilled water set point, demand limit set point and machine operating parameters, such as leaving chilled water temperature, refrigerant temperature, bearing temperature, etc. Other codes which could be called-up are the present operating status codes or the stored shutdown status codes which identify the faults and the history of causes for the last five chiller shut-downs.

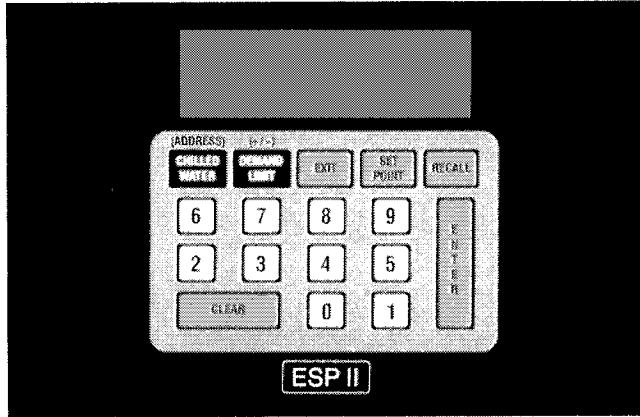
MACHINE OPERATING PARAMETERS FOR LEAD/LAG SYSTEM

SINGLE COMPRESSOR CHILLERS

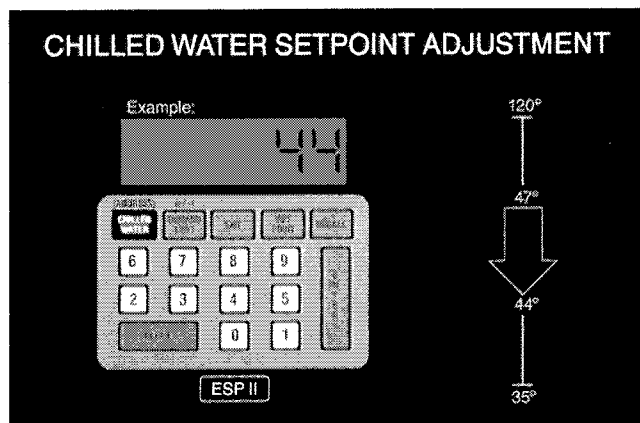
PARAMETER CODE		PARAMETER TO BE DISPLAYED
Activated or Deactivated Lead/Lag		
Lead Chiller	Lag Chiller	
10	20	Leaving Chilled Water Temperature
11	21	Motor Current % FLA
12	22	Evaporator Refrigerant Temperature
13	23	Condenser Refrigerant Temperature
14	24	Bearing Temperature
15	25	Motor Winding Temperature
16	26	Compressor Discharge Temperature
17	27	Line Voltage
18	28	Spare Sensor #1 Temperature (Return Water Control)
19	29	Spare Sensor #2 Temperature - Temperature at common point (Mixed CW Temperature)
30	32	Spare Sensor #3 Temperature
31	33	Spare Sensor #4 Temperature

12. If chillers are operating with the lead/lag option, parameters and present status codes for both chillers can be displayed independently. In this case, different parameter code numbers are

used to differentiate between the lead and lag chillers. For example, the leaving chilled water temperature on the lead chiller is a code 10, while the lag chiller is a code 20 for this temperature.

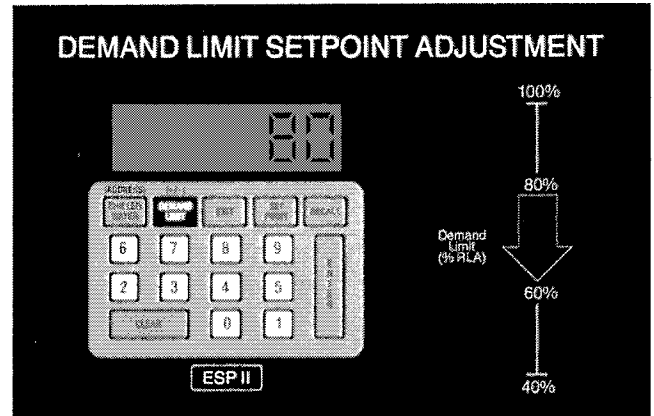


13. Along with the display function of the ESP, there is an address function which programs and activates the various control functions. Two special function keys on the keypad provide Direct Programming or readout for the **CHILLED WATER** and **DEMAND LIMIT** set points. All other control functions are accessed through an Address Format mode. Direct Programming and Address Format Programming will be covered later in the program. Next, let's identify and explain the control functions.

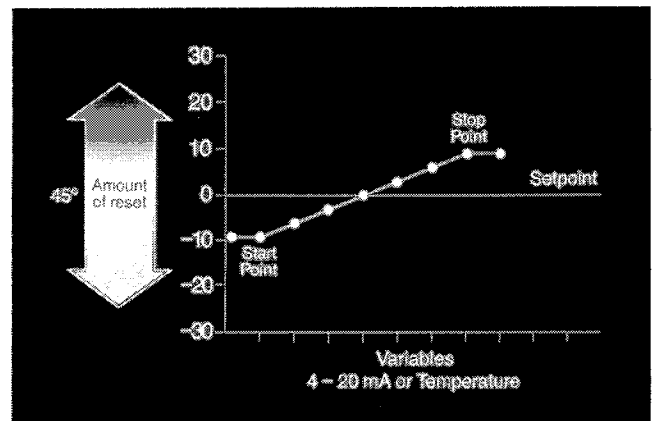


14. **Chilled Water Set Point Adjustment** - Any change to the chilled water set point is made through the keypad. These changes operate within limits of 35° to 120°F for water, and 0° to 120°F

with brine. For example, the set point can be changed from 47 to 44 using the keys. These adjustments can be made without changing the position of the thermostat on the Set Point/Display Board.

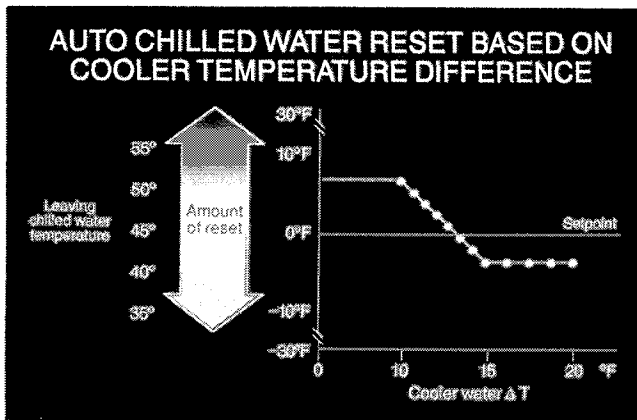


15. **Demand Limit Set Point Adjustment** - To limit motor current, any value down to 40% of rated load amps (RLA) can be entered at the keypad without changing the position of the demand limit setting on the Set Point/Display Board.

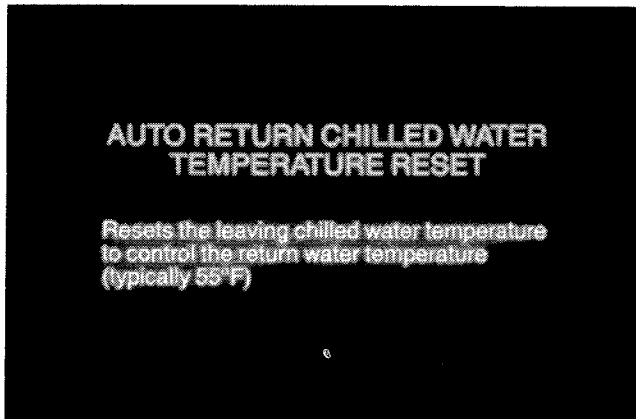


16. The 3200MP offers four different types of chilled water reset, each one must be programmed and then activated. The examples in this program will use a diagram with two axis. The vertical axis represents the amount of reset and the horizontal is the input variable. Reset can be plotted as a line. The ends of this line are where the reset

starts and stops. The data which must be programmed in, are called the coordinates. These locate the ends of the line.

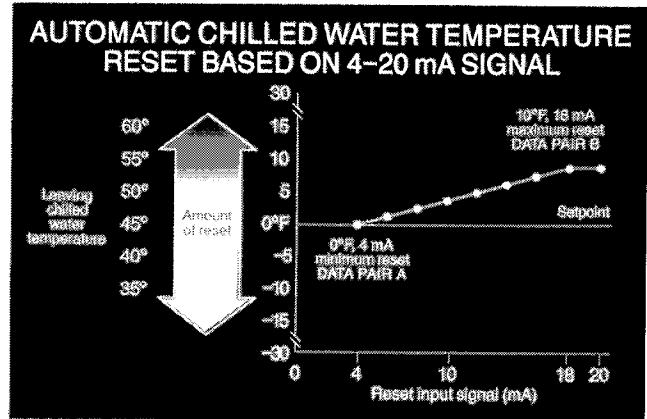


17. Auto Chilled Water Reset Based on Cooler Temperature Difference - This permits up to plus or minus 30°F of automatic reset of the leaving chilled water or brine temperature set point, based on a differential temperature between 0° and 20°F of entering and leaving water or brine temperature.

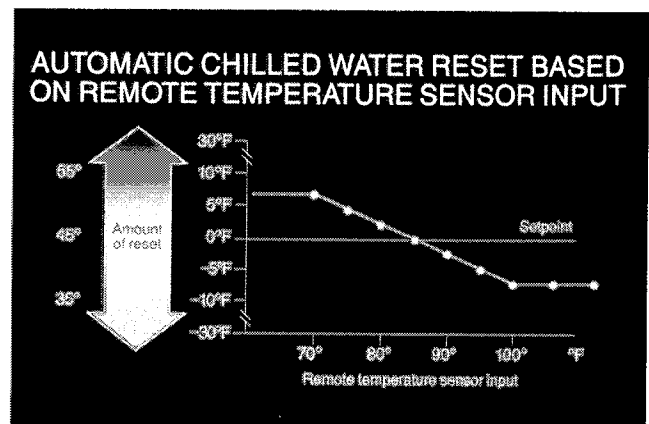


18. Automatic Return Chilled Water Reset is based on the difference in return water set point and return water temperature. This method of control resets the leaving chilled water or brine temperature up to plus or minus (+/-) 30°F to provide a desired entering (return) chilled water temperature. The amount of reset is based on the difference between return chilled water or brine

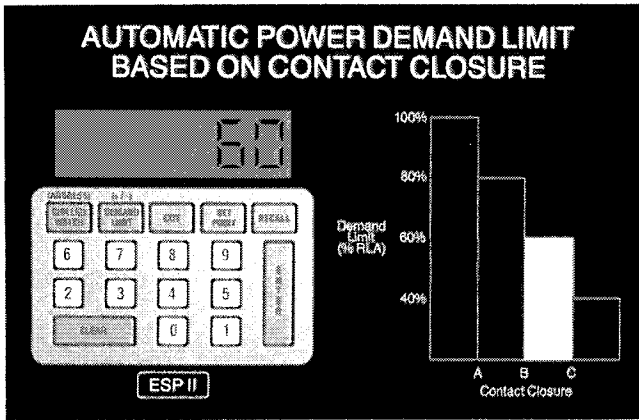
temperature and return chilled water set point. Programming a desired entering temperature control point anywhere between 1° and 120°F activates and controls the entering water at that temperature.



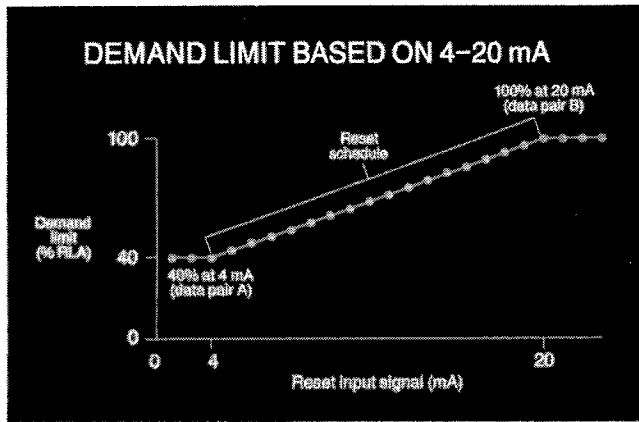
19. Automatic Chilled Water Temperature Reset Based on 4-20 mA dc Input Signal - This feature permits up to plus or minus 30°F of automatic reset to the leaving chilled water or brine temperature set point. This is based on the input from a 4-20 mA dc signal.



20. Automatic Chilled Water Reset Based on a Remote Temperature Sensor Input - This feature permits up to plus or minus (+/-) 30°F of automatic reset to the leaving chilled water or brine temperature set point, based on the input from a remote temperature sensor.



21. Automatic Power Demand Limit Based on Contact Closure - This operates by permitting automatic stepped limiting of motor current down to 40% of RLA based on the closure of 3 discrete contacts. Contact closure can be provided by any means desired, although clock-operated switches enable the user to take advantage of a "time of day" utility power rate structure.



22. Automatic Power Demand Limit Based on a 4-20 mA dc Input Signal - This permits automatic linear limiting of motor current within a range of 100% down to 40% of RLA based on a 4-20 mA signal.

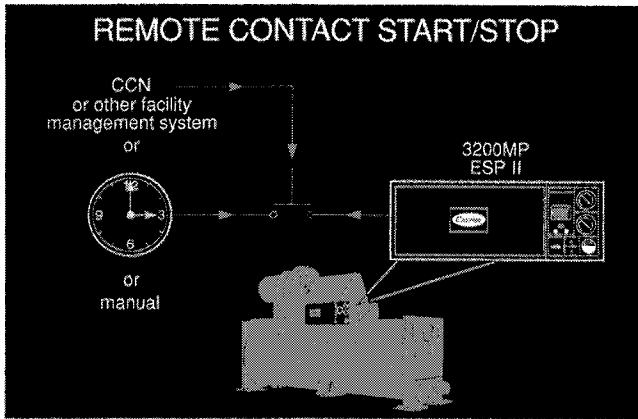
Automatic restart after a power failure
Permits ESP II to automatically restart the machine

23. Automatic Restart after a Power Failure - With this feature, the ESP II can automatically restart the machine. For lead/lag systems, the first machine started will be the lead chiller followed by the lag chiller, if needed.

Table 3 - ESP Address Format (cont)

ADDRESS	DESCRIPTION	VARIABLE INPUT RANGE
Variables Associated with Ramp Loading Rate Adjustment		
51	Ramp loading rate code	Code
		Loading Rate (degrees/minute)
		Reset Rate
		0
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
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		21
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		32
		33
		34
		35
		36
		37
		38
		39
		40
		41
		42
		43
		44
		45
		46
		47
		48
		49
		50

24. Ramp Loading Rate Adjustment - If active, this feature selects a ramp loading rate that is slower in degrees per minute than the value established by the basic 3200MP DIP switches. In lead/lag applications, ramp loading only applies to the lead machine.



25. **Remote Contact Start/Stop** - This feature allows the use of a switch from a time clock or other device for start-stop control of the machine. In lead/lag systems, only the lead chiller will be controlled when lead/lag is active, but the lag will follow if more capacity is needed.

ESP II LEAD/LAG CONTROL

- Starting and stopping each chiller as required
- Ensuring lag chiller is operational
- Maintain system operations if communication is lost
- Exit from and return to lead/lag without chiller shutdowns
- Provides lag chiller turn-off correction capability

26. **Lead/Lag Option** - Lead/Lag is where the ESP II really performs. Its purpose is to optimize the performance of two chillers to maintain the most efficient system performance. Features of the ESP II lead/lag include:

- Starting and stopping each chiller as required to match system load changes.
- Ensuring the lag chiller is operational if the lead chiller fails.
- Maintaining system operations if communication is lost.

- Allowing an exit from and return to Lead/Lag without chiller shutdowns.
- Providing a lag chiller turn-off correction capability. This function modifies the chillers percentage of total system RLA for lag chiller turn-off by adjusting the turn-off threshold towards sooner or later for each chiller.

LEAD CHILLER AT 100%

LEAD

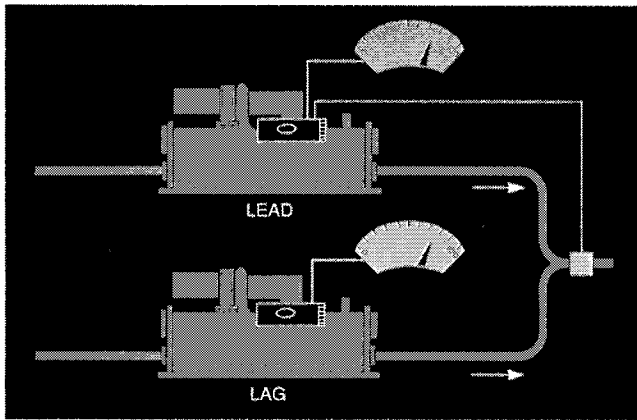
LAG

Variables

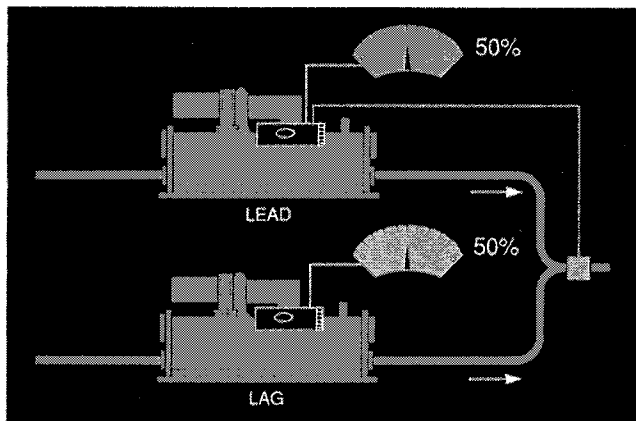
- A: Actual leaving chilled water temperature
- B: How much of the chilled water temperature is above setpoint
- C: How long the chiller has been running
- D: System current draw compared to system demand limit setpoint

27. Let's look at an example of lead/lag, assuming the two chillers are of equal size. Remember, the purpose of lead/lag is to optimize the chiller operation to get the most efficient performance. If the lead chiller is running at 100% RLA, the 3200MP ESP II will look at four variables.

- A. Actual leaving chilled water temperature.
- B. How much the chilled water temperature is above set point.
- C. How long the chiller has been running.
- D. The system current draw compared to system demand limit set point.



28. Based on this information, the ESP makes a decision to start the lag chiller. Once this decision is made, the ESP throttles the lead chiller back. The lag chiller is started and both chillers are loaded-up together. The lag chiller's capacity is controlled through the ESP by matching lag chiller percent motor current to the lead chiller percent motor current. The lead chiller looks at a common chilled water temperature sensor and adjusts to load changes with the lag chiller following so that both chillers control to a common chilled water set point.



29. To drop off the lag compressor, after the need for both chillers has passed, the ESP checks to see if the amps are less than 50% on both chillers and then looks at how long the two chillers have been running. If the time period is long enough and the amps are less than 50%, the lag chiller is shut down.

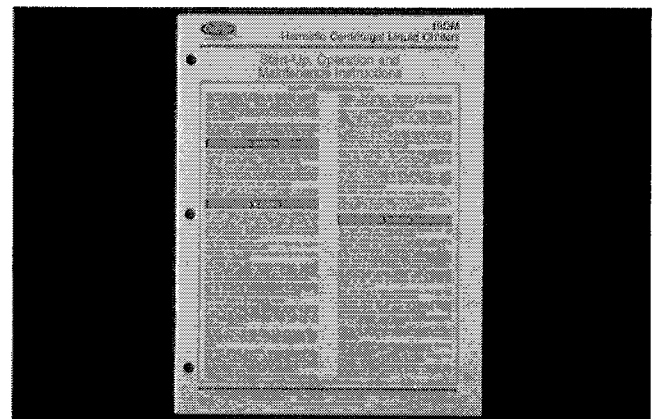
FAMILIARIZATION REVIEW

- ESP II identification
- Display and control functions

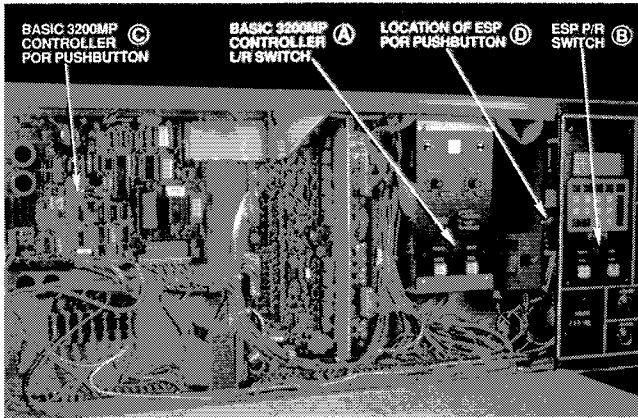
30. The major topics covered in the Familiarization section were:

- ESP II Identification
- Display and Control Functions

START-UP AND PROGRAMMING



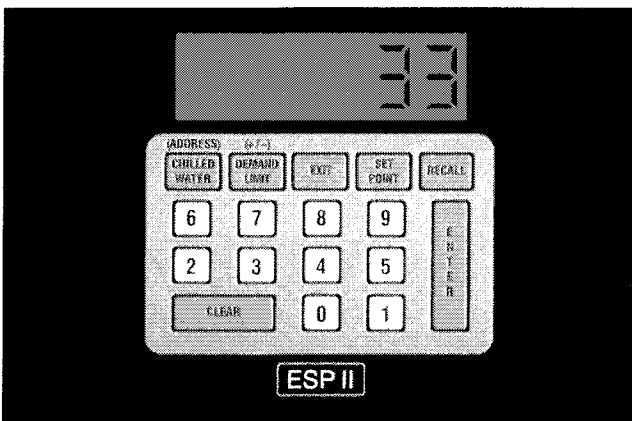
31. **WARNING:** Before the ESP II is used, the chiller must be started-up and operated by following the Basic 3200MP Controls section of the Chiller Start-Up Operations and Maintenance Instructions, otherwise the machine might be damaged.



32. Once the 3200MP control has been checked out, the ESP II can be energized.

- A. Position the Local/Remote switch on the basic 3200MP Controller to REMOTE.
- B. Position the Panel/Remote switch on ESP II to PANEL.
- C. Push the Power-On Reset (POR) button on the basic 3200 MP Processor Board.
- D. Push the POR button on the ESP II.

NOTE: The POR button on remote ESP II panels is inaccessible. To perform a POR, use the power button on the enclosure to interrupt, then re-establish control power to the ESP II.



33. After this is done, a code 33, 34, or 81 may appear on the ESP display. This means communication has not been established. Check to make sure the ESP and MX board have been installed

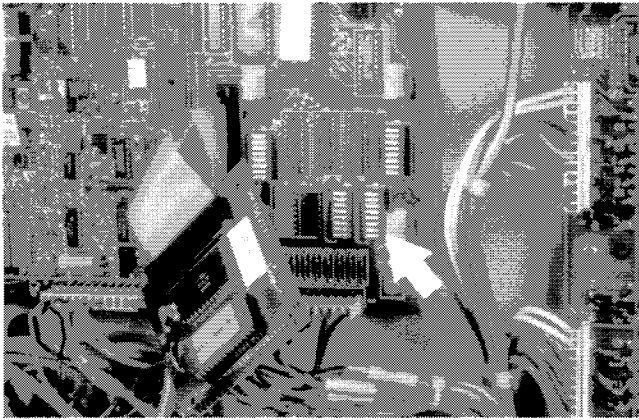
properly, along with compatible software. Make sure the Start-up Instructions have been followed. It may be necessary to repeat the process of energizing the ESP II just mentioned.



34. Before operating the ESP, there are seven special function keys on the ESP II keypad to be familiar with. These keys are:

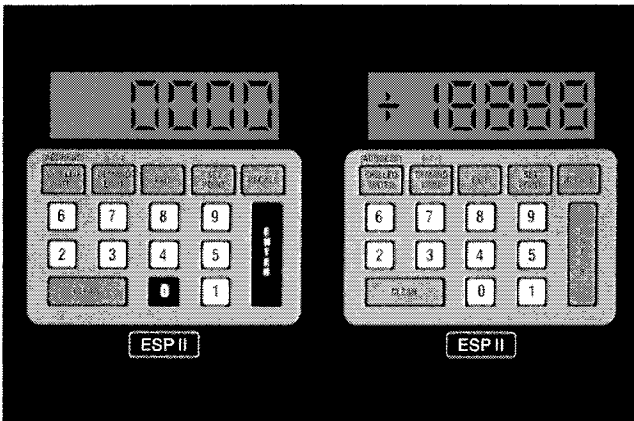
- **CHILLED WATER** - This key is used when displaying/selecting a chilled water set point.
- **DEMAND LIMIT** - Used when displaying/selecting a demand limit set point.
- **EXIT** - This key registers program inputs and returns the display to the present status code.
- **SET POINT** - Used to input a new set point.
- **RECALL** - This key displays stored shut-down status codes or selected machine parameters.
- **ENTER** - Used to enter program data or codes.
- **CLEAR** - This key clears errors, out-of-range inputs, or illegal keystrokes when the display or plus (+) sign in the display is blinking. Pressing this key will also return the display to the last valid keystroke.

This is a brief explanation of the seven special function keys which will be discussed in more detail when the actual programming procedures are covered.



35. Remember that before operating the ESP II, a chiller identification number must be programmed, along with the chilled water set point and the demand limit set point.

To program the chiller ID number, select any number between one and seven you wish to assign to the chiller. Configure this number with the DIP switches on the 3200MP processor board. Refer to the chiller Start-up, Operating and Maintenance Instructions to find the (DIP) switch setting tables.



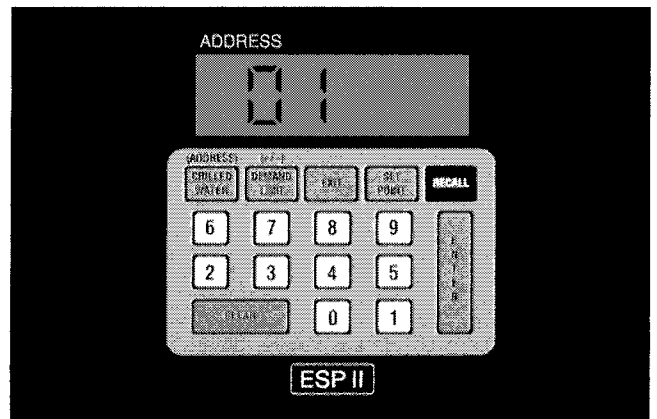
36. Let's review this programming with an example using the number "2" for the ID number. When initializing the chiller ID number on the ESP, a code 76 might be flashing in the display. Code 76 indicates an invalid configuration which, in this case, means the basic controller ID has not yet been programmed in the ESP address format.

Begin by positioning the ESP's P/R switch to Panel. Enter four zeros **0 0 0 0**, and then press the **ENTER** key. The display should show plus-one-eight-eight-eight (**+18888**) -- indicating the access code has been accepted and the ESP II will enter an active programming sequence.

Table 3 -- ESP Address Format

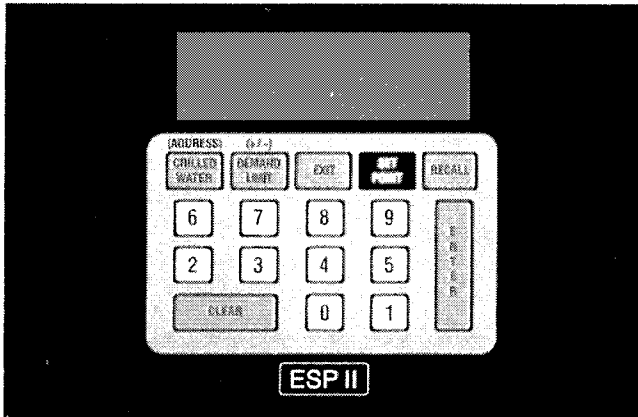
ADDRESS	DESCRIPTION	PARAMETER RANGE
1	Chiller Identification Number From fielding request: Only chiller ID no. Lead/lag systems may use ID no. of either chiller in system.	0 to 7
2	Chiller Identification Number From fielding system. Must be same ID no. as chiller at Address #1 Lead/lag systems. Other chiller in system must be chiller programmed at Address #3.	0 to 7
3	Chiller Identification Number From fielding system. Must be same ID no. as chiller at Address #1 Lead/lag systems. Must be same ID no. as chiller at Address #1 for Address #2.	0 to 7

37. For a single chiller system, the ID number must be input into address 1 and 3. Programming lead/lag systems will be covered later in the program. If a mistake is made while trying to enter any of the data, just press the **CLEAR** key and start again. For more detail, see Start-up, Operation, and Maintenance Instructions for the ESP address format table.

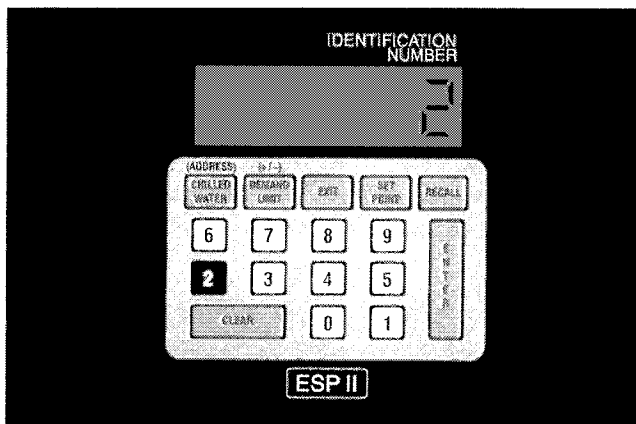


38. Once the acknowledgment (+18888), has been received, press the **RECALL** key and the display should show the program address number - - zero-one (01) -- for 2 seconds. Following this,

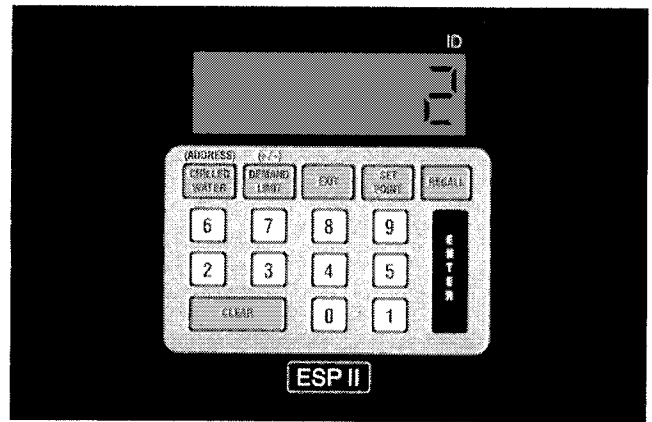
the display will show the contents of address 01 which could be any number programmed in the software. Remember, if the data here does not correspond with the address as set by the DIP switches on the processor board, a code 76 will be generated.



39. Press the **SET POINT** key and the display should become blank. In a rare situation, the display may be blinking. If so, press the **CLEAR** key. Check to be sure the P/R switch is in the **PANEL** position, then continue.

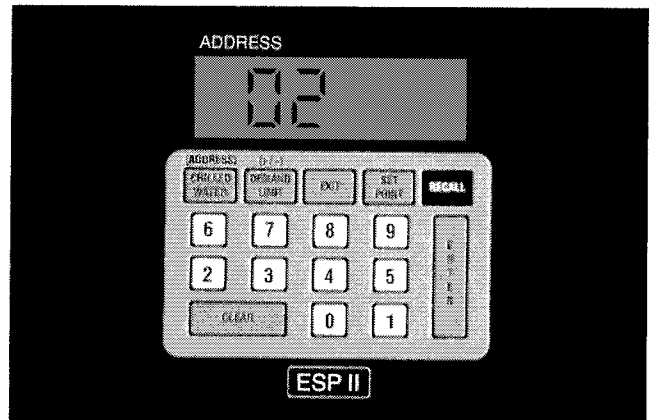


40. Press the number **2** and this selected chiller ID number will appear in the display as (2).

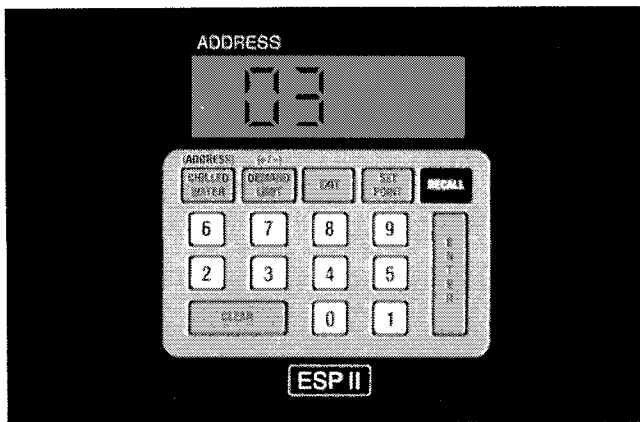


41. Press the **ENTER** key and the display should blank out then show (2) again. This means the new data (ID number) has been accepted.

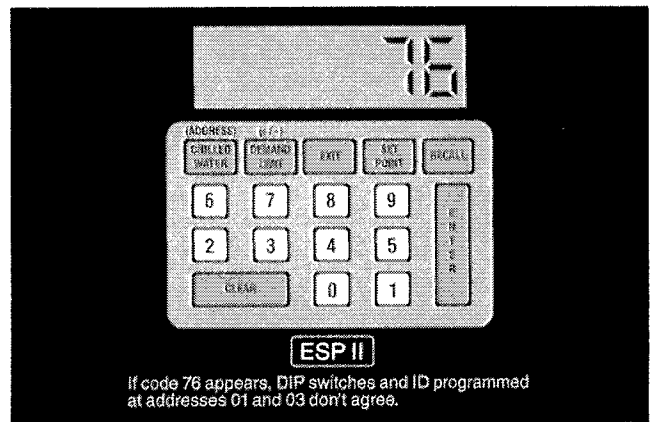
In rare circumstances, you may see a blinking "EE" in the display. This indicates an error occurred when the ID number was entered. This means the chiller ID number at this location already matches your selected ID number. Further, it indicates no additional action is required at this address.



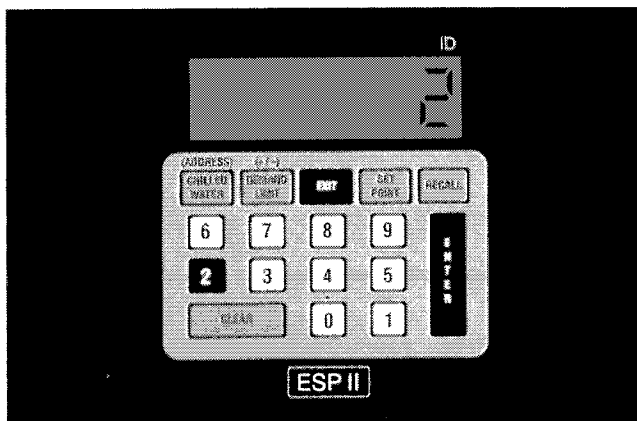
42. Press the **RECALL** key and zero-two (02) will appear in the display. This will be followed by its contents indicating the next programming address.



43. Press **RECALL** again and zero-three (03) should appear followed by its contents. Remember, this is the second address code where the chiller ID number must be entered for single compressor chillers. Press **SET POINT** and the display blanks out.



45. If the programming steps have been followed as explained, and a code 76 (Invalid Configuration) is displayed, then the chiller ID number that was set with the DIP switches and the ID programmed at addresses 01 and 03 do not agree. The numbers must agree before operation of the ESP can begin.

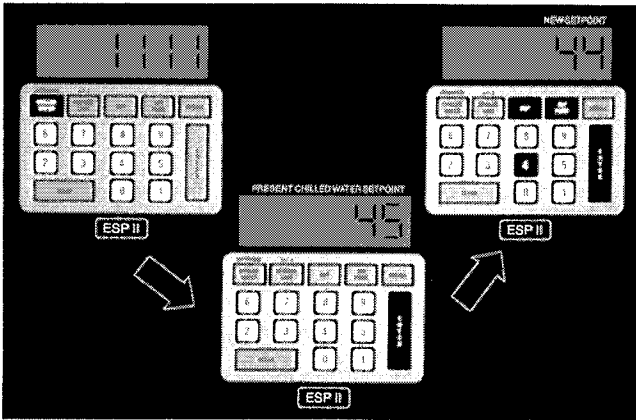


44. Now, press **2** and (2) will be displayed. Press **ENTER** and (2) will again appear showing the new data has been accepted. Finally, press the **EXIT** key and the chiller present status code will appear on the display. These codes can be found in the Diagnostic Codes table in the Start-Up, Operation and Maintenance Instructions.



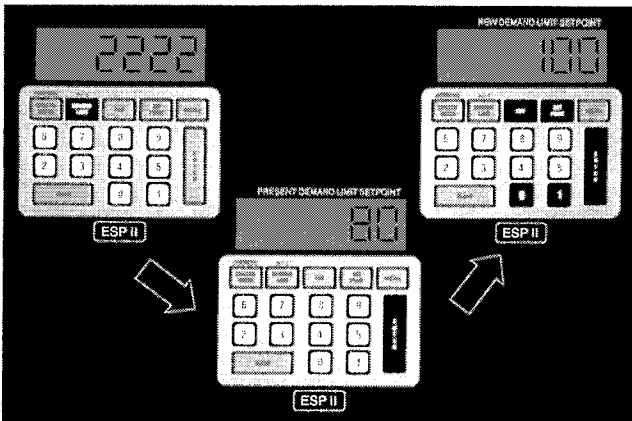
46. As indicated earlier, the chilled water set point and the demand limit set point must also be programmed into the ESP address format.

To program the chilled water set point, select any temperature between 35° and 120°F (0° to 120° for brine). The P/R switch should still be in the PANEL position and the ESP will be displaying one of the present status codes from the Diagnostic Codes table.



47. Press the **CHILLED WATER** button and the display should show four ones (1111). Press **ENTER** and the present chilled water set point should appear. For example: 44°F would be set as follows: Press the **SET POINT** key, then the number 4 4. The new chilled water set point, 44, will appear in the display. Now, press **ENTER**. The display blanks, then shows (44). This means the new data has been accepted.

Press **EXIT** and a code reflecting the chiller's present status will appear.



48. Let's input the demand limit set point. Its value can be anywhere between 40% and 100% RLA. 100% will be used in the following example.

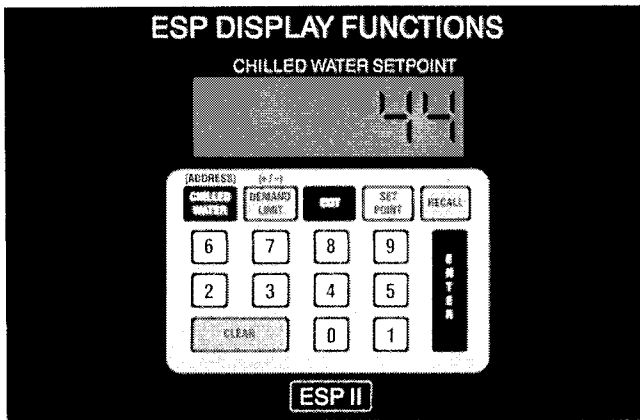
Begin by pressing **DEMAND LIMIT**. Four twos (2222) will be displayed. Press the **ENTER** key to display the present demand limit set point. Press **SET POINT**, which blanks the display. Press 1 0 0 and this value appears in the display. Now, press **ENTER**, which again blanks the screen before (100) re-appears. The new data has now been accepted.

Press the **EXIT** key and a chiller present status code will be displayed.

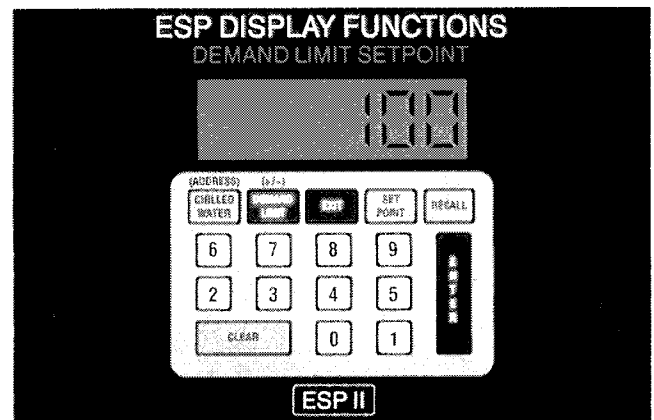
At this point the ESP II has been activated and the initial programming completed, it is now safe to start the chiller.



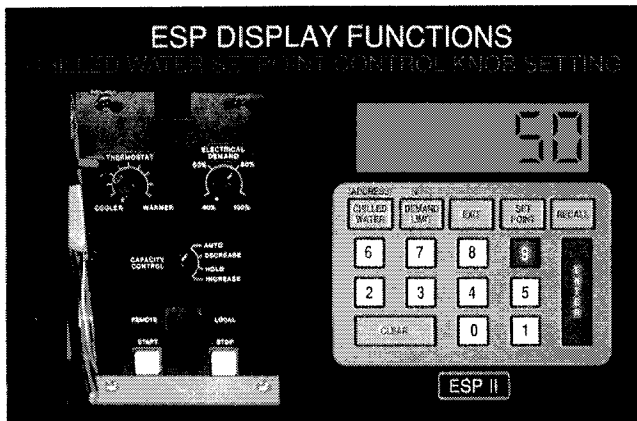
49. Before going more deeply into programming the ESP II, the ESP's display function will be covered. To do this, the seven special function keys will be used to display some routine information necessary for later work.



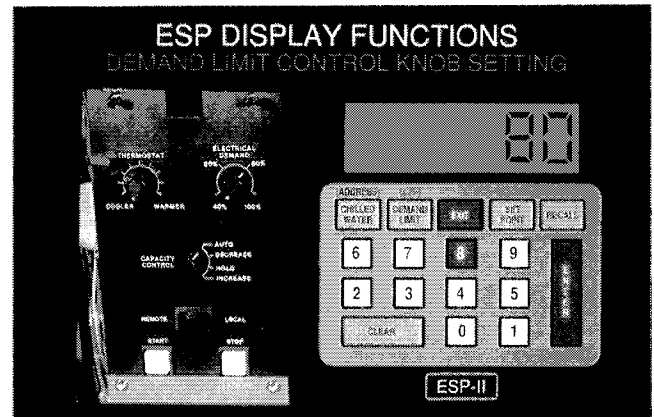
50. Now that the ESP chilled water set point has been programmed in, let's take a look at it. Depress the **CHILLED WATER** key, followed by the **ENTER** key. The number programmed, (44)°F, will appear in the display. Push **EXIT** and the display will show the present status code.



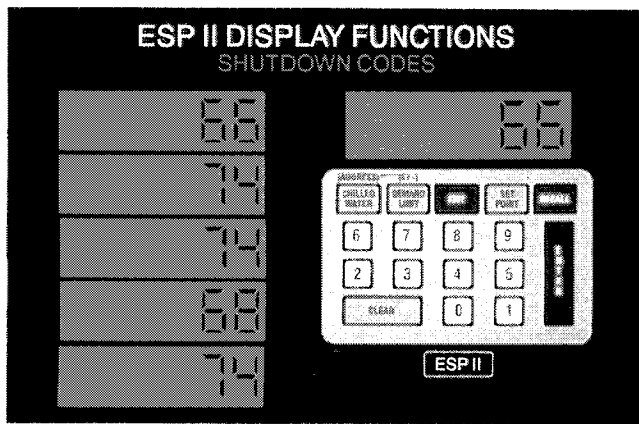
52. To look at the ESP demand limit set point, push the **DEMAND LIMIT** key, then **ENTER**. The display will show the (100)% entered previously. Press **EXIT** and the display will show the present status code. The basic controllers demand limit set point can be looked at the same way as the chilled water set point.



51. To display the chilled water set point control knob setting on the 3200MP Basic Controller S/D (Set Point/Display) panel, position the Local Remote switch on the S/D panel to LOCAL. Press **9 9 9 9**, then **ENTER**. The value can be changed and the display updated if the thermostat is moved. By changing the L/R switch back to REMOTE, the ESP chilled water set point will return to the display.

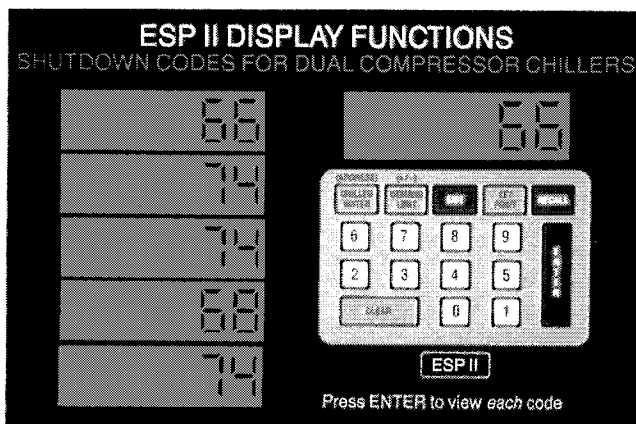


53. By positioning the Local/Remote (L/R) switch on the S/D panel to LOCAL, pressing **8 8 8 8** and then the **ENTER** key, the value of the demand limit knob setting will be displayed. This value can also be changed and the display updated as the knob is moved. Changing the L/R switch back to REMOTE will display the ESP demand limit set point. Pressing the **EXIT** key will show the present status code.



54. The ESP will store the shutdown codes of the last five chiller shutdown faults. These are stored in permanent memory so the codes will not be lost if the ESP II experiences a power failure.

To display the shutdown fault codes, depress the **RECALL** button, then the **ENTER** key. The codes appear in the display with the most recent fault shown first, followed by the remaining shutdown codes in order from the most recent to the oldest. After the last code has been displayed, the ESP blanks for ten seconds, then repeats the sequence. Push **EXIT** at any time to return to the chiller present status code.



55. To review shutdown codes for dual-compressor chillers, press **RECALL**, then press **ENTER** for each code. Codes will appear in the same pattern, from the most recent to the oldest. Push **EXIT** when done.

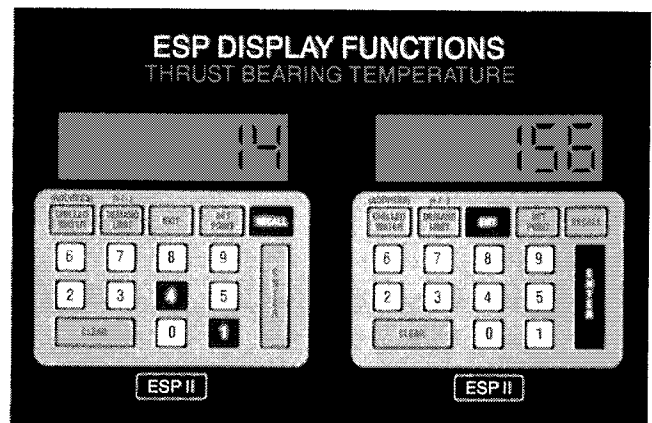
MACHINE OPERATING PARAMETERS (NON-LEAD/LAG SYSTEM)

SINGLE COMPRESSOR CHILLERS

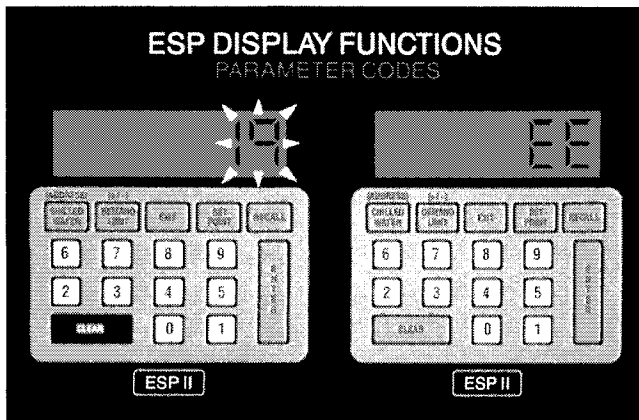
PARAMETER CODE	PARAMETER TO BE DISPLAYED
10	Leaving Chilled Water Temperature
11	Motor Current % FLA
12	Evaporator Refrigerant Temperature
13	Condenser Refrigerant Temperature
14	Bearing Temperature
15	Motor Winding Temperature
16	Compressor Discharge Temperature
17	Line Voltage
18	Spare Sensor #1 Temperature
19	Spare Sensor #2 Temperature
30	Spare Sensor #3 Temperature
31	Spare Sensor #4 Temperature

56. To display machine operating parameters, review Table One in the ESP II Start-Up, Operation and Maintenance Instructions.

Press **RECALL**, then keystroke the parameter of your choice, then press the **ENTER** key. If a number is entered before depressing the **ENTER** key, it signals the ESP that a machine parameter code is being entered. Remember, if you do not enter a number before pressing **ENTER**, you are requesting a shutdown status recall request.

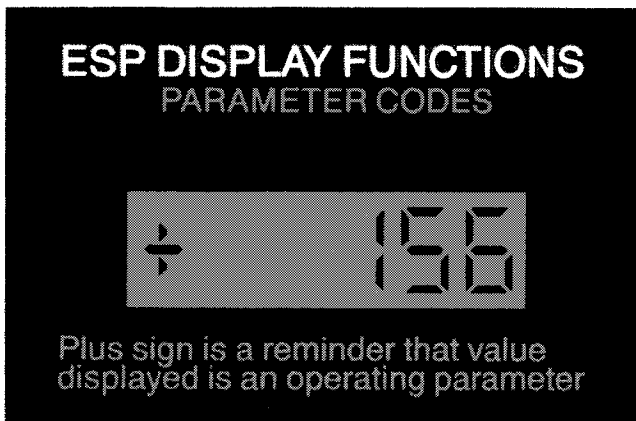


57. For example, to display the thrust bearing temperature, press **RECALL**, then **1 4**, the parameter code for bearing temperature. (14) will appear in the display. Press **ENTER** and the bearing temperature will appear. Press **EXIT** when done.



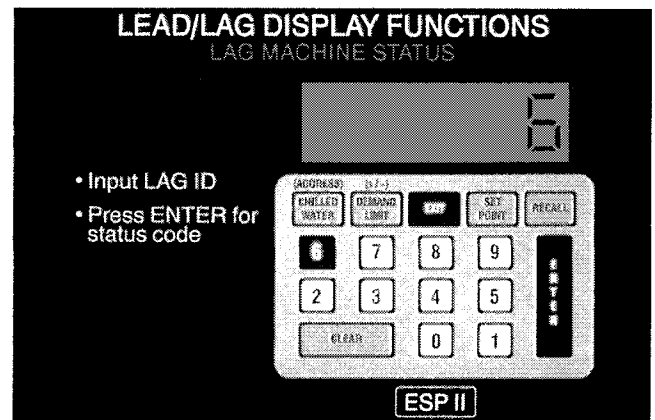
58. If a code is entered for a parameter that does not have a sensor, the display will blink until the **CLEAR** key is depressed.

If a sensor goes out-of-range, the display will show (EE).



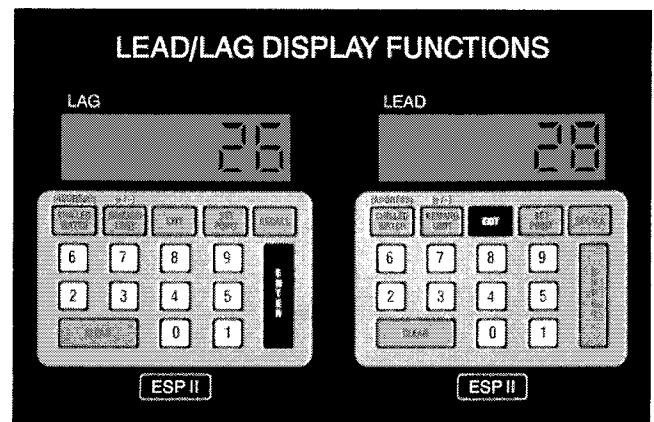
59. If, while reading a parameter, no keyboard activity takes place within 60 seconds, the plus (+) sign in the display will blink until the **CLEAR** key is used.

The plus sign is a reminder that the value being displayed is an operating parameter code and not a present status code.

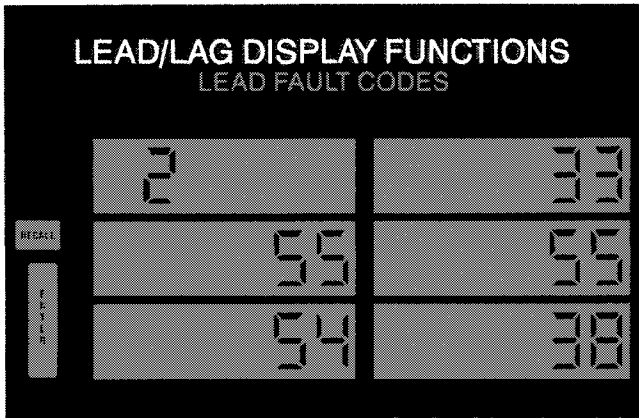


60. Now, focus attention on display functions for Lead/Lag systems. When Lead/Lag is activated, the ESP II normally displays the present status code of the lead machine.

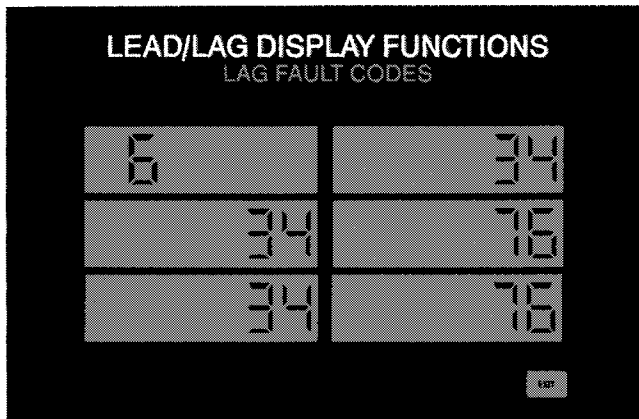
To display the status of the lag machine, keystroke the lag chiller ID and press **ENTER**. To return the display to the lead chiller, press **EXIT**.



61. Here is an example. If the lag chiller with ID number six (6) is in the start-up process, enter the number **6** and the display shows this number. Press **ENTER** and the code for lag chillers operating status, in this case code (26), will appear on the display. Press **EXIT** and the lead chiller operating status, normally (28), will be displayed.



62. When displaying the stored shutdown fault status codes for a lead/lag system, if lead/lag is activated, the lead chiller ID number is displayed followed by the five shutdown fault codes for this chiller.



63. The ESP will pause momentarily and then display the ID number for the lag chiller, followed by its shutdown codes. This pattern repeats until the **EXIT** key is used.

MACHINE OPERATING PARAMETERS FOR LEAD/LAG SYSTEM		
SINGLE COMPRESSOR CHILLERS		
PARAMETER CODE		PARAMETER TO BE DISPLAYED
Activated or Deactivated Lead/Lag		
Lead Chiller	Lag Chiller	
10	20	Leaving Chilled Water Temperature
11	21	Motor Current % FLA
12	22	Evaporator Refrigerant Temperature
13	23	Condenser Refrigerant Temperature
14	24	Bearing Temperature
15	25	Motor Winding Temperature
16	26	Compressor Discharge Temperature
17	27	Line Voltage
18	28	Spare Sensor #1 Temperature (Return Water Control)
19	29	Spare Sensor #2 Temperature – Temperature at common point (Mixed CW Temperature)
30	32	Spare Sensor #3 Temperature
31	33	Spare Sensor #4 Temperature

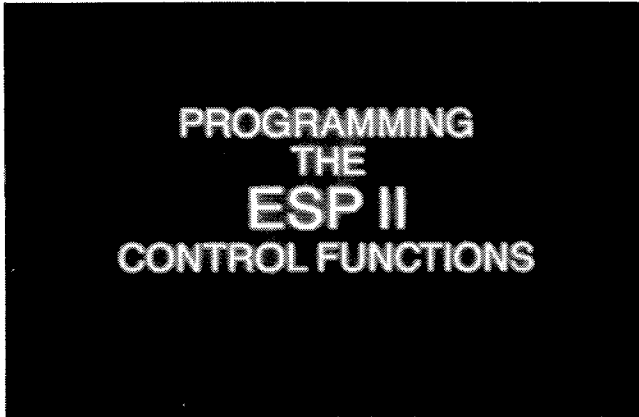
64. All machine operating parameters for the lead and lag machines can be displayed at any time even when lead/lag is not activated. Codes for the lead or main chiller are always 10 through 19, 30 and 31. Codes for the lag machine are always 20 through 29, 32 and 33.

START-UP AND PROGRAMMING REVIEW
• Special function keys
• Programming chiller identification
• Programming chilled water setpoint
• Programming demand limit setpoint
• ESP display functions

65. The major topics covered in the Start-up and Programming section were:

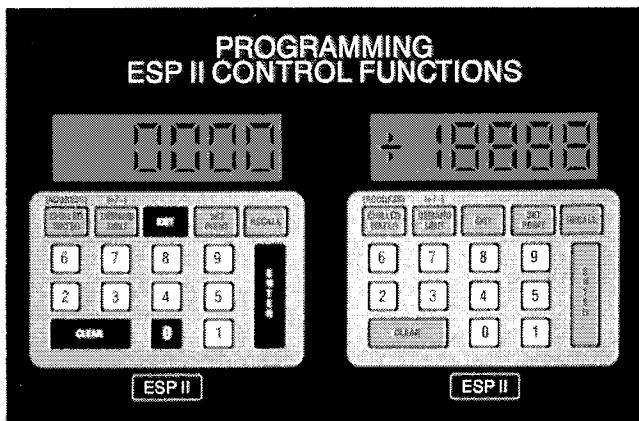
- Special Function Keys
- Programming Chiller Identification
- Programming Chilled Water Set Point
- Programming Demand Limit Set Point
- ESP Display Functions

PROGRAMMING EXERCISES



66. At this point, let's return and take a more in-depth look at programming the ESP II, and go through a couple of actual exercises.

Programming the ESP II control functions is the same for all chillers. In order to do the programming, the ESP must be activated as discussed earlier. If you recall, we input the chiller ID number, chilled water set point and the demand limit set point.

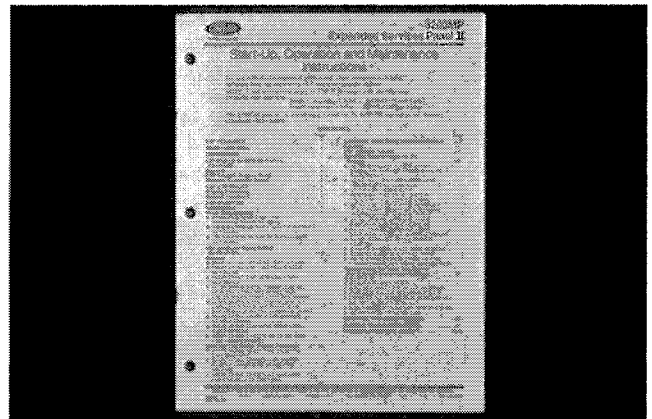


67. Programming, and the ESP II control functions will follow these general rules:

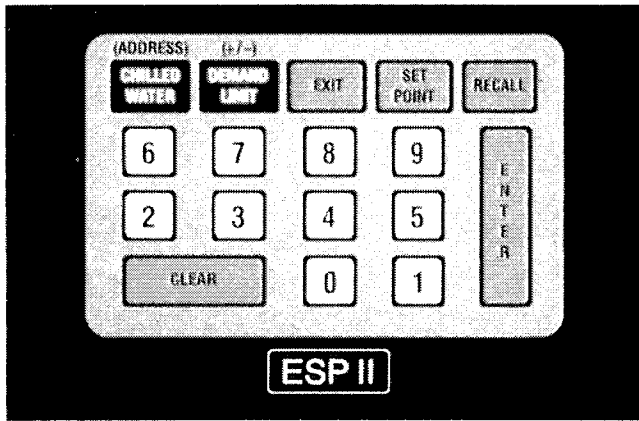
- A. Programming begins with the ESP II displaying the unit present status code. If the code does not appear in the display, press the **EXIT** key. The program mode is entered by

pressing zero, four times **0 0 0 0**, followed by **ENTER**. When the display responds with (+18888), programming can begin.

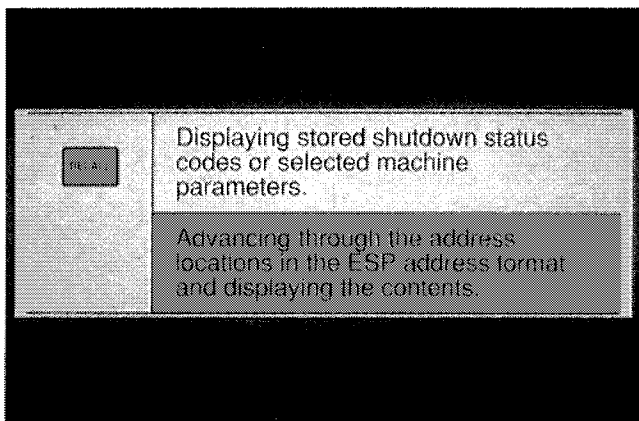
- B. If a mistake is made during programming procedure, press **CLEAR**. You can also eliminate a blinking display or a blinking (EE) display with the **CLEAR** key.
- C. If the data entry is in error or the programming sequence has not been followed correctly, press **CLEAR**, then **EXIT**, to return to the chiller present status code and start the programming sequence again.
- D. If an attempt is made to enter data out of limits, or to activate an option for which data is missing, the data or activation code will be rejected and the display will blink. Press the **CLEAR** key to return to the previous programming step.



68. Programming the ESP II, closely follows the format outlined in the Start-Up, Operation and Maintenance Instructions. You may want to locate this information and the address and code tables to have them available for reference. A review of the Abbreviations and Definitions given in the ESP II Start-up, Operation, and Maintenance Instructions will be helpful.

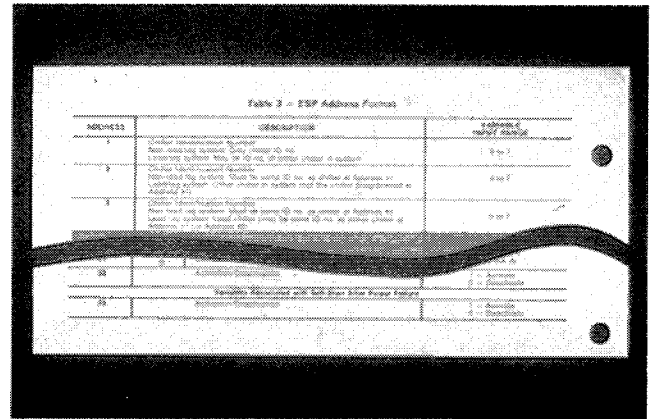


69. To program the ESP II, the seven special function keys and ten numerical keys are used as seen by the previous examples. The **CHILLED WATER** and **DEMAND LIMIT** keys also have secondary functions. When used for ESP II address format programming, these keys will always perform their secondary function. This secondary function for the **CHILLED WATER** key is to serve as the Address key, while the **DEMAND LIMIT** key has a Plus and Minus (+/-) function.



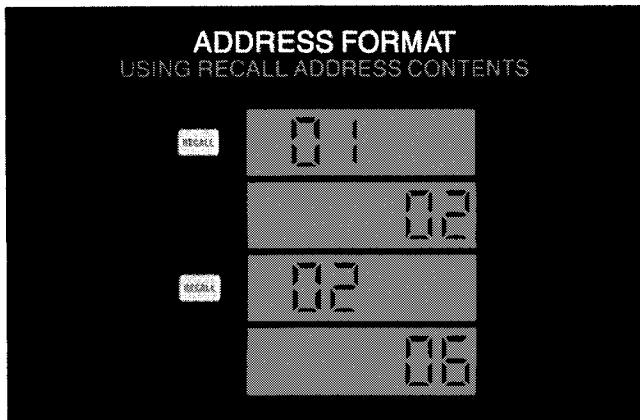
70. The **RECALL** key also has two functions as shown in the Special Function Keys Chart located in the 3200MP-ESP-ISOM Instructions. The shaded areas indicate the functions these keys perform when used for programming the ESP address format.

One more item should be noted. Temperatures can be entered and displayed in either Fahrenheit or Centigrade depending on how the DIP switches are set on the Basic 3200MP Controller Processor Board.



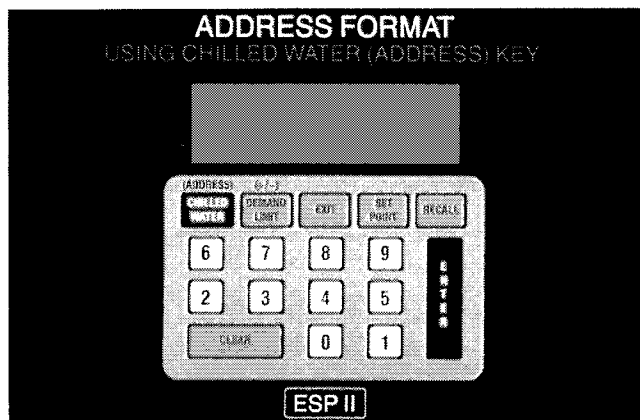
71. Here is a brief review of how to access the ESP II address format. For more detail, see the Start-up, Operation, and Maintenance Instructions for the ESP address format table.

- Position the P/R switch to Panel.
- Press zero, four times **0 0 0 0** while the machine's present status code is being displayed.
- Press **ENTER**.
- Display will show (+18888) which means your access code has been accepted and the ESP II will enter an active programming sequence.

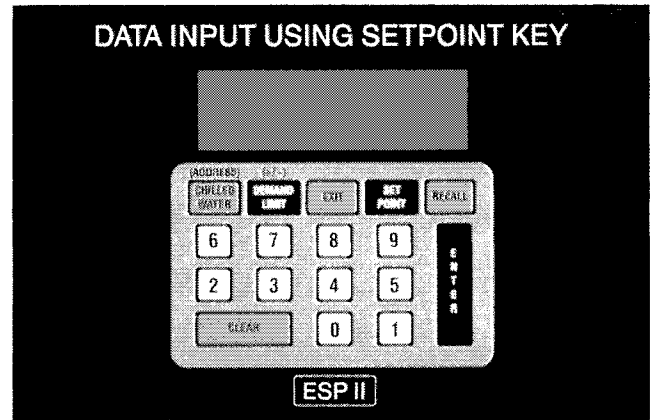


72. When the programming sequence has been established there are two ways to call up an address in the format to program data.

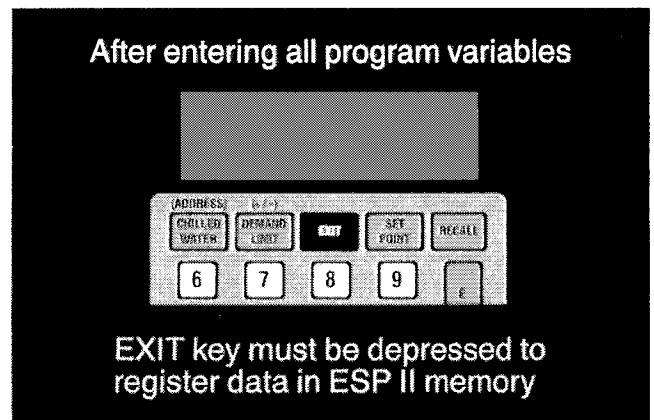
You can depress the **RECALL** key to advance through each address location one at a time. Each time **RECALL** is pressed, the number of the new address will be displayed for half a second followed by its contents.



73. The **CHILLED WATER** (Address) key lets you go directly to an address by depressing this key, inputting the address number desired, then pressing **ENTER**. The number of the selected address will be displayed for half a second followed by its contents.



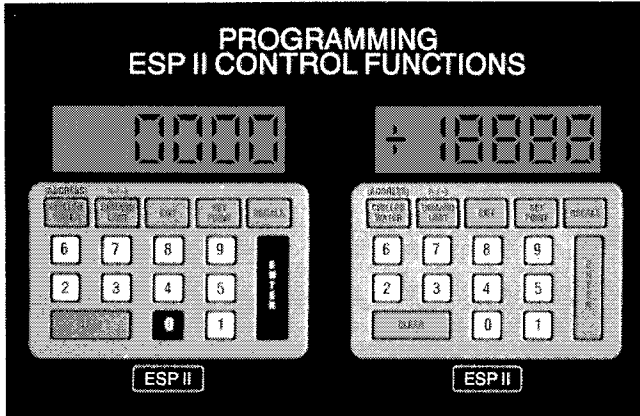
74. After selecting an address, new data can be inserted at that location by depressing the **SET POINT** key, inputting the desired data, then depressing the **ENTER** key. The display blanks for half a second, then displays the new data. Negative data are programmed by depressing the **DEMAND LIMIT (+/-)** key after depressing the **SET POINT** key.



75. Remember that once a programming sequence begins and no keypad activity takes place within 60 seconds, the plus (+) sign in the display will blink until the **CLEAR** key is pressed. To enter data, the P/R switch must be in the **PANEL** position.

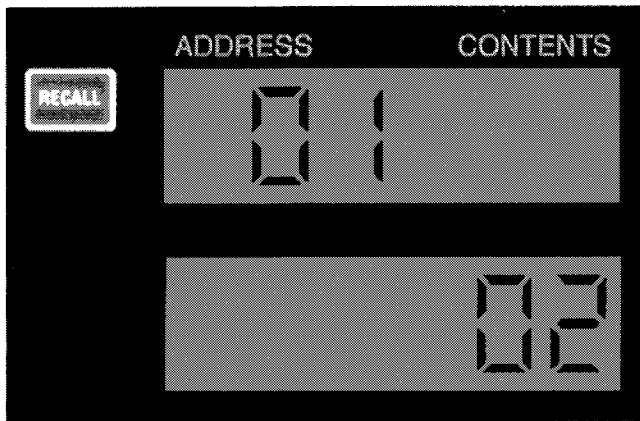
After entering all the program variables, the **EXIT** key must be depressed to register the data in the ESP II's memory, and return to the chiller's present status code. The L/R switch may be in either position when programming.

Programming the ESP Address Format



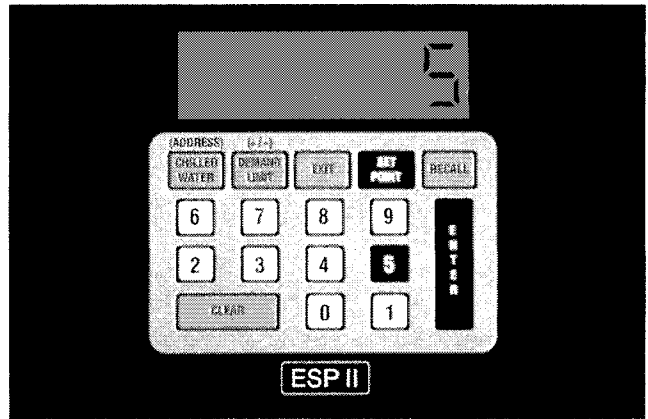
76. Let's repeat all of this with a step-by-step example.

- Set P/R switch to PANEL
- Press zero, four times **0 0 0 0**
- Press **ENTER**
- Display shows (+18888). The access code has been accepted and the ESP is ready for programming.



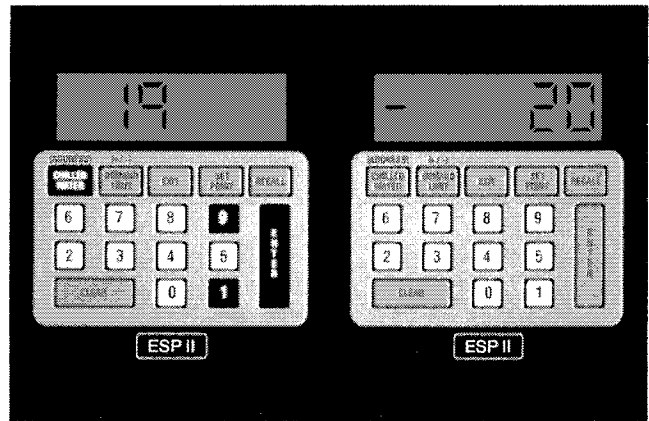
77. Programming the ESP Address Format continued.

- Press **RECALL** key
- Check display for address code 01 followed by contents in address one. We previously input the ID number **2** in this address, so (02) should appear in the display.



78. Programming the ESP Address Format continued.

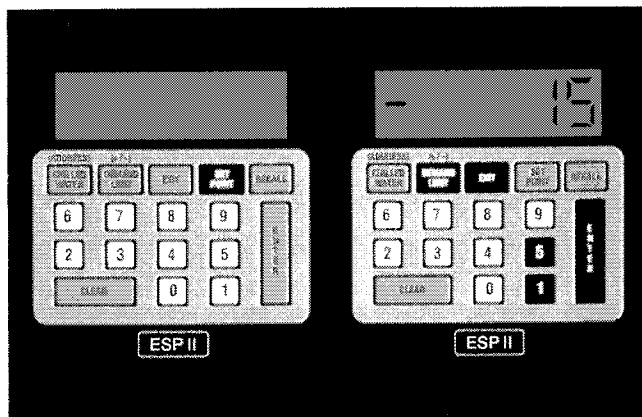
- Press **SET POINT** key and the display blanks to accept new data
- Press the number **5** and (5) appears in the display
- Press the **ENTER** key. Display blanks, then shows (5) which is now the new chiller ID number.



79. Programming the ESP Address Format continued.

- Press the **CHILLED WATER** (Address) key. Display blanks to accept direct address input.

- Press **1 9** on keypad and (19) appears on display.
- Press the **ENTER** key and the new address, (19), will be displayed for a second then its contents will be displayed. Assume (-20), the remote temperature value, is displayed.



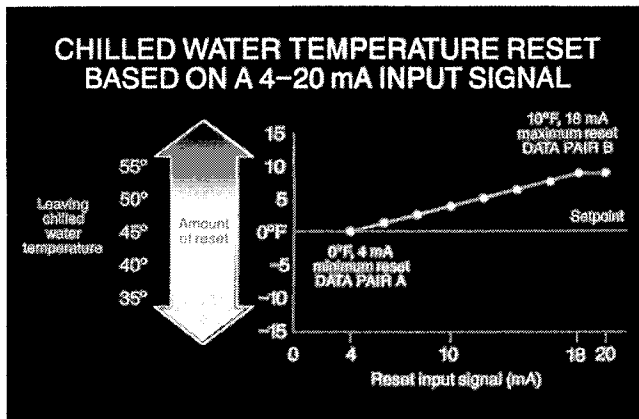
80. Programming the ESP Address Format continued.

- Press the **SET POINT** key. The display blanks to accept the new remote temperature set point.
- Press the **DEMAND LIMIT (+/-)** key. The display will show a negative sign indicating data to be programmed is negative.
- Keystroke the new remote temperature value, **1 5**. It will appear on the display.
- Press the **ENTER** key and (-15) appears on the display.
- Press the **EXIT** key and the new input is registered in ESP II memory. The display returns to the chiller present status code.

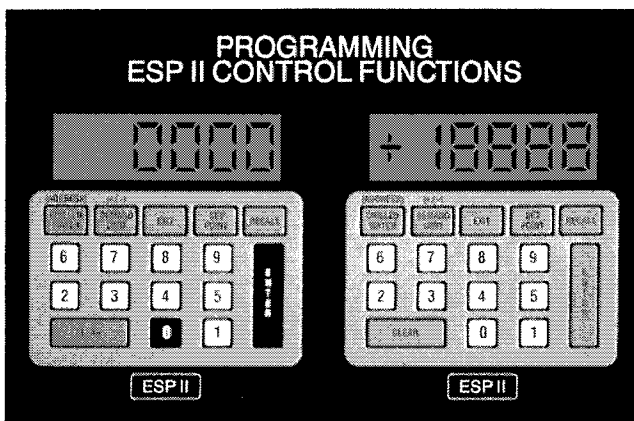
Programming the ESP Address Format

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	22	Machine operating status code. P/R switch must be in PANEL to proceed with programming the access code
0 0 0 0	0000	
ENTER	+18888	Access code accepted, programming sequence begins
RECALL	01 02	Shows address 01 for 2 seconds then displays contents of address 01 (Chiller identification number is 02)
SET POINT		Display blanks to accept data input
5	5	
ENTER	5	Display blanks for 1/2 second and then shows new chiller identification number for address 01 is "5"
(ADDRESS) CHILLED WATER		Display blanks to accept direct address input
1 9	19	Input
ENTER	19 -20	Displays new address (19) for 2 seconds and then its contents (Remote temperature value = -20)
SET POINT		Display blanks to accept new remote temperature set point
(+/-) DEMAND LIMIT	—	Negative data coming
1 5	-15	
ENTER	-15	Display blanks for 1/2 second and then accepts new data (New remote temperature value is -15)
EXIT	28	Registers inputs and returns display to chiller present status code

Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal



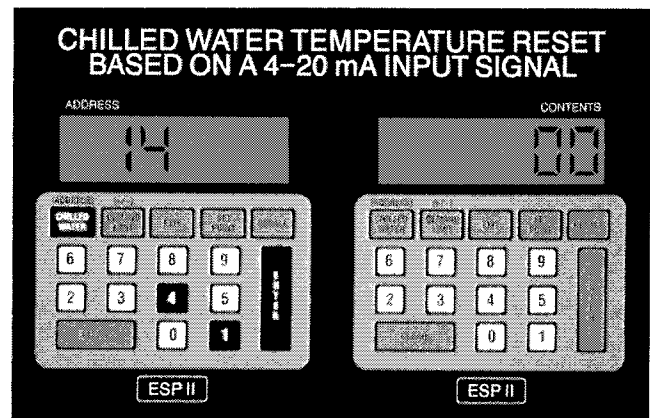
81. Let's set up an example where we program the Automatic Chilled Water Temperature Reset based on a 4-20 mA input signal. To establish the reset schedule, first determine what the maximum and minimum reset values would be. Then, input the conditions that determine the range over which the reset is to take place. As we proceed with the example, notice that the input for the reset schedule has to be programmed in data pairs. For our example, the set point temperature will reset to a higher temperature as the 4-20 mA signal increases.



82. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

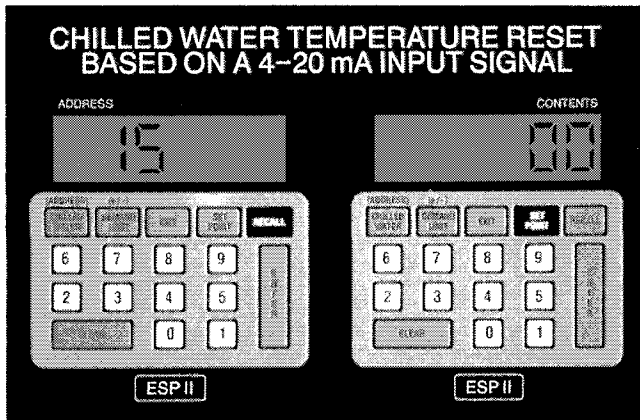
Begin by preparing the ESP for programming.

- Set the P/R switch to panel.
- Press zero, four times **0 0 0 0**.
- Press **ENTER**.
- The display shows (+18888). The access code has been accepted and the ESP is now ready for programming.



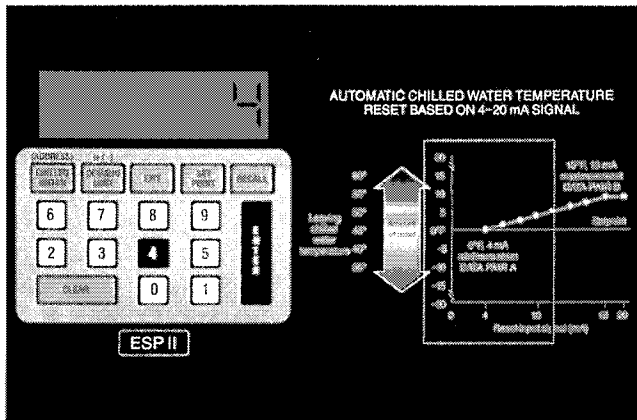
83. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

- Press the **CHILLED WATER** (Address) key. The display blanks.
- Press 14, which is the address for reset temperature A.
- Press the **ENTER** key and 14 appears on the display followed by the contents of the address (00). The desired reset temperature is the same as the present reset temperature (zero degrees). Data need not be entered. Proceed to the next address.



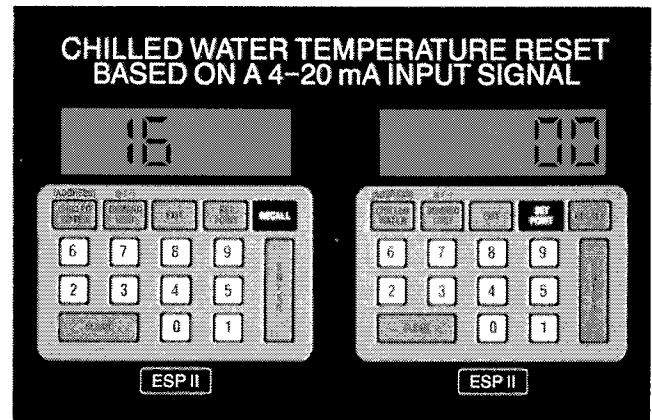
84. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

- Press the **RECALL** key and the display shows address (15) followed by its contents for input signal A. Present value (00) appears in the display.
- Press the **SET POINT** key. The display will blank.



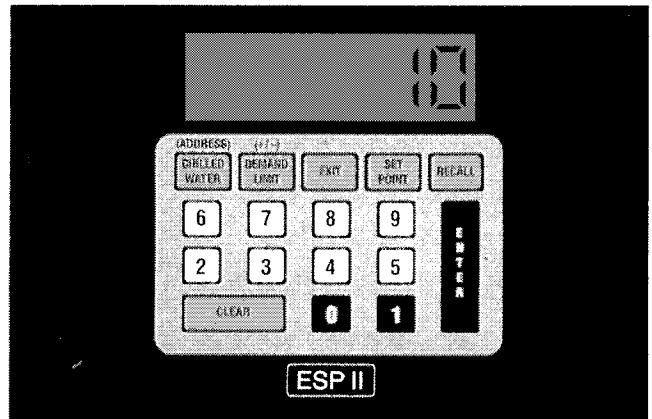
85. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

- Enter **4** on the keypad. This represents a 4 mA input signal corresponding to reset temperature A.
- Press **ENTER** and (4) appears in the display.



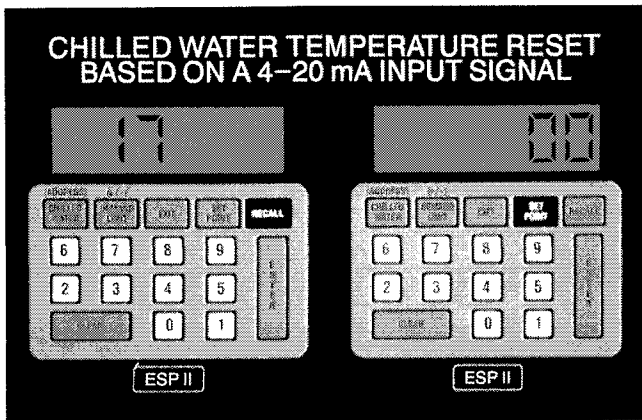
86. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

- Press the **RECALL** key and (16) appears. This is the address for reset temperature B. It is followed by the contents of the address, (00), which represents the present reset temperature.
- Press the **SET POINT** key and the display blanks.



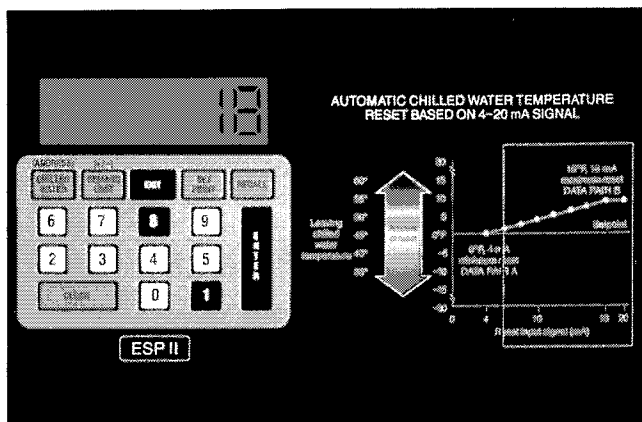
87. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

- Press **10** for 10 degrees of reset.
- Press the **ENTER** key and (10) is displayed.



88. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

- Press the **RECALL** key and (17) appears. This is the address for input signal B. It is followed by the contents of the address, (00), which represents the present mA input signal.
- Press the **SET POINT** key and the display blanks.



89. Programming Automatic Chilled Water Reset Based on 4-20 mA Input Signal continued.

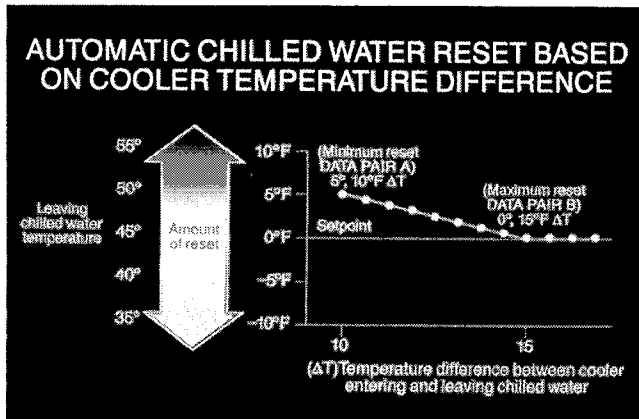
- Enter **1 8** which represents a 18 mA input signal corresponding to the reset temperature B.
- Press the **ENTER** key and (18) appears on the display.
- Press the **EXIT** key and the new input is registered in the ESP's memory. The display returns to the chiller present status code.

Programming Auto. Chilled Water Temperature Reset Based on 4-20 mA dc Input Signal

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/INPUT	DISPLAY/RESPONSE	COMMENTS
	28	Chiller present status
0 0 0 0	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
(ADDRESS) CHILLED WATER		Blank display; ready for address for reset temperature A
1 4	14	
ENTER	14 00	Address for reset temperature A Present reset temperature The desired reset temperature is the same as the present reset temperature (zero degrees), therefore, it is not necessary to enter new data. Proceed to the next address by pressing RECALL
RECALL	15 00	Address for input signal A Present value
SET POINT		Blank display; ready for data
4	4	mA dc input signal corresponding to reset temperature A above
ENTER	4	Data accepted
RECALL	16 00	Address for reset temperature B Present reset temperature
SET POINT		Blank display; ready for data
1 0	10	10 degrees reset temperature B
ENTER	10	Data accepted
RECALL	17 00	Address for input signal B Present value
SET POINT		Blank display; ready for data
1 8	18	mA dc input signal corresponding to reset temperature B above
ENTER	18	Data accepted
EXIT	28	Chiller present status (new data registered)

Automatic Chilled Water Reset Based On Cooler Temperature Difference



90. For this example, let's say we want to reset the chilled water set point using cooler water temperature difference. Assume the chilled water set point is 45°F and we want to raise this to 50°F when the cooler ΔT is 10°. We also want reset to begin when the cooler ΔT is 15°.

ESP ADDRESS FORMAT AND DATA DESCRIPTION

Table 3 - ESP Address Format

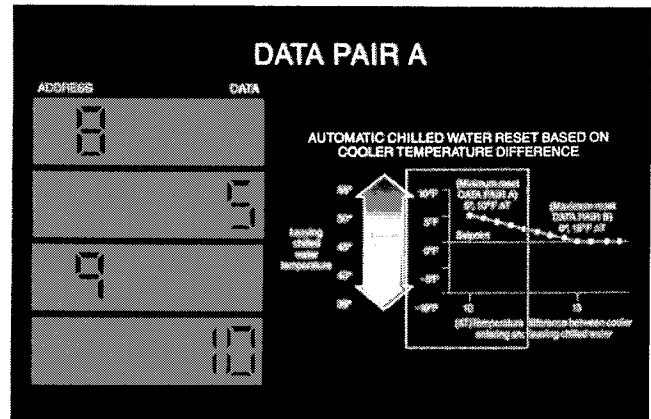
ADDRESS	DESCRIPTION	VARIABLE RANGE/STATUS
1	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
2	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
3	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
4	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
5	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
6	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
7	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
8	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
9	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
10	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
11	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
12	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
13	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
14	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
15	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
16	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
17	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
18	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
19	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999
20	Chiller identification number. Must be 1-9999. Only chiller 00 can be used for system. Other chiller in system must be 01-9999.	0-9999

91. Automatic Chilled Water Reset Based On Cooler Temperature Difference continued.

For this example, we will assume you have already entered the programming mode.

To program the necessary information, the ESP II uses an address format. We will input the data using both an "A" and "B" data pair. Check the address codes and find that the chilled water reset

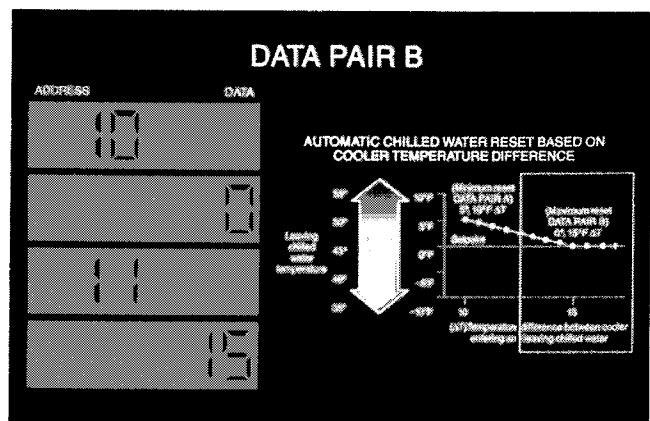
based on chiller return water temperature must be programmed at address 8 and 9 for "A" data and 10 and 11 for "B" data.



92. Automatic Chilled Water Reset Based On Cooler Temperature Difference continued.

Let's start at address 8 and enter **5** for five degrees of reset at this set point.

Press **RECALL** for address 9, we enter **10** which is the chiller design ΔT . Data pair "A" says that there will be five degrees of reset if the chiller ΔT is 10°F or less.



93. Automatic Chilled Water Reset Based On Cooler Temperature Difference continued.

For data pair "B", beginning with address 10, we enter 0 for 0° of reset which lowers the leaving chilled water to 45°F.

At address 11, we enter 15, which is the cooler ΔT where we want the maximum reset to occur. Data pair "B" says that there will be a maximum 0° of reset when the cooler ΔT is 15°F or higher.

**AUTOMATIC CHILLED WATER
RESET BASED ON COOLER
TEMPERATURE DIFFERENCE**

Address	Value	
8	5°F	Data Pair A
9	10°F	Data Pair A
10	0°F	Data Pair B
11	15°F	Data Pair B
12	1	Activate

94. Automatic Chilled Water Reset Based On Cooler Temperature Difference continued.

At address 12, we enter 1 to activate reset control.

Let's review the numbers again.
Address Value

- at address 8 we entered 5° for data pair A
- at address 9 we entered 10° for data pair A
- at address 10 we entered 0° for data pair B
- at address 11 we entered 15° for data pair B
- at address 12 we entered 1 to activate

**Programming Auto. Chilled Water Reset
Based on Cooler Temperature Difference**
Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status
0 0 0 0	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
ADDRESS CHILLED WATER		Blank display; ready for address for reset temperature A
8	8	
ENTER	08 03	Address for reset temperature A Present reset temperature
SET POINT		Blank display; ready for data†
5	5	
ENTER	5	Data accepted
RECALL	09 00	Address for cooler Δ T Present value
SET POINT		Blank display; ready for data
1 0	10	10 degrees Δ T corresponding to reset temperature A above
ENTER	10	Data accepted
RECALL	10 08	Address for reset temperature B Present temperature
SET POINT		Blank display; ready for data
0	0	0 degrees reset temperature B
ENTER	0	Data accepted
RECALL	11 00	Address for cooler Δ T Present value
SET POINT		Blank display; ready for data
1 5	15	15 degrees Δ T corresponding to reset temperature B above
ENTER	15	Data accepted
EXIT	26	Chiller present status (new data registered)

Automatic Chilled Water Temperature Reset Based on Remote Temperature Sensor

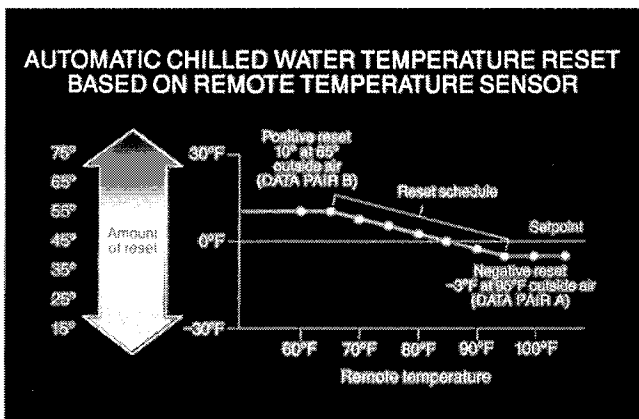
AUTOMATED CHILLED WATER TEMPERATURE RESET BASED ON REMOTE TEMPERATURE SENSOR

Table 3 - ESP Address Format

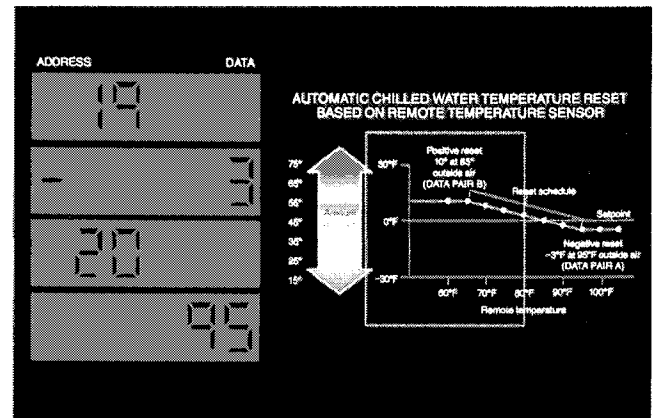
ADDRESS	DESCRIPTION	DEFAULT SETPOINT
1	Chiller Identification Number Reset schedule when Data Pair A is Leaving chilled water May be 00 up to 99 in 10's 0 to 9	0 to 9
2	Chiller Identification Number Reset schedule when Data Pair B is Leaving chilled water May be 00 up to 99 in 10's 0 to 9	0 to 9
3	Chiller Identification Number Reset schedule when Data Pair C is Leaving chilled water May be 00 up to 99 in 10's 0 to 9	0 to 9

ADDRESS	DESCRIPTION	DEFAULT SETPOINT
19	Temperature of reset for the temperature at address 05 Remote temperature value for degree of reset at address 20	0 to 99.99°F or 0 to 112.02°C
20	Temperature of reset for the temperature at address 05 Remote temperature value for degree of reset at address 19	0 to 99.99°F or 0 to 112.02°C

95. This option must be programmed at address 19 and 20 for data pair "A", and 21 and 22 for data pair "B".

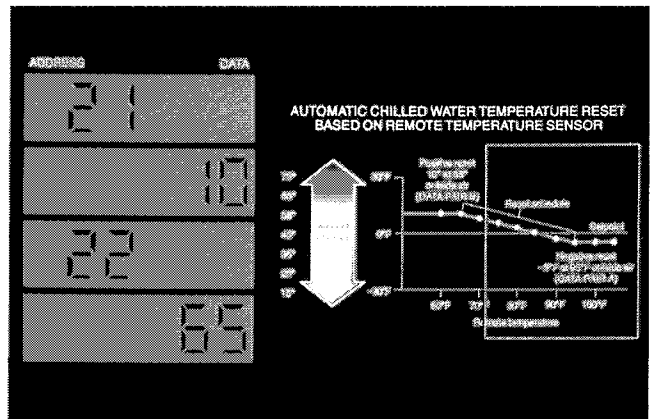


96. For this example, we will assume 45° leaving chilled water set point temperature which we want to reset to 55°F when outside air is 65°F, and to 42°F when outside air reaches 95°F.



97. Automatic Chilled Water Temperature Reset Based on Remote Temperature Sensor continued.

- For data pair "A" at address 19 we press **DEMAND LIMIT** for **-** negative data. Then we enter **3** °F to reset the leaving chilled water to 42°F when the outside air temperature is 95°F, or higher.
- At address 20 enter **9** **5** °F for the remote temperature at which we want the -3°F of reset.



98. Automatic Chilled Water Temperature Reset Based on Remote Temperature Sensor continued.

- For data pair "B" at address 21 enter **1** **0** °F to reset the leaving chilled water to 55°F when the outside air temperature is 65°F, or lower.

- At address 22 enter 65°F for the remote temperature at which we want the +10°F of reset.

AUTOMATIC CHILLED WATER TEMPERATURE RESET BASED ON REMOTE TEMPERATURE SENSOR

Address	Value	
19	-3°F	} Data Pair A
20	95°F	
21	10°F	} Data Pair B
22	65°F	
23	1	Activate

99. At address 23 enter 1 to activate reset control.

Let's review the numbers again.
Address Value

at address 19 we entered 3° for data pair A
 at address 20 we entered 95° for data pair A
 at address 21 we entered 10° for data pair B
 at address 22 we entered 65° for data pair B
 at address 23 we entered 1 to activate

Programming Auto. Chilled Water Temperature Reset Based on a Remote Temperature Sensor Input

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status
0 0 0 0	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
(ADDRESS) CHILLED WATER		Blank display; ready for address for reset temperature A
1 9	19	
ENTER	19 00	Address for reset temperature A Present reset temperature
SET POINT		Blank display; ready for data
(+/-) DEMAND LIMIT	—	New data will be a negative value
3	-3	5 degrees negative reset temperature A
ENTER	-03	Data accepted
RECALL	20 00	Address for remote temperature A Present temperature
SET POINT		Blank display; ready for data
9 5	95	95 F remote temperature corresponding to reset temperature A above
ENTER	95	Data accepted
RECALL	21 00	Address for reset temperature B Present reset temperature
SET POINT		Blank display; ready for data
1 0	10	10 degrees positive reset temperature B
ENTER	10	Data accepted
RECALL	22 00	Address for remote temperature B Present value
SET POINT		Blank display, ready for data
6 5	65	65 F remote temperature corresponding to reset temperature B above
ENTER	65	Data accepted
EXIT	27	Chiller present status (new data registered)

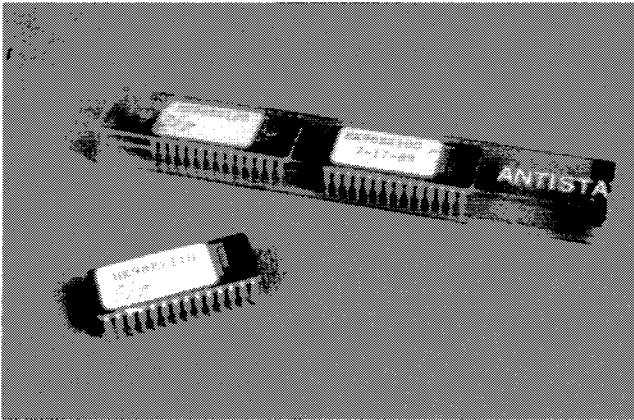
PROGRAMMING EXERCISES REVIEW

- ESP address format
- Automatic chilled water temperature reset based on 4–20 mA input signal
- Automatic chilled water temperature reset based on cooler temperature difference (ΔT)
- Automatic chilled water temperature reset based on remote temperature sensor

100. The major topics covered in the Programming Exercises section were:

- ESP Format
- Automatic Chilled Water Temperature Reset Based on 4-20 mA Input Signal
- Automatic Chilled Water Temperature Reset Based on Cooler Temperature Difference
- Automatic Chilled Water Temperature Reset Based on Remote Temperature Sensor

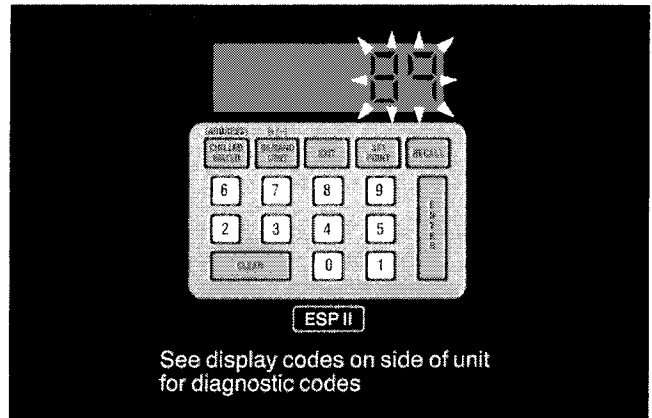
TROUBLESHOOTING



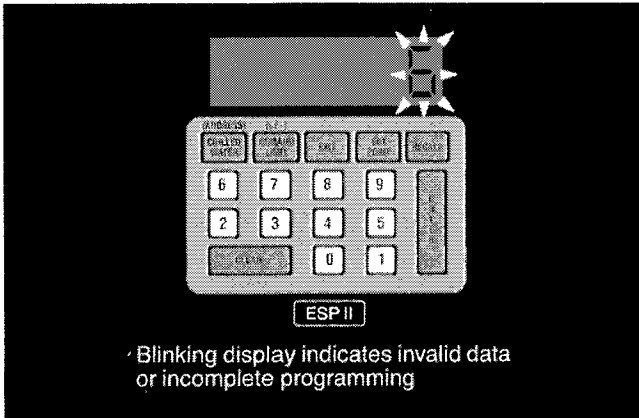
101. Now, let's discuss troubleshooting the ESP II. With any 3200MP ESP II panel, the first thing to check when troubleshooting is to be sure you have the correct EPROMS. They come in sets of three and they must have the correct matching numbers.



102. The second important item is the DIP switch positions. These four rows of DIP switches must be configured for each particular chiller.



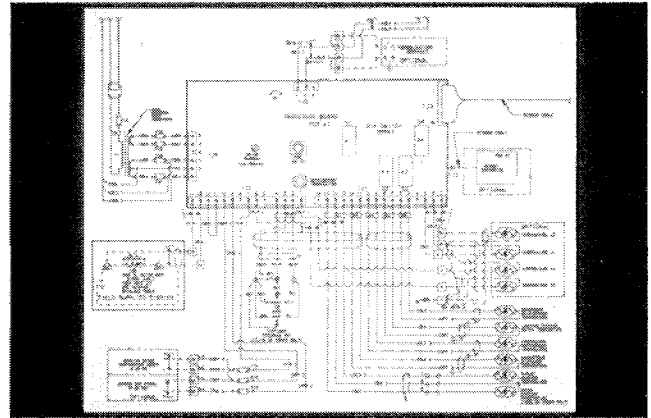
103. The ESP has the capability to monitor inputs from control sensors, 4-20 mA output devices and the Basic 3200MP Controller serial communications port. If a problem with one of these inputs is detected, the ESP II will display a flashing diagnostic code.



104. The ESP II also has the ability to find out if the data programmed in its address format is invalid or incomplete. The display will blink if invalid data is input, or if an attempt is made to activate a control or option that has not been fully programmed.



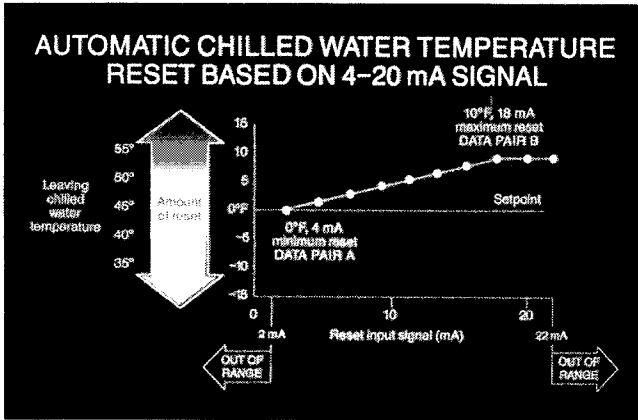
105. If you suspect there is a control problem, operate the machine in Local to find out if the problem exists in the Basic 3200MP Controller or the ESP II.



106. If a problem with a control is suspected, remember that the ESP II program depends on remote inputs. These inputs must be accurate and reflect the parameters programmed in the ESP II address format.

TROUBLESHOOTING	
64/1	Leaving chilled water sensor out-of-range
64/2	Evaporator refrigerant sensor out-of-range
64/3	Condenser refrigerant sensor out-of-range
64/4	Thrust bearing sensor out-of-range
64/5	Motor winding sensor out-of-range
64/6	Discharge temperature sensor out-of-range
64/7	Optional temperature #1 sensor out-of-range
64/8	Optional temperature #2 sensor out-of-range

107. The ESP II monitors optional inputs for out of range conditions. If an out-of-range temperature sensor is detected, a safety shutdown will be activated. A code 64, alternating with the number for that particular sensor, will be displayed to identify the problem. Sensors are identified 1 through 8. A missing motor current signal would display 82.



108. If an out-of-range 4-20 mA input is detected, there will not be a safety shutdown. However, the ESP will revert to the reset value programmed at the upper or lower limit at which the mA signal went out of range; for example, 2 or 22 mA.

The acceptable range for temperature inputs is -20 to 240°F. For 4-20 mA inputs, the range is 2 through 22 mA.

Table 4 - Controls Test

STEP NUMBER	TEST DESCRIPTION	DISPLAY CODE OR ACTION
34	Display Spare #1 sensor input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
35	Display Spare #2 sensor input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
36	Display temperature reset 4 - 20 mA input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
37	Display demand limit set point 4 - 20 mA input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
38	Cycle back to first test (depress reset pushbutton) End controls test (depress POR pushbutton)	0.1 (Test Step) 0.3 (Minutes)

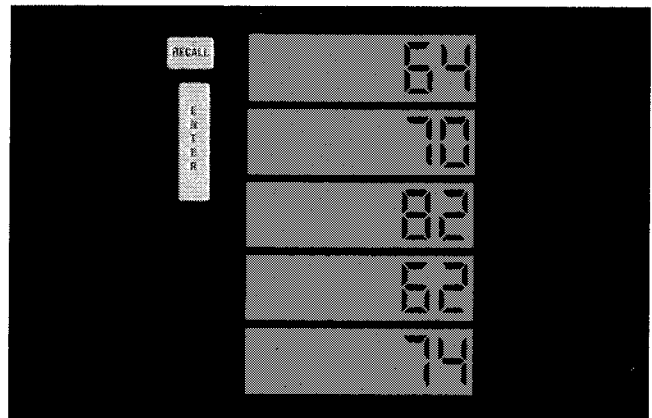
109. Out-of-range sensors or defective 4-20 mA inputs can be isolated by performing the controls test. Refer to the Start-up, Operation, and Maintenance Instructions for a description of the controls test procedure.

NOTE: While the controls test is being performed, the ESP II keypad display may not match the information on the set point display.

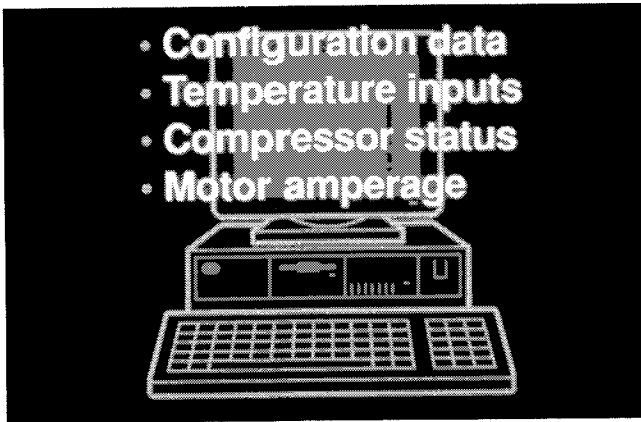
ADDITIONAL CONTROLS TEST STEPS FOR ESP II

STEP NUMBER	Single-Compressor Chiller	Dual-Compressor Chiller	TEST DESCRIPTION	DISPLAY CODE STATUS
34		44	Display Spare #1 sensor input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
35		45	Display Spare #2 sensor input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
36		46	Display temperature reset 4 - 20 mA input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
37		47	Display demand limit set point 4 - 20 mA input status	1 - OK (Activated) 0 - Faulty 2 - OK (Not Activated)
38		48	Cycle back to first test (depress reset pushbutton) End controls test (depress POR pushbutton)	0.1 (Test Step) 0.3 (Minutes)

110. Controls tests are outlined for the Basic 3200MP Controller with additional control test steps shown for the ESP II in the Start-up Instructions. Test steps for the ESP II are automatically added to tests for the 3200MP when the two panels are connected. It might be wise to check the accuracy of the sensors as described for the Basic 3200MP Controls before starting the controls test.

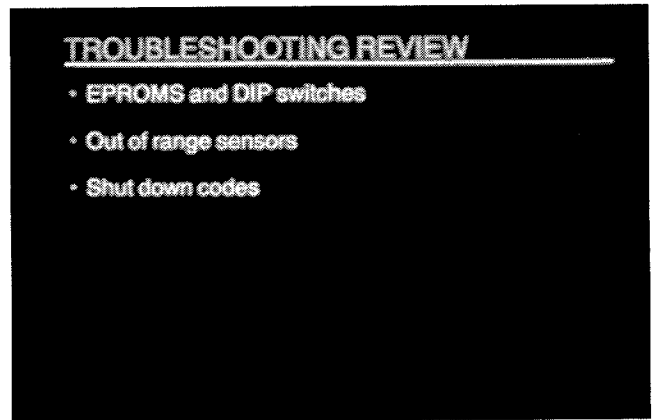


111. The ESP can also serve as an aid when diagnosing a problem with a chiller or multiple chillers. Shutdown codes are captured and stored in permanent memory and will not be lost even if the ESP II loses power. These shutdown codes are listed in the chiller Start-up, Operation, and Maintenance Instruction Manual. Other codes relating to specific problems involving the ESP II are shown in the ESP instructions.



112. With the combination of ESP II and Gateway, you will be able to troubleshoot using the CCN Supervisor or Service Tool and have access to:

- Configuration Data
- Temperature Inputs
- Compressor Status
- Motor Amperage



113. The topics covered in the Troubleshooting section were:

- EPROMS and DIP switches
- Out-of-Range Sensors
- Shut-Down Codes

This concludes our instructions for the latest version of the 3200MP Expanded Services Panel ESP II. We hope this program has helped you to better understand how this panel operates.

APPENDIX

For additional information on the 3200MP ESP II and topics highlighted throughout this program, use this list in preparation of supplementary training sessions.

<u>Title</u>	<u>Format</u>	<u>Form No.</u>	<u>Catalog No.</u>
3200MP Centrifugal Control Familiarization and Operating Sequences	Slides Workbook	32MP-02 32MP-01	021-007 021-006
3200MP Centrifugal Control Start-up and Troubleshooting	Slides Workbook	32MP-04 32MP-03	021-009 021-008
CCN Overview	Video		600-001
Safety...It's Everybody's Responsibility	Video Workbook	GT32-02 GT32-01	020-456 020-455

QUIZ

Familiarization

1. A basic 3200MP panel does not contain:
 - A. a display board
 - B. an input/output board
 - C. a processor board
 - D. a memory expansion board
2. A new system called _____ allows the 3200MP ESP II control to be connected into the CCN.
3. Codes which identify the faults and history of causes for the last five chiller shutdowns are called _____ status codes.
4. The 3200MP ESP II offers _____ different types of reset, each one must be _____ and then _____.
5. The purpose of the lead/lag option is to optimize the performance of two chillers to maintain the most efficient system performance.
TRUE or FALSE

Start-up and Programming

6. If a code 33, 34, or 81 appears on the ESP display, it means _____ has not been established.
7. When programming the ESP, begin by positioning the _____ switch to _____, enter _____ and press **ENTER**.
8. If a code 76 (invalid configuration) is displayed, then the chiller ID number that was set-up with the DIP switches and the ID programmed at address 01 and 03 do not agree.
TRUE or FALSE
9. Demand limit set point value can be from _____ % to _____ %.
10. Shutdown codes for dual compressor chillers appear from the most _____ to the _____.

Operating Sequence

11. To program the ESP II, seven _____ keys and ten _____ keys are used.
12. Temperatures can be entered and displayed in either Fahrenheit or Centigrade depending on how the DIP switches are set on the basic 3200MP board.
TRUE or FALSE
13. When the programming sequence has been established, there are two ways to call up an address in the format to program data:
 - A. Press **RECALL** to advance through each address one at a time.
 - B. Press **ENTER** to scroll through the addresses.
 - C. Press the **CHILLED WATER** key, then input the address number, then press **ENTER**.
 - D. Only A and B
 - E. Only A and C
14. The **CHILLED WATER** key can directly access an address by depressing the key, inputting the address number desired and then pressing **ENTER**.
TRUE or FALSE
15. After selecting a new address, new data can be inserted at that location by depressing the _____ key, inputting the desired data then pressing _____.

Troubleshooting

16. With any 3200MP ESP II panel, the first thing to check when troubleshooting is to be sure you have the correct _____.
17. The display will _____ if invalid data is input, or if an attempt is made to activate a control or option that has not been fully programmed.
18. If an activated out-of-range temperature sensor is detected, a safety shutdown will not be activated.
TRUE or FALSE
19. Out-of-range sensors or defective 4-20 mA inputs can be isolated by performing the controls test.
TRUE or FALSE
20. With the combination of _____ and _____, you will be able to troubleshoot using the CCN Supervisor or Service Tool.

NOTES

NOTES

NOTES

QUIZ KEY

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