Carrier
HEATING & COOLING

3200MP
Expanded Services Panel

Start-Up, Operation and Maintenance Instructions

For use with dual-compressor chillers and single-compressor chillers, including lead/lag sequencing of 2 single-compressor chillers.

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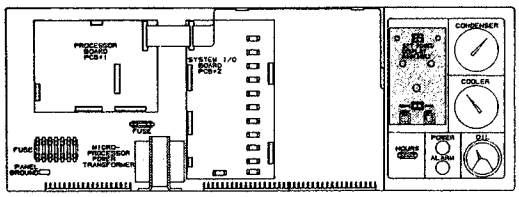
Book 2 2 Tab 5a 5d PC 211 Catalog No. 533-210 Printed in U.S.A. Form 3200MP-ESP-1SOM Pg 1 8-87 Replaces: 3200MP-ESP-1SSM

For replacement items use Carrier Specified Parts.

BASIC 3200MP CONTROLLER



SINGLE- OR DUAL-COMPRESSOR CHILLER

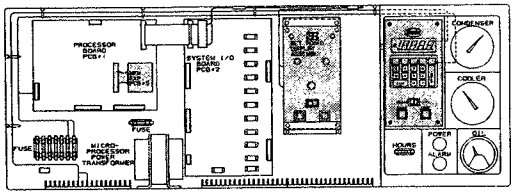
FEATURES

The microprocessor control system matches the cooling capacity of the machine to the cooling load while providing machine protection. The system controls cooling load within the set point deadband. Machine protection is provided by monitoring certain digital and analog inputs and executing capacity overrides or safety shutdowns.

REFER TO BASIC 3200MP CONTROLS SECTION OF CHILLER START-UP, OPERATION AND MAINTENANCE INSTRUCTIONS.

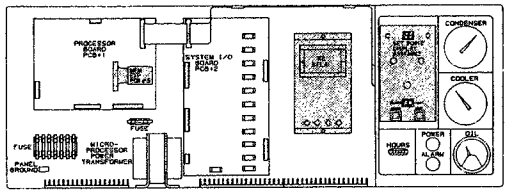
BASIC CONTROLLER + ESP

(Two Choices)

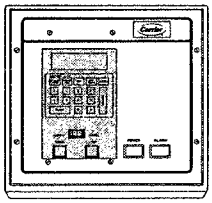


SINGLE- OR DUAL-COMPRESSOR CHILLER AND MACHINE-MOUNTED ESP

OR



SINGLE- OR DUAL-COMPRESSOR CHILLER



REMOTE ESP

FEATURES

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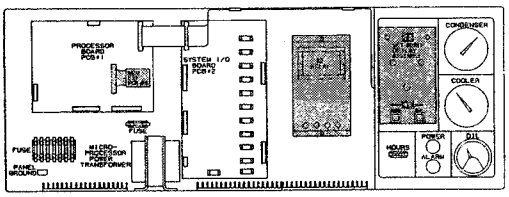
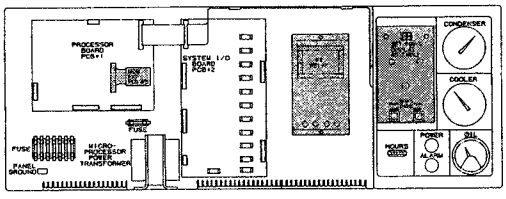
BASIC CONTROLLER + ESP WITH LEAD/LAG OPTION

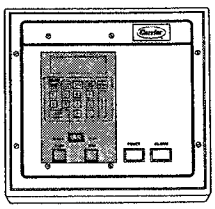
(Two Single-Compressor Chillers and Remote ESP)



SINGLE-COMPRESSOR CHILLER



SINGLE-COMPRESSOR CHILLER



REMOTE ESP

ALL THE FEATURES LISTED ABOVE, PLUS:

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ESP FEATURES

The ESP can be machine mounted or remote. It permits the operator to read machine operating parameters and status codes and enter machine set points through the keypad. Temperature values may be displayed in Centigrade or Fahrenheit. Other features include:

1. Programming of automatic chilled water temperature reset (choose one of 4 ways available).
2. Programming of automatic demand limit (choose one of 2 ways available).
3. Programming of automatic restart after power failure.
4. Programming of ramp loading rate slower than that established by the Basic 3200MP Controller.
5. Activation of a remote contact to start/stop the chiller (time clock, energy management system, etc.).
6. Chiller operation/monitoring from a remote location (remote ESP only).

Programming of 2-chiller lead/lag sequencing is available as an option (single-compressor chillers with remote ESP only).

ABBREVIATIONS

CPU — Central Processing Unit
DIP — Dual Inline Package
ESP — Expanded Services Panel
K/D — Keypad/Display Panel (ESP)
L/R — Local/Remote Switch (Basic 3200MP)
MX — Memory Expansion Board (Basic 3200MP)
POR — Power-On Reset
P/R — Panel/Remote Switch (ESP)
RLA — Rated Load Amps
S/D — Set Point/Display Panel (Basic 3200MP)

DEFINITIONS

Analog Signal — A representation of a value that varies in proportion to the monitored source. It quantifies values between operating limits.

Example: A temperature sensor is an analog device because its resistance changes in proportion to the temperature, generating many values.

Digital (Discrete) Signal — A 2-position representation of the value of a monitored source.

Example: A switch is a digital device because it only indicates whether a value is above or below a fixed point by generating an ON/OFF, HIGH/LOW or OPEN/CLOSE signal.

Basic 3200MP Controller — The standard machine-mounted 3200MP chiller control system not including the ESP package.

Address — A location in the ESP format (memory) in which data can be programmed.

Active Programming Sequence — The programming sequence begun by entering the address format access code and acknowledged by display of the acceptance code.

Set Point — The value of a parameter such as chilled water or brine temperature, demand limit, etc., which is set by the operator.

Control Point — The value of a parameter such as chilled water or brine temperature to which the control is operating, including reset. (Control Point = Set Point + Reset.)

Present Status Code — The current machine diagnostic code displayed by the ESP when it is not in an active programming sequence.

NOTE: A complete diagnostic codes table can be found in the Start-Up, Operation and Maintenance Instructions for each chiller model. Codes related to the ESP are listed in the Chiller Troubleshooting section of this book.

Chiller Identification Number — Operator-assigned number from 0 to 7 configured with the Basic 3200MP Controller DIP switches. The ESP uses this number to establish communications with the Basic Controller and identify the lead, lag and main chiller in a lead/lag system.

Control Activation — Programming of the activation code at the address location for a control function.

Main Chiller (Lead/Lag System of 2 Single-Compressor Chillers) — The chiller designated by the ESP to execute control functions if lead/lag is not activated. The chiller selected by the ESP as designated will depend on the part no. of the memory expansion (MX) EPROM being used. The EPROM part no. is shown on sticker on the EPROM located on the MX board. With EPROM part no. HK98EZ015 or higher, the chiller at Address #3 (lead chiller) will be designated as the main chiller. For EPROM with part no. HK98EZ014 or lower, the chiller at Address #1 will be designated as the main chiller, even though the chiller at Address #1 may not have been selected as the lead chiller when the identification numbers were programmed.

For example, assume the following chiller identification numbers have been programmed in the ESP address format (Chiller identification numbers are assigned by the user).

Chiller at Address #1	Chiller ID No. 04
Chiller at Address #2	Chiller ID No. 05
Chiller at Address #3 (Lead Chiller)	Chiller ID No. 05

For EPROM part no. HK98EZ015 or higher: When lead/lag is not activated, chiller with ID number 05 will be designated as the main chiller because it is at Address #3.

For EPROM part no. HK98EZ014 or lower: When lead/lag is not activated, chiller with ID number 04 will be designated as the main chiller because it is at Address #1.

Lead Chiller — The principal machine in an activated lead/lag system. The lead chiller is the first machine started and remains on until cooling is no longer required.

Lag Chiller — The secondary or accessory machine in an activated lead/lag system. The lag chiller only operates when the cooling requirement exceeds the capability of the lead chiller.

EXPANDED SERVICES PANEL PACKAGE

General — The ESP provides expanded control capability by offering functions not included as part of the Basic 3200MP Controller.

The ESP package consists of 2 distinct hardware elements: The expanded services panel (ESP) and a memory expansion board (MX). (See Fig. 1.) The ESP can be mounted on the machine or remote from the machine. The memory expansion board is mounted on the Basic 3200MP Controller processor board. (Refer to ESP Installation Instructions.)

ESP Keypad/Display Panel — The ESP keypad/display panel (K/D) (Fig. 2) serves as a data entry port and as a status display. It contains a 4.5 digit liquid crystal display (LCD), a 17-position keypad consisting of 10 numerical and 7 special function keys, a 2-position rocker switch for selecting panel/remote programming authority (P/R switch), and chiller system start and stop switches. Display of temperature values in Centigrade or Farenheit is determined by a setting of the DIP switch on the Basic 3200MP Controller.

Memory Expansion Board — The memory expansion board (MX) is mounted on and connected to the Basic 3200MP Controller processor board. It contains information provided by the ESP and the Basic Controller for implementing control functions. A memory expansion board must be installed on each machine in a lead/lag system.

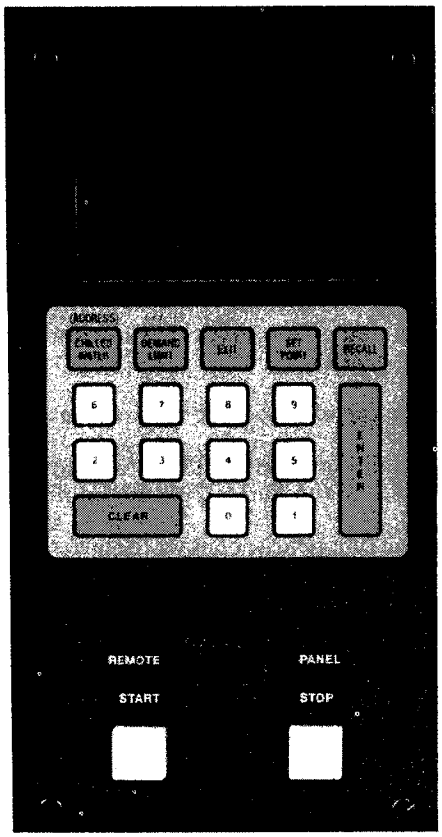
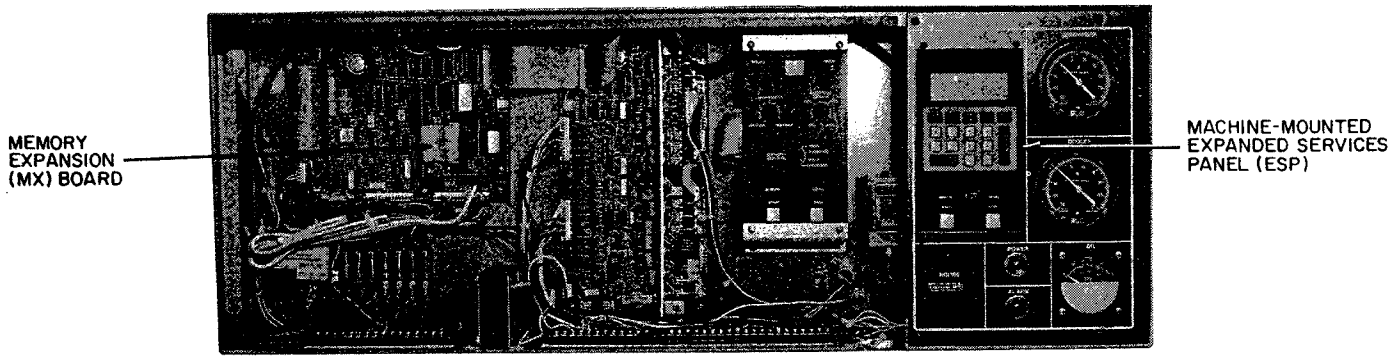
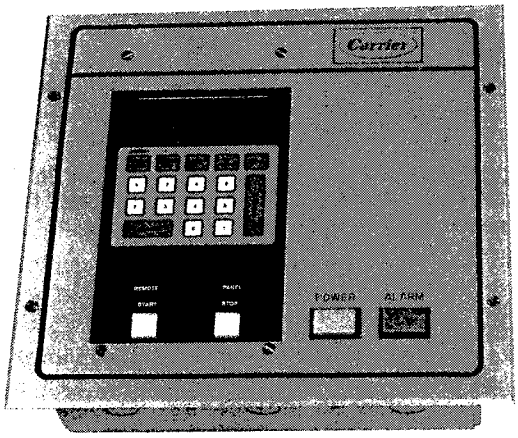
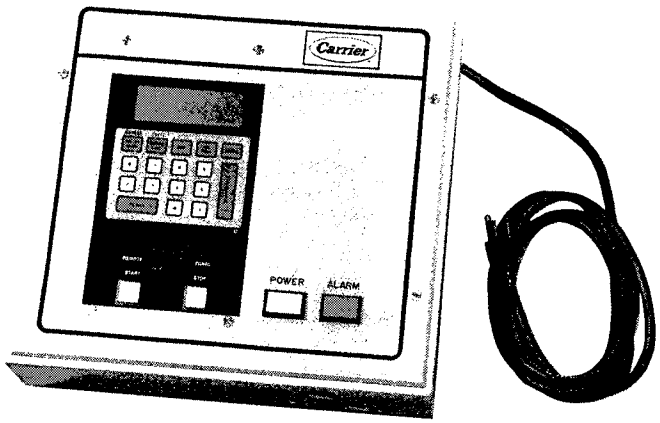


Fig. 2 — ESP Keypad/Display Panel





REMOTE ESP
(Recessed Enclosure for Flush Wall Mounting)



REMOTE ESP
(Surface Enclosure for Desktop or Wall Surface Installation)

Fig. 1 — Expanded Services Panel Package

ESP CAPABILITY

The following functions are provided with the ESP package. References to lead/lag apply only when the lead/lag option is specified.

Display Functions — Display functions permit use of the keypad to read chilled water set point, demand limit set point, machine operating parameters, present status codes, and stored shutdown status codes. Parameter codes and present status codes for both chillers in a lead/lag system can be displayed when lead/lag is activated.

Control Functions — Control functions permit the operator to enter machine set points and activate controls. Functions include:

CHILLED WATER SET POINT ADJUSTMENT — Permits keypad adjustment of leaving chilled water temperature set point from 35 F to 120 F (2 C to 49 C) or leaving brine temperature set point from 0° F to 120 F (-18 C to 49 C) without changing the position of the thermostat on the S/D board.

DEMAND LIMIT SET POINT ADJUSTMENT — Permits keypad limiting of % motor current to any value down to 40% of RLA without changing the position of the demand limit setting on the S/D board.

AUTO. CHILLED WATER RESET BASED ON COOLER TEMPERATURE DIFFERENCE — Permits up to ± 30 F (17 C) of automatic reset of the leaving chilled water or brine temperature set point, based on a range of 0° F to 20 F (0° C to 11 C) difference between entering and leaving chilled water or brine temperature.

AUTO. RETURN CHILLED WATER TEMPERATURE CONTROL — Automatically resets the leaving chilled water or brine temperature up to ± 30 F (17 C) from entering temperature control point to provide the desired entering chilled water temperature. Reset is based on the difference between entering and leaving chilled water or brine temperature. Entering temperature control point is established by the chilled water temperature set point entered through the keypad. The maximum rate of change in leaving temperature is limited to 1/8° F (0.07 C) per minute.

AUTO. CHILLED WATER TEMPERATURE RESET BASED ON 4-20 mA INPUT SIGNAL — Permits up to ± 30 F (17 C) of automatic reset to the leaving chilled water or brine temperature set point, based on the input from a 4-20 mA signal.

AUTO. CHILLED WATER TEMPERATURE RESET BASED ON A REMOTE TEMPERATURE SENSOR INPUT — Permits up to ± 30 F (17 C) of automatic reset to the leaving chilled water or brine temperature set point, based on the input from a remote temperature sensor.

AUTO. POWER DEMAND LIMIT BASED ON CONTACT CLOSURE — Permits automatic stepped limiting of % motor current down to 40% of RLA based on closure of up to 3 discrete contacts.

AUTO. POWER DEMAND LIMIT BASED ON A 4-20 mA INPUT SIGNAL — Permits automatic linear limiting of % motor current within a range of 100% down to 40% of RLA based on a 4-20 mA signal.

AUTO. RESTART AFTER POWER FAILURE — Permits the ESP to automatically restart the machine. For lead/lag systems, the machine started will be the lead chiller if lead/lag is activated or the main chiller if lead/lag is deactivated.

RAMP LOADING RATE ADJUSTMENT — Permits selection of ramp loading rate that is slower (in degrees/minute) than the value established by the Basic 3200MP Controller DIP switches. When lead/lag is activated, ramp loading only applies to the lead machine.

REMOTE CONTACT START/STOP — Permits use of a switch from a time clock or other device for start-stop control of the machine. For lead/lag systems, the machine controlled will be the lead chiller when lead/lag is activated or the main chiller when lead/lag is deactivated.

LEAD/LAG OPTION — Permits selection of the lead chiller and the programming of temperature vs time inputs for starting the lag chiller and the programming of capacity of chiller at Address #1 for turning off the lag chiller.

ESP START-UP

Initialization

⚠ WARNING

To prevent equipment damage, the machine must be started up and operated according to the Basic 3200MP Controls section of the chiller Start-Up, Operation and Maintenance Instructions before the ESP is initialized.

Refer to Fig. 3. After installation of the ESP is completed, energize the chillers.

1. Position L/R switch on Basic 3200MP Controller on chiller(s) to REMOTE.
2. Position P/R switch on ESP to PANEL.
3. Depress Power-On Reset (POR) pushbutton on the Basic 3200MP Controller(s).
4. Depress POR pushbutton on the ESP.

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

If the ESP displays a code 81 (loss of communication) check to be sure that the ESP has been installed properly and that the above start-up instructions have been followed.

Once initialized, if power to the ESP is lost or it is disconnected while the chiller is operating under ESP control (L/R switch on chiller Basic 3200MP Controller set to REMOTE), a shutdown will occur. If power is maintained at the ESP but the communication line is disconnected, or if communication with the Basic 3200MP Controller is lost for more than 15 seconds while operating in remote, Code 81 will be displayed at the ESP and the Basic 3200MP Controller and a safety shutdown will be initiated. When the Basic 3200MP Controller L/R switch is set to LOCAL, the ESP will usually show the same display as the S/D board. If communication is lost while the machine is operating in local, Code 81 will only be displayed at the ESP and the machine will continue to operate.

Initial Programming — Before the ESP can be operated, the chiller identification number, the chilled water set point and demand limit set point must be programmed in the ESP address format. Refer to Fig. 4.

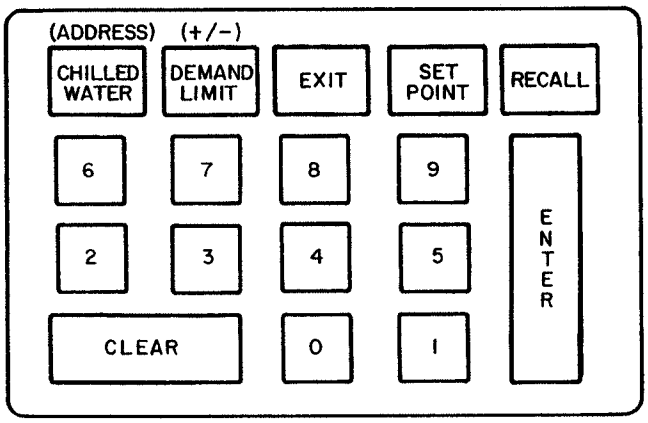


Fig. 4 — Close-Up View of ESP Keypad

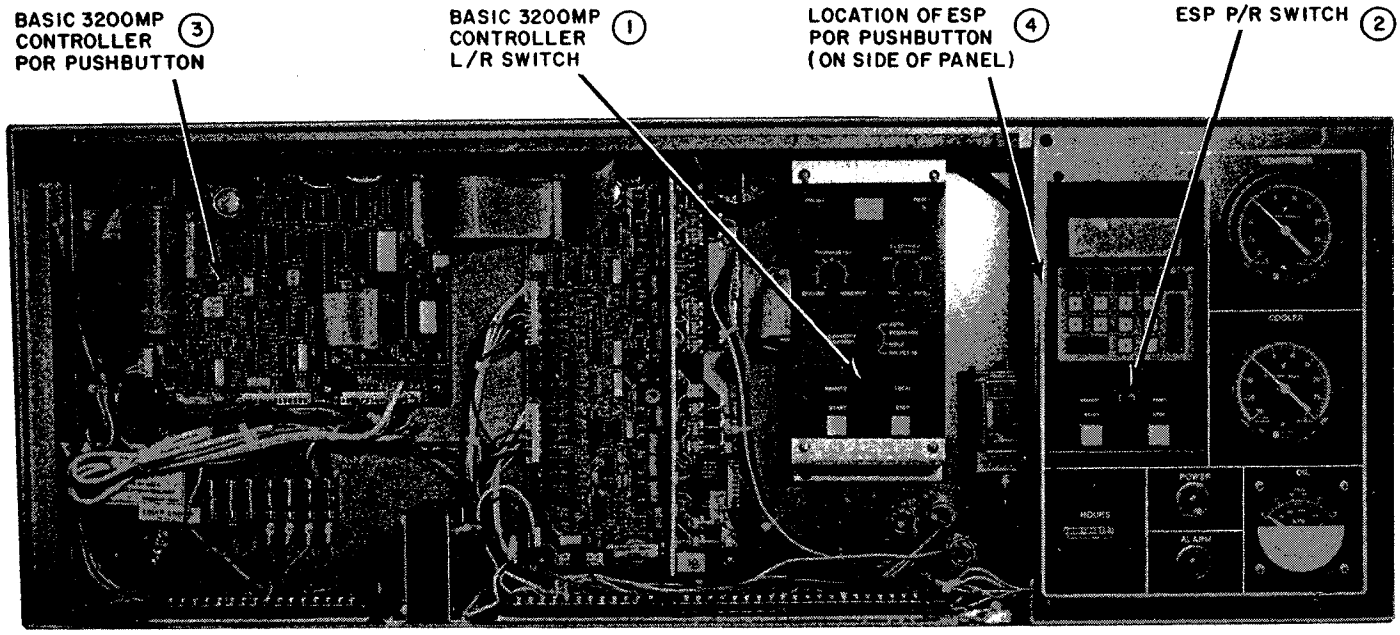


Fig. 3 — Initialization Procedure

PROGRAMMING CHILLER IDENTIFICATION NUMBER — To program this number, position the P/R switch to PANEL, input 0000 (4 zeros) then depress the ENTER key. Acceptance of the access code will be acknowledged by the display of +18888 and the ESP will enter an active programming sequence.

In a non-lead/lag system, the same chiller ID no. must be programmed at Address #1 and Address #3. For programming of chiller identification numbers in a lead/lag system, see page 19.

Programming Chiller Identification Number

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	*	Chiller Present Status
0000	0000	Each zero appears with each keystroke
ENTER	+18888	Access open — Programming can begin
RECALL	01 XX	Address for chiller identification number Present value
SET POINT		Blank display — Ready for new data†
2	2	New chiller identification number
ENTER	2	Entry of new data accepted
RECALL	02	Next address
RECALL	03 XX	Address for chiller identification number Present value
SET POINT		Blank display — Ready for new data†
2	2	New chiller identification number (same number as programmed in Address #1)
ENTER	2	Entry of new data accepted
EXIT	*	Chiller present status (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.
XX — Value may be zero or any variable within the input range.

PROGRAMMING CHILLED WATER SET POINT — The chilled water set point can be from 35 F to 120 F (2 C to 49 C) for water or from 0° F to 120 F (-18 C to 49 C) for brine.

Programming Chilled Water Set Point

Place P/R Switch on ESP to PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	*	Chiller present status
CHILLED WATER	1111	
ENTER	XX	Present chilled water set point
SET POINT		Blank display — ready for new data†
44	44	New chilled water set point.
ENTER	44	Entry of new data accepted
EXIT	*	Chiller present status (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.
XX — Value may be zero, or any variable within the input range.

PROGRAMMING DEMAND LIMIT SET POINT — The demand limit set point can be from 40% to 100% RLA.

Programming Demand Limit Set Point

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	*	Chiller present status
DEMAND LIMIT	2222	
ENTER	XX	Present demand limit set point (% RLA)
SET POINT		Blank display — Ready for new data†
100	100	New demand limit set point
ENTER	100	Entry of new data accepted
EXIT	*	Chiller present status (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.
XX — Value may be zero or any variable within the input range.

After the above steps have been completed, the ESP will display the present status code. If code 76 (invalid configuration) continues to be displayed, the chiller identification number set with DIP switches in the chiller Basic 3200MP Controller and the chiller identification number programmed at Address #1 and at Address #3 do not agree. The numbers must agree before system operation can begin.

When the ESP has been started up and the initial programming has been performed, the chiller can be started.

ESP DISPLAY FUNCTIONS OPERATION

General — When performing display functions, the 7 special function keys are used as shown in Fig. 5. (Parentheses indicate secondary functions used only for programming. These are explained in the ESP Address Format section.)

SPECIAL FUNCTION KEYS

SPECIAL KEY	FUNCTION
Chilled Water (Address)	Displaying/selecting chilled water set point.
Demand Limit (±)	Displaying/selecting demand limit set point.
Exit	Registering program inputs and returning display to present status code.
Set Point	Inputting new set point.
Recall	Displaying stored shutdown status codes or selected machine parameters.
Enter	Entering program data or codes.
Clear	Clearing errors, out-of-range inputs or illegal keystrokes when the display or the "+" sign in the display is blinking. Returns the display to the last valid keystroke.

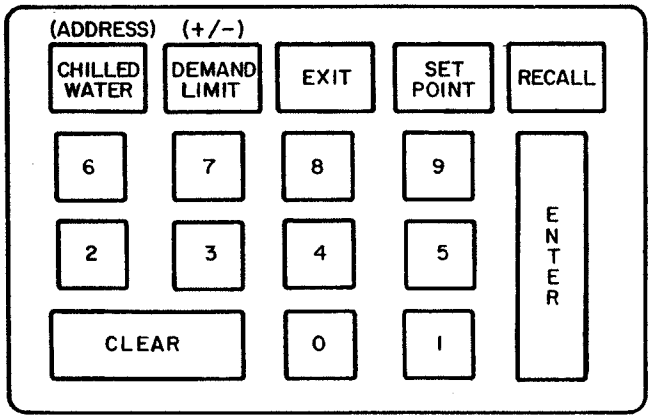


Fig. 5 — Display Functions

NOTE: Any time a mistaken entry is made it can be erased by depressing CLEAR. This includes entry errors that result in a blinking display or a blinking "E." If there is any doubt about the values being shown on the display, press EXIT and the present status code will be displayed.

DISPLAYING PRESENT STATUS CODE — While a chiller is connected to the ESP, the ESP will display the chiller present status code.

DISPLAYING CHILLED WATER SET POINT — To display the chilled water set point, depress the CHILLED WATER key, followed by the ENTER key. Depress the EXIT key to return to display of the present status code.

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
CHILLED WATER	1111	
ENTER	42	Displays chilled water set point (42°)
EXIT	28	Chiller present status code

DISPLAYING DEMAND LIMIT SET POINT — To display the demand limit set point, depress the DEMAND LIMIT key, followed by the ENTER key. Depress the EXIT key to return to display of the present status code.

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
DEMAND LIMIT	2222	
ENTER	100	Displays demand limit set point (100%)
EXIT	28	Chiller present status code

DISPLAYING STORED SHUTDOWN STATUS CODES

NOTE: Shutdown codes are stored in permanent memory. Codes will not be lost if the ESP experiences a power failure.

The ESP will store shutdown codes for the last 5 chiller shutdowns. To display the stored shutdown codes, depress the RECALL key followed by the ENTER key. The codes will be displayed with the most recent shutdown code displayed first, followed by the other 4 in reverse chronological order. After the fifth most recent code has been displayed, the ESP will blank for ten seconds, and then the sequence will repeat. Depress the EXIT key to return to display of the chiller present status code.

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
RECALL	5555	
ENTER	66	Displays most recent shutdown code (66)
	74	Displays second most recent shutdown code which was 74. Blank for 1/2 second before displaying next code
	74	Displays third most recent which was also 74. Blank for 1/2 second before displaying next code
	68	Displays fourth most recent which was also 68. Blank for 1/2 second before displaying next code
	74	Displays fifth most recent which was 74 again. Blank for 1/2 second before displaying next code
	66	Displays most recent shutdown code (66)
EXIT	28	Returns to displaying chiller present status code*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.

To read stored shutdown codes for a dual-compressor chiller, depress ENTER for each code. Codes appear in the same pattern as described above until the fifth most recent code appears; then the sequence will repeat. Press EXIT to return to display of the chiller present status code.

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
RECALL	5555	
ENTER	66	Displays most recent shutdown code (66)
ENTER	74	Displays second most recent shutdown code which was 74. Blank for 1/2 second before displaying next code
ENTER	74	Displays third most recent which was also 74. Blank for 1/2 second before displaying next code
ENTER	68	Displays fourth most recent which was also 68. Blank for 1/2 second before displaying next code
ENTER	74	Displays fifth most recent which was 74 again. Blank for 1/2 second before displaying next code
EXIT	28	Returns to displaying chiller present status code*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.

DISPLAYING MACHINE OPERATING PARAMETERS — To display machine operating parameters, press RECALL, keystroke the parameter code from the Machine Operating Parameters table (Table 1), then press ENTER. A number input before depressing the ENTER key signals the entry of a machine parameter code and not shutdown status recall request. For example, to display the motor bearing temperature:

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28*	Present status code
RECALL	5555	
4	4	Parameter code for bearing temperature
ENTER	156	Bearing temperature is 156°
EXIT	28	Displays chiller present status code*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.

If a code is entered for a parameter without a sensor, the display will blink until the CLEAR key is depressed. If reading a parameter that goes out-of-range, or a parameter with a sensor out-of-range, the ESP displays "EE." If reading a parameter and no keypad activity takes place for more than 60 seconds, the "+" sign in the display will blink until the CLEAR key is depressed. This is a reminder that the value being displayed is a parameter and not a present status code.

Table 1 — Machine Operating Parameters (Non-Lead/Lag System)

SINGLE-COMPRESSOR CHILLERS WITH EPROM PART NO. HK98EZ014 OR LOWER

PARAMETER CODE	PARAMETER TO BE DISPLAYED
0	Leaving Chilled Water Temperature
1	Motor Current % RLA
2	Evaporator Refrigerant Temperature
3	Condenser Refrigerant Temperature
4	Bearing Temperature
5	Motor Winding Temperature
6	Compressor Discharge Temperature
7	Line Voltage
8	Spare Sensor #1 Temperature

SINGLE-COMPRESSOR CHILLERS WITH EPROM PART NO. HK98EZ015 OR HIGHER

PARAMETER CODE	PARAMETER TO BE DISPLAYED
10	Leaving Chilled Water Temperature
11	Motor Current % RLA
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

DUAL-COMPRESSOR CHILLERS

PARAMETER CODE		PARAMETER TO BE DISPLAYED
Compr A	Compr B	
0	10	Leaving Chilled Water Temperature*
1	11	Motor Current % RLA
2	12	Evaporator Refrigerant Temperature*
3	13	Condenser Refrigerant Temperature*
4	14	Bearing Temperature
5	15	Motor Winding Temperature
6	16	Compressor Discharge Temperature
7	17	Line Voltage*
8	18	Spare Sensor #1 Temperature*

*Parameters for the chiller, rather than individual compressors, use the same sensor for and display the same value for compressor A or B.

Lead/Lag Display Functions

DISPLAYING STATUS OF LAG MACHINE — When lead/lag is activated, the ESP normally displays the status code of the lead machine. To display the status of the lag machine, keystroke the lag chiller ID, then press ENTER. To return to display of the lead chiller present status code, press EXIT.

For example, if the lag chiller (ID no. 6) is in the start-up process:

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Lead chiller present operating status*
6	6	ID of lag chiller
ENTER	26	Lag chiller present operating status (prestart)†
EXIT	28	Lead chiller operating status*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†Chiller present status code may be any in the Diagnostic Codes table except for timer or start status types.

DISPLAYING STORED SHUTDOWN STATUS CODES FOR LEAD/LAG SYSTEM — If lead/lag is activated, the lead chiller ID number will appear first followed by the 5 stored codes for the lead chiller. The ESP will pause and then display the lag chiller ID number followed by the 5 stored codes for the lag chiller. This pattern is repeated until EXIT is depressed.

Table 2 — Machine Operating Parameters for Lead/Lag System

SINGLE-COMPRESSOR CHILLERS

PARAMETER CODE					PARAMETER TO BE DISPLAYED
EPROM PART NO. HK98EZ014 OR LOWER			EPROM PART NO. HK98EZ015 OR HIGHER		
Deactivated Lead/Lag (Main Chiller)	Activated Lead/Lag		Activated or Deactivated Lead/Lag		
	Lead Chiller	Lag Chiller	Lead (Main) Chiller	Lag Chiller	
0	10	20	10	20	Leaving Chilled Water Temperature
1	11	21	11	21	Motor Current % RLA
2	12	22	12	22	Evaporator Refrigerant Temperature
3	13	23	13	23	Condenser Refrigerant Temperature
4	14	24	14	24	Bearing Temperature
5	15	25	15	25	Motor Winding Temperature
6	16	26	16	26	Compressor Discharge Temperature
7	17	27	17	27	Line Voltage
8	18	28	18	28	Spare Sensor #1 Temperature
9	19	29	19	29	Temperature at Common Point (Mixed Temp)

DISPLAYING LEAD/LAG MACHINE OPERATING PARAMETERS

MX Board with EPROM Part No. HK98EZ014 or Lower — When lead/lag is activated, machine operating parameter codes for the lead and lag chiller can be displayed. (Refer to Table 2.) In addition, the mixed water temperature at the common point can be read. If lead/lag is deactivated, the ESP will not accept lead/lag parameter codes and the display will blink. The parameter values for the main chiller can be read when lead/lag is deactivated by entering the main chiller parameter codes listed in Table 2.

MX Board with EPROM Part No. HK98EZ015 or Higher — All machine operating parameters for the lead and lag machine can be displayed at anytime regardless of whether lead/lag is activated. Codes for the lead machine or main chiller are always 10 through 19; codes for the lag machine are always 20 through 29.

CONTROL FUNCTION PROGRAMMING

General — Programming to utilize ESP control functions is the same for all chillers, except for those features directly related to 2-chiller lead/lag sequencing. Programming ESP with the lead/lag options is covered separately.

In order to program and activate a control function, the ESP must be initialized and ready to operate the system, as explained under ESP Start-Up. A chiller identification number, the chilled water set point and the demand limit set point must be entered into the ESP as described in the Initial Programming section. All programming follows the same general rules:

1. All programming begins with the ESP displaying the unit present status. If the unit present status is not being displayed, press EXIT. Entry into the program mode is gained by depressing "zero" four times followed by ENTER. The display response (+18888) indicates that programming can proceed.
2. Any time a mistaken entry is made it can be deleted by entering CLEAR. This includes entries that result in a blinking display or a blinking "E."
3. If in doubt about an entry or lost in a programming sequence, depress CLEAR, then EXIT to return to the display of the present status code and begin the programming sequence again.
4. If an attempt is made to enter data that is out of limits or to activate an option for which the data is missing, the data or activation code will be rejected and simply blink. Press CLEAR to return to the previous programming step (i.e., SET POINT blank screen).

ESP Address Format (Table 3) — To program the ESP, the 7 special function keys (see Fig. 6) are used along with the 10 numerical keys. The CHILLED WATER (ADDRESS) key and DEMAND LIMIT (±) key have secondary functions as shown in parentheses. When used for ESP address format programming, these keys always perform the secondary function. The RECALL key also has 2 functions as shown in the table in Fig. 6. The shaded areas indicate the functions these keys perform when used for programming in the ESP address format.

SPECIAL FUNCTION KEYS

SPECIAL KEY	FUNCTION
Chilled Water (Address)	Displaying/selecting chilled water set point.
	(Address) Selecting an address in the ESP address format.
Demand Limit (±)	Displaying/selecting demand limit set point.
	(±) Selecting negative data input.
Exit	Registering program inputs and returning display to present status code.
Set Point	Inputting new set point or programming data.
Recall	Displaying stored shutdown status codes or selected machine parameters.
	Advancing through the address locations in the ESP address format and displaying the contents.
Enter	Entering program data/codes.
Clear	Clearing errors [illegible]

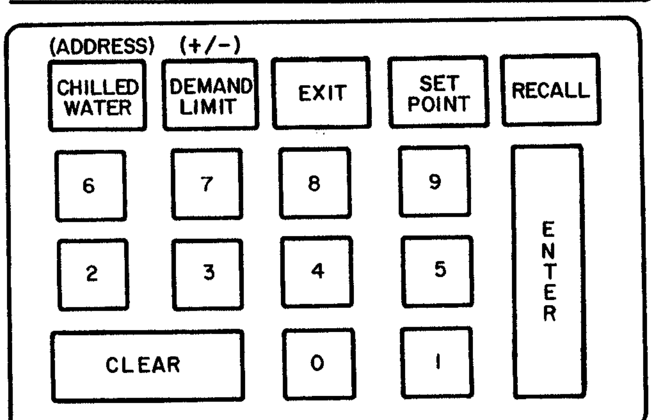


Fig. 6 — Special Function Keys for Programming ESP Address Format

Temperature set points may be entered and will be displayed in Centigrade or Fahrenheit according to setting of DIP switch on Basic 3200MP Controller.

NOTE: Out-of-range inputs or invalid keystrokes will cause the display to blink until the CLEAR key is depressed. The CLEAR key may also be used to delete keystroke errors while programming; in this case, the display returns to the last valid keystroke. If in doubt or lost, depress EXIT and start over.

To access the ESP address format, position the P/R switch to PANEL input code 0000 (4 zeros) while the machine's present status code is being displayed, then depress the ENTER key. (See example below.) Acceptance of the access code will be acknowledged by the display of +18888 and the ESP will enter an active programming sequence. Once in the programming sequence, there are 2 ways to call up an address in the format to program data:

1. Depressing the RECALL key advances through the format one address number (location) at a time. After each depression, the number of the new address will be displayed for 1/2 second followed by its contents (data).
2. The CHILLED WATER (ADDRESS) key permits direct call-up of address numbers in the format by depressing the key, inputting the number of the desired address, then depressing the ENTER key. The number of the selected address will be displayed for 1/2 second followed by its contents.
3. After selecting the desired address, data can be programmed at the location by depressing the SET POINT key, inputting the desired data, then depressing the ENTER key. The display will blank for 1/2 second and then the new data will be displayed. Negative data is programmed by depressing the DEMAND LIMIT (±) key after depressing the SET POINT key.

The ESP must be displaying the machine's present status code before a programming sequence can begin. If the ESP is not displaying the present status code or there is some doubt, depress the EXIT key. Once a programming sequence begins and no keypad activity takes place for over 60 seconds, the "+" sign in the display will blink until the CLEAR key is depressed. To input data, the P/R switch must be in the PANEL position. After program variables are entered, the EXIT key must be depressed to register the data in the ESP's memory and return to the display of the machine's present status code. The L/R switch may be in either position when programming.

In addition to data input through the keypad, the ESP uses configuration inputs established by the Basic 3200MP Controller DIP switches. If a DIP switch is reconfigured on the Basic 3200MP Controller, a POR must be performed at the Basic 3200MP Controller and at the ESP to register the change. If the DIP switch changes involve the chiller ID number, the new ID must be programmed in the ESP address format.

Programming the ESP Address Format

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Machine operating status code.* P/R switch must be in PANEL to proceed with programming the access code
0000	0000	
ENTER	+18888	Access code accepted, programming sequence begins
RECALL	01 0	Shows address 01 for 2 seconds then displays contents of address 01 (Chiller identification number is 0)
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"
CHILLED WATER (Address)		Display blanks to accept direct address input
19	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
25	-25	
ENTER	-25	Display blanks for 1/2 second and then accepts new data (New remote temperature value is -25)
EXIT	28	Registers inputs and returns display to chiller present status code*

*Chiller present status code may be any in the Diagnostics Codes table, or blank when unit is ready to start.

Common Programming for All Chillers

AUTOMATIC LEAVING CHILLED WATER TEMPERATURE SET POINT RESET — The ESP offers 4 ways to reset the leaving chilled water temperature set point. Only one of the 4 ways can be activated at a time. The method chosen will depend on system design and requirements. In all cases, set point reset can be positive or negative. The set point can be lowered to provide compensating capacity as building load increases, or raised as the building load decreases. Building load sensing can be done with the actual chiller load, outdoor or other remote temperature or an energy management system control device.

AUTO. CHILLED WATER RESET BASED ON COOLER TEMPERATURE DIFFERENCE — Permits up to ±30 F (17 C) of automatic reset to the leaving chilled water or brine temperature set point, based on a range of 0° F to 20 F (0° C to 11 C) difference between entering and leaving chilled water or brine temperature.

Figure 7 shows a desire to maintain the set point (no reset) at a 10° F difference between entering and leaving cooler water temperature, and to reset to a control point 3° F below the set point when the cooler water temperature difference rises to 15° F.

This function must be programmed and activated.

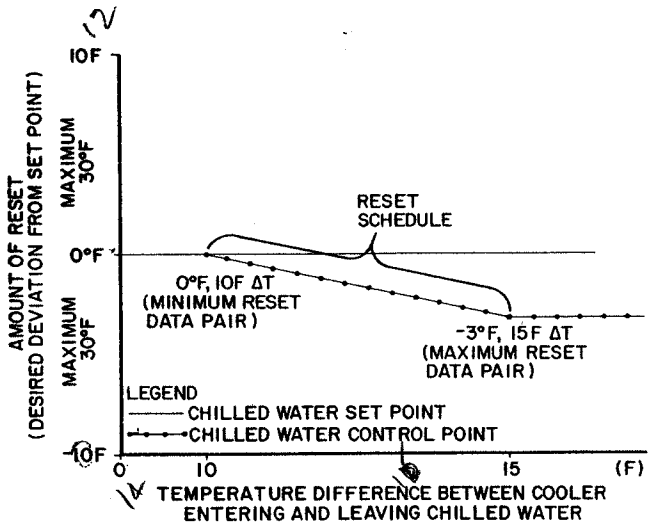


Fig. 7 — Reset Schedule Based on Cooler Temperature Difference

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*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		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†
0	0	Zero °F; no reset
ENTER	0	Data accepted
RECALL	09 00	Address for cooler ΔT Present value
SET POINT		Blank display; ready for data†
10	10	10 degrees ΔT corresponding to reset temperature A above
ENTER	10	Data accepted
RECALL	10 00	Address for reset temperature B Present temperature
SET POINT		Blank display; ready for data†
DEMAND LIMIT (±)	—	New data will be a negative value
3	-3	3 degrees reset temperature B
ENTER	-03	Data accepted
RECALL	11 00	Address for cooler ΔT Present value
SET POINT		Blank display; ready for data†
15	15	15 degrees ΔT corresponding to reset temperature B above
ENTER	15	Data accepted
EXIT	26	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Activating 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*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
12	12	
ENTER	12 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	26	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

AUTO. RETURN CHILLED WATER TEMPERATURE CONTROL — Resets the leaving chilled water or brine temperature up to ±30 F (17 C) to provide desired entering chilled water temperature. The amount of reset is based on the difference between entering and leaving chilled water or brine temperature. *The entering temperature control point used in this function is the leaving chilled water temperature set point entered through the keypad. When the function is activated, the set point entered through the keypad automatically becomes the entering temperature control point.* The maximum rate of change in leaving temperature is limited to 1/8° F (0.07 C) per minute.

The only programming necessary is to set the leaving chilled water set point to the desired entering water temperature and activate the control. The set point must be entered at ESP Start-Up (see Initial Programming section). To program a new set point, follow example below.

Programming Chilled Water Set Point

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
CHILLED WATER	1111	
ENTER	47	Present chilled water set point
SET POINT		Blank display — Ready for new data†
54	54	New chilled water set point
ENTER	54	Entry of new data accepted
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Activating Auto. Return Chilled Water Temperature Control

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	26	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
13	13	
ENTER	13 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	26	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

AUTO. CHILLED WATER TEMPERATURE RESET BASED ON A 4-20 mA INPUT SIGNAL — Permits up to ±30 F (17 C) of automatic reset to the leaving chilled water or brine temperature set point, based on the input from a 4-20 mA signal.

Figure 8 shows a desire to control to 0° F above the set point at the lower control signal and to 10° F above the set point at the upper control signal. Reset can be positive or negative; positive reset is shown.

This function must be programmed and activated.

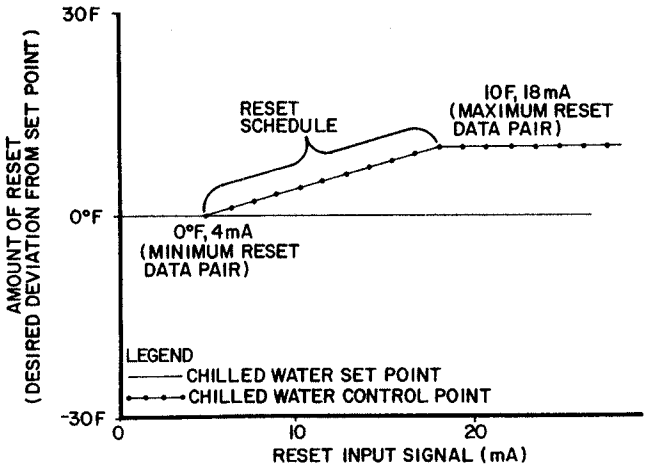


Fig. 8 — Reset Schedule Based on 4-20 mA Input Signal

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

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address for reset temperature A
14	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	4 mA input signal corresponding to reset temperature A above
ENTER	04	Data accepted
RECALL	16 00	Address for reset temperature B Present reset temperature
SET POINT		Blank display; ready for data†
10	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†
18	18	20 mA input signal corresponding to reset temperature B above
ENTER	18	Data accepted
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Activating Auto. Chilled Water Temperature Reset Based on a 4-20 mA Input Signal

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
18	18	
ENTER	18 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	28	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

AUTO. CHILLED WATER TEMPERATURE RESET BASED ON A REMOTE TEMPERATURE SENSOR INPUT — Permits up to ±30 F (17 C) of automatic reset to the leaving chilled water or brine temperature set point, based on the input from a remote temperature sensor.

In many cases it is desirable to raise or lower the chilled water temperature as a function of another temperature, i.e., outdoor temperature. Properly located, the remote sensor may be more responsive to factors influencing building load than the chilled water sensor, or the remote sensor may be used to provide anticipation in the system load.

Figure 9 shows a pattern of reset temperature control with a change in outdoor temperature from night set back (10° F positive reset) to high load (5° F negative reset) in a typical day.

This set point must be programmed and activated.

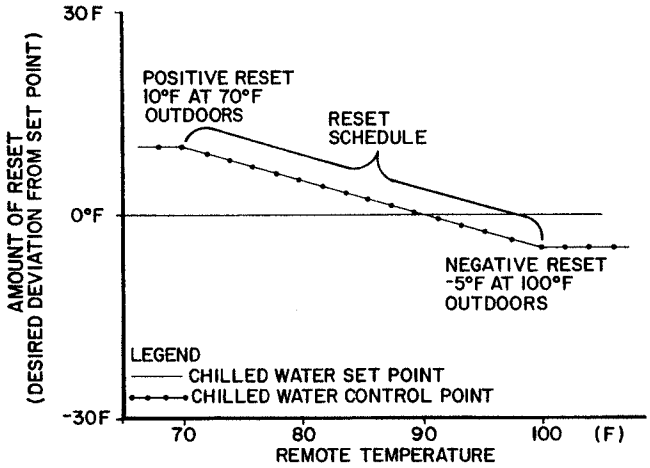


Fig. 9 — Reset Schedule Based on Remote Temperature Sensor

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*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address for reset temperature A
19	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
5	-5	5 degrees negative reset temperature A
ENTER	-05	Data accepted
RECALL	20 00	Address for remote temperature A Present temperature
SET POINT		Blank display; ready for data†
100	100	100 F remote temperature corresponding to reset temperature A above
ENTER	100	Data accepted
RECALL	21 00	Address for reset temperature B Present reset temperature
SET POINT		Blank display; ready for data†
10	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†
70	70	70 F remote temperature corresponding to reset temperature B above
ENTER	70	Data accepted
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Activating 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*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
23	23	
ENTER	23 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	28	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

AUTOMATIC POWER DEMAND LIMIT — The ESP offers 2 ways to limit electrical demand. Only one of the two can be activated at a time. The demand limiting control chosen will depend on energy management system design, power company rate schedules and the equipment available. Demand limiting can be based on a single contact closure from a timer to a programmed energy management system. Multiple steps of demand limiting with contact closures are available.

AUTO. POWER DEMAND LIMIT BASED ON CONTACT CLOSURE — Permits automatic stepped limiting of % motor current down to 40% of RLA based on closure of up to 3 discrete contacts. When activated and no contact is closed, demand limit = demand limit set point value. If more than one contact is closed, the smallest value programmed for any closed contact will be used as set point.

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. This example portrays a desire to limit the electrical demand to 3 different levels with 2 contacts. This could be at 3 different times per day, per week or on another schedule. Two switches have been installed as indicated in ESP Installation Instructions (a total of 3 switches may be used) and in this case are in positions A and B. Switch A is programmed for an 80% demand limit and switch B is programmed for a 60% limit. Accordingly, when no switch is closed, the demand limit is the set point value; when A closes the limit is 80%; and when B closes (with or without A closed) the limit is 60%.

Note that the switch C address must be programmed within the assigned limits of from 40% to 100% RLA even though there is no switch C to close. A demand limit value must be programmed for each switch position before the control can be activated.

This function must be programmed and activated.

Programming Auto. Power Demand Limit Based on Contact Closure

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address for switch A
24	24	
ENTER	24 00	Address for switch A Present value
SET POINT		Blank display; ready for data†
80	80	80% RLA for switch A demand limit
ENTER	80	Data accepted
RECALL	25 00	Address for switch B Present value
REPEAT ENTRY PROCEDURE FOR SWITCH B		
RECALL	26	Address for switch C
REPEAT ENTRY PROCEDURE FOR SWITCH C		
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Activating Auto. Power Demand Limit Based on Contact Closure

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	26	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
27	27	
ENTER	27 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	26	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

AUTO. POWER DEMAND LIMIT BASED ON A 4-20 mA INPUT SIGNAL — Permits automatic linear limiting of % motor current within a range of 100% down to 40% of RLA based on a 4-20 mA signal.

The signal can come from any 4-20 mA controller including an energy management system. The slope of the demand limiting schedule can be negative or positive with respect to the 4-20 mA signal, i.e., the demand limit can be programmed to increase or decrease with an increased current signal.

Figure 10 shows a positive demand limiting schedule. This function must be programmed and activated.

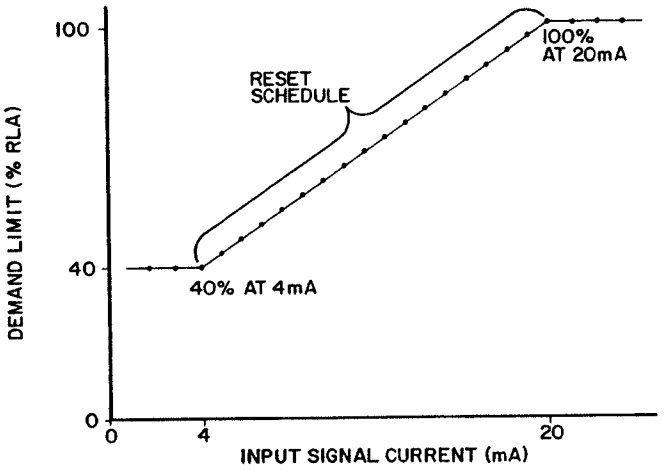


Fig. 10 — Demand Limit Schedule Based on 4-20 mA Input

Programming Auto. Power Demand Limit Based on a 4-20 mA Input Signal

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
28	28	
ENTER	28 00	Address for demand limit A Present value
SET POINT		Blank display; ready for data†
40	40	40% RLA demand limit A
ENTER	40	Data accepted
RECALL	29 00	Address for input signal current A Present value
SET POINT		Blank display; ready for data†
4	4	4 mA input signal corresponding to demand limit A above
ENTER	04	Data accepted
RECALL	30 00	Address for demand limit B Present value
REPEAT ENTRY PROCEDURE FOR DEMAND LIMIT B		
RECALL	31 00	Address for input signal B Present value
REPEAT ENTRY PROCEDURE FOR INPUT SIGNAL B		
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Activating Auto. Power Demand Limit Based on a 4-20 mA Input Signal

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
32	32	
ENTER	32 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	28	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

AUTO. RESTART AFTER POWER FAILURE — Permits activation of the ESP to automatically restart the machine after a power loss under the following conditions: 1) the machine was operating when the power was interrupted; 2) control voltage has been re-established to within ±18% of nominal 115 vac and all restart checks have been verified; 3) a shutdown is not requested by the opening of an activated remote start/stop contact or a stop button. No programming is necessary other than to activate this function.

Activating Auto. Restart After Power Failure

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	26	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
33	33	
ENTER	33 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	26	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

RAMP LOADING RATE ADJUSTMENT — Permits selection of any ramp loading rate that is slower (in degrees/minute) than the value established by the Basic 3200MP Controller DIP switches. Ramp loading rate is selected by programming the code for one of 8 rates listed in the ESP address format (Table 3). When deactivated, the ESP uses the value established by the Basic Controller DIP switches.

This example sets the ramp loading rate at code 6 for 3°F per minute. No additional activation programming is required. To deactivate, enter the deactivation code. The DIP switches must be set for a rate of 3°F per minute or faster (higher).

Programming Ramp Loading Rate Adjustment

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address for ramp loading rate
34	34	
ENTER	34 00	Address for ramp loading rate Present value
SET POINT		Blank display; ready for data†
6	6	New code 6 for 3F ramp loading rate
ENTER	06	Data accepted
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

REMOTE CONTACT START/STOP — Permits activation of a contact closure from a time clock, EMS system or other device for start-stop control of the machine. When activated, this function establishes the remote contact as being in control of starting the chiller over any other start command and the chiller *cannot* be started unless the remote contacts are closed. The chiller can be stopped at any time from any stop command source, including the regular opening of the remote contacts.

No programming is necessary other than to activate this control.

Activating Remote Contact Start/Stop

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	26	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
35	35	
ENTER	35 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	26	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

Programming ESP with Lead/Lag Option for 2 Single-Compressor Chillers

GENERAL — Most of the functions outlined in the previous section are applicable to chillers with the lead/lag option. Following are some exceptions to the operation of these controls in a lead/lag system:

1. The chilled water temperature set point controls the lead chiller only. The lag chiller capacity is controlled through the ESP by matching lag chiller % motor current with the lead chiller % motor current.
2. The demand limit set point controls the whole system when lead/lag is activated. The demand limit is based on the total RLA of the system and may inhibit lag chiller operation.
3. The chilled water temperature reset options and demand limit reset options control capacity of the lead chiller only. The lag chiller capacity is controlled by the lead chiller % motor current.
4. The auto. restart after power failure control will restart the lead chiller only. The lag chiller will restart when the normal conditions for the lag chiller are satisfied.
5. The ramp loading rate adjustment control applies to the lead machine only. The lag chiller is not ramp loaded at start-up, but goes immediately into a temperature control operating mode.
6. The remote start/stop contacts control starts the lead machine only. The lag machine starts when the normal conditions for its start-up have been satisfied. When the remote start/stop control stops the lead machine, the lag machine stops also.

LEAD/LAG OPERATION — The lead/lag option permits selection of the lead chiller and the programming of temperature vs time inputs to establish a minimum desired pulldown rate. If the lead machine fails to maintain this minimum pulldown rate, the lag machine will be started when the following conditions have been met:

- Lead/lag is activated
- The lead machine is on
- Ramp loading of the lead machine has been completed for at least 5 minutes
- The chilled water temperature is greater than the control point + deadband
- The chilled water temperature is not decreasing at the desired rate over a continuous 2-minute period
- The system RLA is not at the demand limit set point
- The pulldown time (in minutes) has elapsed since the lead machine started
- A lag machine safety limit is not exceeded
- The lag machine has been off for at least 15 minutes

NOTE: These conditions also apply for restart of the lag machine after a normal recycle shutdown.

When all conditions for a lag machine start-up have been satisfied, the lag chiller chilled water pump will be started (parallel system). Two minutes later, the lead chiller's guide vanes will be closed until the lead chiller's motor current is 75% of its RLA. The lead chiller's motor current will be held at or below 75% RLA until the lag machine start-up is aborted or the lag machine starts and has been running for 2 minutes. The lead machine will then return to normal capacity control and the lag machine guide vanes are opened or closed so that lag machine % RLA is within ± 5% of lead machine % RLA. This is the only criterion for control of the lag machine.

Normally the demand limit is simply a percentage of RLA of the single-compressor chiller. When lead/lag is activated, regardless of whether one or both machines are operating, the demand limit is based on a percentage of the total RLA of the lead/lag system. For example, if the RLA of the lead chiller is 250 amps and the RLA of the lag chiller is 150 amps, the total system RLA is 400 amps. If the demand limit is set for 50%, the ESP controls the system operating current to 200 amps. If only the lead chiller is operating it can run up to the 200 amps limit or effectively at 80% of its individual RLA. In that case the lag chiller would not come on.

When the total system load with both chillers running is less than the lead chiller maximum capacity for 15 minutes, the lag chiller's guide vanes will be closed for 2 minutes and then a nonrecycle shutdown of the lag machine will be initiated.

The machines may be operated as basic chillers (with the L/R switches in LOCAL) only if lead/lag is deactivated. If lead/lag is activated while one or both machines are operating, the ESP will initiate a nonrecycle shutdown of the operating machine(s). No diagnostic code will be displayed.

Operation in lead/lag means that lead/lag has been activated and the lead chiller has been started up. To initiate a start-up in lead/lag, L/R switches on Basic 3200MP Controllers of both machines must be in remote. The ESP start button must be depressed or the remote contact must be closed to initiate a lead machine start-up.

A manual override shutdown (code 78) will be initiated by the ESP for any machine switched to local while operating in lead/lag. If both lead and lag machines are operating in lead/lag and the lead machine is switched to local, both machines will shut down. If the lag machine is not operating it can be switched to local without shutting down the lead machine and without the display of a diagnostic code, but it cannot be operated as a basic chiller.

If lead/lag is deactivated while one or both chillers are operating in lead/lag (which means that the L/R switches are in REMOTE), the main chiller will operate and execute control functions and the other chiller will shut down.

CHILLER IDENTIFICATION NUMBERS — In addition to programming a chiller identification number at Address #1, the lead/lag option requires programming of the identification number of the other chiller in the lead/lag system at Address #2, and selection of one of these 2 chillers as the lead chiller at Address #3. The ID number of the "other" chiller in the lead/lag system must be different from the ID number of the chiller at Address #1. The lead chiller can be either chiller. In addition, the lag chiller does not have to be selected. The chiller not selected as the lead chiller will automatically be selected by the ESP as the lag chiller.

The method for programming these chiller identification numbers in the ESP lead/lag option address format is the same as that outlined previously in ESP Start-Up, Programming Chiller Identification. The only difference is that a chiller ID number must be programmed at 3 different addresses: first for the chiller at Address #1, then for the other chiller, and then for the lead chiller.

CHILLED WATER PULLDOWN RATE — The time and temperature inputs are variables that define a minimum desired leaving chilled water temperature pulldown rate (slope) in degrees/minute. The time variable also controls the minimum time that must elapse between the start of the lead chiller and the start of the lag chiller.

The programming example below shows a desire to have the chilled water temperature pulldown at least 2 degrees F in 10 minutes.

Programming Chilled Water Pulldown Rate

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address for pulldown rate time
4	4	
ENTER	04 00	Address for pulldown rate time Present value
SET POINT		Blank display; ready for data†
10	10	New time rate of 10 minutes
ENTER	10	Data accepted
RECALL	5 00	Address for pulldown rate temperature Present value
SET POINT		Blank display; ready for data†
2	2	New pulldown rate temperature of 2 degrees
ENTER	02	Data accepted
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

CHILLER AT ADDRESS #1 PERCENTAGE OF TOTAL SYSTEM CAPACITY — In order for the ESP to determine when the lead chiller can carry the load and shut down the lag chiller, it is necessary to enter the chiller capacity split of the total system. Entry of only the chiller at Address #1 is required; the ESP will automatically assign the remainder of the total to the other machine. The entry is made as a percentage of the total. If, for example, the capacity of each chiller were the same, the chiller at Address #1 percentage of total capacity would be 50.

The programming example below shows the capacity of the chiller at Address #1 to be two-thirds of the total system capacity.

Programming Chiller at Address #1 Percentage of Total System Capacity

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address for chiller at address #1 percentage of capacity
6	6	
ENTER	06 00	Address for chiller at address #1 percentage of capacity Present value
SET POINT		Blank display; ready for data†
67	67	67% of total system capacity for the chiller at address #1
ENTER	67	Data accepted
EXIT	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

ACTIVATION OF LEAD/LAG — Activation of lead/lag requires entry of all lead/lag program parameters shown above and activation of the lead/lag option as shown below.

Activating Lead/Lag Option

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
		Unit present status*
0000	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
CHILLED WATER (Address)		Blank display; ready for address
7	7	
ENTER	07 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT		Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table, or blank when unit is ready to start.
†If the display response to set point input is blinking, press CLEAR; check to be sure P/R switch is in PANEL position; then continue.

NOTE: Activation or deactivation of lead/lag while chillers are operating will cause chillers to shut down.

Table 3 — ESP Address Format

ADDRESS	DESCRIPTION		VARIABLE INPUT RANGE
1	Chiller Identification Number		0-7
[redacted]			
3	Chiller Identification Number Non-lead/lag system: Must be same ID no. as chiller at Address #1. Lead-lag system: Lead chiller (may be same ID no. as either chiller at Address #1 or Address #2).		0-7
[redacted]			
Variables Associated with Chilled Water Reset Based on Cooler Temperature Difference			
8 9	DATA PAIR A	Degrees of reset for the temperature difference at address 9. Temperature difference for the degrees of reset at address 8.	0° to ±30F (0° to ±17C) 0° to 20F (0° to 11C)
10 11	DATA PAIR B	Degrees of reset for the temperature difference at address 11. Temperature difference for the degrees of reset at address 10.	0° to ±30F (0° to ±17C) 0° to 20F (0° to 11C)
12	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Return Chilled Water Temperature Control			
13	Activation/Deactivation NOTE: When activated, chilled water set point = return water control point		1 — Activate 0 — Deactivate
Variables Associated with Chilled Water Temperature Reset Based on a 4-20 mA Input Signal			
14 15	DATA PAIR A	Degrees of reset for the amount of current at address 15. Amount of current for degrees of reset at address 14.	0° to ±30F (0° to ±17C) (4-20 mA)
16 17	DATA PAIR B	Degrees of reset for the amount of current at address 17. Amount of current for degrees of reset at address 16.	0° to ±30F (0° to ±17C) (4-20 mA)
18	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Chilled Water Temperature Reset Based on a Remote Temperature Sensor Input			
19 20	DATA PAIR A	Degrees of reset for the temperature at address 20. Remote temperature value for degrees of reset at address 19.	0° to ±30F (0° to ±17C) -20 to 240F (-29 to 116C)
21 22	DATA PAIR B	Degrees of reset for the temperature at address 22. Remote temperature value for degrees of reset at address 21.	0° to ±30F (0° to ±17C) -20 to 240F (-29 to 116C)
23	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Demand Limit Set Point Based on Contact Closure			
24 25 26 27	Demand limit when contact A is closed. Demand limit when contact B is closed. Demand limit when contact C is closed. Activation/Deactivation		40% to 100% 40% to 100% 40% to 100% 1 — Activate 0 — Deactivate
Variables Associated with Demand Limit Set Point Based on a 4-20 mA Input Signal			
28 29	DATA PAIR A	Demand limit for the current at address 29. Current for demand limit at address 28.	40% to 100% 4-20 mA
30 31	DATA PAIR B	Demand limit for the current at address 31. Current for demand limit at address 30.	40% to 100% 4-20 mA
32	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Self-Start After Power Failure			
33	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Ramp Loading Rate Adjustment			
34	Ramp loading rate code	Code	Loading Rate (Degrees/Minute) F / C
		0	Deactivate
		1	2.25 / 1.25
		2	.75 / 0.42
		3	1.13 / 0.63
		4	1.50 / 0.83
		5	.38 / 0.21
		6	3.0 / 1.67
		7	5.25 / 2.92
		8	10.5 / 5.38
Variables Associated with Enabling a Remote Contact			
35	Activation/Deactivation		1 — Activate 0 — Deactivate

[redacted] Shaded area indicates addresses that apply only to ESP with lead/lag option.

CONTROL TROUBLESHOOTING

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 will display a diagnostic code. The ESP also has the ability to determine if data programmed in its address format is invalid or incomplete. The display will blink while attempting to program invalid data or activate a control or option that has not been fully programmed.

If a control problem is suspected, the machine should be operated in local to determine if the problem exists in the Basic 3200MP Controller or the ESP. If a problem with a control is suspected, bear in mind that the ESP program depends on remote inputs. These inputs must be accurate and indicative of the parameters programmed in the ESP address format.

The ESP monitors options inputs for out-of-range conditions. If an out-of-range condition is detected a safety shutdown will be initiated and code 64 (sensor-out-range) will be displayed. The acceptable range for temperature inputs is –20 to 240 F (–29 to 116 C) and for 4-20 mA inputs is 2 mA (0.5 vdc) to 22 mA (5.5 vdc).

Out-of-range or defective remote sensor inputs can be isolated by performing the controls test for the chiller (Basic Controller L/R switch set to LOCAL). Refer to chiller Start-Up, Operation and Maintenance Instructions for instructions for descriptions of controls test procedure.

> NOTE: While the chiller controls test is being performed, the ESP K/D panel may not mimic the display on the S/D board.

Additional controls test steps are shown in Table 4. These test steps are automatically added to the steps for the Basic 3200MP Controller when an ESP is connected.

Check the accuracy of temperature sensors as described in the Basic 3200MP Controls section of the chiller Start-Up, Operation and Maintenance Instructions.

CHILLER TROUBLESHOOTING

The ESP can serve as an aid to diagnosing a problem with the chiller(s). Shutdown codes are captured and stored in permanent memory and will not be lost, even if the ESP loses power. Shutdown codes are listed in the Start-Up, Operation and Maintenance Instructions for the chiller. Additional codes related specifically to problems involving the ESP are shown in Table 5.

The ESP will store the shutdown codes from the last 5 chiller shutdowns in order from most recent to least recent. Displaying stored shutdown status codes is described in ESP Display Functions Operations section.

Table 4 — Additional Controls Test Steps for ESP

STEP NUMBER		TEST DESCRIPTION	DISPLAY CODE STATUS
Single-Compressor Chiller	Dual-Compressor Chiller		
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) 03 (Minutes)

Table 5 — ESP Diagnostic Codes

CODE NO.	DESCRIPTION/MALFUNCTION	PROBABLE CAUSE/REMEDY
45	Sensor Out-of-Range (Prestart)	Perform controls test to check for defective set point potentiometer(s) or open or shorted sensors; check sensor resistance.
55	Lag Chiller Malfunction (ESP displays 55, lead chiller displays error code, lag chiller displays present status code.) Code 55 will be displayed at ESP only when lead/lag option is active. When lead/lag is not active, ESP will display error code.	Lag chiller shutdown on safety. Lead chiller under ESP control. Check lag chiller status for shutdown code. Correct malfunction and reset lag chiller.
64	Sensor Out-of-Range (Operating)	Temperature sensor or diffuser feedback potentiometer (on DM) open or shorted or 4-20 mA input signal below 2 mA. Perform 38-step Controls Test to isolate defective input; check temperature sensor accuracy. Check connections at Basic Controller processor board.
76	Invalid Configuration	Basic Controller identification number not programmed in the ESP address format. Determine basic chiller identification number and program at address #1 and address #3 in the format.
81	Loss of Communication	Communication between the Basic Controller and the ESP not initialized or lost for more than 15 seconds after being initialized. See Initializing the ESP; check serial communication line for proper connection and contact; check line for shorts or breaks. Check for proper installation of memory expansion module.