



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.

NOTE: These instructions apply to ESP II packages with the following EPROM part numbers:

- Single Compressor Chiller — HK98EZ110 and higher
- Dual Compressor Chiller — HK98EZ140 and higher

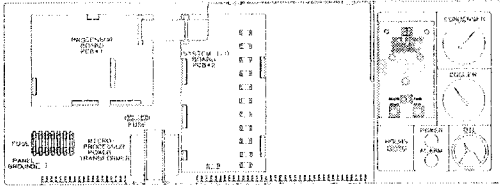
The EPROM part no. is shown on a sticker on the EPROM located on the memory expansion (MX) board.

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Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

BASIC 3200MP CONTROLLER



SINGLE OR DUAL COMPRESSOR CHILLER

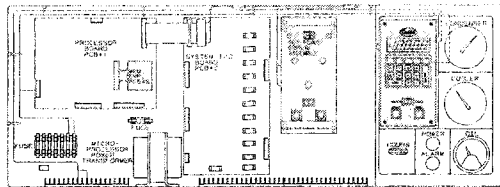
FEATURES

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.

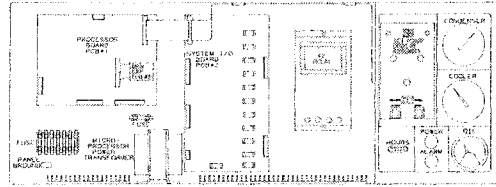
REFER TO BASIC 3200MP CONTROLS SECTION OF CHILLER START-UP, OPERATION AND MAINTENANCE INSTRUCTIONS.

BASIC CONTROLLER + ESP

(Two Choices)

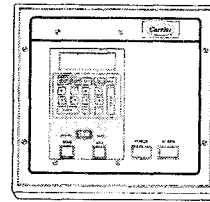


SINGLE OR DUAL COMPRESSOR CHILLER AND MACHINE-MOUNTED ESP



SINGLE OR DUAL COMPRESSOR CHILLER

OR



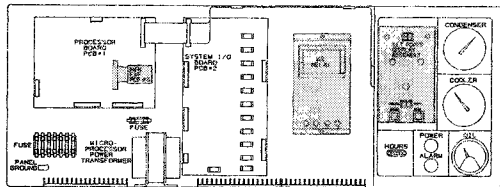
REMOTE ESP

FEATURES

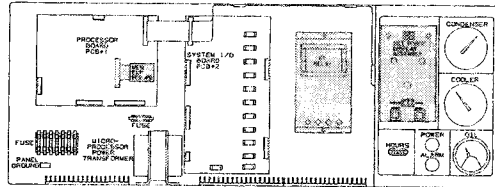
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BASIC CONTROLLER + ESP WITH LEAD/LAG OPTION

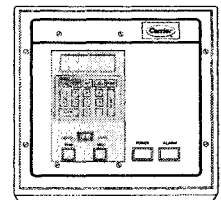
(Two Single Compressor Chillers and Remote ESP)



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 — Set 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 and lag chillers in a lead/lag system.

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

Basic Chiller — Machine placed under the control of a Basic 3200MP Controller (instead of the ESP) by the setting of the L/R switch on the S/D Board to LOCAL.

Lead/Lag — The coupling of 2 independent single compressor chillers to provide integrated system control of the building's cooling demand.

ACTIVATED LEAD/LAG — Lead/lag is *activated* when the activation code is programmed in the ESP Address Format. The 2 machines become logically interfaced and will use the common point temperature (spare sensor #2) for chilled water control until lead/lag is deactivated by the programming of the deactivation code.

ACTIVE LEAD/LAG — A lead/lag system is *active* when the following conditions exist: 1) Lead/lag has been activated; 2) Both chillers are under ESP control (meaning that neither of the chillers L/R switches have been switched to LOCAL and there has not been a communication error causing a machine to revert to the enabled mode); and 3) The lead machine is operating.

Lead Chiller — The principal machine in a lead/lag system under ESP control. The lead chiller is the first machine to start and it remains on until cooling is no longer required. Whether or not lead/lag is activated, the lead chiller is the principal machine and as such will perform control functions.

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.

Enabled Mode — The enabled mode allows a chiller that was operating under ESP control to automatically continue operating after a communications error. The chiller will be controlled by the local leaving chilled water and demand limit set points on the S/D board, not the ESP set points.

For an activated lead/lag system, the enabled mode also means that in the event of a communications error on either chiller or a lead chiller problem, the lag chiller can continue to operate or even start-up as required to provide system cooling. An enabled chiller is controlled by the local leaving chilled water and demand limit set points, but will use the common point temperature sensor. (See Programming Lead/Lag Option for details.)

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 for single compressor machines consists of 2 distinct hardware elements: The expanded services panel (ESP) and a memory expansion board (MX). The basic dual compressor machine has an MX board and requires only the ESP. (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 Fahrenheit is determined by setting a 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.

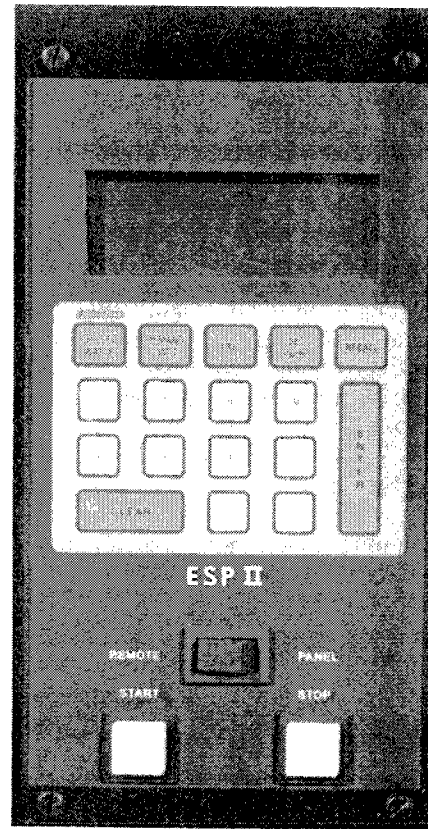
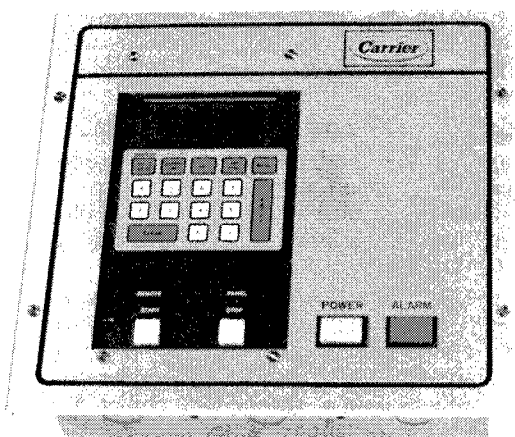
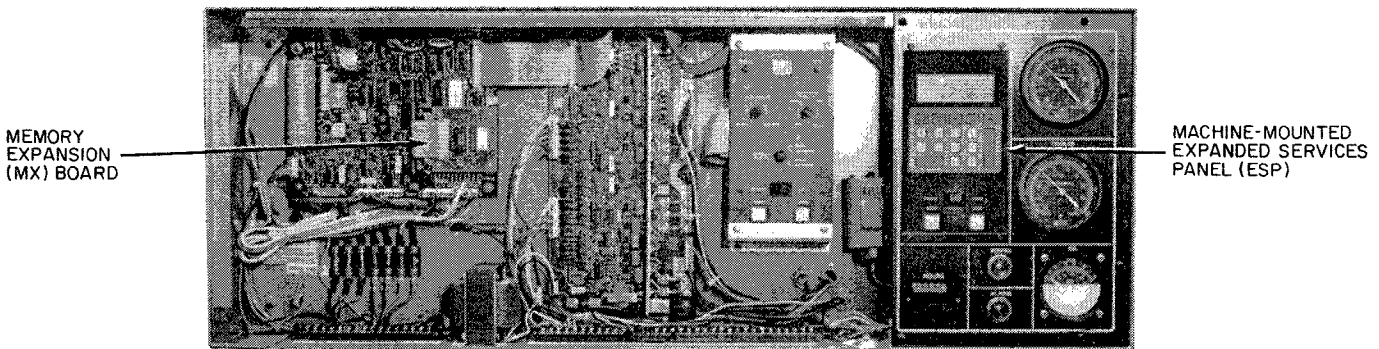
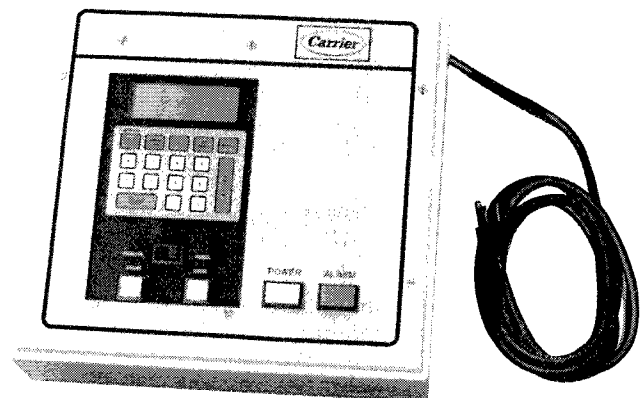


Fig. 2 — ESP Keypad/Display Panel



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.

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 even when lead/lag is not 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.

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 first machine started will be the lead chiller.

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. 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.

LEAD/LAG OPTION — Permits selection of the lead chiller and the programming of system-related inputs for starting and stopping the lag chiller as needed to satisfy capacity requirements.

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 33, 34 or 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 while the chiller or chillers are operating under ESP control (L/R switch on the Basic 3200MP Controller in REMOTE), the ESP will blank out and the chillers will revert to an enabled mode.

If power is maintained at the ESP but communication is lost for more than 15 seconds, the chillers will revert to an enabled mode and the ESP will display code 33 or 34 for single compressor chillers or code 81 for dual compressor chillers. In a lead/lag system a communication error with the lead chiller will cause both chillers to revert to the enabled mode. A communication error with the lag chiller will only cause the lag chiller to enter the enabled mode; the lead chiller will remain under the control of the ESP.

If the L/R switch on Basic 3200MP Controller on dual compressor chiller or single compressor chiller in a non-lead/lag system is switched to LOCAL, the chiller will revert to basic control and the ESP and the S/D board will usually display the same present status code. If the L/R switch on a 3200MP single compressor controller in an activated lead/lag system is set to LOCAL, the chiller will revert to basic control and the ESP will display code 31 or 32.

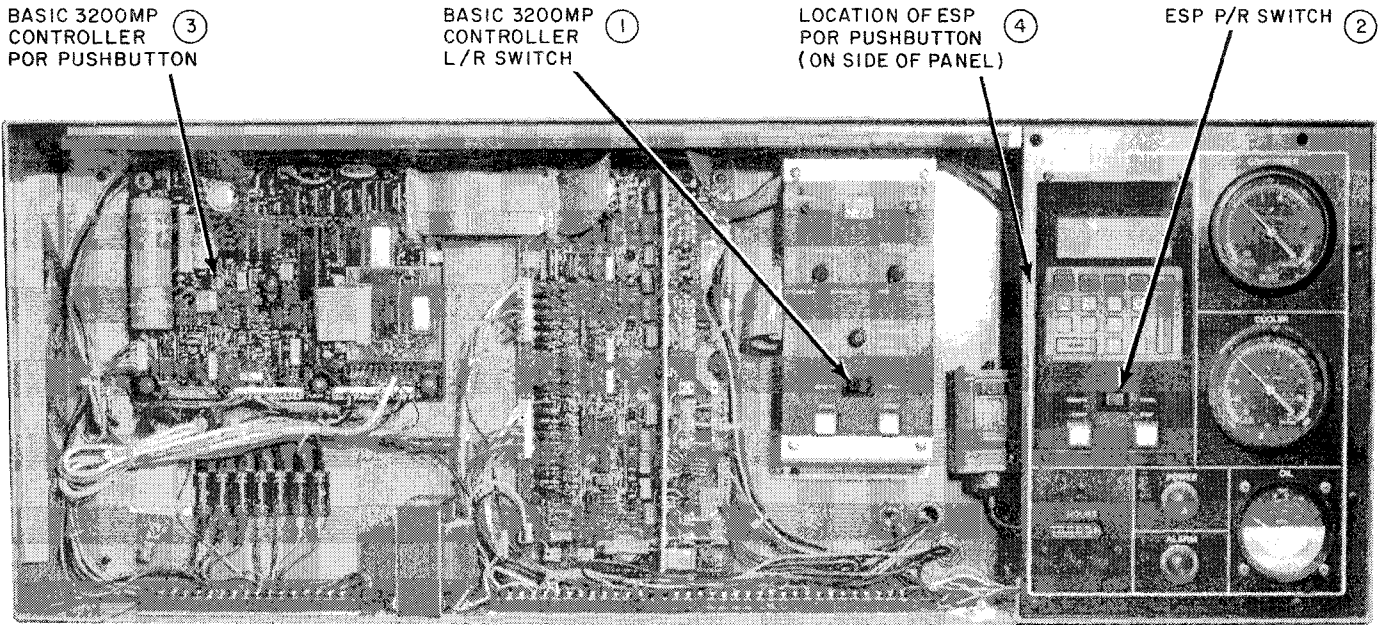


Fig. 3 — Initialization Procedure

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. Refer to Fig. 4.

Programming Chiller Identification Number

Place P/R switch on ESP in PANEL Position

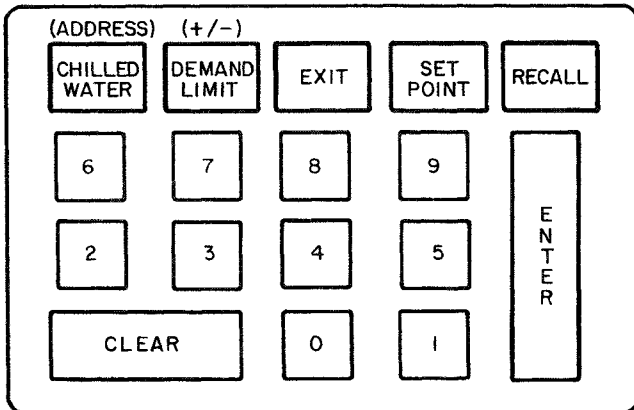


Fig. 4 — Close-Up View of ESP Keypad

KEYSTROKE/INPUT	DISPLAY/RESPONSE	COMMENTS
	*	Chiller Present Status
0 0 0 0	0000	A 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.

†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 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, Address #2, and Address 3. For programming of chiller identification numbers in a lead/lag system, see page 24.

PROGRAMMING ESP 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 ESP Chilled Water Set Point

Place P/R Switch on ESP to PANEL Position

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

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; 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 ESP DEMAND LIMIT SET POINT — The demand limit set point can be from 40% to 100% RLA.

Programming ESP Demand Limit Set Point

Place P/R Switch on ESP in PANEL Position

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

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; 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 numbered programmed at Address #1, Address #2, 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 in the ESP address format. These are explained in the ESP Address Format section.

SPECIAL FUNCTION KEYS

SPECIAL KEY	FUNCTION
(ADDRESS)	Displaying/selecting chilled water set point.
(+/-)	Displaying/selecting demand limit set point.
	Registering program inputs and returning display to present status code.
	Inputting new set point.
	Displaying stored shutdown status codes or selected machine parameters.
	Entering program data or codes.
	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.

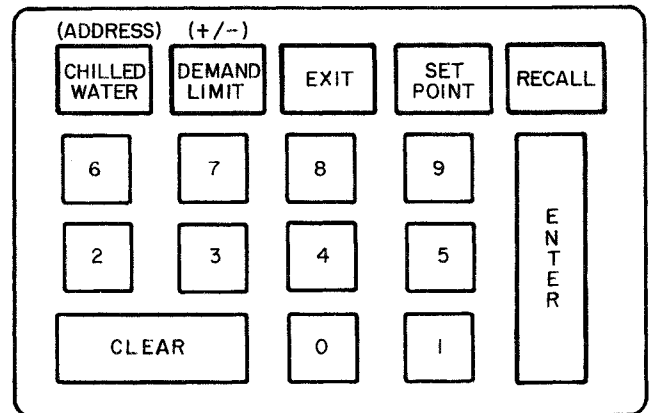


Fig. 5 — Display Functions

NOTE: Any time a mistaken entry is made it can be erased by depressing . 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 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 ESP CHILLED WATER SET POINT — To display the chilled water set point, depress the

key followed by the key. Depress the key

key to return to display of the present status code.

KEYSTROKE/INPUT	DISPLAY/RESPONSE	COMMENTS
<input type="button" value="CHILLED WATER"/>	1111	
<input type="button" value="ENTER"/>	42	Displays chilled water set point (42°)
<input type="button" value="EXIT"/>	28	Chiller present status code

DISPLAYING ESP DEMAND LIMIT SET POINT —

To display the demand limit set point, depress the key, followed by the key. Depress the key

to return to display of the present status code.

KEYSTROKE/INPUT	DISPLAY/RESPONSE	COMMENTS
<input type="button" value="DEMAND LIMIT"/>	2222	
<input type="button" value="ENTER"/>	100	Displays demand limit set point (100%)
<input type="button" value="EXIT"/>	28	Chiller present status code

DISPLAYING BASIC 3200MP (LOCAL) DEMAND LIMIT SET POINT AND ESP DEMAND LIMIT CONTROL POINT — The local set point and the ESP control point for electrical demand can be displayed on the ESP. Position the L/R switch on the Basic Controller

S/D Board to LOCAL, then enter

on the ESP K/D Panel and depress the key; the

local set point will be displayed. If the position of the knob is changed, the displayed value will change to reflect the new setting.

To display the ESP demand limit control point, position the L/R switch to REMOTE, then enter

on the ESP K/D Panel and

depress the key.

NOTE: If neither of the auto. demand limit set point options is activated, the control point displayed will be equal to the ESP demand limit set point.

Once has been entered, the

local set point can be compared to the ESP control point by moving the L/R switch back and forth between LOCAL and REMOTE.

Press to return to present status display.

DISPLAYING BASIC 3200MP (LOCAL) CHILLED WATER SET POINT AND ESP CHILLED WATER CONTROL POINT — The local set point and the ESP chilled water control point can be displayed on the ESP. Position the L/R switch on the Basic Controller S/D

Board to LOCAL, then enter on

the ESP K/D Panel and depress the key; the local

set point will be displayed. If the position of the thermostat is changed, the displayed value will change to reflect the new setting.

To display the ESP chilled water control point,

position the L/R switch to REMOTE, then enter

on the ESP K/D Panel and de-

press the key.

NOTE: If neither of the chilled water reset options is activated, the control point will be equal to the ESP chilled water set point.

Once has been entered, the

local chilled water set point can be compared to the ESP control point by moving the L/R switch back and forth between LOCAL and REMOTE.

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 package will store shutdown codes for the last 5 chiller shutdowns. To display the stored shutdown

codes, depress the key followed by the 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

key to return to display of the chiller present status code.

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
<input type="button" value="RECALL"/>	5555	
<input type="button" value="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 68. Blank for 1/2 second before displaying next code
	74	Displays fifth most recent which was 74 again. Blank for 10 seconds, then repeats
	66	Displays most recent shutdown code (66)
<input type="button" value="EXIT"/>	28	Returns to displaying chiller present status code *

*Chiller present status code may be any in the Diagnostic Codes table.

To read stored shutdown codes for a dual-compressor

chiller, depress 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

to return to display of the chiller present status code.

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

*Chiller present status code may be any in the Diagnostic Codes table.

DISPLAYING MACHINE OPERATING PARAMETERS

To display machine operating parameters, press , keystroke the parameter code from the Machine Operating Parameters table (Table I), then

press . A number input before depressing the

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
<input type="button" value="RECALL"/>	5555	
<input type="button" value="4"/>	4	Parameter code for bearing temperature
<input type="button" value="ENTER"/>	156	Bearing temperature is 156°
<input type="button" value="EXIT"/>	28	Displays chiller present status code *

*Chiller present status code may be any in the Diagnostic Codes table.

If a code is entered for a parameter without a sensor, the display will blank until the 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 key is depressed. This is a reminder that the value being displayed is a parameter and not a present status code.

DISPLAYING STATUS OF LEAD AND LAG COMPRESSORS — The ESP normally displays the status of the 2-compressor system (the dual compressor chiller). To display the status of the lead

compressor, press , then . To display the status of the lag compressor, press , then .

To return to display of the system present status, press .

For example, if a lead compressor failure causes the system to enter standby, (where the lag compressor becomes the lead) the status of the lead and lag compressors could be displayed as follows:

KEYSTROKE/INPUT	DISPLAY/RESPONSE	COMMENTS
	54	System status: lead compressor failure. Chiller in standby mode
<input type="text" value="1"/>	1	Enter 1 to display present status code for lead compressor (was lag)
<input type="text" value="ENTER"/>	28	
<input type="text" value="2"/>	2	Enter 2 to display present status code of lag compressor (was lead compressor before failure)
<input type="text" value="ENTER"/>	87	
<input type="text" value="EXIT"/>	54	System status

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

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
19	Spare Sensor #2 Temperature
30	Spare Sensor #3 Temperature
31	Spare Sensor #4 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*
9	19	Spare Sensor #2 Temperature*
30	30	Spare Sensor #3 Temperature*
31	31	Spare Sensor #4 Temperature*

*These parameters are for the chiller, rather than individual compressors A or B. Where 2 codes are shown, either one may be used.

Lead and Lag Chiller Display Functions

DISPLAYING STATUS OF LEAD OR LAG MACHINE — When lead/lag is activated, the ESP normally displays the status code of the lead/lag system. To display the status of the lead or lag machine, keystroke

the chiller ID, then press . To return to display of the system present status code, press .

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

KEYSTROKE/INPUT	DISPLAY/RESPONSE	COMMENTS
	28	System present operating status*
<input type="text" value="6"/>	6	ID of lag chiller
<input type="text" value="ENTER"/>	26	Lag chiller present operating status (prestart)*
<input type="text" value="EXIT"/>	28	System operating status*

*Chiller present status code may be any in the Diagnostic Codes table.

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 is depressed.

DISPLAYING LEAD/LAG MACHINE OPERATING PARAMETERS — All machine operating parameters for the lead and lag machine can be displayed at anytime regardless of whether lead/lag is activated.

Table 2 — 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 % RLA
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 Temperature)
30	32	Spare Sensor #3 Temperature
31	33	Spare Sensor #4 Temperature



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.


1. All programming begins with the ESP displaying the unit present status. If the unit present status is not


being displayed, press . Entry into the ESP Address Format program mode is gained by depress-



ing  four times followed by . The display


response (+18888) indicates that programming can proceed.

Entry into the direct programming mode is gained by depressing either the  or  special function




key, followed by the  key.

2. Any time a mistaken entry is made it can be deleted by entering . 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  , then  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  to return to the previous programming step.

DIRECT PROGRAMMING — The Chilled Water and Demand Limit special function keys permit these 2 features to be read or programmed by the direct method. To read a set point, the P/R switch may be in either panel or remote. To enter a new set point, the P/R switch must be in the panel position. Then depress the key for the

desired set point; depress the  key (the present set point will be displayed); depress  and then input the desired new set point; and depress the  key.

The display will blank for 1/2 second and then display the new set point. (See Examples on page 7.)

ESP ADDRESS FORMAT PROGRAMMING — The chiller identification number, enabled options, ramp loading rate adjustment, and the remote contact and self-start after power failure features must be programmed in the ESP address format. Most control options require the programming of 2 data pairs to establish a reset schedule. One data pair is based on the minimum amount of desired temperature reset vs an input indicative of the building load parameter at that condition. The other data pair is based on the maximum amount of desired temperature reset vs an input indicative of the building load parameter at that condition. The input may be a temperature or a 4-20 mA (1-5 vdc) signal. The amount of desired temperature reset is an independent variable decided by the programmer. The data pairs (4 values) are programmed at 4 different addresses in the ESP address format. The ESP automatically establishes a linear reset schedule between the 2 data pairs and adds the scheduled amount of reset to the programmed set point. Further reset does not occur at input signals outside the range of the 2 data pairs. (See Fig. 2.) Control options and features in the format require the programming of a code to activate or deactivate them. In order to activate a control feature or option, the leaving chilled water temperature and demand limit set points must be programmed (direct method) so the ESP can compute control point. In addition, the programming of other required data must be completed. If program data is missing or inaccurate, the ESP will reject activation and display a blinking code "EE."

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 ^(ADDRESS) CHILLED WATER 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
^(ADDRESS) CHILLED WATER	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 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.

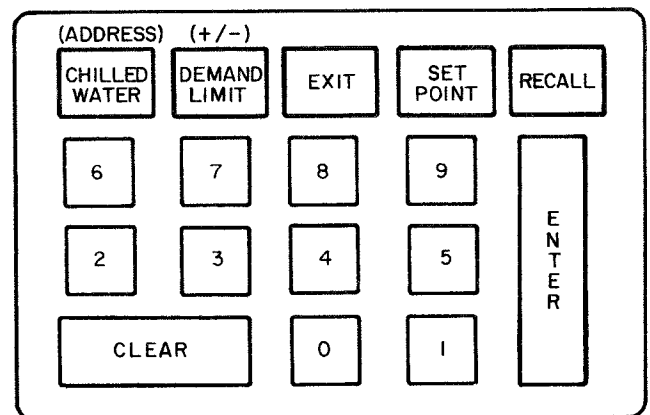


Fig. 6 — Special Function Keys for Programming ESP Address Format

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 0 0 0 0 (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 ^(ADDRESS) CHILLED WATER 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 by 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 communicating and displaying a 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
	76	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 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"
(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
2 5	-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 Diagnostic Codes table.

Common Programming for All Chillers

AUTOMATIC LEAVING CHILLED WATER TEMPERATURE 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 above the set point when the cooler water temperature difference rises to 15° F.

This function must be programmed and activated.

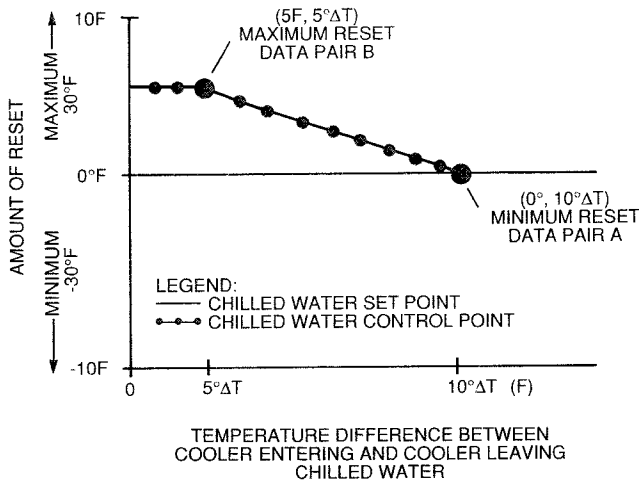


Fig. 7 – Reset Schedule Based on Cooler Temperature Difference

→ 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*
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 00	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 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 00	Address for reset temperature B Present temperature
SET POINT		Blank display; ready for data†
5	5	5 degrees reset temperature B
ENTER	05	Data accepted
RECALL	11 00	Address for cooler Δ T Present value
SET POINT		Blank display; ready for data†
5	5	5 degrees Δ T corresponding to reset temperature B above
ENTER	5	Data accepted
EXIT	26	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table.
 †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 *
<input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/>	0000	(A zero appears with each keystroke)
<input type="button" value="E"/> <input type="button" value="N"/> <input type="button" value="T"/> <input type="button" value="E"/> <input type="button" value="R"/>	+18888	Access open; programming can begin
<input type="button" value="(ADDRESS)"/> <input type="button" value="CHILLED"/> <input type="button" value="WATER"/>		Blank display; ready for address
<input type="button" value="1"/> <input type="button" value="2"/>	12	
<input type="button" value="E"/> <input type="button" value="N"/> <input type="button" value="T"/> <input type="button" value="E"/> <input type="button" value="R"/>	12 00	Activation/deactivation address Present value
<input type="button" value="S"/> <input type="button" value="E"/> <input type="button" value="T"/> <input type="button" value="P"/> <input type="button" value="O"/> <input type="button" value="I"/> <input type="button" value="N"/> <input type="button" value="T"/>		Blank display (ready for data) †
<input type="button" value="1"/>	1	
<input type="button" value="E"/> <input type="button" value="N"/> <input type="button" value="T"/> <input type="button" value="E"/> <input type="button" value="R"/>	01	Activation code accepted
<input type="button" value="E"/> <input type="button" value="X"/> <input type="button" value="I"/> <input type="button" value="T"/>	27	Chiller present status code (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; 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 chilled water or brine temperature and return chilled water control point.

The maximum rate of change in leaving temperature is limited to 1/8 degrees F (0.07 degree C) per minute.

Programming a desired entering temperature control point between the range of 1° F to 120 F (17 C to 49 C) activates and controls the entering water at that temperature. Programming a zero deactivates the option.

Programming/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 *
<input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/>	0000	(A zero appears with each keystroke)
<input type="button" value="E"/> <input type="button" value="N"/> <input type="button" value="T"/> <input type="button" value="E"/> <input type="button" value="R"/>	+18888	Access open; programming can begin
<input type="button" value="(ADDRESS)"/> <input type="button" value="CHILLED"/> <input type="button" value="WATER"/>		Blank display; ready for address
<input type="button" value="1"/> <input type="button" value="3"/>	13	
<input type="button" value="E"/> <input type="button" value="N"/> <input type="button" value="T"/> <input type="button" value="E"/> <input type="button" value="R"/>	13 00	Activation/deactivation address Present value
<input type="button" value="S"/> <input type="button" value="E"/> <input type="button" value="T"/> <input type="button" value="P"/> <input type="button" value="O"/> <input type="button" value="I"/> <input type="button" value="N"/> <input type="button" value="T"/>		Blank display (ready for data) †
<input type="button" value="5"/> <input type="button" value="5"/>	55	Entering temperature control point
<input type="button" value="E"/> <input type="button" value="N"/> <input type="button" value="T"/> <input type="button" value="E"/> <input type="button" value="R"/>	55	Control point/activation accepted
<input type="button" value="E"/> <input type="button" value="X"/> <input type="button" value="I"/> <input type="button" value="T"/>	27	Chiller present status code (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; check to be sure P/R switch is in PANEL position; then continue.

AUTO. CHILLED WATER TEMPERATURE RESET BASED ON A 4-20 mA dc 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 dc signal. Signal must be ungrounded type.

Figure 8 shows a desire to control to 0°F reset (set point) at the lower control signal of 4 mA dc and to 10°F above the set point at the upper control signal of 18 mA dc. Reset can be positive or negative; positive reset is shown.

This function must be programmed and activated.

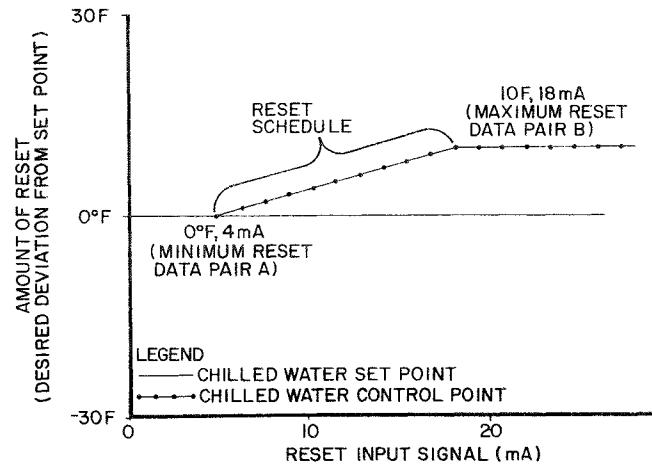


Fig. 8 — Reset Schedule Based on 4-20 mA dc Input Signal

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	04	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) *

*Chiller present status code may be any in the Diagnostic Codes table.

†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 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
1 8	18	
ENTER	18 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data) †
1	1	
ENTER	01	Activation code accepted
EXIT	27	Chiller present status code (new data registered) *

*Chiller present status code may be any in the Diagnostic Codes table.

†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 option must be programmed and activated.

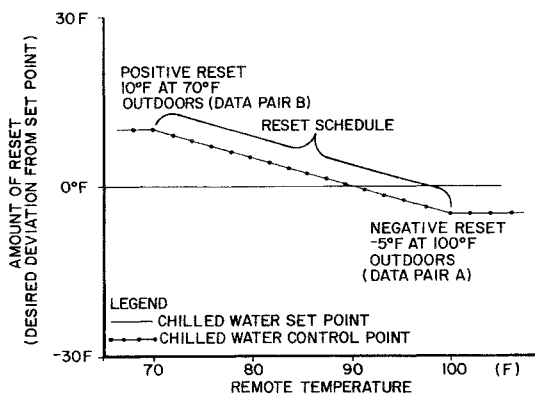


Fig. 9 — Reset Schedule Based on Remote Temperature Sensor

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 *
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
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 †
1 0 0	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 †
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 †
7 0	70	70 F remote temperature corresponding to reset temperature B above
ENTER	70	Data accepted
EXIT	27	Chiller present status (new data registered) *

*Chiller present status code may be any in the Diagnostic Codes table.

†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 *
0 0 0 0	0000	(A zero appears with each keystroke)
ENTER	+18888	Access open; programming can begin
(ADDRESS) CHILLER WATCH		Blank display, ready for address
2 3	23	
ENTER	23 00	Activation/Deactivation address Present value
SET POINT		Blank display (ready for data)†
1	1	
ENTER	01	Activation code accepted
EXIT	27	Chiller present status code (new data registered *)

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; check to be sure P/R switch is in PANEL position; then continue.

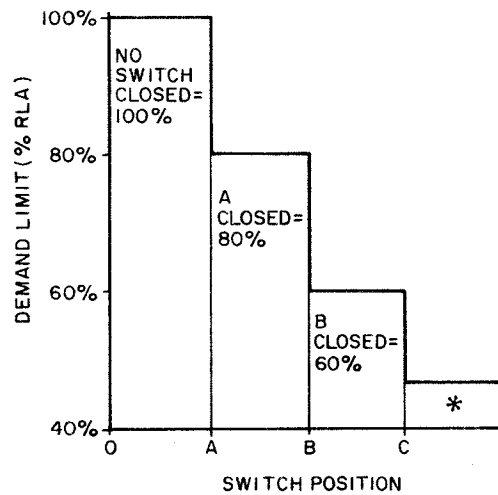
AUTOMATIC POWER DEMAND LIMIT — The ESP offers 2 ways to limit electrical demand. Only one of the two can be activated at a time. The demand limiting control chosen will depend on energy management system design, power company rate schedules and the equipment available. Demand limiting can be based on 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 (See Fig. 10) — 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 = 100%. 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 100%; 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.



*C is not used in example, but is shown here programmed for 45%.

Fig. 10 — Demand Limit Schedule Based on Contact Closure

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*
<input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/>	0000	(A zero appears with each keystroke)
<input type="text" value="ENTER"/>	+18888	Access open; programming can begin
<input type="text" value="(ADDRESS) CHILLED WATER"/>		Blank display; ready for address for switch A
<input type="text" value="2"/> <input type="text" value="4"/>	24	
<input type="text" value="ENTER"/>	24 00	Address for switch A Present value
<input type="text" value="SET POINT"/>		Blank display; ready for data†
<input type="text" value="8"/> <input type="text" value="0"/>	80	80% RLA for switch A demand limit
<input type="text" value="ENTER"/>	80	Data accepted
<input type="text" value="RECALL"/>	25 00	Address for switch B Present value
REPEAT ENTRY PROCEDURE FOR SWITCH B		
<input type="text" value="RECALL"/>	26	Address for switch C
REPEAT ENTRY PROCEDURE FOR SWITCH C		
<input type="text" value="EXIT"/>	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; 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 presents status*
<input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/>	0000	(A zero appears with each keystroke)
<input type="text" value="ENTER"/>	+18888	Access open; programming can begin
<input type="text" value="(ADDRESS) CHILLED WATER"/>		Blank display; ready for address
<input type="text" value="2"/> <input type="text" value="7"/>	27	
<input type="text" value="ENTER"/>	27 00	Activation/deactivation address Present value
<input type="text" value="SET POINT"/>		Blank display (ready for data)†
<input type="text" value="1"/>	1	
<input type="text" value="ENTER"/>	01	Activation code accepted
<input type="text" value="EXIT"/>	27	Chiller present status code (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; check to be sure P/R switch is in PANEL position; then continue.

AUTO. POWER DEMAND LIMIT BASED ON A 4-20 mA dc 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 dc signal.

The signal can come from any ungrounded 4-20 mA dc 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 dc signal, i.e., the demand limit can be programmed to increase or decrease with an increased current signal.

Figure 11 shows a positive demand limiting schedule. This function must be programmed and activated.

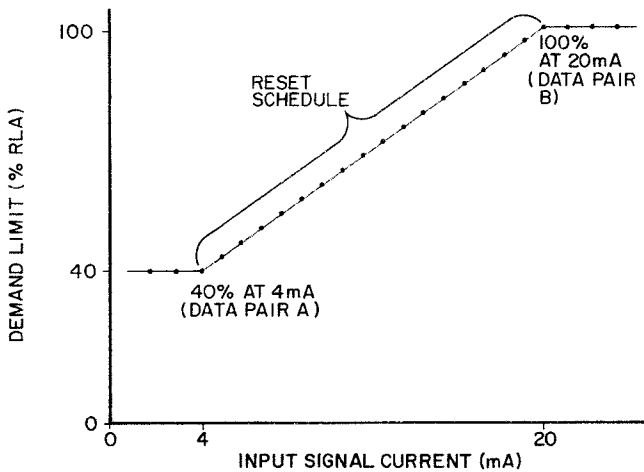


Fig. 11 — Demand Limit Schedule Based on 4-20 mA dc Input Signal

Programming Auto. Power Demand Limit Based on a 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
2 8	28	
ENTER	28 00	Address for demand limit A Present value
SET POINT		Blank display; ready for data†
4 0	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 data registered)*

*Chiller present status code may be any in the Diagnostic Codes table.

†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 *
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
3 2	32	
ENTER	32 00	Activation/deactivation address Present value
SET POINT		Blank display (ready for data) †
1	1	
ENTER	01	Activation code accepted
EXIT	27	Chiller present status code (new data registered)

*Chiller present status code may be any in the Diagnostic Codes table.

†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. Restart After Power Failure

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	26	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
3 3	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.

†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 $\pm 18\%$ 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.

When activated, this option also provides automatic control reset in the event of a low, high, or loss of power failure while the machine is not running; this prevents the display of codes 48, 67, 68 and 69.

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. In order to do this, the DIP switches must be set for a rate of 3°F per minute or faster (higher). No additional activation programming is required. To deactivate, enter the deactivation code.

Programming Ramp Loading Rate Adjustment

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status*
<input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/>	0000	(A zero appears with each keystroke)
<input type="text" value="ENTER"/>	+18888	Access open; programming can begin
<input type="text" value="(ADDRESS?)
CHILLED WATER"/>		Blank display; ready for address for ramp loading rate
<input type="text" value="3"/> <input type="text" value="4"/>	34	
<input type="text" value="ENTER"/>	34 00	Address for ramp loading rate Present value
<input type="text" value="SET POINT"/>		Blank display; ready for data†
<input type="text" value="6"/>	6	New code 6 for 3 F ramp loading rate
<input type="text" value="ENTER"/>	06	Data accepted
<input type="text" value="EXIT"/>	28	Chiller present status (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; 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. A normal chiller stop is accomplished by opening of the remote contact. The chiller can be stopped at any time from the S/D or ESP stop button; code 78 (manual override shutdown) will be displayed.

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*
<input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/>	0000	(A zero appears with each keystroke)
<input type="text" value="ENTER"/>	+18888	Access open; programming can begin
<input type="text" value="(ADDRESS?)
CHILLED WATER"/>		Blank display; ready for address
<input type="text" value="3"/> <input type="text" value="5"/>	35	
<input type="text" value="ENTER"/>	35 00	Activation/deactivation address Present value
<input type="text" value="SET POINT"/>		Blank display (ready for data)†
<input type="text" value="1"/>	1	
<input type="text" value="ENTER"/>	01	Activation code accepted
<input type="text" value="EXIT"/>	26	Chiller present status code (new data registered)*

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; check to be sure P/R switch is in PANEL position; then continue.

DUAL COMPRESSOR CHILLER LAG COMPRESSOR TURN-OFF CORRECTION — As an alternative to using the DIP switch setting that permits optimum selection of the lag turn-off for only one of the 2 compressors, the ESP can be used to select settings for lag compressor turn-off for each compressor. The settings are based on how each compressor performs in the system when it is selected as the lead compressor. When the lead designation is changed on a machine with unequally sized compressors, this optional configuration can be used for more precise control over lag compressor turn-off. The turn-off threshold can be adjusted towards SOONER or LATER when compressor A is the lead (ESP Address #36) and when compressor B is the lead (ESP Address #37). See Table 3.

Programming the ESP Lead/Lag Option (For 2 Single Compressor Chillers)

GENERAL. – The lead/lag option couples 2 single compressor machines and the ESP controls them as an active system to maintain the building's cooling requirement. If a chiller problem or loss of communication occurs, active lead/lag operation will end and the chiller will enter the enabled mode. In the enabled mode, the lead/lag system will utilize all available cooling capacity. A lead chiller communications error enables both chillers, a lag chiller communication error enables the lag chiller, and a lead chiller safety shutdown enables the lag chiller. A lag chiller safety shutdown or communications error has no effect on lead chiller operation (see diagnostic codes 33, 34, 54 and 55).

The enabled mode allows any healthy (non-faulted) machine that is ON to continue operating. If the lead chiller loses communications or shuts down on a safety, a lag machine that is ready for restart (Code 23) will enter a recycle restart pending state (code 25); this enables it to start when the common point temperature is $> 5^{\circ}\text{F}$ (2.8°C) above the local set point (on S/D board thermostat). An enabled chiller will not perform reset functions. It is controlled solely by the local leaving chilled water and demand limit set points on the S/D board. However, it always uses the lead/lag (common point) sensor for chilled water control.

Program variables are used to adapt the lead/lag system to the building's load profile. Variables are programmed to:

1. Select the lead chiller.
2. Establish a minimum desired leaving chilled water pulldown rate (slope). The ESP compares this desired rate to the actual chilled water pulldown rate to determine when the lag chiller is needed to provide additional cooling capacity.
3. Establish a lag chiller turn-off threshold which relates to a system load with both chillers running that is less than the lead chiller's cooling capacity.

Most of the functions outlined in the previous section for non-lead/lag chillers are applicable to chillers with the lead/lag option. Following are some examples of the operation of these controls in a lead/lag system:

1. The common point temperature sensor (sensor #2) is always used for leaving chilled water temperature control. The chilled water temperature set point and chilled water temperature reset options control capacity of the lead chiller only. The lag chiller's capacity is controlled through the ESP by matching lag chiller percent motor current with the lead chiller percent motor current.
2. The demand limit set point controls the whole system when lead/lag is active. 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. If the demand limit is set below the lead chiller's percent RLA in the system, the lag chiller will not be permitted to start. 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. The lead chiller percent RLA in the system is $250\text{ amps}/400\text{ amps} = 62\%$. 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.

3. The auto. restart after power failure will restart the lead machine and wait until the lead transitions to "RUN" to restart the lag. If the lag was not running at the time of the power failure, it will not be started by the auto. restart option but will be started when the conditions for a lag chiller start-up have been satisfied.
4. 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.
5. The remote START/STOP contact option starts the lead machine only. The lag machine is started by the ESP when the normal conditions for its start-up have been satisfied. When the remote start contact opens, shutdown of the lead and lag machine will be initiated. If the lead/lag system enters the enabled mode, each machine will be started/stopped by its own remote contact.

Lead/lag becomes activated when the activation code is programmed in the ESP address format. At this point, the 2 machines are logically interfaced and will use the common point temperature (spare sensor #2) for chilled water control until lead/lag is deactivated by the programming of the deactivation code.

Lead/lag can be activated while one or both chillers are operating, and the chiller(s) can be in local or remote. However, once activated, all lead/lag rules apply.

If lead/lag is activated while the lead chiller is operating and both chillers are under ESP control, the system becomes an active lead/lag system. If lead/lag is activated while both chillers are under ESP control but the lag chiller is the only machine operating, the ESP will display code 39 until the lead machine enters the run mode or the lag machine shuts down. If lead/lag is activated during a chiller communications error, code 33 or 34 will be displayed. If activated when a chiller is in local, code 31 or 32 will be displayed.

START-UP/OPERATION — To effect a start-up in lead/lag, both machines must be under ESP control and a start request must be initiated. If the ESP is displaying code 21, the start must be initiated by closing the remote contact; if displaying code 22, the start must be initiated by depressing the ESP START button. Once the start request is initiated, the lead/lag system becomes active. The system remains active until a stop request is initiated or it enters the enabled mode due to a chiller problem.

If the lead machine in an active lead/lag system fails to pull the leaving chilled water temperature down at the programmed rate, the lag machine will be started when the following conditions have been met:

- The lag machine has not been started for 15 minutes.
- Ramp loading of the lead machine has been completed for at least 5 minutes.
- The pulldown time (programmed at ESP address #4) has elapsed since the start of the lead chiller.
- The chilled water temperature is greater than the control point plus deadband.
- The chilled water temperature is not decreasing at the desired rate (slope) over a continuous 2-minute period (2 sequential one-minute samples).
- The system RLA is not at the demand limit set point.

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

When all conditions for a lag machine start-up have been satisfied, the lag chiller's chilled water pump will be started (parallel system). Two minutes later, the lead chiller's guide vanes will be closed for 3 minutes or until the lead chiller's motor current is < 65% of its RLA. The lead chiller's motor current will be held at this value until the lag machine start-up is aborted or the lag machine starts and matches the % RLA of the lead chiller. The lead chiller will then return to normal capacity control and the lag chiller's guide vanes are opened or closed so that lag chiller % RLA is within $\pm 5\%$ of lead chiller % RLA. This is only criterion for capacity control of the lag chiller.

The lead or lag chiller in an activated or active lead/lag system may be manually decoupled and operated independently as a basic chiller by positioning its L/R switch to LOCAL. If the lead chiller's L/R switch is positioned to LOCAL, both machines will operate as basic chillers and the ESP will display code 31. If only the lag chiller's L/R switch is positioned to LOCAL, the lead chiller's operation will not be affected, and the ESP will display code 32. Returning the L/R switches to REMOTE will cause lead/lag to recouple and lead/lag operation will resume.

If lead/lag deactivated while one or both chillers are operating in an active lead/lag system, the lead chiller will remain on and under ESP control, and the lag chiller if on will remain on and revert to a basic chiller. If the lag chiller is off when lead/lag is deactivated, it will remain off and revert to a basic chiller.

NOTE: If a lag chiller with an activated remote contact enters the enabled mode, it can only be started when the leaving chilled water temperature is 5°F (2.8°C) above local set point and the contact is closed. If an immediate start of the lag chiller is required, position the L/R switch to LOCAL and press the STOP pushbutton (code 20 appears), then press the START pushbutton. The L/R switch can then be returned to REMOTE under remote contact control.

→ **Lag Chiller Shutdown** — The lag chiller will be cycled off when the following conditions exist:

- the corrected motor current is less than lag shutdown set point
- the corrected motor current remains below lag shutdown set point for 15 minutes
- the ESP Addresses 36 and 37 affect the shutdown set point. A value of 5 sets the lag shutdown set point to 45%. A lower value will cause the set point to increase, therefore causing the lag chiller to shutdown sooner. A higher value will cause the set point to decrease, therefore causing the lag chiller to shutdown later (see Table 3).

The sequence of events, once the control has determined to shut the lag chiller off, is to close the lag machine guide vanes for 2 minutes, then shut off the compressor. The normal machine shutdown routine now continues.

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.

NOTE: This 10 minutes also establishes the minimum time delay between lead and lag chiller start in this 2 degree/10 minute slope. This time delay can be increased or decreased while keeping the desired pulldown slope the same, as in the following examples:

- Increase — 3 degrees/15 minutes
4 degrees/20 minutes
- Decrease — 1 degree/5 minutes

Programming Chilled Water Pulldown Rate 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 pulldown rate time
4	4	
ENTER	04 00	Address for pulldown rate time Present value
SET POINT		Blank display; ready for data †
1 0	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.

†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 RLA — 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 RLA 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 RLA of each chiller were the same, the chiller at Address #1 percentage of total RLA would be 50.

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

Programming Chiller at Address #1 Percentage of Total System RLA

Place P/R Switch on ESP in PANEL Position

KEYSTROKE/ INPUT	DISPLAY/ RESPONSE	COMMENTS
	28	Chiller present status *
<input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/>	0000	(A zero appears with each keystroke)
<input type="button" value="ENTER"/>	+18888	Access open; programming can begin
<input type="button" value="ADDRESS"/> <input type="button" value="CHILLED WATER"/>		Blank display; ready for address for chiller at address #1 percentage of system RLA
<input type="button" value="6"/>	6	
<input type="button" value="ENTER"/>	06 00	Address for chiller at address #1 percentage of system RLA Present value
<input type="button" value="SET POINT"/>		Blank display; ready for data †
<input type="button" value="6"/> <input type="button" value="7"/>	67	67% of total system RLA for the chiller at address #1
<input type="button" value="ENTER"/>	67	Data accepted
<input type="button" value="EXIT"/>	28	Chiller present status (new data registered) *

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; check to be sure P/R switch is in PANEL position; then continue.

LAG CHILLER TURN-OFF CORRECTION — In addition to programming the chillers percentage of total system RLA for lag chiller turn-off, this turn-off threshold can be adjusted towards SOONER or LATER for each chiller. The lag turn-off setting can be based on how each chiller performs as the lead. The lag chiller turn-off correction when the chiller at Address #1 is lead is programmed at Address #36 in the ESP format. The lag chiller turn-off correction for when chiller at Address #2 (the other chiller in the system) is lead is programmed at Address #37 in the ESP format. When chillers of unequal size are used in a lead/lag system, this optional configuration affords more precise control over lag chiller turn-off when the lead designation is changed.

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
	28	Chiller present status *
<input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/> <input type="button" value="0"/>	0000	(A zero appears with each keystroke)
<input type="button" value="ENTER"/>	+18888	Access open; programming can begin
<input type="button" value="ADDRESS"/> <input type="button" value="CHILLED WATER"/>		Blank display; ready for address
<input type="button" value="7"/>	7	
<input type="button" value="ENTER"/>	07 00	Activation/deactivation address Present value
<input type="button" value="SET POINT"/>		Blank display (ready for data) †
<input type="button" value="1"/>	1	
<input type="button" value="ENTER"/>	01	Activation code accepted
<input type="button" value="EXIT"/>	28	Chiller present status code (new data registered) *

*Chiller present status code may be any in the Diagnostic Codes table.

†If the display response to set point input is blinking, press ; 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 Non lead/lag system: Only chiller ID no. Lead/lag system: May be ID no. of either chiller in system		0 to 7
2	Chiller Identification Number Non-lead/lag system: Must be same ID no. as chiller at Address #1 Lead/lag system: Other chiller in system (not the chiller programmed at Address #1)		0 to 7
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 to 7
4	Pulldown Time		5 to 60 minutes in 5-minute increments
5	Pulldown Temperature		1° to 10F (5 to 5.5 C)
6	Chiller at Address 1 Percentage of Total System RLA		30 to 70%
7	Single Compressor Units Activation/Deactivation of Lead/Lag		1 — Activate 0 — Deactivate
7	Dual Compressor Unit		0 Enables lag, 1 Disables lag
Variables Associated with Chilled Water Reset Based on Cooler Temperature Difference			
8	DATA PAIR A	Degrees of reset for the temperature difference at address 9.	0° to ± 30 F (0° to ± 17 C) 0° to 20F (0° to 11 C)
9		Temperature difference for the degrees of reset at address 8.	
10	DATA PAIR B	Degrees of reset for the temperature difference at address 11.	0° to ± 30 F (0° to ± 17 C) 0° to 20F (0° to 11 C)
11		Temperature difference for the degrees of reset at address 10.	
12	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Return Chilled Water Temperature Control			
13	Return Water Control Point and Activation		1° to 120 F (-17 to 49 C) — Activate 0 — Deactivate
Variables Associated with Chilled Water Temperature Reset Based on a 4-20 mA dc Input Signal			
14	DATA PAIR A	Degrees of reset for the amount of current at address 15.	0° to ± 30 F (0° to ± 17 C) (4-20 mA dc)
15		Amount of current for degrees of reset at address 14.	
16	DATA PAIR B	Degrees of reset for the amount of current at address 17.	0° to ± 30 F (0° to ± 17 C) (4-20 mA dc)
17		Amount of current for degrees of reset at address 16.	
18	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Chilled Water Temperature Reset Based on a Remote Temperature Sensor Input			
19	DATA PAIR A	Degrees of reset for the temperature at address 20.	0° to ± 30 F (0° to ± 17 C) -20 to 240 F (-29 to 116 C)
20		Remote temperature value for degrees of reset at address 19.	
21	DATA PAIR B	Degrees of reset for the temperature at address 22.	0° to ± 30 F (0° to ± 17 C) -20 to 240 F (-29 to 116 C)
22		Remote temperature value for degrees of reset at address 21.	
23	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Demand Limit Set Point Based on Contact Closure			
24	Demand limit when contact A is closed.		40% to 100%
25	Demand limit when contact B is closed.		40% to 100%
26	Demand limit when contact C is closed.		40% to 100%
27	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Demand Limit Set Point Based on a 4-20 mA dc Input Signal			
28	DATA PAIR A	Demand limit for the current at address 29.	40% to 100% 4-20 mA dc
29		Current for demand limit at address 28.	
30	DATA PAIR B	Demand limit for the current at address 31.	40% to 100% 4-20 mA dc
31		Current for demand limit at address 30.	
32	Activation/Deactivation		1 — Activate 0 — Deactivate
Variables Associated with Self-Start After Power Failure			
33	Activation/Deactivation		1 — Activate 0 — Deactivate

→ Table 3 — ESP Address Format (cont)

ADDRESS	DESCRIPTION	VARIABLE INPUT RANGE		
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	0.75	0.42
		3	1.13	0.63
		4	1.50	0.83
		5	0.38	0.21
		6	3.00	1.67
7	5.25	2.92		
8	10.50	5.38		
Variables Associated with Enabling a Remote Contact				
35	Activation/Deactivation	1 — Activate 0 — Deactivate		
Variables Associated with Lag Turn-Off Correction				
36	When chiller at Address #1 or compressor "A" on dual-compressor unit is lead	0 — Default to DIP Switch Settings. Dual Compressor Chiller. Single Compressor Chillers ESP will not accept 0. 1 Turn Lag Off Sooner 2 ↑ 3 4 5 Normal 6 ↓ 7 8 Turn Lag Off Later		
37	When chiller at Address #2 (other chiller) or compressor "B" on dual-compressor unit is lead			

NOTE: Shaded areas indicate addresses that apply only to lead/lag operation of 2 single compressor chillers, except for 36 and 37, which also apply to lead/lag operation of a dual compressor machine.

CONTROL TROUBLESHOOTING

The ESP has the capability to monitor inputs from control sensors, 4-20 mA dc 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 activated out-of-range temperature sensor is detected, a safety shutdown will be initiated and code 64 (sensor-out-of-range) will be displayed, identifying the faulty sensor. If an out-of-range 4-20 mA dc input is detected, a safety shutdown will not be initiated. Reset or demand limit will continue at the value that was programmed for the input that is out of range.

For example, if a 4-20 mA dc signal goes to zero mA dc when a data pair is programmed for 0°F reset at 4 mA dc,

reset will remain at 0°F and the temperature will be controlled at set point. However, if the data pair is programmed for 2 F reset 4 maA dc, reset will remain at 2 F and the temperature will be controlled at set point + 2 F. Reset or demand limit will operate in the same manner for the other data pair if out of range.

The acceptable range for temperature inputs is -20 to 240 F (-29 to 116 C) and for 4-20 mA dc inputs is 2 mA dc (0.5 vdc) to 22 mA dc (5.5 vdc).

Out-of-range sensors or defective 4-20 mA dc 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 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.

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)

CHILLER TROUBLESHOOTING

The ESP package 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 package 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 5a — ESP Diagnostic Codes (Single Compressor Chillers)

CODE NO.	DESCRIPTION/MALFUNCTION	PROBABLE CAUSE/REMEDY
27	Reset Option Active	Indicates that either of the temperature reset options is active.
31	Lead/Lag Manually Decoupled. ESP displays 31, lead and lag chillers display present status code.	Lead chiller switched to LOCAL. Both chillers under local control. To resume lead/lag operation, return lead machine to REMOTE.
32	Lead/Lag Manually Decoupled. ESP displays 32, lead and lag chillers display present status code.	Lead chiller under ESP control. Lag chiller switched to LOCAL and under local control. To resume lead/lag operation, return lag machine to REMOTE.
33	Chiller Communication Error. (Lead chiller if lead/lag system.)	Chiller(s) revert to enabled mode.
34	Lag Chiller Communication Error. ESP displays 34, chiller displays present status code.	Lag chiller communication line disconnected. Lag chiller reverts to enabled mode. Lead chiller remains under ESP control.
38	Lead Chiller Redesignation in Process. ESP displays 38, lead and lag chillers display present status code.	ESP reprogrammed to switch lead/lag chillers when one chiller was ON and the other was OFF. Switch will take place when either both are ON or both are OFF.
39	Lead/Lag Operation Temporarily Decoupled. ESP displays 39, lead and lag chillers display present status code.	Error that decoupled lead/lag has been corrected. Lead/lag operation will be restored when either both chillers are ON or both chillers are OFF.
54	Lead Chiller Malfunction. ESP displays 54, lead chiller displays error code, lag chiller displays present status code. Code 54 will be displayed at ESP only when lead/lag option is active. When lead/lag is not active, ESP will display error code.	Lead chiller shutdown on safety. Lag chiller under local control. Check lead chiller status for shutdown code. Correct malfunction and reset lead chiller.
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 option 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. NOTE: If this code appears in a non-lead/lag system of one chiller, check to be sure that the chiller ID number is programmed at Address #1, Address #2, and Address #3 in the format.
64/7	Optional Temperature #1 Sensor Out of Range	Check for open or shorted sensor. Check sensor resistance.
64/8	Optional Temperature #2 Sensor Out of Range	Check for open or shorted sensor. Check sensor resistance.
76	Invalid Configuration	Basic Controller identification number not programmed in the ESP address format. For non-lead/lag system, determine basic chiller identification number and program at Address #1, Address #2, and Address #3 in the format. For lead/lag system, check programming of ID numbers as described on page 24.

Table 5b — ESP Diagnostic Codes (Dual Compressor Chillers)

CODE NO.	DESCRIPTION/MALFUNCTION	PROBABLE CAUSE/REMEDY
27	Reset Option Active	Indicates that either of the temperature reset options is active.
33	Chiller Communication Error.	Chiller reverts to enabled mode.
39	Lead/Lag Operation Temporarily Decoupled. ESP and Chiller display 39.	Error that decoupled lead/lag has been corrected. Lag compressor is running as the lead under Standby control. Lead/lag operation will be restored when either the compressor selected as the lead with the lead compressor selector switch is ON or both compressors are OFF. Example: If compressor A had been selected as lead by setting of lead compressor selection switch, compressor B would now be running as lead under Standby control. Lead/Lag operation will be restored when compressor A starts. Compressor A will then resume operation as the lead if the lead compressor selection switch is set at A. When both compressors are off, compressor A will resume operation as the lead and be the first to start.
54	Lead Compressor Malfunction	Lead compressor shutdown on safety. Lag compressor substituted for lead under Standby control or waiting to be started. Check lag compressor status for original lead compressor's shutdown code. Correct malfunction and reset.
56	Lag Compressor Malfunction	Safety limit exceeded on lag compressor. Check lag compressor status for shutdown code.
64/7	Optional Temperature #1 Sensor Out of Range	Check for open or shorted sensor. Check sensor resistance.
64/8	Optional Temperature #2 Sensor Out of Range	Check for open or shorted sensor. Check sensor resistance.
76	Invalid Configuration	Basic Controller identification number not programmed in the ESP address format. Determine basic chiller identification number and program at address #1, address #2 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.