

ENG. NO. 334495C EPC-2000 Installation Instruction for Super Plus February, 1990 Supersedes 334495B Dated July, 1989

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REVISION CHANGES ("C")

- 1. New CPU Board, Figure 1-2
- 2. System High Suction Alarm Limit Change, Page 3-15
- 3. New Wiring Diagrams

INTRODUCTION

PURPOSE

The EPC-2000TM is the most advanced COMPRESSOR SYSTEM controller in the industry today. The electronics of this controller have been developed utilizing the most advanced technology available on the market. The EPC-2000 will control up to 8 compressors, or 6 compressors and 2 Satellites.

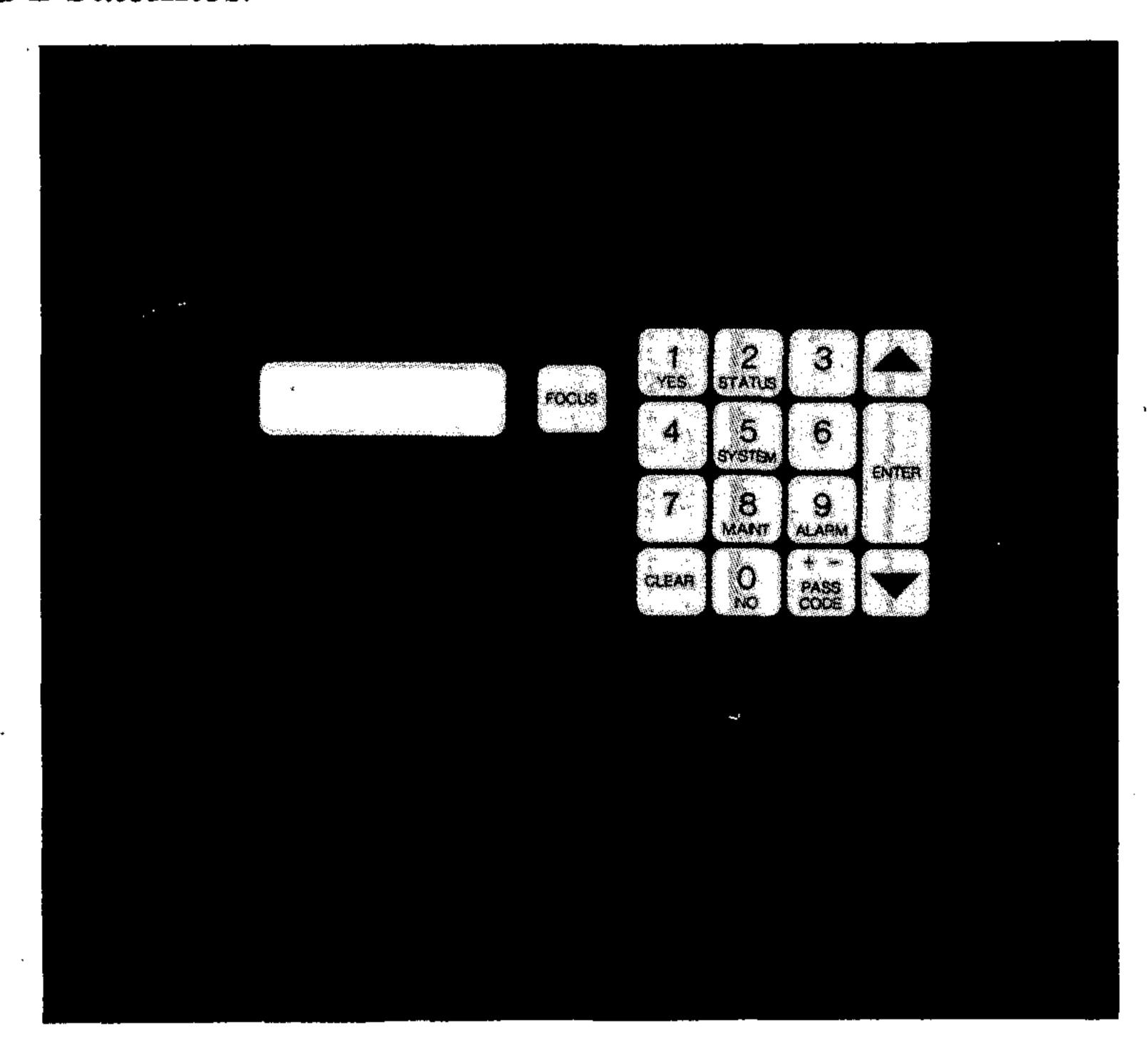


Figure 1-1. Front Panel Membrane

COMPONENTS

Processor Components:
Front Panel Membrane
CPU Board
Fan

Connected Components:

Relay Board
Input Terminal Board
Temperature Sensor
Pressure Transducer
Transformer
Control Circuit Plug Assemblies
Interconnect Cables

Front Panel Membrane

The front panel membrane consists of a 16 button keypad and LCD display with a backlight. The keypad is a pressure sensitive touchpad which acknowledges each press of any key with an audible signal. Readouts or settings can be monitored or changed through the use of the keypad. The display has a two line, 16 character LCD readout, 32 characters in total. See Figure 1-1.

CPU Board

The "CPU" board (Central Processing Unit) is located within the enclosure directly behind the front panel membrane. See Figures 1-2 and 1-3.

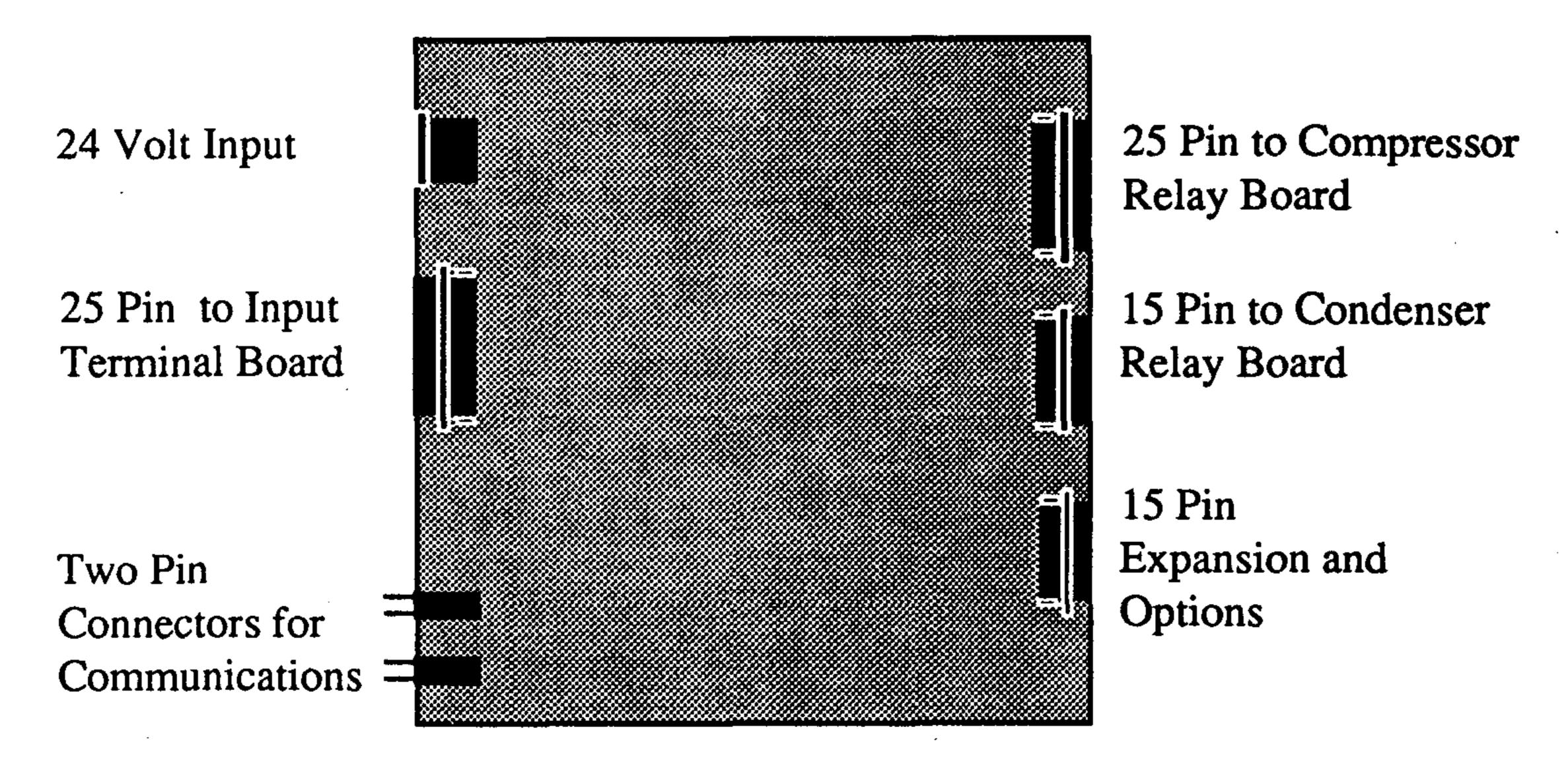


Figure 1-2. CPU Board

This board contains the internal power source for operation of the controller, the central processing unit (control chip), memory, and all input/output drivers.

There are 6 plugs located on the sides of the CPU board as labeled. The connections of the two 25 pin as well as the two 15 pin cables are not interchangable. See Figure 1-2.

Fan

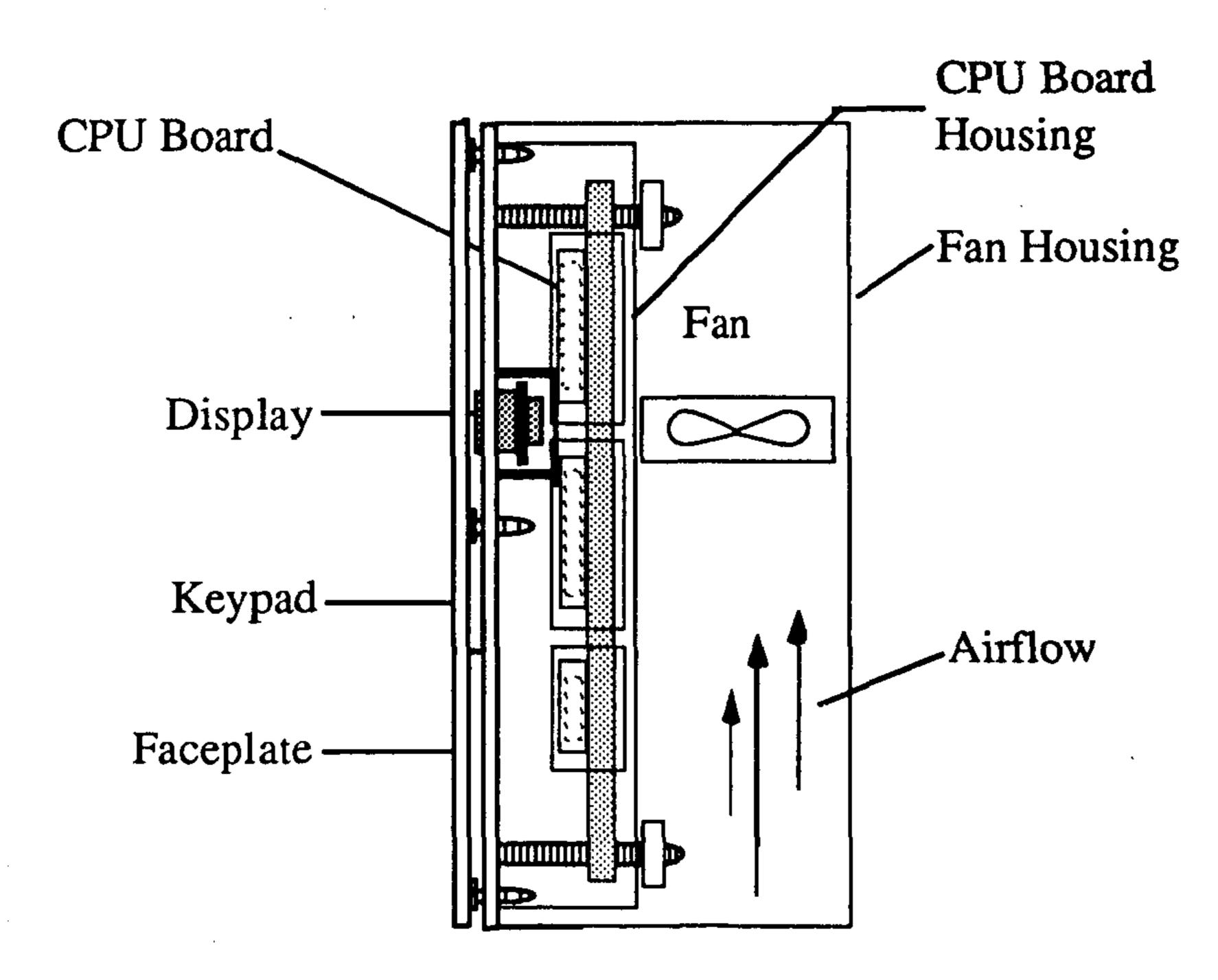


Figure 1-3. EPC-2000 Processor Assembly Cross-Section

The fan will turn on at 110° F and then turn off after dropping below 105° F. An alarm will be sounded if the temperature goes above 150° F. See Figure 1-3.

Relay Board

The relay board is connected by a 25 pin cable to the EPC-2000 processor assembly. See Figure 1-4. This board consists of the following 11 relays:

- A. 8 compressors (may include a maximum of 2 Satellites)
- B. 1 Alarm
- C. 1 Switchback
- D. 1 Compressor disable (for when switchback occurs)
 This relay deactivates the entire relay board.

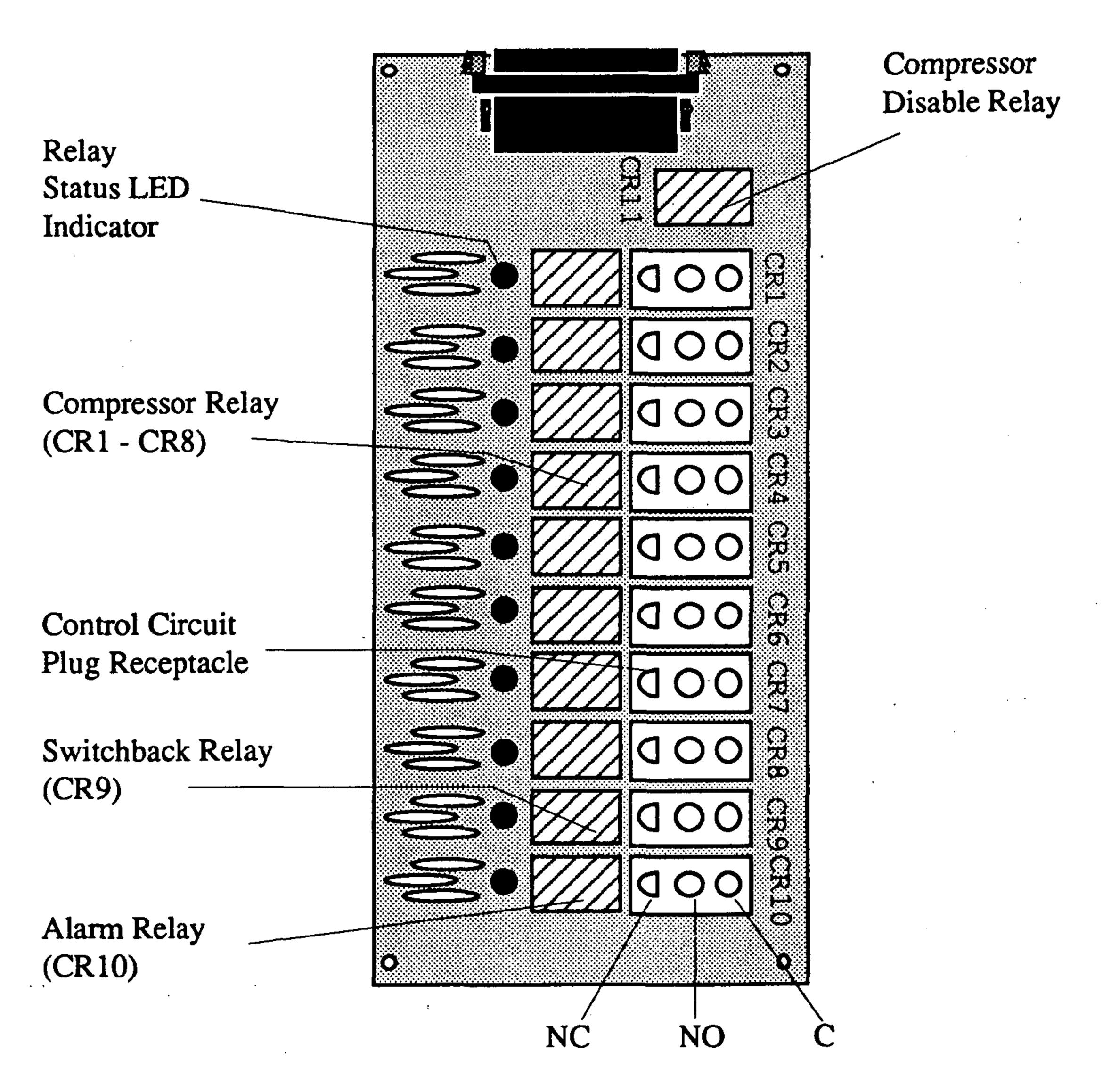


Figure 1-4. Compressor Control Relay Board

Input Terminal Board

The input terminal board will accommodate the connections from all required inputs. See Figure 1-5.

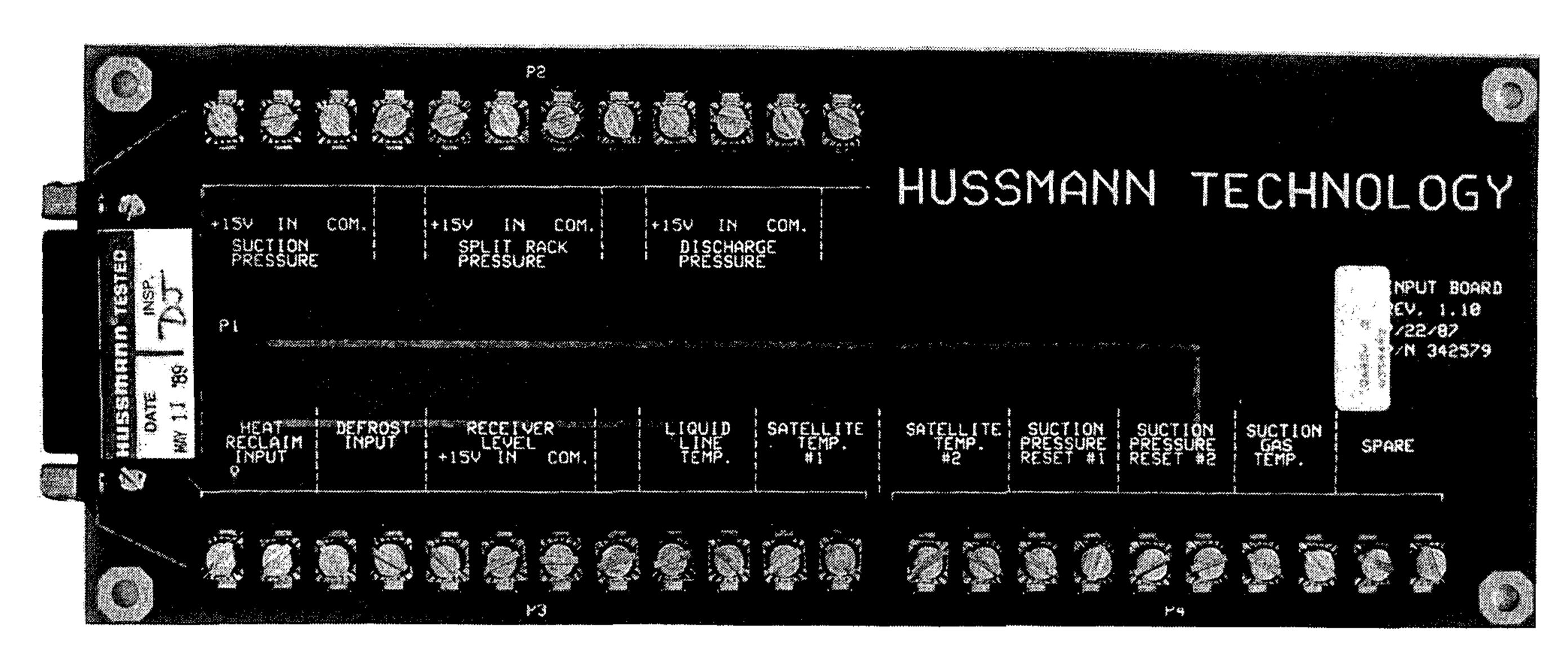


Figure 1-5. Input Terminal Board

Temperature Sensor

The temperature probe is a fast response, non-polarized, resistive type sensor. See Figure 1-6.

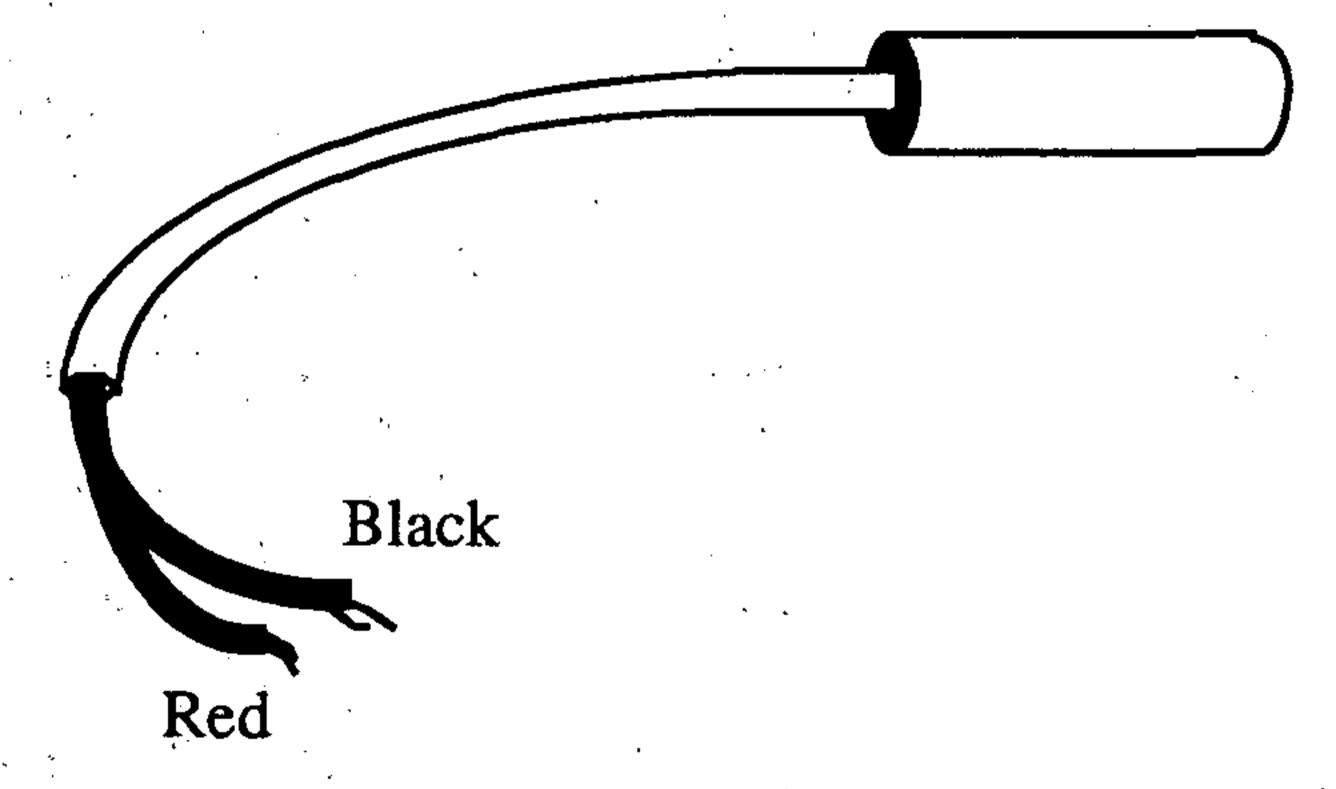


Figure 1-6. Temperature Sensor

Pressure Transducer

The pressure transducer provides an analog signal back to the processor proportional to the pressure detected. See Figure 1-7.

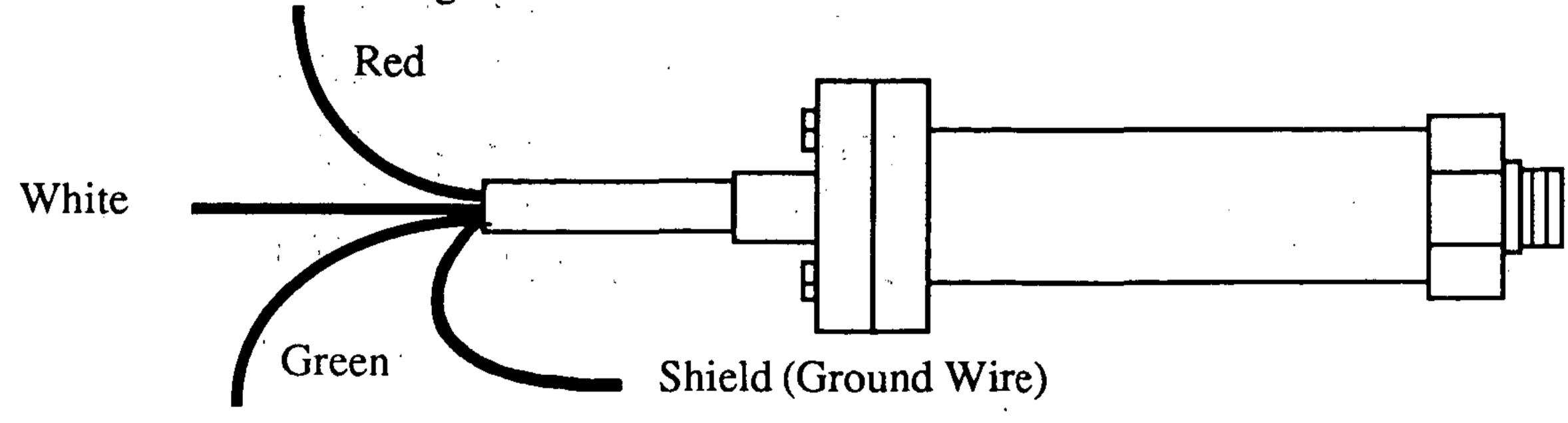


Figure 1-7. Typical Pressure Transducer

Transformer

The control transformer is the power source for the EPC-2000, providing conversion from power line voltages to 24V AC. See Figure 1-8. The transformer is connected to the processor assembly by the power plug assembly. See Figure 1-12.

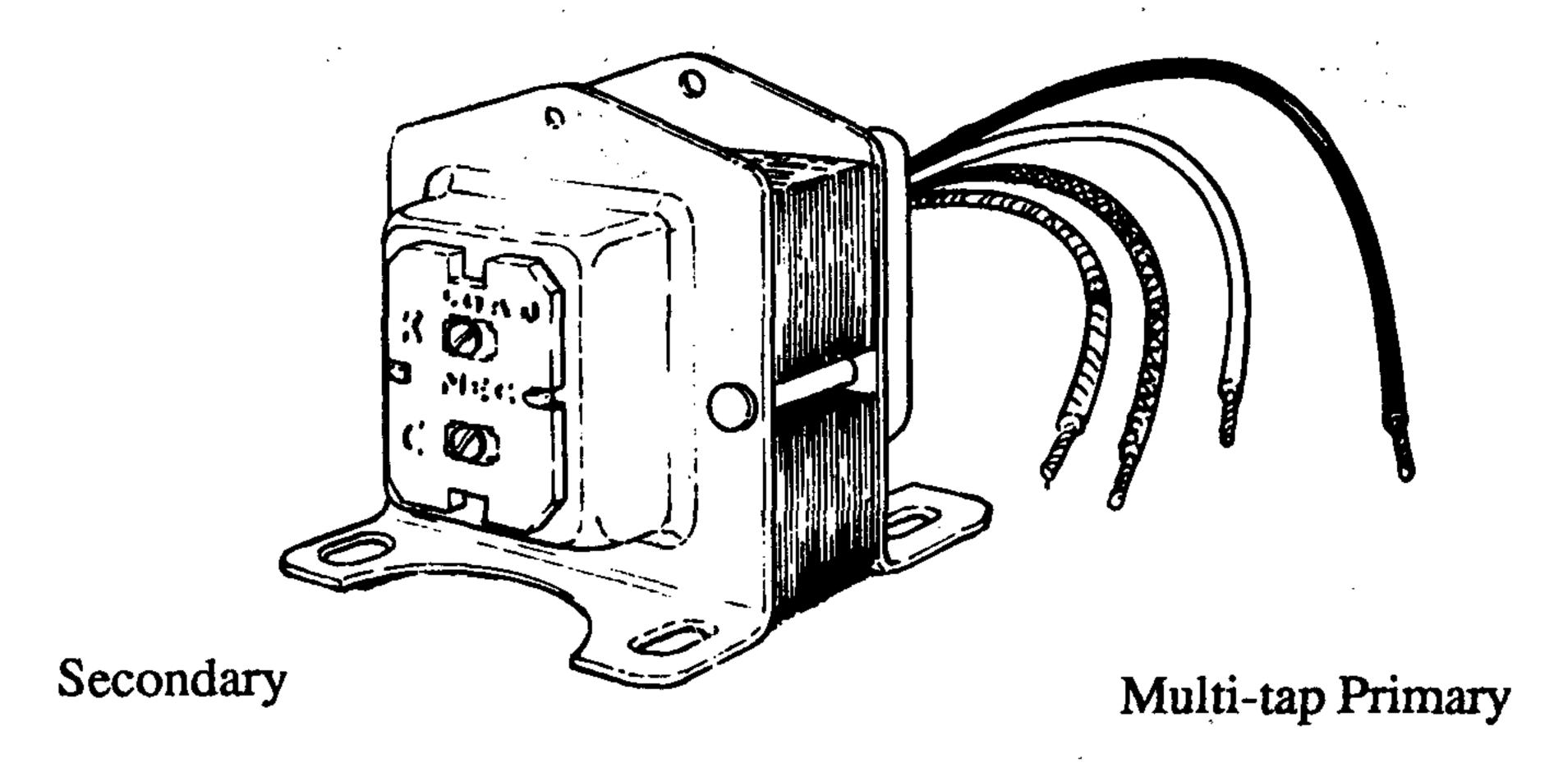


Figure 1-8. Control Transformer

Control Circuit Plug Assemblies

The control circuit plug asemblies connect the Super Plus control circuit to the relay board. See Figures 1-9 thru 1-11.

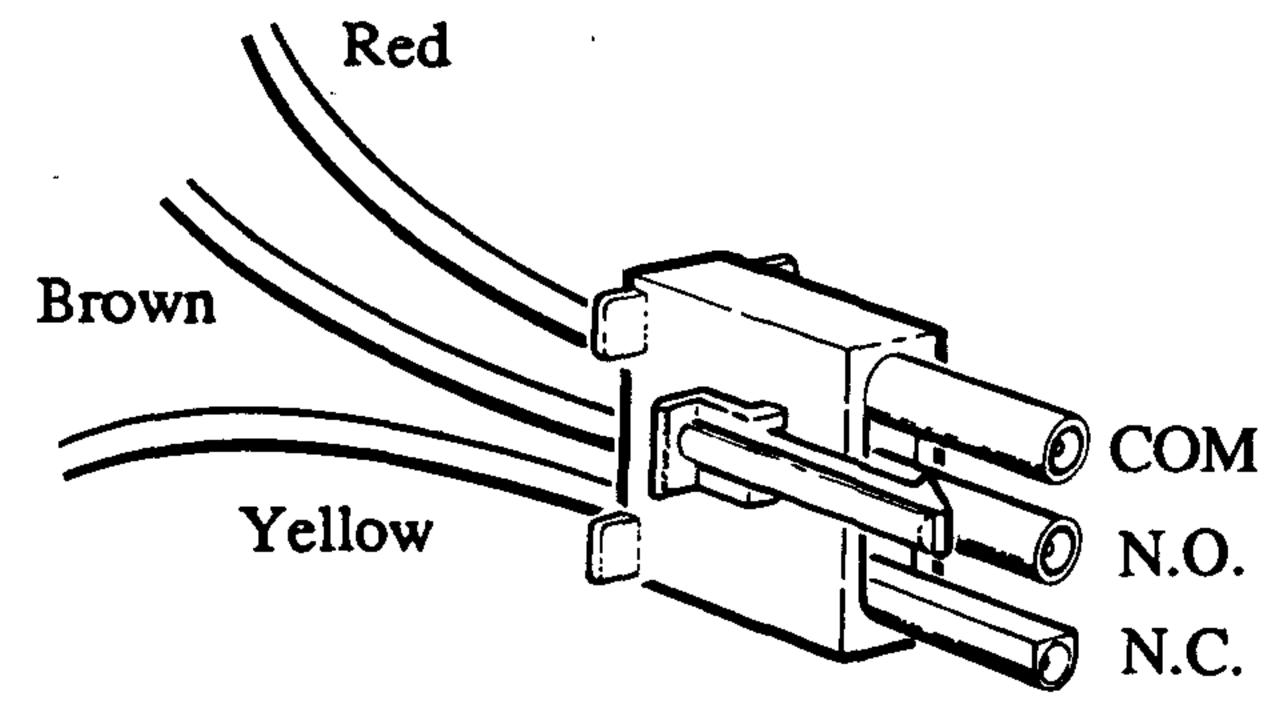


Figure 1-9. Compressor and Satellite Plug Assemblies

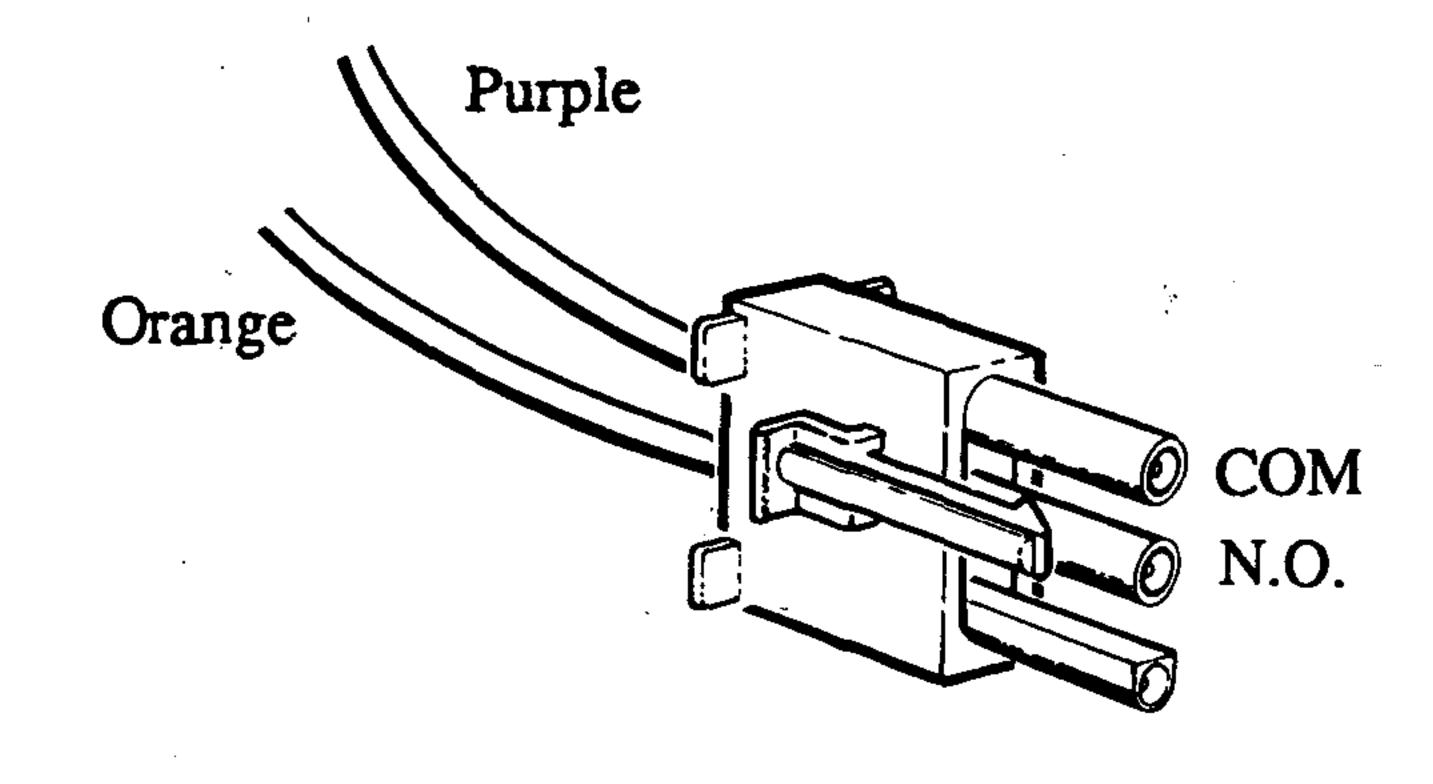


Figure 1-10. Alarm Plug Assembly

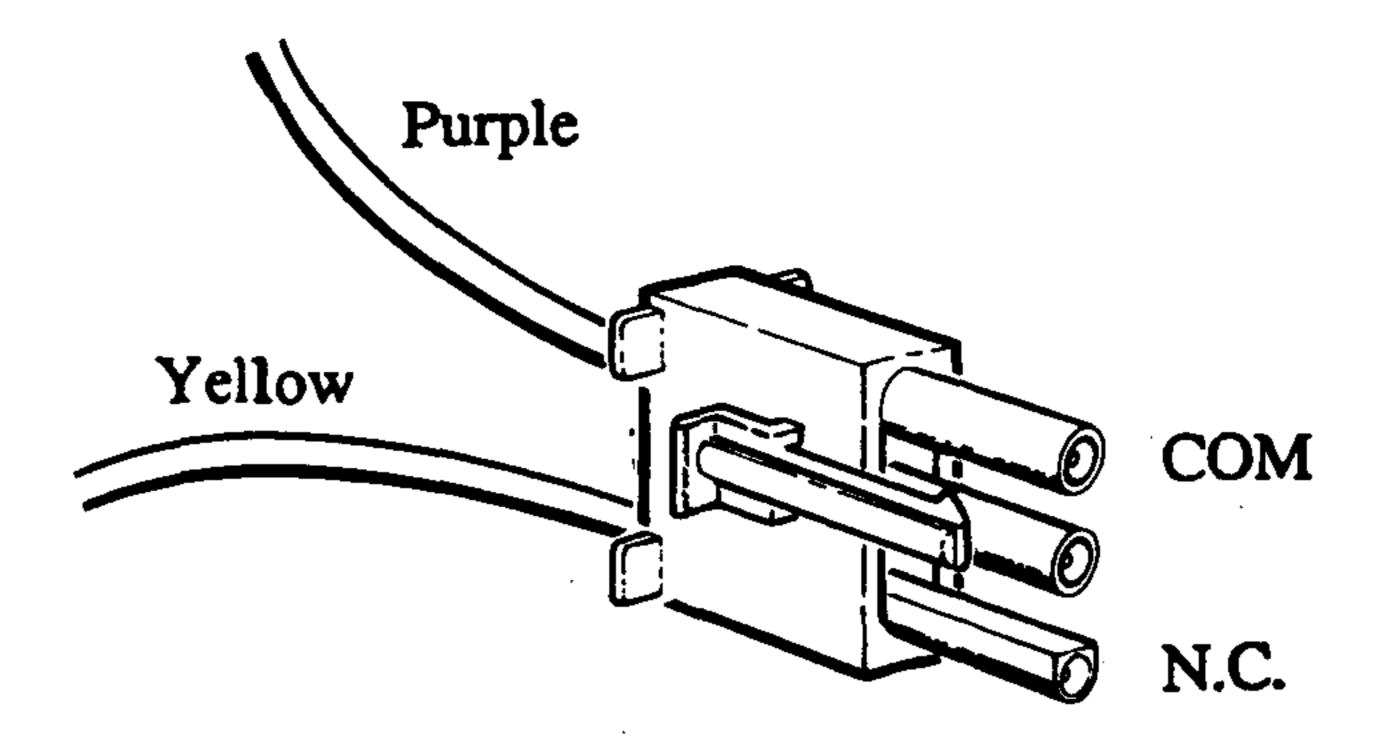


Figure 1-11. Switchback Plug Assembly

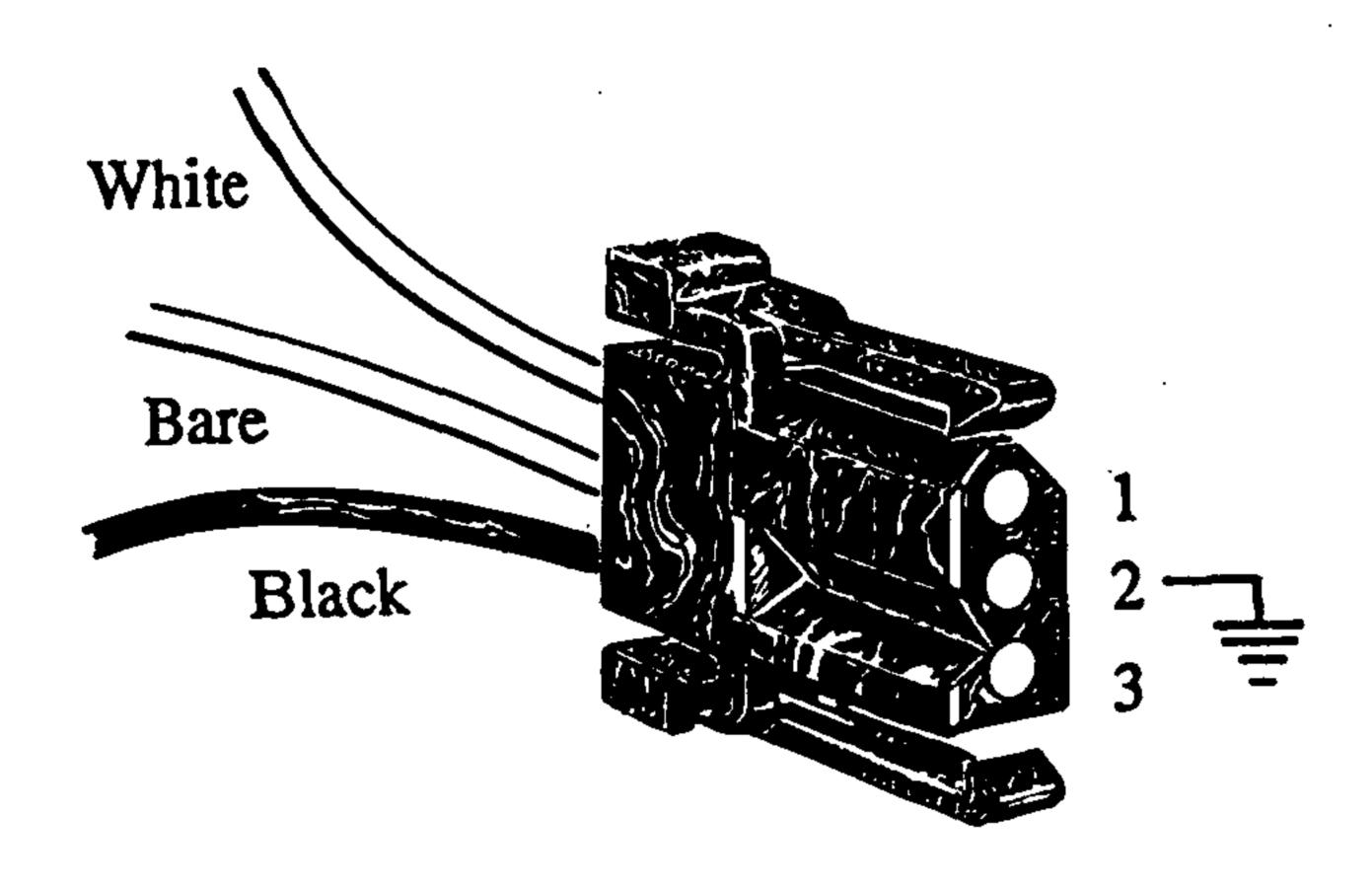


Figure 1-12. 24V AC Power Plug Assembly

Interconnect Cable

The interconnect cable provides a signal and power pathway from the EPC-2000 to the terminal and relay boards. See Figure 1-13.

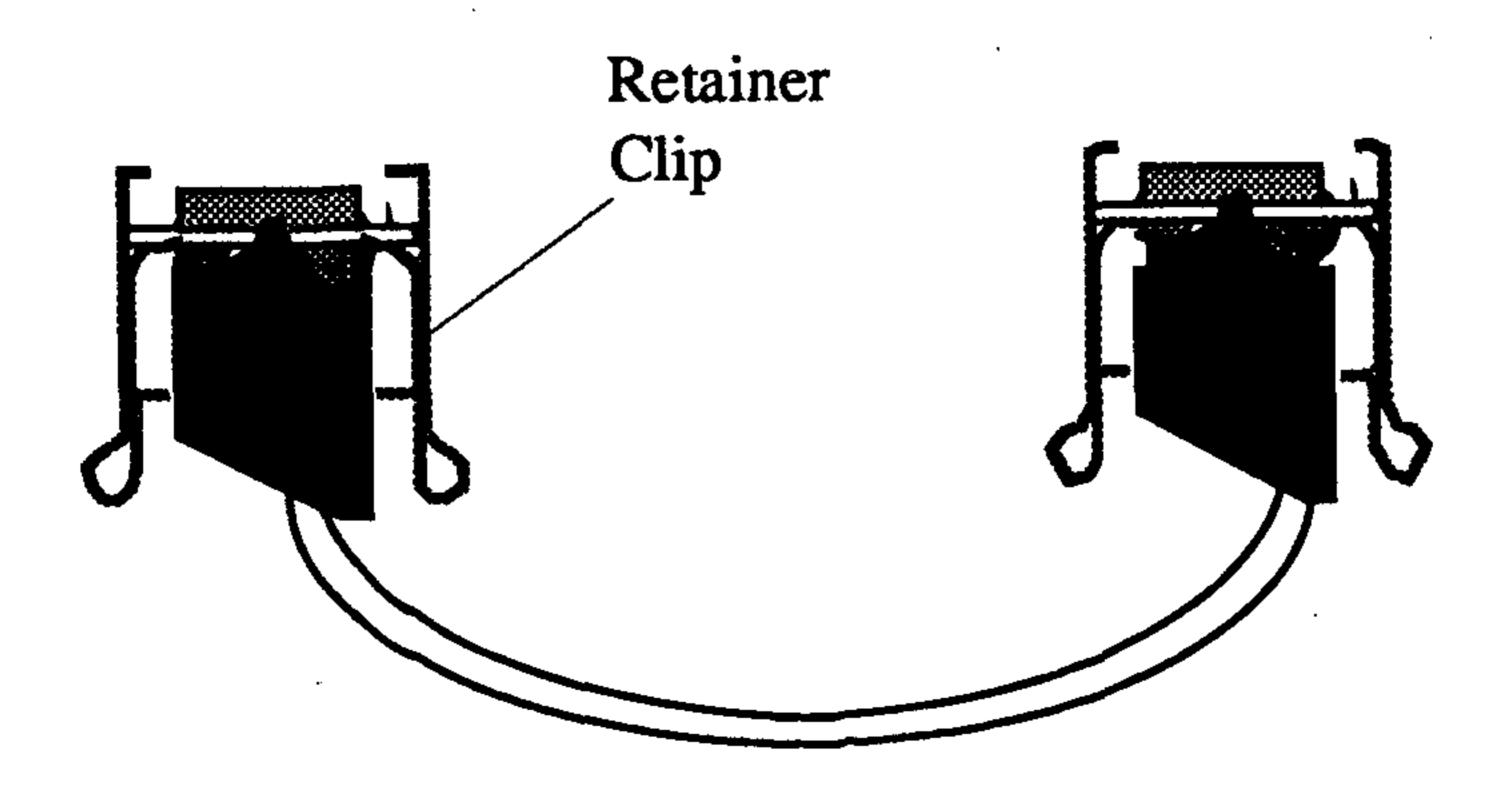


Figure 1-13. 25 Pin Interconnect Cable (Relay or Terminal Board)

INSTALLATION

GENERAL

This section covers both factory and field installed EPC-2000 on Super Plus Systems.

NOTE: Be sure to read these instructions carefully, make sure that all the necessary materials are available, and the procedures are understood in order to minimize unit downtime.

This section will describe the wiring which has been completed at the factory and the wiring which must be completed in the field. Super Plus Wiring Diagrams are included at the end of this section for reference. In addition, a startup sequence is included for the EPC-2000.

FACTORY INSTALLED EPC-2000

The EPC-2000 is mounted on the left-hand door of the Super Plus System. The transformer, relay board, and input terminal board are mounted inside the panel directly behind the EPC-2000. The pressure transducer has been mounted on the suction header. All wiring integral to the control panel is completed at the factory. This includes the 24V interconnect cables, and input terminal board connections (except case Satellite and suction pressure reset temperature sensors which must be field wired to the EPC-2000 terminal board in the refrigeration control panel).

The specific components are wired as follows:

EPC-2000 Transformer

The transformer is a multi-tap transformer. The 120V primary connections are connected to terminals X1C (through fuse F10) and X21 in the control panel. The unused 208 and 240V primary wires have been insulated. The 24V AC is connected to the EPC processor assembly via the 24V AC power plug assembly. The bare ground wire is connected to the panel liner.

EPC-2000 Alarm Relay

The alarm relay (CR10) on the relay board is connected to terminal Y1 and terminal Y2 of the TDU control panel via the alarm plug assembly.

EPC-2000 Switchback Relay

The switchback relay (CR9) on the relay board is connected to terminal X1C and terminal 2 of the TDU relay in the control panel via the switchback plug assembly.

Compressor Control Relays

The compressor control relays (CR1 through CR8) on the relay board are connected to terminals 4#, 5#, and C# in the control panel via the compressor plug assembly. The # sign refers to the compressor number and the terminal block number. For example, compressor number 2 would wire into terminals 42, 52, and C2. Make sure the normally open (N.O.) contact is connected to 4#; the normally closed (N.C.) contact is connected to C#; and the common (C) is connected to 5#.

Defrost Input

The defrost input on the input terminal board is connected to terminals 1 and 3 of the KR relay in the control panel using Belden 8760 cable. The ground (drain) wire is connected to the panel liner at the input terminal board.

Heat Reclaim Input

The heat reclaim input (if so equipped) on the input terminal board is connected to terminals 4 and 6 of the HR relay in the control panel using Belden 8760 cable. The ground (drain) wire is connected to the panel liner at the input terminal.

Factory Installed Satellite Compressor

If a factory installed satellite(s) is included, the compressor control relay (CR7 and CR8 for satellites 1 and 2 respectively) on the relay board is connected to terminal SR, SY, and B_ in the control panel via the compressor plug assembly. The blank "_" following the number designates the actual defrost system number determined from the store legend.

Temperature Sensors

Case temperature sensors for satellites or suction pressure reset are either factory installed or field installed based on the customer's preference. Mount the field installed sensor(s) as shown in the case installation/service instructions for the particular case being controlled.

Attach the temperature sensor to Belden 8618 or equivalent cable. Extend the temperature sensor cable back to the Super Plus control panel. Do not allow the sensor cable to be grouped with high voltage wiring. Keep the sensor wiring segregated from the power wiring on long runs of adjacent cases where case raceways form a long duct prior to exiting into the floor conduits. Attach the cable wires to the terminals marked satellite temperature or suction pressure reset on the input terminal board. Also attach the ground (drain) wire to the panel liner.

Pressure Transducer

The suction pressure transducer is mounted on the suction header. Three-conductor cable (Belden 8618 or equivalent) is run to the input terminal board. This cable is not to be run in conduit with high voltage wiring. It is a low voltage signal cirucit and need not be in conduit. The Red wire is connected to the "+15V"; the Black wire to "COM", and the White wire to "IN" on the input terminal board marked suction pressure.

This concludes the wiring for a factory installed EPC-2000. Proceed to the EPC-2000 startup and checkout procedure following.

FIELD INSTALLED EPC-2000

On field installed units, the following EPC-2000 components will be preassembled in a sheet metal enclosure. See Figure 2-1: EPC-2000 processor assemble, relay board, input terminal board and control transformer.

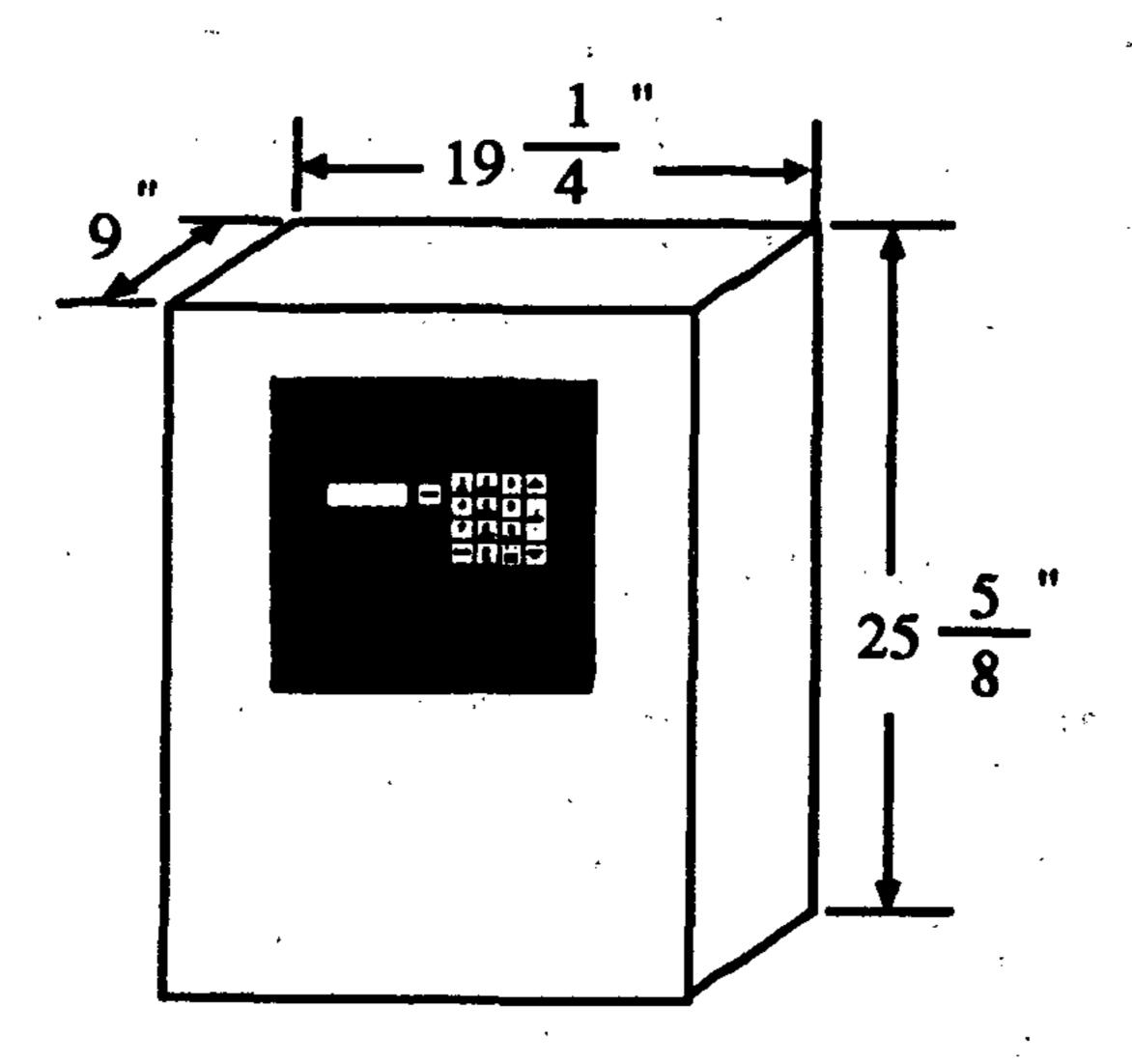


Figure 2-1. Sheet Metal Enclosure

Materials

The following materials must be supplied by the installer:

- 1. Four 5/16" lag bolts or four #20 wood screws (as required)
- 2. 1" diameter solid or flex conduit of sufficient length to reach from the EPC-2000 to the Super Plus control panel
- 3. 18 AWG stranded copper wire with 600 volt insulation
- 4. Wire markers or tags
- 5. Insulated butt splice wire connectors
- 6. Belden 8618 (or equivalent)
- 7. Belden 8760 (or equivalent)
- 8. Wire ties
- 9. Refrigerant thread sealant

Tools

Digital Multimeter, AC-DC Voltmeter, 0-480V AC minimum with Ohmmeter function (used to measure resistance and continuity)

WARNING

Exercise caution against inadvertent panel shorts and shock hazard when working with the Super Plus panel doors open.

Pre-Installation

- 1. Unpack the field installed EPC-2000 assembly and check for damaged or missing parts.
- 2. Mount the EPC-2000 assembly to the wall nearest to the Super Plus System to be controlled. The top of the enclosure should be approximately 4 feet off the floor with a minimum of 3 feet clearance in front. The wall surface should be flat so that the enclosure can be securely fastened without distorting the enclosure. Use 5/16" lag bolts or #20 wood screws (as required) with washers in each corner of the enclosure. Make sure the enclosure has not been warped and the door swings freely.
- 3. Install a 1" diameter piece of solid or flex conduit between the EPC-2000 assembly and the Super Plus panel. Use the box assembly knockouts located on the Super Plus panel's lower right-hand side and bottom for conduit connection.

Installation

Pull the appropriate number of 18 AWG 600V stranded wires through the conduit for connection to the relay board plug assemblies. Three wires are required for each compressor or satellite relay, 2 wires for the switchback relay, 2 wires for the alarm relay, and 2 wires for line voltage supply to the EPC-2000 transformer. For example: 4 compressors, 1 satellite, alarm, switchback, and power will require 21 separate wires. Label both ends of the wires for easy identification.

Before proceeding any further, open the main disconnect and control panel circuit breaker to the Super Plus System.

WARNING

Complete the following with all power turned off to the rack. This also applies to any remote satellite to be controlled by the EPC-2000.

Once the wires have been pulled, connect the labeled wires to the terminal blocks in the Super Plus control panel for each compressor or satellite, the switchback relay, the alram relay and the transformer. These connections are described above in the factory installed subsections. Use the appropriate transformer primary taps 120/208/240 for the control circuit voltage for the rack on which the EPC-2000 is installed. Utilize the butt splice connectors to join the 18 AWG wire to the control circuit plug assemblies.

Pull the appropriate type cable for the defrost input (as described on Page 2-2), heat reclaim input, temperature sensor, and pressure transducer. Follow the instructions above in the factory installed subsections. Make the connections at the input or sensor and at the input terminal board.

This concludes the wiring for a field installed EPC-2000. Proceed to the EPC-2000 Start-up and Checkout Procedure.

STARTUP

Complete the following sequence to startup the Super Plus System:

Carefully check all wiring before startup. Check the interconnect cables to insure they are properly seated into the EPC-2000 processor assembly, the relay board, and input terminal board.

- 1. Turn off the individual compressor branch switches. Unplug the 24V AC power plug assembly from the side of the EPC-2000 processor assembly.
- 2. Close the Super Plus System main disconnect
- 3. Close the Super Plus System control circuit breaker
- 4. Using a digital multimeter, verify 24V AC secondary supply across terminals 1 and 3 of the power plug assembly (Figure 1-12). If the power supply is 21-30V AC, connect power plug assembly into the 24V AC connection on side of processor assembly. When the EPC-2000 is first powered up, the initial display will appear as shown in Figure 3-2.

CHECKOUT PROCEDURE

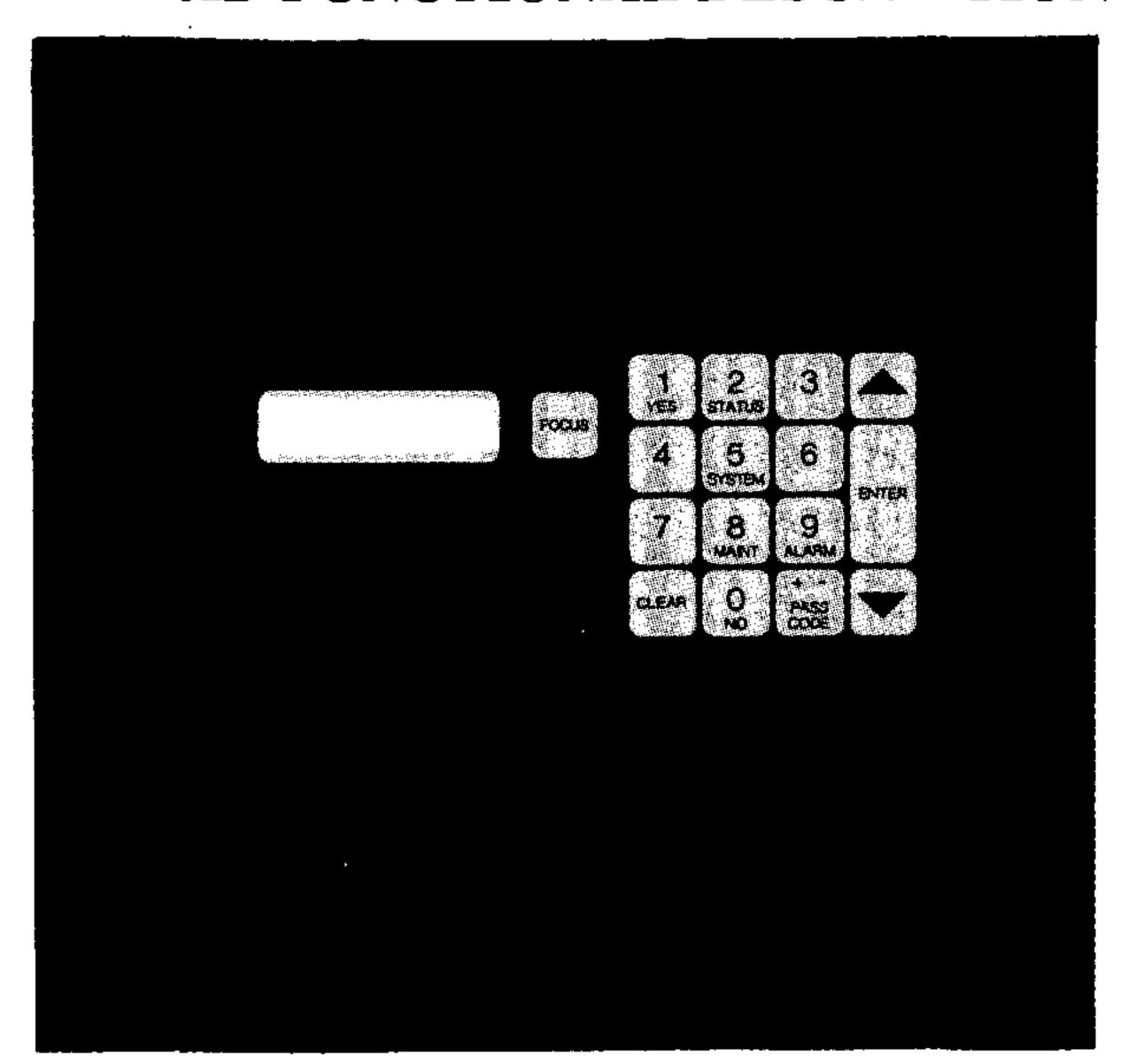
NOTE: To complete the remaining steps of the startup procedure, you must be familiar with Section 3, Operation.

- 1. Check EPC-2000 factory setup. Factory setup can be reviewed using the SYSTEM MENU.
- 2. Turn on the compressor branch switches.
- 3. Observe that the EPC-2000 begins to sequence compressors.
- 4. Verify that the suction pressure and any case temperature probes are operating correctly.
- 5. Force all connected compressors and satellites individually ON and OFF using the passcode 71962 to enter the MAINTENANCE MENU.
- 6. Place the rack in switchback by use of the MAINTENANCE MENU to check that the low pressure controls and satellite thermostats are operational and adjusted.
- 7. Return the EPC-2000 to controlling the rack by resetting EPC-2000 in MAINTENANCE MENU.
- 8. Place a KOOLGAS system into defrost and observe that the EPC-2000 defrost screen shows ON status. Terminate the defrost and verify that the status screen changes to OFF (STATUS MENU).
- 9. Unplug the 25 PIN interconnect cable from the EPC-2000 relay board and make sure the refrigeration rack alarm is activated. This should also cause switchback to occur immediately.
- 10. Return the EPC-2000 to controlling the rack.

If any problems are detected, go to Section 4, Service (Trouble Shooting).

OPERATION

KEYPAD FUNCTIONAL DESCRIPTION



The keypad consists of:

• A display FOCUS key, allowing the intensity of the display to be enhanced for varying viewing angles



• NUMERICAL keys from 0 to 9



Figure 3-1. EPC-2000 Faceplate

Scroll UP and scroll DOWN keys

The up and down arrow keys, which only operate within a menu, allow a user to scroll through the information within that menu. When the last screen of a particular menu is reached, the controller will revolve back to the top of the menu. Within all but one menu, ALARM, the display can be scrolled forward or backward one screen at a time. If the up arrow is pressed in the ALARM Menu, the display will revert to the top of the menu. The down arrow scrolls through the alarms in chronological order.



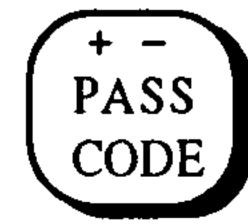


• An ENTER key

Any time information needs to be changed within the processor, the ENTER key must follow the change in information for the processor to recognize the change or the entering of that information into the system. If no information is being changed, pressing the ENTER key will prompt you to exit the menu and return to the initial display.



• A PASSCODE key

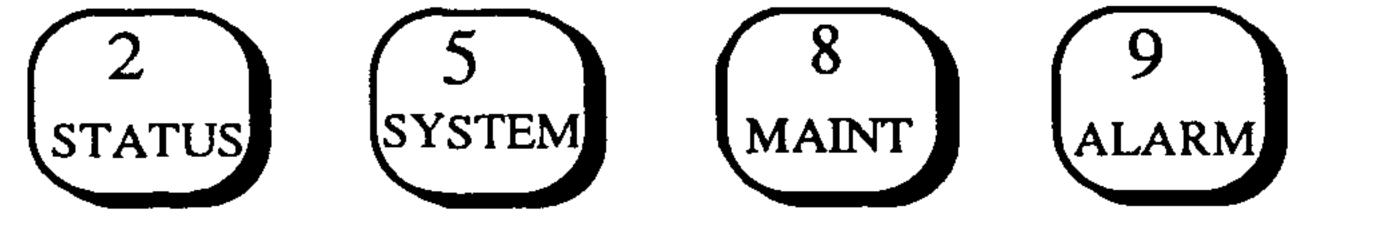


• A CLEAR key



• And 7 keys that have a secondary function, 4 of which are used to access the MENUs available

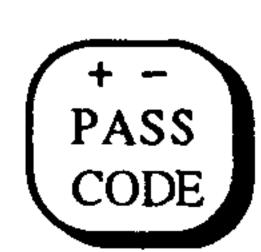


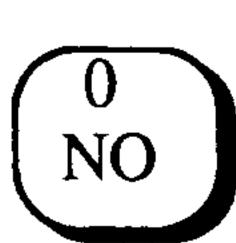












Four menus are available: STATUS, MAINTENANCE, SYSTEM, and ALARM. These menus contain information pertaining to the operation of the controller. Some of the menus require special passcodes for access. See the Passcode System Section for further information on the types of passcodes.

The display has a blue backlight that will flash in all EPC-2000 initiated alarm conditions.

The backlight turns off after 30 minutes of no user activity. Also, if the backlight is off upon entering the machine room, this is not an indication that the unit is inoperative – it is waiting for user inquiry.

NOTE: Anytime within a menu when the keypad is not used for 90 seconds the processor will automatically exit and return to the initial display.

POWERING UP THE SYSTEM

When the system is first powered up the display will read:

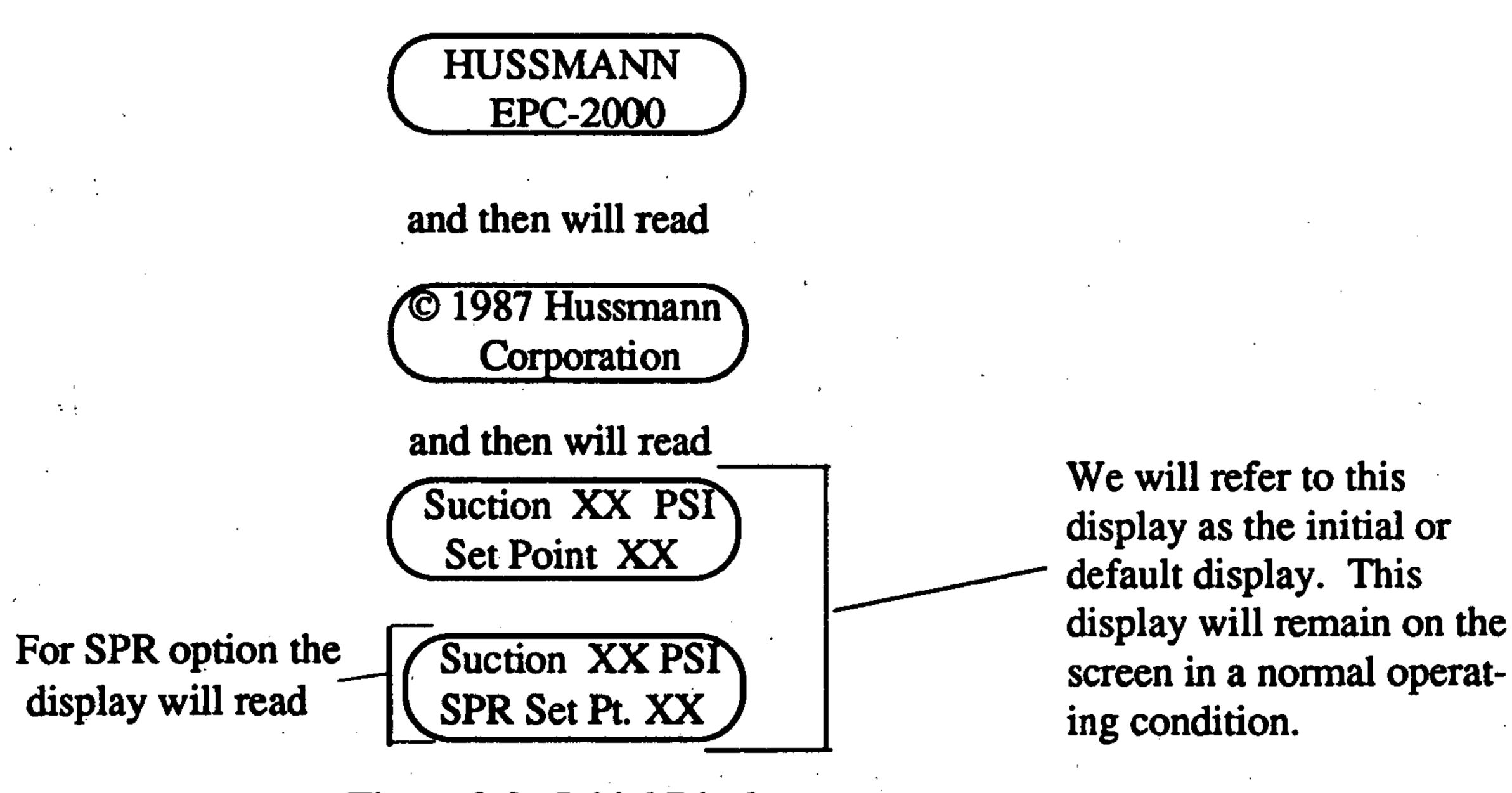


Figure 3-2. Initial Display

THE TIME AND DATE DISPLAY

It is possible to have the time and date show continually on the display. This is done by pressing the STATUS key when the initial display is on the screen. The time and date will be displayed within 3 seconds and continue until other information is requested. Refer to the alarm section for setting the clock.

PASSCODES

The controller's basic functions can be monitored at any time through the STATUS MENU. This menu does not require a PASSCODE for access.

To allow access to set points and other information by authorized people, there are USER and MAINTENANCE PASSCODES.

User Passcode

The first type of passcode is a USER PASSCODE. This passcode number can be from 1 to 6 digits. It can be determined by the user and is entered into the controller by using the procedure described later in the ENTERING PASSCODES section. ("0" by itself cannot be used as a USER passcode.) A USER passcode gives access to the SYSTEM MENU and the ALARM MENU. Operational set points can be changed, but factory set points can only be observed.

Maintenance Passcode

The second type of passcode is a MAINTENANCE PASSCODE. This passcode is preset into the controller. The 5 digit code is 71962 and cannot be changed. This passcode allows the access to the MAINTENANCE MENU in addition to the system and alarm menus and will allow maintenance personnel to change the functions of the system if needed for maintenance purposes such as: forcing specific compressors on and off, forcing switchback, resetting the controller, etc. See the Section on the MAINTENANCE MENU.

> LIST YOUR PASSCODE HERE FOR EASY REFERENCE USER PASSCODE MAINTENANCE PASSCODE 71962

ENTERING PASSCODES

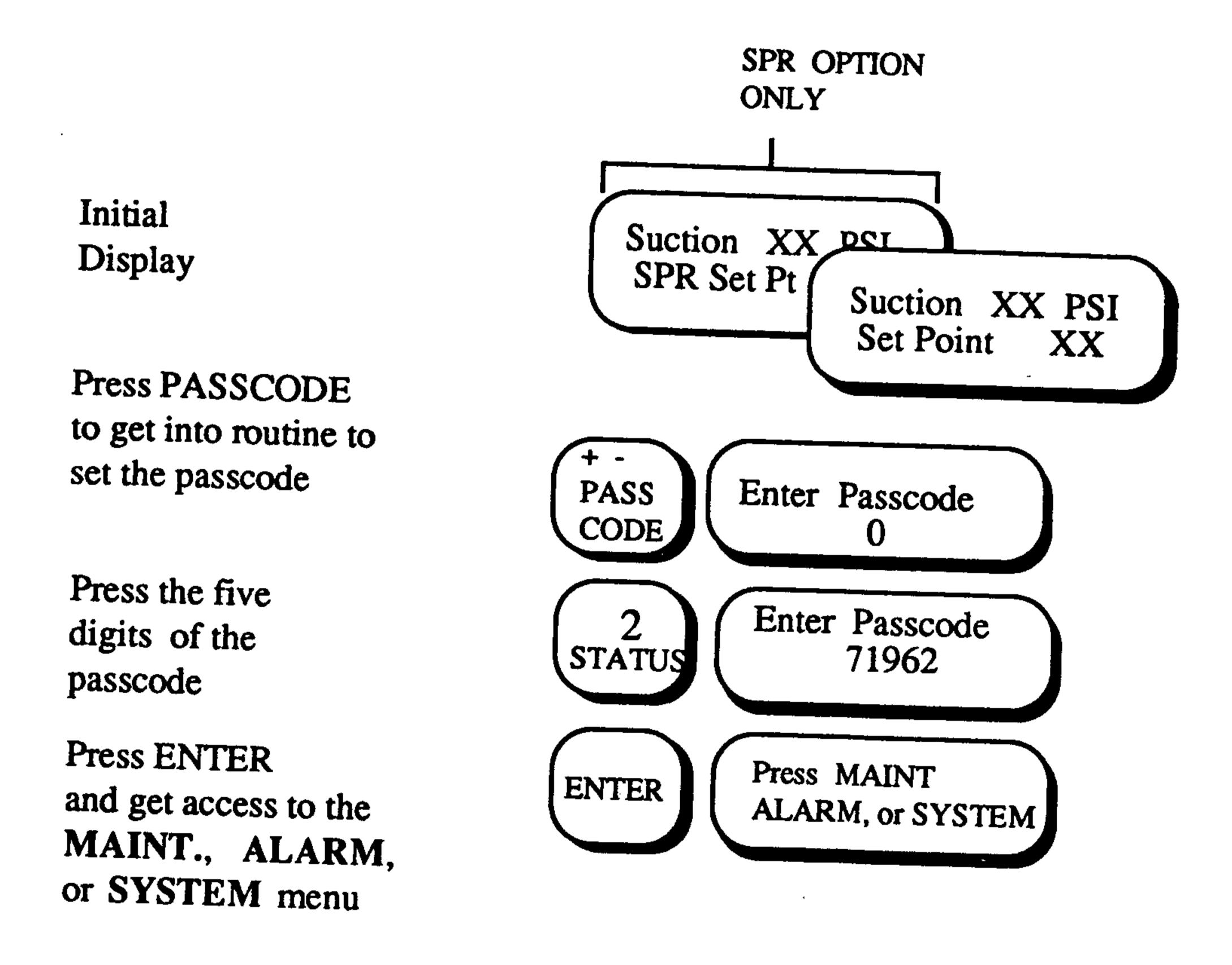
User Passcode

| ode | | |
|--|----------------------|------------------------------------|
| DESCRIPTION OF FUNCTION | PRESS THIS KEY | THIS WILL DISPLAY |
| | • | SPR OPTION ONLY |
| ÷ | | |
| Initial Display | Suctions | Set Pt Suction XX PSI Set Point XX |
| Press PASSCODE to get into routine to set the passcode | PAS CO | Enter Passcode O O |
| Press the digits of the passcode | 3 | Enter Passcode 3 |

| OF FUNCTION | PRESS THIS KEY | THIS WILL DISPLAY |
|--|----------------|-------------------------|
| Press ENTER and get access to the ALARM or SYSTEM menu | | ress LARM, or SYSTEM |

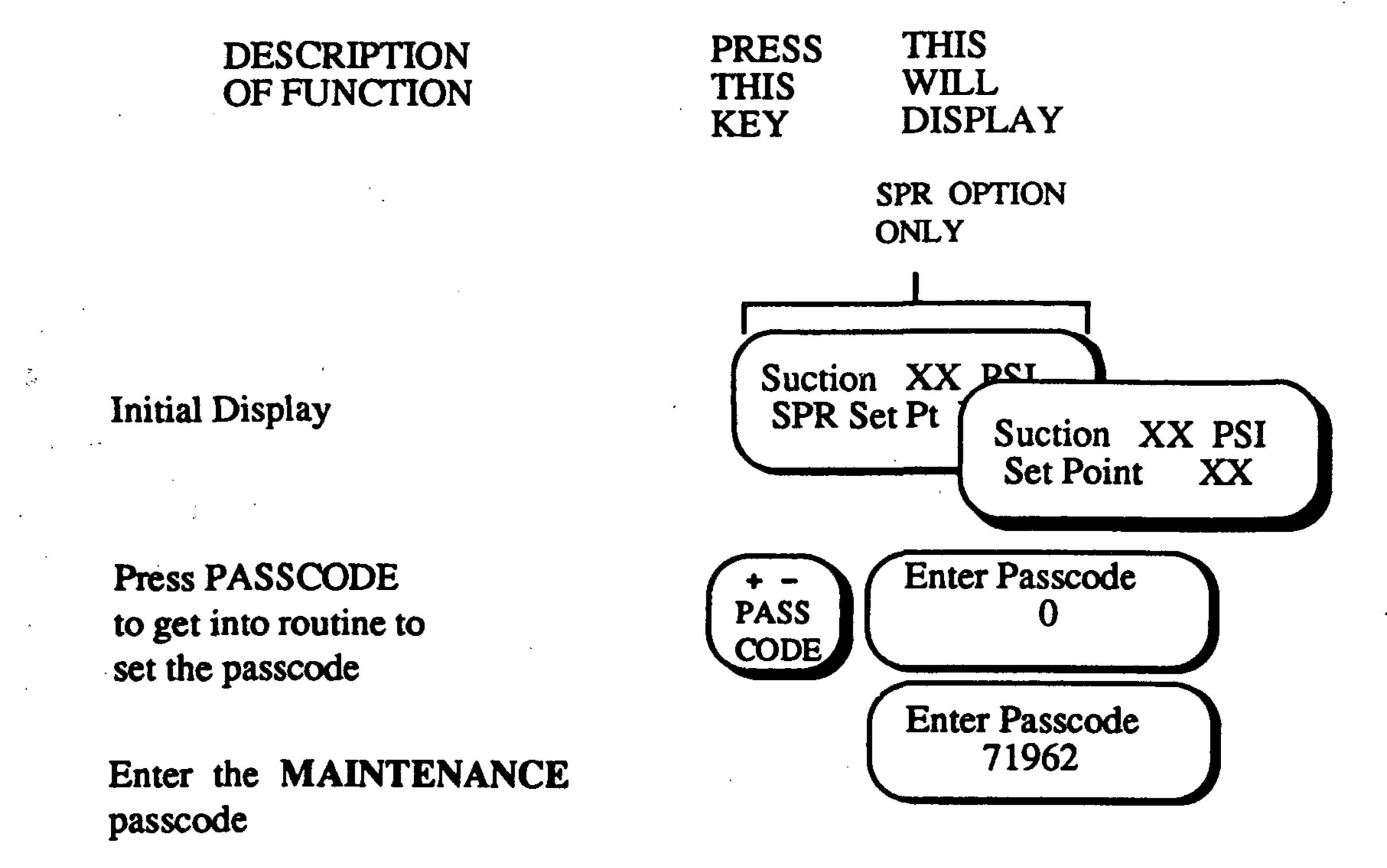
NOTE: If an incorrect passcode is entered, access is denied and the EPC-2000 returns to the intial display.

Maintenance Passcode

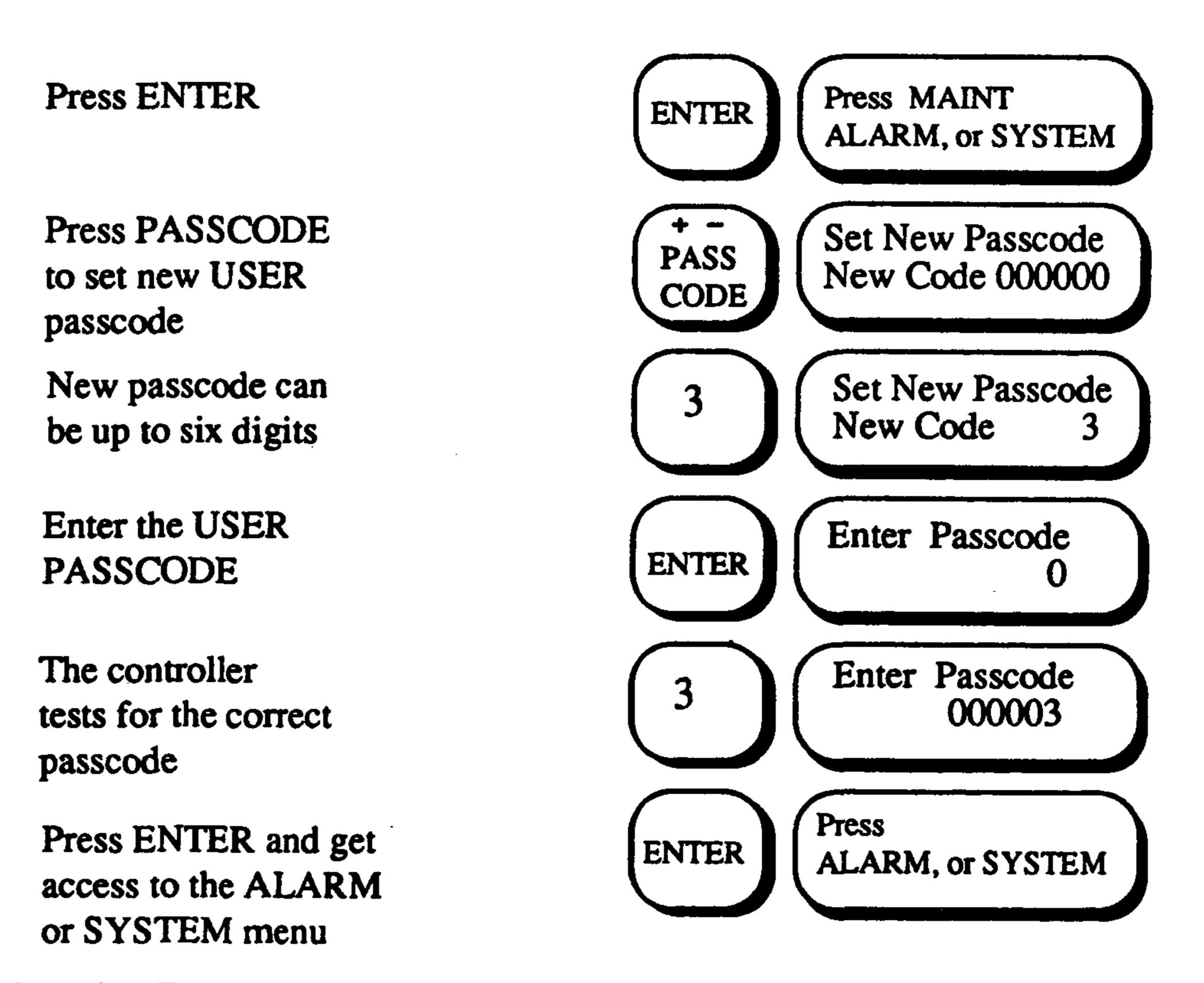


Setting New USER passcode

Setting a new USER passcode can be accomplished as shown in the following steps. After you have entered the desired digits for the passcode, the EPC-2000 will ask you for confirmation. You must enter the passcode digits again. Upon correct entry, you will get access to either the ALARM or SYSTEM MENUS.

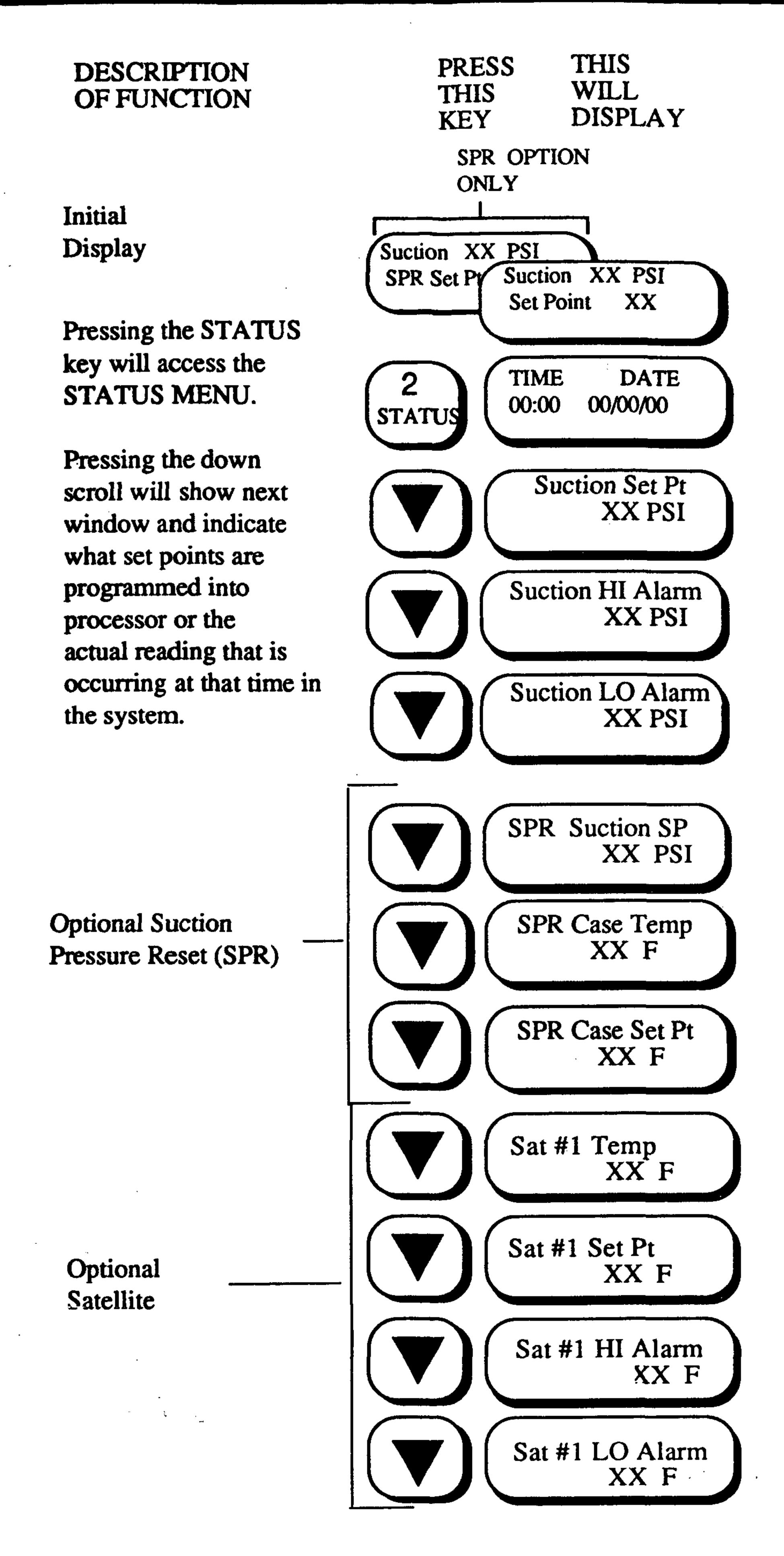


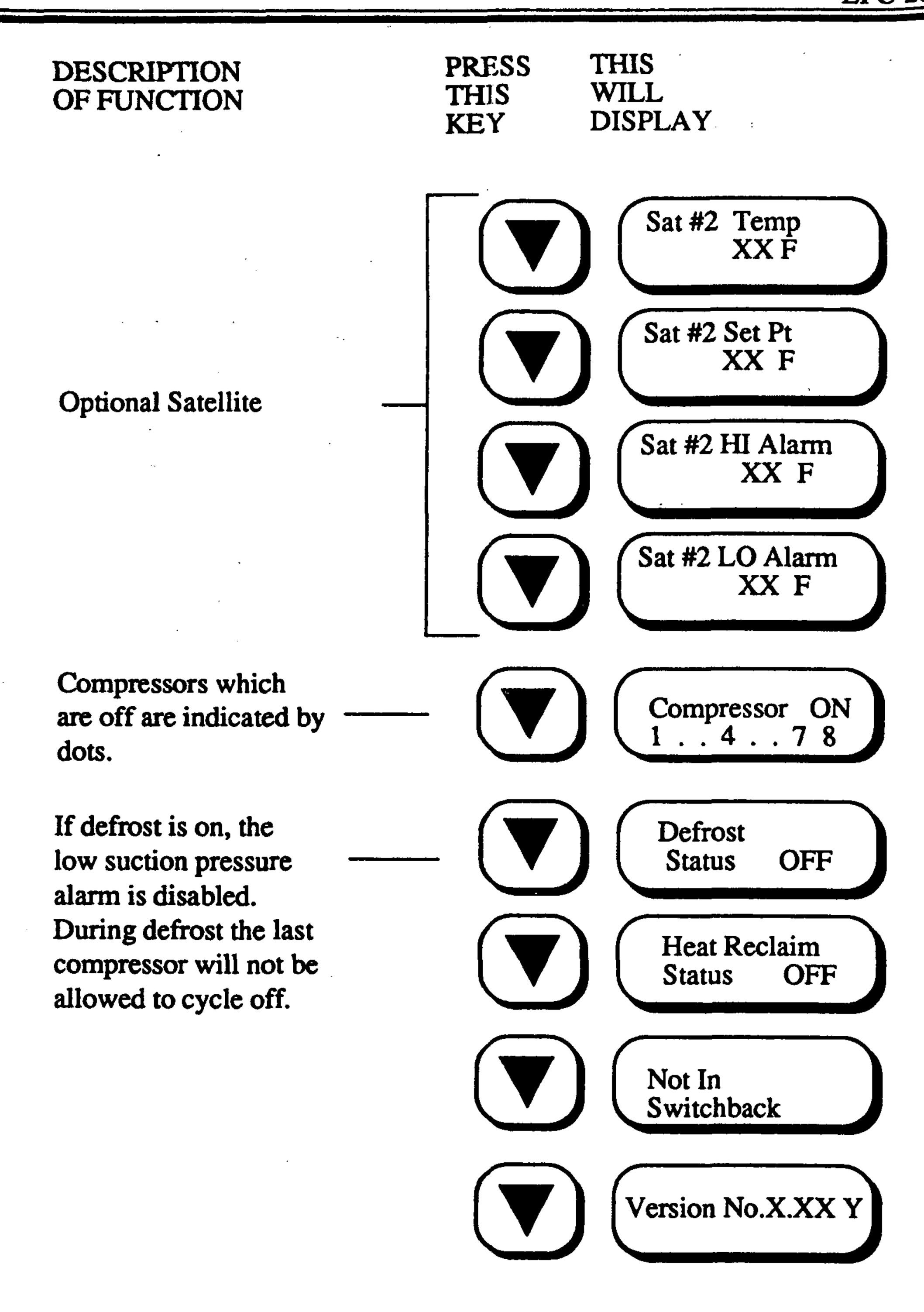
NOTE: You cannot return to the top level until the new passcode is successfully entered and verified.



End of Entering Passcodes

STATUS MENU





This is the end of the STATUS MENU.

To leave the menu, press ENTER and answer the prompt with 1=YES.

MAINTENANCE MENU

DESCRIPTION OF FUNCTION

PRESS THIS
THIS WILL
KEY DISPLAY

SPR OPTION ONLY

Initial Display

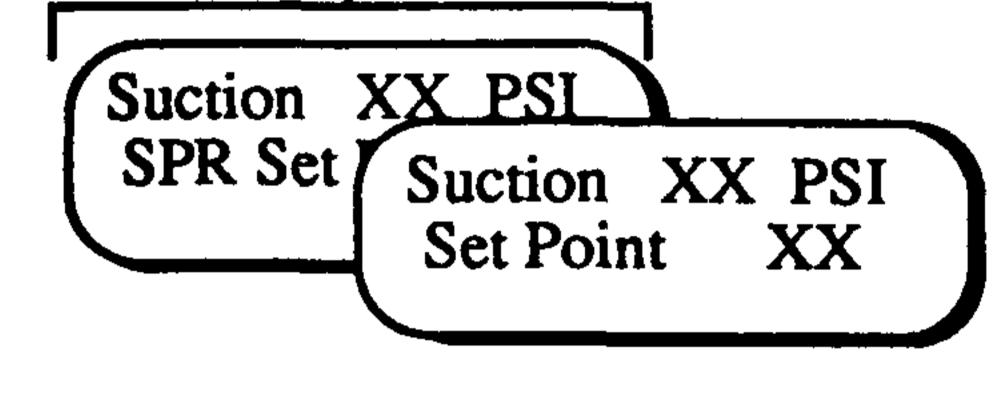
Enter the MAINTE-NANCE PASSCODE

After a 3 second delay, the first screen will appear

This display only appears if compressor(s) have been forced ON or OFF

NOTE: If you are forcing particular compressors on or off, the controller initially makes you ENTER the compressor number. After the compressor has been forced on or off the controller will ask if you would like to DO ANOTHER ONE?

NOTE: Once a compressor has been forced on or off, return to KILL FORCED COMP display and answer YES before proceeding to remainder of menu.





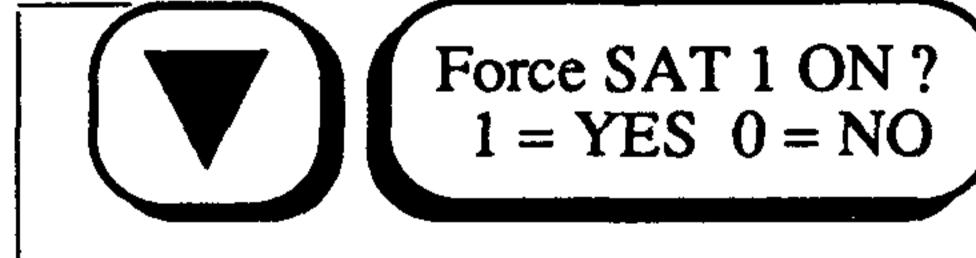
ENTER PASSCODE 71962

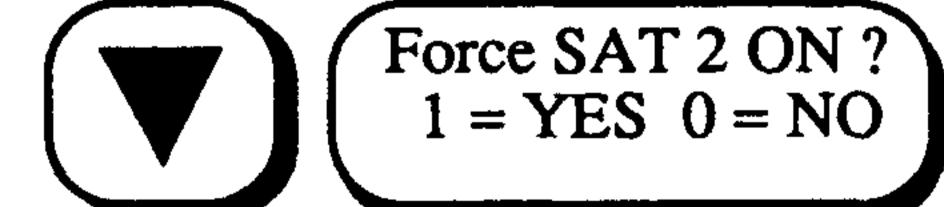
ENTER Press MAINT,
ALARM, or SYSTEM

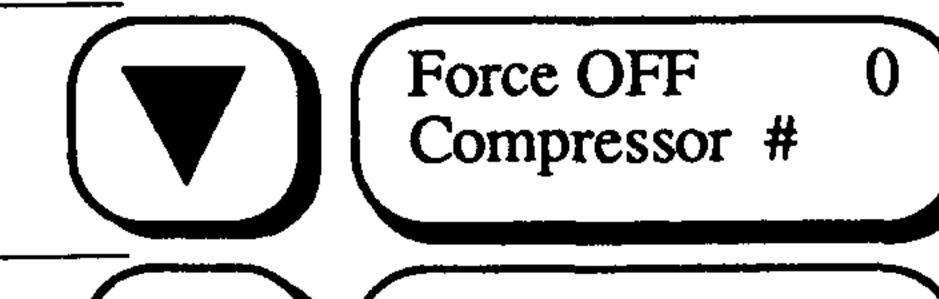
8 MAINT (<<MAINT MENU>>

> Kill Forced Comp 1=YES 0=NO





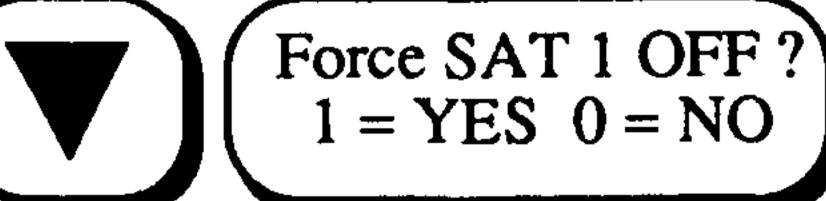


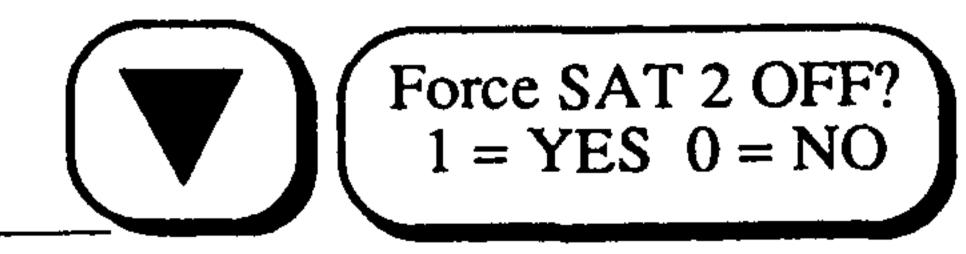


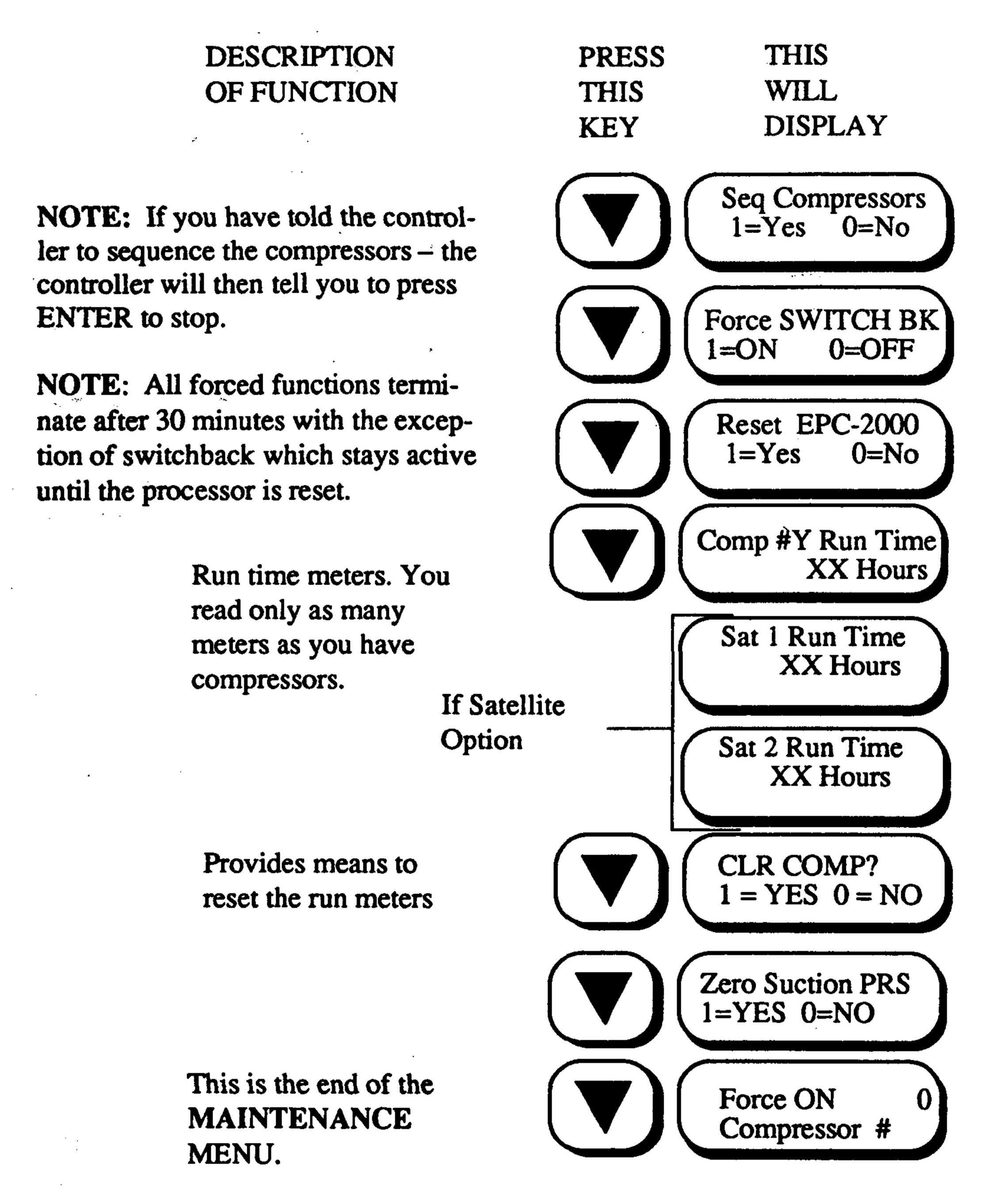
If
Satellite
Option

Satellite

Option

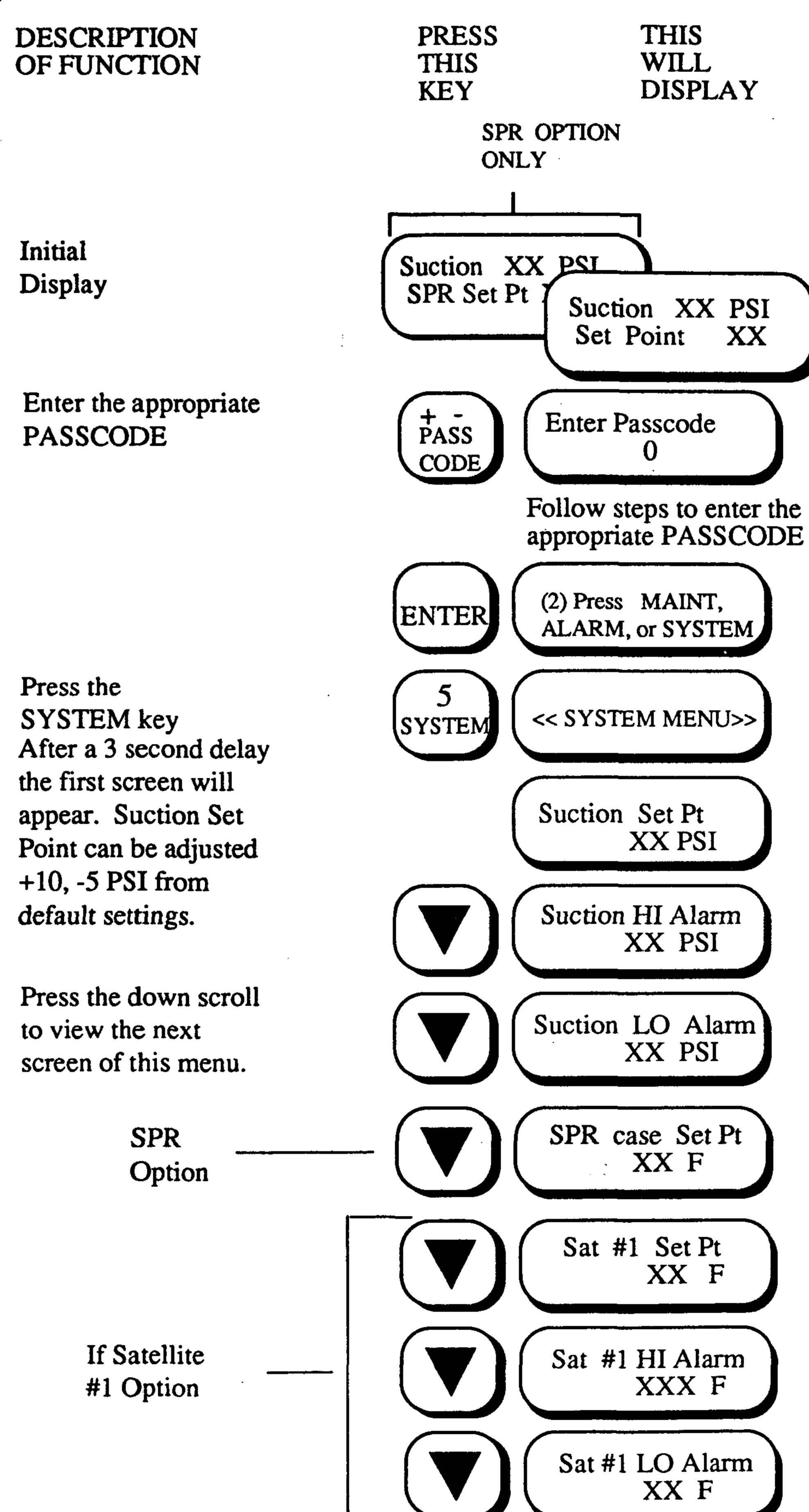


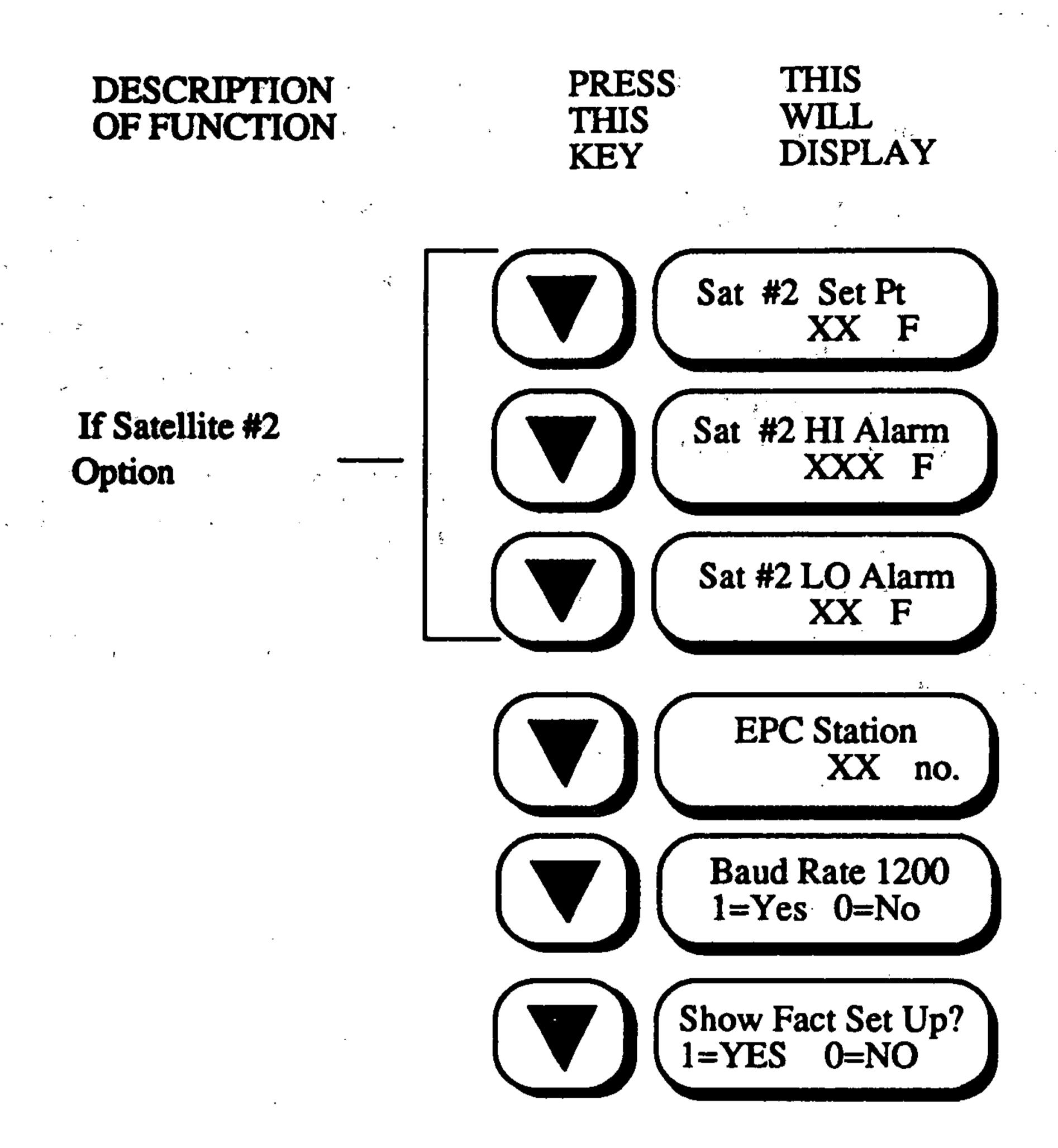




NOTE: The display will revolve until you press ENTER to leave the menu.

SYSTEM MENU





At this point, you have the ability to <u>view</u> the factory setup of the system's controller, if you choose YES. If you choose NO, you will return to the top of the SYSTEM MENU. If you need to change the factory setup, see Section 4—Configuration.

ALARM MENU

In an alarm situation the following sequence should be initiated to turn off the alarm and read the processor for the information.

THIS **PRESS** DESCRIPTION WILL THIS OF FUNCTION DISPLAY **KEY** Initial Display: constant beeping, backlight flashing. PASS Enter Passcode Press PASSCODE to get CODE into routine to set passcode. NOTE: Beeping will stop, Enter Passcode flashing continues. Press the digit(s) of the **PASSCODE** Press **ENTER** ALARM, or SYSTEM Press ENTER Turn Alarm OFF 1=Yes 0 = NoPress the ALARM key ALARM to initiate the ALARM menu. SET CLOCK? YES Press YES to turn the 1 = YES 0 = NOALARM off. The backlight will stop flashing. Suction Pressure is too HIGH If YES then go to Setting the Clock. Logged time at Down scroll key will HH:MM MM/DD/YY indicate past alarm history * End of Alarms! Press Enter at any time during any menu to **ENTER** Leave Menu? 0=No1=Yes prompt LEAVE MENU? SPR OPTION ONLY Press #1 to go back to initial display. Suction XX

SPR Set Pt

Suction XX PSI

Set Point

XX

* See Table 3-2 for list of alarms

Setting the Clock

DESCRIPTION OF FUNCTION

From the initial display enter the USER or MAINTENANCE passcode.

Select the Alarm menu.

After 3 seconds, the display will read

Press YES

Use numeric keys to input proper time and date

NOTE: After pressing a numeric key, the key cursor advances to the next field. The arrow keys may be used to select fields.

After proper time and date have been entered, press ENTER to set the clock.

Press ENTER again to leave the menu.

Press YES

Enter the STATUS menu and check for proper time and date display.

PRESS THIS
THIS WILL
KEY DISPLAY

ENTER Enter Passcode 0

ENTER Press MAINT
ALARM, or SYSTEM

SET CLOCK? 1 = YES 0 = NO

Time Date
HH:MM MM/DD/YY

Previous Field

Next Field

Clock Set to
HH: MM MM/DD/YY

ENTER Leave Menu?

1=Yes 0=No

1 YES

This is the end of the ALARM menu.

EPC-2000 Alarm System

The EPC-2000 is equipped with an extensive alarm system designed to notify service personnel of a refrigeration problem. For several alarm situations, the EPC-2000 will transfer control to the backup mechanical pressure and temperature controls.

Table 3-1 addresses the alarms which are generated because the EPC-2000 has detected a refrigeration condition which is causing reduced system performance. Typically these alarms will be a result of a rack malfunction.

Table 3-2 lists the alarms associated with EPC-2000 self diagnostics. These alarms would generally indicate an EPC-2000 malfunction.

Column 1 of Tables 3-1 and 3-2 lists the alarm message that will be logged in the alarm menu. Column 2 lists the action that will be taken by the EPC-2000 based on the alarm. Possible causes and solutions to the specific alarm are tabulated in columns 3 and 4, respectively.

TABLE 3-1. SYSTEM ALARMS

| | IABLE 3-1. SYSTE | | |
|---------------------------------|---|--|---|
| ALARM LOG MESSAGE | EPC-2000 ACTIONS | POSSIBLE CAUSE | SOLUTION |
| Suction pressure is too HIGH | Rack alarm and switchback will occur if the suction pressure reading stays above the alarm limit set point for 30 minutes | -Rack suction HI -Compressor turned OFF or failure -EPC-2000 suction transducer | -Check for rack problem -Check transducer for correct operation -Turn OFF alarm and reset processor |
| Suction pressure is too LOW | Rack alarm and switchback will occur if the suction pressure reading stays below the alarm limit set point for 30 minutes | -Rack suction LO -Compressor locked ON -EPC-2000 suction transducer error -LOW on refrigerant | -Check for rack problem -Check transducer for correct operation -Turn OFF alarm and reset processor |
| Satellite #1 high limit reached | Rack alarm will occur if case temperature stays above alarm set point for 90 minutes. Switchback will not occur for this alarm parameter. | -Control ciruit switch OFF -Low pressure control adjusted too HIGH -Compressor failure -Defrost clock failure -Improper expansion valve setting -EPC-2000 temp. sensor error | -Check for case and rack problem -Check sensor for correct operation -Turn OFF alarm and reset processor |
| Satellite #1 low limit reached | Rack alarm will occur if case temperature stays below alarm set point for 30 minutes. Switchback will not occur for this alarm parameter. | -Compressor locked ON -Case thermostat adjusted below EPC-2000 -Sat LO alarm set point -EPC-2000 temperature sensor error | -Check for rack problem -Check case thermostat set point -Check EPC-2000 sensor probe for correct operation -Turn OFF alarm and reset processor |

TABLE 3-1 SYSTEM ALARMS (cont.)

| ALARM LOG MESSAGE | EPC-2000 ACTIONS | POSSIBLE CAUSE | SOLUTION |
|---|---|--|--|
| All Compressors OFF (Super Market version only) | Rack alarm and switchback will occur if the EPC-2000 intelligently turns OFF all compressors for more than 60 minutes continuously. The EPC-2000 operates on a suction pressure rate and distance algorithm, thus under unusual system operational conditions all compressors could cycle off. | -Rack load reduced -Wrong EPC-2000 suction set point -EPC-2000 suction pressure transducer error | -Check rack and case operation for problems -Check EPC-2000 suction pressure set point -Check EPC-2000 transducer -Turn off alarm and reset processor |
| Defrost over 1 hour | Rack alarm and switchback will occur if the EPC-2000 senses that the rack is in Koolgas defrost for more than 60 minutes. | - Defrost clock failed in Koolgas defrost -Several overlapping Koolgas defrosts -Panel KR relay failure -EPC-2000 error in reading KR relay status | -Check rack Koolgas defrost system for problems -Check EPC-2000 defrost inputs for correct operation -Turn OFF alarm and reset processor |

TABLE 3-2. EPC-2000 ALARMS

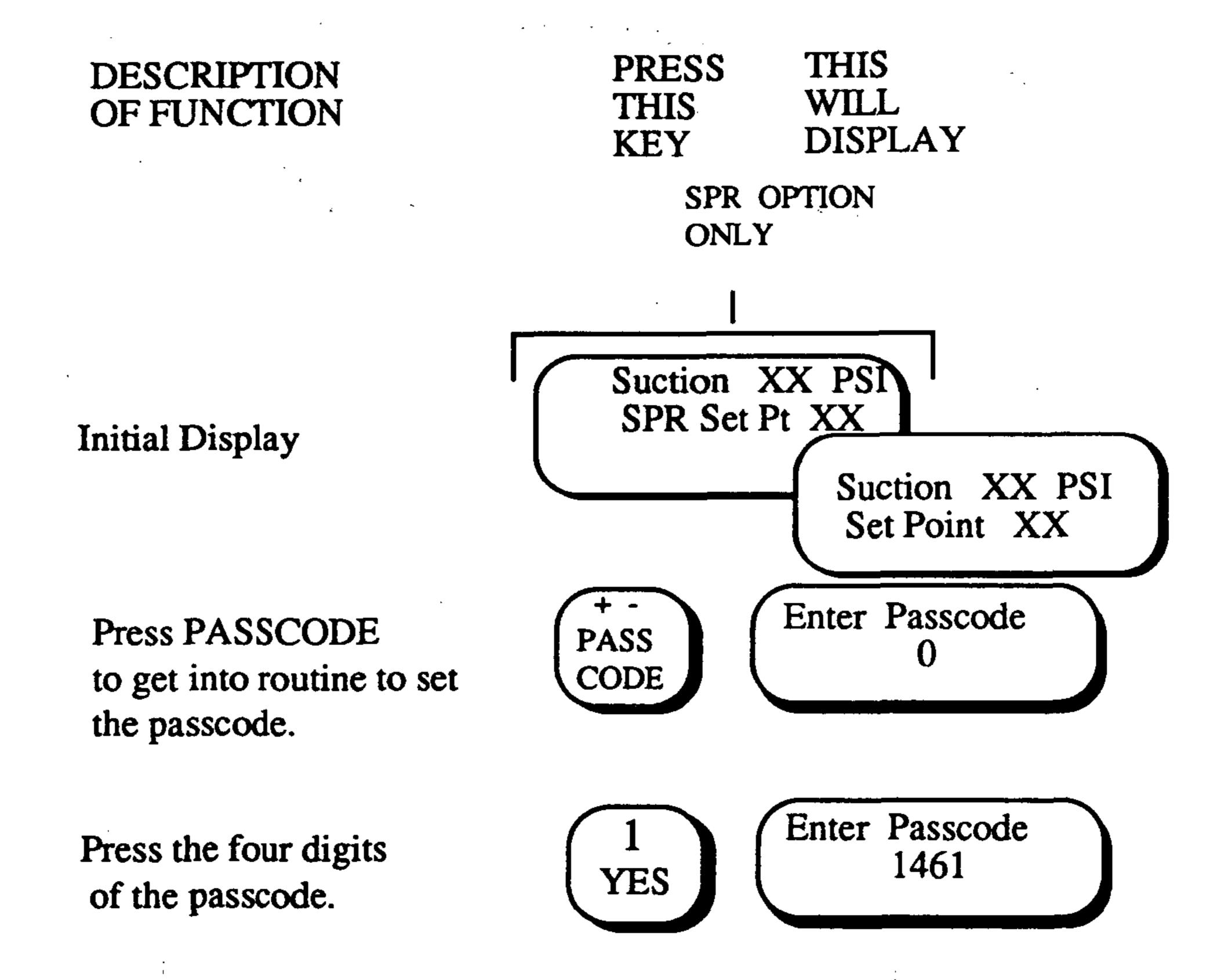
| ALARM LOG MESSAGE | EPC-2000 ACTIONS | POSSIBLE CAUSE | SOLUTION |
|--|--|---|---|
| Time of last power up reset | Alarm and switchback will occur if power supply fails | -Processor Reset -Rack control circuit turned off -Primary fuse/transformer failure -Processor 5V power supply failure | -Check primary power -Check transformer and fuse -Check processor, restore -power |
| 24V DC Power Supply Failure | Alarm and switchback will occur immediately on loss of 24V DC power supply | -Relay board(s) shorted 24V DC to ground -Processor Failure | -Check relay boards and interconnect cables for shorts -Replace processor |
| Compressor Board failed Cable check Input Board failed Cable check | Alarm and switchback will occur within 18 seconds after sensing the loss of the interconnect cable connection to the terminal/relay board(s) | -Relay board or terminal board inter- connect cable failure -Poor interconnect cable connection | -Check cable indicated as a failure -Turn OFF alarm and reset processor |
| EPROM Failure | Alarm and switchback will occur immediately on detection of an EPROM failure | -Processor EPROM failure | -Replace processor |
| EEPROM Error | Alarm and switchback will occur immediately on detection of an EEPROM failure | -Processor EEPROM Error | -Replace processor |
| EPC-2000 temperature exceeds 150° F | Alarm will occur immediately after sensing a processor internal temperature of 150° F or greater. Switchback will not occur for this alarm. This alarm is a warning of an adverse operating environment, and not a response to an EPC-2000 component failure. | -Machine room ventilation failure -Refrigeration control panel overheating -EPC-2000 processor internally overheating | -Restore machine room ventilation -Ventilate refrigeration panel -Check EPC-2000 fan -Turn OFF alarm and reset processor |

CONFIGURATION

PURPOSE

The EPC-2000 Configuration (setup) is programmed into the processor for the specific job application prior to shipment. The configuration (setup) includes such information as type of refrigerant, number of compressors, compressor cycling routines, number of satellites, and whether various options (such as condenser fan control) are utilized. On most installations, the configuration will never have to be changed. If the need arises, however, this section is designed to allow users to reconfigure the EPC-2000 factory setup.

CONFIGURATION PASSCODE



SYSTEM/CONFIGURATION MENU

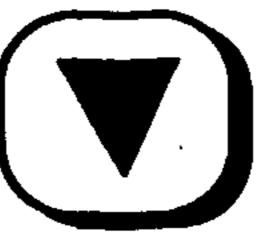
Turn to the SYSTEM MENU in Section 3. Where it says enter appropriate passcode, enter the configuration passcode 1461. Proceed through all the menus shown in Section 3. When you reach the SHOW FACTORY SETUP screen, at that point return to this page for instructions.

FACTORY SETUP

If you entered the SYSTEM MENU by using the MAINTENANCE CODE you can only view the following screens. However, if you entered by using the CONFIGURATION CODE you may make changes.

DESCRIPTION OF FUNCTION

PRESS THIS KEY THIS WILL DISPLAY



Show Fact Setup? 1=Yes 0=No

Choose Yes to continue, if you choose No you will return to the top of the SYSTEM MENU.

1 Yes

Clear Memory? 1=Yes 0=No

CAUTION

Answering Yes to the next two screens will erase the entire configuration (factory setup).

User should be prepared to re-enter ALL configuration data.

Also, the clock will need to be reset using the ALARM MENU.

Press Yes

Press Yes

1 Yes Are You Sure? 1=Yes 0=No

1 Yes

Done...No Errors

NOTE: It takes approximately

10 minutes to clear the memory. (Light dims and a test screen will appear.) Answering No will place you on the next screen, which is Clear Alarms.

Press the down scroll

Clear Alarms? 1=Yes 0=No

1 Yes

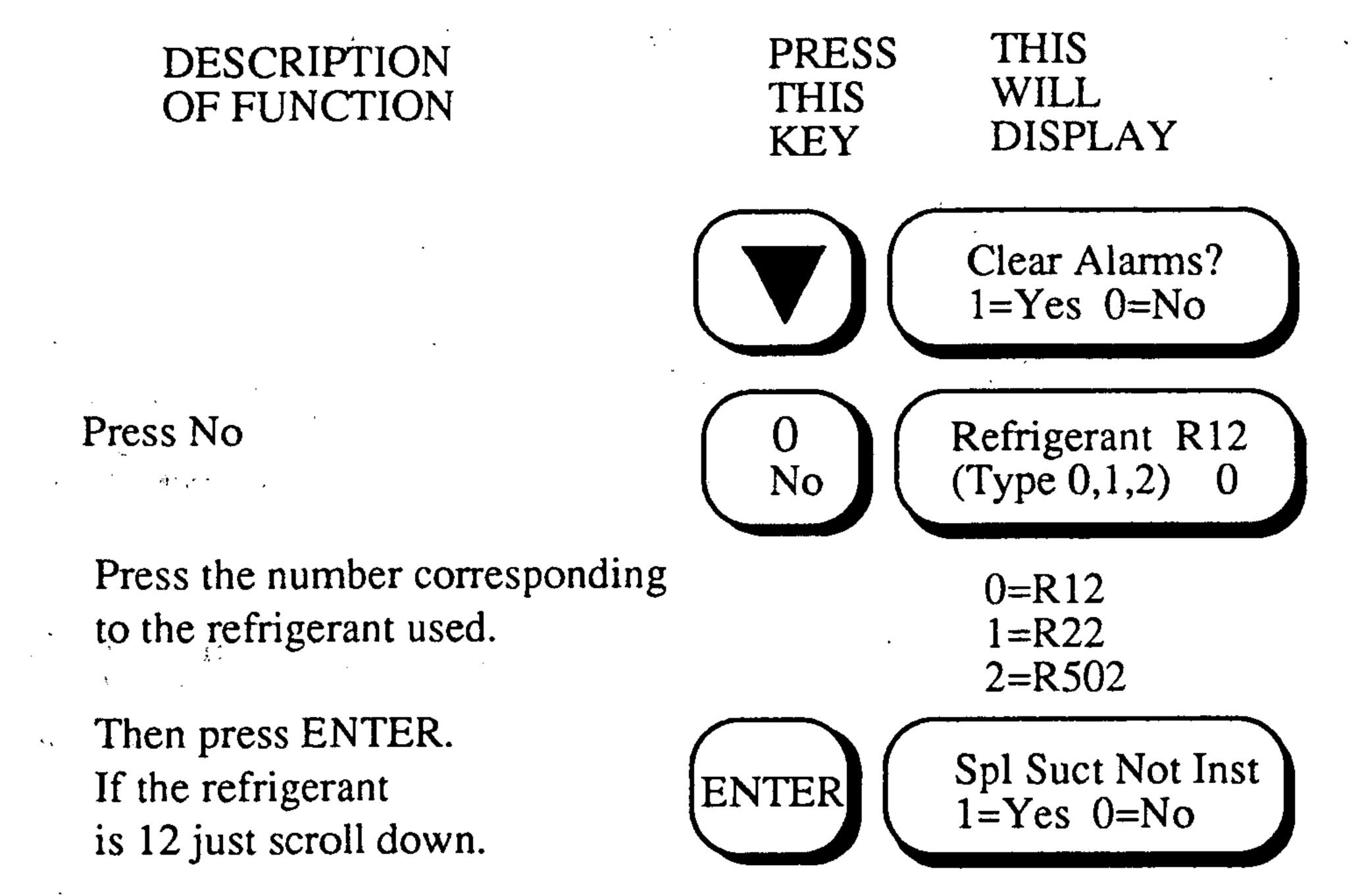
Are You Sure? 1=Yes 0=No

1 Ye Are You Sure? Alarms Cleared

Press Yes

Press Yes

Now press enter to exit the menu. This will place you at the intial display. You must enter the SYSTEM/CONFIGURATION MENU again. When you reach CLEAR MEMORY, press NO; CLEAR ALARMS, press NO. Answering NO to CLEAR ALARMS will place you at the next screen.

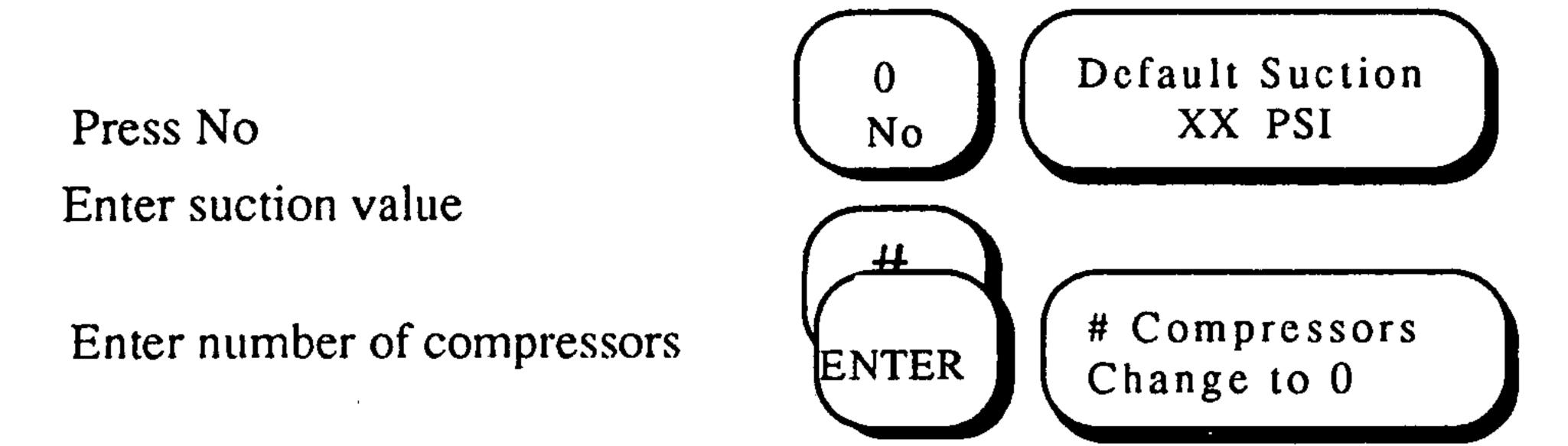


Split Suction

This option is sold separately. This screen tells you that Split Suction is not installed. Press Yes (Split Suction is NOT Installed) to get to the next screen.

If you have purchased this option and wish to reconfigure the factory setup to install the Split Suction Option, press NO.

NOTE: Answering NO when the option is not available will trigger an alarm. When installing the Split Suction Option the following screens will appear twice, first to allow you to enter values for the low side (L) and again to allow you to enter values for the high side (H).



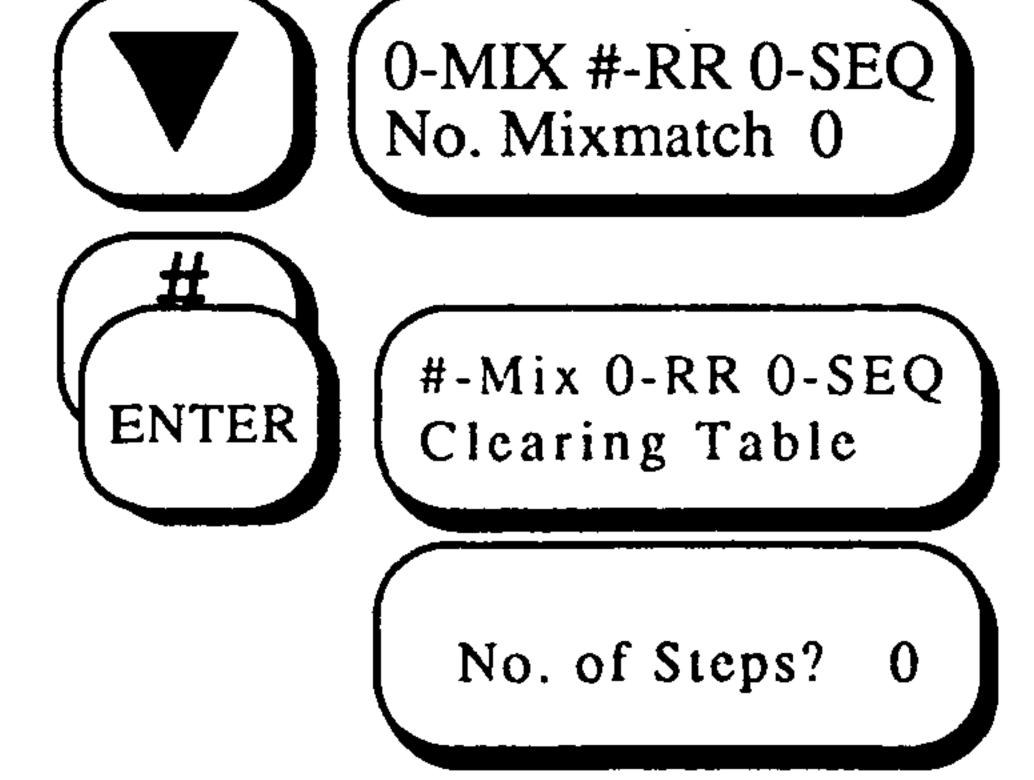
Mixmatch, Round Robin And Sequential Systems

The next step asks if Mixmatch, Round Robin or Sequential Compressor Systems are being user defined.

<u>Mixmatch</u>

To enter a
Mixmatch System
enter the number of
Mixmatch compressors.

After a 3-second delay this screen appears



From this point on in Mixmatch, direction is required from Bridgeton Engineering. Below are the steps Engineering will provide.

DESCRIPTION OF FUNCTION

PRESS THIS KEY THIS WILL DISPLAY

Enter number of steps as provided by Bridgeton Engineering.

ENTER

No. of Steps? # Clearing Table

Enter step number 01-XX as provided by Bridgeton Engineering

ENTER

Mixmatch Setup Step #01? 00

The screen will repeat until all steps have been entered



Mixmatch Setup Step #02 00

After the last step is entered, the next screen will read:



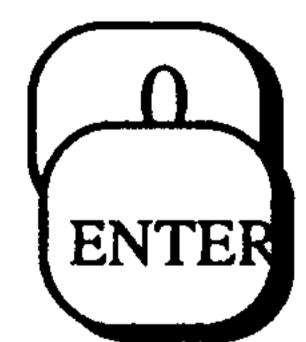
SPR Not Inst. 1=Yes 0=No

Round Robin and Sequential

Round Robin Systems even the runtime on compressors and Sequential cycles compressors.

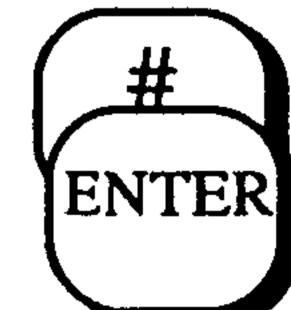
0-Mix #-RR 0-Seq No Mixmatch 0

To enter a Round Robin or Sequential System, ENTER 0 for Mixmatch compressors



0-Mix #-RR 0-SEQ No. Round Robin #

For Round Robin, enter the number of compressors on which you want even runtimes



0-Mix #-RR 0-SEQ

For Sequential, enter 0 for Round Robin



0-Mix 0-RR #-SEQ

Swing

Swing is programmed to cycle compressor #1 between the other compressors. If you install one sequential compressor and the rest round robin, you will get this screen next. Otherwise, you will go directly to the next screen.

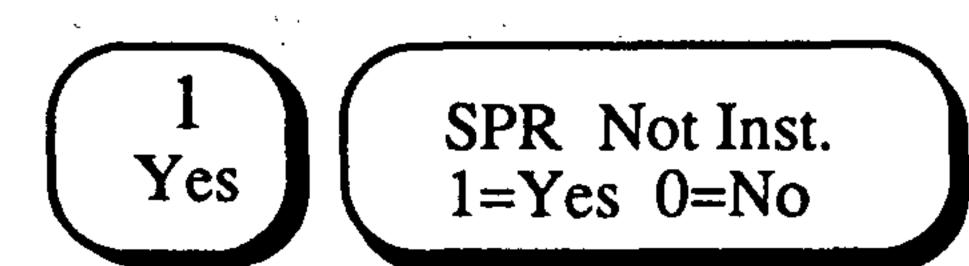
| DESCRIPTION |
|-------------|
| OF FUNCTION |

PRESS THIS
THIS WILL
KEY DISPLAY

Press the down scroll

Swing Not Inst 1=Yes 0=No

Press Yes
(answering No
installs Swing.)



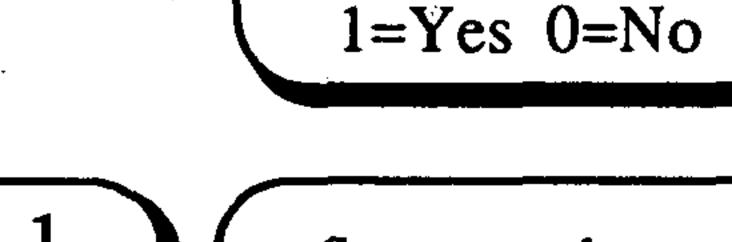
Suction Pressure Reset

This option is sold separately.

If you wish to reconfigure the Factory Setup for this option, press NO to install SPR.

If you have not purchased this option, press Yes.

EPCs are designed for Supermarket or Commercial installations. Answer appropriately.



SPR Not Inst.

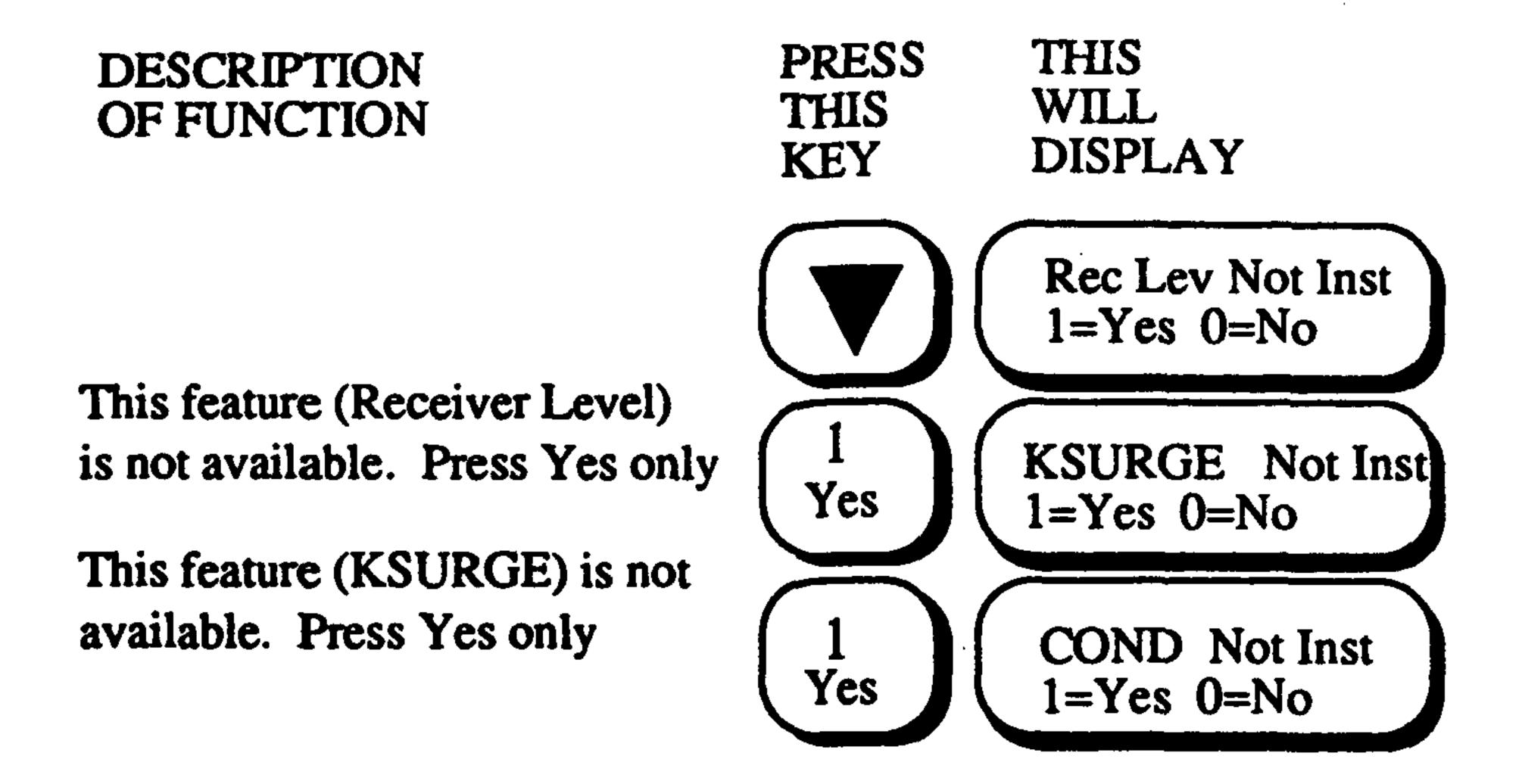


Sat #1 Not Inst 1=Yes 0=No

Satellite Option

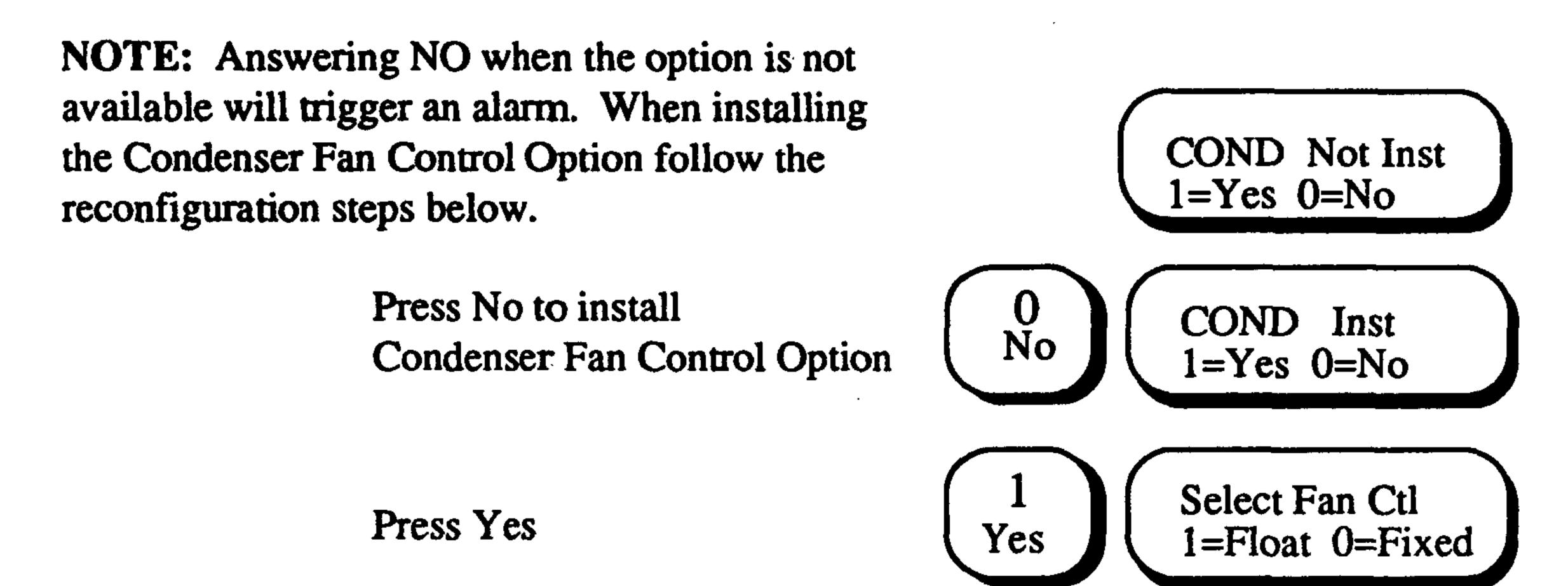
Up to 2 satellite compressors can be controlled by the EPC-2000.

| | Sat #1 Not Inst 1=Yes 0=No |
|-------------------------------|--|
| Press No to install satellite | Sat #1 Inst 1=Yes 0=No |
| Press Yes | 1 Sat #1 Diff 3 F |
| For an installed satellite, | Yes Sat #1 Diff 3 F Change to (1-3) 0 |
| temperature differential | |
| can be from 1-3° F | Sat #2 Not Inst |
| Press the down scroll | 1=Yes 0=No |
| | Sat #2 Inst |
| Repeat for second satellite | No l=Yes 0=No |
| | |
| | 1 |
| | |



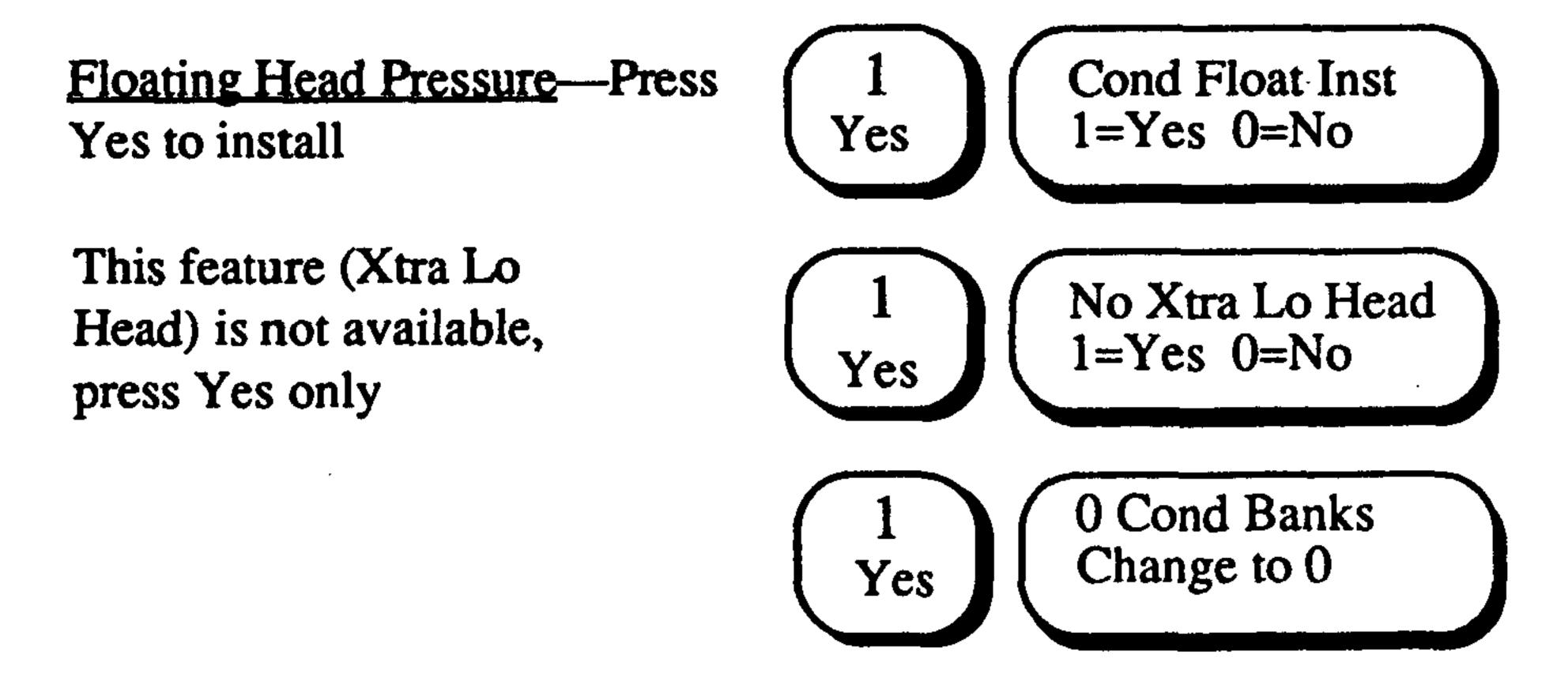
Condenser Fan Control Option

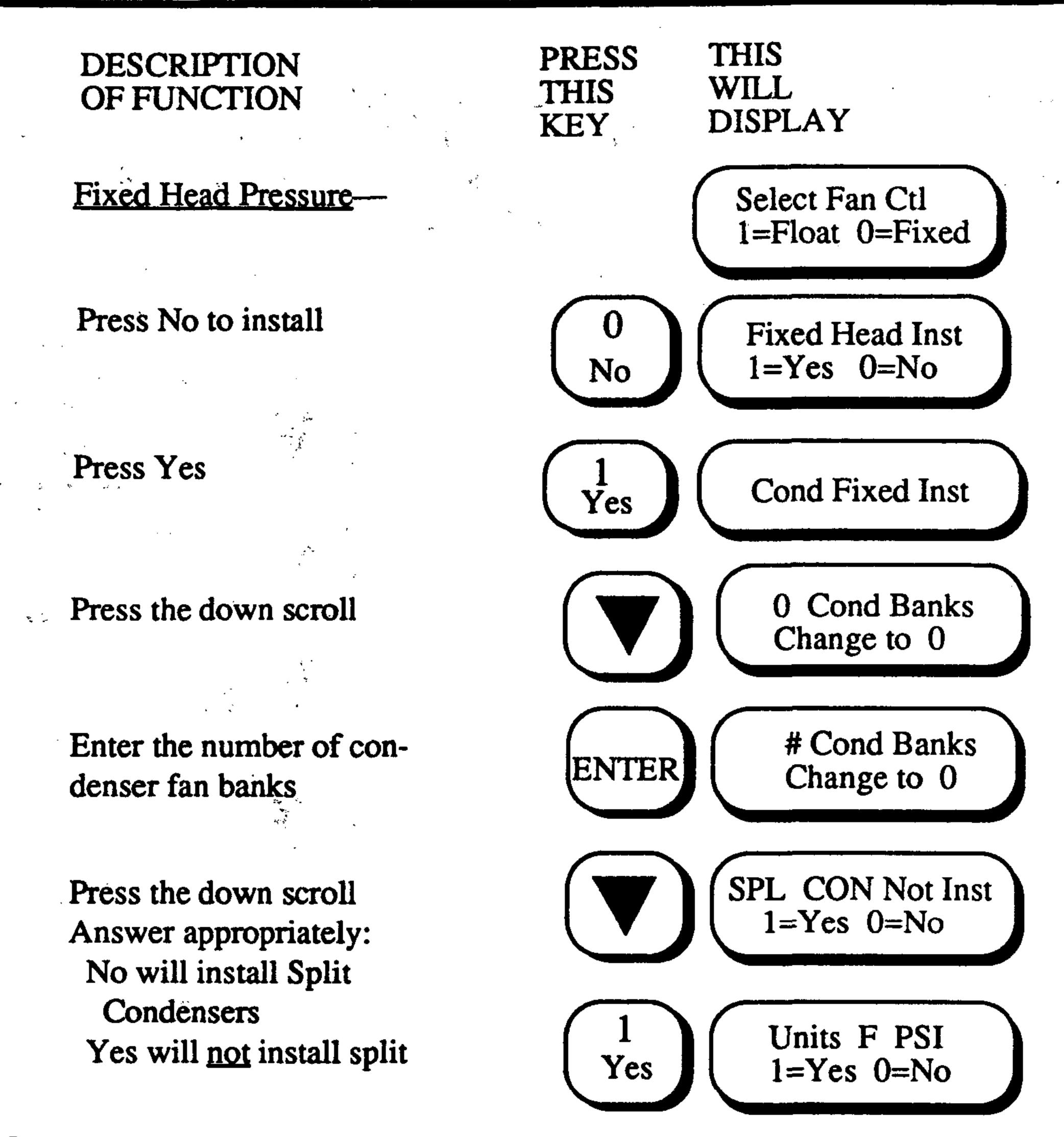
This option is sold separately. This screen tells you that Condenser Fan Control option is not installed. Press Yes (Condenser Fan Control is NOT Installed) to get to the next screen. If you have purchased this option and wish to reconfigure the Factory Setup to install the Condenser Fan Control Option, press NO.



Floating And Fixed Head Pressure

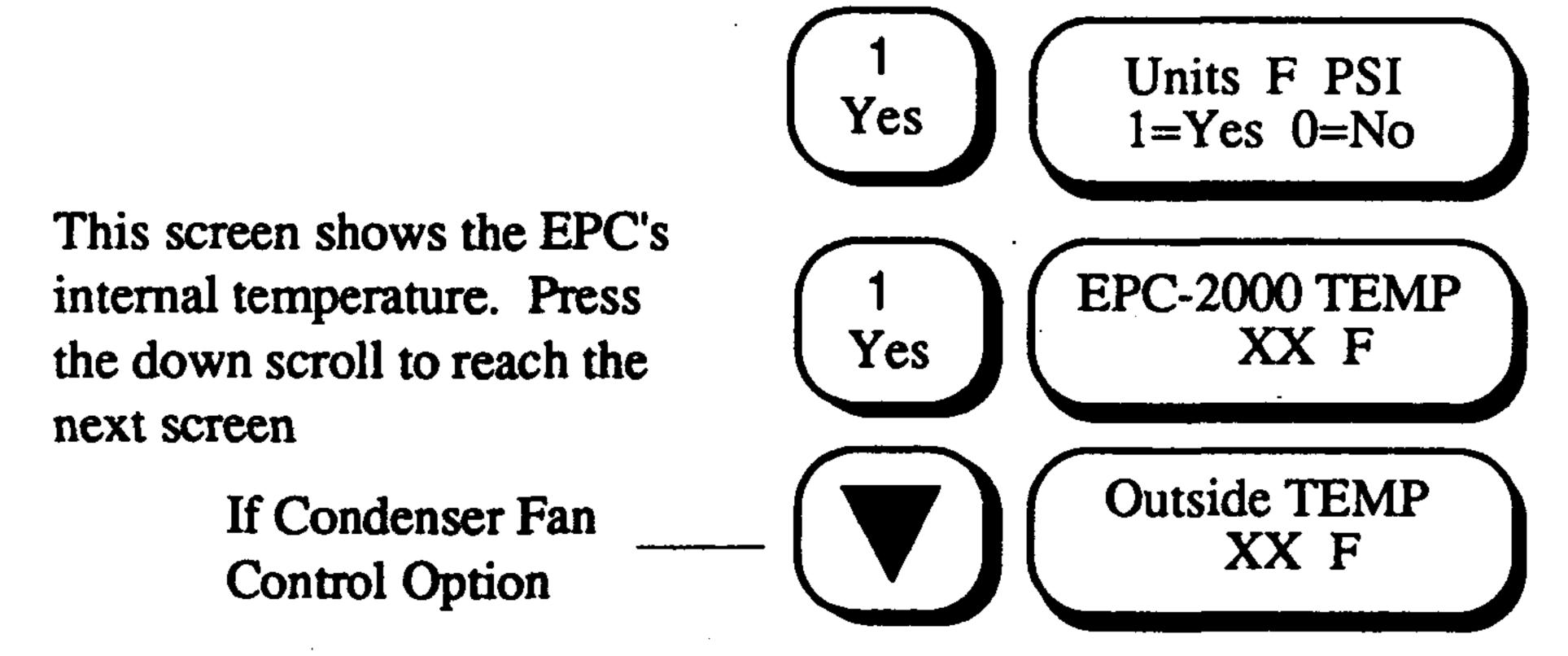
Two types of controls are available, fixed and floating head pressure. Fixed is a preset value while floating head allows the head pressure to go below the fixed head setting.





Units of Measurement

This screen allows you to select either °F or °C for temperature measurement and PSI or ATM for pressure.

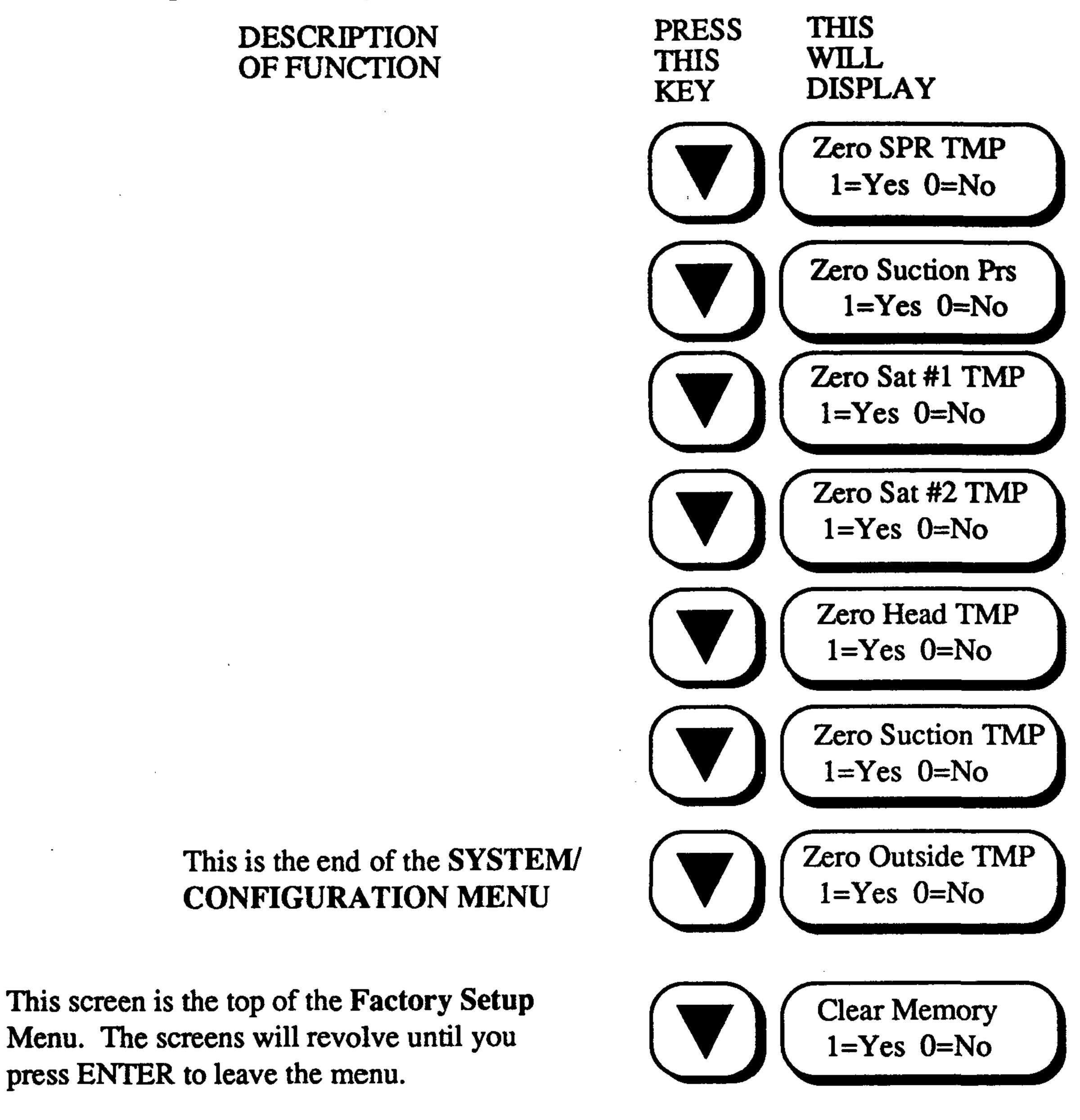


Zeroing

All inputs are zeroed before the EPC leaves the factory. When an input is zeroed, it should report a reading with more accuracy. Zeroing, however, doesn't guarantee a precise reading.

A pressure input may need zeroing after replacing a transducer in the field. It is not necessary, however, to zero a temperature input at any time, even if replacing a sensor.

The following screens allow you to zero the EPC's temperature and pressure inputs if desired. Answering YES to any of the screens below will enable you to zero that input. When the screen flashes the message ZEROING COMPLETE, press the down scroll to reach the next screen. Note 1 describes the procedure for zeroing a temperature (TMP) input and Note 2 describes the procedure for a pressure (PRS) input.



NOTES

- 1. Zeroing Temp input is not required. To zero a temperature input for calibrations a 1731 ohm resistance must be connected across the temperature input. The existing probe must be disconnected from the input during this calibration.
- 2. To zero a pressure input for calibration all rack pressure on the transducer being calibrated must be removed (0 psi the transducer). The transducer should remain connected to the input during this calibration.

CHECKOUT AND TROUBLESHOOTING PROCEDURE

This section is designed to assist servicemen in troubleshooting the EPC-2000. A step by step checkout procedure is included to isolate the cause of the malfunction.

RECORDING INFORMATION

Upon arrival at the refrigeration rack, make a record of the following information for future reference.

- A. Rack model and serial number
- B. EPC-2000 model and serial number
- C. EPC-2000 options installed on the rack

Record the following applicable settings and present readings as shown in the STATUS menu.

| psi |
|--------|
| psi |
| psi |
| psi |
| on/of |
| on/off |
| |
| |
| °F/C |
| °F/C |
| |
| |
| °F/C |
| °F/C |
| psi |
| |

If an option is not installed in the EPC-2000 control, then there will not be any display screen shown for that option.

APPARENT MALFUNCTIONS

If there are indications of recurrent problems, then proceed with this instruction and verify the complete EPC-2000 operation or identify the rack component failure.

Check the alarm log for a history of rack alarms. Note the most recent alarm entered and the time and date.

Based on your observations, proceed to Table 5-2 to determine the most likely cause. Proceed in order through the checkout procedures listed for the observation until the fault is isolated.

WARNING

Several parts of this checkout procedure have to be performed with the power applied to the rack control circuit and the EPC-2000. Use caution when probing any voltage.

NOTE: When performing continuity and resistance checks in this procedure, make sure the circuit being tested is disconnected from any other circuits or unplugged from the EPC-2000.

Compressor Control Circuit Test

By use of the MAINTENANCE menu, force ON each of the parallel compressors and Satellites (if installed) on the rack. Next, force OFF each of the compressors which was forced on in the above test.

After completing any compressor forcing function, go to the screen in the MAINTE-NANCE menu KILL FORCED COMPRESSORS? and answer YES. All compressors will turn OFF, then slowly cycle ON depending on the suction pressure requirements.

If one or more compressors do not respond then perform the following checks.

Verify that all control wiring and safety controls are correctly wired and set. Refer to Super Plus wiring diagrams Figures 2-2 and 2-3.

Compressor Will Not Turn ON

Using the MAINTENANCE menu, force ON the suspect compressor.

Using an AC voltmeter, measure the voltage from the common connection 5# or B_ terminal in the Super Plus control panel for the suspect compressor to X2 of the control circuit. Full control circuit voltage should be measured at this time, 120, 208, or 240V AC for example. (See Super Plus Wiring Diagrams.)

If the proper voltage is not measured, unplug the compressor plug assembly from the EPC-2000 relay board and check continuity with an ohmmeter between the COM and N.O. positions of the relay board plug socket. See Figure 5-1. There should be 0 ohms resistance between these contacts.

If there was continuity, next verify continuity of the compressor control plug assembly. See Figure 1-9. The compressor should be running if the above steps check OK. Recheck the control circuit and all safety controls. Retest.

If continuity does not exist use a DC voltmeter to measure voltage between G1 and PS1 on the relay board.

Use the tip of the voltmeter negative probe to scratch through the green solder mask to make good contact with G1. If the voltage reads 20 to 30V DC, proceed to measuring voltage between G1 and the particular diode associated with the relay, as given below. If no voltage is measured, go to the cable continuity check. In the event the voltage is below this value, go to the power supply test.

If the cable and power supply are satisfactory, replace the EPC processor assembly.

Measure the voltage between G1 (-) and the diode (+) for the particular relay being tested. The diodes are labeled D1 through D10. D1 through D6 correspond to compressor relays #1 through #6, respectively. D7 and D8 correspond to Satellite relays #1 and #2 respectively. D9 corresponds to the switchback relay and D10 corresponds to the alarm relay.

The + probe of the voltmeter must be placed on the diode lead nearest the edge of the board. See Figure 5-1.

NOTE: Do not short voltmeter probe between diode and adjacent resistors.

If the measured voltage is greater than 3V DC then proceed with relay board and cable continuity test. If the relay board and cable continuity check out OK, replace the EPC processor assembly. If the measured voltage is 0 to 3V DC then replace the relay board.

Compressor will not turn OFF

Using the MAINTENANCE menu, force the suspect compressor OFF.

Unplug the appropriate compressor plug assembly from the EPC-2000 relay board and check continuity with the ohmmeter between the COM and N.O. positions of the relay board plug socket. See Figure 5-1. There should be an open circuit between these contacts.

If an open circuit exists, check the compressor control plug assembly and control panel wiring for shorts. Make sure all power to the rack is turned off.

If continuity exists between COM and N.O. above, use a DC voltmeter to measure the voltage between G1 (-) and the diode (+) for the particular relay being tested above.

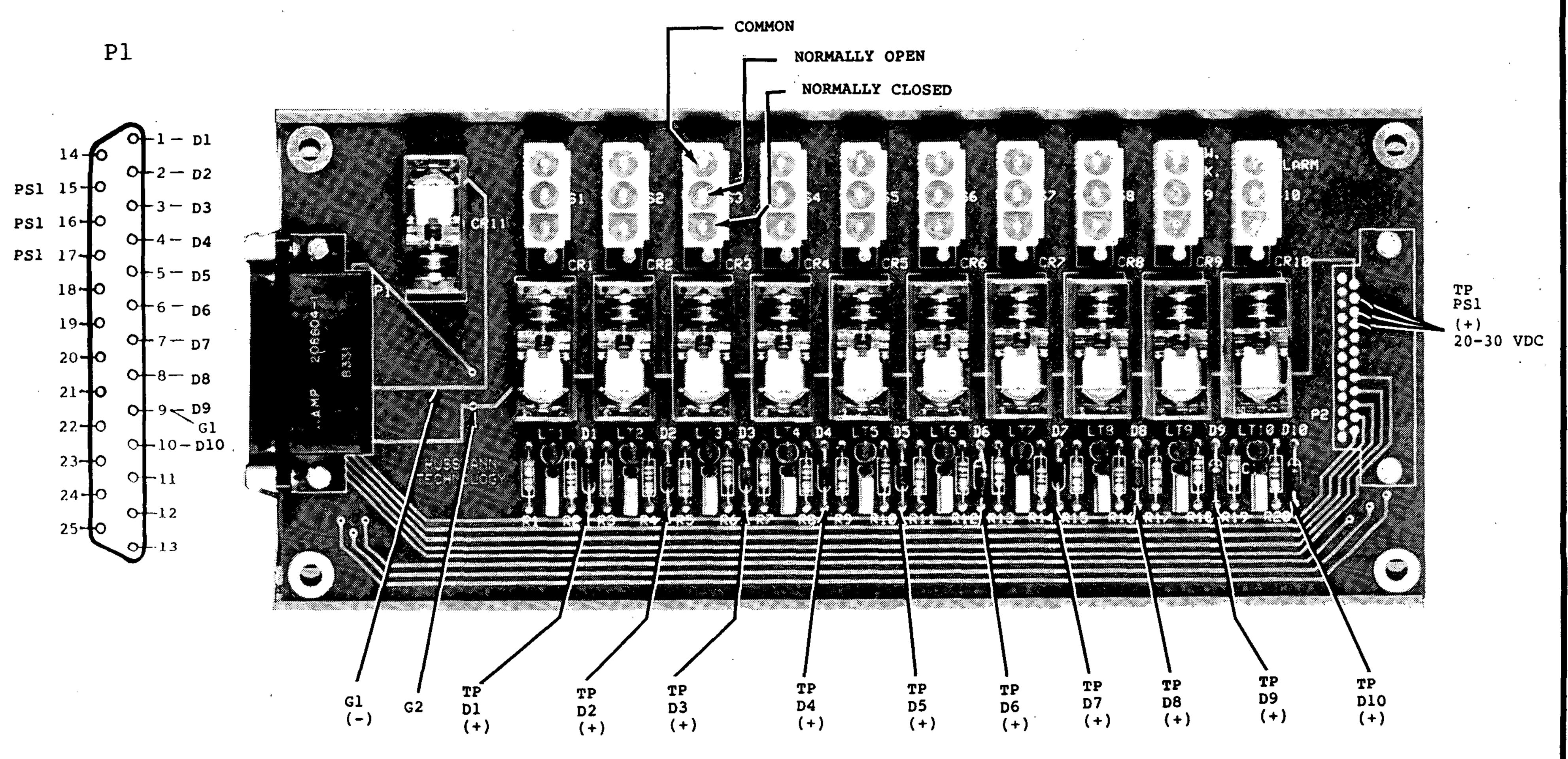


Figure 5-1. Compressor Control Relay Board

If the voltage is 20 to 30V DC, then replace the relay board.

If the voltage is 0 to 3V DC, proceed with the relay board and cable continuity test. If the relay board and cable checkout OK, replace the EPC processor assembly.

Switchback Mode Test

If the Super Plus system appears to be stuck in either the auto mode (under EPC-2000 control) or the switchback mode (under mechanical pressure control), perform the following steps.

Stuck in Automatic (EPC-2000)

Force switchback using the MAINTENANCE menu.

Using a DC voltmeter, measure the voltage between G1 (+) and G2 (-), see Figure 5-1. The voltage measured should be 20 to 30V DC. The switchback LED and relay will be OFF.

If the measured voltage is 0 - 3V DC, go to the relay board and cable continutiy tests. Replace the processor if no problem is seen with the relay board or cable.

If the voltage measured is correct above, then check for continuity thru the switchback COM and N.C. contacts of the relay board switchback socket S9. See Figure 5-1. Replace the relay board if an open is measured.

Check the switchback plug assembly, see Figure 1-11, for continuity and proper connections in the Super Plus control panel. The problem is in the control panel if no faults are located above.

Stuck in Switchback (Mechanical Pressure Controls)

Force EPC-2000 out of switchback using the MAINTENANCE menu.

Using a voltmeter, measure the voltage between G1 (+) and G2 (-). The voltage measured should be 0 to 3V DC. The switchback LED and relay should be ON. Proceed to the paragraph below if the voltage is greater than 3V DC.

Measure the continuity thru the N.C. and COM contacts of switchback socket S9. An open circuit should be measured.

Carefully check the switchback plug assembly, see Figure 1-11, for continuity and proper connections in the Super Plus control panel. The problem exists in the control panel if no faults have been located above.

If the measured voltage is 20 to 30V DC, go to the relay board and cable continuity tests. Replace the processor if no problem is seen with the relay board or cable.

Alarm Relay Test

To check the EPC-2000 alarm relay, a comparison between the LCD display and the relay board alarm relay status must be made. To cause the EPC-2000 to signal an alarm, unplug the terminal board cable assembly from the processor. Within 18 seconds the EPC-2000 will signal terminal board cable failure alarm and cause switchback. Complete the following steps for an observed EPC-2000 alarm failure.

EPC-2000 Alarm Relay Will Not Signal Rack Alarm

Observe that the EPC is signaling alarm (flashing the backlight and the beeper is sounding as described in Section 3 of this manual.)

If the alarm relay LED indicator is OFF, proceed with the following continuity check, otherwise do the next check.

Using an ohmmeter, verify that there is an open circuit between the COM and N.O. contacts of relay socket S10. If an open was measured, then there is a wiring problem in the Super Plus panel control circuits preventing the signaling of the rack alarm.

If continuity exists, use a DC Voltmeter to measure voltage between PS1 (-) and D10 (+). If the measured voltage is 20 to 30V DC then replace the relay board.

If the measured voltage is 0 - 3V DC, conduct the relay board continuity test and verify that D10 is not shorted to G1 or any other pin on plug P1. Replace the relay board if found shorted.

Conduct the cable continuity test. Replace the cable if found faulty.

If the above steps have not located the problem, replace the processor.

Alarm Relay Stuck in Alarm

Verify that the EPC-2000 is not signaling an alarm.

Check for continuity between the N.O. and COM pins of alarm plug S10. If the resistance is 0.1 ohms or less, check the alarm circuit plug assembly and control circuit wiring. The problem exists in the panel wiring, not the EPC-2000.

Using a DC voltmeter, measure voltage from G1 (-) to D10 (+). If the voltage is 0 - 3V DC, replace the relay board. If the measured voltage is 20 - 30V DC, conduct the relay board continuity test and verify that diode D10 has continuity through to plug P1 pin 10. Replace the relay board, if a fault is found.

Conduct the 25 pin cable continuity check for the relay board cable. Replace the cable if the fault is located. Replace the processor if a fault is not found.

Power Supply Test

The EPC-2000 is supplied with power by a multi-tap primary transformer. The primary taps are: 120/208/240V AC with a secondary output of 24V AC at full load. Acceptable secondary voltage limit is 21 to 30V AC.

Using an AC voltmeter, verify the power transformer primary and secondary voltages. Replace the transformer if voltages measured are outside the specified range. If primary voltage is 0V AC, check panel fuse (F10) and replace with similar type rating if blown.

Unplug the 24V AC power plug from the processor and verify the secondary voltages across pins 1 and 3. If voltage is less than 21V AC, replace the power plug assembly. If the voltage is within the specified range but the EPC fails to operate when the 24V AC power plug is connected, replace the EPC processor assembly. Good continuity from pin 2 to ground (panel or box assembly liner) must exist.

Suction Pressure Transducer And Cable Test

The suction pressure transducer used by the EPC-2000 is a 0-100 psi sealed part. See Figure 1-7. The output voltage range is 1 to 6V DC maximum.

Using a DC voltmeter, place the positive probe on +15V and the negative probe on COM-MON of the suction pressure terminals on the input terminal board. See Figure 5-2. If the voltage is greater than 15.25V DC, replace the processor. If the voltage measured is less than 14.5V DC, go to the input terminal board and cable continuity tests. Replace the processor if no faults are found in continuity checks.

If the transducer is operating properly, measure the voltage from IN to COMMON. The positive probe should be on IN. The measured voltage will be proportional to the rack suction pressure. To determine the rack suction pressure, use the following equation.

Using a gage manifold, measure the rack suction pressure.

If the EPC-2000 readout does not match gage pressure, then compare the calculated suction pressure to gage pressure. If the two pressures are equal, then conduct the input terminal board and cable assembly continuity test. Replace the processor if the problem is not found in the input terminal board or cable assembly.

If the display matches the calculated suction pressure but is not within 2 psi of gage, replace the transducer.

Temperature Sensor Checkout

The same temperature sensor (Figure 1-6) is used for all EPC-2000 temperature inputs. Testing and verification of all sensors will be identical except for the location of the sensor connection on the terminal board.

General Check

The most fundamental checkout of the temperature sensor is to place an accurately calibrated thermometer in the airstream near the sensor bulb and make a direct comparison between the reading of the thermometer and the reading on the EPC-2000.

If the readings are within 3 degrees, the sensor and other components are probably OK. If the readings are unacceptable, then the following items need to be checked to find the problem.

Sensor Mounting

Check to see that the entire sensor is in the air stream. Clamping the sensor to the metal wall of a flue can allow the metal wall temperature to adversely affect the temperature reading.

For cases with single air curtain passages, this has not been a problem. However, clamping the sensor onto the sheet metal divider between two-temperature air curtains can affect the temperature of the sensor. Make sure the entire sensor is within and sensing the air stream you want to measure.

Resistance Check

Remove the EPC-2000 temperature sensor cable from the input terminal board in the machine room. Using an accurate ohmmeter, measure the resistance of the sensor with the cable leads removed from the input terminal board. Polarity of the ohmmeter leads will not change the measurement.

Compare the ohmmeter reading to Table 5-1 below, and find an equivalent temperature value. If the resistance equivalent temperature is more than 3 degrees from the actual thermometer measurements, check the sensor and cable installation. Replace the sensor if installation is found to be correct. If the problem still exists, check input terminal board and cable continuity check section.

If the problem is not found in the above steps, replace the processor.

Table 5-1 EPC-2000 Probe Checkout Table

| Temperature | Resistance | Temperature | Resistance | Temperature | Resistance |
|-----------------------|--------------|-------------|--------------|-------------|--------------|
| • F | Ohms | °F | Ohms | • F | Ohms |
| . 46 | 1 5 9 4 | • | 1750 | 50 | 1027 |
| -40 • 20 | 1584 1588 | 5 6 · | 1750 | 50 50 | 1927 |
| ` -39 | | 7 | 1754 | 51 - | 1931 |
| -38 37 | 1591 1505 | , e | 1758 | 52 53 | 1935 |
| -37 26 | 1595 | 9 | 1761 | 53 54 | 1939 |
| -36 | 1598 | ÷ | 1765 | 54 | 1943 |
| -35 | 1602 | 10 | 1769 | 55 | 1947 |
| -34 | 1606 | 11 | 1773 | 56 | 1951 |
| -33 | 1609 | 12 | 1777 | 57 | 1955 |
| -32 | 1613 | 13 | 1781 | 58 | 19 59 |
| -31 | 1616 | 14 | 1784 | 59 | 1963 |
| -30 | 1620 | 15 | 1788 | 60 | 1967 |
| -29 | 1624 | 16 | 1792 | 61 | 1971 |
| -28 | 1627 | 17 | 1796 | 62 | 1975 |
| -27 | 1631 | 18 | 1800 | 63 | 1980 |
| -26 | 1635 | 19 | 1804 | 64 | 1984 |
| -25 | 1638 | 20 | 1808 | 65 | 1988 |
| -24 | 1642 | 21 | 1811 | 66 | 1992 |
| -23 | 1646 | 22 | 1815 | 67 | 1996 |
| -22 | 1649 | 23 | 1819 | 68 | 2000 |
| - 21 | 1653 | 24 | 1823 | 69 | 2004 |
| -20 | 1657 | 25 | 1827 | 70 | 2008 |
| -19 | 1660 | 26 | 1831 | 71 | 2012 |
| -18 | 1664 | 27 | 1835 | 72 | 2017 |
| -17 | 1668 | 28 | 1839 | 73 | 2017 |
| -16 | 1671 | 29 | 1843 | 74 | 2025 |
| 16 | 1675 | 30 | 1047 | 26 | 2022 |
| -1 5 | 1679 | 31 | 1847 | 75 26 | 2029 |
| -14 12 | 1682 | 31 32 | 1851 | 76 77 | 2034 |
| -13 -12 | 1686 | 32 33 | 1855 | 77 70 | 2038 |
| -12 -11 | 1690 | 34 | 1859 1863 | 78 79 | 2042 2046 |
| •• | 1604 | 25 | 1066 | 00 | 2072 |
| -10 | 1694 | 35 36 | 1866 | 80 | 2050 |
| - 9 | 1697 | 36 33 | 1870 | | |
| - 8 - 1 | 1701 | 37 | 1874 | | |
| - 7 - 6 | 1705 1708 | 38 39 | 1878 1882 | | |
| _ | | | | | |
| - 5 | 1712 1716 | 40 41 | 1886 | | |
| - 4 | 1716 | 41 | 1890 | | |
| - 3 | 1720 | 42 43 | 1894 | | |
| - 2 | 1724 | 43 | 1898 | | |
| - 1 | 1727 | 44 | 1902 | | |
| 0 | 1731 | 45 | 1906 | | |
| 1 | 1735 | 46 | 1910 | | |
| 2 | 1738 | 47 | 1914 | | |
| 3 | 1742 | 48 | 1918 | | |
| 4 | 1746 | 49 | 1922 | | |

Koolgas Relay And Heat Reclaim Relay Input Tests Koolgas Relay

To check the operation of the Koolgas status input, place a system in Koolgas defrost. Observe the STATUS menu. The defrost screen should show ON. Using a DC voltmeter, measure the voltage between the system's defrost input terminals on the input terminal board. The voltage measured should be 0 to 0.1V DC. If the voltage is greater than this value, check the KR relay in the control panel. Insure the proper terminals are connected.

check the KR relay in the control panel. Insure the proper terminals are connected.

If no voltage was measured in the above step, and the STATUS menu continually shows OFF, go to the input terminal board and cable continuity tests. Replace the processor if the problem is not found.

Next, take the system out of Koolgas defrost. The STATUS menu screen should now read OFF. Again using a DC voltmeter, measure voltage across the defrost input terminals on the input terminal board. The voltage measured should be 13.8 to 14.5V DC.

If the STATUS screen continues to show ON and the measured voltage is 0.1V DC or less when a system is not in defrost, check the KR relay in the control panel to insure the proper terminals are connected and that the KR relay is de-energized.

If the STATUS menu screen shows defrost ON when no system is in Koolgas defrost and the measured voltage across the defrost input is 13.8 to 14.5V DC, replace the EPC-2000 processor assembly.

Heat Reclaim Relay

To check the operation of the heat reclaim status input, conduct the same test steps as in the Koolgas input test. Substitute the heat reclaim terminals for Koolgas terminals. The voltage specifications still apply.

Continuity Checks

Relay Board

This test checks for proper connection of the 25 pin plug assembly P1 to the appropriate relay drive circuits.

Using an ohmmeter, verify continuity of the labeled test points on the PC board to their corresponding positions on P1. The resistance should be 0 to 0.1 ohms maximum. No adjacent pins on P1 should be shorted together. Refer to Figure 5-1 for location of testpoints on the board and their corresponding pin locations on plug 1. Replace the relay board if a problem is seen.

Input Terminal Board

Using an ohmmeter, check the continuity between terminal blocks P2, P3 and P4 to the 25 pin plug P1. Less than 0.1 ohms resistance should be measured between each terminal block and its corresponding P1 pin location. Replace input terminal board if fault is found. Refer to Figure 5-2.

<u>Cable</u>

To check the continuity of the 25 pin relay and input terminal board cable assemblies, each pin must be checked for connection thru to the other plug. No more than 0.1 ohms resistance should be measured from one plug pin to the other end. If resistance is greater than 0.1 ohm, then replace the cable. Check for adjacent pins being shorted together. If shorts are measured, replace the cable.

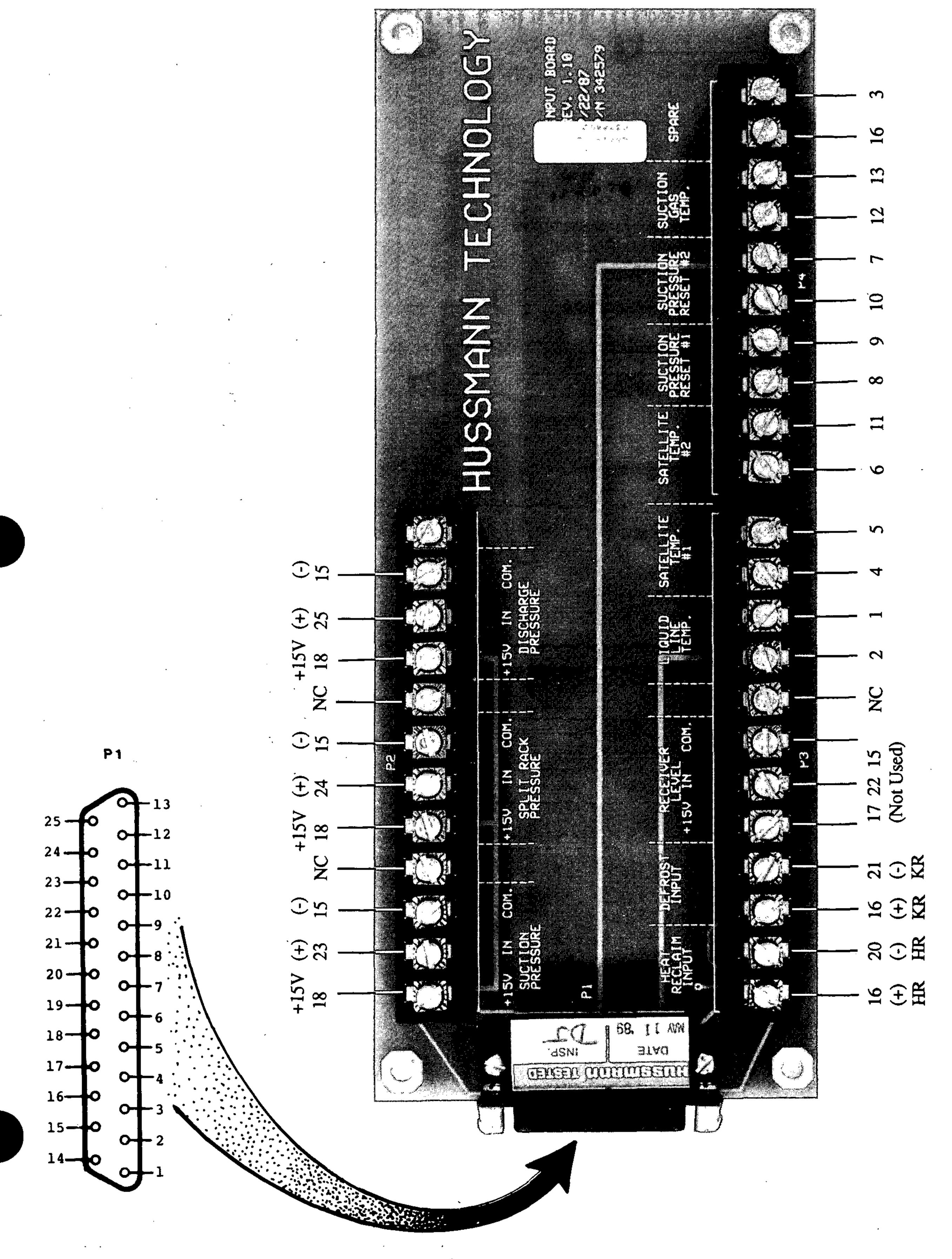


Figure 5-2. Input Terminal board

TABLE 5-2. TROUBLESHOOTING CHECKOUT PROCEDURES


| OBSERVATION | PROBABLE CAUSE | CHECKOUT PROCEDURE | PAGE 5- |
|--|---|---|---------------|
| Display Blank | -Power Failure -Fuse Failure -Transformer Failure -24V AC Power Cable -Processor Failure | -Power Supply Test -Power Supply Test -Power Supply Test -Power Supply Test | 7 7 7 7 |
| Displayed Suction Pressure does not match gauge | -Transducer Failure -Input Terminal Board Failure -Terminal Board Cable Failure -Processor Failure | Cable Continuity Check | 7 10 10 |
| Case Temperature does not match displayed temperature | -Temperature Sensor Failure -Input Terminal Board Failure -Terminal Board Cable Failure -Processor Failure | α 11 α α 1 | 8 10 10 |
| EPC-2000 "Compressors ON" indication does not match actual compressor status | -Panel Wiring -Relay Board Failure -Relay Board Cable Failure -Processor Failure | -Compressor Control Circuit Test, "Compressor Will Not Turn ON" steps -Compressor Control Circuit Test, "Compressor Will Not Turn OFF" steps, Relay Board Continuity Check -Cable Continuity Check | 2, 10 |
| Actual compressor status does not match relay board "LED" indication | -Panel Wiring -Relay Board Failure | -Compressor Control Circuit Test, "Compressor Will Not Turn ON" steps -Relay Board Continuity Test | 2 |
| Actual defrost status does not match EPC-2000 indication | -Panel Wiring/Terminal Board -Input Terminal Board Failure -Terminal Board Cable Failure -Processor Failure | -Cable Continuity Check | 9 10 10 |

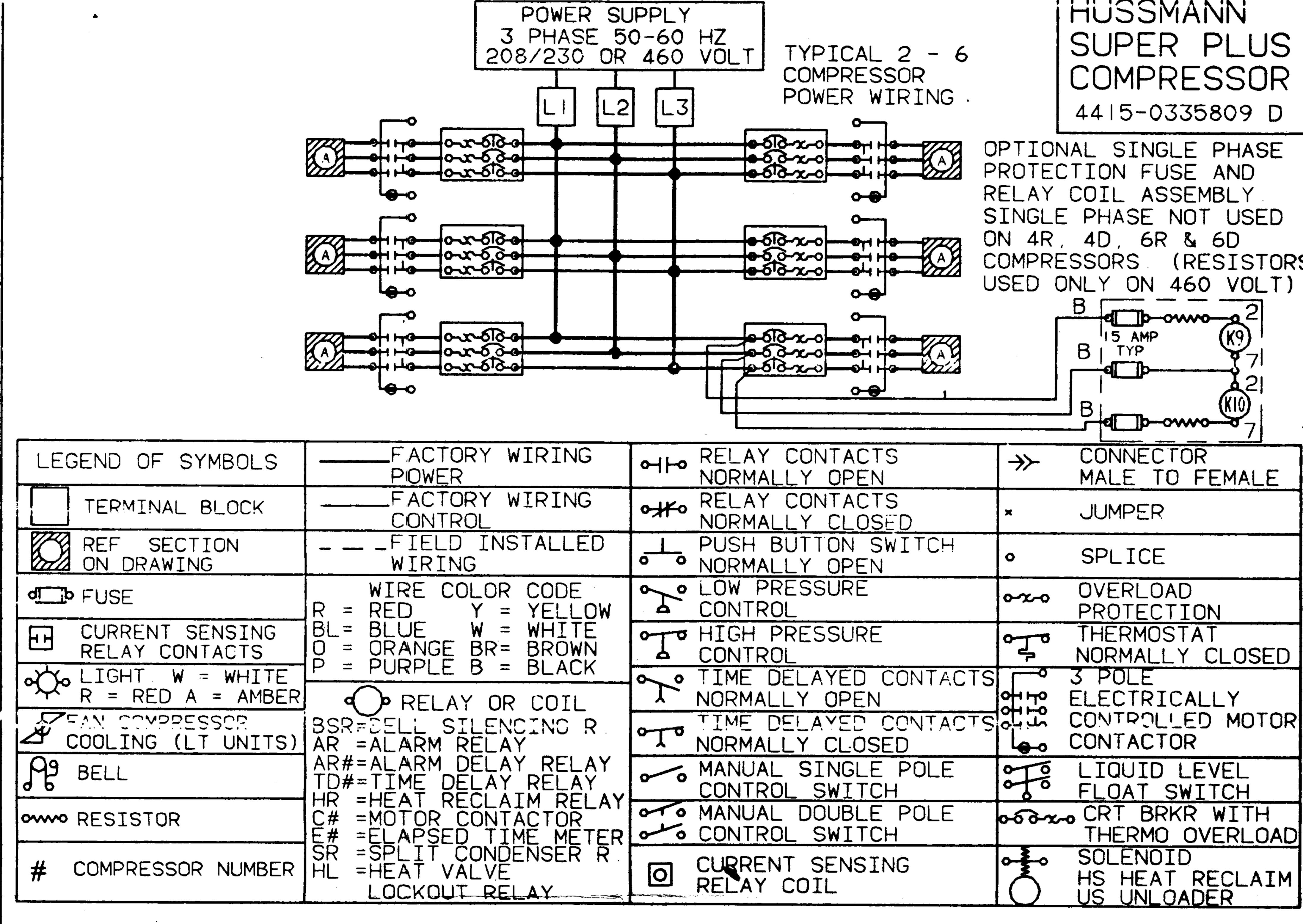
TABLE 5-2. TROUBLESHOOTING CHECKOUT PROCEDURES (cont.)

| OBSERVATION | PROBABLE CAUSE | CHECKOUT PROCEDURE | PAGE 5- |
|---|--|---|------------------|
| Actual heat reclaim status does not match EPC-2000 indication | -Panel Wiring/Terminal Board -Terminal Board Cable Failure -Input Terminal Board Failure | | 10 10 10 |
| Rack in alarm EPC-2000 not in alarm | -Panel Wiring -Relay Board Failure -Relay Board Cable Failure -Processor Failure | -Compressor Control Circuit, first step -Alarm Relay Stuck in Alarm, Relay Board Continuity -Cable Continuity Check | 2 6, 10 10 |
| EPC-2000 in alarm Rack not in alarm | -Panel Wiring -Relay Board Failure -Relay Board Cable Failure -Processor Failure | -Compressor Control Circuit, first step -Alarm Relay Will Not Signal Alarm, Relay Board Continuity Check -Cable Continuity Check | 2 6, 10 |
| Rack and EPC-2000 in alarm, but alarm will not reset | -Panel Wiring -Relay Board Failure -Relay Board Cable Failure -Processor Failure | -Compressor Control Circuit, first step -Alarm Relay Stuck In Alarm, Relay Board Continuity Check -Cable Continuity Check | 2 6, 10 10 |
| EPC-2000 in switchback Rack not in switchback | -Panel Wiring/TDU -Relay Board Failure -Relay Board Cable Failure -Processor Failure | -Compressor Control Circuit Test, first step -Switchback Mode Test, "Stuck in Automatic" steps, Relay Board Continuity Check -Cable Continuity Check | 2 5, 10 10 |
| EPC-2000 not in swichback Rack in switchback | -Panel Wiring/TDU -Relay Board Failure -Relay Board Cable Failure -Processor Failure | -Compressor Control Circuit Test, first step -Switchback Mode Test, "Stuck in Switchback" steps, Relay Board Continuity Check -Cable Continuity Check | 2 5, 10 10 |

REPLACEMENT PARTS LIST

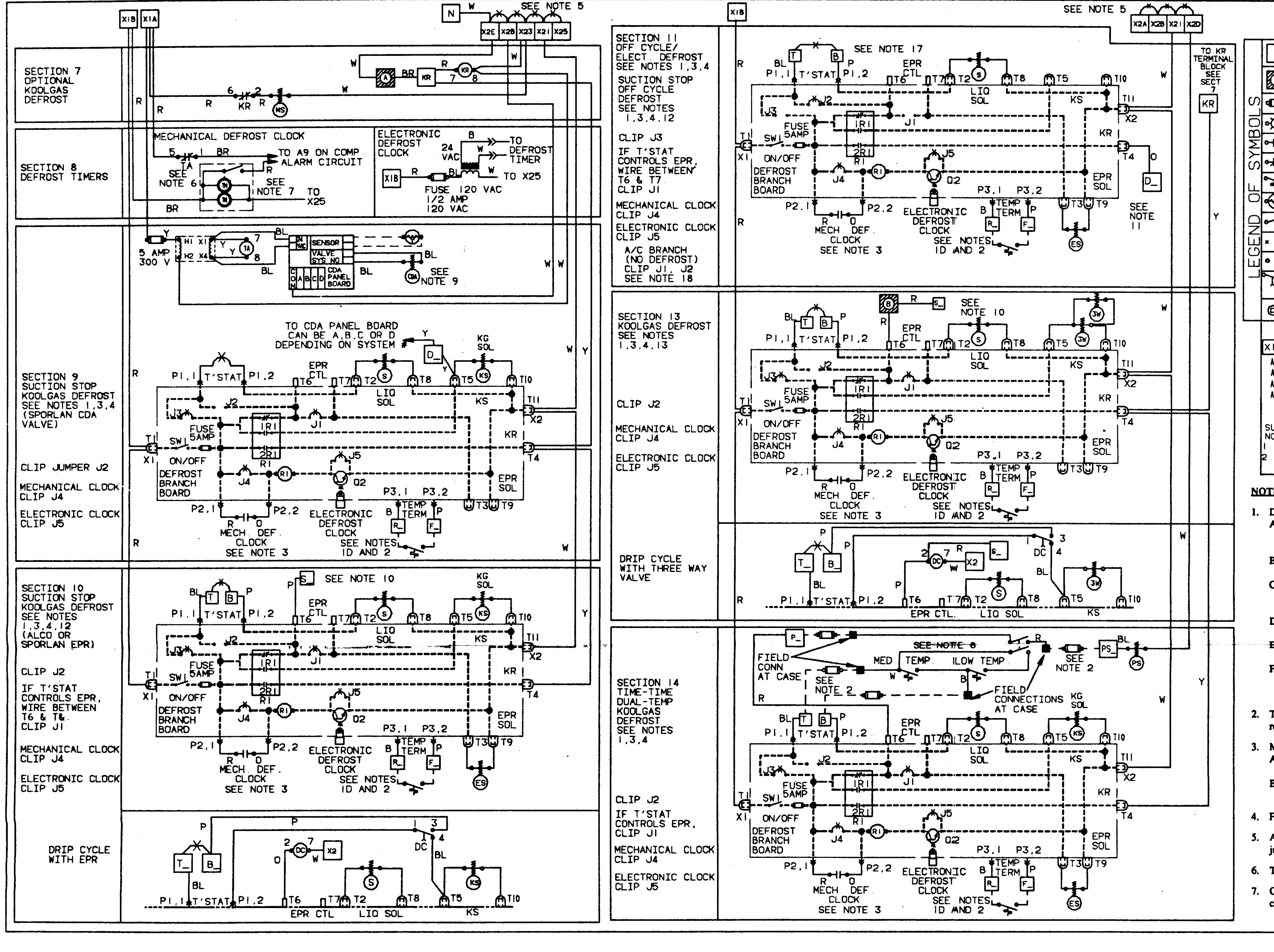
| ITEM | PART NUMBER | DESCRIPTION |
|------|-------------|--------------------------------|
| 1 | 0340226 | EPC-20002 Compressor Processor |
| | | EPC-20003 Compressor Processor |
| | | EPC-20004 Compressor Processor |
| | | EPC-20005 Compressor Processor |
| | | EPC-20006 Compressor Processor |
| 2 | 0334493 | Sat Probe EPC-2000 |
| | | SPR Probe EPC-2000 |
| | | Liquid Line Probe EPC-2000 |
| 3 | 0334482 | Relay Board |
| 4 | 0334492 | Input Terminal Board Assembly |
| 5 | 0334267 | 25 Pin Relay Board Cable |
| 6 | 0335183 | Transducer |
| 7 | 0332714 | Transformer |
| 8 | 0335836 | 25 Pin Terminal Board Cable |
| 9 | 0334199 | 24V AC Cable |
| 10 | 0334198 | Switchback Plug Assembly |
| 11 | 0334196 | Alarm Plug Assembly |
| 12 | 0334197 | Compressor Plug Assembly |





- Terminals 34, 35 and 36 are provided for use with Remote Alarm Systems. Contacts between Terminals 34 and 35 (Hussmann Remote Alarm) open on alarm. Contacts between Terminals 34 and 36 close on alarm. See wiring diagram included with Remote Alarm System for proper connections. Only one alarm system can connect to these terminals. Maximum load 10 amps.
- The remote alarm bell and light are field wired between Terminals 31, 32 and 33. The Alarm Bell connected between Terminals 32 and 33 must be UL listed. The bell must be a Jenkins Model No.1005 or equivalent. Maximum load on terminals 32 and 33 is 125 VA 125 VAC.
- . HR coil for HR Contacts located in Heat Reclaim Section of diagram. Low Liquid Level Alarm: Alarm set point 10% receiver level during Heat Reclaim, 30% at all other times. (HR Relay used only when Heat Reclaim is used with Low Liquid Level Alarm.)
- 4. Alarm time delays are shown for a 6 compressor unit. (One alarm delay for each compressor plus AD9 delay.)
- Current Sensing Relay-Sensor will be positioned to sense the current flow of the L1 Line to the compressor. The contacts are wired into the control circuits as shown. On 460 volt units the lead must be looped through the Relay 2 times. Current Sensing Relays are options.
- 6. For Remote Satellite with Alarm connections, wire between Y1 and Y2.
- 7. A. For Satellites with Koolgas Defrost connect [SAT] to S_ Terminal on corresponding Satellite Defrost Circuit.
- B. For Satellites with Off-Time Defrost, connect [SAT] to T_ Terminal (for high end) or to B_ Terminal (for low end) on corresponding defrost circuit.
- 8. For Copeland Sentronic Oil Failure Control see Detail Block E. CSR Relay required only when Current Sensing Relay is used with Sentronic.
- 9. Terminal X1B provided for Defrost Control Circuit connection.
- 10. When not using Single Phase Protector, wire the Blue wire from X1 and Orange wire from X1A directly to circuit breaker.

- 12. 4# Terminal required only for compressors with Solid State Protection, see Detail Block B.
- 13. When 2 High Suction Pressure Controls are used, wire in parallel.
- 14. Wire 24 volt secondary to the three pin power input plug. Connect the Red and Black leads of the cable to transformer secondary terminals. Using a Crimp Stakeon, screw the drain wire to the liner near the
- 15. When the rack is equipped with Koolgas Defrost Systems, using Belden 8760 cable, connect one end to KR Relay Terminals 5 and 3. Connect the other ends to the "Defrost" screw terminals of the EPC Terminal Board. Connect the drain wire to the liner at the Terminal Board.
- 16. When the rack is equipped with Heat Reclaim, using Belden 8760 cable, connect one end to HR Reclaim Terminals 4 and 6. Connect the other ends to the "Heat Reclaim" Terminals on the EPC-2000 Terminal Board. Screw the drain wire to the liner at the Terminal Board.
- 17. EPC-2000 Compressor Alarm and Switchback Control Circuit Connections are made using cable assemblies. These cables are labelled 1 through 10 respectively. The plug end of the cable inserts into the EPC-2000 Relay Board. The other end to the appropriate Control Circuit Branch wiring.
- 18. TDSP is the Time Delay Compressor Split Relay for when the rack goes into Switchback to prevent all the compressors from coming on at once. Wire TDSP contacts 4 and 3 between the second and third compressors on racks with 3 and 4 compressors, or between the third and fourth compressors on racks with 5 and 6 compressors. No TDSP is used for 2 compressor racks. TDSP is not used if individual time delays are wired in the Switchback circuit as shown in Detail Block C.
- 19. All relays shown in non-energized position.
- 20. For Split Suction Header Racks which have 2 EPC-2000s installed, connect the KR and HR Relay Contacts per note 15 and 16 to the EPC-2000 controlling the left side of the Suction Header. Do not connect any cables to the Terminal Board Heat Reclaim or Defrost Terminals of




FACTORY WIRING REF. SECTION ON DRAWING WIRE COLOR CODE (KOOLGAS (OFFTIME RACK WITH FLOODED SUBCOOLER WIRING P SEE SUBCOOLER WHEN MORE THAN ONE EPR VALVE IS USED TO CONTROL SUBCOOLER BRANCH, WIRE IN PARALLEL SET OUTSIDE DIAL SETTING 10 DEGREES ABOVE THE DESIGN SUBCOOLED LIQUID TEMPERATURE. SET INNER DIAL WITHIN CASING (DIFFERENTIAL) FOR APPROX. 10 DEGREES.

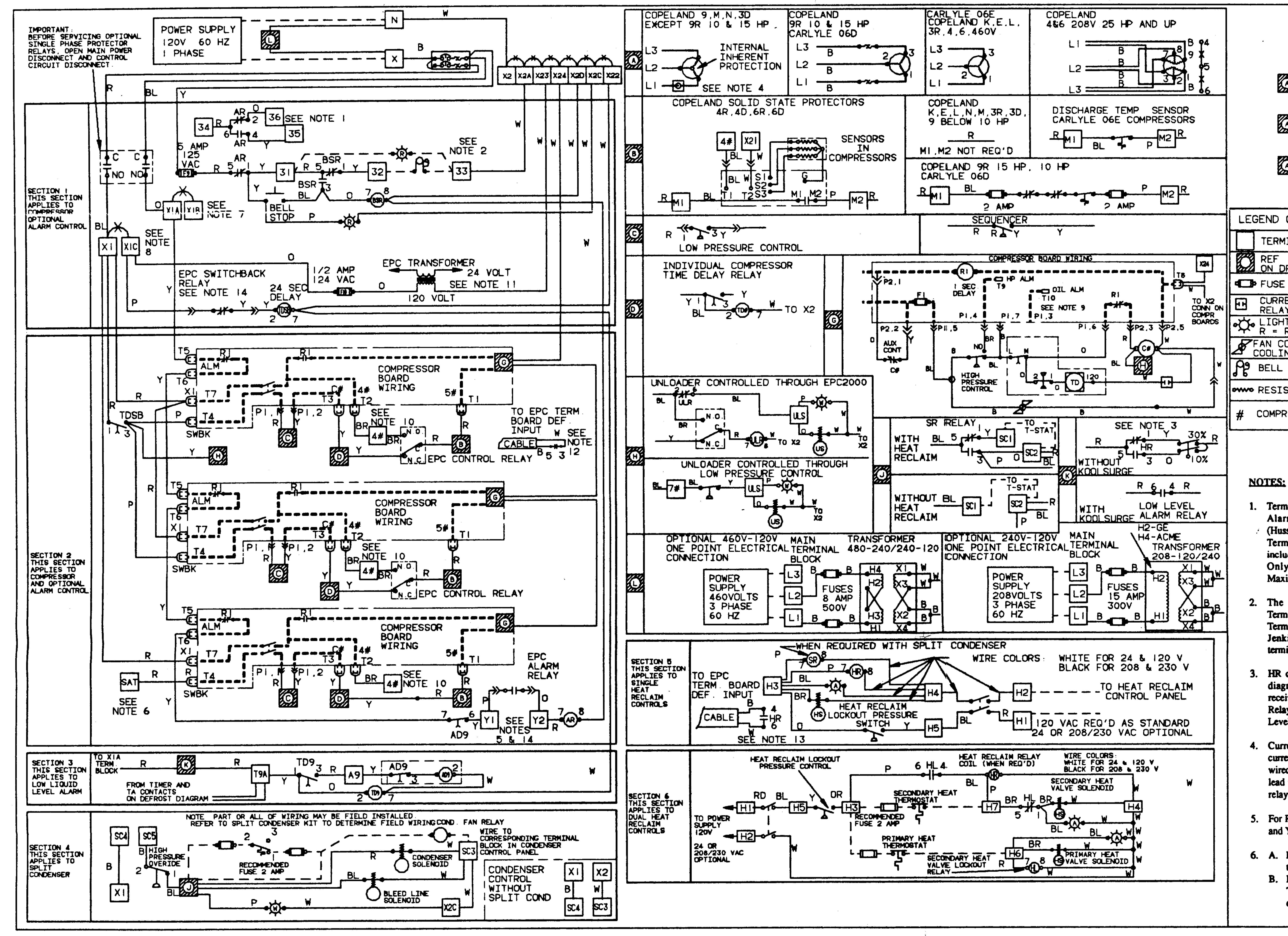
HUSSMANN SUPER PLUS DEFROST & SUBCOOLER CONTROL CIRCUITS | 2415 0340621 D

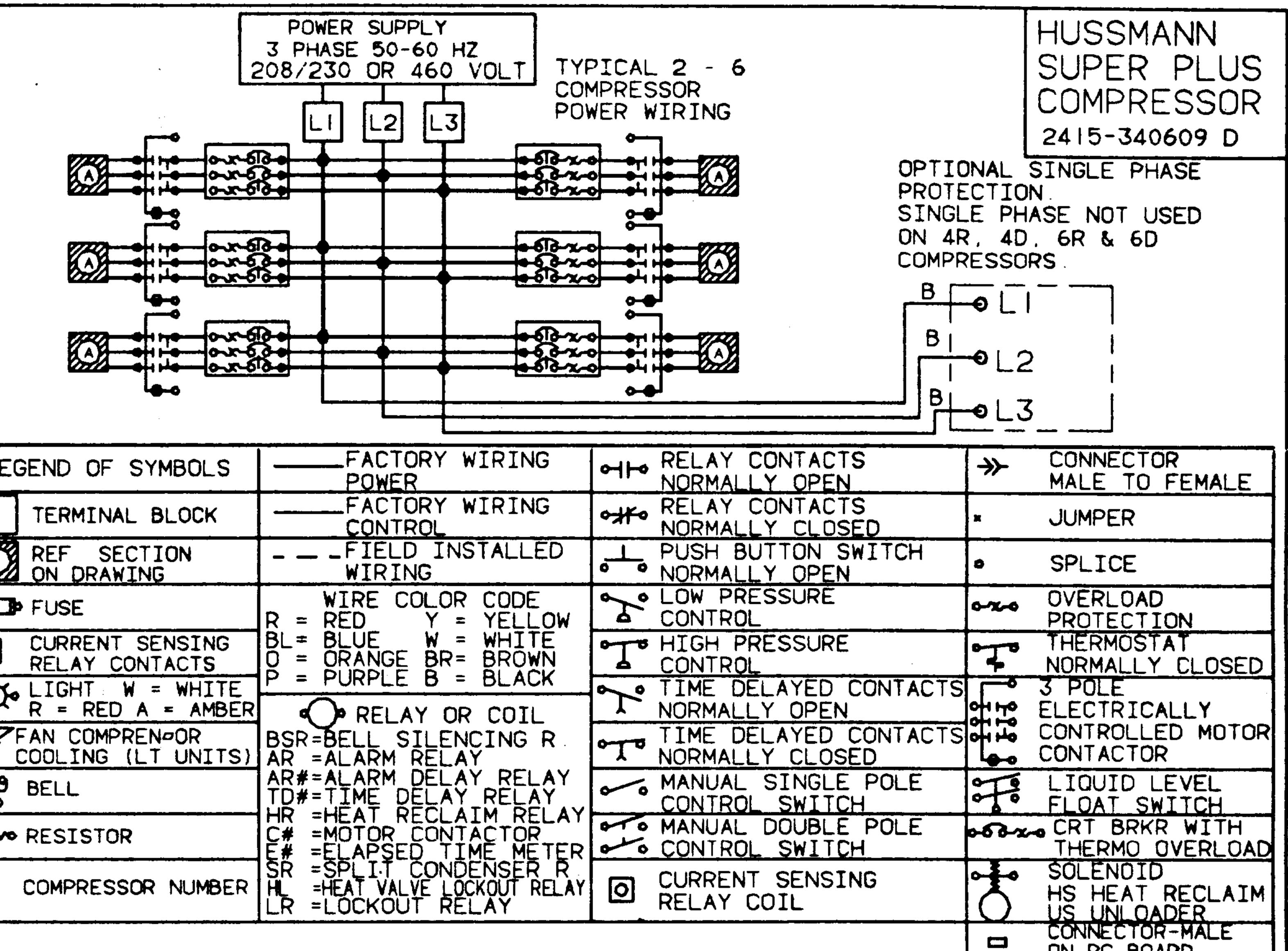
NOTES:

- Defrost Control Wiring:
 - L. Shown are typical defrost system wiring diagrams. There may be multiples of one type or combinations of types up to a total of 24 systems.
- . The "_" designations in various symbols indicate the actual defrost system number determined from the store legend.
- ... Refrigeration thermostats—when required remove jumper and field wire to the B_ and T_ terminals of the appropriate defrost system. Minimum thermostat rating 125 VA.
- /. Defrost termination thermostat—minimum rating 125 VA pilot duty
- Optional system solenoid valve answer. For tranches without this option omit wires between T2 and T8.
- When temperature termination defrost is not used, R and F terminal blocks and associated Purple and Blue wires are
- Thermostat fusing—Thermostat lines may be protected, as required by NEC or local codes, by field installed fuses.
- Mechanical Defrost Timers:
- A. Defrost timer is wired to N.O. contacts (S and C on Precision, 3 and 2 on Paragon). These contacts close on defrost.
- Timers are wired from left to right to the system number sequence.
- For unit cooler defrost wiring see separate wiring diagram.
- . All X2_ series terminal blocks in the control panel must be jumped together.
- TA contacts used only when CDA valves are furnished.
- . Optional Paragon Timer does not have second motor or alarm 19. For field installed defrost timer wire defrost clock connectors contacts.

- Low- and medium-temperature thermostats and double pole single throw switch located in case.
- Each CDA panel board will handle up to 4 fused systems. One thermistor (located in case or unit cooler) for each system. Rotary switch common to each system.
- 10. S_ terminal required only for satellites.
- . Wire to corresponding terminal block in electric defrost panel. (D block required for electric defrost only.) For electric defrost refer to wiring diagram 0256534.
- 12. For control of ES solenoid through a T-stat, wire T-stat between T6 and T7 on defrost board.
- 13. Two (2) 3-way reversing valves (3W) may be required to provide the necessary refrigeration capacity for some applications and will be wired in parallel as shown.
- 14. When ES solenoid is not used, wires between T3 and T9 are omitted.
- 15. Satellite backup thermostat must be set 3° higher than EPC-1000 satellite temperature set point.
- 16. Terminals SR, SY and B are connected to the EPC compressor outputs using a cable and plug assembly. Relay board compressor socket S7 is for satellite 1 and S8 for satellite 2 (EPC-2000 only).
- 7. When satellite is controlled through EPC remove jumper and wire according to Detail Block B.
- 18. For A/C branch (no defrost) omit timer connections.
- P2-1 and P2-2 to terminal blocks N.O....







- Terminals 34, 35 and 36 are provided for use with Remote Alarm Systems. Contacts between Terminals 34 and 35 (Hussmann Remote Alarm) open on alarm. Contacts between Terminals 34 and 36 close on alarm. See wiring diagram included with Remote Alarm System for proper connections. Only one alarm system can connect to these terminals. Maximum load 10 amps.
- The remote alarm bell and light are field wired between Terminals 31, 32 and 33. The Alarm Bell connected between Jenkins Model No.1005 or equivalent. Maximum load on terminals 32 and 33 is 125 VA 125 VAC.
- HR coil for HR Contacts located in Heat Reclaim Section of diagram. Low Liquid Level Alarm: Alarm set point 10% receiver level during Heat Reclaim, 30% at all other times. (HR Relay used only when Heat Reclaim is used with Low Liquid Level Alarm.)
- Current Sensing relay sensor will be positioned to sense the current flow of the L1 line to the compressor. The contacts are wired into the control circuits as shown. On 460 volt units the lead must be looped through the relay 2 times. Current sensing relays are options.
- For Remote Satellite with Alarm connections, wire between Y1 and Y2.
- A. For satellites with Koolgas Defrost connect [SAT] to S_ terminal) on corresponding satellite defrost circuit.
- B. For satellites with Off-Time defrost connect [SAT] to T_ terminal (for high end) or to B_ terminal (for low end) on corresponding defrost circuit.

- Terminal X1B provided for Defrost Control Circuit connection.
- When not using Single Phase Protector, wire the Blue wire from X1 and Orange wire from X1A directly to circuit breaker.
- For compressors without Oil Failure Control, splice Blue wire from High Pressure Control to Orange wire on compressor
- 10. 4# Terminal required only for compressors with Solid State Protection, see Detail Block B.
- 1. Wire 24 volt secondary to the three-pin power input plug. Connect the Red and Black leads of the cable to transformer secondary terminals. Using a Crimp Stakeon, screw the drain wire to the liner near the Transformer.
- 12. When the rack is equipped with Koolgas Defrost Systems, using Belden 8760 cable, connect one end to KR Relay Terminals 5 and 3. Connect the other ends to the "Defrost" screw terminals of the EPC Terminal Board. Connect the drain wire to the liner at the Terminal Board.
- 13. When the rack is equipped with Heat Reclaim, using Belden 8760 cable, connect one end to HR Reclaim Terminals 4 and 6. Connect the other ends to the "Heat Reclaim" Terminals on the EPC-2000 Terminal Board. Screw the drain wire to the liner at the Terminal Board.
- 14. EPC-2000 Compressor Alarm and Switchback Control Circuit Connections are made using cable assemblies. These cables are labelled 1 through 10 respectively. The plug end of the cable inserts into the EPC-2000 Relay Board. The other end to the appropriate Control Circuit Branch wiring.
- 15. All relays shown in non-energized position.