

# HEATING COOLING AND DEHUMIDIFICATION

## ENVIRONMENTAL CONTROL PANEL

INSTALLATION / SERVICE INSTRUCTIONS

# ENG. NO. 322321A

August, 1986 SUPERCEDES #322321 DATED JULY, 1986 SECTION 10

### TABLE OF CONTENTS

### **GENERAL INFORMATION**

System Function..... 1-1

leilts.....

2. DESCRIPTION OF COMPONENTS

Standard and Optional..... 2-1 Component Detail..... 2-1

### 3. INSTALLATION

Humidistat	3-5
Remote Space Sensor (Honeywell)	3-5
Discharge Sensor (Honeywell)	3-6
Seven Day Night Setback Timer	3-6
Night Recovery	3-7
Time Delay Relays	3-7
Insufficient Air Switch/Alarm	3-8
Outdoor Ambient Lockout (Air Conditioning/Heating)	3-9
Chron*o*mizer Control Relav	3-1

#### .

### 

### 

i

### TABLE OF CONTENTS (cont.)

- ELECTRICAL 4
- 5. START-UP AND CHECKOUT

6.

SPECIFICATIONS

# 

i i

### TABLE OF CONTENTS (cont.)

### 7. TROUBLE SHOOTING

### LIST OF ILLUSTRATIONS

Figure 2.	HCD's Environmental Control Configuration2-6
Figure 3.	HCD Panel Mounting
Figure 4.	Accustat Thermostat
Figure 5.	Temperature Sensor Installation
Figure 6a.	Humidistat
Figure 6b.	Remote Space Sensor (Honeywell)
Figure 6c.	Discharge Sensor (Honeywell)
Figure 7.	Night Setback Timer
Figure 8.	TDN Relay

### 

Figure 10. Outdoor Ambient Lockout Wiring for A/C....3-9

Figure 15. Accustat Thermostat Front and Rear View....4-2

Figure 17. Relay Board Terminal/Contactor Designation.....4-7

### GENERAL INFORMATION

1-1

### GENERAL DESCRIPTION

Eng. #322321

The HCD Control Panel is a compact solid-state device designed to regulate heating, cooling, and dehumidification. The HCD Control Panel has a 24V output, and stages the air-conditioning, reclaim heat, and booster heat according to the logic of the control panel, to obtain desired environmental conditioning. Temperature sensing devices (multi-stage thermostats) are used in conjuction with humidistats to provide environmental data to the HCD's logic circuit. The HCD interprets these readings and causes electro-mechanical relays to activate initiating heating, cooling or dehumidification, as determined appropriate by the HCD's logic.

### SYSTEM FUNCTION

Staging is the key to the HCD's environmental conditioning. Staging takes place in the following ways:

- 1. Heating Superheated compressor discharge gas is re-routed via a three-way valve to the heating coil in the air-handler. It is used here as an initial heating stage. A second supplementary stage, if necessary, is provided in the form of resistance, (strip) heat, or gas heat, when most economically feasible.
- 2. Cooling The HCD's logic takes advantage of the store's free reclaim air. This air is collected from venting

located beneath each case (underflow air return). This tempered air is routed to the air handler and distributed via overhead ducting. Initially the panel brings on one of four potential stages of cooling, when required. Additional stages are brought on by the panel's logic, and the multi-stage thermostat when required, to maximize efficiency.

3. Dehumidification - Humidity is kept in check to minimize frost on the product, and the evaporator case coil. The air-handler again conditions the air to maintain a 55% or lower relative humidity. In the event this dehumidification stage lowers the sales area temperature below the desired setting, the heat reclaim system balances the sales area ambient.



The HCD Control Panel benefits are derived from the savings in energy usage resulting from its intelligent control of the building's environment. The HCD Panel will accurately provide the correct amount of heating, cooling, or dehumidification, using the most efficient method available.

The HCD panel provides energy efficiency in two ways. First it dictates the use of reclaim heat, before calling for gas or electric heat, and second, it provides sequenced stages of heating and air-conditioning to minimize power consumption.

#### FEATURES

- Compact Size
- Isolated Contacts
- 3. 2 or 4 Air Conditioning Stages
- 4. 1, 2, 4, or 6 Heating Stages
- 5. 1 or 2 Reclaim Heat Stages

Factory Prewiring 6.

Multi-Stage Thermostats for Temperature Control

Simple Control Logic 8.

Standardized Parts

LED Indicator Lights 10.

Elapsed Time Meters 11.

Night Setback and Recovery 12.

Air-Flow Alarm 13.

Power Failure Protection 14.

15. Humidistat or Dew Point Control

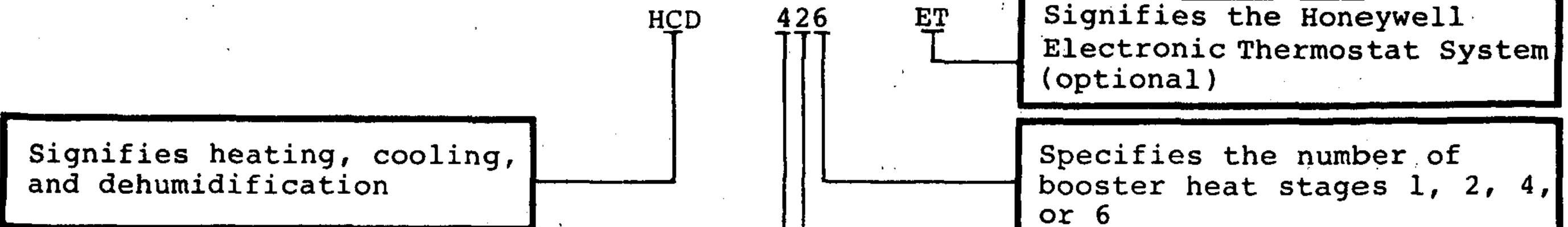
16. Ambient Lockouts

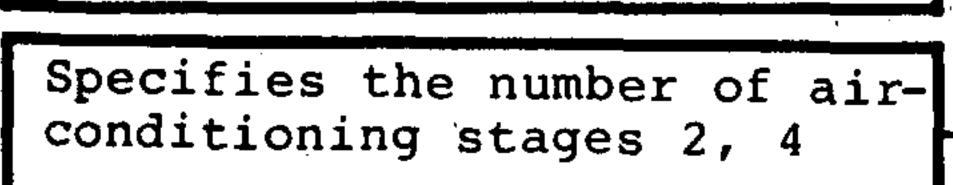
Time Delays 17.

Remote Source Time Control 18.

### ORDERING NOMENCLATURE

The HCD nomenclature is illustrated below. This nomenclature is used to described the basic features, as well as ordering nomenclature for the desired HCD panel. Optional features are ordered with additional kits. Refer to Price List 632.2 for complete kit listing.





Specifies the number of heat reclaim stages 1, 2

Figure 1. HCD Nomenclature

2 - 1

#### COMPONENTS DESCRIPTION OF

### STANDARD AND OPTIONAL COMPONENTS

Standard

- Sensors for Accustat Thermostats
- Accustat Thermostats
- Humidistat
- System LED Indicator Printed Circuit Board
- Main Logic Printed Circuit Board
- Staging Check Button Relays
- Transformer, Terminal Blocks, and Control Switches

### Optional

- Honeywell Electronic Thermostat
- 7-Day Night Setback Clock
- Adjustable Time Delays (1-30 min.)
- Isolated Relay Package
- Recovery Period Time Delay (6-180 min.)
- Outdoor Ambient Lockouts
- Insufficient Air Flow Monitor with Fan Alarm
- Elapsed Time Meters
- Remote Indicator Panel
- Twelve Hour Power Failure Protection (clock)
- Ductstat (thermostat limiter)
- Dew Point Controller
- Power Failure Protection
- Chron\*O\*Mizer Control Relay

**COMPONENT DETAIL** - An illustration follows with relative positioning of components. Note also that the description of components are listed. This listing corresponds directly to Figure 2, and its callouts. Encircled numbers are standard components. Triangular letters denote optional accessories.

Standard Components

Accustat Thermostat

This thermostat is mounted in the store sales area and has 24 available preset temperature sensors ranging from 50°F to 88°F. The sensors use a mercury volume that rises on an increase in temperature to contact a platinum wire embedded in the glass, thus activating the electrical circuitry of the thermostat. A11 circuits are single-pole, single-throw, normally closed

### for heating and normally opened for cooling.

Humidistat

This is an adjustable device to be mounted in the store sales area which activates the first stage of air-conditioning for dehumidification. The dehumidification contacts bypass both the night setback and normal air-conditioning time delays. The humidistat should be adjusted for 55% relative humidity or lower.

Eng. 322321 2-2

3.) System LED Indicator Printed Circuit Board

This printed circuit board contains light emitting diodes to indicate which systems are on, and the mode that the panel is controlling. This board also has accommodations for the optional elapsed time meters.

) Main Logic Printed Circuit Board

This printed circuit board contains all the circuitry required for the staging functions. Relay sockets and terminal blocks are mounted on the circuit board to allow relays to simply plugin, and external devices to be wired into the circuit. All components on or connected with this board are 24 VAC.

# 5.

Check Button Relays

The Check Button function is a unique feature in that it allows manual operation of the relays for testing and diagnostic purposes.

Heat reclaim relays - The relays used for heat reclaim are four-pole relays that have all the normally open contacts wired to the terminals for control of heat reclaim valves. These contacts will allow up to two valves per contact. When relays are activated, they provide 24 VAC at each contact.

Booster heat and air-conditioning relays - These double-pole, double-throw relays have one normally open contact wired to the ouput terminals for control of heat or A/C. These contacts when activated provide 24 VAC.

Remaining relays - Any other relays connected to the main printed circuit board are of the double-pole double-throw variety. Also, all relays connected with the HCD Panel have 24 VAC coils.

Heat Reclaim

Heat reclaim is a simple system for returning heat that has been removed from the store cases, back to the sales area. The complete heat reclaim system includes a heat reclaim coil, and a combination 3 way/4 way solenoid operated heat reclaim valve.

(7.) A/C

# Available in two or four stages, for cooling sales area.

### \ Honeywell Electronic Thermostat

The Honeywell Electronic Single Zone Control System (W973) is an optional kit used as an alternate to the standard Accustat thermostat. All Honeywell System components, excluding the Remote Space Sensor (T7047C) and the Discharge Air Sensor (C7046A), are factory installed into the HCD-ET Control Panel. The Remote Space sensor and Discharge sensor must be field installed (see Section 3 "Installation").

2 - 3

The Honeywell Transmitter (T7067B) utilizes separate heating and cooling set point adjustment levers to provide an adjustable deadband from 3°F to 30°F. The set point adjustment range is 55°F to 85°F.

The optional Honeywell Night Setback Module (W974A) provides 5°F, 10°F or 15°F setback, and cooling shutdown during low building occupancy. Either the Time Clock or Chron\*o\*mizer Control option must be ordered with the Night Setback Module.

B\ Seven Day Night Setback Clock

#### NOTE

This clock is available in synchronized drive (60 hz) or quartz movement (international).

This programmable clock has single-pole, double-throw contacts that will switch the store to the night setback mode. In the night setback mode the fresh air damper will be powered closed and the thermostat will operate on the setback temperature set points.

Accustat only: The internal wiring allows only the first stage of heat to be activated, although jumpers can be installed to bring on any other stage as required.

# Adjustable Time Delays

Adjustable time delays are added as an option to delay air-conditioning and booster heat stages. The time delay is placed in the existing relay socket and the control relay plugs into a socket on top of the time delay. The actual time delay is adjustable from one to thirty minutes, and is connected across the relay coil to prevent energization for the set period of time. The delay period is adjusted by a potentiometer screw on the front face of the relay.

Isolated Relay Package

The isolated relay package provides a normally open isolated contact for any ouput from the control panel. The relays used are of the single-pole, double-throw variety, and will allow a 10 amp resistive, 7 amp inductive, load to be connected in series with up to a 240 volt power source. Relays have a limit of 1200 VA per relay. This package is separated into air-conditioning, heat reclaim, booster heat, damper, and fan kits. All stages can use the isolated relay package or any stage can utilize the isolated contact, while others still use the 24 VAC supply from the panel.

2 - 4



Recovery Period Time Delay

The circuitry for this option is incorporated in the printed circuit design. The only component that needs to be added is the time delay relay, which for this application is adjustable from six to one hundred-eighty minutes. THIS OPTION IS STRONGLY RECOMMENDED WHEN NIGHT SETBACK IS DESIRED. It will lockout the booster heat for the time delay period and allow the heat reclaim to operate on its original predetermined set point for heating the store.



Outdoor Lockouts (heating and cooling)

The heating lockout is a remote SPDT (single-pole, double-throw) thermostat that on a rise in outdoor temperature will lockout the booster heat stages, allowing only heat reclaim to provide heat. The cooling lockout is a remote SPDT enthalpy control that will lockout the air-conditioning and humidity controls when the outdoor enthalpy exceeds the useable conditions necessary to cool the store.



Insufficient Air Switch and Fan Alarm

This switch measures a velocity pressure in the supply air duct by means of total pressure and static pressure probes. If the airflow in the duct is reduced lower than the set point all heating and cooling functions will stop and an optional bell alarm will sound.



Elapsed Time Meters

Elapsed time meters, when ordered are connected to the indicator panel to show the hours of operation for each stage of heating or cooling. A monitored operation span provides for a winter to summer kw consumption comparison and is useful in other budgeting.

<u>Remote Indicator Panel</u>

There is a connector on the top of the main logic printed circuit board for a remote indicator panel. This remote panel can be placed anywhere in the store for an easy access indication of the operation of the unit. The remote panel has indicator lights identical to the HCD panel.

2 - 5

Ductstat (optional for Accustat Thermostat only)

The ductstat (multi-stage thermostat limiter) is wired in series with the existing thermostat and will override the thermostat to shut down the air-conditioning or heating when the store temperature reaches the selected limit level. The remoting of this limiter prevents energy wasting temperature settings, and eliminates tampering with the primary control. The ductstat sensor is placed in the return air duct.

Dew Point Controller

When specified, this replaces the standard humidistat. Power Failure Protection

This option substitutes a power loss protection 7-day timer for the standard 7-day timer. When power is lost, this optional timer will provide up to 12 hours of timer motor backup. This timer has the same physical appearance as the standard timer.

Chron\*O\*Mizer Control relay

When specified, this relay replaces the seven day clock to permit the Hussmann Chron\*O\*Mizer to schedule setback functions.



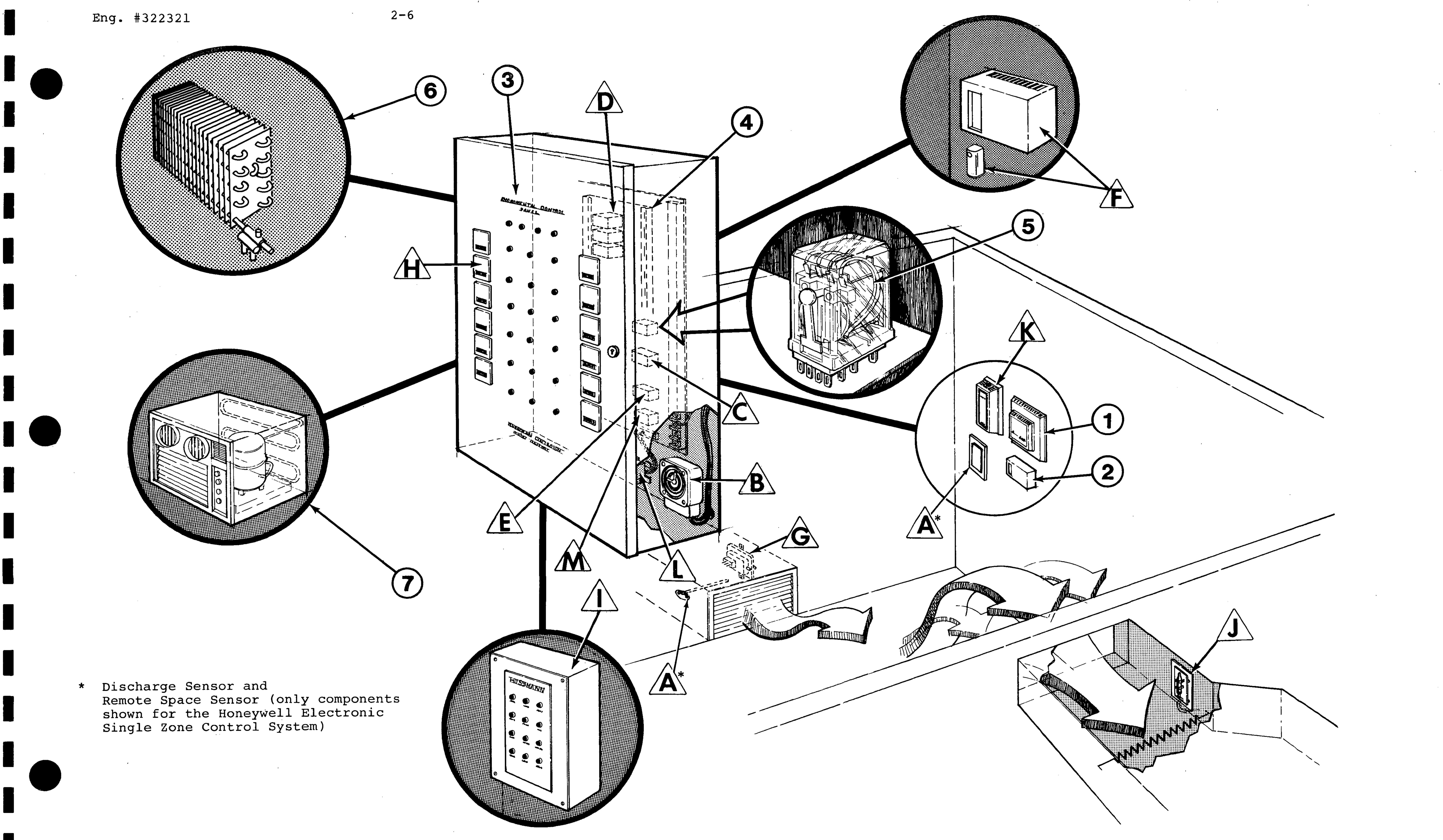


Figure 2. HCD's Environmental Control Configuration

3-1

INSTALLATION

PACKAGING

Shipping Damage

All equipment should be thoroughly examined for shipping damage as soon as it is received.

This equipment has been carefully inspected and the carrier has assumed responsibility for safe arrival. If damaged, either apparent or concealed, a claim must be made to the

carrier.

### Apparent Loss or Damage

If there is an obvious loss or damage, it must be noted on the freight bill or express receipt and signed by the carrier's agent, otherwise, the carrier may refuse the claim. The carrier will supply the necessary claim forms.

### Concealed Loss or Damage

When loss or damage is not apparent until after equipment is uncrated, a claim for concealed damage should be made. Upon discovering damage, make request in writing to the carrier for inspection within 15 days and retain all packing. The carrier will supply inspection report and required claim forms.

Separate Packaging

Some components of the HCD may be packaged separately and shipped along with the unit to reduce its cubic dimensions for economical shipping. These components will require field installation.



### HCD PANEL INSTALLATION

### CAUTION:

- 1. Installer must be trained, and experienced.
- 2. Disconnect power supply before installation to prevent electrical shock and equipment damage.

3 - 2

- 3. All wiring must comply with applicable codes and ordinances.
- 4. Do not exceed the ratings given in the SPECIFICATIONS section.
- 5. Always conduct a thorough checkout when installation is complete.

The HCD Panel should be located in an area easily accessible to the air-conditioning, heating, and dehumidification equipment, such as an equipment room. Panel dimensions and mounting hole locations are shown in Figure 3. The HCD Panel should be mounted in a vertical position against a flat wall. Enough clearance space should be provided for all wiring and conduit connections. Knockouts for electrical connections are located on the top and bottom of the panel. Insure that the panel is mounted to the wall stud to insure adequate support.

When the Honeywell Electronic Thermostat option is ordered the control panel box will be 4.25 inches wider than the standard panel.

Attachment should be made with 7/16" bolts or screws to a wall stud or other firm support.

NOTE

Local code may require special mounting and clearance requirements. Consult local authority.

•

•

· •

.

•

• •

.

 SYM
 HCD
 HCD-ET

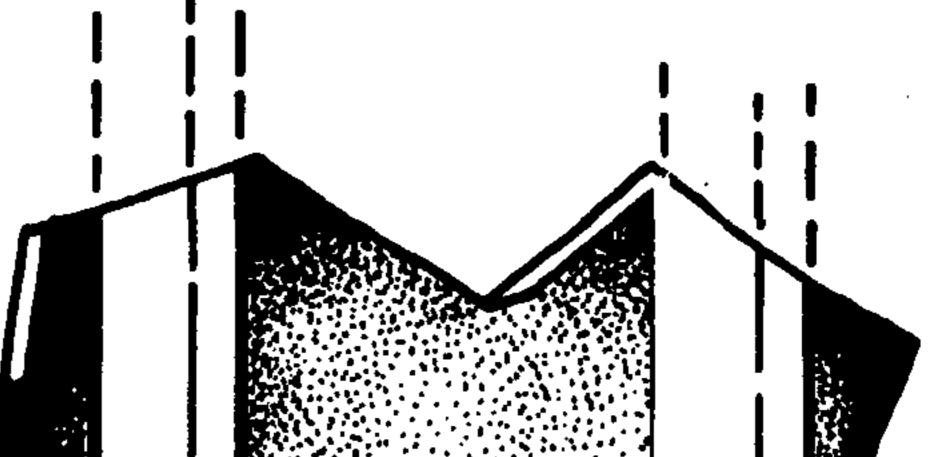
 A
 24
 7/8
 24
 7/8

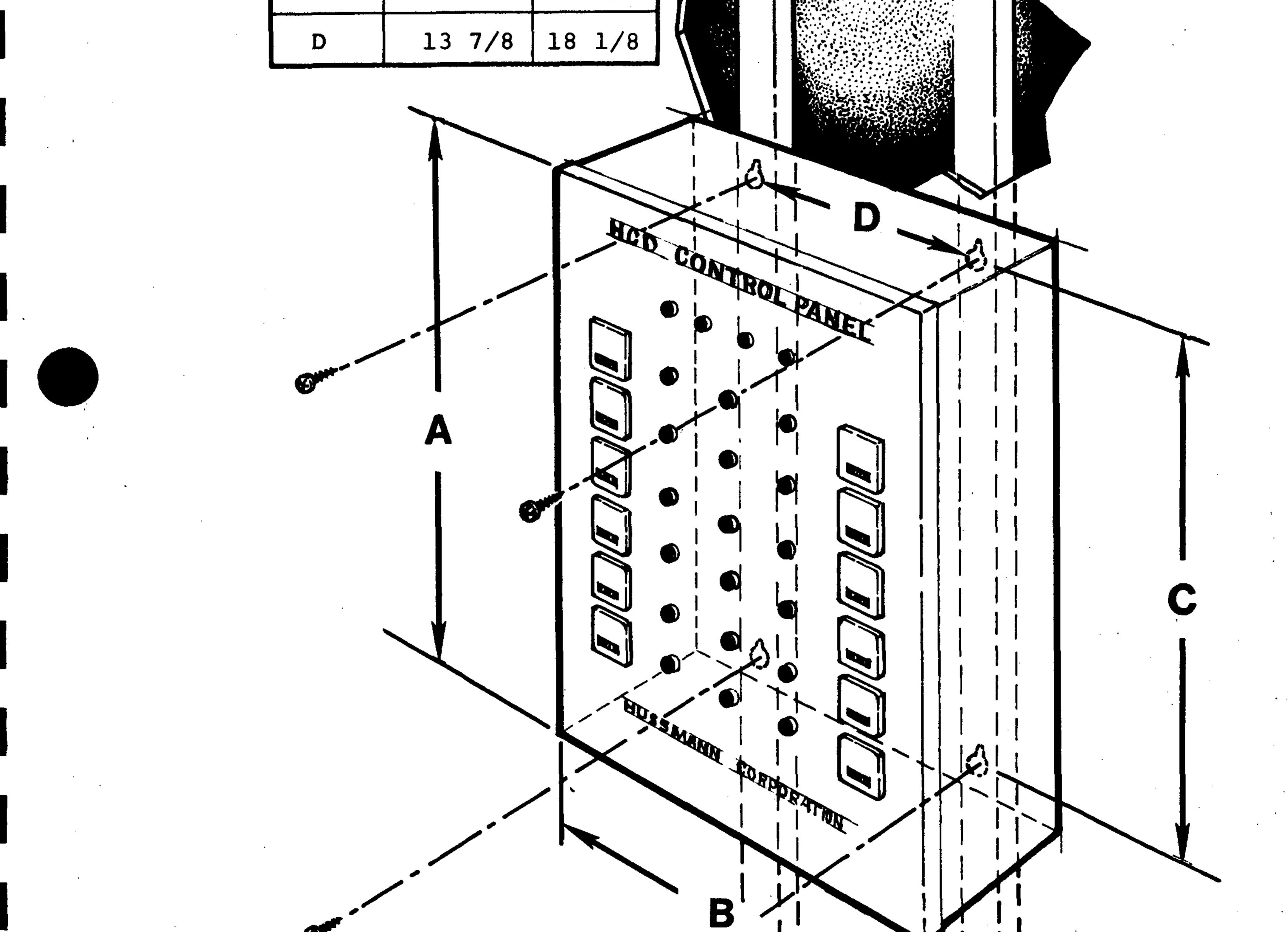
 B
 15
 7/8
 20
 1/8

 C
 22
 7/8
 22
 7/8

3-3

.



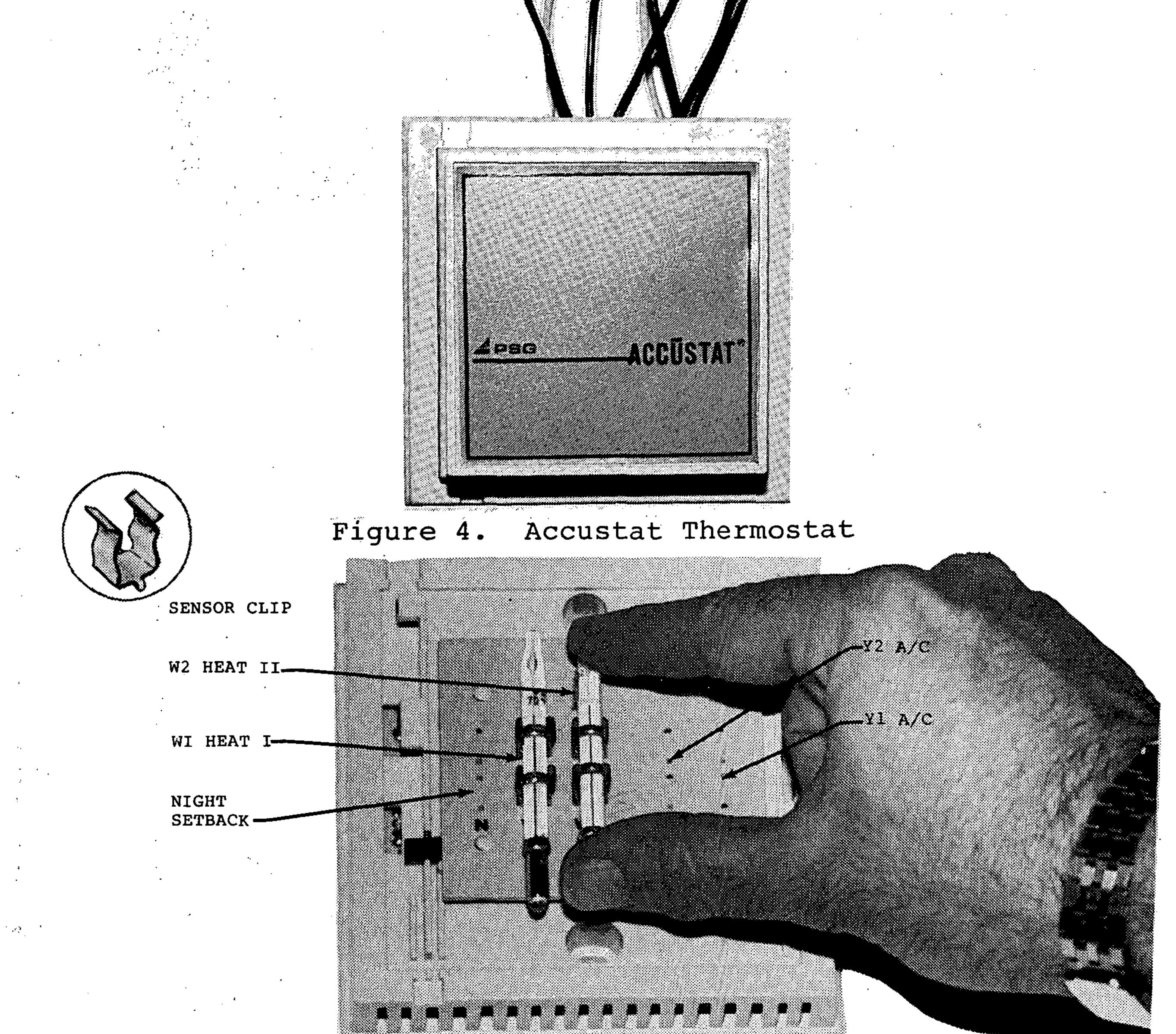


### Figure 3. HCD Panel Mounting

### ACCUSTAT THERMOSTAT(s)

Accustat thermostats should be screw-mounted in the sales area in an appropriate location on a wall or column. Thermostat(s) can be mounted into a standard junction box. Thermostat location should be in an area where an accurate mixture of normal store air is available. Avoid locations where the thermostat can be affected by abnormal conditions, such as heat from appliances and lights, cold air from refrigerated fixtures, doors, windows, and air from heating and cooling discharge diffusers. For further information consult vendor literature packet.

3 - 4



### Figure 5. Temperature Sensor Installation

### TEMPERATURE SENSOR INSTALLATION

Each HCD is shipped with temperature sensors which must be field installed in each Accustat thermostat. Please refer to Figure 5 for installation procedure. Insure that contact rings make good contact with holding clips. Note that the night setback, and first and second stage of A/Csensor clips are not shown above.

Eng. 322321

3-5

### HUMIDISTAT INSTALLATION

Humidistat installation is similar to that of the Accustat thermostat. Consult vendor literature packet with the humidistat. Be sure to locate the humidistat in a location where it is exposed to average store air.

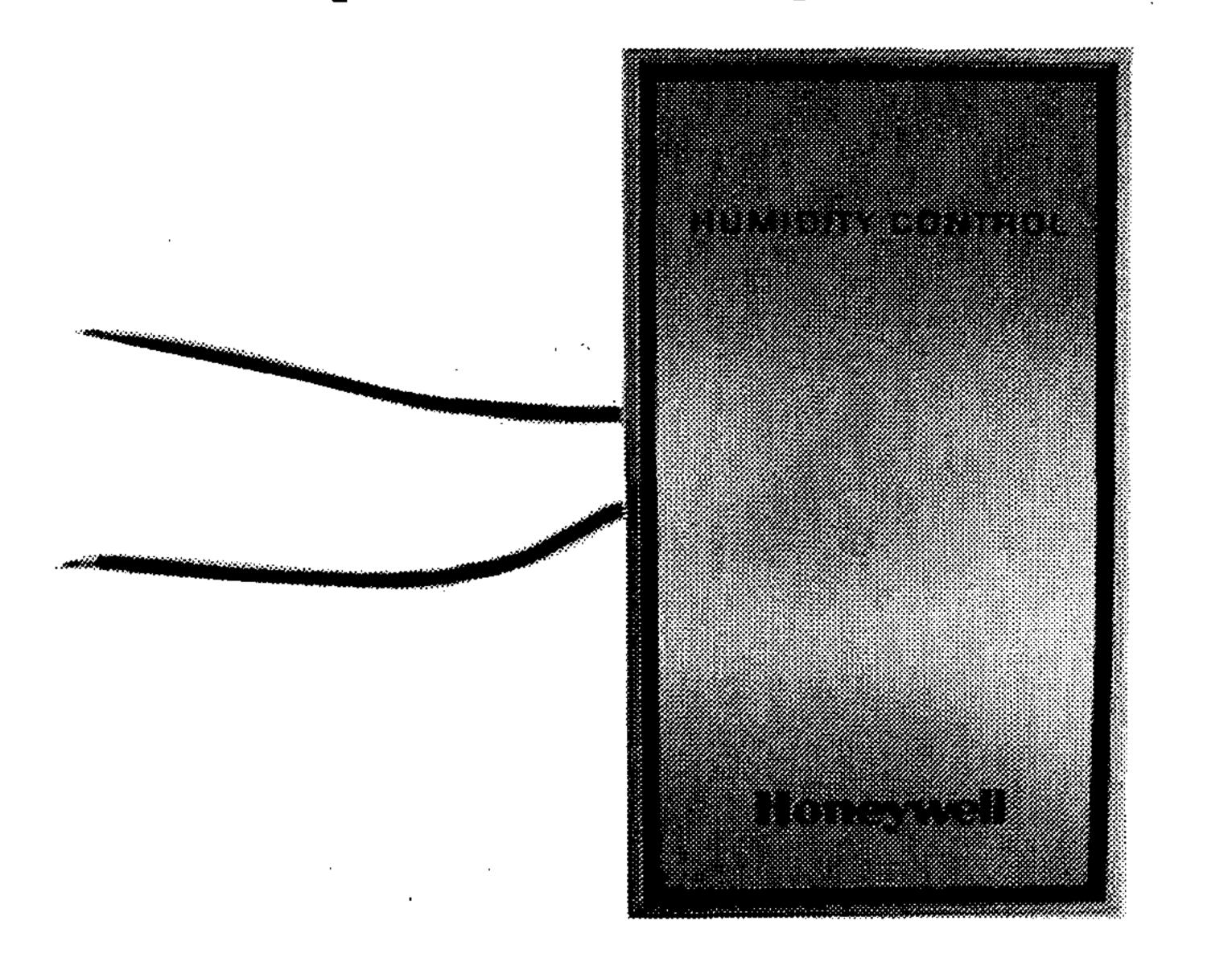
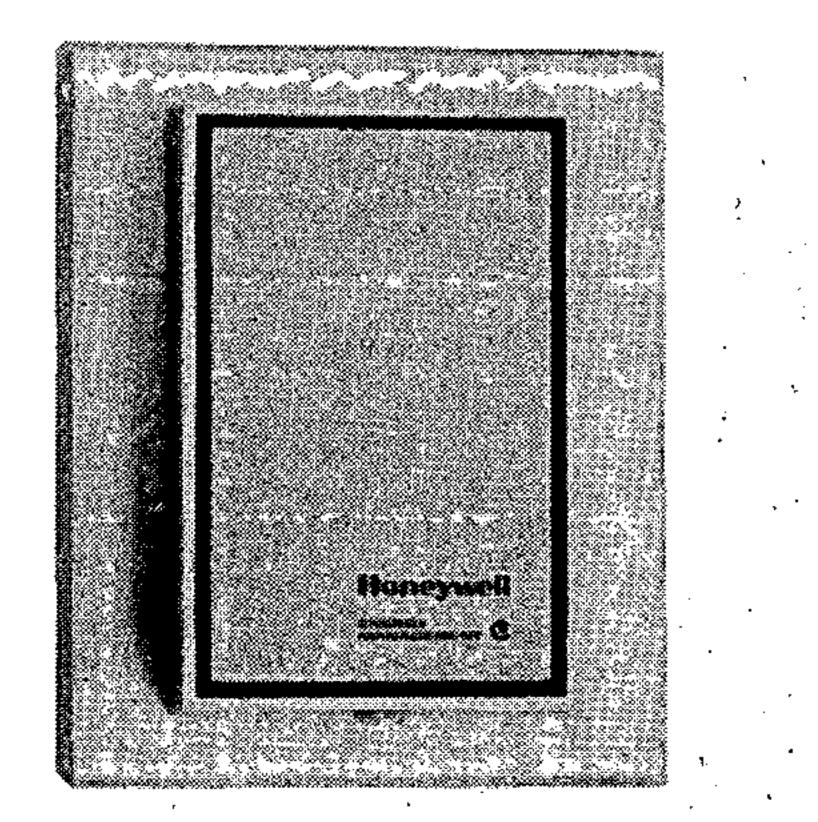


Figure 6a. Humidistat

### REMOTE SPACE SENSOR (HONEYWELL)

The Remote Space Sensor (T7047Cl025) should be mounted in the sales area, and wired to the T and R terminals of the HCD-ET panel using low voltage thermostat wire (2 conductors). Consult the Honeywell Installation Instructions (in vendor literature packet) for specific instructions.



### Figure 6b. Remote Space Sensor (Honeywell)

•

### DISCHARGE SENSOR (HONEYWELL)

Eng. 322321

Locate the Discharge Sensor (C7046A1004) in the discharge air stream, as far as possible from the heating and cooling coils. Connect the discharge sensor to the 'a" lugs. (T and T1) of the logic module (W973) using low voltage thermostat wire.

Figure 6c. Discharge Sensor (Honeywell)

### SEVEN DAY NIGHT SETBACK TIMER INSTALLATION

The night setback option when ordered consists of a factory installed 7-day timer as shown in Figure 7. The time clock operates by tripping on/off time controls as set by the red and green contact pins. Red pin is "off" time night setback, green pin is "on" time night setback. The only wire needed to be installed is the lead from contact "N" of the Accustat thermostat (see Figure 5). This lead is connected to N1 on HCD Control Board (see Figure 16).

Figure

Night Setback Timer

### Setting the 7-Day Night Setback Time Clock Installation

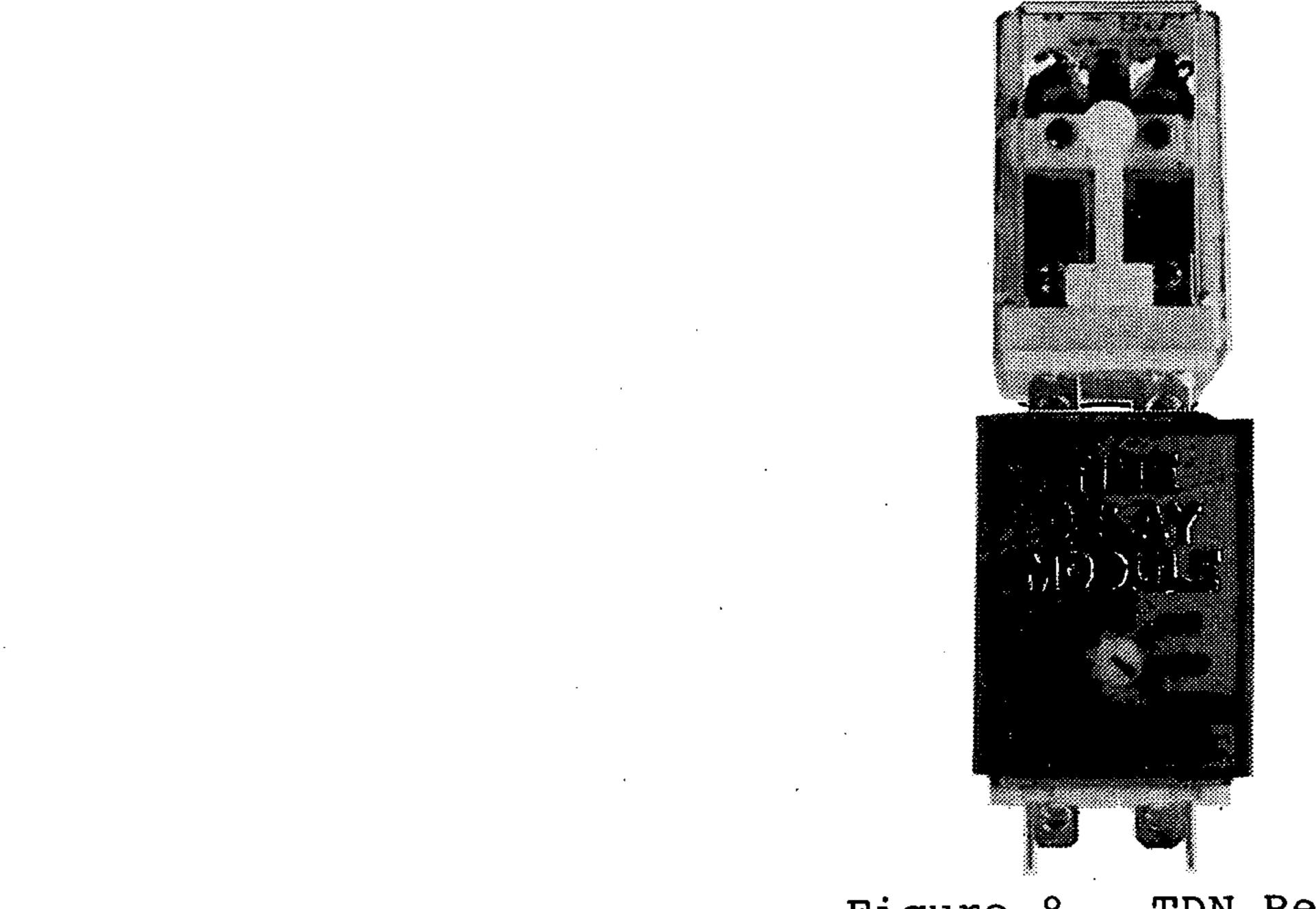
1. Remove plastic cover.

- 2. Rotate center knob clockwise until arrow on inside dial points to the correct day and time on the outside dial.
- 3. Place all timer set pins in desired time slot for each day's operation. Green is time when night setback begins, and red is when night setback terminates.
- 4. Replace plastic cover. System operation is displayed by on/off designater in upper right hand corner of

timer.

### NIGHT RECOVERY INSTALLATION

The night recovery option consists of a variable time delay relay, and a control relay. Both relays are of the DPDT type. The variable time delay relay locks out booster heat for a period of 6 to 180 minutes to allow heat reclaim to adjust store temperature. This relay, (shipped loose), is referenced as "TDN" on the HCD control board. The screw type potentiometer on this relay permits adjustments from 6 to 180 minutes. (See Figure 8). The rotation of the potentiometer is 270 degrees. The other relay in this kit is a control relay that enables a time delay for night recovery. This relay, shipped loose also, is labled "CRN" on the HCD control board.



### Figure 8. TDN Relay

### TIME DELAY RELAY INSTALLATION

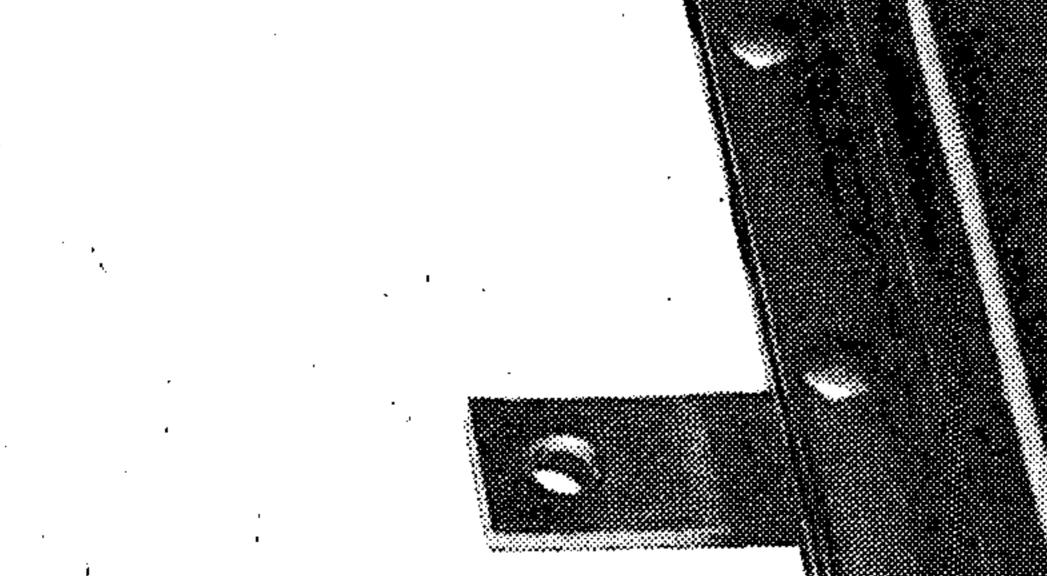
This option provides "plug-in" delay relays (shipped loose), with a delay of 1 to 30 minutes. Adjustment is by screw potentiometer with a 270 degree rotation. The time delay relays postpone the start of the next air-conditioning stage or heat stage, by not switching power to the relay until the set time delay has expired. See Figure 8 for typical view of this relay.

### INSUFFICIENT AIR SWITCH/ALARM INSTALLATION

Air switch control wires are connected between terminals Fl and SS on the control board. Polarity is not important. Mounting of the air switch must be done in accordance with enclosed manufacturer's instructions. When air switch is ordered, time delay module "TDM" must be installed on the HCD Control Board, and there should be no jumper between "X3" and "X4". Time delay is variable from 1 to 30 minutes in the same manner as the night recovery time delay relay. Control is such that if duct velocity does not reach the required amount before the time delay runs out, the system will shut down and the "Air Flow" alarm will light on the front panel.

`**3−8**. ∗

Eng. 322321





# Insufficient Air Figure

### 3-9

### OUTDOOR AMBIENT LOCKOUT INSTALLATION

Heat lockout thermostat and air-conditioning lockout enthalpy control should be mounted in accordance with the enclosed manufacturer's instructions. Control points should be wired as in Figure 10 and 11. These options do not allow heating (or cooling stages) to operate when ambient outside conditions are above (or below) the set points.

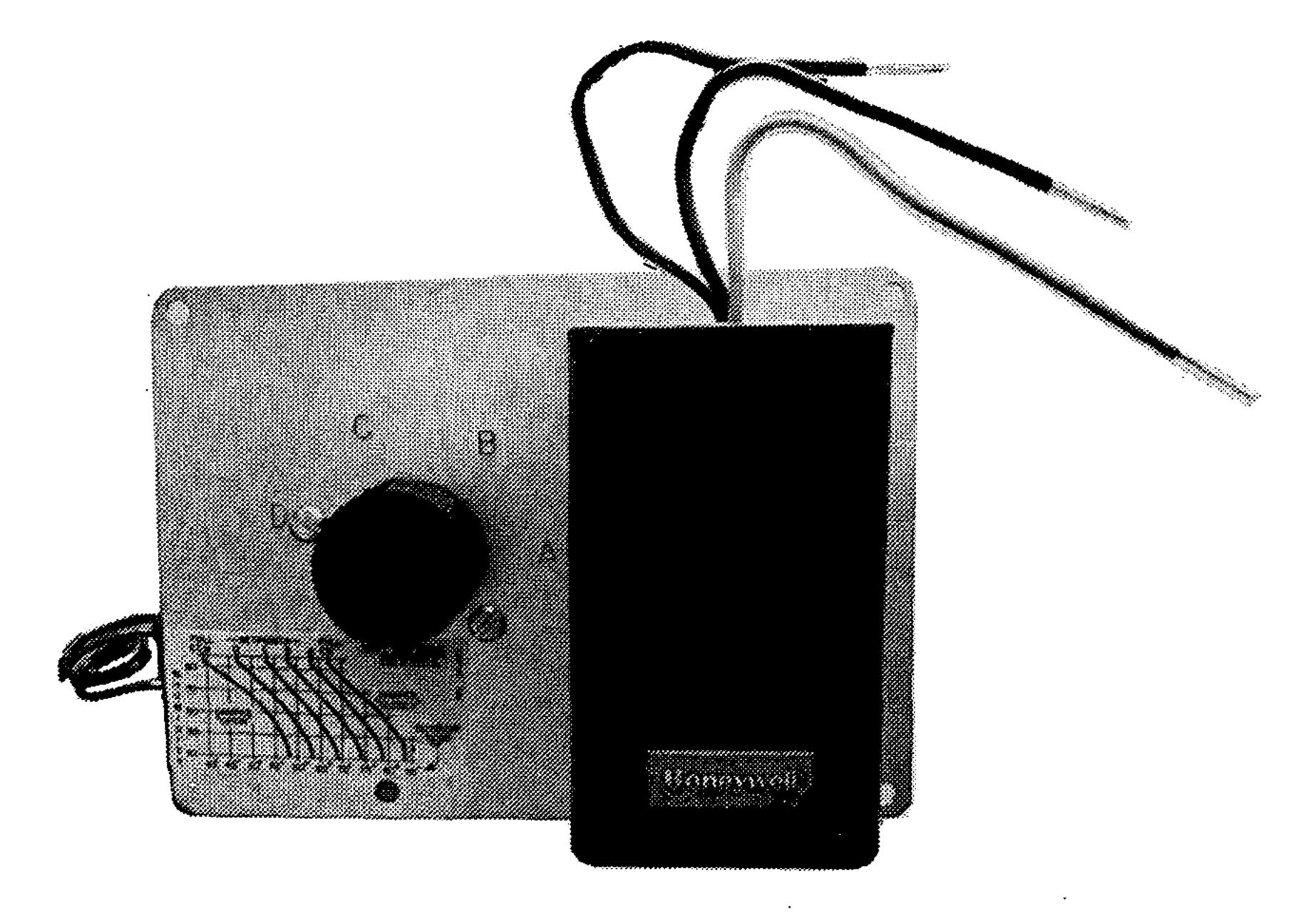
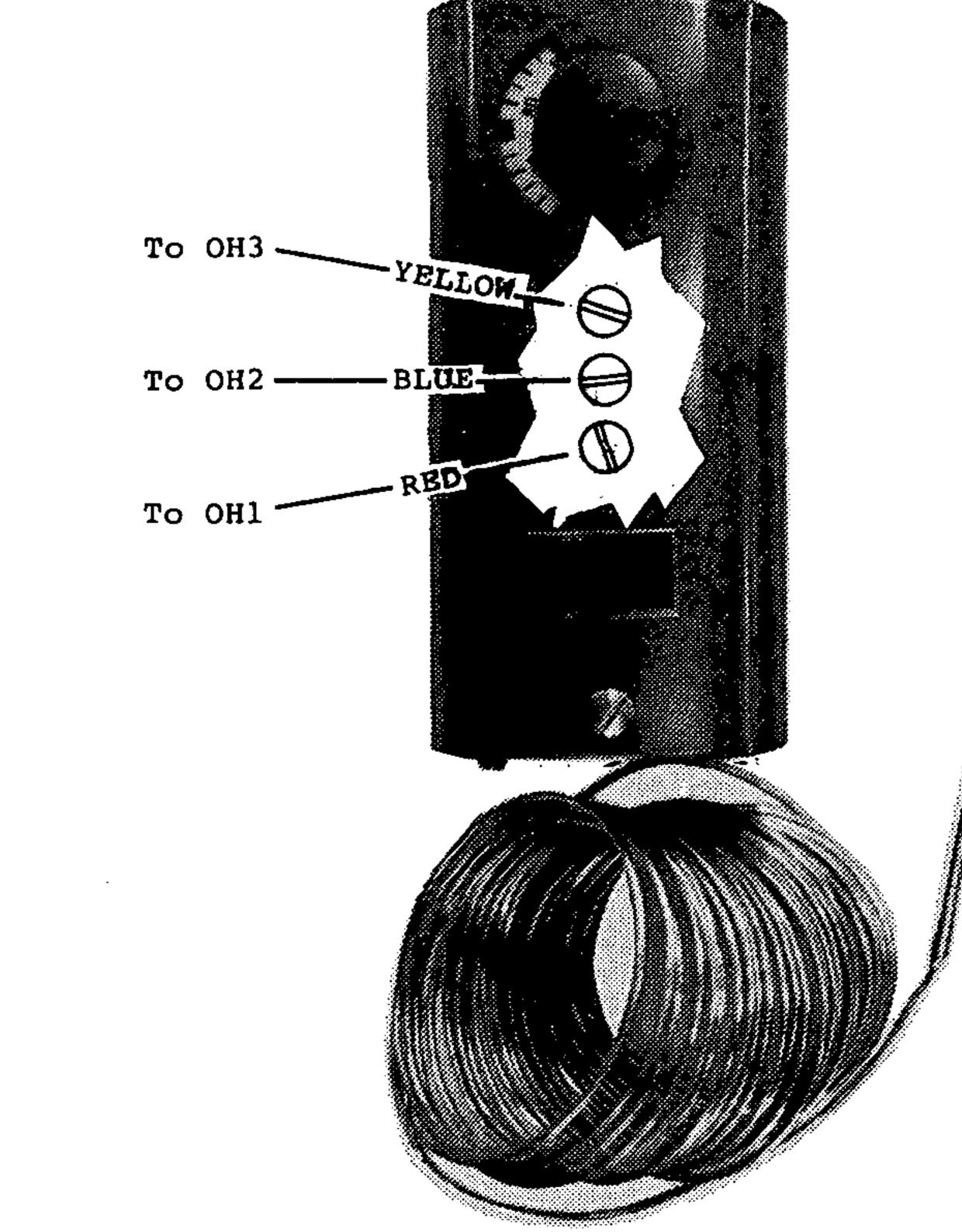


Figure 10. Outdoor Ambient Lockout Wiring for Air-Conditioning



### Figure 11. Outdoor Ambient Lockout Wiring for Heating

### CHRON\*O\*MIZER CONTROL RELAY INSTALLATION

This optional relay replaces the time clock in HCD Panels equipped for night setback, with a relay to be operated by Hussmann's Chron\*o\*mizer. Field wiring to the Chronomizer is all that is necessary. Refer to Figure 19 for relay wiring.

3-10

Figure 12. Chron\*o\*mizer Control Relay Wiring

### DUCTSTAT INSTALLATION

Mount ductstat in the return air duct. Wire the ductstat in series with the Accustat thermostat to override

### thermostat when desired temperature is reached.

Figure 13. Ducts

Ductstat

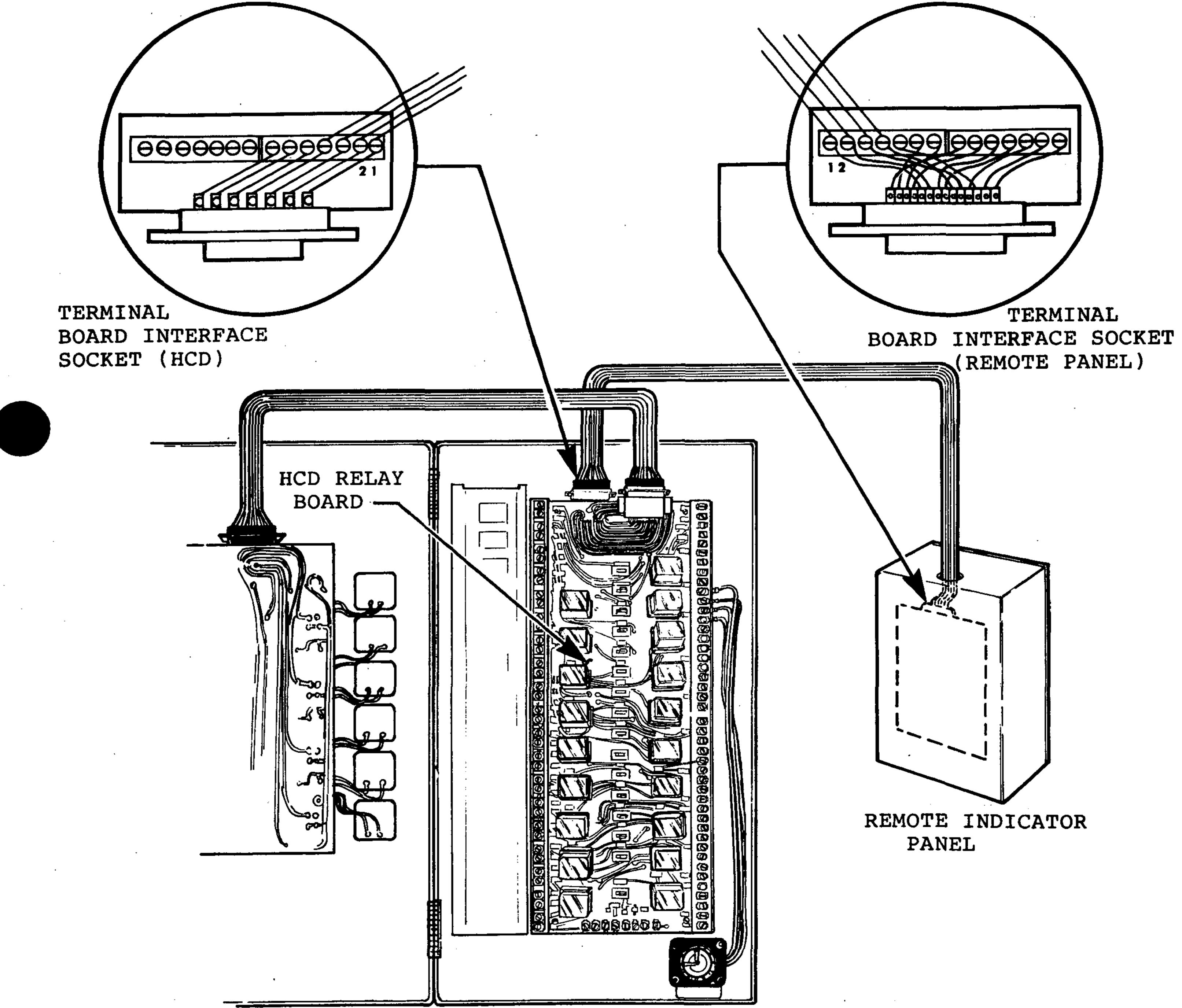
Eng. 322321

### 3-11

### REMOTE INDICATOR PANEL INSTALLATION

Linking the remote indicator panel with the HCD panel involves a relatively simple male to female connection. Wiring must be run from the remote indicator panel to the PCB (printed circuit board), on the HCD panel. Run wiring from the remote panel to HCD panel, connecting 25 individual wire strands in a one to one connection.





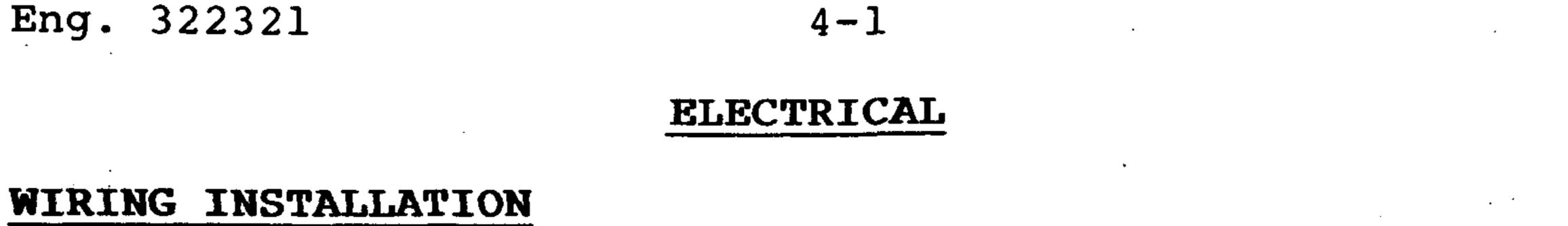


### Figure 14. Remote Indicator Panel Wiring

.

· · ·

• •



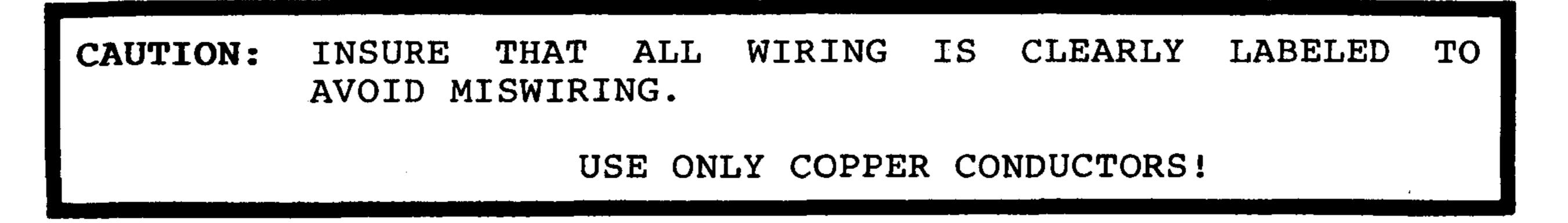
### WARNING

INSURE THAT POWER IS DISCONNECTED BEFORE ANY INSTALLATION BEGINS. ALL WIRING SHOULD CONFORM TO NEC AND LOCAL CODES.

The following items are assumed to have been accomplished prior to HCD wiring:

- 1. Wiring from booster heat control(s) to panel location.
- 2. Wiring from heat reclaim valve(s) to panel location.
- 3. Wiring from air-conditioning compressor motor control(s) to panel location.
- 4. Twenty-two gauge shielded copper cable has been run from panel location to specified multi-stage thermostat and humidistat locations in store area.
- 5. All external control devices, even those not supplied by Hussmann, should be installed and the necessary wiring run to panel location.
- 6. Supply power of 120V, 60 HZ, 1 phase has been made

available at bottom or top of panel.





# Eng. 322321 4-2 HCD PANEL BASIC WIRING

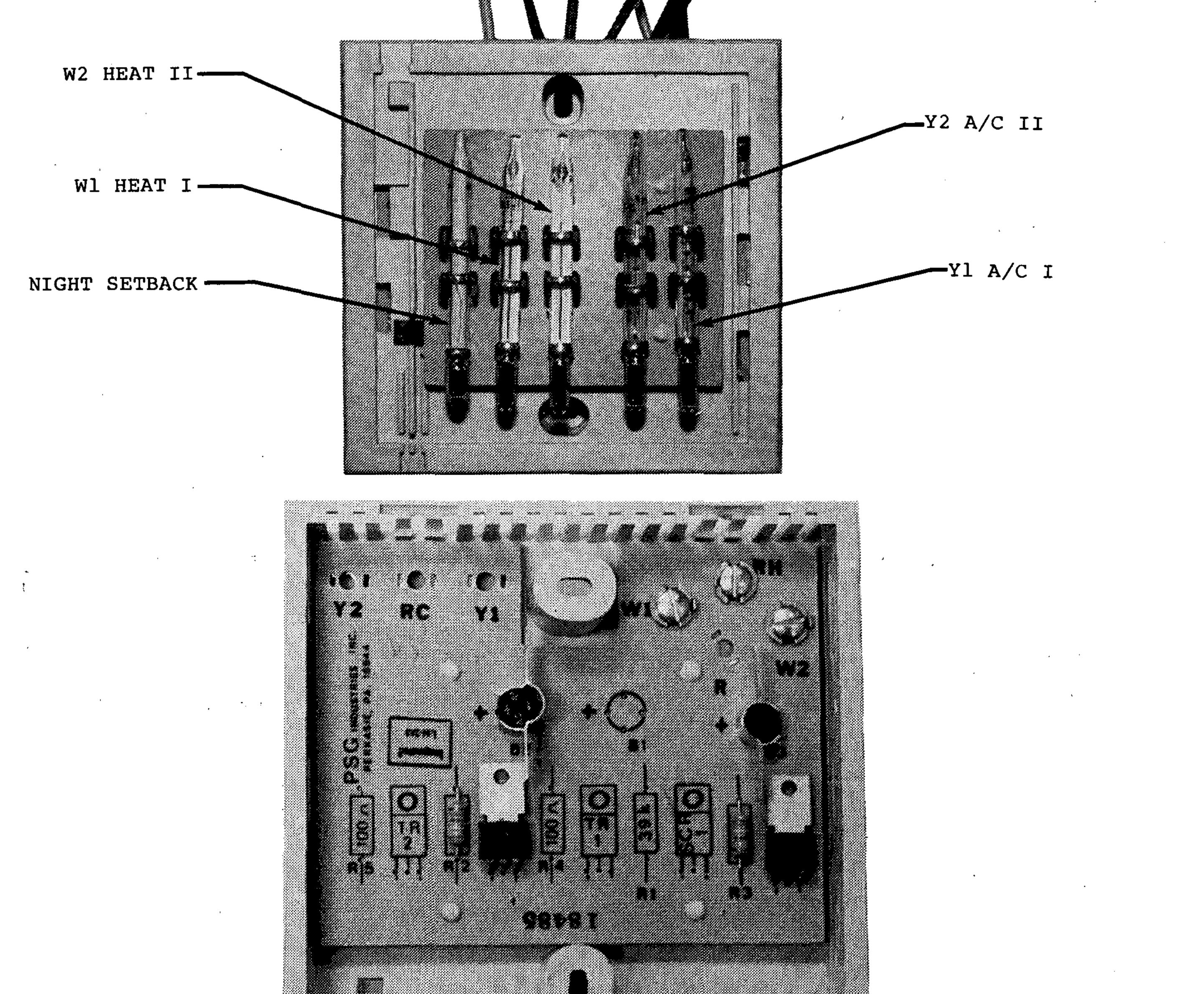
+

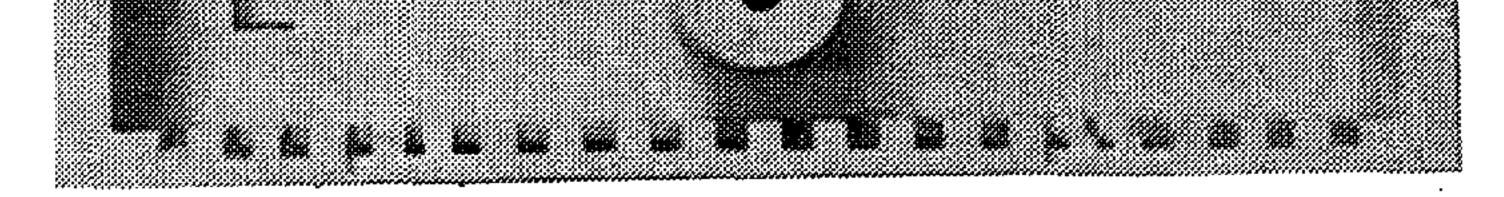
.

Reference Figure 16, 17, and 19 while wiring the HCD panel. These figures provide loadside wiring, terminal descriptions, and schematics, respectively.

Accustat Thermostat Wiring for Air-Conditioning, Heat Reclaim and Booster Heat

See the reverse side of the thermostat for wiring connection (refer to Figure 15).





### Figure 15. Accustat Thermostat Front and Rear View

### The following steps apply to Accustat Thermostats only:

Jumper <u>RC</u> and <u>RH</u> on the thermostat and run one Step 1. common line to terminal R on the HCD Control Board.

Step 2. For first stage air-conditioning, connect terminal Yl on the first thermostat to Yl on the input side of the HCD Control Board. Connect thermostat terminal Y2 to Y2 on the Control Board. For stage 3 and 4 of air-conditioning, connect terminals Yl and Y2 of the second thermostat to Y3 and Y4 of the HCD Control Board. Insure that sensor bulbs are in clips.

Step 3. For heat reclaim, W1 of the thermostat is wired to W1 on the control board for the first stage. Connect W2 to W2 for the second stage, if applicable. Also connect heat reclaim valves to appropriate heat reclaim stage.

Step 4. For booster heat, connect the next available thermostat heat terminal to W3 on the HCD Control Board. Continue connecting next available thermostat heat terminal to W4, W5, ... W8 as necessary to connect all heat stages.

Step 5. For Night Setback, connect terminal N on thermosts to N1 on HCD Control Board.

HCD-ET Wiring

Figure 20 shows the Environmental Control panel with the Honeywell Electronic Thermostat System.

Figure 21 shows the Honeywell component interconnection wiring for the different HCD-ET panels, which should be used when troubleshooting thermostat problems.

### Humidistat Wiring

- 1. Connect red wire of humidistat to Hl on HCD Control Board.
- 2. Connect yellow wire of humidistat to H2 on HCD Control Board.
- 3. Cap off blue wire of humidistat.

### Dew Point Wiring

Option to Humidistat

1. Connect H1 on HCD Control Board to "N.C." terminal on Dew Point Control.

2. Connect H2 on HCD Control Board to "COM." terminal on Dew Point Control.

### Isolated Relay Package Wiring

If the Isolated Relay Package option is ordered, the coil side of the Isolated Relay Pack will be factory installed. The load side of the relay pack should be wired in accordance with the wiring of the load side of the HCD Control Board. The load side of the Isolated Relay Package has dry contacts with ratings as outlined in the Specifications Section.

### Loadside Wiring

Figure 16 details load side contacts which are labeled ACIF through F2. All of these contacts will have either 24 VAC

or zero volts when the HCD panel is in operation.

The first terminal is the hot side and the next is the common side.

The terminals are connected as follows:

AC1B AC1C	(Hot) (Common)	A/C Stage l,	Relay Control
AĊ2B AC2B	(Hot (Common)	A/C Stage 2,	Relay Control
AC3B AC3C	(Hot) (Common)	A/C Stage 3,	Relay Control
AC4B AC4C	(Hot) (Common)	A/C Stage 4,	Relay Control

RH1B RH1C	(Hot) (Common)	Heat Reclaim Stage 1, Relay control #1
RH1E RH1F	(Hot) (Common)	Heat Reclaim Stage 1, Relay Control #2
RH1H RH1I	(Hot) (Common)	Heat Reclaim Stage 1, Relay Control #3
RH2B RH2C	(Hot) (Common)	Heat Reclaim Stage 2, Relay Control #1
RH2E RH2F	(Hot) (Common)	Heat Reclaim Stage 2, Relay Control #2
RH2H RH2I	(Hot) (Common)	Heat Reclaim Stage 2, Relay Control #3

RH2K (Hot) RH2L (Common) Heat Reclaim Stage 2, Relay Control #4
BH1B (Hot) BH1C (Common) Booster Heat Stage 1, Relay Control
BH2B (Hot) BH2C (Common) Booster Heat Stage 2, Relay Control

Eng. 322321

4-5

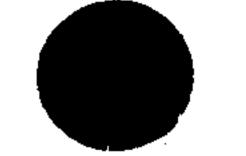
BH3B (Hot) BH3C (Common) Booster Heat Stage 3, Relay Control

BH4B (Hot) BH4C (Common) Booster Heat Stage 4, Relay Control

BH5B (Hot) BH5C (Common) Booster Heat Stage 5, Relay Control

BH6B (Hot) BH6C (Common) Booster Heat Stage 6, Relay control

Dl (Hot) D2 (Common) Damper Motor Control Contacts Fl (Hot) F2 (Common) Air Handler Blower Motor Control Contacts



.

. . .

.

·

1

.

.



Ű.

ų,

4-6

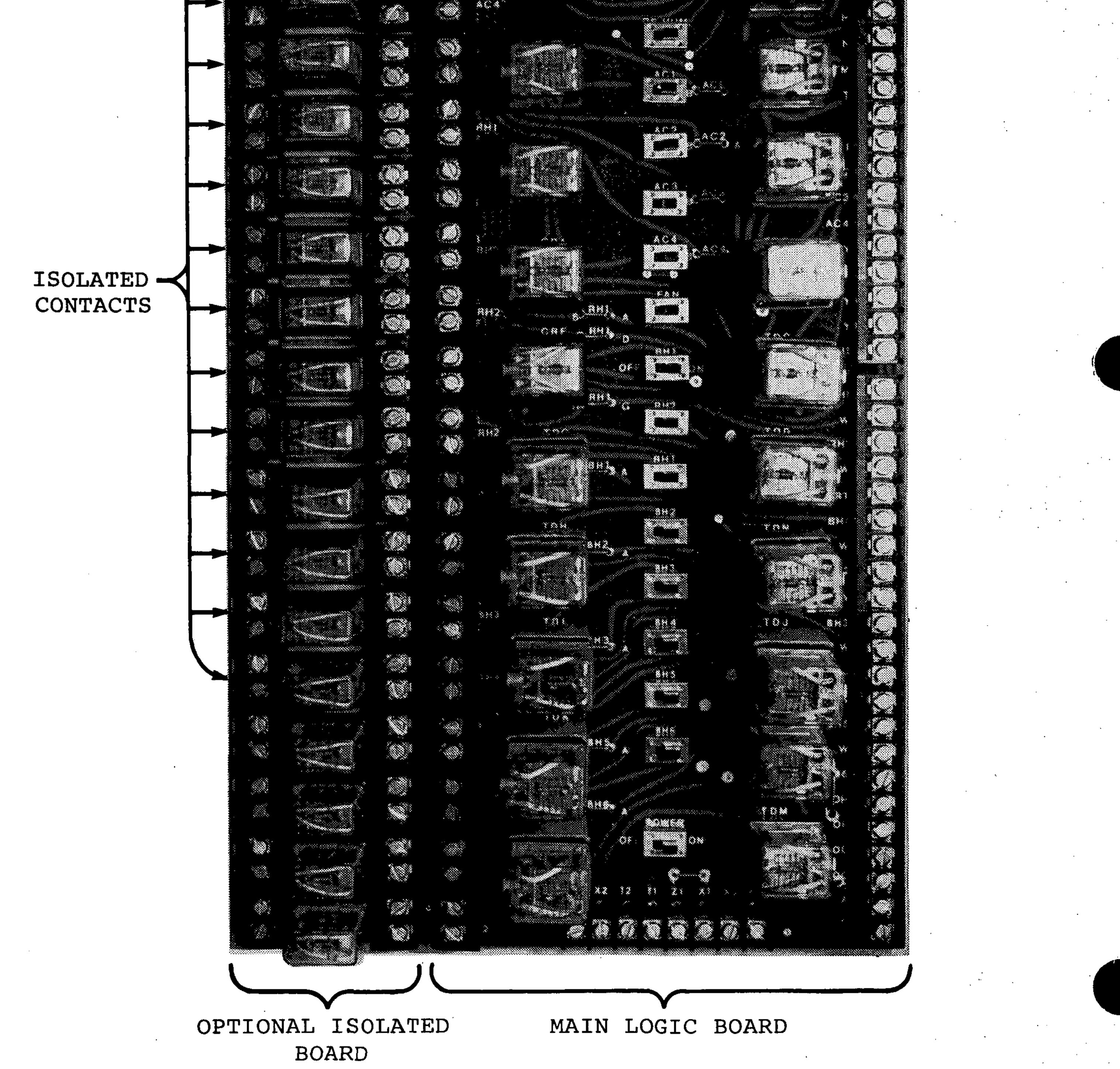
h ( M Adams 10.00 S State & A 9 10

\*\*\*\*\* HUS H.C.D. CONTROL PANEL MODEL NO 426N & C 2. N 8112 e RHS

R3AMSC

STAGING SWITCH

- C3 - }



### Figure 16. Loadside Wiring

۰. <sub>د</sub>

•

0C3 ACT ОНЗ B RH2 A HUSSMANN CORPORATION AC2 H.C.D. CONTROL PANEL H RH2 G C MODEL NO.\_\_\_\_ RH2 Ε K RH2 J AC3 CRF DAMPER W2 OFF ON H1 AC4

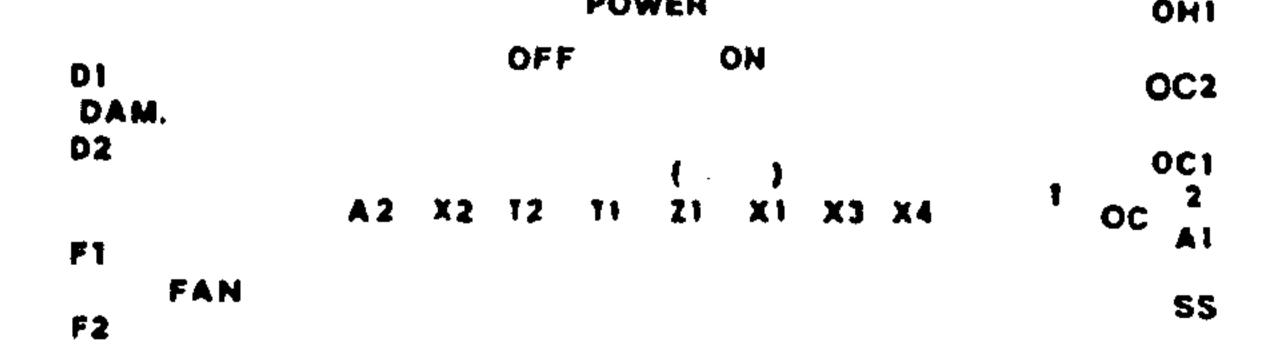
4 - 7

H2

CRK 8 RHI C E RH1 F CRP H RH1 B RH2 C CRA E RH2 F RH1 B CRE RHI H RH2 **RH1** 

DE-HUM, N1 CRN TMR ACI ACT T 2 R . AC2 AC2 ACIA TDA AC2A AC.3 AC3 AC3A AC4A AC4 TDB **Y** 1 AC4 Y2 FAN ¥3 ¥4 TDC D 8H1A RH1 OFF ON RHID RH2 H

••	K RH2	TDG	W 1 T D D	
	L L		RHIG	· · ·
E	 8	B BHI A BHI	<b>W3</b>	
	ВН1 C		RTD	
		BH 2 T D H	TDN BHIA	
•	B BH2	BH2	₩4	
	C	BH3	BH2A	* **
	8		₩5	
	8H3 C	TDI BH4	TDJ BHJA	
-	_	6 BH 3 6 A	<b>W6</b>	
	8 8 H 4	BH S	A <sub>BH4</sub>	
•	<b>C</b>	•	вн4 w7 .	
	•	TDK BH6	CRL B BH5A	
	8H5 C	B BH5 A	W 8	4
	₿		BH6A 2	-
	ВН6 С	TDLB BH6 A	OH OH2 TDM 1	
		POWER	 Он1	



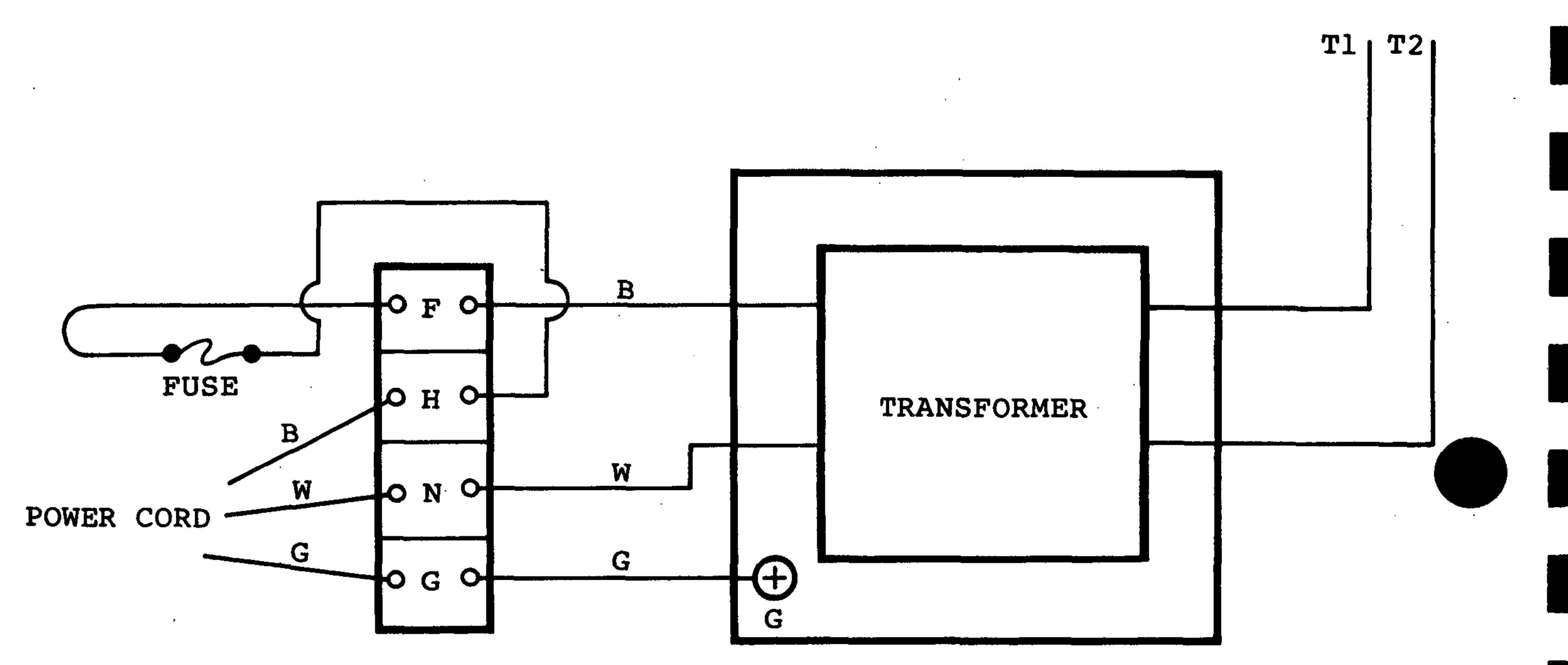
#### Relay Board Terminal/Contactor Designation Figure 17.

• .

Power Wiring

**CAUTION:** MUST BE ALL WIRING INSTALLED TO CONFORM TO APPLICABLE LOCAL CODE STANDARDS. WIRING SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN. INSURE THAT POWER IS OFF WHEN WIRING.

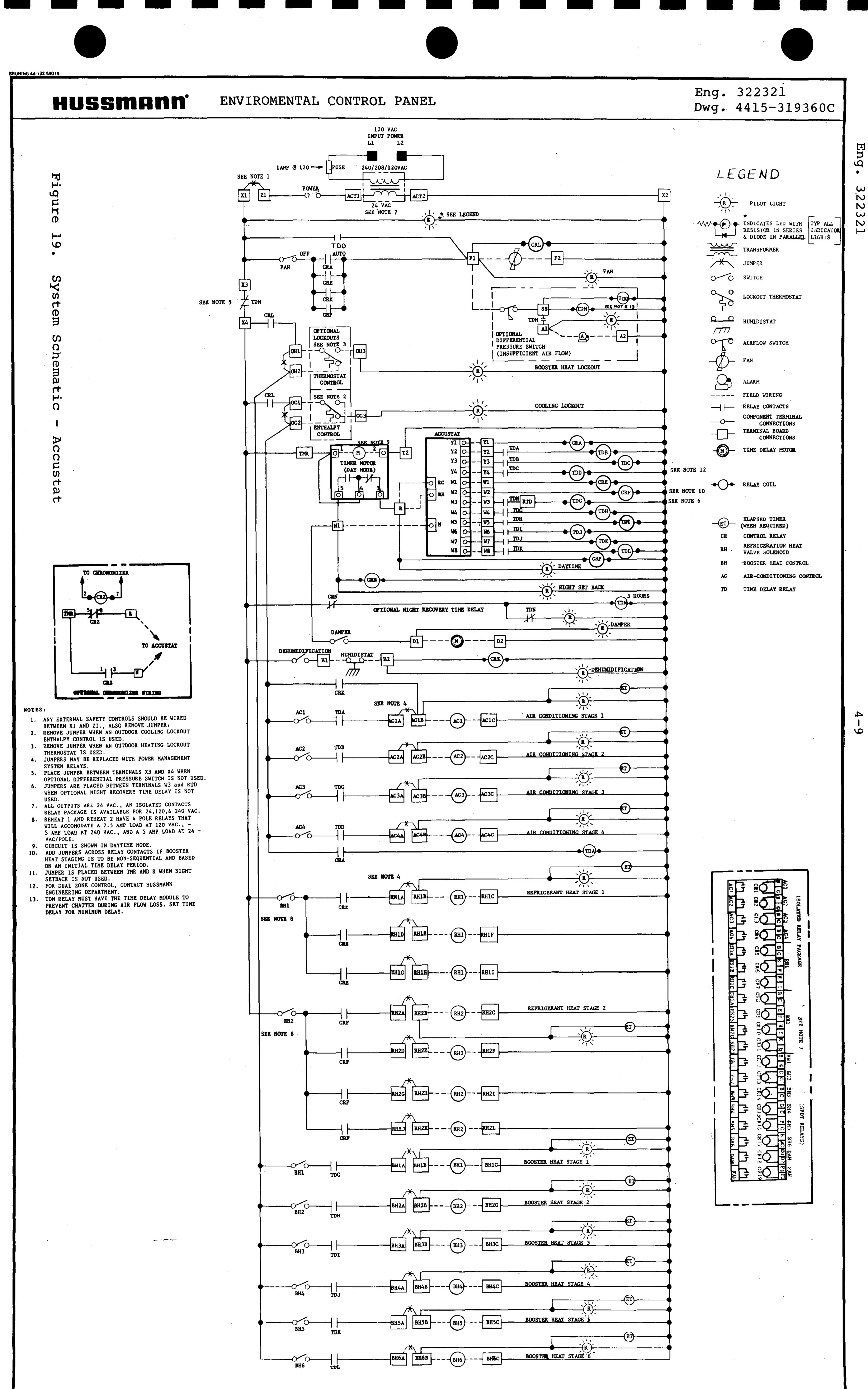
Power connection's are as outlined below in Figure 18. Connections are made at lower left of HCD Panel.

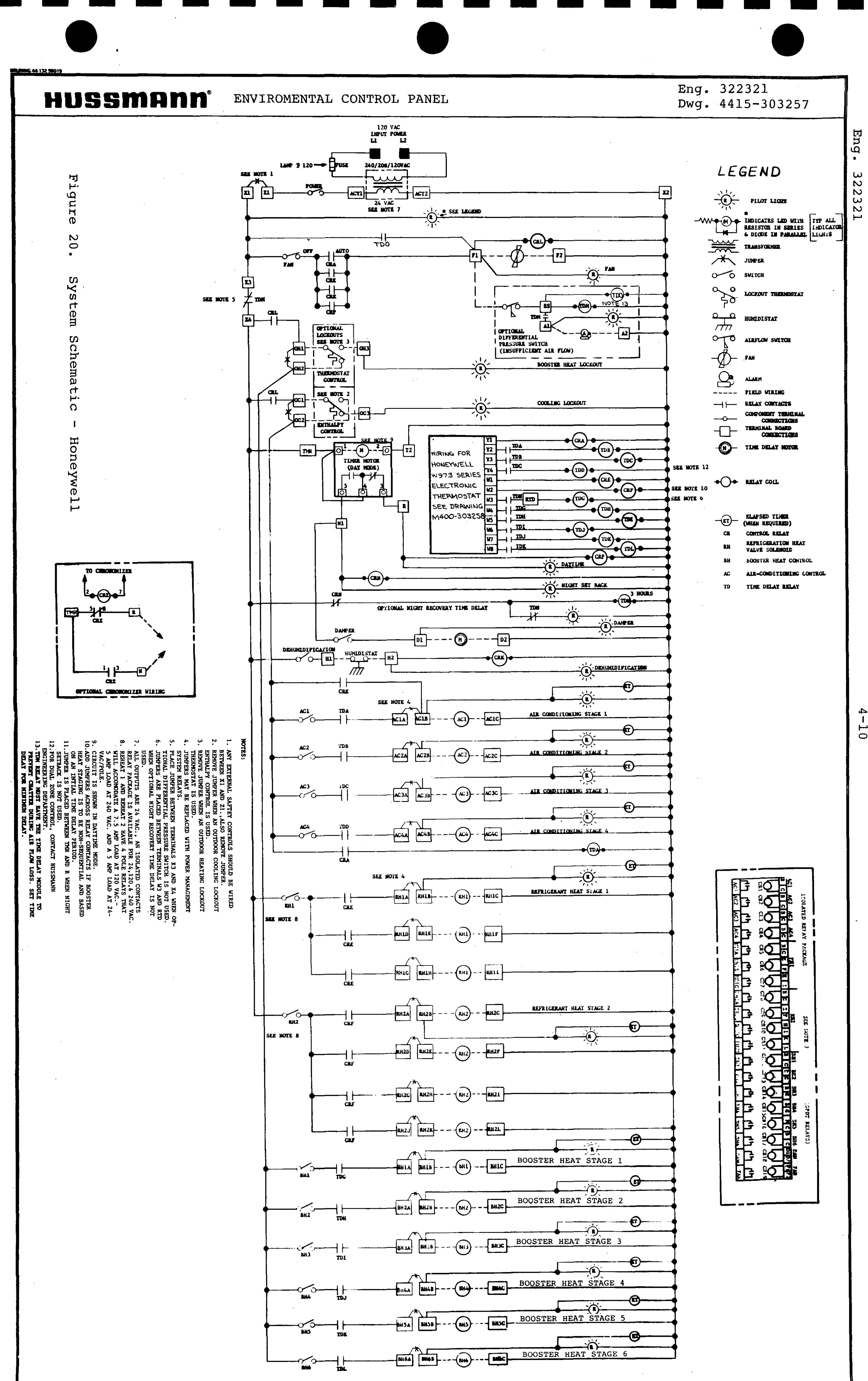


### Figure 18. Power Wiring

•

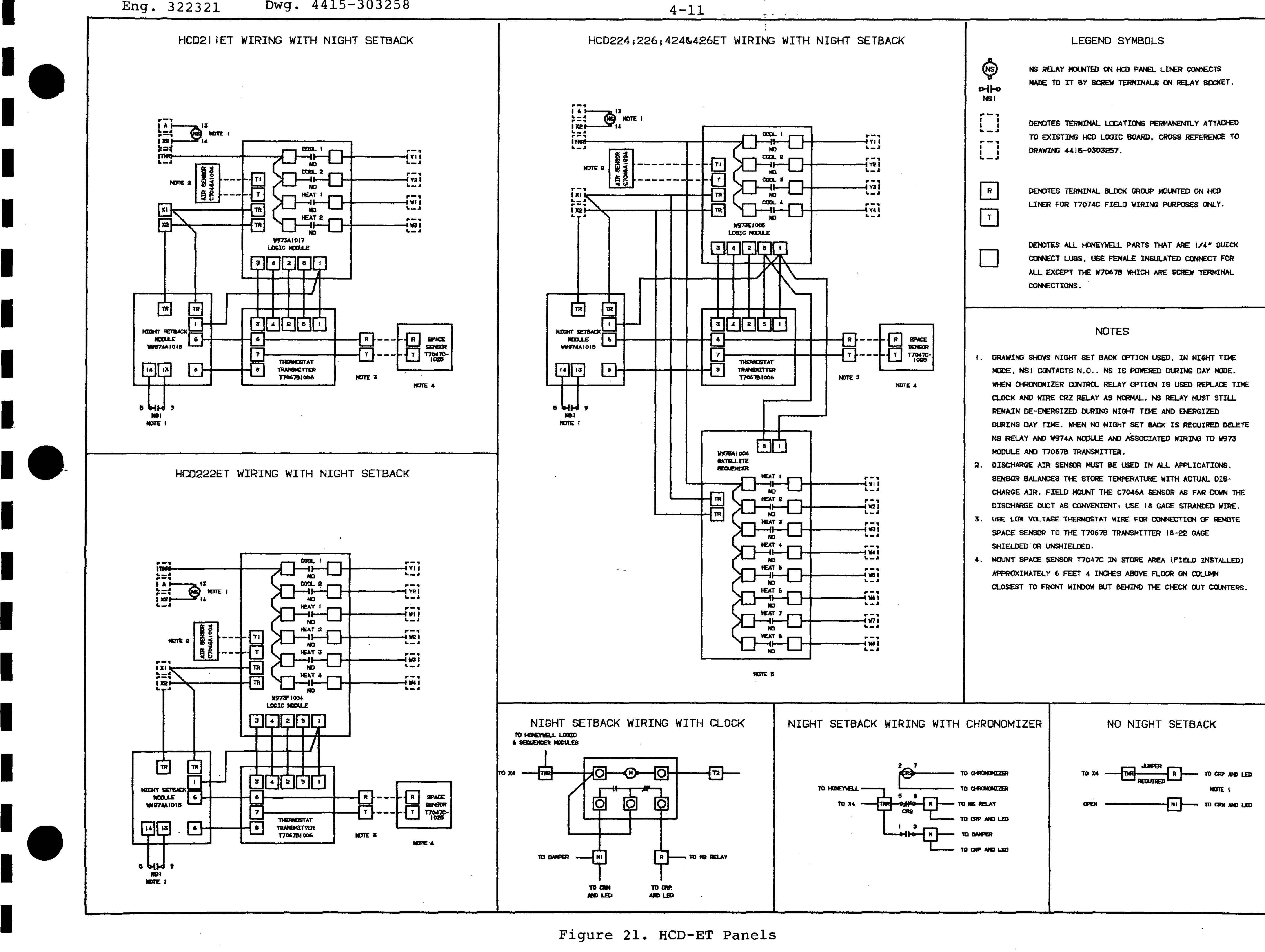
.





•

0



### START-UP AND CHECKOUT

### PRELIMINARY START-UP CHECKLIST

Be sure that the following items are performed before testing the HCD panel.

l.\_\_\_Input voltage 120v.

2. All wires are connected to proper terminals.

3. All time delays are set to their minimum (test conditions

- only) setting.
- 4. <u>All temperature sensors have been inserted into all</u> Accustat Thermostat controls.
- 5. <u>All humidistats are set to their highest setting</u>. (Dew point control is set to setting "F").
- 6. All system switches are in the "OFF" position.

### CHECKOUT

Insure that all required functions operate, by manually putting the HCD panel through each function. This is done by bringing on one stage at a time. Turn main power "ON". Next, turn "ON" each staging switch (located in the center of the main logic board), one stage at a time. See Figure 16. Make both visual and operational checkouts. HCD front panel lights should operate when its particular function is activated. Air-conditioning, Heating, etc. should work as panel indicates. Refer to Table 1 for indicator light function.

Table 1 specifies a complete listing of the HCD's system conditions. The corresponding headings that fall under the "Illuminated Indicator Lights" title block signify an illuminated panel light and directly correspond to the system condition listed to the left of it.

#### NOTE

TIME DELAYS WILL CAUSE DELAYS IN VARIOUS FUNCTIONS. BE SURE THAT THE APPARENT MALFUNCTION IS NOT A CAUSE OF THE TIME DELAY.



,



.

•

.

							<b>-</b>				
System Condition	Power	Fan	Air Flow Alarm	Daytime	AC1	AC Lockout	AC2	AC 3	Damper Closed	AC4	Rec. heat l
Power											
Daytime											
No Air Flow											
AC 1									,		,
AC Lockout											
AC 2								· · ·			
AC 3											
Damper Closed											,
AC 4											
Rec. Heat l											
Rec. Heat 2	2				1					······	
Dehumidification											
Booster l											
Booster Lockout											
Booster 2						· ,					
Booster 3						+					
Night Setback					·						
Booster 4											
Booster 5											
Night Recovery											
Booster 6		Ŏ									· · · · · · · · · · · · · · · · · · ·

This chart illustrates the indicator lights that should be on when a particular system condition is on. Although as in the case of the night recovery, other indicator lights <u>may</u> be on, such as heat reclaim, or various stages of A/C.

•

INATED

Table 1. Indicator Light Function Table

•

· ·

-

• ·

	INDICATOR	LIGHTS				
	Dehumid.	Rec. heat 2	Booster l	Booster Lockout	Booster 2	Boost 3
				·		
-						
	· · · · · · · · · · · · · · · · · · ·					
			•			
ļ						
				· · · · · · · · · · · · · · · · · · ·		
		E				
	A					

•

.

Night Setback Booster ster Night Booster Booster Recovery

•

·

. .

•

,

In checking out the HCD, use the "Check Button Relays" to simulate operation. Care must be taken not to force the HCD into an abnormal condition. Only an installer with full knowledge of the circuit schematic should attempt a checkout using the Check Button Relays.

5-3

All initial stages of air-conditioning and heat must be activated before the next stage will activate. For example, stage one of air-conditioning must be on before stage two can come on.

All other control devices should be manually operated to ensure HCD Panel is functioning as intended. Once again, refer to Table 1 to check indicator light panel output.

Perform the following procedures to check the heating and cooling stages:

Accustat Thermostat

1. Heating Stages

The heating stages are normally closed contacts. Removing the appropriate sensors will cause the contacts to close. This simulates a low store temperature and calls for heat.

2. Cooling Stages

The cooling stages are normally open contacts. Jumpers must be installed in place of the sensor to close the contact. This will simulate a high store temperature, and call for cooling.

### Honeywell Electronic Thermostat

1. Heating Stages

Remove transmitter cover. Move the thermostat heating lever (red) above room temperature. Observe that the heating stages begin to operate, starting with the heat reclaim system. Verify that all equipped heating stages activate properly.

2. Cooling Stages

Move the thermostat cooling lever (blue) below room temperature. Observe the cooling stages begin to operate. Verify that all equipped cooling stages activate properly. The cooling LED should glow brightly during this test.

3. Night Setback

If the night setback is controlled by the Chron\*o\*mizer, instead of the 7-Day Night Setback Clock, place the Load Control Switch to "Manual On" to observe the reactions of the heating and cooling stages.

5-4

In the following procedures, "time clock" refers to either the 7-Day Time Clock or Chron\*o\*mizer.

After placing the time clock in the day mode, set the heat setback jumper to the 15°F position. Activate the heating stages (refer to Step 1). Place the time clock in night mode; one or more heating stages should turn off, depending upon the amount of temperature adjustment needed. Return the time clock to the daytime mode and observe that the heating stages reactivate.

To test the cooling lockout function, perform Step 2, then place the time clock in the night mode to observe that the cooling stages turn off. Restore the time clock to the daytime mode to complete the checkout.

After completing the above steps, position the heating and cooling levers to the desired set points. Recommended temperature settings are 70°F for heating and 75°F for cooling. Place the heat setback jumper to the desired setback temperature differential.

For more information on component specifics, refer to the Vendor Literature Packet for the following items:

• Setback Module-W974A, B

,

.

- Electronic Satellite Sequencer-W975A, B
- Electronic Thermostat and Transmitter-T7067A, B
- Logic Panel Instructions-W973A, B, D-H, J

### START-UP

Upon conclusion of the operational checkout, it is time to set up the HCD Control System for correct operation.

### 1. Accustat Thermostat(s)

Be sure proper temperature bulbs are in correct stage location.

### 2. <u>Humidistat</u>

Check for correct setting. Set humidistat at or below 55%. Dew Point Control should be in position "B" or "C".

7-Day Time Clock

### All start/stop settings should be in appropriate position. Desired time/day position should also be set.

#### Night Recovery 4.

Time delay relay should be set to desired delay. Settings vary for different buildings. If in doubt, set at maximum position.

5-5

#### Stage Time Delay 5.

Set time delay adjustment screws to desired setting. If in doubt, set at maximum position.

#### Insufficient Air Switch 6.

Set time delay relay, TDM, to desired setting. If in doubt, set at minimum position.

Outdoor Ambient Lockouts 7.

> Set heating and cooling lockouts and differential point. Recommended settings are shown below.



This concludes Start-Up. The HVAC System should now be monitored over the next few weeks to ensure proper operation.

.

.

· -

• ,

- ·

.

· · 



Eng. 322321

6-1

### SPECIFICATIONS

ELECTRICAL

#### **TEMPERATURE ADJUSTMENT**

Accustat Thermostat:

- 24 set points
- 35°F to 88°F
- Differential: 1½°F to 3°F

Honeywell Electronic Thermostat:

- Set point adustment: 55°F to 85°F
- Heating/Cooling deadband: 3°F to 30°F
- Setback temperatures: 5°, 10°, 15°F

### MOUNTING

Location: Directly to wall or panel Layout Dimensions: 25"H x 16"W x 7"D

### ACCUSTAT THERMOSTAT

SPDT, pilot duty 24 VAC, 2 heat and air-conditioning stages
Standard Accustat: P/N 4011-316510
Night Setback Accustat: P/N 4011-316509
2 Heat Stages Only: P/N 4011-316511

#### HONEYWELL COMPONENTS

ITEM	HONEYWELL P/N	HUSSMANN P/N
Thermostat Transmitter	<b>T7067B1008</b>	4011-0303947
Satellite Sequencer	W975A1004	4011-0303948
Discharge Sensor (Duct Stat)	C7046A1004	4011-0303949
Remote Šensor (Room)	T7047C1025	4011-0303951
Logic Module	W973E1005	4011-0303946
Logic Module	W973A1017	4011-0303114
Logic Module	W973F1004	4011-0303115
Night Setback Module	W974A1015	4011-0303299



Air-conditioning and Booster Heat: DPDT

24 VAC coil: P/N 4011-319167 Heat Reclaim: 4PDT, 24 VAC coil, P/N 4011-319170 Isolated: SPDT, 24 VAC coil, P/N 4011-319159

### NOTE

Total 24 VAC output load on control board should not exceed 90 VA, if isolated relay package is not ordered.

6-2

### SEVEN DAY CLOCK

Synchronous or quartz drive, 24 VAC, 60 HZ input: •Synchronous Standard: P/N 4011-319161 •Synchronous W/Power Back Up: P/N 4011-319163 •Quartz W/Power Back Up: P/N 4011-319162

### TRANSFORMER

Input: 120 VAC Output: 24 VAC, 100 VA

### ADJUSTABLE TIME DELAYS

1 to 30 minute adjustment: Air-conditioning and Heat Stage Delays, Insufficient Air Delay, P/N 4011-316506

6 to 180 minute adjustment: Night Recovery, P/N 4011-319168

### OUTDOOR LOCKOUT THERMOSTATS

SPDT,  $30^{\circ}$ F to  $100^{\circ}$ F, for Heat Lockout, P/N 4011-147573 SPDT, 55°F to 85°F, for Air-conditioning, P/N 4011-303067

DUCTSTAT

24 VAC Pilot Duty, SPDT w/NC Contacts, P/N 4011-319169

### DEW POINT CONTROL

SPDT, temperature range  $55^{\circ}F$  to  $85^{\circ}F$ , 24 VAC Pilot Duty, P/N 4011-148017

.

.

-

### TROUBLE SHOOTING

### **GENERAL INFORMATION**

Effective electrical trouble-shooting is done by a process of elimination. Any electrical circuit that is functioning properly can be eliminated as a potential malfunctioning component. For example, the HCD can have either 2 or 4 stages of air conditioning. If an air-handler has three major loads, and two of the loads are operating correctly, then the trouble should be in the third circuit. That electrical load, and the circuits controlling it should be tested.

### PRE-TROUBLE SHOOTING CHECKOUT

Insure that the following listed items have been checked before pursuing more involved troubleshooting:

- 1. Power is on. (Check "power" indicator light)
- 2. All wires are connected to proper terminals (see schematic figure 19)
- 3. All function switches are in the "ON" position.
- 4. <u>All time delays are set to their minimum settings</u> (for trouble-shooting only)
- 5. <u>Accustat-- all temperature sensors have</u> been inserted into all thermostat controls.

\_\_Honeywell--room thermostat and discharge air sensor are properly wired to the control panel.

6. All humidistats are set to their highest setting. Insure that all required functions operate by manually putting the HCD panel through each function. Make both visual and operational checkout. HCD front panel lights should operate when its particular function is activated. Various stages of heating and cooling lights should illuminate as appropriate. Refer to Table 1 for indicator light function table.

#### HCD-ET

The first step of troubleshooting the HCD-ET panel is to determine whether a fault is an HCD relay logic failure or a Honeywell component failure. The following troubleshooting procedures should identify most HCD faults. The Honeywell Component Installation Instructions should be used to identify specific module failures. Refer to the CHECKOUT SECTION of the respective instruction sheet to verify proper operation of a specific module.

### Eng 322321

	Trouble Shooting Procedure					
MALFUNCTION	POTENTIAL CAUSE	CORRECTIVE ACTION				
System will not function	a. Main power switch "Off"	a. Turn switch "ON".				
Power indicator light is "OFF"	a. Main input voltage problem	a. Check for 120V between Ll (H), and L2 (N), on terminal blocks.				

b. Check voltage across fuse F to N for 120v input, or pull fuse and check visually.

Air-flow indicator light is illuminated, and fan does not operate. (light is "OFF") b. Bad fuse (burnt)
c. Transformer (bad)
d. Loose cable interconnection to indicator light board

a. Insufficient airflow c. At output side of transformer check Tl and T2 for 24V.

d. Check output connector on indicator light board, from relay board. Insure good connection.

a. Reset alarm switch off, then on.

Note that when the above condition occurs, the four subsequent processes of elimination under "corrective action" require the main power switch "OFF" then "ON". This resets the TDM coil.

b. No voltage to fan

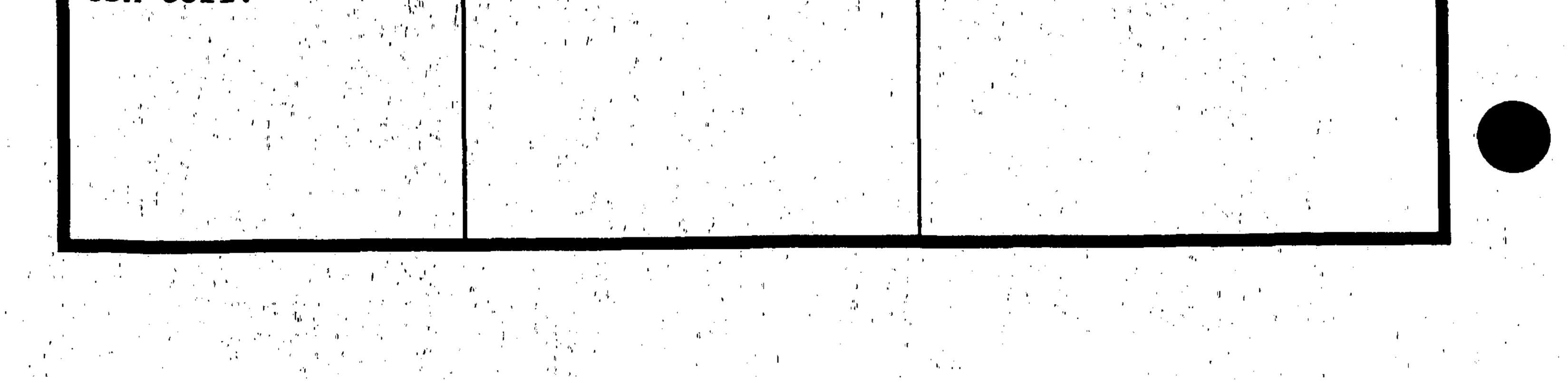
c. Blown Fused. Filter clogged

· · ·

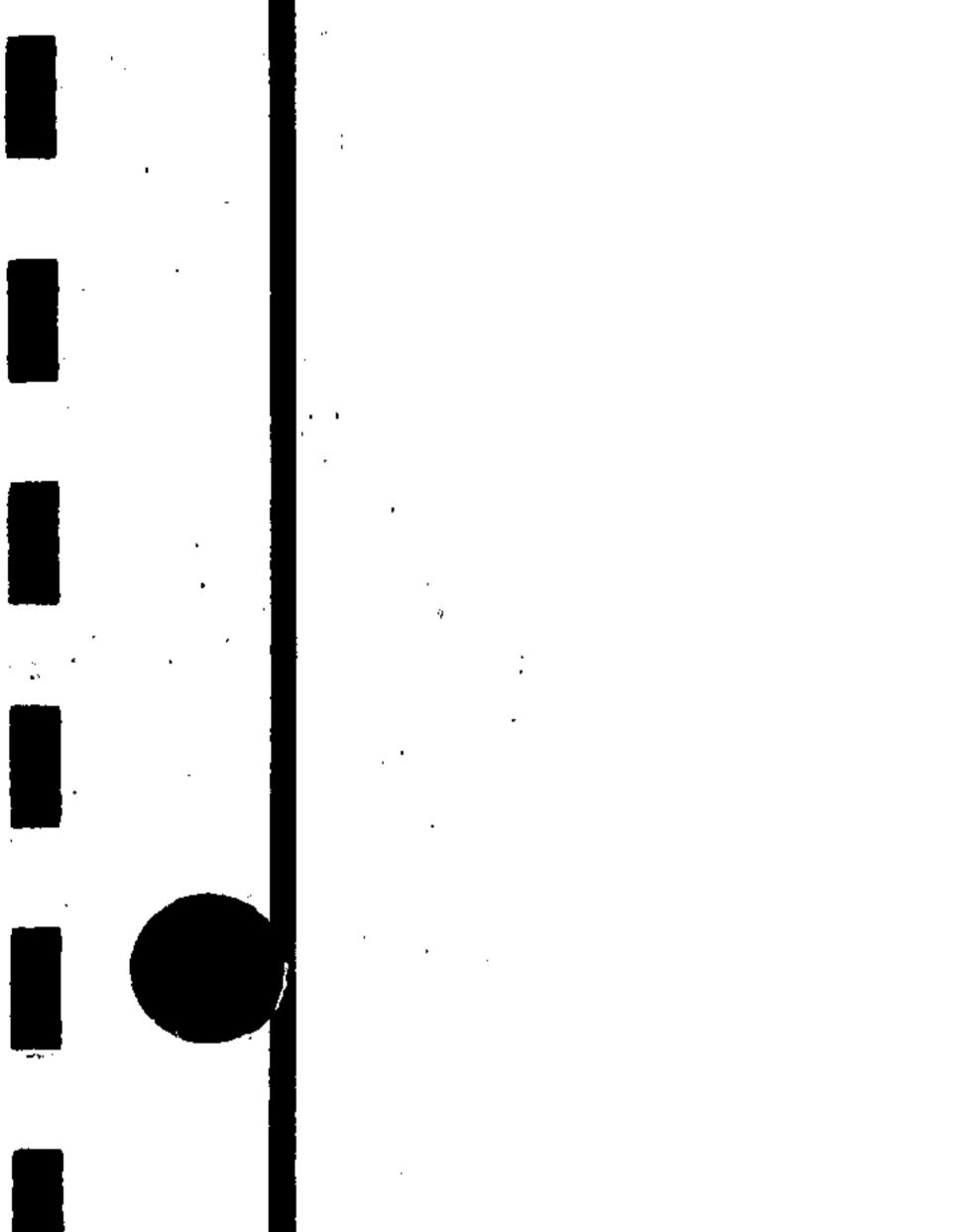
b. Check voltage across Fl and F2 for 24V, if ok check voltage at coil of isolated relay.

c. Replace fuse in air-handler circuit.

d. Replace filter.



	Eng. 322321		1 · · · · · · · · · · · · · · · · · · ·	
		Trouble Shooting Proce	edure	
	MALFUNCTION	POTENTIAL CAUSE	CORRECTIVE ACTION	
.!	No A/C, Heat, or Heat Reclaim (Accustat Thermostat)	a. Check fan.	a. See previous procedure ("No voltage to fan").	
		b. Check power to relay coils.	b. Check the following terminal connections - R to Yl, for 24V (cooling)	



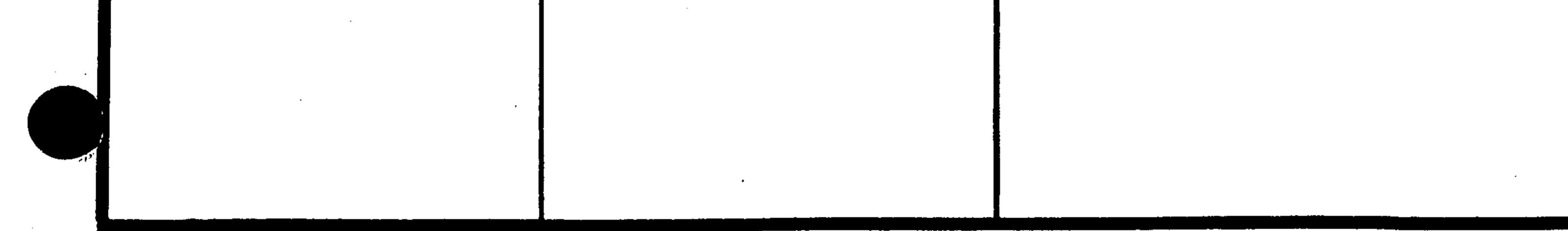
- c. Accustat thermostat burns due to over current.
- d. Mercury column separation.
- e. Thermostat not operating properly.

- 24V (Cooling)
- R to Wl for 24V (heat reclaim)

11 A.

- R to W3, for 24V(booster heat)
- c. Replace thermostat.
- d. Heat bulb to reunite mercury column.
- e. Check RH to Wl for (24V to 30V) (If calling, 3V or

- heating - cooling	less) check RC to Yl for 24V to 30V. (If calling, 3V or less)
<pre>f. Lockout activated    due to outdoor    temperature.</pre>	f. Change setting as appropriate.



•

•

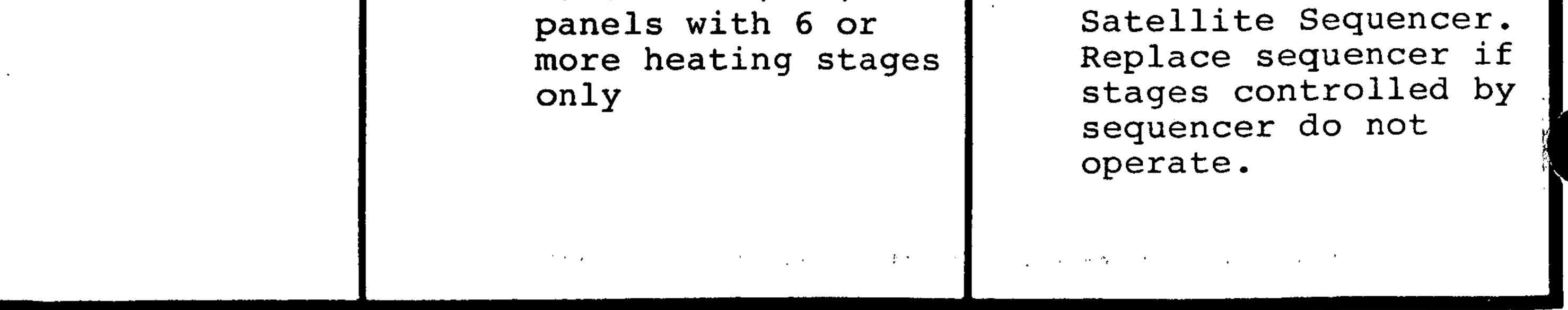
• • •

.

7-4

Trouble Shooting Procedure					
MALFUNCTION	POTENTIAL CAUSE CORRECTIVE ACTION	N			
No A/C, Heat, or Heat Reclaim	a. Check fan a. See previous pro ("No voltage to	cedure fan").			
(Honeywell Thermostat)	b. Check power to relay coils. - R to Y1, for 24V (cooling) - R to W1 for 2	ions			
	(heat reclaim) - R to W3, for (booster heat)				
	c. Night Setback Module C. Remove W973 con W974A1015 (bad) nections 1, 6 &				
	d. Transmitter Module d. Verify that ter T7067Bl006 (bad) mitter are wire blocks R and T.	s- d to			
	Check voltage 1 on transmitter heating or cool Terminals 2 to (>20VDC), 4 to (cooling ramp).	for ing. l			

			<pre>(cooling ramp), 5 to l (heating ramp); only one ramp should be present at one time. The LED "ON" should be the ramp on.</pre>
e.	Logic Module W973Al017, W973El005, or W973Fl004 (bad)	e.	Verify all wiring connections to Logic Module. Replace Logic Module if stages controlled by Module do not operate.
f.	Satellite Sequencer W975Al004 (bad) -	f.	Verify all wiring connections to



· · · •

. •

Eng. 322321

### Trouble Shooting Procedure

MALFUNCTION	POTENTIAL CAUSE	CORRECTIVE ACTION
Night Setback does not operate (Honeywell Thermostat)	a. Check Night Setback Clock, relay or Chron*o*mizer.	a. Replace clock or relays.
	b. Night Setback Module (bad)	b. Replace Night Setback Module.



.

.

۱ ۱

.

1 F

.

. . . .

. .

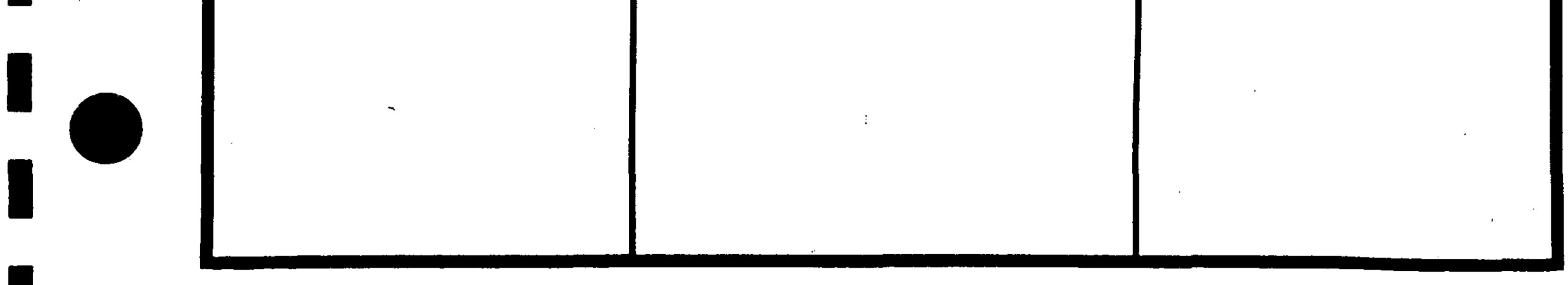
•

, •

.

.

•



•

.