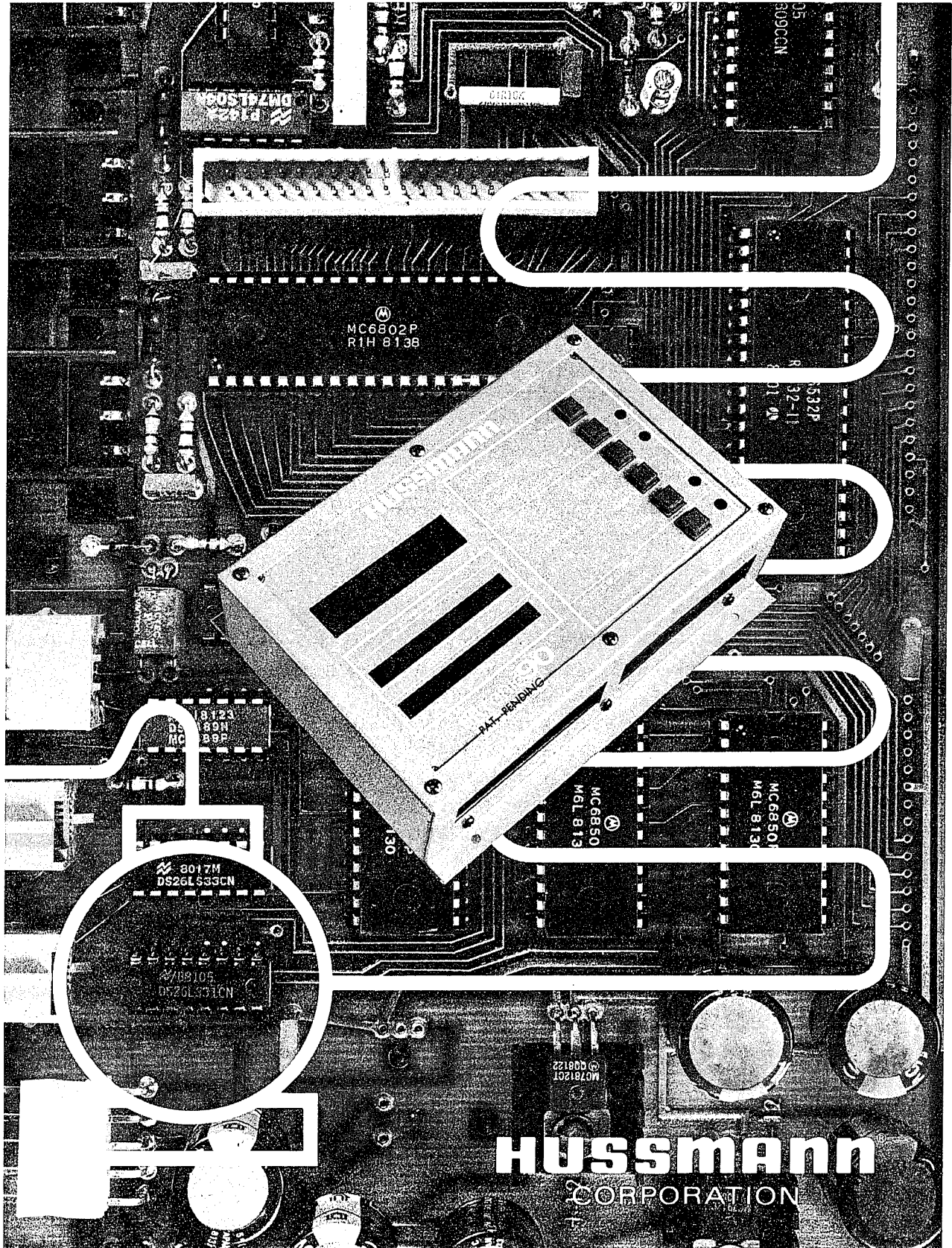


INSTALLATION INSTRUCTIONS

301100C-Rev.

February, 1985

BULLETIN 334.1



HUSSMANN
CORPORATION

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FCC REGULATIONS REQUIRE THE FOLLOWING WARNING:

Warning: This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the instructions manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

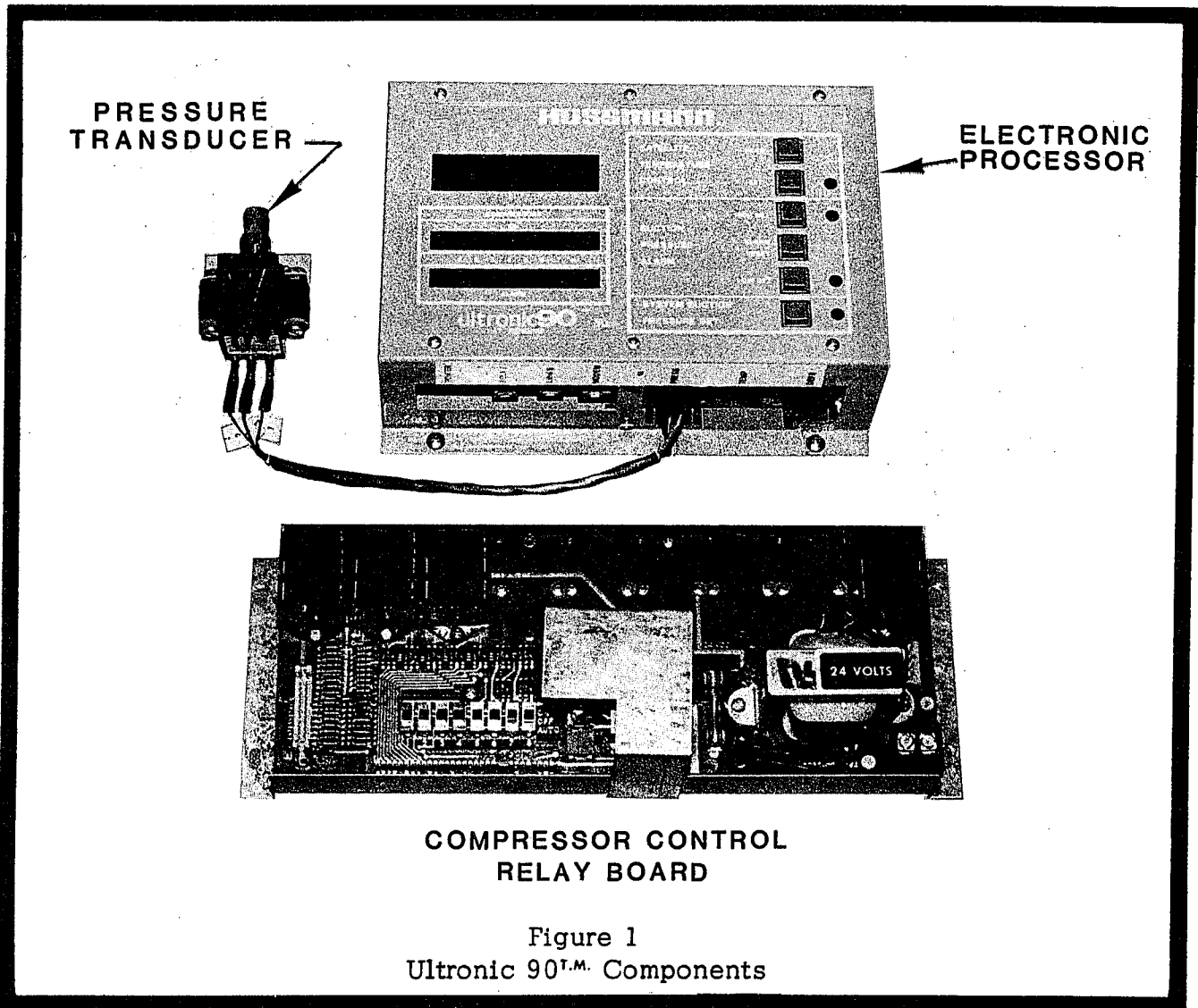
DESCRIPTION OF COMPONENTS

Hussmann's Ultronic 90™ is an electronic compressor controller PAT. PENDING designed to control up to 7 parallel compressors. A single set point based on suction pressure is used by the processor to determine which compressors are cycled and for how long each will run.

Hussmann's Ultronic 90™ consists of:

- The Electronic Processor
- The Personality Module
- The Compressor Control Relay Board
- A 24 Volt Transformer
- The Pressure Transducer

An optional temperature control for a mounted or remote Satellite is also available.



COMPRESSOR CONTROL
RELAY BOARD

Figure 1
Ultronic 90™ Components

ELECTRONIC PROCESSOR

The electronic processor is the heart of the system, located on the left side of the compressor unit (facing the control panel). The processor displays the system's suction pressure, which compressors are running, and if an alarm condition exists for a particular compressor. The electronic processor has the following displays and functions:

The suction pressure adjustment (factory programmed range from 0 to 63.5 psig. Field adjustable to ± 4 psig from the factory set point).

The suction pressure alarm (high, low, and reset buttons).

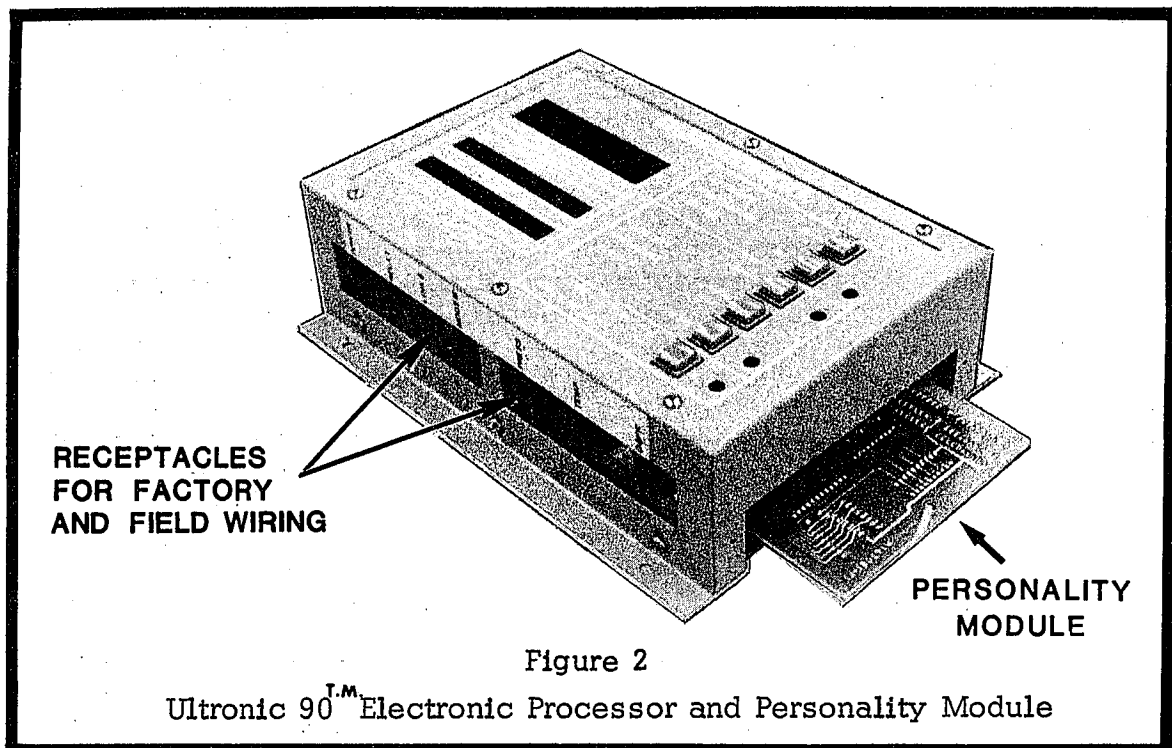
And if applicable,

The Satellite temperature set and read buttons (range from - 45 to 68 degrees F or -43.5 to 20°C).

PERSONALITY MODULE

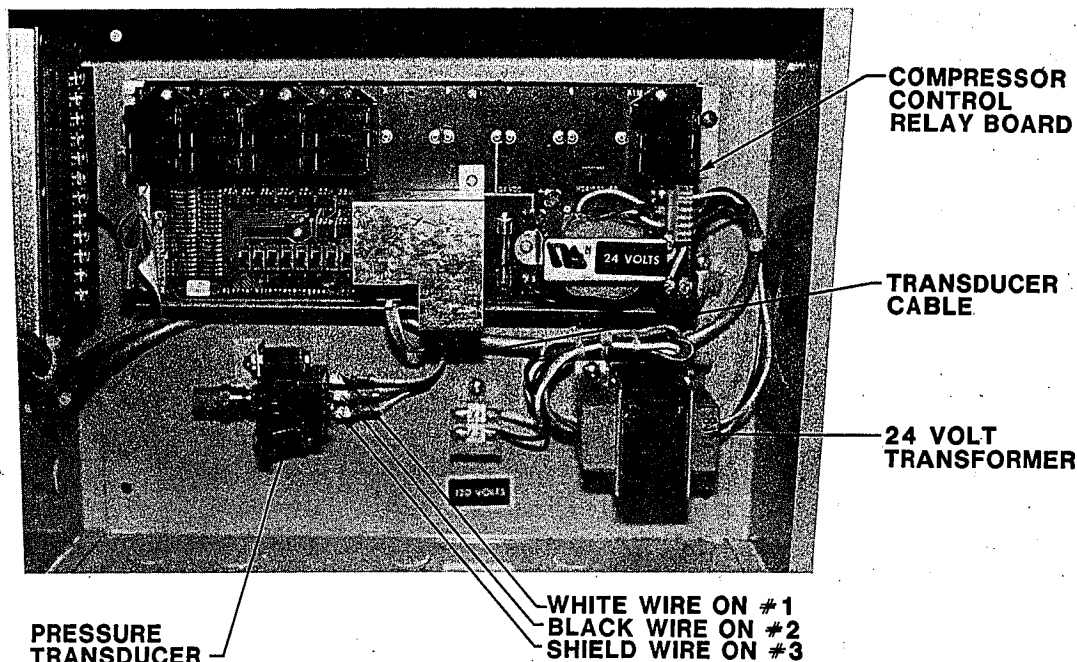
The personality module is located behind the access panel on the right side of the electronic processor. This module is set to provide the suction range, whether or not the compressors will cycle: in rotation, in progression, or any combination of progression and rotation.

Optional accessories that can be factory programmed into the personality module include: the Satellite controlled by the case temperature (Fahrenheit or centigrade, remote communications capability mix match compressor programming, suction pressure reset.



COMPRESSOR CONTROL RELAY BOARD

For field retrofit kits, the compressor control relay board is located inside a 15 x 12 x 6 inch enclosure. On factory installed units, the compressor control relay board is located inside of the compressor unit control panel. Relays, (Hussmann supplied) one per compressor, are energized according to which compressor will be cycled on.



**FIGURE 3
FIELD RETROFIT KIT
COMPRESSOR CONTROL RELAY BOX**

The alarm relay, on field installed units, can be wired in series with existing Hussmann compressor unit alarm wiring. Factory installed units have the alarm wiring complete as noted. Should an alarm occur, the in-store light or bell will still function. (See Electrical).

Three-way override switches (See Figure 4) are provided on the compressor control relay board for ease of servicing. Individual compressors can be turned OFF, ON, or AUTO (controlled by the electronic processor). Electrically, these 3-way override switches are downstream of the compressor control panel. Do not assume all power to the compressors is off if these override switches are turned off. Some compressors solid state modules will still be energized.

WARNING: If the 3-way compressor override switches are left in any position other than auto, and the electronic processor tries to cycle a compressor a nominal 8 times (at least one hour), the electronic processor will assume an alarm condition exists and the alarm will trip.

A 1½ amp Slo-Blo fuse is also located on the compressor control relay board which protects the processor. Spares are provided. Fuse type is MDL-1½.

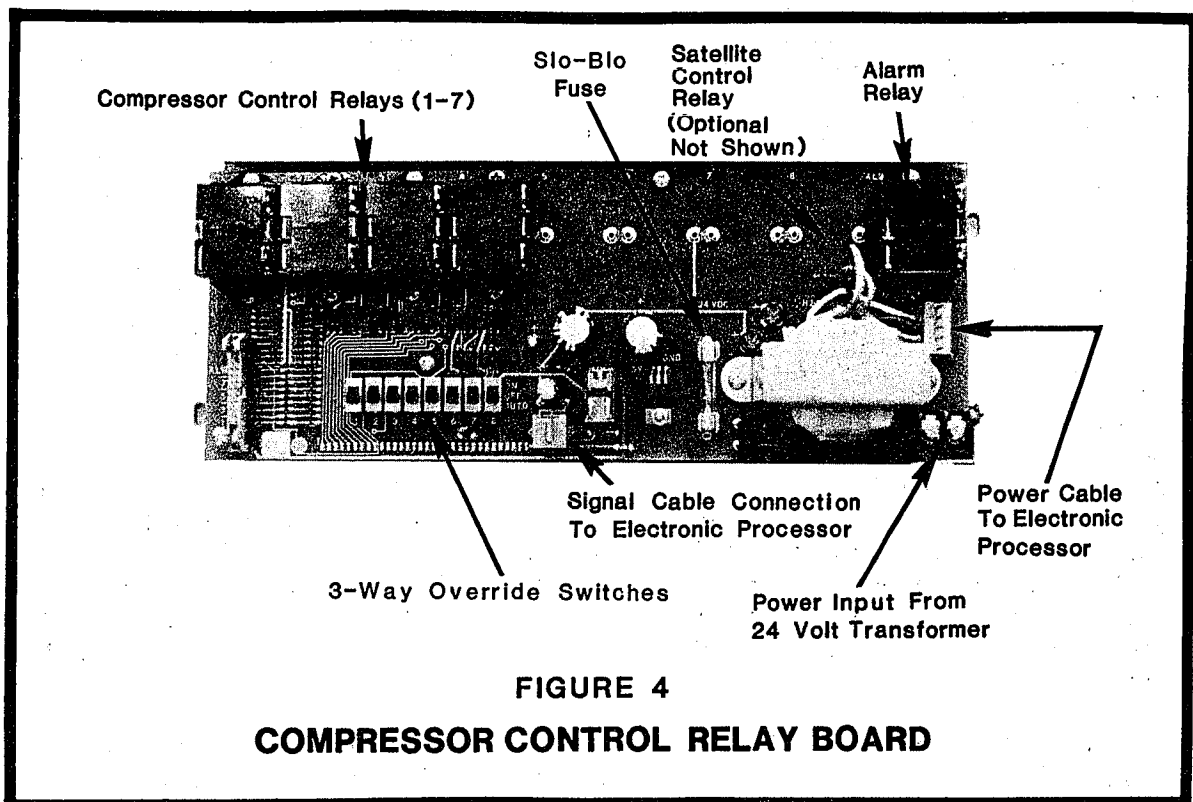


FIGURE 4
COMPRESSOR CONTROL RELAY BOARD

24 VOLT TRANSFORMER

Located in the compressor unit control panel on factory installed units, or inside the compressor control relay box for retrofits, the dual voltage 24 volt transformer provides power to the processor and the compressor control relays.

PRESSURE TRANSDUCER

Located underneath the processor on factory installed units, or inside the compressor control relay box for retrofits, the transducer converts suction pressure into an electrical signal. This signal is read by the processor to determine operating suction pressure.

ALARMS

The Ultronic 90 is equipped with an alarm relay which, when an alarm condition with the U-90 exists, will cause the U-90 to automatically switchback to conventional control. (See Figure 4). When wired in series with existing compressor unit alarms, the alarms will provide the following:

1. SUCTION PRESSURE ALARMS - The high suction alarm will be activated after the suction pressure has remained above the set point for over 15 minutes. The low pressure alarm will be activated if the suction pressure has remained below the set point for over 5 minutes. If the Koolgas defrost plug is wired to Koolgas relay (normally open) contacts 1 & 3, then closure of K.R. contacts will override the alarm during Koolgas defrost.

A special feature of these alarms is that if suction pressure has been adjusted in the field, the alarm set points do not necessarily have to be changed. They adjust automatically with adjustment of suction pressure. Also, these two alarms cannot be accidentally reversed. There can be no crossover between the high and low alarm set points.

If the Koolgas defrost plug is wired to Koolgas relay contact 1 & 3, a defrost alarm will be activated if a Koolgas defrost does not terminate 1 hour after initiation.

2. RELAY ASSEMBLY COMMUNICATIONS FAILURE - If the normal communication link between the electronic processor and the control relay is broken, an "-E-" will flash in the processor's digital display & activate an alarm. The back up function will be activated.
3. PERSONALITY MODULE CONFIGURATION FAILURE - If the personality module does not have any of the compressor switch links activated, the digital display will flash "EEE" and the alarm will activate. The back up function will be activated.
4. COMPRESSOR PROBLEM - The Ultronic 90 monitors the system response after each compressor is cycled on. Should a compressor fail to respond after 8 successive compressor starts, the alarm will be activated.
5. ALL COMPRESSORS CYCLE-OFF - Should all compressors cycle off for over 60 minutes, the alarm will be activated. The back up function will be activated.
In the refrigeration system, the alarm will trip should a slow leak cause the system to lose suction pressure. A system purposely put into pump down for maintenance reasons could also cause an alarm.
6. FAILURE OF THE ELECTRONIC PROCESSOR UNIT - Should the electronic processor fail, an alarm will trip. The back up function will be activated.

7. POWER OUTAGE ALARM - Should the processor only lose its power, the alarm will be activated and the back up function be activated.
8. COMPLETE ULTRONIC 90 POWER OUTAGE - If the main power feeding the Ultronic 90 system is lost, the alarm will be activated and the back up function will be activated.

RETROFIT INSTALLATION INSTRUCTIONS

If factory installed, skip retrofit section and continue with Installation (Factory Installed Ultronic 90).

PRELIMINARY - Since the compressor unit must be turned off in order to connect the electronic processor, read thoroughly the installation, electrical, and operation sections before beginning. By becoming familiar with the necessary changes to existing control panel wiring, the compressor unit will not be off any longer than necessary.

Field Wiring Includes:

Rewiring compressor control circuitry (Ultima or low pressure controls).
Jumpering compressor time delays.

Wiring the compressor control relays, 24 volt transformer, and alarm relay.

Rewiring the low pressure controls.

Rewiring Koolgas relay (if applicable).

Satellite control and temperature probe. (optional accessories).

Rewiring of a new time delay for control of switchback.

Rewiring compressor control manual switches.

The electronic processor and compressor control relay box can be either wall or compressor unit mounted. If compressor unit mounted, and there is no Ultima control (low pressure controls only) the space normally occupied by Ultima can be used.

-CAUTION-

The Ultronic-90 is an intelligent controller with all required cycling "delays", short cycle protection, etc. built in. Do not wire any compressor time delay relays into the Ultronic-90 relay to a compressor contactor coil circuits. To do so causes a "fight" between the U-90 intelligence and the totally blind time delays. The result is erratic, incorrect cycling patterns. All required compressor handling methods are within the Ultronic-90.

ELECTRONIC PROCESSOR AND RELAY BOX INSTALLATION

1. Bolt the compressor control relay box in place, either on a nearby wall or in place of Ultima (if not used). If rack mounted on a System IV unit, new holes will have to be drilled in the mounting plate.

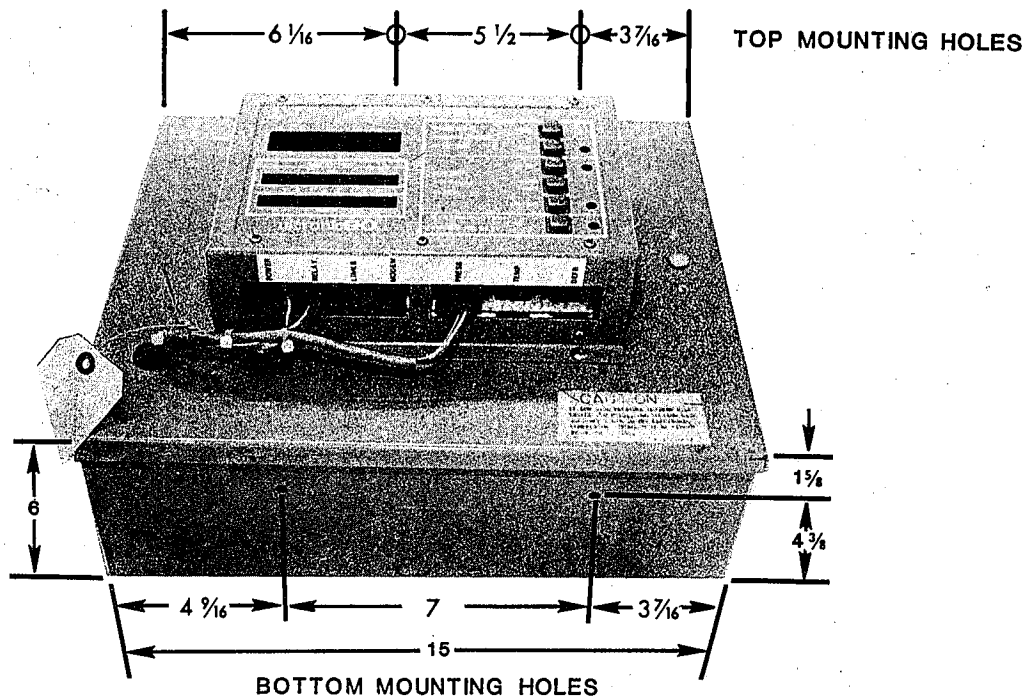


FIGURE 5

DIMENSIONS & MOUNTING HOLE LOCATION for
U-90 RETROFIT KIT (COMPRESSOR CONTROL RELAY BOX)

2. Run conduit from the Ultronic 90 to the compressor unit control panel. Size will depend on the number of wires to be run for a particular unit. See Electrical (Retrofit), page 9.

If the compressor unit is equipped with a relay to force a compressor to run during gas defrost, run a second line of conduit ($\frac{1}{2}$ inch) from the processor to the compressor unit control panel.

3. Install a $\frac{1}{4}$ inch copper line from the service valve on the suction header to the pressure transducer. If Ultima will be used as backup, tee into The Ultima suction control line, (See Figure 6-II) running one line to the Ultronic 90^{T.M.} pressure transducer and the other back to Ultima. Brace the pressure transducer with a second wrench when connecting the tubing to avoid damaging the transducer. Leak check all tubing. Note: Do not exceed 200 PSIG during leak checking. To do so will cause irreversable damage to the pressure transducer.

FIGURE 6-1

Plus System and System II Mounting Location (For System IV Ultima location, see System IV Installation and Service Manual)

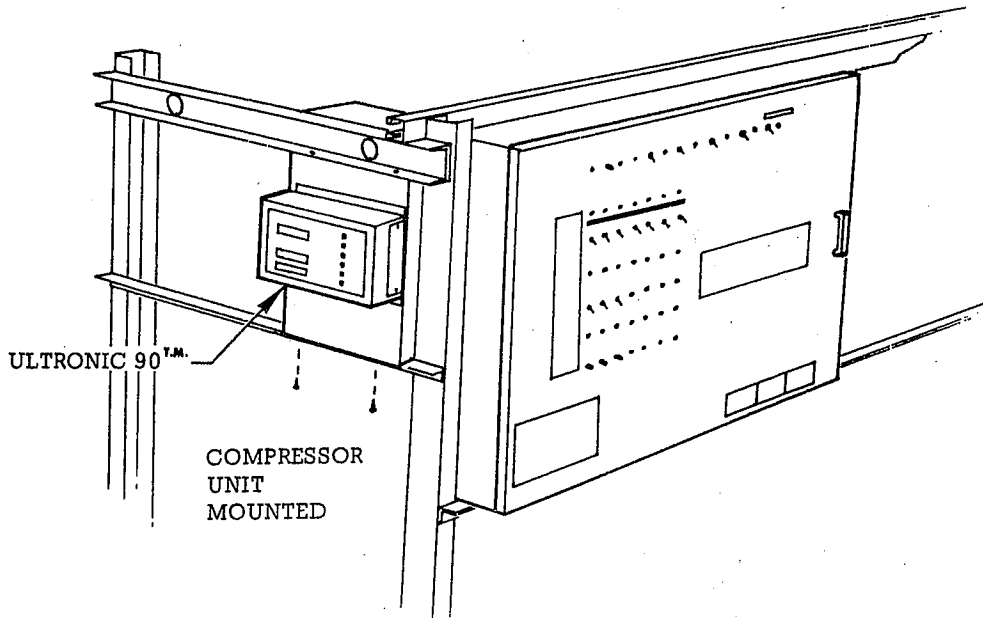
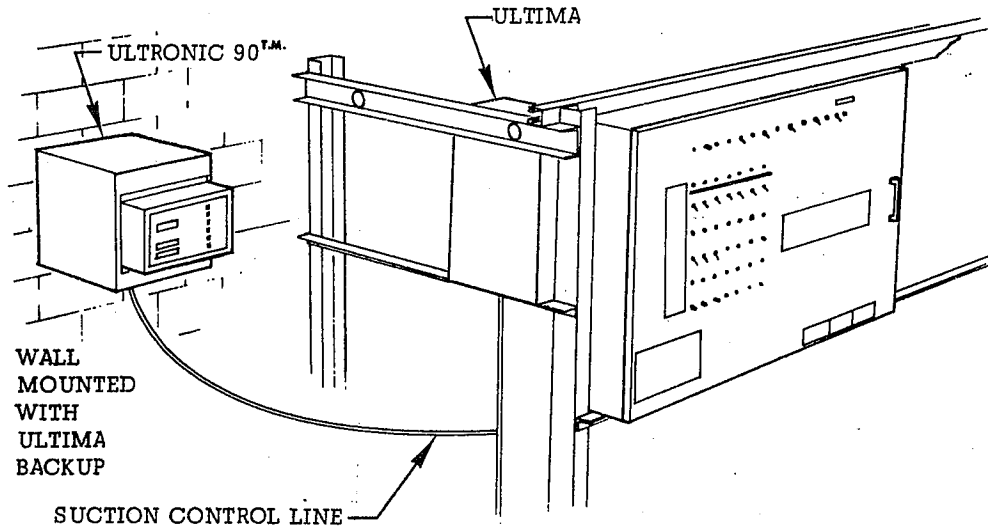


FIGURE 6-II



ELECTRICAL (RETROFIT) - Turn off power to the compressor control panel from the main distribution panel.

Following The National Electric Code, run color coded 18 AWG minimum copper wire (600 volt insulated) as follows: refer to the appropriate field wiring diagrams for the Ultronic 90 as well as the compressor unit wiring diagram in the appropriate installation and service manual. A point to point wiring diagram for each system as well as a markup of changes to the compressor unit control panel is provided. (See Figure 6-11).

Run field supplied wiring from the compressor control relay board to the compressor unit control panel. Number tag both ends of each wire. Required wiring is:

1. 3 wires per compressor for the control relays.
2. 2 wires for input power to the Ultronic 90 24v transformer.
3. 2 wires for the alarm relay (if applicable).
4. A Hussmann supplied cable for the Koolgas relay (for units which force a compressor to run during gas defrost). A six foot defrost cable and plug is provided for this connection; it is shipped in a bag located inside the Ultronic 90 . If the processor is any further away than six feet, new wire will have to be run and spliced into the provided wire.

-CAUTION-

Do not run this cable with power wiring.

If Ultronic 90 is connected to a 2 or 3 parallel compressor unit utilizing Koolgas defrost with no Koolgas relay, one must be added in the field in order to prevent nuisance low suction alarms. Connect the special defrost plug (6 foot lead and plug provided) from the dry, normally open contacts on the relay to the electronic processor. The relay must be powered every time a system goes on gas defrost.

If Ultronic 90 is connected to a 2 or 3 parallel compressor unit with no Koolgas relay, one must be added in the field in order to prevent nuisance low suction alarms. Connect the special defrost plug (6 foot lead and plug provided) from the dry, normally open contacts on the relay to the electronic processor. The relay must be powered every time a system goes on gas defrost.

When the dry contacts close at initiation of gas defrost, the controller will lock on one compressor and negate the low suction alarm during defrost. Also, when the dry contacts close, a one hour defrost failure time delay initiates. If defrost fails to terminate 1 hour after the initiation a defrost failure alarm will activate.

5. For low pressure controls, one side of each pressure control can be wired as a common connection, to pin 3 of the time delay. The other side of the TDU contact (1) connects to X-1 . The other contact of the pressure control connects to one pole of the individual compressor control switch. (Note: this switch must be replaced with a DPST switch provided the unit is not equipped with one; see wiring diagram). Complete wiring as shown. Mount the base provided for the plug in time delay inside the unit control panel.

For Ultima compressor control, run wiring similiar to low pressure controls.

6. Pin 7 of the time delay is to be wired to X2. Pin 2 of the time delay is to be wired to the normally closed contact of the designated switchback relay on the U-90 panel. The switchback relay may be in positions 5, 6, 7 or 8 in the U-90 relay panel. Its position is determined as follows.

1	2	3	4	5	6	7	8	9

Position 7 will be the position in which the switchback relay is normally installed unless the unit has the SPR (Suction Pressure Reset) option.

If the unit has the SPR option but the U-90 satellite control kit (ECCKTST or 99ED) is not used, the switchback relay will be in position 8.

If the unit has the SPR option and satellite control kit, the switchback relay will be in position 5.

WARNING

Disconnect and cap all wiring to low pressure controls or Ultima. Do not use any old wiring.

7. If the optional Satellite control is used, follow instructions under "Installation" (Factory Installed Ultronic 90).

8. Jumper the compressor time delays according to the appropriate field wiring diagram.

INSTALLATION (FACTORY INSTALLED ULTRONIC 90)

ELECTRICAL - Ultronic 90 has been factory wired as completely as possible. Only the optional remote Satellite control needs field wiring. Field wiring includes:

Connection of the remote Satellite control and switchback circuitry.

Installation of the temperature probe (if not factory installed) and wiring.

Turn off power to the compressor control panel from the main distribution panel.

Refer to the appropriate field wiring diagrams for the electronic processor as well as the compressor unit wiring diagram in the appropriate installation and service manual.

Run wiring as follows:

3. **SATELLITE TEMPERATURE CONTROL** - Run one 3-wired shielded cable, 16 AWG rated at 600 volts, (Belden 8618 or equivalent) from the temperature probe assembly in the refrigerator or unit cooler, to the electronic processor. A Satellite temperature probe assembly with a special plug is provided. Note: It is mandatory that the temperature probe shielded cable be run in separate conduit. Do not allow the sensor circuit wire to be grouped along with high voltage control or power wiring. It will be necessary to cut this cable and splice in the necessary length of 3-wire shielded cable (field supplied) to connect the refrigerator to the electronic processor. Keep the sensor cable away from the power wire in the case raceway. On long runs of adjacent cases that form a long duct prior to exiting into the floor conduits, it is recommended to keep the sensor physically segregated from the power wiring. Important: Color coding of wires must be followed when splicing in the field wiring. Insert plug into "TEMP" socket on the processor to complete installation. (For case or unit cooler location, the temperature probe for Ultronic 90 will be in the same position as that of the CDA temperature sensor refrigeration thermostat bulb. See the appropriate compressor unit installation instructions).

To complete the satellite back up circuit, run 2 control wires, rated for 600 volt insulation and 220 volt control circuits, from the refrigerator containing the thermostat to the location containing the relay assembly. See wiring diagrams for proper termination.

CAUTION: DOUBLE CHECK ALL WIRING. MISWIRING MAY CAUSE SERIOUS DAMAGE TO THE ELECTRONIC PROCESSOR.

NOTE: The backup circuit for the Satellite will be the refrigeration thermostat. The low pressure control must remain in the circuit.

FIGURE 7
FACTORY INSTALLED ULTRONIC 90

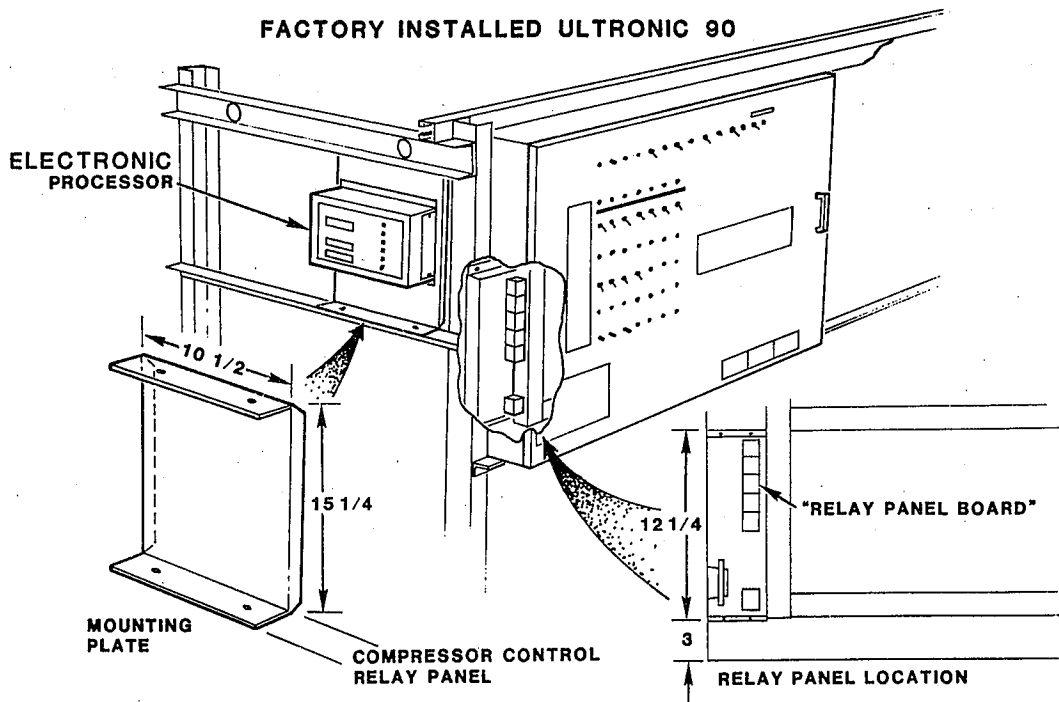
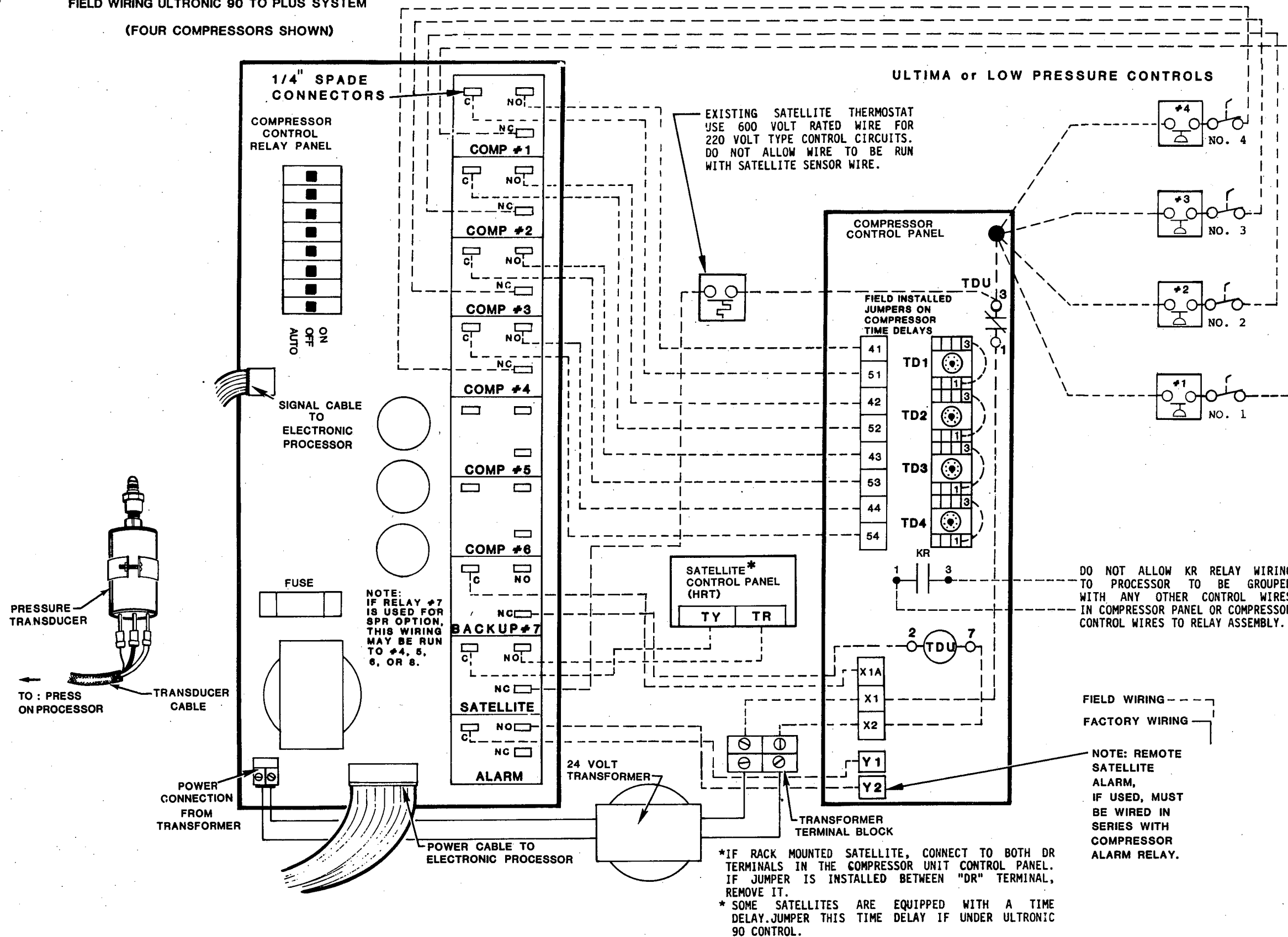


FIGURE 8

FIELD WIRING ULTRONIC 90 TO PLUS SYSTEM

(FOUR COMPRESSORS SHOWN)



EXISTING SATELLITE THERMOSTAT
USE 600 VOLT RATED WIRE FOR
220 VOLT TYPE CONTROL CIRCUITS.
DO NOT ALLOW WIRE TO BE RUN
WITH SATELLITE SENSOR WIRE.

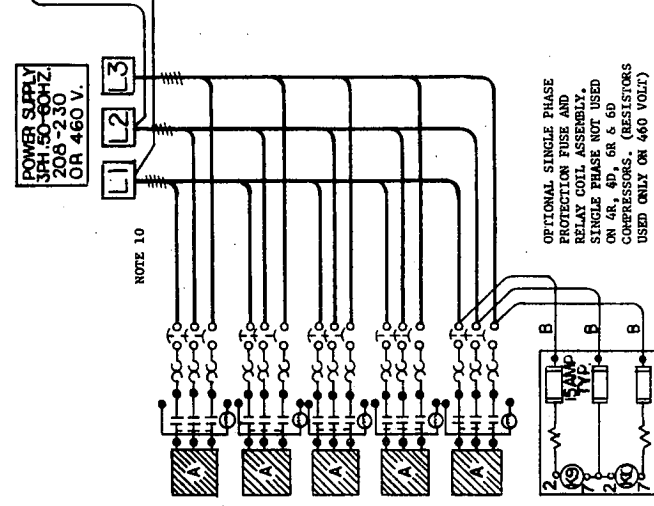
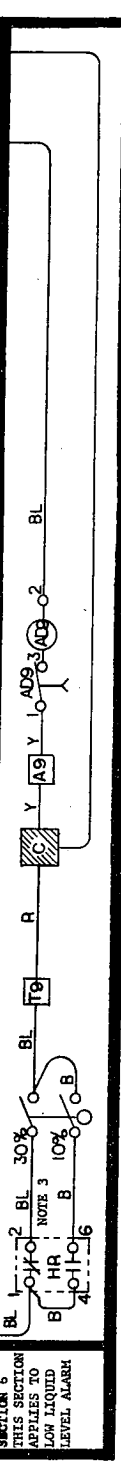
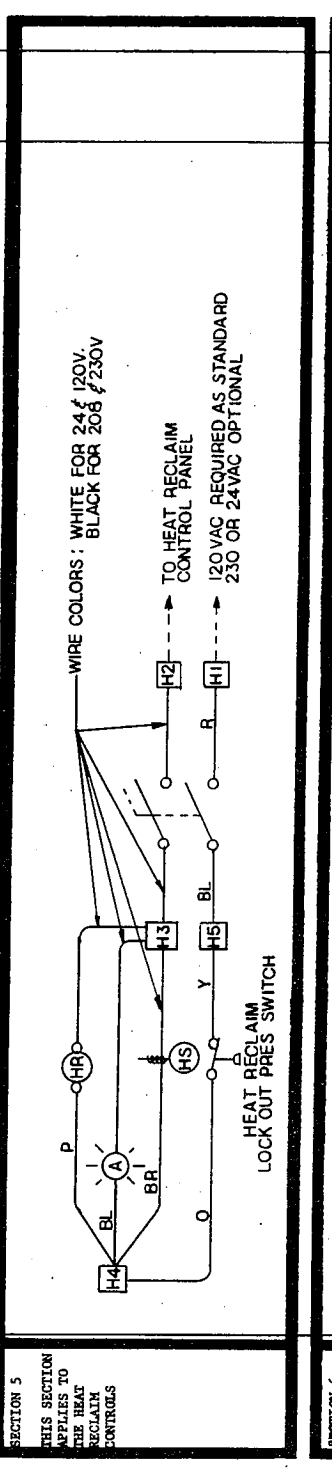
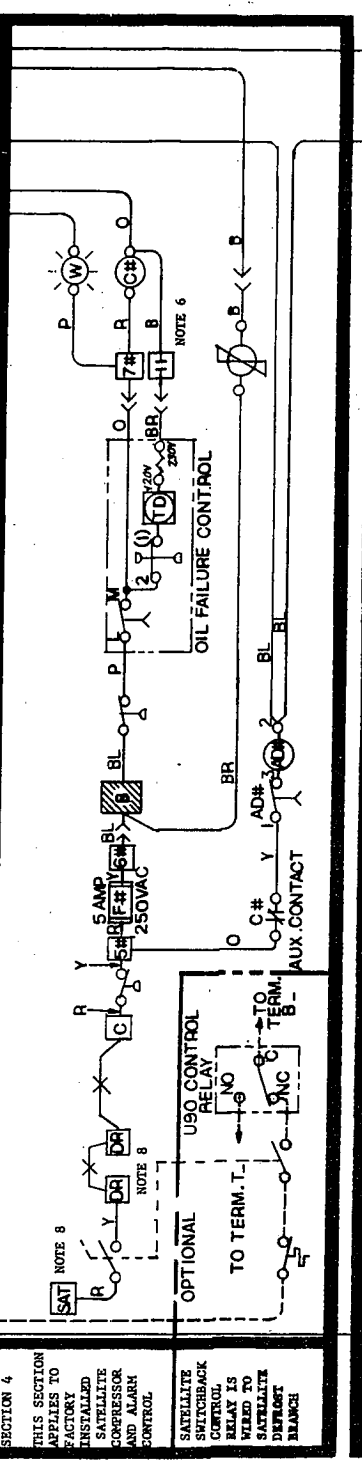
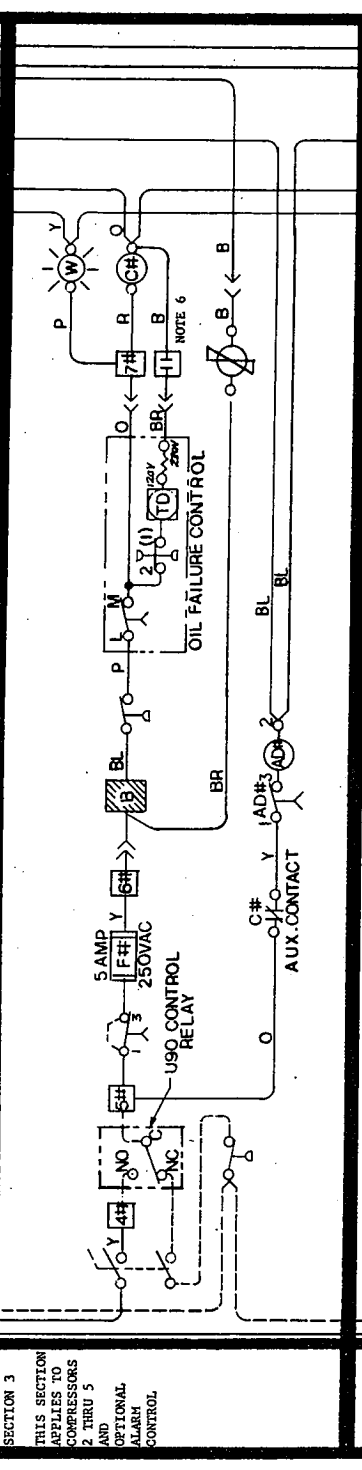
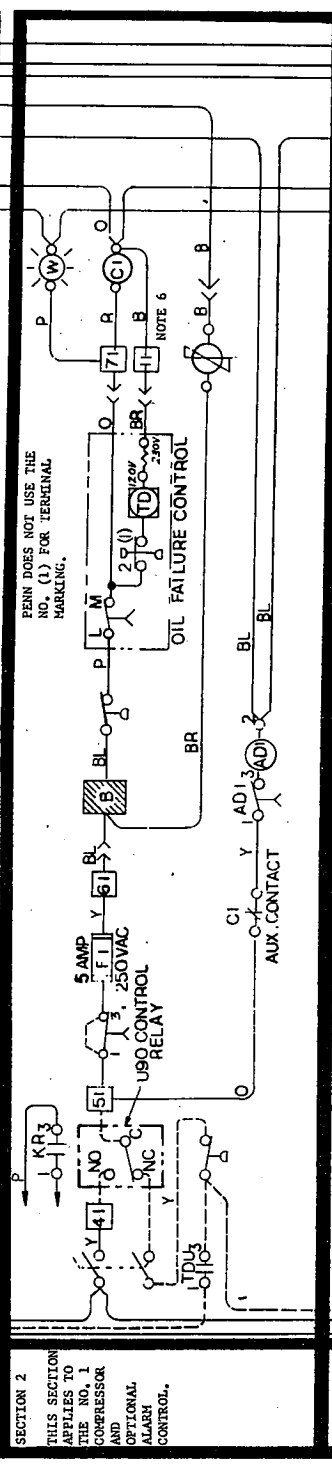
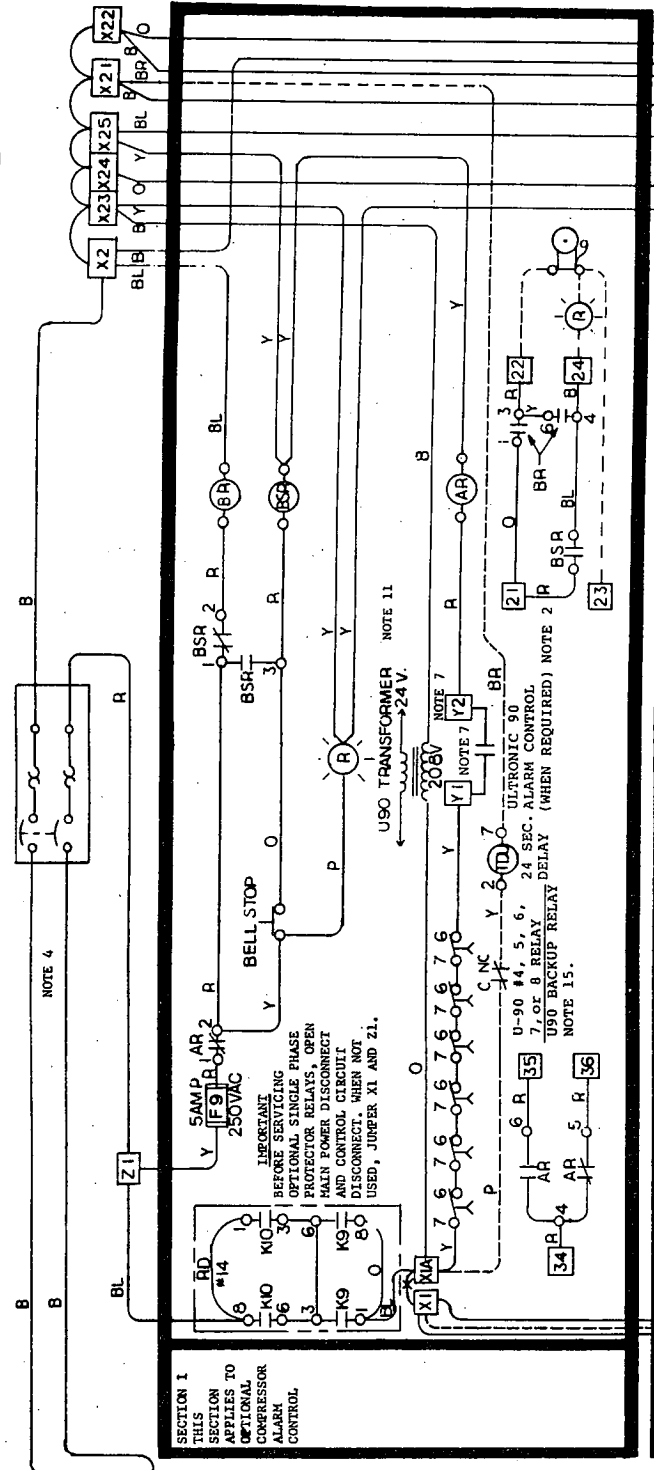
ULTIMA or LOW PRESSURE CONTROLS

NOTE:
IF RELAY #7
IS USED FOR
SPR OPTION,
THIS WIRING
MAY BE RUN
TO #4, 5,
6, OR 8.

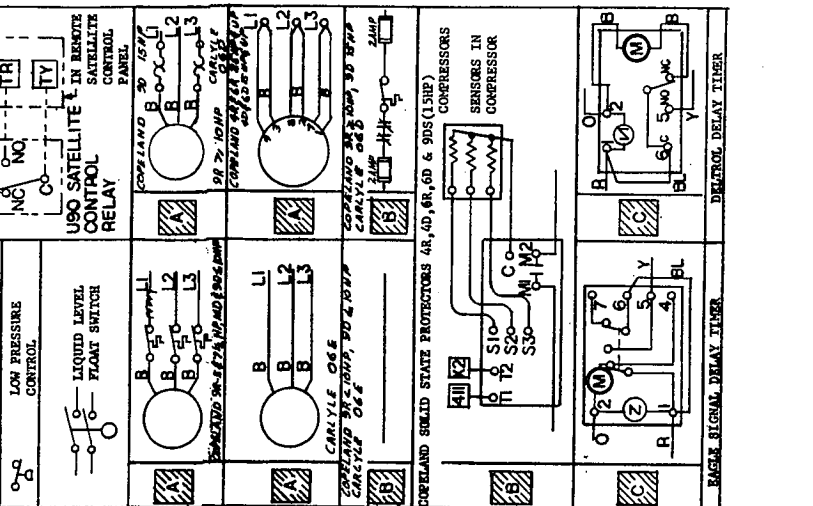
DO NOT ALLOW KR RELAY WIRING
TO PROCESSOR TO BE GROUPED
WITH ANY OTHER CONTROL WIRES
IN COMPRESSOR PANEL OR COMPRESSOR
CONTROL WIRES TO RELAY ASSEMBLY.

NOTE: REMOTE
SATELLITE
ALARM,
IF USED, MUST
BE WIRED IN
SERIES WITH
COMPRESSOR
ALARM RELAY.

*IF RACK MOUNTED SATELLITE, CONNECT TO BOTH DR
TERMINALS IN THE COMPRESSOR UNIT CONTROL PANEL.
IF JUMPER IS INSTALLED BETWEEN "DR" TERMINAL,
REMOVE IT.
* SOME SATELLITES ARE EQUIPPED WITH A TIME
DELAY. JUMPER THIS TIME DELAY IF UNDER ULTRONIC
90 CONTROL.



	CIRCUIT BREAKER (W/ TRIPPING OVERLOAD)
	FUSE
	RELAY CONTACTS (NORMALLY OPEN)
	RELAY CONTACTS (NORMALLY CLOSED)
	RELAY CONTACTS (CURRENT SENSING)
	RELAY CONTACTS (OPTIONAL)
	LIGHT (V = WHITE; R = RED; B = BLUE; W = WHITE; O = ORANGE; P = PURPLE; B = BLACK)
	MANUAL SINGLE POLE CONTROL SWITCH
	MANUAL DOUBLE POLE CONTROL SWITCH
	FAN COMPRESSOR
	COOLING (4T UNITS)
	NORMALLY CLOSED
	NORMALLY OPEN TIME DELAYED CONTACTS
	DELAYED CONTACTS
	SOLENOID (HEAT RECLAIM)
	SOLENOID (HUNGDOWN)
	MALE TO FEMALE CONNECTOR
	FACTORY WIRE
	POWER
	FACTORY WIRE CONTROL
	FIELD INSTALLED WIRE
	RESISTOR
	HIGH PRESSURE CONTROL
	LOW PRESSURE CONTROL
	LIQUID LEVEL CONTROL
	FLOAT SWITCH



HUSSMANN PLUS SYSTEM COMPRESSOR

- NOTES:
- 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 34 AND 36 CLOSE ON ALARM. SEE WIRING DIAGRAM INCLUDED WITH REMOTE ALARM SYSTEM FOR PROPER CONNECTIONS. ONLY ONE ALARM SYSTEM CAN BE CONNECTED TO THESE TERMINALS. MAXIMUM LOAD 10 AMPS AT 208 VOLTS.
 - THE REMOTE ALARM BELL AND LIGHT ARE FIELD WIRED BETWEEN TERMINALS 22, 23 AND 24. A FUSED 120 VAC POWER SUPPLY IS FIELD WIRED TO TERMINALS 21 AND 23. MAXIMUM CIRCUIT LOAD IS 10 AMPS AT 120 VAC.
 - THE "HR" COIL FOR THE "HR" CONTROL IS LOCATED IN THE 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).
 - THESE WIRES ARE OMITTED ON 460 VOLT UNITS. THE 208-230/1/60 POWER SUPPLY FOR THE PILOT CIRCUIT IS WIRED DIRECTLY TO THE "MAIN CONTROL PROTECTION".
 - ALARM TIME DELAYS ARE SHOWN FOR A 5 COMPRESSOR UNIT. (ONE ALARM DELAY FOR EACH COMPRESSOR PLUS "AD9" DELAY).
 - CURRENT SENSING RELAY - SENSOR WILL BE POSITIONED TO SENSE CURRENT FLOW OF THE "TI" LINE TO THE COMPRESSOR. THE CONTACTS ARE WIRED IN THE CONTROL CIRCUIT AS SHOWN. WHEN THE CURRENT SENSING RELAY IS NOT USED THE 230 V. TERMINAL OF THE OIL FAILURE RELAY WILL BE CONNECTED TO "X2". ON 460 VOLT UNITS THE LEAD MUST BE LOOPED THROUGH THE RELAY TWO TIMES. CURRENT SENSING RELAYS ARE AN OPTION.
 - DIAGRAM SHOWN WITH OPTIONAL ULTRONIC 90 CONTROLLER WITH ALARM CONNECTIONS. WIRE IN SERIES WITH ULTRONIC 90 WITH 208 VOLT CONTROL CIRCUITS BETWEEN Y1 AND Y2. FOR REMOTE SATELLITE WITH ALARM CONNECTIONS, WIRE IN SERIES WITH ULTRONIC 90 WITH 208 VOLT CONTROL CIRCUITS BETWEEN Y1 AND Y2. IF OPTIONAL ULTRONIC 90 IS NOT SUPPLIED, IMPORTANT ONLY SATELLITE UNITS WITH 208 VOLT CONTROL CIRCUITS CAN BE CONNECTED TO THESE TERMINALS.
 - A. FOR LOW END SATELLITES, CONNECT SAT TO B. TERMINAL ON CORRESPONDING SATELLITE DEFROST CIRCUIT.
B. WHEN A HIGH END SATELLITE WITH PUMPDOWN CYCLE IS USED, CONNECT SAT TO X1 TERMINAL AND WIRE AS FOLLOWS.
C. IF REMOTE HEADER IS USED, CONNECT SAT TERMINAL TO X1 TERMINAL AND WIRE AS FOLLOWS.
 - WHEN LOW END SATELLITE IS USED WITH A REMOTE DEFROST HEADER, REMOVE THE JUMPER ON THE DR TERMINALS AND FIELD WIRE DR TERMINALS TO CONTACT 1 AND 3 OF THE "DR" RELAY LOCATED IN THE REMOTE DEFROST HEADER ELECTRICAL PANEL.
 - WHEN A HIGH END SATELLITE WITH PUMPDOWN CYCLE IS USED WITH A REMOTE DEFROST HEADER, REMOVE THE "DR" JUMPER AND FIELD WIRE THE "DR" TERMINALS TO CONTACTS 1 AND 3 OF THE "DR" RELAY, AND MOVE THE YELLOW WIRE ON B TO X1 TERMINAL.
 - THE BLACK COMPRESSOR FAN WIRES ARE WIRING DENOTES THE NUMBER OF WIRES FROM THE TERMINALS OF POWER DISTRIBUTION BLOCK.
 - WIRE THE "DR" TERMINALS TO CONTACTS 1 AND 3 OF THE "DR" RELAY, AND MOVE THE YELLOW WIRE ON B TO X1 TERMINAL.
 - WIRE 24 VOLT SECONDARY ON POWER WIRING DENOTES THE NUMBER OF WIRES FROM THE TERMINALS OF POWER DISTRIBUTION BLOCK.
 - POWER TO "TR" AND TERMINAL #3 OF THE "TDU" MUST BE THE SAME PHASE TO INSURE OPERATION WHEN IN SWITCHBACK MODE. WIRING TO "TR" AND "TY" IS FOR LOW END SATELLITE OPERATION.
 - "TY" IS TO "B" TERMINAL IN SATELLITE DEFROST WIRING.
 - EXISTING SPST CONTROL SWITCHES ARE TO BE REPLACED WITH SPDT SWITCHES.
 - CONNECT THE WIRES FROM THE KOOLGAS DEFROST CABLE TO "KR" TERMINALS 1 AND 3, PLUG THE OTHER END INTO THE "DEFR" RECEPTACLE ON THE PROCESSOR.
 - RELAY USED IS DETERMINED BY ANY OPEN POSITION ON RELAY PANEL. (SEE INSTRUCTIONS)

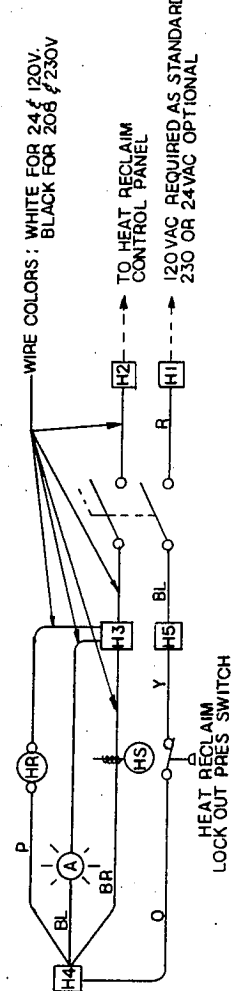


FIGURE 10

FIELD WIRING ULTRONIC 90 TO SYSTEM IV

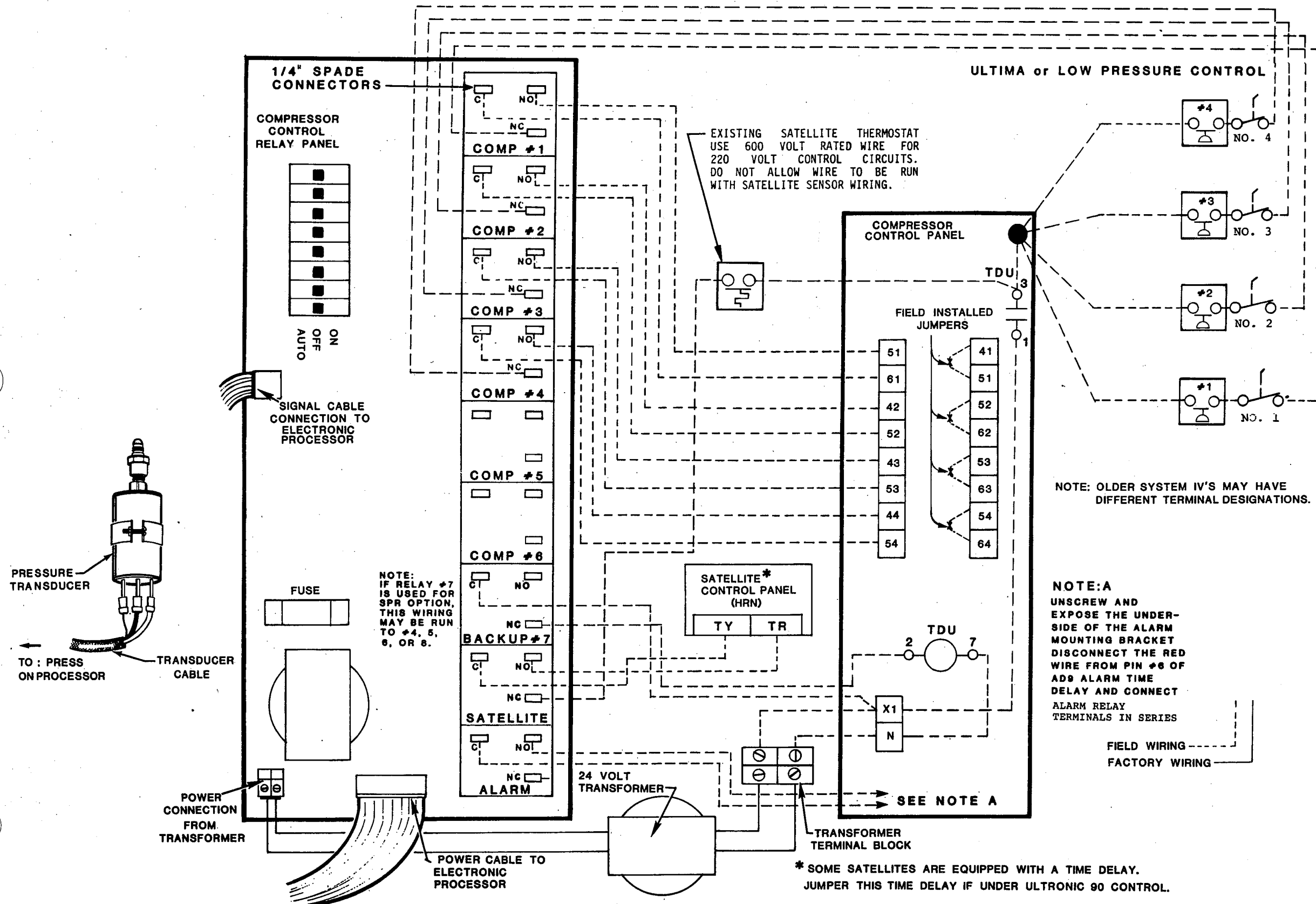
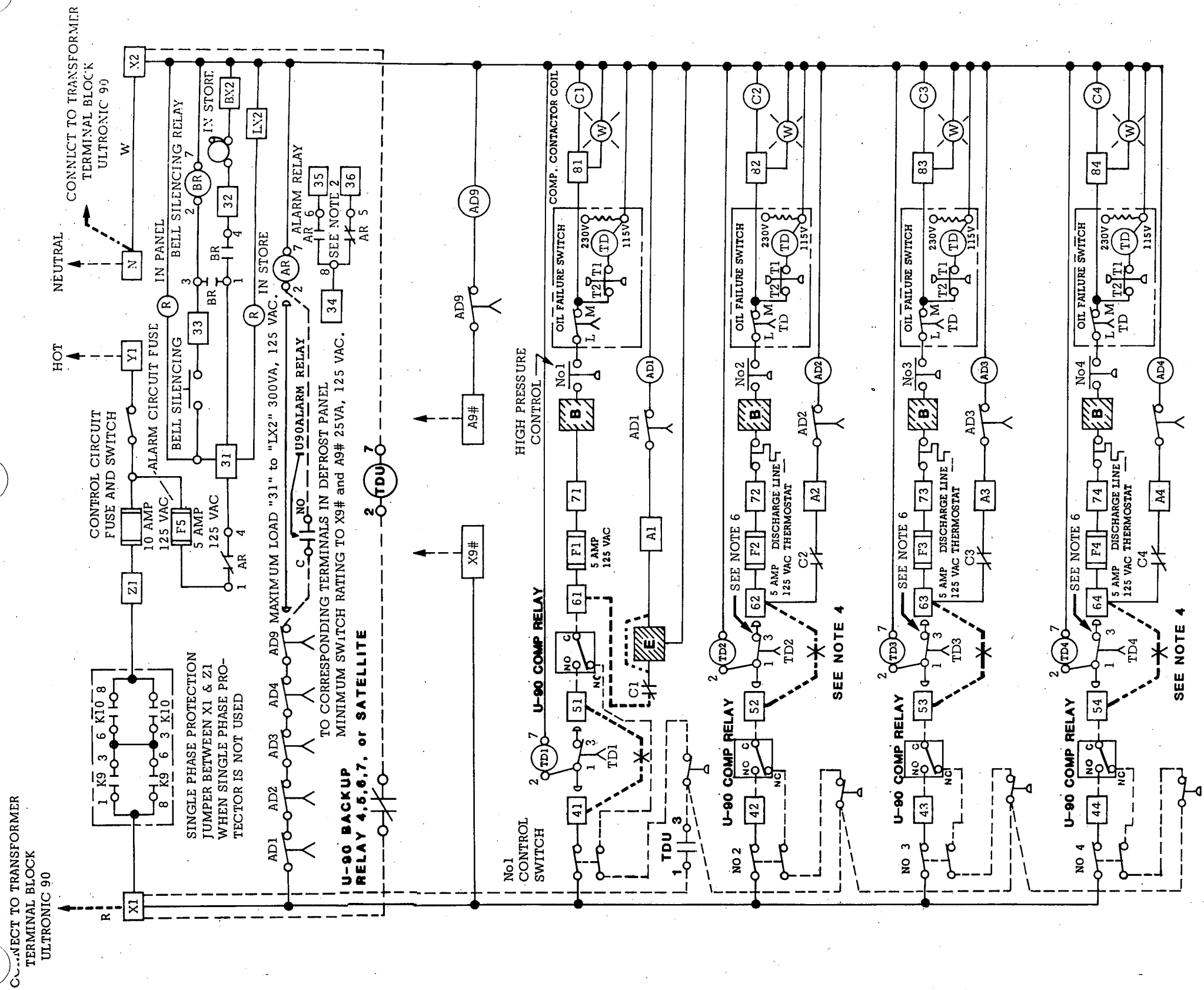


FIGURE 11
SYSTEM IV WIRING DIAGRAM WITH ULTRONIC 90 MODIFICATION



NOTE 4:

Remove pressure controls from circuit and connect as shown. Disconnect wire from terminal 51 and reconnect to terminal 61. Compressor no. 1 alarm delay should be jumpered as shown in callout 'E'. Omit jumper if unit is equipped with a refrigerant loss alarm.

NOTE 6:

Unscrew and expose the underside of the alarm mounting bracket; disconnect the red wire from PIN #6 of AD9 alarm time delay and connect alarm relay in series.

Field Wiring

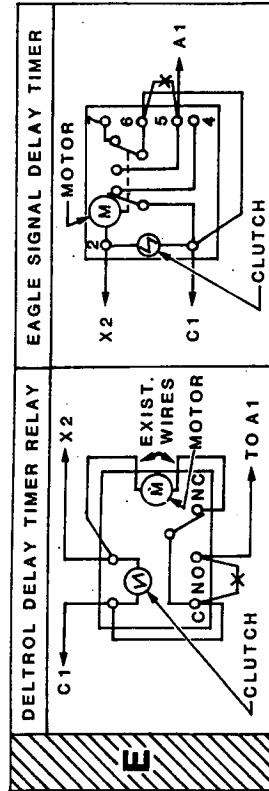
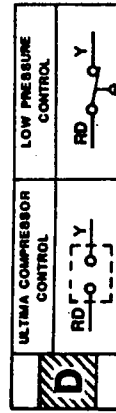


FIGURE 12
FIELD WIRING ULTRONIC 90 TO SYSTEM II

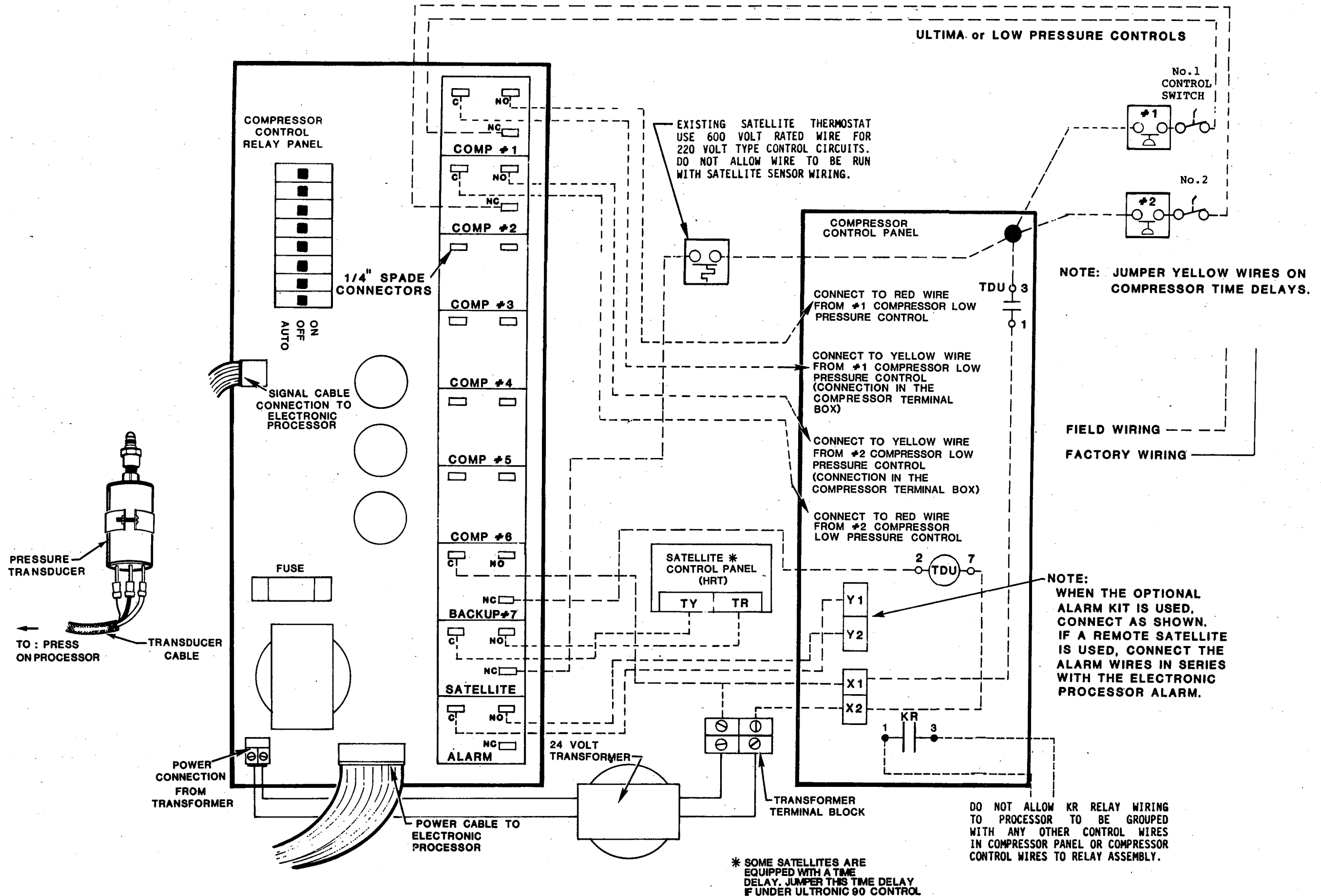
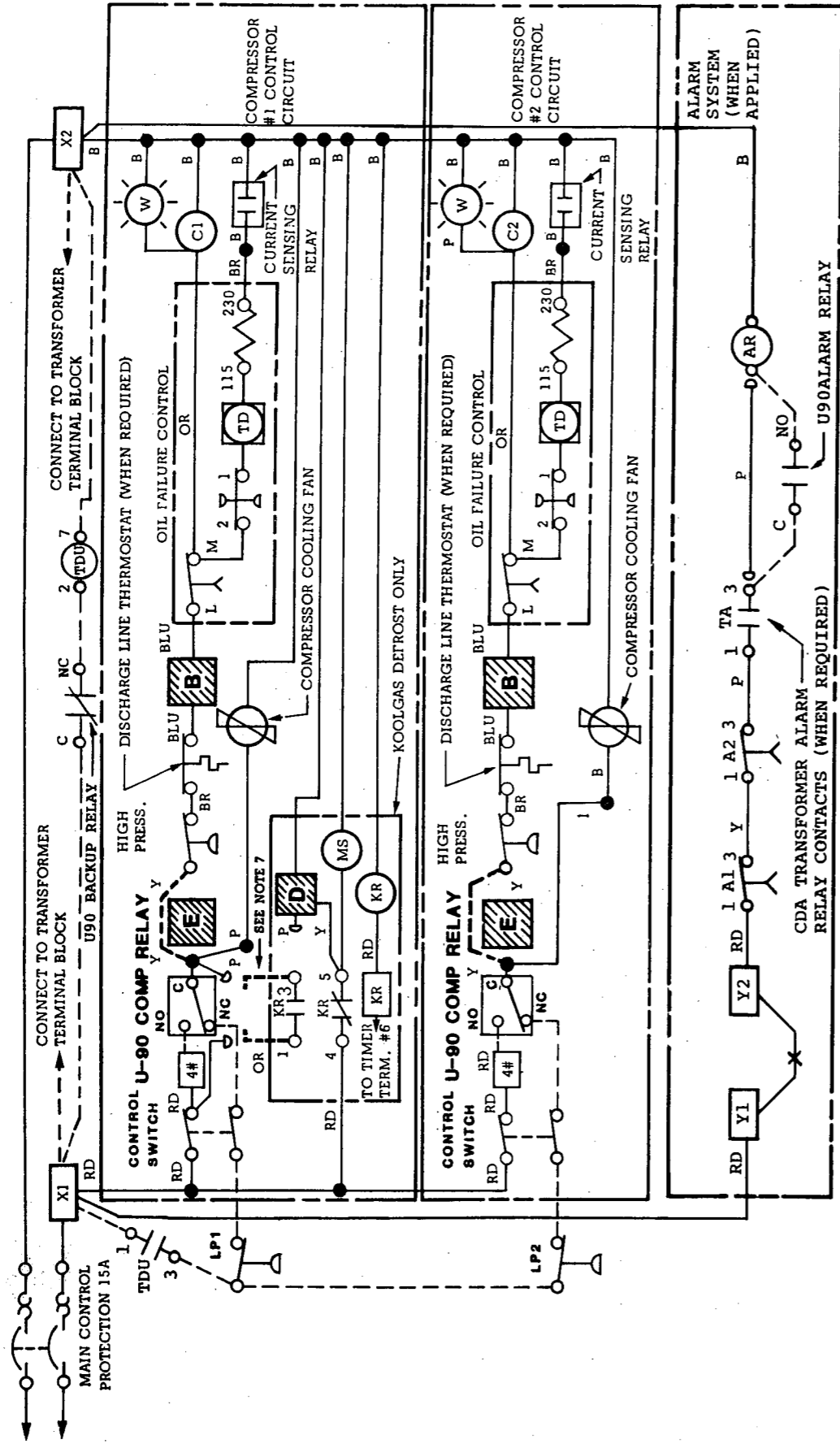
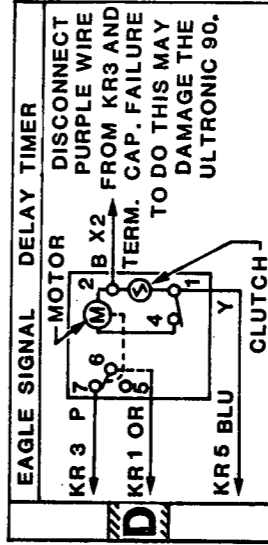
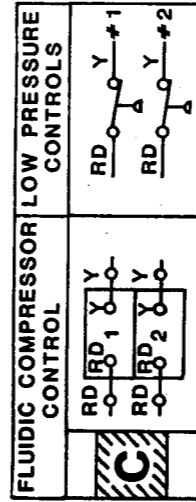


FIGURE 13
SYSTEM II WIRING DIAGRAM WITH ULTRONIC 90 MODIFICATION



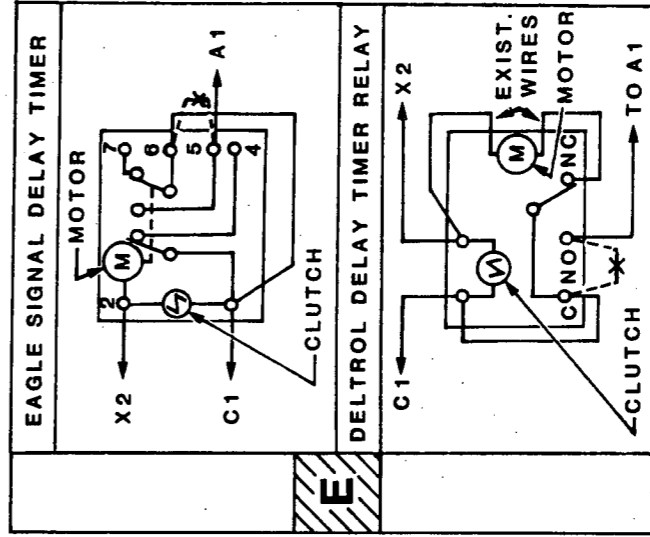
NOTE 4.

Remove pressure controls from circuit and connect as shown.



NOTE 5:

Connect terminals to compressor control relays for Ultronic 90



NOTE 7:

If the System II unit is equipped with Koolgas defrost, disconnect and cap all the wires connected to the KR relay terminals no. 1 and 3. Connect the wires from the Koolgas defrost cable (shipped inside the Ultronic kit) to KR 1 and 3; and plug the other end into the "DEFR" receptacle on the processor.

Field Wiring

PLACING THE CONTROL IN OPERATION

Restore power to the compressor unit control circuit but leave the compressor circuit breakers off.

TO SET THE SUCTION PRESSURE CONTROL

The digital readout on the processor will display suction pressure.

Depress the "System Suction Pressure Set" button. The readout will show the set point. While holding the button down, the control can be adjusted by inserting a small screwdriver in the slot behind the button. Turning this screw clockwise will raise the set point as much as 4 psi as indicated on the readout. From the mid position turning the screw counterclockwise will lower the set point as much as 4 psi.

Table 1 contains the proper evaporator temperatures and corresponding pressure settings. Since the Ultronic 90 automatically determines when the remaining compressors should be cycled there is no typical cut-in and cut-out setting. The system suction pressure is set for the coldest evaporator temperature according to the store legend (excluding Satellite branches).

TABLE 1
 SUCTION PRESSURE SETTINGS (PSIG)
 (Round pressures to nearest whole number)

TEMP.	REFRIGERANT			TEMP	REFRIGERANT		
(°F)	12	22	502	(°F)	12	22	502
-40			4.1	4	11.2	27.3	34.9
-39			4.6	5	11.8	28.2	35.9
-38		1.3	5.0	6	12.3	29.1	36.9
-37		1.7	5.5	7	12.9	30.0	37.9
-36		2.2	6.0	8	13.5	30.9	38.9
-35		2.6	6.5	9	14.1	31.8	39.9
-34		3.0	7.0	10	14.6	32.8	41.0
-33		3.5	7.6	11	15.2	33.7	42.1
-32		3.9	8.1	12	15.8	34.7	43.2
-31		4.4	8.6	13	16.5	35.7	44.3
-30		4.9	9.2	14	17.1	36.7	45.4
-29		5.4	9.8	15	17.7	37.7	46.5
-28		5.9	10.3	16	18.4	38.7	47.7
-27		6.5	10.9	17	19.0	39.8	48.8
-26		6.9	11.5	18	19.7	40.9	50.0
-25		7.4	12.1	19	20.4	41.9	51.2
-24		7.9	12.7	20	21.0	43.0	52.5
-23		8.5	13.4	21	21.7	44.1	53.7
-22		9.0	14.0	22	22.4	45.4	54.9
-21		9.6	14.6	23	23.2	46.4	56.2
-20		10.1	15.3	24	23.9	47.6	57.5
-19		10.7	16.0	25	24.6	48.8	58.8
-18	1.3	11.3	16.7	26	25.4	49.9	60.1
-17	1.7	11.9	17.4	27	26.1	51.2	61.5
-16	2.1	12.5	18.1	28	26.9	52.4	62.8
-15	2.4	13.2	18.8	29	27.7	53.6	64.2
-14	2.8	13.8	19.5	30	28.5	54.9	65.6
-13	3.2	14.4	20.3	31	29.3	56.2	67.0
-12	3.6	15.1	21.0	32	30.1	57.5	68.4
-11	4.1	15.8	21.8	33	30.9	58.8	69.9
-10	4.5	16.5	22.6	34	31.7	60.1	71.3
-9	4.9	17.2	23.3	35	32.6	61.5	72.8
-8	5.4	17.9	24.2	40	37.0	68.5	80.5
-7	5.8	18.6	25.0	45	41.7	76.0	88.7
-6	6.3	19.3	25.8	50	46.7	84.0	97.4
-5	6.7	20.1	26.7	60	57.7		
-4	7.2	20.8	27.5	65	63.8		
-3	7.7	21.6	28.4	70	70.2		
-2	8.2	22.4	29.3	75	77.0		
-1	8.6	23.1	30.2	80	84.2		
0	9.2	24.0	31.1	85	91.8		
1	9.7	24.8	32.0	90	99.8		
2	10.2	25.6	32.9	95			
3	10.7	26.5	33.9				

TO SET THE SUCTION PRESSURE ALARM - Depress the "HIGH SET" button. The readout will show the high suction alarm set point. To adjust the setting, hold the button depressed and insert a small screwdriver in the slot beside the button. Turning clockwise will raise the set point, counterclockwise will lower it.

Set the high suction alarm according to Table 2.

Table 2
High Suction Alarm Settings

SATURATED SUCTION TEMPERATURE (°F)		ALARM SETTING (PSIG)
Low Temp. R502	-35	25
	-30	30
	-25 to -23	35
	-22 to -20	40
Medium Temp. R502	+6 to +12	55
	+15 to +21	63
Medium Temp. R22	+6 to +12	47
	+15 to +21	57
Medium Temp. R12	+ 6 to +12	25
	+15 to +21	31

Next, set the low suction alarm. Depress the "LOW SET" Button. The digital readout will show the set point. While depressing the button, adjust the processor using a small screwdriver in the slot behind the button.

Set the "LOW SET" adjustment to 1/2 the setting of the suction pressure (from Table 1).

Example: If the suction pressure setting is 30 psig, the low suction alarm should be set at 15 psig.

If the compressor unit or remote header defrost assembly is equipped with high suction pressure control, raise its setting by 5 to 10 psig above the Ultronic 90TM high suction set point. This control will then be used as backup.

TO RESET A SUCTION PRESSURE ALARM - After condition is corrected, press "Alarm Reset" button to clear display of alarm conditions. Note: When an alarm condition which causes switchback occurs, there is a 20 to 40 second delay before the switchback circuit activates, and a further delay of 20 to 30 sec. before compressors are brought on.

TO SET THE SATELLITE TEMPERATURE CONTROL - (If applicable): depress the "Satellite Temperature Control" set button. The digital display will show the set point. While holding the set button down, adjust the control using a small screwdriver in the slot beside the button.

Set the satellite temperature control to the refrigerator or unit cooler discharge air temperature as shown on the store legend.

To check the temperature in the refrigerator, depress the Satellite temperature control read button. The display will read the temperature in degrees Fahrenheit (or centigrade if so programmed).

START-UP - Unless either a set or read button is pressed, the readout will only show suction pressure. Check settings by pressing each set button. Adjust if necessary.

If all the settings are OK, switch on the compressor circuit breakers, starting with compressor number 1. The system is now under the control of the electronic processor. By starting and cycling compressors, the electronic processor will maintain the optimum system suction pressure. Malfunctions, such as high or low suction pressure, failure of a compressor to start or run, failure to terminate a Koolgas defrost, or Satellite failure, will produce an alarm. The nature of the alarm is indicated by a display on the readout, or in case of a compressor malfunction, the alarm light below the compressor number will be lit.

To silence an alarm, push the "Alarm Reset" button on the electronic processor, and the "Bell Silencing" button (if applicable) on the compressor cycle in rotation.

Unless otherwise noted on the store legend, compressor number 1 will be first on. With Plus System and System IV, compressors 2 through 5 will cycle in rotation. At least one compressor will remain operating during a Koolgas defrost cycle. For the standard sequence noted above, this would be the No. 1 compressor.

DIAGNOSTIC TEST

The electronic processor has a comprehensive built-in test that allows the serviceman to quickly check that the processor is operating properly, or which component is faulty.

To activate this test, insure the system is in operation. Then, momentarily depress the top button marked "Satellite Temp Read" and the bottom button marked "Suction Pressure Set" at the same time. A sequence of numbers will appear in the display. If the numbers cycle through 1, 2, and 3 (twice), and the suction pressure reappears, the processor has successfully completed its internal self-test and you should look elsewhere for the problem. If, however, a number sticks in the display, match the number below to determine which component might need replacement.

If the display sticks on 1: replace the electronic processor

If the display sticks on 2: replace the compressor control relay board

If the display sticks on 3: replace the pressure transducer

DIAGNOSTIC CHARTS

These charts are arranged to help troubleshoot to component level, the Ultronic 90^{T.M.} system.

First, locate the trouble description that most closely matches what you observe the Ultronic 90^{T.M.} is doing.

Second, perform the checks, if any, in the test column.

Third, replace or repair, as indicated in the cure column.

SYMPTOM	CAUSE	CURE
<p>1. Processor display completely blank</p>	<ul style="list-style-type: none"> ● Fuse on relay assembly blown ● Bad power cable, relay board to processor ● 24 volt transformer bad ● Personality card loose ● Processor bad ● Line voltage feeding Ultronic 90^{T.M.} missing or less than 85 VAC (120 VAC line) or 170 VAC (220VAC line) 	<p>Replace fuse Repair or replace cable</p> <p>Replace transformer Plug card in properly Replace processor Cure missing or low voltage condition.</p>
<p>2. Processor reads 0 PSIG suction pressure (or abnormal, very low pressure)</p>	<ul style="list-style-type: none"> ● Bad pressure transducer ● Bad cable pressure transducer to processor ● Bad processor 	<p>Replace transducer Repair or replace cable</p> <p>Replace processor</p>
<p>3. Processor refuses to read a setpoint when button is pushed</p>	<ul style="list-style-type: none"> ● Bad processor 	<p>Replace processor</p>
<p>4. Processor display shows flashing "SEE"</p>	<ul style="list-style-type: none"> ● Personality card is not programmed properly 	<p>Obtain properly programmed personality card, or program existing one. (Consult Factory).</p>
<p>5. Processor display shows flashing "-E-"</p>	<ul style="list-style-type: none"> ● Small cable from processor ("relay") is not plugged in ● Relay assembly bad ● Processor bad 	<p>Check both ends - plug it in</p> <p>Replace relay assembly Replace processor</p>

(con't.)

SYMPTOM	CAUSE	CURE
6. Suction alarm ("PRES ALM") flashing	<ul style="list-style-type: none"> • High or low suction pressure condition existed and tripped the alarm. 	Find and repair refrigeration problem.
7. "ALM-ALM" flashing (standard units only)	<ul style="list-style-type: none"> • All compressors cycled off for over one hour. 	Refrigeration system problem - Find and repair. Bad pressure transducer, causing very low suction pressure reading - See cures under Symptom 2.
8. Individual compressor fail alarm lamp flashing	<ul style="list-style-type: none"> • Compressor does not perform adequately. • Compressor removed or off-line due to failure. • Manual/ Auto switches, or control circuit switches in wrong (Non-Auto) position. • Processor failure • Relay board failure • Wiring (control circuits, and control) incorrect or disconnected. • Relay bad 	Repair compressor's problem Ignore - Alarm will self-cancel upon restoring compressor to refrigeration system. Restore to "AUTO" position (relay assembly) and/or on position (rack). Replace processor Replace relay assembly Repair as required Replace relay or relay assembly
9. Processor display appears garbled	<ul style="list-style-type: none"> • Internal failure 	Replace processor
10. Does not cycle compressors properly	<ul style="list-style-type: none"> • Note: Compressors are under intelligent control; there are no set cut in/cut out points; the cycling patterns vary with programmed-in requirements. Do not be misled by what may appear unconventional cycling patterns - this is normal. What is <u>NOT</u> normal: <ul style="list-style-type: none"> • Two or more compressors turn off/on at <u>EXACTLY</u> the same time. 	Replace relay board

(con't.)

SYMPTOM	CAUSE	CURE
<p>11. Does not cycle compressors properly</p>	<p>What is <u>NOT</u> normal:</p> <ul style="list-style-type: none"> • Compressor does not turn on (or off) • More than the number of compressors in the rack are indicated on processor as cycling. • System just went into backup with suction pressure high. 	<p>Restore the compressor to Auto (relay assembly) and/or on (rack) Improper programming of personality card - reprogram Processor failed - replace Relay assy. failed - replace Normal - pressure controls do not have time delays in backup mode.</p>
<p>12. All compressors suddenly turn off- (processor may blink, then return to normal), then cycle up normally a minute later</p>	<ul style="list-style-type: none"> • Self-protection system of processor operated, probably due to very short power outage, or severe electrical noise. This is a normal function of internal monitoring circuits, to insure that externally created problems do not cause loss of refrigeration. 	<p>On particularly troublesome systems (self-protective cycling occurring quite often), special snubbers may need to be installed on contactor coils, and/or processor - connected wiring rerouted. Otherwise, ignore the recycling operation - it is the processor's way of insuring internal integrity amidst adverse of product - keeping occurs.</p>

^{T.M.}
ULTRONIC 90 ALARM DIAGNOSTIC SERVICE TIPS

The following identifies the various alarm readout light configurations for the Hussmann Ultronic 90 compressor control. The Ultronic 90 alarm system is externally activated through an alarm relay on the Ultronic compressor control relay board. This relay is the right most relay on the panel (9th relay from left).

The Ultronic 90^{T.M.} unit will at all times hold the relay in (closed contacts) to prevent sending an alarm. The alarm circuits are therefore activated by the alarm relay dropping out of service. The normal interface with the Hussmann refrigeration systems, is to wire the Ultronic alarm relay in the circuit controlling the alarm bell on the refrigeration alarm system. When either the refrigeration alarm or the Ultronic 90 alarm is activated the refrigeration alarm bell will sound and the bell can be silenced from the refrigeration system panel.

When the alarm has been activated from the Ultronic 90, the normal indicator (pop outs) in the refrigeration panel will not be activated. These will still have their previous meanings. The Ultronic 90 will normally have a flashing message on the display to indicate the cause of the alarm. If the Ultronic 90 unit suffers a loss of power feeding the control, the external alarm circuits will be activated, but there would be no display on the control, since it is not operational.

All alarm conditions are reset on the Ultronic 90 by pressing the alarm reset button on the front of the control.

ALARM DISPLAY

DESCRIPTION

PRES	ALM
------	-----

Either the HIGH SUCTION pressure or the LOW SUCTION pressure alarm has sounded. The high suction alarm will sound 15 minutes after the suction pressure has stayed above the alarm setting. The low suction pressure has remained below the alarm setting. The HIGH and LOW setting can be read by depressing the appropriate button on front of the control. This does not activate backup circuits.

DEFR**ALM**

The defrost circuit that is activated during a Koolgas[®] defrost has stayed in the "Defrost" mode for 1 hour. This circuit is expected to terminate before the 1 hour has elapsed. The defrost clock has either "stuck" in the defrost mode or a Koolgas[®] defrost is set for a defrost in excess of 1 hour. Two or more Koolgas defrost timed for overlapping can cause this alarm.

ALM**ALM**

The Ultronic 90^{T.M.} control has cycled all compressors off and they have stayed off for more than 60 minutes.

This alarm could be activated by a unit pumping down because of charge loss. It could also happen if the pressure transducer failed in a position to cause the control to sense a low (false) suction pressure.

-E-

The flashing "E" in the main display is caused by a loss of communication between the main control processor and the relay assembly. This is a possible control failure and not a refrigeration system problem. Check the interconnection cables between the two units to see if they are plugged in correctly and connections are tight. Normally, the Ultronic 90^{T.M.} will automatically switch to backup control system. If there is no backup controls all compressors turn off.

Small LED on in the lower ALARM display lined up with a compressor number.

This is a compressor probable failure alarm. The LED light will be on under one of the compressor numbers identifying the compressor associated with the alarm.

PERSONALITY MODULE REPLACEMENT

Permission of the factory is needed to remove or replace the personality module. Since the module is a non-adjustable component, only a qualified service engineer, schooled in the module's functions, may remove or replace it.

WARNING: REMOVAL OF THE MODULE WHILE OPERATING MAY CAUSE DAMAGE.

Remove as follows:

1. Turn off power to the electronic processor.
2. Remove the cover plate on the right side of the electronic processor.
3. Remove the personality module by sliding it straight out.
4. Install the new module, component side facing toward the rear of the box. Make sure the module slides evenly along the alignment slots. Press straight in. DO NOT COCK IT. The personality module will slide smoothly with light hand pressure until almost all the way in. Press firmly to completely seat the module in its socket.
5. Turn the power back on. The display will indicate the current suction pressure.
6. Recheck all electronic processor settings.
7. Return the old module to Hussmann in the same packing box. If this is not available, wrap the module in aluminum foil to protect it from static charge build-up, and place in a firm container.

PRESSURE TRANSDUCER REPLACEMENT

1. Turn off power to the electronic processor.
2. Label and remove the wires to the pressure transducer.
3. Close the service valve on the suction header.
4. Disconnect the suction pressure line at the pressure transducer. Use two wrenches when removing this line or damage may result.
5. Replace the pressure transducer.
6. Re-install the tubing. When tightening, again use two wrenches. Open the service valve and leak check.
7. Connect the wires to the pressure transducer. Recheck the wiring. There is 12 volt DC on the pressure transducer and miswiring may damage the pressure transducer.
8. Turn on power to the electronic processor.

The display on the electronic processor should show the suction pressure. The electronic processor will only read up to 127 psig so if the unit has been off long enough for the suction pressure to rise above this mark, wait until the compressors begin cycling before checking the settings.

ULTRONIC PARTS LIST

Item Description	Single Piece Part No.
1-Electronic Controller Assembly, 0310805 consists of: 1-Electronic Processor and Personality Module Sub Assembly 0312695 consisting of: 1-Electronic Module ① 1-Personality Module ② 1-Compressor Control Relay Board 1-Signal Cable 1-Power Cable	 0312694 0261595 0261594 0261599 0261600
1-Pressure Transducer	0261592
1-Transducer Cable	0301038
1-Koolgas Defrost Cable	0301035
1-24 Volt Transformer	0301031
1-Fuse 1½ Amp (Slo-Blo, MDL 1-½)	0301032
*-Relay, SPDT. 24 VAC Coil	0319211
*-Switch Link	0301034

1. Contains 3 switch links, if replacement switch links (0301034) are needed, order as Single Piece Parts.
 2. The compressor control relay board usually contains 1 fuse (1½ amps) and 5 relays (SPDT 24 VAC Coil) as standard. If replacement fuses (0301032) of relays (0319211) are needed, order as required.
- * Quantity As Required.

HUSSMANN®

LIMITED WARRANTY

Hussmann Refrigeration, Inc. warrants each new Hussmann ULTRONIC 90™ microprocessor based refrigeration system controller to be free from defects in material and workmanship at the time of purchase. Hussmann's obligations under this warranty shall be limited to repairing or exchanging any part or parts, without charge, F.O.B. factory or nearest authorized parts depot, which may prove defective within one (1) year from date of original installation (not to exceed fifteen (15) months from date of shipment from the factory) and which is proven to the satisfaction of Hussmann to be thus defective. Hussmann may at its option ship a replacement part prior to receipt of the customer's defective part upon receipt of a purchase order from the customer. Upon receipt by Hussmann of a defective part proven to Hussmann's satisfaction to be thus defective, the customer will be credited the exchange price of the part. The warranties to repair or replace above recited, are the only warranties, express, implied, or statutory, made by Hussmann with respect to the equipment, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS, and it neither assumes, nor authorizes any person to assume for it, any other obligations or liability in connection with the sale of said equipment or any part thereof.

THIS WARRANTY SHALL NOT APPLY TO LOSS OF FOOD OR INCREASED POWER CONSUMPTION OR INCREASED UTILITY CHARGES DUE TO FAILURE FOR ANY REASON.

Hussmann SHALL NOT BE LIABLE for any repairs or replacements made by buyer without the written consent of Hussmann, or when the equipment is installed or operated in a manner contrary to the printed instructions covering installation and service which accompanied the equipment nor for payment of any removal or installation charges of warranted parts.

Hussmann SHALL NOT BE LIABLE for any damages, delays, or losses, direct or consequential, caused by defects, nor for damages caused by short or reduced supply of materials, fire, flood, strikes, acts of God, or circumstances beyond its control or when the failure or defect of any part or parts is incident to ordinary wear, accident, abuse or misuse, or when the serial number of the equipment has been removed, defaced, altered, or tampered with.

Said warranty shall be void when this equipment is operated on low or improper voltages, or is put to a use other than normally recommended by Hussmann or when the equipment is moved to a different address other than the original installation.

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Quality That Sets Industry Standards

--- CAUTION ---

**SATELLITE PROBE CABLE MUST NOT BE
RUN WITH ANY OTHER WIRES. THIS CABLE
MUST BE RUN IN A SEPARATE CONDUIT.**