LENNOX SOLID STATE DEFROST CONTROL

The CMC defrost control (figure 1) is a solid state control manufactured by Hamilton Standard. The control provides automatic switching from normal heating operation to defrost mode and back. Current models using the Hamilton Standard defrost control include CHP15, CHP16, and HP19 series units. Future models are also scheduled to use the control.

The control contains a solid state timer which switches an external defrost relay through 1/4" male spades mounted on the control's circuit board. The control energizes the defrost relay at regular timed intervals. On CHP15 and CHP16 units, a normally open defrost switch placed in series between the defrost relay and the control initiates defrost only when needed at the end of the timed interval. On HP19 units, the control initiates defrost on demand from the defrost thermostat.

Defrost Control Components:

1 - '24V' Terminal

Terminal '24V' receives 24VAC from the control transformer. This terminal powers the control's internal timer and relays. Terminal '24V' must be powered at all times in order to provide 'HOLD' between thermostat demands.

2 - 'COM' Terminal

Terminal 'COM' provides 24VAC common.

3 - 'HLD' Terminal

Terminal 'HLD' holds the internal timer in place between thermostat demands and allows the unit to continue timing upon resumption of thermostat demand. In most units, terminal 'HLD' is connected directly to thermostat demand.

4 - 'OUT' Terminal

Terminal 'OUT' controls unit defrost when connected to one side of the defrost relay coil. An internal relay connected to terminal 'OUT' closes to allow external defrost relay to energize and initiate defrost. At the end of the defrost period, the internal relay connected to terminal 'OUT' opens to de-energize the external defrost relay.

5 - 'RST' Terminal (not used in HP19)

Terminal 'RST' resets the internal timer when power is removed and begins timer operation when power is returned. Terminal 'RST' is connected to terminal 'COM' through a set of normally closed defrost relay contacts. When the defrost relay contacts open terminal 'RST' loses power and the internal timer is reset. The control resumes timing when the defrost relay contacts close.

6 - Timing Pins 30(T1), 60(T2), 90(T3)

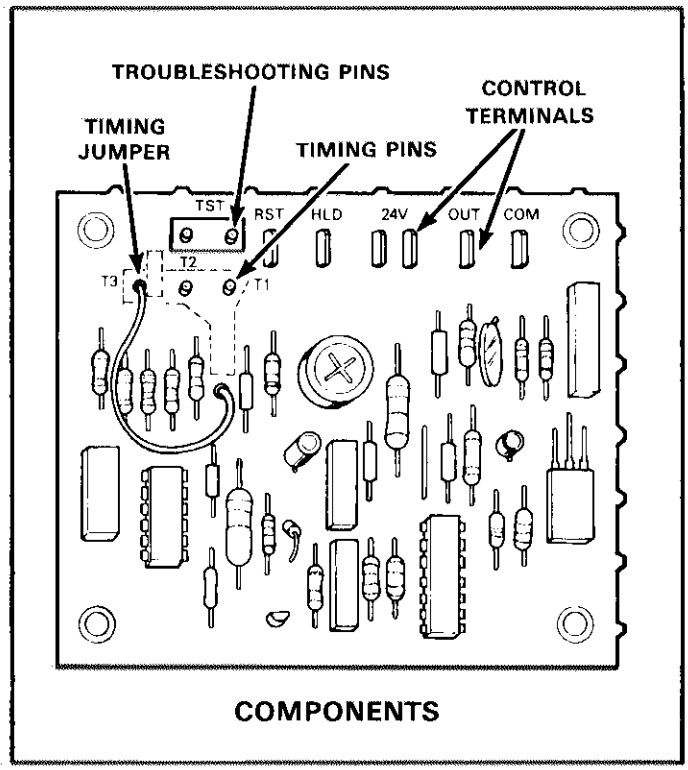
Each of these pins provides a different timed interval between defrosts. A jumper connects the pins to circuit board terminal W1. Table 1 shows the timings of each pin. To change the interval between defrosts, simply remove the jumper from the pin it is connected to and reconnect the jumper to one of the other available pins.

7 - Timing Jumper

A factory installed jumper on the circuit board connects terminal W1 on the circuit board to one of the three timing pins.

8 - 'TST' Pins

Each board is equipped with a set of test pins for use in troubleshooting the unit. When jumpered together, these pins reduce the control timing to about 1/256 original time (see table 1 on next page).



COMPONENTS

FIGURE 1

CAUTION – DO NOT CONNECT THE TIMING JUMPER TO EITHER OF THE 'TST' PINS. 'TST' PINS MUST ONLY BE JUMPERED TOGETHER DURING A TEST AND MUST NOT CONNECT WITH ANY OTHER PINS. CONTROL DAMAGE COULD RESULT.

IMPORTANT – THE CONTROL WILL BEGIN TEST MODE ONLY IF A NORMAL LOAD IS APPLIED TO CONTROL'S TERMINALS. DO NOT ATTEMPT TO OPERATE OR TEST CONTROL OUT OF UNIT.

TO CHANGE CONTROL TIMINGS:

1 - Turn off all power to the unit to avoid damaging the circuit board.
2 - Grasp wire connector firmly with needle nose pliers as shown.
3 - Gently pull connector from pin.
4 - Select new timing pin. DO NOT SELECT A TEST PIN.
5 - Gently push connector onto desired pin (see Table 1 for timings). Connector is seated when pin snaps.
6 - Turn on power to unit.

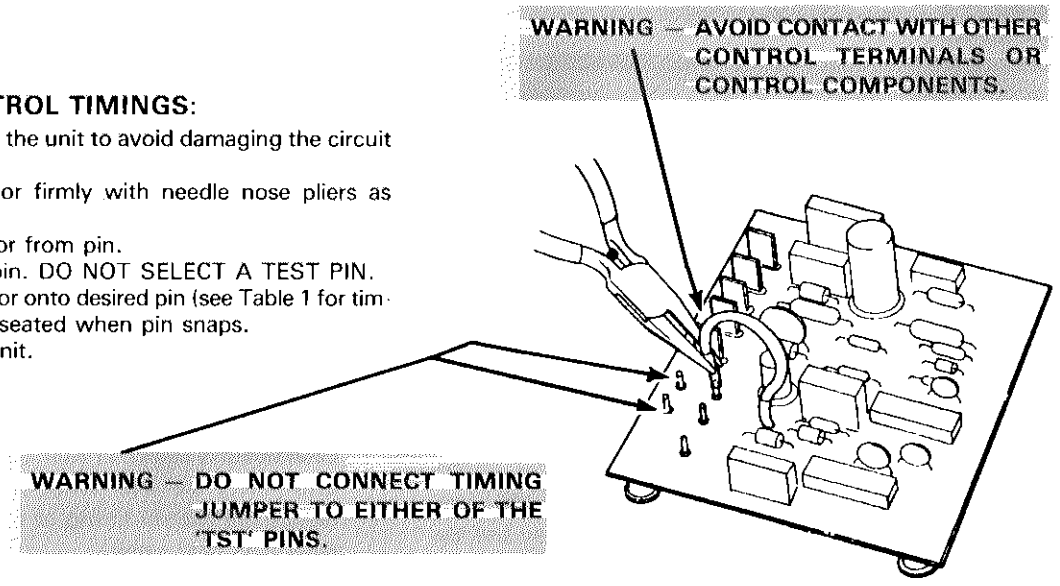


TABLE 1

DEFROST CONTROL CMC TIMINGS	INTERVAL BETWEEN DEFROSTS JUMPERED CONNECTED TO			DEFROST TIME	
	30 (T1)	60 (T2)	90 (T3)	CHP15, CHP16 SERIES UNITS	HP19 SERIES UNIT
NORMAL OPERATION	30 ± 3 MIN.	60 ± 6 MIN.	90 ± 9 MIN.	10 ± 1 MIN.	14 ± 1.4 MIN.
'TST' PINS JUMPERED TOGETHER	7 ± 0.7 SEC.	14 ± 1.4 SEC.	21 ± 2.1 SEC.	2.3 ± 0.2 SEC.	3.3 ± 0.3 SEC.

FIGURE 2

TO PLACE CONTROL IN TEST MODE:

1 - Turn off all power to the unit to avoid damaging the circuit board.
2 - Make sure all control terminals are connected as shown on unit wiring diagram before attempting to place control in test mode. See NOTE below.

NOTE — Control will not go into mode when disconnected from unit. Unit load must be applied to control terminals before the control will go into test mode.

3 - Connect jumper to 'TST' pins as shown.
4 - Turn indoor thermostat to heat mode and adjust to highest temperature setting.
5 - Turn on power to unit.
6 - See Table 1 for control timings in 'TST' mode. Follow troubleshooting flow chart to diagnose problems.
7 - Turn on power to unit.

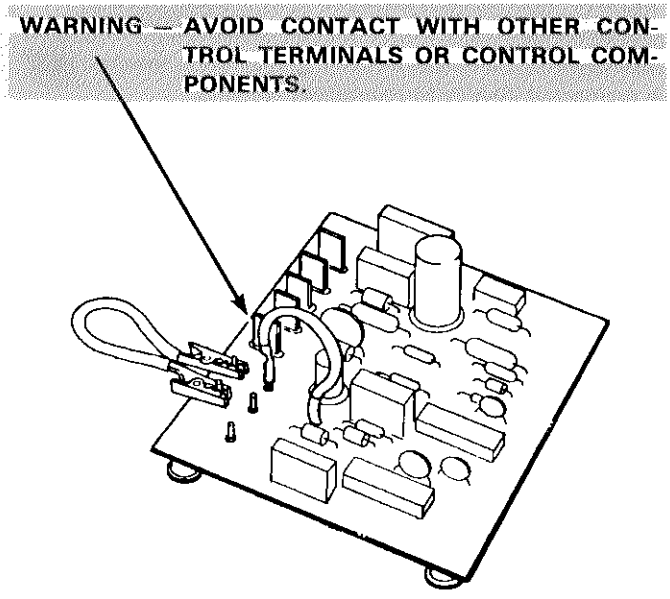
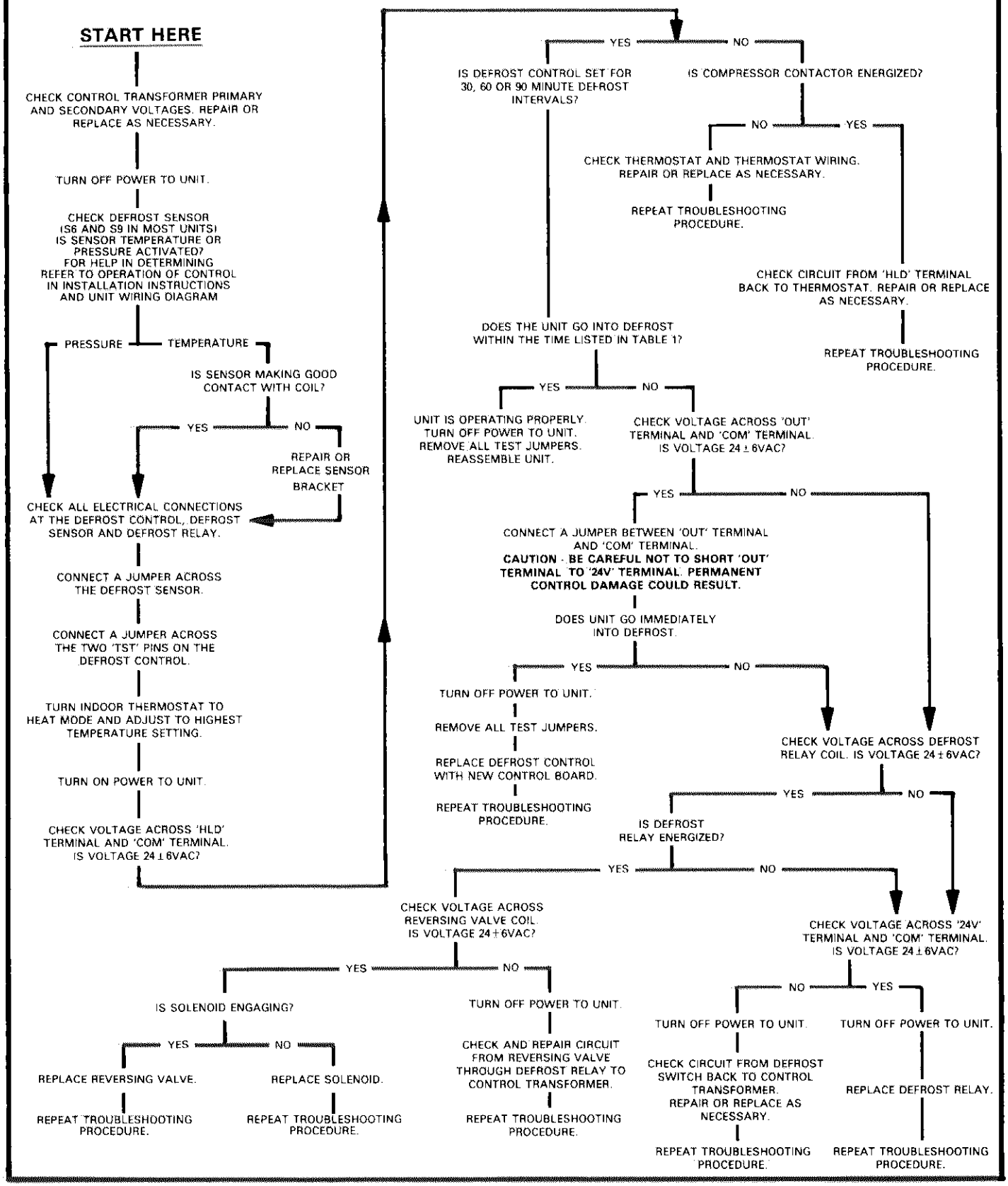
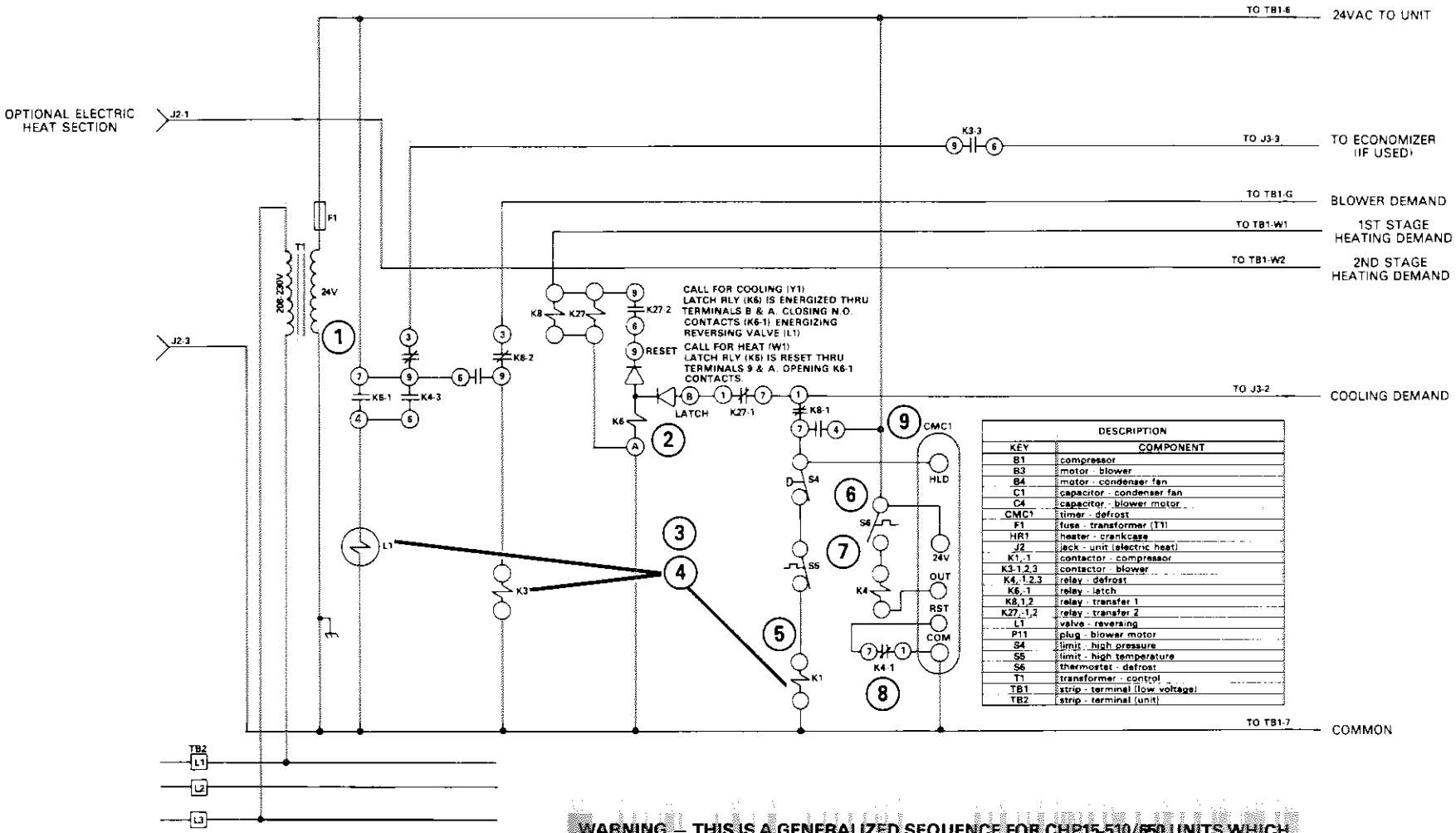


FIGURE 3

HAMILTON STANDARD MODEL 621
DEFROST CONTROL
TROUBLESHOOTING FLOWCHART



CHP15-510/650 SEQUENCE OF OPERATION



DESCRIPTION	
KEY	COMPONENT
B1	compressor
B3	motor - blower
B4	motor - condenser fan
C1	capacitor - condenser fan
C4	capacitor - blower motor
CMC1	timer - defrost
F1	fuse - transformer (T1)
HR1	heater - crankcase
J2	jack - unit (electric heat)
K1,-1	contactor - compressor
K3-1,2,3	contactor - blower
K4,-1,2,3	relay - defrost
K6,-1	relay - latch
K8,1,2	relay - transfer 1
K27,-1,2	relay - transfer 2
L1	valve - reversing
P11	plug - blower motor
S4	limit - high pressure
S5	limit - high temperature
S6	thermostat - defrost
T1	transformer - control
TB1	strip - terminal (low voltage)
TB2	strip - terminal (unit)

WARNING – THIS IS A GENERALIZED SEQUENCE FOR CHP15-510/650 UNITS WHICH USE THE HAMILTON STANDARD DEFROST CONTROL. THE DIAGRAM IS NOT COMPLETE. THIS SEQUENCE SHOULD ONLY BE USED WHEN TROUBLESHOOTING THE HAMILTON STANDARD DEFROST CONTROL. DO NOT USE THIS SEQUENCE TO TROUBLESHOOT THE CHP15.

Sequence of Operation:

1 - Line voltage applied to T1 supplies 24VAC to thermostat and unit controls.

2 - Latch relay K6 controls operation of reversing valve L1 during normal operation (contacts K4-3 control reversing valve L1 during defrost.) Latch relay K6 operates as follows:
   a. 24VAC applied between terminals A and B closes terminals 7 and 4. Terminals 7 and 4 remain closed when power is removed.
   b. 24VAC applied between terminals A and 9 opens terminals 7 and 4. Terminals 7 and 4 remain open when power is removed

3 - Cooling demand passes through K8-1 contacts 1-7, S4 and S5 to energize contactor K1. K1 energizes compressor and outdoor fan. Cooling demand also passes through K27-1 to energize latch relay K6 through terminals A and B. K6-1 closes to energize reversing valve L1. Blower demand (TB1-G), energized simultaneously with cooling demand, passes through K8-2 to energize contactor K3. K3-2 (not shown) switches to energize blower. K3-3 closes to energize economizer.

4 - When cooling demand is satisfied, contactor K3 drops out. K3-2 opens to de-energize blower. K3-3 opens to de-energize economizer. Latch relay K6 drops out but K6-1 remains closed and reversing valve L1 remains energized (in case of subsequent 2nd cooling demand - keeps L1 from cycling). L1 remains energized until the system is transferred to heating mode. Contactor K1 drops out and the compressor is de-energized.

5 - Heating demand energizes relays K8 and K27. K8-1 switches to energize contactor K1 through S4 and S5. The compressor starts up. K8-2 switches to energize contactor K3. K3-2 (not shown) closes to energize blower. K3-3 closes to energize economizer. K27-1 opens to allow latch relay K6 to reset and to prohibit cooling demand from entering K6. K27-2 closes to energize K6 through terminals A and 9. Terminals K6-1 open to de-energize reversing valve L1.

6 - After 30, 60, or 90 minutes of heating demand (as preset), defrost control CMC1 checks for defrost by closing an internal relay connected to terminal 'OUT'. Defrost thermostat S6 closes when the outdoor coil vapor line drops below 35 ± 4°F. If defrost thermostat S6 is closed when CMC1 checks for defrost, relay K4 will energize to initiate defrost. K4-1 opens to reset the internal timer to zero. K4-2 (not shown) opens to disconnect outdoor fan. K4-3 switches to disconnect the economizer and energize reversing valve L1. CMC1 allows K4 to remain energized for a maximum of 10 ± 1 minutes.

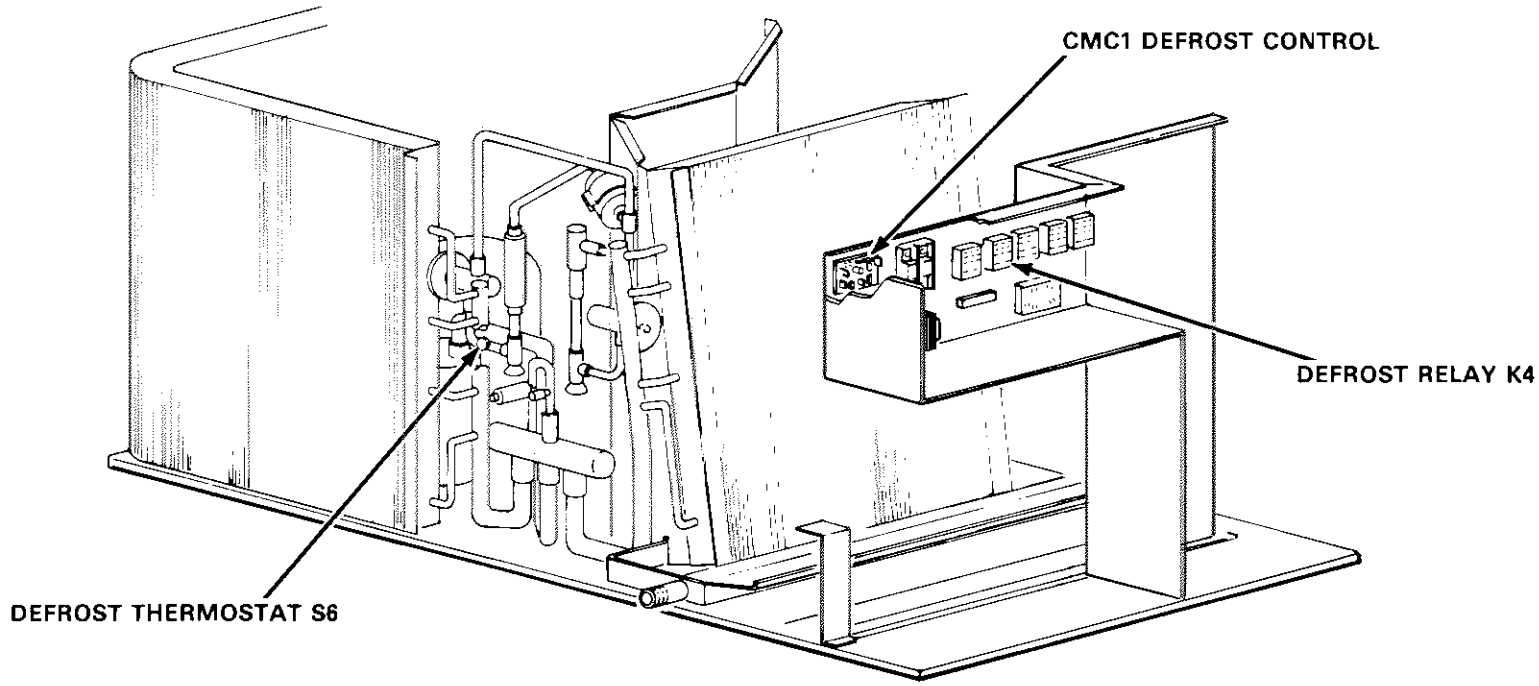
7 - Defrost continues until defrost thermostat S6 opens or the 10 minute defrost time is complete. If heating demand is satisfied during defrost, 24VAC is still supplied to terminal '24V' and 'OUT' but terminal 'HLD' loses power. This tells the control that heating demand is satisfied. The control 'HOLDS' at that point in the defrost cycle until 24VAC is returned to terminal 'HLD' (when the compressor starts back up).

8 - Defrost may be terminated two ways:
   a. Defrost thermostat S6 opening when outdoor coil vapor line rises above 70 ± 5°F.
   b. CMC1 internal relay connected to terminal 'OUT' opening when the 10 minute defrost cycle is complete.

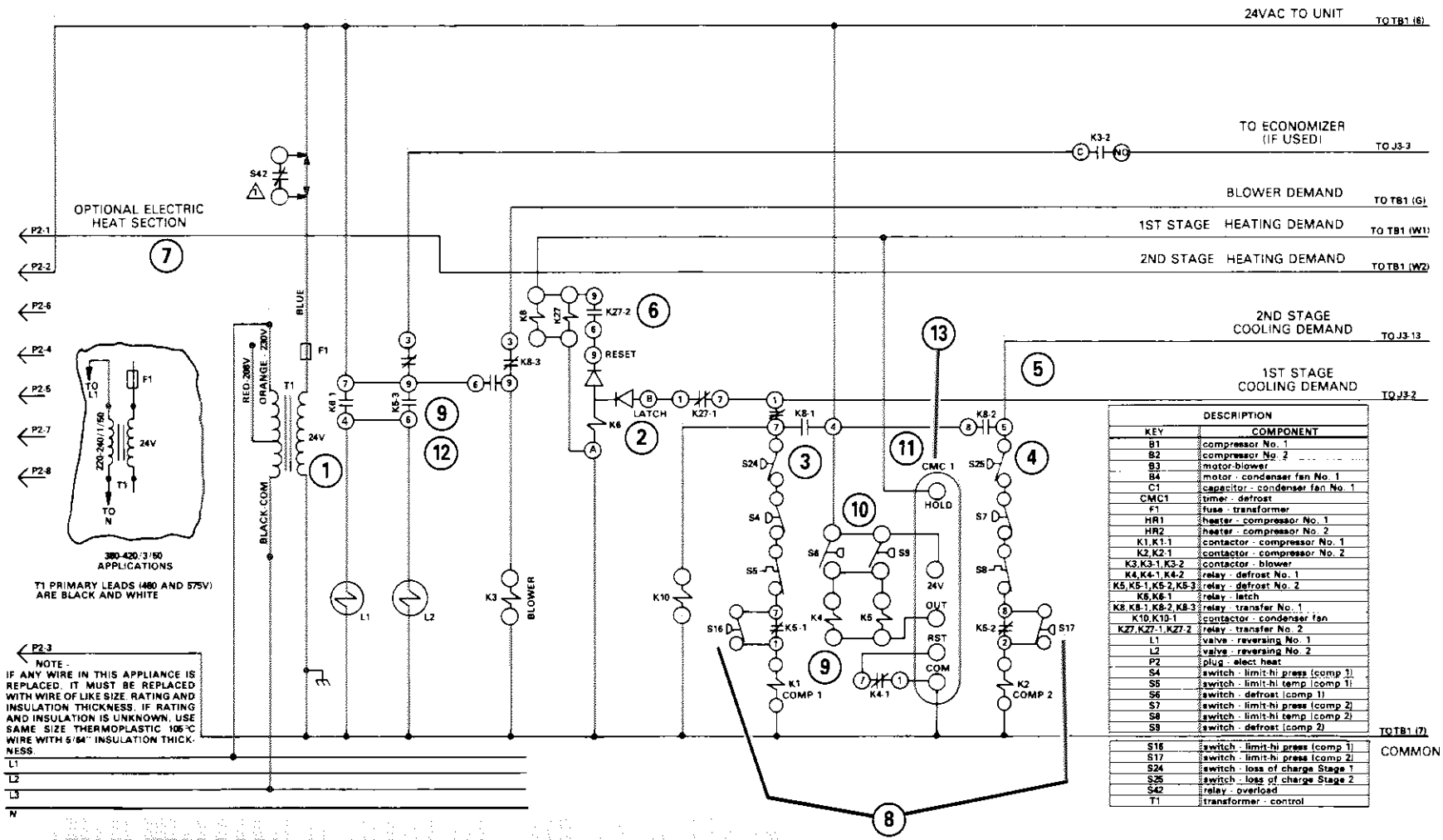
   When either of these two happen, relay K4 de-energizes. K4-1 closes to begin timer for next defrost. K4-2 (not shown) closes to allow outdoor fan to operate with the compressor. K4-3 switches to allow economizer to energize and to de-energize reversing valve L1.

9 - If unit receives a cooling demand while defrost control CMC1 is 'HOLDING' a defrost, step 3 repeats. As the outdoor coil warms, defrost thermostat S6 opens then step 8 repeats.

CHP15 CONTROL BOX AND COMPRESSOR COMPARTMENT



CHP16-953 SEQUENCE OF OPERATION



DESCRIPTION	
KEY	COMPONENT
B1	compressor No. 1
B2	compressor No. 2
B3	motor-blower
B4	motor - condenser fan No. 1
C1	capacitor - condenser fan No. 1
CMC1	timer - defrost
F1	fuse - transformer
HR1	heater - compressor No. 1
HR2	heater - compressor No. 2
K1,K1-1	contactor - compressor No. 1
K2,K2-1	contactor - compressor No. 2
K3,K3-1,K3-2	contactor - blower
K4,K4-1,K4-2	relay - defrost No. 1
K5,K5-1,K5-2,K5-3	relay - defrost No. 2
K6,K6-1	relay - latch
K8,K8-1,K8-2,K8-3	relay - transfer No. 1
K10,K10-1	contactor - condenser fan
KZ7,KZ7-1,KZ7-2	relay - transfer No. 2
L1	valve - reversing No. 1
L2	valve - reversing No. 2
P2	plug - elect heat
S4	switch - limit-hi press (comp 1)
S5	switch - limit-hi temp (comp 1)
S6	switch - defrost (comp 1)
S7	switch - limit-hi press (comp 2)
S8	switch - limit-hi temp (comp 2)
S9	switch - defrost (comp 2)
S16	switch - limit-hi press (comp 1)
S17	switch - limit-hi press (comp 2)
S24	switch - loss of charge Stage 1
S25	switch - loss of charge Stage 2
S42	relay - overload
T1	transformer - control

WARNING — THIS IS A GENERALIZED SEQUENCE FOR ALL CHP16-953 UNITS. THE DIAGRAM IS NOT COMPLETE. THIS SEQUENCE SHOULD ONLY BE USED WHEN TROUBLESHOOTING THE HAMILTON STANDARD DEFROST CONTROL. DO NOT USE THIS SEQUENCE TO TROUBLESHOOT THE CHP16.

Sequence of Operation:

1 - Line voltage applied to T1 supplies 24VAC to thermostat and unit controls.

2 - Latch relay K6 controls operation of reversing valves L1 and L2 during normal operation (contacts K5-3 control reversing valves L1 and L2 during defrost). Latch relay K6 operates as follows:
   a. 24VAC applied between terminals A and B closes terminals 7 and 4. Terminals 7 and 4 remain closed when power is removed.
   b. 24VAC applied between terminals A and 9 opens terminals 7 and 4. Terminals 7 and 4 remain open when power is removed.

3 - Initial cooling demand passes through K8-1 terminals 1-7, S24, S4, S5 and K5-1 to energize contactor K1. K1 energizes compressor B1. Outdoor fan B4 is energized by contactor K10. Cooling demand also passes through K27-1 to energize K6 (24VAC applied across terminals B and A - see step 2). K6-1 closes to energize reversing valves L1 and L2. Blower demand (TB1-G) simultaneously passes through passes through K8-3 terminals 3-9 to energize K3. K3-1 (not shown) closes to energize blower motor B3. K3-2 closes to energize the economizer.

4 - Increased cooling demand passes through K8-2 terminal 5, S25, S7, S8 and K5-2 to energize contactor K2. K2 energizes compressor B2.

5 - When cooling demand is satisfied, compressor contactors K1 and K2 and outdoor fan contactor K10 all drop out. Compressors and outdoor fan de-energize.

6 - Initial heating demand energizes K8 and K27. K8-1 and K8-2 switch to energize K1, K2 and K10. Both compressors and outdoor fan energize. K8-3 switches to energize K3. K27-1 opens to allow K6 to reset. K27-2 closes to energize K6 (24VAC applied across terminals 9 and A - see step 2). K6-1 opens to de-energize L1 and L2.

7 - Increased heating demand is routed directly to the auxiliary heat section of the unit.

8 - During heating demand, S16 and S17 close when outdoor coil vapor line pressure drops below 195 ± 10 psig. This resets the defrost high pressure limit switches.

9 - After 30, 60, or 90 total minutes of heating demand (depending on how the control is preset), CMC1 checks for defrost by closing an internal relay connected to terminal 'OUT' for 10 ± 1 minutes. Defrost pressure switches S6 and S9 close when either of the outdoor coil vapor lines drop below 45 ± 10 psig. If either S6 or S9 are closed when CMC1 checks for defrost, relays K4 and K5 both energize and both compressor circuits begin defrost. CMC1 terminal 'OUT' accepts 24VAC for maximum of 10 ± 1 minutes. K4-1 opens to reset the internal timer to zero. K4-2 (not shown) opens to disconnect outdoor fan. K5-1 and K5-2 open to route heating demand through defrost high pressure limits S16 and S17. S16 and S17 allow each circuit to terminate defrost independently (see step 10). K5-3 switches to energize both reversing valves and to de-energize the economizer.

10 - Defrost continues until both S6 and S9 open or until 10 minutes has elapsed. S6 and S9 open when either outdoor coil vapor line rises above 225 ± 10 psig. If only one switch opens (S6 or S9), CMC1 continues defrost until the other switch (S6 or S9) also opens or until 10 minutes has elapsed. For example, if S6 opens and S9 remains closed, both circuits continue to defrost. If this happens, the outdoor coil vapor line pressure of both compressors will continue to rise. Defrost high pressure limit switch S16 opens when the outdoor coil vapor line pressure rises above 275 ± 10 psig. When S16 opens, K1 is de-energized and the 1st stage compressor stops until S9 opens or until 10 minutes has elapsed. The 1st stage circuit is de-energized until the 2nd stage circuit has completed defrost. S17 in the 2nd stage circuit operates in the same manner to de-energize the 1st stage circuit until the 2nd stage circuit has completed defrost.

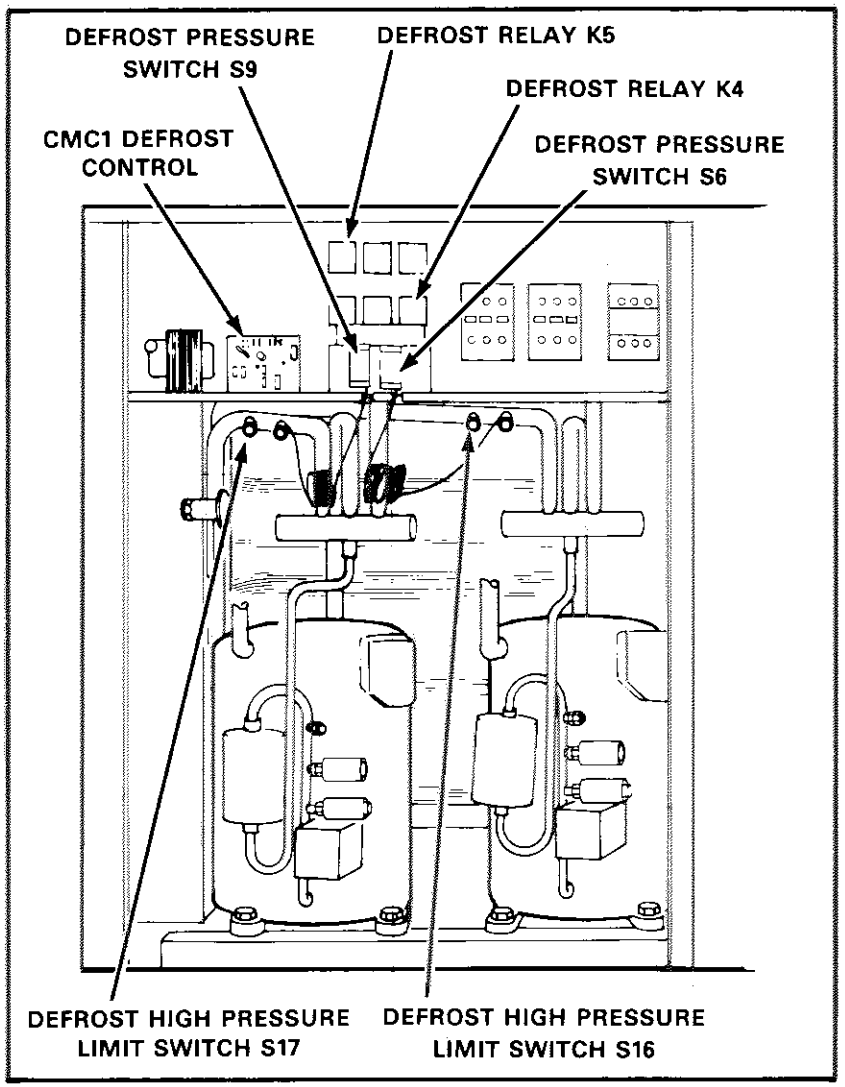
11 - If heating demand is satisfied during defrost, 24VAC is still supplied to terminal '24V' and 'OUT' but terminal 'HLD' loses power. This tells the control that heating demand is satisfied. The control 'HOLDS' the internal timer at its current position in the defrost cycle until 24VAC is returned to terminal 'HLD' (when the compressors start back up).

12 - When defrost is complete, relays K4 and K5 lose power (CMC1 internal relay at terminal 'OUT' opens). K4-1 closes to begin internal timer for next defrost. K4-2 (not shown) closes to allow outdoor fan to operate with compressor demand. K5-1 and K5-2 close to disconnect S16 and S17 from the circuit (defrost high pressure termination is no longer needed). K5-3 switches to de-energize reversing valves L1 and L2 and to reconnect the economizer to the circuit.

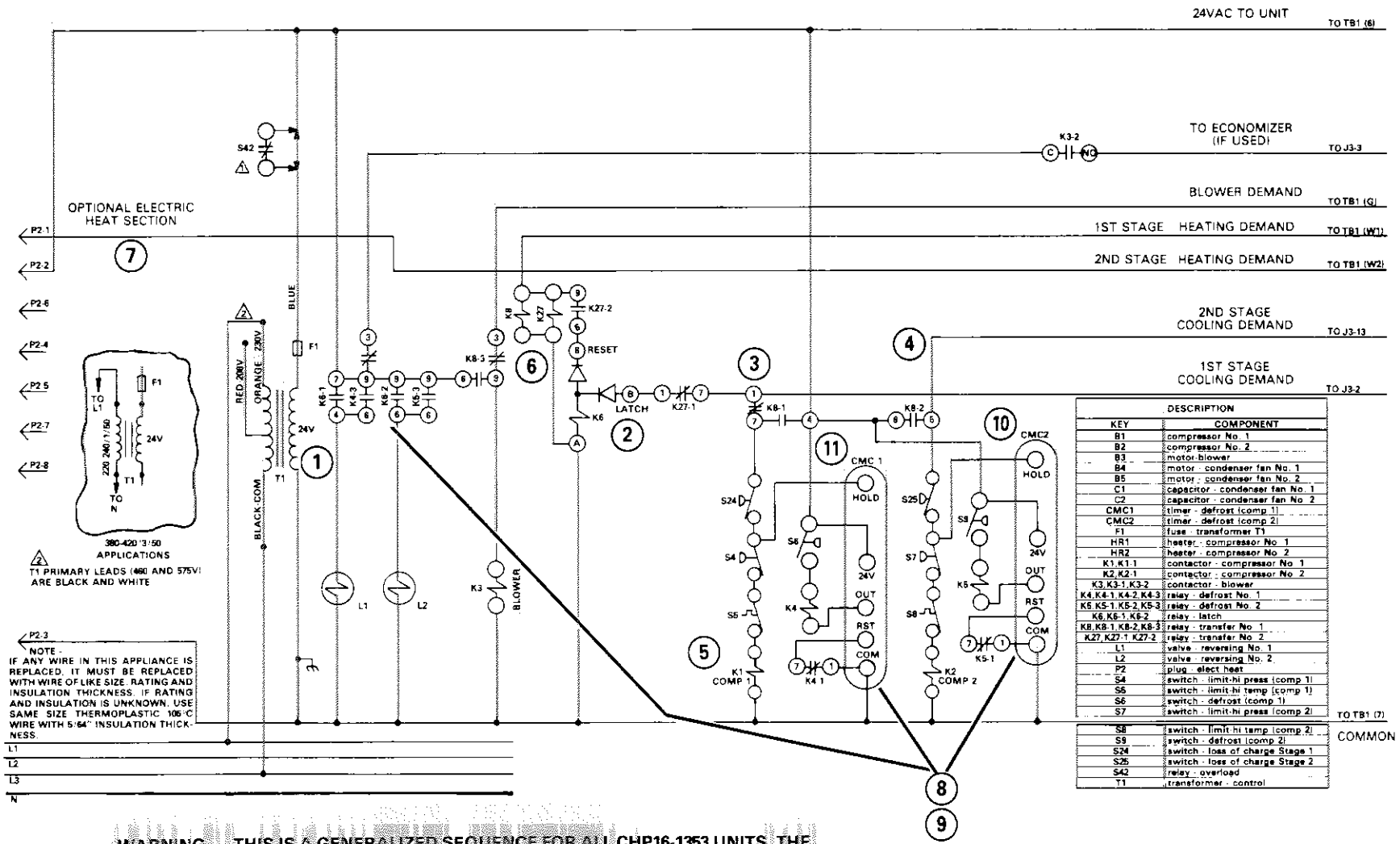
13 - If the unit receives a cooling demand while defrost control CMC1 is 'HOLDING' a defrost (step 12), step 3 repeats. As the outdoor coil builds pressure, S16, S6 and S9 all open to terminate defrost 'HOLD'.

If the 2nd stage circuit receives a cooling demand while defrost control CMC1 is 'HOLDING' a defrost (step 12), step 4 repeats. As the outdoor coil builds pressure, S17 opens to terminate defrost 'HOLD'.

CHP16-953 CONTROL BOX AND COMPRESSOR COMPARTMENT



CHP16-1353 SEQUENCE OF OPERATION



DESCRIPTION	
KEY	COMPONENT
B1	compressor No. 1
B2	compressor No. 2
B3	motor-blower
B4	motor - condenser fan No. 1
B5	motor - condenser fan No. 2
C1	capacitor - condenser fan No. 1
C2	capacitor - condenser fan No. 2
CMC1	timer - defrost (comp 1)
CMC2	timer - defrost (comp 2)
F1	fuse - transformer T1
HR1	heater - compressor No. 1
HR2	heater - compressor No. 2
K1,K1-1	contactor - compressor No. 1
K2,K2-1	contactor - compressor No. 2
K3,K3-1,K3-2	contactor - blower
K4,K4-1,K4-2,K4-3	relay - defrost No. 1
K5,K5-1,K5-2,K5-3	relay - defrost No. 2
K6,K6-1,K6-2	relay - latch
K8,K8-1,K8-2,K8-3	relay - transfer No. 1
K27,K27-1,K27-2	relay - transfer No. 2
L1	valve - reversing No. 1
L2	valve - reversing No. 2
P2	plug - elect heat
S4	switch - limit-hi press (comp 1)
S5	switch - limit-hi temp (comp 1)
S6	switch - defrost (comp 1)
S7	switch - limit-hi press (comp 2)
S8	switch - limit-hi temp (comp 2)
S9	switch - defrost (comp 2)
S24	switch - loss of charge Stage 1
S25	switch - loss of charge Stage 2
S42	relay - overload
T1	transformer - control

WARNING – THIS IS A GENERALIZED SEQUENCE FOR ALL CHP16-1353 UNITS. THE DIAGRAM IS NOT COMPLETE. THIS SEQUENCE SHOULD ONLY BE USED WHEN TROUBLESHOOTING THE HAMILTON STANDARD DEFROST CONTROL. DO NOT USE THIS SEQUENCE TO TROUBLESHOOT THE CHP16.

Sequence of Operation:

1 - Line voltage applied to T1 supplies 24VAC to thermostat and unit controls.

2 - Latch relay K6 controls operation of reversing valves L1 and L2 during normal operation (during defrost, contacts K4-3 control reversing valve L1 and contacts K5-3 control reversing valve L2). Latch relay K6 operates as follows:
   a. 24VAC applied between terminals A and B closes terminals 7 and 4. Terminals 7 and 4 remain closed when power is removed.
   b. 24VAC applied between terminals A and 9 opens terminals 7 and 4. Terminals 7 and 4 remain open when power is removed.

3 - Initial cooling demand passes through K8-1 terminals 1-7, S24, S4 and S5 to energize contactor K1. K1 energizes compressor B1 and outdoor fan B4. Cooling demand also passes through K27-1 to energize K6 (24VAC applied across terminals B and A - see step 2). K6-1 and K6-2 both close to energize reversing valves L1 and L2. Blower demand (TB1-G) simultaneously passes K8-3 to energize K3. K3-1 (not shown) closes to energize blower motor B3. K3-2 closes to energize the economizer.

4 - Increased cooling demand passes through K8-2 terminal 5, S25, S7 and S8 to energize contactor K2. K2 energizes compressor B2 and outdoor fan B5.

5 - When cooling demand is satisfied, compressor contactors K1 and K2 drop out. Compressors B1 and B2 and outdoor fans B4 and B5 all de-energize.

6 - Initial heating demand energizes K8 and K27. K8-1 and K8-2 switch to energize K1 and K2. Both compressors and both outdoor fans energize. K8-3 switches to energize K3. K27-1 opens to allow K6 to reset. K27-2 closes to energize K6 (24VAC applied between terminals 9 and A - see step 2). K6-1 and K6-2 open to de-energize reversing valves L1 and L2.

7 - Increased heating demand is routed directly to the auxiliary heat section of the unit.

8 - Although both refrigeration circuits operate during a single heating demand, each circuit defrosts independently of the other. After 30, 60, or 90 total minutes of heating demand (depending on how the control is preset), CMC1 checks for defrost in the 1st stage circuit by closing an internal relay connected to terminal 'OUT'. At approximately the same time, CMC2 checks for 2nd stage defrost in the same manner.

   Defrost pressure switches S6 (1st stage) and S9 (2nd stage) close when the outdoor coil vapor line drops below 45 ± 10 psig.

   If S6 is closed when CMC1 checks for defrost, relay K4 energizes to begin 1st stage circuit defrost cycle. K4-1 opens to reset CMC1's internal timer to zero. K4-2 (not shown) opens to disconnect 1st stage outdoor fan. K4-3 switches to energize reversing valve L1 and to disconnect economizer.

   If S9 is closed when CMC2 checks for defrost, relay K5 energizes to begin 2nd stage circuit defrost cycle. K5-1 opens to reset CMC2's internal timer to zero. K5-2 (not shown) opens to disconnect 2nd stage outdoor fan. K5-3 close to energize reversing valve L2.

9 - 1st stage continues defrost until S6 opens or until 10 minutes has elapsed. S6 opens when the 1st stage outdoor coil vapor line rises above 225 ± 10 psig.

   2nd stage continues defrost until S9 opens or until 10 minutes has elapsed. S9 opens when the 2nd stage outdoor coil vapor line rises above 225 ± 10 psig.

10 - If heating demand is satisfied during defrost, terminals '24V' and 'OUT' of both CMC1 and CMC2 remain powered. However, terminal 'HLD' of each control loses power. This tells each control that heating demand is satisfied. Each control 'HOLDS' the internal timer at that point in the defrost cycle until 24VAC is returned to terminal '24V' (when the compressors start back up).

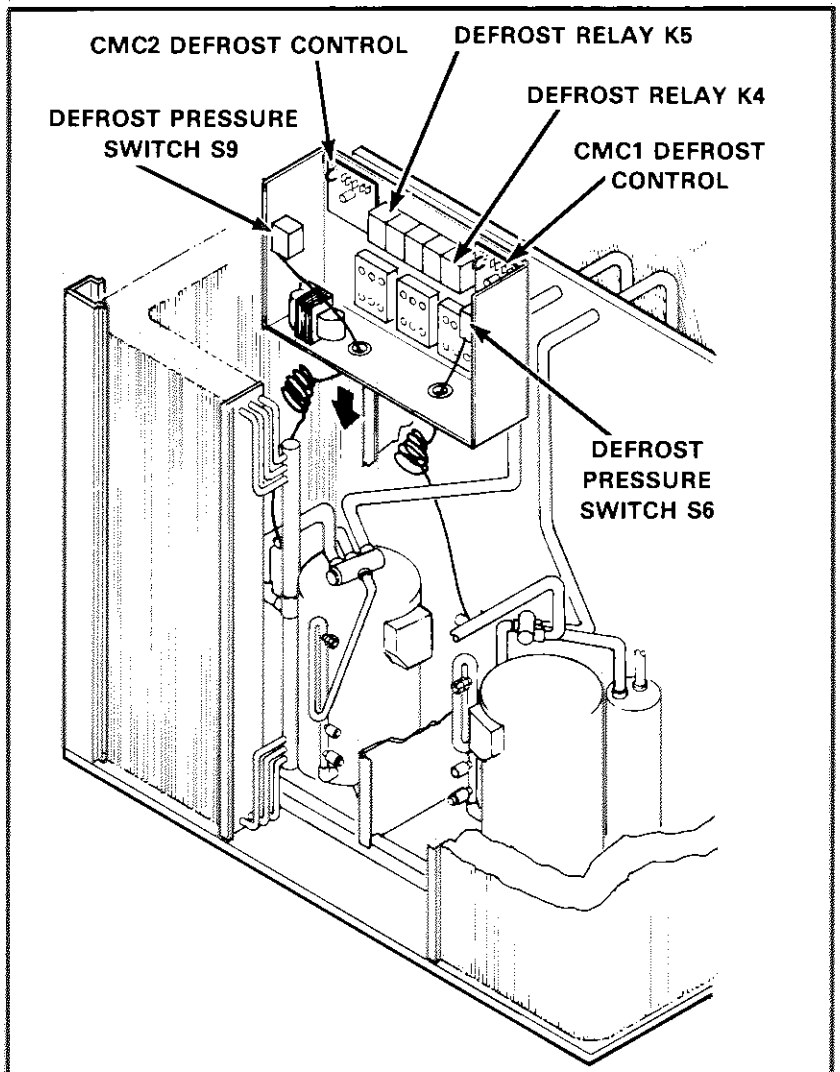
11 - When 1st stage defrost is complete relay K4 loses power (CMC1 internal relay at terminal 'OUT' opens). K4-1 closes to begin internal timer for next defrost. K4-2 (not shown) closes to allow 1st stage outdoor fan to operate with 1st stage compressor demand. K4-3 switches to de-energize reversing valve L1 and to reconnect the economizer to the circuit.

   When 2nd stage defrost is complete relay K5 loses power (CMC2 internal relay at terminal 'OUT' opens). K5-1 closes to begin internal timer for next defrost. K5-2 (not shown) closes to allow 2nd stage outdoor fan to operate with 2nd stage compressor demand. K5-3 opens to de-energize reversing valve L2.

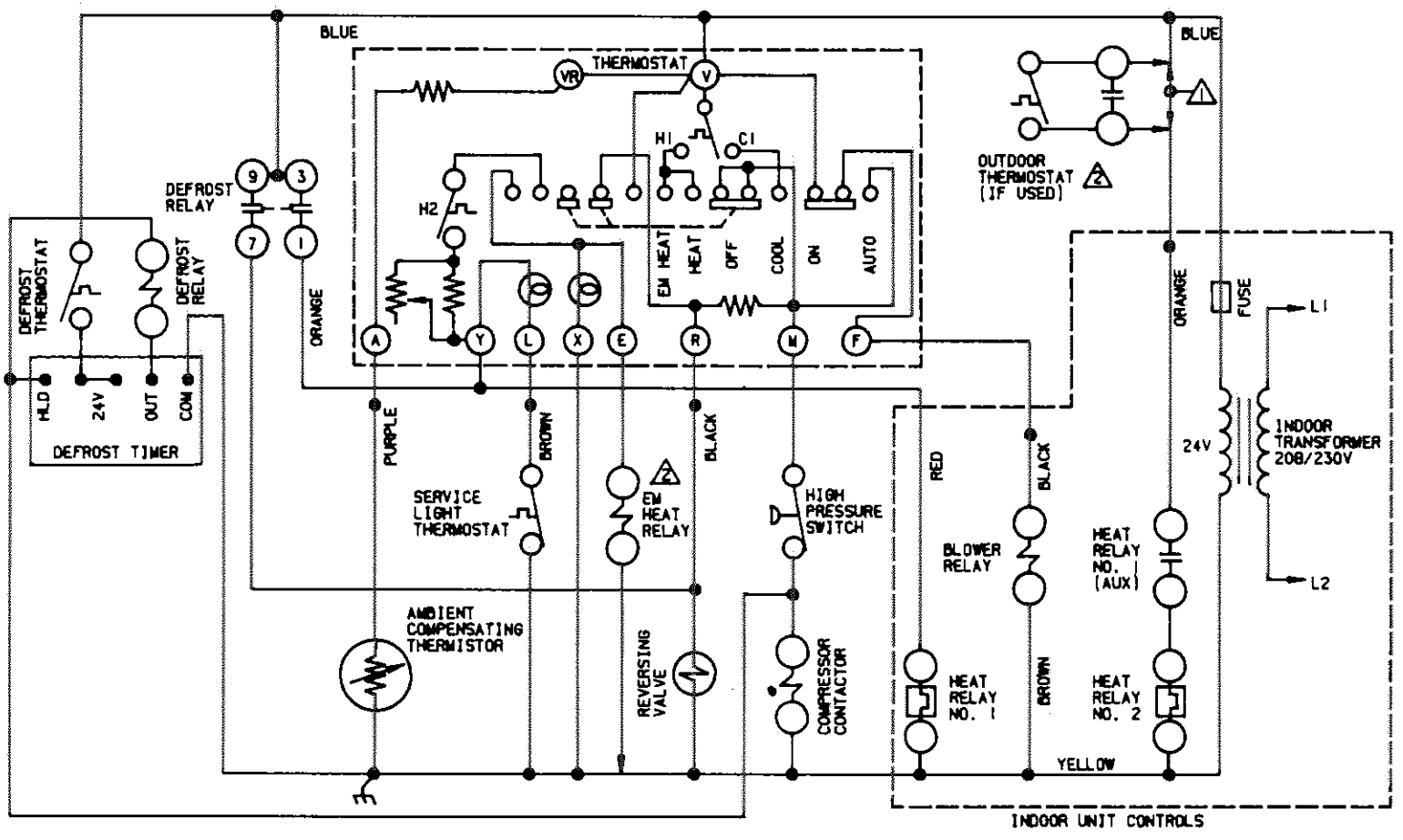
12 - If the unit receives a cooling demand while defrost control CMC1 is 'HOLDING' a defrost, step 3 repeats. As outdoor coil builds pressure, S6 opens to terminate defrost 'HOLD'.

   If the 2nd stage circuit receives a cooling demand while defrost control CMC2 is 'HOLDING' a defrost, step 4 repeats. As outdoor coil builds pressure, S9 opens to terminate defrost 'HOLD'.

CHP16-1353 CONTROL BOX AND COMPRESSOR COMPARTMENT



HP19 SEQUENCE OF OPERATION



WARNING – THIS IS A GENERALIZED SEQUENCE FOR HP19 SERIES UNITS. THE DIAGRAM IS NOT COMPLETE. THIS SEQUENCE SHOULD ONLY BE USED WHEN TROUBLESHOOTING THE HAMILTON STANDARD DEFROST CONTROL. DO NOT USE THIS SEQUENCE TO TROUBLESHOOT THE HP19 SERIES UNITS.

1. JUMPER IF OUTDOOR THERMOSTAT IS NOT USED
2. EMERGENCY HEAT RELAY (USED ONLY IF OUTDOOR THERMOSTAT IS USED) FIELD PROVIDED AND INSTALLED NEAR INDOOR UNIT. 24VAC. 5VA MAX. NEC CLASS 2

Sequence of Operation:

1 - Transformers in indoor unit supplies 24VAC power to the thermostat and outdoor unit's controls.
2 - Cooling demand energizes thermostat terminals M and R. Voltage from terminal M passes through high pressure switch and energizes compressor contactor.
3 - Thermostat demand (from thermostat terminal M) is also supplied to the defrost control. Defrost control cannot operate in cooling mode because defrost thermostat cannot close.
4 - Thermostat demand (from thermostat terminal R) energizes reversing valve.
5 - Heating demand energizes thermostat terminal M. Voltage from terminal M passes through high pressure switch and energizes compressor contactor.
6 - During heating operation, when outdoor coil drops below 35 ± 4°F, the defrost thermostat closes. When defrost thermostat closes, defrost timer begins timing. If defrost thermostat remains closed at the end of 30, 60 or 90 minutes, defrost relay energizes and defrost begins.
7 - When defrost relay energizes, reversing valve and indoor electric heat relay are energized.
8 - Defrost continues until 14 ± 1 minutes have elapsed or until the defrost timer loses power and resets. Defrost timing is stopped until the next call for defrost (when defrost thermostat closes).

HP19 CONTROL BOX AND COMPRESSOR COMPARTMENT