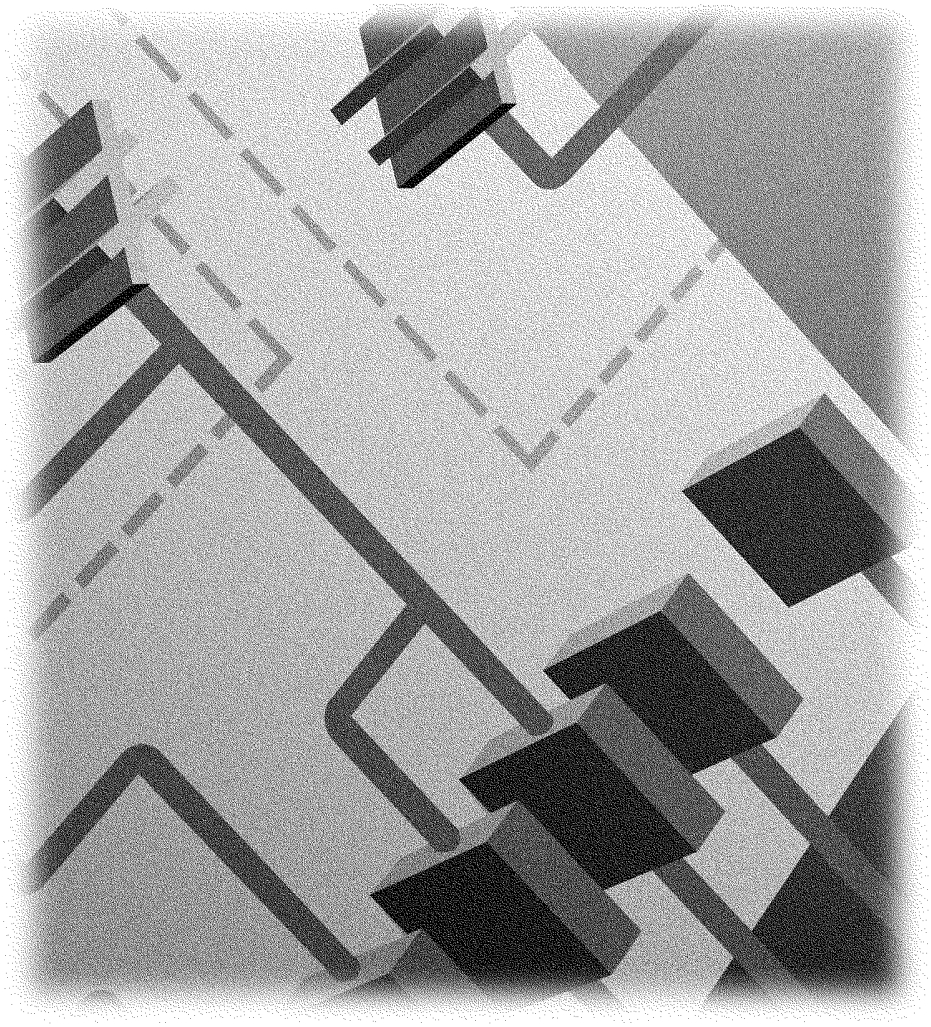
Heat Pump Defrost Controls



Electronic Timer Time and Temperature | Solid State Demand

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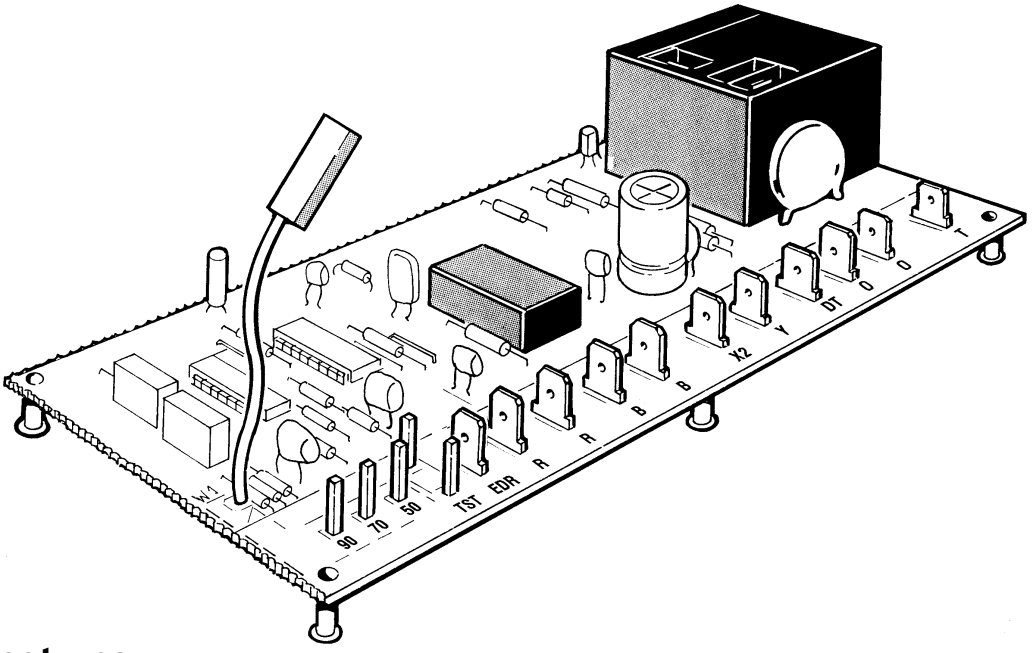
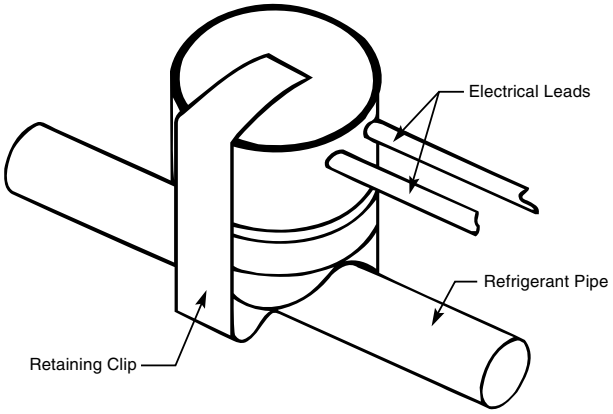


Features

- Electronic operation similar to electro-mechanical timers
- Selectable 50-70-90 minute total compressor run time. Ten minute time override in defrost cycle if defrost operation is enabled by DFC
- Test pins available for servicer to advance electronic timer into defrost cycle
- On-board relays for outdoor fan, switch-over valve and auxiliary heat
- Defrost cycles terminated on time or temperature. Compressor run time accrued and memorized only when coil thermostat is closed
- One control applicable for package unit or split unit heat pump products
- Simple service procedure

Defrost Terminator



Electronic time-temperature defrost controls (DFC) use a temperature sensing switch and an electronic timer circuit with on-board relays for control of the outdoor fan, the switch-over valve, the strip heat, and the defrost relay (EDR) during heat pump defrost cycles. The timer is powered by 24V AC system low voltage power and electronically "memorizes" timed control functions as long as low voltage power is applied. An on-board jumper is used to select a 50, 70, or 90 minute compressor run time followed by a 10 minute time over-ride or defrost cycle. The recommended run time is 90 minutes and if the jumper is not connected, the run time will be 90 minutes. Following the defrost cycle, the process is repeated and the DFC re-starts the preset compressor run timer sequence.

The thermostatic temperature sensing switch (DT) is usually attached to the lowest circuit of the outdoor coil and is supplied with normally open contacts. The DT contacts close when a coil temperature of 40°F, or below, is sensed. The fixed temperature is not standard for all models and Reddi or Service Facts should be checked for temperature specifications when needed.

Compressor run time is accrued and memorized by DFC as long as "Y" call (24V AC applied between DFC Y & B terminals) is made from indoor thermostat. When the DT switch contacts are open during the preset compressor run or defrost timing and the indoor thermostat terminates "Y" call, the compressor run timer or defrost timer stops and is reset to zero on the next "Y" call and normal heat pump operation is resumed. When the DT switch contacts are closed and the indoor thermostat terminates the "Y" call during the preset or defrost timing, the timing is memorized and will resume on the next "Y" call.

The DFC timer is activated when 24V AC is applied between DFC R & B terminals. The "TST" pins should not be jumpered unless an attempt is being made to speed up the defrost cycle time. When DFC timer receives a "Y" call from the indoor thermostat, the outdoor fan is turned on, auxiliary heat is de-energized, the switch-over valve (SOV) is de-energized to the heating mode position, and the EDR relay, if equipped, will be de-energized.

The EDR relay is only energized in the cooling cycle so that the EDC thermostat will be in the system circuit. The EDC or LPCO must be bypassed during the defrost cycle. For products using the EDR relay, DFC timer CNT1642 is used since the timer is furnished with an EDR control terminal. For products not using the EDR relay, timer CNT1152 may be substituted, since the timer is furnished without an EDR control terminal.

A defrost cycle is initiated when the DT switch contacts close and the compressor run timer has accrued the preset total run time. When the defrost cycle is initiated, the DFC stops the outdoor fan, energizes the auxiliary heat, and reverses the refrigerant cycle to the cooling mode by energizing the SOV. The DFC keeps the EDR relay, if equipped, de-energized during the defrost cycle.

The defrost cycle is terminated when the DT switch senses that the coil temperature is above 55°F or 70°F, depending on the type installed, or 10 minute timed over-ride has elapsed, whichever occurs first. When the defrost cycle terminates, the DFC turns on the outdoor fan, de-energizes the auxiliary heat, and de-energizes the switch-over valve to the heating mode position. The defrost cycle may be interrupted by the indoor thermostat terminating the "Y" call during the defrost cycle, then the defrost time resumes on the next "Y" call unless the DT switch contacts open. When the defrost cycle is terminated, the timers are reset to zero, and the compressor run timer starts accruing run time.

A test mode, to speed up defrost cycle times, may be activated by putting a jumper between the two "TST" pins on the DFC. When the "TST" pins are jumpered, all timing is divided by 256 (example: 90 minutes is reduced to about 21 seconds and 10 minutes is reduced to about 2.5 seconds). The "TST" pins should only be jumpered **momentarily** until the control is advanced to defrost cycle.

1. To advance DFC timer into a defrost cycle, **momentarily** jumper the two "TST" pins together. The jumper should be removed when the DFC advances the system into a defrost cycle (example: when fan turns off). Defrost cycle will not occur if outdoor coil thermostat contacts are open. To bypass the outdoor coil thermostat, jumper between R & D terminals on DFC timer board and, again, **momentarily** jumper the two "TST" pins together. Remove jumper as soon as defrost cycle starts. Do **NOT** leave outdoor coil thermostat jumpered very long if outdoor coil is NOT iced because compressor may cycle on internal overload. If the outdoor coil was iced and a defrost cycle could not be obtained, unless the outdoor coil thermostat was jumpered, then the outdoor coil thermostat is faulty and should be replaced. If a defrost cycle cannot be obtained, check for the following voltages at the DFC timer board:

2. 24V AC between B and R terminals; if no voltage, check field wiring.

3. 24V AC between B and Y terminals; if no voltage, check 24V wiring or indoor room thermostat. If compressor is running, the 24V wiring and indoor room thermostat are OK.

4. If voltage in Steps 2 and 3 are correct and a defrost cycle cannot be obtained as in Step 1, replace DFC timer board.

5. If outdoor fan turns off, but the switch-over valve will not switch in a defrost cycle, check for 24V AC between O and B terminals on the timer when the outdoor fan turns off. If no voltage, replace DFC timer board. If 24V AC is present and the switch-over valve will not switch, switch-over valve or valve coil is faulty and should be replaced.

6. If auxiliary heat will not come on during a defrost cycle, check for 24V AC between X2 and B terminals on the timer. If no voltage is present during a defrost cycle and voltages in Steps 2 and 3 are correct, replace DFC timer board. If voltage between X2 and B terminals is OK, either the outdoor thermostat (if used), field wiring, or heater assembly is faulty.

7. If outdoor fan will not turn off during a defrost cycle, replace DFC timer board.

General Notes

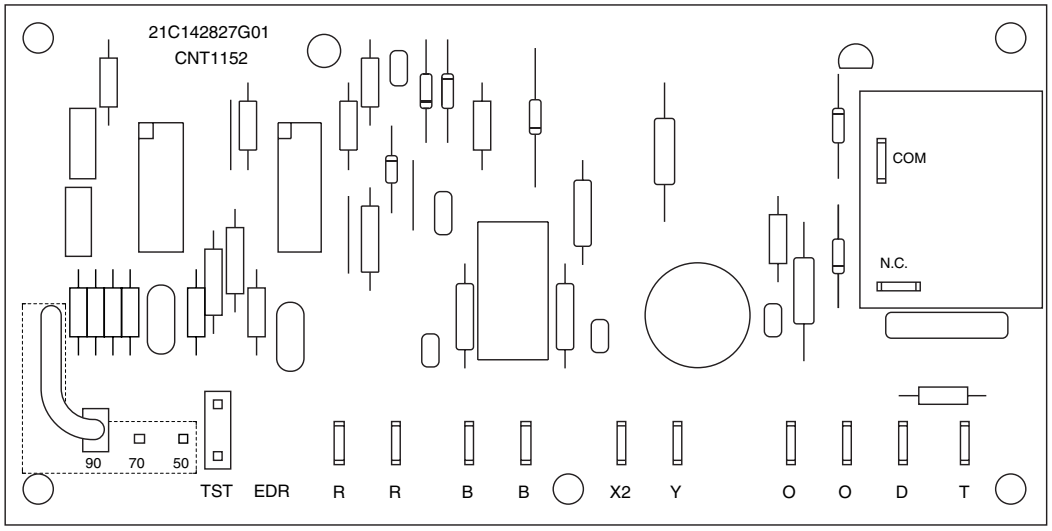
1. DFC timer uses a 1000 ohm resistor for the outdoor sensor (ODS), **NOT** a thermistor. 1000 ohm resistor is about equal to thermistor resistance at 25°F.
2. If compressor run time jumper is not connected, compressor run time will be 90 minutes.
3. For products equipped with EDR relay and EDC thermostat or LPCO, use DFC timer CNT1642, for products without EDR relay and EDC thermostat, use DFC timer CNT1152 or CNT1642.

SYMPTOMS	CHECKS	YES/NO	ACTIONS
1. Control does not initiate normal defrost	1. OD Temp. below 40°F and OD coil is iced?	Y	Complete Check #2
		N	Refer to Symptom #2
	2. 24V R - B	N	Check 24V AC field wiring
		Y	Complete Check #3
	3. 24V Y - B	N	Check 24V AC field wiring or indoor thermostat
		Y	Complete check #4
	4. 24V D - B	N	Initiate forced defrost
		Y	Replace Timer DFC
2. Control only responds to forced defrost	Is R - D jumper installed?	N	Jumper DFC R - D terminals
		Y	Replace DT thermostat
3. OD fan stops, SOV will not switch in defrost cycle	24V O - B when fan stops	N	Replace Timer DFC
		Y	Check SOV solenoid or SOV
4. SOV switches, OD fan runs during defrost cycle	0V M1-M2	Y	Replace Timer DFC
		N	Check 240V AC field wiring, OD fan motor, fan capacitor
5. AUX HEAT light does not light during defrost cycle	24V B - X2 24V Y - B OK 24V R - B OK	N	Replace Timer DFC
		Y	Check OD thermostat, if used Check 24V AC field wiring or auxiliary heater

Timer Defrost Control Supersedure

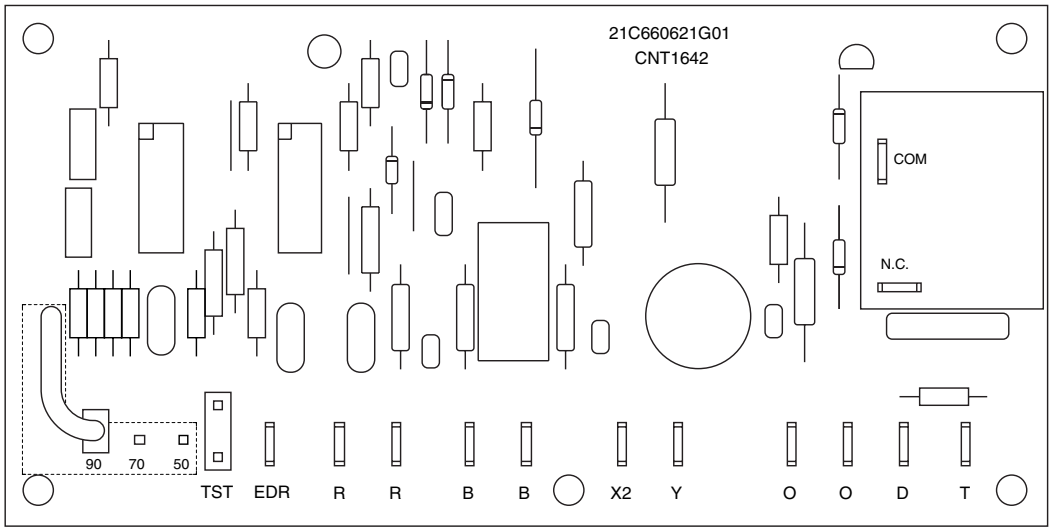
MNEMONIC #	DRAWING #	SUPERSEDURE #	PRODUCT
CNT1106	C726476G01	CNT1642	Package Units
CNT1152	C142827G01	CNT1642	Split Systems

CNT1152 Timer for Installations Without EDR Relay

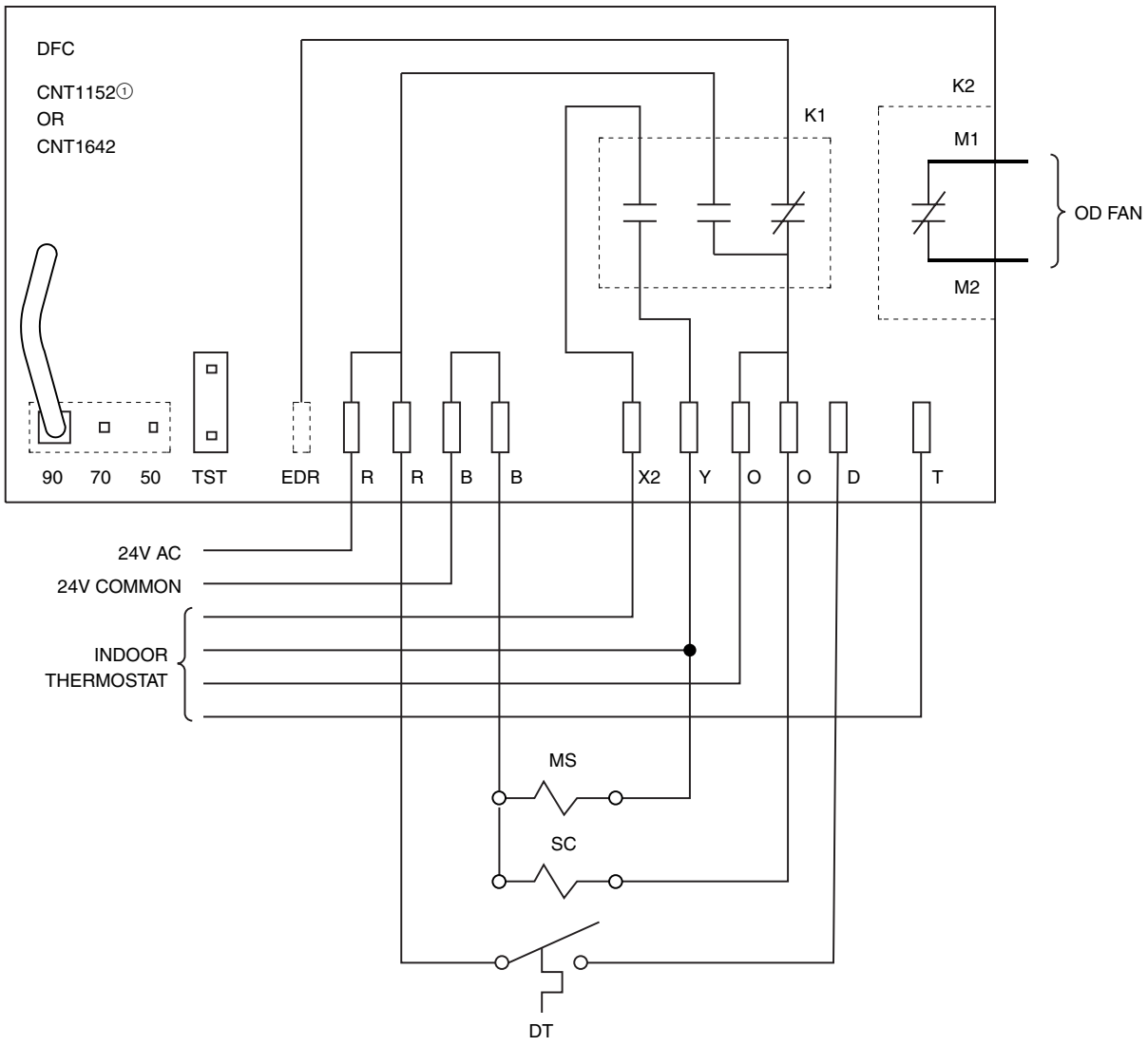


- CNT1152 is NOT furnished with EDR control terminal and may be replaced by CNT1642

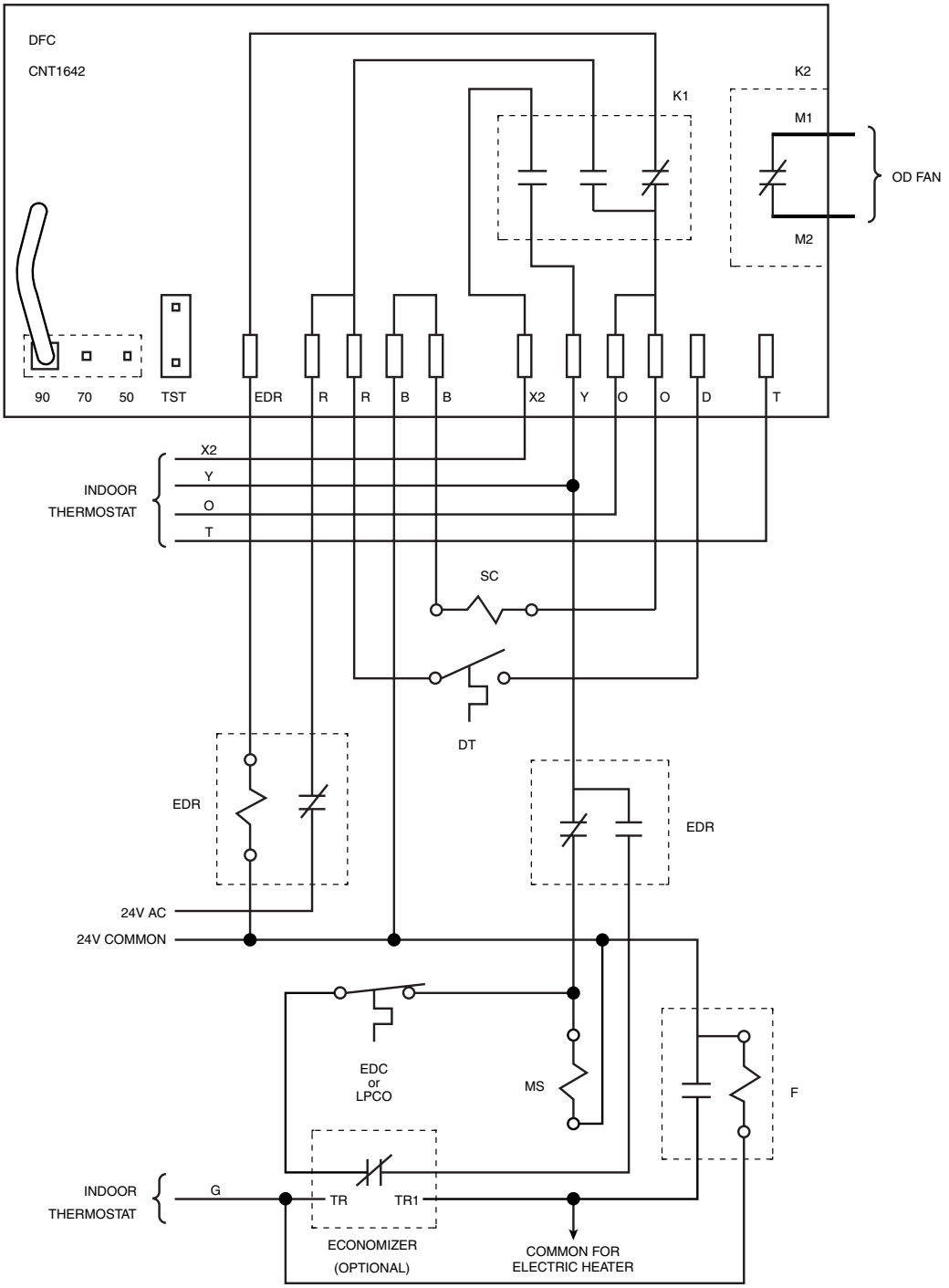
CNT1642 Timer for Installations With or Without EDR Relay



- CNT1642 is furnished with EDR terminal



① CNT1152 may be replaced by CNT1642



EDR relay energized in the cooling cycle only, so EDC thermostat will be in the circuit. EDC or LPCO must be bypassed during defrost cycle.

Features

- **Adaptability**

  Product improvements over the years have resulted in the latest model defrost controls described in this manual. The latest control models are applicable to many different heat pump products with up to 14 SEER ratings and minimize ID/OD mismatch and varying electrical installation problems. For prior model specifications and performance data, refer to Demand Defrost Quick Specs table in this section.

- **Logic Process**

  Microcomputer logic is used to sense the need for defrost by monitoring the difference between outdoor ambient and coil temperatures. The microcomputer that is used allows unit operating conditions to be memorized and continually compares the most recent defrost performance to conditions from prior defrost cycles and adjusts defrost cycle initiation and termination times to improve system performance.

- **Defrost On Demand**

  Demand Defrost Controls permit defrost cycles only when coil icing conditions begin to cause serious heat pump capacity reductions. The advantages over time – temperature initiated defrost controls are:

  1. Time-temperature controls may initiate defrost cycles when not needed, or

  2. a defrost cycle may be held off during rapid coil icing conditions by the time requirement.

- **Diagnostics**

  System faults detected by the control circuitry will be displayed by a flashing Light Emitting Diode (LED) on the circuit board. Full featured controls provide a service output signal that will cause the indoor thermostat service light① to flash, advising the consumer that a fault condition exists. Under certain fault conditions, the Defrost Control will revert to a defrost cycle every 30 minutes in an attempt to minimize condition(s) causing fault until needed service is performed.

- **Time Override**

  The Control prevents the system from being locked into a defrost cycle by automatic time termination of a defrost cycle if the heat pump is unable to satisfy the conditions necessary for a normal defrost termination.

- **Soft Switch-Over**

  The Control provides for a time delay in reversing the switch-over valve after a defrost cycle termination to prevent refrigerant lines from "banging" against adjacent system components. The outdoor fan is turned on at the end of the defrost cycle and the switch-over valve remains energized 12 additional seconds. When the fan comes on the system head pressure is reduced and the velocity of the refrigerant traveling thru the system is therefore reduced, which prevents liquid hammer or lines "banging."

① EMERG HEAT, EM HT, or SERVICE notation on some electronic thermostats

The Demand Defrost Controls (DFC) use two thermistor sensors to sense the outdoor ambient temperature (ODT) and the coil temperature (COIL T). The ambient sensor (ODS-B) is located in the outdoor unit below the control box and the coil sensor (CBS) is attached to the outdoor coil on the lowest circuit. The DFC determines the need for defrost by learning the current frosting conditions and storing them in the microcomputer memory. The DFC then compares more recent conditions to those stored in memory and, adjusts the temperature difference, ΔT, to initiate a defrost cycle or time between defrost cycles to fit weather conditions. Thus, defrost on demand or need, rather than by timed cycle.

The DFC is powered by 24V AC system low voltage power and microcomputer memory remains stored as long as low voltage power is applied. Microcomputer memory also retains any timed condition if the indoor thermostat terminates the "Y" call during a timed state to continue timing on the next "Y" call.

The DFC is activated when 24V AC is applied between DFC R & B and test lead is on the "NORM" pin. The DFC Light Emitting Diode (LED) will flash once per second and the DFC microcomputer begins learning ODT and COIL T conditions.

Normal heat pump operation occurs when the microcomputer senses the outdoor ambient is above 52°F, or the outdoor coil is above 36°F (33°F for CNT1695 controls) and a "Y" call from the indoor thermostat is received by the DFC, applying 24V AC between DFC Y & B and to the compressor motor contactor (MS). The DFC LED may flash 1, 2, 3, or 4 times per second.

When the DFC receives a "Y" call from the indoor thermostat, the outdoor fan is turned on, the strip heat is de-activated and the switch-over valve (SOV) is de-energized to the heating mode position. On full-featured controls, the "F" output to the indoor thermostat service light is de-activated.

A defrost cycle is enabled when the DFC microcomputer senses the outdoor ambient is 52°F, or below, the outdoor coil is 36°F (33°F on CNT1695 controls), or below, and the DFC has received a "Y" call for heat for two minutes, min. After the DFC is first powered up, the first defrost will be a timed cycle after a 30 minute compressor run time. Then, excluding faults, defrost cycles will be initiated on delta-T (ΔT) conditions where the dif-ference is between outdoor ambient temperature and outdoor coil temperature or ODT minus COIL T.

At the start of the first 30 minutes of run time when the a defrost cycle is enabled, the DFC senses ODT and COIL T and calculates a current ΔT value. After a predetermined time, the DFC stores the current ΔT value in memory and compares to pre-programmed ΔT values to determine if the current ΔT value is between minimum and maximum pre-programmed values or if the current ΔT value is outside pre-programmed min./max. values. Stored values are then used to calculate an initiate value: ΔT initiate = current ΔT x 2.0 (1.5 for CNT1926 controls) + temperature bin correction factor. Initiate ΔT is not a constant value, but is a value that DFC has calculated and memorized to provide fast, complete defrost cycle for a specified outdoor temperature.

A defrost cycle is initiated when the current ΔT exceeds the ΔT initiate value. During the defrost cycle, the ODT is not sensed but this value is memorized and only the COIL T is sensed to determine defrost termination. After the first defrost, the 30 minute run time requirement is discontinued and the control becomes a defrost on demand control. When a defrost cycle is initiated, the DFC turns off the outdoor fan, energizes the auxiliary heat and energizes the SOV to the cooling mode position.

A defrost termination may occur any time after one minute in a defrost cycle unless a FRC DFT mode was initiated, then there is no minimum. After one minute, the defrost cycle terminates when the microcomputer senses that the COIL T terminate value is exceeded or the maximum override time has passed (see Demand Defrost Quick Specs). Memorized pre-defrost cycle ODT conditions are used to determine COIL T terminate values (see Demand Defrost Quick Specs).

When a defrost cycle terminates, the DFC turns on the outdoor fan, de-energizes the auxiliary heat, and de-energizes the SOV to the heating mode position after a switch-over time delay (see Demand Defrost Quick Specs). If the "Y" call terminates during the defrost cycle, the SOV will stay in cooling mode position until the next "Y" call. If the "Y" call terminates during the switch-over delay period after the defrost cycle terminates, the SOV will be immediately de-energized to the heating mode position.

If icing conditions are present when a defrost cycle is terminated, there will be an interval time before the next defrost cycle is initiated. During this interval time, the DFC microcomputer resumes sensing ΔT conditions and will continually vary the ΔT initiate value slightly for subsequent defrost cycles to learn the best value for optimum defrost cycle and system performance. The interval time between defrost cycles is variable and depends on the prior defrost time, the ODT and the presence of any fault modes (see Demand Defrost Quick Specs).

A Test Mode, to speed up defrost cycle times, may be activated by placing the DFC test jumper on P1 "TST" pin. A time multiplier (see Demand Defrost Quick Specs, Test Mode – Timing Increase Multiplier) is used to speed up the DFC internal timing when the "TST" pin is jumpered and is shown by rapid flashing (time multiplier flashes per second) of the DFC Light Emitting Diode (LED). The test mode remains active as long as the jumper is on the "TST" pin and may be activated during the time interval between defrost cycles or during the defrost cycle and while forced defrost and/or forced fault (not applicable to de-featured controls) modes are activated.

A **Forced Fault** mode (not applicable to de-featured controls), to simulate DFC or system fault condition reporting, may be activated by placing the DFC test jumper on P1 "FRC FLT" pin whenever "Y" call is on. When the "FRC FLT" pin is jumpered, the DFC LED flashes 4 times per second and the "F" output is activated, causing the thermostat service light to flash once per second. See note below, If the forced fault mode is used with the test mode, both the DFC LED and the thermostat service light flash four times per second. The forced fault mode is reset by putting DFC test jumper on the "NORM" pin and jumpering DFC F to R contacts for about five seconds or by setting the thermostat "EMERG HEAT" switch to "EMERG HEAT" for about five seconds and then returning to "NORM".

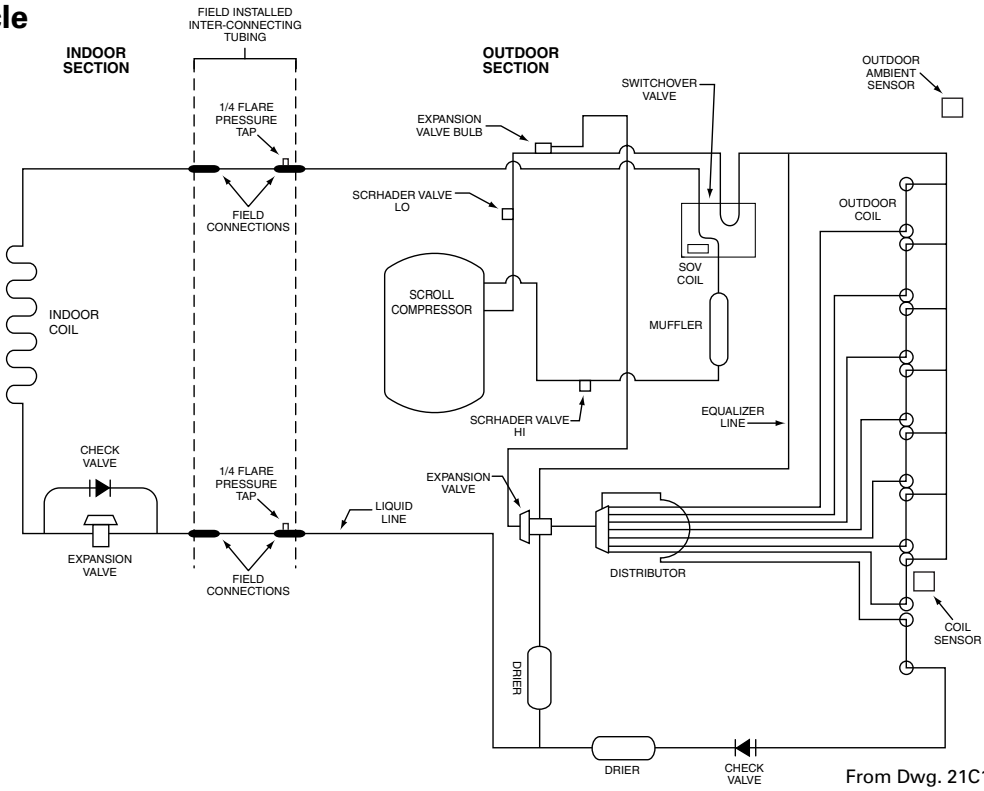
On products with fixed speed outdoor compressors that do not use the DFC service light feature, jumper the "F" wire (RD/WH) to the "R" wire (RD) in the field wiring. On products with four or five ton variable speed outdoor compressors the "F" wire must be connected to the controller. DO NOT install "F" to "R" jumper for this will lock out compressor operation. On products using CNT1695 controls, if the ODT is below -7°F, this control outputs a constant "F" signal to the system controller to lock out a call for the compressor, this lock out signal will stop when the ODT is above +3°F.

A **Forced Defrost** mode, to initiate the defrost cycle when "Y" is on, may be activated by placing the DFC test jumper on P1 "FRC DFT" pin. The DFC will immediately initiate a defrost cycle that may terminate at any time up to the maximum defrost cycle times (see Demand defrost Quick Specs). If the outdoor coil is not iced, it is recommended that the forced defrost mode be used with the test mode to speed up the defrost cycle to prevent tripping the compressor internal overload.

On full featured controls, during FRC FLT or if fault condition is detected, DFC K3 causes "clicking"sound in outdoor unit.

Refrigerant Circuit — Typical High Efficiency

Heating Cycle



From Dwg. 21C152500 Rev. 1

Typical Defrost Cycle

		EXAMPLES		
		#1	#2	#3
Clean Coil				
DFC calculates defrost initiate ΔT based on defrosted coil condition.	ODT	25	40	44
	COIL T	18	32	35
	ΔT	7	8	9
After Running				
ΔT is increasing, indicating greater coil icing condition.	ODT	25	40	44
	COIL T	15	30	32
	ΔT	10	10	12
Prior To Defrost				
ΔT has increased to point of defrost cycle initiation.	ODT	25	40	44
	COIL T	12	26	22
	ΔT	13	14	22
After Defrost Termination				
After termination, ΔT has improved to permit optimum performance.	ODT	25	40	44
	COIL T	18	32	35
	ΔT	7	8	9

When the heat pump system operates outside the DFC microcomputer pre-programmed time or temperature limits, a fault condition is detected. During normal operation, the DFC LED will flash once per second. When a fault condition is detected, the DFC LED flash rate indicates the type of fault detected. When the maximum time period or the maximum number of times a fault condition is detected are exceeded (see Demand Defrost Quick Specs), the fault condition will cause the DFC to become a timer defrost control by initiating a defrost cycle every 30 minutes. When this occurs, the DFC "F" circuit is activated, on full featured defrost controls.

On installations using full-featured controls, the indoor thermostat "EMERG. HEAT" or "SERVICE" light is connected to the DFC "F" circuit. Faults A, B, C, A and B or A and C are indicated by the DFC LED when detected. Faults A, C, A and B or A and C are reported to the thermostat when the "F" circuit is activated, causing the thermostat service light to flash once per second. Faults can be reset by jumpering DFC F-R contacts for five seconds or setting the thermostat "EMERG HEAT" switch to "EMERG HEAT" for five seconds and then returning to "NORM". Faults will be reset by removing 24V AC from DFC R-B for more than 30 seconds.

On installations using de-featured controls, Faults A, B, C, A and B or A and C are indicated by the DFC LED when detected and the faults are not reported to the thermostat. Instead, the de-featured control will activate the "F" circuit (no output) and reset the fault itself. If the fault is detected again, the same process is repeated. Faults will be reset by removing 24V AC from DFC R-B for more than 30 seconds.

When fault(s) are detected, DFC LED flash rate indicates:

FAULT A – Two quick flashes per second, indicates very low delta-T or low heat pump capacity, possibly caused by an inoperative compressor, loss of charge, shorted coil sensor or open ambient sensor. When a Fault A condition is detected after a time period (see Demand Defrost Quick Specs) following a defrost cycle, the DFC will initiate another defrost cycle after 20 minutes of accrued run time. After 30 minutes in a continuous Fault A condition, the DFC LED will begin flashing two times per second. After an additional 90 minutes in a continuous Fault A condition, the "F" circuit will be activated.

Fault A will be reset when two defrost cycles have occurred with normal delta-T conditions.

FAULT B – Three quick flashes per second, indicates a defrost cycle terminated on maximum override time instead of temperature. When a Fault B condition is detected, the DFC LED will begin flashing three times per second. The DFC will become a timer defrost control by initiating a defrost cycle every 30 minutes after 10 consecutive defrost terminations have occurred on maximum override time. Fault B condition will not be reported to the thermostat on full-featured controls.

Fault B will be reset if the system reaches the coil temperature terminate value during any defrost cycle.

FAULT C – Three quick flashes per second, indicating very high delta-T, possibly caused by the SOV being stuck in heating mode or inoperative solenoid, outdoor fan failure or remaining turned on during defrost cycle, slight undercharge, open coil sensor, shorted ambient sensor, or faulty expansion valve. When a Fault C condition is detected after a time period (see Demand Defrost Quick Specs) following a defrost cycle, the DFC will immediately initiate another defrost cycle and begin flashing the DFC LED three times per second. When the DFC has initiated 15 more consecutive defrost cycles resulting in a Fault C condition, the "F" circuit will be activated.

Fault C will be reset if the system reaches the delta-T terminate value during any one of 16 successive defrost cycles.

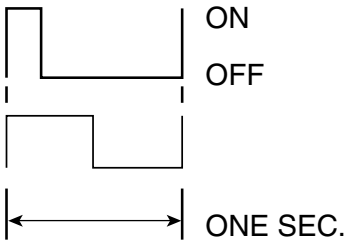
FAULTS A and B or A and C – Four quick flashes per second, indicate 60 or more Fault A's and one or more Fault B's, or 60 or more Fault A's and one or more Fault C's have occurred during defrost cycles. When combination faults have accrued, the DFC LED flashes four times per second and the "F" circuit will be activated. Combination faults will also be reset if any of the faults have reset on their own and one defrost cycle has terminated with normal delta-T conditions.

When service is required, a check of the flash rate of the LED on the defrost control circuit board offers an indication of what the problem might be. Possible causes identified by an asterisk (*) may be due to a faulty defrost control circuit board. Some possibilities and procedures are indicated in the following chart:

LED Status

Off completely

1. Make certain test jumper wire on circuit board is connected to "NORM" pin
2. Check power to circuit board- 24 V.A.C. between B-R and B-Y with system running



1 Flash/sec Indicates normal operation, Compressor not being called

1 Flash/sec Indicates normal operation, Compressor being called

2 Flashes/sec Low ΔT
FAULT A Inoperative compressor
Complete loss of charge
Open ODS-B (outdoor ambient sensor) – See Sensor Check
Shorted coil sensor – See Sensor Check
(Defrost not permitted)

3 Flashes/sec 10 defrosts terminated
FAULT B on time override

3 Flashes/sec High ΔT
FAULT C *SOV stuck in heating position
Shorted ODS-B sensor – See Sensor Check
Open coil sensor – See Sensor Check
OD TXV starving
*OD fan motor failure
*OD fan on during defrost
Slight undercharge

4 Flashes/sec Indicates that within a given length
FAULT A and C of time, both faults existed
or FAULT A and B

LED flashes but control fails to initiate defrost with forced defrost

1. Make sure thermostat and system are operating in the heat mode
2. Make sure jumper wire is on FRC DFT pin
3. Verify 24V between R & B
4. Verify 24V between Y & B, with unit running
5. Verify correct sensor locations and mounting
6. Verify ambient sensor is connected to "AMBIENT" position on board
7. Verify coil sensor is connected to "COIL" position on board

SYMPTOMS	CHECKS	YES/NO	ACTIONS
1. LED off.	1. 24V R-B & Y-B at board, with unit running?	N	Repair low voltage wiring.
		Y	Complete Check #2.
	2. Move test wire to FRC DFT & FRC FLT. Does control respond accordingly?	N	Replace Defrost Control.
		Y	LED is bad but control will still function.
2. LED flashing very rapidly.	Test wire on TST pin?	Y	Move test wire to NORM pin.
		N	If test wire is on NORM pin, replace Defrost Control.
3. Control does not initiate a normal defrost.	ODT below 52°F & COIL T below 36°F?① Is ΔT increasing?		
	1. LED flashing?	N	Refer to Symptom #1.
		Y	Complete Check #2.
	2. Check for 24V Y-B at board, with unit running.	N	Repair low voltage wiring.
		Y	Complete Check #3.
	3. Check sensors for correct mounting and resistance.		Replace or remount sensor if necessary.
4. Control does not initiate a forced defrost.	24V R-B & Y-B at board, with unit running?	N	Repair low voltage wiring.
		Y	Replace Defrost Control.
5. Defrost initiates on FRC DFT but terminates in less than 10 sec.			Replace Defrost Control.
6. Defrost initiates on FRC DFT but terminates on time. (LED flashing 3 times per sec.?)	1. Coil sensor open or reading very high resistance?	Y	Replace coil sensor.
		N	Does Check #2 checkout?
	2. Does OD fan cycle off in defrost?	N	Replace Defrost Control.
		Y	See Check #3
	3. Is windy weather preventing normal termination?	Y	Cover coil covers with rolled newspaper or plastic sheeting.
		N	Replace Defrost Control.
7. Defrost initiates on about 15/30 minute intervals. (LED flashing 3 times per sec.?)	Be sure OD coil is clean		
	1. Coil sensor open or reading very high resistance?	N	Complete Check #2.
		Y	Replace coil sensor.
	2. ODT sensor shorted or reading lower than normal resistance?	N	Complete Check #3.
		Y	Replace ambient sensor.
	3. OD fan off in defrost?	N	Replace Defrost Control.
		Y	Perform Unit Service Procedure.
8. Defrost initiates on about 15/30 minute intervals. (LED flashing 2 times per sec.?)	1. Test wire on NORM pin?	N	Move test wire to NORM pin.
		Y	Complete Check #2.
	2. Do both sensors check OK?	N	Replace defective sensor, clear coil and reset EMERG HEAT light.
		Y	Complete Check #3.
	3. Verify correct system charge		Adjust as needed.
	4. Does FRC DFT terminate in less than 15 minutes?	N	Replace Defrost Control.
	5. OD fan off in defrost?	N	Replace Defrost Control.
	6. Verify proper SOV operation		Replace if necessary.
9. OD fan runs during defrost.			Replace Defrost Control.
10. No SOV delay on defrost termination.	Is R34 removed from board?	Y	
		N	Replace Defrost Control.
11. EMERG HEAT light on constantly②	1. EMERG HEAT switch in NORM position?	Y	Complete Check #2.
		N	Move switch to NORM position.
	2. Disconnect RD/WH wire in LV box of OD unit. Does EMERG HEAT light go off?	Y	Replace Defrost Control.
		N	Repair field wiring.

① 33°F for CNT1695 controls

② Condition is normal for CNT1695 controls if OD temp is less than –7°F

Resistance Checks

Measure the temperature the sensor is exposed to. If the sensor is mounted on a tube, place the lead on an Annie 8 (or equivalent) temperature tester on the same tube near the sensor and insulate the bulb.

Unplug the sensor and measure the resistance with a good quality Ohmmeter. Read the value as quickly as possible to prevent the meter current from changing the resistance reading.

Using the chart below, locate, as closely as possible, the actual sensor temperature. The measured sensor resistance should be relatively close to the resistance value shown.

Example: Sensor temperature is 20°F and the measured resistance is 45.28K ohms. This sensor is good since measured value is relatively close to the chart value of 45.08K ohms.

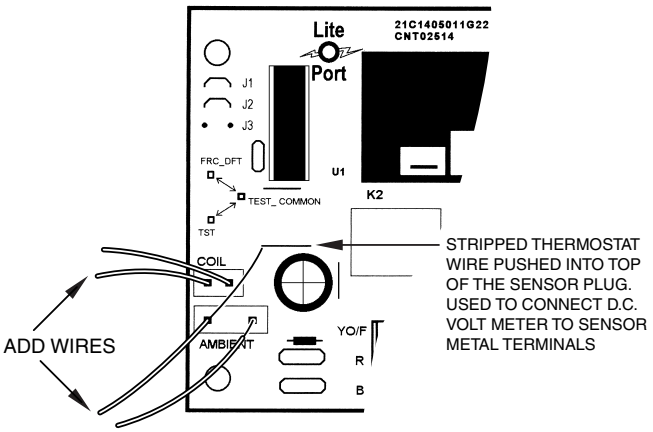
Defrost Board Sensor Table

Temperature Relation to Resistance and D.C. Voltage

Temperature Fahrenheit	Resistance	DC Voltage ±15%
85	8.04K	0.83 VDC
80	9.10K	0.92 VDC
75	10.24K	1.01 VDC
70	11.59K	1.12 VDC
65	13.14K	1.24 VDC
60	14.93K	1.36 VDC
55	17.00K	1.50 VDC
50	19.41K	1.64 VDC
45	22.20K	1.80 VDC
40	25.45K	1.96 VDC
35	29.25K	2.13 VDC
30	33.70K	2.32 VDC
25	38.93K	2.51 VDC
20	45.08K	2.70 VDC
15	52.34K	2.90 VDC
10	60.93K	3.09 VDC
5	71.12K	3.29 VDC
0	83.27K	3.48 VDC

Voltage Checks

Measure the voltage at the coil and ambient sensor plugs with the plugs connected to the defrost control. Note 24 volts A.C. must be present at the defrost control harness plug terminals R and B. Suggest using short pieces of stripped thermostat wire to perform this test. Push stripped thermostat wire into the top of the sensor plugs so they make contact with the sensor plug metal terminals.



Connect a D.C. Volt meter to the stripped wires and read the voltage. Determine the sensor's temperature and compare the voltage taken to the Defrost Board Sensor Table. If they are within plus or minus 15 percent, the sensor is OK. If the readings are out of range or no voltage reading, proceed as follows:

If zero (0) Volts D.C., go to #1.

If five (5) Volts D.C., go to #3.

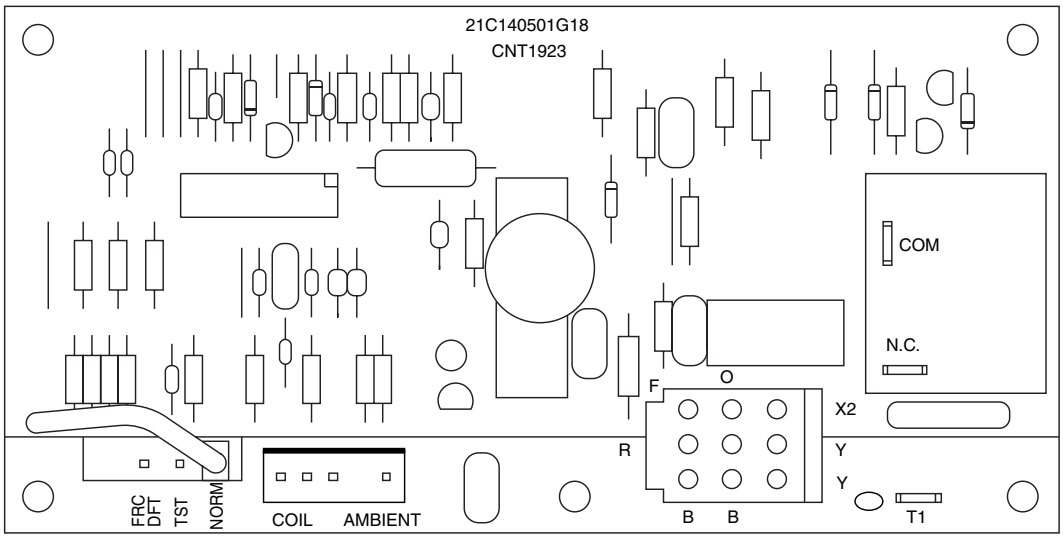
1. Check for 24 volts A.C. at the defrost control harness plug terminals R and B repair if needed; if o.k., go to #2.

2. Remove sensor plug and check for 5 to 6 volts D.C. at the defrost control sensor pins. If no voltage is read, replace the defrost control; if 5 to 6 volts D.C. is read at the defrost control, the sensor may be shorted (0 OHMS) or the sensor metal terminals may need cleaning or are deformed. Go to #3.

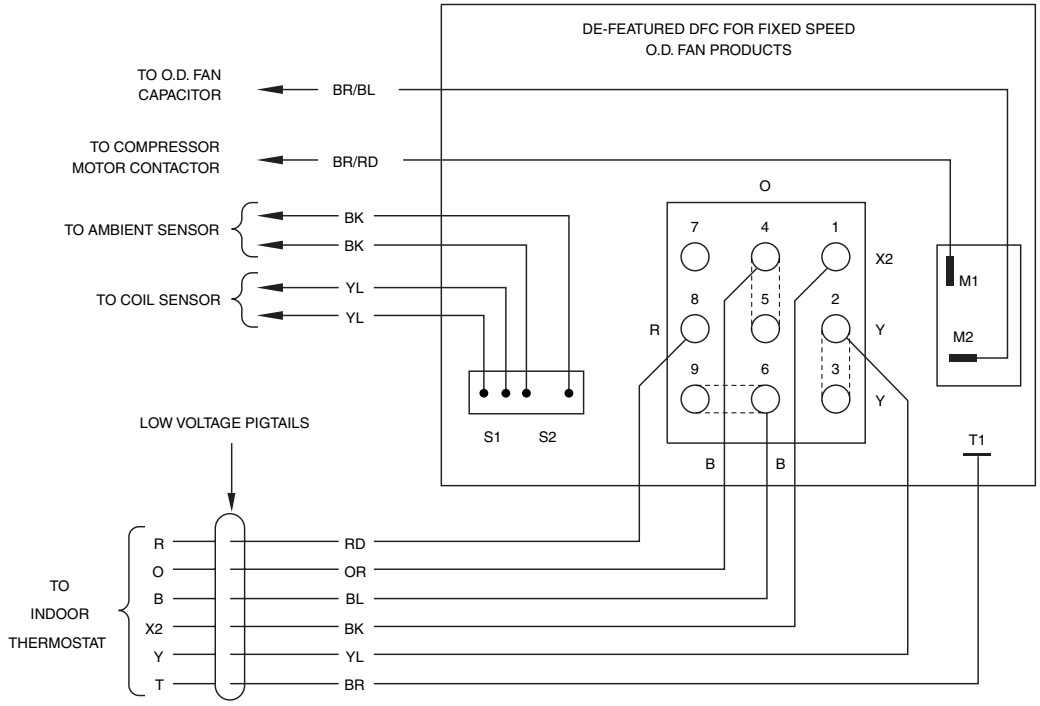
3. Check the resistance and temperature of the sensor and compare it to the Defrost Board Sensor Table. If shorted (0 OHMS), replace; if resistance is within five percent of table, go to #4.

4. Replace sensor or repair sensor connector terminals by removing the metal sensor terminals from the sensor plug housing and clean or reshape the metal connectors. After servicing the sensor terminals, reassemble them in the plug housing and recheck voltage at the sensor plug metal terminals. If now o.k., force a defrost cycle and check for proper operation.

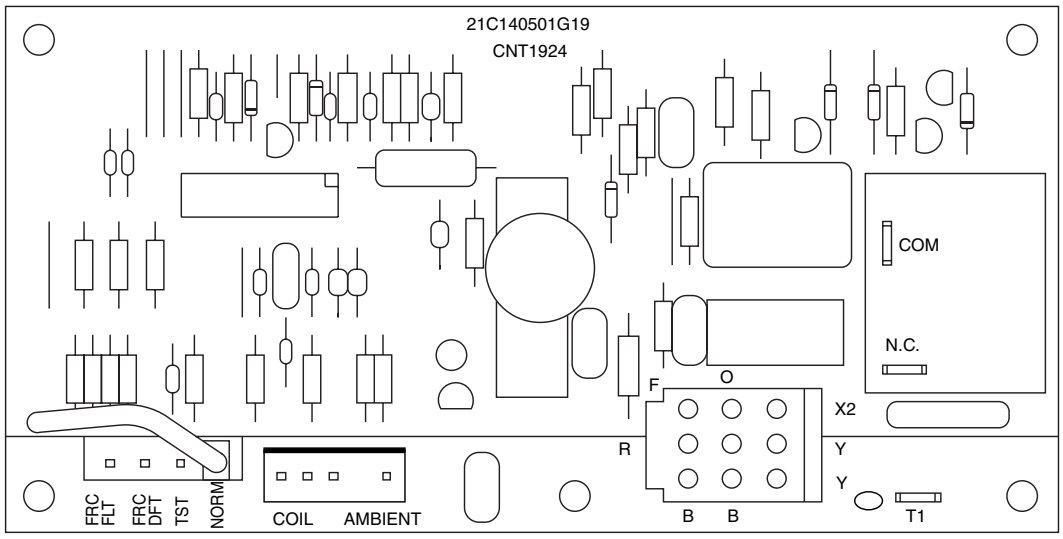
CNT1923 or CNT1926 De-Featured Control



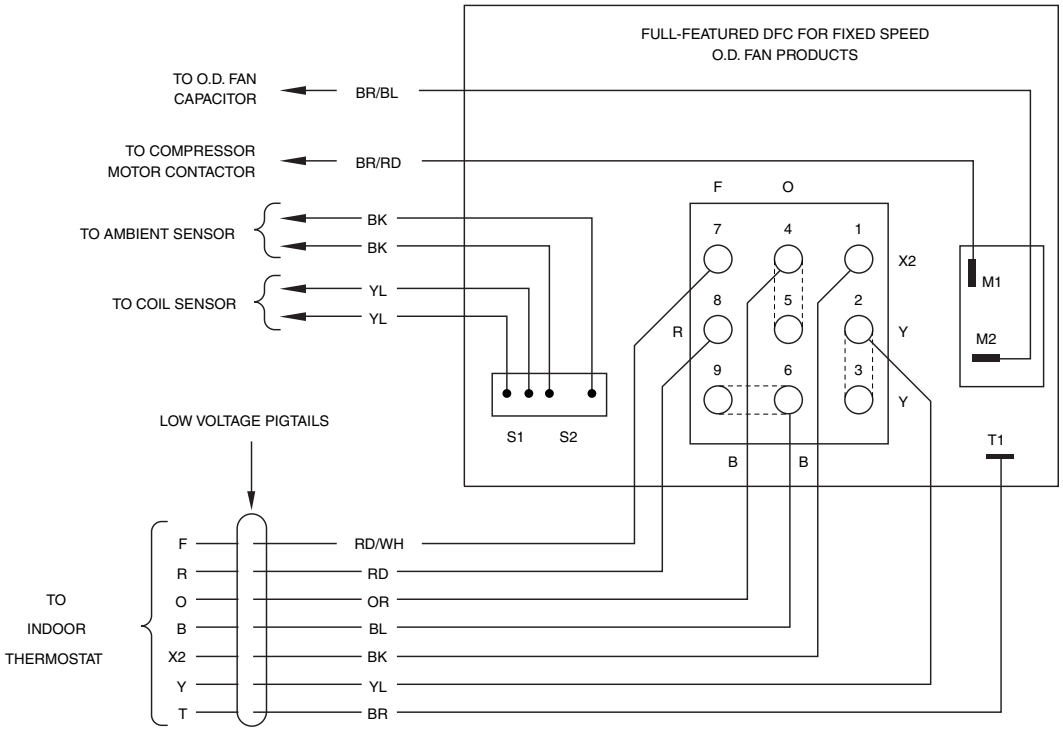
Connection Diagram



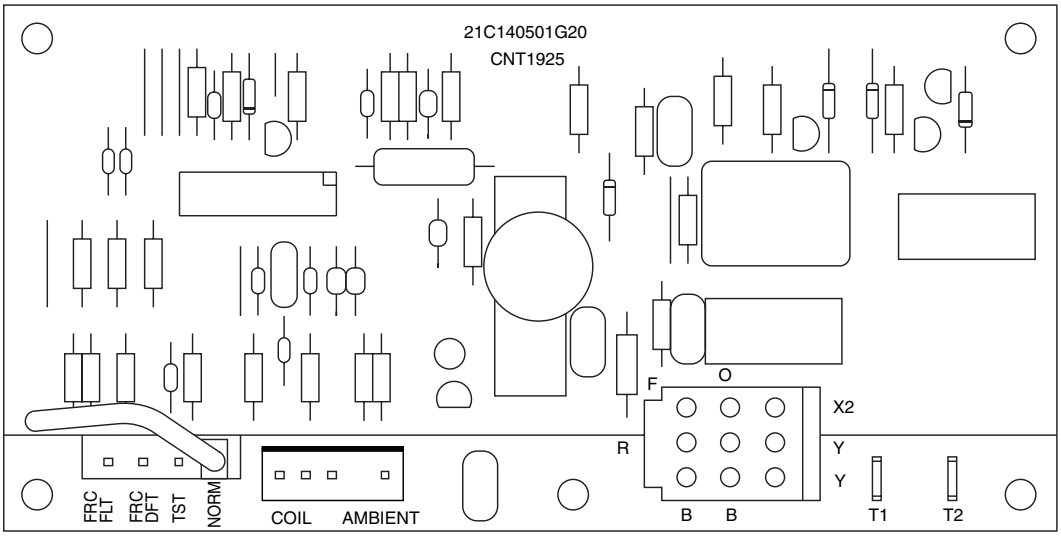
CNT1924 Full-Featured Control for Fixed Speed O.D. Fan Installations



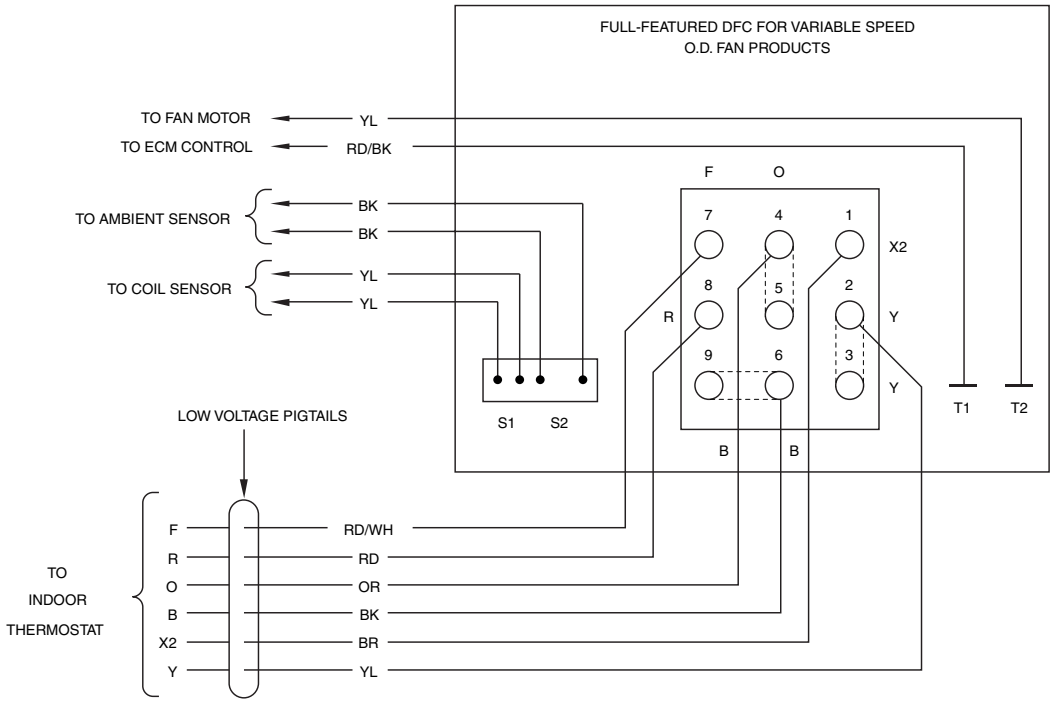
Connection Diagram



CNT1925 or CNT1695 Full-Featured Control for Variable Speed O.D. Fan Installations



Connection Diagram



Used With Reciprocating and Scroll Compressor Units

During the last quarter of 1998, there were eight new defrost controls released for the heat pump lines produced in both Tyler and Fort Smith. These controls were grouped into the traditional full-featured and de-featured controls but also included single-speed and two-speed models. Controls for units using Permanent Split Capacitor (PSC) fan motors and Electronically Comutated (ECM) fan motors were released. Finally, the differentiated defrost controls for the units using Reciprocating and Scroll compressors were included.

While the release seems large, the position of mounting holes in the new controls is the same as the existing control mounting. This allows flexibility in replacement. **DO NOT ASSUME THAT A CONTROL IS A SUITABLE REPLACEMENT WITHOUT CHECKING CURRENT SERVICE LITERATURE!** There will be replacement supersedures shown in the literature, as they are approved by engineering.

As you review the following pages, be sure to note the titles of the defrost controls shown. In the title, you will see the application for which they are intended. Note the size of the board and compare them to the original boards earlier in this publication. For the most part, they will be more compact. Note the wiring diagrams shown as they will guide you in wiring diagnosis.

The control cycle of the new controls is the same as the existing controls. Timing and temperatures may be changed so refer to the chart page showing the specifications. Only one pair of controls has a different pattern and deserves special attention.

As we mentioned, two new defrost controls have been introduced to control heat pumps fitted with the Scroll compressor. These controls have all the features of past controls with one exception. The fault indicator signal displayed on the indoor control thermostat is not used. Therefore, these defrost controls are programmed as de-featured controls.

The CNT02920 is the standard control for Scroll compressor units using the PSC fan motor. The CNT02921 control is for use on Scroll compressor units having an ECM Variable Speed outdoor fan motor.

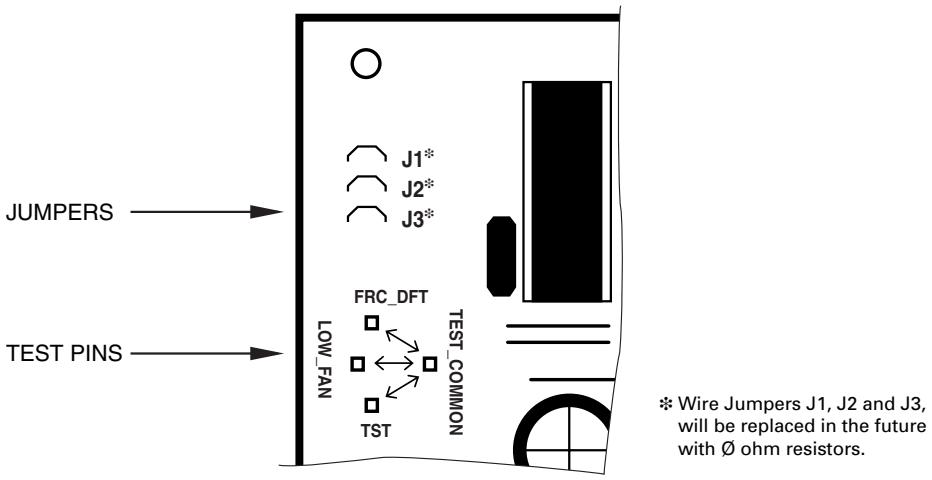
These defrost controls add one control action, which will be seen as the control starts the defrost cycle or an interruption in the "Y" signal from the indoor thermostat occurs. The control will stop the compressor for a minimum of thirty (30) seconds. It will then re-start the compressor to complete the cycle. When in defrost, the reversing valve will switch in the normal way, due to the pressure difference remaining in the refrigeration system.

On both controls, the MS contactor power is taken from the "YO" plug terminal. This is a change from the wiring on previous controls. This terminal will ensure that the thirty second delay in compressor operation is present, even if the "Y" signal from the thermostat is removed and re-connected during a defrost cycle, heating cycle or in a **normal cooling cycle**. This delay will occur after any interruption in the "Y" signal.

The use of the red jumper to the test (TST) pin to speed up the time required to enter and complete a defrost cycle for test purposes will also by-pass the thirty second delay at the start of the test cycle.

Lite Port™

The LED on controls designated with the **Lite Port**™ symbol has a special feature. These defrost controls will be programmed to flash their LEDs with the standard fault codes plus additional information which can be obtained with an appropriate optical coupler to transfer this data from the defrost control to a computer. The computer must have the defrost control monitor program installed to be able to display and log this information. More information on this feature will be available in future product data sheets.



Jumpers

The Soft Switch Over may be stopped by cutting Jumper #J-1 on the new designed defrost controls (DFC) which have a J-1 jumper. This normally is not done unless the heat pump is installed in an area where the outdoor temperature remains below 10°F for long periods of time.

Jumper #J-2 is used to set up the DFC for a Spine Fin Coil or Plate Fin Coil.

Jumper #J-3 is used to set up the DFC for use with a Reciprocating or Scroll compressor.

Test Pin Identification

Test Pin_Common, placing a jumper between this Test Pin to any other Test Pin will cause the defrost control to perform the function listed of the other test pin.

Test Pin_TST, jumpered to PinTest_Common speeds up all defrost control timing.

Test Pin FRC_DFT, jumpered to the Pin Test_Common for two seconds or more will initiate a forced defrost cycle. Remove the jumper after the defrost cycle is initiated to prevent the compressor from cycling on it's overload.

Test Pin Low_Fan

The defrost control series #21C151619G01, G02, G03 and G04 use their outdoor ambient temperature sensor input to the defrost control during the heating and cooling cycle. The defrost control will switch the outdoor fan motor to the correct speed in the heating or cooling cycle.

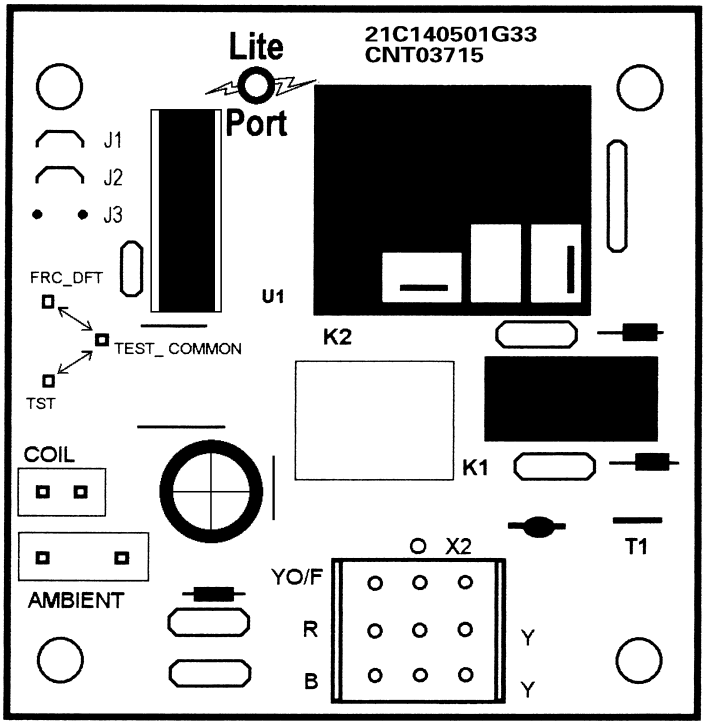
In the cooling cycle, the outdoor fan should be running at high-speed above 78°F outdoor temperature +/–5°F and go to low speed at 74°F +/–5°F. In the heating cycle, the outdoor fan will be operated at high speed.

On units with two-speed PSC outdoor fan motors there will be two large switching relays which will be used to energize the motor at low or high-speed. On units that have two-speed ECM™ outdoor fan motors, the defrost control will change the Pulse Width Modulation (P.W.M.) voltage. Low-speed P.W.M. Voltage will be 10 volts D.C.and High-speed the P.W.M. Voltage will be 17 volts D.C.These P.W.M. voltages were read with a digital volt meter and, depending on your meter type, these voltages may vary.

These boards also have a fan motor speed test pin terminal labeled LOW_FAN. To test to see it the outdoor fan will change speed correctly, use a jumper connected between this LOW_FAN test pin and the TEST_COMMON test pin.

If the fan motor is running at high speed, it should go to the low speed. If the outdoor fan motor does not go to low speed, replace the defrost control. If the outdoor fan is running at low speed and the jumper is connected as above, the outdoor fan motor should remain in low-speed operation. After 15 seconds, remove the jumper and the outdoor fan should go to high-speed operation for at least 4 seconds and then drop back to low speed unless the outdoor ambient temperature has changed. If the outdoor fan does not go to high-speed operation for this short period of time, replace the defrost control.

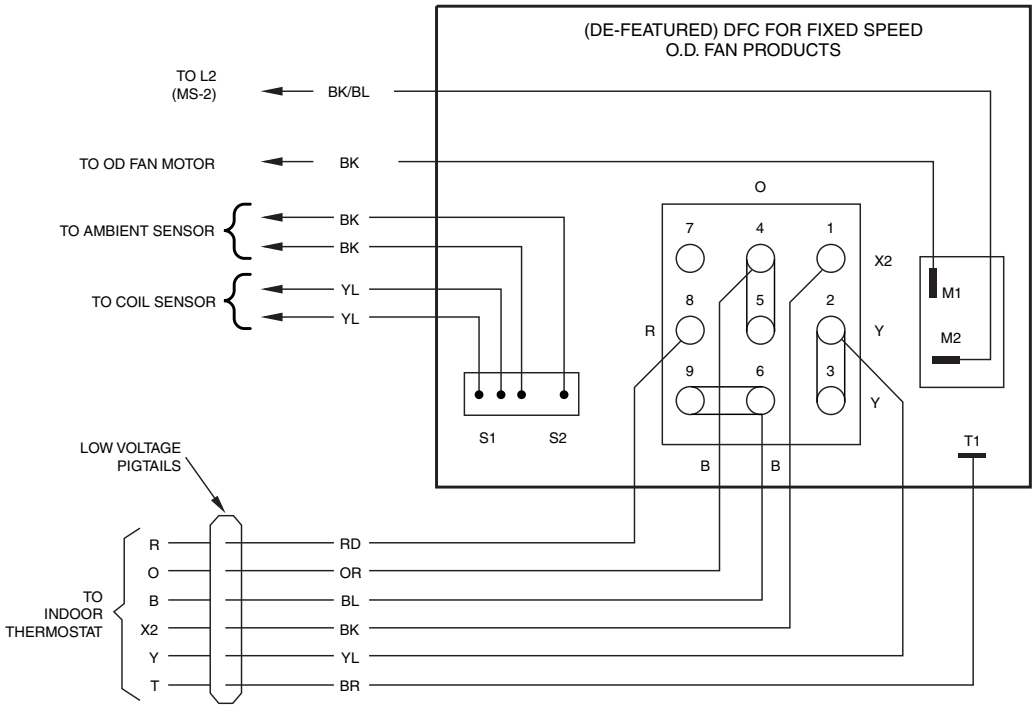
CNT03715 De-Featured Control – Reciprocating 1-Speed PSC O.D. Fan Motor



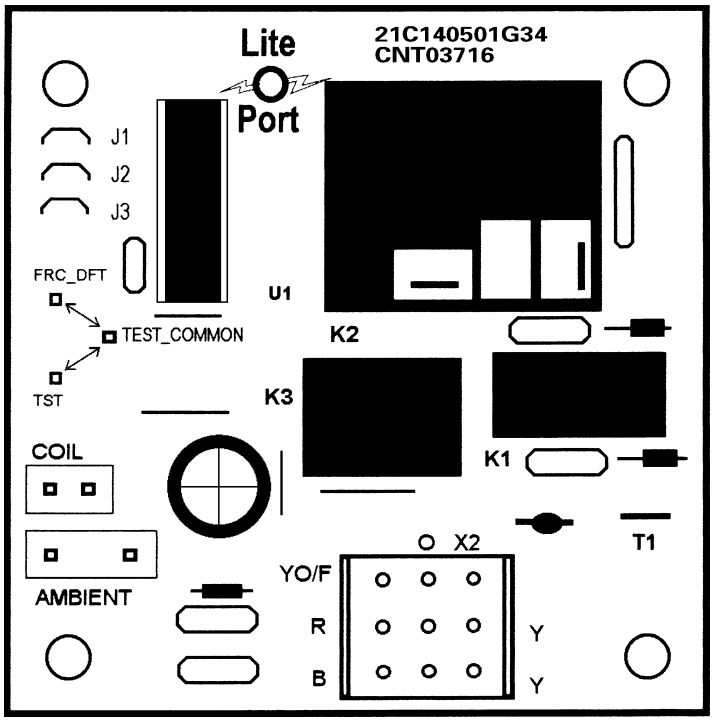
The change to the controls is in the software of the programming. The new controls will sense the result of the first defrost after powering up. If a high difference in coil temperature and the outdoor temperature (High ΔT) occurs, the control will allow the fan to operate for six (6) minutes in the next defrost cycle. This will lengthen the defrost cycle and ensure a heavily frosted coil will more completely achieve defrost. For technicians familiar with the previous controls, this operation of the fan in defrost will seem to be a fault. This is the proper operation.

Any defrosts after the first defrost, will return to normal operation, fan cycles off as defrost initiates.

Connection Diagram



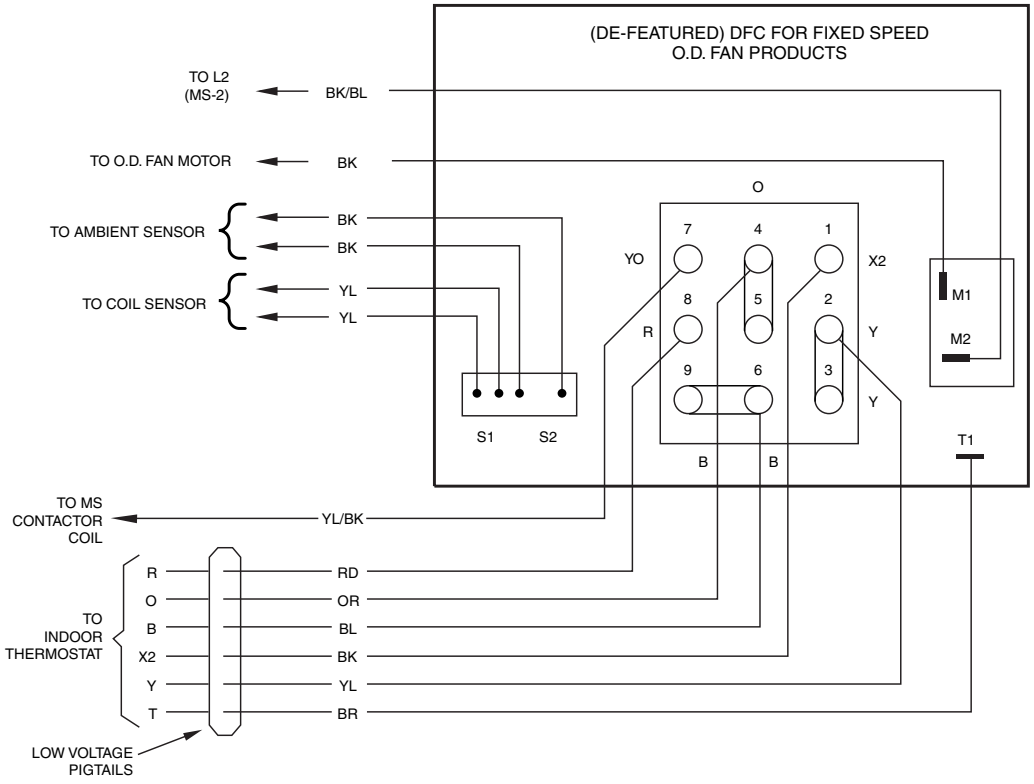
CNT03716 De-Featured Control – Scroll 1-Speed PSC O.D. Fan Motor



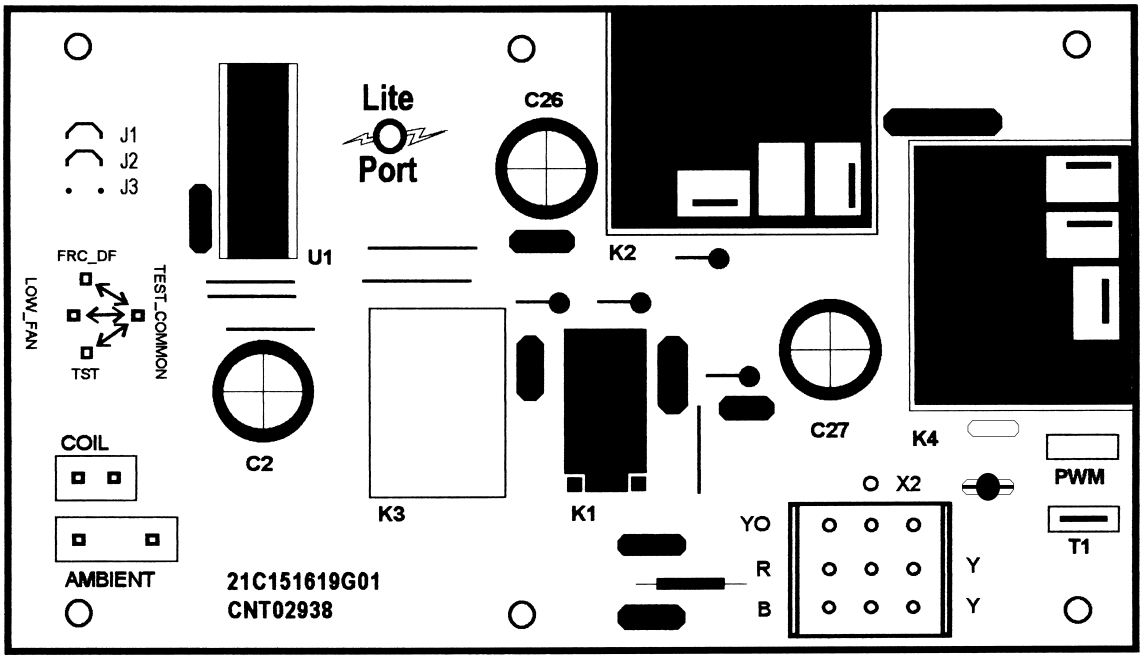
The change to the controls is in the software of the programming. The new controls will sense the result of the first defrost after powering up. If a high difference in coil temperature and the outdoor temperature (High ΔT) occurs, the control will allow the fan to operate for six (6) minutes in the next defrost cycle. This will lengthen the defrost cycle and ensure a heavily frosted coil will more completely achieve defrost. For technicians familiar with the previous controls, this operation of the fan in defrost will seem to be a fault. This is the proper operation.

Any defrosts after the first defrost, will return to normal operation, fan cycles off as defrost initiates.

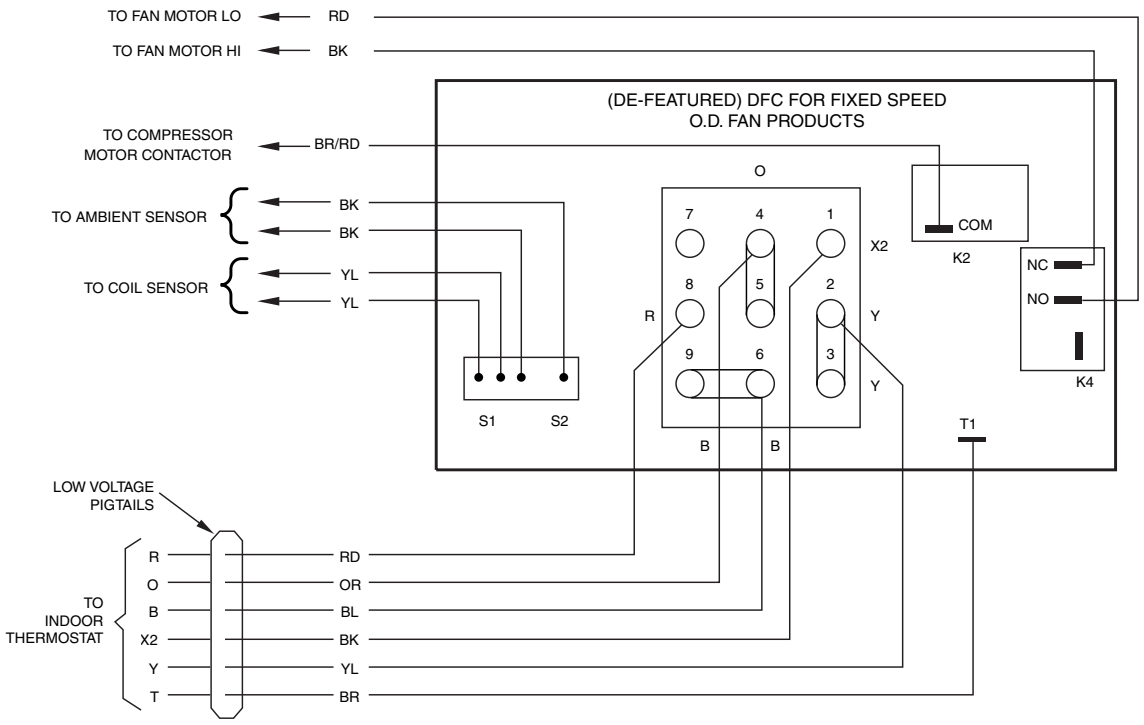
Connection Diagram



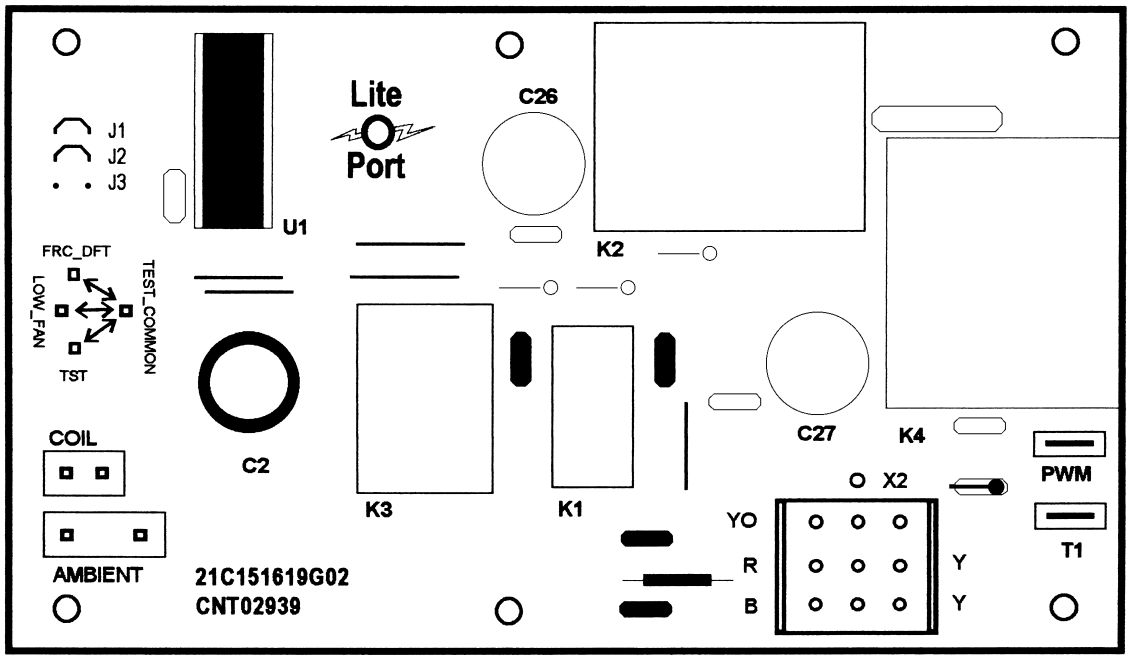
CNT02938 De-Featured Control – Reciprocating 2-Speed PSC O.D. Fan Motor



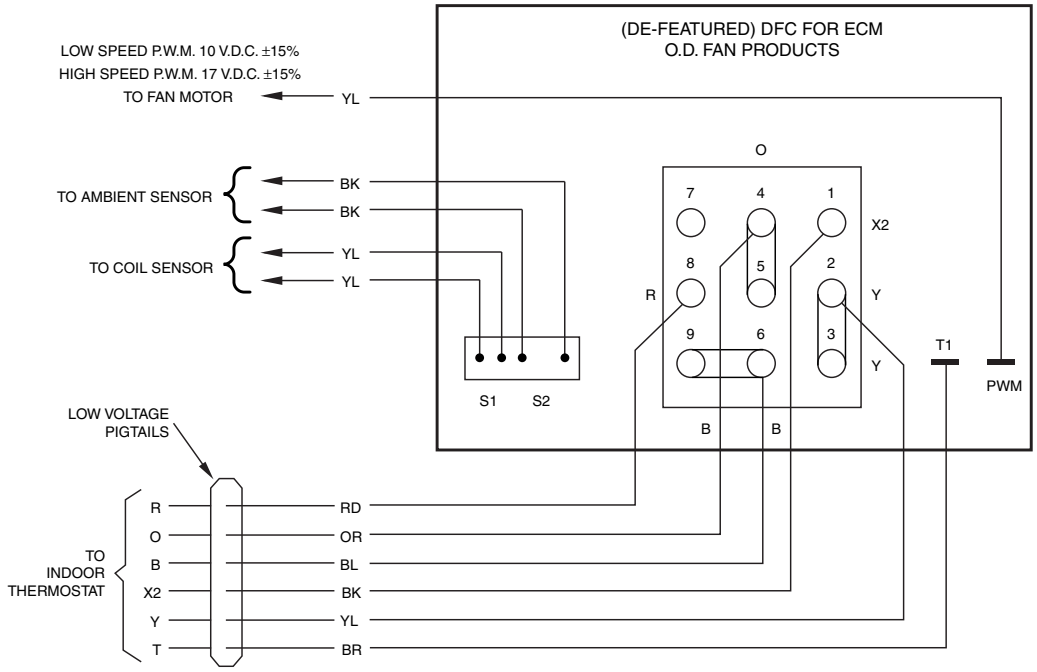
Connection Diagram



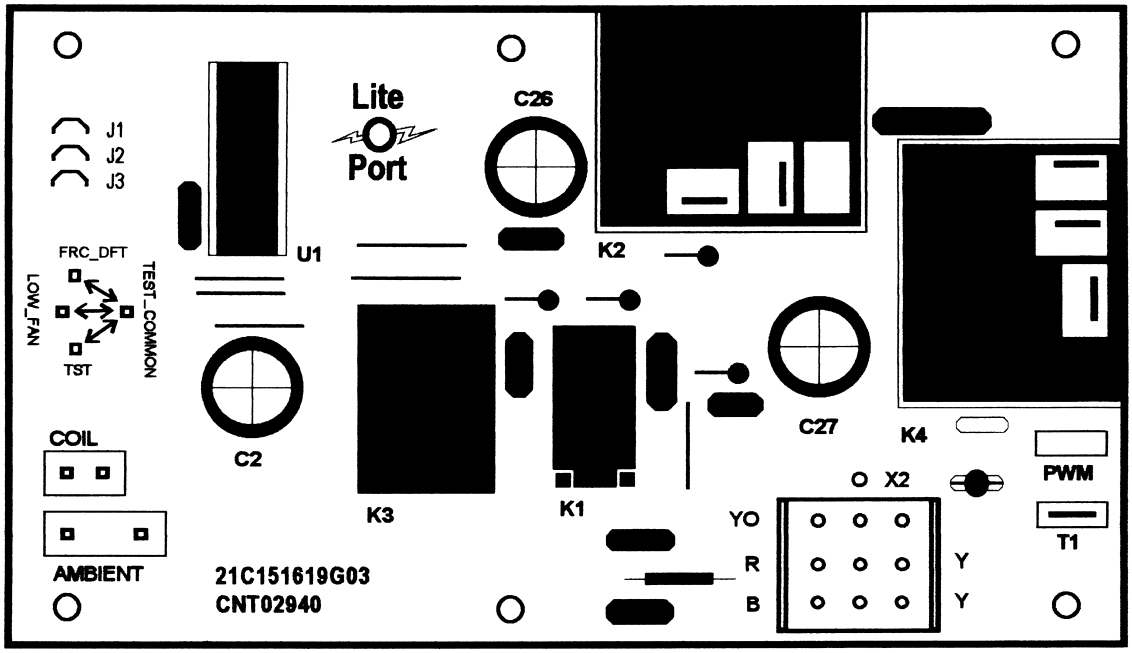
CNT02939 De-Featured Control – Reciprocating ECM O.D. Fan Motor



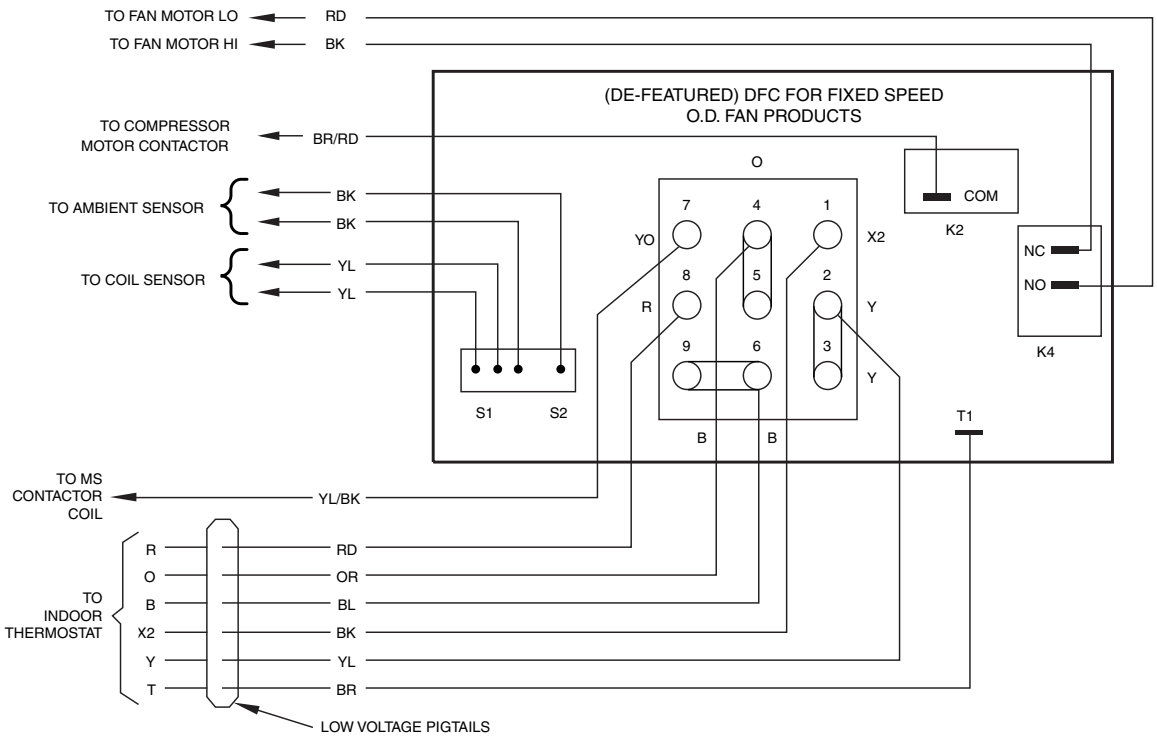
Connection Diagram



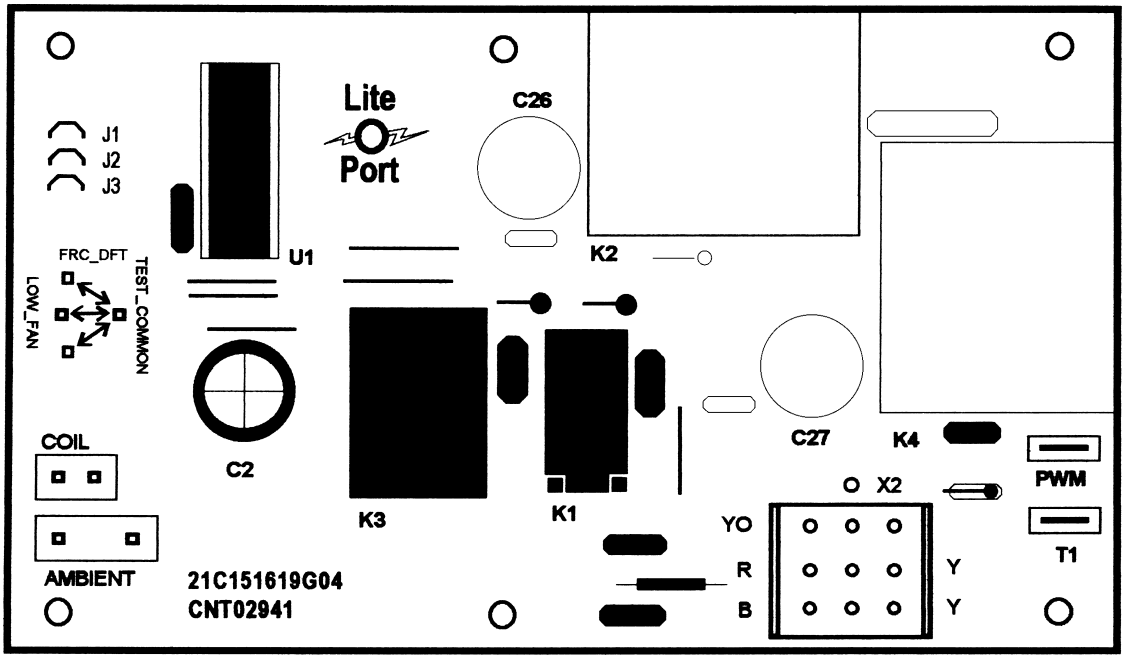
CNT02940 De-Featured Control – Scroll 2-Speed PSC O.D. Fan Motor



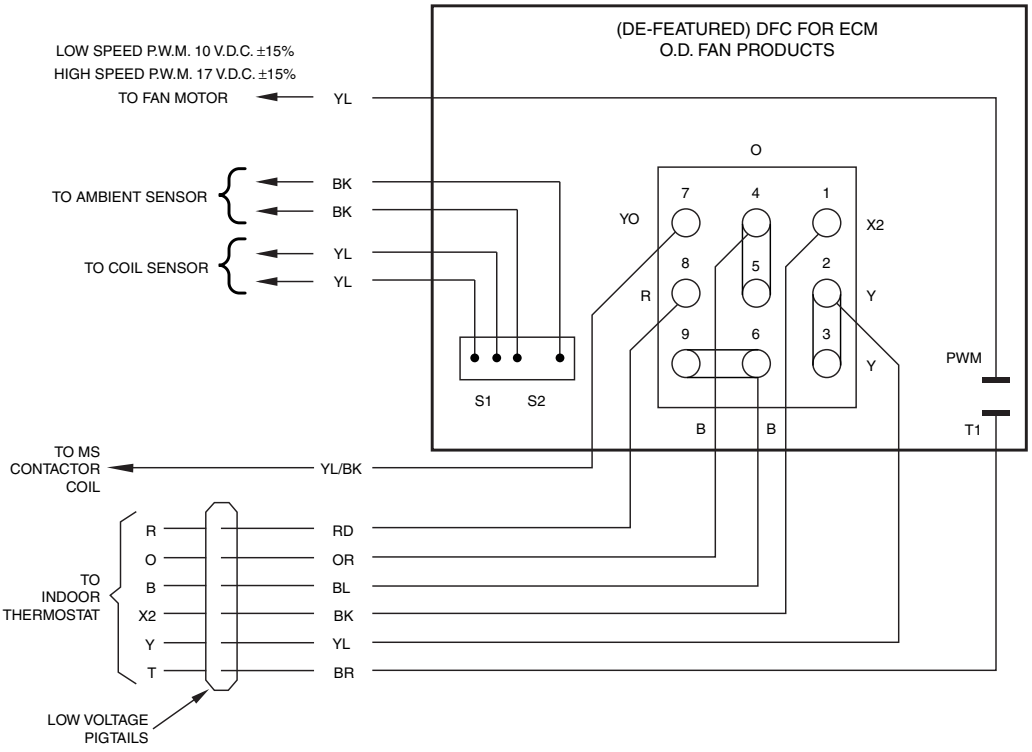
Connection Diagram



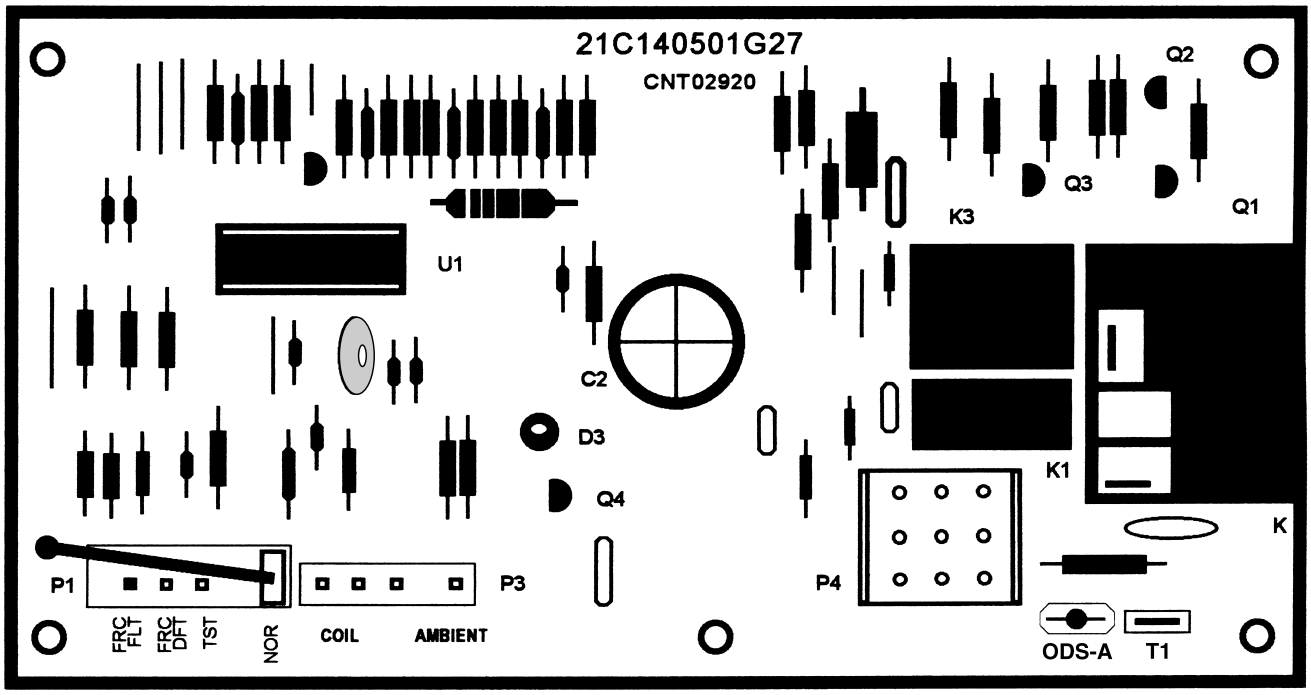
CNT02941 De-Featured Control – Scroll ECM O.D. Fan Motor



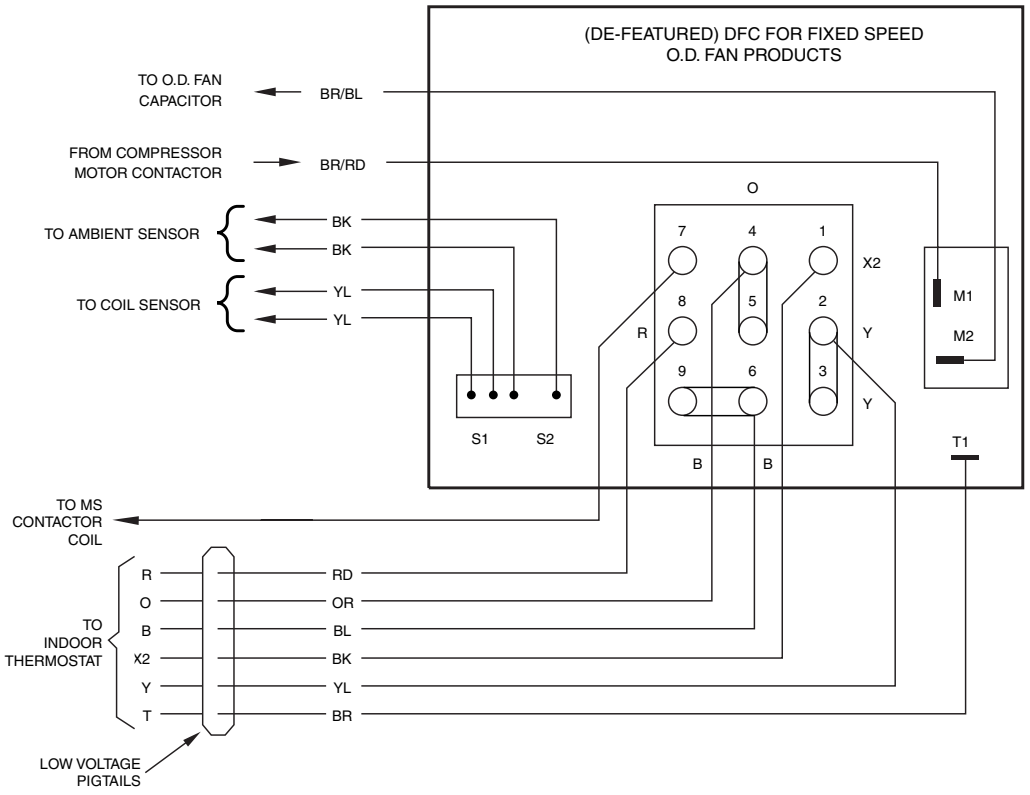
Connection Diagram



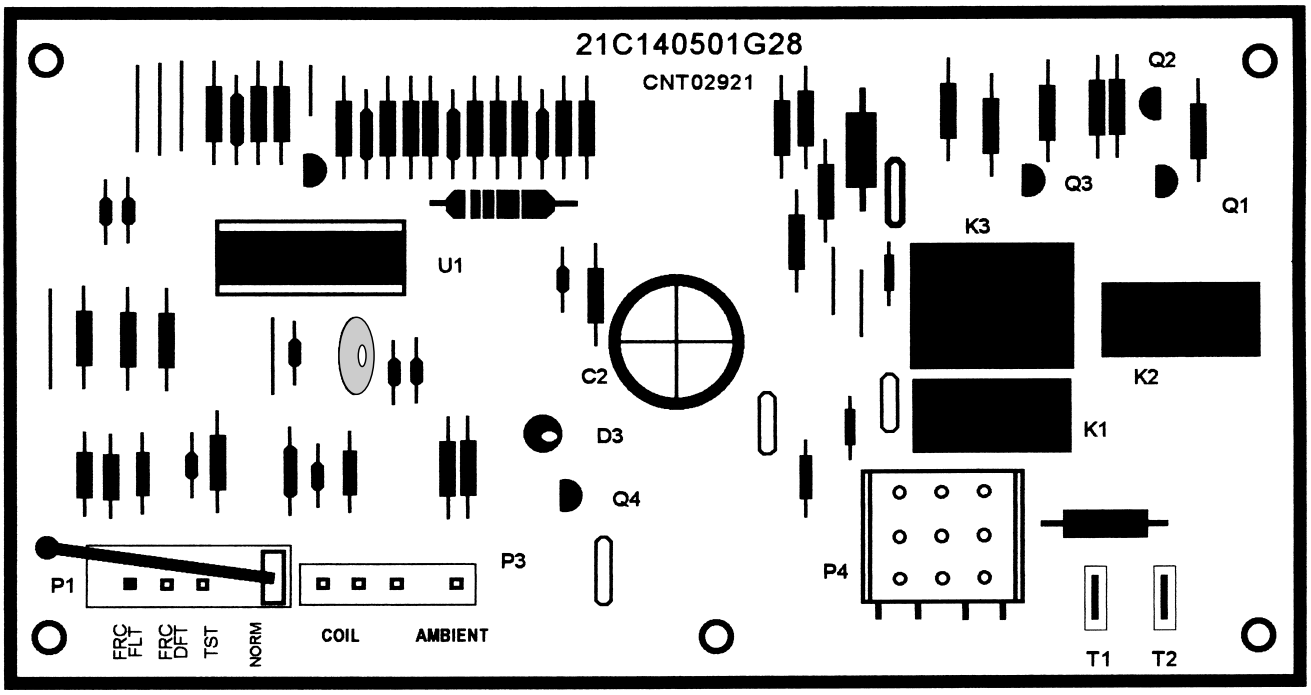
CNT02920 De-Featured Control – Scroll 1 and 2-Speed PSC O.D. Fan Motor



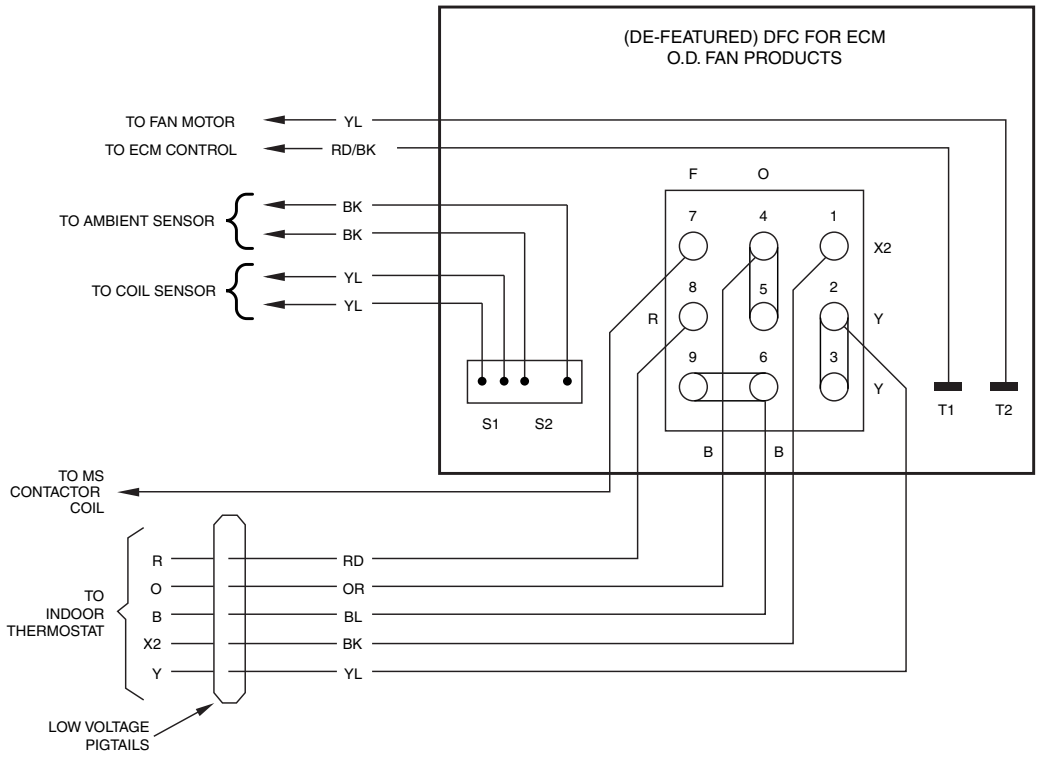
Connection Diagram



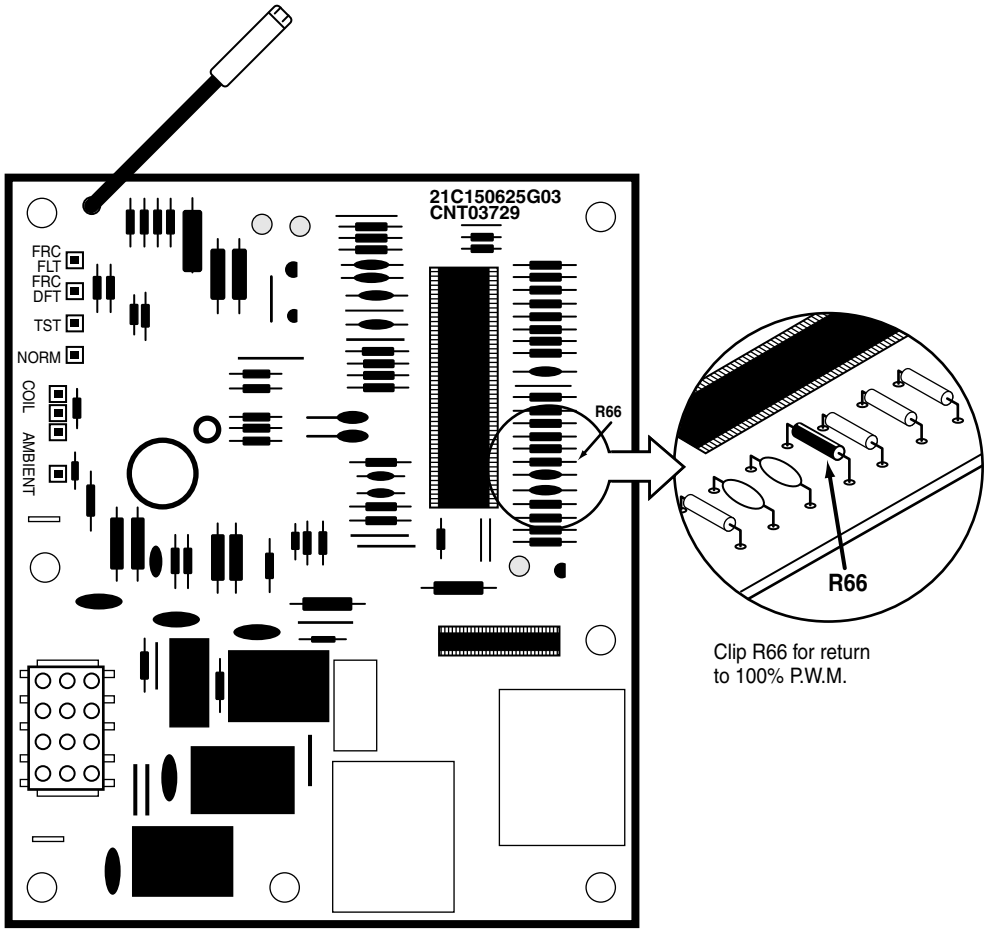
CNT02921 De-Featured Control – Scroll ECM O.D. Fan Motor



Connection Diagram



CNT03729 Full-Featured Control – 2 Compressor Reciprocating ECM O.D. Fan Motor



Heating — High and Low Speed P.W.M. ..... 20 Volts D.C. ±15%

Cooling — Low Speed P.W.M. ..... 6 Volts D.C. ±15%

Cooling — High Speed P.W.M. ..... 14 Volts D.C. ±15%

P.W.M. D.C. Voltage for Cooling
if R66 is cut off ..... 10 & 17 Volts D.C. ±15%

A new defrost control has been introduced for the two compressor heat pump series of units. The control, part number CNT03729 (Dwg. #C150625G03), will be compatible with the existing controls.

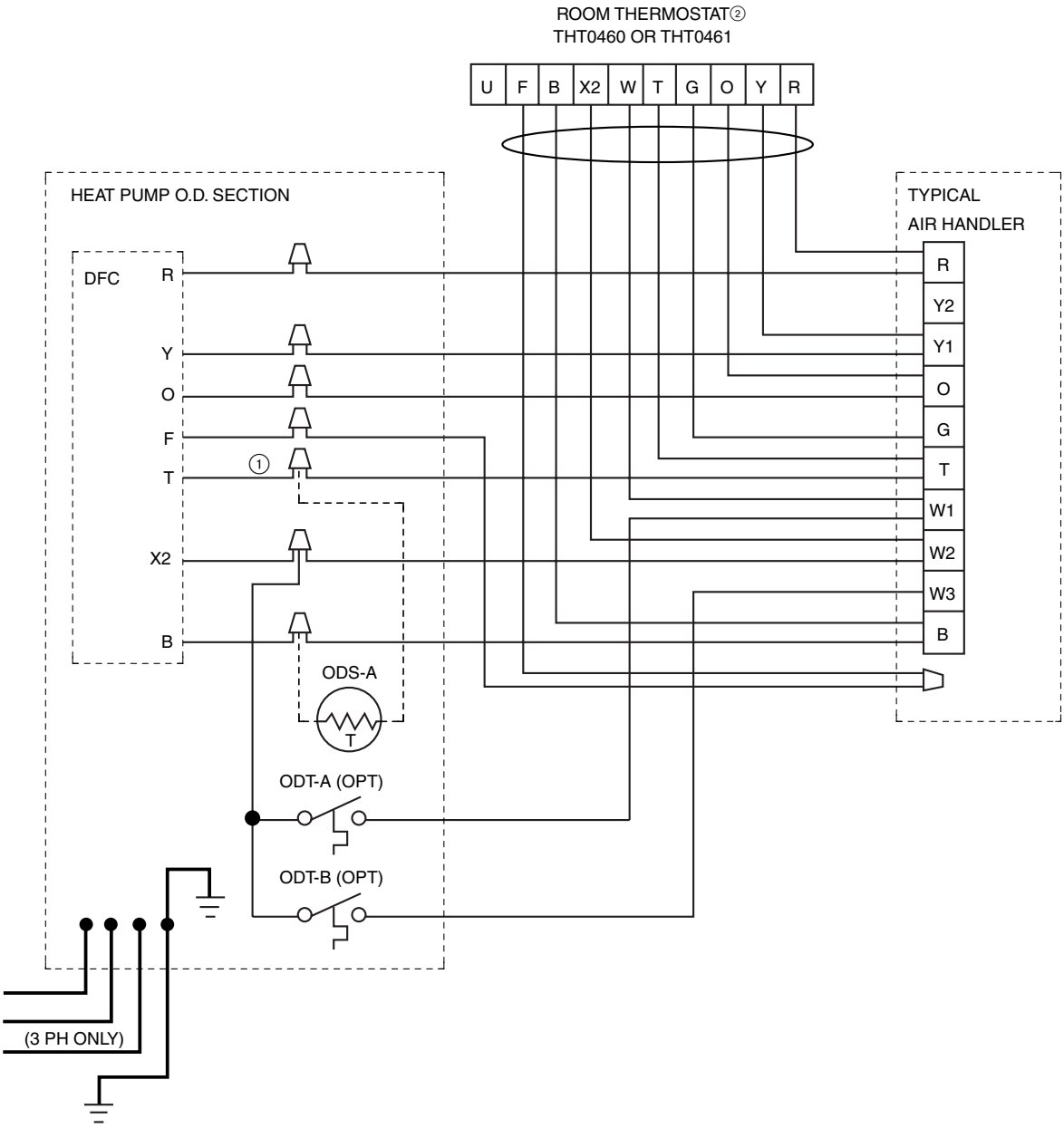
One apparent change on the programming will be a reduction in the speed of the outdoor fan. The high speed will be reduced to 79% P.W.M. of full speed. This will give a reduction in noise generated by the outdoor fan. The low speed will drop from 50% P.W.M to 29% P.W.M.

To ensure backward compatibility, there is a provision for returning the fan speeds to the prior programming. On the board edge, you will see a line of resistors, as seen above. One of the resistors is raised above the level of the others. This resistor (R66) may be clipped on one leg and it will return the programming to full 100% P.W.M. on high fan speed and 50% P.W.M. on low speed.

This adjustment should not be made unless there is a performance issue. The reduction in noise is noticeable and desirable.

Full-Featured Controls using DFC Service Light Feature

- For Installations using Fixed or Variable Speed O.D. Compressors
- De-Featured Controls have no "F" Circuit Field Wiring

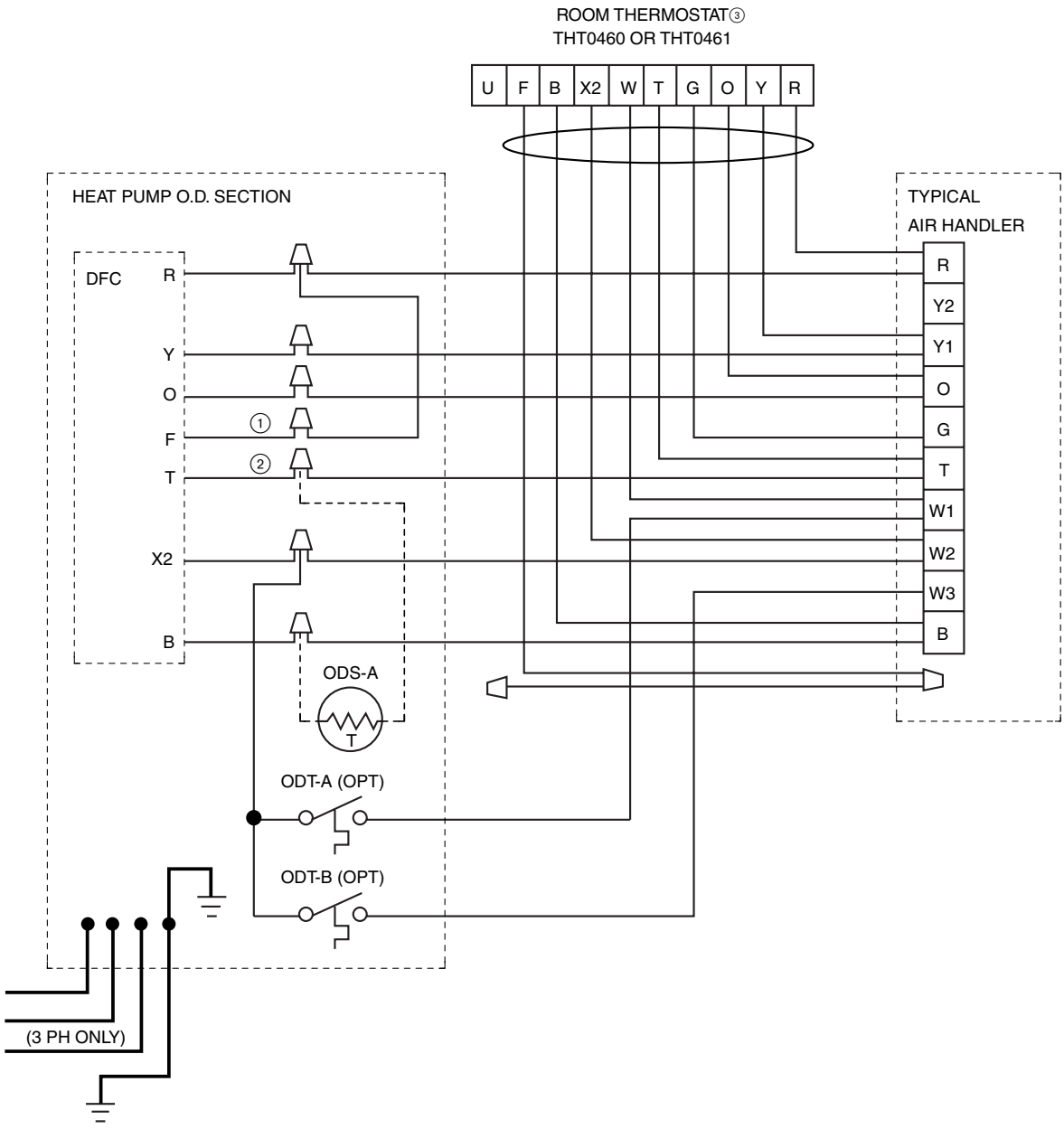


① Control models CNT1923, CNT1924 and CNT1926 have ODS-A mounted on circuit board. Control models CNT1695 and CNT1925 are for installations using variable speed O.D. fan and "T" wire (BR) is connected to "T" terminal on ECM control board where ODS-A is mounted.

② Electronic thermostats do not utilize "T" circuit.

Full-Featured Controls not using DFC Service Light Feature

- De-Featured Controls have no "F" Circuit Field Wiring



① Installations not using DFC service light feature, **MUST** have "F" wire (RD/WH) jumpered to "R" wire (RD) in O.D. unit. Do **NOT** use for installations with variable speed O.D. compressors.

② Control models CNT1923, CNT1924 and CNT1926 have ODS-A mounted on circuit board. Control models CNT1695 and CNT1925 are for installations using variable speed O.D. fan and "T" wire (BR) is connected to "T" terminal on ECM control board where ODS-A is mounted.

③ Electronic thermostats do not utilize "T" circuit.

MNEMONIC NO. CNT	1150	1108	1049	1151	1071	1050	1128	1129	1192	1509
GROUP NOMENCLATURE	G01①	G02①	G01②	G03②	G04②	G05②	G06②	G07②	G08②	G10②
SUPERSEDURE CNT	1108	1050	1071	1596	1128	1129	1509	1510	1597	1692
THERMOSTAT "F" LIGHT FEATURE	Y	Y	N	Y	N	Y	N	Y	Y	N
OD FAN TYPE – PSC/ECM	PSC	PSC	PSC	ECM	PSC	PSC	PSC	PSC	ECM	PSC
DEFROST ENABLED: Y = ON OUTDOOR TEMPERATURE < 52°F, COIL T < 33°F	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
DEFROST TIME (MINUTES) MIN.	1	1	1	1	1	1	1	1	1	1
(TIME OVERRIDE) MAX.	10	12	12	15	12	12	12	12	15	15
IF OUTDOOR TEMPERATURE < 6°F MAX.	NA	NA	NA	NA	NA	NA	NA	NA	3	3
DEFROST TERMINATE COIL TEMPERATURE										
OUTDOOR TEMPERATURE > 25°F	52°	52°	52°		52°	52°	52°	52°		
OUTDOOR TEMPERATURE 10°F TO 25°F	OUTDOOR TEMPERATURE PLUS 27 DEGREES									
OUTDOOR TEMPERATURE < 10°F	37°	37°	37°		37°	37°	37°	37°		
OUTDOOR TEMPERATURE > 22°F				47°					47°	47°
OUTDOOR TEMPERATURE 10°F TO 22°F	OUTDOOR TEMPERATURE PLUS 25 DEGREES									
OUTDOOR TEMPERATURE < 10°F				35°					35°	35°
SOV SWITCH-OVER DELAY AFTER DEFROST TERM. (SECONDS)	15	15	15	15	15	15	15	15	12	12
TEST MODE – TIMING INCREASE MULTIPLIER	10	10	10	10	10	10	6	6	7	7
FAULT A – LOW ΔT DETECT TIME (MINUTES) (AFTER DEFROST TERMINATE)	10	12	12	12	12	12	12	12	20	20
INITIATE DEFROST AFTER FAULT A DETECT?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
LED FLASHES/SEC	2	2	2	2	2	2	2	2	2	2
TIME IN FAULT A TO LED FLASH (MINUTES)	30	30	30	30	30	30	30	30	30	30
TIME IN FAULT A TO "F" OUTPUT (MINUTES)	120	120	NA	120	NA	120	NA	120	120	NA
FAULT B – DEFROST TERMINATE ODT > 6°F	10	12	12	12	12	12	12	12	15	15
ON TIME (MINUTES) ODT < 6°F	10	12	12	12	12	12	12	12	3	3
INITIATE DEFROST AFTER FAULT B DETECT?	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
LED FLASHES/SEC	3	3	3	3	3	3	3	3	3	3
# OF FAULT B DETECTS TO "F" OUTPUT	10	10	NA	10	NA	10	NA	10	10	NA
FAULT C – HIGH ΔT DETECT TIME (MINUTES) (AFTER DEFROST TERMINATE)	10	12	12	12	12	12	12	12	20	20
INITIATE DEFROST AFTER FAULT C DETECT?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
LED FLASHES/SEC	3	3	3	3	3	3	3	3	3	3
# OF FAULT C DETECTS TO "F" OUTPUT	16	16	NA	16	NA	16	NA	16	16	NA
TIME TO RE-DEFROST AFTER 16 ATTEMPTS:										
OUTDOOR TEMPERATURE > 6°F (MINUTES)	30	30	30	30	30	30	30	30	45	45
OUTDOOR TEMPERATURE < 6°F (HOURS)	6	6	6	6	6	6	6	6	6	6

① Group suffix for drawing number 21C138000

② Group suffix for drawing number 21C140501

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MNEMONIC NO. CNT	1510	1596	1597	1692	1693	1694	1695	1859	1923	1924	1925	1926	2276
GROUP NOMENCLATURE	G11①	G12①	G13①	G14①	G15①	G16①	G17①	G01②	G18①	G19①	G20①	G21①	G02②
SUPERSEDURE CNT	1693	1694	1695	1923	1924	1925	——	——	——	——	——	——	——
THERMOSTAT "F" LIGHT FEATURE	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	N	Y
OD FAN TYPE – PSC/ECM	PSC	ECM	ECM	PSC	PSC	ECM	ECM	PSC	PSC	PSC	ECM	PSC	ECM
DEFROST ENABLED: Y = ON OUTDOOR TEMPERATURE < 52°F, COIL T < 33°F	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
DEFROST TIME (MINUTES) MIN.	1	1	1	1	1	1	1	1	1	1	1	1	1
(TIME OVERRIDE) MAX.	15	15	15	15	15	15	15	15	15	15	15	15	15
IF OUTDOOR TEMPERATURE < 6°F MAX.	3	3	3	3	3	3	3	3	3	3	3	3	3
DEFROST TERMINATE COIL TEMPERATURE													
OUTDOOR TEMPERATURE > 22°F	47°	47°	47°	47°	47°	47°	47°	47°	47°	47°	47°	47°	47°
OUTDOOR TEMPERATURE 10°F TO 22°F	OUTDOOR TEMPERATURE PLUS 25 DEGREES												
OUTDOOR TEMPERATURE < 10°F	35°	35°	35°	35°	35°	35°	35°	35°	35°	35°	35°	35°	35°
SOV SWITCH-OVER DELAY AFTER DEFROST TERM. (SECONDS)	12	12	12	12	12	12	12	12	12	12	12	12	12
TEST MODE – TIMING INCREASE MULTIPLIER	7	7	7	7	7	7	7	7	7	7	7	7	7
FAULT A – LOW ΔT DETECT TIME (MINUTES) (AFTER DEFROST TERMINATE)	20	20	20	20	20	20	12	15	15	15	15	15	12
INITIATE DEFROST AFTER FAULT A DETECT?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
LED FLASHES/SEC	2	2	2	2	2	2	2	2	2	2	2	2	2
TIME IN FAULT A TO LED FLASH (MINUTES)	30	30	30	30	30	30	30	30	30	30	30	30	30
TIME IN FAULT A TO "F" OUTPUT (MINUTES)	120	120	120	NA	120	120	120	NA	NA	120	120	NA	120
FAULT B – DEFROST TERMINATE ODT > 6°F	15	15	15	15	15	15	15	15	15	15	15	15	15
ON TIME (MINUTES) ODT < 6°F	3	3	3	3	3	3	3	3	3	3	3	3	3
INITIATE DEFROST AFTER FAULT B DETECT?	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
LED FLASHES/SEC	3	3	3	3	3	3	3	3	3	3	3	3	3
# OF FAULT B DETECTS TO "F" OUTPUT	10	10	10	NA	10	10	10	NA	NA	10	10	NA	10
FAULT C – HIGH ΔT DETECT TIME (MINUTES) (AFTER DEFROST TERMINATE)	20	20	20	20	20	20	20	15	15	15	15	15	20
INITIATE DEFROST AFTER FAULT C DETECT?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
LED FLASHES/SEC	3	3	3	3	3	3	3	3	3	3	3	3	3
# OF FAULT C DETECTS TO "F" OUTPUT	16	16	16	NA	16	16	16	NA	NA	16	16	NA	16
TIME TO RE-DEFROST AFTER 16 ATTEMPTS:													
OUTDOOR TEMPERATURE > 6°F (MINUTES)	45	45	45	30	30	30	30	30	30	30	30	30	30
OUTDOOR TEMPERATURE < 6°F (HOURS)	6	6	6	6	6	6	6	6	6	6	6	6	6

① Group suffix for drawing number 21C140501

② Group suffix for drawing number 21C150625

> Above or greater than

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COMPRESSOR		RECIP	SCROLL	RECIP	RECIP	SCROLL	SCROLL	SCROLL	SCROLL
MNEMONIC NO.	CNT	02514	02935	02938	02939	02940	02941	02920	02921
GROUP NOMENCLATURE		G22①	G29①	G01②	G02②	G03②	G04②	G27①	G28①
SUPERSEDURE	CNT	03715	03716	—	—	—	—	—	—
THERMOSTAT "F" LIGHT FEATURE		N	N	N	N	N	N	N	N
OD FAN TYPE – PSC/ECM		PSC	PSC	2-SPD PSC	ECM	2-SPD PSC	ECM	PSC & 2-SPD PSC	ECM
DEFROST ENABLED: Y = ON OUTDOOR TEMPERATURE < 52°F, COIL T		<35°F	<35°F	<35°F	<35°F	<35°F	<35°F	<35°F	<35°F
DEFROST TIME (MINUTES)	MIN.	1	1	1	1	1	1	1	1
(TIME OVERRIDE)	MAX.	15	15	15	15	15	15	15	15
IF OUTDOOR TEMPERATURE < 6°F	MAX.	3	3	3	3	3	3	3	3
DEFROST TERMINATE COIL TEMPERATURE OUTDOOR TEMPERATURE > 22°F		47°	47°	47°	47°	47°	47°	47°	47°
OUTDOOR TEMPERATURE 10°F TO 22°F		OUTDOOR TEMPERATURE PLUS 25 DEGREES							
OUTDOOR TEMPERATURE < 10°F		35°	35°	35°	35°	35°	35°	35°	35°
SOV SWITCH-OVER DELAY AFTER DEFROST TERM. (SECONDS)		12	12	12	12	12	12	12	12
TEST MODE – TIMING INCREASE MULTIPLIER		5	5	5	5	5	5	5	5
FAULT A – LOW ΔT DETECT TIME (AFTER DEFROST TERMINATE)	(MINUTES)	15	15	15	15	15	15	15	15
INITIATE DEFROST AFTER FAULT A DETECT?		YES	YES	YES	YES	YES	YES	YES	YES
	LED FLASHES/SEC	2	2	2	2	2	2	2	2
TIME IN FAULT A TO LED FLASH	(MINUTES)	30	30	30	30	30	30	30	30
TIME IN FAULT A TO "F" OUTPUT	(MINUTES)	NA	NA	NA	NA	NA	NA	NA	NA
FAULT B – DEFROST TERMINATE	ODT > 6°F	15	15	15	15	15	15	15	15
ON TIME (MINUTES)	ODT < 6°F	3	3	3	3	3	3	3	3
INITIATE DEFROST AFTER FAULT B DETECT?		NO	NO	NO	NO	NO	NO	NO	NO
	LED FLASHES/SEC	3	3	3	3	3	3	3	3
# OF FAULT B DETECTS TO "F" OUTPUT		NA	NA	NA	NA	NA	NA	NA	NA
FAULT C – HIGH ΔT DETECT TIME (AFTER DEFROST TERMINATE)	(MINUTES)	15	15	15	15	15	15	15	15
INITIATE DEFROST AFTER FAULT C DETECT?		YES	YES	YES	YES	YES	YES	YES	YES
	LED FLASHES/SEC	3	3	3	3	3	3	3	3
# OF FAULT C DETECTS TO "F" OUTPUT		NA	NA	NA	NA	NA	NA	NA	NA
TIME TO RE-DEFROST AFTER 16 ATTEMPTS:									
OUTDOOR TEMPERATURE > 6°F	(MINUTES)	30	30	30	30	30	30	30	30
OUTDOOR TEMPERATURE < 6°F	(HOURS)	6	6	6	6	6	6	6	6

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COMPRESSOR		RECIP	SCROLL	RECIP
MNEMONIC NO.	CNT	03715	03716	03729
GROUP NOMENCLATURE		G33①	G34①	G03②
SUPERSEDURE	CNT	—	—	—
THERMOSTAT "F" LIGHT FEATURE		N	N	Y
OD FAN TYPE – PSC/ECM		PSC	PSC	ECM
DEFROST ENABLED: Y = ON OUTDOOR TEMPERATURE < 52°F, COIL T		<35°F	<35°F	<35°F
DEFROST TIME (MINUTES)	MIN.	1	1	1
(TIME OVERRIDE)	MAX.	15	15	15
IF OUTDOOR TEMPERATURE < 6°F	MAX.	3	3	3
DEFROST TERMINATE COIL TEMPERATURE OUTDOOR TEMPERATURE > 22°F		47°	47°	47°
OUTDOOR TEMPERATURE 10°F TO 22°F		OUTDOOR TEMPERATURE PLUS 25 DEGREES		
OUTDOOR TEMPERATURE < 10°F		35°	35°	35°
SOV SWITCH-OVER DELAY AFTER DEFROST TERM. (SECONDS)		12	12	12
TEST MODE – TIMING INCREASE MULTIPLIER		5	5	7
FAULT A – LOW ΔT DETECT TIME (AFTER DEFROST TERMINATE)	(MINUTES)	15	15	12
INITIATE DEFROST AFTER FAULT A DETECT?		YES	YES	YES
	LED FLASHES/SEC	2	2	2
TIME IN FAULT A TO LED FLASH	(MINUTES)	30	30	30
TIME IN FAULT A TO "F" OUTPUT	(MINUTES)	NA	NA	120
FAULT B – DEFROST TERMINATE	ODT > 6°F	15	15	15
ON TIME (MINUTES)	ODT < 6°F	3	3	3
INITIATE DEFROST AFTER FAULT B DETECT?		NO	NO	NO
	LED FLASHES/SEC	3	3	3
# OF FAULT B DETECTS TO "F" OUTPUT		NA	NA	10
FAULT C – HIGH ΔT DETECT TIME (AFTER DEFROST TERMINATE)	(MINUTES)	15	15	20
INITIATE DEFROST AFTER FAULT C DETECT?		YES	YES	YES
	LED FLASHES/SEC	3	3	3
# OF FAULT C DETECTS TO "F" OUTPUT				
TIME TO RE-DEFROST AFTER 16 ATTEMPTS:				
OUTDOOR TEMPERATURE > 6°F	(MINUTES)	30	30	30
OUTDOOR TEMPERATURE < 6°F	(HOURS)	6	6	6

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