



CC750

(AL3501) CC750-115 (AL3503) CC750-230



Application Guide

For more information on our complete range of American-made products – plus wiring diagrams, troubleshooting tips and more, visit us at www.icmcontrols.com



Specifications

Ratings

- **Nominal 24 VAC inputs ($\pm 25\%$):** 18-30 VAC RMS absolute
- **Operating temperature:** -40°F to +167°F (-40°C to +75°C)
- **Power consumption:** 10 watts typical

Line Ratings – Nominal 115 VAC RMS

- **Inverter operation:** 95-135 VAC RMS absolute
- **Bypass operation:** 85-145 VAC RMS absolute
- **Maximum inverter amps:** 10 amps RMS
- **Maximum bypass amps:** 20 amps (60 Hz)

Line Ratings – Nominal 208-230 VAC RMS

- **Inverter operation:** 180-264 VAC RMS absolute
- **Bypass operation:** 170-264 VAC RMS absolute
- **Maximum inverter amps:** 8.5 amps RMS
- **Maximum bypass amps:** 10 amps (60 Hz)

Features/Benefits

The ICM Comfort Control Center (CC series) is a field-installed blower motor speed control that:

- Enhances overall system comfort for both air conditioners and heat pump based systems
- Provides "hot" heat pump operation in heating
- Provides humidity and moisture control in cooling
- Contributes to improved indoor air quality
- Saves energy

By measuring both the return air and evaporator temperature, the CC series control has direct system feedback and will adjust the blower speed to achieve the desired settings with respect to comfort, moisture control, and energy savings.

Important Safety Information

WARNING! *Electrical Shock Hazard*

- Verify power is disconnected by removing a fuse or opening a circuit breaker before making any connections
- Direct or indirect contact with line voltage AC can cause personal injuries or death
- Do not mount the CC750 in an area with extreme amounts of moisture
- Do not mount the CC750 in an area with an explosive atmosphere
- Follow all local and national codes while installing this control
- Mount to clean metal surface only

Installation

! BEFORE PROCEEDING, READ THIS !

CRITICAL FIRST STEP!: Before installing the CC750, it is vital that the installer ensure that the A/C or heat pump is configured such that Heat Speed = Cool Speed. If necessary, shunt/jumper the Heat/Cool on the fan control board to ensure Heat Speed = Cool Speed before proceeding with installation. With an A/C or heat pump, there can only be one power lead to the motor and it must be from the CC750! **Note:** On a gas furnace, both heating and cooling leads may connect to the fan motor, however the CC750 will place the blower in heating speed (heating bypass) when "W" is energized.

CAUTION!: Before installing the CC750 on a gas furnace, check to make certain that the cooling speed is energized when "FAN ON" is selected on the thermostat for continuous operation. If cooling speed is not energized, check with furnace manufacturer for their recommended modification of fan board for cooling speed to be energized with "FAN ON." If unsure, do not connect thermostat lead to the G terminal of the CC750. If any speed other than cooling is energized with "FAN ON," damage to the CC750 and/or the blower motor could occur.

WARNING!: *Electrical Shock Hazard*

Verify power is disconnected by removing a fuse or opening a circuit breaker before making any connections.

Follow the installation instructions carefully and use the wiring diagrams in this manual to correctly install the CC750. Failure to follow these instructions can result in equipment damage, personal injury, or death.

Mount the CC750 on a clean metal surface. It can be mounted inside or outside of the cabinet. Mount in an area that is free from condensing moisture and extremely wet conditions.

Be sure the installation conforms to all local and national wiring codes.

CAUTION!: Before proceeding with the installation, turn off the circuit breaker or remove the fuse and verify that 120/230 VAC is not present at the fan control board.

WARNING!: Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service, or maintenance can cause injury or property damage. Refer to this manual for assistance or additional information. Consult with a qualified installer, service agency, or the gas supplier.

Wiring Instructions

WARNING!: *Electrical Shock Hazard – Verify power is disconnected by removing a fuse or opening a circuit breaker before beginning installation.*

High Voltage Wiring	
1	Remove the motor lead from the cool position of the fan control board. NOTES: 1. If this motor lead is not the high speed of the motor, insulate end of motor lead or park on an “unused” isolation terminal of the fan board. 2. If a jumper was present between the COOL and HEAT outputs of the fan control board (allowing the same motor tap to be used for the cooling and heating operations), keep the jumper on the fan control board (see Figure 1, Page 5).
2	Connect the HIGH speed motor lead to the Motor High (T2) terminal on the CC750. If required, strip and re-terminate the wire with a 1/4 inch female insulated connector.
3	Field install a wire from the COOL connection on the fan control board to the COOL (T1) connection on the CC750.
4	Remove the white motor common lead from the neutral terminal on the fan control board.
5	Fasten the motor common lead to the MOTOR COMMON (T3) connection on the CC750. If required, strip and re-terminate the wire with a 1/4 inch female insulated connector.
6	Field install one end of a white wire from the NEUTRAL terminal on the fan control board and connect the other end of the wire to the T4 NEUTRAL (L2) on the CC750.

Low Voltage Wiring	
1	Field install a red wire from the R input terminal on the fan control board to the R connection on the CC750.
2	Field install a black wire from the C terminal on the fan control board to the C connection on the CC750.
3	Field install a yellow wire from the Y or Y1 terminal on the fan control board to the Y1 connector on the CC750.
4	Field install a white wire from the W or W1 terminal on the fan control board to the W connection on the CC750.
5	If you want the furnace to deliver inverter-controlled fan operation during continuous fan operation, field install a green wire from the G terminal on the fan control board to the G connection on the CC750. CAUTION!: Before connecting the green wire to the CC750, check air handler (furnace) to make sure the cooling speed is energized when “FAN ON” is selected on the thermostat for continuous fan operation. If another speed is energized when the “FAN ON” is selected, either: (1) Do not connect green wire to CC750, or (2) Check with air handler (furnace) manufacturer for the procedure to change blower to cooling speed when “FAN ON” is selected. Damage to the CC750, fan board, and/or blower motor can result if cooling speed is not energized when “FAN ON” is selected on the thermostat.
6	Make all other connections between the room thermostat and the outdoor cooling unit as required.
7	Install return sensor in air return duct (see Figure 9, Page 10).
8	Install coil sensor near center of the evaporator on the top side (see Figure 9, Page 10). If sensor wire will be exposed to UV light, cover it with aluminum tape.

Wiring Diagrams

Figure 1
Typical Furnace Line Connections
Single-speed Motor

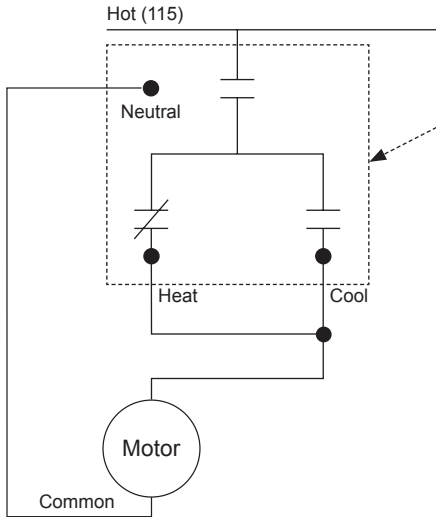


Figure 2
Typical Furnace Line Connections
with Inverter
Single-speed Motor

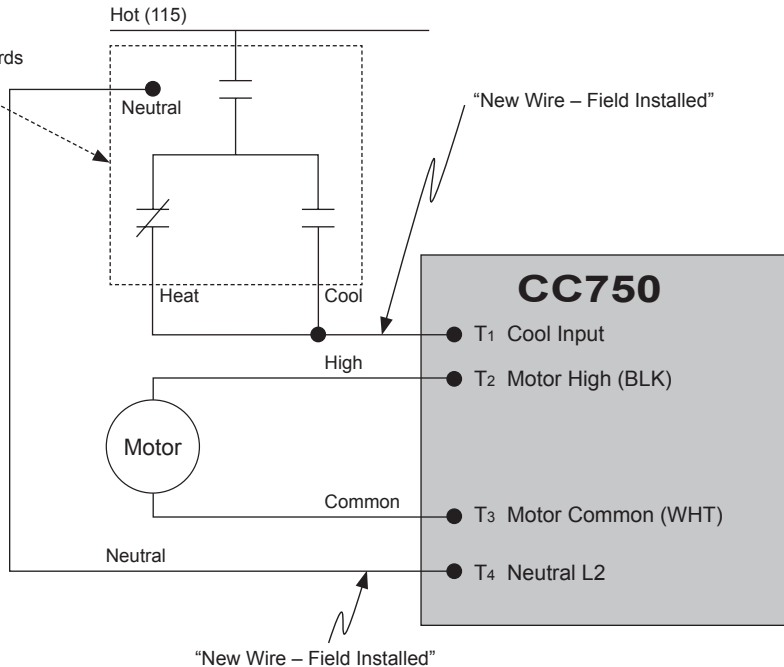


Figure 3
Typical Furnace Line Connections
Two-speed Motor

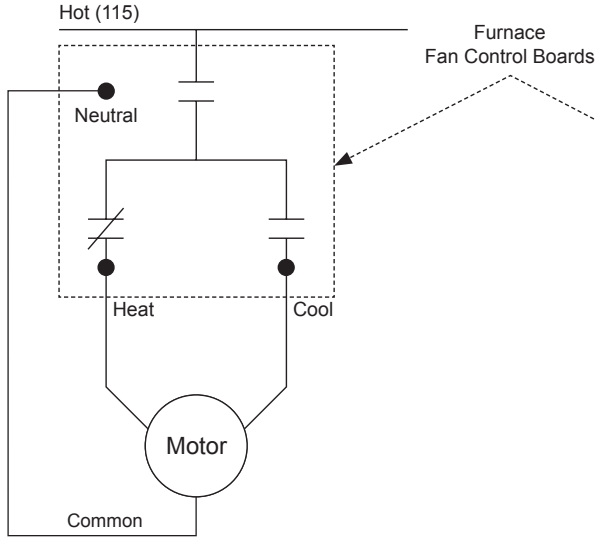


Figure 4
Typical Furnace Line Connections
with Inverter
Two-speed Motor

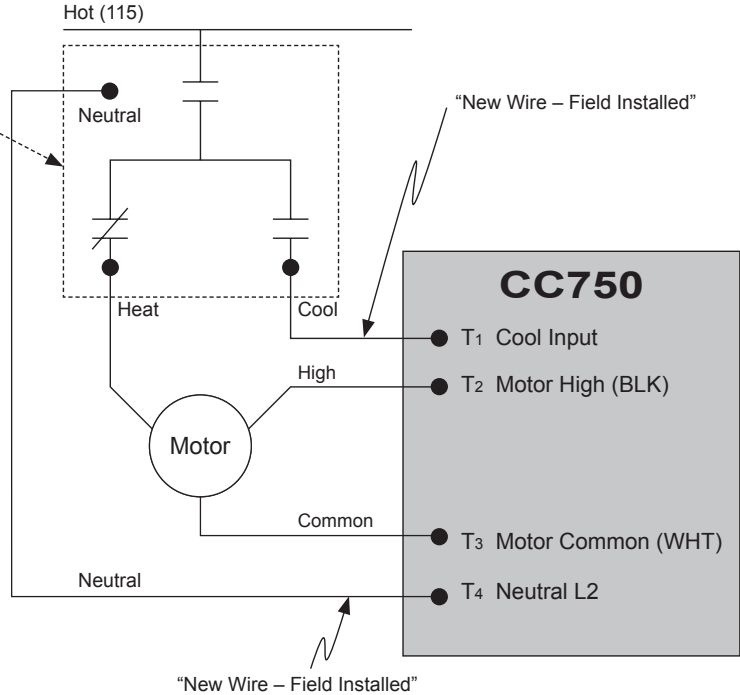
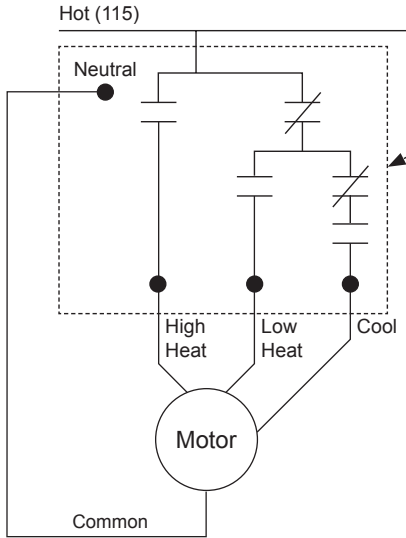
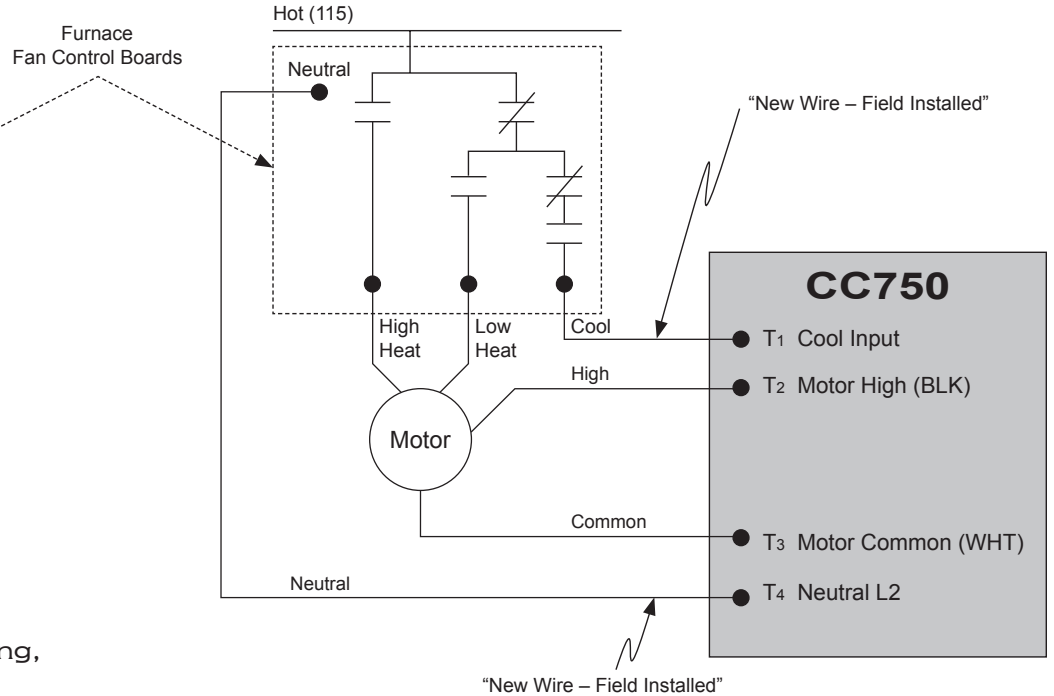


Figure 5
Typical 2-Stage Furnace
Line Connections
Three-speed Motor



Note:
 When connecting low voltage wiring,
DO NOT connect G to CC750.

Figure 6
Typical 2-Stage Furnace Line Connections
with Inverter
Three-speed Motor



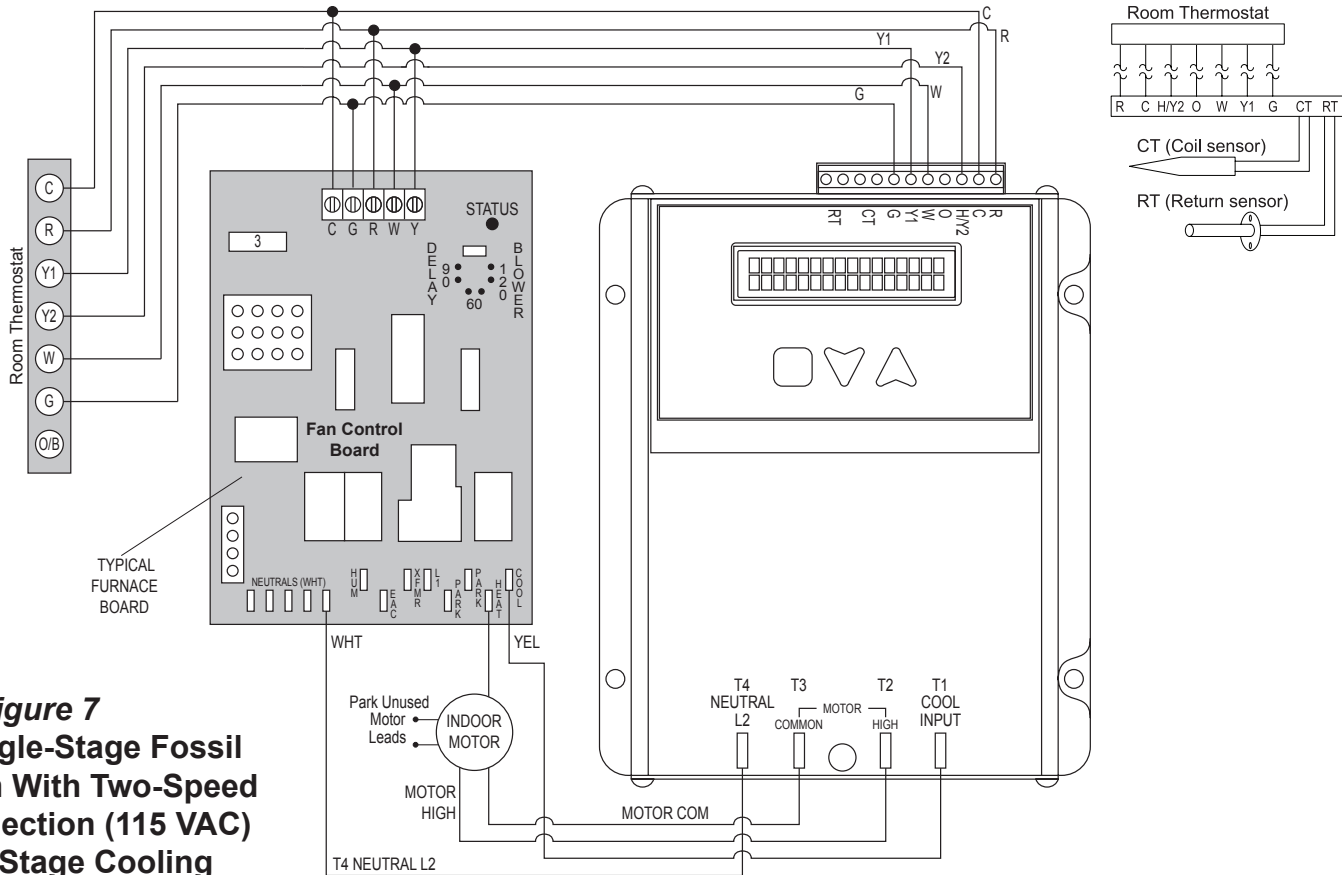


Figure 7
Typical Single-Stage Fossil
Fuel System With Two-Speed
Motor Connection (115 VAC)
and Two-Stage Cooling

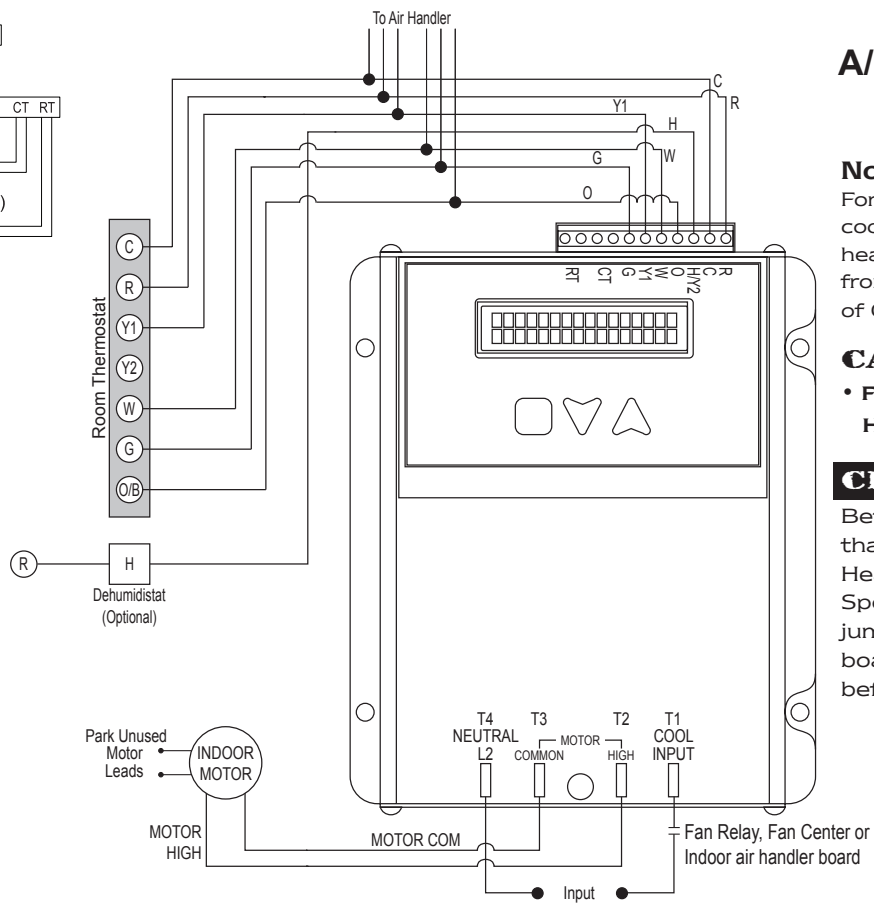
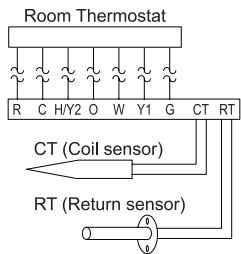


Figure 8
A/C or Heat Pump Connections
(208/230 VAC)

Note:
 For heat pump systems, connect heat and cool taps together for inverter operation in heating and A/C. Connect **HIGH** speed wire from fan motor to **MOTOR HIGH T2** terminal of CC750.

CAUTION!:
 • For 2-speed or multi-speed motors
 Heat Speed = Cool Speed = High Motor Tap

CRITICAL FIRST STEP!:
 Before installing the CC750, it is vital that the installer ensure that the A/C or Heat Pump is configured such that Heat Speed=Cool Speed. If necessary, shunt/jumper the Heat/Cool on the fan control board to ensure Heat/Cool=Cool Speed before proceeding with installation.



CT* (Coil Sensor)

Note:
 Insert coil sensor on top side of evaporator (near center of evaporator) to prevent condensation from dripping down sensor wire. If sensor wire will be exposed to UV light, cover it with aluminum tape.

To Air Handler

(T1) COOL (Black)

(T2) Motor High (Black)

(T3) Motor Common (White)

(T4) Neutral (L2) (White)

Power

Air Flow

RT (Return Sensor)

Figure 9

°C	°F	RESISTANCE (K)
0°	32°	32.7
5°	41°	25.4
10°	50°	19.9
15°	59°	15.7
20°	68°	12.5
25°	77°	10.0
30°	86°	8.1
35°	95°	6.5
40°	104°	5.3
45°	113°	4.4
50°	122°	3.6

Operation

The CC750 is a variable frequency/variable voltage fan motor speed control that adjusts the output to the motor according to two temperature sensors. One sensor is mounted in the return air duct and the other is mounted in the evaporator coil. A temperature differential between these two probes is monitored based on user-set parameters to create ideal conditions for humidity control in cooling. Other benefits include lower fan noise, warmer heat pump operation, and colder air conditioning operation. When the CC750 is operating in inverter mode, it uses significantly less energy than a fan motor operating at full speed.

Intelligent features are built into the control. It has a ramp up feature that slowly increases the motor speed to eliminate noise, reduce the inrush current, and eliminate the surge of unconditioned/unheated air at the beginning of a cycle. The humidity sensor input works with any dehumidistat to extract the most moisture from the air when the dehumidistat senses high moisture. When a dehumidistat is not used, the cooling cycle is adjusted periodically for maximum cooling and maximum moisture removal with a time cycle.

Over-current protection, brownout protection, and lost synchronization protection are incorporated in the CC750. If any of these fault conditions are detected, the CC750 switches from inverter operation to bypass operation. During bypass operation, full voltage is applied to the motor, which allows full blower operation for the duration of this call. If any of these faults occurs three consecutive times, the inverter operation is locked out until power to the CC750 is cycled.

The CC750 also goes into bypass operation if any of the following conditions occur:

1. Maximum indoor coil temperature is reached during heat pump operations in heating mode.
2. Minimum indoor coil temperature is reached for 20 seconds in cooling mode.
3. When two-stage cooling thermostat calls for second stage cooling (Y2).
4. When humidity sensor (dehumidistat) senses low humidity in the structure (H/Y2).
5. When maximum cool minutes are reached, the system will operate in the bypass mode according to the recycle time selected.

Example: maximum cool minutes = 40, recycle time = 60

With these settings, the system will operate in inverter mode for 40 minutes, switch to bypass mode for the remaining 20 minutes of the 60-minute recycle time, then switch back to inverter mode. This switching action between inverter mode and recycle mode will continue until room temperature is satisfied.

✱ **Note:** When charging an air conditioning system using the superheat method, place a jumper between R and H/Y2 terminals to place CC750 in bypass operation for full blower operation.

Output Table

Operation	Inputs						Output
	Cool	Y ₁	H/Y2	G	W	O/B	
Off	0	0	0	0	0	0	Off
Open Limit, Fan Purge, etc.	1	0	0	0	0	0	Bypass (full speed fan operation)
Fan G	1	0	0	1	0	0	Inverter controls fan speed ^{*1}
Cool 1 Y ₁	1	1	0	1	0	0	Inverter controls fan speed ^{*2}
Cool 2 Y ₂	1	1	1	1	0	0	Bypass (full speed fan operation) ^{*3}
Heat W	1 (heat tap)	0	0	1	1	0	Bypass (full speed fan operation) ^{*4}
Heat Pump, Heating	1	1	0	1	1	Active	Inverter controls fan speed ^{*5}
Humidity Sensor Input (Close on Rise)	1	0	1(H)	0	0	0	Inverter controls fan speed ^{*6}
Humidity Sensor Input (Open on Rise)	1	0	0(H)	0	0	0	Inverter controls fan speed ^{*6}

^{*1} Green wire must be installed from the G terminal on the fan control board to the G terminal on the CC750.

^{*2} Upon completion on the Y1 call, the blower will remain in inverter mode for the post purge time provided the cool speed input is receiving line power.

^{*3} A Y2 thermostat call signifies more cooling is required. The CC750 switches from inverter to bypass. Upon completion on the Y2 call, the blower will remain at full speed for post purge time provided the cool speed input is receiving line power.

^{*4} W call (for heat pumps) locks out inverter for the duration of W call plus 5 minutes. W call (for furnace applications) locks out inverter for the duration of W call plus 5 minutes and until there is no voltage on the cool input (T1).

^{*5} Speed controlled to maintain discharge temperature setting (hot heat pump).

^{*6} Inverter operates at greatest differential between evaporation temperature and return air temperature for maximum dehumidification.

Configuration

The CC750 must be set up correctly to properly control your fan.

Press the SELECT button to enter configuration.

Use the UP and DOWN buttons to change the settings.

After 20 seconds of inactivity, the CC750 exits Configuration Mode.

Rt: 74 Coil: 74
–Ready for Call–

1. **Heat pump Yes/No:**

If non-heat pump, set to no.

If heat pump is set to yes, select O or B active.

The reversing valve can either be O (Cool) active or B (Heat) active, the factory setting is O active (reversing valve energized in cooling).

Heat Pump System
..... No

Heat Pump System
. Yes (B-Active)

Heat Pump System
. Yes (O-Active)

2. **Maximum coil temperature** (in Heat Mode, 110°F to 135°F in 1° increments – heat pump only):

The maximum coil setting sets the maximum indoor coil temperature during heating. If the system hits the maximum indoor coil temperature, the fan speed will revert and lock-in to full (bypass) speed operation until the next call for heat. The maximum coil setting is designed to prevent the system from operating at excessive pressures due to low blower speed.

Max. Coil Temp.
..... 135 F

3. **Minimum coil temperature** (in Cool Mode, 34°F to 50°F in 1° increments):

Sets the minimum indoor coil temperature in which the system is allowed to operate in cooling. If the indoor coil reaches the minimum coil temperature, after 20 seconds the fan speed will revert and lock-in to full (bypass) speed operation until the next call for cooling. The minimum coil temperature feature is designed to prevent coil freeze up due to low blower speed.

Min. Coil Temp.
..... 34 F

4. **Discharge temperature** (in Heat Mode, 70°F to 130°F in 1° increments – heat pump only):

The discharge temperature screen sets the indoor coil temperature during a call for heat. The fan blower speed will modulate to maintain the discharge temperature. If there is a call for auxiliary heat, the blower will revert to bypass mode. The discharge temperature provides the installer with the option of setting a higher discharge temperature in heat, enhancing the comfort level of the system. Select a discharge temperature at least 5 degrees lower than the maximum coil temperature setting in Step 2.

Discharge Temp.
..... 100 F

5. **Differential** (15°F to 35°F adjustable, 21°F to 26°F suggested – cooling only):

The differential setting is the temperature difference between the evaporator temperature and return air temperature as measured by their respective probes. Select a 15° differential for minimum dehumidification and a 35° differential for maximum dehumidification (21° - 26° suggested). Dehumidification begins when coil temperature is sufficiently maintained below dew point (see Psychometric Chart).

Differential
..... 25 F

6. **Minimum frequency** (25-40 Hz in 1-Hz increments):

The minimum frequency is the minimum speed at which the system will operate during cooling (i.e. minimum CFM). The minimum frequency setting provides the installer with the flexibility to vary the minimum blower motor speed to ensure a minimum level of air flow and lubrication for a wide variety of motors.

Min. Frequency
..... 30 Hz

7. **Maximum frequency** (40-50 Hz in 1-Hz increments):

Maximum frequency is the upper limit of inverter speed prior to operating in bypass mode when the system is calling for inverter operation. The maximum frequency setting (up to 50 Hz) provides the installer with the flexibility to vary the maximum blower motor speed to optimize the system for the quietest and most efficient operation possible.

Max. Frequency
..... 50 Hz

8. **G call frequency** (25-50 Hz in 1-Hz increments):

The G call frequency setting sets the blower speed on a G call. The G call setting allows the installer to set a unique speed for continuous blower operation. The G call setting provides the installer the ability to field-tune the blower speed when in continuous blower operation, and to provide the homeowner with the lowest noise level while maintaining sufficient airflow for air cleaning devices to work efficiently.

G Call Frequency
..... 34 Hz

9. **Humidity sensor Yes/No:**

The humidity sensor setting allows for the use of an optional humidity sensing device. The system can be run either as a stand-alone control or with a dehumidistat to switch from latent to sensible cooling. This feature allows the installer the option of further fine-tuning humidity control with an off-the-shelf dehumidistat.

- If No – The dehumidistat is not installed
- If Yes – The dehumidistat will either close on humidity rise or open on humidity rise

Humidity Sensor
No (As Y2 Input)

10. **Ramp-up time** (5-255 seconds in 5-second increments):

The ramp-up time is the time the blower motor takes to achieve maximum inverter speed on the initial call. The ramp-up feature starts at the minimum blower speed setting and linearizes the rate of change of the frequency to the maximum blower speed. The ramp-up time allows the installer to field-tune the ramp to provide for imperceptible startup of the system as well as guaranteeing proper lubrication of the motor.

Note: If the ramp-up time is set too long with a heat pump application, the maximum indoor coil temperature could be reached and the system will operate in bypass mode until the end of the heating cycle.

Ramp-up Time
..... 60 Sec.

11. **Post purge time** (5-135 seconds in 5-second increments):

The post purge time is the time in which the blower will continue to operate at the G speed setting once the call for cooling is satisfied. The post purge provides the installer with the flexibility to have the system shutdown or return to G speed in a manner imperceptible to the homeowner. The post purge delay also allows any conditioned air to be removed from the ducts for increased efficiency. If the fan control board has a post purge feature, set the CC750 post purge time for the same length of time.

Post Purge Time
..... 90 Sec.

12. **Maximum cool minutes** (5-105 minutes in 5-minute increments or indefinite):

Maximum cool minutes is the time in which the system will transfer from speed control to bypass operation. The maximum cool minutes provides the installer with the option to switch to normal full speed operation of the blower after a certain amount of time. The cool minutes allows the installer to determine when the system should switch from latent cooling to sensible cooling.

Max Cool Minutes
..... 30 Min.

13. **Recycle time** (10-210 minutes in 5-minute increments or indefinite):

Recycle time is the time in which the system will operate in bypass operation after reaching the maximum cool minutes. The recycle time allows the installer to determine how long the system should operate in bypass before it can return to inverter operation. Recycle time is tied to maximum cool minutes. The display will show a minimum of 5 minutes longer than maximum cool minutes selected.

Recycle Time
..... 60 Min.

14. **Power Adjustment** (adjustable from -8 to +8 with 0 as the factory setting):

Power adjustment allows the installer the ability to vary the voltage-to-frequency ratio for a given motor and installation (static). The power setting provides the installer with the flexibility to tune the V-to-F ratio for a given motor if necessary to provide more or less torque. The power setting also allows the installer to optimize quiet operation over a wide range of motors.

Power Adjustment
..... +0

Troubleshooting	
Symptom	Remedy
Brownout fault	When the CC750 sees a low voltage condition, it runs in bypass (full speed blower) during a call until the low voltage condition is corrected.
Over-current fault	When the CC750 experiences an over-current fault, a fault is displayed and it runs in bypass during a call. If 3 over-current faults occur, Bypass Lockout displays, inverter operation is locked out, and it runs in bypass during a call. Check the condition of the fan motor and verify wiring is correct. Remove and reapply power to reset the CC750.
Synchronous fault	When the CC750 loses its synchronous signal, it runs in bypass (full speed blower) during a call. This fault can be caused by component failure or a mis-wired control.
No display	Verify there is 24 volts to the R and C terminals.
No output	Verify there is high voltage to the CC750.
Noisy motor during ramp up	If motor is noisy during startup at low frequencies, set minimum frequency above the noisy frequencies of the motor.
Noisy motor during run	Decrease power adjustment.
Motor does not start	Increase power adjustment.
Fault in coil/return probe	In the event the coil probe or return probe fail, the CC750 will run in bypass. The following message will appear: BYPASS-COIL TEMP (coil probe) or BYPASS-THERMIST (return probe).

ONE-YEAR LIMITED WARRANTY

The Seller warrants its products against defects in material or workmanship for a period of one (1) year from the date of manufacture. The liability of the Seller is limited, at its option, to repair, replace or issue a non-case credit for the purchase prices of the goods which are provided to be defective. The warranty and remedies set forth herein do not apply to any goods or parts thereof which have been subjected to misuse including any use or application in violation of the Seller's instructions, neglect, tampering, improper storage, incorrect installation or servicing not performed by the Seller. In order to permit the Seller to properly administer the warranty, the Buyer shall: 1) Notify the Seller promptly of any claim, submitting date code information or any other pertinent data as requested by the Seller. 2) Permit the Seller to inspect and test the product claimed to be defective. Items claimed to be defective and are determined by Seller to be non-defective are subject to a \$30.00 per hour inspection fee. This warranty constitutes the Seller's sole liability hereunder and is in lieu of any other warranty expressed, implied or statutory. Unless otherwise stated in writing, Seller makes no warranty that the goods depicted or described herein are fit for any particular purpose.



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