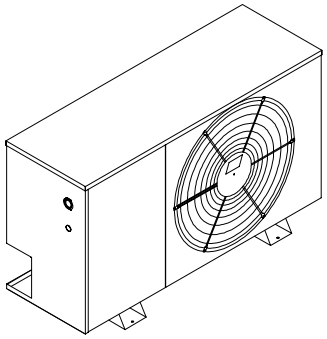
Installation Instructions

Outdoor Condensing Section



Models:

CTHAC181-A	CTHAC181-D
CTHAC241-A	CTHAC241-D
CTHAC301-A	CTHAC301-D
CTHAC361-A	CTHAC361-G
CTHAC421-A	CTHAC421-E
CTHAC421-F	CTHAC421-G
CTHAC481-A	CTHAC481-B
CTHAC481-E	CTHAC481-E
CTHAC481-G	CTHAC601-A
CTHAC601-B	CTHAC601-E
CTHAC601-F	CTHAC601-G

For Use With:
Matching Indoor Blower Coil Units and
Matching Add On Coil Units Only

Manual No.: 2100-292
Date: 12-19-96

Contents

Split Air Conditioner General Information

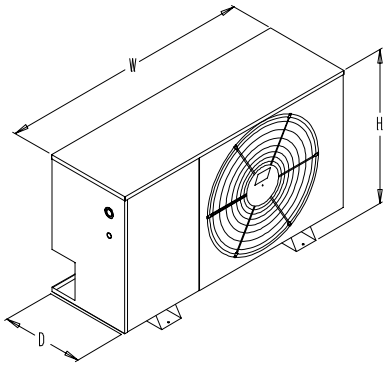
Split Air Conditioner Model Nomenclature

CTHAC 36 1 - A

- **A** — **Electrical Characteristics**
  - **A - 230/208-60-1**
  - **B - 230/200-60-3**
  - **D - 240/220-50-1**
  - **E - 220/200-50-3**
  - **F - 415/380-50-3**
  - **G - 220/200-50-1**
- **1** — **Modification Code**
- **36** — **Capacity -- 3 Ton or Approx. 36,000 BTU**
- **CTHAC** — **Basic Model Number**

Table 1 — Dimensions

Model No.	"W" Width	"D" Depth	"H" Height
CTHAC181 CTHAC241	40"	15"	26"
CTHAC301 CTHAC361	45"	15"	26"
CTHAC421 CTHAC481 CTHAC601	50"	15"	32"



MIS-617

Figure 1

TABLE 2 – Rated CFM and Air Flow Data (Wet Coil – Cooling)

Condensing Unit Model Number	Evaporator Coil Model Number	CFM	System Orifice Required
CTHAC181	FCP24 CEVA018	600 600	0.051 0.050
CTHAC201	FCP24 CEVA024	800 800	0.059 0.061
CTHAC301	FCP30 CEVA030	1000 1000	0.065 0.063
CTHAC361	FCP36 CEVA036	1200 1200	0.072 0.065
CTHAC421	FCP42	1225	0.078
CTHAC461	FCP48 CEVA048	1600 1600	0.079 0.080
CTHAC601	FCP60 CEVA060	2000 2000	0.090 0.090

Table 3 — Specifications

MODELS	CTHAC181-A	CTHAC241-A	CTHAC301-A	CTHAC361-A	CTHAC421-A
Electrical Rating (60HZ/V/Ph)	230/208-1	230/208-1	230/208-1	230/208-1	230/208-1
Operating Voltage Range	197 - 253	197 - 253	197 - 253	197 - 253	197 - 253
Minimum Circuit Ampacity	15	15	19	20	25
① Field Wire Size	14	14	12	12	10
② Delay Fuse Maximum or Circuit Breaker	20	20	30	30	40
Total Unit Amps 230/208	7.9/8.6	10.2/11.4	13.4/14.0	14.5/15.8	19.1/19.6
COMPRESSOR					
Volts 230/208	230/208	230/208	230/208	230/208	230/208
Rated Load Amps	6.8/7.5	9.1/10.3	12.3/12.9	13.4/14.7	17.6/18.1
Branch Circuit Selection Current	8.6	10.3	13.7	14.7	18.1
Lock Rotor Amps 230/208	49/49	56/56	75/75	82/82	105/105
Crankcase Heat	None				Immersion Type
FAN MOTOR AND CONDENSER					
Fan Motor — HP / RPM	1/6 - 825				1/4 - 825
Fan Motor — Amps	1.1				1.5
Fan — Diameter / CFM	20" - 2,000				24" - 2,600
SWEAT CONNECT SYSTEM					
Suction Line Size ID	5/8"	3/4"	3/4"	3/4"	7/8"
Liquid Line Size ID	1/4"	3/8"	3/8"	3/8"	3/8"
Factory Charge R-22 Oz.	73 oz.	79 oz.	84 oz.	96 oz.	102 oz.
SHIPPING WEIGHT — Lbs.	155	155	180	180	250

① 75º C copper wire size

② Maximum time delay fuse or HACR type circuit breaker

Table 3 — Specifications (continued)

MODELS	CTHAC481-A	CTHAC481-B	CTHAC601-A	CTHAC601-B
Electrical Rating (60HZ/V/Ph)	230/208-1	230/208-3	230/208-1	230/208-3
Operating Voltage Range	197 - 253	187 - 253	197 - 253	187 - 253
Minimum Circuit Ampacity	26	17	35	21
① Field Wire Size	10	12	8	10
② Delay Fuse Maximum or Circuit Breaker	45	25	60	35
Total Unit Amps 230/208	19.4/21.0	12.8/13.4	22.7/26.7	15.3/17.2
COMPRESSOR				
Volts	230/208	230/208	230/208	230/208
Rated Load Amps 230/208	17.9/19.5	11.3/11.9	21.2/25.2	13.8/15.7
Branch Circuit Selection Current	19.5	12.6	26.3	15.7
Lock Rotor Amps 230/208	102/102	91/91	135/135	150/150
Crankcase Heat	Immersion Type		None	
FAN MOTOR AND CONDENSER				
Fan Motor — HP / RPM	1/4 - 825			
Fan Motor — Amps	1.5			
Fan — Diameter	24" - 2,600			
SWEAT CONNECT SYSTEM				
Suction Line Size ID	7/8"	7/8"	7/8"	7/8"
Liquid Line Size ID	3/8"	3/8"		3/8"
Factory Charge R-22 Oz.	155 oz.	155 oz.	153 oz.	153 oz.
SHIPPING WEIGHT — Lbs.	250	250	255	255

① 75º C copper wire size

② Maximum time delay fuse or HACR type circuit breaker

Table 4 — Specifications

MODELS	CTHAC181-D	CTHAC241-D	CTHAC301-D	CTHAC361-G	CTHAC421-G	CTHAC421-E	CTHAC421-F
Electrical Rating (50HZ/V/Ph)	240/220-1	240/220-1	240/220-1	220/200-1	220/200-1	220/200--3	415/380-3
Operating Voltage Range	198 - 254	198 - 254	198 - 254	180 - 242	180 - 242	180 - 242	342 - 456
Minimum Circuit Ampacity	12	16	17	28	32	20	11
① Field Wire Size	14	14	12	10	8	12	14
② Delay Fuse Maximum or Circuit Breaker	15	25	30	45	50	30	15
Total Unit Amps	9.6	12.8	14.9	21.2	23.0	14.8	8.1
Control Circuit				24 Volt ②			
COMPRESSOR							
Volts	240/220	240/220	240/220	220/200	220/200	220/200	415/380
Rated Load Amps	8.1	11.3	13.4	19.7	21.5	13.3	6.6
Branch Circuit Selection Current	8.1	11.3	13.7	21.1	23.7	14.7	7.0
Lock Rotor Amps	45.0	65.0	80.7	108.0	116.0	92.0	46.0
Crankcase Heat				Immersion Type			
FAN MOTOR AND CONDENSER							
Fan Motor — HP / RPM			1/4 - 825			1/4 - 825	
Fan Motor — Amps			1.5			1.5	
Fan — Diameter / CFM			20" - 2,000			24" - 2,600	
SWEAT CONNECT SYSTEM							
Suction Line Size ID	5/8"	3/4"	3/4"	3/4"	7/8"	7/8"	7/8"
Liquid Line Size ID	1/4"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
Factory Charge R-22 Oz.	73 oz.	79 oz.	84 oz.	96 oz.	102 oz.	102 oz.	102 oz.
SHIPPING WEIGHT — Lbs.	155	155	180	180	180	250	250

① 75º C copper wire size
② Maximum time delay fuse or HACR type circuit breaker
③ For high voltage control circuit options consult factory

Table 4 — Specifications (continued)

MODELS	CTHAC481-G	CTHAC481-E	CTHAC481-F	CTHAC481-G	CTHAC601-E	CTHAC601-F
Electrical Rating (50HZ/V/Ph)	220/200-1	220/200-3	415/380-3	220/200-1	220/200-3	415/380-3
Operating Voltage Range	180 - 220	180 - 242	342 - 456	180 - 220	180 - 242	342 - 456
Minimum Circuit Ampacity	38	23	13	40	27	15
① Field Wire Size	8	10	14	8	8	14
② Delay Fuse Maximum or Circuit Breaker	60	40	20	60	45	20
Total Unit Amps	25.9	16.0	9.0	29.7	18.5	10.3
Control Circuit			24 Volt ②			
COMPRESSOR						
Volts	220/200	220/200	415/380	220/200	220/200	415/380
Rated Load Amps	24.4	14.5	7.5	28.2	17.0	8.8
Branch Circuit Selection Current	28.8	17.3	9.0	30.1	20.5	10.2
Lock Rotor Amps	138	106	53	178	124	62
Crankcase Heat			Immersion Type			
FAN MOTOR AND CONDENSER						
Fan Motor — HP / RPM			1/4 - 825			
Fan Motor — Amps			1.5			
Fan — Diameter			24" - 2,600			
SWEAT CONNECT SYSTEM						
Suction Line Size ID	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"
Liquid Line Size ID	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
Factory Charge R-22 Oz.	155 oz.	155 oz.	155 oz.	153 oz.	153 oz.	153 oz.
SHIPPING WEIGHT — Lbs.	250	250	250	255	255	255

① 75º C copper wire size
② Maximum time delay fuse or HACR type circuit breaker
③ For high voltage control circuit options consult factory

Application and Location

General

These instructions explain the recommended method to install the air cooled remote type condensing unit, the interconnecting refrigerant tubing and the electrical wiring connections to the unit.

The condensing units are to be used in conjunction with the matching evaporator coils or evaporator blower units for comfort cooling applications as shown in the specification sheet.

These instructions and any instructions packaged with any separate equipment required to make up the entire air conditioning system should be carefully read before beginning the installation. Note particularly “Starting Procedure” and any tags and/or labels attached to the equipment.

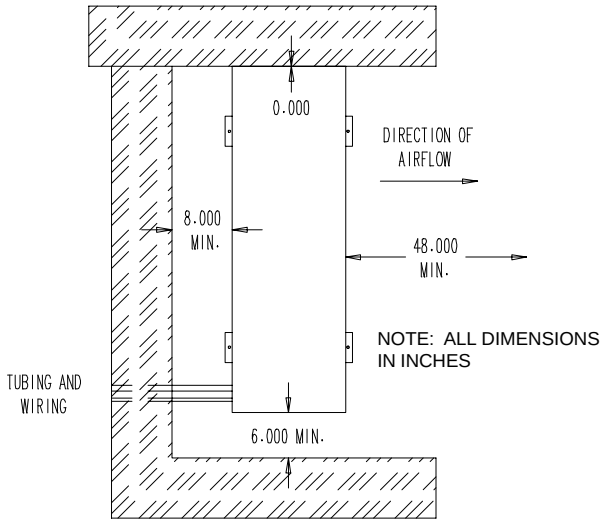
While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities having jurisdiction should be consulted before the installation is made.

Shipping Damage

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier’s agent.

Application

Size of unit for a proposed installation should be based on heat loss calculation and air duct sizing made according to methods of Air Conditioning Contractors of America. The air duct should be installed in accordance with the Standards of the National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems of Other Than Residence Type, NFPA 90A, and Residence Type Warm Air Heating and Air Conditioning Systems, NFPA 90B. Where local regulations are at a variance with instructions, installer should adhere to local codes.



Location

Figure 2 — Installation Clearance

The condensing unit is designed to be located outside with free and unobstructed condenser air inlet and discharge. It must also permit access for service and installation. Condenser air enters the coil and discharges. Refrigerant and electrical connections are made from the rear of the unit as shown in Figure 2 with electrical service access.

Mounting Unit Outside on Slab

A solid level base or platform, capable to support the unit’s weight, must be set at the outdoor unit predetermined location. The base should be at least two inches larger than the base dimensions of the unit and at least two inches higher than surrounding grade level. The required unit minimum installed clearances must be maintained as called out in Figure 2 when locating and setting the base.

Remove the unit from its shipping carton and position the unit on the prepared base or platform.

Do not attach the unit or its base to the building structure to avoid the transmission of noise into the occupied area.

NOTE: These units employ internally sprung compressors; therefore, it is not necessary to remove or loosen the base mounting bolts on the compressor prior to operation.

Consideration should be given to the electrical and tubing connections when placing the unit to avoid unnecessary bends or length of material.

Important Installer Note

For improved start-up performance, wash the indoor coil with a dishwater detergent.

Installation Refrigerant Tubing

The information that follows on installing refrigerant tubing and for changing the system orifice (if required) covers applications listed in the front of this installation instruction only. Although other indoor units may be of similar construction, the installation instructions for these units should be consulted for proper installation of those units prior to installation.

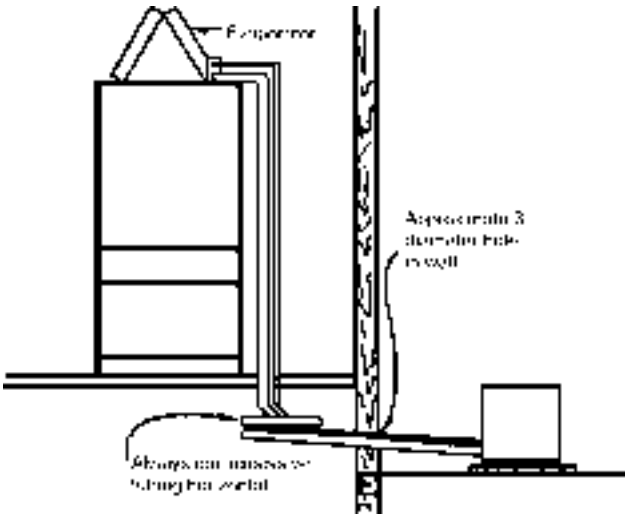


Figure 3 — Installing Refrigerant Tubing

Sweat Style Tubing Connections: Sweat Indoor Unit and Sweat Outdoor Unit

Use only refrigeration grade (dehydrated and sealed) copper tubing. Care must be taken to insure that the tubing is kept clean and dry before and during installation. Do not remove the plugs from the tubing ends, coil connections or base valves until the connection is ready to be brazed.

The suction line must be insulated with a minimum of 3/8" Armaflex or equivalent before cutting and making connections.

Step 1. Being careful not to kink, route both the suction line and liquid line between the indoor unit and outdoor unit. Use a tubing bender to make any necessary bends in tubing. When necessary to bend the insulated tube suction line, cut the insulation around its circumference at a distance far enough beyond the point of the bend so as to clear the tubing bender. Slip the insulation back together and vapor seal the joint with tape. Coil any excess tubing in a horizontal place with the slope of the tubing toward the condensing unit. See Figure 3.

CAUTION

1. Be careful not to tear the insulation when pushing it through hole in masonry or frame walls. 2. When sealing the tube opening in house wall, use a soft material to prevent tube damage and vibration transmission. 3. Avoid excessive bending in any one place to avoid kinking.

Step 2. The tubing ends should be cut square. Make sure it is round and free of burrs at the connecting ends. Clean the tubing to prevent contaminants from entering the system.

NOTE: ***Do not braze line to units!*** If orifice needs to be changed, change out orifice first.

If the orifice does not have to be changed, skip the instructions outlined further in Step 3 and proceed to Step 8.

Step 3. Disassemble Flow Control Assembly by turning body hex.

Step 4. If existing orifice has not dropped out of the body when disassembled, remove by using a pin or paper clip. Discard this original orifice.

Step 5. Insert proper sized orifice fully into the flow control body with rounded "bullet" nose towards the unit as shown. Insure the orifice stays inserted in body before connecting mating half. See chart in the outdoor unit installation instructions for proper size.

CAUTION

Be sure there is no dirt introduced into the flow control —orifice assembly. Be sure to install the orifice with the bullet nose pointing in the proper direction as shown in Figure 4. Failure to do so will result in improper operation.

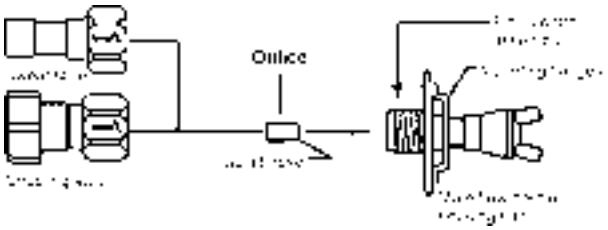


Figure 4 — Flow Control Assembly Field Orifice Replacement Instructions

Step 6. Thread assembly halves together by hand to insure proper mating of threads and tighten until bodies "bottom" or a definite resistance is felt.

Step 7. Using a marker pen or ink pen, mark a line lengthwise from the union nut to the bulkhead. Then tighten an additional 1/6 turn (or 1 hex flat). The misalignment of the line will show the amount the assembly has been tightened. This final 1/6 turn is necessary to insure the formation of the leakproof joint.

Step 8. Wrap a wet rag around the copper stub before brazing.

Step 9. Flux the copper tube and insert into the stub. Braze the joint using an alloy of silver or copper and phosphorus with a melting temperature above 1,100° F for copper to copper joints. The phosphorus will act as a flux, therefore, no flux will be required.

A copper-silver alloy with a high silver content should be used when iron or steel material is involved in the joint. These alloys require the use of silver solder flux. Alloys containing phosphorus should not be used with iron or steel. Phosphorus reacts with the iron, forming iron phosphate which is extremely brittle.

CAUTION

1. Brazing alloys with a melting temperature below 700° F should not be used. 2. Lead-tin or tin-antimony solders should not be used due to their low melting point and necessity for corrosive fluxes.

To further prevent the formation of copper oxide inside the tubing, dry nitrogen may be purged through the refrigerant system during brazing.

WARNING

Never purge or pressurize a system with oxygen. An explosion and fire will result.

Step 10. After brazing, quench with wet rag to cool the joint and remove any flux residue.

Step 11. Leak test all connections using an electronic leak detector or a halide torch.

Step 12. Evacuate suction line, liquid line and indoor unit through outdoor unit base valves.

Step 13. Open both the suction and liquid base valves to the fully open position. Refer to section later in installation instructions for details on setting proper system charge.

Table 5 — Tubing Chart

Basic Condensing Unit Model	Refrigerant Line Length (Ft.) 0 - 20		21 - 60		61 - 100	
	Liquid	Suction	Liquid	Suction	Liquid	Suction
CTHAC181	1/4"	5/8"	1/4"	5/8"	3/8"	3/4"
CTHAC241	3/8"	5/8"	3/8"	3/4"	3/8"	3/4"
CTHAC301	3/8"	5/8"	3/8"	3/4"	3/8"	3/4"
CTHAC361	3/8"	5/8"	3/8"	3/4"	1/2"	7/8"
CTHAC421	3/8"	3/4"	3/8"	7/8"	1/2"	7/8"
CTHAC481	3/8"	7/8"	3/8"	7/8"	1/2"	1-1/8"
CTHAC601	3/8"	7/8"	3/8"	7/8"	1/2"	1-1/8"

General

All wiring must be installed in accordance with the National Electrical Code and local codes. In Canada, all wiring must be installed in accordance with the Canadian Electrical Code and in accordance with the regulations of the authorities having jurisdiction. Power supply voltage must conform to the voltage shown on the unit serial plate. A wiring diagram of the unit is attached to the inside of the electrical cover. The power supply shall be sized and fused according to the specifications supplied. A ground lug is supplied in the control compartment for equipment ground.

The unit rating plate lists a "Maximum Time Delay Fuse" or "HACR Type" circuit breaker that is to be used with the equipment. The correct size must be used for proper circuit protection and also to assure that there will be no nuisance tripping due to the momentary high starting current of the compressor motor.

Control Circuit Wiring

For split systems, the minimum control circuit wiring gauge needed to insure proper operation of all controls in both indoor and outdoor units will depend on two factors.

1. The rated VA of the control circuit transformer.
2. The maximum total distance of the control circuit wiring. (This is the distance between the wall thermostat to the indoor unit plus the distance between the indoor unit to the outdoor unit.)

   The following table should be used to determine proper gauge of control circuit wiring required.

Table 6 — Control Circuit Wiring

Rated VA of Control Circuit Transformer	Transformer Secondary FLA @ 24V	Maximum Total Distance of Control Circuit Wiring in Feet
40	1.6	20 gauge - 65
		18 gauge - 90
		16 gauge - 145
		14 gauge - 230
50	2.1	20 gauge - 45
		18 gauge - 60
		16 gauge - 100
		14 gauge - 160
		12 gauge - 250
65	2.7	20 gauge - 40
		18 gauge - 55
		16 gauge - 85
		14 gauge - 135
		12 gauge - 210

Example: 1. Control circuit transformer rated at 40VA.
2. Maximum total distance of control circuit wiring 85 feet.

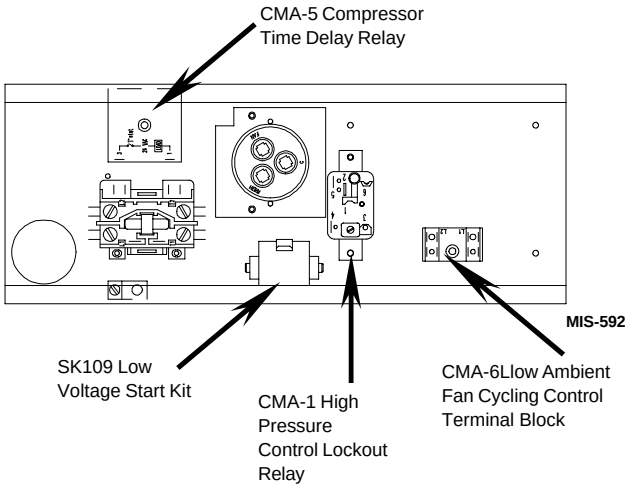
From Table 6, minimum of 18 gauge wire should be used in the control circuit wiring.

For control circuit transformers rated other then those listed, use the next lower rated transformer listed.

Example: 1. Control circuit transformer rated at 55VA.

From table use 50VA transformer.

Optional Controls



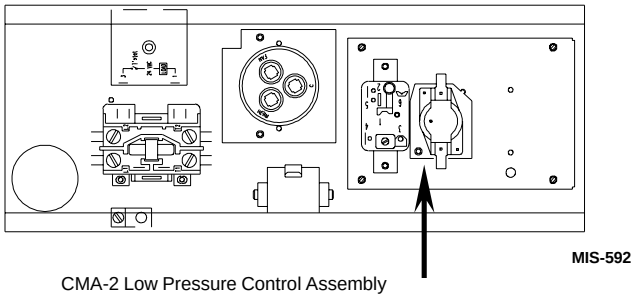


Figure 5 — Component Mounting Location

Installation Instructions — CMA-1

Disconnect all power to unit. Remove control panel cover.

Step 1. Mount lockout relay in position shown in Figure 5.

Step 2. Disconnect yellow low voltage (Y) wire at compressor contactor coil or (Y1) at optional CMA-5 and reconnect to terminal #4 of the lockout relay.

Step 3. Connect yellow wire from terminal #3 of the lockout relay to the (Y) terminal of the compressor contactor coil or (Y1) at optional CMA-5. This is the terminal that the wire was removed from in Step 2.

Step 4. Route high (red) pressure switch wires up through the bushing in the bottom of the control panel. Connect the high pressure switch wires between terminal #5 of the lockout relay and the (Y) terminal of the compressor contactor coil or (Y1) at optional CMA-5.

Step 5. Remove service port cap on the discharge line. Install the high pressure switch on the discharge line with the flare tee adapter that is brazed to the high pressure switch. Check for pressure at the flare tee dill valves after installation to insure that the dill valve in the unit service port was depressed by the flare tee connector. Check for leaks at the flare tee connectors. Replace service port cap on the flare tee service port and tighten.

Step 6. Recheck wiring. See Figure 6. Check for proper operation of the unit by energizing in cooling mode for at least 5 minutes. The unit should not go into lockout.

Step 7. Replace all panels and covers. This completes installation.

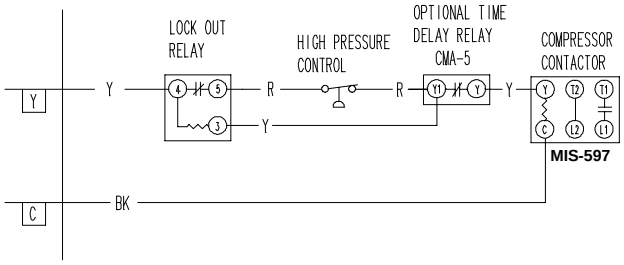


Figure 6 — Installation Instructions for CMA-1 High Pressure Control

Installation Instructions — CMA-2

Disconnect all power to unit. Remove control panel cover.

Step 1. Snap control assembly into control panel as shown in Figure 5.

Step 2. Disconnect yellow low voltage (Y) wire at compressor contactor coil or (Y1) at optional CMA-5 and reconnect to terminal #4 of the lockout relay.

Step 3. Connect yellow wire from terminal #3 of the low pressure bypass TDR to the (Y) terminal of the compressor contactor coil or (Y1) at optional CMA-5. This is the terminal that the wire was removed from in Step 2.

Step 4. Connect the black wire from terminal H of the low pressure bypass TDR to the common (C) side of the compressor contactor coil.

Step 5. Route low (blue) pressure switch wires up through the bushing in the bottom of the control panel. Connect low pressure switch wires between terminals #1 and #3 of the low pressure bypass TDR.

Step 6. Remove service port caps on the suction line. Install the low pressure switch on the suction line with the flare tee adapter that is brazed to the low pressure switch. Check for pressure at the flare tee dill valves after installation to insure that the dill valve in the unit service port was depressed by the flare tee connector. Check for leaks at the flare tee connectors. Replace service port caps on the flare tee service ports and tighten.

Step 7. Recheck wiring. See Figure 7. Check for proper operation of the unit by energizing in heating or cooling mode for at least 5 minutes. The unit should not go into lockout.

Step 8. Replace all panels and covers. This completes installation.

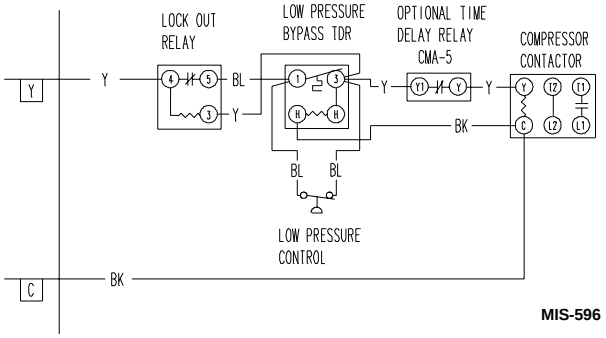


Figure 7 — Installation Instructions for CMA-2 Low Pressure Control

Installation Instructions — CMA-4

Disconnect all power to unit. Remove control panel cover.

Step 1. Snap control assembly into control panel as shown in Figure 5.

Step 2. Disconnect yellow low voltage (Y) wire at compressor contactor coil or (Y1) at optional CMA-5 and reconnect to terminal #4 of the lockout relay.

Step 3. Connect yellow wire from terminal #3 of the low pressure bypass TDR to the (Y) terminal of the compressor contactor coil or (Y1) at optional CMA-5. This is the terminal that the wire was removed from in Step 2.

Step 4. Connect the black wire from terminal H of the low pressure bypass TDR to the common (C) side of the compressor contactor coil.

Step 5. Route high (red) and low (blue) pressure control wires up through the bushing in the bottom of the control panel. Connect low pressure control wires between terminals #1 and #3 of the low pressure bypass TDR.

Step 6. Connect the high pressure control wires between terminal #5 of the lockout relay and terminal #1 of the low pressure bypass TDR.

Step 7. Remove service port caps on both the suction and discharge lines. Install the high pressure control on the discharge line with the flare tee adapter that is brazed to the high pressure switch. Install the low pressure control on the suction line. Check for pressure at the flare tee dill valves after installation to insure that the dill valve in the unit service port was depressed by the flare tee connector. Check for leaks at the flare tee connectors. Replace service port caps on the flare tee service ports and tighten.

Step 8. Recheck wiring. Refer to Figure 8. Check for proper operation of the unit by energizing in heating or cooling mode for at least 5 minutes. The unit should not go into lockout.

Step 9. Apply “This unit equipped with CMA-4 control module” label to inside of inner control panel cover above wiring diagram. Leave these instructions in the unit.

Step 10. Replace all panels and covers. This completes installation.

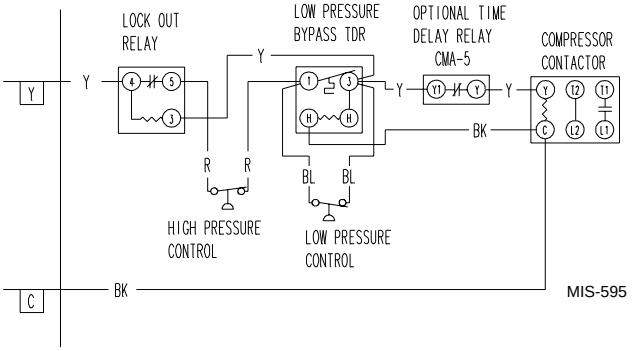


Figure 8 — Installation Instructions for CMA-4 High and Low Pressure Control

Installation Instructions — CMA-5

Disconnect all power to the unit. Remove control panel cover.

Step 1. Mount compressor TDR in position shown in Figure 5 with screw provided.

Step 2. Disconnect yellow low voltage (Y) wire at the compressor contactor coil and reconnect to the Y1 or #3 terminal of the TDR.

Step 3. Connect yellow wire from terminal (Y) of the TDR to the (Y) terminal of the compressor contactor coil. This is the terminal that the wire was removed from in Step 2.

Step 4. Recheck wiring. Refer to Figure 9. Energize unit. Compressor should start. Remove power and reapply. Compressor should not start until the 5 minute time delay has expired.

Step 5. Apply "This unit equipped with CMA-5 control module" label to inside of the inner control panel cover above wiring diagram.

Step 6. Replace all panels and covers. This completes installation.

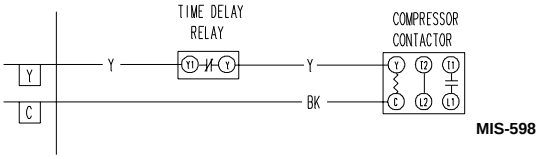


Figure 9 — Installation Instructions for CMA-5 Compressor Time Delay Relay

Installation Instructions — CMA-6

Disconnect all power to unit. Remove control panel inner and outer cover.

Step 1. Mount terminal block in position shown in Figure 5.

Step 2. Disconnect black high voltage outdoor motor lead from compressor contactor and reconnect to terminal block.

Step 3. Route low ambient control wires up through the bushing in the bottom of the control panel. Connect the low ambient control wires between the terminal block and T2 of the compressor contactor.

Step 4. Remove service port cap on discharge line. Install the low ambient control on the discharge line with the flare tee adapter that is brazed to the low ambient control. Check for pressure at the flare tee dill valve after installation to insure that the dill valve in the unit service port was depressed by the flare tee connector. Check for leaks at the flare tee connectors. Replace service port cap on the flare tee service port and tighten.

Step 5. Recheck wiring. See Figure 10. Check for proper operation of the unit by energizing in cooling mode. The condenser fan motor should not run until the discharge pressure has exceeded 300 PSI. Should the discharge pressure fall below 200 PSI while running, the condenser fan motor will de-energize until the head pressure builds to 300 PSI.

Step 6. Apply "This unit equipped with CMA-6 control module" label to the inside of the control panel cover above the wiring diagrams.

Step 7. Replace all panels and covers. This completes installation.

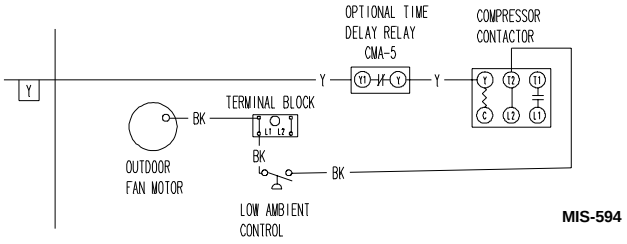


Figure 10 — Installation Instructions for CMA-6 Low Ambient Fan Cycling Control

Installation Instructions — CMA-11

Disconnect all power to unit. Remove control panel inner cover.

Step 1. Snap control assembly into control panel as shown in Figure 5.

Step 2. Disconnect yellow low voltage (Y) wire at compressor contactor coil or (Y1) at optional CMA-5 and reconnect to terminal #4 of the lockout relay.

Step 3. Connect the black wire from terminal H of the low pressure bypass TDR to the common (C) side of the compressor contactor coil.

Step 4. Connect yellow wire from terminal #1 or (Y) of the low pressure bypass relay to the (Y) terminal of the compressor contactor coil or (Y1) at optional CMA-5. This is the terminal that the wire was removed from in Step 2.

Step 5. Route high (red) and low (blue) pressure switch wires up through the bushing in the bottom of the control panel. Connect the high pressure switch wires between terminal #5 of the lockout relay and terminal #1 of the low pressure bypass TDR.

Step 6. Connect low pressure switch wires between terminals #1 and #3 of the low pressure bypass TDR.

Step 7. Disconnect black high voltage outdoor motor lead from compressor contactor and reconnect to terminal block.

Step 8. Route low ambient control wires up through the bushing in the bottom of the control panel. Connect the low ambient control wires between the terminal block and T2 of the compressor contactor.

Step 9. Remove service port caps on both the suction and discharge lines. Install the high pressure switch and low ambient control on the discharge line with the flare tee adapter that is brazed to the controls. Install the low pressure switch on the suction line. Check for pressure at the flare tee dill valves after installation to insure that the dill valve in the unit service port was depressed by the flare tee connector. Check for leaks at the flare tee connectors. Replace service port caps on the flare tee service ports and tighten.

Step 10. Recheck wiring. Refer to Figure 11. Energize unit in first stage cooling. Compressor should start. Run the unit for at least 5 minutes. The unit should not go into lockout. The condenser fan motor should not run until the discharge pressure has exceeded 300 PSI. Should the discharge pressure fall below 200 PSI while running, the condenser fan motor will de-energize until the head pressure builds to 300 PSI.

Step 11. Apply “This unit equipped with CMA-11 control module” label to the inside of the inner control panel cover above the wiring diagram.

Step 12. Replace all panels and covers. This completes installation.

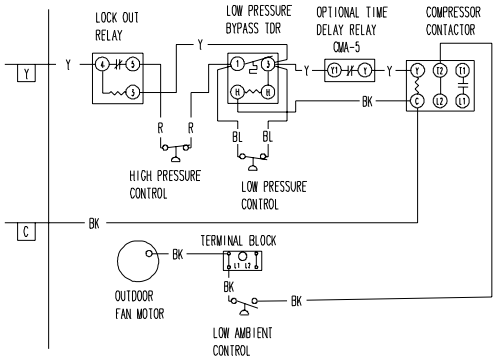


Figure 11 — Installation Instructions for CMA-11 Dual Pressure and Low Ambient Fan Cycling Control

Charging Instructions

Pressure Service Ports

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure tables can be found later in the manual covering all models. It is imperative to match the correct pressure table to the unit by model number.

System Start-Up (Indoor Units Without Expansion Valves)

Step 1. Close disconnect switch(es) and set the thermostat to cool and the temperature to the highest setting.

Step 2. Check for proper airflow across the indoor coil by referring to indoor unit installation.

Step 3. Connect the service gauges and allow the unit to run for at least 10 minutes or until pressures are stable. Check pressures to the system pressure table attached to the outdoor unit service panel. For optimum system performance, go to Step 4.

Step 4. Install a thermometer on the suction line approximately 6" to 10" from the compressor. Optimum system performance will occur with a refrigerant charge resulting in a suction line superheat as determined from the following calculations.

A. Measure outdoor air dry bulb temperature _____ºF

B. Measure indoor air wet bulb temperature _____ºF

C. Measure suction pressure _____PSIG

D. Measure suction line temperature _____ºF

E. Determine optimum system superheat from Table 9 using outdoor air dry bulb (Step B) and indoor air wet bulb (Step A) _____ºF

F. Determine saturated suction temperature from suction pressure using Table 10 _____ºF

G. Determine system superheat:
Suction line temperature (Step D) _____ºF
- Saturated suction temperature (Step F) - _____ºF
= System superheat = _____ºF

H. Adjust the system superheat (Step G) to the optimum system superheat (Step E) by adding charge to lower the superheat or removing charge to raise the superheat.

I. Check final system operating pressures to the system pressure tables as was done in Step 3.

Table 7 — System Superheat

Outdoor Ambient Temperature (º F Dry Bulb)	Return Air Temperature º F — Wet Bulb			
	59	63	67	71
105	1	1	5	—
95	1	3	(8)	20
90	1	7	14	26
85	3	9	19	33
80	8	14	25	39
75	10	20	30	42

Table 8 — Saturated Suction Temperature (R-22)

Suction Pressure PSIG	Saturated Suction Temperature (º F)
50	26
53	28
55	30
58	32
61	34
63	36
65	38
67	39
70	41
73	43
76	45
79	47
82	49
86	51

Service

Service Hints

1. Caution homeowner to maintain clean air filters at all times. Also, not to needlessly close off supply and return air registers. This reduces air flow through the system, which shortens equipment service life, as well as, increasing operating costs.
2. Check all power fuses or circuit breakers to be sure that they are the correct rating.
3. Periodic cleaning of the outdoor coil to permit full and unrestricted air flow circulation is essential.

Fan Blade Setting Dimensions

Shown in Figure 12 are the correct fan blade setting dimensions for proper air delivery across the outdoor coil.

Any service work requiring removal or adjustment in the fan and/or motor area will require that the dimensions below be checked and blade adjusted in or out on the motor shaft accordingly.

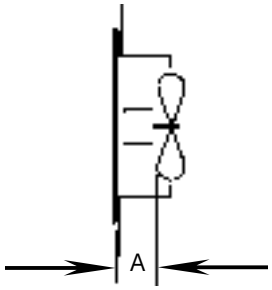


Figure 12 — Fan Blade

Table 9 — Fan Blade Setting Dimensions

Model	Dimension A
CTHAC181	3"
CTHAC241	
CTHAC301	
CTHAC361	
CTHAC421	3-1/4"
CTHAC481	
CTHAC601	

TABLE 10 – CTHAC181

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP24	75° DB/62° WB	Low Side	70	72	74	76	78	80	82	84	86
		High Side	187	202	217	231	246	260	275	290	304
	80° DB/67° WB	Low Side	75	77	79	82	84	86	88	91	93
		High Side	192	207	222	237	252	267	282	297	312
	85° DB/72° WB	Low Side	81	83	85	88	90	92	95	97	99
		High Side	198	214	229	245	261	277	293	308	324
CEVA018	75° DB/62° WB	Low Side	60	64	67	71	74	78	81	84	88
		High Side	180	196	211	227	243	259	274	290	306
	80° DB/67° WB	Low Side	65	68	72	75	79	82	86	89	93
		High Side	185	201	218	234	250	266	282	298	315
	85° DB/72° WB	Low Side	69	73	77	81	85	89	93	96	100
		High Side	191	208	225	242	259	276	293	310	327

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 11 – CTHAC241

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP24	75° DB/62° WB	Low Side	67	70	73	75	78	81	83	86	89
		High Side	198	213	228	243	258	273	288	303	318
	80° DB/67° WB	Low Side	72	75	78	80	83	86	88	91	94
		High Side	203	219	234	249	265	280	296	311	326
	85° DB/72° WB	Low Side	78	81	84	86	89	92	94	97	100
		High Side	211	227	242	258	274	290	305	321	337
CEVA024	75° DB/62° WB	Low Side	62	65	68	71	74	77	80	83	86
		High Side	198	214	229	244	260	275	291	306	321
	80° DB/67° WB	Low Side	67	70	73	76	79	82	85	88	91
		High Side	204	220	235	251	267	283	298	314	330
	85° DB/72° WB	Low Side	71	75	78	81	85	88	92	95	99
		High Side	211	227	244	260	276	292	308	324	340

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 12 – CTHAC301

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP30	75° DB/62° WB	Low Side	64	67	70	73	76	79	82	85	88
		High Side	202	216	230	245	259	273	287	302	316
	80° DB/67° WB	Low Side	69	72	75	78	81	84	87	90	93
		High Side	208	222	237	251	266	280	295	310	324
	85° DB/72° WB	Low Side	73	77	80	84	87	90	94	97	100
		High Side	215	230	245	260	275	290	305	320	335
CEVA030	75° DB/62° WB	Low Side	61	64	67	70	73	76	79	82	85
		High Side	196	211	226	241	256	271	286	301	316
	80° DB/67° WB	Low Side	66	69	72	75	78	81	84	87	90
		High Side	201	217	232	248	263	278	294	309	325
	85° DB/72° WB	Low Side	70	74	77	81	84	87	91	94	98
		High Side	207	223	239	256	272	288	304	320	336

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 13 – CTHAC361

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP36	75° DB/62° WB	Low Side	65	67	69	72	74	76	79	81	83
		High Side	185	200	216	231	247	262	278	293	308
	80° DB/67° WB	Low Side	70	72	74	77	79	81	83	86	88
		High Side	190	206	221	237	253	269	284	300	316
	85° DB/72° WB	Low Side	74	77	80	82	85	88	90	93	96
		High Side	196	221	229	245	262	278	295	311	328
CEVA036	75° DB/62° WB	Low Side	61	64	67	69	72	75	77	80	83
		High Side	197	210	224	238	252	365	280	293	307
	80° DB/67° WB	Low Side	66	69	72	74	77	80	82	85	88
		High Side	202	216	230	245	259	273	287	301	316
	85° DB/72° WB	Low Side	71	74	77	80	83	86	89	92	95
		High Side	209	224	238	253	268	281	297	311	326

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 14 – CTHAC421

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP42	75° DB/62° WB	Low Side	68	70	72	75	77	79	81	84	86
		High Side	184	199	215	231	247	263	278	294	310
	80° DB/67° WB	Low Side	73	75	77	80	82	84	86	89	91
		High Side	188	204	221	237	253	269	285	301	318
	85° DB/72° WB	Low Side	78	81	83	86	88	90	93	95	97
		High Side	194	211	228	245	262	279	296	313	330

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 15 – CTHAC481

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP48	75° DB/62° WB	Low Side	70	72	74	77	79	81	84	86	88
		High Side	191	205	220	234	249	263	278	293	307
	80° DB/67° WB	Low Side	75	77	79	82	84	86	89	91	93
		High Side	195	210	225	240	255	270	285	300	315
	85° DB/72° WB	Low Side	81	83	85	88	90	92	95	97	99
		High Side	202	218	233	249	264	278	295	310	326
CEVA048	75° DB/62° WB	Low Side	63	65	67	70	70	74	76	79	81
		High Side	173	189	206	222	239	256	272	289	305
	80° DB/67° WB	Low Side	68	70	72	75	77	79	82	84	86
		High Side	177	194	211	228	245	262	279	296	313
	85° DB/72° WB	Low Side	72	75	78	80	83	86	88	91	94
		High Side	183	201	219	236	254	272	289	307	325

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 16 – CTHAC601

Indoor Section	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
FCP60	75° DB/62° WB	Low Side	68	70	72	75	77	79	82	84	86
		High Side	194	211	228	246	263	280	298	315	332
	80° DB/67° WB	Low Side	73	75	77	80	82	84	87	89	91
		High Side	199	217	235	252	270	288	305	323	341
	85° DB/72° WB	Low Side	79	81	83	86	88	90	93	95	97
		High Side	207	225	243	261	279	297	315	333	351
CEVA060	75° DB/62° WB	Low Side	60	61	63	64	65	66	67	68	70
		High Side	197	210	222	235	248	261	273	286	299
	80° DB/67° WB	Low Side	64	65	67	68	70	72	73	75	76
		High Side	202	215	228	241	254	267	280	293	306
	85° DB/72° WB	Low Side	69	70	72	73	75	77	78	80	81
		High Side	209	222	236	250	263	276	289	303	317

Low side pressure ± 2 PSIG

High side pressure ± 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil. If there is any doubt as to correct operation charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.