Heating & Cooling Products

INSTALLATION INSTRUCTIONS

BC36C
INDOOR BLOWER COIL UNIT

FOR USE WITH
SPLIT HEAT PUMP and
SPLIT AIR CONDITIONER SYSTEMS

BARD MANUFACTURING COMPANY
Bryan, Ohio 43506

Since 1914...Moving ahead, just as planned.

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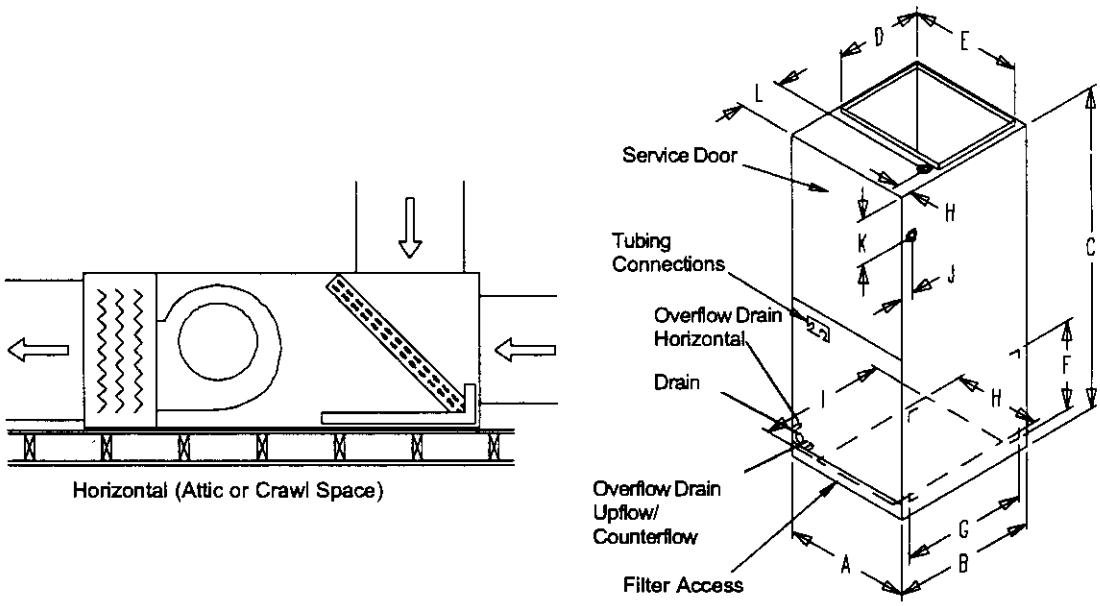
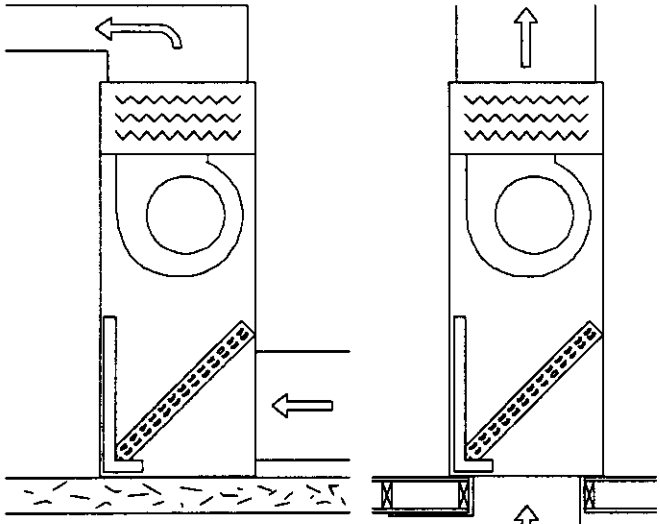
Contents

FIGURE 1

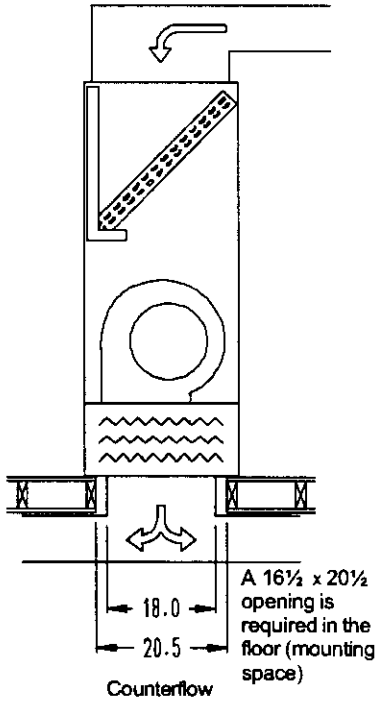


Horizontal (Attic or Crawl Space)



Upflow (Side Inlet)

Upflow (Bottom Inlet)



Counterflow

Requires Combustible Floor Base CFB35

Model	Cabinet Size			Supply Outlet		Side Return Air Opening		Bottom Return Air Opening		Electrical Opening Right Side		Electrical Opening Top	
BC36C	A	B	C	D	E	F	G	H	I	J	K	L	M
	20	23	51	14	18	14	20	16	19	2	7-1/4	6-11/16	2-1/4

TABLE 1

Model	BC36C
Electrical Rating – 60HZ – 50HZ	240/208V 1PH 240/220V 1PH
Operating Voltage Range	197-253
Fusing and Ampacity	See Electric Heat Table
Blower and Motor	10x9 Direct
Motor – RPM / Speed	1075 / 2 Speed
Motor – HP / Amps	1/3 / 2.1
Evaporator Face Area Sq. Ft. / Rows/ Fins Per Inch	3.12 / 3 / 10
Filter – Throwaway	16x20x1 T
Refrigerant Cont./ R22 Charge	Orifice
Maximum Electric Heat	18 KW

TABLE 2 – MAXIMUM E.S.P. OPERATION BC36C (1)

Type of Application	Upflow Position		Counterflowl Position (2)		Horizontal Position	
	Low. Speed	High Speed	Low Speed	High Speed	Low Speed	High Speed
Heat Pump w/18KW	.30	.45	(3)	(3)	.20	.40
Heat Pump w/14KW	.40	.55	(3)	(3)	.35	.50
Heat Pump w/ 9KW	.60	.60	.40	.50	.50	.55
Heat Pump w/ 5KW	.60	.60	.60	.60	.55	.60
Heat Pump Only	.60	.60	.60	.60	.60	.60
18KW Only	.60	.60	.60	.60	.60	.60
14KW Only	.60	.60	.60	.60	.60	.60
9KW Only	.60	.60	.60	.60	.60	.60
5KW Only	.60	.60	.60	.60	.60	.60

(1) Values shown are for bottom and side return air opening.

(2) Side inlet not available on counterflow applications.

(3) 18KW and 14KW not approved in counterflow position when used with heat pump heating.

NOTE: 14KW is the maximum electric heat approved for 50HZ applications.

TABLE 3 – OPTIONAL FIELD INSTALLED ELECTRIC HEATER TABLE

Heater Package Model No.	Heater Package Volts/Phase	Heater KW and Capacity @ 240 Volts		Heater KW and Capacity @ 208 Volts		Heater Amps @240/208 Volts	Max. Fuse Size (3)	Maximum Circuit Breaker (3)	Minimum Circuit Ampacity (3)	Field Wire Size (4)	Ground Wire Size (5)
		KW	BTU	KW	BTU						
None	---	---	---	---	---	---	15	HACR Type 15	15	14	14
EH3BA-A05N,C	240/208–1	4.5	15345	3.38	11525	18.8/16.3	30	HACR Type30	28.1	10	10
EH3BA-A09N,C	240/208–1	9	30690	6.75	23018	37.5/32.5	50	HACR Type 50	50	6	10
EH3BB-A14N,C	240/208–1	13.5	46035	10.13	34543	56.3/48.7	80	80	74.9	3	8
EH3BA-A18N,C	240/208–1	18	61380	13.5	46035	75/64.9	100	100	98.3	1	8

(3) Includes blower motor

(4) Suggested size based on use of 60 degree C wiring material for ampacities less than 100A.

(5) Based upon table 250-95 degree F 1987 N.E.C.

NOTE: 9KW is the maximum electric heat approved for 50 HZ applications.

TABLE 4 – INDOOR BLOWER COIL PERFORMANCE [DRY COIL @ 230 VOLTS 60 HZ (3)] (1)

Model	KW	Speed	Position	IN H_2O						
				.00	.10	.20	.30	.40	.50	.60
BC36C	0	HI	Upflow/Horizontal	1348	1297	1230	1174	1110	1009	883
	0	Low	Upflow/Horizontal	1169	1135	1090	1042	987	853	707
BC36C	5	Hi	Upflow/Horizontal	1333	1282	1215	1159	1095	994	868
	5	Low	Upflow/Horizontal	1154	1120	1075	1027	972	838	692
BC36C	9	Hi	Upflow/Horizontal	1275	1219	1143	1090	956	832	672
	9	Low	Upflow/Horizontal	1173	1105	1055	974	867	734	619
BC36C	14	Hi	Upflow/Horizontal	1260	1198	1128	1075	941	817	657
	14	Low	Upflow/Horizontal	1158	1090	1040	959	852	719	604
BC36C	18	Hi	Upflow/Horizontal	1245	1183	1113	1060	926	802	642
	18	Low	Upflow/Horizontal	1143	1075	1025	944	837	704	589

TABLE 5 INDOOR BLOWER COIL PERFORMANCE [DRY COIL @ 230 VOLTS 60 HZ (3)] (1)

Model	KW	Speed	Position	IN H_2O						
				.00	.10	.20	.30	.40	.50	.60
BC36C	0	HI	Counterflow	1305	1243	1173	1120	986	862	702
	0	Low	Counterflow	1203	1135	1085	1004	897	764	649
BC36C	5	Hi	Counterflow	1290	1228	1158	1105	971	847	687
	5	Low	Counterflow	1188	1120	1070	989	882	749	634
BC36C	9	Hi	Counterflow	1275	1219	1143	1090	956	832	672
	9	Low	Counterflow	1173	1105	1055	974	867	734	619
BC36C	14	Hi	Counterflow	1260	1198	1128	1075	941	817	657
	14	Low	Counterflow	1158	1090	1040	959	852	719	604
BC36C	18	Hi	Counterflow	1245	1183	1113	1060	926	802	642
	18	Low	Counterflow	1143	1075	1025	944	837	704	589

(1) Values shown are standard for both bottom and side return air opening.

(2) Values shown are standard for bottom return air opening, side return air opening nor available for counterflow.

(3) Reduce airflow values shown by 130 CFM for 208 volt operation.

NOTE: For 50 HZ applications, reduce CFM's by 17%

I. APPLICATION AND LOCATION

GENERAL

Units are shipped completely assembled and internally wired, requiring only duct connections, thermostat wiring and external 208-240 volt AC power supply.

The blower coil units, with various KW electric heat options can be used both as an air conditioning system with electric heat and as a heat pump with electric heat. Refer to sections titled, *"Air Conditioning With Electric Heat"* and *"Heat Pump With Electric Heat"* for complete information.

SHIPPING DAMAGE

Upon receipt of equipment, carton should be checked for external signs of damage. If damage is found, request for inspection by carrier's agent should be made in writing immediately.

APPLICATION

Size of unit for a proposed installation should be based on heat loss calculation 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 No. 90A, and Residence Type Warm Air heating and Air Conditioning System, NFPA No. 90B. Where local regulations are at a variance with instructions, installer should adhere to local codes.

DUCT WORK

Design duct work according to methods given by the Air Conditioning Contractors of America. When duct runs through unheated spaces, it should be insulated with a minimum of two inches of insulation. Use insulation with a vapor barrier on the outside of the insulation. Flexible joints should be used to connect the duct work to the equipment in order to keep the noise transmission to a minimum.

LOCATION AND CLEARANCES

All access to the equipment is from one side, and at least 24 inches should be provided from this side for service access.

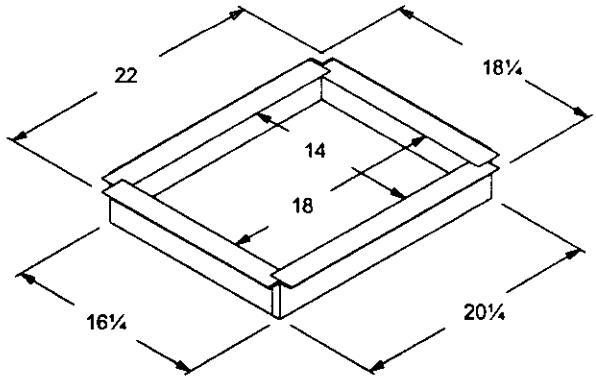
Unit casing is suitable for 0 inch clearance. The fist four (4) feet of duct work attached to the outlet (supply air) connections of the unit are to have a minimum of one inch clearance for any remaining duct work.

A CFB combustible floor base is required for downflow installations to assure a one inch clearance from combustible materials to the outlet plenum (duct). See Figure 2.

A 16½ x 20½ opening is required in the floor (mounting surface).

The CFB35 combustible floor base must be ordered separately. It is not included as part of the basic unit.

FIGURE 2



⚠ WARNING

Failure to provide the one inch clearance for the first four feet between the supply duct and a combustible surface can result in fire.

MOUNTING POSITIONS

The blower coil can be installed in three positions with respect to airflow direction: upflow, horizontal and downflow. The general intent of these mounting positions is shown in Figure 1 of this installation manual. Capacity and efficiency ratings are certified in the vertical installation position. Capacity may be reduced slightly for other installation positions.

The unit is shipped with the coil installed for upflow or horizontal position. It is secured in place by four screws, two on the top left support angles and two on the top right support angles. The following steps will enable the installer to convert to counterflow position:

1. Remove front access panel;
2. Remove the four screws securing the coil pan assembly and remove coil.
3. Place cabinet in desired mounting position and reinstall coil as shown in Figure 1. Make sure the coil is installed as shown with respect to blower.

*** * IMPORTANT * ***

The unit as received has coil installed for upflow/ horizontal position only. It must be rotated 180 degrees for downflow positions. See note under "Condensate Drain".

EXPANSION DEVICE

The flow control assembly has an orifice which provides the function of the expansion device as well as distributes the refrigerant equally to all evaporator circuits. It features a "take apart" brass body which housed a removable orifice assembly which meters the proper amount of refrigerant flow and serves as the expansion device. This orifice can be removed and replaced.

There is an orifice shipped installed with the flow control in each coil. Refer to outdoor unit installation instructions to find if the orifice shipped installed is matched to the outdoor unit. Example: Outdoor unit 36UHPQC with BC36C is a matched combination. For other combinations of indoor coil to outdoor unit application, the orifice in the flow control devise ***must*** be changed to the size shown in the chart in the outdoor unit installation instructions. An additional proper sized orifice to be used with each outdoor unit is shipped packaged in the envelope with the installation instructions with each outdoor unit. The installer should mark the size of the orifice installed on the rating plate of the indoor coil. The diameter of the orifice is stamped on the side of the brass orifice and on the plastic bag. Example: 063 indicates the orifice is .063" inside diameter. Refer to outdoor unit installation instructions for proper procedure for changing orifice.

CONDENSATE DRAIN

Determine where the drain line will run. This drain line contains cold water and must be insulated to avoid drops of water from dropping on ceiling, etc. A trap ***must*** be installed in the primary drain line below the bottom of the drain pan. With a trap installed on a unit located in an unconditioned area, water in the trap may freeze. It is recommended that the trap material be of a type that will allow for expansion of water when it freezes.

For horizontal installations with auxiliary drain pan, a separate drain line should be run form the auxiliary drain pan and terminated where the homeowner can see it. Be certain to show the homeowner the location of the drain line and to explain its purpose. In the event of overflow of primary drain, water will collect in the auxiliary pan and run out through the auxiliary drain line.

It is not recommended that any condensate drain lines be connected to sewer main. Drain lines must be installed in accordance with local codes.

When installed horizontally in an attic installation, a platform should be made for the unit to sit on. This platform can be made from 3/4 inch plywood or boards. An auxiliary drain pan should always be used when equipment id installed over a finished living area to provide protection from water damage in case of plugging of the primary drain line from the unit condensate collection pan.

Secure 4 pieces of cork or live rubber, 4" x 4", of sufficient thickness to allow primary drain to clear edge of auxiliary drain pan under each corner of the unit.

NOTE: There are two 3/8" copper tubes brazed through the coil drain pan approximately 2 inches from the 3/4 inch main drain pipe coupling. These are overflow drains to control the point at which water would exit the drain pan in the event the primary drain becomes plugged. Whenever the coil assembly is removed and reinstalled, make sure the 3/8" drain overflow tubes extend slightly beyond the coil door when in place.

II. WIRING

THERMOSTAT LOW-VOLTAGE WIRING

A 24V terminal block is mounted on the inside of the unit. There is also a 24V terminal block located in the outdoor section of remote heat pumps and two tagged 24V wires in the outdoor section of remote air conditioners. Wire sizing is determined from the table below for 24V control circuit wiring.

Transformer VA	FLA @ 240V	Maximum Distance in Feet (1)
55	2.3	20 gauge – 45
		18 gauge – 60
		16 guage – 100
		14 gauge – 160
		12 gauge – 250

(1) For split systems, this is the maximum distance between the indoor section and outdoor section, and between the indoor section and thermostat each could be up to 90 feet for 18 gauge and 65 feet for 20 gauge on 40VA transformer.

Specific control circuit wiring diagrams for the various applications are reverenced in the sections titled "*Air Conditioning With Electric Heat*" and "*Heat Pump With Electric Heat*". These diagrams detail the recommended controls and wiring to allow the best possible operation of the different types of systems with respect to energy conservation while still maintaining close comfort levels for the occupant.

UNIT OPERATION

The controls in the blower coil provide for manual/auto fan control in addition to the staging of the installed electric heat. Staging is accomplished in basic 9KW increments, that is, each two (2) heating elements are controlled by one heat relay.

TABLE 6
HEATER ELEMENT STAGING

Heater KW	Stages
5, 9	1
14, 18	2

Heater stage designations are as follows on the 24V terminal strip:

W2	1st stage
W3	2nd stage

AIR CONDITIONING WITH ELECTRIC HEAT

Typical situations would be to utilize a 1-stage cool, 1-stage heat wall thermostat for 5KW and 9KW applications; and a 1-stage cool, 2-stage heat thermostat for 14KW and 18KW applications. Listed below are the appropriate control circuit connection diagrams based upon KW rating and also the number of field installed outdoor thermostats required for each application.

TABLE 7

KW Rating	Connection Diagram	Quantitiy of Outdoor Thermostats
0	4091-300	0
5, 9	4091-301	0
14, 18	4091-303	0

HEAT PUMP WITH ELECTRIC HEAT

The system and its safety controls are designed in such a manner that the heat pump and up to 18KW of the resistance strip heaters can operate at the same time being brought on in stages.

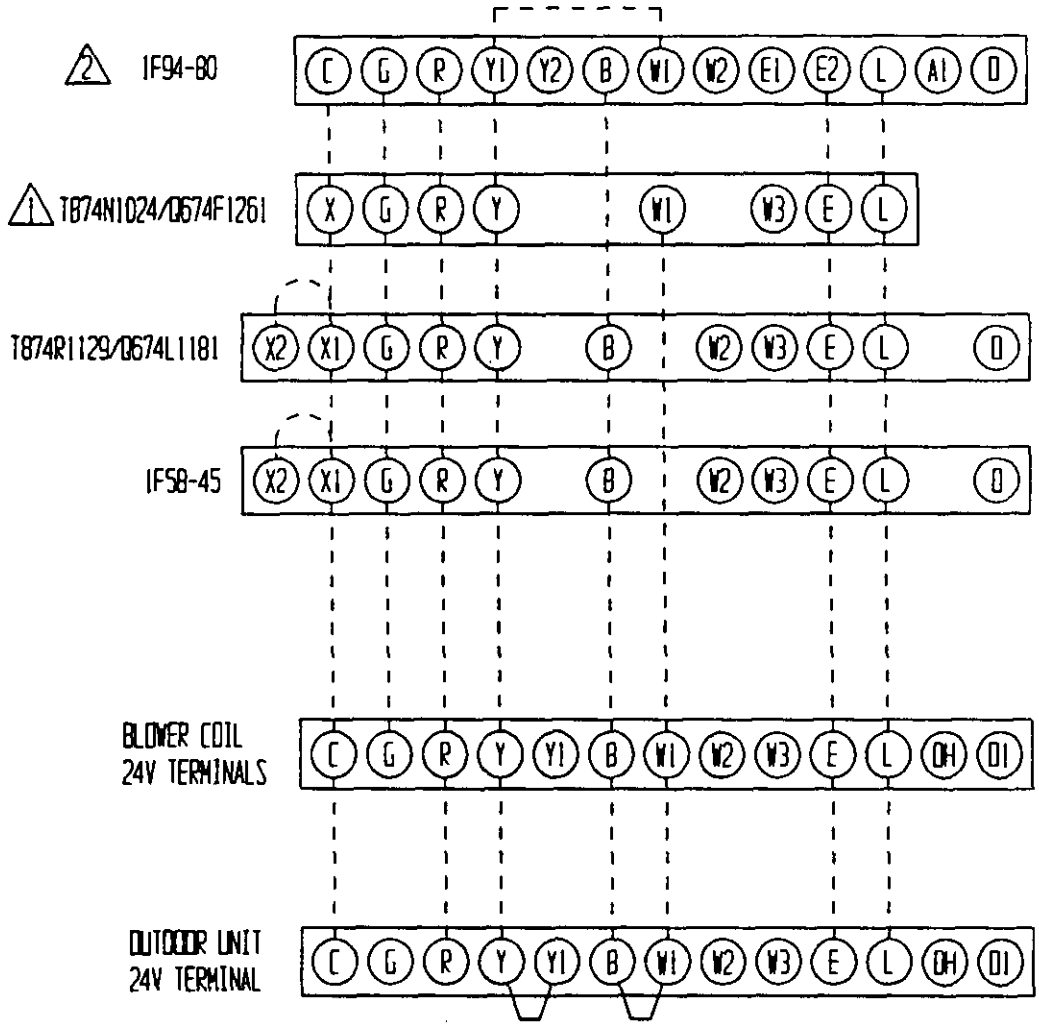
Table 8 lists the appropriate control circuit connection diagrams based on KW rating, and also the number of field installed outdoor thermostats recommended for each application.

TABLE 8

KW Rating	Connection Diagram	Quantitiy of Outdoor Thermostats
0	4091-400	0
5, 9	4091-401	1
14, 18	4091-403	1

In geographical areas where compressor cutoff would not be required because winter temperatures below 10 degrees F are never experienced, Disregard the compressor cutoff wiring shown on the control circuit diagram.

FIGURE 3



1 SET ADJUST HEAT ANTICIPATOR (SEE BLOWER COIL INSTRUCTIONS).

HEATPUMP W/OKW BLOWER COIL

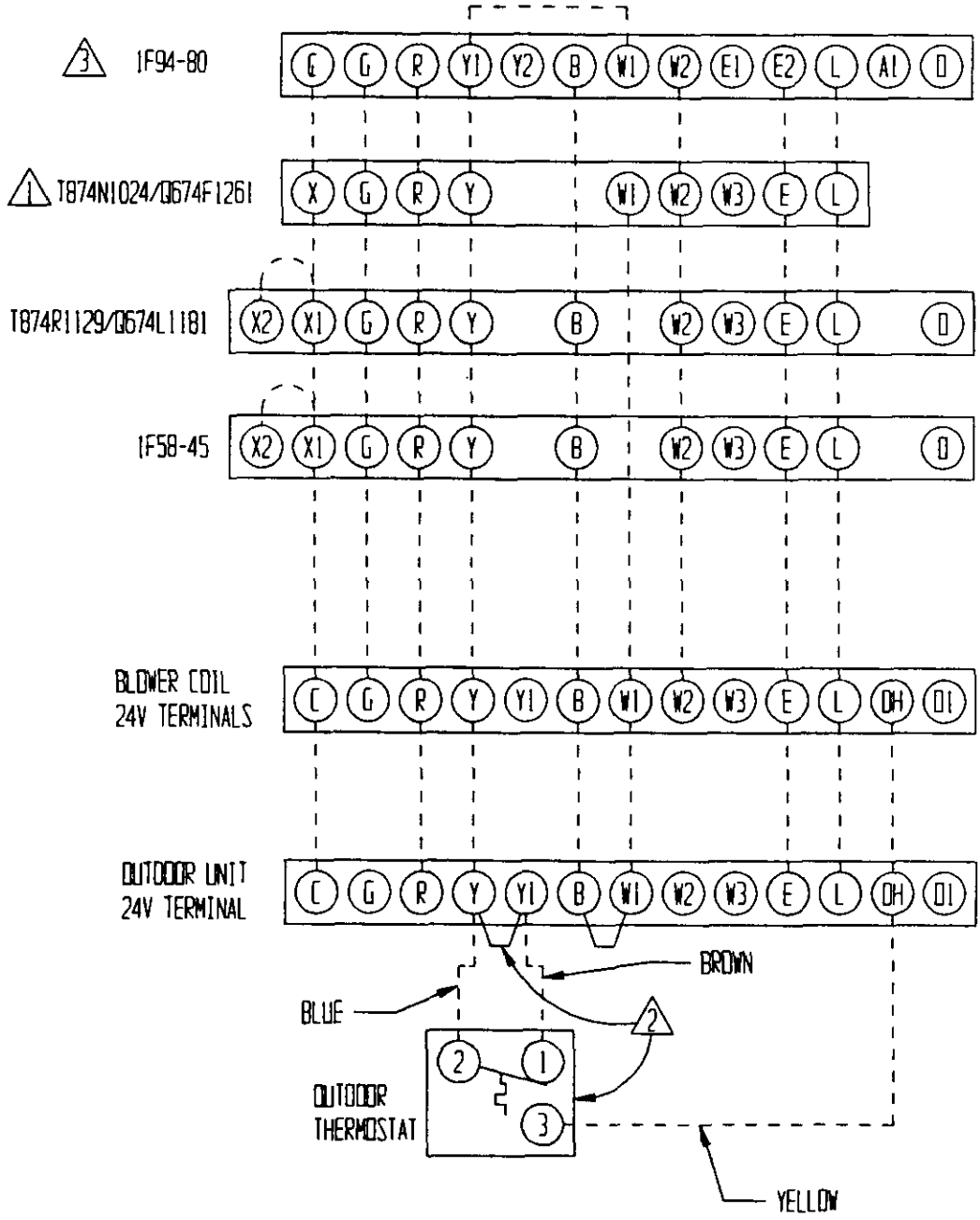
2 OPTION SWITCH SETTING

SWITCH #1 "OFF"
SWITCH #2 "OFF"
SWITCH #3 "OFF"
SWITCH #4 SEE THERMOSTAT INSTALLATION INSTRUCTIONS

	FACTORY WIRING	FIELD WIRING
LOW VOLTAGE	———	- - - -
H VOLTAGE	———	- - - -

4091-400 C

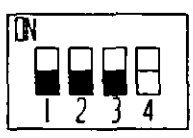
FIGURE 4



HEATPUMP W/5 TO 10KW BLOWER COIL

1. SET ADJUST HEAT ANTICIPATOR (SEE BLOWER COIL INSTRUCTIONS).
2. WHEN OUTDOOR THERMOSTAT (USED AS COMPRESSOR CUTOFF) IS INSTALLED, REMOVE JUMPER Y-Y1.
3. OPTION SWITCH SETTING

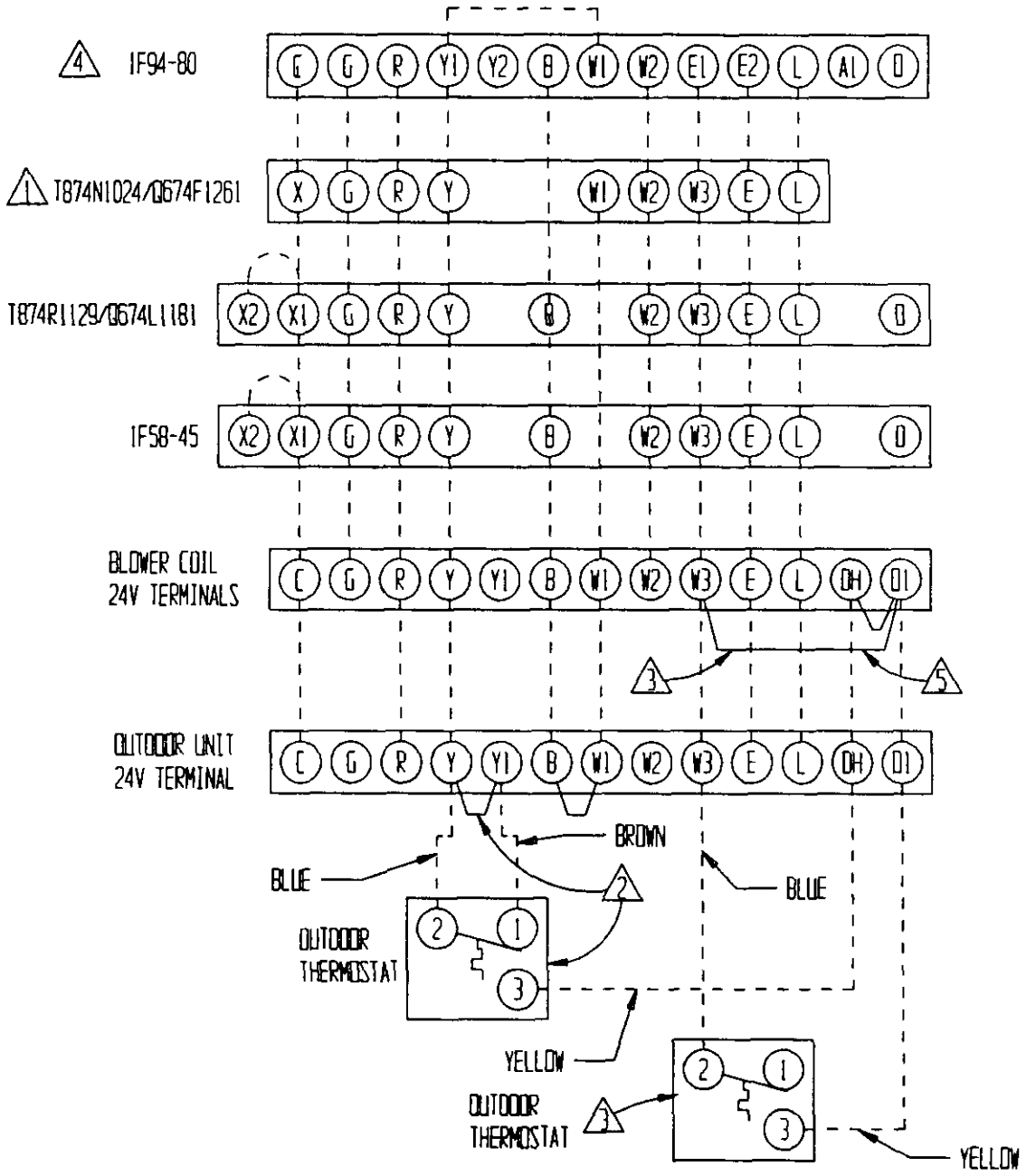
	FACTORY WIRING	FIELD WIRING
LOW VOLTAGE	———	- - - -
HIGH VOLTAGE	———	- - - -



SWITCH #1 "OFF"
SWITCH #2 "OFF"
SWITCH #3 "OFF"
SWITCH #4 SEE THERMOSTAT INSTALLATION INSTRUCTIONS

4091-401 E

FIGURE 5

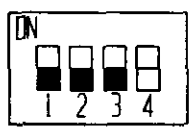


1. SET ADJUST HEAT ANTICIPATOR (SEE BLOWER COIL INSTRUCTIONS).
2. WHEN OUTDOOR THERMOSTAT (USED AS COMPRESSOR CUTOFF) IS INSTALLED, REMOVE JUMPER Y-Y1.

HEATPUMP W/14 TO 20KW BLOWER COIL

	FACTORY WIRING	FIELD WIRING
LOW VOLTAGE	———	- - - -
HIGH VOLTAGE	———	- - - -

3. IF OUTDOOR THERMOSTAT IS USED TO STAGE HEAT, REMOVE JUMPER W3-D1.
4. OPTION SWITCH SETTING



SWITCH #1 "OFF"
SWITCH #2 "OFF"
SWITCH #3 "OFF"
SWITCH #4 SEE THERMOSTAT INSTALLATION INSTRUCTIONS

5. FOR COUNTERFLOW APPLICATIONS, REMOVE JUMPER W3-D1 ON BC35B & BC36B MODELS ONLY.

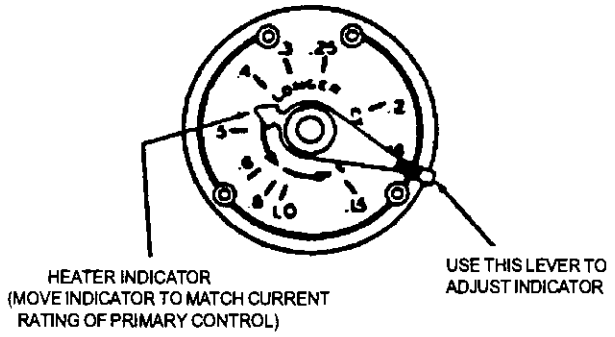
4091-403 E

HOW TO SET AN ADJUSTABLE ANTICIPATOR

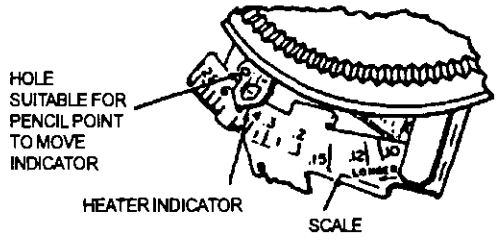
The primary purpose of the adjustable anticipator thermostat is to provide a single thermostat to match almost any type of primary control in the field today.

The adjustable heat anticipator has a slide wire adjustment with the pointer scale marked in tenths of an ampere. This is used to set the anticipator to agree with the control amp draw of the control system in use. Refer to Figure 6.

FIGURE 6



OR



If the primary control nameplate has no rating or if further adjustment is necessary, use the following procedure to determine the current draw of each stage:

The current draw of each heating stage must be measured with the thermostat removed and the power on.

1. Connect an AC ammeter of appropriate range between the heating terminals of the subbase.

   Stage 1 — between W1 and RH or R

   Stage 2 — between W2 and RH or R

2. Move the system switch to *HEAT* or *AUTO*.
3. After one minute, read the ammeter and record the reading.
4. After mounting the thermostat, set the adjustable heat anticipator(s) to match the respective reading(s) measured in Step 3.

If you want to change the cycle of the heating system, you can make a simple adjustment on the anticipator to do this.

Additional adjustment, if necessary, may be made as follows:

Heater cycles too short – set adjustable heater to a slightly higher dial setting (1/2 division).

Heater cycles too long – set adjustable heater to a slightly lower dial setting (1/2 division).

Occasionally you may find a system where longer or shorter cycles of the primary control are desirable. If the primary control draws .45 amps and you want a longer cycle, set the anticipator to .5 of .6 amps. This puts *less* resistance in the circuit. With less resistance, but the same current (from the primary control), you will generate less "false" heat and get a longer cycle of the primary control.

If a setting of .45 amps on the adjustable anticipator gives a cycle that is longer than desired, reset the indicator to .3 or .25 amps. This will put *more* resistance in the circuit and thus generate more "false" heat for shorter cycles.

ADDITIONAL INFORMATION FOR ELECTRIC HEAT OR HEAT PUMP APPLICATIONS

Adjust heat anticipator to match current rating of heating relay for W1 (and W2 if 2 stage). Move indicator on the scale to correspond with this current rating.

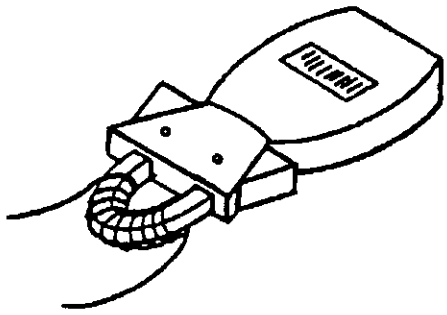
If the current rating is not given, proceed as follows:

1. Wrap exactly 10 loops of thermostat wire (W1) around the prongs of an Amprobe. See Figure 4.
2. Let the heating system operate for one minute before reading the W1 or W2 current draw.
3. Divide the reading obtained in step 2 by 10.
4. Use the value calculated in Step 3 to set the heat.
5. Repeat the procedure for W2 if 2 stage heat anticipator.

NOTE: Cooling anticipators on all thermostats are fixed and do not require setting.

Example: $\frac{6.0 \text{ Amp}}{10 \text{ loops}} = .6\text{A}$

FIGURE 7



III. SERVICE

TWO SPEED BLOWER MOTOR

The blower coil has a two speed, 1/3 hp blower motor.

Motor lead wire identification is as follows:

Common	Yellow
High	Black
Medium	Blue
Low	Red
Capacitor	Brown

Models are shipped wired on high speed. The unused red (low speed) lead wire is taped off. If low speed operation is desired, remove and tape black wire from terminal *com.* on blower relay and connect red wire to terminal *com.* Refer to wiring diagrams for electrical circuitry and to airflow charts for capabilities and limitations on blower speeds, static pressures and air delivery versus installed KW heaters.

BLOWER MOTOR OILERS

The blower motors should be oiled twice a year with approximately 8 - 10 drops of 20 weight motor oil. *DO NOT* over oil and *DO NOT* use 3-in-1 oil or any other light oil.

IMPORTANT NOTE FOR DOWNFLOW INSTALLATION:
Loosen bellyband bolt securing motor enough to rotate motor so oilers are above either 3 or 9 o'clock position so oiler do not drain and to permit reoiling.

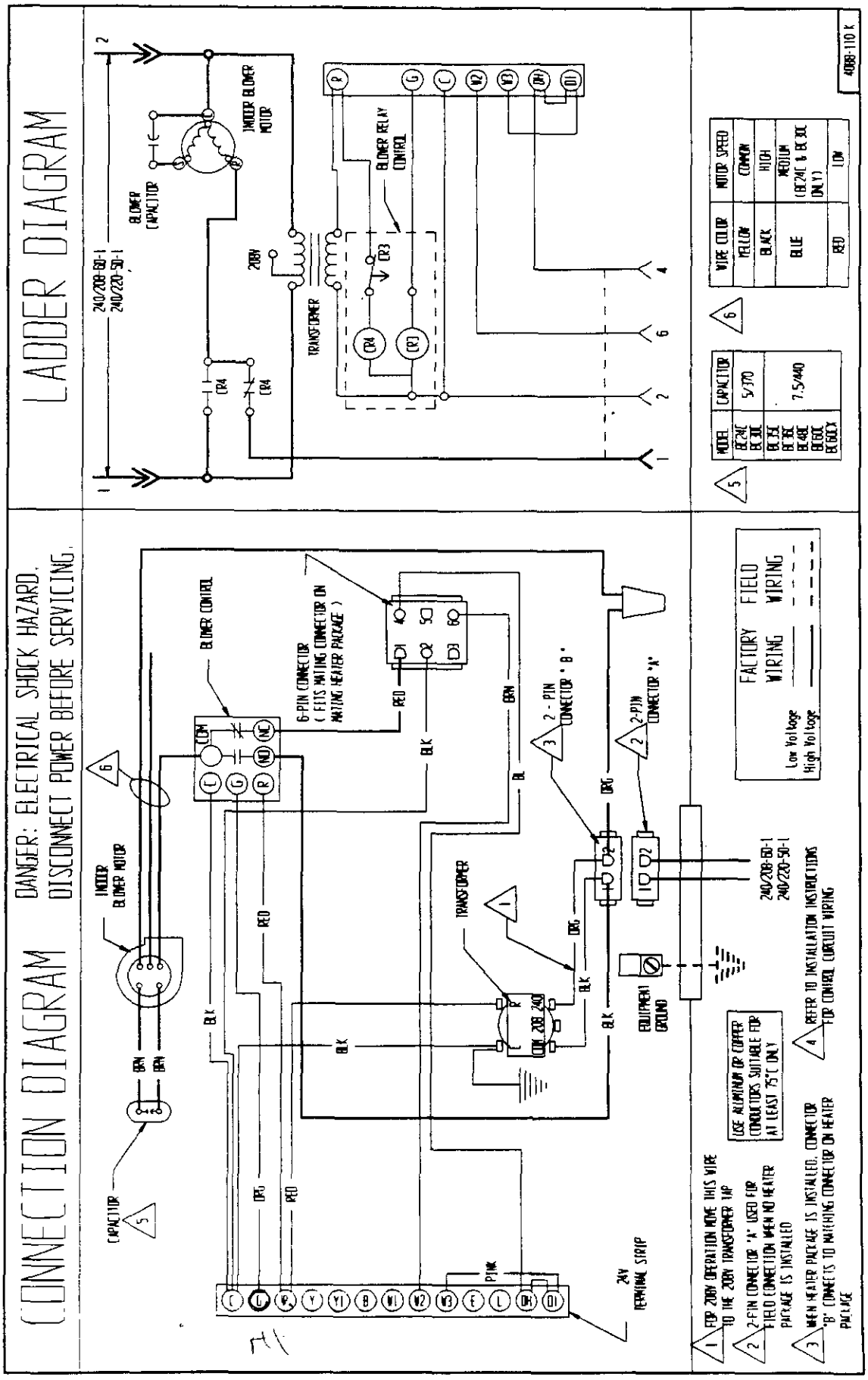
FILTERS

These units come equipped with a 16" x 20" x 1" thick disposable fiberglass filter and must not be operated without a filter in place. Filter access is gained by removing and angle piece located at the bottom of the main unit cabinet (as viewed in upflow position).

The filter should be replaced periodically throughout the year as these are year-round heat-cool systems. Special attention should be given to filter cleanliness on any new installation as airborne dust and debris from recent construction can easily plug a filter in a matter of days.

Dirty filters are the most prevalent and most easily corrected problem to be encountered in any forced air heating and/or cooling system.

FIGURE 8


LADDER DIAGRAM
CONNECTION DIAGRAM
DANGER: ELECTRICAL SHOCK HAZARD.
DISCONNECT POWER BEFORE SERVICING.
240/208-60-1
240/220-50-1
INDOOR BLOWER MOTOR
BLOWER CAPACITOR
208V
TRANSFORMER
CR4
CR3
CR1
BLOWER RELAY CONTROL
MOTOR
CAPACITOR
WIRE COLOR
MOTOR SPEED
YELLOW
COMMON
BLACK
HIGH
BLUE
MEDIUM (DE/24C & DE 30C ONLY)
RED
LOW
4086-110 K
BLOWER CONTROL
6-PIN CONNECTOR (FITS MATING CONNECTOR ON MATING HEATER PACKAGE)
2 - PIN CONNECTOR "B"
2-PIN CONNECTOR "A"
FACTORY WIRING
FIELD WIRING
Low Voltage
High Voltage
24V TERMINAL STRIP
EQUIPMENT GROUND
FOR 208V OPERATION MOVE THIS WIRE TO THE 208V TRANSFORMER TAP
2-PIN CONNECTOR "A" USED FOR FIELD CONNECTION WHEN NO HEATER PACKAGE IS INSTALLED
WHEN HEATER PACKAGE IS INSTALLED, CONNECTOR "B" CONNECTS TO MATCHING CONNECTOR ON HEATER PACKAGE
USE ALUMINUM OR COPPER CONDUCTORS SUITABLE FOR AT LEAST 75°C ONLY
REFER TO INSTALLATION INSTRUCTIONS FOR CONTROL CIRCUIT WIRING