



INSTALLATION INSTRUCTIONS

BC24C and BC30C INDOOR BLOWER COIL UNIT

FOR USE WITH SPLIT HEAT PUMP and SPLIT AIR CONDITIONER SYSTEMS

BARD MANUFACTURING COMPANY
Bryan, Ohio 43506

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Contents

I. Application and Location

General	4
Shipping Damage	4
Application	4
Duct Work	4
Location and Clearances	4
Mounting Positions	4
Expansion Device	5
Condensate Drain	5

II. Wiring

Thermostat Low-Voltage Wiring	5
Unit Operation	5
Air Conditioning with Electric Heat	6
Heat Pump with Electric Heat	6
How To Set an Adjustable Anticipator	10
Additional Information for Electrical Heat or Heat Pump Applications	10

III. Service

Three Speed Blower Motor	11
Filters	11

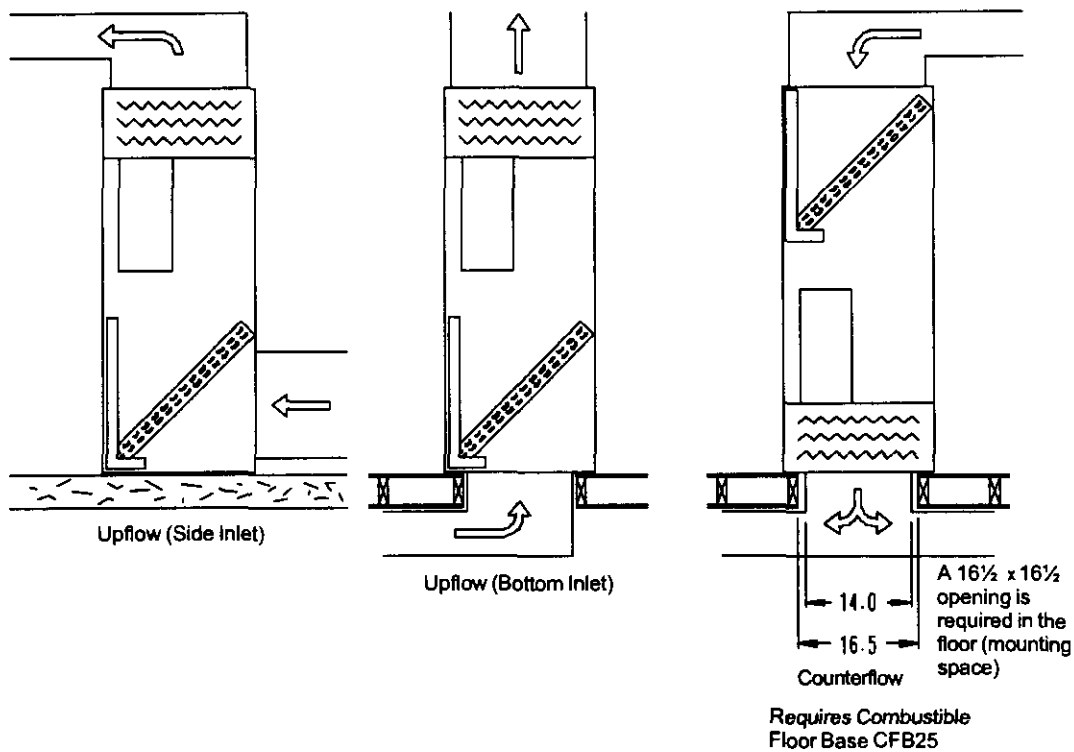
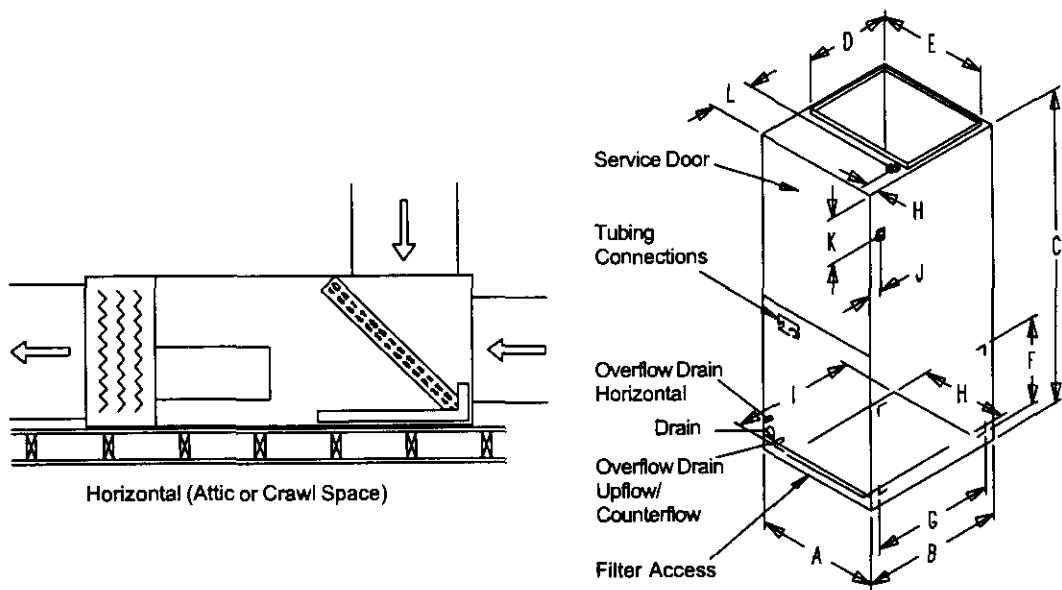
Figures

Figure 1 Mounting Positions	1
Figure 2 Dimensions of CFB25	3
Figure 3 Wiring Diagram	7
Figure 4 Wiring Diagram	8
Figure 5 Wiring Diagram	9
Figure 6 Adjustable Anticipator Thermostats	10
Figure 7 Amprobe	10
Figure 8 Wiring Diagram	12

Tables

Table 1	2
Table 2	2
Table 3	3
Table 4	3
Table 5	3
Table 6	5
Table 7	6
Table 8	6

FIGURE 1



Model	Cabinet Size			Supply Outlet		Side Return Air Opening		Bottom Return Air Opening		Electrical Opening Right Side		Electrical Opening Top	
	A	B	C	D	E	F	G	H	I	J	K	L	M
BC24C BC30C	16	23	47	14	14	10	20	12-1/2	19	2	7	2	4-1/2

TABLE 1

Model	BC24C, BC30C
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	10x6 Direct
Motor – RPM / Speed	1100 / 3 Speed
Motor – HP / Amps	1/4 / 1.9
Evaporator Face Area Sq. Ft. / Rows/ Fins Per Inch	2.75 / 3 / 15
Filter – Throwaway	12x20x1 T
Refrigerant Cont./ R22 Charge	Orifice
Maximum Electric Heat	9 KW

TABLE 2 – OPTIONAL FIELD INSTALLED ELECTRIC HEATER TABLE

Heater Package Model No.	Heater Package Volts/Phase	Heater Amps, KW and Capacity @ 240 Volts			Heater Amps, KW and Capacity @ 208 Volts			Heater Amps @240/208 Volts	Max. Fuse Size (3)	Minimum Circuit Ampacity (3)	Maximum Circuit Breaker (3)	Field Wire Size (4)	Ground Wire Size (5)
		AMPS	KW	BTU	AMPS	KW	BTU						
None	--	--	--	--	--	--	--	--	15	15	HACR Type 15	14	14
EH2BA-A05N,C	240/208-1	37.5	9	30690	32.5	6.75	23018	18.8/16.3	60	54	HACR Type 60	6	10
EH2BB-A09N,C	240/208-1	56.3	13.5	46035	48.7	10.13	34543	37.5/32.5	80	77	80	3	10

(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: 5KW is the maximum electric heat approved for 50 HZ applications.

TABLE 3 – MAXIMUM E.S.P. OPERATION INFORMATION ELECTRIC HEAT ONLY

KW Installed	Upflow Position			Horizontal Position			Counterflow Position		
	Low Speed	Med. Speed	High Speed	Low Speed	Med. Speed	High Speed	Low Speed	Med. Speed	High Speed
0 KW	.60	.60	.60	.60	.60	.60	.60	.60	.60
5 KW	.60	.60	.60	.60	.60	.60	.60	.60	.60
9 KW	.60	.60	.60	.60	.60	.60	.60	.60	.60

TABLE 4 – MAXIMUM E.S.P. OPERATION INFORMATION HEAT PUMP HEATING WITH ELECTRIC HEAT

Compressor Section	KW Installed	Upflow Position			Horizontal Position			Counterflow Position		
		Low Speed	Med. Speed	High Speed	Low Speed	Med. Speed	High Speed	Low Speed	Med. Speed	High Speed
18HPQ6, 24HPQ6, 24UHPQC	5 KW	.60	.60	.60	.60	.60	.60	.60	.60	.60
18HPQ6, 24HPQ6, 24UHPQC	9 KW (1)	.20	.50	.60	.40	.55	.60	.50	.55	.60
30HPQ6	5 KW	N/A	.45	.50	N/A	.40	.55	N/A	N/A	.50
30HPQ6	9 KW (1)	N/A	.15	.15	N/A	.15	.25	N/A	N/A	.15
WQS30A	5 KW	N/A	N/A	.30	N/A	N/A	.35	N/A	N/A	.35
WQS30A	9 KW (1)	N/A	N/A	.30	N/A	N/A	.35	N/A	N/A	.35

(1) Control circuit connections allow only for operation of heat pump and 5 KW. Second stage 5 KW can only be used as emergency heat.

TABLE 5 – INDOOR BLOWER COIL PERFORMANCE (DRY COIL @ 230 VOLTS 60 HZ) (1) (2) (3)

Model	KW	Speed	Position	IN H ₂ O						
				.00	.10	.20	.30	.40	.50	.60
BC24C, BC30C	0	Hi	All	1007	944	934	883	833	773	722
BC24C, BC30C	0	Med	All	825	818	801	770	735	695	641
BC24C, BC30C	0	Low	All	---	---	627	613	599	575	542
BC24C, BC30C	5	Hi	All	992	962	919	868	818	758	707
BC24C, BC30C	5	Med	All	810	803	786	755	718	680	626
BC24C, BC30C	5	Low	All	---	---	612	597	582	560	527
BC24C, BC30C	9	Hi	All	977	947	904	853	803	743	692
BC24C, BC30C	9	Med	All	795	788	771	740	703	665	611
BC24C, BC30C	9	Low	All	---	---	597	583	569	545	512

- (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 not available for counterflow.
- (3) Reduce airflow valves shown by 70 CFM for 208 volt operation.

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.

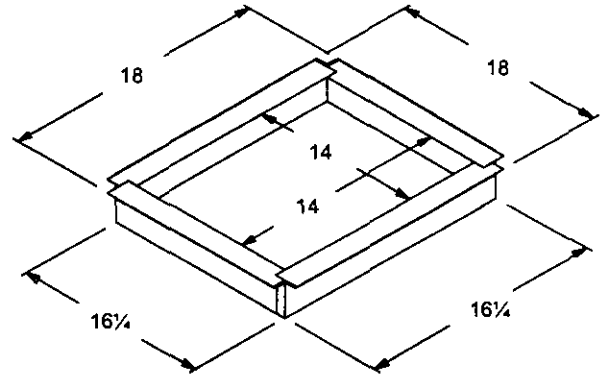
Unit casing is suitable for 0 inch clearance. The first four (4) feet of duct work attached to the outlet (supply air) connections of the unit are to have a minimum of one inch clearance for any remaining duct work.

A CFB25 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 16½ opening is required in the floor (mounting surface).

The CFB 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 device **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 from 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 is 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)
40	1.6	20 gauge - 65
		18 gauge - 90
		16 gauge - 145
		14 gauge - 230

- (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 referenced 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 4.5KW increments, that is, each heating element is controlled by one heat relay.

**TABLE 6
HEATER ELEMENT STAGING**

Heater Package	Stages
EH2BA-A05N,C	1
EH2BB-A09N,C	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

Heater Package	Connection Diagram	Quantity of Outdoor Thermostats
None	4091-300	0
EH2BA-A05N,C	4091-301	0
EH2BB-A09N,C	4091-303 *	0

* To convert this application to 1 stage, use connection diagram 4091-301 and add jumper between "W2" and "W3" on blower coil.

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.

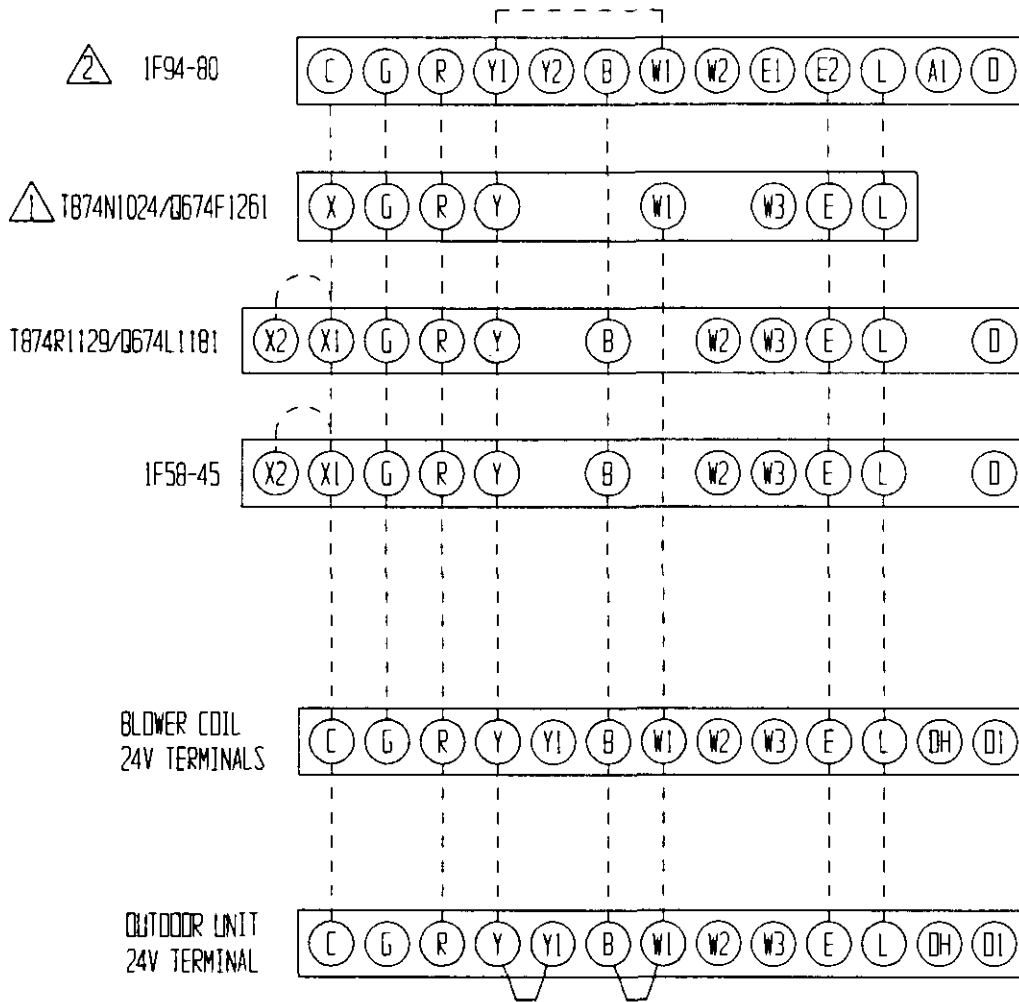
TABLE 8

Heater Package	Connection Diagram	Quantity of Outdoor Thermostats
None	4091-400	0
EH2BA-A05N,C	4091-401	1
EH2BB-A09N,C	4091-403*	1

* To convert this application to 1 stage, use connection diagram 4091-401 and add jumper between "W2" and "W3" on blower coil.

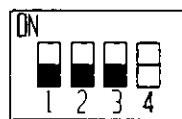
In geographical areas where compressor cutoff would not be required because winter temperatures below 10 degrees F are never experienced, Disregard the compressor cutoff wiring shown on the control circuit diagram.

FIGURE 3



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

2 OPTION SWITCH SETTING



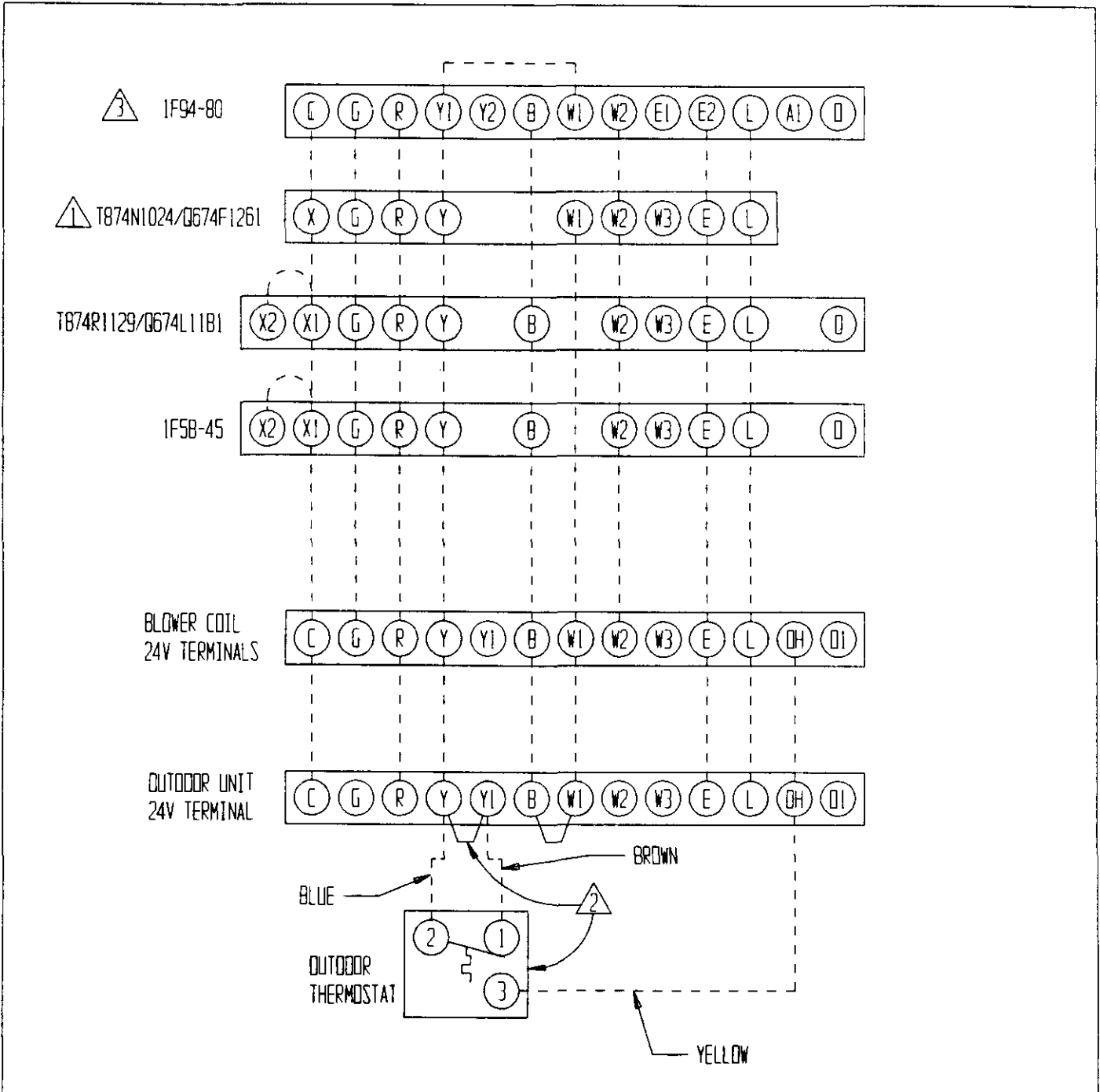
SWITCH #1 "OFF"
 SWITCH #2 "OFF"
 SWITCH #3 "OFF"
 SWITCH #4 SEE THERMOSTAT
 INSTALLATION INSTRUCTIONS

HEATPUMP W/O KW BLOWER COIL

	FACTORY WIRING	FIELD WIRING
LOW VOLTAGE	_____	-----
HIGH VOLTAGE	_____	-----

4091-400 C

FIGURE 4



HEATPUMP W/S TO 10KW BLOWER COIL

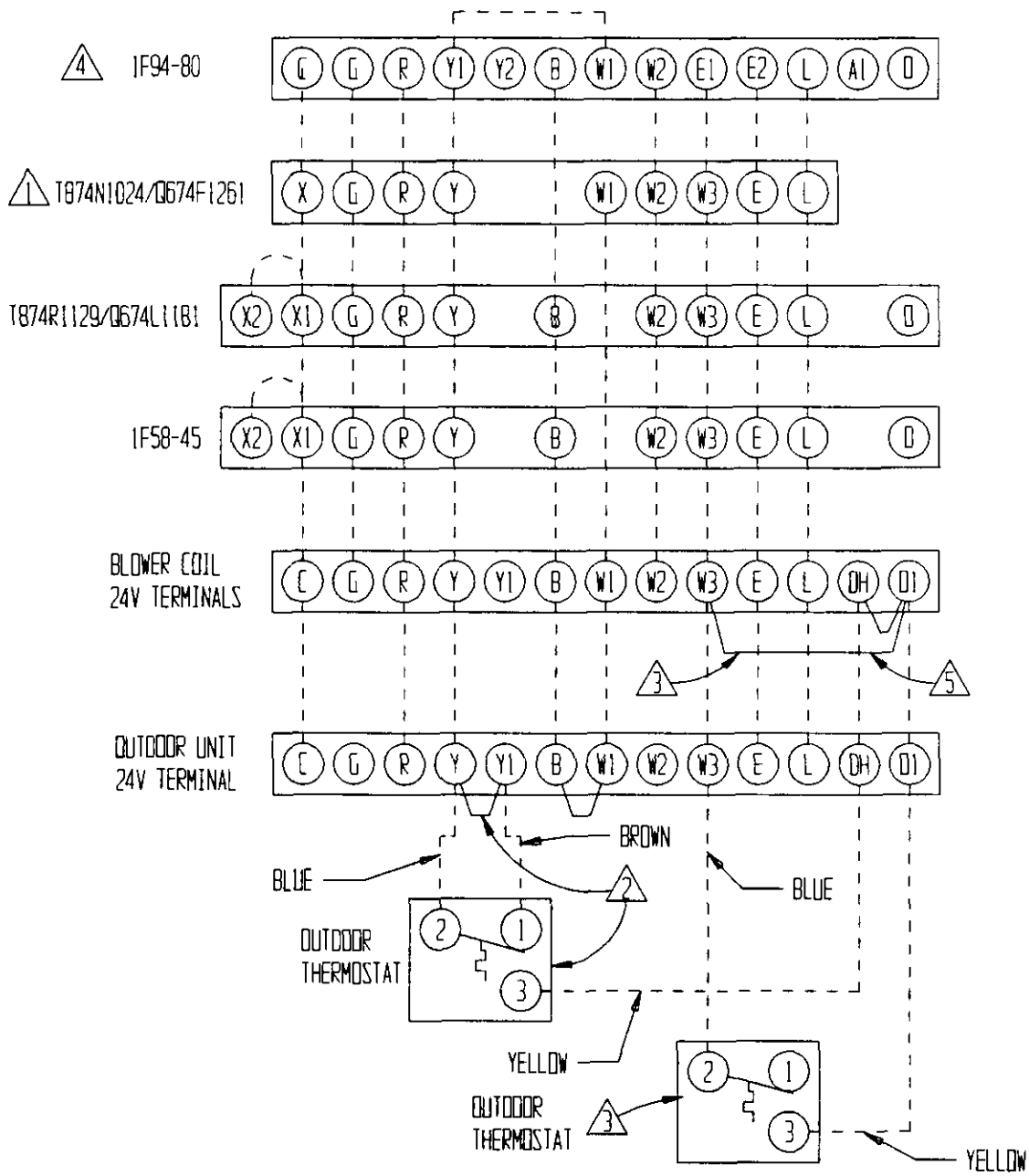
- ⚠ SET ADJUST HEAT ANTICIPATOR (SEE BLOWER COIL INSTRUCTIONS).
- ⚠ WHEN OUTDOOR THERMOSTAT (USED AS COMPRESSOR CUTOFF) IS INSTALLED, REMOVE JUMPER Y-Y1.
- ⚠ OPTION SWITCH SETTING

	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



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

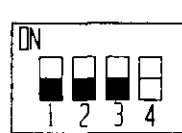
⚠ WHEN OUTDOOR THERMOSTAT (USED AS COMPRESSOR CUTOFF) IS INSTALLED, REMOVE JUMPER Y-Y1.

HEATPUMP W/14 TO 20KW BLOWER COIL

	FACTORY WIRING	FIELD WIRING
LOW VOLTAGE	_____	-----
HIGH VOLTAGE	_____	-----

⚠ IF OUTDOOR THERMOSTAT IS USED TO STAGE HEAT, REMOVE JUMPER W3-O1.

⚠ OPTION SWITCH SETTING



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

⚠ FOR COUNTERFLOW APPLICATIONS, REMOVE JUMPER W3-O1 ON BC35B & BC36B MODELS ONLY.

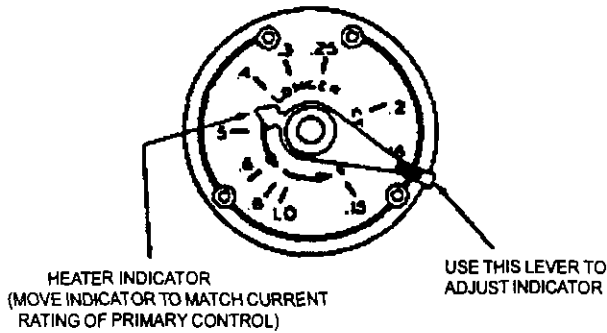
4091-403 E

HOW TO SET AN ADJUSTABLE ANTICIPATOR

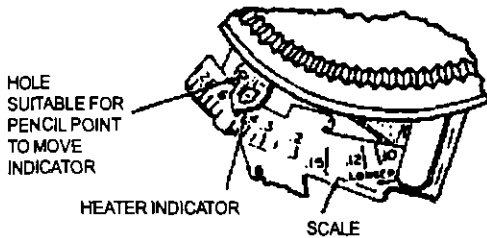
The primary purpose of the adjustable anticipator thermostat is to provide a single thermostat to match almost any type of primary control in the field today.

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 or .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.

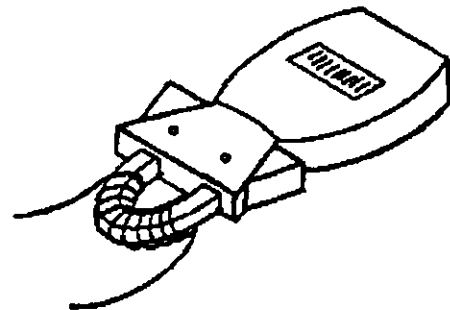
If the current rating is not given, proceed as follows:

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.

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

FIGURE 7



III. SERVICE

THREE SPEED BLOWER MOTOR

The blower coil has a three speed 1/4 hp blower motor.

Motor lead wire identification is as follows:

Common	Yellow
High	Black
Medium	Blue
Low	Red
Capacitor	Brown (2)

Models are shipped wired on high speed. The unused red (low speed) and blue (medium speed) lead wires are taped off. If another speed operation is desired, remove and tape black wire from terminal *com.* on blower relay and connect red or blue 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.

FILTERS

These units come equipped with a 12" 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

