Bldg Main M220

REPLACE A/C SYSTEMS
BUILDINGS AS-710, M-217, M-218, M-220, TC-910, TC-1038, TC-1059
MCB & MCAS

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NO. N62470-85-C-6336

MECHANICAL
OPERATION AND MAINTENANCE MANUAL

SUBMITTED BY: KINSTON PLUMBING & HEATING COMPANY, INC.
POST OFFICE BOX 637
KINSTON, NORTH CAROLINA 28501

PHONE NUMBER: (919) 522-4490

TAB PLACEMENT HERE

DESCRIPTION:

Bldg. A.S. 710

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Confidential Records Management, Inc.
New Bern, NC
1-888-622-4425
9/08

SEQUENCE OF OPERATION

FOR

BUILDING AS-710

SYSTEM INDEXING CONTROLS

System will be put into operation by panel mounted 7 day time clock. During timeclock off times system may be restarted by either night thermostat (T-N) or manual timer (ORT). Fire alarm interlock relay will stop system on alarm. Heating will be indexed if O.A. temperature is below thermostat T-H setpoint, cooling will be indexed above thermostat T-C setpoint.

CONVERTER CONTROL

With system indexed for heating, hot water supply temperature will be controlled by two input controller RKS modulating a normally closed steam valve.

CHILLED WATER CONTROL

Chilled water temperature will be controlled by chiller controls when system is indexed for cooling.

ZONE CONTROL (TYPICAL 4 ZONES)

A duplex thermostat with separate heat and cooling setpoints will modulate AHU zone damper by cooling output and zone hot water valve by heating output.

I

Discharge

EQUIPMENT SCHEDULE

CUSTOMER: Kinston Plumbing & Heating

JOB NAME: Replace A/C Systems
Bldgs. AS 710,TC 910

DATE: April 27, 1987

REF.# Tc-4622/E-1447

MARK	QTY.	PART NUMBER	FEATURES	FUNCTION	LOCATION
			BUILDING AS-710 -- SYSTEM INDEXING		
P-1	1	AE-630	16 x 24	Control Cabinet	Mech. Room
CB	1	QUO-110	10A	Circuit Breaker	In P-1
SW1-4	4		SPDT	System Switches	On P-1 Door
R	1	P-125-1-3	24 Vac, SPDT	Fire Alarm Relay	In P-1
TCK	1	Paragon 7008	120 VAC	System Timeclock	In P-1
ORT	1	90007	6 Hrs.	Override Timer	On P-1 Door
T-N	1	TC-1102	Set: 55°F	Night Setback Thermostat	Near T-3 (In dining room)
T-C	1	TC-4111	Set: 50°F	Cool Index	On outside wall
T-H	1	TC-4111	Set: 60°F	Heat Index	On outside wall
	1	AT-211	Shield	Sun Shield	With T-C & T-H Outdoor
			H.W. RESET CONTROLS		
RKS	1	RKS-3002		Receiver-Controller	In P-1
TS-1	1	TKS-2031 w/AT-211	40-160°F	O.A. Transmitter	Outdoor
TS-2	1	TKS-8033 w/AT-201	40-240°F	HWS Transmitter	Converter Discharge
EP-1	1	AL-110	120 VAC	Interlock	Near Steam Valve

EQUIPMENT SCHEDULE

CUSTOMER: Kinston Plumbing & Heating

JOB NAME: Replace A/C Systems
BLDGS. AS-710, TC-910

DATE: April 27, 1987

REF.# TC-4622/E-1447

MARK	QTY.	PART NUMBER	FEATURES	FUNCTION	LOCATION
VH	1	VK-9223-353-4-11	2", NC	Steam Control Valve	At converter
			ZONE CONTROL		
T	4	TK-11111	DA,DA 55-85°F	Heat-Cool Control	As Per Plans
M	4	MK-3121	(8-13#)	Zone Damper Control	At Zone Dampers
VH	2	VK-9313-303-4-6	3/4", 3 Way	Zone Valve Control	At #1 & 2 Htg. coils
VH	2	VK-9313-353-4-9	1¼", 3 Way	Zone Valve Control	AT #3 & $ Htg. coils

TRANE™

The Trane Company
Division of American Standard Inc.

La Crosse WI 54601-7599
Clarksville TN 37040

11-12-86

15

Page Number: 1 OF 1

Trane Order Number: L F4-M372A

Trane Job Number: F4-10490

Customer Order Number: 3299

Number of Prints: 11 LIT 4

Date to Ship: 12-12-86 HA

Type of Order: STK

Architect:

Engineer: CHEATHAM & ASSOC., WILMINGTON,- NC

Trane Salesman:
R. CRAWFORD
RALEIGH

REPLACE AC BLDGS AS-710
CAMP LEJEUNE, NC

Sold To:
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC
28502

Ship To Project:
KINSTON PLBG. & HTG. CO.
HWY. 258 NORTH
KINSTON, NC
28501

Mark Packages — Project Name:
MUA UNIT, BLDG. AS-170
CAMP LEJEUNE, NC
CALL 919-522-4490 ATTN. MR. LEE 24 HRS. BEFORE

Item	Quantity	Trane Ordering Number	Specifications
10.00	1	HBAC300DCA3	HBAC300DCA3 625 RPM, .25 ESP, ~~300~~ 3000 CFM, 3/4 HP, 230/60/3 TE MOTOR

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED AS NOTED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-85-C-6336

DATE 12/22/86

T. L. Huguelet
Cheatham + Assoc.
CDR, CEC, USN
Officer in Charge
of Construction

X APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO
BY JCR DATE 12/5/86

Submittal Approval Drawings: HBAC-SQ-001.00

Service Literature:

1-30.11-2 (585)

Submittal Data

TRANE™

The Trane Company
Division of American Standard Inc.

La Crosse WI 54601-7599
Clarksville TN 37040

11-12-86

Page Number	Trane Order Number
15 1 OF 1	L F4-M372A

Trane Job Number	Customer Order Number	Number of Prints	Date to Ship	Type of Order
F4-10490	3299	11 LIT 4	12-12-86 HA	STK

Architect

Engineer CHEATHAM & ASSOC., WILMINGTON,-NC

Trane Salesman
R. CRAWFORD
RALEIGH

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Mark Packages — Project Name
MUA UNIT, BLDG. AS-170 CAMP LEJEUNE, NC
CALL 919-522-4490 ATTN.MR. LEE 24 HRS. BEFORE

Item	Quantity	Trane Ordering Number	Specifications
10.00	1	HBAC300DCA3	HBAC300DCA3 625 RPM, .25 ESP, ~~300~~ 3000 CFM, 3/4 HP, 230/60/3 TE MOTOR

X APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO
BY JCH DATE 12/5/86

Submittal Approval Drawings
HBAC-SQ-001.00

Service Literature

1-20.11-2 (585)

Submittal Data

TAG ______________________________

PRINT DATE: 3/84	FILE NO. PL-TD-UH-HBAC-SQ-001.00	REPLACES: HBAC-S-1	HBAC-SQ-001.00

TRANE®

SUBMITTAL/SELECTION

HORIZONTAL BLOWER ASSEMBLY

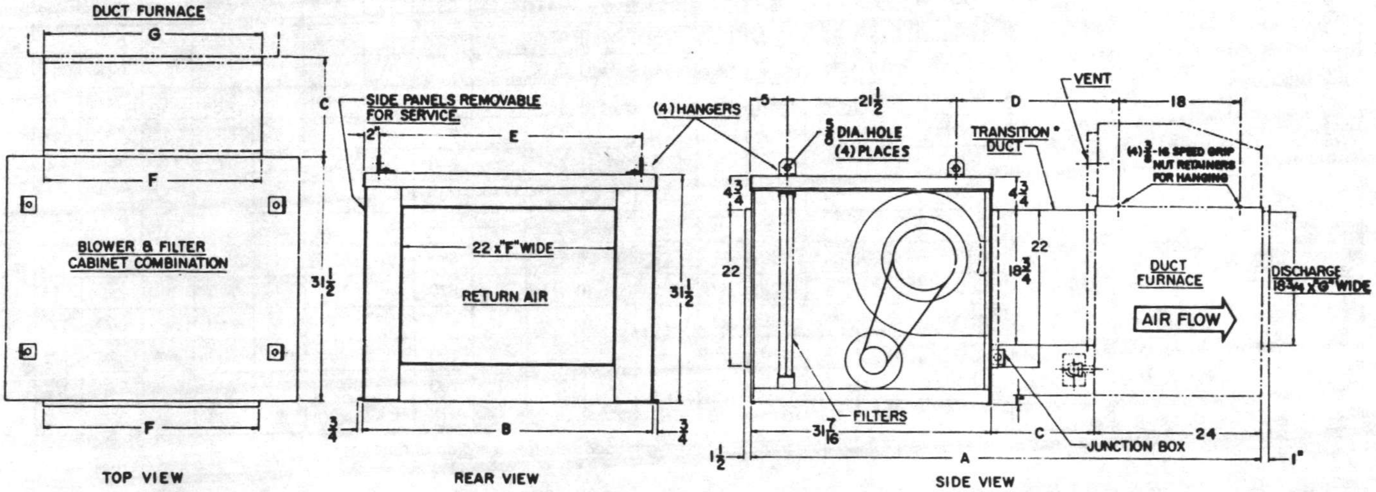
MODEL HBAC

NOMINAL CFM

- ☐ 1500 CFM
- ☐ 2000 CFM
- ☑ 3000 CFM
- ☐ 4500 CFM

VOLTAGE

- ☐ 115/60/1
- ☐ 230/60/1
- ☐ 208/60/3
- ☑ 230/60/3
- ☐ 460/60/3



DIMENSIONAL DATA

MODELS	NOMINAL CFM	DUCT FURNACE SIZE USED WITH (INPUT-MBH)	INCHES A	B	C	D	E	F	G	FILTER DATA SIZE	NO.	APPROX. WT. LESS MOTOR NET	SHIP
HBAC-15	1500	100	65½	26	10	18	21	15¾	15⅝	25 x 25 x 1	1	125	135
		125	65½	26	10	18	21	15¾	18⅜	25 x 25 x 1	1		
HBAC-20	2000	150	65½	26	10	18	21	15¾	18⅜	25 x 25 x 1	1	142	155
		175	65½	26	10	18	21	15¾	21⅛	25 x 25 x 1	1		
HBAC-30	3000	200	65½	40½	10	18	35½	30⅜	23⅞	25 x 20 x 1	2		
		225	65½	40½	10	18	35½	30⅜	26⅝	25 x 20 x 1	2	178	200
		250	65½	40½	10	18	35½	30⅜	29⅜	25 x 20 x 1	2		
HBAC-45	4500	300	65½	60½	10	18	55½	50⅜	34⅞	25 x 20 x 1	3		
		350	69½	60½	14	22	55½	50⅜	40⅜	25 x 20 x 1	3	263	296
		400	69½	60½	14	22	55½	50⅜	45⅞	25 x 20 x 1	3		

NOTE: Nominal 4500 CFM unit has two blowers driven by one motor.
*Transition designed for specific duct furnace referenced above. Variations from standard will require field supplied transitions.

PERFORMANCE DATA

MODELS	NOMINAL CFM	BLOWER SIZE	CFM	STATIC PRESSURE 0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
				RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
HBAC-15	1500	10"	1250	525	⅓	650	⅓	680	⅓	760	⅓	780	⅓	840	⅓				
			1500	600	⅓	680	⅓	715	⅓	790	⅓	810	½	860	½	895	½	970	½
			1750	650	⅓	710	⅓	750	½	805	½	850	½	890	½	940	½	990	¾
			2000	700	½	760	½	800	½	850	½	890	½	925	¾	980	¾	1010	¾
HBAC-20	2000	12"	1500	425	⅓	500	⅓	550	⅓	630	⅓								
			1750	450	⅓	515	⅓	560	⅓	635	½	680	½	725	½				
			2000	475	⅓	530	⅓	590	½	640	½	690	½	740	½	785	½	810	¾
			2250	515	½	560	½	610	½	650	½	700	¾	750	¾	790	¾	815	¾
			2500	540	½	590	½	625	½	670	½	710	¾	760	¾	795	¾	820	¾
			2750	575	½	615	½	650	¾	690	¾	730	¾	780	¾	800	¾	830	1
HBAC-30	3000	12"	1750	450	⅓	510	⅓	560	⅓	630	⅓	675	½	720	½				
			2000	475	⅓	525	⅓	590	½	635	½	680	½	735	½	780	¾	805	¾
			2250	500	½	550	½	600	½	645	½	685	½	740	¾	785	¾	810	¾
			2500	525	½	580	½	615	½	665	½	700	¾	750	¾	790	¾	815	¾
			2750	560	½	605	½	640	¾	685	¾	715	¾	775	¾	805	¾	825	1
			3000	610	½	640	¾	660	¾	710	¾	750	1	790	1	815	1	845	1
			3250	630	¾	675	¾	700	1	735	1	750	1	790	1	830	1	860	1
			3500	675	¾	700	1	725	1	775	1	800	1	840	1½	875	1½	890	1½
HBAC-45	4500	2-12"	2750	400	¾	450	¾	510	¾										
			3000	425	¾	475	¾	550	¾	600	¾	650	¾						
			3500	430	¾	480	¾	560	¾	610	¾	660	¾	700	1	730	1		
			4000	450	¾	500	¾	565	¾	615	¾	670	1	710	1	740	1	790	1
			4500	475	¾	525	¾	575	¾	620	1	680	1	715	1	750	1	800	1½
			5000	500	¾	540	¾	600	1	630	1	690	1	720	1½	760	1½	810	1½
			5500	530	1	575	1	615	1	650	1½	700	1½	700	1½	730	1½	820	1½
			6000	575	1½	615	1½	660	1½	690	1½	715	1½	760	2	800	2	830	2

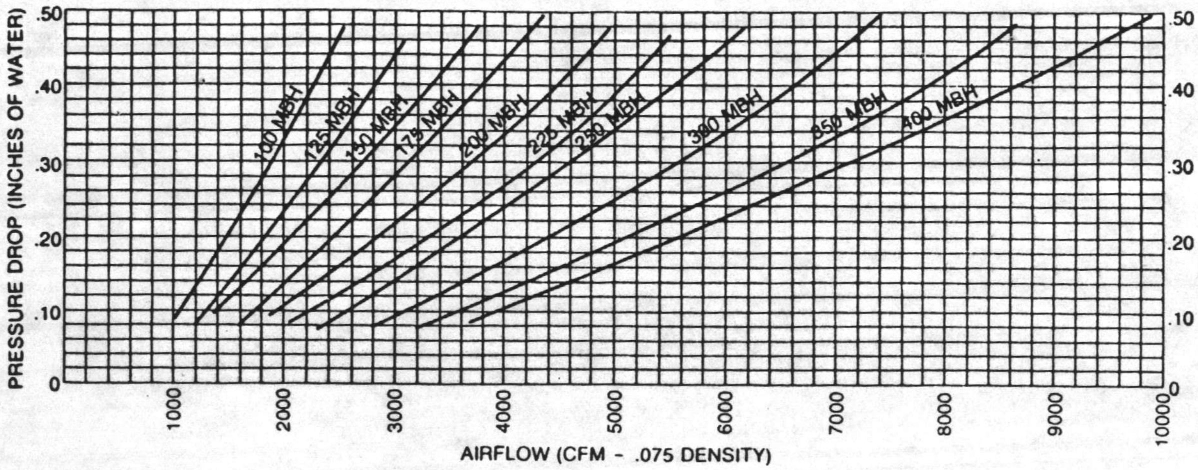
*External Static Pressure in inches of water. Add pressure drop of indoor duct furnace, if used, to pressure drop of ductwork.

MOTOR ELECTRICAL DATA

CURRENT CHARACTERISTICS	FULL LOAD AMPS* ⅓ HP	½ HP	¾ HP	1 HP	1½ HP	2 HP
115/60/1	7.2	9.8	13.8	16.0	20.0	24.0
230/60/1	3.6	4.9	6.9	8.0	10.0	12.0
208/60/3	NR	2.2	3.1	4.1	6.0	7.8
230/60/3	NR	2.0	2.8	3.5	5.0	6.5
460/60/3	NR	1.0	1.4	1.8	2.5	3.3
Motor Wt. (lb)	18	33	33	36	39	40

*FLA based on NEC ratings. All motors are 1725 RPM.
NR = motor available, but not rated by NEC.

INDOOR DUCT FURNACE PRESSURE DROP



MECHANICAL SPECIFICATIONS

HORIZONTAL BLOWER ASSEMBLY

GENERAL
Units are completely factory assembled, and have four point suspension hangers and filter racks as standard.

CASING
Casings are 18 gauge galvanized steel with baked enamel finish. Side panels are removable for easy servicing and motor maintenance. Duct flanges are provided for simple ductwork connection. Standard filters are one inch permanent washable type.

MOTORS
Factory mounted motors are open drip proof, 115, 230/60/1 or 208, 230, 460/60/3 with built-in thermal overload protection.

FANS
Centrifugal fan is belt driven with adjustable pitch motor sheave. Motor and fan are dynamically balanced for quiet operation.

FACTORY INSTALLED OPTIONS

☐ INSULATION
Blower assembly and transition are insulated with fire-resistant, odorless, mat-faced one inch glass fiber material.

☐ FLOOR MOUNTING LEGS
Legs allow floor mounting of the blower assembly.

☑ TOTALLY ENCLOSED MOTOR

FIELD INSTALLED ACCESSORIES

Optional Filters (One Inch Permanent Standard)
☐ One inch throwaway
☐ One inch permanent

Transition
☐ When used with a duct furnace, a sheet metal transition is supplied to connect the blower assembly to the duct furnace.

Since The Trane Company has a policy of continuous product improvement, it reserves the right to change design and specification without notice.

TRANE™

The Trane Company
Division of American Standard Inc.

La Crosse WI 54601-7599
Clarksville TN 37040

11-12-86

Page Number	Trane Order Number
15	F4M371A

Trane Job Number	Customer Order Number	Number of Prints	Date to Ship	Type of Order
F4-1C49C	3299	11 LIT 04	00-00-00HA	SUB

Architect

Engineer CHEATHAM & ASSOC., WILMINGTON, NC

Trane Salesman: R CRAWFORD

Job Name/Location: REPLACE AC BLDGS AS-710
CAMP LEJEUNE, NC

Sold To
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC 28502

Ship To Project
KINSTON PLBG. & HTG. CO.
C/O BLDG. AS710
CAMP LEJEUNE, NC
28542

Mark Packages — Project Name

Item	Quantity	Trane Ordering Number	Specifications
10.00	0001	CGABC253AAC1	CGABC253 FLOW SWITCH 230/60/3 DESIGN AMBIENT 95 DEG. F. ENT WATER 55 DEG. F., LVG WATER 45 DEG. F. 57 GPM, PD 16 FT. ACTUAL CAPACITY 23 TONS, 24.8 KW

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA
APPROVED
SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-85-C-6336
DATE 12-22-86
J. L. Huguelet
CDR, CEC, USN
Officer in Charge
of Construction

Cheatham & Assoc.

Submittal Approval Drawings
☒ APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO
BY [signature] DATE 12/5/86

Service Literature

1-30.11-2—(8/86)

Submittal Data

TRANE™

HERMETIC RECIPROCATING LIQUID CHILLERS

AIR COOLED COLD GENERATORS®
MECHANICAL SPECIFICATIONS
CGAB-20 THRU 60 TON

GENERAL:

All Cold Generators ® are factory run tested. Capacity, current draw and control operation are monitored and recorded. Units ship with a full operating charge of refrigerant and oil.

Units are constructed of a 14-guage, welded steel frame with 14 and 16-guage galvanized steel panels and access doors. Unit surface is phosphatized and finished with gray-green air-dry paint.

CGAB C40K, C50K and C60K have two completely independent refrigerant circuits.

EVAPORATOR:

Shell-and-tube design with seamless copper tubes, roller-expanded into tube sheets. Chiller designed, tested and stamped in accordance with ASME code for refrigerant side working pressure of 225 psig, water side working pressure of 150 psig. One water pass with a series of internal baffles. Each shell includes drain connection, bulb wells for low temperature cutout and temperature controller, flare connections on water inlet and outlet for pressure drop measurements, and ¾-inch expanded polyvinyl chlorid insulation (k = 0.26). Heater tapes protect evaporator to ambient of −20 F.

CONDENSER:

Air-cooled condenser coils have configurated aluminum fins mechanically bonded to seamless copper tubing. Includes subcooling circuits with liquid accumulators. Factory leak tested with air under water at 425 psig air pressure.

Direct-drive vertical-discharge condenser fans are statically and dynamically balanced. Three-phase condenser fan motors have permanently lubricated ball bearings and three-phase thermal overload protection. Low ambient units start and operate to 0 F with external damper assemblies for head pressure control.

Decorative grilles provide protection from exterior damage for coil surface and other interior unit components. Grilles are factory mounted, louvered, galvanized steel mesh panels finished with an air-dry, gray-green finish. Grilles will cover all open ends of units.

COMPRESSOR AND MOTOR:

Direct-drive, 1,750 rpm, Trane Model K hermetic reciprocating compressor with integral suction accumulator, centrifugal oil pump; oil filter screen and magnetic disks; oil level sightglass; oil charging valve, two-point lubrication for each bearing and connecting rod, crankcase heater and well; double mesh suction inlet screen, high strength nonflexing ring-type suction and discharge valves, large gas passages, and minimum clearance volumes, electric-actuated unloading, replaceable unloader solenoid valve; suction and discharge valves; and rubber-in-shear isolators.

Motor is suction gas-cooled and has voltage utilization range ± 10 percent of nameplate voltage. Two winding thermostats embedded between the three motor windings protect against excessive winding temperatures.

CONTROL PANEL:

Starter and refrigeration controls in a weathertight panel have customer connections with knockouts for remote interlocks. Control section also contains: compressor contactors, control power transformer for 115-volt control voltage, terminal strip, control relays, reset relay in lockout circuit, compressor overload relay and fan contactors.

Other controls include thermal electric motor protector and chilled water temperature controller (electric). A fixed-off timer prevents rapid cycling of compressors and times from compressor shutdown to delay restarting for five minutes.

REFRIGERANT CIRCUIT:

Each circuit has: liquid line solenoid valves, filter driers, liquid line sightglasses, thermal expansion valves, and insulated suction lines.

CAPACITY MODULATION AND TEMPERATURE CONTROL:

Two-step (20 ton), three-step (25 and 30 ton), or four-step (40, 50, and 60 ton) capacity control in response to return chilled water temperature. Unloaders are electric solenoid-actuated and gas operated.

OPTIONS

Hot Gas Bypass:

Hot gas bypass valve and associated control panel wiring and piping furnished to allow operation of unit below minimum step of loading.

Load Limit Thermostat:

Unloads compressor if return water temperatures is too high. Prevents nuisance compressor shutdown on start-up due to motor temperature protection or compressor overload.

Flow Switch:

Recommended as safety interlock to prevent operation of machine without evaporator flow. Available for field installation.

Isolators (Kit):

Spring or rubber-in-shear isolators are available for installation beneath unit frame.

Gauges:

Suction and discharge gauges available as standard options.

Low Ambient:

Modulates condenser airflow by means of a direct-acting damper operator which senses head pressure in the liquid line and positions damper blades, maintaining proper head pressure at lower ambients. Standard unit equipped with damper(s) which will start and operate satisfactorily to 0 F ambient. Option consists of damper assembly, operator and all necessary mountings and control interfaces.

Copper Fins:

Copper fins are available as a standard option.

Sequence Panel:

Remote-mounted panel allows multiple units to operate in series or parallel with lead-lag capability.

Unit-mounted Disconnect Switch:

Unfused disconnect switch, factory mounted in unit control panel, provides service disconnecting function. In many areas this can replace costly external field installed disconnect.

TAG ______________________________

PRINT DATE: 10-1-85	FILE NO. PL-RF-CG-CGAB-SU-002.00	REPLACES:	CGAB-SU-002.00

HERMETIC RECIPROCATING LIQUID CHILLERS

(CGA-S-2)

TRANE

AIR COOLED COLD GENERATOR®

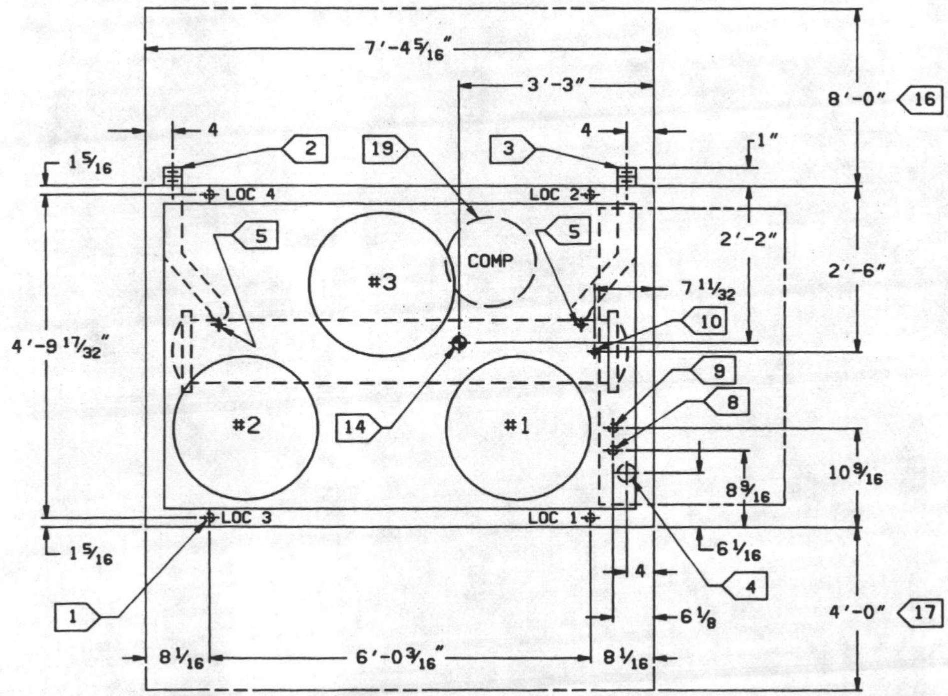
CGAB C25

SUBMITTAL

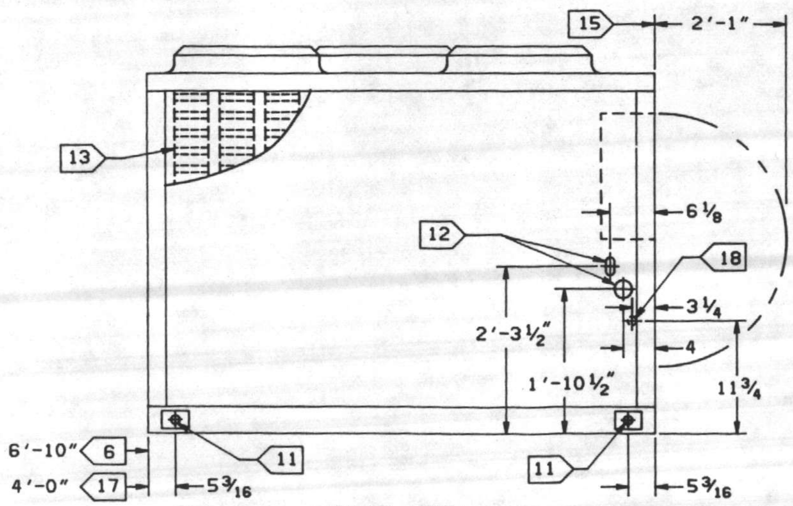
CUSTOMER NOTE:

1. MOUNTING HOLES FOUR LOCATIONS 3/4 DIA.
2. WATER INLET 2 1/2" NPS.
3. WATER OUTLET 2 1/2" NPS.
4. ELECTRICAL CONNECTION 2" CONDUIT. (SEE NOTE 12)
5. FLARE CONNECTION 1/4 SAE FOR CUSTOMER PRESSURE TEST ON EVAPORATOR WATER CONNECTIONS.
6. EVAPORATOR SERVICE CLEARANCE - EITHER END.
7. HEATER CABLE JUNCTION BOX 7/8 DIA HOLES. (SEE NOTE 18)
8. CIRCULATING PUMP INTERLOCK AND FLOW SWITCH ELECTRICAL CONNECTIONS 7/8 DIA.
9. STARTER SWITCH CIRCULATING PUMP CONTROL CIRCUIT ELECTRICAL CONNECTION 7/8 DIA KNOCKOUT.
10. DRAIN CONNECTION 3/4 NPT.
11. LIFTING POINTS TWO EACH SIDE.
12. ELECTRICAL ACCESS THRU PANEL. (SEE NOTE 4)
13. DECORATIVE GRILL (FAR SIDE).
14. CENTER OF GRAVITY.
15. MINIMUM CLEARANCE CONTROL PANEL DOOR.
16. SUGGESTED MINIMUM CLEARANCE CONDENSER AIR.
17. SUGGESTED MINIMUM SERVICE CLEARANCE.
18. ELECTRICAL ACCESS TO HEAT TAPE 1" DIA (FAR SIDE). (SEE NOTE 7)
19. LOCATE COMPRESSOR ACCESS PANEL BEFORE PIPING THE UNIT. DO NOT INSTALL PIPING IN A MANNER THAT WOULD OBSTRUCT ACCESS TO AND/OR REMOVAL OF THE COMPRESSOR. THIS COULD HINDER PROPER COMPRESSOR SERVICE PROCEDURES.

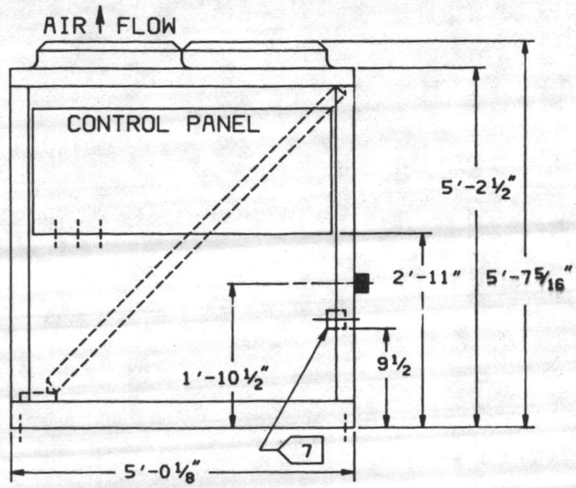
OPERATING WEIGHT (LBS)	WEIGHT DISTRIBUTION (LBS)			
	LOC 1	LOC 2	LOC 3	LOC 4
2415	595	785	445	590



PLAN VIEW



SIDE VIEW



END VIEW

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PRINT DATE: 6-28-83	FILE NO. PL-RF-CG-CGAB-SA-008.00	REPLACES:	CGAB-SA-008.00

TRANE AIR CONDITIONING

SUBMITTAL

HERMETIC RECIPROCATING LIQUID CHILLERS
AIR COOLED COLD GENERATOR®
FLOW SWITCH
CGAB C20 THRU C60

(CGAB-S-8)

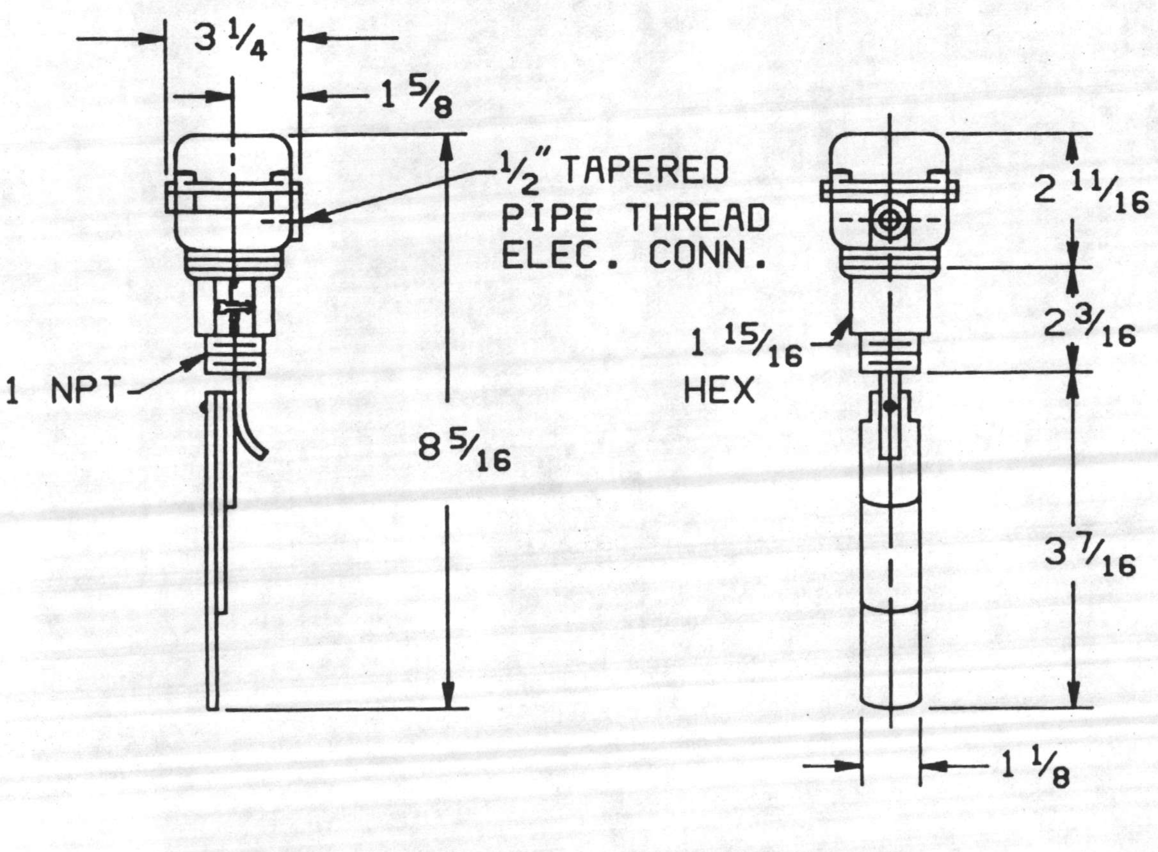
CUSTOMER NOTE:

1. FLOW SWITCHES ARE FIELD INSTALLED.

ELECTRICAL RATINGS
AMPERE RATING

MOTOR DUTY	115V A.C.	230V A.C.
FULL LOAD	7.4 AMPS	3.7 AMPS
LOCKED ROTOR	44.4 AMPS	22.2 AMPS
PLOT DUTY: A.C. 125 V.A., 115-130V		

150 PSI WATER SIDE WORKING PRESSURE VAPOR PROOF



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CAD/CAM

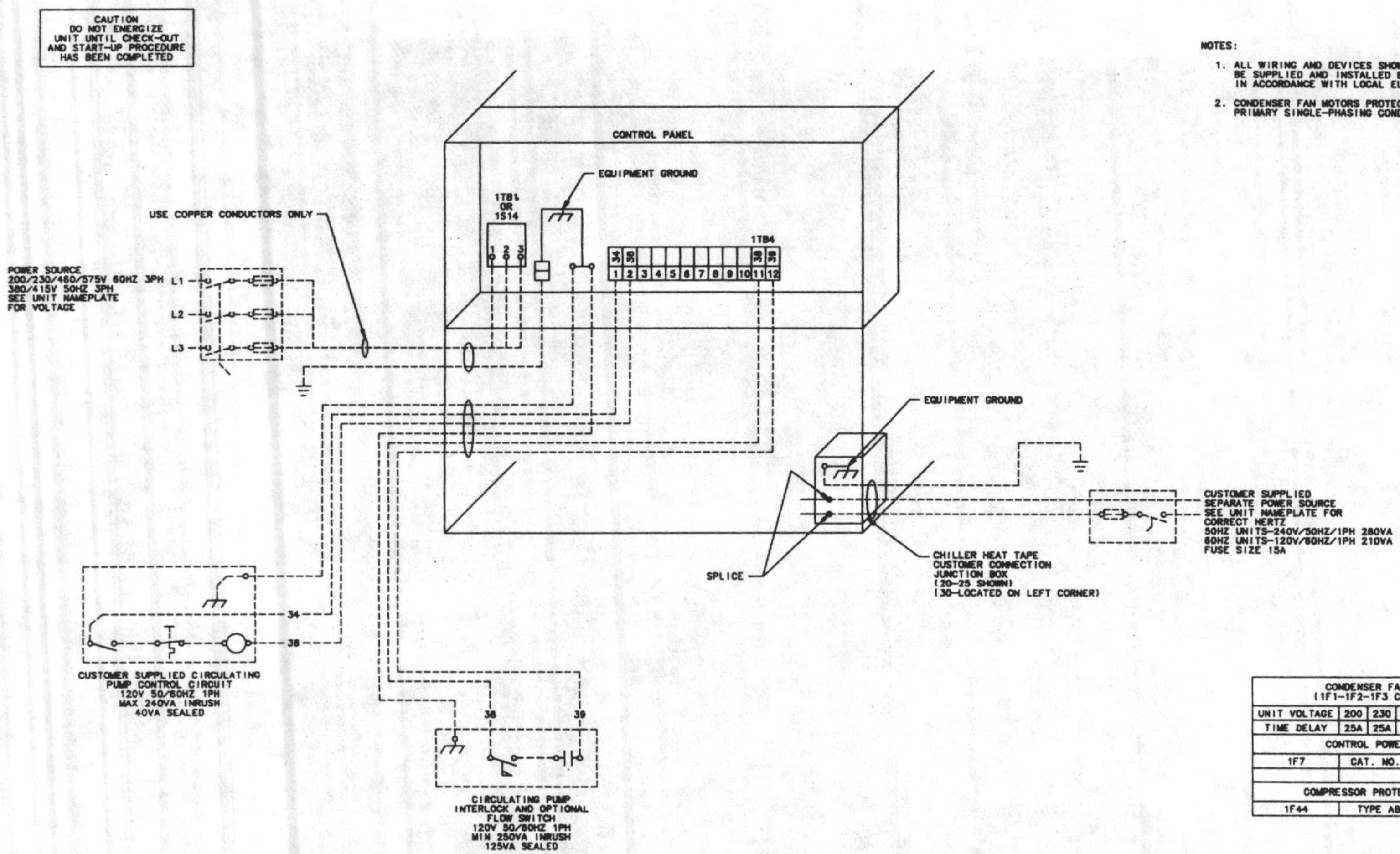
PRINT DATE: 10-5-84	FILE NO. PL-RF-CG-CGAB-SW-100.00	REPLACES:	CGAB-SW-100.00

TRANE

HERMETIC RECIPROCATING LIQUID CHILLER

AIR COOLED COLD GENERATOR®
FIELD WIRING
CGAB 20,25,30 TON

SUBMITTAL



NOTES:

1. ALL WIRING AND DEVICES SHOWN DASHED TO BE SUPPLIED AND INSTALLED BY THE CUSTOMER IN ACCORDANCE WITH LOCAL ELECTRICAL CODES.
2. CONDENSER FAN MOTORS PROTECTED UNDER PRIMARY SINGLE-PHASING CONDITIONS.

CONDENSER FAN FUSE (1F1-1F2-1F3 CLASS K5)						
UNIT VOLTAGE	200	230	380	415	460	575
TIME DELAY	25A	25A	15A	15A	15A	15A
CONTROL POWER FUSE						
1F7	CAT. NO. S		6.25A			
COMPRESSOR PROTECTOR FUSE						
1F44	TYPE ABC		15A			

TAG

CAD/CAM

PRINT DATE: 4-15-86	FILE NO. PL-RF-CG-CGAB-SW-203.03	REPLACES: CGAB-SW-203.02	CGAB-SW-203.03

TRANE

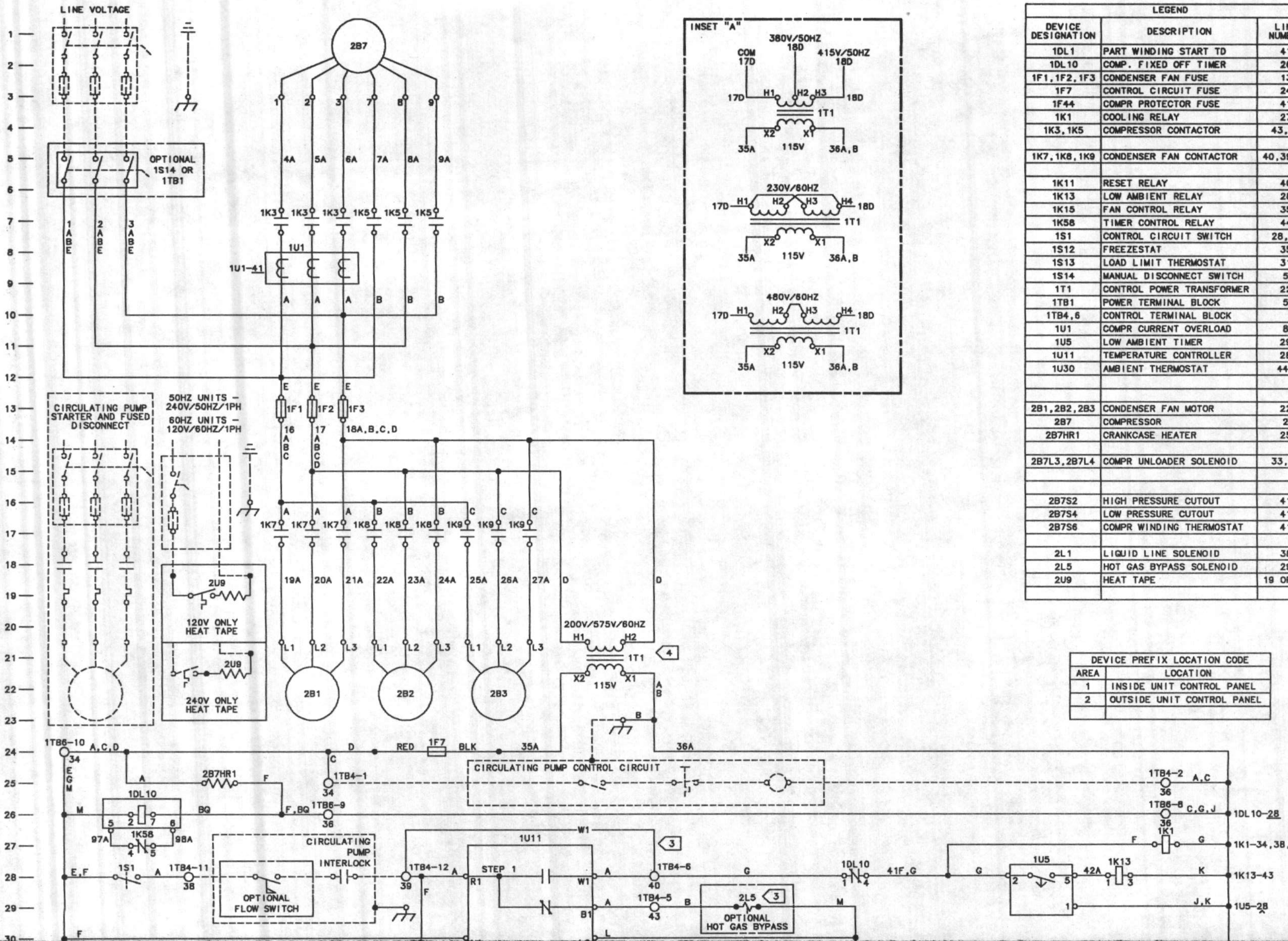
HERMETIC RECIPROCATING LIQUID CHILLER

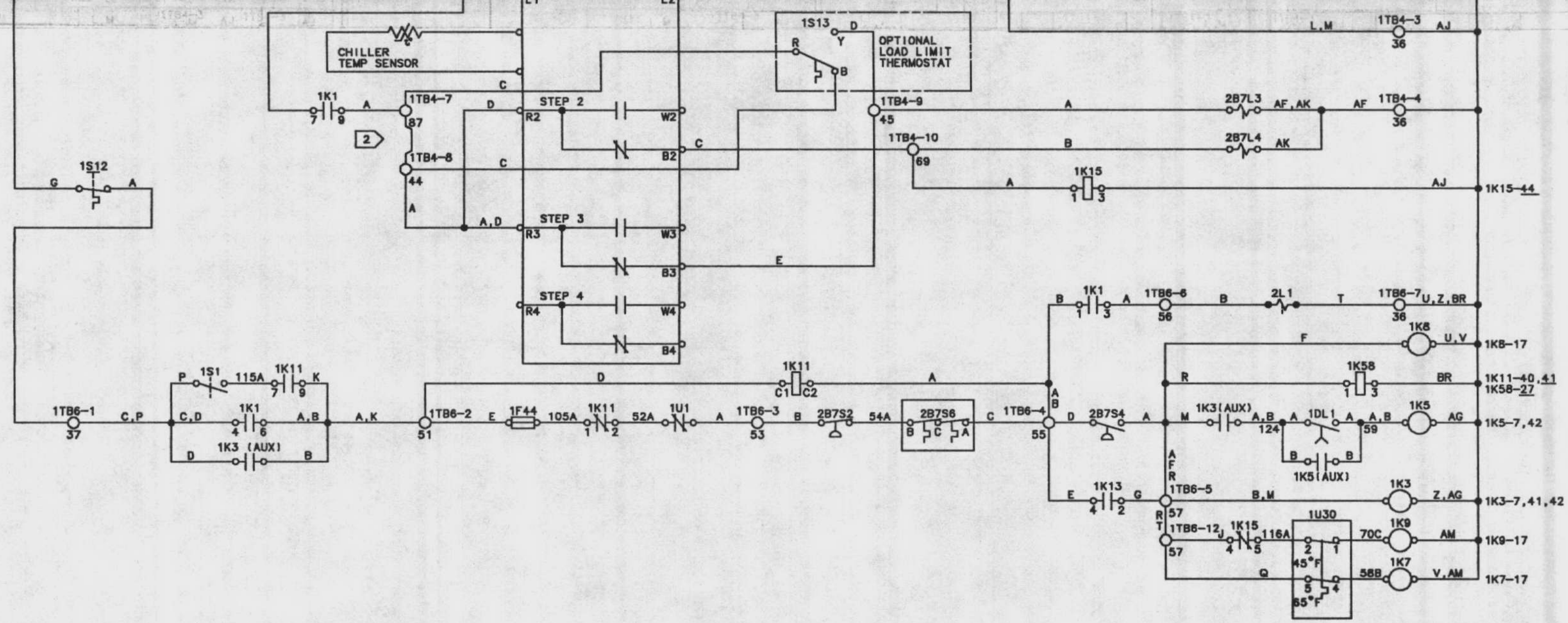
AIR COOLED COLD GENERATOR®
SCHEMATIC WIRING (PW)
CGAB 25,30 TON

SUBMITTAL

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1DL1	PART WINDING START TD	41
1DL10	COMP. FIXED OFF TIMER	26
1F1,1F2,1F3	CONDENSER FAN FUSE	13
1F7	CONTROL CIRCUIT FUSE	24
1F44	COMPR PROTECTOR FUSE	41
1K1	COOLING RELAY	27
1K3,1K5	COMPRESSOR CONTACTOR	43,41
1K7,1K8,1K9	CONDENSER FAN CONTACTOR	40,39,44
1K11	RESET RELAY	40
1K13	LOW AMBIENT RELAY	28
1K15	FAN CONTROL RELAY	35
1K58	TIMER CONTROL RELAY	44
1S1	CONTROL CIRCUIT SWITCH	28,40
1S12	FREEZESTAT	35
1S13	LOAD LIMIT THERMOSTAT	31
1S14	MANUAL DISCONNECT SWITCH	5
1T1	CONTROL POWER TRANSFORMER	22
1TB1	POWER TERMINAL BLOCK	5
1TB4,6	CONTROL TERMINAL BLOCK	
1U1	COMPR CURRENT OVERLOAD	8
1U5	LOW AMBIENT TIMER	29
1U11	TEMPERATURE CONTROLLER	28
1U30	AMBIENT THERMOSTAT	44
2B1,2B2,2B3	CONDENSER FAN MOTOR	22
2B7	COMPRESSOR	2
2B7HR1	CRANKCASE HEATER	25
2B7L3,2B7L4	COMPR UNLOADER SOLENOID	33,34
2B7S2	HIGH PRESSURE CUTOUT	41
2B7S4	LOW PRESSURE CUTOUT	41
2B7S6	COMPR WINDING THERMOSTAT	41
2L1	LIQUID LINE SOLENOID	38
2L5	HOT GAS BYPASS SOLENOID	29
2U9	HEAT TAPE	19 OR 22

DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	INSIDE UNIT CONTROL PANEL
2	OUTSIDE UNIT CONTROL PANEL





NOTES:

1. UNLESS OTHERWISE NOTED ALL SWITCHES ARE SHOWN AT 25°C(77°F), AT ATMOSPHERIC PRESSURE, AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF, AND AFTER A NORMAL SHUT DOWN HAS OCCURED.
DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. DASHED LINE ENCLOSURES AND/OR DASHED DEVICE OUTLINES INDICATE COMPONENTS PROVIDED BY THE FIELD.
PHANTOM LINE ENCLOSURES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTION.
NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF THE CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.
AN OPEN ARROWHEAD BELOW THE LINE NUMBER POINTING UPWARD INDICATES A TIMED CONTACT WHICH BEGINS TIMING WHEN ENERGIZED.

2. WHEN LOAD LIMIT THERMOSTAT (1S13 LINE 31) IS USED, REMOVE METAL JUMPER BETWEEN NODES 87 AND 44 (1TB4-7 AND 8) AND INSTALL THERMOSTAT AS SHOWN.

3. WHEN HOT GAS BYPASS SOLENOID (2L5 LINE 29) IS USED, ADD JUMPER BETWEEN NODES 39 AND 40 (1TB4-12 AND 1TB4-6) AND INSTALL SOLENOID AS SHOWN.

4. 200V 60HZ OR 575V 60 HZ TRANSFORMER SHOWN - SEE INSET "A" FOR 450V 60HZ, 230V 60 HZ, 380V 50HZ AND 415V 50HZ TRANSFORMER.

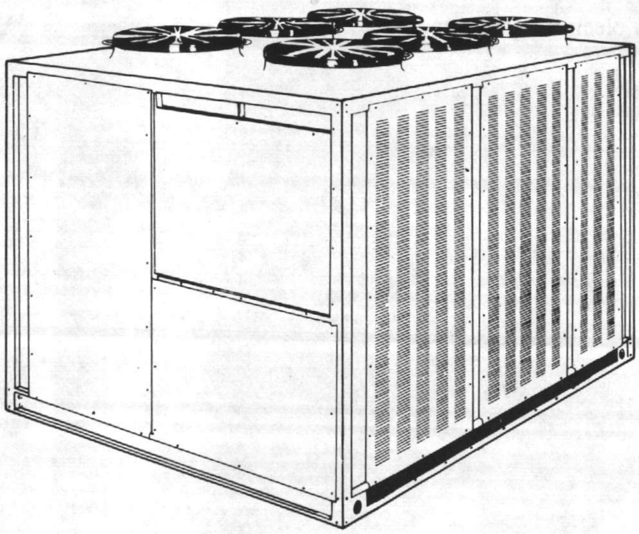
TRANE™

Operation Maintenance

Library	**Service Literature**
Product Section	**Refrigeration**
Product	**Recip. Liquid Chillers - Cold Gen.**
Model	**CGAB**
Literature Type	**Operation-Maintenance**
Sequence	**2**
Date	**June 1985**
File No.	**SV-RF-CG-CGAB-M-2-685**
Supersedes	

Ordering No. **CGAB-M-2**

OWNER-OPERATOR'S GUIDE
AIR-COOLED
COLD GENERATOR®



MODELS

CGAB C20	CGAB C40
CGAB C25	CGAB C50
CGAB C30	CGAB C60

With Model 'K' Compressors

FOR USE BY OWNER-OPERATOR PERSONNEL

Commercial Systems Group
La Crosse, Wisconsin 54601
Printed In U.S.A.

Table of Contents

LITERATURE CHANGES
Ambient thermostat fan cycling, new electrical diagrams for UL Standard 465 change.

MODEL NUMBER DESCRIPTION

Trane products are identified by a multiple character model number that precisely identifies a particular type of unit. An explanation of the multiple character number is shown below. It will enable the owner or Service Engineer to define operation, components and accessories.

DIGIT NUMBER	1,2	3	4		567	8	9	10	11	12	13
MODEL NUMBER	**CG**	**A**	**B**	-	**C20**	**3**	**A**	**E**	**1**	**0**	**A**

DIGITS 1,2
PRODUCT TYPE
CG = **Cold Generator**

DIGIT 3
UNIT TYPE
A = Air-Cooled Condensing

DIGIT 4
DEVELOPMENT SEQUENCE
B = Second

DIGIT 5,6,7
CAPACITY RANGE
C20 = 20 Tons
C25 = 25 Tons
C30 = 30 Tons
C40 = 40 Tons
C50 = 50 Tons
C60 = 60 Tons

DIGIT 8
ELEC. CHARACTERISTICS
1 = 460/60/3 PWS
2 = 575/60/3 PWS
3 = 230/60/3 PWS
4 = 460/60/3 XL
6 = 200/60/3 PWS
A = 380/50/3 PWS
B = 415/50/3 PWS

DIGIT 9
SYSTEM CONTROL
A = Electric

DIGIT 10
DESIGN SEQUENCE
A = First
B = Second
C = Third, etc.

DIGIT 11
AMBIENT CONTROL
0 = Standard
1 = 0 F Ambient

DIGIT 12
AGENCY APPROVAL
0 = None
1 = UL
2 = CSA

DIGIT 13
MISCELLANEOUS OPTIONS
A = Unit Disconnect Switch
B = Hot Gas Bypass
C = Omit Decorative Grill
F = Pressure Gauges
H = Copper Fins
K = Load Limit
1 = Spring Isolator
2 = Rubber Isolator
3 = Flow Switch
4 = 0 F Ambient Kit (Stock Unit)

OPERATION

SYSTEM CONTROL

CGAB system operation is controlled by a solid-state multiple stage temperature controller (Figure 1). The remote sensing bulb of the controller is located in a bulbwell on the evaporator water inlet where it monitors return water temperature to the evaporator. The 20 ton CGAB has two control stages, the 25 and 30 ton three stages, and the 40, 50, and 60 ton have four stages of control.

OPERATING THE UNIT

Close the chilled water circulating pump fused disconnect switch and start the pump at the remote pushbutton station. Unit operation is initiated by turning the Control Circuit Switch (1S1) in the control panel (Figures 2 and 3) to the "On" position. The unit power fused disconnect switch (provided at installation by the installing contractor) and the manual disconnect switch (1S14) (in the control panel) must be closed. The compressor crankcase heater(s) must have been energized for a minimum of 8 hours before starting the unit.

CAUTION: Energize the compressor crankcase heater(s) for a minimum of 8 hours before start-up if the unit is shut down for four hours or longer. This will evaporate any liquid refrigerant from the crankcase. Failure to do this may result in insufficient compressor lubrication at start-up and cause extensive compressor damage.

The compressor crankcase heater is energized when the unit power fused disconnect and the manual disconnect (1S14) (in the control panel) are closed. The control circuit switch (1S1) should be in the "Off" position.

If the prevailing ambient temperature is above the minimum start-up temperature for the unit (Table 1), and there is sufficient water flow to the evaporator, the unit will operate normally. The compressor(s) will run if the return water temperature rises to the first stage setpoint of the temperature controller.

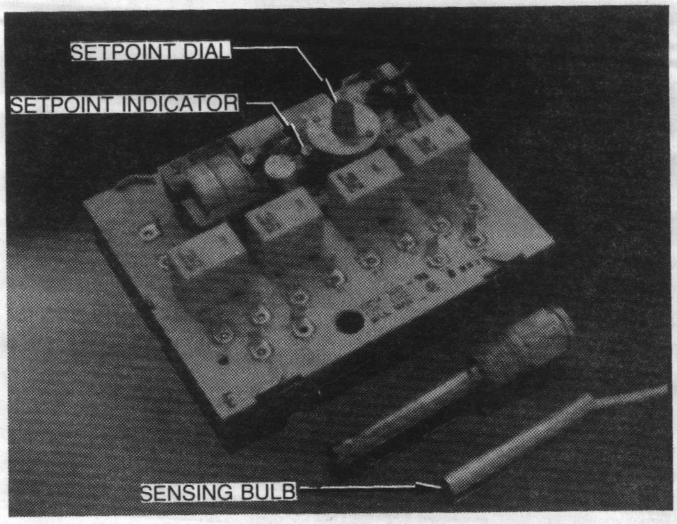


FIGURE 1 - CGAB Solid-State Multiple Stage Temperature Controller

As return water temperature increases or decreases, the temperature controller will sequence through its stages, loading and unloading the compressor(s) and sequencing the condenser fans on and off as conditions demand to provide the required cooling.

CONDENSER FAN SEQUENCING

Condenser fan sequencing is as follows: (Refer to Figure 4 for fan locations.)

20 Ton Unit

Fan 2 starts with compressor start, stops when the compressor stops. Fan 1 starts when the ambient temperature rises above 73 F, stops when the ambient temperature falls to 65 F.

TABLE 1 - CGAB Minimum Operating Ambients

UNIT SIZE	MINIMUM OPERATING TEMPERATURE (°F)[1]		
		LOW AMBIENT UNIT[3]	
	STANDARD UNIT[2]	WITH HGBP[4]	WITHOUT HGBP
CGAB C20	40	10	0
CGAB C25	50	10	0
CGAB C30	45	10	0
CGAB C40	40	10	0
CGAB C50	50	10	0
CGAB C60	45	10	0

1. At minimum step of unloading.
2. With or without hot gas bypass. No low ambient dampers.
3. Unit equipped with low ambient damper(s).
4. Based on minimum compressor unloading and wind across the condenser at 5 mph max.

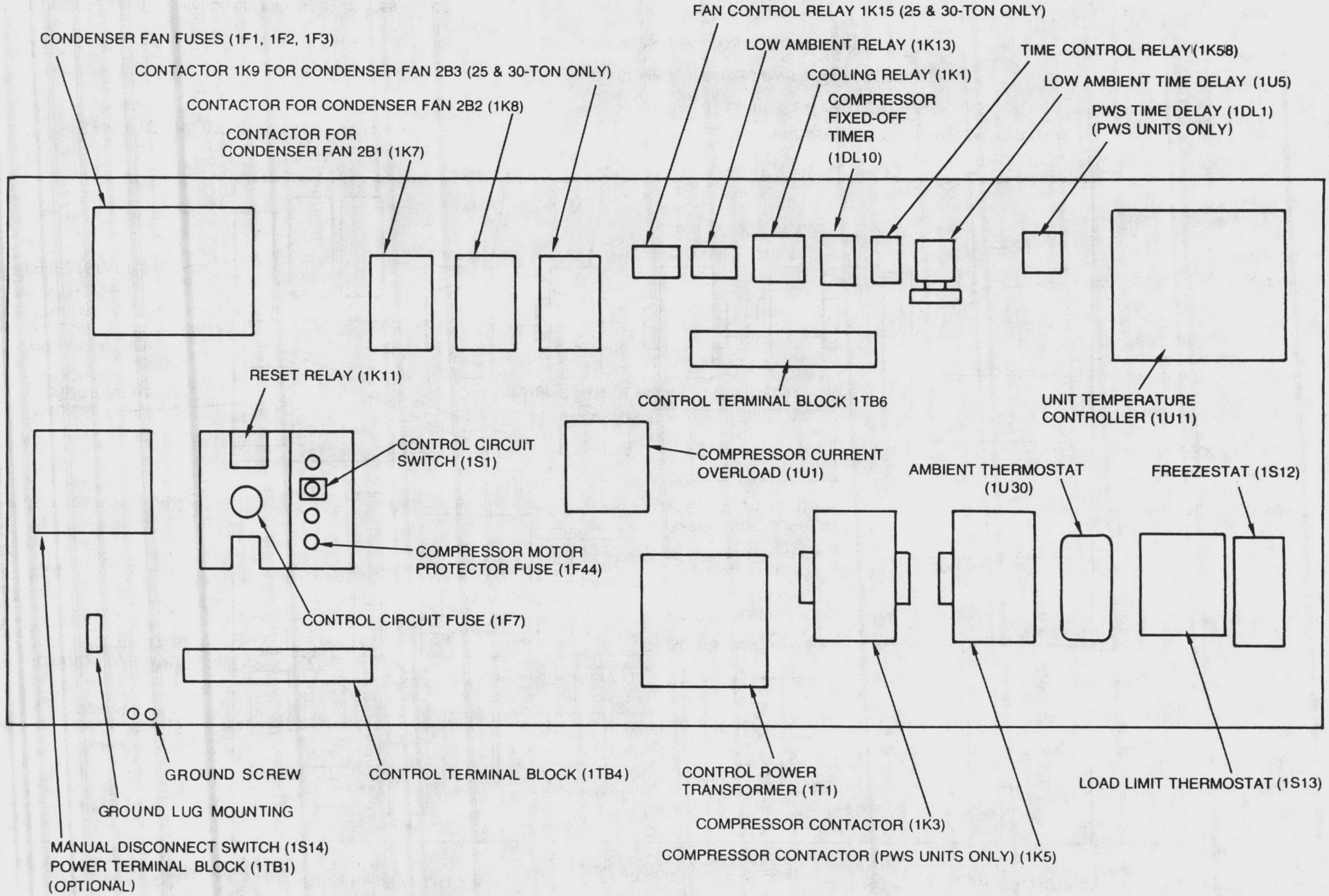


FIGURE 2 — Control Panel Layout for CGAB-C20, C25 and C30

4401-1769

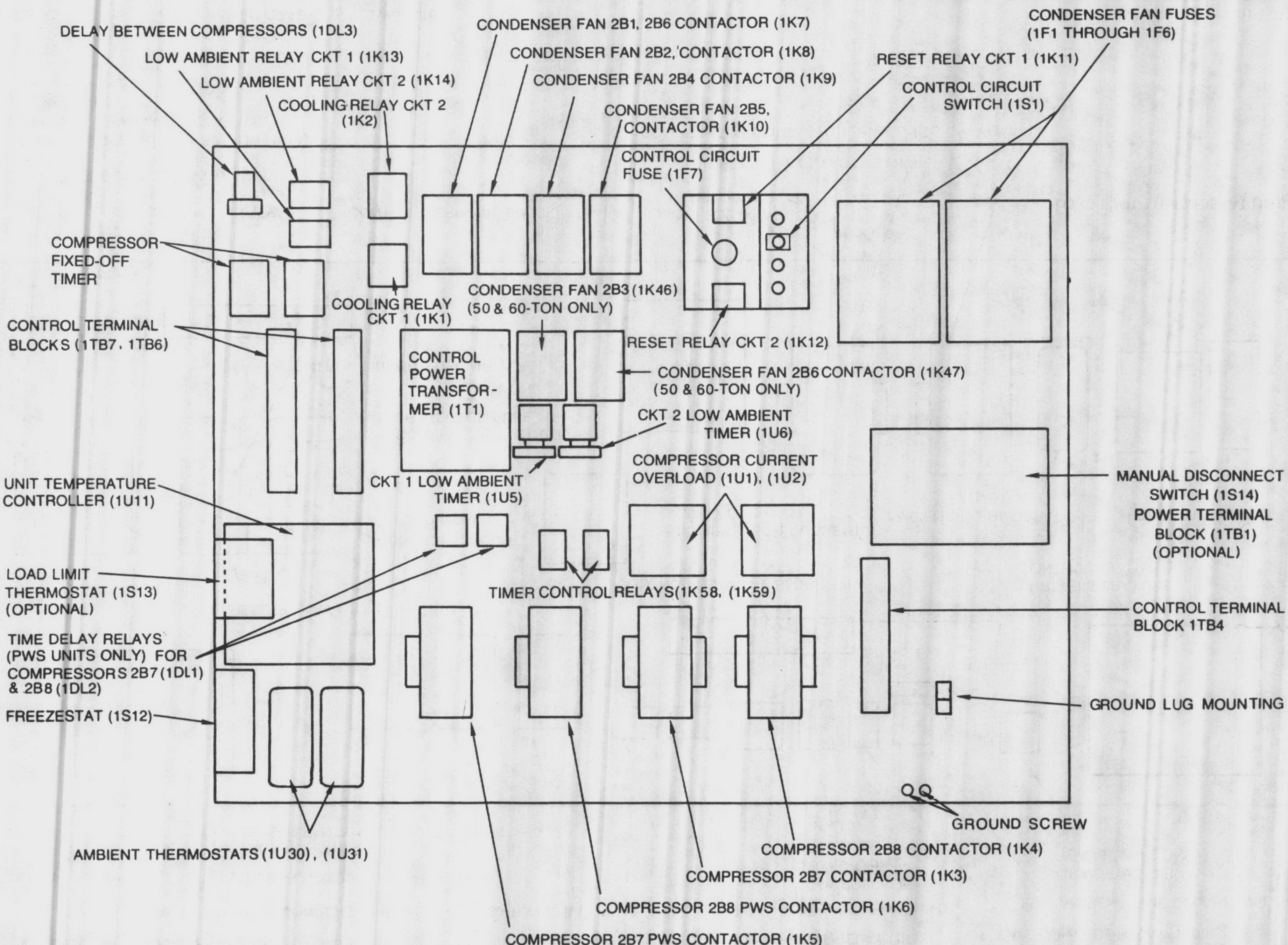


FIGURE 3 — Control Panel Layout for CGAB-C40, C50 and C60

4401-1770

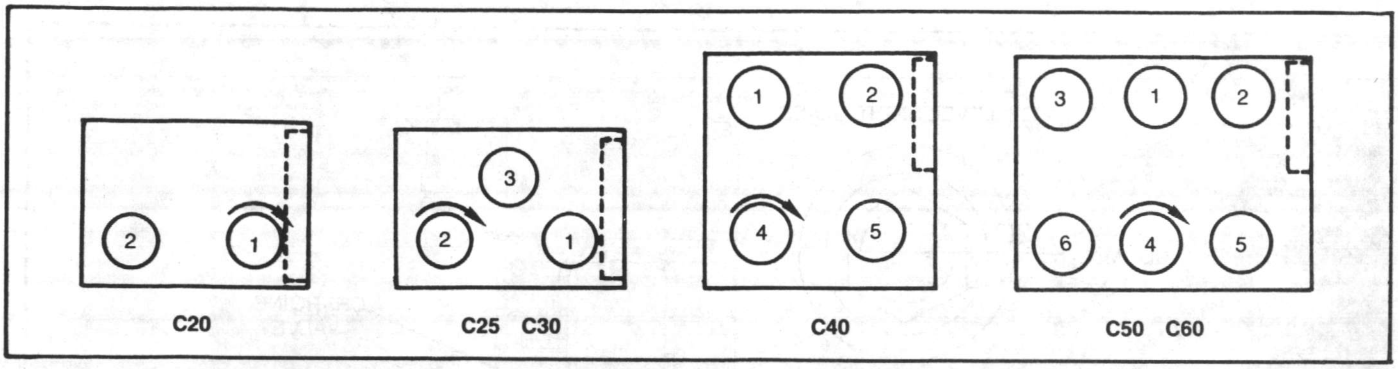


FIGURE 4 - CGAB Condenser Fan Locations

25 and 30 Ton Units

Fan 2 starts with compressor start, stops when the compressor stops. Fan 1 starts when the ambient temperature rises above 73 F, stops when the ambient temperature falls to 65 F. Fan 3 starts with second stage call for cooling from the temperature controller when the ambient temperature is above 53 F, stops when the ambient temperature is below 45 F.

40 Ton Unit

Fan 2 starts and stops with compressor 1. Fan 5 starts and stops with compressor 2. Fan 1 starts when ambient temperature is above 73 F, stops when ambient temperature drops below 65 F. Fan 4 starts with circuit 2 when ambient temperature is above 73 F, stops when ambient temperature reaches 65 F.

50 and 60 Ton Units

Fan 2 starts and stops with compressor 1. Fan 5 starts and stops with compressor 2. Fans 1 and 3 start with circuit 1 when the ambient temperature rises to 73 F, stops when ambient temperature falls to 65 F. Fans 4 and 6 start with circuit 2 when the ambient temperature reaches 53 F, stops at 45 F.

LIMITED PERIOD SHUT-DOWN AND START-UP

Use this procedure to shut the unit down for less than four (4) hours.

1. Turn the control circuit switch (1S1) in the control panel to the "Off" position.
2. When the unit has pumped down and the compressor has stopped, turn off the circulating (chilled) water pump at the pump remote control station.
3. Leave the unit power fused disconnect switch and the manual disconnect (1S14) in the control panel closed to permit continued operation of the compressor crankcase heater(s). This will prevent condensing of refrigerant in the compressor oil sump. The control circuit switch (1S1) should be "Off".
4. If the unit will be subjected to freezing temperatures during the shut-down period, energize the water pipe heat tapes and evaporator heat tape (if control is not automatic).

WARNING: THIS PROCEDURE IS NOT APPROVED FOR MAINTENANCE OR SERVICE SHUT-DOWN. OBSERVE SAFETY WARNINGS IN THE "MAINTENANCE" SECTION OF THIS MANUAL. FAILURE TO DO SO MAY RESULT IN HAZARDOUS CONDITIONS AND POSSIBLE INJURY TO OPERATING PERSONNEL.

To restart the unit, start the circulating water pump and turn the control circuit switch (1S1) to the "On" position. If the prevailing ambient temperature is above the minimum start-up temperature for the unit (Table 1) and there is sufficient water flow to the evaporator, the unit will operate normally.

SEASONAL SHUTDOWN PROCEDURE

Use this procedure to shut the unit down if it is to be inoperative for an extended period.

1. Pump the system down. See "System Pumpdown" procedure in the "Maintenance" section of this manual.
2. Front-seat (close) the compressor suction service valve.
3. Test the condenser and all high side piping for refrigerant leak.
4. Service the circulating water pump and all air handling equipment according to the manufacturer's recommendations.
5. Freeze-proof the evaporator and chilled water piping by energizing the piping and evaporator heat tapes or by adding a non-freezing low temperature heat transfer fluid such as DOWTHERM SR-1 or equivalent to the chilled water as described under "Low Ambient Operation" in this manual. If this is done, the chilled water system remains filled the year-around.

SEASONAL START-UP PROCEDURE

1. Perform all "Annual" maintenance procedures.
2. With the control circuit switch (1S1) in the control panel in the "Off" position, close the unit power fused disconnect switch and the manual disconnect (1S14) in the control panel (if used). This will energize the compressor crankcase heater(s).

CAUTION: Energize the compressor crankcase heater(s) for a minimum of 8 hours before start-up after an extended shutdown period. This will evaporate any liquid refrigerant that has migrated to the compressor crankcase during shutdown. Failure to do this may result in insufficient compressor lubrication at start-up and cause extensive compressor damage.

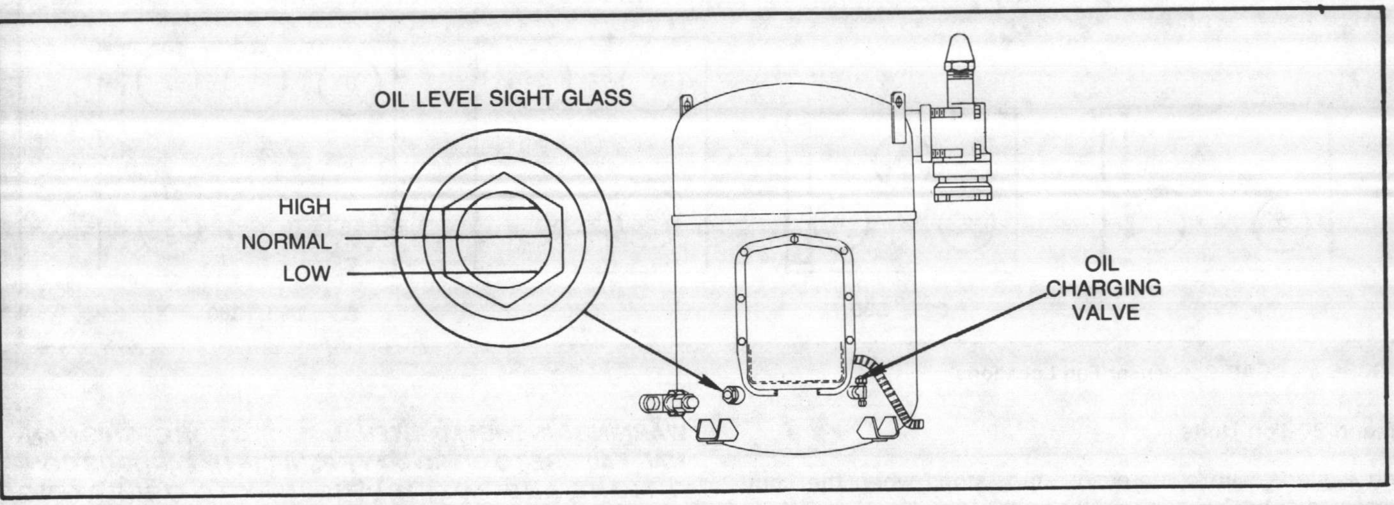


FIGURE 5 - Model K Compressor Oil Level Sight Glass, Oil Charging Valve

3. Backseat (open) the compressor suction and discharge service valves. If the unit is not equipped with pressure gauges, install gauges on the compressor service valve backseat ports.

CAUTION: Do not start the unit with the compressor service valves frontseated (closed). This may result in compressor damage.

4. Open the liquid line valve(s).
5. Using a leak detector, inspect the entire system for refrigerant leakage.
6. Start the unit and monitor operating conditions as described in "Operational Checks" in this manual.

OPERATIONAL CHECKS

Monitor these functions until the system stabilizes (approximately a half hour) after any start-up:

CAUTION: Any service procedures other than the routine operational checks given here, must be performed by a qualified service technician.

Compressor Oil Level

The oil level should be visible in the center of the oil level sight glass on the compressor (Figure 5) while it is running. The oil should be clear. Excessive foaming indicates the presence of refrigerant in the oil and will result in insufficient compressor lubri-

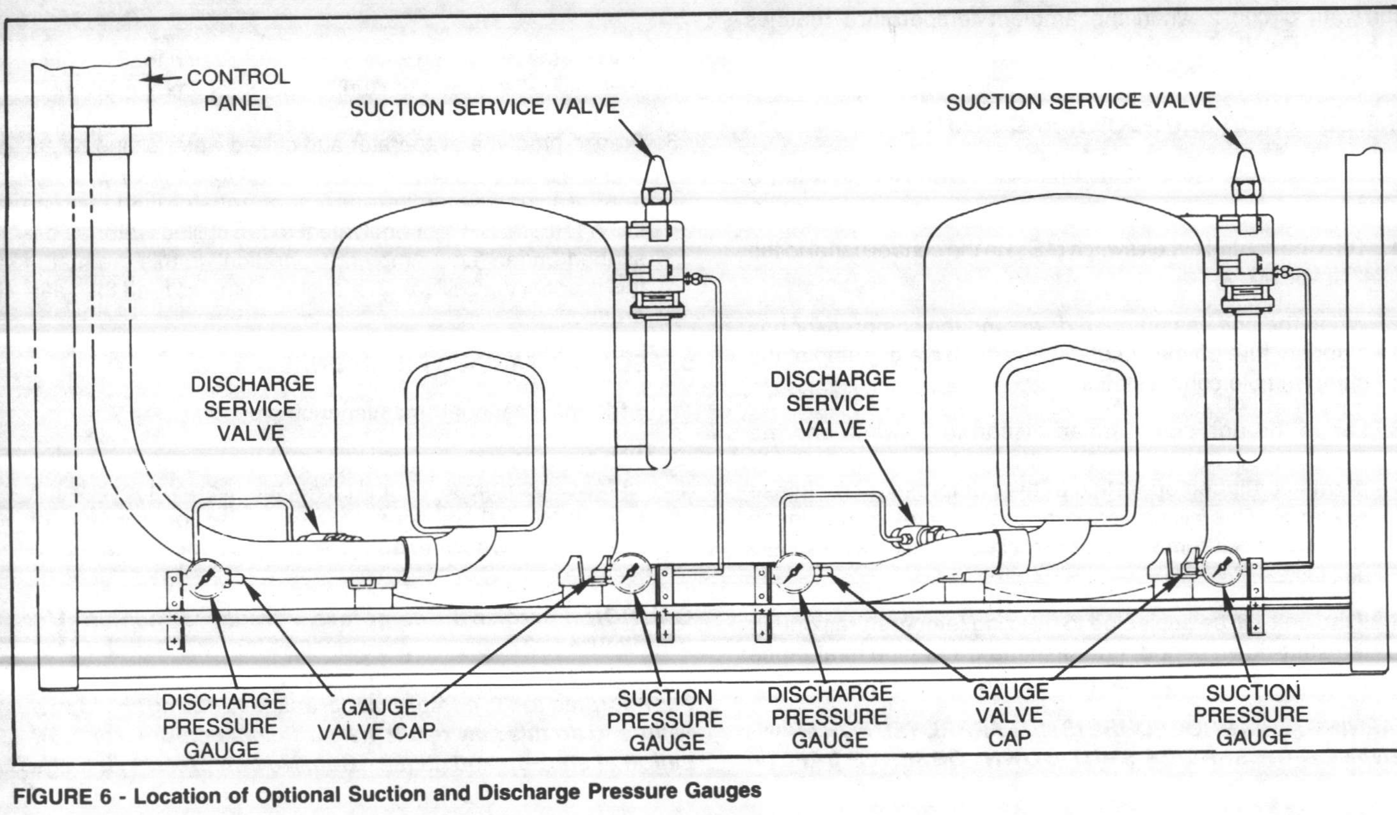


FIGURE 6 - Location of Optional Suction and Discharge Pressure Gauges

TABLE 2 - Normal Full Load Operating Pressures (PSIG)

UNIT SIZE	AMBIENT TEMPERATURE 85 F		95 F		105 F		115 F	
	SUCT.[1]	DISC.	SUCT.	DISC.	SUCT.	DISC.	SUCT.	DISC.
CGAB C20	61	241	62	270	64	303	64	339
CGAB C25	62	248	63	277	65	309	66	343
CGAB C30	62	241	63	271	64	304	65	340
CGAB C40	62	241	63	271	64	304	65	340
CGAB C50	63	251	64	280	65	312	66	346
CGAB C60	63	243	64	274	65	307	66	343

1. Suction based on 54 F EWT, 44 F LWT, .0005 FF in evaporator.

cation. The correct oil charge for each compressor is 22 pints. Recommended oils for this compressor are: Suniso 3GS; Virginia 150; Texaco Capella B or WF 32; Mobil Gargyl Arctic 150; Calumet R015 or equivalent. Shut the unit off and energize the compressor crankcase heater(s) for a period of 8 hours before restarting.

Operating Pressures

Check the compressor suction and discharge pressures if the unit is equipped with pressure gauges (Figure 6). Remove the cap from the gauge valve. Backseat (open) the gauge valves and read the pressure. When readings are completed, front-seat (close) the gauge valve. Replace the valve cap.

CAUTION: Be certain to close the gauge valve on each pressure gauge after making pressure readings. Leaving the valve to the gauge open continuously during unit operation can cause premature pressure gauge failure.

Pressures should approximate those given in Table 2 for various ambient temperatures. If pressures are not close to those in Table 2, contact a qualified service representative.

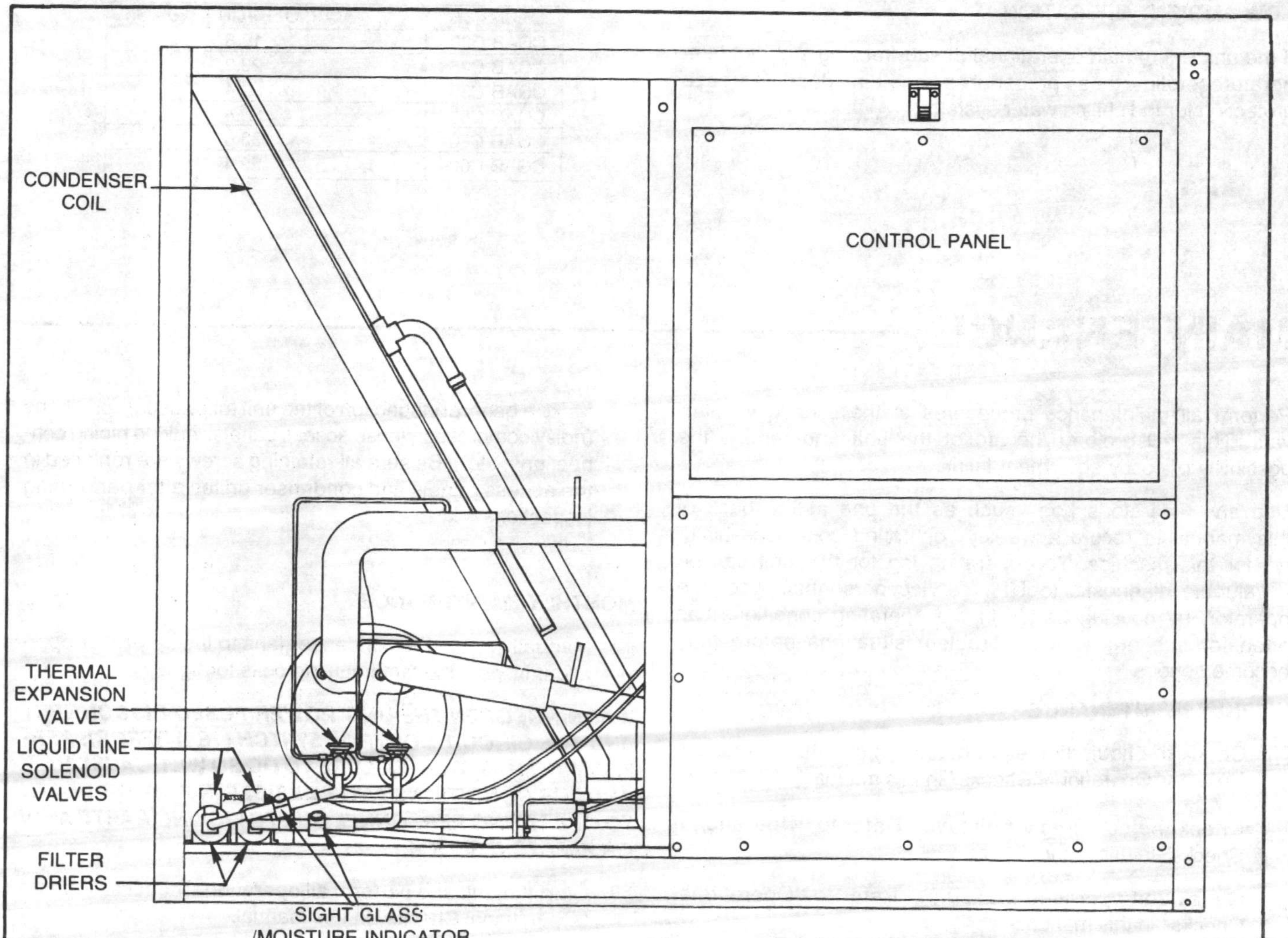


FIGURE 7 - Liquid Line Sight Glass/Moisture Indicator Locations (CGAB-C60 Shown)

Liquid Line Sight Glass/Moisture Indicator

The refrigerant flow past the sight glass/moisture indicator on each liquid line (Figure 7) should be clear without bubbles. Bubbles or flash gas in the liquid refrigerant flow may indicate low refrigerant charge or a restriction in the liquid line. Contact a qualified service representative.

Each sight glass is equipped with a moisture indicator. The color of the indicator element changes with the amount of moisture present in the refrigerant. Refer to the reference label on the sight glass to determine the level of moisture in the refrigerant. The indicator element should indicate "dry" refrigerant. If wet refrigerant is indicated, run the unit for a minimum of 12 hours and check the indicator again. (A minimum of 12 hours is required for a complete indicator color change.) If the indicator remains consistently in the "Caution" or "Wet" zones, contact a qualified service representative.

CAUTION: Run the compressor(s) for a minimum of two (2) hours before taking the initial moisture level readings after a start-up. The moisture indicator element is moisture and temperature sensitive, so the system must be at normal operating temperatures to obtain correct moisture level readings.

LOW AMBIENT OPERATION

If the unit will remain operational at sub-freezing ambient temperatures, follow these procedures to obtain adequate freeze protection for the chilled water system.

Turn Heat Tape and Evaporator Heater On

Energize both the chilled water piping heat tape and the evaporator heater circuit at the fused disconnect provided by the installing contractor. Be certain that all exposed piping is adequately protected. This will provide system freeze protection to 0 F which is the minimal operational temperature for low ambient units.

Use Freeze-Proofing Fluid

If, for any reason, there is no provision for power to the evaporator heater or the piping heat tape, freeze-proof the chilled water system by adding a non-freezing, low temperature heat transfer fluid such as DOWTHERM SR-1 or equivalent to the chilled water. The solution must be strong enough to provide enough protection to prevent ice formation at the lowest ambient temperature that will be encountered (include wind chill factor). This type of solution is recommended due to its high resistance to corrosion, long life and ease of analysis. Also, this type of fluid can be replenished without draining the system. Follow the manufacturer's recommendations for installation and testing procedures for any freeze-proofing fluid used. Refer to Table 3 for evaporator liquid capacities.

TABLE 3 - Evaporator Liquid Capacity (Gals.)

UNIT SIZE	EVAP. CAPACITY (GALS.)
CGAB C20	10.8
CGAB C25	22.2
CGAB C30	20.4
CGAB C40	34.4
CGAB C50	33.6
CGAB C60	29.4

MAINTENANCE

Perform all maintenance procedures at the scheduled intervals. This will prolong the life of the unit and reduce the possibility of costly equipment failure.

Use an "Operator's Log" such as the one at the back of this manual to record a weekly "operating conditions history" for this machine. The operating log for this unit can be a valuable diagnostic tool for service personnel. Also, the operator, by noticing trends in the operating conditions can often foresee and prevent problem situations before they become serious.

WEEKLY MAINTENANCE

- ☐ Check the liquid line sight glass(es)/moisture indicator. Refer to "Operational Checks" in this manual.
- ☐ Check the compressor oil level. Refer to "Operational Checks" in this manual.
- ☐ Check unit operating pressures. Refer to "Operational Checks" in this manual.
- ☐ Make a general inspection of the unit for unusual conditions (noisy compressor, loose access panels, leaking piping connections, etc.). Be sure all retaining screws are replaced in the access panels and condenser grilles after performing inspections.

MONTHLY MAINTENANCE

- ☐ Manually rotate the condenser fans to insure proper operation. Inspect the fan mounting bolts for tightness.

WARNING: OPEN THE UNIT POWER FUSED DISCONNECT AND THE CIRCUIT CONTROL SWITCH (1S1) BEFORE PERFORMING THIS STEP. FAILURE TO DO SO WILL CAUSE HAZARDOUS CONDITIONS AND POSSIBLE INJURY OR DEATH TO OPERATING PERSONNEL DUE TO MOVING PARTS AND/OR ELECTRIC SHOCK.

- ☐ Start the unit and perform all operational checks. Refer to "Operational Checks" in this manual.

ANNUAL MAINTENANCE

☐ Clean the condenser coil(s) with a soft-bristled brush. Flush with cool, clear water. A solvent may be used if it is non-corrosive to the ondenser coil.

WARNING: DO NOT STEAM CLEAN THE CONDENSER COIL. THIS CAN GENERATE EXCESSIVE PRESSURE BUILD-UP AND RESULT IN HAZARDOUS CONDITIONS AND POSSIBLE INJURY TO OPERATING PERSONNEL.

☐ Clean the water strainers in the evaporator chilled water supply piping.

WARNING: THE CHILLED WATER SYSTEM MAY BE PRESSURIZED. USE PROPER SERVICE PROCEDURES TO RELIEVE PRESSURE BEFORE OPENING THE CHILLED WATER SYSTEM. FAILURE TO DO SO CAN RESULT IN HAZARDOUS CONDITIONS AND POSSIBLE INJURY TO OPERATING PERSONNEL.

☐ Remove corrosion from any surface and repaint. Check the condition of the gasket around the control panel door. It must fit correctly and be in good condition to prevent water leakage.

☐ Inspect the chilled water system for leakage. Check operation of the circulating pump and related equipment. Test and replenish the permanent freeze-proofing fluid in the chilled water system (if used).

☐ Perform all weekly and monthly maintenance procedures.

☐ Perform an oil analysis to determine acidity of the compressor oil and record results.

WARNING/CAUTION: THE OIL ANALYSIS PROCEDURE MUST BE PERFORMED BY A QUALIFIED SERVICE TECHNICIAN. INCORRECT INTERPRETATION OF ANALYSIS RESULTS CAN CAUSE DAMAGE TO THE UNIT. THE USE OF IMPROPER ANALYSIS PROCEDURES CAN CAUSE HAZARDOUS CONDITIONS THAT MAY RESULT IN INJURY TO SERVICE PERSONNEL.

SYSTEM PUMPDOWN PROCEDURE

For each circuit:

1. Open unit master disconnect switch.
2. Install gauges on the unit if it is not so equipped.
3. Install jumper across terminals of low pressure control (2B7S4, 2B8S5).
4. Close the liquid line shutoff valves.
5. Close disconnect switch, and energize control system, starting unit.
6. Observe suction pressure gauge. When reading drops to 2-3 psig, open disconnect switch.
7. Front seat compressor discharge valve.

NOTE: *If suction pressure rises, repeat pumpdown procedure until pressure holds at 2-3 psig.*

8. Remove jumper from low pressure control.

TROUBLE ANALYSIS

IF, FOR ANY REASON, THIS UNIT DOES NOT OPERATE PROPERLY, CONTACT A QUALIFIED SERVICE REPRESENTATIVE.

IMPORTANT: FILL OUT THE INFORMATION BELOW FOR USE WHEN CONTACTING THE TRANE SERVICE REPRESENTATIVE FOR PARTS OR INFORMATION.

UNIT MODEL NUMBER ____________________

UNIT SERIAL NUMBER ____________________

INSTALLATION DATE ____________________

INSTALLING CONTRACTOR ____________________

TRANE SERVICE COMPANY ____________________

ADDRESS ____________________

TELEPHONE NUMBER ____________________

FOR ADDITIONAL INFORMATION ON THIS PRODUCT:

This Trane Owner-Operator Manual provides necessary information to operate and perform routine maintenance on the Trane CGAB.

A comprehensive Service Guide, intended for use by experienced service personnel is available at additional cost. Contact a Trane Sales Office or Service Company for current prices.

OPERATOR'S MAINTENANCE LOG (1)

DATE	WEEKLY MAINTENANCE INSPECTION — COMPRESSOR(S) — COMPRESSOR 1 — OIL LEVEL	SUCT. (3) PRESS.	DSCHG. PRESS.	COMPRESSOR 2 (2) — OIL LEVEL	SUCT. PRESS.	DSCHG. PRESS.	SIGHT GLASS/MOISTURE INDICATOR — SIGHT GLASS 1 — REFRIG. CONDITION	MOISTURE LEVEL	SIGHT GLASS 2 (2) — REFRIG. CONDITION	MOISTURE LEVEL	WATER TEMP. (°F) — EWT (WATER ENT. EVAPORATOR)	LWT (WATER LVG. EVAPORATOR)
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
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	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
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	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ OK ☐ LOW			☐ OK ☐ LOW			☐ OK ☐ BUBBLES	☐ DRY ☐ WET	☐ OK ☐ BUBBLES	☐ DRY ☐ WET		
	☐ LOW ☐ OK			☐ LOW ☐ OK			☐ BUBBLES ☐ OK	☐ WET ☐ DRY	☐ BUBBLES ☐ OK	☐ WET ☐ DRY		

1. Perform each inspection once per week with the unit operating.
2. Dual compressor units only.
3. Record operating pressures in psig. Available only if the unit is equipped with pressure gauges.

FOR FURTHER INFORMATION ON THIS PRODUCT OR OTHER TRANE PRODUCTS, REFER TO THE "TRANE SERVICE LITERATURE CATALOG", ORDERING NUMBER IDX-IOM-1. THIS CATALOG CONTAINS LISTINGS AND PRICES FOR ALL SERVICE LITERATURE SOLD BY TRANE. THE CATALOG MAY BE ORDERED BY SENDING A $15.00 CHECK TO: THE TRANE COMPANY, SERVICE LITERATURE SALES, 3600 PAMMEL CREEK ROAD, LA CROSSE, WI 54601.

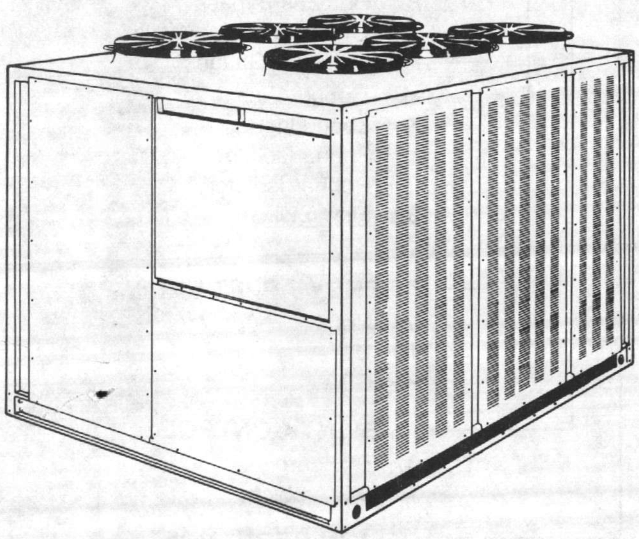
TO HELP ENSURE OPTIMUM PERFORMANCE, BE SURE TO SPECIFY QUALITY TRANE PARTS.

Installation

Library	**Service Literature**
Product Section	**Refrigeration**
Product	**Recip. Liquid Chillers - Air-Cooled**
Model	**CGAB**
Literature Type	**Installation**
Sequence	**2**
Date	**June 1985**
File No.	**SV-RF-CG-CGAB-IN-2-685**
Supersedes	

Ordering No. **CGAB-IN-2**

LIQUID CHILLER - RECIPROCATING AIR-COOLED COLD GENERATOR®



MODEL 'K' COMPRESSOR

'B' DEVELOPMENT SEQUENCE

MODELS

CGAB-C20	CGAB-C40
CGAB-C25	CGAB-C50
CGAB-C30	CGAB-C60

LITERATURE CHANGES
Covers CGAB units of design sequence 'E' with ambient thermostat controlled fan cycling, changes for U.L. Standard 465.

TABLE OF CONTENTS

UNIT MODEL NUMBER DESCRIPTION

DIGIT NUMBER	12	3	4	567	8	9	10	11	12	13
MODEL NUMBER	CG	A	B	C20	3	A	E	1	0	A

UNIT MODEL
CG = Cold Generator

UNIT TYPE
A = Air-Cooled Condensing

DEVELOPMENT SEQUENCE
B = Second

NOMINAL CAPACITY
C20 = 20 Tons
C25 = 25 Tons
C30 = 30 Tons
C40 = 40 Tons
C50 = 50 Tons
C60 = 60 Tons

POWER SUPPLY
1 = 460/60/3 PWS
2 = 575/60/3 PWS
3 = 230/60/3 PWS
4 = 460/60/3 XL
6 = 200/60/3 PWS
A = 380/50/3 PWS
B = 415/50/3 PWS

MISCELLANEOUS
A = Unit Disconnect Switch
B = Hot Gas Bypass
C = Omit Decorative Grille
F = Pressure Gauges
H = Copper Fins
K = Load Limit
1 = Spring Isolator
2 = Rubber Isolator
3 = Flow Switch

AGENCY APPROVAL
0 = None
1 = UL
2 = CSA

AMBIENT CONTROL
0 = Standard
1 = 0 F Ambient

DESIGN SEQUENCE
A = First
B = Second, etc.

SYSTEM CONTROL
A = Electronic

FOR FURTHER INFORMATION ON THIS PRODUCT OR OTHER TRANE PRODUCTS, REFER TO THE "TRANE SERVICE LITERATURE CATALOG", ORDERING NUMBER IDX-IOM-1. THIS CATALOG CONTAINS LISTINGS AND PRICES FOR ALL SERVICE LITERATURE SOLD BY TRANE. THE CATALOG MAY BE ORDERED BY SENDING A $15.00 CHECK TO: THE TRANE COMPANY, SERVICE LITERATURE SALES, 3600 PAMMEL CREEK ROAD, LA CROSSE, WI 54601.

TO HELP ENSURE OPTIMUM PERFORMANCE, BE SURE TO SPECIFY QUALITY TRANE PARTS.

GENERAL INFORMATION

Trane Air-Cooled Cold Generators are assembled, pressure tested, dehydrated, charged and run tested before shipment. The information contained in this manual applies to 20 through 60 ton units designated CGAB. The compressor(s) contain a correct oil charge and each refrigerant circuit contains an operating charge of R-22. All valves, including the compressor suction and discharge service valves are backseated (open) as shipped, with two exceptions. If the unit is equipped with factory installed low ambient dampers, the liquid line valve is closed to isolate the low ambient damper line(s) during shipment. If the unit is equipped with pressure gauges, the compressor discharge valves are shipped ¼ turn off backseat. Evaporator pipe connections are capped.

Shipping and Receiving

When the unit is delivered, inspect all components for damage. Manually rotate the condenser fans to be sure they revolve freely. Report any damage or material shortage to the carrier and note on the bill of loading. File damage claims with the carrier. Notify the appropriate Trane Sales Office before installing a damaged unit. Report any material shortage directly to the Trane Sales Office. Optional accessories such as the flow switch and neoprene or spring isolator kits ship with the unit. Refer to Figures 1-3 for the shipping positions of these items.

Verify that the correct unit has been shipped by comparing the electrical data on the unit nameplate with ordering and submittal information.

Handling

Two wooden runners are attached to the bottom of 20-40 ton units (Figures 1-3). The 50 and 60 ton CGAB have three runners. Remove and discard them at the jobsite. Two steel shipping channels are attached to the bottom of each unit. Do not remove them if the unit will be lifted by fork truck. Align the forks to lift the unit under these steel channels. The forks should extend beyond the width of the unit. Discard the steel channels once the unit is in position. Refer to "Unit Installation" for rigging instructions for a crane or helicopter lift.

Unit wiring diagrams, installation instructions and operation and maintenance literature are attached to the back of the control panel door. Read the literature to become familiar with the unit before start-up.

Figures 4-8 show unit dimensions and location of piping connections, electrical connections and centers of gravity. Refer to Table 5 for evaporator piping inlet and outlet sizes.

CAUTION: Check compressor suction and discharge valves to be certain that they are backseated (open) before starting the unit. Starting the unit with these valves closed can damage the compressor.

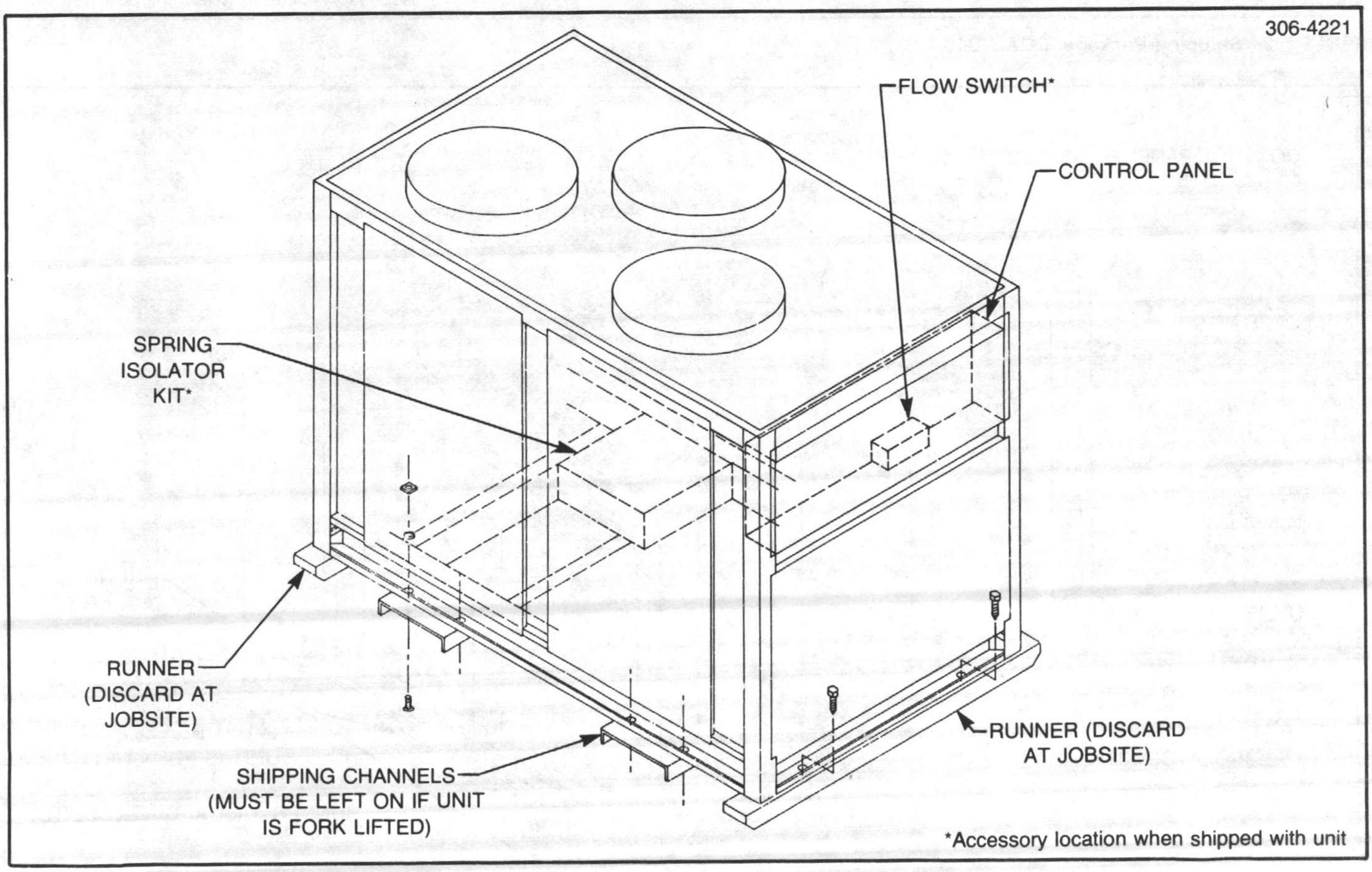


FIGURE 1 - Shipping Package. CGAB C20, C25 and C30.

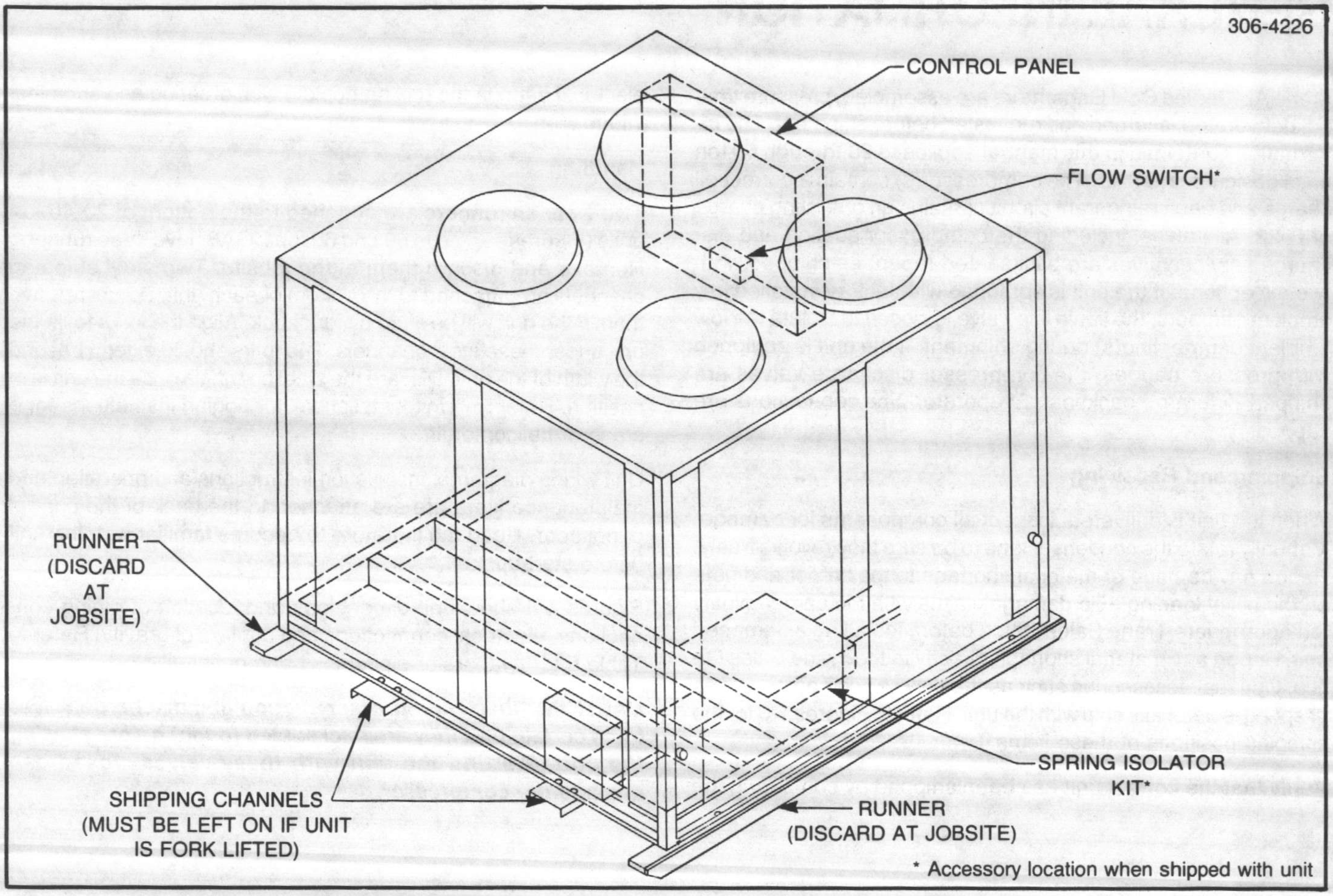


FIGURE 2 - Shipping Package. CGAB C40.

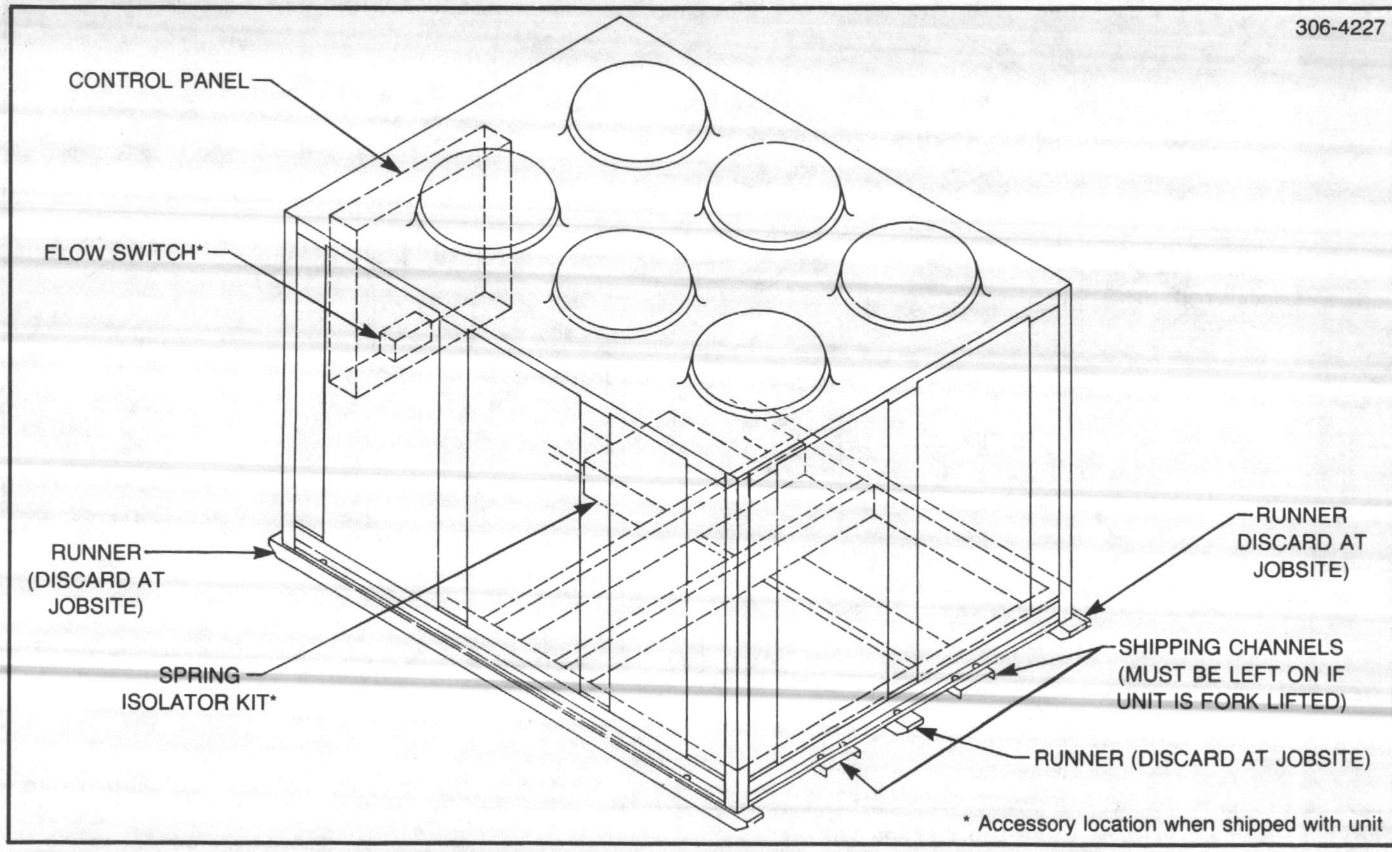


FIGURE 3 - Shipping Package. CGAB C50 and C60.

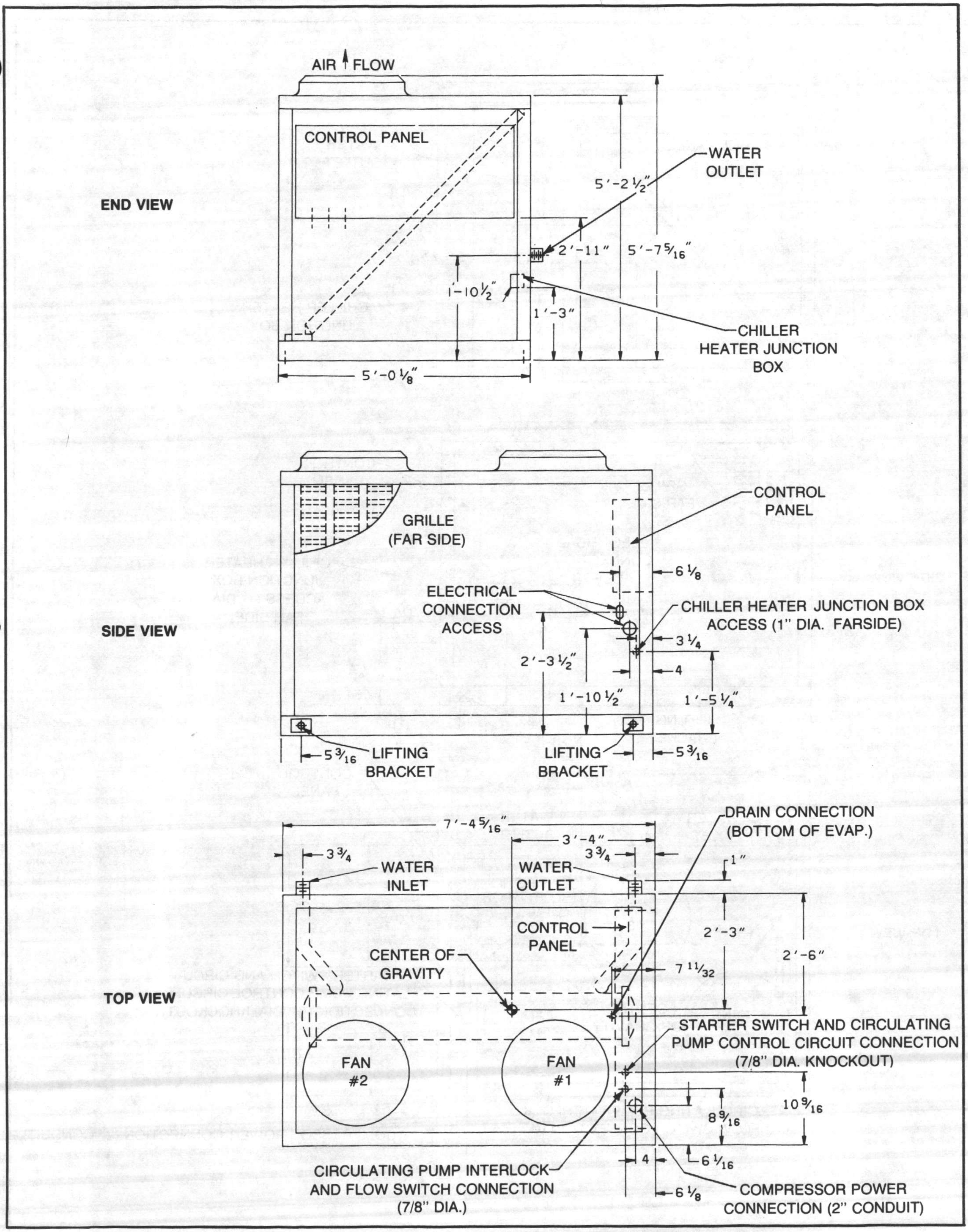


FIGURE 4 - Unit Dimensions and Connections. CGAB C20.

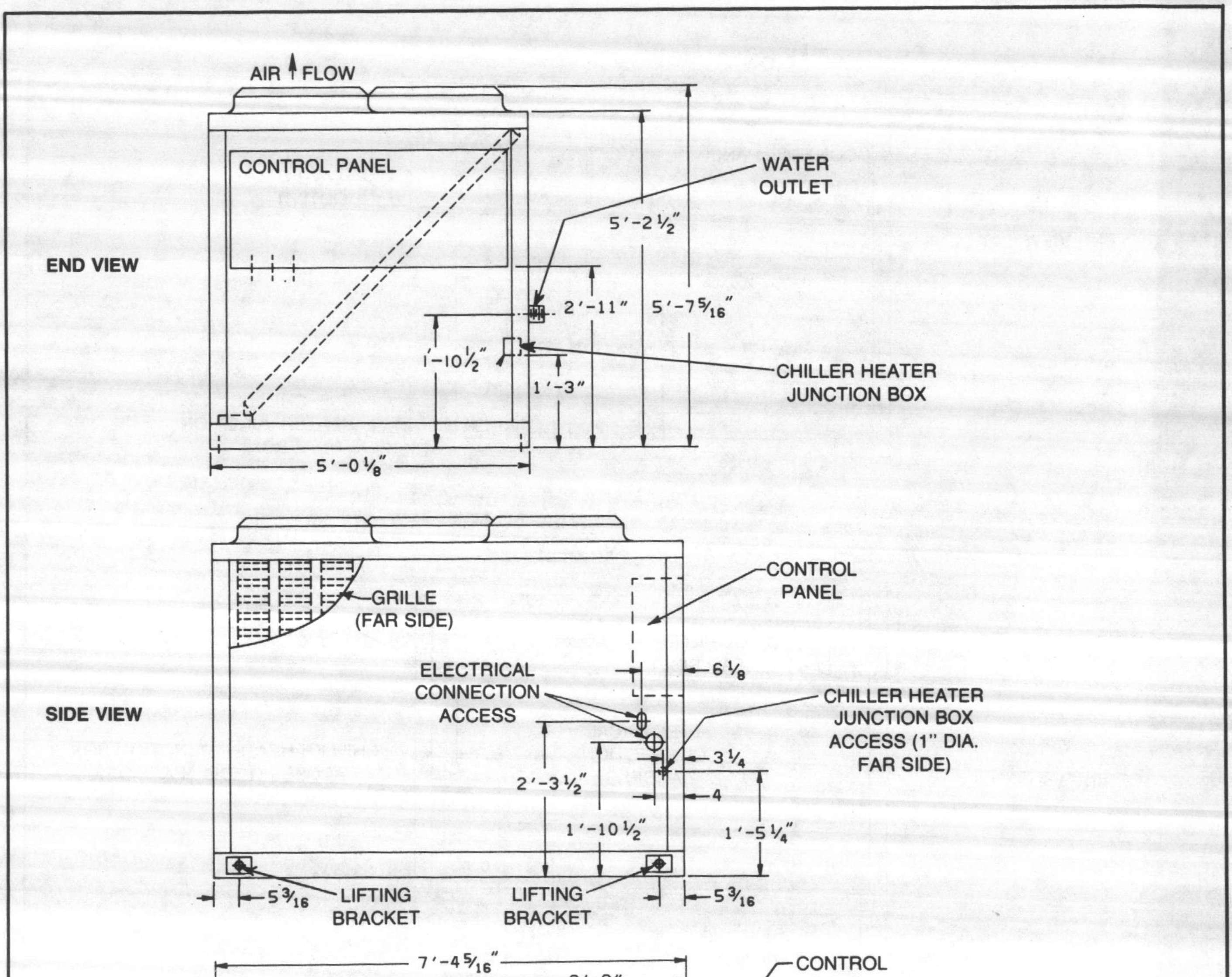


FIGURE 5 - Unit Dimensions and Connections. CGAB C25.

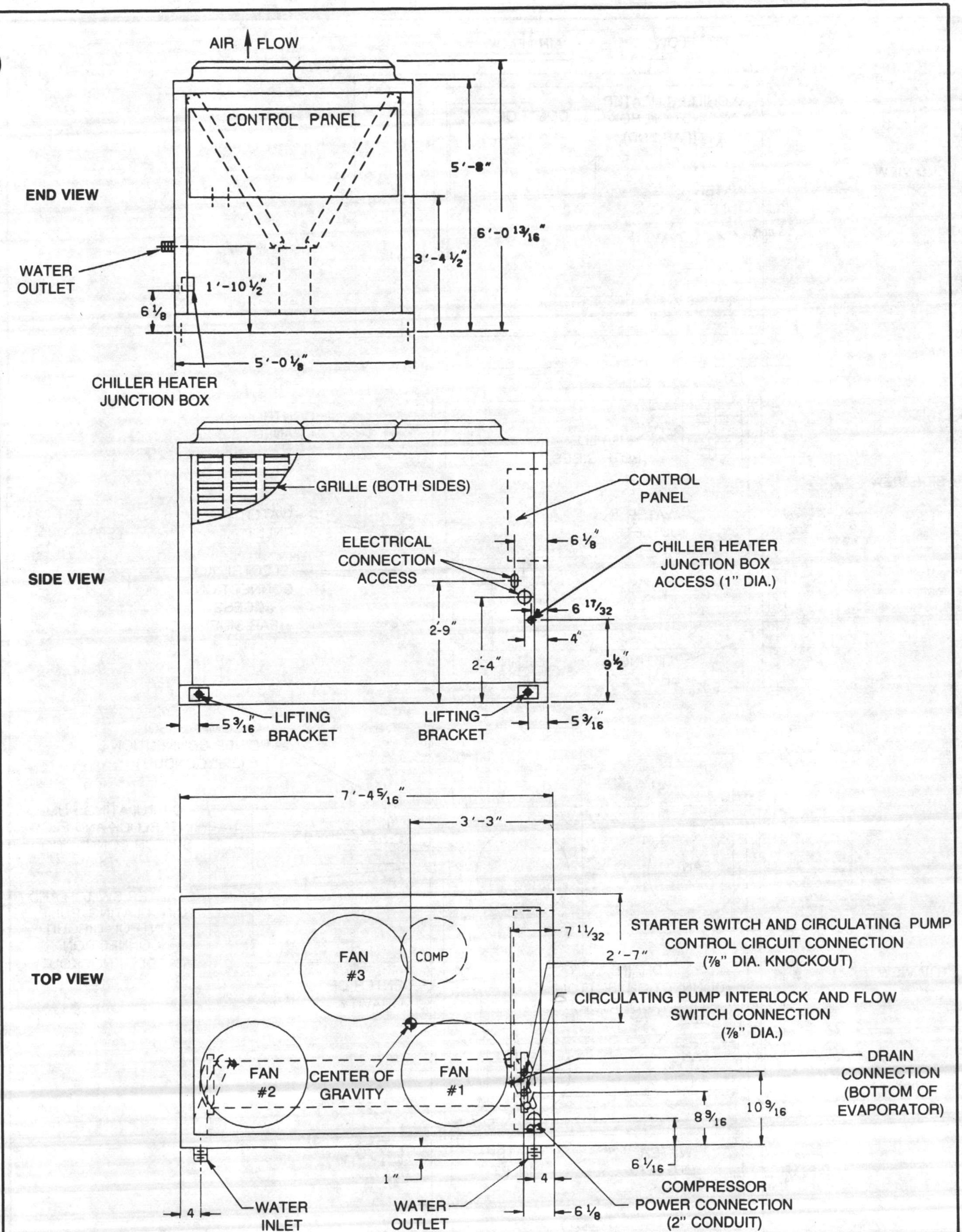


FIGURE 6 - Unit Dimensions and Connections. CGAB C30.

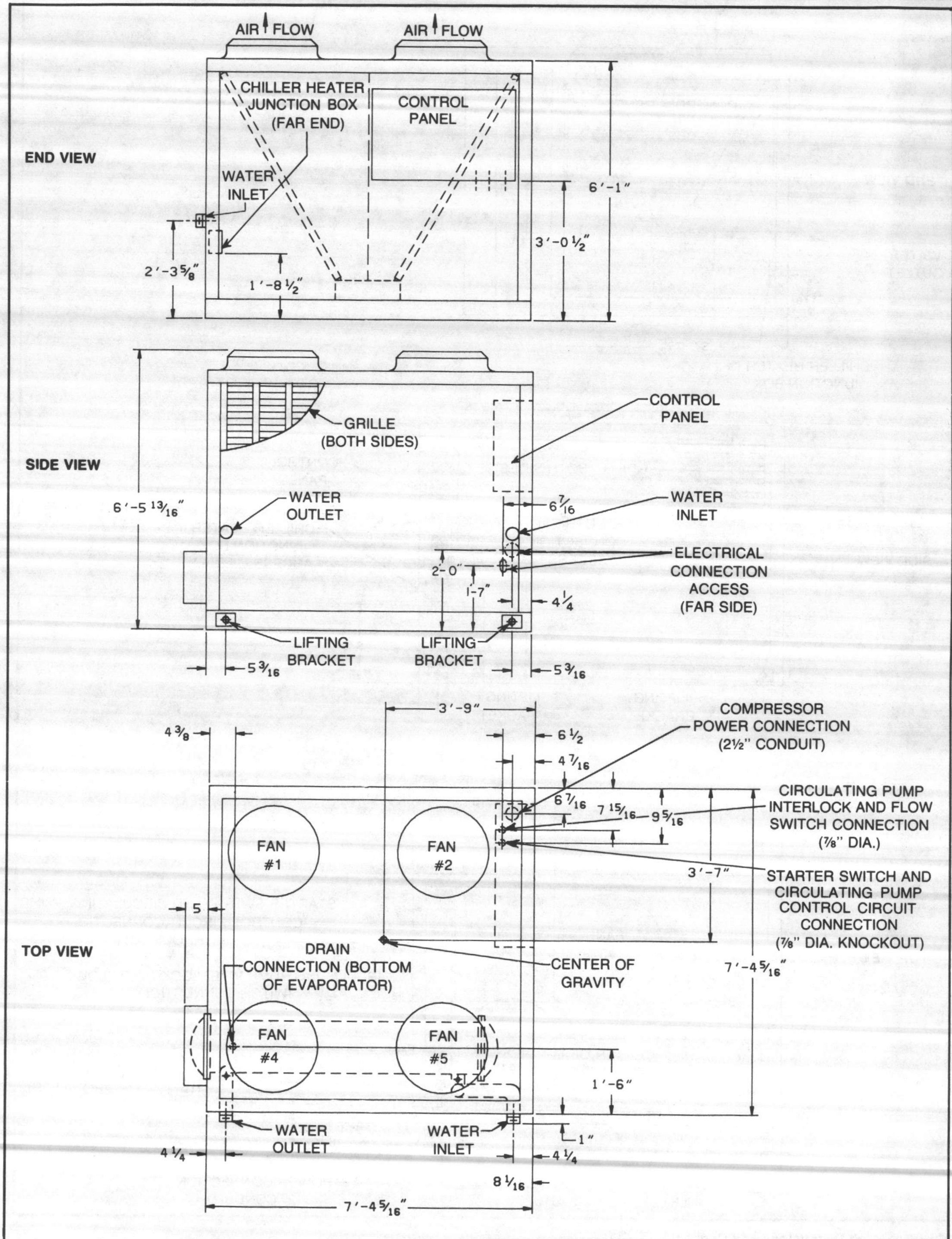


FIGURE 7 - Unit Dimensions and Connections. CGAB C40.

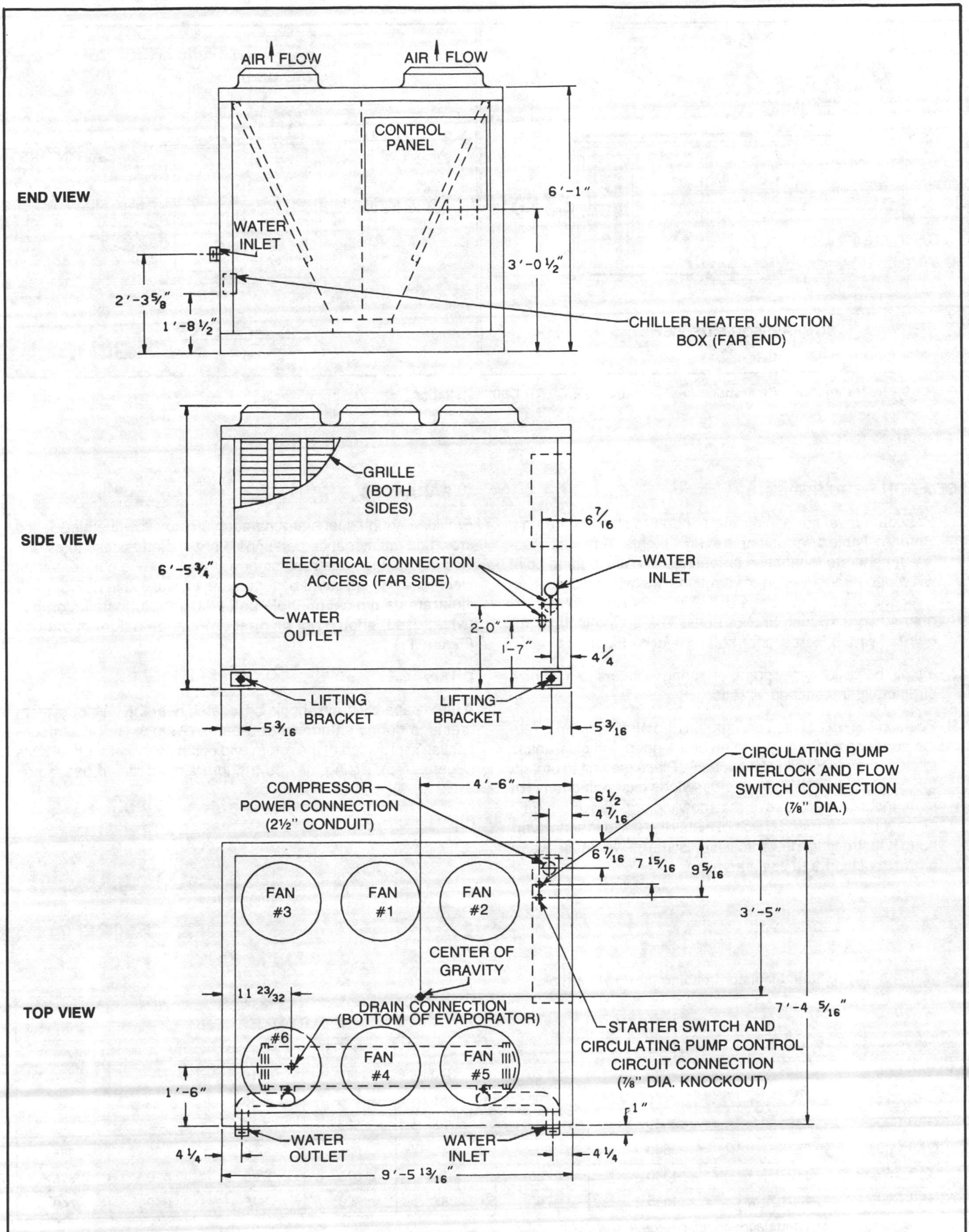


FIGURE 8 - Unit Dimensions and Connections. CGAB C50 and C60.

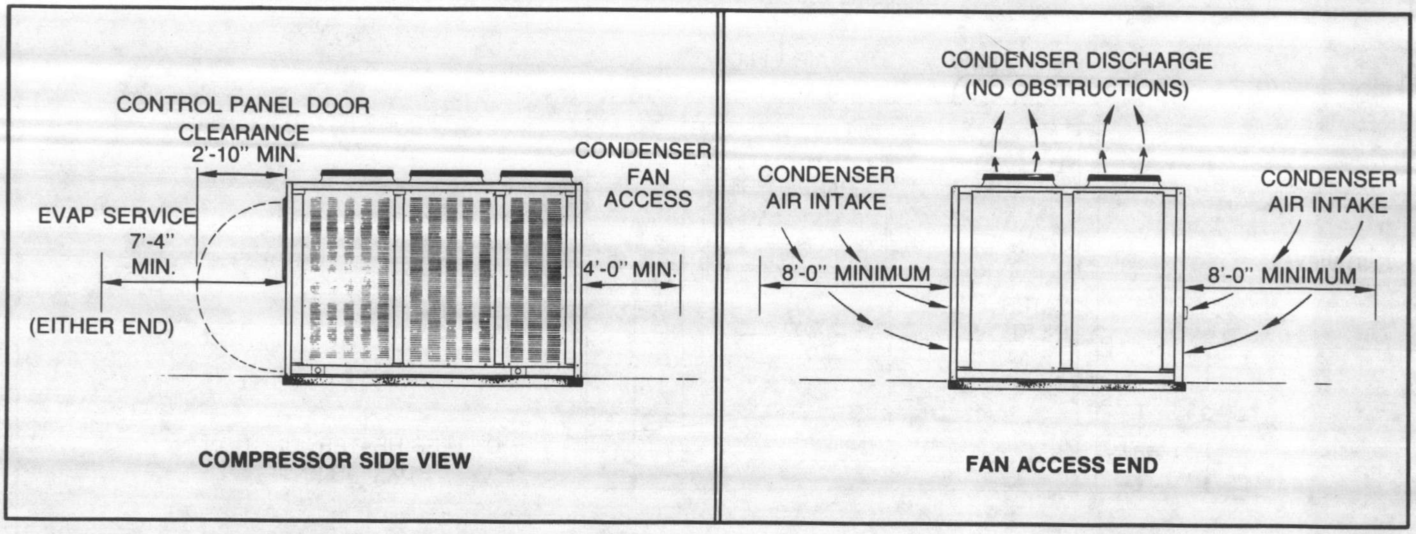


FIGURE 9 - Recommended Clearances for Typical Single CGAB C60 Installation.

LOCATION REQUIREMENTS

1. Provide a level surface strong enough to support the unit. Refer to Table 1 for unit operating weights. A flexible (isolated) concrete foundation or footings at each loading point will reduce transmission of vibrations. Install anchor bolts in the concrete to secure the unit. The neoprene isolator requires two 9/16 inch anchor bolts. The spring isolator requires two 5/8 inch anchor bolts. Refer to Figure 14.
2. Install the optional neoprene or spring isolators to minimize structurally transmitted vibration.
3. Position the unit to provide unrestricted air flow to and from the condenser. Comply with recommended unit clearances to prevent reduction in unit capacity. Place the unit to protect the condenser intakes from crosswinds exceeding ten (10) mph. Install the unit above the snowline and above the path of the windblown debris. Do not install the unit under an overhang. Obstructing the vertical air discharge will cause warm air recirculation and coil starvation.

CLEARANCES

Provide enough space around each unit to allow the installation crew and maintenance personnel unrestricted access to all service points. Maintain recommended service and condenser air clearances as indicated by Figures 9-11 and Table 2. Figure 10 illustrates a typical multiple unit installation. Installation pits (when used) should not be deeper than the height of the unit (Figure 11).

DRAINAGE

A large capacity drain should be located near the unit for system drainage during shutdown or repair. A ¾ inch NPT drain connection is provided at the return end of the evaporator on all units (Figures 4-8). Piping may be run to drain facilities if desired.

TABLE 1 - Unit Weight and Isolator Loading Information (Lbs.)

UNIT SIZE	SHIPPING WEIGHT	OPERATING[1] WEIGHT	WEIGHT DISTRIBUTION (EACH ISOLATOR LOCATION)					
			LOC. 1	LOC. 2	LOC. 3	LOC. 4	LOC. 5	LOC. 6
CGAB C20	1991	2080	520	640	410	510	—	—
CGAB C25	2231	2415	595	785	445	590	—	—
CGAB C30	2461	2630	775	725	585	545	—	—
CGAB C40	3575	3860	605	640	625	655	650	685
CGAB C50	4102	4380	735	850	675	785	620	715
CGAB C60	4301	4545	765	885	700	815	640	740

1. Operating weight includes refrigerant, oil charge and water in chiller.

TABLE 2 - CGAB Recommended Minimum Clearances.

UNIT SIZE	CONDENSER AIR CLEARANCE				SERVICE CLEARANCE		
	COIL SIDE TO WALL	COIL SIDE TO PIT SIDE	BETWEEN UNITS	MAX. PIT DEPTH	EVAPOR-ATOR[1]	CONTROL PNL DOOR	FAN MTR. ACCESS
CGAB C20	8' - 0"	16' - 0"	16' - 0"	5' - 2½"	6' - 10"	2' - 1"	4' - 0"
CGAB C25	8' - 0"	16' - 0"	16' - 0"	5' - 2½"	6' - 10"	2' - 1"	4' - 0"
CGAB C30	8' - 0"	16' - 0"	16' - 0"	5' - 8"	6' - 10"	2' - 1"	4' - 0"
CGAB C40	8' - 0"	16' - 0"	16' - 0"	6' - 1"	6' - 9"	2' - 10"	4' - 0"
CGAB C50	8' - 0"	16' - 0"	16' - 0"	6' - 1"	7' - 4"	2' - 10"	4' - 0"
CGAB C60	8' - 0"	16' - 0"	16' - 0"	6' - 1"	7' - 4"	2' - 10"	4' - 0"

1. Evaporator service clearance is from either end.

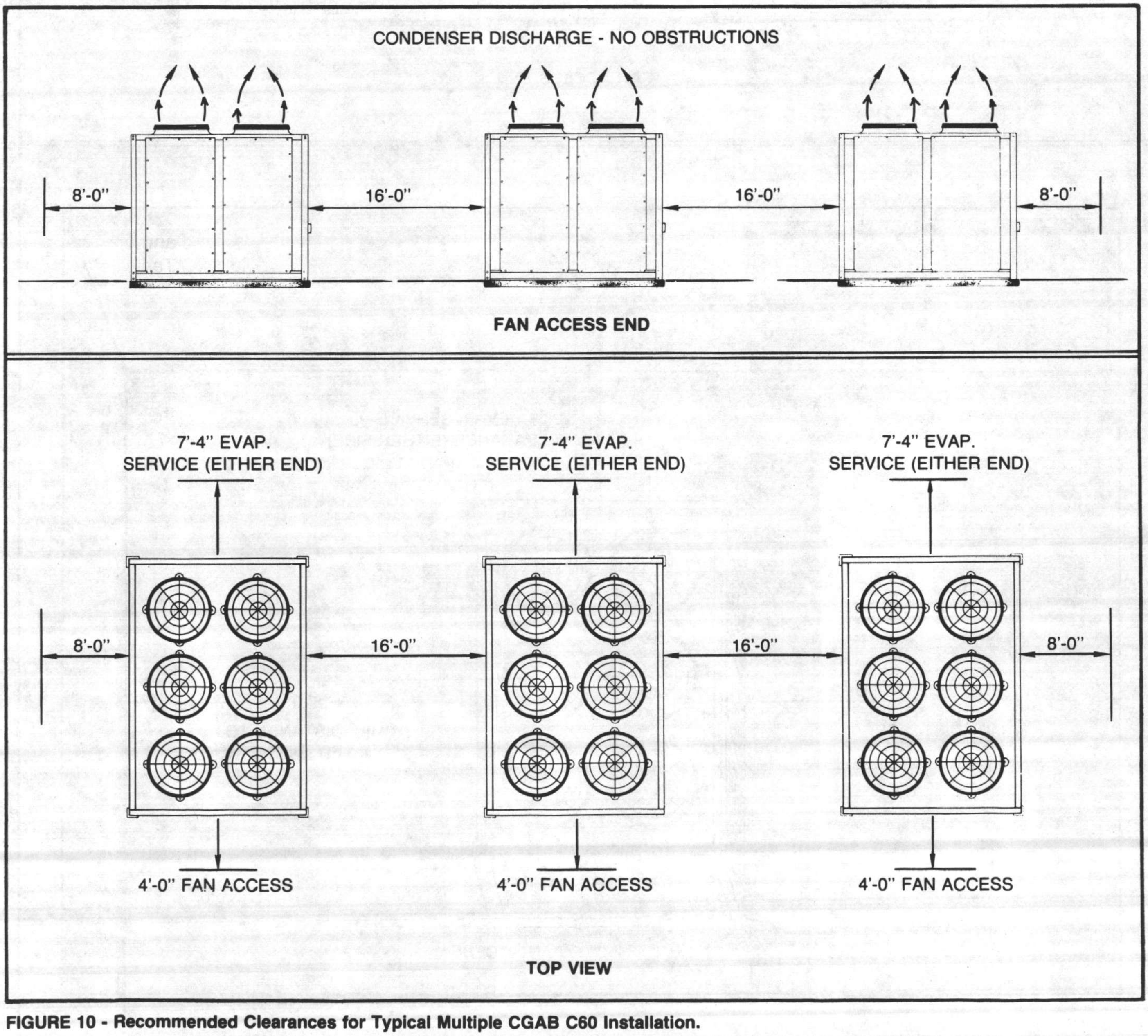


FIGURE 10 - Recommended Clearances for Typical Multiple CGAB C60 Installation.

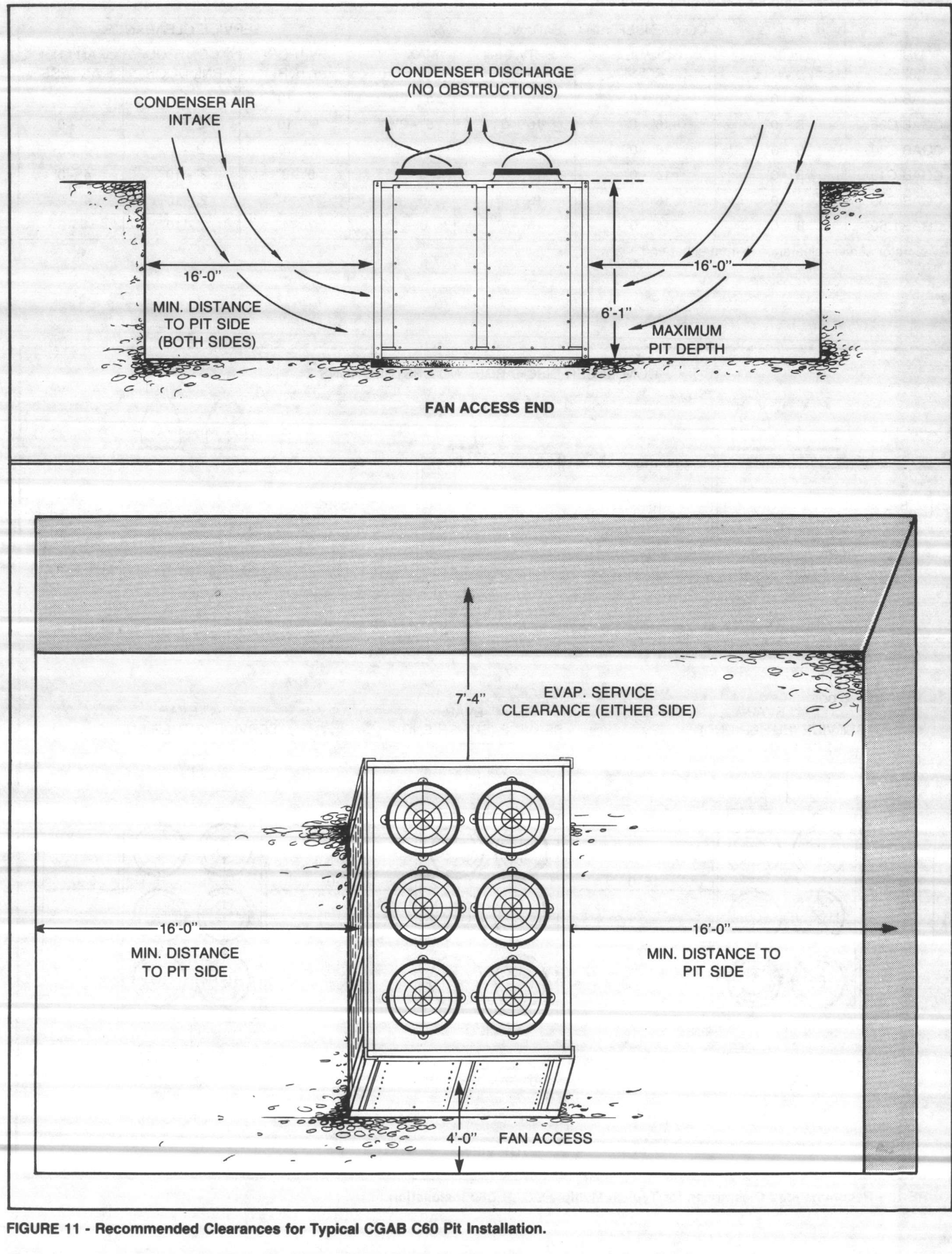


FIGURE 11 - Recommended Clearances for Typical CGAB C60 Pit Installation.

UNIT INSTALLATION

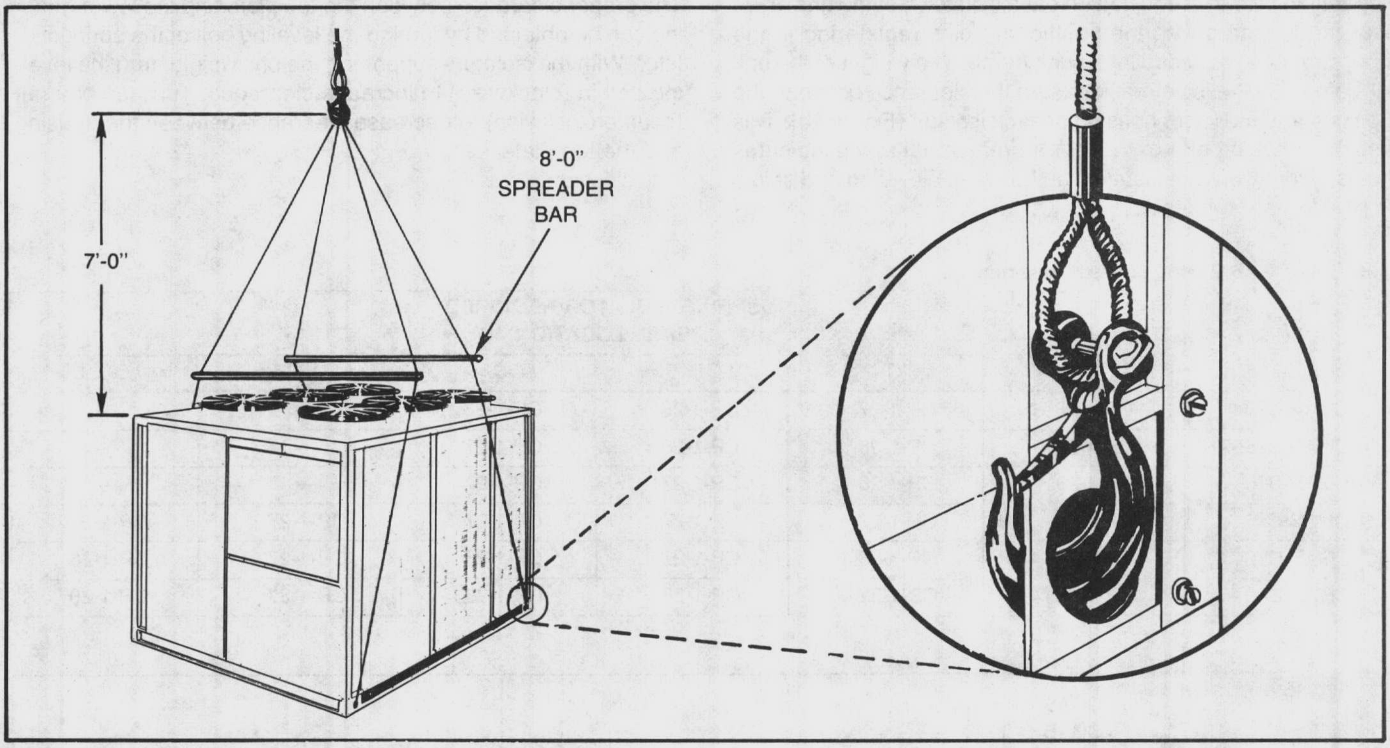


FIGURE 12 - Unit Properly Rigged for Crane or Helicopter Lift.

RIGGING

Four (4) lifting lugs are provided at the base of each unit for crane or helicopter lift. Attach cable slings to each lifting lug (Figure 12) and install eight (8) foot spreader bars between the cables to protect the unit. The point at which the cable slings run through the lifting hook should be at least seven (7) feet above the top of the unit. A lifting label illustrating the proper rigging procedure is located near each lifting lug. Be certain that the lifting equipment is capable of handling the weight of the unit (Table 1). The unit should balance at its center of gravity when lifting. Refer to Figures 4-8 for center of gravity locations.

COMPRESSOR

The Trane Model K hermetic compressor is fully operational as shipped. The compressor is mounted on neoprene grommet isolators that require no special pre-operational adjustments. The compressor receives a correct operational oil charge before shipment.

CAUTION: Check compressor suction and discharge valves to be certain that they are backseated (open) before starting the unit. Starting the unit with these valves closed can damage the compressor.

ISOLATOR INFORMATION

Refer to Table 1 for unit loading at the points of isolation. Place optional neoprene or spring isolators (when used) at the locations indicated in Figure 13. Refer to Tables 3 and 4 to determine which isolators to install at each mounting location. Isolators should be secured to the foundation by installing them on the anchor bolts imbedded in the foundation. Where necessary, provide shims or grouting under the isolators to assure a level surface for all mounting points. Support the full underside of each isolator base plate. Do not allow the isolator to straddle small gaps or shims. A ¼ inch maximum difference in elevation is acceptable and is adjustable at each location.

TABLE 3 - CGAB Neoprene Isolator Selection

UNIT SIZE	NEOPRENE ISOLATOR REQUIRED (EACH LOCATION)					
	LOC. 1	LOC. 2	LOC. 3	LOC. 4	LOC. 5	LOC. 6
CGAB C20	R-3 GRN.	R-3 GRN.	R-3 RED	R-3 GRN.	—	—
CGAB C25	R-3 GRN.	R-3 GRAY	R-3 RED	R-3 GRN.	—	—
CGAB C30	R-3 GRAY	R-3 GRAY	R-3 GRN.	R-3 GRN.	—	—
CGAB C40	R-3 GRN.	R-3 GRN.	R-3 GRN.	R-3 GRN.	R-3 GRN.	R-3 GRN.
CGAB C50	R-3 GRAY	R-3 GRAY	R-3 GRN.	R-3 GRAY	R-3 GRN.	R-3 GRAY
CGAB C60	R-3 GRAY	R-3 GRAY	R-3 GRAY	R-3 GRAY	R-3 GRN.	R-3 GRAY

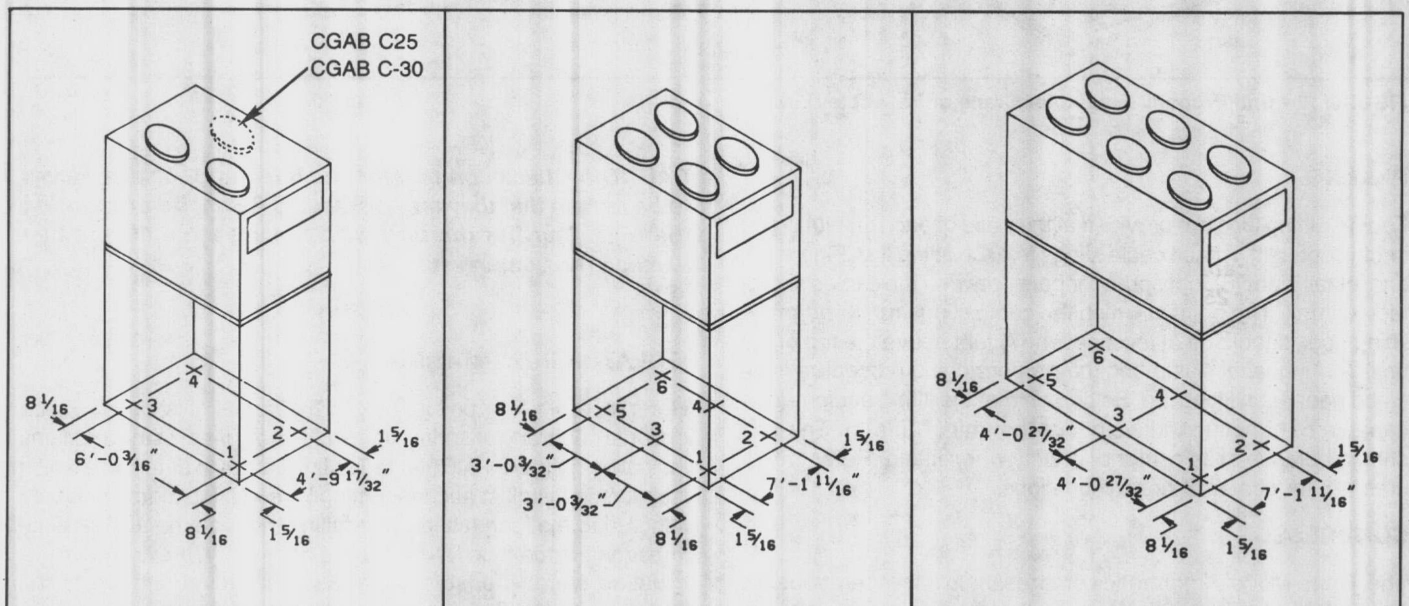
ADJUSTING SPRING ISOLATORS

Positioning pins are provided on each isolator. Set the unit down over the isolators with the positioning pins registering in the mounting holes provided in the unit frame. The weight of the unit will compress the isolators. Measure the clearance between the top plate and the lower housing of each isolator (Figure 14). This distance should be ¼ to ½ inch. A greater clearance indicates that isolators were not installed at the same elevation and shims or grouting are required.

The proper clearance between the top plate and the lower housing can be obtained by turning the leveling bolt of the spring isolator. With the isolators supporting the unit weight, turn the leveling bolt in (clockwise) to increase clearance. Turn the bolt out (counterclockwise) to decrease clearance between the housing and the top plate.

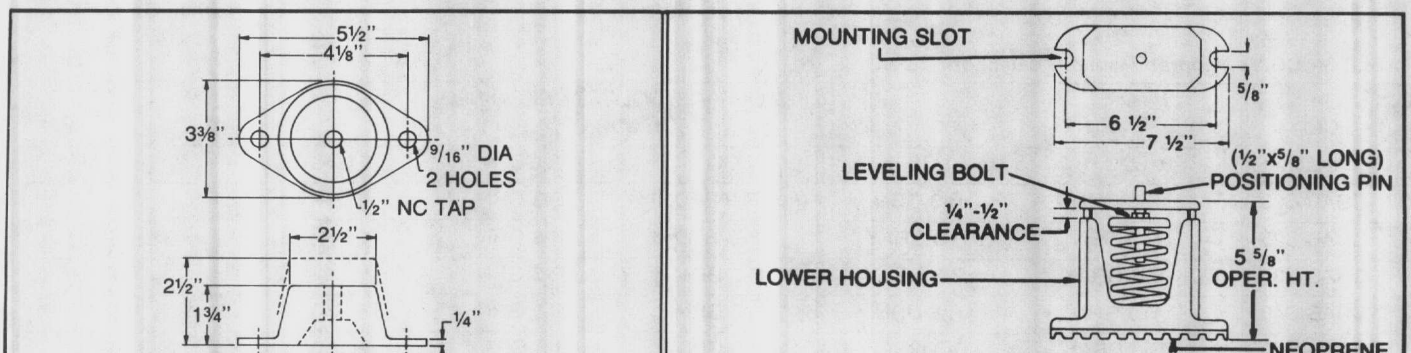
TABLE 4 - CGAB Spring Isolator Selection

UNIT SIZE	SPRING ISOLATOR REQUIRED (EACH LOCATION)					
	LOC. 1	LOC. 2	LOC. 3	LOC. 4	LOC. 5	LOC. 6
CGAB C20	CP-1-26	CP-1-27	CP-1-26	CP-1-26	—	—
CGAB C25	CP-1-27	CP-1-28	CP-1-26	CP-1-27	—	—
CGAB C30	CP-1-28	CP-1-28	CP-1-27	CP-1-27	—	—
CGAB C40	CP-1-27	CP-1-27	CP-1-27	CP-1-27	CP-1-27	CP-1-27
CGAB C50	CP-1-28	CP-1-28	CP-1-27	CP-1-28	CP-1-27	CP-1-28
CGAB C60	CP-1-28	CP-1-31	CP-1-28	CP-1-28	CP-1-27	CP-1-28



CGAB C-20, C-25, C-30 | CGAB C-40 | CGAB C-50, C-60

FIGURE 13 - Unit Isolator Locations.



NEOPRENE ISOLATOR | CP-1 SPRING ISOLATOR

FIGURE 14 - Unit Isolators.

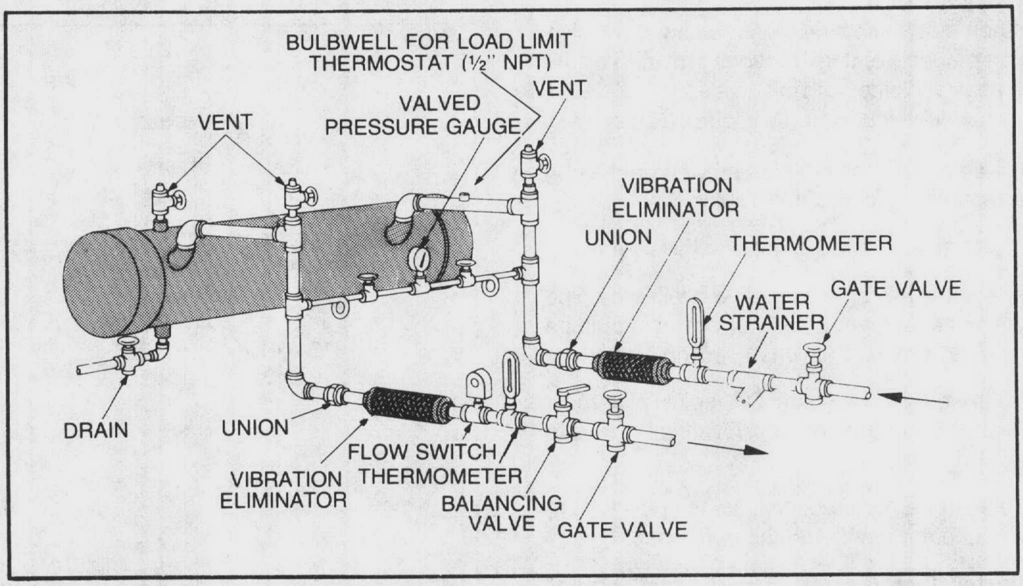


FIGURE 15 - Evaporator Water Piping Components.

LEVELING

After setting the unit in place, level it carefully before tightening the anchor bolts. Shims may be placed under the isolators or the unit support channels if isolators are not used.

WATER PIPING

Refer to the Trane Reciprocating Refrigeration Manual for a complete presentation of proper water piping practices and sizing methods. This manual is available at local Trane Sales Offices.

CAUTION: Locate the compressor access panel before piping the 20 or 25 ton unit. Do not install piping in an area that obstructs access to and/or removal of the compressor. This can hinder proper compressor service procedures.

The CGAB evaporator water inlet and outlet piping connection sizes are given in Table 5. Figure 15 illustrates the recommended piping, fittings and related components. These components perform the following functions:

Pressure gauges — register entering and leaving water pressures. Provide shutoff valves in the connections to the gauges.

Pipe Union — simplifies removal of evaporator piping.

Vibration Isolators — prevents transmission of unit vibration through chilled water lines.

Flow Switch — stops compressor if supply water flow is reduced drastically. Refer to "Flow Switch".

TABLE 5 - Evaporator Piping Connection Sizes (N.P.S.)

UNIT SIZE	EVAPORATOR INLET	EVAPORATOR OUTLET
CGAB C20	2"	2"
CGAB C25	2½"	2½"
CGAB C30	2½"	2½"
CGAB C40	3"	3"
CGAB C50	3"	3"
CGAB C60	3"	3"

Strainer — filters foreign matter from supply water, preventing damage to pump and control valves.

Thermometers — register entering and leaving chilled water temperatures.

Balancing Cock — establishes balanced system water flow.

Shutoff Valves — Used to isolate evaporator and circulating water pump for service.

CAUTION: The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The Trane Company warranty specifically excludes liability for corrosion or deterioration. Trane assumes no responsibility for equipment damage or failure which results from the use of untreated or improperly treated water or saline or brackish water.

WATER PIPE HEAT TAPE

Install heat tape on all water piping that may be subjected to subfreezing temperatures. A suitable antifreeze solution may be added to the system as an alternate method of preventing piping freeze-up.

WARNING: THE EVAPORATOR WATER CIRCUITS MAY BE PRESSURIZED. FOLLOW PROPER SERVICE PROCEDURES TO RELIEVE PRESSURE BEFORE OPENING THE SYSTEM TO ADD ANTIFREEZE. FAILURE TO DO SO MAY RESULT IN HAZARDOUS CONDITIONS AND POSSIBLE INJURY TO SERVICE PERSONNEL.

Heat tapes recommended for low temperature applications are: Chromalox, 110/120 volt automatic, or equivalent which dissipates seven (7) watts per linear foot. The heat tape selected should provide pipe freeze protection to the lowest temperature that will be encountered. Refer to Tables 6 and 7 for the recommended application procedure and amount of heat tape needed to obtain required freeze protection.

Thermostatic control of the heat tape is recommended. Automatic heat tapes are thermostatically controlled. Install an accessory thermostat on non-automatic heat tapes. Below is a typical heat tape installation procedure. If instructions provided by the manufacturer of the heat tape differ with this procedure, follow the manufacture's recommendations. Refer to Figure 16.

1. Wrap the heat tape around the pipe or apply straight along the pipe as determined by consulting Tables 6 and 7.
2. Use friction tape to secure the heat tape to the pipe.
3. Place the thermostat tightly against and parallel to the pipe and tape it in place at each end. The thermostat should be installed on the most exposed (coldest) section of pipe.
4. Wrap the pipe with weatherproof tape. On vertical pipe runs, start the wrap at the bottom and work up. Overlap the tape to shed moisture.
5. If additional protection is required, insulate the pipe with fiberglass pipe wrap before installing the outer tape.

CAUTION: Do not install fiberglass insulation under the outer wrap if the heat tape is not thermostatically controlled. This could cause generation of excessive amounts of heat, resulting in fire or electrical failure of heat tape.

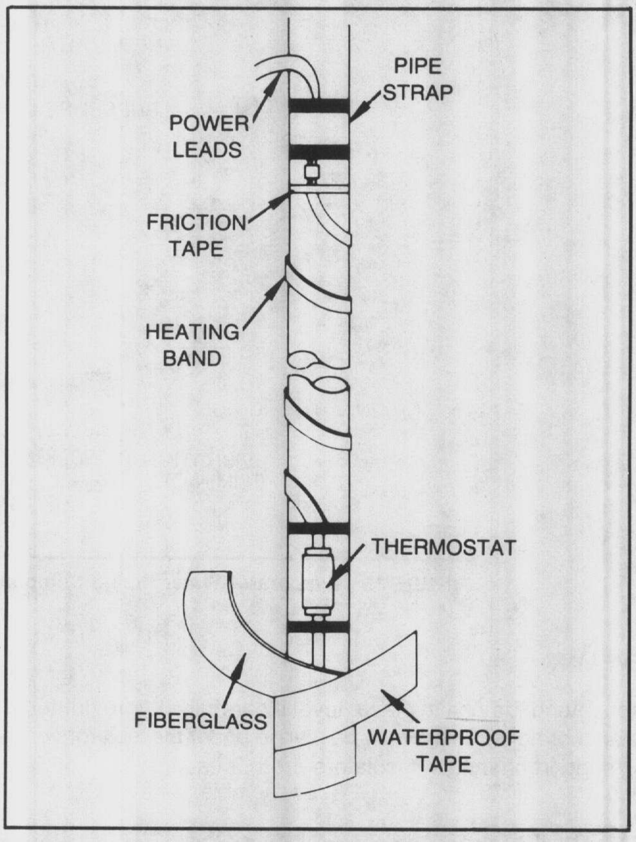


FIGURE 16 - Installing Chilled Water Piping Heater Cable.

TABLE 6 - Non-Thermostatic Heat Tape With Outer Wrap Only (No Insulation)

PIPE SIZE	APPLICATION PROCEDURE[1]	HEAT TAPE REQUIRED/FT. PIPE	DEGREES PROTECTION AVAILABLE (F)
2"	STRAIGHT	1'-0"	+ 6
	SPIRALLED	2'-4"	-27
2½"	STRAIGHT	1'-0"	+11
	SPIRALLED	2'-7"	-23
3"	STRAIGHT	1'-0"	+15
	SPIRALLED	2'-11"	-20
4"	STRAIGHT	1'-0"	+20
	SPIRALLED	3'-11"	-17
5"	STRAIGHT	1'-0"	+22
	SPIRALLED.	4'-6"	-15

1. Heat Tape Applied Straight Along Pipe or Spiralled Around Pipe at 3 Turns Per Foot of Pipe.

TABLE 7 - Thermostatic Heat Tape With Insulation and Outer Wrap

PIPE SIZE	APPLICATION PROCEDURE[1]	HEAT TAPE REQUIRED/FT. PIPE	DEGREES PROTECTION AVAILABLE (F)
2"	STRAIGHT	1'-0"	- 6
	SPIRALLED	2'-2"	-55
2½"	STRAIGHT	1'-0"	0
	SPIRALLED	2'-7"	-50
3"	STRAIGHT	1'-0"	+ 3
	SPIRALLED	2'-11"	-45
4"	STRAIGHT	1'-0"	+12
	SPIRALLED	3'-11"	-40
5"	STRAIGHT	1'-0"	+16
	SPIRALLED	4'-6"	- 1

1. Heat Tape Applied Straight Along Pipe or Spiralled Around Pipe at 3 Turns Per Foot of Pipe.

EVAPORATOR FLOW SWITCH

Install a flow switch in the evaporator leaving chilled water line to prevent or stop compressor operation if evaporator water flow drops off drastically. Refer to "Electrical Wiring" for the flow switch electrical interlock diagram. Refer to the manufacturer's instructions for proper flow switch adjustment.

ELECTRICAL WIRING

The installer must provide system interconnection wiring and power supply wiring that is properly sized and provided with appropriate fused disconnect switches.

WARNING: DISCONNECT ELECTRICAL POWER SOURCE BEFORE COMPLETING WIRING CONNECTION TO THE UNIT. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH DUE TO ELECTRICAL SHOCK.

CAUTION: Use copper conductors only. The use of other types of conductors may result in overheating or corrosion and resultant equipment failure.

CAUTION: All wiring must comply with applicable local and national (NEC) codes. Type and location of fused disconnect switches must comply with all applicable codes.

Figure 4 through 8 illustrate the locations of unit electrical access points. Minimum circuit ampacities, recommended fuse sizes and other electrical data are given in Table 8.

POWER SUPPLY WIRING

Unit Power Wiring

The installer must connect appropriate power wiring with fused disconnects to power section of the unit control panel as shown in the "Customer Connections Diagrams" in Figures 17 and 18.

The unit power fused disconnect switch should be located in the general area of the unit to comply with NEC and local codes. The disconnect is not intended to be used as a normal shutdown device. Always shut the unit OFF first by turning the control circuit switch (1S1) in the control panel to the OFF position.

Chilled Water Pump Power Wiring

Connect appropriate power supply wiring (with fused disconnect) to the customer-supplied chilled water pump starter. Refer to Figures 17 and 18.

Evaporator Heater Power

CAUTION: The evaporator heater (heat tape) must be energized before operating the unit or adding water to the chilled water system. Failure to energize the heater may result in damage to the evaporator internal components or piping due to excessively low temperature conditions.

The evaporator shell is insulated from ambient air and is protected by a factory-installed, thermostatically controlled heat tape for operation during low ambient conditions. The thermostat energizes the heat tape when ambient temperature drops to approximately 38 F.

The installer must provide an independent power source with a fused disconnect switch to the evaporator heater junction box as shown in Figures 17 and 18. Junction box locations are shown in Figures 4 through 8. Wiring from the junction box to the evaporator heat tape is factory complete.

Auxiliary Heat Tape Power

Provide power supply wiring with fused disconnect to any electrical heat tape installed on system water piping. Heat tape application is discussed under "Water Pipe Heat Tapes".

SYSTEM INTERCONNECTION WIRING

Circulating Pump Interlock

Provide interconnecting wiring from the chilled water pump pushbutton station to the proper terminals of terminal strip 1TB4 in the control panel as shown in Figures 17 and 18. The water pump motor starter must have two normally open auxiliary contacts. One contact is wired in series with the pump START pushbutton and the other is wired in the flow switch circuit as shown.

Flow Switch Interlock

Provide interconnecting wiring between the unit control panel, the auxiliary contacts of the chilled water pump motor starter and the flow switch in the evaporator water inlet piping (Figures 15, 17 and 18). Connect the flow switch and circulating pump interlock to the proper terminals of terminal strip 1TB4 in the control panel (Figures 17 and 18). This interlock will allow compressor operation only if the chilled water pump is operating.

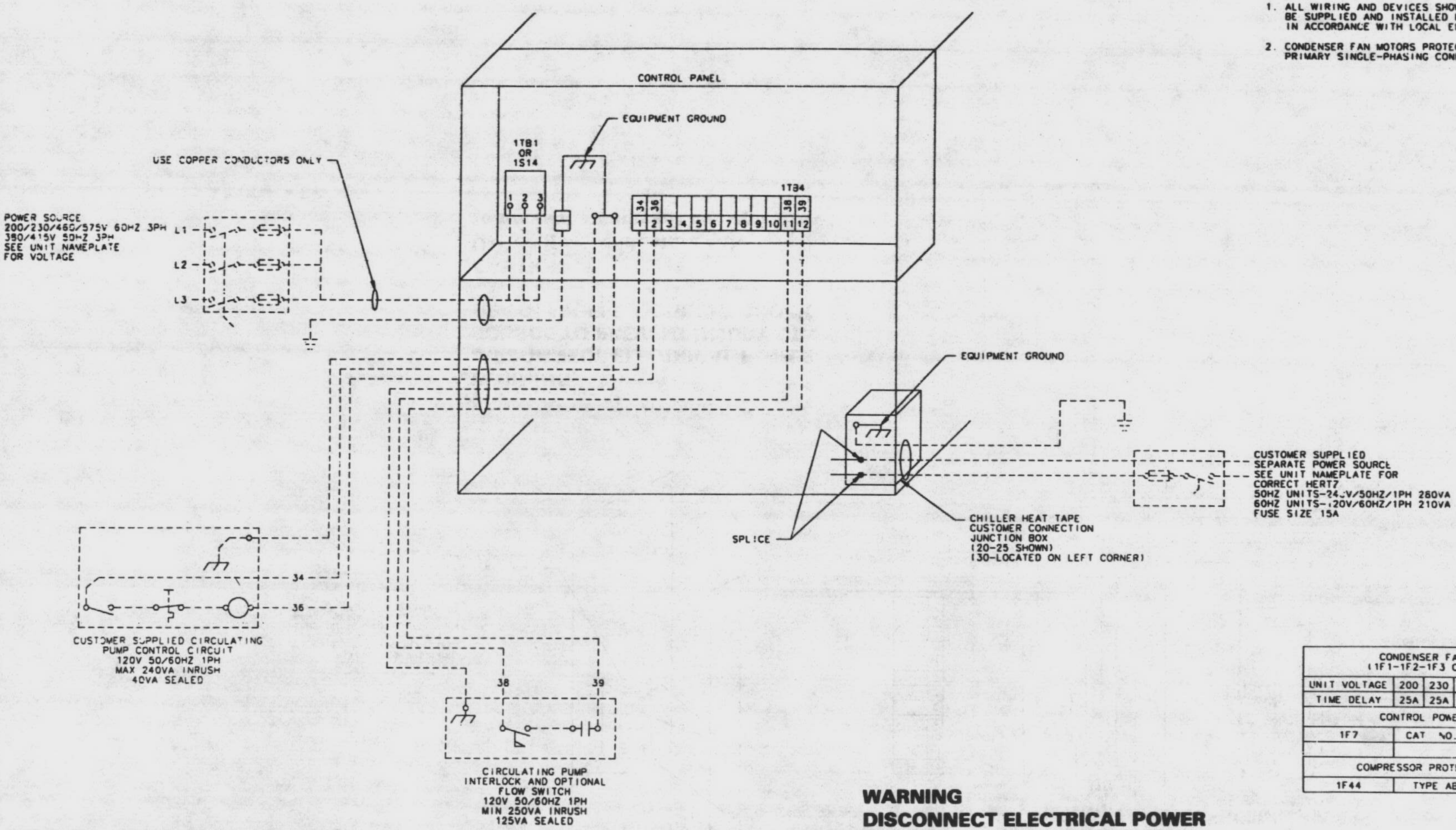
TABLE 8 - CGAB Electrical Data

UNIT	NOMINAL UNIT VOLTAGE	COMPRESSOR MOTOR[1] NO.	RLA	LRA[2]	KW[3]	CONDENSER FAN MOTOR[1] NO/UNIT	HP EACH	FLA	LRA	KW	UNIT WIRING DATA MFS[4]	MCA[5]	DEFS[6]
CGAB C20	200/60/3	1	72.2	394	19.6	2	1.0	4.1	22.0	0.95	150	98	110
	230/60/3	1	62.8	343	19.6	2	1.0	3.6	20.1	0.95	125	86	100
	460/60/3	1	31.4	172	19.6	2	1.0	1.8	9.2	0.95	70	43	50
	575/60/3	1	25.1	138	19.6	2	1.0	1.4	7.3	0.95	50	34	40
	380/50/3	1	32.4	181	16.6	2	.75	1.6	9.2	0.70	70	44	50
	415/50/3	1	29.9	166	16.6	2	.75	1.7	9.2	0.70	70	41	45
CGAB C25	200/60/3	1	86.0	426	23.8	3	1.0	4.1	22.0	0.95	200	120	125
	230/60/3	1	74.8	370	23.8	3	1.0	3.6	20.1	0.95	175	104	110
	460/60/3	1	37.4	185	23.8	3	1.0	1.8	9.2	0.95	80	52	60
	575/60/3	1	29.9	148	23.8	3	1.0	1.4	7.3	0.95	70	42	45
	380/50/3	1	39.0	195	20.1	3	.75	1.6	9.2	0.70	90	54	60
	415/50/3	1	35.7	178	20.1	3	.75	1.7	9.2	0.70	80	50	50
CGAB C30	200/60/3	1	103.3	488	28.6	3	1.0	4.1	22.0	0.95	225	141	150
	230/60/3	1	89.8	424	28.6	3	1.0	3.6	20.1	0.95	200	123	125
	460/60/3	1	44.9	212	28.6	3	1.0	1.8	9.2	0.95	100	62	70
	575/60/3	1	35.9	170	28.6	3	1.0	1.4	7.3	0.95	80	49	50
	380/50/3	1	47.4	224	24.2	3	.75	1.6	9.2	0.70	110	64	70
	415/50/3	1	43.4	205	24.2	3	.75	1.7	9.2	0.70	100	59	70
CGAB C40	200/60/3	2	72.2	394	19.7	4	1.0	4.1	22.0	0.95	250	179	175
	230/60/3	2	62.8	343	19.7	4	1.0	3.6	20.1	0.95	200	156	150
	460/60/3	2	31.4	172	19.7	4	1.0	1.8	9.2	0.95	100	78	80
	575/60/3	2	25.1	138	19.7	4	1.0	1.4	7.3	0.95	80	62	60
	380/50/3	2	32.4	181	16.6	4	.75	1.6	9.2	0.70	110	79	80
	415/50/3	2	29.9	166	16.6	4	.75	1.7	9.2	0.70	100	74	80
CGAB C50	200/60/3	2	86.0	426	24.0	6	1.0	4.1	22.0	0.95	300	218	225
	230/60/3	2	74.8	370	24.0	6	1.0	3.6	20.1	0.95	250	190	200
	460/60/3	2	37.4	185	24.0	6	1.0	1.8	9.2	0.95	125	95	100
	575/60/3	2	29.9	148	24.0	6	1.0	1.4	7.3	0.95	100	76	80
	380/50/3	2	39.0	195	20.2	6	.75	1.6	9.2	0.70	125	97	100
	415/50/3	2	35.7	178	20.2	6	.75	1.7	9.2	0.70	125	91	100
CGAB C60	200/60/3	2	103.3	488	28.8	6	1.0	4.1	22.0	0.95	350	257	250
	230/60/3	2	89.8	424	28.8	6	1.0	3.6	20.1	0.95	300	223	225
	460/60/3	2	44.9	212	28.8	6	1.0	1.8	9.2	0.95	150	111	110
	575/60/3	2	35.9	170	28.8	6	1.0	1.4	7.3	0.95	125	89	90
	380/50/3	2	47.4	224	24.3	6	.75	1.6	9.2	0.70	150	116	125
	415/50/3	2	43.4	205	24.3	6	.75	1.7	9.2	0.70	150	108	110

1. Electrical information is for each individual motor.
2. Figure given is full winding LRA for part winding starter units. Part winding starter is standard on all units voltages, 460 V across-the-line start is also available.
3. Compressor KW @ 54 F return (to the unit) water, 44 F supply water, and 95 F ambient temperature.
4. Max. fuse size per N.E.C. 440-22 is 225% of one compressor motor RLA plus the total RLA of the other motors in the circuit.
5. Min. circuit ampacity is 125% the RLA of one compressor plus the RLA of the remaining motors.
6. Recommended dual element fuse is 150% of the RLA of one compressor plus the RLA of the remaining motors. Select the next smaller fuse size unless the number exceeds the next smaller fuse size plus 90% of the increment to the next larger fuse. Then select the next larger fuse.

NOTES:

1. ALL WIRING AND DEVICES SHOWN DASHED TO BE SUPPLIED AND INSTALLED BY THE CUSTOMER IN ACCORDANCE WITH LOCAL ELECTRICAL CODES.
2. CONDENSER FAN MOTORS PROTECTED UNDER PRIMARY SINGLE-PHASING CONDITIONS.



CONDENSER FAN FUSE (1F1-1F2-1F3 CLASS K5)						
UNIT VOLTAGE	200	230	380	415	460	575
TIME DELAY	25A	25A	15A	15A	15A	15A

CONTROL POWER FUSE		
1F7	CAT NO. S	6.25A

COMPRESSOR PROTECTOR FUSE		
1F44	TYPE ABC	15A

WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

CAUTION
Use copper conductors only to prevent equipment damage

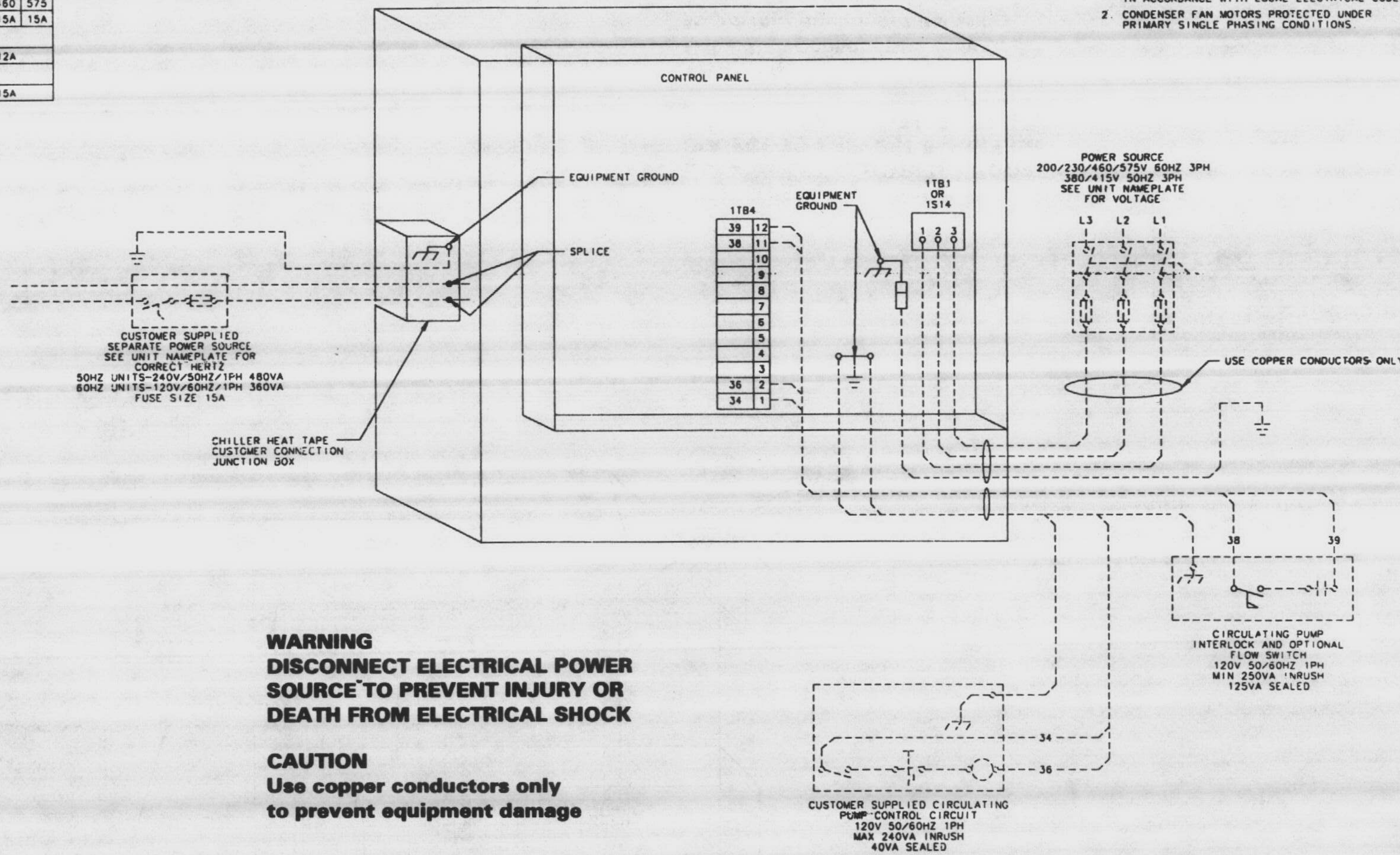
2305-9529

FIGURE 17 - Typical Field (Customer) Wiring. CGAB C20, C25 and C30.

CONDENSER FAN FUSE (1F1 THRU 1F6 CLASS K5)						
UNIT VOLTAGE	200	230	380	415	460	575
TIME DELAY	25A	25A	15A	15A	15A	15A
CONTROL POWER FUSE						
1F7	TYPE S			12A		
COMPRESSOR PROTECTOR FUSE						
1F44 & 1F45	TYPE ABC			15A		

NOTE:

1. ALL WIRING AND DEVICES SHOWN DASHED TO BE SUPPLIED AND INSTALLED BY THE CUSTOMER IN ACCORDANCE WITH LOCAL ELECTRICAL CODES.
2. CONDENSER FAN MOTORS PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS.



WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

CAUTION
Use copper conductors only to prevent equipment damage

2305-9528

FIGURE 18 - Typical Field (Customer) Wiring. CGAB C40 C50 and C60.

INSTALLATION CHECKLIST

Complete this checklist as the unit is installed to verify that all recommended procedures are accomplished before the unit is started. This checklist does not replace the instructions given in the "Unit Installation" section of this manual. Read the section carefully to become familiar with the procedures before installing the unit.

RECEIVING

☐ Inspect unit for shipping damage and missing material.
☐ Report unit damage or missing material.

UNIT LOCATION

☐ Provide drain facilities for evaporator water.
☐ Inspect for adequate service and condenser supply and discharge air clearances.
☐ Remove and discard all shipping material (skid, crating, lifting channels, etc.)
☐ Install optional neoprene or spring isolators (if required).
☐ Secure the unit to the mounting surface.
☐ Level the unit.

CHILLED WATER PIPING

☐ Make evaporator water connections
☐ Vent the chilled water system at system high points.
☐ Install pressure gauges, thermometers, shutoff valves and vibration eliminators on water inlet and outlet piping.
☐ Install water strainer in water inlet line.
☐ Install flow switch and balancing valve on water outlet line.
☐ Flush and clean all chilled water piping.

ELECTRICAL WIRING

Power Supply Wiring

☐ Connect unit power supply wiring (with fused disconnect) to terminal block (or unit-mounted disconnect) in power section of control panel.
☐ Connect power supply wiring (with fused disconnect) for chilled water circulating pump.
☐ Connect power supply wiring (with fused disconnect) for evaporator heater (heat tape).
☐ Connect power supply (with fused disconnect) for auxiliary heat tapes installed on exposed water piping.

System Interconnection Wiring

☐ Connect wiring to complete flow switch and circulating pump interlock with unit operation.

UNIT START-UP

Preparation

Before starting the unit, complete the "Installation Checklist" in this manual to insure that the unit is completely and properly installed and ready for start-up.

Before putting the system into operation, perform these service and check-out procedures:

1. Inspect all wiring connections. Connections should be clean and tight. Trace circuits to insure that wiring agrees with "as-wired" wiring diagrams provided with the unit. Information in the title block of the wiring diagrams should match the data that appears on the unit nameplate.

2. Lubricate all electric motors according to the manufacturer's recommendations. Check the condenser fans. The blades must be secure on the motor shafts and rotate freely. Airflow must be unobstructed.

3. Energize the evaporator heater (heat tape) by closing the heater fused disconnect.

4. Close the unit power fused disconnect switch and the manual disconnect switch in the control panel (if used). The control circuit switch (1S1) in the control panel should be in the "Off" position. This will energize the compressor crankcase heater(s). The crankcase heater(s) should be energized for a minimum of 8 hours prior to running the compressor(s).

5. Check the unit supply voltage to insure that voltage is within the utilization range in Table 8.

6. Fill, flush and refill the chilled water circuit. Refer to Table 10 for evaporator liquid capacities. Operate the chilled water system as described below.

WARNING: THE EVAPORATOR WATER CIRCUIT MAY BE PRESSURIZED. FOLLOW PROPER SERVICE PROCEDURES TO RELIEVE PRESSURE BEFORE OPENING THE SYSTEM FOR FLUSHING OR REFILLING OPERATIONS. FAILURE TO DO SO MAY CAUSE HAZARDOUS CONDITIONS FOR SERVICE PERSONNEL.

CAUTION: If an acidic solution is used during flushing procedure, the evaporator must be bypassed. Failure to bypass the evaporator may result in permanent damage to evaporator internal components.

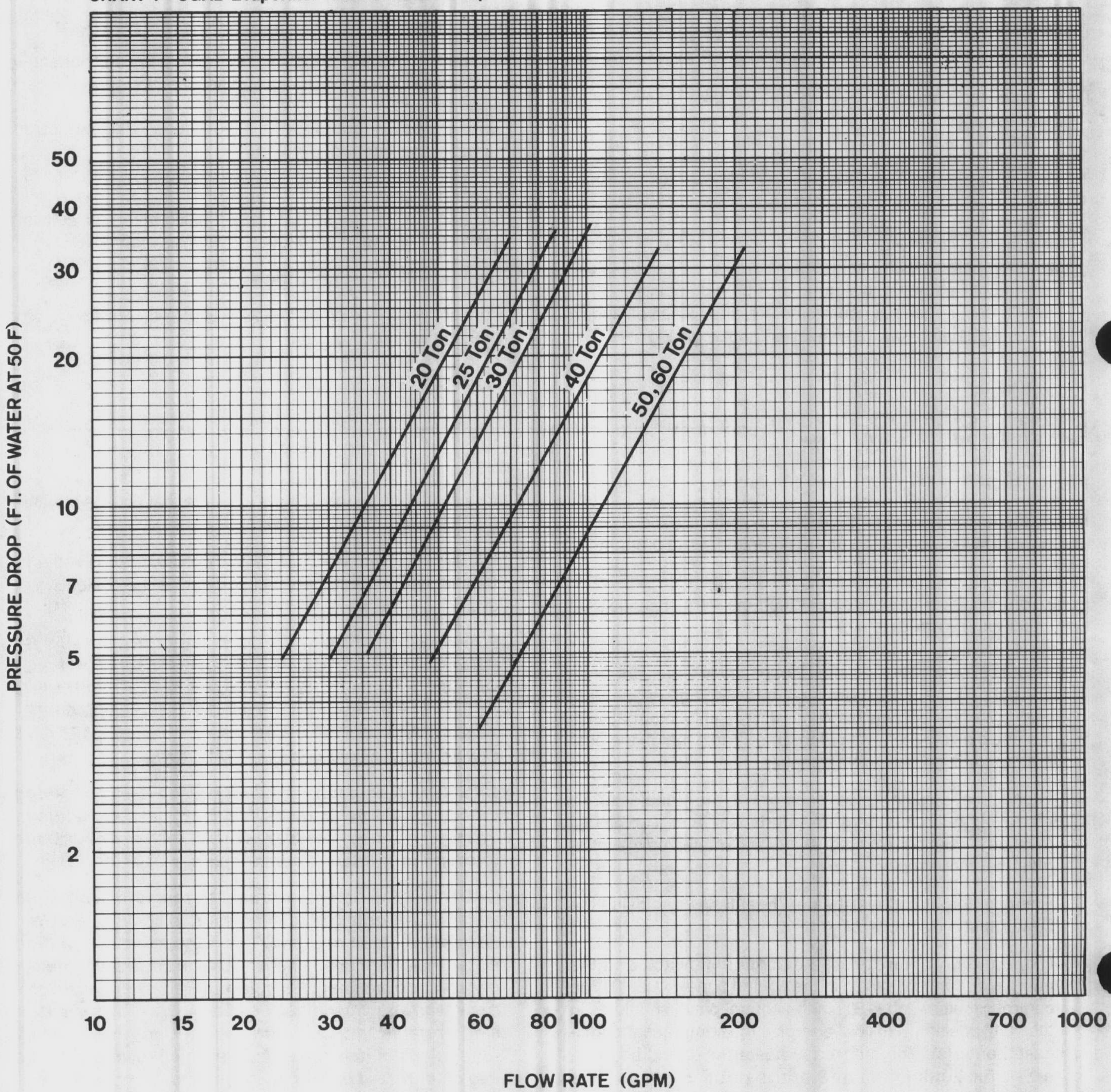
CAUTION: The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The Trane Company warranty specifically excludes liability for corrosion or deterioration. Trane assumes no responsibility for equipment damage or failure which results from the use of untreated or improperly treated water or saline or brackish water.

a. Close the fused disconnect switch in the chilled water pump starter circuit.
b. Turn the circulating pump On/Off switch at the pump remote station to "On".
c. With the circulating pump operating and water circulating through the entire chilled water circuit, inspect all piping and connections for leakage. Make any necessary repairs.
d. Check chilled water pressure drop through the evaporator. Use the capped valves provided on the evaporator inlet and outlet to determine pressure drop (Figure 19). Valve connection size is 1/4 inch S.A.E. flared. Pressure drop readings should coincide with Chart 1.

7. Check compressor suction and discharge service valves to be sure they are open (backseated). Open the liquid line valve (low ambient units only).

CAUTION: Check the compressor suction and discharge service valves to be certain that they are backseated (open) before starting the unit. Starting the unit with these valves closed can damage the compressor(s).

CHART 1 - CGAB Evaporator Water Pressure Drop



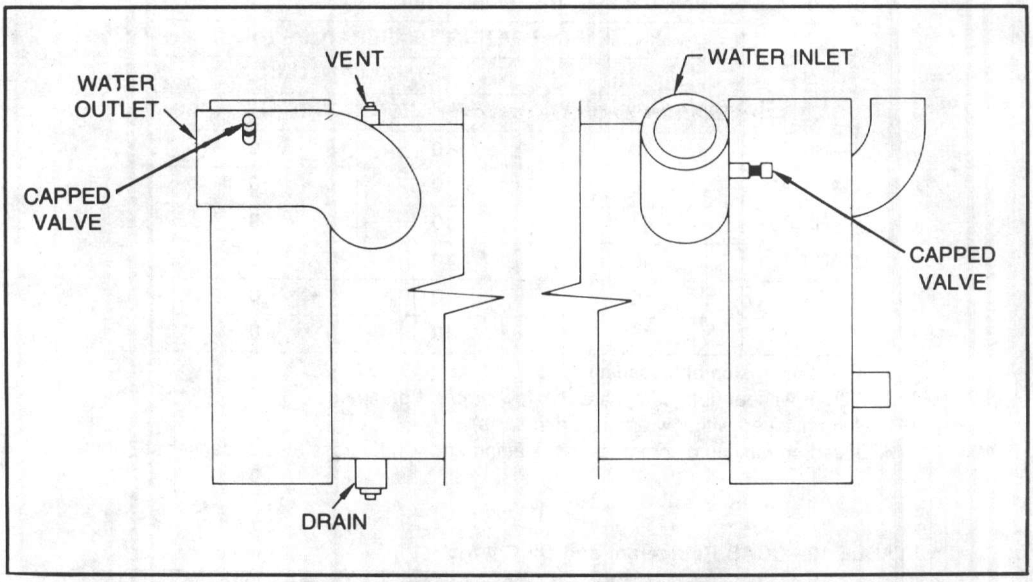


FIGURE 19 - Typical Evaporator Components. Measure Water Pressure Drop at Capped Valves.

8. Check the settings of all temperature and pressure controls. Refer to Table 13 for control setpoints. Figures 20 and 21 illustrate control layout for typical unit control panels. Be sure that all remote sensing bulbs are properly installed in bulbwells with heat transfer compound. Remote bulb capillary tubes must be secured (protected from vibration and abrasion) and undamaged.
9. Inspect the inside of the unit. Remove any debris.
10. Check the fit of the control panel door. Gasketing must be properly installed to prevent water damage.

STARTING THE UNIT

START-UP PROCEDURE

1. Check the compressor suction and discharge service valves to be sure they are open.
2. Reset all controls equipped with a manual reset function. Unit power fused disconnect switch should be closed at this time. The compressor crankcase heater(s) should have been in operation for 8 hours.

   CAUTION: Energize the compressor crankcase heater(s) for a minimum of 8 hours before operating the unit. This will evaporate any liquid refrigerant from the crankcase, avoiding possible damage due to loss of compressor lubrication at start-up.

3. Place all chilled water and refrigerant circuit valves in operating position and start the circulating pump at the remote station.
4. Switch control circuit On/Off switch (1S1) in the control panel to "On".

The unit should now be operating normally provided that the following conditions are met:

1. The chilled water temperature controller (1U11) must call for cooling.
2. The control circuit to terminals 11 and 12 of 1TB4 in the control panel must be completed by the flow switch sensing a sufficient water flow entering the evaporator. This circuit must also be completed through the auxiliary contacts of the circulating water pump starter.
3. Ambient temperatures must be above the minimum start-up temperatures in Table 9.
4. All electric motors must rotate in the correct direction.

After the unit has been in operation for a short time, check compressor oil level, liquid line sight glass(es), suction and discharge pressures and make a superheat reading. Adjust superheat if required.

Oil Level

The oil level should be visible in the center of the oil level sight glass on the compressor while it is running. The oil should be clear. Excessive foaming indicates the presence of refrigerant in the oil and will result in insufficient compressor lubrication. The correct oil charge for a Model K compressor is 22 pints (see Table 10). Recommended oils for this compressor are Suniso 3GS; Virginia 150; Texaco Capella B; Mobil Gargyl Arctic 150; Calumet R0150 or equivalent.

Liquid Line Sight Glass(es) and Refrigerant Charge

Refrigerant flow past the liquid line sight glass(es) should be clear without bubbles. Gas bubbles in the refrigerant may indicate a restriction in the liquid line or a shortage of refrigerant. A restriction in the line can be identified by a noticeable temperature differential on either side of the restricted area. Refer to Table 10 for the correct operational charge of R-22 for each refrigerant circuit.

CAUTION: Use only refrigerant specified on the unit nameplate. Do not mix refrigerant types. The system must have the correct refrigerant charge for proper operation.

TABLE 9 - CGAB Minimum Start-Up Temperatures

UNIT SIZE	MINIMUM OPERATING TEMPERATURE (°F)[1]		
		LOW AMBIENT UNIT[3]	
	STANDARD UNIT[2]	WITH HGBP[4]	WITHOUT HGBP
CGAB C20	40	10	0
CGAB C25	50	10	0
CGAB C30	45	10	0
CGAB C40	40	10	0
CGAB C50	50	10	0
CGAB C60	45	10	0

1. At minimum step of unloading.
2. With or without hot gas bypass. No low ambient dampers.
3. Unit equipped with low ambient damper(s).
4. Based on minimum compressor unloading and wind across the condenser at 5 mph max.

TABLE 10 - CGAB Refrigerant and Oil Charge

UNIT SIZE	REFRIGERANT CHARGE[1] (LBS.)	OIL CHARGE (PINTS/CIRCUIT)	EVAP. LIQUID CAPACITY (GALS.)
CGAB C20	40	16	10.8
CGAB C25	42	16	22.2
CGAB C30	50	16	20.4
CGAB C40	45/45	16/16	34.4
CGAB C50	50/50	16/16	33.6
CGAB C60	55/55	16/16	29.4

1. R-22

TABLE 11 - CGAB Normal Full Load Operating Pressures (PSIG)

UNIT SIZE	AMBIENT TEMPERATURE							
	85 F		95 F		105 F		115 F	
	SUCT.[1]	DISC.	SUCT.	DISC.	SUCT.	DISC.	SUCT.	DISC.
CGAB C20	61	241	62	270	64	303	64	339
CGAB C25	62	248	63	277	65	309	66	343
CGAB C30	62	241	63	271	64	304	65	340
CGAB C40	62	241	63	271	64	304	65	340
CGAB C50	63	251	64	280	65	312	66	346
CGAB C60	63	243	64	274	65	307	66	343

1. Suction based on 54 F EWT, 44 F LWT, .0005 FF in evaporator.

TABLE 12 - Percent Unit Capacity Per Control Stage

CONTROL TYPE	UNIT SIZE	% UNIT CAPACITY/CONTROL STAGE			
		STAGE 1	STAGE 2	STAGE 3	STAGE 4
Two Stage	CGAB C20	50	100	—	—
Three Stage	CGAB C25	33	66	100	—
	CGAB C30	33	66	100	—
Four Stage	CGAB C40	25	50	75	100
	CGAB C50	33	50	83	100
	CGAB C60	33	50	83	100

Suction and Discharge Pressure

Refer to Table 11 for normal full load suction and discharge pressure at varying ambient temperatures.

Superheat

Vaporized refrigerant, passing through the final lengths of evaporator tubing, continues to absorb heat from the water being chilled, causing the vapor to be superheated. A certain amount of superheat is essential to assure that all liquid refrigerant is evaporating, eliminating the possibility of liquid carryover into the compressor.

Normal superheat is 12-14 F. Overfeeding of the evaporator results in high suction pressure, low superheat and possible liquid carryover. Inadequate or too high a superheat is remedied by adjusting the superheat adjusting stem on the thermostatic expansion valve (TEV). If this fails to correct the condition, then the valve cage or power element of the TEV may be defective and should be replaced.

Superheat Adjustment Procedure:

1. Remove a small patch of insulation from the suction line near the TEV remote bulb.
2. Clean the suction line and tape the sensor of an electronic thermometer (pyrometer) to the line.
3. Reinsulate the suction line over the pyrometer sensor.
4. Start the unit and allow the temperature reading to stabilize. The expansion valve will need 15-30 minutes to stabilize.
5. Read suction pressure at the compressor suction service valve or at the pressure gauge on the unit (if used). Use the saturation table for R-22 to convert the suction pressure reading to degrees F.
6. The degree difference between the temperature reading and the pressure-to-temperature conversion of suction pressure is the amount of superheat.
7. Read the superheat once with the compressor loaded and once with it unloaded.
8. If superheat is not between 12-14 F, remove the nut covering the superheat adjustment stem on the body of the expansion valve, and make the necessary adjustment. Allow 15-30 minutes for the TEV to settle at the new setting and repeat the procedure.
9. Once the desired superheat reading is obtained, remove the pyrometer sensor from the suction line and reinsulate the line.

UNIT CAPACITIES

Refer to Table 12 for the percent of unit rated capacity for each control step.

CONTROLS

The operation of all unit controls is tested and calibrated at the factory. They do not require extensive re-checking at the jobsite. Refer to Figures 20 and 21 for locations of controls in the unit control panels. See Table 13 for unit control settings.

TABLE 13 - CGAB Control Settings

CONTROL	CONTROL SETTING		RESET MODE	ADJUSTABLE RANGE
TEMPERATURE CONTROLLER (1U11)	2 ½ F above design Leaving Water Temperature		N/A	0-60 F
	OPEN	CLOSE		
FREEZESTAT (1S12)	36 F	42 F	Manual	20-80 F
LOAD LIMIT THERMOSTAT (1S13)	68 F	62 F	Auto	0-150 F
LOW PRESS. CUT-OUT (2B7S4, 2B8S5)	45±4 PSIG	60±5 PSIG	Auto	Fixed
HIGH PRESS. CUT-OUT (2B7S2, 2B8S3)	405 PSIG	355 PSIG	Auto	Fixed
AMBIENT TEMP. FAN CONTROL	STAGE 1 65 F	STAGE 1 73 F	Auto	Fixed
	STAGE 2 45 F	STAGE 2 53 F	Auto	Fixed

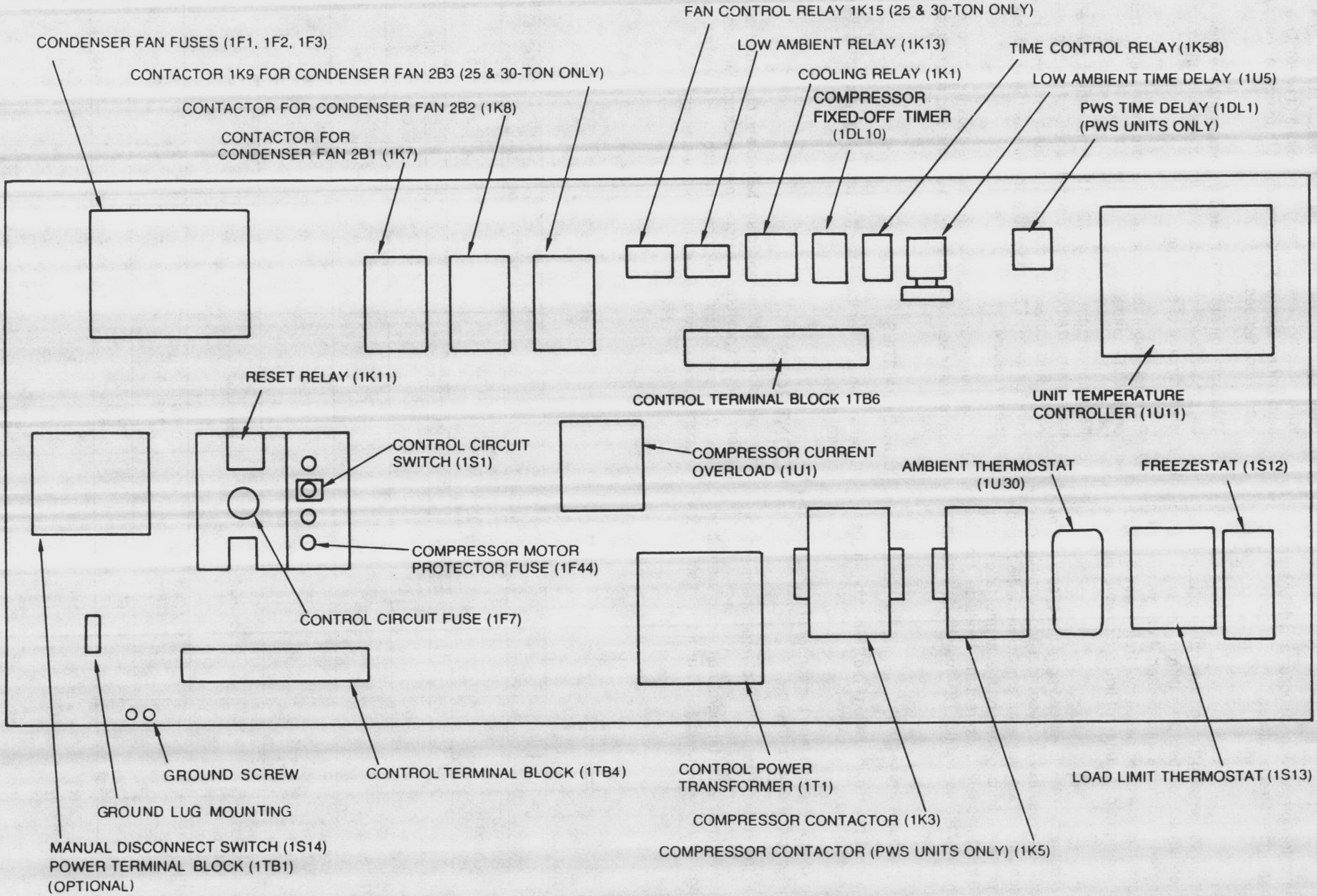


FIGURE 20 - Typical Control Panel Layout. CGAB C20, C25 and C30.

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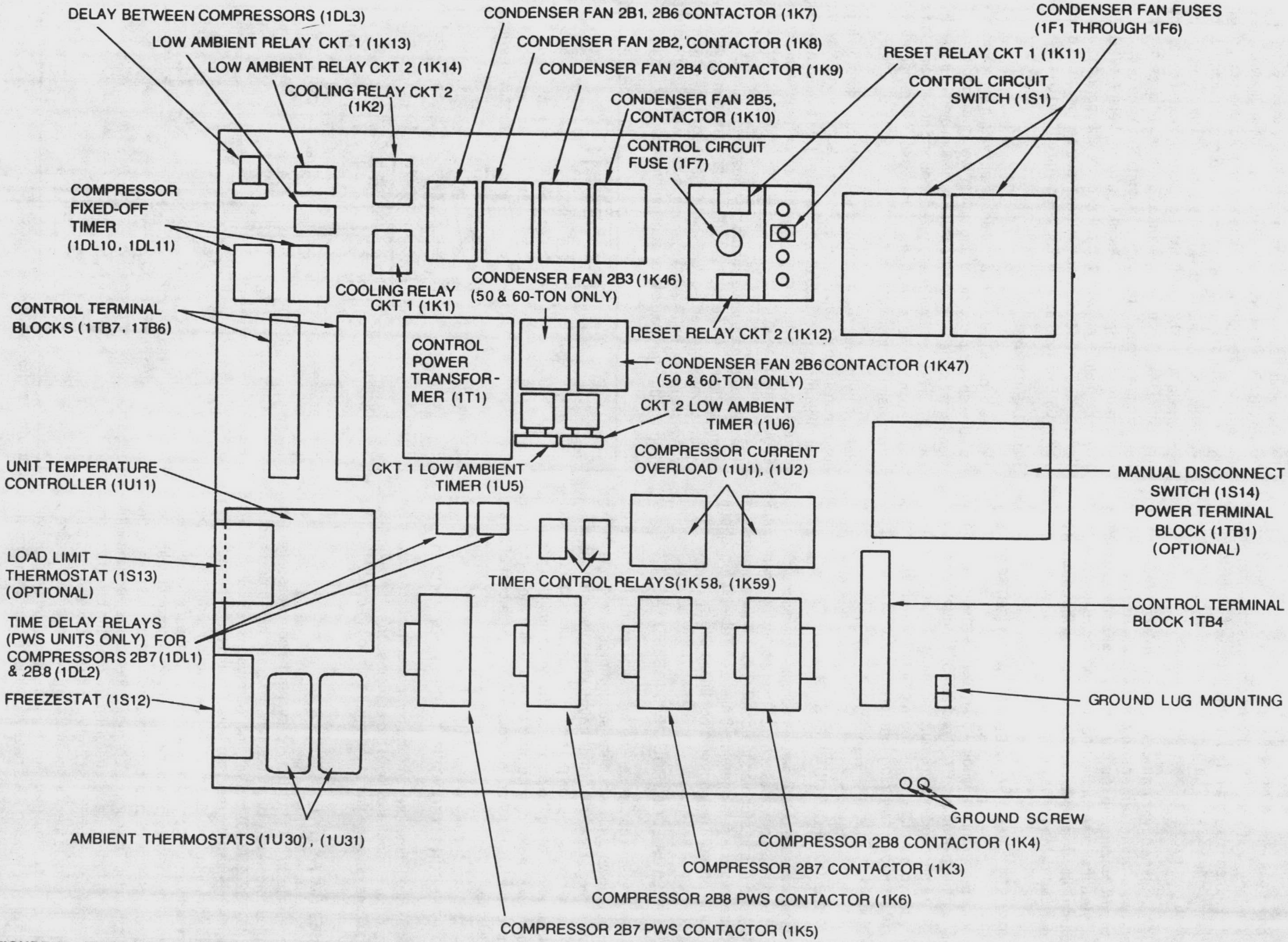

FIGURE 21 - Typical Control Panel Layout. CGAB C40, C50 and C60.

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COMPRESSOR OVERLOAD(S) (1U1, 1U2)

The compressor motor current overloads (1U1 on single compressor units, 1U1 and 1U2 for dual compressor units) are located in the control panel. The normally closed contacts of the overloads open to stop compressor operation if compressor motor current exceeds operational limitations.

CAUTION: Whenever unit operation is interrupted by any compressor motor protection device, be certain to correct the condition causing the control lockout before resetting the control and resuming unit operation. Repeated resets of a motor protection device without correcting the cause of the lockout can damage the compressor.

COMPRESSOR WINDING THERMOSTAT(S) (2B7S6,2B7S7)

The compressor motor winding thermostat sensors (2B7S6 in single compressor units, 2B7S6 and 2B7S7 for dual compressor units), are embedded in the compressor motor windings. The normally closed contacts of the thermostats open to stop compressor operation if winding temperature exceeds safe operational limits.

HIGH PRESSURE CUTOUT (2B7S2,2B8S3)

The high pressure cutout senses compressor discharge pressure. It prevents compressor motor overloading by opening the control circuit and stopping the compressor if the condensing pressure exceeds safe operating limits. See Table 13 for cut-out and cut-in points. This control is not adjustable.

LOW PRESSURE CONTROL (2B7S4,2B8S5)

The low pressure control senses suction pressure. It terminates the pumpdown cycle when the suction pressure drops to the cutout setting (Table 13) of the control. When the liquid line solenoid valve opens, suction pressure will rise, closing the control contacts and starting the compressor. The control also prevents compressor motor overheating by monitoring the refrigerant volume which is required for motor cooling. This control is not adjustable.

COMPRESSOR FIXED "OFF" TIMER(S) (1DL10,1DL11)

The "fixed off" timer prevents the compressor(s) from starting for a period of 5 minutes to keep the compressor(s) from short cycling. Time delay begins at the end of a cooling cycle.

RESET RELAY (1K11,1K12)

The reset relay (1K11 or 1K12) prevents the compressor from cycling on compressor overload (1U1, 1U2) and high pressure control (2B7S2, 2B8S3) and winding thermostats (2B7S6, 2B7S7), which are automatic reset controls. Should the overloads, high pressure control or winding stats open during compressor operation, sufficient voltage is developed across the reset relay coil to open relay contacts. The relay coil remains energized with open contacts. Sufficient load is not available for the rest of the unit control circuit. The compressor motor contactor(s), and the liquid line solenoid valve are de-energized. To reset the reset relay and restart system, turn the control circuit OFF/ON switch 1S1 to "Off" and back to the "On" position. This will repower the control circuit, providing that the high pressure cut-out, compressor overloads and/or winding stats have had time for automatic reset.

LOAD LIMIT THERMOSTAT (1S13)

The load limit thermostat is a factory installed accessory available for the CGAB. It is used to avoid nuisance unit shutdown due to compressor overloading or compressor motor thermal protection. The control is designed to limit compressor loading during pull-down under conditions where the return water temperature rises above 70 F. The load limit thermostat is wired in series with the control stages of the temperature controller. If the return water temperature exceeds the control setting (70 F), the control circuits to the compressor solenoid unloader valve(s) (2B7L3, 2B7L4) remain energized. The compressor will operate in a partially loaded condition. Once return water temperature drops below 65 F, compressor loading is energized by 1U11.

HOT GAS BYPASS

Hot gas bypass is used in a chilled water system to prevent the compressor from cycling at fluctuating low load conditions. At loads smaller than the compressor's minimum step of unloading the hot gas bypass valve is energized, inducing an artificial load in the evaporator. As a result, the compressor will reload as the return water temperature rises.

Hot gas bypass is recommended for systems where building loads can fluctuate rapidly, where control is required below the unit minimum step of unloading, or where close temperatures or humidity control is necessary (as outline in the Trane Applications Engineering Manual).

The hot gas bypass valve should be adjusted to maintain a minimum suction pressure of 57 psig (Figure 22). This setting will vary when a water ethylene-glycol solution is used. In all cases, the valve should be adjusted to maintain a zero water temperature drop through the evaporator at minimum load.

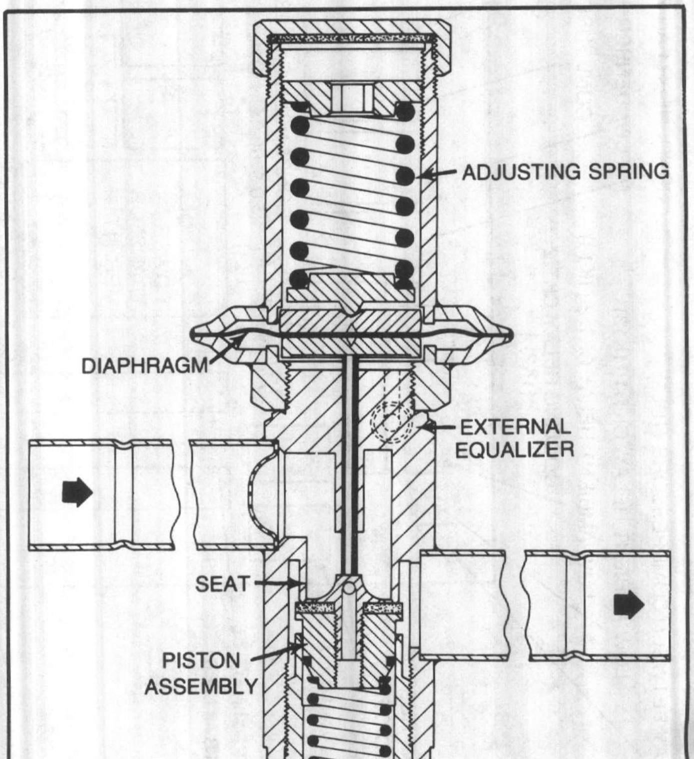


FIGURE 22 - Hot Gas Bypass Valve.

FAN OPERATION

CGAB condenser fan motors are direct drive. Fan sequencing is controlled by: (1) Compressor "On/Off"; (2) Ambient temperature, or (3) A call for second stage cooling by 1U11 (25 and 30 ton units only). Refer to Table 14 for fan sequencing. See Figure 23 for fan locations and direction of rotation.

TABLE 14 - CGAB Condenser Fan Sequencing [1]

UNIT SIZE	STARTS WITH COMPRESSOR	CONTROLLED BY AMBIENT TEMP.
CGAB C20	FAN NO. 2	FAN NO. 1
CGAB C25	FAN NO. 2	FAN NO. 1,3[6]
CGAB C30	FAN NO. 2	FAN NO. 1,3[6]
CGAB C40	FAN NO. (2)[2](5)[3]	FAN NO. 1[4], 4[5]
CGAB C50	FAN NO. (2)[2](5)[3]	FAN NO. (1,3)[4] (4,6)[5]
CGAB C60	FAN NO. (2)[2](5)[3]	FAN NO. (1,3)[4] (4,6)[5]

1. Refer to Figure 23 for condenser fan locations.
2. Fans start with compressor number 1.
3. Fans start with compressor number 2.
4. Fan controlled by compressor number 1.
5. Fan controlled by compressor number 2.
6. Fan controlled by second-stage cooling and ambient thermostat.

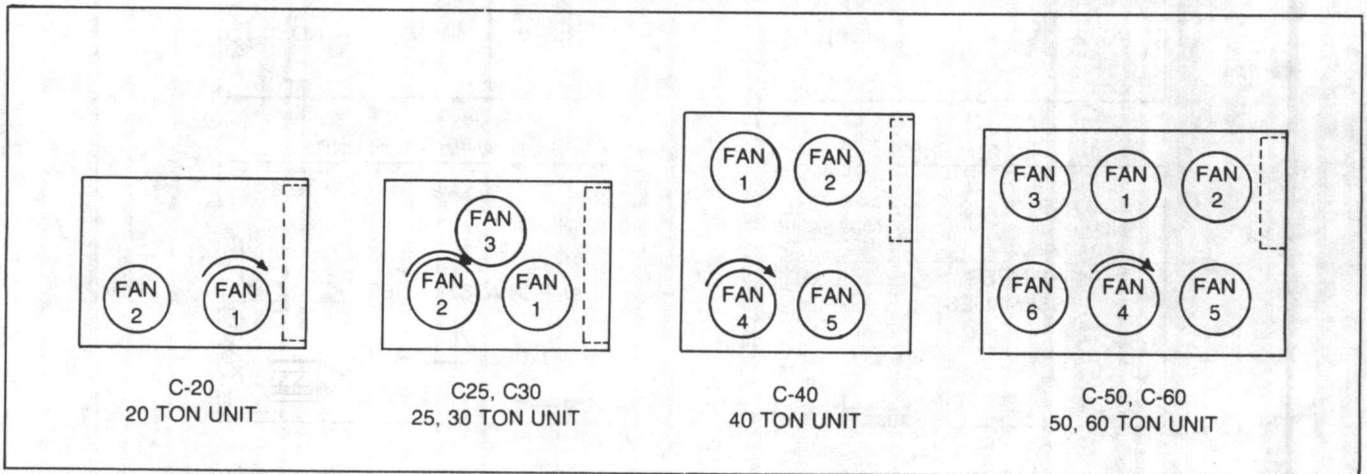


FIGURE 23 - CGAB Condenser Fan Locations.

LOW AMBIENT TIMERS (1U5, 1U6)

Low ambient timers are provided as a means of bypassing the low pressure control during compressor start-up in low ambient conditions. The timer(s) keeps the unit on for a period of three (3) minutes.

FREEZESTAT (1S12)

The freezestat is used to protect the system from excessively low leaving chilled water temperatures. This control does not protect the evaporator from freeze-up. The flow switch and the evaporator heat tapes are the primary freeze protection for the evaporator. If, during normal unit operation, leaving chilled water temperature drops low enough to threaten possible ice formation (cut-out setpoint of 37 F), 1S12 contacts open to interrupt compressor operation until chilled water temperature rises to the cut-in setpoint of the control (42 F). Once the contacts of 1S12 open, it must be manually reset by tripping the reset lever on the top of the control. This control will not reset unless leaving chilled water temperature has risen to a minimum of 42 F. At this temperature or above, the contacts of 1S12 can be reset to resume normal compressor operation.

AMBIENT THERMOSTAT(S) (1U30, 1U31)

The ambient thermostat(s) (1U30, 1U31) energize condenser fan(s) based on ambient temperature. Refer to Table 14 for condenser fan sequencing. The nonadjustable fan cut-in/cut-out setpoints are 53/45 F and 73/65 F for each thermostat. In the CGAB C20 and C40, only the 73/65 F setpoint is used.

LOW AMBIENT DAMPERS (Figure 24)

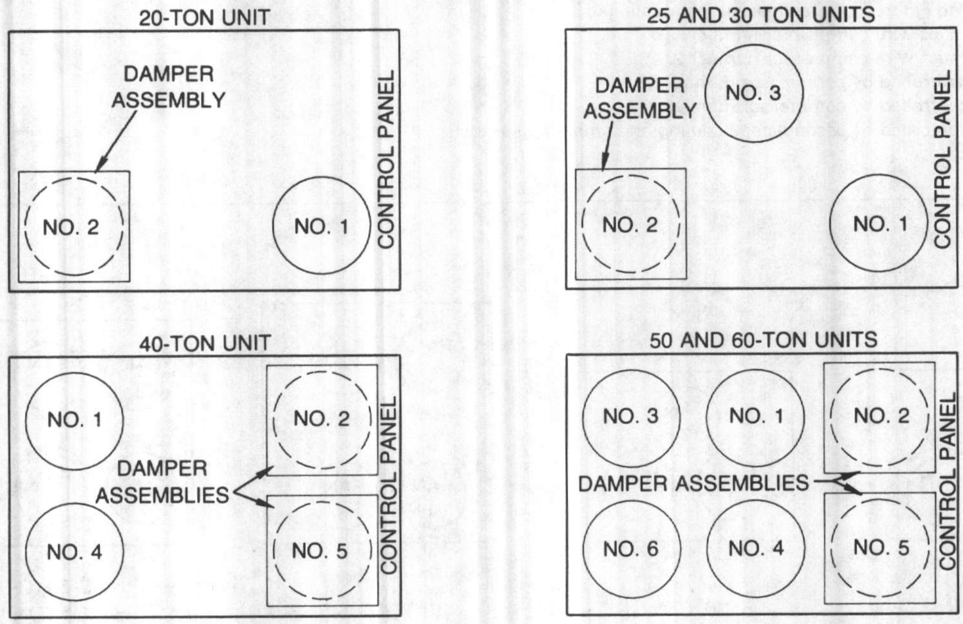
A special set of dampers are used to extend operation of all CGAB units from the standard low limit operation to a minimum of 0 F for all units. These dampers are mounted to restrict air flow across the condenser coils and maintain condenser head pressure during low ambient operation.

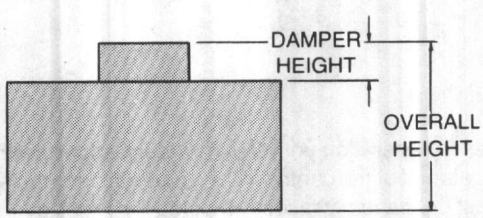
Damper modulation is controlled by refrigerant operated actuators. The actuators respond to condenser head pressure for the appropriate compressor circuit. Dampers are completely open at 250 psig. As condenser head pressure decreases with a drop in ambient temperature, the actuator closes the damper. Dampers are completely closed at 170 psig.

The low ambient damper assembly is mounted over one or two of the condenser fans, depending on the unit. The 20, 25 and 30 ton units use one damper assembly mounted over the number "2" fan. The 40, 50 and 60 ton units have two damper assemblies, mounted over the number "2" and "5" condenser fans.

Blade Adjustment

Inspect damper blades for proper alignment, freedom from obstructions and free operation. If damper adjustment is required, adjust damper blades by holding blades firmly in closed position and sliding the operator to remove any slack in the actuating linkage.





UNIT	NO. OF DAMPERS	OVERALL HEIGHT	DAMPER HEIGHT
CGAB C20	1	6'-3$\frac{17}{32}$"	1'-1$\frac{1}{16}$"
CGAB C25	1	6'-3$\frac{17}{32}$"	1'-1$\frac{1}{16}$"
CGAB C30	1	6'-9$\frac{1}{32}$"	1'-1$\frac{1}{16}$"
CGAB C40	2	7'-2$\frac{1}{32}$"	1'-1$\frac{1}{16}$"
CGAB C50	2	7'-2$\frac{1}{32}$"	1'-1$\frac{1}{16}$"
CGAB C60	2	7'-2$\frac{1}{32}$"	1'-1$\frac{1}{16}$"

FIGURE 24 - CGAB Low Ambient Dampers.

FINAL CHECKOUT

Run the unit sequentially through its stages of cooling. Once proper unit operation is confirmed, perform these final steps:

1. Inspect the unit for debris and/or misplaced tools and hardware.
2. If the unit will be operating immediately, be sure all valves are in operating position.
3. Secure all exterior panels, including control panel door and condenser grilles in place.

TRANE®

FILE INFORMATION
DIVISION TAB - TRANE HEATING PRODUCTS
PRODUCT TAB - UNIT HEATERS
MODEL TAB - GAS FIRED
LITERATURE ITEM - Installation, Operation, Maintenance

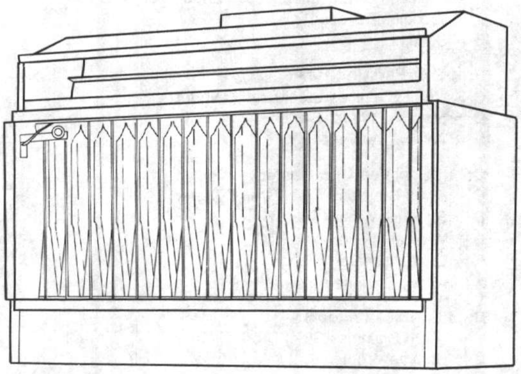
LITERATURE FILE NO.

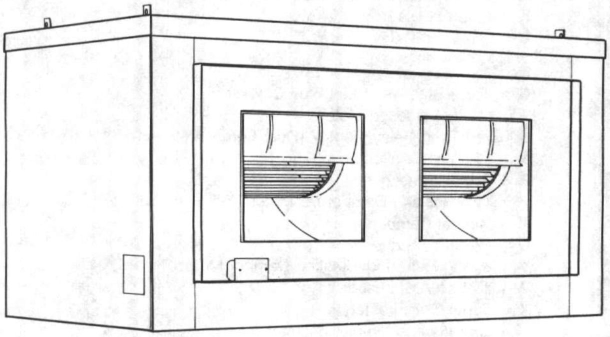
GDNC-IOM-1

INST.-OPER.-MAIN.

MARCH 1982

Since the Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.





INDOOR DUCT FURNACE AND BLOWER ASSEMBLY

MODELS
GDNC/GDPC-005, 007, 010, 012, 015, 017, 020, 022, 025, 030, 035, 040

DESIGN SEQUENCE A

TABLE OF CONTENTS

COMMERCIAL AIR CONDITIONING DIVISION
LA CROSSE, WISCONSIN 54601
PRINTED IN U.S.A.

INDOOR GAS DUCT FURNACE

MODEL NUMBER DESCRIPTION

Trane products are identified by a multiple character model number that precisely identifies a particular type of unit. An explanation of the multiple character number is shown below. It will enable the owner or Service Engineer to define operation, components and accessories.

G D N C 0 0 5 A A A I 0 0 0 A

GAS HEATING EQUIPMENT

UNIT TYPE
C = Centrifugal Fan Unit Heater
D = Indoor Duct Furnace
F = Rooftop Duct Furnace
R = Rooftop Heating Unit
P = Propeller Fan Unit Heater
S = Special

FUEL
N = Natural Gas
P = LP Gas (Propane)
S = Special

DEVELOPMENT SEQUENCE
C = Third Generation

INPUT CAPACITY
SINGLE FURNACE
003 = 30 MBH
004 = 45 MBH
005 = 50 MBH
006 = 60 MBH
007 = 75 MBH
010 = 100 MBH
012 = 125 MBH
015 = 150 MBH
017 = 175 MBH
020 = 200 MBH
022 = 225 MBH
025 = 250 MBH
030 = 300 MBH
035 = 350 MBH
040 = 400 MBH

DOUBLE FURNACE
050 = 500 MBH
060 = 600 MBH
070 = 700 MBH
080 = 800 MBH

TRIPLE FURNACE
120 = 1200 MBH

MAIN POWER SUPPLY
A = 115/60/1
B = 230/60/1
C = 208/60/3
D = 230/60/3
E = 460/60/3
S = Special

GAS CONTROL OPTION
A = Single-Stage, Standing Pilot
B = Two-Stage, Standing Pilot
C = Hydraulic Modulating, Standing Pilot
D = Single-Stage, Intermittent Pilot Ignition
E = Two-Stage, Intermittent Pilot Ignition
F = Hydraulic Modulating, Intermittent Pilot Ignition
G = Hydraulic Modulating With Bypass, Intermittent Pilot Ignition
H = Electronic Modulating With Room T-Stat, Intermittent Pilot Ignition
J = Electronic Modulating With Duct T-Stat, Intermittent Pilot Ignition
S = Special

DESIGN SEQUENCE
A = First Design

HEAT EXCHANGER MATERIAL
1 = Aluminized Steel
2 = #409 Stainless Steel
3 = #321 Stainless Steel
S =Special

MISCELLANEOUS OPTIONS

All Units
0 = None
A = #409 Stainless Steel Burners
B = Orifices For Elevation Above 2000 Feet (Specify Elevation)
S = Special

Propeller Fan Unit Heater
C = #409 Stainless Steel Draft Diverter
D = Summer-Winter Switch
E = Vertical Louvers

Centrifugal Fan Unit Heater
C = #409 Stainless Steel Draft Diverter
D = Summer-Winter Switch
E = Vertical Louvers
H = Duct Discharge Flange
J = Totally Enclosed Motor

Duct Furnace (Indoor)
C = #409 Stainless Steel Draft Diverter
D = Summer-Winter Switch
F = Horizontal Louvers
G = Horizontal & Vertical Louvers
K = Side Access Burner Drawer
L = Fan Time Delay Control

Rooftop
C = #409 Stainless Steel Flue Collector
J = Totally Enclosed Motor
L = Fan Time Delay Control (Duct Furnace Only)
N = 115 Volt Convenience Outlet
P = Power Venting
R = Two Position Dampers & Motor
T = Manual Dampers
U = Magnetic Starter
V = Spring Return Modulating Damper Motor
W = Return Air Firestat
X = Supply Air Firestat
Y = Line Voltage Motor Contactor
Z = Low Voltage Motor Contactor

ROOFTOP FAN SECTION
0 = None (Indoor Unit & Rooftop Duct Furnace)
1 = Standard
S = Special

ROOFTOP HEATING UNIT MOTOR SELECTION
0 = None (Indoor Unit & Rooftop Duct Furnace)
A = 1/2 HP
B = 3/4 HP
C = 1 HP
D = 1-1/2 HP
E = 2 HP
F = 3 HP
G = 5 HP
H = 7-1/2 HP
J = 10 HP
S = Special

ROOFTOP ARRANGEMENTS
0 = None (Indoor Unit)
1 = Rooftop Duct Furnace
2 = Rooftop Heating Unit With O.A. Hood
3 = Rooftop Heating Unit With Horiz. R.A.
4 = Rooftop Heating Unit With Bottom R.A.
5 = Rooftop Heating Unit With O.A. Hood & Bottom R.A.
6 = Rooftop Heating Unit With O.A. Hood & Supply Plenum
7 = Rooftop Heating Unit With Horiz. R.A. & Supply Plenum
8 = Rooftop Heating Unit With Bottom R.A. & Supply Plenum
9 = Rooftop Heating Unit With O.A. Hood, Bottom R.A. & Supply Plenum
S = Special

MODEL NUMBER DESCRIPTION

Trane products are identified by a multiple character model number that precisely identifies a particular type of unit. An explanation of the multiple character number is shown below. It will enable the owner or Service Engineer to define operation, components and accessories.

H B A C 1 5 A A A A 0

HORIZONTAL BLOWER ASSEMBLY

DEVELOPMENT SEQUENCE
C = Third Generation

BLOWER SIZE
15 = Nominal 1500 CFM
20 = Nominal 2000 CFM
30 = Nominal 3000 CFM
45 = Nominal 4500 CFM

TRANSITION SIZE (SPECIFIES DUCT FURNACE SIZE)
0 = None
A = 100 MBH
B = 125 MBH
C = 150 MBH
D = 175 MBH
E = 200 MBH
F = 225 MBH
G = 250 MBH
H = 300 MBH
J = 350 MBH
K = 400 MBH

MISCELLANEOUS OPTIONS
0 = None
1 = Insulation
2 = Floor Mounting Legs
3 = Totally Enclosed Motor
S = Special

DESIGN SEQUENCE
A = First Design

MOTOR HORSEPOWER
A = 1/3 HP
B = 1/2 HP
C = 3/4 HP
D = 1 HP
E = 1-1/2 HP
F = 2 HP
S = Special

MAIN POWER SUPPLY
A = 115/60/1
B = 230/60/1
C = 208/60/3
D = 230/60/3
E = 460/60/3
S = Special

GENERAL INFORMATION

The duct furnace design is certified by the American Gas Association in accordance with Standard ANS Z83.9 titled "Duct Furnaces", for use with natural and LP (propane) gases. ANSI and NFPA Standards referred to in this manual are the ones that were applicable at the time the design was certified. In addition, the duct furnace may be installed on the downstream side of a cooling unit, without need of a bypass duct.

If the unit is to be installed at an altitude exceeding 2,000 feet above sea level, derate the input by 4% for each 1,000 foot rise above sea level. Special orifices are required for installations above 2,000 feet.

Installations in airplane hangers should be in accordance with NFPA No. 409, Standards on Aircraft Hangars. Those in garages should be in accordance with NFPA No. 88, Standards for Garages.

INSTALLATION

Duct furnace dimensions are given in Figure 1.

WARNING: Open all disconnect switches and secure in that position before installing unit. Failure to do so may result in personal injury or death from electrical shock.

RECEIVING

Carefully inspect the unit at the time it is received. If damage is discovered, notify the delivering carrier immediately.

LOCATION

Heating and air conditioning requirements should be considered when locating the unit. See Figure 2 and Table 1 for performance data. Other location considerations include:

1. Accessibility: Allow a minimum of 18 inches at the bottom of the unit to facilitate servicing the burners and pilot, or six inches if the unit has a side access burner drawer. Provision should also be made to assure accessibility for recurrent maintenance purposes.
2. Mounting Height: A mounting height of 8 to 12 feet above the floor is recommended.
3. Duct furnaces are suitable for use in aircraft hangars but must be installed as specified by NFPA.

   NFPA specifies a clearance of at least 10 feet above the upper surface of wings or engine enclosures of the highest aircraft which will be housed in the hanger. The measurement must be made from the wing or engine enclosure.

   Duct furnaces must be installed at least eight feet above the floor in shops, offices, and other sections of the hangar where aircraft are not stored or housed. They must be so located in all spaces of aircraft hangars that they will not be subject to injury by aircraft, cranes, movable scaffolding, or other objects.

   A safe distance must be maintained between the duct furnace and vent, and adjacent combustible material either in storage or in the building construction. In conformance with standards NFPA No. 52 and 54, pertaining to gas burning devices, the duct furnaces must not raise surrounding combustible material above 160 F.
4. Clearances: Minimum clearances are listed in Figure 1.

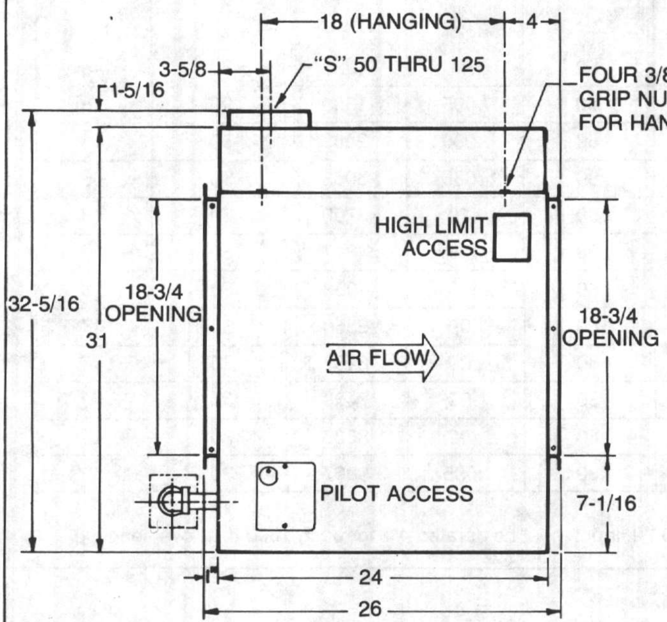
WARNING: Under no circumstances should combustible material be located within the clearances specified in Figure 1. Failure to provide proper clearance could result in personal injury or equipment damage from fire.

5. Drafts: Avoid installing the duct furnace in an extremely drafty location. Strong drafts may cause pilot outage. Units with intermittent pilot ignition may be preferable in areas where drafts cannot be avoided.
6. Atmospheres containing commercial solvents or chlorinated hydrocarbons will produce corrosive acids when coming in contact with the flames. This will greatly reduce the life of the gas duct furnace and may void the warranty. Avoid such areas.

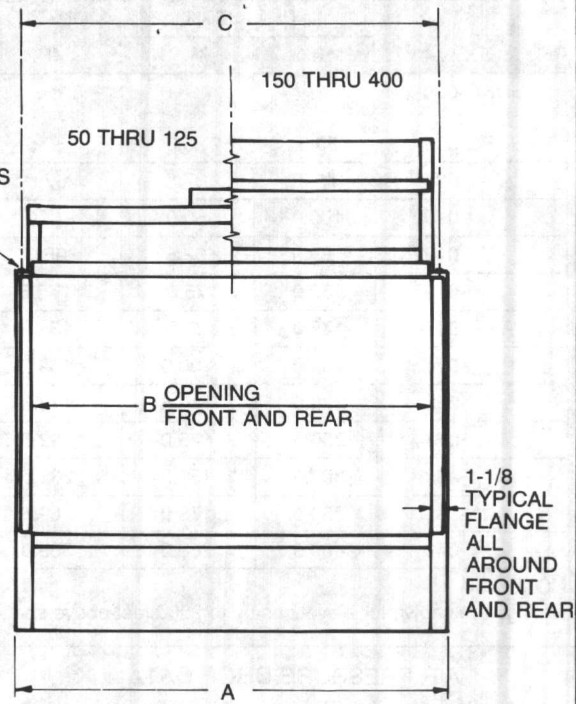
   NOTE: *If the gas duct furnace is to be used in a building classified as having a hazardous atmosphere, the installation must comply with the standards set by the National Board of Fire Underwriters. Consult the authorities having jurisdiction before starting the job.*

SUSPENSION

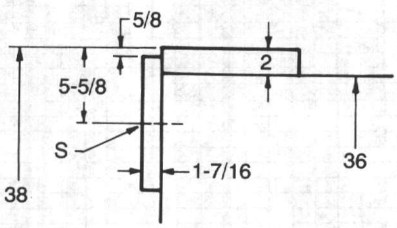
The duct furnace must be hung level from side to side and front to back, from four suspension points provided at the top of the unit. Refer to Figure 3 for typical suspension arrangements.



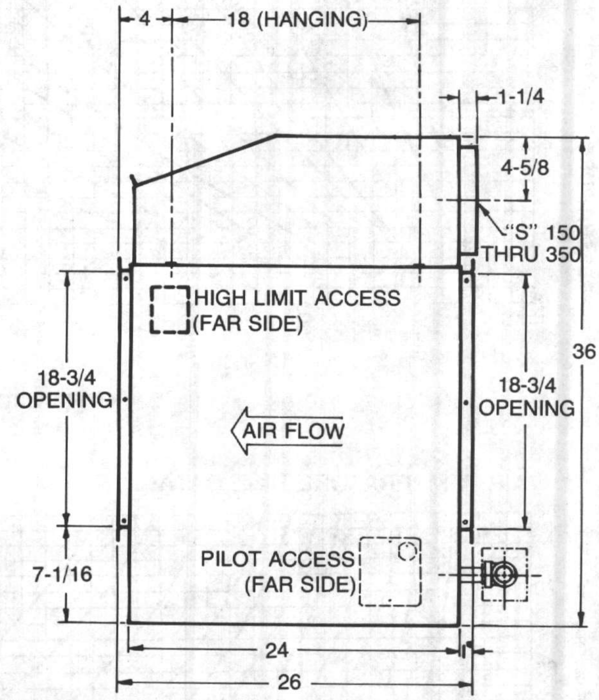
SIDE VIEW 50 THRU 125



FRONT VIEW 50 THRU 400



400 VENT



SIDE VIEW 150 THRU 400

MODEL	A	B	C	S	GAS INLET NAT.	GAS INLET LP	APPROX. SHIP WT.
GDNC-005 and GDPC-005	17⅞	15½	17⅛	4" R	½	½	126
-007	17⅞	15½	17⅛	5" R	½	½	132
-010	17⅞	15½	17⅛	6" R	½	½	135
-012	20⅝	18¼	19⅞	6" R	½	½	150
-015	20⅝	18¼	19⅞	7" R	½	½	161
-017	23⅜	21	22⅝	7" R	½	½	179
-020	26⅛	23¾	25⅜	8" R	½	½	195
-022	28⅞	26½	28⅛	8" R	¾	½	213
-025	31⅝	29¼	30⅞	8" R	¾	½	229
-030	37⅛	34¾	36⅜	10" ov	¾	½	262
-035	42⅝	40¼	41⅞	10" ov	¾	½	294
-040	48⅛	45¾	47⅜	12" ov	¾	½	326

R - Round ov - Oval

Minimum Clearances

SIZES	6"
TOP	6"
BOTTOM	18"*
FLUE	6"

*6" with side access burner drawer.

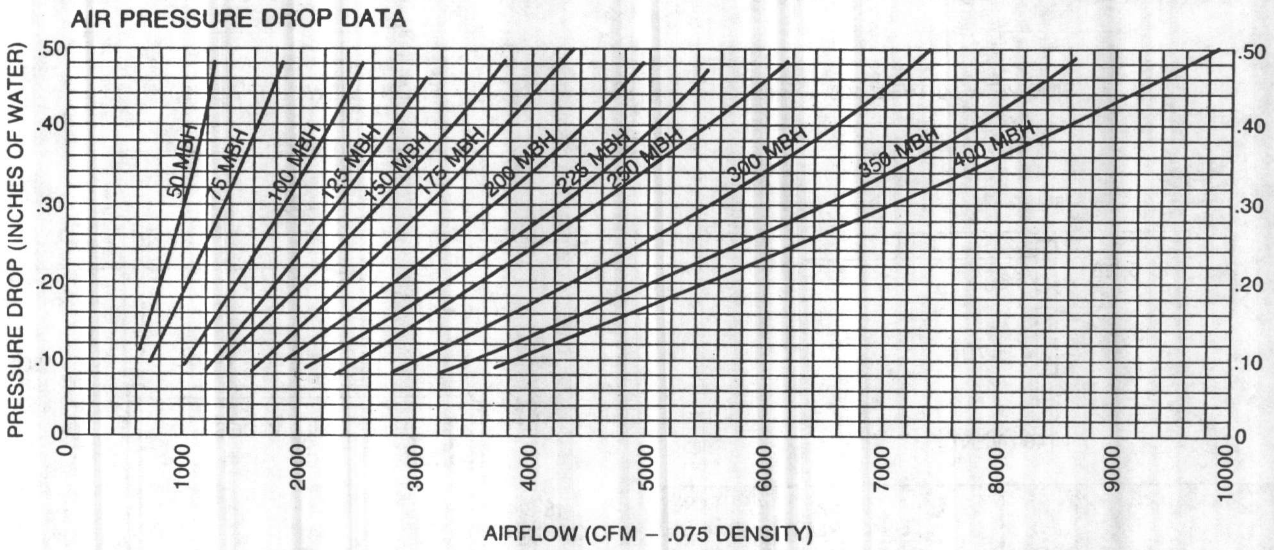
When the clearances required for accessibility are greater than the minimum safety clearances, the accessibility clearances take precedence.

FIGURE 1 - Duct Furnace Dimensions

TABLE 1 - Duct Furnace Performance Data

MODELS	INPUT - MBH MAX.	MIN.	OUTPUT MBH	MIN. CFM	TEMP. RISE	P.D.	MAX. CFM	TEMP. RISE	P.D.
GDNC-005 and GDPC-005	50.0	25.0	38.5	463	80	.11	1233	30	.48
-007	75.0	37.5	57.8	694	80	.095	1850	30	.48
-010	100.0	50.0	77.0	925	80	.090	2467	30	.48
-012	125.0	62.5	96.3	1156	80	.088	3083	30	.46
-015	150.0	75.0	115.5	1388	80	.10	3700	30	.48
-017	175.0	87.5	134.8	1619	80	.09	4317	30	.50
-020	200.0	100.0	154.0	1850	80	.10	4933	30	.48
-022	225.0	112.5	173.3	2081	80	.09	5550	30	.47
-025	250.0	125.0	192.5	2313	80	.09	6167	30	.48
-030	300.0	150.0	231.0	2775	80	.09	7400	30	.50
-035	350.0	175.0	269.5	3238	80	.09	8633	30	.49
-040	400.0	200.0	308.0	3700	80	.095	9867	30	.50

NOTE:
Ratings are shown for elevations up to 2000 feet above sea level. Above 200 ft. input must be derated 4% for each 1000 ft. above sea level.



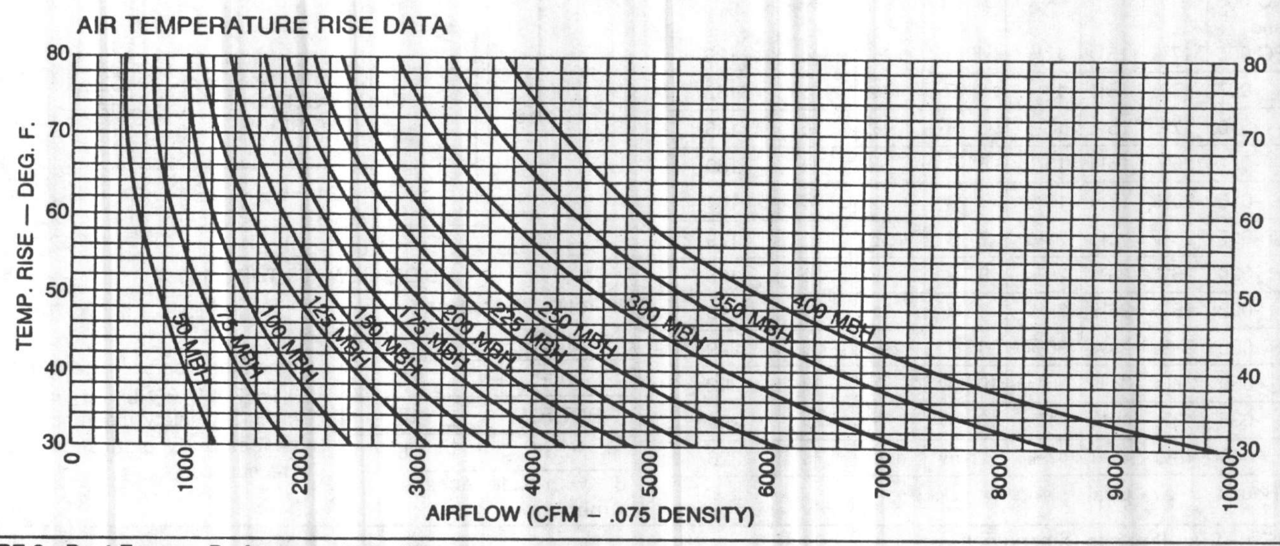


FIGURE 2 - Duct Furnace Performance Data Curve

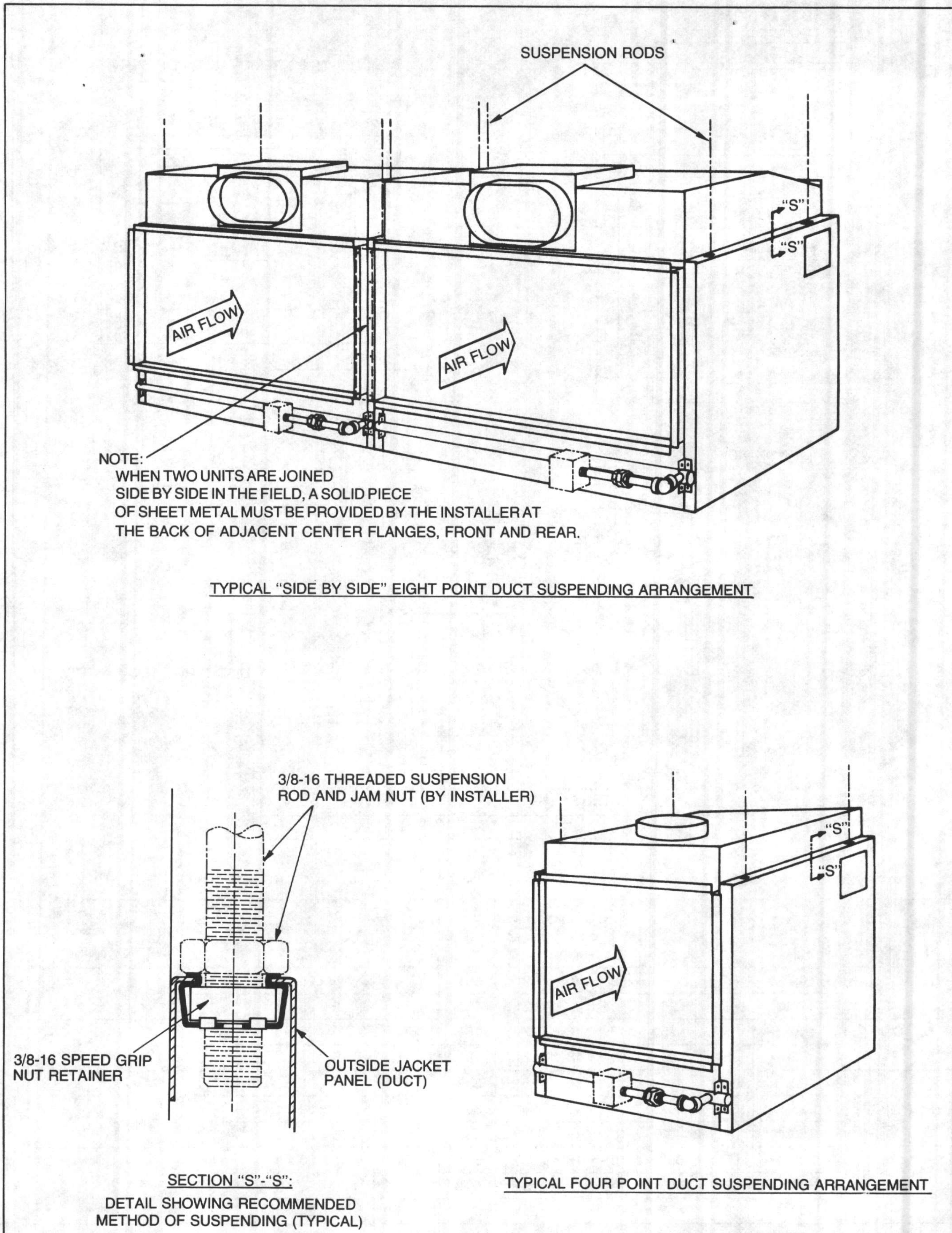
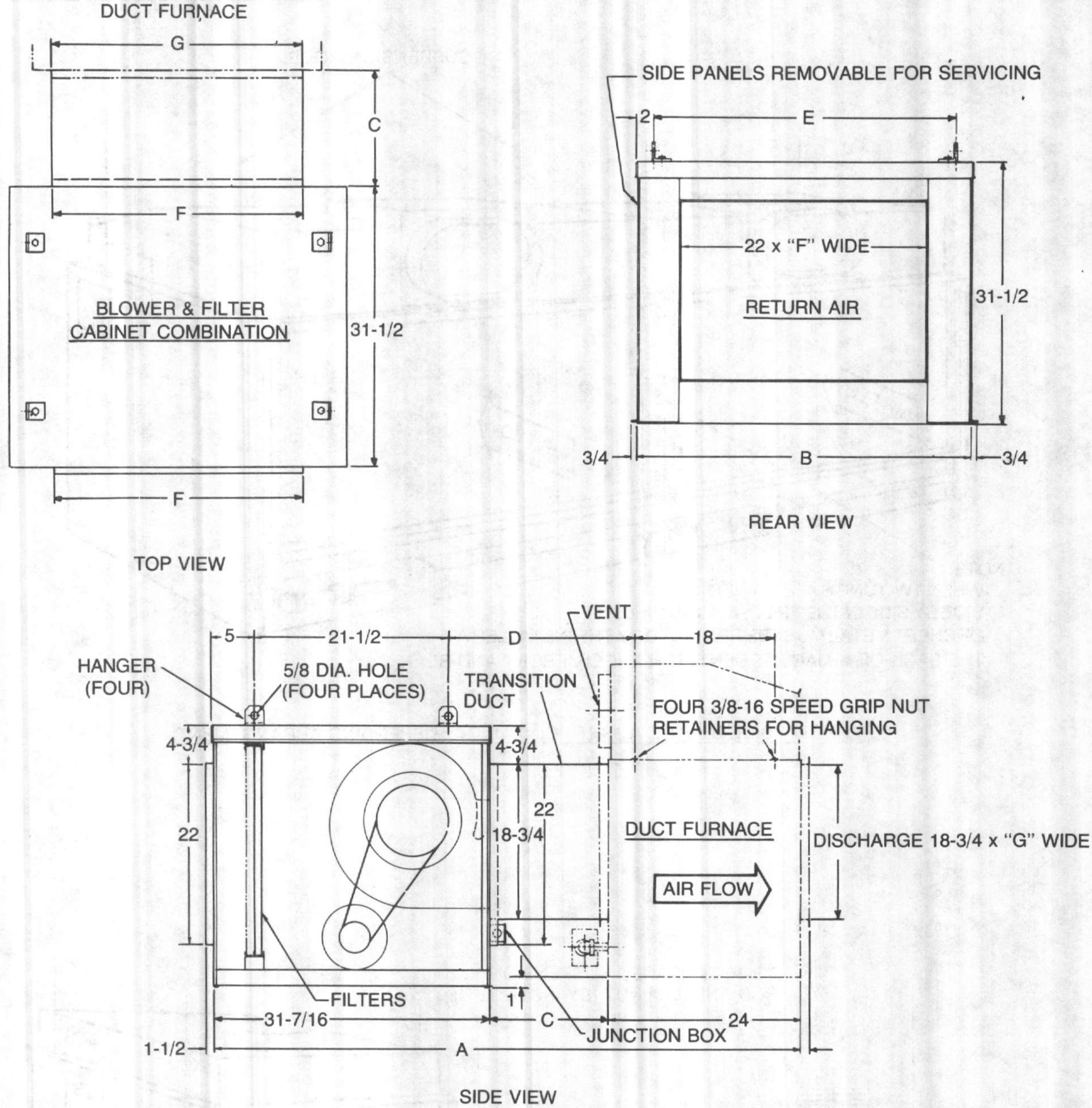


FIGURE 3 - Duct Furnace Suspension



BLOWER MODEL	DUCT FURNACE MBH	A	B	C	D	E	F	G	FILTER DATA SIZE	FILTER DATA NO.	APPROX. SHIP WT. LESS MOTOR
HBAC-15	100	65½	26	10	18	21	15¾	15⅝	25 x 25 x 1	1	135
	125	65½	26	10	18	21	15¾	18⅜	25 x 25 x 1	1	
HBAC-20	150	65½	26	10	18	21	15¾	18⅜	25 x 25 x 1	1	155
	175	65½	26	10	18	21	15¾	21⅛	25 x 25 x 1	1	
HBAC-30	200	65½	40½	10	18	35½	30⅜	23⅞	25 x 20 x 1	2	200
	225	65½	40½	10	18	35½	30⅜	26⅝	25 x 20 x 1	2	
	250	65½	40½	10	18	35½	30⅜	29⅜	25 x 20 x 1	2	
HBAC-45	300	65½	60½	10	18	55½	50⅜	34⅞	25 x 20 x 1	3	296
	350	69½	60½	14	22	55½	50⅜	40⅜	25 x 20 x 1	3	
	400	69½	60½	14	22	55½	50⅜	45⅞	25 x 20 x 1	3	

HBAC-45 has two blowers driven by one motor.

FIGURE 4 - Blower Assembly Dimensions

MOUNTING THE BLOWER

The blower assembly and transition piece between the blower and gas duct furnace ship separately. Refer to Figure 4 for blower assembly, dimensions and to Table 2 for performance data. Mount the blower assembly as follows:

1. Suspend the gas duct furnace. Make sure the unit is level.
2. Attach the transition piece to the inlet flange of the unit.
3. Suspend the blower package from the four hangers provided at the top of the unit (refer to Figure 4).
4. Level the transition piece and check to see that the hangers support only the weight of the blower assembly. Attach the outlet flange of the blower to the transition piece.

VENTILATION

If the duct furnace is to be installed in a tightly constructed room or compartment, provide two vent openings to avoid over-pressurizing the room. The size of each vent opening should be no less than one square inch of free area for each 1,000 Btu/hr input. Each opening should not be less than 100 square inches.

If the enclosure is vented to the outside, the vent opening must be no smaller than one square inch of free open area for each 2,500-3,000 Btu/hr input. Each opening should not be less than 100 square inches.

DUCTWORK

Properly designed and installed ductwork, providing a uniformly distributed flow of air across the surfaces of the heat exchanger, is essential to satisfactory unit performance and life of the equipment.

If uniform air distribution is not obtained, install additional baffles and/or turning vanes in the ductwork.

Figures 5 and 6 illustrate recommended ductwork designs for both the straight-through and elbowed air inlet arrangements.

Access panels large enough to observe smoke and reflected light, and to detect the presence of leaks in the heating equipment, are required both upstream and downstream from the gas duct furnace. These panels must be sealed to prevent air leaks. If allowed by local regulations, install canvas connectors between the ductwork and fan discharge opening to eliminate the transmission of sound.

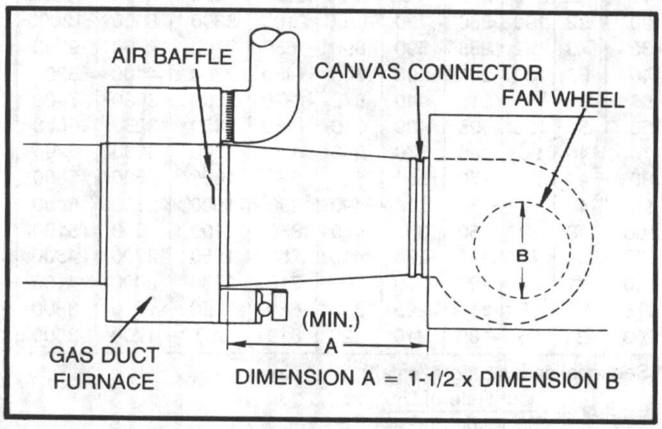


FIGURE 5 - Recommended Ductwork Design for Straight-Through Arrangement

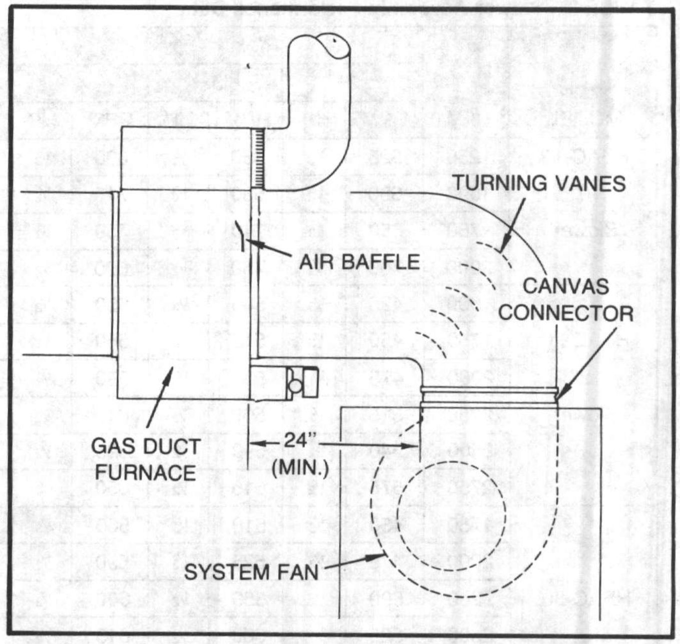


FIGURE 6 - Recommended Ductwork Design for Elbowed Arrangement

BYPASS

When a gas duct furnace is installed to operate in conjunction with a summer air conditioning system, the cfm air delivery of the system blower should be adjusted to meet the design air volume requirements for cooling. If this cfm delivery is greater than that required for heating, resulting in a low air temperature rise, install a damper bypass around the gas duct furnace to bypass a portion of the air.

VENTING

Observe the following precautions when venting the unit:

1. Use flue pipe of the same size as the flue connection on the gas duct furnace.
2. Where two or more gas duct furnaces vent into a common flue, the cross sectional area of the common flue must be equal to the largest vent connection, plus 50% of the area of each additional vent connection.
3. Provide as long a vertical run of flue at the gas duct furnace as possible. A minimum of four feet of vertical flue is required. The top of the vent pipe should extend at least two feet above the highest point on the roof. Install a weather cap over the vent opening.
4. Slope horizontal runs upward from the gas duct furnace at least 1/4-inch per foot. Horizontal runs should not exceed 75% of the vertical height of the vent pipe, or chimney, above the flue pipe connection.
5. Use as few elbows as possible.
6. Tape flue pipe joints with fireproof paper or material.
7. Avoid running vent pipe through unheated spaces. When this cannot be avoided, insulate the pipe to prevent the condensation of moisture on the inside walls of the pipe.
8. Do not damper the flue piping. Failure to open such a damper prior to operating the gas duct furnace will result in the spillage of flue gas into the occupied space.
9. Avoid installing units in areas under negative pressure due to large exhaust fans or air conditioning.
10. When required, a flue vent fan should be installed in accordance with the instructions included with the fan.

TABLE 2 - Blower Assembly Performance Data

MODEL	CFM	STATIC PRESSURE*															
		2		3		4		5		6		7		8		9	
		RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
HBAC-15	1250	525	⅓	650	⅓	680	⅓	760	⅓	780	⅓	840	⅓				
10"	1500	600	⅓	680	⅓	715	⅓	790	⅓	810	½	860	½	895	½	970	½
Blower	1750	650	⅓	710	⅓	750	½	805	½	850	½	890	½	940	½	990	¾
	2000	700	½	760	½	800	½	850	½	890	½	925	¾	980	¾	1010	¾
	1500	425	⅓	500	⅓	550	⅓	630	⅓								
HBAC-20	1750	450	⅓	515	⅓	560	⅓	635	½	680	½	725	½				
12"	2000	475	⅓	530	⅓	590	½	640	½	690	½	740	½	785	½	810	¾
Blower	2250	515	½	560	½	610	½	650	½	700	¾	750	¾	790	¾	815	¾
	2500	540	½	590	½	625	½	670	½	710	¾	760	¾	795	¾	820	¾
	2750	575	½	615	½	650	¾	690	¾	730	¾	780	¾	800	¾	830	1
	1750	450	⅓	510	⅓	560	⅓	630	⅓	675	½	720	½				
	2000	475	⅓	525	⅓	590	½	635	½	680	½	735	½	780	¾	805	¾
HBAC-30	2250	500	½	550	½	600	½	645	½	685	½	740	¾	785	¾	810	¾
12"	2500	525	½	580	½	615	½	665	½	700	¾	750	¾	790	¾	815	¾
Blower	2750	560	½	605	½	640	¾	685	¾	715	¾	775	¾	805	¾	825	1
	3000	610	½	640	¾	660	¾	710	¾	750	1	790	1	815	1	845	1
	3250	630	¾	675	¾	700	1	735	1	750	1	790	1	830	1	860	1
	3500	675	¾	700	1	725	1	775	1	800	1	840	1½	875	1½	890	1½
	2750	400	¾	450	¾	510	¾										
	3000	425	¾	475	¾	550	¾	600	¾	650	¾						
HBAC-45	3500	430	¾	480	¾	560	¾	610	¾	660	¾	700	1	730	1		
(2) 12"	4000	450	¾	500	¾	565	¾	615	¾	670	1	710	1	740	1	790	1
Blower	4500	475	¾	525	¾	575	¾	620	1	680	1	715	1	750	1	800	1½
	5000	500	¾	540	¾	600	1	630	1	690	1	720	1½	760	1½	810	1½
	5500	530	1	575	1	615	1	650	1½	700	1½	700	1½	730	1½	820	1½
	6000	575	1½	615	1½	660	1½	690	1½	715	1½	760	2	800	2	830	2

* External static pressure in inches of water. Add the pressure drop of the duct furnace if used (see Figure 2) and the pressure drop of the ductwork to determine the total external static pressure.

GAS PIPING

WARNING: To avoid equipment damage or possible personal injury, do not connect gas piping to this unit until a supply line pressure/leak test has been completed. Connecting the unit before completing the pressure/leak test may damage the unit gas valve and result in a fire hazard.

Do not rely on a shutoff valve to isolate the unit while conducting gas pressure/leak tests. These valves may not be completely shut off, exposing the unit gas valve to excessive pressure and damage.

PIPE SIZING

To provide adequate gas pressure at the gas duct furnace, size the gas piping as follows:

1. Find the cu ft/hr by using the following formula:

   $$\text{Cu ft/hr} = \frac{\text{Input}}{\text{Btu}}$$

2. Refer to Table 3. Match "Pipe Run in Feet" with the appropriate "Gas Input - Cu Ft/Hr" figure. This figure can then be matched to the pipe size at the top of the column.

TABLE 3 - Gas Pipe Sizing (Natural Gas)

PIPE	PIPE SIZE								
RUN	½"*	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
FEET	GAS INPUT - CU FT/HR**								
10	132	278	520	1050	1600	3050	4800	8500	17500
20	92	190	350	730	1100	2100	3300	5900	12000
30	73	152	285	590	890	1650	2700	4700	9700
40	63	130	245	500	760	1450	2300	4100	8300
50	56	115	215	440	670	1270	2000	3600	7400
60	50	105	195	400	610	1150	1850	3250	6800
70	46	96	180	370	560	1050	1700	3000	6200
80	43	90	170	350	530	990	1600	2800	5800
90	40	84	160	320	490	930	1500	2600	5400
100	38	79	150	305	460	870	1400	2500	5100
125	34	72	130	275	410	780	1250	2200	4500
150	31	64	120	250	380	710	1130	2000	4100
175	28	59	110	225	350	650	1050	1850	3800
200	26	55	100	210	320	610	980	1700	3500

* See local codes before installing ½" pipe.

** $\text{Cu ft/hr} = \frac{\text{Input Rate of Unit}}{\text{Btu Value of Gas}}$

Pipe capacity based upon a pressure drop of 0.3 inches water column and 0.6 specific gravity of gas.

Example: It is determined that a 67 foot run of gas pipe is required to connect a GDNC-020 gas duct furnace to a 1,000 Btu/cu ft natural gas supply.

$$\frac{200{,}000 \text{ Btu/hr}}{1{,}000 \text{ Btu/cu ft}} = 200 \text{ cu ft/hr}$$

Using Table 3, a 1-1/4 inch pipe is needed.

NOTE: *If more than one gas duct furnace is to be served by the same piping arrangement, the total cu ft/hr input and length of pipe must be considered.*

NOTE: *If the gas duct furnace is to be fired with LP gas, consult the local LP gas dealer for pipe sizing information.*

Before any connection is made to an existing line supplying other gas appliances, contact the local gas company to make certain that the existing line is of an adequate size to handle the combined load.

PIPE INSTALLATION

1. Install the gas piping in accordance with applicable local codes.
2. Check gas supply pressure. Minimum gas supply pressure to the unit should be one inch water column greater than the recommended manifold pressure, or five inches for natural gas or 11 inches for propane gas. Maximum gas pressure to the unit should not exceed 14 inches (1/2 psig) for natural gas or propane units. If gas pressure is excessive on natural gas applications, install a pressure regulating valve in the line upstream from the main shutoff valve.
3. Adequately support the piping to prevent strain on the gas manifold and controls.
4. To prevent the mixing of moisture with gas, run the take-off piping from the top, or side, of the main.
5. Standard gas duct furnaces, optional two-stage units, and hydraulic modulating units are supplied with a combination valve which includes:
   a. Manual "A" valve
   b. Manual "B" valve
   c. Solenoid valve
   d. Pilot safety
   e. Pressure regulator (except with Propane units)

   Pipe directly into the combination valve (see Figure 7).

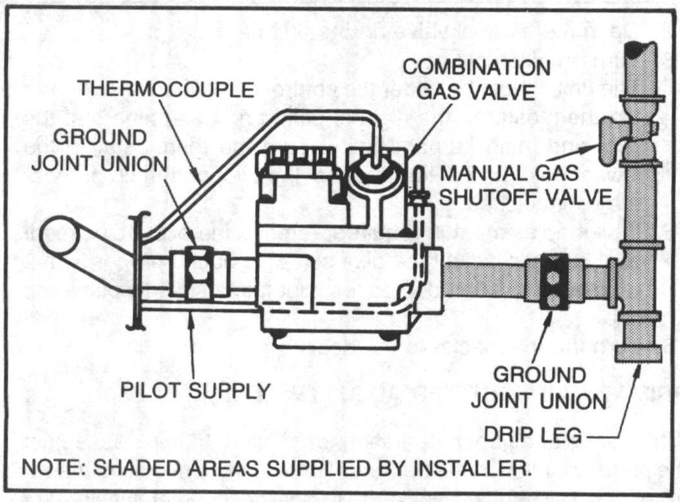


FIGURE 7 - Pipe Installation, Standard Controls

6. Provide a drip leg in the gas piping near the gas duct furnace. A ground joint union and a manual gas shutoff valve should be installed ahead of the unit heater controls to permit servicing. See Figure 7.
7. Make certain that all connections have been adequately doped and tightened.

   NOTE: *Use pipe joint sealant resistant to the action of liquefied petroleum gases regardless of gas conducted.*

8. Check all connections with a soap solution before leaving the job.

WARNING: Never use an open flame to detect gas leaks. Explosive conditions may exist which could result in personal injury or death.

ORIFICE SIZING

Orifice sizes for the various unit models and fuels are given in Table 4.

If the manifold pressure requires minor adjustment, remove the cap from the pressure regulator and turn the adjustment screw clockwise to increase the pressure, or counterclockwise to decrease the pressure. The adjusted manifold pressure should not vary more than 10% from the pressures specified in Table 4.

TABLE 4 - Orifice Schedule

INPUT IN 1000 BTU	TYPE OF GAS	NATURAL	PROPANE	NO. OF BURNERS
	BTU VALUE	1075	2500	
	MANIFOLD PRESSURE IN INCHES WATER	3.5	10.5	
50	Cu. Ft/Hr Orifice Drill	48 41	20.0 54	2
75	Cu. Ft/Hr Orifice Drill	72 41	30 54	3
100	Cu. Ft/Hr Orifice Drill	96 41	40 54	4
125	Cu. Ft/Hr Orifice Drill	120 41	50 54	5
150	Cu. Ft/Hr Orifice Drill	140 41	60 54	6
175	Cu. Ft/Hr Orifice Drill	163 41	70 54	7
200	Cu. Ft/Hr Orifice Drill	186 41	80 54	8
225	Cu. Ft/Hr Orifice Drill	210 41	90 54	9
250	Cu. Ft/Hr Orifice Drill	233 41	100 54	10
300	Cu. Ft/Hr Orifice Drill	280 41	120 54	12
350	Cu. Ft/Hr Orifice Drill	326 41	140 54	14
400	Cu. Ft/Hr Orifice Drill	372 41	160 54	16

THERMOSTAT LOCATION

Mount the thermostat approximately five feet above the floor in an area where it will be exposed to a free circulation of average temperature air. Avoid mounting the thermostat in the following locations:

1. Cold areas - Outside walls or areas where drafts may affect the operation of the control.
2. Hot areas - Areas where the sun's rays, radiation, or warm air currents may affect control operation.
3. Dead areas - Areas where air cannot circulate freely, such as behind doors or in corners.

WIRING

WARNING: Open all disconnect switches and secure in that position before wiring unit. Failure to do so may result in personal injury or death from electrical shock.

NOTE: *All wiring must be in accordance with National and Local Electrical Codes.*

Typical unit wiring diagrams are shown in Figures 8 through 11. Wire the unit according to the wiring diagram supplied with the unit.

FAN TIME DELAY CONTROL (Optional)

Leads from the time delay controls are factory wired to the junction box. The fan control option is a time delay relay (45 seconds ON, 60 seconds OFF). The fan control is rated at 17 amps. Wire the control as shown for the proper control system.

NOTE: *Use 230 F insulated wire.*

MODULATING GAS VALVE (Optional, for Natural Gas Only)

Install the thermal sensing element of the modulating gas valve as far upstream from the gas duct furnace as the length of the capillary tube will permit, minimizing the effect of radiant heat. The minimum rate setting of this valve is preset and is not adjustable.

OPERATION

STANDARD UNITS WITH STANDING PILOT

START-UP

Open the manual shutoff gas valve to the unit heater and, with the union connection loose, purge air from the gas line. Tighten the union and check for leaks.

WARNING: Never use an open flame to detect gas leaks. Explosive conditions may exist which could result in personal injury or death.

Light the pilot as follows:

1. Close the main and pilot gas supply by depressing and turning the gas cock dial to OFF. Refer to Figure 13 for burner component identification.
2. Turn the thermostat to the OFF position or lowest temperature setting on the dial.

   WARNING: Before attempting to light or relight the pilot, wait five minutes to allow gas which may have accumulated in the burner compartment to escape. Failure to do so could cause the accumulated gas to ignite rapidly, leading to personal injury.

3. Turn the gas cock dial to the PILOT position.
4. Depress and hold the gas cock dial while lighting the pilot burner. Allow the pilot to burn for approximately 30 seconds before releasing. If the pilot does not remain lit, repeat the operation allowing a longer period of time before releasing.
5. If pilot adjustment is required, remove the pilot adjustment cap and adjust the pilot key to obtain proper flame. Replace the cap.

   NOTE: *A proper pilot flame is a soft steady flame that envelopes 3/8-inch to 1/2-inch of the thermocouple tip.*

6. Turn the gas cock dial to the ON position.
7. Turn the thermostat to the desired position.

SHUT-DOWN

1. Turn the valve selector knob to the OFF position.
2. Turn off the electricity.
3. To relight, follow the "START-UP" instructions above.

STANDARD UNITS WITH INTERMITTENT PILOT IGNITION

START-UP

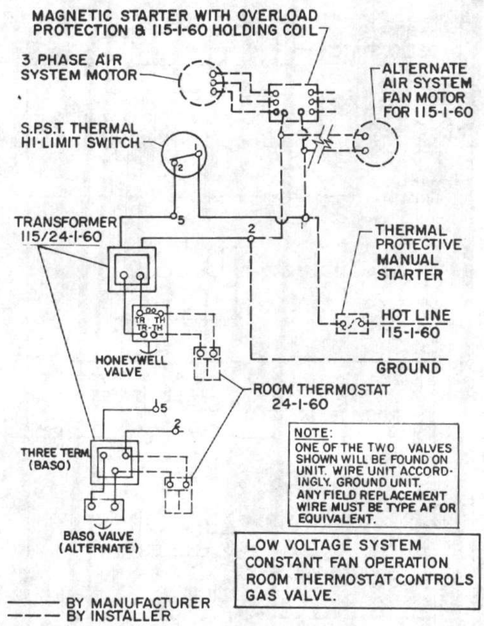
1. Open the manual valve supplying gas to the unit heater, and with the union connection loose, purge air from the gas line. Tighten the union and check for gas leaks.

   WARNING: Never use an open flame to detect gas leaks. Explosive conditions may exist which could result in personal injury or death.

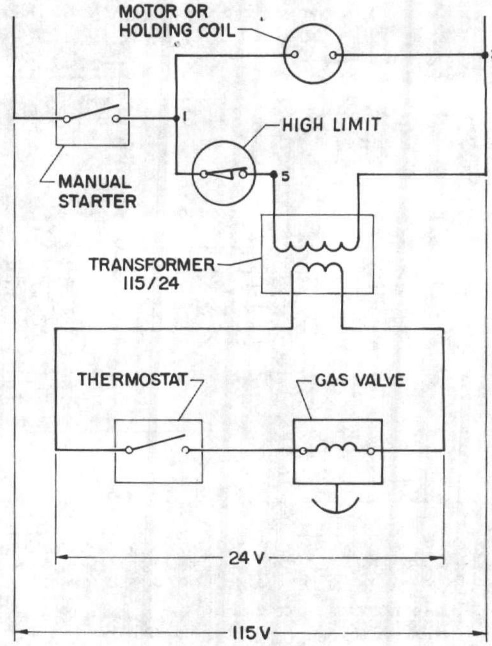
2. Open the manual valve on the unit heater.
3. Turn on electrical power.
4. The unit should be under the control of the thermostat. Turn the thermostat to the highest point and determine that the pilot and main burners ignite. Turn the thermostat to the lowest point and determine that the pilot and main burners are extinguished.
5. If pilot adjustment is required, remove the pilot adjustment seal cap and adjust the pilot screw to obtain proper flame. Clockwise rotation decreases pilot flame size. Replace the cap.
6. Turn the thermostat to the desired position.

PRIMARY AIR SHUTTER ADJUSTMENT

After the unit has been operating for at least 15 minutes, adjust the primary air flow to the burners. Turn the friction-locked, manually-rotated air shutters clockwise to close, or counterclockwise to open.



INTERCONNECTING DIAGRAM

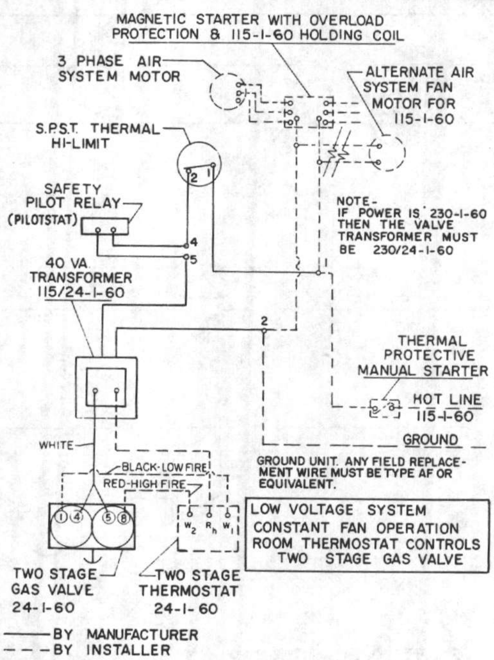


LINE DIAGRAM

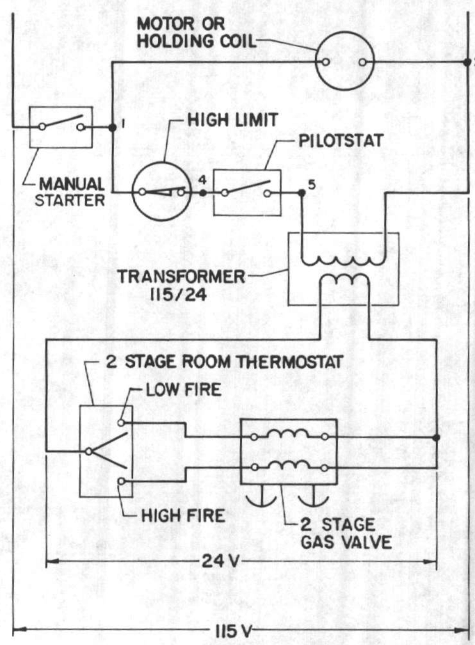
WARNING

DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

FIGURE 8 - Duct Furnace Wiring Diagram, Single Stage Standing Pilot



INTERCONNECTING DIAGRAM



LINE DIAGRAM

WARNING

DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

FIGURE 9 - Duct Furnace Wiring Diagram, Two Stage Standing Pilot

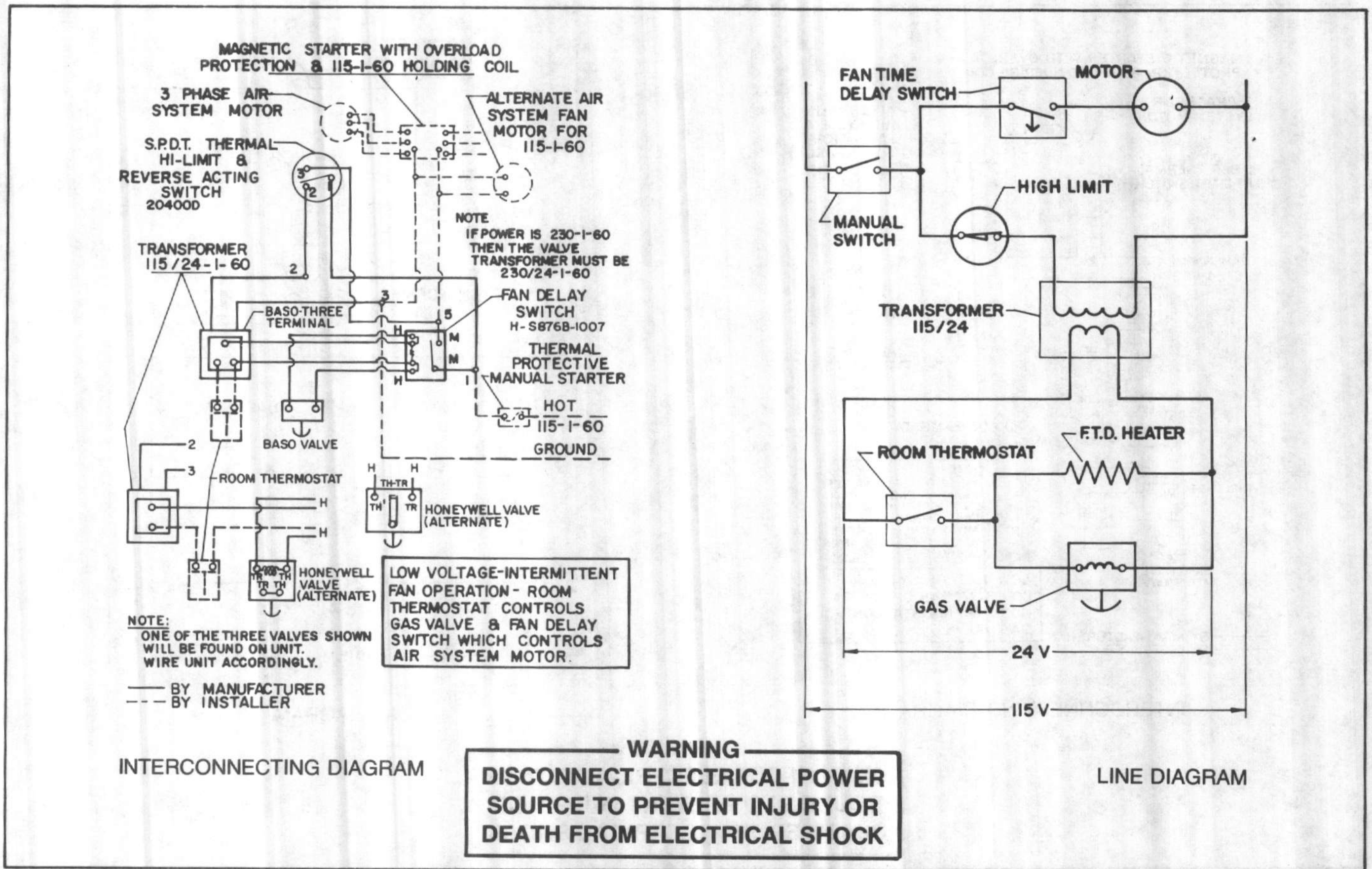


FIGURE 10 - Duct Furnace Wiring Diagram, Single Stage Standing Pilot With Fan Time Delay Relay

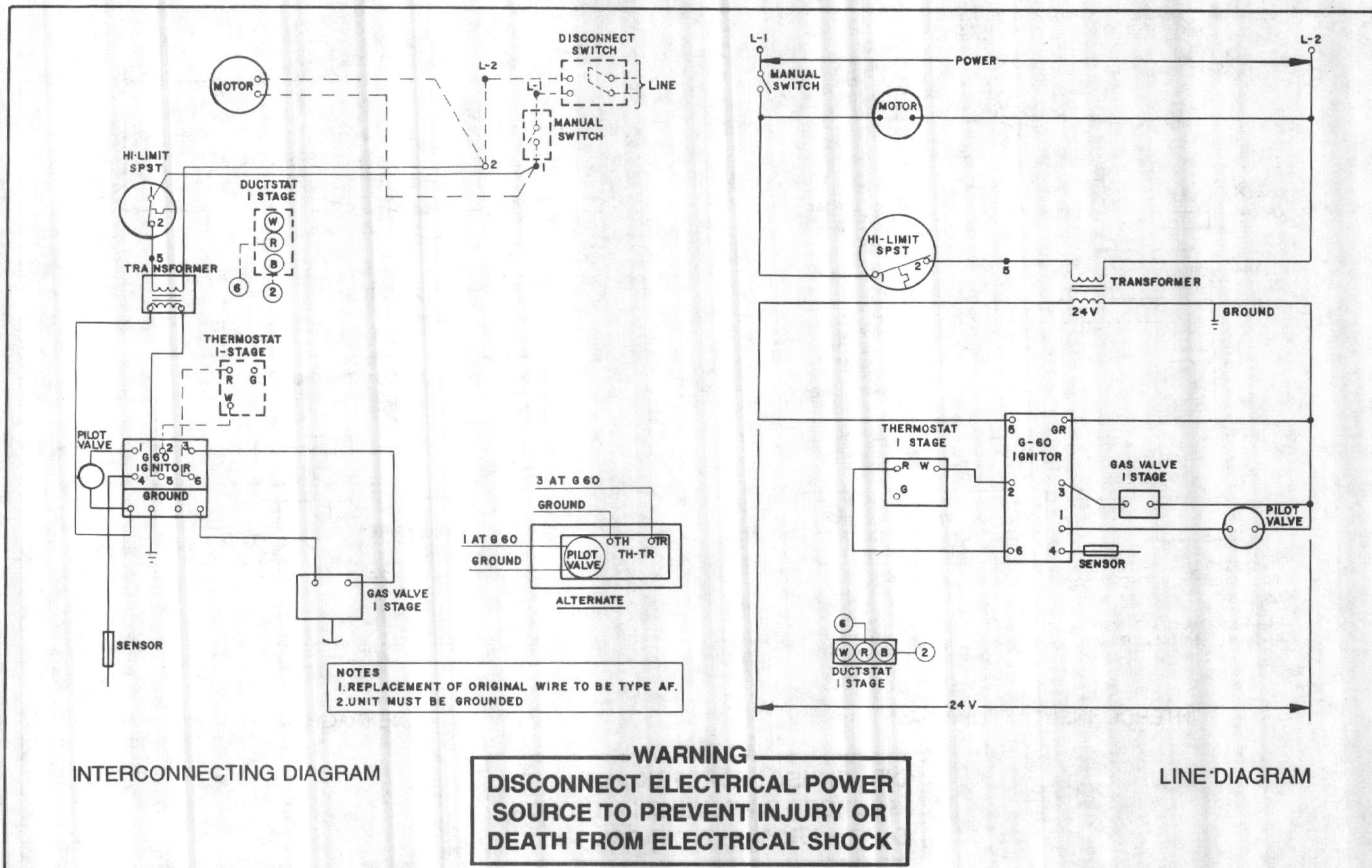


FIGURE 11 - Duct Furnace Wiring Diagram, Single Stage Intermittent Pilot Ignition

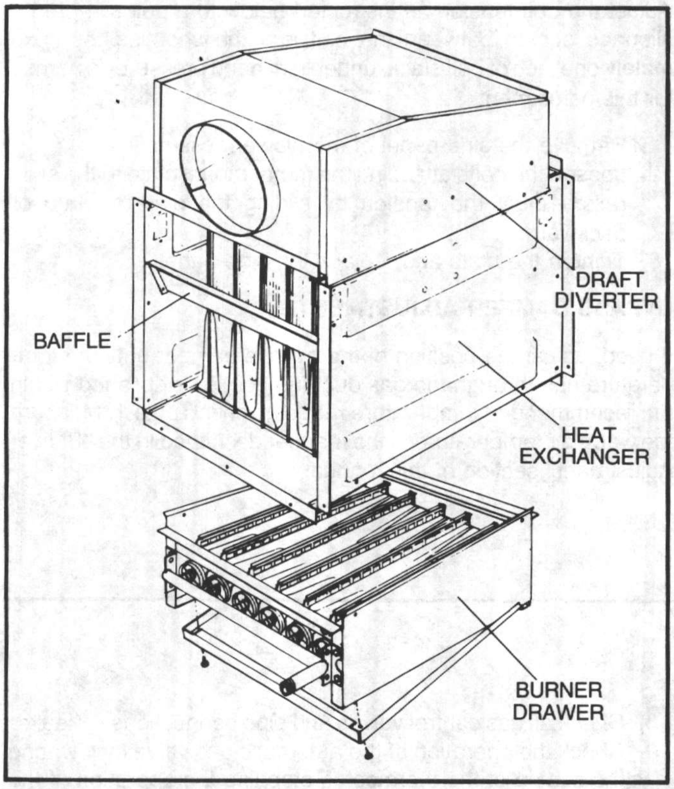


FIGURE 12 - Duct Furnace Components

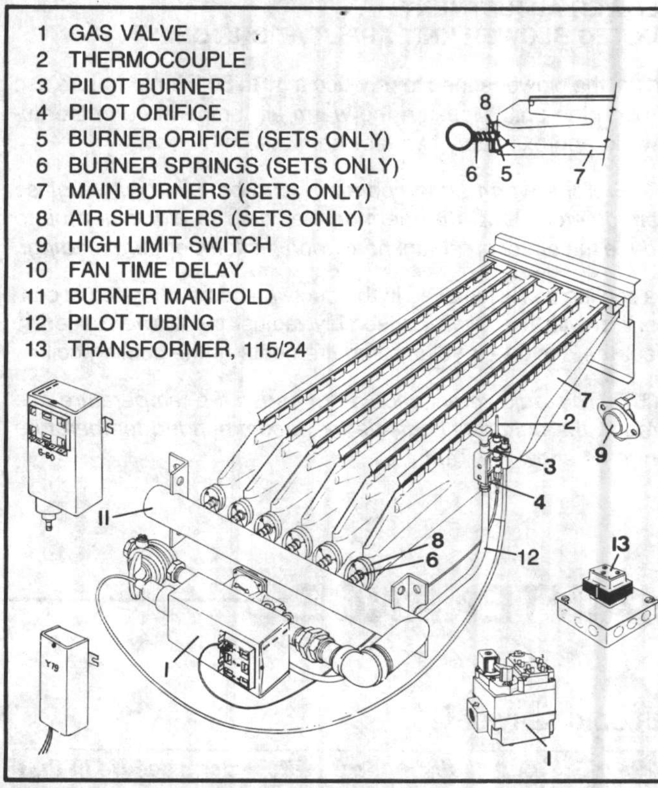


FIGURE 13 - Burner Components

For correct air adjustment, close the air shutter until yellow tips in the flame appear. Then open the air shutter to the point just beyond the position where yellow tipping disappears. On some propane units the air shutter may be completely closed for correct adjustment.

CAUTION: There may be momentary and spasmodic orange flashes in the flame. This is caused by the burning of airborne dust particles, and is not to be confused with the yellow tipping, which is a stable or permanent situation when there is insufficient primary air.

GAS INPUT RATE

Check the gas input rate as follows:

CAUTION: Never overfire the unit heater, as this may cause unsatisfactory operation or shorten the life of the heater.

1. Turn off all gas appliances that use gas through the same meter as the duct furnace.
2. Turn gas on to the duct furnace.
3. Clock the time in seconds required to burn one cubic foot of gas by checking the gas meter.
4. Insert the time required to burn one cubic foot of gas into the following formula and compute the input rate.

$$\frac{3600 \text{ (Sec. Per Hr.) x Btu/Cu. Ft.}}{\text{Time (Sec.)}} = \text{Input Rate}$$

For example, assume the Btu content of one cubic foot of gas equalled 1000 and that it takes 18 seconds to burn one cubic foot of gas.

$$\frac{3600 \times 1000}{12} = 3{,}000{,}000 \text{ Btuh}$$

NOTE: *If the computation exceeds or is less than 95 percent of the gas Btuh input rating (see Table 1), adjust the gas pressure.*

Adjust the gas pressure as follows:

1. NATURAL GAS: Best results are obtained when the duct furnace is operating at its full input rating with the manifold pressure of 3.5 inches WC. Adjustment of the pressure regulator is not normally necessary since it is preset at the factory. However, field adjustment may be made as follows:
   a. Attach manometer at pressure tap plug below control outlet.
   b. Remove regulator adjustment screw cap, located on combination gas valve.
   c. With a small screwdriver, rotate the adjustment screw counterclockwise to decrease or clockwise to increase pressure. Do not force beyond stop limits.
   d. Replace regulator adjustment screw cap.
2. PROPANE GAS: An exact manifold pressure of 10.0 inches WC must be maintained for proper operation of the duct furnace. If the unit is equipped with a pressure regulator on the combination gas valve, follow steps "a" through "d" above. If the unit is not so equipped, the propane gas supply system pressure must be regulated to attain this manifold operating pressure.

PILOT ADJUSTMENT

1. Remove the pilot adjustment cap.
2. Adjust the pilot screw to provide a properly sized flame.
3. A proper pilot flame is a soft steady flame that envelopes 3/8-inch to 1/2-inch of the thermocouple tip.
4. Replace the pilot adjustment cap.

BLOWER ADJUSTMENT - DUCTED BLOWER UNIT APPLICATIONS ONLY

Adjust the blower speed to produce a 30 to 80 F temperature rise through the unit. Measure the warm air temperature in the ductwork, approximately two feet from the unit.

NOTE: *If the warm air temperature is to be taken with a glass thermometer, wrap the thermometer bulb in aluminum foil to reduce the effect of radiant heat upon the temperature reading.*

If a cooling coil is installed in the ductwork to be operated in conjunction with the blower assembly, adjust the blower speed to meet the design air volume requirements of the cooling coil.

NOTE: *This adjustment should not cause the temperature rise through the unit to fall outside the recommended temperature range as shown in Table 1.*

Adjust the belt tension as instructed below to a point where no slippage occurs between the belt and the sheeves. Approximately one inch of belt slack, under light hand pressure, is normal for this adjustment.

1. Remove the side panel of the blower assembly.
2. Loosen the bolts attaching the motor mount plate to the slide rails. Adjust the tension by sliding the plate forward or backward.
3. Tighten the bolts and replace the side panel.

BYPASS DAMPER ADJUSTMENT

If used, adjust the position of the bypass damper until the temperature rise through the gas duct furnace is established within the recommended temperature range given in Table 1. Measure the warm air temperature in the manner described in the "Blower Adjustment" section of this manual.

MAINTENANCE

PERIODIC SERVICE

WARNING: Open all disconnect switches and secure in that position before servicing unit. Failure to do so may result in personal injury or death from electrical shock.

Should maintenance be required, perform the following inspection and service routine.

1. Inspect the area near the unit to be sure that there is no combustible material located within the minimum clearance requirements listed in Figure 1.

   WARNING: Under no circumstances should combustible material be located within the clearances specified in Figure 1. Failure to provide proper clearance could result in personal injury or equipment damage from fire.

2. Turn off the manual gas valve, manual pilot valve, and electrical power to the gas duct furnace.
3. To clean or replace the main burners, remove the bottom panel or slide out the pullout drawer, and compress the spring by moving the burner toward the manifold. Slide the opposite end of the burner downward from the locating slot while the retaining spring is still compressed. Pull the burners away from the heater.
4. With the burners removed, wire brush the inside surfaces of the heat exchanger.
5. Reassemble the gas duct furnace by replacing all parts in reverse order.
6. Relight the pilot burner (see lighting instructions on the unit nameplate). Complete the appropriate unit start-up procedure as given in the "Operation" section of this manual.
7. Check the burner adjustment. See the "Primary Air Shutter Adjustment" section of this manual.
8. Check all gas control valves and pipe connections for leaks.
9. Check the operation of the automatic gas valve by lowering the setting of the thermostat, stopping the operation of the gas duct furnace. The gas valve should close tightly, completely extinguishing the flame on the main burners.
10. Check the operation of the pilot safety device by closing the pilot line valve, extinguishing the pilot flame. Within one minute the automatic gas valve should close, extinguishing the flame on the main burners.
11. Inspect and service the blower section of the system.

AIR FILTERS

It is recommended that air filters be changed or cleaned at least twice a year. More frequent attention will be required if the air being handled is unusually dirty. Air flow reduction, caused by clogged air filters, will increase the discharge air temperature and may cause nuisance tripouts.

The size and number of air filters required for the horizontal blower assembly are given in Figure 4. Standard filters are one inch thick, and may be either throw-away or permanent/cleanable filters.

THROW-AWAY: Remove the filter from the unit and dispose of the entire filter. Replace it with a new filter of the correct size, making sure the air flow arrows point toward the fan.

PERMANENT/CLEANABLE: Remove the filter from the unit and wash it under water to remove dust, dirt, and lint. Follow this with a wash of mild alkali solution to remove old filter oil. Rinse in clean, hot water and allow to dry. Recoat the filter with Air Maze Filter Kote "W" or an equivalent, either with a spray gun or by immersion. If a spray gun is used, spray both sides of the filter. After allowing it to drain and dry, reinstall the filter in the unit.

TRANE™

#6336-14; Item 1

SUBMITTAL DATA

SPECIFICALLY PREPARED FOR:

PROJECT: REPLACE AC, BLDG. AS-710

DATE OF SUBMITTAL: 11/20/86

ARCHITECT:

ENGINEER: CHEATHAM & ASSOC., WILMINGTON, NC

SOLD TO:
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC 28502

SHIP TO:
KINSTON PLBG. & HTG. CO.
C/O BLDG. AS-710

CAMP LEJEUNE, NC 28542

CUSTOMER PURCHASE ORDER: 3299

TRANE JOB NUMBER: 10490

TRANE ORDER KF4-M373A

THIS PACKAGE CONTAINS THE FOLLOWING:

QTY	CENTRAL STATION AIR HANDLER	TAG(S)
1	17 CLIMATE CHANGER	ITEM 1

THE ATTACHED DRAWINGS DESCRIBE THE ABOVE EQUIPMENT THAT WE PROPOSE TO FURNISH FOR THIS PROJECT.

☒ APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO.
BY JCB DATE 12/5/86

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA
APPROVED
SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-85-C-6336
DATE 12-22-86
I. L. Huguelet
Cheatham & Assoc.
CDR, CEC, USN
Officer in Charge
of Construction

SALES OFFICE/SALES ENGINEER

RALEIGH R. CRAWFORD

TRANE™

SUBMITTAL DATA

SUBMITTAL APPROVAL DRAWINGS

TAG: ITEM 1

TRANE ORDER # KF4-M373A

QTY	SIZE	MODEL:	
1	17C	MULTI-ZONE BLOW-THRU CLCH W/2-13 1/2" FC WHEEL FRONT DISCHARGE RODS TOP WITH 4 ZONES	CLCH-SA007.00 CLCH-SU405.03

COIL CAPACITY

COIL BANK	M B H	EAT °F DB	EAT °F WB	LAT °F DB	LAT °F WB	A P D
COLD DECK	238.8	78.8	65.8	57.0	55.4	.73

TYPE	G P M STEAM-SUCT.	WATER TEMP °F IN	WATER TEMP °F OUT	W P D (FT)
CW	57.00	47.0	57.0	5.2

COIL INFORMATION / SPECIFICATIONS

COIL BANK	TYPE	ROWS	FIN TYPE	FINS PER FOOT	FIN MATL.	QTY	SIZE WIDE	SIZE LONG	TURBS	TUBE MATL.	COIL CONN.	H/C	F COIL BANK	CIR TYPE	DIST	UPSTREAM SIZE	UPSTREAM CIR	DOWNSTREAM SIZE	DOWNSTREAM CIR	
COLD DECK	W	6	SF	84	AL	1	30	81	N	CU.	RT	C	TOP							CCOL-SU016.01
													MID							
													BOT							

ACCESSORIES INCLUDE:
1" 1.5 LB STD INSULATION (C-SECT ONLY)
1 #22 HOT DECK-BAFFLE
1 COMBINATION FILTER-MIXING BOX WITH BOTTOM BACK OPENINGS RODS RIGHT - WITH PLEATED MEDIA FILTERS CLCH-SA825.02

FAN CAPACITY / DRIVE SPECIFICATIONS

	SCFM	ESP	TSP	BHP	FAN RPM
	8530	.95	2.50	6.90	1314

QTY		
	DRIVE:	VARIABLE, 1.20 MHP MOTOR/DRIVE MOUNTED RIGHT
1	MOTOR	10.00 HP MOTOR 230 VOLTAGE 60 CYCLE 3 PHASE 215T 1750 MOTOR RPM OPEN
10	ISOLATORS	SPRING TYPE FLOOR CES-1-26

CLCH-SA900.00

COPS-SD-CLCH (8/86)

THE TRANE COMPANY -- LEXINGTON, KENTUCKY 40505

TAG Item-1

PRINT DATE: 7-31-85	FILE NO. PL-AH-CLCH-CLCH-SM-007.00	REPLACES:	CLCH-SM-007.00

TRANE™

CENTRAL STATION AIR HANDLERS
DRAW-THRU & BLOW-THRU CLIMATE CHANGER®
SIZES 3 THRU 86
MECHANICAL SPECIFICATIONS

SUBMITTAL

UNIT CONSTRUCTION†

Unit Casing: High grade steel reinforced, braced with steel angle framework. Sectionalized construction; fan section, coil section, drain pan. Removable panels in fan and coil sections provide access to all internal parts. Mounting holes prepunched at factory.

Unit Insulation: Panels insulated with 1-inch mat-faced glass fiber. Drain pan has seamless, ½-inch cellular, spray foamed-in-place insulation. (OPTIONAL) drain pan with galvanized steel inner liner, spray foam-in-place insulation between liner and drain pan. Blow-thru fan sections are not insulated.

Centrifugal Fans: Sizes 3 thru 31 double width, double inlet, forward curved multi-blade. Sizes 35 thru 86, double width, double inlet, nonoverloading, backward inclined or air-foil blades. Fan shaft operates below first critical speed. Fan bearings, grease lubricated ball bearings for 200,000 hour average life. Fan housing die-formed, air tight. Fans dynamically balanced, tested after being installed in factory assembled fan section.

Coils: Sigma-Flo ® II or Prima-Flo design, continuous aluminum fin, copper tube. Copper fins optional. Fin collars drawn, belled, bonded to tubes by mechanical tube expansion. No soldering or tinning used. Coils removable through access panels.

Unit and Accessory Finish: Casing and all accessories, except coil, chemically cleaned, phosphatized, coated with enamel paint.

ACCESSORIES

Face and Bypass Dampers: Opposed blade face dampers, locked to slotted damper rods, rotate in nylon bushing.

Filter Boxes: Flat, medium capacity, high capacity and combination filter mixing boxes. Hold two-inch permanent or throwaway filters. High efficiency filter sections will accept two-inch disposable cartridges prefilters along with extended surface filters of either 55%, 85% and 95% average atmospheric dust spot efficiency based on ASHRAE 52-76. Flat filter boxes have access doors on both sides. Other filter boxes sizes 3 thru 31 have a single large access door on one side. All units, sizes 35 and larger, have individual access doors on each side provided for each row of filters.

Mixing Box and Combination Filter Mixing Box: Parallel damper blades, merge airstream inside box. Blades locked to slotted rods, rotate in nylon bushings.

Inlet Vanes: Forward curve fan inlet vanes operated by aluminum center rotating ball bearing hub located out of fan inlet. Inlet vanes are 14-gauge steel, welded to vane rods and have edges form fit to inlet cone circumference. Inlet vane rods are offset for rotation out of fan inlet.

Airfoil fan inlet vanes are operated by steel center, roller bearing, directly linked hub. Inlet vanes are 14-gauge steel, rotate about the rods and have edges form fit to inlet cone circumferences. Inlet vane rods are stationary.

UNIT INSTALLATION

Shipping: Sizes 3 thru 31 and horizontal draw-thru sizes 35 thru 50 ship assembled. Remaining unit sizes 35 and larger ship in sections on separate skids. Motors may be removed for shipment.

Accessories ship on separate skids designed for direct attachment to base unit or other accessories. Mounting hardware ships with each skid.

Handling: Handling and location recommendations in Installation and Maintenance Bulletin shipped with unit. Mounting hole locations shown on the "Mounting Hole Location" diagram.

Weights: See Tables 1 and 2.

Connections: Hydronic and refrigerant coils. See Tables 4 and 5. Connections for electric heat shown on submittal diagrams, wiring diagrams supplied with unit (mounted inside control panel door).

† Variations from above construction will be indicated on the submittal data sheet.

TABLE 1 — Approximate Operating Weights (Lbs.)

	UNIT MODEL NUMBER															
	3	6	8	10	12	14	17	21	25	31	35	41	50	63	73	86
DRAW-THRU CLIMATE CHANGERS																
Casing Only	205	275	400	460	700	750	1075	1225	1380	1455	2100	2540	2750	4270	4710	503[illegible]
With 2 Row	291	424	570	677	978	1060	1429	1639	1850	2117	2832	3558	3708	5529	5850	6390
4 Row	328	487	657	785	1108	1213	1618	1870	2219	2453	3198	3797	4260	6218	6710	7420
6 Row	368	552	742	891	1243	1369	1807	2098	2381	2813	3616	4261	4794	6929	7560	8440
8 Row	406	618	828	988	1373	1520	1981	2321	2643	3143	3984	4699	5330	7611	8320	9330
	BLOW-THRU CLIMATE CHANGERS ®															
Casing Only	—	605	765	810	880	1095	1260	1425	1600	1810	3250	3650	4025	4580	5030	5530
With 2 Row	—	754	935	1027	1158	1405	1614	1839	2070	2472	3982	4463	4983	5839	6436	7142
4 Row	—	817	1022	1135	1288	1558	1803	2070	2339	2808	4348	4907	5535	6528	7240	8114
6 Row	—	882	1107	1241	1423	1714	1992	2298	2609	3168	4766	5367	6069	7239	8018	9046
8 Row	—	948	1193	1338	1553	1865	2166	2521	2863	3498	5134	5809	6605	7921	8824	9998
	SINGLE ZONE BLOW-THRU CLIMATE CHANGERS															
Casing Only	—	386	544	631	760	900	1080	1235	1310	1560	2780	3115	3435	4425	4870	5280
With 2 Row	—	535	714	848	1038	1210	1434	1629	1840	2222	3512	3928	4393	5684	6276	6892
4 Row	—	598	801	956	1168	1363	1623	1860	2109	2558	3878	4372	4935	6373	7080	7864
6 Row	—	663	886	1062	1303	1519	1812	2088	2379	2918	4296	4832	5479	7084	7858	8796
8 Row	—	729	972	1159	1473	1670	1986	2311	2633	3248	4664	5274	6015	7766	8664	9748
	THREE DECK MULTIZONE															
Casing Only	—	725	885	930	1000	1255	1440	1615	1830	2060	3350	4000	4385	4960	—	—
With 2 Row	—	874	1055	1147	1278	1560	1794	2029	2300	2722	4082	4813	5343	6219	—	—
4 Row	—	937	1142	1255	1408	1718	1983	2260	2569	3058	4448	5257	5895	6908	—	—
6 Row	—	1002	1227	1361	1543	1874	2172	2488	2839	3418	4816	5717	6429	7619	—	—
8 Row	—	1068	1313	1458	1673	2025	2346	2711	3093	3748	5234	6159	6965	8301	—	—
	ACCESSORIES															
Flat-Filter Box																
Throwaway	28	38	45	68	73	76	92	113	120	135	170	180	210	335	388	457
Low Velocity Permanent	33	47	56	84	91	97	117	145	155	183	222	234	284	426	494	582
High Velocity Permanent	51	63	75	108	120	131	156	193	207	257	306	338	365	582	674	794
Medium-Filter Box																
Throwaway	76	101	144	171	178	228	247	303	324	355	370	456	520	565	655	775
Low Velocity Permanent	84	117	162	195	204	260	284	348	373	413	429	546	631	695	805	950
High Velocity Permanent	96	141	190	231	248	312	347	428	456	513	557	706	799	935	1085	1275
High Capacity Box																
Throwaway	111	148	170	192	229	260	278	330	398	425	470	535	590	680	789	930
Low Velocity Permanent	120	166	194	223	261	305	324	393	568	512	574	660	735	865	1000	1180
High Velocity Permanent	136	198	230	271	317	360	296	489	576	648	742	852	950	1160	1345	1585
High Efficiency Filter Section																
Less Diffuser Section	—	—	204	244	271	347	359	439	504	653	683	759	810	873	—	—
With Diffuser Section	—	—	270	337	373	463	496	605	692	867	951	1038	1117	1330	—	—
Roll Filters	80	114	142	158	187	204	219	250	290	363	430	475	500	750	870	1025
Comb. Filter-Mixing Box																
Throwaway	115	168	248	286	300	315	358	400	490	620	710	790	885	1133	1310	1550
Low Velocity Permanent	122	184	266	310	324	345	393	441	540	686	780	874	997	1265	1465	1730
High Velocity Permanent	134	208	298	346	368	397	456	521	625	786	906	1035	1165	1505	1740	2060
Mixing Box	82	118	160	182	256	270	319	340	380	437	519	623	750	869	1010	1185
External Face and Bypass	40	58	96	112	154	161	170	216	292	417	457	470	618	925	1070	1265
Internal Face and Bypass	30	53	77	100	109	113	124	184	223	327	334	363	441	535	620	730
Face Dampers	39	55	91	106	111	115	142	225	232	297	312	370	446	543	630	741

Inlet vane weights will vary from 38 to 93 lbs. per fan.

TABLE 2 — Approximate Motor Weights — Open, Drip-Proof, T-Frame, 1,800 RPM

Motor Horsepower	1/4	1/3	1/2	1	1-1/2	2	3	5	7-1/2	10	15	20	25	30	40	50	60	75
Motor Wt. (Lbs.)	20	20	25	33	44	44	71	82	127	144	187	214	263	300	409	460	560	640

TABLE 3 — Fan Data

UNIT SIZE	FAN SIZE AND TYPE				
3 DT	1-7½ FC	1-9 FC	—	—	—
6 DT & BT	1-12¼ FC	1-10½ FC	—	—	—
8 DT & BT	1-15 FC	1-13½ FC	1-12¼ FC	—	—
10 DT & BT	1-16½ FC	1-15 FC	1-13½ FC	—	—
12 DT & BT	1-18¼ FC	1-16½ FC	1-15 FC	—	—
14 DT & BT	1-20 FC	1-18¼ FC	1-16½ FC	—	—
17 DT	1-20 FC	1-18¼ FC	1-16½ FC	—	—
17 BT	2-15 FC	2-13½ FC	—	—	—
21 DT	1-22 FC	1-20 FC	1-18¼ FC	—	—
21 BT	2-16½ FC	2-15 FC	—	—	—
25 DT	1-25 FC	1-22 FC	—	—	—
25 BT	2-18¼ FC	2-16½ FC	—	—	—
31 DT	1-25 FC	1-22 FC	—	—	—
31 BT	2-20 FC	2-18¼ FC	—	—	—
35 DT & BT	1-30 BI	1-30 AF	1-27 AF	1-24 AF	—
41 DT & BT	1-33 BI	1-33 AF	1-30 AF	1-27 AF	1-24 AF
50 DT & BT	1-36 BI	1-36 AF	1-33 AF	1-30 AF	1-27 AF
63 DT & BT	1-40 BI	1-40 AF	1-36 AF	1-33 AF	1-30 AF
73 DT & BT	1-40 BI	1-40 AF	1-36 AF	1-33 AF	—
86 DT & BT	1-40 BI	1-40 AF	1-36 AF	1-33 AF	—

TABLE 4 — Water and Steam Coil Connections

COIL TYPE	HEADER HEIGHT	CONNECTION SIZE (NPT)		
		SUPPLY	RETURN	DRAIN & VENT
W - Water	18, 24, 30, 33	2-½	2-½	
D - Water	18, 24, 30, 33	2-½	2-½	½ (Ext.)
DD - Water	18, 24, 30, 33	2-½	2-½	½ (Ext.)
K - Water	18, 24, 30, 33	2-½	2-½	
P2 - Water	12, 18, 24, 30	¾	¾	
P4 - Water	12, 18, 24, 30	1	1	
P8 - Water	18, 24, 30	1-¼	1-¼	
A - Steam	18, 24, 30, 33	2-½	1	
WA - Hot Water	18, 24, 30, 33	2-½	2-½	
WC - Hot Water	12, 18	1	1	
WC - Hot Water	24	1-¼	1-¼	
WC - Hot Water	30, 33	2-½	1-½	
N, NS Steam	12	1-½	1	
N, NS Steam	18	2	1	
N, NS Steam	24	2-½	1-¼	
N, NS Steam	30, 33	3	1-¼	

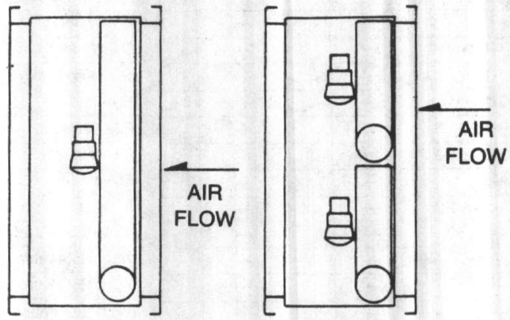
All 12" header height coils, Types A, AW, D, K and W, supply 1-¼ NPT; return 1-¼ NPT. Above connections internal except drain and vent.

TABLE 5 — Type F1 and F2 Coil Connections

FINNED WIDTH	NO. OF REFRIG. CIRCUITS	1-SET CONNS. - OD ALL ROWS		2 SETS CONNS. - OD ALL ROWS	
		LIQUID	SUCTION	LIQUID	SUCTION
12	1	5/8	5/8	NA	NA
	2	7/8	1-3/8	5/8	5/8
	4	7/8	1-5/8	7/8	1-3/8
	8	1-1/8	2-1/8	7/8	1-3/8
18	1	5/8	5/8	NA	NA
	2	7/8	1-3/8	5/8	5/8
	3	7/8	1-5/8	NA	NA
	6	1-1/8	2-1/8	7/8	1-5/8
	12	1-3/8	2-1/8	1-1/8	2-1/8
24	2	7/8	1-5/8	5/8	5/8
	4	7/8	1-5/8	7/8	1-3/8
	8	1-1/8	2-1/8	7/8	1-5/8
	16	NA	NA	1-1/8	2-1/8
30	2	7/8	1-3/8	5/8	5/8
	4	7/8	1-5/8	7/8	1-5/8
	5	7/8	2-1/8	NA	NA
	10	1-3/8	2-1/8	7/8	2-1/8
	20	NA	NA	1-3/8	2-1/8
33	3	7/8	1-5/8	NA	NA
	7	1-1/8	2-1/8	7/8	1-5/8
	11	1-3/8	2-1/8	**	2-1/8
	22	NA	NA	1-3/8	2-1/8

NA - Not available as standard.
* - 1-3/8" for 2 circuit split coil with 2 sets of connections.
** - 6 circuit connection 1-1/8". 5 circuit 7/8".

REFER TO BASIC UNIT SUBMITTAL
DRAWING FOR SIZE AND NUMBER OF
COILS IN UNIT.



ONE SET CONNECTION

TWO SETS CONNECTION

EXAMPLE, 4 6 AND 8 ROWS

TABLE 6 — Two-Inch Filter Sizes And Quantities Per Set

UNIT SIZE	FLAT FILTER BOX	COMB. AND MEDIUM FILTER BOX	HIGH CAPACITY BOX
3	1 - 20 x 25	2 - 16 x 25	2 - 20 x 25
6	2 - 20 x 25	4 - 16 x 25	4 - 20 x 25
8	4 - 16 x 20	4 - 20 x 25	6 - 20 x 20
10	4 - 16 x 25	6 - 16 x 25	6 - 20 x 25
12	2 - 20 x 20	4 - 20 x 25	6 - 16 x 20
	2 - 16 x 25	2 - 16 x 25	3 - 20 x 25
	1 - 16 x 20		
14	4 - 16 x 20	8 - 16 x 25	6 - 20 x 20
	2 - 20 x 25		3 - 20 x 25
17	6 - 16 x 20	8 - 20 x 25	3 - 20 x 25
	2 - 16 x 25		9 - 20 x 20
21	8 - 16 x 20	10 - 20 x 25	3 - 20 x 25
	2 - 16 x 25		12 - 20 x 20
25	12 - 16 x 20	6 - 20 x 25	6 - 20 x 25
		6 - 16 x 25	9 - 20 x 20
31	7 - 16 x 20	8 - 16 x 25	8 - 20 x 25
	7 - 16 x 25	12 - 16 x 20	12 - 20 x 20
35	14 - 16 x 25	16 - 20 x 25	28 - 16 x 25
41	6 - 16 x 20	20 - 20 x 25	
	12 - 20 x 20		32 - 16 x 25
50	7 - 16 x 20	28 - 16 x 25	
	14 - 16 x 25		35 - 16 x 25
63	10 - 16 x 25	30 - 20 x 25	49 - 16 x 25
	12 - 20 x 25		
73	6 - 20 x 20	36 - 20 x 25	42 - 20 x 25
	18 - 20 x 25		
86	21 - 20 x 25	42 - 20 x 25	49 - 20 x 25
	7 - 20 x 20		

TABLE 7 — Extended Surface Filters

UNIT SIZE	QUANTITY	FILTER SIZE (H x W)
8	1	24H x 12W
	1	24H x 24W
10	2	24H x 24W
12	2	24H x 12W
	2	20H x 20W
14	2	24H x 12W
	3	20H x 20W
17	1	24H x 12W
	3	24H x 24W
21	5	24H x 20W
25	4	24H x 12W
	5	20H x 20W
31	10	20H x 20W
35	2	24H x 12W
	8	24H x 24W
41	2	24H x 12W
	8	24H x 24W
50	15	20H x 20W
63	20	20H x 20W

NOTE:
Extended surface filters can be of 20, 30, 32 or 36 inches in direction of airflow depending upon efficiency and capacity. Disposable cartridge prefilters are two inches in depth and of same size and quantities as above.

TABLE 8 — Torque and Force to Operate Inlet Vanes FC FA Fans - Unit Sizes 6 Thru 31

NO. OF FANS AND FAN SIZE	TO OPEN OR CLOSE INLET VANES	FAN OUTLET VELOCITY					
		2,000 FPM			3,000 FPM		
		TORQUE (IN.-LBS.)	FORCE (LBS.)		TORQUE (IN.-LBS.)	FORCE (LBS.)	
			9⅛" ARM	4" ARM		9⅛" ARM	4" ARM
1-10½	Open	8.7	1.0	2.2	19.6	2.2	5.1
	Close	2.9	0.4	0.8	6.5	0.8	1.9
1-12¼	Open	10.0	1.1	2.5	22.5	2.5	5.7
	Close	3.5	0.4	0.9	7.8	0.9	2.1
1-13½	Open	10.9	1.2	2.8	24.5	2.7	6.2
	Close	3.9	0.4	1.0	8.7	1.0	2.3
1-15	Open	14.1	1.6	3.6	31.9	3.5	8.0
	Close	5.0	0.6	1.3	11.4	1.3	3.0
1-16½	Open	18.0	2.0	4.5	40.5	4.5	10.3
	Close	6.4	0.7	1.6	14.4	1.6	3.7
1-18¼	Open	23.1	2.6	5.8	52.2	5.8	13.3
	Close	8.3	1.0	2.1	18.6	2.1	4.8
1-20	Open	24.0	2.7	6.0	54.0	6.0	13.7
	Close	9.0	1.0	2.3	19.5	2.2	5.1
1-22	Open	25.0	2.8	6.3	56.0	6.2	14.2
	Close	9.5	1.1	2.4	21.0	2.3	5.3
1-25	Open	26.5	2.9	6.7	59.7	6.6	15.1
	Close	10.0	1.1	2.5	22.5	2.5	5.7
2-13½	Open	21.8	2.4	5.5	49.1	5.4	12.4
	Close	7.8	0.9	2.0	17.5	2.0	4.6
2-15	Open	28.3	3.1	7.1	63.9	7.0	16.0
	Close	10.1	1.2	2.6	22.8	2.5	5.7
2-16½	Open	36.0	4.0	9.0	81.1	8.9	20.3
	Close	12.8	1.4	3.2	28.9	3.2	7.3
2-18¼	Open	46.3	5.1	11.6	104.4	11.5	26.3
	Close	16.5	1.8	4.2	37.3	4.1	9.4
2-20	Open	48.0	5.3	12.0	10.8	11.9	27.2
	Close	18.0	2.0	4.5	39.0	4.3	9.9

TABLE 9 — Torque and Force Required to Operate Inlet Vanes - AF Fans - Unit Sizes 35 Thru 86

UNIT SIZE	TO OPEN OR CLOSE INLET VANES	FAN OUTLET VELOCITY			
		2,000 FPM		3,000 FPM	
		TORQUE (IN.-LBS.)	FORCE (LBS.)	TORQUE (IN.-LBS.)	FORCE (LBS.)
35	Open	70.0	7.7	153.0	16.7
	Close	17.0	1.9	39.0	4.3
41	Open	94.0	10.3	214.0	23.5
	Close	23.0	2.6	53.0	5.9
50	Open	128.0	14.1	287.0	31.5
	Close	31.0	3.4	71.0	7.8
63	Open	172.0	18.9	388.0	42.6
	Close	42.0	4.6	96.0	10.6
73	Open	172.0	18.9	388.0	42.6
	Close	42.0	4.6	96.0	10.6
86	Open	172.0	18.9	388.0	42.6
	Close	42.0	4.6	96.0	10.6

NOTE: Force and torque requirements listed above are applied to 3/8" rod pneumatic or electric operator by others.

TAG Item-1

PRINT DATE: 3-6-85	FILE NO. PL-AH-CLCH-CLCH-SU-405.03	REPLACES: CLCH-SU-405.02	CLCH-SU-405.03

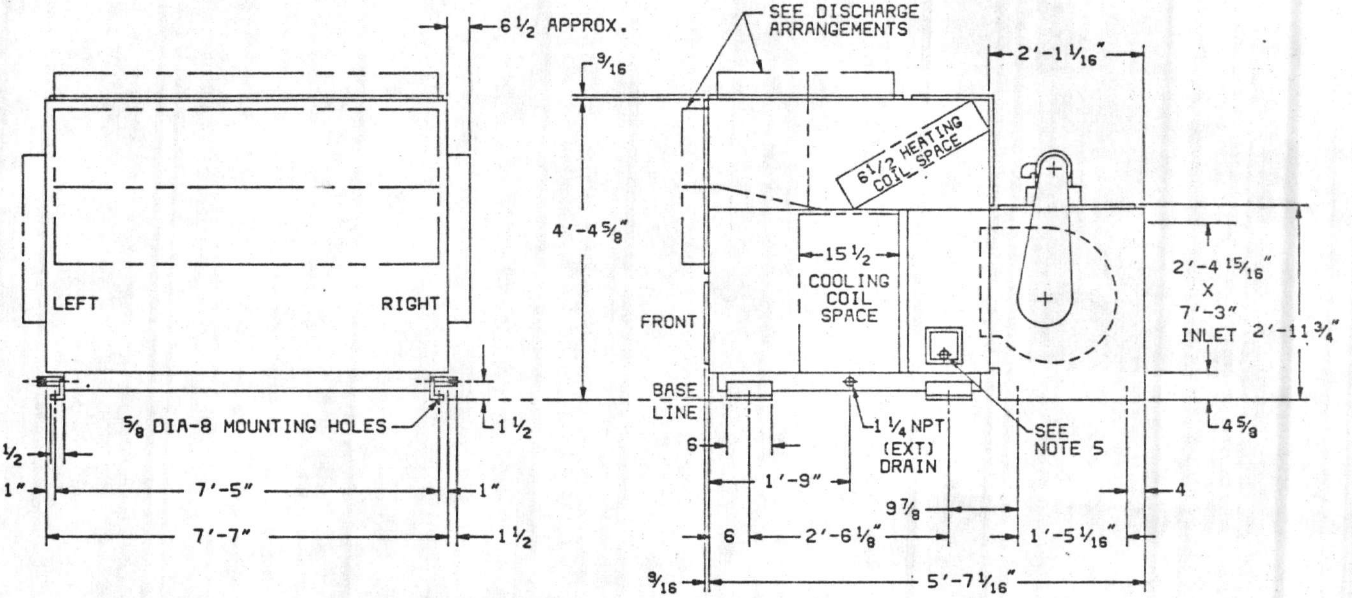
TRANE

CENTRAL STATION AIR HANDLERS

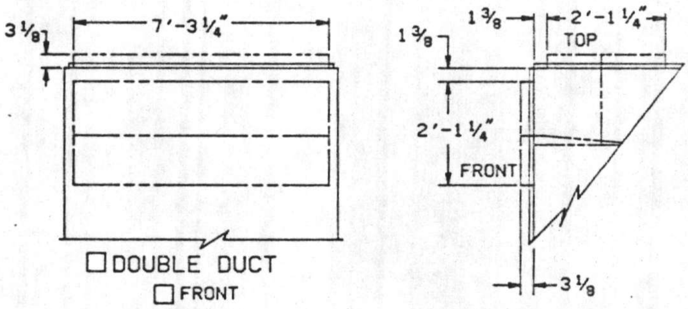
BLOW-THRU CLIMATE CHANGER®

SIZE 17 WITH TWO FANS

SUBMITTAL



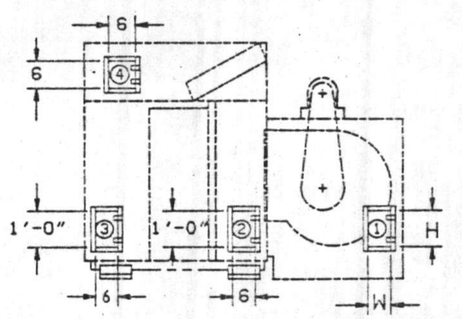
FRONT ELEVATION **BASIC UNIT** SIDE ELEVATION



☐ DOUBLE DUCT

☐ FRONT

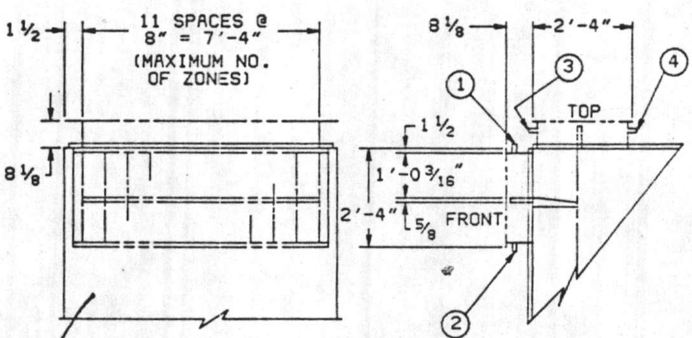
☐ TOP



☐ **ACCESS DOOR** (OPTIONAL)

☐ (1) FAN SECTION ☐ (3) COLD DECK

☐ (2) PLENUM SECTION ☐ (4) HOT DECK



☑ MULTI-ZONE DAMPERS

☑ (1) FRONT, RODS TOP ☐ (3) TOP, RODS FRONT

☐ (2) FRONT, RODS BOTTOM ☐ (4) TOP, RODS BACK

DISCHARGE ARRANGEMENTS

	FAN ACCESS DOOR LOCATION	W	H
✓	DRIVE SIDE	6"	6"
	OPPOSITE DRIVE SIDE	6"	1'-0"

CUSTOMER NOTE:

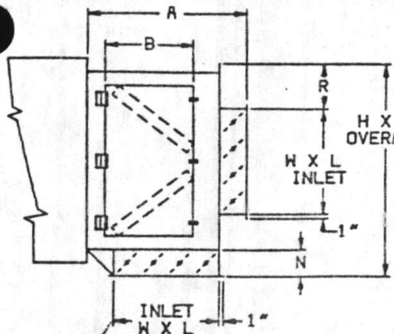
1. DRIVE AND COIL(S) AVAILABLE RIGHT OR LEFT SIDE (DETERMINED BY FACING FRONT OF UNIT).
2. LOCATION OF MOTOR SHOWN, WHEN MOUNTED.
3. OPTIONAL ACCESS DOOR(S) AVAILABLE RIGHT AND/ OR LEFT SIDE OF UNIT.
4. DRAIN PAN CONNECTIONS PROVIDED BOTH RIGHT AND LEFT SIDE, EXTERNAL DRAIN PIPING MAY BE CONNECTED TO EITHER SIDE.
5. OPTIONAL STEAM GRID HUMIDIFIER- 1" N.P.T.(INT.).

TAG Item - 1

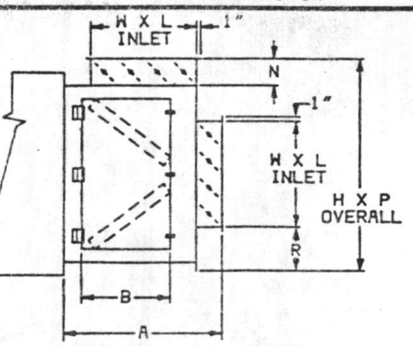
PRINT DATE: 8-13-86	FILE NO. PL-AH-CLCH-CLCH-SA-825.02	REPLACES: CLCH-SA-825.01	CLCH-SA-825.02

CENTRAL STATION AIR HANDLERS
COMBINATION BOXES
DRAW-THRU, BLOW-THRU, AND SPRAY COIL CLIMATE CHANGERS ®,
TORRIVENT®, CABINET FAN, AND CENTRIFUGAL FAN AIR COOLED CONDENSERS
SIZES 3 THRU 31

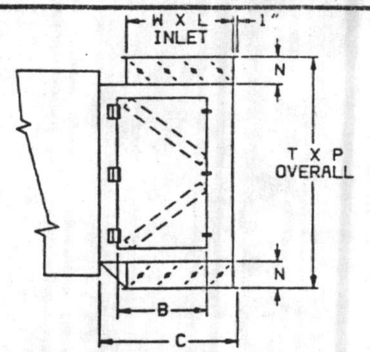
SUBMITTAL



☑ BACK AND BOTTOM

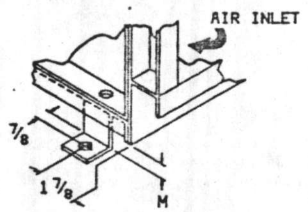


☐ TOP AND BACK



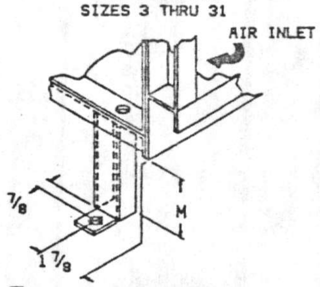
☐ TOP AND BOTTOM

TOP AND BACK
SIZES 3 THRU 31



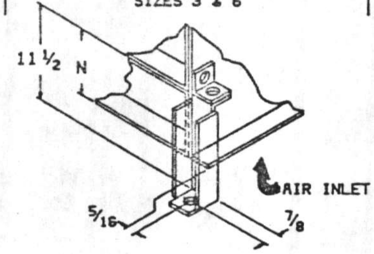
☐ DRAW-THRU CLIMATE CHANGER
☐ BLOW-THRU CLIMATE CHANGER
☐ TORRIVENT
☐ FLOOR MOUNTED

TOP AND BACK
SIZES 3 THRU 31



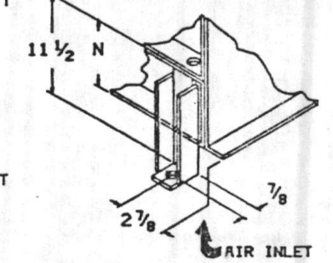
☐ SPRAY COIL CLIMATE CHANGER
☐ FLOOR MOUNTED

TOP AND BOTTOM / BACK AND BOTTOM
SIZES 3 & 6



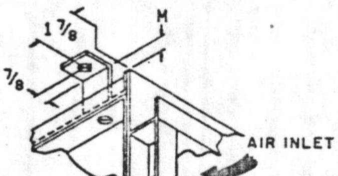
☐ SPRAY COIL CLIMATE CHANGER
☐ FLOOR MOUNTED

TOP AND BOTTOM / BACK AND BOTTOM
SIZES 8 THRU 31



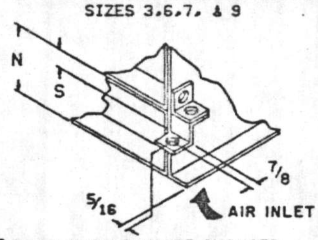
☐ SPRAY COIL CLIMATE CHANGER
☐ FLOOR MOUNTED

BACK AND BOTTOM
SIZES 3 THRU 31



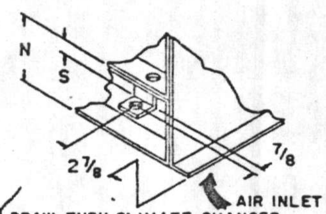
☐ DRAW-THRU CLIMATE CHANGER
☐ TORRIVENT
☐ CEILING SUSPENDED

TOP AND BOTTOM / BACK AND BOTTOM
SIZES 3,6,7, & 9



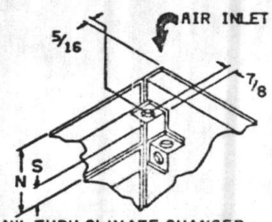
☐ DRAW-THRU CLIMATE CHANGER
☐ BLOW-THRU CLIMATE CHANGER
☐ TORRIVENT
☐ FLOOR MOUNTED

TOP AND BOTTOM / BACK AND BOTTOM
SIZES 8 THRU 31



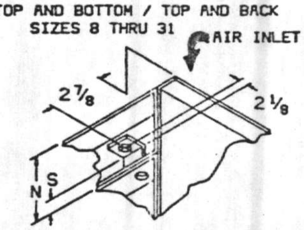
☑ DRAW-THRU CLIMATE CHANGER
☐ BLOW-THRU CLIMATE CHANGER
☐ TORRIVENT
☑ FLOOR MOUNTED

TOP AND BOTTOM / TOP AND BACK
SIZES 3,6,7, & 9



☐ DRAW-THRU CLIMATE CHANGER
☐ TORRIVENT
☐ CEILING SUSPENDED

TOP AND BOTTOM / TOP AND BACK
SIZES 8 THRU 31



☐ DRAW-THRU CLIMATE CHANGER
☐ TORRIVENT
☐ CEILING SUSPENDED

UNIT SIZE	H	P	T	W	L	N	R	A	C	B
3	2'-0¾"	2'-9"	2'-4½"	1'-0½"	2'-5¼"	5¾"	4¼"	2'-4¾"	2'-0"	1'-4⅞"
6	2'-2¾"	4'-6"	2'-6½"	1'-0½"	4'-2¼"	5¾"	5¼"	2'-4¾"	2'-0"	1'-4½"
7	2'-0¾"	5'-0"	2'-4½"	1'-0½"	4'-6⅝"	5¾"	4¼"	2'-4¾"	2'-0"	1'-4⅞"
8	3'-1¾"	3'-9"	3'-6½"	1'-8½"	3'-3⅝"	6¾"	6¼"	3'-3¾"	2'-10"	2'-0⅛"
9	2'-2¾"	7'-0"	2'-6½"	1'-0½"	6'-7⅜"	5¾"	5¼"	2'-4¾"	2'-0"	1'-4½"
10	3'-1¾"	4'-6"	3'-6½"	1'-8½"	4'-2¼"	6¾"	6¼"	3'-3¾"	2'-10"	2'-0⅛"
12	3'-4¾"	5'-0"	3'-8½"	1'-10½"	4'-6⅝"	5¾"	7¼"	3'-1½"	2'-8¾"	1'-10⅞"
14	3'-4¾"	5'-9"	3'-8½"	1'-10½"	5'-4⅝"	5¾"	7¼"	3'-1½"	2'-8¾"	1'-10⅞"
17	3'-1¾"	7'-6"	3'-6½"	1'-8½"	7'-0⅝"	6¾"	6¼"	3'-3¾"	2'-10"	2'-0⅛"
21	3'-1¾"	9'-0"	3'-6½"	1'-8½"	8'-6¼"	6¾"	6¼"	3'-3¾"	2'-10"	2'-0⅛"
25	3'-4¾"	9'-6"	3'-8½"	1'-10½"	9'-0¼"	5¾"	7¼"	3'-1½"	2'-8¾"	1'-10⅞"
31	4'-3¾"	9'-7"	4'-8½"	2'-2½"	9'-0¼"	6¾"	10¼"	3'-2¼"	2'-8½"	1'-3⅞"

UNIT	M	S
DRAW-THRU CLIMATE CHANGER	2½"	4½"
BLOW-THRU CLIMATE CHANGER	2⅝"	4⅝"
SPRAY COIL CLIMATE CHANGER	9½"	N/A
TORRIVENT	¼"	2 7/16"

CUSTOMER NOTE:
1. DAMPER DRIVE ROD LOCATION RIGHT AND LEFT SIDE FOR BACK AND BOTTOM / TOP AND BACK, RIGHT OR LEFT FOR TOP AND BOTTOM.
2. ALL MOUNTING HOLES ARE 9/16 DIAMETER.
3. BOX WITH TOP AND BOTTOM INLET, DOOR MAY BE RIGHT OR LEFT SIDE, OTHER BOXES DOORS RIGHT AND LEFT SIDE, DOORS ARE HINGED DOWNSTREAM SIDE OF FILTER BOX.
4. COMBINATION BOXES FOR TORRIVENTS TO ALSO BE USED FOR CABINET FAN AND CENTRIFUGAL FAN AIR COOLED CONDENSERS.
5. MOUNTING LEGS PROVIDED FOR FIELD INSTALLATION.
6. A FLANGE IS PROVIDED AT DAMPER OPENING FOR ATTACHED DUCTWORK. ON LOW/ULTRA LOW LEAK DAMPER ACCESSORIES DUCT DIMENSIONS SHOULD BE NO LESS THAN DAMPER DUCTWORK OPENING WITHIN 1" OF FLANGE TO PREVENT DAMPER BLADE INTERFERENCE DO NOT ATTACH DUCTWORK INSIDE DUCTWORK OPENING.

TAG Item-1

PRINT DATE: 3-22-85	FILE NO. PL-AH-COIL-CCOL-SU-016.01	REPLACES: CCOL-SU-016.00	CCOL-SU-016.01

TRANE

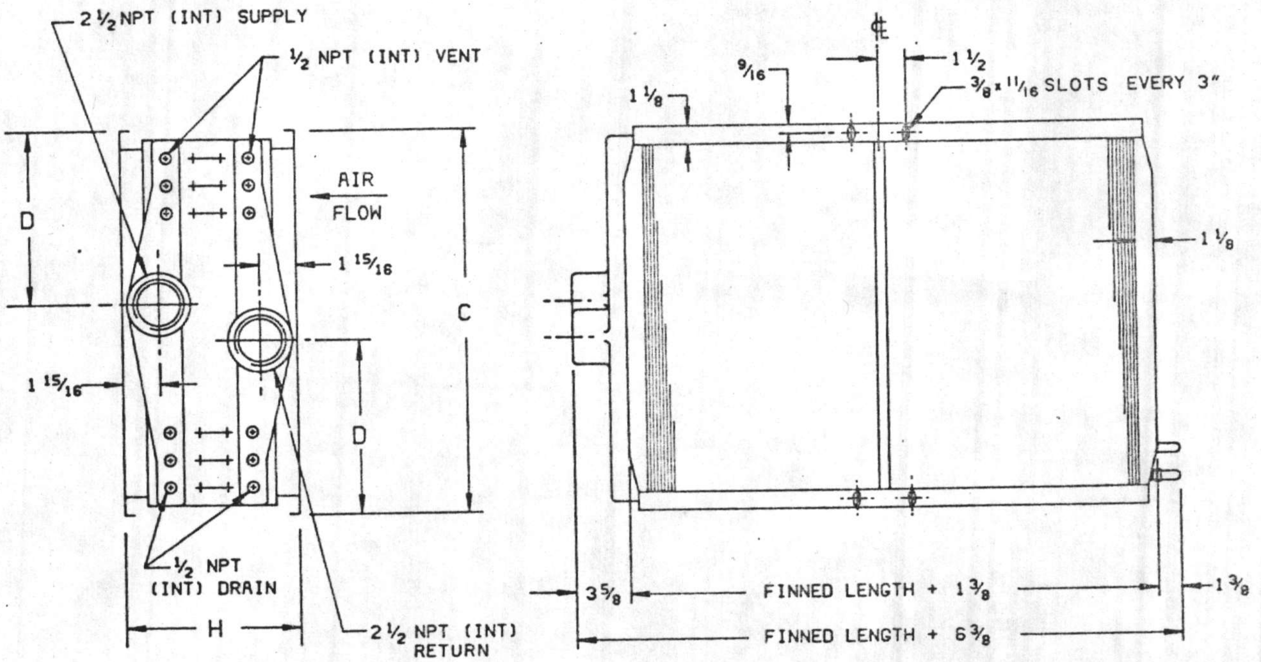
AIR COOLING/HEATING COIL

TYPE W

2,4,6,8,10,12 ROW 18",24",30",33" FINNED WIDTHS

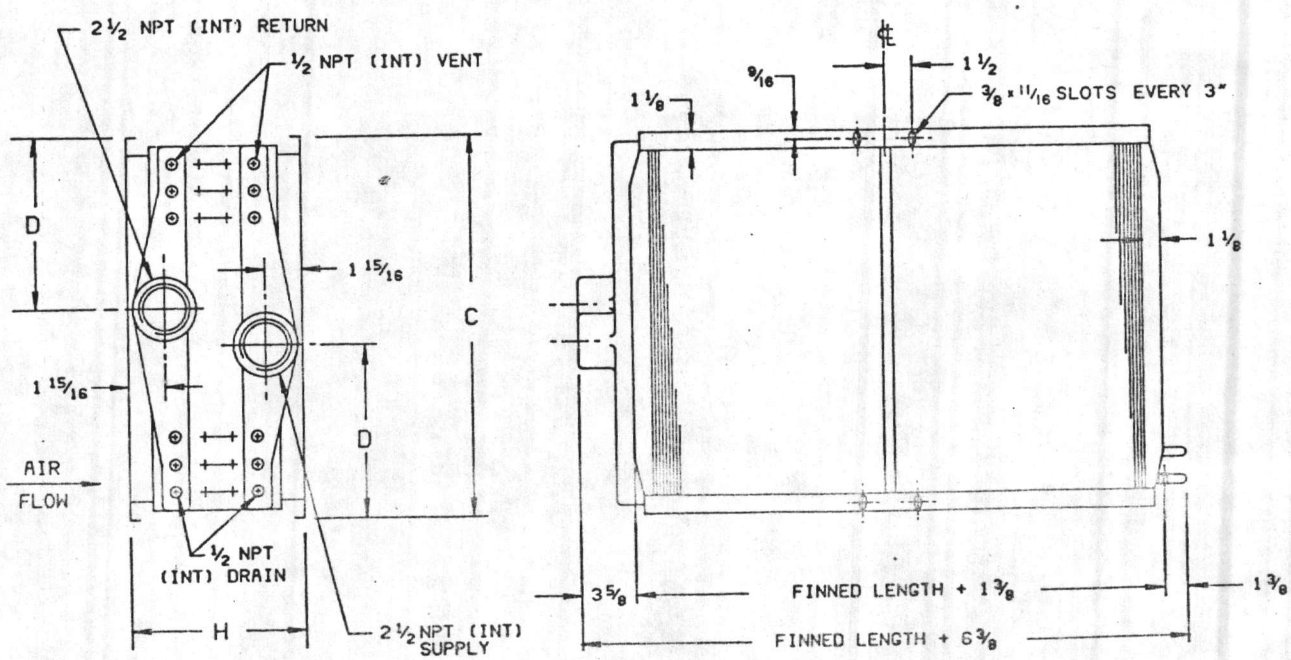
SUBMITTAL

☑ HORIZONTAL AIR FLOW RIGHT HAND SUPPLY



	FINNED WIDTH	C	D	2 ROW H	4 ROW H	6 ROW H	8 ROW H	10 ROW H	12 ROW H
☐	18	19 1/2	8 1/4	6 1/2	9 1/2	12 1/2	15 1/2	18 1/2	21 1/2
☐	24	25 1/2	11 1/4						
☑	30	31 1/2	14 1/4						
☐	33	34 1/2	15 3/4						

☐ HORIZONTAL AIR FLOW LEFT HAND SUPPLY



TAG Item - 1

TRANE	CENTRAL STATION AIR HANDLERS ISOLATORS FOR CLIMATE CHANGERS® TORRIVENTS® AND CABINET FANS	CLCH-S-000 DATE 10-1-80 SUPERSEDES 11-1-79 SUBMITTAL

RUBBER IN SHEAR ISOLATORS

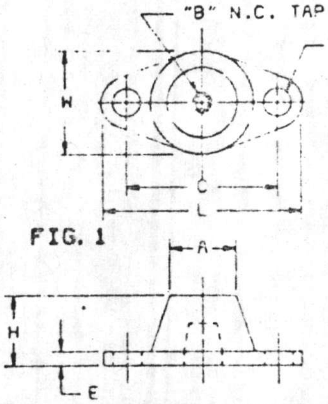


FIG. 1

FLOOR MOUNTED

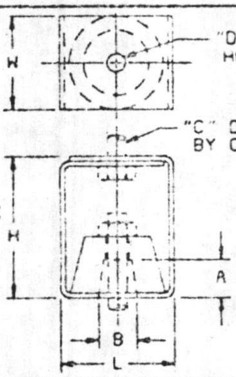


FIG. 2

CEILING SUSPENDED

TYPE		MAXIMUM LOAD LBS.	DEFLEC IN INCHES	L	W	H	A	B	C	D	E
BLUE	R-1	35	0.20	3 1/8"	1 3/4"	1"	1 1/4"	5/16"	2 3/8"	11/32"	3/16"
BLACK		45									
RED		75									
GREEN		120									
BLUE	R-2	135	0.25	3 7/8"	2 3/8"	1 1/4"	1 3/4"	3/8"	3"	11/32"	7/32"
BLACK		170									
RED		240									
GREEN		360									
GRAY		550									
BLACK	R-3	250	0.25	5 1/2"	3 3/8"	1 3/4"	2 1/2"	1/2"	4 1/8"	9/16"	1/4"
RED		525									
GREEN		750									
GRAY		1100									
BLACK	R-4	1500	0.25	6 1/2"	4 1/4"	1 3/4"	3 3/4"	5/8"	5"	9/16"	1/4"
RED		2250									
GREEN		3000									
GRAY		4000									
BLUE	RH1	35	0.20	2 1/4"	2"	3"	1 1/8"	3/4"	3/8"	13/32"	—
BLACK		45									
RED		75									
GREEN		120									
BLACK	RH2	170	0.25	3"	2 1/4"	4 1/2"	1 3/8"	7/8"	5/8"	11/16"	—
RED		240									
GREEN		380									
GRAY		550									
BLACK	RH3	250	0.25	3 3/4"	3 1/4"	6 1/4"	2"	1 1/8"	3/4"	7/8"	—
RED		525									
GREEN		750									
GRAY		1100									
BLACK	RH4	1500	0.25	4 3/4"	4"	8"	2"	1 1/2"	1"	1 1/16"	—
RED		2250									
GREEN		3000									
GRAY		4000									

SPRING TYPE ISOLATORS

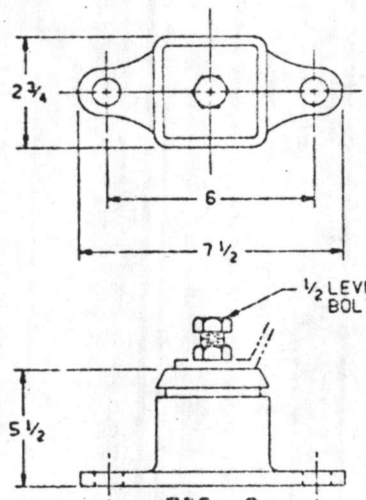


FIG. 3

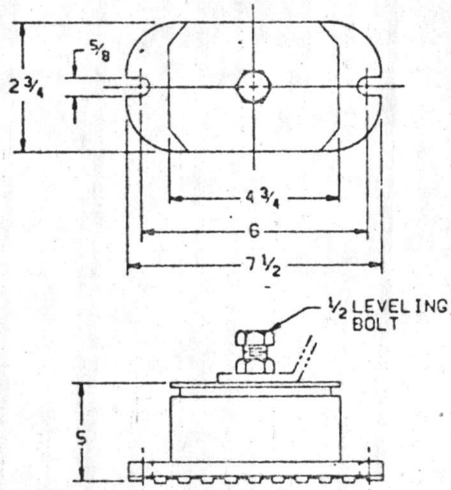


FIG. 4

FLOOR MOUNTED

TYPE FIG. 3	TYPE FIG. 4	LOAD RANGE *
OCT1-15	CES-1-21	TO 75
OCT1-25	CES-1-23	75-150
OCT1-35	CES-1-24	150-250
OCT1-45	CES-1-25	250-325
OCT1-55	CES-1-26	325-450
OCT1-65	CES-1-27	450-750
OCT1-75	CES-1-31	650-1100
OCT1-85	CES-1-35	1100-1500

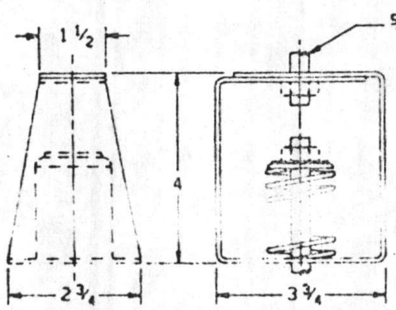


FIG. 5

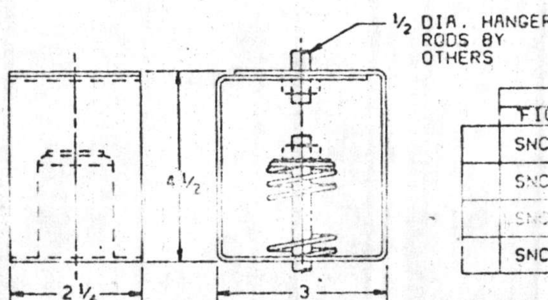


FIG. 6

CEILING SUSPENDED

TYPE FIG. 5	TYPE FIG. 6	LOAD RANGE *
SNC1-14	SHS-13	TO 140
SNC1-26	SHS-14	50-260
SNC1-45	SHS-17	[illegible]
SNC1-70	SHS-18	200-700

CUSTOMER NOTE:

1. FIG.1 IS FLOOR MOUNTED TYPE R-1 THRU R-4 AND FIG.2 IS CEILING SUSPENDED TYPE RH-1 THRU RH-4.

TRANE™ #6336-14, Item 2

SUBMITTAL DATA

SPECIFICALLY PREPARED FOR:

PROJECT: REPLACE AC, BLDG. AS-710

DATE OF SUBMITTAL: 11/18/86

ARCHITECT:

ENGINEER: CHEATHAM & ASSOC., WILMINGTON, NC

SOLD TO:
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC 28502

SHIP TO:
KINSTON PLBG. & HTG. CO.
HWY. 258 NORTH

KINSTON, NC 28501

CUSTOMER PURCHASE ORDER: 3299

TRANE JOB NUMBER: 10490

TRANE ORDER KF4-M374A

THIS PACKAGE CONTAINS THE FOLLOWING:

QTY	HEATING COIL	TAG(S)
2	ITEM - A	ZONE 1
2	ITEM - B	ZONE 2
2	ITEM - C	ZONE 3
2	ITEM - D	ZONE 4

THE ATTACHED DRAWINGS DESCRIBE THE ABOVE EQUIPMENT THAT WE PROPOSE TO FURNISH FOR THIS PROJECT.

X APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO.
BY [signature] DATE 12/5/86

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA
APPROVED
SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-85-C-6336
DATE 12-22-86
I. L. Huguelet
Cheatham & Assoc.
CDR, CEC, USN
Officer in Charge
of Construction

SALES OFFICE/SALES ENGINEER

RALEIGH R. CRAWFORD

TRANE™

SUBMITTAL DATA

TRANE ORDER # KF4-M374A

ITEM	QTY	COIL TAG	FIN AREA WIDE	FIN AREA LONG	COIL TYPE	ROWS	FIN TYPE	FINS PER FOOT	FIN MAT'L.	TURBS	TUBE MAT'L	AIR FLOW & CONN	"F" COIL CIRCUITING CIR TYPE	DIST	UPSTREAM SIZE	UPSTREAM CIR	DOWNSTREAM SIZE	DOWNSTREAM CIR	DRAIN HOLES
A	2	ZONE 1	18	30	W	01	SF	144	AL	Y	CU.	HR							N
B	2	ZONE 2	09	30	W	01	SF	120	AL	Y	CU.	HR							N
C	2	ZONE 3	33	30	W	01	SF	144	AL	Y	CU.	HR							N
D	2	ZONE 4	24	30	W	01	SF	144	AL	Y	CU.	HR							N

SUBMITTAL APPROVAL DRAWINGS

ITEM	COIL TAG	SCFM	MBH	ENTERING AIR TEMP. DB/WB (°F)	LEAVING AIR TEMP. DB/WB (°F)	GPM OR PSIG	ENTERING OR SUCTION (°F)	AIR PRESSURE DROP	WATER PRESSURE DROP (FT.)	REFRIG. TYPE	SUBMITTAL APPROVAL DRAWINGS
A	ZONE 1	1200	90.5	64.3	133.8	10.00	180.0	.14	.1	HW	COIL-SM-001.03 HCOL-SU-022.01
B	ZONE 2	900	50.5	64.3	115.1	6.00	180.0	.24	.1	HW	HCOL-SU-022.01
C	ZONE 3	3900	235.0	64.3	118.7	24.00	180.0	.38	.1	HW	HCOL-SU-022.01
D	ZONE 4	2530	152.5	64.3	119.0	16.00	180.0	.30	.1	HW	HCOL-SU-022.01

SHEET
OF

TAG Zone-1 thru Zone-4

PRINT DATE 8-8-86	FILE NO PL-AH-COIL-COIL-SM-001.03	REPLACES: COIL-SM-001.02	COIL-SM-001.03

TRANE™

Air Heating/Cooling Coils
Mechanical Specifications

SUBMITTAL

General

⅝" Tube Coils

Tubes — Round copper tubes, ⅝" OD arranged in a parallel pattern. Bronze spring turbulators are available for increasing capacities for lower water velocities.

Fins — Sigma-Flo® or Prima-Flo® plate type, configurated, aluminum or copper fins. Fins are positioned continuously across entire coil width and die formed in multiple stages with full fin collars for maximum fin-tube contact and accurate spacing. Fins are mechanically bonded to the tubes for lasting reliability.

Casing — 16-gauge galvanized steel casings, center and end supports are provided on all coils with header heights 33" or less. On 36", 42", and 48" header height coils up to 6 rows and 120" in length, 16-gauge casings with 14-gauge end and center supports are provided. On 36", 42", and 48" header height coils greater than 6 rows or 120" in length, 14-gauge casings, center and end supports are provided. Coated galvanized steel center tube supports are provided on ordering lengths over 42".

U-Bends — Round copper tubes, ⅝" OD, machine die-formed on each end to provide an accurate fit for silver brazed joints.

Headers — Close-grained gray-cast iron headers are provided on all 12" through 33" header height type "W", "D", "AA", "K", "N", "NS", "A", "D", "WD", "P", "WC", "WA" coils. For 36", 42", and 48" header height coils, round copper pipe headers are provided. The copper pipe headers are provided with a female threaded adapter for direct pipe connection.

Testing and Working Pressures — Coils are proof tested at 300 psig and leak tested at 200 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Type F
Coils are proof tested at 450 psig and leak tested at 300 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

½" Tube Coils

Tubes — Round ½-inch OD copper. Tubes expanded into full fin collars for permanent fin-tube bond.

Fins — Delta-Flo™ plate-type configurated aluminum with full fin collars for maximum fin-tube contact and accurate spacing mechanically bonded to tubes for permanent fin-tube bond.

Casings — Galvanized steel, 16-gauge casings on all coils. One or more galvanized steel center tube supports on lengths over 42 inches.

*Air Bypass and Water Carryover Arrestor-Foam sealing strip located between casing bottom channels and fins.

Testing and Working Pressures. Type WL, DL, and LL
Coils are proof tested at 300 psig and leak tested at 200 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Type FD
Coils are proof tested at 450 psig and leak tested at 300 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Headers

Type WL, DL and LL
Round copper tubes with a female threaded adapter for direct pipe connection for 12" through 54-inch header heights.

Coil Types — ⅝"

Type WC — One-row, ⅝" OD tubes, same-end connections, water coil.

Type WA — One or two-row, ⅝" OD tubes, water coil.

Type T — One or two-row, ⅝" OD tubes, single tube continuous circuit, same-end ¾" NPT (male) connections.

Type ST — One or two-row, ⅝" OD tubes, single tube continuous circuit, same-end ¾" NPT (male) connections. Offers same performance as type "T", but with a slip-flange casing designed for low cost installations.

Type A — One-row, ⅝" OD tubes, opposite-end connection steam coil.

Type NS — Steam distributing tube-type with 1" OD condensing tubes, same-end connections.

Type N — Steam distributing tube-type with 1" OD condensing tubes, opposite-end connections.

Type W — Single-row serpentine, general purpose, water coil.

Type D — Single-row serpentine water coil. Cast iron headers provided over entire supply connection end for drainable, positive freeze protection.

Type K — Single-row serpentine water coil. Removable cast iron headers provided at both ends of coil for periodic cleaning of tubes and drainability.

Type P2, P4, P8 — Multi-tube-feed water coils for low gpm applications.

Type DD, WD — Double-row serpentine water coil for high gpm applications.

Type F — Refrigerant cooling coils provided with one piece Venturi style, multi-circuit distributors to assure uniform distribution.

Type H — Refrigerant heat recovery coils. Individual circuits allow for multiple compressors to be piped to a single coil.

Type TT — One or two-row, ⅝" OD tube, dual-tube circuiting water coil.

Type AA One-row, ⅝" OD tubes, alternate tube feed, opposite-end connections steam coil.

Coil Types — ½"

Type WL — Single-row serpentine, general purpose water coil.

Type DL — Single-row serpentine, drainable for positive freeze protection, water coil.

Type LL — Double-row serpentine drainable for positive freeze protection, water coil.

Type FD — Refrigerant cooling coils with one piece, Venturi style, multi-circuit distributors to assure uniform distribution.

TAG Zone-1 thru Zone-4

PRINT DATE: 3-22-85	FILE NO. PL-AH-COIL-HCOL-SU-022.01	REPLACES: HCOL-SU-022.00	HCOL-SU-022.01

TRANE

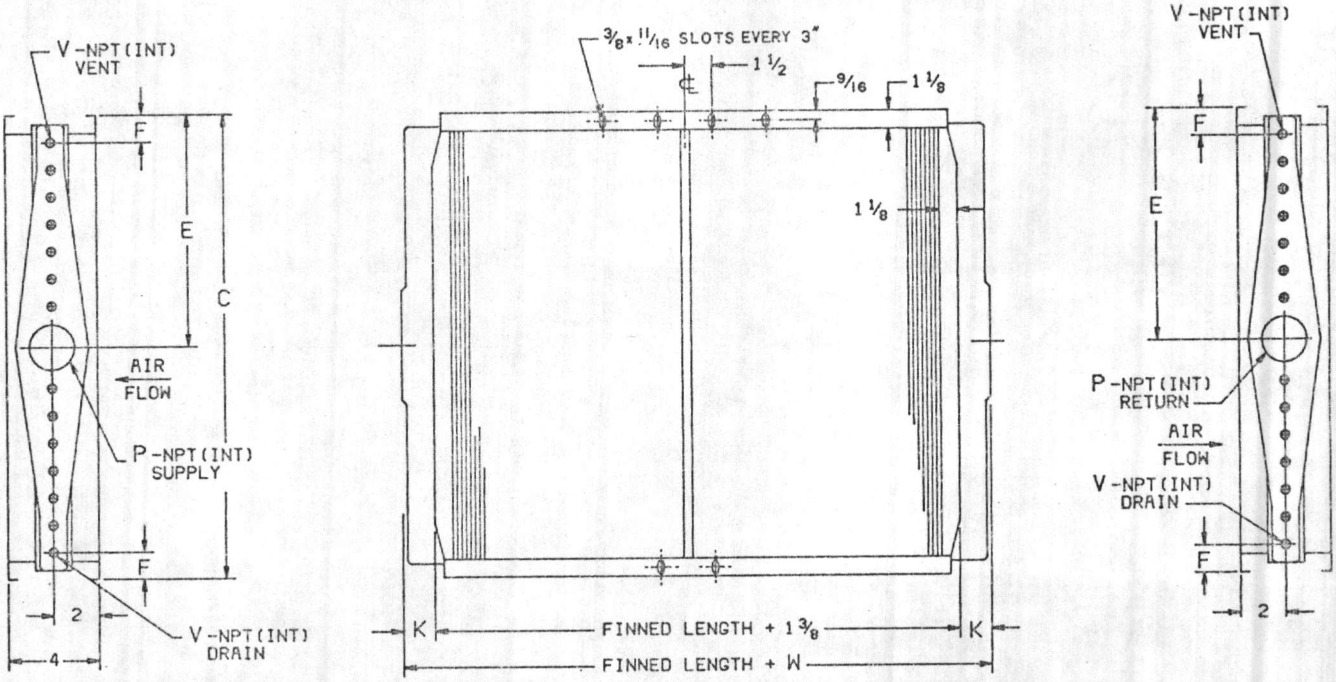
AIR HEATING COIL

TYPE W & WA

1 ROW 6",9",12",18",24",30" & 33" FINNED WIDTHS

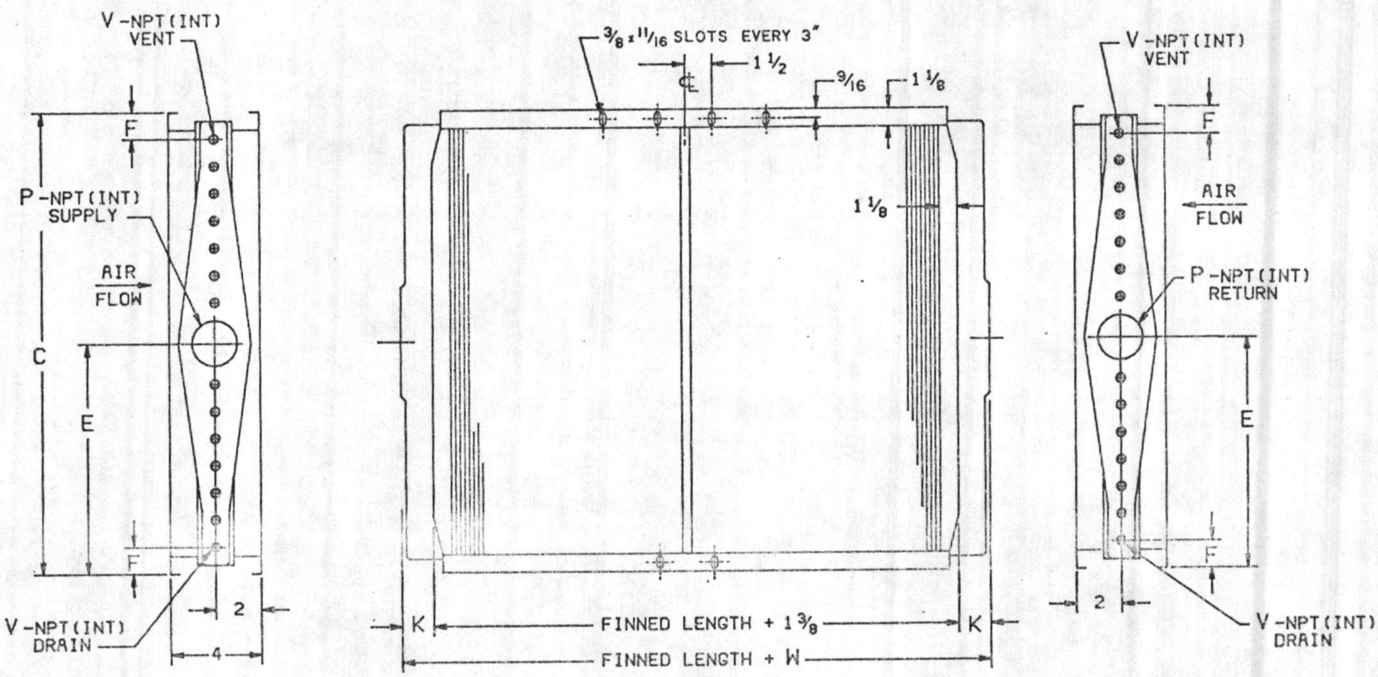
SUBMITTAL

☑ HORIZONTAL AIR FLOW RIGHT HAND SUPPLY



	FINNED WIDTH	C	E	F	K	P	V	W
	6	7 1/2	3	1 9/16	1 3/8	1	3/4	4 1/8
✓	9	10 1/2	4 1/2	1 9/16	1 3/8	1	3/4	4 1/8
	12	13 1/2	6	1 1/2	1 1/2	1 1/4	1/2	4 3/8
✓	18	19 1/2	9 3/4	1 1/2	1 3/4	2 1/2	1/2	4 7/8
✓	24	25 1/2	12 3/4	1 1/2	1 3/4	2 1/2	1/2	4 7/8
	30	31 1/2	15 3/4	1 1/2	2	2 1/2	1/2	5 3/8
✓	33	34 1/2	17 1/4	1 1/2	2	2 1/2	1/2	5 3/8

☐ HORIZONTAL AIR FLOW LEFT HAND SUPPLY



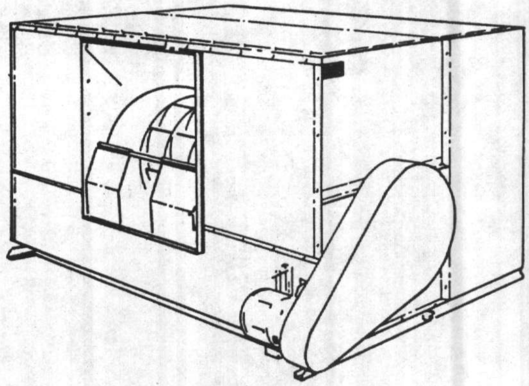
Maintenance CLCH-M-2

Library	**Service Literature**
Product Section	**Air Handling**
Product	**Central Station Air Handlers**
Model	**Climate Changers**
Literature Type	**Maintenance**
Sequence	**2**
Date	**January 1986**
File No.	**SV-AH-CLCH-CLCH-M-2-186**
Supersedes	

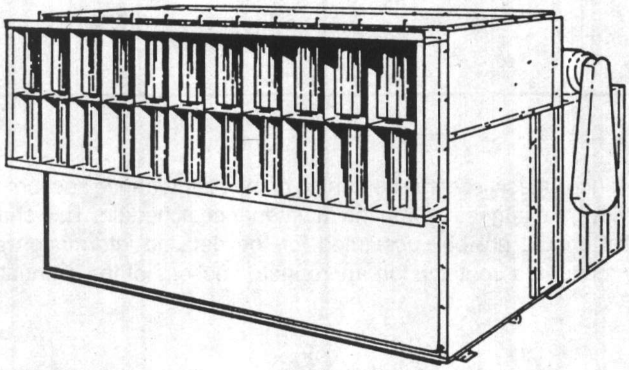
CLIMATE CHANGER® CENTRAL STATION AIR HANDLERS

DRAW-THRU, BLOW-THRU SPRAYED COIL AND HIGH PRESSURE UNITS

B DEVELOPMENT SEQUENCE



DRAW-THRU



BLOW-THRU

X39640291-01

LITERATURE HISTORY CHANGE:
Delta—Flow Coils added to units, changing design sequence to 'E'.

TABLE OF CONTENTS

GENERAL INFORMATION

Central Station Climate Changers® are air handlers designed to provide complete heating, cooling and dehumidifying by means of wide variety of unit sizes, coils, fans and efficiency capabilities. This manual will cover all vertical and horizontal, draw-thru, blow-thru, sprayed coil and high pressure units. A Periodic Maintenance Checklist at the beginning of the Maintenance section provides the suggested routine maintenance schedule. This checklist should not be substituted for the detailed information and procedures contained in appropriate sections of the manual.

The Trane Company
La Crosse, Wisconsin 54601-7599
Printed in U.S.A.

START-UP

WARNING: DISCONNECT ELECTRICAL POWER AND ALLOW ALL ROTATING PARTS TO STOP COMPLETELY BEFORE SERVICING OR INSPECTING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK, ENTANGLEMENT IN MOVING PARTS OR PRESSURE DIFFERENTIAL WITHIN THE UNIT.

PREPARATION

Perform the following checks and inspections before operating the unit:

1. **With the system de-energized,** check that the electrical connections are complete and tight at the terminals.
2. Make sure the belt guard is in place.
3. Inspect the fan wheels. They should turn freely.
4. As mentioned previously in the Installation Manual, check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.
5. Inspect fan belt tension. Belt tension, sheave alignment and setscrew torque information is given in the applicable section of this manual.
6. Check the piping and valves for leaks. Open or close the valves, depending on their function in the system. If a refrigerant coil is used, the system must be evacuated, leak-tested with dry nitrogen and charged with refrigerant.
8. Remove any foreign material from the drain pan. Check the drain pan and condensate line to make sure they are not obstructed.
9. All unit access panels must be in place. All screws, nuts and bolts must be tight.
11. If the unit includes fan paralleling controls, open them fully.
12. Inspect fan motor and bearing lubrication.

CAUTION: To prevent fan motor or bearing failures, it is necessary that they are lubricated properly. This must be checked before the unit is started for the first time. See the label on the side of the unit, the tag attached to the motor, and the Maintenance section of this manual.

START-UP PROCEDURES

After completing all the items uner "Pre-Start-Up," the unit may be started and the following checks and adjustments performed:

NOTE: *High Pressure units with self-locking collar fan bearings. During start-up check rotation of fan shaft to determine if fan motor is wired correctly. Incorrect rotation of fan may cause premature bearing and shaft failure. Refer to bearing section in this manual.*

1. Measure the motor voltage and amps on all phases to insure proper operation. Compare these readings with the motor nameplate.
2. If the unit includes a spray pump, open the spray pump air valve and purge air from the system. Adjust the spray pump valve until the spray pattern diameter equals the finned height of the top cooling coil. The resulting gauge pressure should be between 7 and 10 psig.
3. If the unit includes fan paralleling control (two-fan, blow-thru units only), adjustment may be required. An indication of an incorrect setting is paralleling of the fan (pulsating operation) and erratic fan motor amperage readings. Adjust the fan paralleling control until fan operation is smooth and the amperage reading is steady.

   The fan paralleling control should be closed only far enough to eliminate erratic operation. Rarely should adjustment exceed two inches on either fan. If the devices are closed too far, unit capacity will be reduced.

   Each fan paralleling control device has two rods per fan extending upward through the top of the blow-thru fan section. To adjust fan operation for a smooth airflow condition, the following should be done:

   a. Loosen the locking nut on one rod, lower the rod ½-inch and retighten. Repeat for the other rod on the fan.
   b. If the unstable condition still exists, repeat Step A.
   c. If the unstable condition still exists, relocate the fan paralleling control to the original position and perform Steps A and B on the other fan.
   d. If the unstable condition still exists, lower both fan paralleling devices to 1-inch from the original position. Repeat Steps A, B, and C, using 1-inch as a base reference.

4. Measure voltage at all three wires. Maximum allowable voltage imbalance is two percent. Voltage imbalance is defined as 100 times the sum of the deviation of the three voltages from the average, divided by twice the average voltage. For example, if the three measured voltages are 221, 230 and 227, the average voltage would be 226 volts. The percent of voltage imbalance is then calculated:

$$\frac{100 \times \{ [226\text{-}221] + [230\text{-}226] + [227\text{-}226] \}}{2 \times 226} =$$
$$2.2\% \text{ (Unacceptable)}$$

   In this example, 2.2 percent imbalance is not acceptable and the power company should be notified to correct it.

5. If the fan speed is changed more than 5% from the original designed rpm, or if parts such as shafts, fan wheels, bearings, or other drive components are replaced, the unit vibration should be checked.

   The unit vibration, measured horizontally and vertically directly on the fan shaft bearing (perpendicular to the shaft centerline), should not exceed 0.2 in/sec. or 3.0 mils, whichever is the lower displacement at the unit operating speed.

MAINTENANCE

PERIODIC MAINTENANCE CHECKLIST

WARNING: DISCONNECT ELECTRICAL POWER AND ALLOW ROTATING PARTS TO STOP BEFORE SERVICING THE UNIT OR REMOVING THE FAN BELT GUARD. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR ENTANGLEMENT IN MOVING PARTS.

The following checklist describes the suggested maintenance schedule to maintain proper operation of the unit. Detailed procedures for owner-operator maintenance checks are given after this checklist. For more information on the unit, refer to the Service Guide or contact a local Trane Service Company.

EVERY MONTH

☐ 1. Inspect air filters. Clean or replace if clogged.

☐ 2. Inspect air filter manometer for bag filters or roll filters with manual controls. Change bag filters when manometer reading is 1 inch wg. Change roll filters when manometer reading is ½ inch wg.

☐ 3. Check sump water concentration in Sprayed Coil units to make sure that no corrosive or scaling conditions have been created by poorly treated water.

EVERY THREE TO SIX MONTHS

NOTE: *The procedures listed in this section should be completed every three to six months. The frequency of their completion will depend on load and ambient conditions. Detailed procedures following this Maintenance Checklist will give more information on suggested conditions and schedules.*

☐ 1. Check that fan bearing grease lines are tight to the bearings so no grease leaks at the connection.

☐ 2. Lubricate fan bearings.

☐ 3. Check bearing locking setscrews and other setscrews for proper tightness. All bearing races must be secure.

☐ 4. Lubricate fan motors.

☐ 5. Check sheave alignment and level of shafts.

☐ 6. Check fan belt tension. Adjust if belts slip. Replace worn or frayed belts with a new matched set.

☐ 7. Inspect coils for frost or dirt built-up. Clean fins if airflow is clogged.

☐ 8. Inspect spray humidifier for lime deposits in the spray nozzle. Clean if flow is clogged.

☐ 9. Inspect steam grid humidifier wrapping. Replace if flow is clogged.

EVERY YEAR

☐ 1. Inspect electrical wiring for condition. Tighten all connections.

☐ 2. Inspect the unit casing and accessories for chipping or corrosion. If damage is found, clean and repaint with a good grade of rust resistant zinc chromate paint.

☐ 3. Inspect the drain pan for sludge or other foreign material. Clear the drain openings and drain line to ensure adequate flow.

☐ 4. Check damper linkages, setscrews and blade adjustment for proper tightness and operation. Do not lubricate nylon damper rod bushings.

☐ 5. Check inlet vane linkages, setscrews and vane adjustment for proper tightness, operation, and alignment.

☐ 6. Recalibrate the filter manometer.

☐ 7. Clean and check the water system on Sprayed Coil Climate Changers.

MAINTENANCE PROCEDURES

FILTERS

Table 1 lists air filter sizes and quantities required for all filter boxes. Replace with UL Class 2 approved filters only. Always install filters with directional arrows pointing in direction of airflow.

To clean permanent filters, wash under a stream of hot water to remove dirt and lint. Follow with a wash of mild alkali solution to remove old filter oil. Rinse thoroughly and let dry. Recoat both sides of the filter with Air Maze filter oil or an equivalent and let dry. Replace filter element in the unit.

Bag filters should be replaced when pressure differential across the filter is 1 inch wg. A manometer should have been installed for surveillance of pressure drop across the filter.

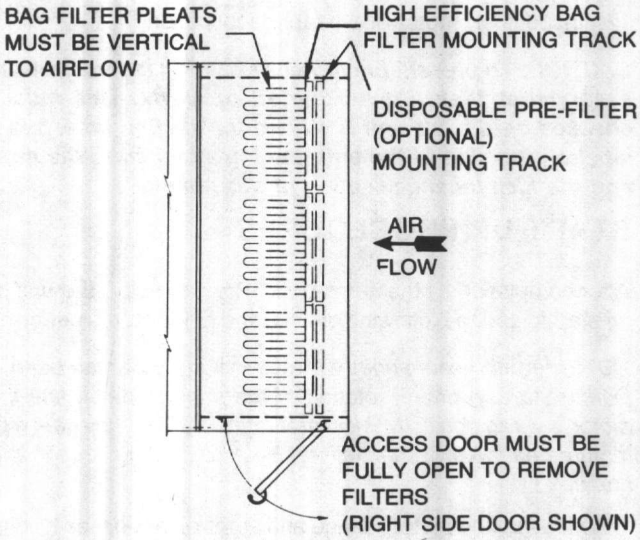


FIGURE 1 - Filter Mounting Track Location (Top View)

TABLE 1 - Filter Sizes and Quantities Per Set

UNIT SIZE	2-INCH FLAT FILTER BOX	COMBINATION & MEDIUM FILTER BOX	HIGH CAPACITY BOX	BAG FILTER AND PREFILTER (HXW)	4-INCH PLEATED FILTER BOX
3	1-20x25	2-16x25	2-20x25	—	—
6	2-20x25	4-16x25	4-20x25	—	—
8	4-16x20	4-20x25	6-20x20	1-24x12 1-24x24	4-16x20
10	4-16x25	6-16x25	6-20x25	2-24x24	4-16x25
12	2-20x20 2-16x25 1-16x20	4-20x25 2-16x25	6-16x20 3-20x25	2-24x12 2-20x20	1-16x20 2-16x25 2-20x20
14	4-16x20 2-20x25	8-16x25	6-20x20 3-20x25	2-24x12 3-20x20	4-16x20 2-20x25
17	6-16x20 2-16x25	8-20x25	3-20x25 9-20x20	1-24x12 3-24x24	6-16x20 2-16x25
21	8-16x20 2-16x25	10-20x25	3-20x25 12-20x20	5-24x20	8-16x20 2-16x25
25	12-16x20	6-20x25 6-16x25	6-20x25 9-20x20	4-24x12 5-20x20	12-16x20
31	7-16x20 7-16x25	8-16x25 12-16x20	8-20x25 12-20x20	10-20x20	7-16x20 7-16x25
35	14-16x25	16-20x25	28-16x25	2-24x12 8-24x24	14-16x25
41	6-16x20 12-20x20	20-20x25	32-16x25	2-24x12 8-24x24	6-16x20 12-20x20
50	7-16x20	28-16x25 14-16x25	35-16x25	15-20x20	7-16x20 14-16x25
63	10-16x25 12-20-25	30-20x25	49-16x25	20-20x20	10-16x25 12-20x25
73	6-20x20 18-20x25	36-20x25	42-20x25	—	—
86	21-20x25 7-20x20	42-20x25	49-20x25	—	—

WARNING: MAXIMUM BAG FILTER PRESSURE DROP IS 1 INCH WG. OPERATION OF THE UNIT AT A PRESSURE DIFFERENTIAL GREATER THAN THIS MAY CAUSE PERSONAL INJURY OR EQUIPMENT DAMAGE FROM COMBUSTION.

Trane recommends the use of optional disposable prefilters with high efficiency bag filters. Prefilters slide into mounting tracks just ahead of the bag filter and serve to prolong the life of bag filters. Figure 1 illustrates bag filter and prefilter installation. Complete the following to install high efficiency bag filters:

1. Ensure power is disconnected. Open filter section access door.

   WARNING: DISCONNECT POWER SOURCE BEFORE OPENING FILTER SECTION ACCESS DOOR. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK, HIGH PRESSURES OR MOVING PARTS.

2. Slide bag filters and flat prefilters into the appropriate filter tracks. Bag filters must be installed with pleats vertical to airflow.
3. Slide adjustable blockoff into filter track.
4. Close access door. If door can be closed without compressing the filters, adjust the blockoff by loosening its screws and sliding it towards the door. The door should squeeze the blockoff against the filters, compressing them together. Tighten the adjusting screws.

NOTE: *Filters must have an airtight seal to prevent air bypass. If using other than recommended filters, apply foam gasketing to the vertical edges of the filter holding frame for a tight seal.*

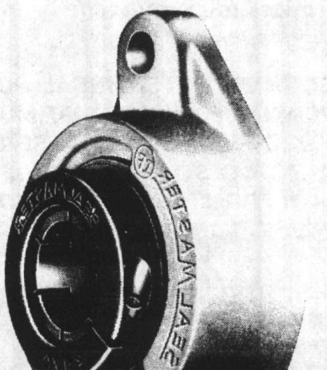


FIGURE 2 - Flange Type Bearing with Grease Fitting and Squeezeloc Tightener

TABLE 2 - Recommendations for Grease Lubricated Fan Bearings

OPERATING CONDITIONS	GREASING INTERVALS -20 F To 140 F	GREASING INTERVALS 140 F To 200 F
Clean, Dry	3-6 Months	1-3 Months
Dirty, Dry	1-3 Months	1-4 Weeks
Dirty, Wet, High Humidity	1-4 Weeks	1-14 Days
RECOMMENDED GREASES	**RECOMMENDED OPERATING RANGE**	
Texaco-Multi Fak #2	-20 F to 250 F	
Shell Alvania #2	-20 F to 250 F	
Mobil Mobilux #2	-20 F to 250 F	
Exxon Unirex #2	-20 F to 250 F	
Texaco Premium RB	-20 F to 250 F	
Mobil 532	-20 F to 250 F	
Exxon Beacon	-65 F to 250 F	
Keystone Keystone 84 H	-40 F to 225 F	

NOTE: Greases used should conform to NLGI No. 2 penetration.

FAN BEARING LUBRICATION

Fan bearings (see Figure 2) with grease fittings or with grease line extensions should be lubricated with a lithium base grease which conforms to NLGI Number 2 for consistency and which is free of chemical impurities. See Table 2 for recommended lubricants. Improper lubrication can result in early bearing failure.

To lubricate the fan bearings, complete the following:

1. Bearings are to be lubricated while unit is not running, disconnect main power switch.
2. Connect a manual grease gun to the grease line or fitting.
3. While turning the fan wheel manually, add grease, preferably when bearing is warm, until a light bead of grease appears at the bearing grease seal.

   NOTE: *On sizes 35 thru 86 CLCH or other size units with internal opposite drive side bearings, it will be necessary to remove unused bearing plate for observation of bearing grease seal.*

CAUTION: Do not over-lubricate bearings. Excessive pressure caused by overlubrication can displace bearing grease seals or cause grease to overheat the bearing, resulting in premature bearing failure.

WARNING: DISCONNECT ELECTRICAL POWER SOURCE BEFORE SERVICING THE UNIT. IF UNIT MUST BE ON FOR MAINTENANCE PROCEDURES, EXERCISE EXTREME CAUTION. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR ENTANGLEMENT IN MOVING PARTS.

FAN BEARING TIGHTENING INSTRUCTIONS (DOUBLE LOCK SETSCREW)

The pillow block bearing with double setscrew locking arrangement requires specific tightening instructions. See Figure 3. Complete the following.

1. Rotate the shaft until the double lock bearing setscrews are in the vertically up position as shown in Figure 4.
2. Without V-Belt tension, snug (hand tight) all four setscrews of the double lock bearing in the numerical sequence as shown in Figure 4.

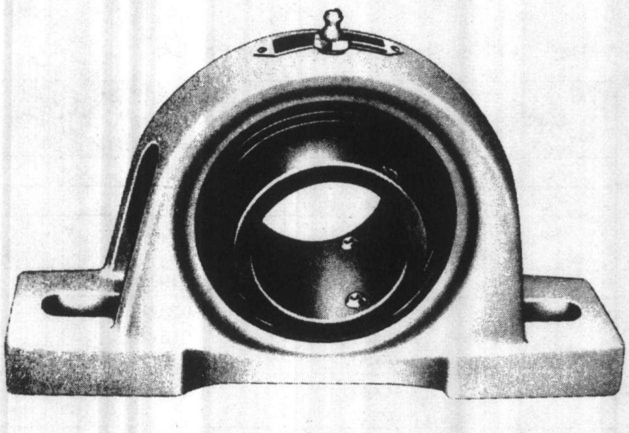


FIGURE 3 - Pillow Block Type Bearing with Grease Fitting and Double Lock Setscrew Arrangement

3. Torque each setscrew of the double lock bearing in the numerical sequence to 66 inch-pounds. See Figure 4.

FAN BEARING SELF-LOCKING COLLAR INSTALLATION

The pillow block bearing with self-locking collar arrangement is used on size 8-35 High Pressure Climate Changer Units. See Figure 5.

NOTE: *At or before start-up check the wiring of the three phase fan motor to assure proper shaft rotation. Incorrect fan rotation may loosen the locking collar resulting in pre-mature bearing failure.*

Complete the following recommended steps for bearing replacement.

1. Slip the shaft through the pillow block. Be certain the bearing is aligned in position along the shaft to eliminate any possibility of cramping loads.
2. Fasten the unit securely to the base using the proper bolt size.

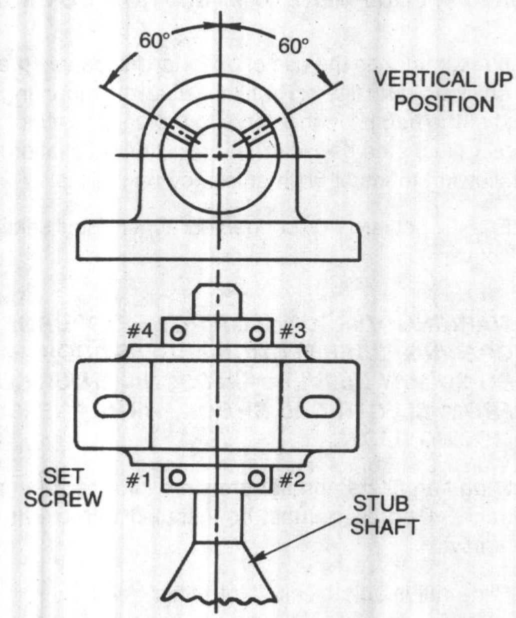


FIGURE 4 - Instruction Sketch for Pillow Block Bearing with Double Lock Setscrew

3. Manually rotate fan shaft several times to assure bearing alignment.
4. Place the self-locking collar on the shaft with its cam adjacent to the cam on the end of bearing's inner ring. Turn the collar in the direction of shaft rotation. The eccentric recessed cam will drop over and engage the corresponding cam on the bearing inner ring.
5. Using a light-weight hammer and drift pin inserted in the drift pin hole strike in the direction of shaft rotation to positively engage the collar. The wide inner ring is now locked to the shaft.
6. Tighten the setscrew to recommended torque. See Table 5.

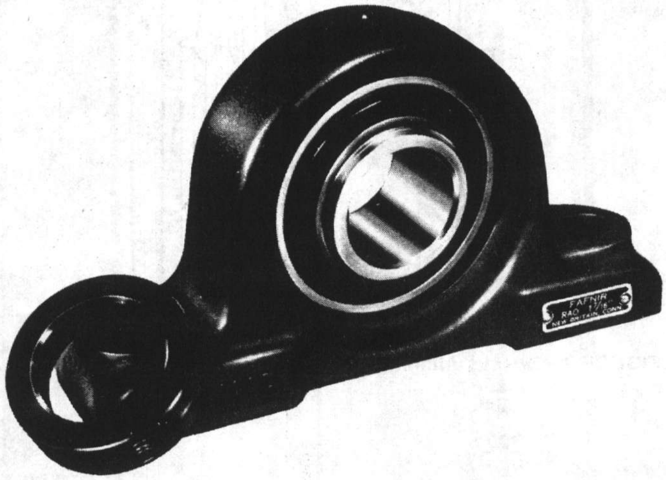


FIGURE 5 - Pillow Block Type Bearing with Grease Fitting and Self-Locking Collar Arrangement

FAN MOTORS

Inspect periodically for excessive vibration or temperature. Operating conditions will vary the frequency of inspection and lubrication. Table 3 lists recommended motor greasing intervals. Motor lubrication instructions are found on the motor tag or nameplate. If not available contact the motor manufacturer for instructions.

To relubricate the motor, complete the following:

WARNING: DISCONNECT POWER SOURCE FOR MOTOR LUBRICATION. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR MOVING PARTS.

1. Turn the motor off. Make sure it cannot accidentally restart.
2. Remove the relief plug and clean out any hardened grease.
3. Add fresh grease through the fitting with a low pressure grease gun.
4. Run the motor for a few minutes to expel any excess grease through the relief vent.
5. Stop the motor and replace the relief plug.

NOTE: *If excessive grease is plugged at the motor shaft, use less grease and/or extend the greasing interval.*

Refer to Table 4 for minimum torques of motor mounting and bearing bolts.

TABLE 3 - Motor Greasing Intervals

TYPE OF SERVICE	UP TO 7.5 HP MOTORS	10-40 HP MOTORS	50-150 HP MOTORS
8-16 Hrs., Clean, Dry	5 Years	3 Years	1 Year
12-24 Hrs., Moderate Dirt Or Moisture	2 Years	1 Year	6 Months
Severe - Very Dirty, High Temperature	6 Months	3 Months	2 Months

TABLE 4 - Minimum Hex Head Bolt Torques

BOLT SIZE	TORQUE - FOOT/POUNDS	
	GRADE 2	GRADE 5
¼" - 20 UNC	4	6
¼" - 28 UNF	4	7
5/16" - 18 UNC	8	14
5/16" - 24 UNF	9	16
⅜" - 16 UNC	14	24
⅜" - 24 UNF	16	28
7/16" - 14 UNC	30	42
7/16" - 20 UNF	35	45
½" - 13 UNC	40	69
½" - 20 UNF	47	83
9/16" - 12 UNC	57	99
9/16" - 18 UNF	68	118
⅝" - 11 UNC	86	150
⅝" - 18 UNF	101	176
¾" - 10 UNC	146	254
¾" - 16 UNF	173	301
⅞" - 9 UNC	206	358
⅞" - 14 UNF	244	422
1" - 8 UNC	289	500
1" - 14 UNF	347	602

NOTE: Grade 2 bolts have no markings on the capscrew. Grade 5 bolts have 3 radial dashes, 120 degrees apart.

TABLE 5 - Torques for Tightening Locking Screws, Bearings and Sheaves

TORQUE FOR TIGHTENING SETSCREWS				TORQUE FOR TIGHTENING SEALMASTER LOCKING COLLAR				
SET SCREW DIA.	HEX SIZE ACROSS FLATS	RECOM. TORQUE		COL-LAR	SCREW DIA.	HEX SIZE ACROSS FLATS	RECOM. TORQUE	
		INCH LBS.	FOOT LBS.				INCH LBS.	FOOT LBS.
¼"	⅛"	66	5.5	2-015B	8-32	⅛"	70	5.8
5/16"	5/32"	126	10.5	2-13B	8-32	⅛"	70	5.8
⅜"	3/16"	228	19.0	2-17B	10-24	9/64"	90	7.5
7/16"	7/32"	348	29.0					
½"	¼"	504	42.0					
⅝"	5/16"	1,104	92.0					

NOTE: Tighten bearing setscrews to the torque shown before running unit. Setscrews can loosen in shipment.

Fan motors should be stored indoors in a clean and dry atmosphere and on solid ground. The motor shaft should be turned occasionally to prevent brinelling of the bearings. If motors must be stored outdoors in varying, humid climate, use space heaters and cover the motors as completely as possible to keep them dry. If space heaters have not been installed and motors have been subjected to the elements for several months, the following steps are recommended before operating the motors:

1. Inspect bearings for moisture and rust. Replace bearings if necessary and repack with new grease.
2. Check motor winding. An acceptable reading is from 6 megohms to infinity. If reading is less than 5 megohms, windings should be dried out in an oven or by a blower.

3. Inspect the entire motor for rust and corrosion.
4. Lubricate the motor as instructed in this Maintenance manual, or as indicated by the maintenance tag on the motor.

SHEAVE ALIGNMENT

To prevent interference of the fan frame with the belt, make sure that the belt edge closest to the motor has the proper clearance from the fan frame, as shown in Figure 6.

Align the fan and motor sheaves by using a straightedge as shown in Figure 7. The straightedge must be long enough to span the distance between the outside edges of the sheaves. When the sheaves are aligned, the straightedge will touch both sheaves at points A through D. A string, drawn tight, may be used in the same manner. For uneven width sheaves, place a string in the center groove of both sheaves and pull tight. Adjust sheaves and tighten the sheave setscrews to the proper torques, given in Table 5.

Parallel operation of the fan and motor shafts is necessary to prolong belt life. Place a level on the shafts to check horizontal alignment. Shim if necessary.

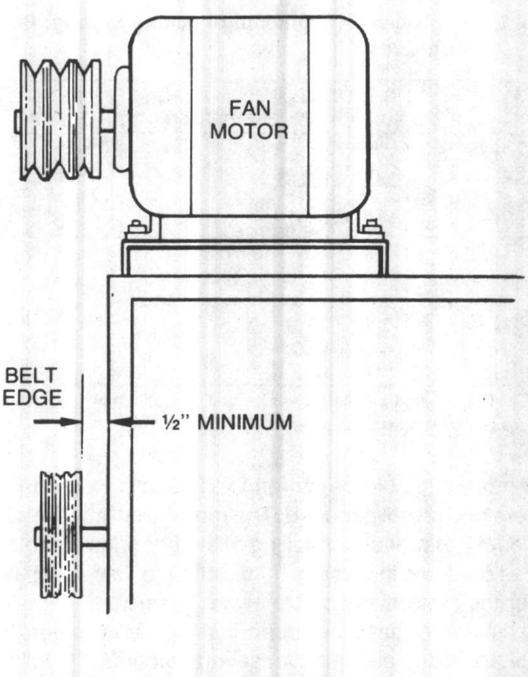


FIGURE 6 - Minimum Allowable Distance Between Frame Work and Fan Sheave

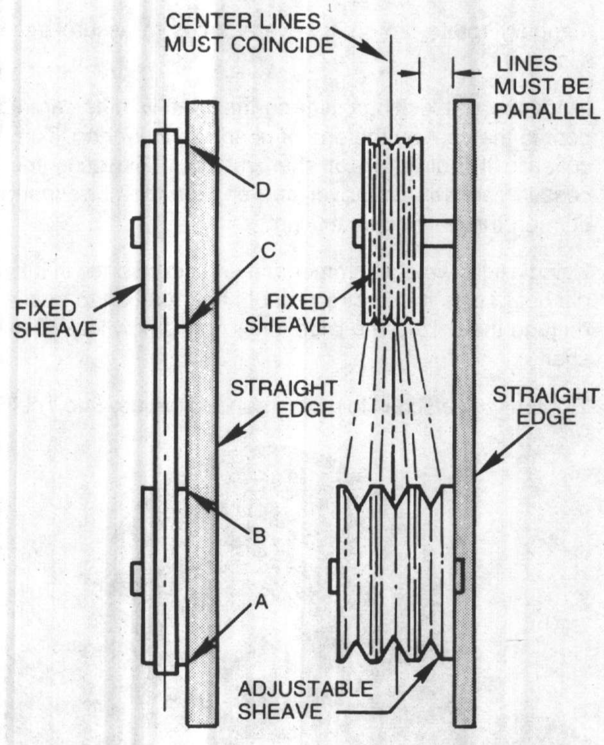


FIGURE 7 - Sheave Alignment

FAN ASSEMBLY SETSCREWS

Check and adjust fan wheel, bearing and sheave setscrews whenever a component is removed or an adjustment is made. Refer to Table 5 for recommended torques.

FAN WHEEL CLAMPS

The clamps that hold the fan hub on the shaft must be properly positioned and tightened to ensure safe fan operation.

NOTE: *On fans that are 20 inches or smaller, the clamps should be replaced whenever the wheel or shaft is replaced.*

On fans that are 20 inches or smaller, locate the two-piece clamp over the hub so that the hub tabs go through the clamp slots. Finger-tighten the two bolts evenly, then torque down both bolts **evenly** in small increments to 25 foot-pounds. The clamp flanges should meet at both bolt locations before 25 foot-pounds is reached.

On fans that are larger than 20 inches, finger-tighten the three bolts evenly, then torque down all three bolts **evenly,** in small increments, to 35 to 40 foot-pounds. Visually check the spacing between the three clamp flanges to make sure they are consistently tightened.

TABLE 6 - Values for K Factor (Belt Cross-Section Types)

BELT TYPE	A	B	C	D	E	3L	4L	5L	3V	5V	8V	AX	BX	CX	DX
"K" FACTOR	8	13	40	80	95	6	6	6	6	12	25	11	18	54	101

FAN BELT TENSION

NOTE: *Fan belt tension should be checked at least twice during the first days of operation, since there is a rapid decrease in tension until belts are run in.*

WARNING: DISCONNECT ELECTRICAL POWER SOURCE AND ALLOW ALL ROTATING EQUIPMENT TO STOP COMPLETELY BEFORE INSPECTING OR SERVICING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR MOVING PARTS.

Proper belt tension is required to ensure maximum bearing and drive component life and is based on fan brake horsepower requirement. Use Chart 1 to find the proper tension and refer to the inset for an example. To use the chart, you must know:

1. Fan design bhp per belt (**not** motor hp)
2. Fan rpm
3. Fan sheave pitch diameter (Figure 8 - found by measuring where the middle of the belt rides in the sheave)
4. Type of belt cross-section (stamped on the belt)

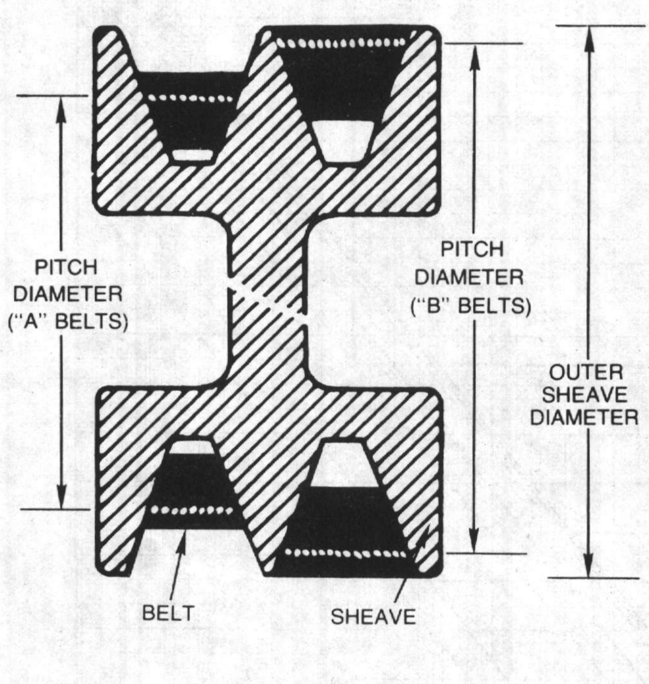


FIGURE 8 - Fan Sheave Pitch Diameter

As shown in the example of Chart 1, the correction tension (pounds force) is 9.6 pounds, at ½-inch deflection. Deflection is determined by dividing the belt span distance by 64, as shown in Figure 9.

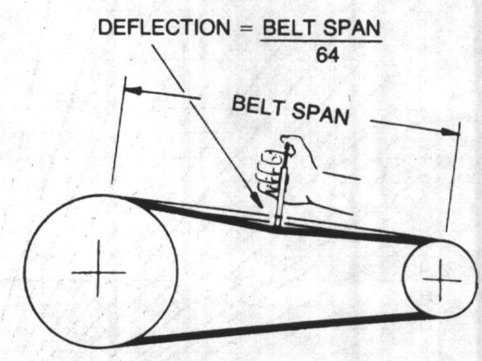


FIGURE 9 - Belt Tension Measurement

To measure belt tension, use a belt tensioner as shown in Figure 10. Determine actual deflection by depressing one belt with the belt tensioner and measuring the deflection relative to the other belts or to belt line. Adjust the belt tension to the correct pounds force and tighten all setscrews to the proper torques.

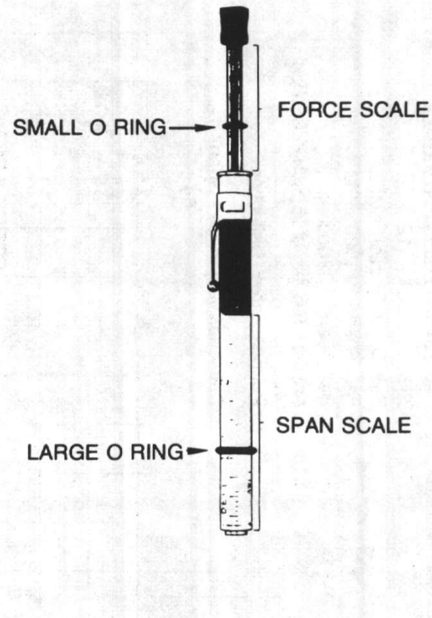
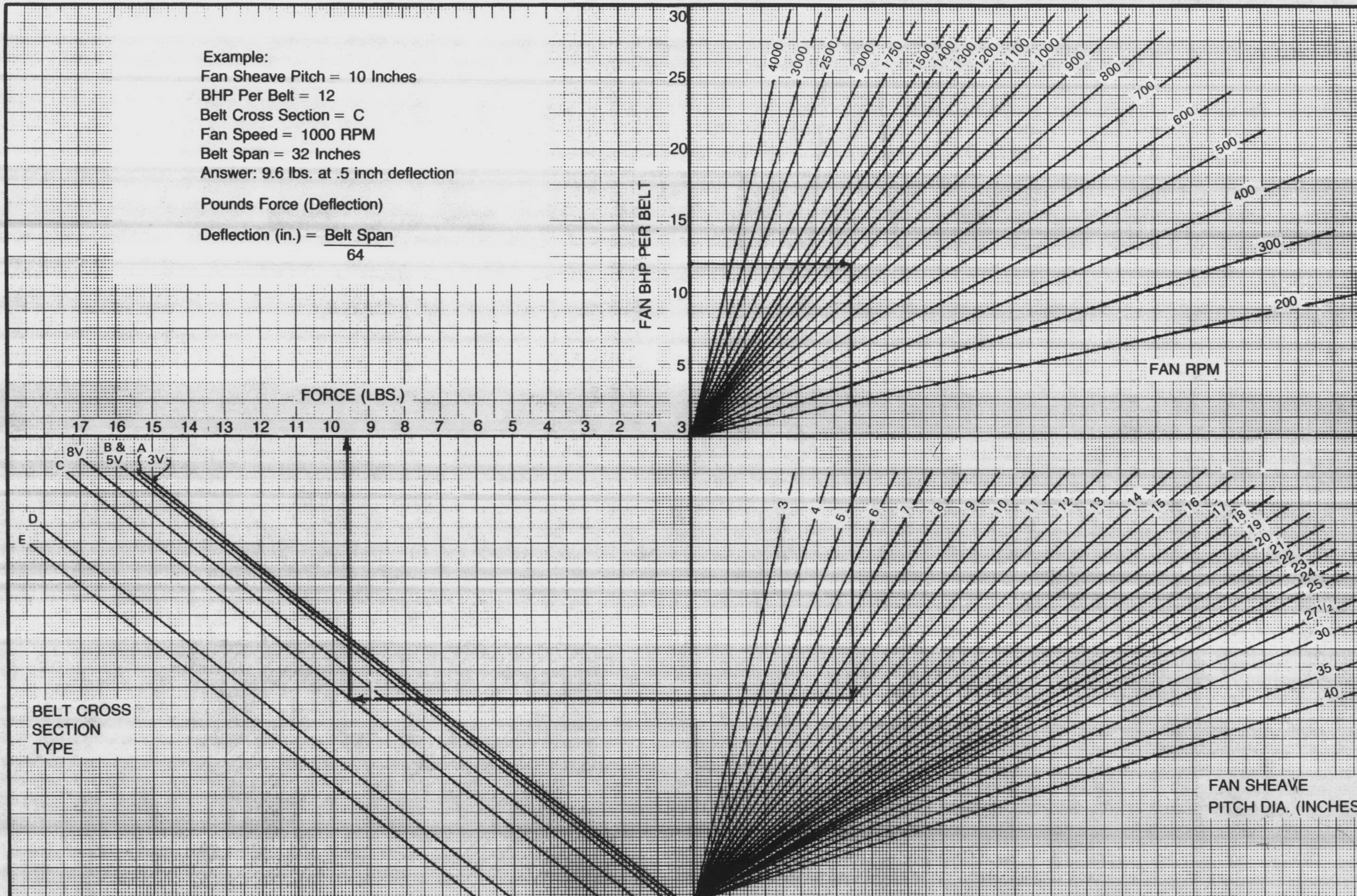


FIGURE 10 - Belt Tensioner

CHART 1 - Belt Tension



For belt cross-section types not given in Chart 1, refer to Table 6 and use the following equations to calculate correct belt tension:

$$F = \frac{T + K}{16}$$

where F = force measured in pounds at specific deflection

K = constant determined by belt cross-section type (See Table 6)

$$T = 24{,}750 \times \frac{\text{(fan hp per belt)}}{\text{(belt speed)}}$$

$$\text{Belt speed} = \frac{\text{(fan pitch diameter)}}{12} \times (\pi) \times \text{fan rpm (ft/min)}$$

For example, given the following:

Motor sheave pitch diameter: 16.8 inches, eight groove
Fan sheave pitch diameter: 19.8 inches, eight groove
Fan horsepower: 262.4 bhp
Fan rpm: 983 rpm
Belt type: 8V
Sheave span: 60.9 inches

$$\text{Belt speed} = \frac{19.8}{12} \times 3.14 \times 983 = 5092$$

$$T = 24{,}750 \times \frac{\text{(262.4 bhp/8 belts)}}{5092} = \frac{24{,}750 \times 32.8}{5092} = 159.4 \text{ lbs}$$

$$F = \frac{159.4 + 25}{16} = 11.5 \text{ lbs}$$

$$\text{Also, } D = \frac{\text{Belt span (inches)}}{64} = \frac{60.9}{64} = .95 =$$

approximately 15/16 inches

Therefore, the belt tensioner should read 11.5 pounds force at 15/16-inch deflection. This will yield 159.4 pounds force belt tension.

Belt tensions determined by using Chart 1 and Table 6 are minimum values. The correct operating tension for a V-belt drive is the lowest tension at which the belts will not slip under start-up or peak load conditions. It may be necessary, however, to increase the tension of some drives to reduce excessive belt flopping.

CAUTION: Do not over-tension the belts. Excessive tension will reduce fan and motor bearing life, accelerate belt wear and possibly cause shaft failure.

Remove the belt guard and clean the sheaves and belts with a dry cloth. Oil and grease should be kept away from the belts because they can cause deterioration and slippage. The use of belt dressing is **not** recommended.

COIL CLEANING

Coils should be kept clean to maintain maximum performance. If fins become dirty, they should be cleaned. Clean steam, hot water and water cooling coils with steam and detergent, hot water spray and detergent, or one of the commercially available chemical coil cleaners. Clean refrigerant coils with cold water and detergent or one of the commercially available chemical coil cleaners. Rinse coils thoroughly after cleaning.

WARNING: DO NOT USE STEAM OR HOT WATER TO CLEAN A REFRIGERANT COIL. IMPROPER APPLICATION OF HEAT MAY RESULT IN PERSONAL INJURY, DEATH OR EQUIPMENT DAMAGE DUE TO HIGH PRESSURE AND EXPLOSION.

COIL WINTERIZATION

Provisions must be made to drain those coils that are not in use when subjected to freezing temperatures.

CAUTION: Failure to properly drain and vent coils when not in use during freezing temperatures may result in coil freeze-up damage.

Coil types N, NS, and A, may be adequately drained in their pitched position in the unit. In coilless units, the coil, after field installation, is not pitched (unless special pitching coil support channel is ordered for steam coils) and may be adequately drained in their position in the unit.

(Type N is drainable through the return connection.) The installer should have provided appropriate piping for adequate drainage.

Type WL coils are not drainable in either pitched or level position. To drain these coils remove the vent and drain plugs and blow the coils out as completely as possible with compressed air. The coils should then be filled and drained several times with full strength glycol so that it will mix thoroughly with the water retained in the coil. Drain the coil out as completely as possible.

Coil types D, DD and K, plus W, P2, P4, P8, DL and LL are drainable in their factory-installed level position. Coil types D, DD, DL and LL also have Trane factory-installed drain and vent connections. See the Installation Manual for illustrated drain and vent connection locations.
Drainable coils installed in units containing coil types DL or LL will also have factory-installed drain and vent connections.

NOTE: *On units with stacked coils, there is a condensate follower located at the end of each coil connection. Figure 11 illustrates the location of the condensate follower provided at the end of the stacked coils.*

NOTE: *Coil type TT is drainable through its supply connection.*

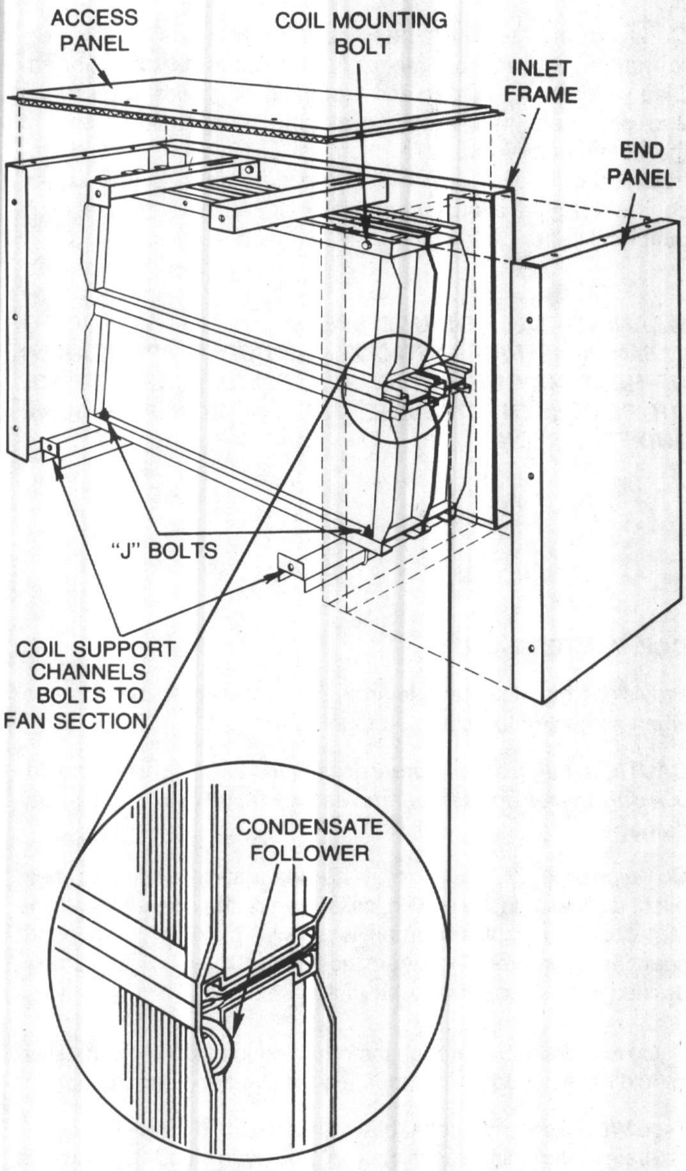


FIGURE 11 - Draw-Thru Coil Section Details with View of Condensate Follower

SPRAY HUMIDIFIER NOZZLE

If lime deposits have developed, clean by soaking the nozzle in an industrial cleaning solution intended for that purpose. Rinse thoroughly with water. Follow the application, safety and cleaning instructions of the industrial cleaner.

MANOMETER CALIBRATION

To check and adjust the calibration of the bag filter or roll filter manometer, complete the following:

1. Make sure the manometer is properly installed on the unit wall within three feet of the filter section. Drain oil from the gauge. Disconnect top tube.
2. Adjust the gauge until the bubble is centered in the spirit level. Tighten the mounting screws and check to be sure that the gauge remained level.
3. Turn the zero-adjust knob counterclockwise until it stops. Then turn it clockwise approximately three full turns so that there is room for adjustment in either direction.
4. Remove the fill plug and pour in needed gauge fluid until the fluid level is visible in the vicinity of zero on the scale. Adjust for exact zero setting with the zero knob and replace the fill plug.

   CAUTION: Use Dwyer red or blue oil only. Other fluids may damage the gauge.

5. Clean the gauge with a soft cloth and soap and water. Rinse carefully.

SPRAYED COIL WATER SYSTEM

To complete the yearly cleaning and check for sprayed coil spray systems, complete the following:

1. Clean the spray tank and the spray pump return line strainer. See Figure 12.
2. Check the spray float valve and pump pressure. Adjust the float so that the water level is 1/2-inch below the overflow pipe.
3. Check that the copper pipe is properly located in the overflow drain and is free of dirt, so that the spray tank water is continually being changed.
4. Clean spray nozzles, if necessary, and check for corrosion. Replace damaged nozzles.

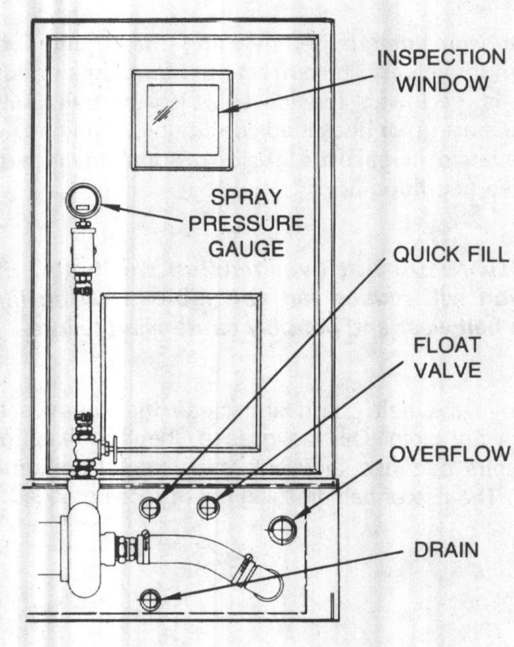


FIGURE 12 - Sprayed Coil Unit Tank Connections

THERMAL EXPANSION VALVE ADJUSTMENT

The importance of proper suction gas superheat cannot be over-emphasized. Accurate superheat measurements should be taken with other trouble analysis procedures to monitor refrigerant flow, coil efficiency and compressor protection. **Refer to compressor or condensing unit service literature for recommended superheat setting.**

Instruments

Because of the importance and sensitivity of superheat measurement and adjustment, the gauges used to measure suction pressure should be of the best quality available. Gauges that are permanently installed on the equipment should not be used. Trane recommends a good quality gauge on a standard refrigerant manifold set. To measure suction temperature, an electronic temperature tester is sufficient.

Measurement

In order to determine suction gas superheat, the pressure at the evaporator outlet must be measured and converted to saturated vapor temperature. Use a Refrigerant-22 pressure temperature conversion chart as given in Table 7 to convert pressure (psig) to temperature (degrees F). The computed saturated vapor temperature is then subtracted from the actual suction temperature, which is also measured on the suction line at the expansion valve sensing bulb location. The difference between these two temperature readings is the suction gas superheat reading.

NOTE: *If a pressure tap is not provided at the thermal expansion valve sensing bulb location, suction pressure may be measured at the compressor, if suction line pressure is added to the compressor pressure reading. Suction pressure at the compressor plus estimated suction line pressure loss equals an estimate of suction pressure at the thermal expansion valve sensing bulb location.*

To determine actual superheat, complete the following:

1. Cut the suction line insulation to gain access to the suction line at the sensing bulb. If Armaflex insulation is used, slit the insulation for the length of the temperature sensor.
2. Clean the line carefully and attach the electronic temperature sensor. Make sure the sensor is making good contact with the tube. Black electrical tape may be used to prevent sensor contact with ambient air.

   NOTE: *For accurate measurement, the temperature sensor* ***must*** *be properly installed and insulated. Make sure that the insulation covers the sensor completely and seal all connections to the pipe to keep ambient air from affecting the temperature readings.*

3. Install the pressure gauge to monitor suction pressure at the expansion valve sensing bulb location. If no pressure tap is provided, install the pressure gauge at the compressor and estimate the suction line pressure loss between the compressor and sensing bulb.
4. Operate the system for approximately 10 to 15 minutes in order for the expansion valve to stabilize.
5. To calculate superheat from pressure and temperature readings, compare the actual vapor temperature of the refrigerant as converted from the suction pressure reading (plus suction line pressure loss, if applicable) to the suction temperature measured by the electronic tester. See the examples given below.

EXAMPLE 1:

SUCTION PRESSURE = 66.0 psig (measured at expansion valve sensing bulb)
SUCTION TEMPERATURE = 52 F
SUCTION PRESSURE CONVERTED TO SATURATED VAPOR TEMPERATURE = 38 F
SUCTION SUPERHEAT = 52-38 = 14 F

EXAMPLE 2:

SUCTION PRESSURE = 65.0 psig (measured at the compressor)
ESTIMATED SUCTION LINE PRESSURE LOSS = 3 psi
TOTAL ESTIMATED SUCTION PRESSURE = 68 psig (at the sensing bulb)
SUCTION TEMPERATURE = 52 F
SUCTION PRESSURE CONVERTED TO SATURATED VAPOR TEMPERATURE = 40 F
SUCTION SUPERHEAT = 52-40 = 12 F

Adjustment

To increase the superheat reading, turn the adjusting stem of the expansion valve to close the valve and to limit the amount of refrigerant flowing into the evaporator. **Adjustment should be made at one-half turn at a time.** To

TABLE 7 - Refrigerant-22 Pressure/Temperature Conversion Chart

TEMPERATURE (DEGREES F)	SUCTION PRESSURE (PSIG)
26	49.9
27	51.2
28	52.4
29	53.6
30	54.9
31	56.2
32	57.5
33	58.8
34	60.1
35	61.5
36	62.8
37	64.2
38	65.6
39	67.1
40	68.5
41	70.0
42	71.4
43	73.0
44	74.5
45	76.0
46	77.6
47	79.2
48	80.8
49	82.4
50	84.0

decrease the superheat reading, increase refrigerant flow to the evaporator. Continue with tests and adjustments, one-half turn at a time, until an acceptable reading is obtained. Allow the system to re-stabilize for 10 minutes after each adjustment.

CAUTION: Incorrect superheat readings may be due to plugged filters or blocked refrigerant flow. Before making major adjustments to the expansion valve, check refrigerant level and filter/driers to ensure proper flow. Blocked filters may cause floodback to the compressor, damaging internal components.

TROUBLE ANALYSIS

SYSTEM CHECK

Before repairing or replacing any Climate Changer unit or component, complete the following simple checks. A trouble analysis chart follows this checklist. For more detailed information on the unit, refer to the Service Guide available through your local Trane Sales Office.

WARNING: DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR INSPECTING THE UNIT. DISCONNECT POWER BEFORE REMOVING OR CONNECTING ELECTRICAL WIRES. ALLOW ALL ROTATING EQUIPMENT TO STOP BEFORE SERVICING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR ENTANGLEMENT IN MOVING PARTS.

- ☐ 1. Electrical power is available to unit.
- ☐ 2. Unit is turned on.
- ☐ 3. Electrical routing and connections are correct. Refer to specific wiring diagrams provided on the unit.
- ☐ 4. Filters are clean and properly positioned.
- ☐ 5. Fan belt is not broken or slipping.
- ☐ 6. Fan sheaves are properly aligned.
- ☐ 7. Fan is not hitting housing or inlet cone.
- ☐ 8. Dampers are not stuck open or closed.
- ☐ 9. Ductwork connections are secure and airtight.
- ☐ 10. Piping has no leaks.
- ☐ 11. Coils are not clogged or frozen.

TROUBLE ANALYSIS CHARTS

Use the tables in this section to assist in identifying the cause or causes of a malfunction in Climate Changer® operation. The column headed RECOMMENDED ACTION will suggest repair procedures.

NOTE: *These tables are intended as a diagnostic aid only. For detailed repair procedures, contact your local Trane Service Company.*

WARNING: DISCONNECT ELECTRICAL POWER BEFORE INSPECTING OR SERVICING THE UNIT AND ALLOW ALL ROTATING EQUIPMENT TO STOP COMPLETELY. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR MOVING PARTS.

CLIMATE CHANGER® TROUBLE ANALYSIS

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED ACTION
Motor fails to start.	Blown fuse or open circuit breaker.	Replace fuse or reset circuit breaker.
	Overload trip.	Check and reset overload.
	Improper wiring or connections.	Check wiring with diagram supplied on unit.
	Improper current supply.	Compare actual supply power with motor nameplate recommendations. Contact power company for adjustments.
	Mechanical failure.	Determine that motor and drive turn freely. Check bearings and lubrication.
	Short-circuited stator.	Indicated by blown fuses. Motor must be rewound.
	One phase of a three-phase motor is open.	Check line for open phase.
	Overloaded motor.	Reduce load or replace with larger motor.

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED ACTION
Motor stalls.	Low line voltage.	Check across AC line. Correct voltage if possible.
	Overloaded motor.	Reduce load or replace with a larger motor.
Motor runs and then dies down.	Partial loss of line voltage.	Check for loose connections. Determine adequacy of main power supply.
	Stator shorts when motor warms up.	Replace stator.
Motor does not come up to speed.	Low voltage at motor terminals.	Check across AC line and correct voltage loss if possible.
	Line wiring to motor too small.	Replace with larger sized wiring.
	60 cycle motor connected to 50 cycle supply.	Replace with a 50 cycle motor.
Motor overheats.	Overloaded motor.	Reduce load or replace with a larger motor.
	Motor fan is clogged with dirt, preventing proper ventilation.	Remove fan cover, clean fan and replace cover.
	Three-phase motor has one phase open.	Check wiring. Secure all connections.
	Improper line voltage.	Check across AC line. Consult power company. Step transformer may be necessary.
	Worn bearings.	Replace bearings and seals.
Excessive motor noise.	Motor mounting bolts loose.	Tighten motor mounting bolts.
	Rigid coupling connections.	Replace with flexible connections.
	Worn motor bearings.	Replace bearings and seals.
	Fan rubbing on fan cover.	Remove interference in fan housing.
Rapid motor bearing wear.	Excessive overhung load due to over-tensioned drive.	Check belt tension and overhung load.
	Excessive overhung load due to a small diameter motor sheave.	Replace sheave with larger one.
Loose fan belt.	Motor is poorly positioned.	Adjust tension.
	Worn or damaged belt.	Replace belt or belt set. Check sheave alignment.
	Worn sheaves.	Replace sheaves.
Short belt life.	Worn sheaves.	Replace sheaves.
	Misaligned belt.	Realign drive with MVP sheave set at mean pitch diameter.
	Grease or oil on belts.	Check for leaky bearings. Clean belts and sheaves.
	Belt slipping.	Adjust tension.
	Belts rubbing.	Remove obstruction or realign drive for clearance.
	High ambient temperature.	Provide ventilation. Shield belts. Use gripnotch belts.

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED ACTION
Low coil capacity. (CHILLED WATER)	Air is bypassing coil.	Prevent bypass with blockoffs.
	Coil tubes are blocked.	Clean and unblock tubes.
	Incorrect airflow.	Check fan operating conditions.
	Incorrect gpm.	Check water pumps, valves and lines for obstructions.
	Incorrect water temperature.	Provide proper water temperature.
Low coil capacity. (REFRIGERANT)	Air is bypassing coil.	Prevent bypass with blockoffs.
	Coil tubes are blocked.	Clean and unblock tubes.
	Incorrect airflow.	Check fan operating conditions.
	Expansion valve not operating.	Check sensing bulb location and TEV operation.
	Poor refrigerant distribution.	Check for blockage in distributor and tubes.
Low coil capacity. (STEAM)	Air is bypassing coil.	Prevent bypass with blockoffs.
	Tubes are blocked.	Clean and unblock tubes.
	Incorrect airflow.	Check fan operating conditions.
	Incorrect steam pressure.	Adjust pressure supply.
Fan does not operate.	Electrical.	Check fuses, electrical on-off switch, overload protector and voltage output.
	Mechanical.	Look for broken belts or loose pulleys. Make sure the fan blades are not stopped or obstructed by the fan housing.
Noisy fan.	Fan hitting inlet cone, cutoff, or housing.	Center fan in inlet cone. Secure cutoff in housing. Secure fan on shaft. Repair or replace damaged parts.
	Drive belts not operating properly.	Adjust belt tension. Check for matched set. Replace worn or broken belts and clean oily or dirty belts.
Bearing is excessively hot.	First start after relubrication. (grease distribution)	Allow machine to cool down and restart.
	Over-lubrication.	Clean surface of grease and purge.
	No lubricant.	Apply lubricant. Check bearings for damage.
	Excessive load or speed.	Replace with a larger bearing.
	Misaligned bearing.	Correct alignment. Check shaft level.

For further information on this product or other Trane products, refer to the "Trane Service Literature Catalog", ordering number IDX-IOM-1. This catalog contains listings and prices for all service literature sold by Trane. The catalog may be ordered by sending a $20.00 check to: The Trane Company, Service Literature Sales, 3600 Pammel Creek Road, La Crosse, WI 54601.

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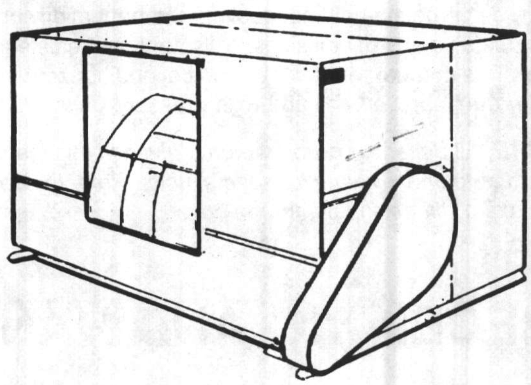
Installation CLCH-IN-3A

Library	Service Literature
Product Section	Air Handling
Product	Central Station Air Handlers
Model	Climate Changers
Literature Type	Installation
Sequence	3A
Date	August 1986
File No.	SV-AH-CLCH-CLCH-IN-3A-886
Supersedes	CLCH-IN-3 (186)

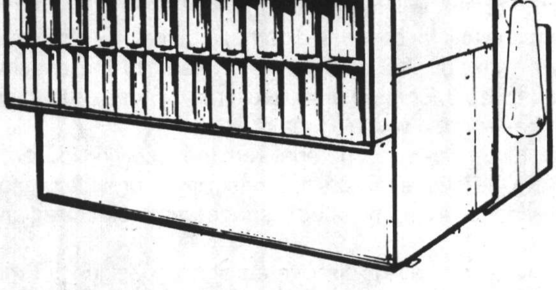
CLIMATE CHANGER® CENTRAL STATION AIR HANDLERS

DRAW-THRU, BLOW-THRU SPRAYED COIL AND HIGH PRESSURE UNITS

B DEVELOPMENT SEQUENCE



DRAW-THRU



BLOW-THRU

X39640290-02

The Trane Company
La Crosse, Wisconsin 54601-7599
Printed in U.S.A.

Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

TABLE OF CONTENTS

Literature Change History:

CLCH-IM-10 (June 81)

Introduce infinity variable fin series. Change design sequence to "C".

CLCH-IN-2 (August 84)

Change bearing type (opposite drive side) on unit sizes 17 thru 31 w/stub shaft. Include weights for units with wide coils. Specific instructions for units shipping with optional coilless. Convert CLCH-IM-10C into separate Installation and Maintenance Manuals (CLCH-IN-2 & CLCH-M-1). Change design sequence to "D".

CLCH-IN-3 (January 1986)

Added level coils and Delta-Flo coils to units. Added cradle dimensions for wide coil unit sizes 3 thru 31. Added and updated Tables (4, 8A and 12). Change design sequence to "E".

CLCH-IN-3A (August 1986)

Corrected Figure 49.

GENERAL INFORMATION

Central Station Climate Changers® are air handlers designed to provide complete heating, cooling and dehumidifying by means of a wide variety of unit sizes, coils, fans and efficiency capabilities. This manual will cover all vertical and horizontal, draw-thru, blow-thru, sprayed coil and high pressure units.

NOTE: *All dimensions and weights given in this manual are approximate and will vary for special units. Refer to submittal data for exact dimensional information.*

An Installation Checklist is given at the end of the Installation section of this manual to be used by the installing contractor to verify proper installation procedures. These checklists should not be substituted for the detailed information and procedures contained in appropriate sections of the manual.

RECEIVING AND HANDLING

SHIPPING

Central Station Climate Changers® are shipped either assembled or in sections, depending on unit size and accessories. All units or sections of units are attached securely to skids. Nuts, bolts and washers necessary for unit assembly are attached to one of the skids. Motors ship separately when their size or location on the unit prevents safe transit. Access section is shipped unassembled.

To protect against loss from in-transit damage, complete the following upon receipt of the unit:

1. Inspect individual pieces of the shipment before accepting it. Check for rattles, bent corners on cartons or other visible indications of shipping damage.
2. If a carton or unit has apparent damage, open it immediately and inspect the contents before accepting the unit. Do not refuse the shipment. Make specific notations concerning the damage on the freight bill.
3. Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Refer to the checklist given in step 8 for internal inspections. Concealed damage must be reported within 15 days.
4. Do not move damaged material from the receiving location if possible. It is the receiver's responsibility to provide reasonable evidence that concealed damage was not incurred after delivery.
5. If concealed damage is discovered, stop unpacking the shipment. Retain all internal packing, cartons and crates. Take photos of the damaged material if possible.
6. Notify the carrier's terminal of the damage immediately by phone and mail. Request an immediate joint inspection of the damage by the carrier and consignee.
7. Notify the Trane sales representative of the damage and ar-

range for repair. Do not repair the unit, however, until damage is inspected by the carrier's representative. Trane is not responsible for shipping damage.

8. Complete the following inspections before installing the unit:
   a. Verify that the correct unit has been received by comparing nameplate and model number information with submittal data.
   b. Rotate the fan manually to be sure that it is free to operate. Inspect the fan housing for obstructions which may have entered the unit during shipment.
   c. Check all dampers in the unit and accessories to be sure they are free to move and have not been damaged in transit.
   d. Make sure the inlet vanes operate freely. Check that all sets of vanes operate together when opening and closing.

Refer to the Unit Location Recommendations in this manual before setting the unit in place. It is recommended that units are left on their skids for protection and ease of handling until set in place. For proper rigging and hoisting procedures, refer to the Rigging section of this manual and the instruction label on the unit.

RIGGING

Before preparing the unit or component for lifting, estimate the approximate center of gravity for lifting safety. Because of placement of internal components, the unit weight may be unevenly distributed, with more weight in the coil area. Approximate unit weights are given in Tables 1, 2 and 3.

Before hoisting the unit, be sure that the proper method of rigging is used, with straps or slings and spreader bars for protection during lifting. See Figure 1. Refer to the unit label for recommended rigging procedures. Always test-lift the unit to determine exact unit balance and stability before hoisting it to the installation location.

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

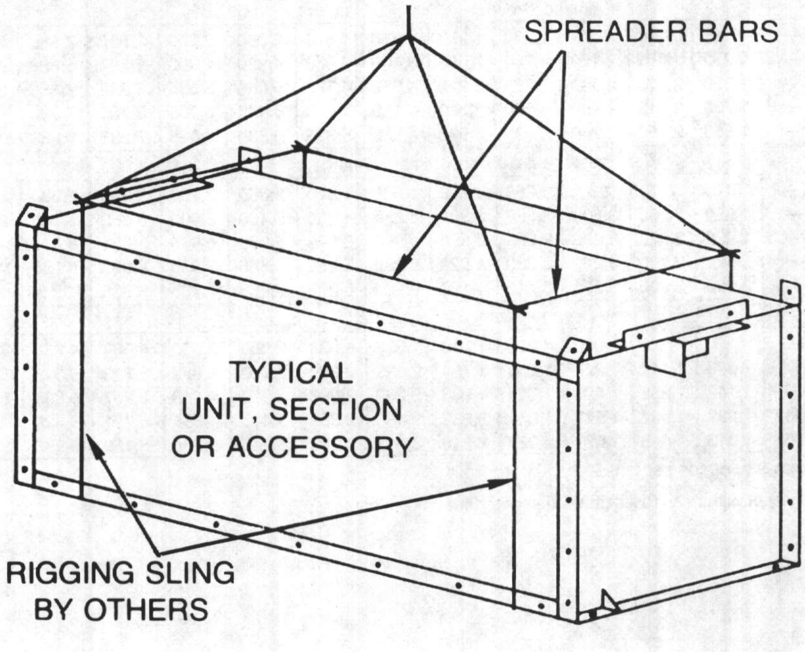


FIGURE 1 - Recommended Rigging Procedure

TABLE 1 - Climate Changer Unit Operating Weights In Pounds (Less Motors)

	UNIT SIZE															
	3	6	8	10	12	14	17	21	25	31	35	41	50	63	73	86
Draw-Thru Climate Changers																
Casing Only	205	275	400	460	700	750	1,015	1,225	1,380	1,455	2,100	2,540	2,750	4,270	4,710	5,030
2 Row	291	424	570	677	978	1,060	1,429	1,639	1,850	2,117	2,832	3,558	,3708	5,529	5,850	6,390
4 Row	328	487	657	785	1,108	1,213	1,618	1,876	2,219	2,453	3,198	3,797	4,260	6,218	6,710	7,420
6 Row	368	552	742	891	1,243	1,369	1,807	2,018	2,381	2,813	3,616	4,261	4,794	6,929	7,560	8,440
8 Row	406	618	828	988	1,373	1,520	1,981	2,321	2,643	3,143	3,984	4,699	5,330	7,611	8,320	9,330
Draw-Thru Climate Changer w/Wide Coil																
Casing Only	225	295	425	490	730	780	1045	1260	1415	1505	2190	2715	2950	4845	4850	5170
With 2 Row	365	495	665	779	1089	1166	1535	1738	1951	2262	3041	3959	4121	5781	6157	6697
With 4 Row	426	579	788	922	1257	1357	1759	2005	2372	2647	3467	4251	4796	6578	7142	7854
With 6 Row	491	666	908	1063	1431	1552	1982	2246	2557	3058	3953	4818	5448	7401	8117	9448
With 8 Row	553	754	1030	1192	1599	1740	2188	2526	2856	3436	4381	5354	6103	8190	8988	9998
Blow-Thru Climate Changers																
Casing Only	—	605	765	810	880	1,095	1,260	1,425	1,600	1,810	3,250	3,650	4,025	4,580	5,030	5,530
2 Row	—	754	935	1,027	1,158	1,405	1,614	1,839	2,070	2,472	3,982	4,463	4,983	5,839	6,436	7,142
4 Row	—	817	1,022	1,135	1,288	1,558	1,803	2,070	2,339	2,808	4,348	4,907	5,535	6,528	7,240	8,114
6 Row	—	882	1,107	1,241	1,423	1,714	1,992	2,298	2,609	3,168	4,766	5,367	6,069	7,239	8,018	9,046
8 Row	—	948	1,193	1,338	1,553	1,865	2,166	2,521	2,863	3,498	5,134	5,809	6,605	7.921	8,824	9.998
Single-Zone Blow-Thru Climate Changers																
Casing Only	—	386	544	631	760	900	1,080	1,235	1,370	1,560	2,780	3,115	3,435	4,425	4,870	5,280
2 Row	—	535	714	848	1,038	1,210	1,434	1,629	1,840	2,222	3,512	3,928	4,393	5,684	6,276	6,892
4 Row	—	598	801	956	1,168	1,363	1,623	1,860	2,109	2,558	3,878	4,372	4,945	6,373	7,080	7,864
6 Row	—	663	886	1,062	1,303	1,519	1,812	2,088	2,379	2,918	4,296	4,832	5,479	7,084	7,858	8,796
8 Row	—	729	972	1,159	1,473	1,670	1,986	2,311	2,673	3,248	4,664	5,274	6,015	7,766	8,664	9,748
Sprayed Coil Climate Changers																
Casing Only	690	915	1,105	1,270	1,880	2,130	3,100	3,285	3,305	3,485	4,950	5,700	6,230	9,050	10,485	12,355
4 Row	815	1,125	1,360	1,595	2,290	2,595	3,745	4,125	4,145	4,485	6,050	6,950	7,740	10,100	11,700	13,787
6 Row	855	1,190	1,445	1,700	2,425	2,750	3,925	4,285	4,305	4,855	6,465	7,420	8,275	11,710	13,560	15,985
8 Row	890	1,260	1,535	1,800	2,555	2,900	4,195	4,550	4,570	5,175	6,835	7,860	8,810	12,390	14,355	16,910
High Pressure Sprayed Coil Climate Changers																
Casing Only	—	—	1,590	2,130	2,500	2,670	3,210	3,840	4,350	5,100	5,350	6,000	7,200	9,400	12,250	14,910
4 Row	—	—	1,845	2,455	2,910	3,135	3,755	4,485	5,190	6,100	6,450	7,250	8,710	11,350	14,250	17,300
6 Row	—	—	1,930	2,560	3,045	3,290	3,940	4,665	5,350	6,460	6,865	7,720	9,245	12,060	15,100	18,320
8 Row	—	—	2,020	2,660	3,175	3,440	4,115	4,935	5,615	8,790	7,235	8,160	9,780	12,740	15,950	19,210
High Pressure Draw-Thru Climate Changers																
Fan Section Only	—	—	610	770	920	1,060	1,290	1,580	1,870	2,060	2,200	2,330	2,580	2,950	4,090	5,400
Fan and Coil Section	—	—	1,250	1,800	2,150	2,250	2,650	3,400	3,950	4,250	4,600	5,250	5,650	6,850	8,260	10,400
4 Row	—	—	1,590	2,170	2,440	2,765	3,210	4,010	4,795	5,055	5,535	6,335	7,180	8,600	10,260	12,790
6 Row	—	—	1,720	2,310	2,690	3,030	3,370	4,180	4,930	5,445	5,935	6,785	7,930	9,350	11,110	13,810
8 Row	—	—	1,850	2,450	2,740	3,095	3,530	4,350	5,325	5,835	6,335	7,235	8,680	10,000	11,960	14,700
High Pressure Blow-Thru Climate Changers																
Fan Section Only	—	—	610	770	920	1,060	1,290	1,580	1,870	2,060	2,200	2,330	2,580	2,950	4,090	5,400
Fan and Coil Section	—	—	1,650	2,250	2,600	2,850	3,300	4,250	4,850	5,400	6,000	6,850	7,300	9,300	12,140	14,900
4 Row	—	—	1,990	2,620	2,900	3,365	3,860	4,860	5,595	6,205	6,935	7,935	8,830	11,050	14,140	17,290
6 Row	—	—	2,120	2,760	3,240	3,630	4,020	5,030	5,860	6,595	7,335	8,385	9,580	11,800	14,990	18,310
8 Row	—	—	2,250	2,900	3,290	3,745	4,180	5,200	6,225	6,985	7,735	8,835	10,180	12,450	15,840	19,200
Three Deck Multizone Climate Changers																
Casing Only	—	725	885	930	1,000	1,255	1,440	1,615	1,830	2,060	3,350	4,000	4,385	4,950	—	—
2 Row	—	874	1,055	1,147	1,278	1,560	1,794	2,029	2,300	2,722	4,082	4,813	5,343	6,219	—	—
4 Row	—	937	1,142	1,255	1,408	1,718	1,983	2,260	2,669	3,058	4,448	5,257	5,895	6,908	—	—
6 Row	—	1,002	1,227	1,361	1,543	1,874	2,232	2,488	2,839	3,418	4,866	5,721	6,429	7,609	—	—
8 Row	—	1,068	1,313	1,458	1,673	2,025	2,346	2,711	3,093	3,748	5,234	6,159	6,965	8,291	—	—

NOTE: Inlet vane weights will vary from 38 to 93 pounds per fan.

NOTE: Units with Delta-Flo coils will weigh approximately 10% lighter than standard coil weights.

TABLE 2 - Approximate Motor Weights*

Motor Horsepower	¼	⅓	½	1	1½	2	3	5	7½	10	15	20	25	30	40	50	60	75
Motor Weight (Lbs.)	20	20	25	33	44	44	71	82	127	144	187	214	263	300	409	460	560	660

*Standard Open Ball Bearing T-Frame Motor.

TABLE 3 - Accessory Weights (LBS.)

UNIT SIZES	3	6	7	8	9	10	12	14	17	21	25	31	35	41	50	63	73	86
Flat Filter Box																		
Throwaway	28	38	42	45	54	68	73	76	92	113	120	135	170	180	210	335	388	457
Low Velocity Permanent	33	47	52	56	67	84	91	97	117	145	155	183	222	234	284	426	494	582
High Velocity Permanent	51	63	69	75	91	108	120	131	156	193	207	257	306	338	365	582	674	794
Medium Filter Box																		
Throwaway	76	101	131	144	167	171	178	228	247	303	324	355	370	456	520	565	655	775
Low Velocity Permanent	84	117	149	162	191	195	204	260	284	348	373	413	429	546	631	695	805	950
High Velocity Permanent	96	141	181	190	227	231	248	312	347	428	456	513	557	706	799	935	1,085	1,275
High Capacity Box																		
Throwaway	111	148	155	170	180	192	229	260	278	330	398	425	470	535	590	680	788	928
Low Velocity Permanent	120	166	184	194	208	223	261	305	324	393	468	512	574	660	735	865	1,002	1,180
High Velocity Permanent	136	198	217	230	257	271	317	360	396	489	576	648	742	852	950	1,160	1,344	1,583
Roll Filter	80	114	—	142	—	158	187	204	219	250	290	363	430	475	500	750	870	1,025
Comb. Filt./Mix Box																		
Throwaway	115	168	200	248	255	286	300	215	358	400	490	620	710	790	885	1,133	1,310	,550
Low Velocity Permanent	122	184	217	266	279	310	324	345	393	441	540	686	780	874	997	1,165	1,465	1,730
High Velocity Permanent	134	208	249	298	315	346	368	397	456	521	635	786	906	1,035	1,265	1,505	1,740	2,060
Deluxe Comb. Filter/Mix Box																		
Throwaway	193	240	263	352	369	376	407	474	501	586	604	732	986	—	—	—	—	—
Low Velocity Permanent	200	256	280	370	393	400	431	504	536	627	654	798	1,056	—	—	—	—	—
High Velocity Permanent	212	280	312	402	429	436	475	556	600	707	739	898	1,182	—	—	—	—	—
Mixing Box	82	118	122	169	175	182	256	270	319	340	380	437	519	623	750	869	1,010	1,185
High Efficiency Bag Filter																		
Filter Sections	—	—	—	191	—	227	249	319	329	403	454	592	606	682	718	751	—	—
Bag Filters	—	—	—	11	—	14	18	23	25	30	41	50	64	64	75	100	—	—
Prefilters	—	—	—	2	—	3	4	5	5	6	9	11	13	13	17	22	—	—
*Diffuser Section	—	—	—	55	—	79	84	88	107	130	138	153	191	202	232	357	—	—
External Face and Bypass	40	58	79	96	100	112	154	161	170	216	292	417	457	470	618	925	1,070	1,265
Internal Face and Bypass	30	53	74	77	92	100	109	113	124	184	223	327	334	363	441	535	620	730
Face Dampers	39	55	65	91	102	106	111	115	142	225	232	297	312	370	446	543	630	742
Straight Thru Discharge Plenum	50	65	90	100	130	110	130	150	170	180	200	300	400	400	—	—	—	—

*Weight given is sum of diffuser section, duct extension and canvas duct.

INSTALLATION

UNIT LOCATION RECOMMENDATIONS

When selecting and preparing the unit operating site, consider the following:

1. Consider the weight of the unit. Tables 1, 2 and 3 list operating weights.
2. Allow sufficient space for the recommended clearances, access panel removal, and maintenance access. Refer to Figure 2. Zero clearance to combustible materials is approved for units with or without steam or hot water heating coils.
   NOTE: *For units with optional wide coil, always maintain a 2-foot clearance from coil section end panel to permanent wall or obstruction.*
3. The foundation or mounting platform must be large enough to include unit and accessory dimensions, given in specific sales submittals.
4. Rubber-in-shear or spring isolators are recommended. For floor-mounted units, anchor the unit to the floor or foundation to prevent strains on the piping and ductwork.
5. Installer must provide suspension or support frame for ceiling-mounted units size 35 and larger. Use the weights given in Tables 1, 2 and 3.
6. Prepare the floor or foundation so that it is level. The unit must be mounted level to ensure proper hydronic coil drainage and condensate flow.
7. Coil piping and condensate drain requirements must be considered. For units with Type F cooling coils, the installer must provide and install a condensing unit and piping. Allow room for proper ductwork and electrical connections. Support all piping and ductwork independently of unit to prevent excess noise and vibration.
8. Optional coilless horizontal draw-thru unit sizes 3, 6, 8, 10, 14 and 21 require the contractor to field install coil in unit per COIL INSTALLATION INSTRUCTIONS given in the installation manual (included with coil shipment). On ceiling-mounted unit applications it is recommended to install coil in unit **before** hoisting unit to operating position.

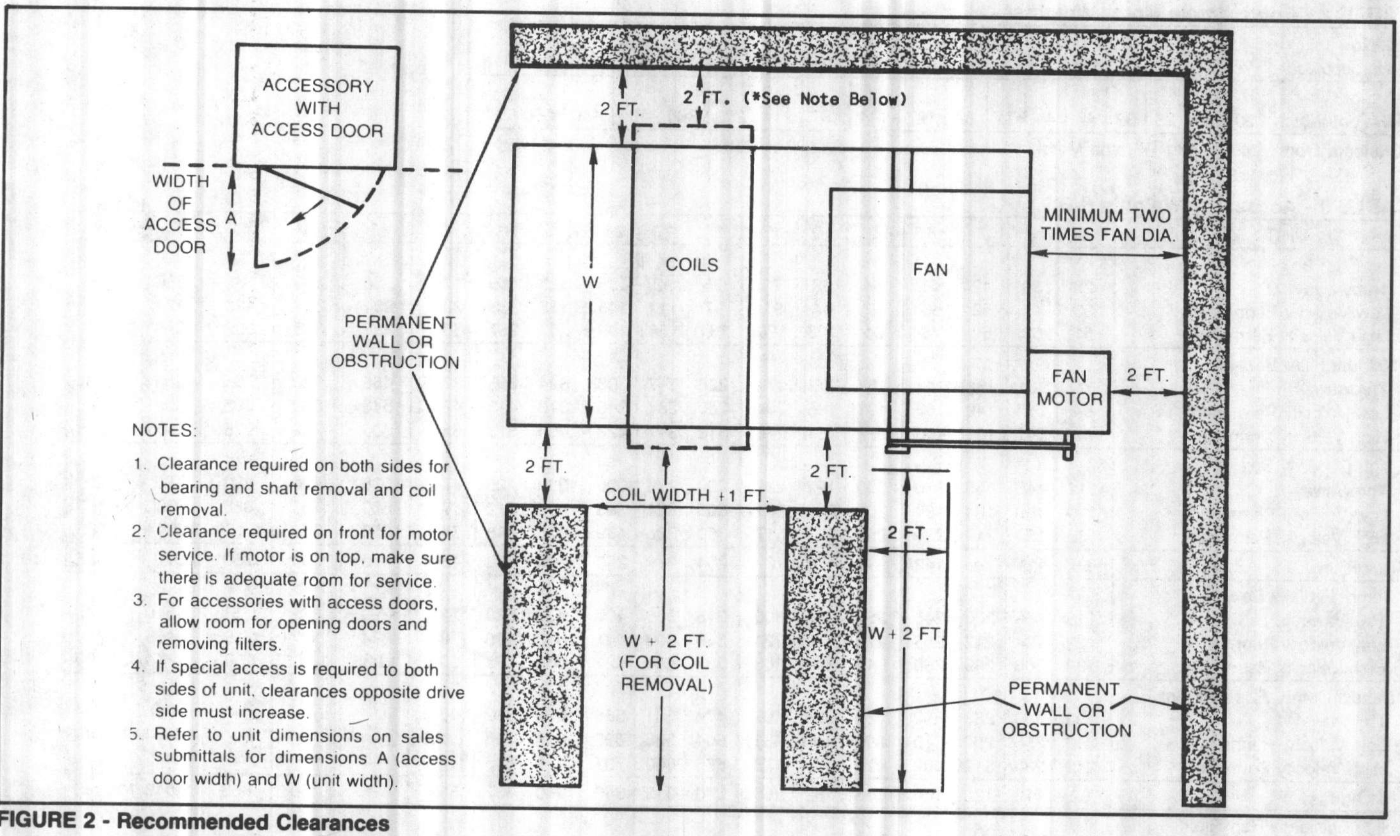


FIGURE 2 - Recommended Clearances

*NOTE FOR WIDE COIL UNITS: Always maintain a 2-foot clearance from coil section end panel to permanent wall or obstruction.

MOUNTING

VIBRATION ISOLATORS

Vibration isolators and isolator mounting legs, when supplied, are shipped with the unit and attached to the shipping skid. Locate the mounting legs at all corners of the unit or component section or at appropriate support sites. Fasten the isolators to the floor securely before mounting the unit. See Figure 3.

NOTE: *If mounting the unit on a raised platform or foundation, be sure to allow room for the mounting legs and isolators, which extend beyond the unit dimensions.*

Level the unit after installation by adjusting the isolator levelling bolts. For ceiling-mounted units, use threaded rods or adjustable isolators to level the unit.

Be sure to consider the additional unit height if isolators are used when making duct, piping and electrical connections. For large Draw-Thru and Sprayed Coil units, the coil section must be mounted on a higher base than the fan section in order to compensate for the height of the fan section isolators.

NOTE: *Non-Trane isolators must be properly sized to ensure adequate support of the unit. Allow at least 20 percent weight addition when sizing isolators.*

If using spring-type isolators, the isolator levelling bolt must be adjusted to provide adequate isolation, as unit weight may cause the upper isolator housing to rest on the lower housing. See Figure 4. Clearance B must be between 1/4-inch and 1/2-inch under full unit weight. To increase the clearance, lift the unit off the mountings and turn the levelling bolt clockwise. Recheck the unit level and shim as necessary under the isolators.

After the isolator height is adjusted correctly, adjust the horizontal snubber bolt to minimize any horizontal movements.

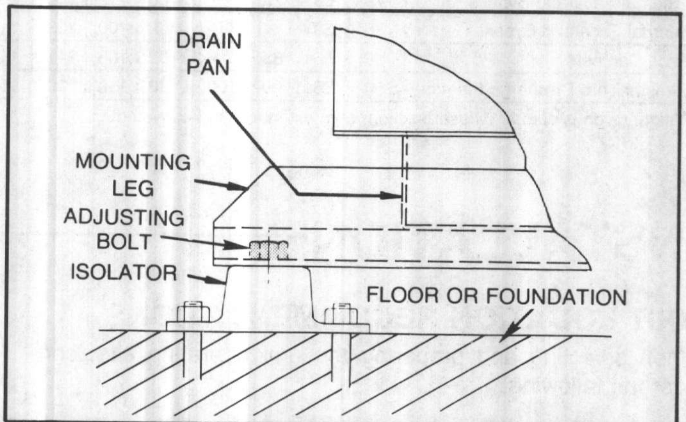


FIGURE 3 - Anchoring the Unit

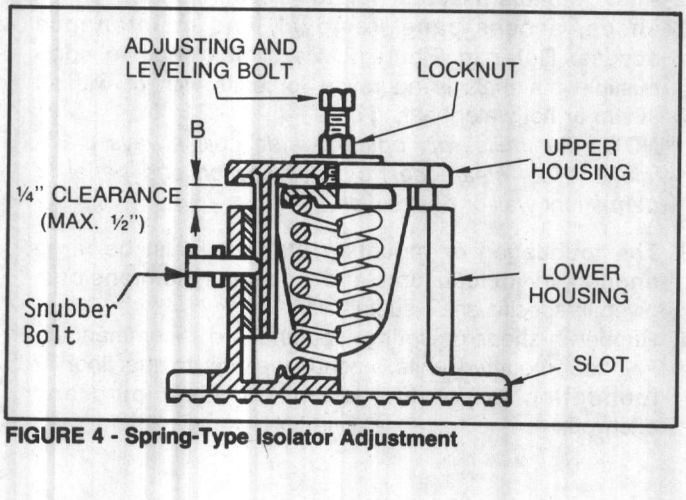


FIGURE 4 - Spring-Type Isolator Adjustment

MOUNTING — CLIMATE CHANGER AIR HANDLERS

DRAW-THRU UNITS

NOTE: No draw-thru units and or accessories have factory gasketed panels or drain pan gasketing unless specified on the order.

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL, DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

NOTE: *On certain horizontal draw-thru units that ship from the factory in sections, a splash angle must be field installed connecting the coil section to the fan section. See Figure 9. The following units apply,*

- Horizontal D. T. Unit size 50 (with back vertical discharge).

- Horizontal D. T. Unit Size 63 (with front or back vertical discharge).

- Horizontal D. T. Unit size 63 (with extra length casing).

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

Floor-Mounted — Horizontal Unit Sizes 3-50 and Vertical Unit Sizes 3-31. Ship from factory as one assembly (Fan Section, Coil Section and Drain Pan).

NOTE: *For optional coilless horizontal draw-thru units (size 3, 6, 8, 10, 14 and 21) refer to COIL INSTALLATION INSTRUCTIONS given in the installation manual to properly install coil in unit.*

1. Remove the diagonal shipping angles which secure coil(s) if they interfere with the use of access doors.
2. Attach accessories, if used. Gasketing not provided unless specified on sales order.
3. Anchor the isolators to the floor and mount the unit on the isolators. See Figure 3. For some applications it may be necessary to shorten the isolator adjusting bolt to properly secure unit to isolator.
4. Level the unit for proper coil drainage and condensate removal from the drain pan.
5. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.
6. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight. Refer to the "Start-Up" section of the maintenance manual.

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

Floor-Mounted — Horizontal Unit Sizes 63-86 and Vertical Unit Sizes 35-50. Ship from factory in 2 sections, (fan section and coil section).

NOTE: *On certain horizontal draw-thru units that ship from the factory in sections, a splash angle must be field installed connecting the coil section to the fan section. See Figure 9. The following units apply,*

- Horizontal D. T. Unit size 50 (with back vertical discharge).

- Horizontal D. T. Unit Size 63 (with front or back vertical discharge).

- Horizontal D. T. Unit size 63 (with extra length casing).

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

1. Remove the diagonal shipping angles which secure coil(s) if they interfere with the use of access doors.
2. Fasten isolators to floor.
3. Horizontal Units Size 63 — To assemble multi-section horizontal units, remove the drain pan from the coil section discharge flange and set in place. Then set the fan and coil sections on the drain pan, as shown in Figure 5. Bolt the sections together, attach gasketing if supplied. Make sure that the coil section support channels are also attached to the fan section. Mount assembled unit on isolators and fasten unit to isolators.
4. Horizontal Units Size 73 and 86 — To assemble unit, mount the fan section on the isolators and fasten. Attach flexible connector to the fan section. Then fasten the splash guard to the fan section. See Figure 8. Mount the coil section on the base with the required distance between fan and coil sections. See Figure 7. Each fan section and coil section have separate factory assembled drain pans. Each drain pan must be trapped separately.

NOTE: *Coil section base is provided by the installer. Height of coil section base should be equal to working height of fan section isolators. Be sure the base is high enough to allow room for a piping trap. See Figure 7. Refer to drain trap sketches in piping section.*

Attach flexible connection to the coil section.

Fasten splash guard to coil section. Panel removal may be necessary to attach splash guard to coil section on size 86 units.

5. Vertical Units Size 35-50 — To assemble multi-section vertical discharge units, attach the fan section to the top of coil section. Removal of front panel on coil section is necessary to assemble fan section. Install gasketing if supplied. Drain pan is factory assembled to coil section. Mount assembled unit on isolators and fasten unit to isolators. See Figure 6.
6. Attach accessories, if used. Gasketing not provided unless specified on sales order.
7. Level the unit, fan and or coil sections to assure proper coil drainage and removal of condensate from the drain pan.

8. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.
9. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

Floor-Mounted — Horizontal and Vertical Spray Coil Unit Sizes 3-31. Ship from factory as one assembly (Fan Section, Coil Section and Drain Pan).

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

NOTE: *The complete spray section is gasketed on all vertical and horizontal sizes. Also, the factory installs a gasket at the joint between the spray section and coil section.*

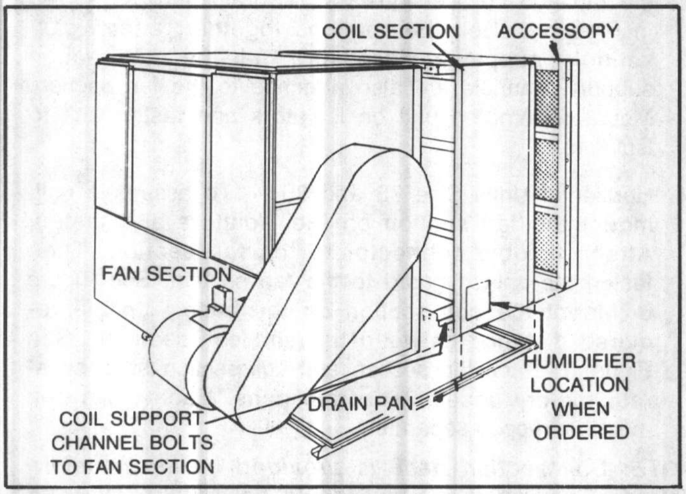


FIGURE 5 - Exploded View of the Horizontal Draw-Thru Unit Size 63

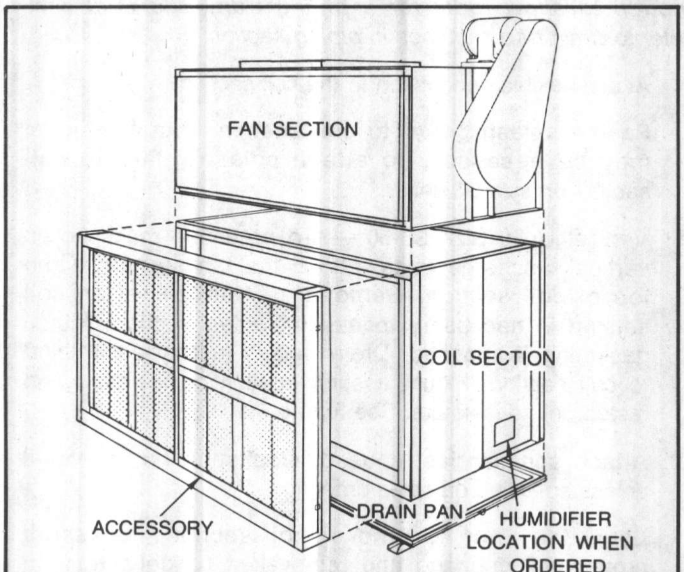
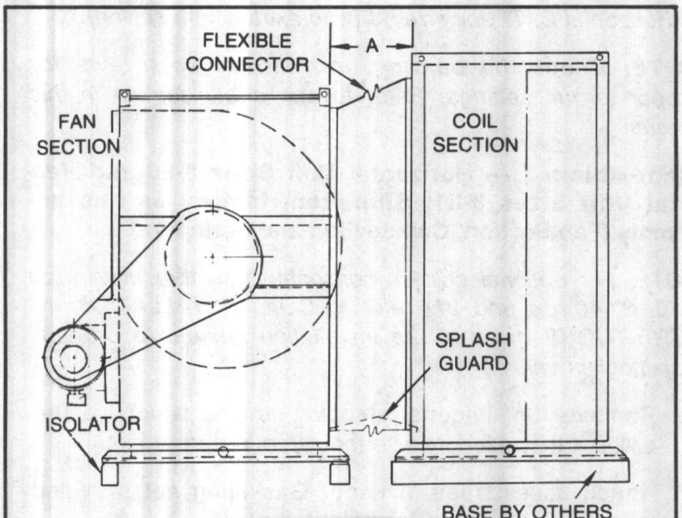


FIGURE 6 - Exploded View of the Vertical Draw-Thru Unit Sizes 35 through 50

NOTE: *Check the bearing, and sheave setscrews for proper torque settings. Refer to Applicable section in this manual.*

1. Remove the diagonal shipping angles which secure coil(s) if they interfere with the use of access doors.
2. Attach accessories, if used. Gasketing not provided unless specified on sales order.
3. Anchor the isolators to the floor and mount the unit on the isolators. See Figure 3. For some applications it may be necessary to shorten the adjusting bolt to properly secure unit to isolator.
4. Level the unit for proper coil drainage and condensate removal from the drain pan. On horizontal units the drain pan empties back into the sump.
5. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.
6. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight. Refer to the "Start-Up" section of this manual.



UNIT SIZE	A
73	9"
86	24"

FIGURE 7 - Mounting Clearance Dimensions for Draw-Thru Units Sizes 73-86

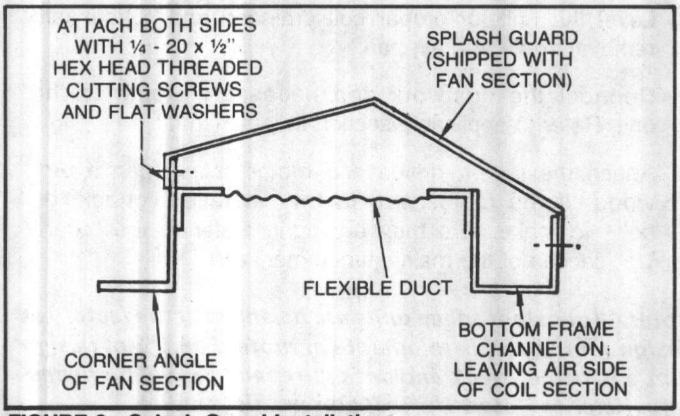


FIGURE 8 - Splash Guard Installation

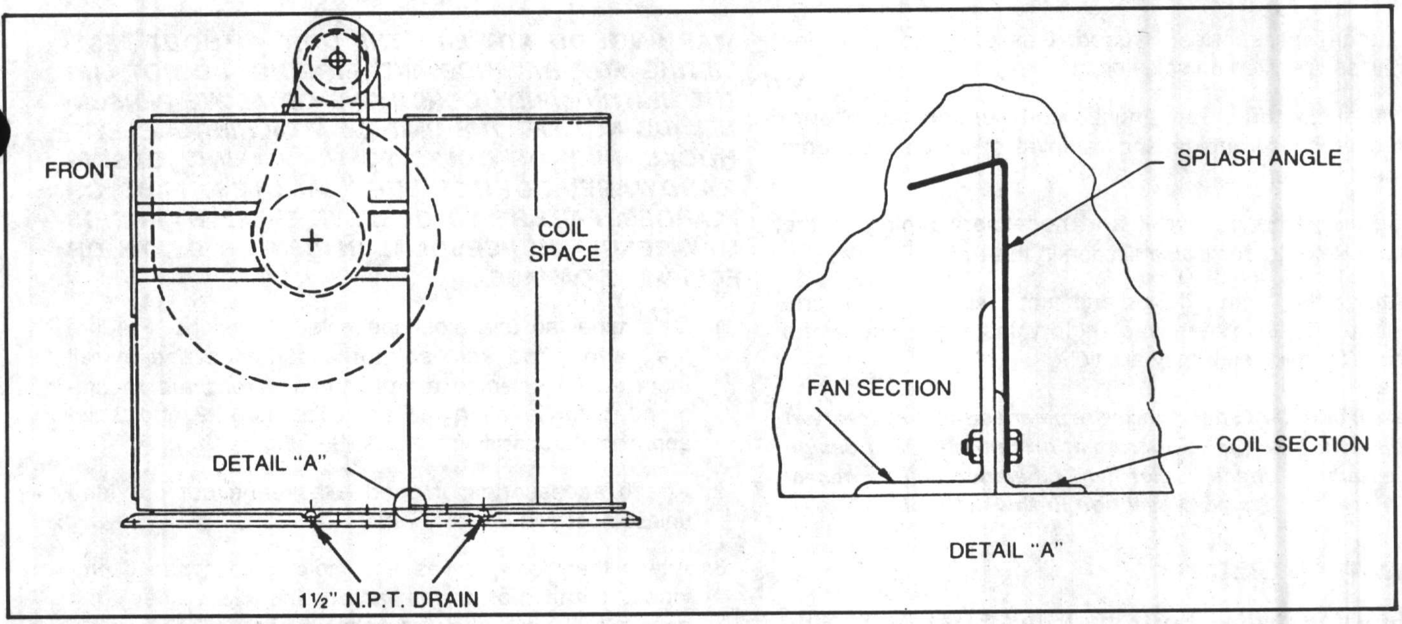


FIGURE 9 - Splash Angle Installation

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

Floor-Mounted — Vertical Spray Coil Unit Sizes 35-50 ship from factory in 2 sections (fan section, coil section). Horizontal Spray Coil Unit Sizes 35-63 ship from factory in 3 sections (coil section, fan section, fan drain pan section). Horizontal Spray Coil Unit Sizes 73-86 ship from factory in 2 sections (fan section, coil section).

Note: The complete spray section is gasketed on all vertical and horizontal sizes. Also, the factory installs a gasket at the joint between the spray section and coil section.

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Remove the diagonal shipping angles which secure coil(s) if they interfere with the use of access doors.
2. Fasten isolators to floor.
3. Horizontal Units Size 35-63 — Attach the spray section to isolators. Fasten the two mounting legs to the fan section drain pan. Set the fan section on the drain pan and bolt in place. Attach the drain pan and fan section to the spray section. See Figure 10.
4. Horizontal Units Size 73 and 86 — To assemble unit, mount the fan section on the isolators and fasten. Attach flexible connector to the fan section. Mount the coil section on the base with the required distance between fan and coil sections. See Figure 7. Drain pan is factory assembled to each section.

NOTE: *Coil section base is provided by the installer. Height of coil section base should be equal to working height of fan section isolators. Be sure the base is high enough to allow room for a piping trap. See Figure 7. Refer to drain trap sketches in piping section.*

Attach flexible connection to the coil section.

5. Vertical Units Size 35-50 — Set the spray section over the isolators and bolt together. Place the fan section on top of the coil section and bolt together. Gasketing not provided between fan section and coil section unless specified on the sales order. Drain pan (sump assembly) is factory assembled to spray coil section.

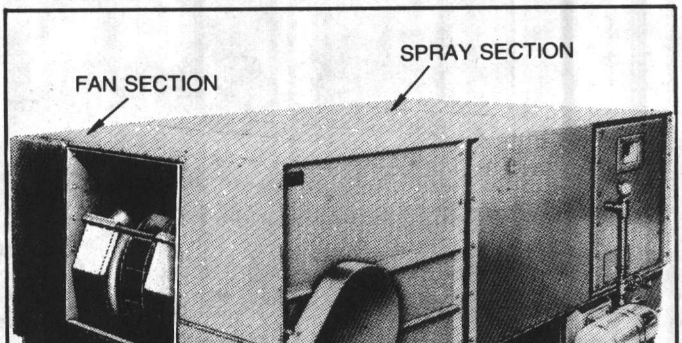


FIGURE 10 - Typical Horizontal Sprayed Coil Climate Changer

6. Attach accessories, if used. Gasketing not provided unless specified on sales order.
7. Level the unit, fan and or coil sections to assure proper coil drainage and removal of condensate from the drain pan.
8. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.
9. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

DRAW-THRU UNITS

Ceiling-Mounted — Horizontal Unit Sizes 3-31. Ship from factory as one assembly (Fan Section, Coil Section and Drain Pan).

NOTE: *For optional coilless horizontal draw-thru units (size 3, 6, 8, 10, 14 and 21) refer to COIL INSTALLATION INSTRUCTIONS given in CLCH-IN-1 to properly install coil in unit. On ceiling-mounted unit applications it is recommended to install coil in unit* ***before*** *hoisting unit to operating position.*

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

Note: *All ceiling suspended units with wide coil application* ***must*** *use a cradle (angle iron). See Figure 11A for details.*

Note: *Because of their weight, unit sizes 3-31 (wide coil only) and 35-86 (wide coil and standard units) require suspension support frames, to be provided by the installer. Figures 11A, 12 and 13 give the configuration and dimension of these frames. Note that two frames are required for sizes 73 and 86. See Figure 13.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Determine the unit mounting hole dimensions. Prepare the hanger rod and isolator assemblies and install them in the selected area. Threaded rods are recommended for leveling the unit. Tables 1, 2 and 3 list approximate operating weights. See Figure 11.
2. Attach accessories, if used. Gasketing not provided unless specified on sales order.
3. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

NOTE: *Check to determine that the motor is clean and dry prior to start-up.*

4. Hoist the unit to the hanger or suspension rods and attach. See Figure 11.
5. Level the unit for proper coil drainage and condensate removal from the drain pan. Refer to drain trap sketches in piping section.
6. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual. Isolate piping separately.

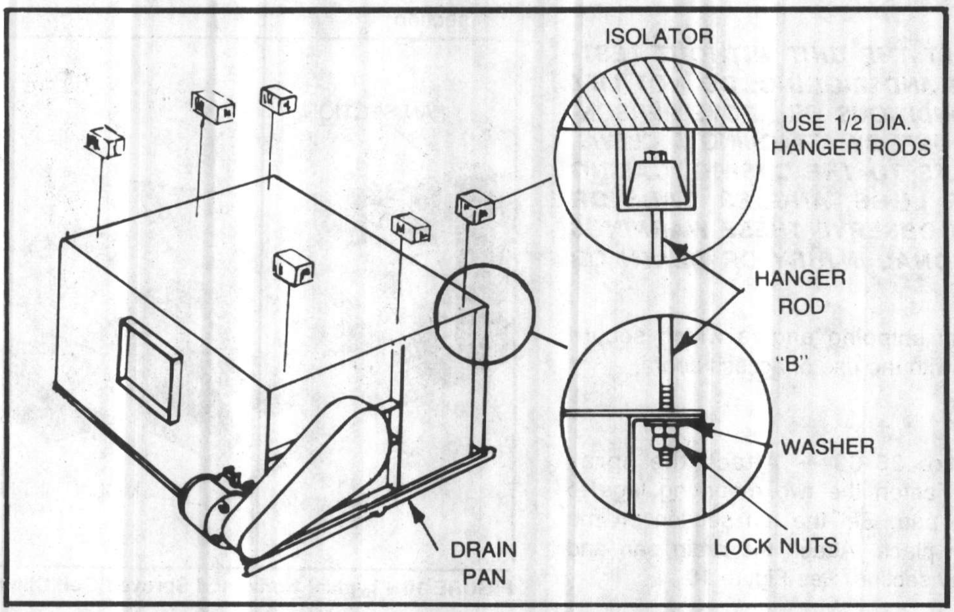
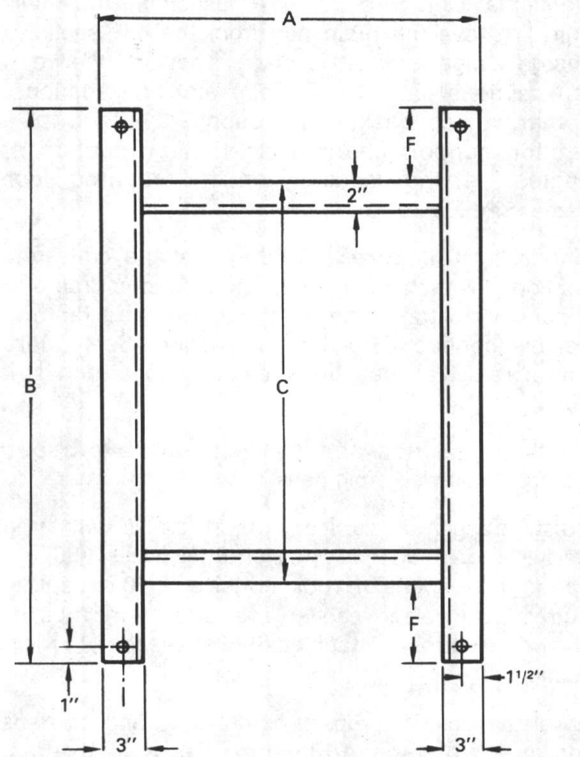


FIGURE 11 - Suspension Method for Horizontal Units Up to Size 31



Vertical Dimensions (Inches) With Wide Coil

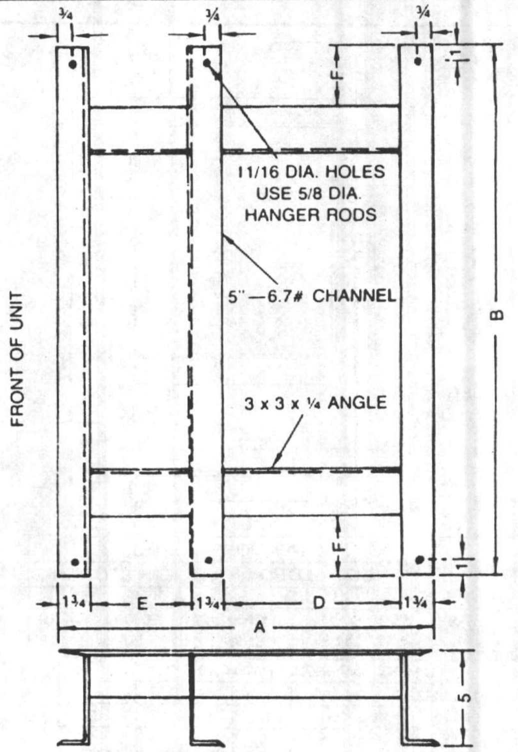
UNIT SIZE	A	B	C	F
3	$23^{7/8}$	54	34	10
6	$23^{7/8}$	75	55	10
8	$28^{7/8}$	66	46	10
10	$28^{7/8}$	75	55	10
12	$32^{7/8}$	81	61	10
14	$32^{7/8}$	90	70	10
17	$32^{7/8}$	111	91	10
21	$36^{7/8}$	129	109	10
25	$42^{7/8}$	135	115	10
31	$42^{7/8}$	135	115	10

Horizontal Dimensions (Inches) With Wide Coil

UNIT SIZE	A	B	C	F
3	$32^{3/4}$	54	34	10
6	$34^{3/4}$	75	55	10
8	$44^{3/4}$	66	46	10
10	$44^{3/4}$	75	55	10
12	$48^{3/4}$	81	61	10
14	$48^{3/4}$	90	70	10
17	$48^{3/4}$	111	91	10
21	$52^{3/4}$	129	109	10
25 Arr. 1 & 2	$52^{3/4}$	135	115	10
25 Arr. 3 & 4	$58^{3/4}$	135	115	10
31 Arr. 1 & 2	$52^{3/4}$	135	115	10
31 Arr. 3 & 4	$58^{3/4}$	135	115	10

Figure 11A — Ceiling Suspension Mounting Frame and Dimensions for Wide Coil Unit Sizes 3 thru 31.

CEILING-MOUNTED — Horizontal Unit Sizes 35-50 ship from factory as one assembly (fan section, coil section, and drain pan). Horizontal Unit Sizes 63-86 ship from factory in 2 sections (fan section and coil section).



UNIT SIZE	DIMENSIONS (INCHES) A	B	D	E	F
#35	79½	132⅝	$40^{1}/_{16}$	$34^{3}/_{16}$	10½
#41	84½	135⅝	$43^{1}/_{16}$	$36^{3}/_{16}$	10½
#50	90½	135⅝	$46^{1}/_{16}$	$39^{3}/_{16}$	10½
#63	97½	143⅝	$50^{1}/_{16}$	$42^{3}/_{16}$	14½

DIMENSIONS (INCHES) WITH WIDE COIL					
UNIT SIZE	A	B	D	E	F
35	79½	$149^{5}/_{8}$	$40^{1}/_{16}$	$34^{3}/_{16}$	19½
41	84½	$159^{5}/_{8}$	$43^{1}/_{16}$	$36^{3}/_{16}$	22½
50	90½	$159^{5}/_{8}$	$46^{1}/_{16}$	$39^{3}/_{16}$	22½
63	97½	$152^{5}/_{8}$	$50^{1}/_{16}$	$42^{3}/_{16}$	19½

NOTE: Above sketch does not apply to Sprayed Coil Units.

FIGURE 12 - Ceiling Suspension Mounting Frame and Dimensions for Unit Sizes 35 to 63

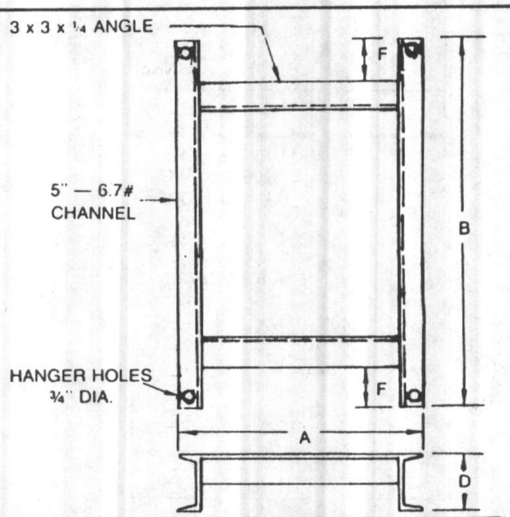
NOTE: *On certain horizontal draw-thru units that ship from the factory in sections, a splash angle must be field installed connecting the coil section to the fan section. See Figure 9. The following units apply,*

- Horizontal D. T. Unit size 50 (with back vertical discharge).

- Horizontal D. T. Unit Size 63 (with front or back vertical discharge).

- Horizontal D. T. Unit size 63 (with extra length casing).

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL, DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.



UNIT SIZE	DIMENSIONS (INCHES)							
	COIL SECTION				FAN SECTION			
	A	B	D	F	A	B	D	F
73	51	129-3/8	5	3-1/2	61	150-5/8	5	18
86	51	151-5/8	5	3-1/2	61	150-5/8	5	18

DIMENSIONS (INCHES) WITH WIDE COIL				
UNIT SIZE	A	B	D	F
73	51	146 3/8	5	12
86	51	168 5/8	5	12

NOTE: Fan section dimensions are same for std. units and/or units with wide coil.

FIGURE 13 - Ceiling Suspension Mounting Frame and Dimensions for Unit Sizes 73 and 86 (Two Frames are Required for Each Unit)

1. Determine the unit mounting hole dimensions. Prepare the hanger rod and isolator assemblies and install them in the selected area. Threaded rods are recommended for leveling the unit. Tables 1, 2 and 3 list approximate operating weights.
2. Remove the diagonal shipping angles which secure coil(s) if they interfere with the use of access doors.
3. Attach accessories, if used. Gasketing not provided unless specified on the sales order.
4. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight. Refer to the "Start-Up" section of the maintenance manual.

***Note:** All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.*

***NOTE:** Check to determine that the motor is clean and dry prior to start-up.*

5. Horizontal Unit Sizes 3-50 — Attach the coil section support channels to the fan section base angles. Set the assembly on the prepared support frame. Reference Figures 11A and 12.
6. Horizontal Unit Size 63 — To assemble multi-section units, remove the drain pan from the coil section discharge flange and set in place. Then set the coil and fan sections on the drain pan and bolt sections together, attach gasketing if supplied. Attach the coil section support channels to the fan section base angles. Set the assembly on the prepared support frame. See Figure 12.
7. Horizontal Unit Sizes 73-86 — Set the coil and fan section on each of the prepared support frame. See Figure 13. Attach the splash guard and fasten the flexible connector to the fan section. See Figure 8. Panel removal may be necessary to attach splash guard.

   Each fan section and coil section have separate factory assembled drain pans.
8. Hoist the assembled unit or separate pieces with support frames and attach the support frames (sizes 3-86) to the hanger or suspension rods. For size 73-86 units, the required distance between fan and coil sections must be as shown in Figure 7. Attach flexible connection to the coil section.
9. Level the unit for proper coil drainage and condensate removal from the drain pan. Refer to drain trap sketches in piping section.
10. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual. Isolate piping separately.

BLOW-THRU UNITS

Floor-Mounted — Three-Deck Unit Sizes 6-25 and Multizone Unit Sizes 6-31 ship from factory as one assembly (fan section, coil section w/drain pan and zone damper section).

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

***NOTE:** Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

1. Fasten isolators to the floor.
2. Mount the unit on the isolators and fasten.
3. Install accessories.
4. Level the unit for proper coil drainage and condensate removal from the drain pan.
5. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.

   ***NOTE:** See Figure 30 for duct installation.*

6. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

Floor-Mounted — Multizone Blow-Thru Unit Sizes 35-41 and Three Deck Unit Sizes 31-35 ship from factory in 3 sections (coil section, fan section and zone damper section).

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Fasten isolators to floor.
2. If ordered, mount zone damper assembly to discharge opening of coil section. First remove shipping angle in discharge opening. Attach zone damper with gasketing factory provided. Attach splitter panel (dividing plate) to zone damper. Gasketing not provided for dividing plate.

CAUTION: When installing the damper assembly to the hot deck and bypass section, make sure it is mounted squarely, otherwise the damper blades may twist and fail to operate.

3. Remove the 90° cover panel.
4. Apply gasketing to the fan section mounting flange.
5. Set the assembled coil and damper sections on the isolators and fasten in place.
6. Gain access thru the 90° cover panel (removed previously) and bolt the fan section to the coil section through the gasketing. Be sure to bolt the fan section to the tie angle assembly, mounted on the coil section.

NOTE: *Horizontal bolting across top and bottom of fan section to coil section require internal access through the 90° cover panel. Vertical bolting along side of fan section to coil section does not require internal access.*

7. Apply gasketing to the 90° cover panel.
8. Attach the coil section 90° cover panel.
9. Install accessories.
10. Level the unit for proper coil drainage and condensate removal from the drain pan.
11. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.

NOTE: *See Figure 30 for duct installation.*

12. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

Floor-Mounted — Multizone Blow-Thru Unit Sizes 50-63 ship from factory in 4 sections (fan section, cooling coil section, heating coil section and zone damper section). Refer to Figure 15.

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Fasten isolators to floor.
2. Remove the shipping angles attached to the front or top of the coil section.
3. Vertical Discharge Units: Place hot deck on top of cold deck and bolt in place with gasketing factory provided. The front panel of coil section ships attached across the discharge opening. It must be removed and installed with gasketing to the front of the coil section. (This does not apply to horizontal discharge units.) Next, bolt the splitter panel (dividing plate) to the panel over the cooling coil.
4. Horizontal Discharge Units: Place the hot deck on top of cold deck and bolt in place with gasketing factory provided. Next, bolt the splitter panel (dividing plate) to the panel over the cooling coil.
5. Apply gasketing to the damper section or double-duct frame. Refer to Figure 14. Gasketing is not required at the center of the damper section where the dividing plate will be fastened.
6. Assemble the damper or double duct frame to the coil section bolting through the gasketing.

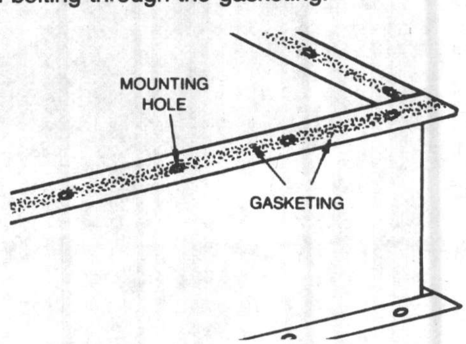


FIGURE 14 - Installation of Gasketing on the Damper Section

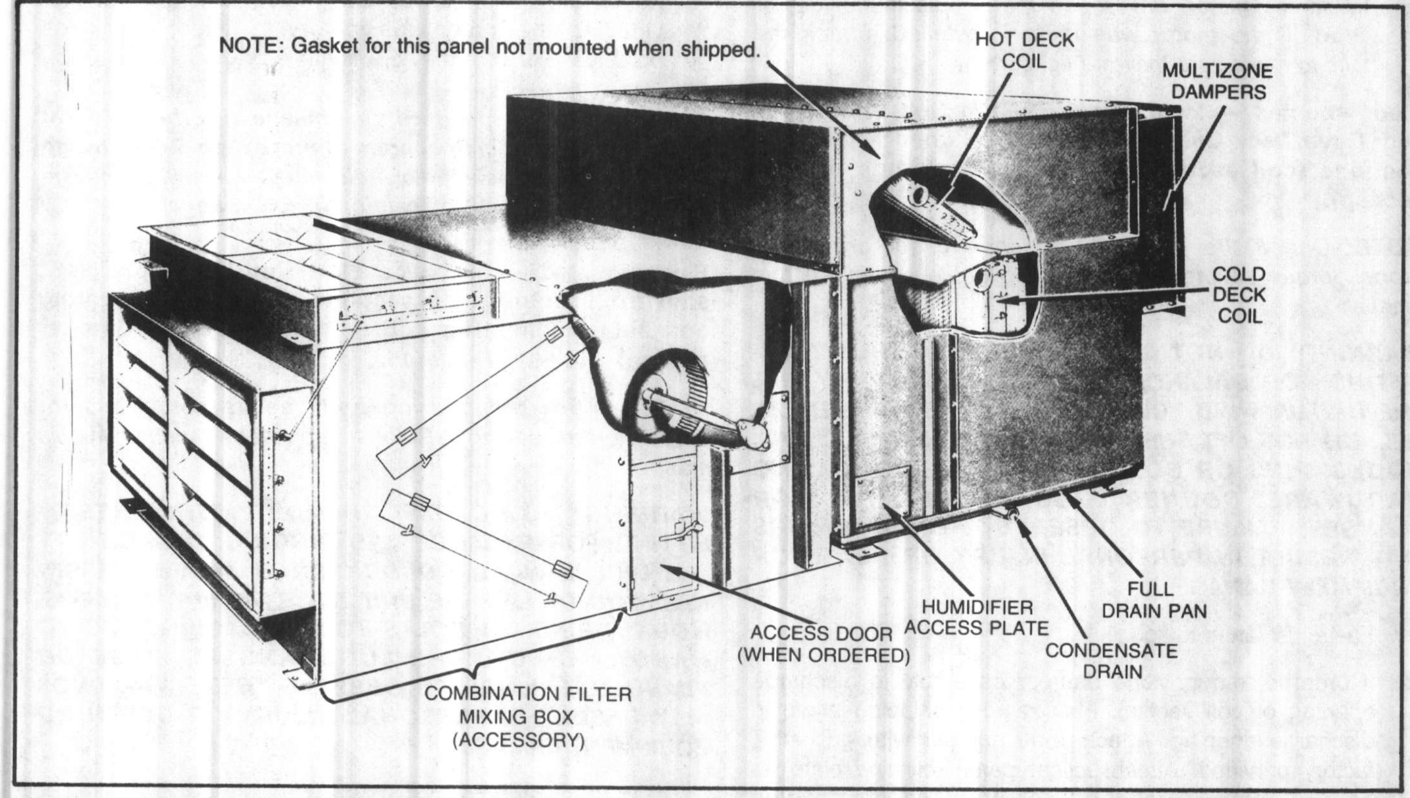


FIGURE 15 - Multizone Blow-Thru Climate Changers

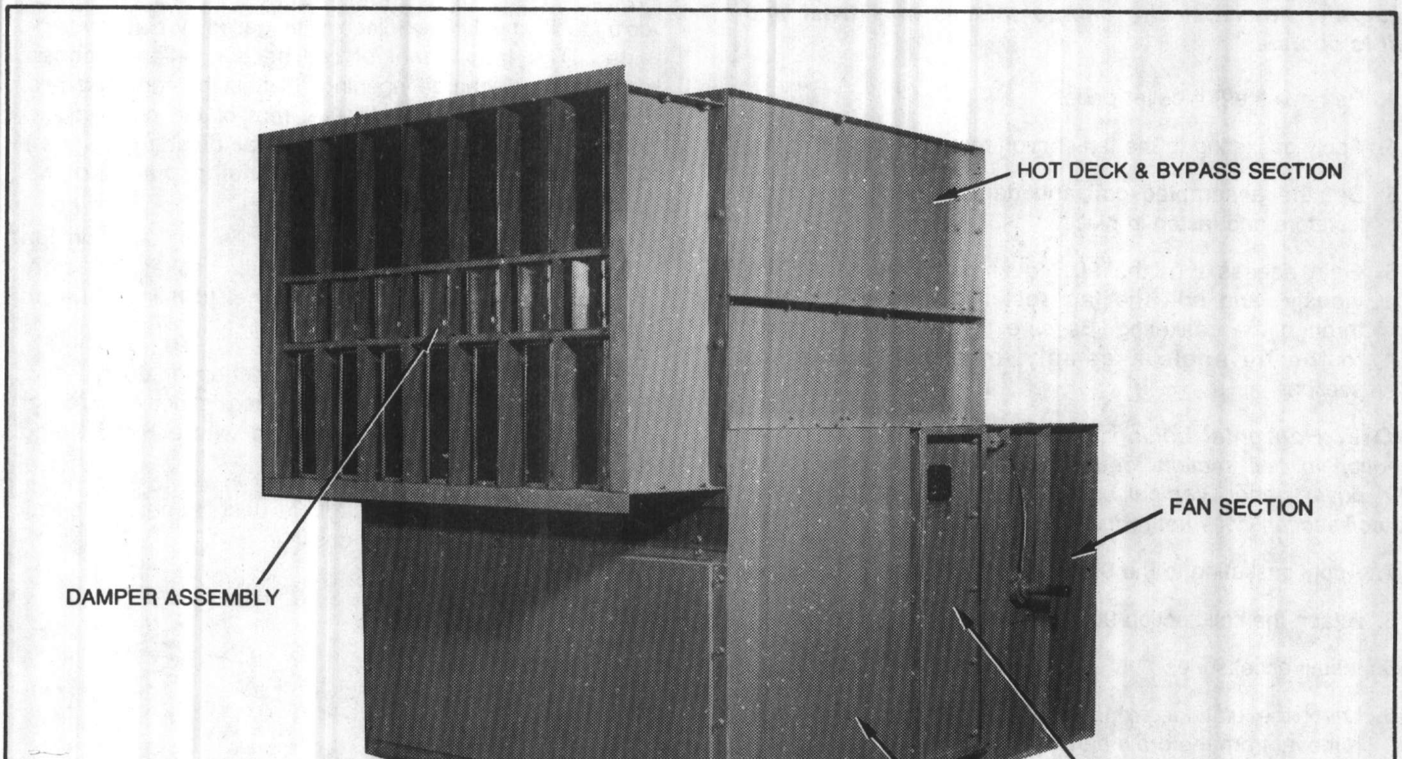


FIGURE 16 - Typical Three Deck Horizontal Discharge Climate Changer

CAUTION: When installing the damper assembly to the hot deck and bypass section, make sure it is mounted squarely, otherwise the dampers may twist and fail to operate.

7. Bolt the hot and cold deck dividing plate to the center of the damper section.

8. Remove the 90° cover panel of the coil section.

9. Apply gasketing to the fan section mounting flange. Set the assembled coil and damper sections on the isolators and fasten in place.

10. Gain access thru the 90° cover panel (removed previously) and bolt the fan section to the coil section through the gasketing. Be sure to bolt the fan section to the tie angle assembly mounted on the coil section.

Note: Horizontal bolting across top and bottom of fan section to coil section requires internal access through the 90° cover panel. Vertical bolting along side of fan section to coil section does not require internal access.

11. Apply the gasketing to the 90° cover panel.

12. Attach the coil section 90° cover panel.

13. Install accessories.

14. Level the unit for proper coil drainage and condensate removal from the drain pan.

15. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.

16. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight. Refer to the "Start-Up" section of this manual.

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

Floor-Mounted — Three Deck Blow-Thru Unit Sizes 41-63 ship from factory in 4 sections (cooling coil section, fan section, vent and heating coil section, and zone damper section). See Figure 16 for assembly.

NOTE: *Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Fasten the isolators to the floor.

2. With gasketing applied to the top of the cooling coil section, mount the hot deck and bypass section to the cooling coil section. Bolt the bypass deck divider plate to the panel over the cooling coil.

3. Remove the shipping angles used to support the hot deck and bypass zone divider plates.

4. Vertical Discharge Units — Apply gasketing to the mounting flange of the fill-in section and mount the fill-in section to the cooling, bypass and hot deck section.

5. Apply gasketing to the damper assembly. See Figure 14. Gasketing is not required at the center of the damper section where the divider plate will be fastened.

6. Attach the damper section to the coil section, bolting through the gasketing.

CAUTION: When installing the damper assembly to the hot deck and bypass section, make sure it is mounted squarely, otherwise the damper blades may twist and fail to operate.

NOTE: *Be sure control rods are in correct position.*

7. Bolt the hot deck and bypass zone divider plates to the center dividers of the damper assembly. These must be bolted from the hot deck and cold deck side only. Gasketing not required.

8. Remove the 90° cover panel of the coil section.

9. Apply gasketing around the fan section mounting flange.

10. Set the assembled coil and damper sections over the isolators. Fasten in place.

11. Gain access thru the 90° cover panel (removed previously) and bolt the fan section to the coil section through the gasketing. Be sure to bolt the fan section to the tie angle assembly mounted on the coil section.

NOTE: *Horizontal bolting across top and bottom of fan section to coil section require internal access through the 90° cover panel. Vertical bolting along side of fan section to coil section does not require internal access.*

12. Apply the gasketing to the 90° cover panel.

13. Attach the coil section 90° cover panel.

14. Attach any accessories.

15. Level the unit for proper coil drainage and condensate removal from the drain pan.

16. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.

17. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight. Refer to the "Start-Up" section of this manual.

Floor-Mounted — Multizone Blow-Thru Unit Sizes 73-86 ship from factory in 6 sections (fan section, cooling coil section, heating coil section, canvas duct section, inlet panel (size 73), extended plenum (size 86), and either double duct frame section or zone damper section).

***NOTE:** Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Fasten isolators to the floor.
2. Remove the shipping angles attached to the front or top of the coil section.
3. Vertical Discharge Units: Place hot deck on top of cold deck and bolt in place with gasketing, factory provided. The front panel of coil section ships attached across the discharge opening. It must be removed and installed with gasketing to the front of the coil section. (This does not apply to horizontal discharge units.) Next, bolt the splitter panel (dividing plate) to the panel over the cooling coil.
4. Horizontal Discharge Units: Place the hot deck on top of cold deck and bolt in place with gasketing factory provided. Next, bolt the splitter panel (dividing plate) to the panel over the cooling coil.
5. Apply gasketing to the damper section or double-duct frame. Refer to Figure 14. Gasketing is not required at the center of the damper section where the dividing plate will be fastened.
6. Assemble the damper or double duct frame to the coil section bolting through the gasketing.

CAUTION: When installing the damper assembly to the hot deck and bypass section, make sure it is mounted squarely, otherwise the damper blades may twist and fail to operate.

7. Bolt the hot and cold deck dividing plate to the center of the damper section.
8. Attach inlet panel (size 73) or extended plenum (size 86) to coil section inlet with gasketing, factory provided. Bolting for these sections is accomplished from exterior of the unit. See Figure 17.
9. Attach flex connector between fan section and coil section (size 73). Attach flex connector between fan section and extended plenum coil section (size 86). Refer to Figure 17 for dimensions.
10. Level the unit, fan and/or coil sections to assure proper coil drainage and removal of condensate from the drain pan.
11. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.
12. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

***NOTE:** All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% design rpm a balance check and/or field rebalance will be necessary. Refer to the "Start-Up" section.*

HIGH PRESSURE CLIMATE CHANGER — ALL SIZES

***NOTE:** Check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.*

WARNING: DO NOT LIFT THE UNIT WITHOUT TEST-LIFTING FOR BALANCE AND RIGGING. DO NOT LIFT THE UNIT IN WINDY CONDITIONS OR ABOVE PERSONNEL. DO NOT LIFT THE UNIT BY ATTACHING A CLEVIS, HOOKS, PINS OR BOLTS TO THE CASING, CASING HARDWARE, CORNER LUGS, ANGLES, TABS OR FLANGES. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH OR EQUIPMENT DAMAGE.

1. Attach the mounting legs (Spray Coil Units only) and spring isolators to the fan section, as illustrated in Figure 18.
2. Set the fan section in place and fasten isolators to the floor.
3. Blow-Thru Units — Apply factory provided gasketing to the sections where canvas duct is to be attached.
4. Set the coil section in place. Attach the flexible connection. Place the bottom flange of the flexible connection in the V channel of the coil section.
5. Attach the splash guard to the bottom of the fan inlet opening, as in Figure 8.
6. Attach flexible connection to the fan section. Place the bottom flange of the flexible connection in the V channel of the fan section. Tighten bolts from exterior of the unit.
7. Blow-Thru Units — Attach horizontal tension restraints (installer-supplied) to the coil section. Span the flexible connection and anchor the restraints to the fan section. See Figure 17. These restraints will counteract reaction forces due to airflow and will relieve pressure from the flexible connection.
8. Install accessories.
9. Level the unit, fan and/or coil sections to assure proper coil drainage and removal of condensate from the drain pan.
10. Connect the ductwork and necessary piping to the unit. Refer to applicable section in this manual.
11. Attach the motor, drives and motor splash pan if provided. If the motor was factory installed, check the bolts to make sure they are tight.

Note: All constant speed units are balanced at the factory at design rpm. If unit is to operate at more than 5% of design rpm a balance check and/or field rebalance will be necessary. Refer to "Start-Up" section in this manual.

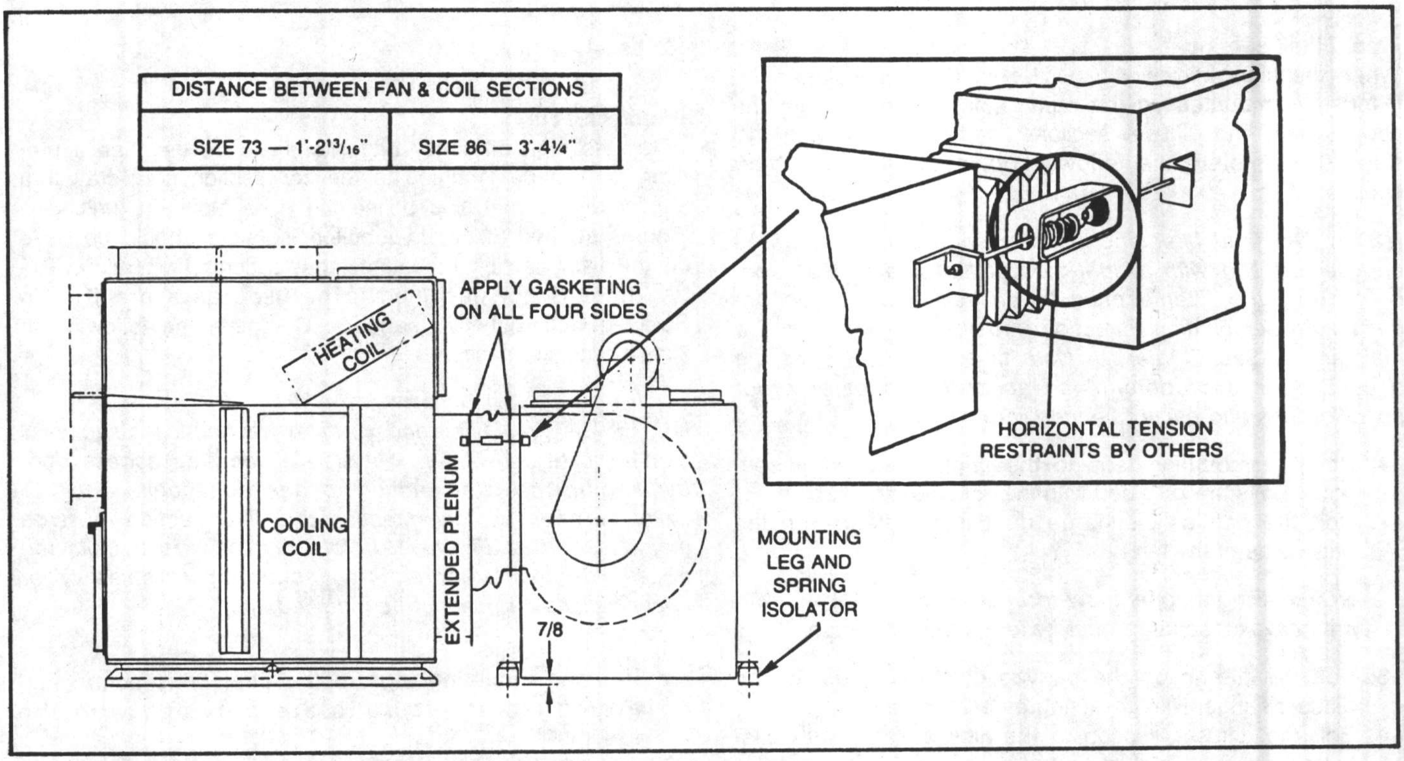


FIGURE 17 - Fan and Coil Section Ductwork Connections for Blow-Thru High Pressure Units

ACCESSORIES

Matching bolt holes are provided on all accessories for attachment to the unit or to other accessories. Mounting hardware is shipped with each accessory. Mounting legs on filter boxes and mixing boxes are to be attached to isolators and fastened to the floor or suspension device.

HIGH EFFICIENCY BAG FILTER

Before installing the bag filter accessory, be sure adequate clearance is provided to open the filter box and remove filters. Four feet of clearance on the access side of the filter section is recommended. Table 3 lists filter, filter section and diffuser section weights.

The high efficiency bag filter can be used as a prefilter when placed on the inlet side of the fan, a final filter when placed on the outlet of the fan, or as both when placed in both locations. When used as a prefilter, the canvas duct and diffuser sections are not used, but isolators should be installed by the contractor to ease vibration. When used as a final filter, the canvas duct and diffuser sections are used, but isolators are not required. Installation instructions for both applications follow.

NOTE: *The high efficiency bag filters can be operated at up to 100 percent relative humidity, but must not make direct contact with water droplets. Care must be taken to ensure that these filters are not used as prefilters with Sprayed Coil Climate Changers and to avoid water carry-over in standard units.*

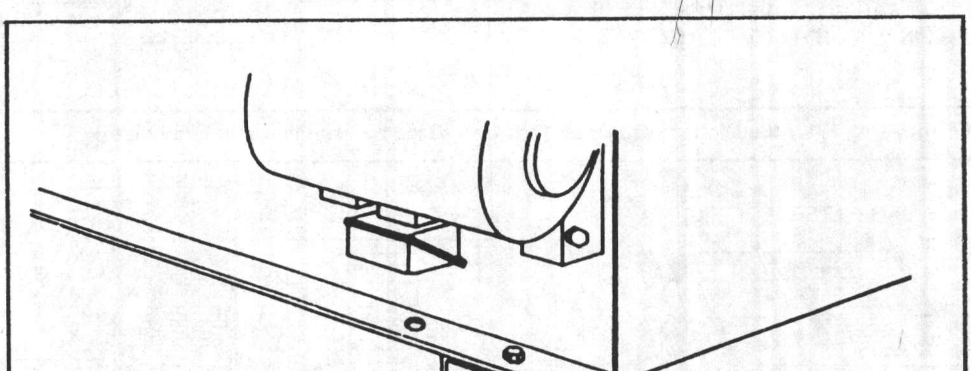


FIGURE 18 - Attaching the Mounting Leg and Spring Isolator to the High Pressure Sprayed Coil Unit

Final Filter Section

When the high efficiency bag filter is used as a final filter, it must be mounted on the outlet side of the fan with the canvas duct and diffuser sections, as shown in Figures 19 and 20. Complete the following to install the final filter section:

NOTE: *The final filter and prefilter section on sizes 6-86 can be installed with a right side or left side access door by flipping the filter section to desired access door location. Proper air flow direction thru filter section must be maintained. See Figure 19. Note that on size 3 units the access door is predetermined according to sales order specifications and cannot be modified.*

1. Bolt the mounting legs to the diffuser and filter sections. Bolts are provided with the assemblies.
2. Bolt the canvas discharge duct to the flange on the outlet side of the fan.

   NOTE: *Single-zone blow-thru units are shipped with the canvas discharge duct bolted to the fan flange.*

3. Bolt the flange on the canvas discharge duct to the diffuser flange, with gasketing properly installed.
4. Bolt the diffuser section to the filter section, with gasketing properly installed.
5. For U.L. listed units, the canvas discharge duct is not provided. Install a field-provided connector which meets the requirements of NFPA 90A Sect. 2.1.1 to 2.1.2.3.
6. Level the unit.

Prefilter Section

When the high efficiency bag filter is to be used as a prefilter, it must be mounted to the coil section of a draw-thru unit or to the inlet side of the fan on a blow-thru unit. See Figures 19 and 20. Field-supplied isolators should be used on the filter section mounting legs to control vibration. The bag filter is not designed to be used as a prefilter on Sprayed Coil Climate Changers. Complete the following to install a prefilter section:

NOTE: *The final filter and prefilter section on sizes 6-86 can be installed with a right side or left side access door by flipping the filter section to desired access door location. Proper air flow direction thru filter section must be maintained. See Figure 19. Note that on size 3 units the access door is predetermined according to sales order specifications and cannot be modified.*

1. Bolt the mounting legs to the filter box section and attach isolators. Bolts are provided with the assemblies.
2. Bolt the filter box section to the coil section on draw-thru units, or to the fan inlet with gasketing installed on blow-thru units.
3. Level the unit.

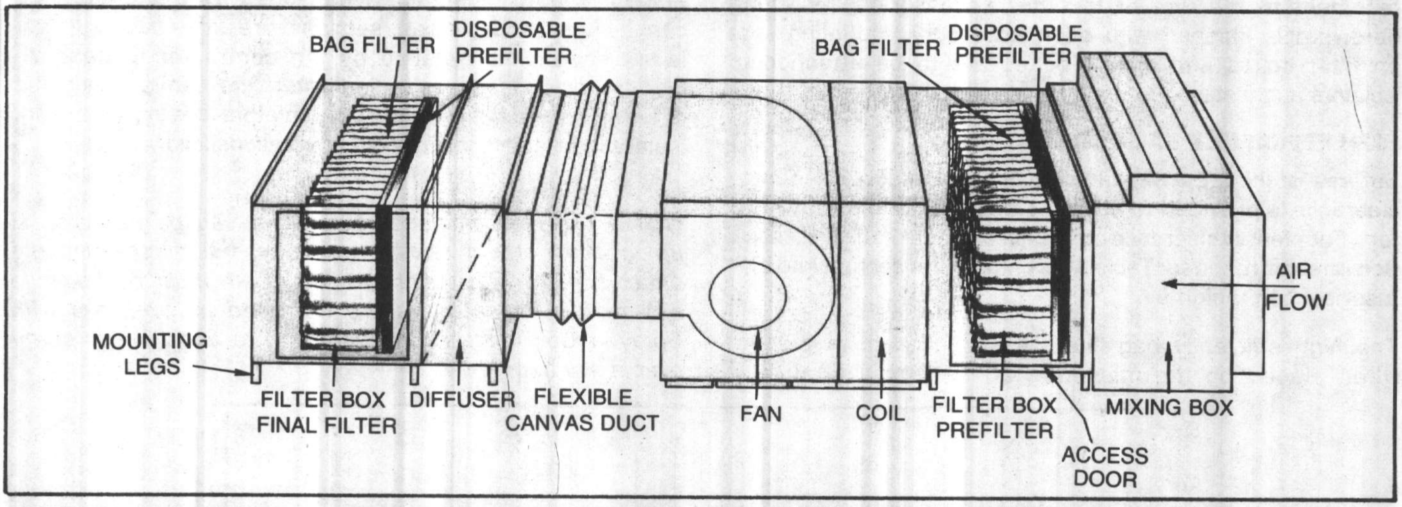


FIGURE 19 - High Efficiency Bag Filter Installation with Draw-Thru Unit (Used as Pre-Filter and Final Filter)

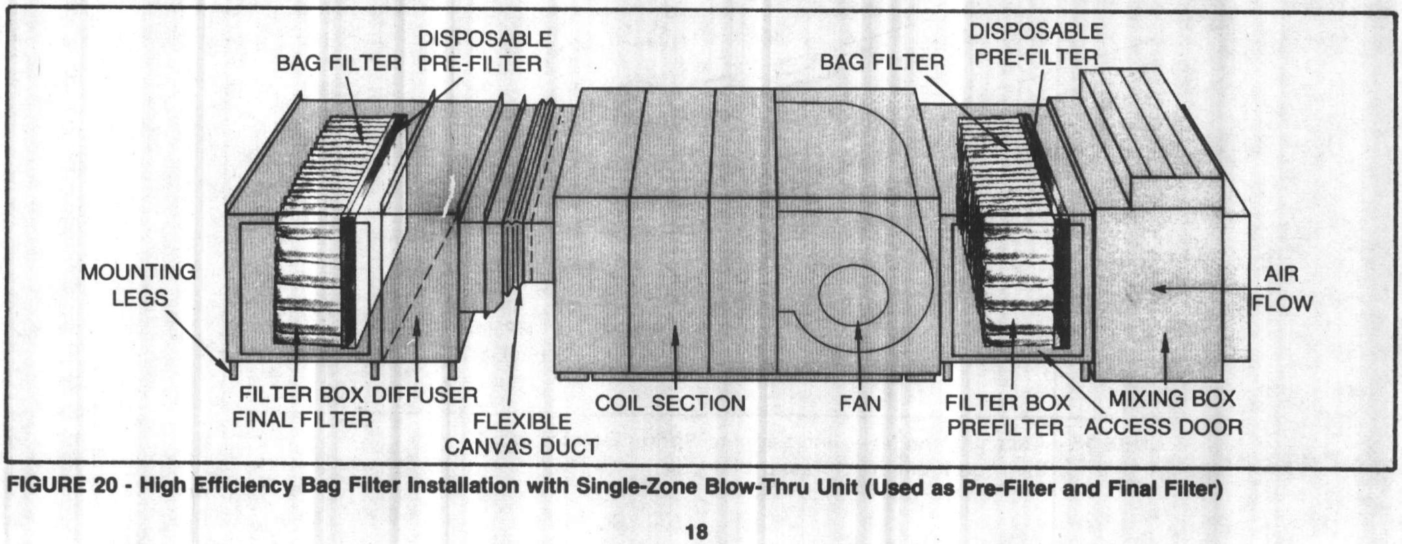


FIGURE 20 - High Efficiency Bag Filter Installation with Single-Zone Blow-Thru Unit (Used as Pre-Filter and Final Filter)

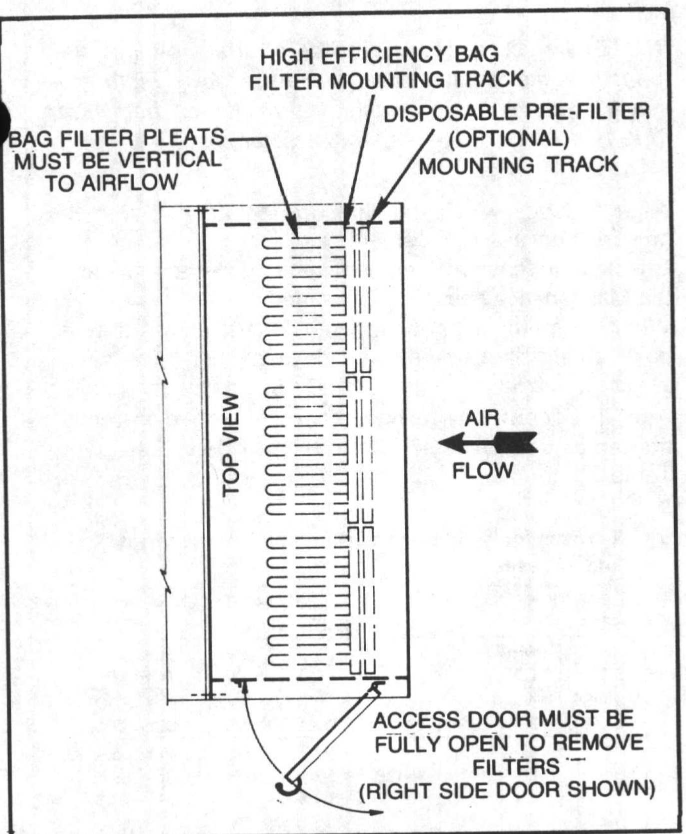


FIGURE 21 - Filter Mounting Track Location (Top View)

Filter Installation

Trane recommends the use of disposable prefilters with high efficiency bag filters. Prefilters slide into mounting tracks just ahead of the bag filter. Bag filter and prefilter size and quantity requirements are the same. See Figure 21 for filter arrangement and complete the following:

1. Ensure power is disconnected. Open filter section access door.

   WARNING: DISCONNECT POWER SOURCE BEFORE OPENING FILTER SECTION ACCESS DOOR. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK, HIGH PRESSURE OR MOVING PARTS.

2. Remove adjustable blockoff from filter track.
3. Slide bag filters and flat prefilters into the appropriate filter tracks. Bag filters must be installed with pleats vertical to airflow.
4. Slide adjustable blockoff into filter track.
5. Close the access door. If door can be closed without compressing the filters, adjust the blockoff by loosening its adjusting screws, moving the blockoff and tightening the screws. The door should squeeze the blockoff against the filters, compressing them.

***NOTE:** Filters must have an airtight seal to prevent air bypass. If using other filters, apply foam gasketing to the vertical edges of the filter-holding frame to ensure a tight fit.*

For roll filter installation and operation checks, refer to RF-IM-1.

MANOMETER INSTALLATION

A manometer should be used with each bag filter accessory to monitor filter loading and is available from Trane. It should be located to read the pressure drop between the inlet and outlet of the filters. A 1-inch wg pressure difference indicates clogged filters.

WARNING: BAG FILTER FINAL RESISTANCE IS 1 INCH WATER GAUGE. FAILURE TO CHANGE BAG FILTERS AT THIS POINT MAY CAUSE PERSONAL INJURY, DEATH OR EQUIPMENT DAMAGE AS FILTERS WITH DUST MAY BE COMBUSTIBLE.

Five feet of double-column plastic tubing is provided with the gauge along with adapters for connection to 1/8" NPT fittings. To install the manometer, complete the following:

1. Mount the manometer in the two 27/64-inch diameter holes drilled in top or side wall of the filter box, using the self-tapping screws provided. Turn the screws down snug, but not tight.
2. Adjust the gauge until the bubble is centered in the spirit level. Tighten the mounting screws and check to be sure that the gauge remained level.
3. Turn the zero adjust knob counterclockwise until it stops. Then turn it clockwise approximately three full turns so that there is room for adjustment in either direction.
4. Remove the fill plug and pour in the provided gauge fluid until the fluid level is visible in the vicinity of zero on the scale. Adjust for exact zero setting with the zero knob and replace the fill plug.
5. Install a tubing adapter on each side of the filter.
6. Connect the coded red striped tube to the high pressure connection at the top of the gauge (left side) and insert the other end into the field-drilled port and adapter upstream of the bag filters.
7. Connect the uncoded tube to the low side connection at the top of the gauge (right side) and insert the other end into the field-drilled port and adapter downstream of the filter bags.

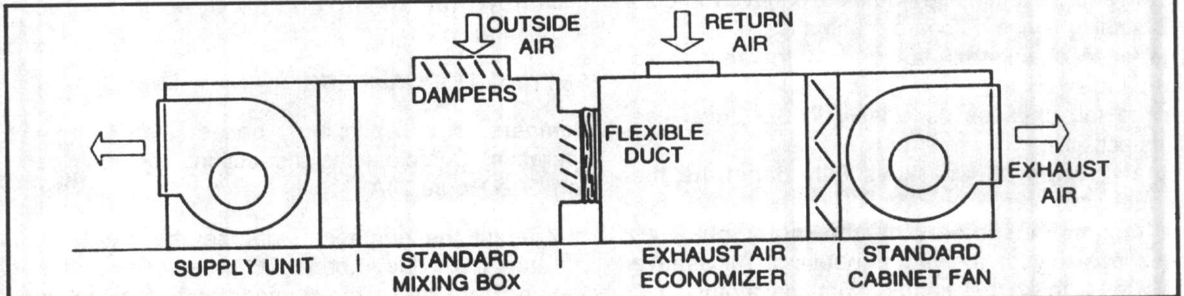


FIGURE 22 - Exhaust Air Economizer Installation

EXHAUST AIR ECONOMIZER

The Exhaust Air Economizer system consists of the economizer section and a Cabinet Fan. The accessory is attached to a Climate Changer with a standard or combination mixing box accessory, as shown in Figure 22. Cabinet Fan size should be identical to Climate Changer size, except as noted below.

NOTE: *Unit sizes 35 to 63 can use either the same size Cabinet Fan or a size 31 Cabinet Fan.*

The economizer section contains a single damper set, similar to a face damper, which is used to prevent backwheeling of the exhaust fan when it is shut off. Low leak and Ultra-low leak dampers can be used on the damper assembly. Refer to the Dampers section of this manual for operating torques.

CAUTION: To avoid equipment damage, the pressure differential across the damper must not exceed 3 inches during operation.

To install the Exhaust Air Economizer, complete the following:

1. Bolt the Exhaust Air Economizer to the Cabinet Fan with the bolts and gasketing provided.
2. If the unit is floor-mounted, fasten the isolators to the floor and mount the accessory on the isolators. If the unit is ceiling-mounted, follow proper safety precautions and hoist the accessory into position, attaching it to the hanger rods.
3. Attach the contractor supplied canvas duct to the mixing box flange with sheet metal screws (not provided).
4. Screw the canvas duct flange onto the economizer section flange from inside the economizer with sheet metal screws (not provided).
5. Attach the return air intake to the economizer section.
6. Level the unit. Secure all fasteners.

FAN MOTOR ASSEMBLY

On units that ship motors separately, the fan shafts, sheaves and drive assembly must be checked and aligned before unit operation. Complete the following:

WARNING: DISCONNECT ELECTRICAL POWER BEFORE INSPECTING FAN MOTOR ASSEMBLY. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR MOVING PARTS.

1. Check that the fan shafts fully penetrate the bore of sheaves or sheave bushings. Bushed sheaves should have the bushing flange outboard of the sheave.
2. Use a level to check that fan and motor shafts are level and parallel.
3. Position the fan sheaves as closely to the drive side bearing as possible.
4. Check that the fan sheave keys fully penetrate the bushing or sheave bore.
5. Position the motor sheaves on the motor shaft as closely as possible to the motor housing. All sheave setscrews must make full contact with the motor shaft or shaft key.

NOTE: *In some cases, motor shafts may not fully penetrate the sheave bore, but the sheave width must never exceed the recommended maximum per NEMA (MG1-14.43 a) for the respective motor size.*

6. Align sheaves with a straightedge or string. For multi-groove sheaves, align center lines.
7. Check belt tension. Detailed instructions are given in the Maintenance section of this manual.
8. When properly aligned and tensioned, check that no point on the belt nearest the drive bearing is within 1/2-inch of unit flanges or structural supports.
9. After drive components have been positioned correctly, tighten all sheave setscrews to the torque values given Table 4.

Table 4 - Torques for Tightening Locking Screws, Bearings and Sheaves

TORQUE FOR TIGHTENING SETSCREWS				TORQUE FOR TIGHTENING SEALMASTER LOCKING COLLAR				
SET SCREW DIA.	HEX SIZE ACROSS FLATS	RECOM. TORQUE INCH LBS.	RECOM. TORQUE FOOT LBS.	COL-LAR	SCREW DIA.	HEX SIZE ACROSS FLATS	RECOM. TORQUE INCH LBS.	RECOM. TORQUE FOOT LBS.
1/4"	1/8"	66	5.5	2-015B	8-32	1/8"	70	5.8
5/16"	5/32"	126	10.5	2-13B	8-32	1/8"	70	5.8
3/8"	3/16"	228	19.0	2-17B	10-24	9/64"	90	7.5
7/16"	7/32"	348	29.0					
1/2"	1/4"	504	42.0					
5/8"	5/16"	1,104	92.0					

NOTE: Tighten bearing setscrews to the torque shown before running unit. Setscrews can loosen in shipment.

DAMPERS

DRIVE ROD ASSEMBLY — BLOW-THRU MULTIZONE UNITS

On all Blow-Thru Multizone units, the zone damper drive rods are recessed to prevent damage during shipment. Before attaching ductwork, complete the following steps and then set the damper zones as instructed after this list. Refer to Figures 23 to 24B.

1. Loosen the damper rod clip screws and extend each drive rod 2-1/2 inches beyond the edge of the damper assembly flange. See Figure 23.
2. Check each set of damper blades to make sure that they are at 90-degree angles to each other. Move the dampers to be sure they are not binding.
3. Tighten all damper rod clip screws.
4. Under certain operating conditions, condensate may form on the cold deck portion of the damper section. To prevent this, insulate around the damper rods. Be sure that the insulation does not affect damper operation.

SETTING THE DAMPERS

Dampers on all units must be adjusted to ensure proper operation. Complete the instructions for each damper section. See Figure 24A.

1. Select the number of damper segments required for the first zone. Loosen the damper lever set screws and turn all of the damper blades within the zone to the same position.

2. Tighten the damper lever set screws for this zone.
3. Cut the damper linkage bar at the last lever. Figure 24A illustrates an example that uses two damper segments.
4. Set all other zones with the same procedure given above.

NOTE: *Damper operators must be connected to damper drive rods on the linkage side of the zone damper section.*

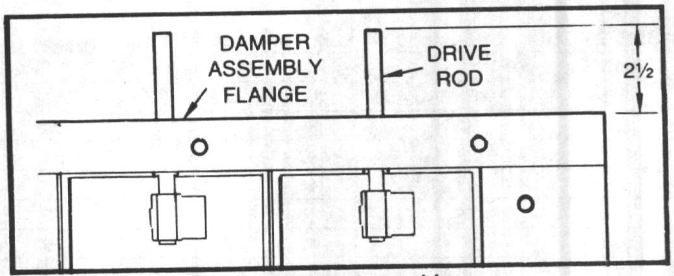


FIGURE 23 - Zone Damper Blade Assembly

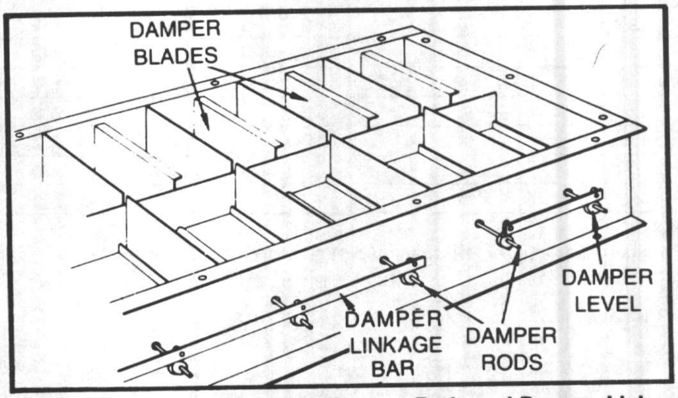


FIGURE 24A - Setting the Zone Damper Rods and Damper Linkage

DAMPER OPERATORS

Damper operators, levers and linkages, if not factory provided, are to be provided and installed by the contractor. Tables 5 through 8 list approximate values of damper torques to size the damper operators. When two motors are required, use synchronous motors. See Table 8A for actuator torques used with Multizone and 3-Deck Multizone damper units.

To install the operators, connect the motor to the damper drive rods on the linkage side of the zone damper section. Mount damper levers as close to the side of the unit as possible.

High-efficiency mixing box damper torques, given in Table 8, will vary with blade position (percent open), damper arrangement (top/back or top/bottom), pressure differential, cfm conditions and installation. The values given in Table 8 represent the maximums for all of the above conditions up to 0.4 inches of pressure difference and at a blade setting of 25 to 75 percent open. Greater pressure differences or incorrect adjustment will not be compensated for.

When low leak and ultra-low leak dampers are installed, operators should be sized according to operating torques given in Tables 5 through 7. Since low leak and ultra-low leak damper operating torques are much higher than those for standard dampers, care must be taken to choose a properly sized operator. Stroke distance from full-closed to full-open is 90 degrees.

Low leak dampers with blade seal material, should not be installed in positions where temperatures might exceed 150 F.

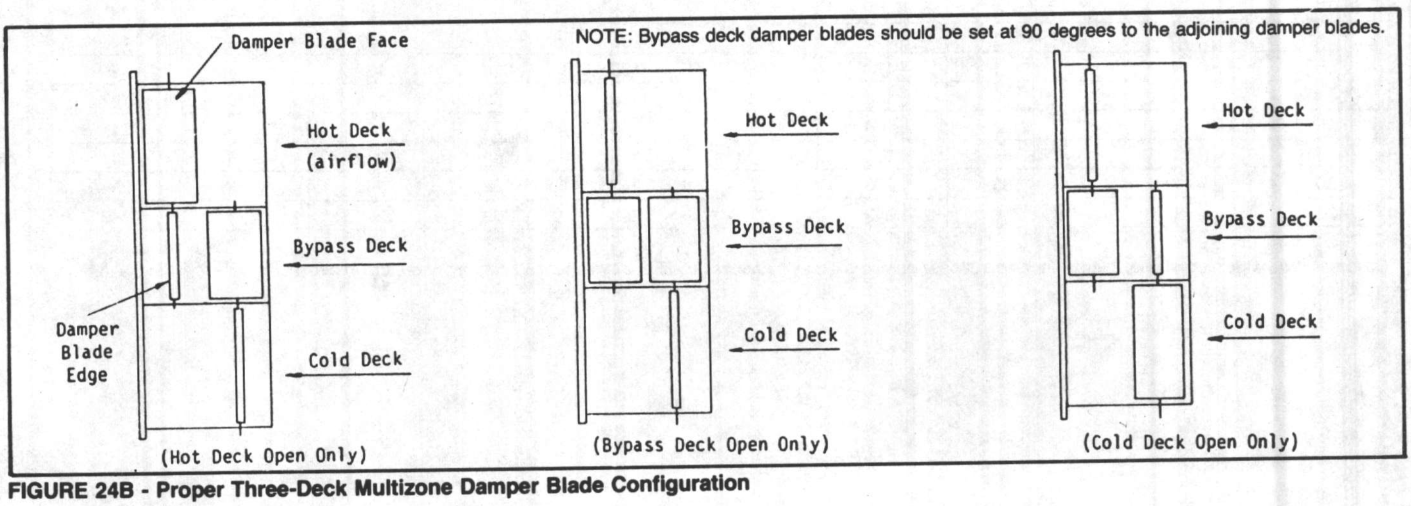


FIGURE 24B - Proper Three-Deck Multizone Damper Blade Configuration

TABLE 5 - External Face and Bypass Low Leak Damper Torques (In./Lbs.)

UNIT SIZE	STANDARD DAMPER	LOW LEAK DAMPER 1" ΔP	2" ΔP	3" ΔP	4" ΔP	ULTRA-LOW LEAK DAMPER 1" ΔP	2" ΔP	3" ΔP	4" ΔP
3	30	36	37	39	41	39	41	43	44
6	33	43	47	50	53	50	54	57	60
7	33	43	47	50	52	49	53	56	59
8	35	47	52	56	59	55	60	64	67
9	36	47	51	55	58	54	58	62	65
10	36	52	58	63	67	62	68	73	77
12	38	67	65	71	76	70	77	83	88
14	40	63	71	79	85	77	86	94	100
17	42	68	78	87	93	85	95	103	110
21	77	108	120	131	139	128	141	151	159
25	84	121	136	149	159	146	161	173	183
31	93	142	161	177	190	174	193	210	222
35	100	159	182	202	217	198	221	241	256
41	110	190	216	239	256	234	261	283	300
50	124	214	250	280	304	273	310	339	363
63	145	259	305	343	373	335	381	419	449

NOTE:
On larger units with external face and bypass dampers it may be necessary to use two opposed damper operators to avoid excessive bending of damper shaft linkage.

TABLE 6 - Internal Face and Bypass Low Leak Damper Torques (In./Lbs.)

UNIT SIZE	STANDARD DAMPER	LOW LEAK DAMPER 1" ΔP	2" ΔP	3" ΔP	4" ΔP	ULTRA-LOW LEAK DAMPER 1" ΔP	2" ΔP	3" ΔP	4" ΔP
3	30	33	35	36	37	35	37	38	39
6	33	40	43	45	47	44	47	49	51
7	33	39	42	44	46	44	46	48	50
8	35	45	48	52	54	51	55	58	60
9	36	44	46	49	51	48	51	54	56
10	36	48	53	57	60	56	61	65	68
12	38	52	57	62	65	61	66	71	74
14	40	56	63	68	72	67	73	78	83
17	42	62	70	77	82	76	84	90	96
21	77	101	111	119	125	118	127	135	142
25	84	111	122	130	138	129	139	148	155
31	93	129	143	154	164	152	166	178	187
35	100	143	160	174	186	171	188	203	214
41	110	159	179	195	208	192	212	228	241
50	124	183	206	226	242	222	245	265	281
63	145	219	249	274	293	269	298	323	343

NOTE:
On larger units with internal and external face and bypass dampers it may be necessary to use two opposed damper operators to avoid excessive bending of damper shaft linkage.

TABLE 7 - Mixing Box, Combination Filter Mixing Box Low Leak Damper Torques (In./Lbs.)

UNIT SIZE	STANDARD DAMPER	LOW LEAK DAMPER				ULTRA-LOW LEAK DAMPER			
		1" ΔP	2" ΔP	3" ΔP	4" ΔP	1" ΔP	2" ΔP	3" ΔP	4" ΔP
3	7	11	13	14	15	14	15	17	18
6	9	16	18	20	22	20	23	25	27
7	10	17	20	23	25	22	25	27	29
8	11	20	23	26	28	25	29	32	34
9	12	20	23	25	27	25	28	30	32
10	13	24	28	32	35	31	35	39	42
12	14	27	32	37	40	35	41	45	48
14	16	31	38	43	47	42	48	53	57
17	18	36	44	50	54	48	56	62	67
21	40	62	71	78	84	77	85	93	98
25	47	73	83	91	98	90	100	108	115
31	57	87	99	109	117	107	119	129	137
35	64	99	112	124	133	122	135	147	156
41	74	114	130	144	154	141	157	170	181
50	89	139	158	174	188	171	191	207	221
63	110	169	192	212	227	208	231	251	266

NOTE:
On larger units with internal and external face and bypass dampers it may be necessary to use two opposed damper operators to avoid excessive bending of damper shaft linkage.

TABLE 8 - High Efficiency Mixing Box Damper Torque

UNIT SIZE	TORQUE (FT.-LBS.) AT 0.4" ΔP 25 TO 75% OPEN
3	0.65
6	1.10
8	1.50
10	1.85
12	2.25
14	2.70
17	3.15
21	3.75
25	4.50
31	5.30
35	6.20
41	7.20
50	9.10
63	10.75

TABLE 8A — Multizone and Three-Deck — Multizone Zone Damper — Actuator Torques (In./Lbs)

UNIT SIZE	3	6	8	10	12	14	17	21	25	31	35	41	50	63
Torque (In./Lbs)	27	29	31	32	33	34	36	38	41	45	48	51	57	66

VARIABLE INLET GUIDE VANES

Inlet vanes are used to regulate fan capacity and to reduce horsepower at lower system requirements.

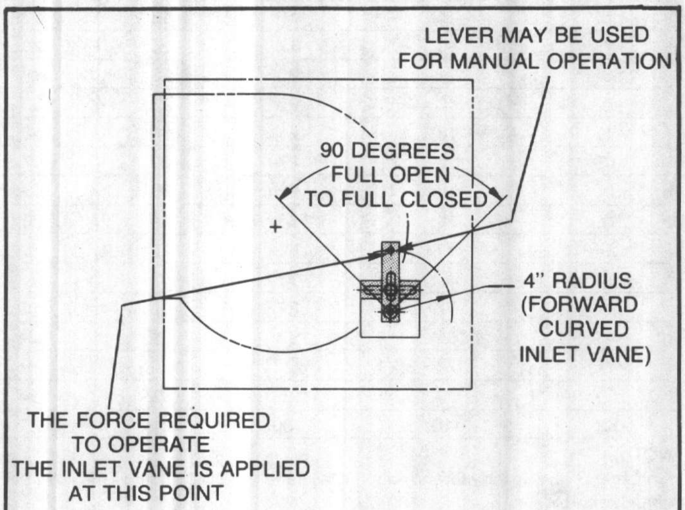
Inlet guide vane operator motors, if not factory provided, are to be provided and installed by the contractor, according to the operating torques given in Tables 9, 10, and 11. Control lever stroke and radius is given in Figure 25.

Before operation, check the vanes and assembly for freedom of movement. If resistance above the torques given in Tables 9, 10 and 11 is encountered, check for vane damage or linkage misalignment. **Do not force the vanes.** See Figure 25 for typical inlet vane operation. Figures 26 and 27 illustrate FC and AF inlet vanes.

TABLE 9 - Torque and Force Required to Operate Inlet Vanes - AF Fans - Unit Sizes 35-86

UNIT SIZE	TO OPEN OR CLOSE INLET VANES	FAN OUTLET VELOCITY 2,000 FPM TORQUE (IN.-LBS.)	FAN OUTLET VELOCITY 2,000 FPM FORCE (LBS.)	FAN OUTLET VELOCITY 3,000 FPM TORQUE (IN.-LBS.)	FAN OUTLET VELOCITY 3,000 FPM FORCE (LBS.)
35	Open	70.0	7.7	158.0	16.7
	Close	17.0	1.9	39.0	4.3
41	Open	94.0	10.3	214.0	23.5
	Close	23.0	2.6	53.0	5.9
50	Open	128.0	14.1	287.0	31.5
	Close	31.0	3.4	71.0	7.8
63	Open	172.0	18.9	388.0	42.6
	Close	42.0	4.6	96.0	10.6
73	Open	172.0	18.9	388.0	42.6
	Close	42.0	4.6	96.0	10.6
86	Open	172.0	18.9	388.0	42.6
	Close	42.0	4.6	96.0	10.6

When automatic vane control is used, adjustment must be made to avoid forcing the vanes past either the full-open or full-closed positions. A locking lever is furnished if the inlet vanes are to be used with manual control.



USE THE 3/8" DIA. HOLE FOR DAMPER OPERATOR (PNEUMATIC OR ELECTRIC, IF BY OTHERS)

(OPPOSITE DRIVE SIDE ONLY)

NOTES:
1. Lever is furnished with the inlet vanes.
2. To open the inlet vanes, rotate the control lever clockwise for left-hand mount and counterclockwise for right-hand mount.

FIGURE 25 - Inlet Vane Operation

TABLE 10 - Torque and Force to Operate Inlet Vanes - FC Fans - Unit Sizes 6-31

NO. OF FANS AND FAN SIZE	TO OPEN OR CLOSE INLET VANES	FAN OUTLET VELOCITY 2,000 FPM TORQUE (IN.-LBS.)	FAN OUTLET VELOCITY 2,000 FPM FORCE (LBS.) 4" ARM	FAN OUTLET VELOCITY 3,000 FPM TORQUE (IN.-LBS.)	FAN OUTLET VELOCITY 3,000 FPM FORCE (LBS.) 4" ARM
1-10½	Open	5.7	2.2	19.6	5.1
	Close	2.9	0.8	6.5	1.9
1-12¼	Open	10.0	2.5	22.5	5.7
	Close	3.5	0.9	7.8	2.1
1-13½	Open	10.9	2.8	24.5	6.2
	Close	3.9	1.0	8.7	2.3
1-15	Open	14.1	3.6	31.9	8.0
	Close	5.0	1.3	11.4	3.0
1-16½	Open	18.0	4.5	40.5	10.3
	Close	6.4	1.6	14.4	3.7
1-18¼	Open	23.1	5.8	52.2	13.3
	Close	8.3	2.1	18.6	4.8
1-20	Open	24.0	6.0	54.0	13.7
	Close	9.0	2.3	19.5	5.1
1-22	Open	25.0	6.3	56.0	14.2
	Close	9.5	2.4	21.0	5.3
1-25	Open	26.5	6.7	59.7	15.1
	Close	10.0	2.5	22.5	5.6
2-13½	Open	21.8	5.5	49.1	12.4
	Close	7.8	2.0	17.5	4.6
2-15	Open	28.3	7.1	63.9	16.0
	Close	10.1	2.6	22.8	5.7
2-16½	Open	36.0	9.0	81.1	20.3
	Close	12.8	3.2	28.9	7.3
2-18¼	Open	46.3	11.6	104.4	26.3
	Close	16.5	4.2	37.3	9.4
2-20	Open	48.0	12.0	108	27.2
	Close	18.0	4.5	39.0	9.9

TABLE 11 - Torque and Force Required to Operate Inlet Vanes — FC Fans — Unit Sizes 35-63

UNIT SIZE	FAN SIZE	TO OPEN OR CLOSE INLET VANES	FAN OUTLET VELOCITY 2000 FPM TORQUE (IN.-LBS.)	2000 FPM FORCE* (LBS.)	3000 FPM TORQUE (IN.-LBS.)	3000 FPM FORCE* (LBS.)	4000 FPM TORQUE (IN.-LBS.)	4000 FPM FORCE* (LBS.)
35	25	Open	26.5	6.7	59.7	15.1	—	—
		Close	10.0	2.5	22.5	5.6	—	—
	27	Open	115	29	190	48	240	60
		Close	40	10	90	23	140	35
41	27	Open	115	29	190	48	240	60
		Close	40	10	90	23	140	35
	30	Open	120	30	200	50	260	65
		Close	50	13	100	25	150	38
50	30	Open	120	30	200	50	260	65
		Close	50	13	100	25	150	38
63	30	Open	120	30	200	50	260	65
		Close	50	13	100	25	150	38

*NOTE: Force is calculated using a 4" lever arm.

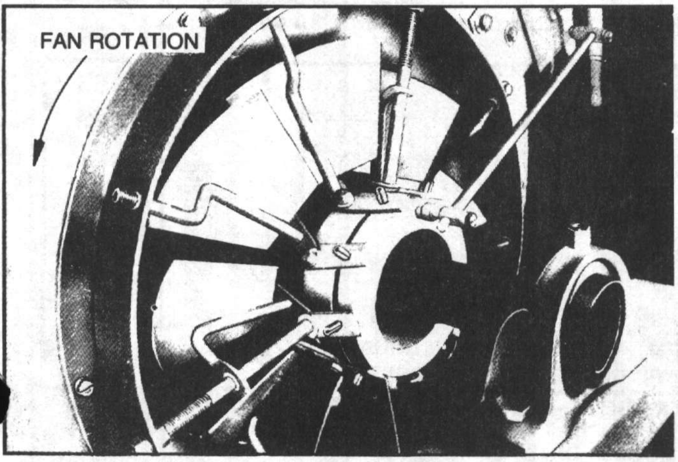


FIGURE 26 - Forward Curved Inlet Vanes

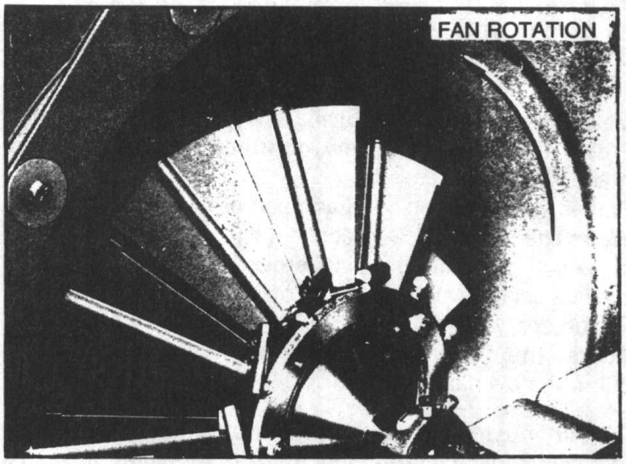


FIGURE 27 - Airfoil Inlet Vanes

DUCT CONNECTIONS

All air ducts should be installed in accordance with the standards of the National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems Other than Residence Type (NFPA 90A), and Residence Type Warm Air Heating and Air Conditioning Systems (90B).

NOTE: *Installations that have supply ductwork without return ductwork may be restricted by local codes to serve a space exceeding 25,000 cubic feet in volume.*

All inlet and discharge air duct connections to the unit should be made with a flexible material. Typically, about three inches is needed for this connection to rigid ductwork. Do not draw the flexible material tight; leave it sufficiently loose to prevent the transmission of any noise or vibration to the ductwork.

Duct turns and transitions must be made carefully to minimize air friction losses. Avoid sharp turns and use splitters or turning vanes when elbows are necessary, as shown in Figure 28. Make turns in the same direction of rotation as the fan. Discharge ductwork should run in a straight line, unchanged in size or direction, for at least a distance of 1-1/2 fan diameters. See Figure 28.

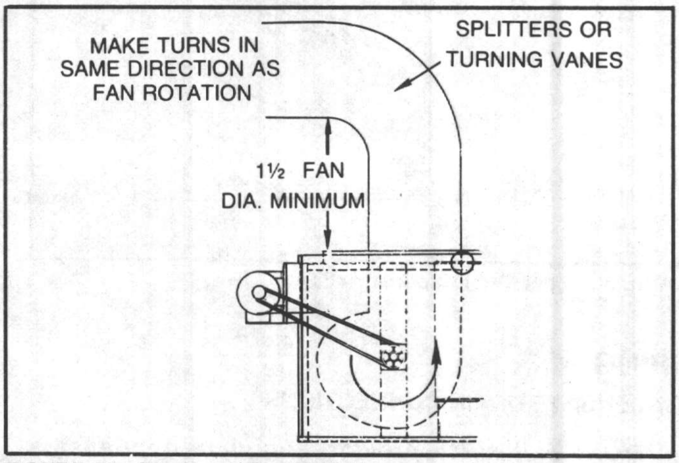


FIGURE 28 - Discharge Ductwork Recommendations

On two-fan units, both fan discharge openings should be jointed to a common duct after the recommended length of straight run. Figure 29 illustrates a proper duct run that will prevent unequal handling of air by the fans. Maximum duct transition should be 30 degrees. The included angle between joining ducts should not exceed 60 degrees. If necessary, split the duct at any point beyond the common connection.

For multizone units, zone duct clips are provided for attaching the ductwork to each zone. Refer to Figure 30. Inset the clips on the damper partitions as required for the number of zones. Approximately 7/16-inches of space will be left between each zone when the duct collar is placed in the duct clip.

NOTE: *When attaching the ductwork to multizone units,* *ensure that the duct connection does not interfere with damper blade travel. If necessary, attach the ductwork to the outside of the fan discharge in order to leave the damper clear of obstructions. A clearance of one inch (minimum) is required between ductwork and low leak dampers for proper damper operation.*

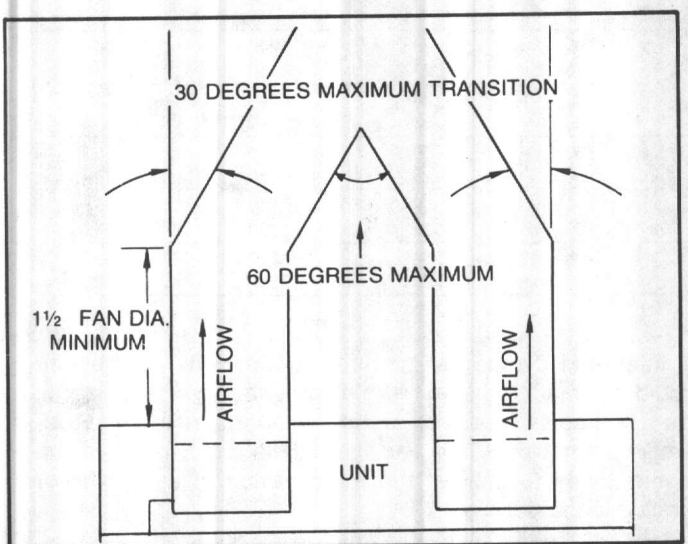


FIGURE 29 - Discharge Ductwork Recommendations for Two-Fan Units

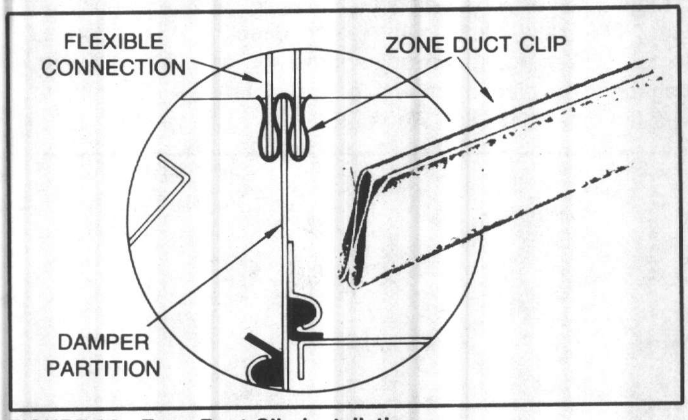


FIGURE 30 - Zone Duct Clip Installation

PIPING

CONDENSATE DRAIN CONNECTIONS

CAUTION: Failure to provide adequate condensate piping may result in water damage to the equipment or building.

Threaded condensate drain connections are provided on both sides of the coil section drain pan. Pitch the line downward toward an open drain and install a plugged tee to facilitate cleaning. Make sure the drain pan connection openings are unobstructed. Trap the drain line as shown in Figure 31 for draw-thru units and Figure 32 for blow-thru units. Draw-thru units size 73 and 86 have additional drain connections on both sides of the fan section. Run these drain connections into the coil section drain line or to a separate open drain.

Drain connection size on unit sizes 3 through 31 is 1-1/4-inch NPT (external). Drain connections on units size 35 to 86 is 1-1/2-inch NPT (internal). Install pipe caps or plugs on all unused unit drain connections.

Note: For units with optional wide coil, the contractor will need to extend the drain pan nipples under the extended drain pan before connecting the drain trap. Nipple length extension is determined by unit size. For size 3-31 units, add an additional 7½-inches in length. Size 41-50 units, add an additional 12-inches in length. Size 35, 63, 73 and 86 units, add an additional 8½-inches in length.

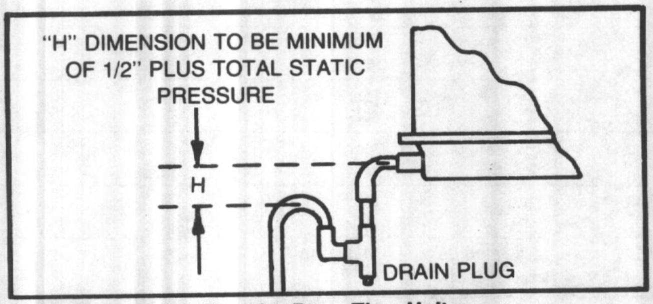


FIGURE 31 - Drain Trap for Draw-Thru Units

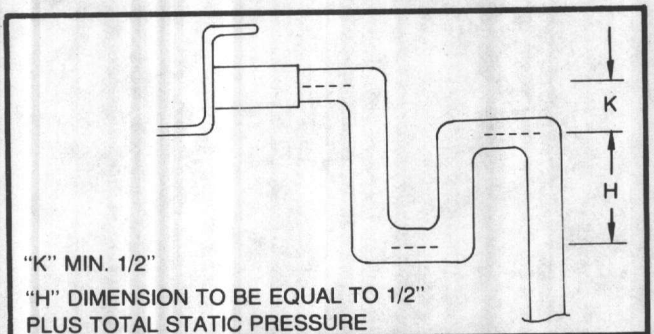


FIGURE 32 - Drain Trap for Blow-Thru Units

SPRAY SECTION PIPING — SPRAYED COIL CLIMATE CHANGER

Sprayed coil units require the following piping to the spray section:

1. Make-up water to the float line. See Figure 33A.
2. Water line from overflow connection to a trapped drain.
3. Shutoff valve and piping to an open or trapped drain.
4. Water line to the quick-fill connection.
5. Insulation of external piping around the spray pump to prevent condensate runoff.
6. Fill the spray tank.
7. Adjust the float valve to maintain a level 1/2-inch below the overflow outlet.

NOTE: *Air must be purged from the system and spray pump vavle must be adjusted for proper water flow. Instructions are given in the Start-Up section of the CLCH maintenance manual.*

CAUTION: Water treatment is required for Sprayed Coil Climate Changers if the supply water is scale forming or corrosive. If neccessary, engage the services of a qualified water treatment specialist. The object of water treatment is to prevent the fouling of the coil surfaces or undue metal damage. THE TRANE COMPANY CAN ASSUME NO RESPONSIBILITY FOR EQUIPMENT FAILURES WHICH ARE THE RESULT OF UNTREATED OR IMPROPERLY TREATED WATER.

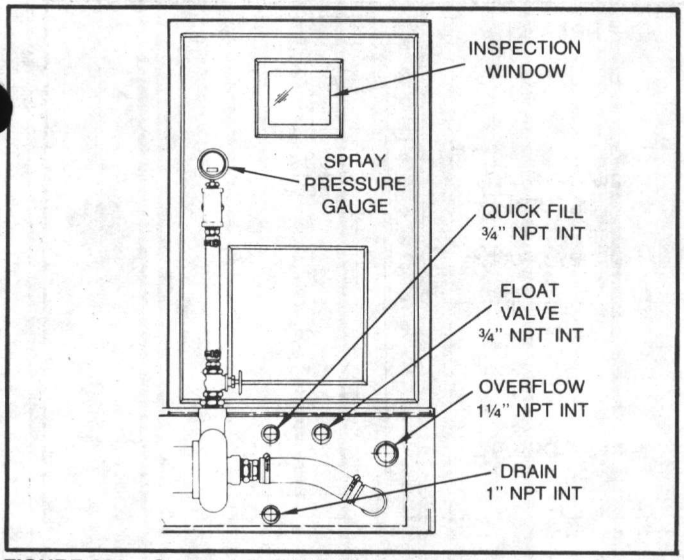


FIGURE 33A - Sprayed Coil Unit Tank Connections

GENERAL COIL PIPING RECOMMENDATIONS

1. Proper installation, piping and trapping is necessary to insure satisfactory coil operation and to prevent operational damage.
2. When selecting coil location, allow sufficient space for access to the coil for routine maintenance and service.
3. Support all piping independently of the coils.
4. Provide swing joints or flexible fittings in all connections that are adjacent to heating coils in order to absorb thermal expansion and contraction strains.
5. The Trane Company recommends that a short pipe nipple be used on coil headers prior to making up any welded flange or welded elbow type connections. This allows the use of a back-up pipe wrench when it is necessary to further rotate the welded flange or elbow when lining up bolt holes on the prefabricated piping.
   ***NOTE:** Use a "Back-Up Wrench" when attaching piping to coils with copper headers. Do not use brass fittings or brass pipe connectors. Brass distorts easily and causes connection leaks.*

   Delta-Flo coils have copper headers which extend outside the unit casing so that back-up pipe wrenches can be used.
6. When attaching the piping to the coil header, make the connection only tight enough to prevent leaks. Maximum recommended torque is 200 foot-pounds. Use pipe sealer on all threaded connections. **The use of Teflon tape or paste is not recommended by Trane.**
7. After completing the piping connections, seal the gap between the pipe and casing with tape or mastic before insulating the pipes.
8. To connect supply and return coil piping, outer coil panels must be removed. If not ordered, drain and vent access holes must be drilled. See Item 9.
9. Provisions must be made to drain those coils that are not in use when subjected to freezing temperatures.

   CAUTION: Failure to properly drain and vent coils when not in use during freezing temperatures may result in coil freeze-up damage.

   Coil types N, NS and A may be adequately drained in their pitched position in the unit. In coilless units, the coil, after field installation, is not pitched (unless special pitching coil support channel is ordered for steam coils) and may be adequately drained in their position in the unit. (Type N is drainable through the return connection.) The installer must provide appropriate piping for adequate drainage.

   Type WL coils are not drainable in either pitched or level position. To drain these coils remove the vent and drain plugs and blow the coils out as completely as possible with compressed air. The coils should then be filled and drained several times with full strength ethylene gylcol so that it will mix thoroughly with the water retained in the coil. Drain the coil out as completely as possible.

   Coil types D, DD, and K, plus W, P2, P4, P8, DL and LL are drainable in their factory-installed level position. Coil types D, DD, DL and LL also have Trane factory-installed drain and vent connections. Figures 34 through 39 illustrate coil drain and vent connections.

   Drainable coils installed in units containing coil types DL or LL will also have factory-installed drain and vent connections.

***NOTE:** On units with stacked coils, there is a condensate follower located at each end of the coil connection. Figure 33B illustrates the condensate follower provided at the end of the stacked coils.*

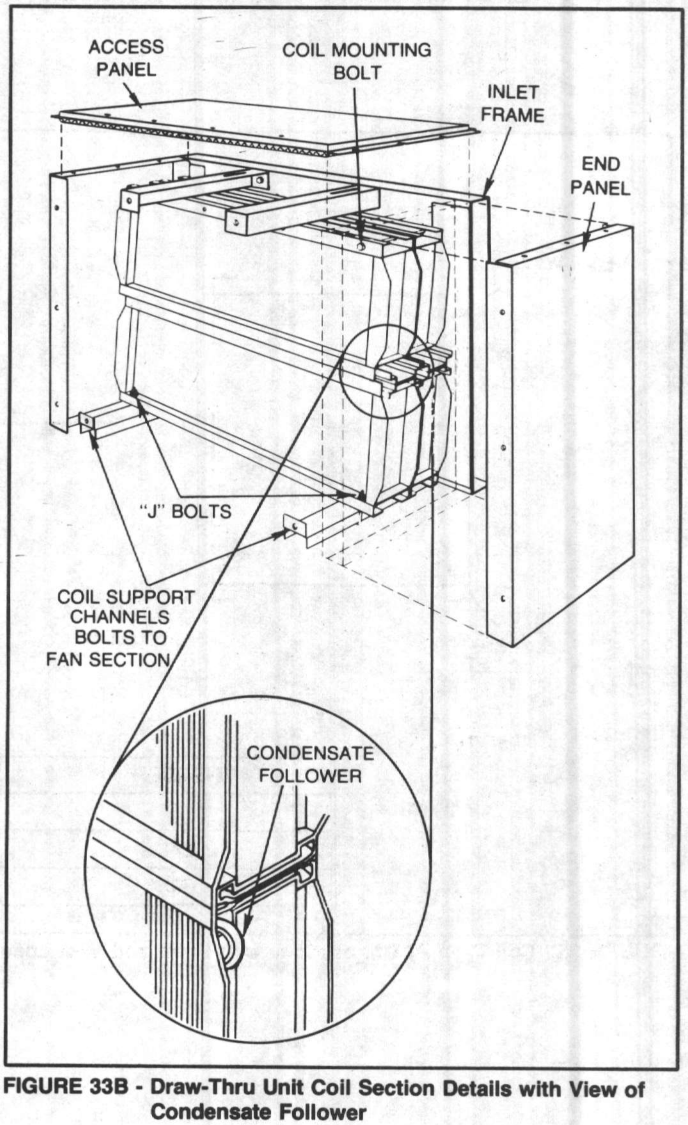
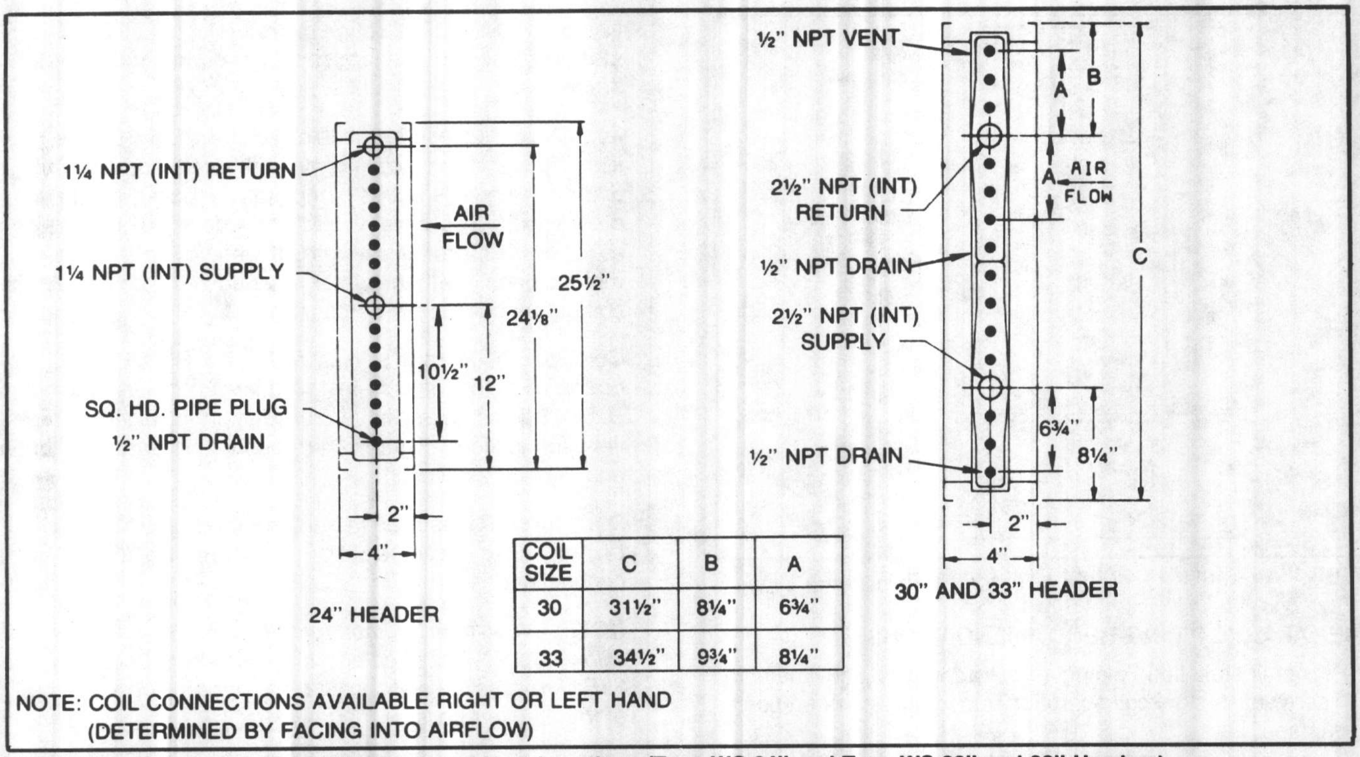
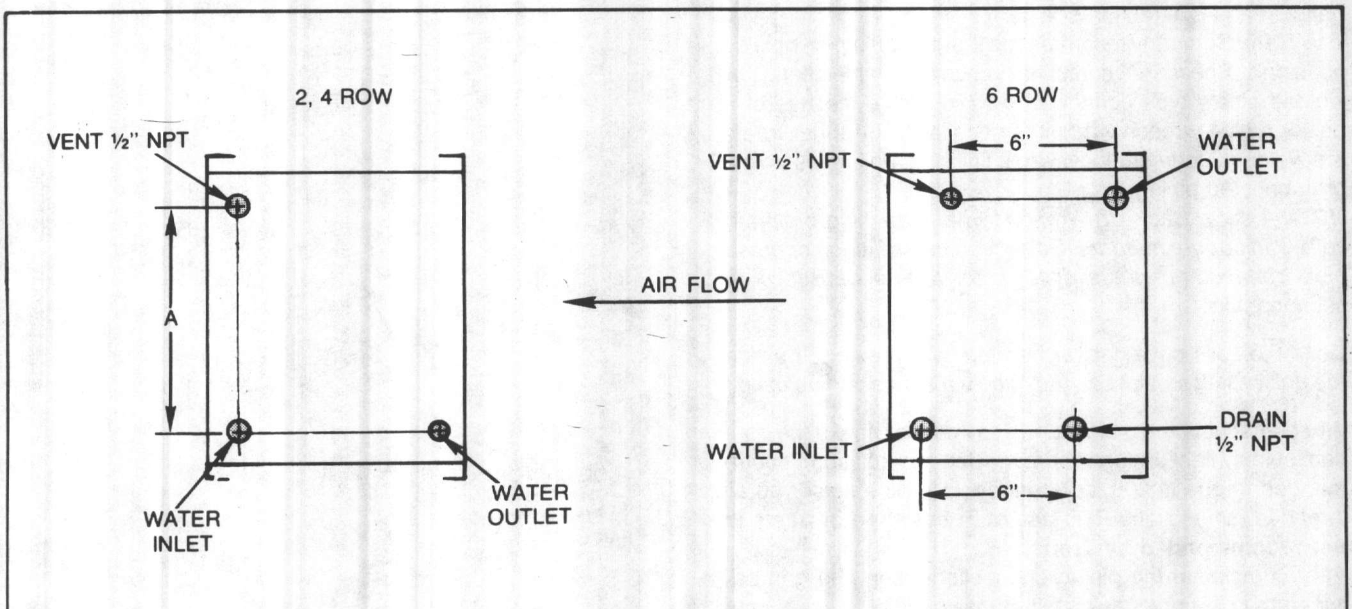


FIGURE 33B - Draw-Thru Unit Coil Section Details with View of Condensate Follower



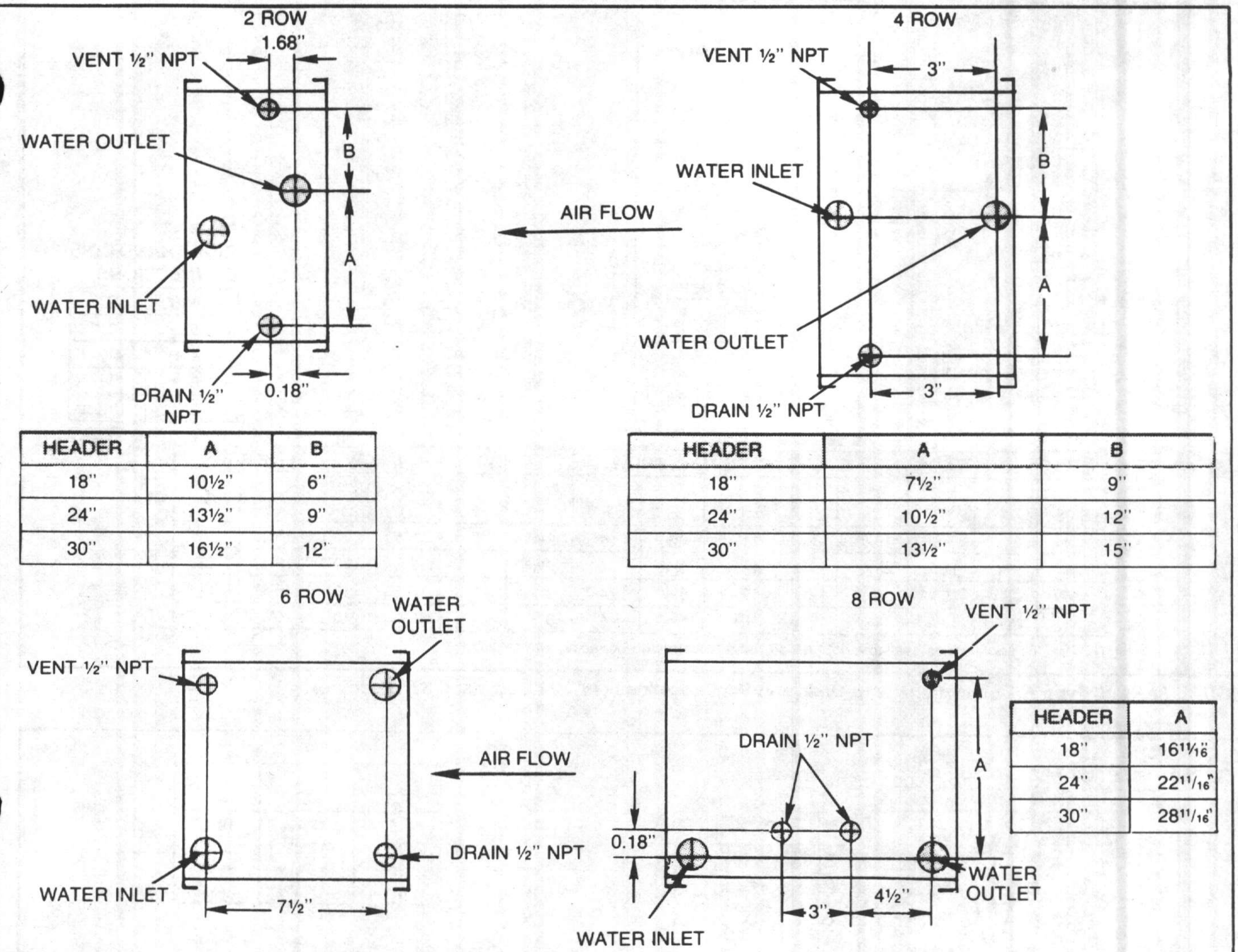
COIL SIZE	C	B	A
30	31½"	8¼"	6¾"
33	34½"	9¾"	8¼"

FIGURE 34 - Coil Connections With Drain and Vent Locations (Type WC 24" and Type WS 30" and 33" Headers)



HEADER	A
18"	16½"
24"	22½"
30"	28½"

FIGURE 35 - Coil Type P2 Connections with Drain and Vent Locations (18", 24" and 30" Headers)

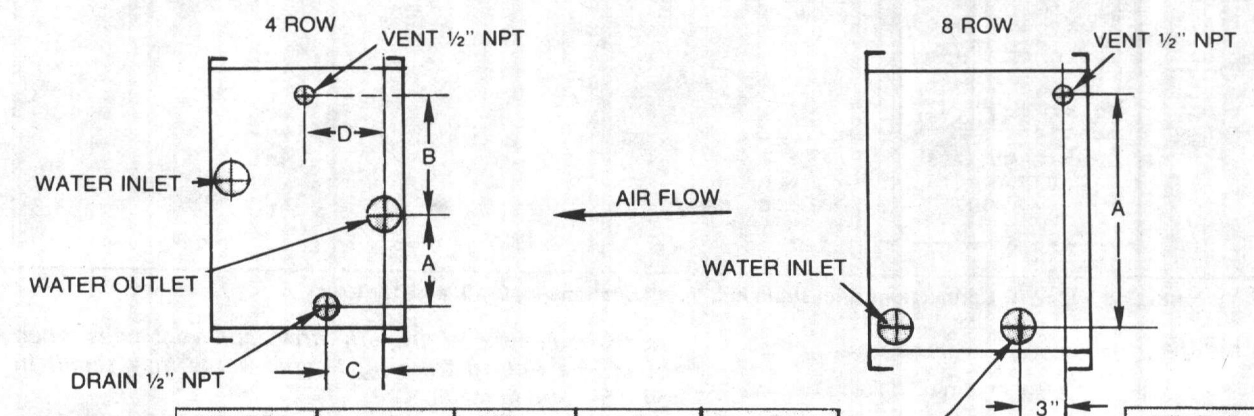


HEADER	A	B
18"	10½"	6"
24"	13½"	9"
30"	16½"	12"

HEADER	A	B
18"	7½"	9"
24"	10½"	12"
30"	13½"	15"

HEADER	A
18"	16¹¹⁄₁₆"
24"	22¹¹⁄₁₆"
30"	28¹¹⁄₁₆"

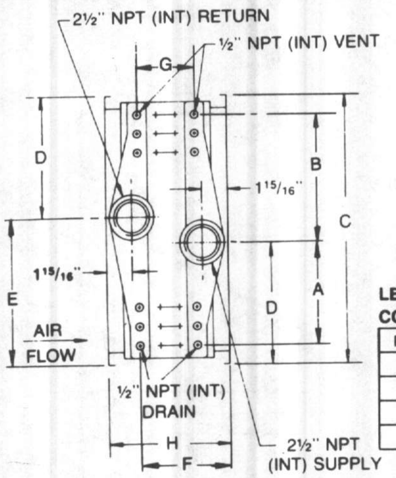
FIGURE 36 - Coil Type P4 Connections with Drain and Vent Locations (18", 24", and 30" Headers)



HEADER	A	B	C	D
18"	7½"	9"	1½"	1½"
24"	10½"	12"	0"	4½"
30"	13½"	15"	1½"	1½"

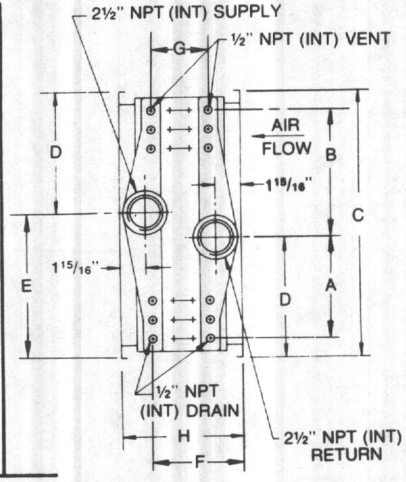
HEADER	A
18"	16½"
24"	22½"
30"	28½"

FIGURE 37 - Coil Type P8 Connections with Drain and Vent Locations (18", 24", and 30" Headers)



LEFT HAND COIL CONNECTIONS

ROWS	G
3	3
4	4½
6	7½
8	10½



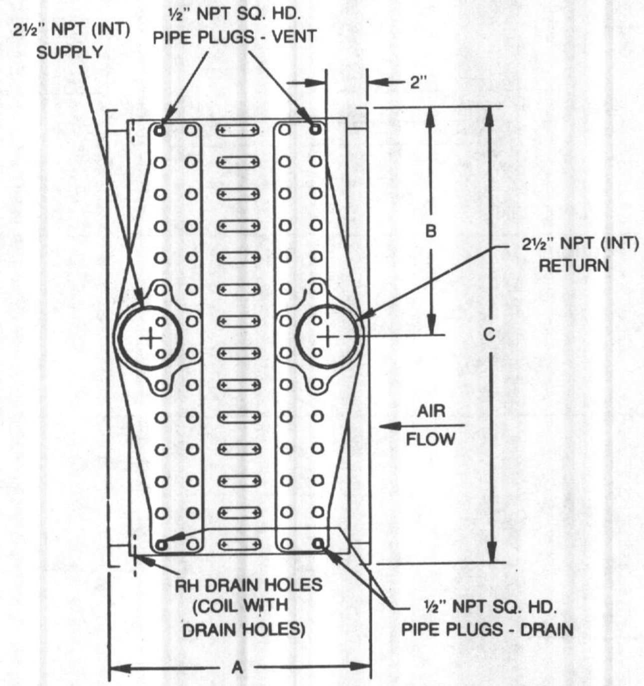
RIGHT HAND COIL CONNECTIONS

ROWS	G
3	3
4	4½
6	7½
8	10½

					2-ROW		4-ROW		6-ROW		8-ROW	
COIL SIZE	A	B	C	D	E	H	F	H	F	H	F	H	F
18	6¾"	9¾"	19½"	8¼"	11¼"	6½"	4"	9½"	7"	12½"	10"	15½"	13"
24	9¾"	12¾"	25½"	11¼"	14¼"	6½"	4"	9½"	7"	12½"	10"	15½"	13"
30	12¾"	15¾"	31½"	14¼"	17¼"	6½"	4"	9½"	7"	12½"	10"	15½"	13"
33	14¼"	17¼"	34½"	15¾"	18¾"	6½"	4"	9½"	7"	12½"	10"	15½"	13"

NOTE: Coil connections available right or left hand (determined by facing into air flow).

FIGURE 38 - Coil Type W Connections With Drain and Vent Locations (18", 24", 30", and 33" Headers)



COIL SIZE	B	C
18	9¾"	19½"
24	12¾"	25½"
30	15¾"	31½"
33	17¼"	34½"

ROWS	A
6	12½"
8	15½"
10	18½"
12	21½"

FIGURE 39 - Right Hand Coil Type WD Connections with Drain and Vent Locations (6, 8, 10, and 12 Rows)

STEAM COIL PIPING

Refer to Figures 40 to 45 for typical steam coil piping.

CAUTION: Condensate must flow freely from the coil at all times in order to prevent coil damage from water hammer, unequal thermal stresses, freeze-up and corrosion. Complete the following recommendations to prevent coil damage.

CAUTION: Failure to properly drain and vent coils when not in use during freezing temperatures may result in coil freeze-up damage.

1. Check that the coil is installed correctly, with airflow in the same direction as indicated on the nameplate or coil casing.
2. Install a 1/2-inch, 15-degree swing-check vacuum breaker in the unused condensate return tapping as close as possible to the coil.

TABLE 12 — Cooling and Heating Coil — Connection Sizes (Inches NPT)

COIL TYPE	HEADER HEIGHT	SUPPLY	RETURN	VENT	DRAIN
W	18, 24, 30, 33	2.5	2.5	0.5	0.5
D	18, 24, 30, 33	2.5	2.5	0.5	0.5
DD	18, 24, 30, 33	2.5	2.5	0.5	0.5
WD	18, 24, 30, 33	2.5	2.5	0.5	0.5
K	18, 24, 30, 33	2.5	2.5	0.5	0.5
P2	18, 24, 30	0.75	0.75	0.5	0.5
P4	18, 24, 30	1.0	1.0	0.5	0.5
P8	18, 24, 30	1.25	1.25	0.5	0.5
WC	18	1.0	1.0	0.5	0.5
	24	1.25	1.25	0.5	0.5
	30, 33	2.5	1.5	0.5	0.5
WA	18, 24, 30, 33	2.5	2.5	0.5	0.5
N, NS	18	2.0	1.0	NA	NA
	24	2.5	1.25	NA	NA
	30, 33	3.0	1.25	NA	NA
A, AA	18	2.5	1.0	NA	NA
	24, 30, 33	2.5	1.25	NA	NA
TT	18, 24, 30, 33	0.75	0.75	NA	NA
DL	18, 24, 30, 33	1.5	2.0	0.375	0.375
WL	18, 24, 30, 33	1.5	2.0	0.375	0.375
LL	18, 24, 30, 33	2.5	2.5	0.375	0.375

Notes:
1. Connections are NPT internal.
2. Coil Type NS drains through supply connections.

3. Vent the vacuum breaker line to the atmosphere or connect it to the return main at the discharge side of the steam trap.

   NOTE: *Vacuum breaker relief is mandatory when the coil is controlled by a modulating steam supply or a two-position (ON-OFF) automatic steam supply valve.*

4. Run the return pipe at the full size of the steam trap connection except for the short nipple screwed directly into the coil condensate connection. **Do not bush or reduce the coil return tapping size.**
5. With automatic controls, or where the possibility of low pressure supply steam exists, use float and thermostatic traps with atmospheric pressure gravity drain and continuous discharge operation. Locate the steam trap discharge at least 12 inches below the condensate return tapping. Use bucket traps **only** when supply steam is unmodulated and pressure is 25 psig or higher.
6. When coils are installed in a series, size the steam traps for each coil using the capacity of the first coil in airflow direction.
7. Always trap each coil separately to prevent holdup in one or more coils.
8. Always install strainers as close as possible to the inlet side of the trap.
9. Use a V-port modulating valve to obtain gradual modulating action.
10. Control each coil bank separately when installing coils for series airflow with automatic steam control valves.

CAUTION: Always open the steam supply control valve slowly to prevent possible coil damage.

11. Do not modulate systems with overhead or pressurized returns unless the condensate is drained by gravity to a receiver (vented to the atmosphere) and returned to the main by a condensate pump.
12. At start-up on units with fresh air dampers, slowly turn the steam on full for at least 10 minutes before opening the fresh air intake.
13. Pitch all supply and return steam piping down a minimum of 1 inch per 10 feet in the direction of flow.
14. Do not drain the steam mains or take-offs through the coils. Drain the mains ahead of the coils through a steam trap to the return line.
15. Overhead returns require 1 psig of pressure at the steam trap discharge for each 2-foot elevation to assure continuous condensate removal.

TABLE 13 - Refrigerant Coil (Type F) Piping Sizes (Inches)

HEADER HEIGHT	NO. OF CIRCUITS	CONNECTION SIZE (INCHES)	
		LIQUID	SUCTION
18	2	⅞	1⅜
	3	⅞	1⅝
	6	1⅛	2⅛
	12	1⅜	2⅛
24	2	⅞	1⅝
	4	⅞	1⅝
	8	1⅛	2⅛
	16	(2)1⅛	(2)2⅛
30	2	⅞	1⅜
	4	⅞	1⅝
	5	⅞	2⅛
	10	1⅜	2⅛
	20	(2)1⅜	(2)2⅛
33	3	⅞	1⅝
	7	1⅛	2⅛
	11	1⅜	2⅛
	22	(2)1⅜	(2)2⅛

NOTE: Connections are piping OD.

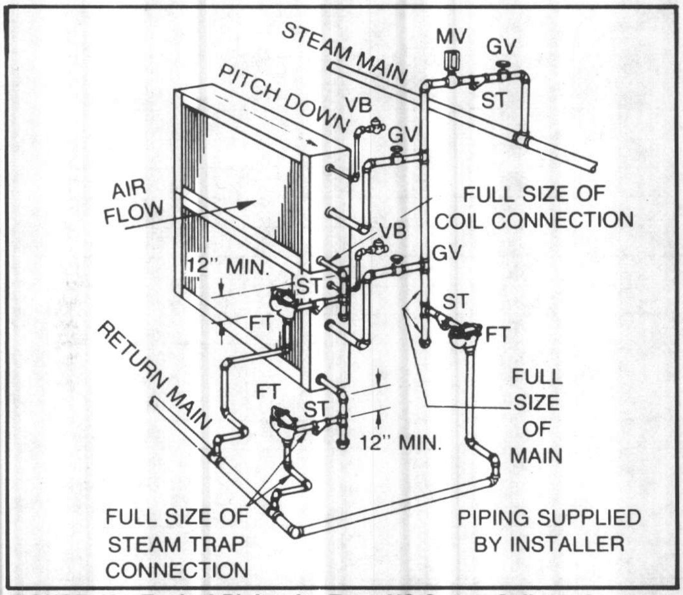


FIGURE 40 - Typical Piping for Type NS Steam Coils and Horizontal Tubes for Horizontal Airflow

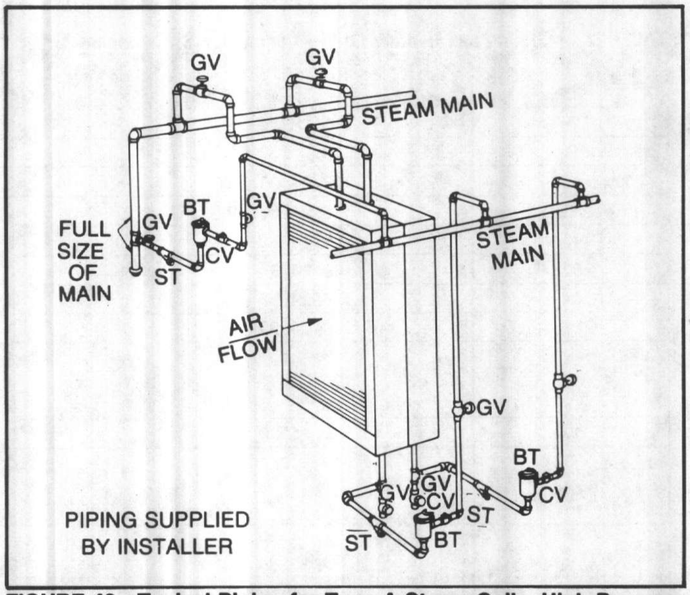


FIGURE 43 - Typical Piping for Type A Steam Coils, High Pressure, Vertical Tubes for Horizontal Airflow

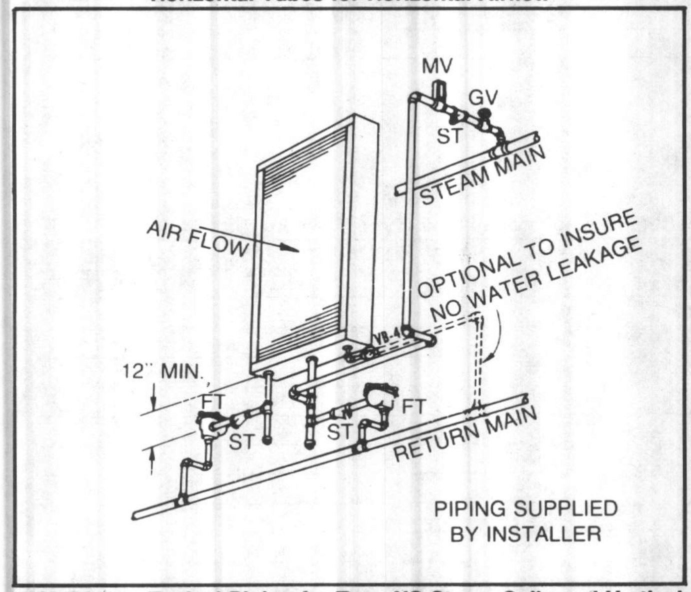


FIGURE 41 - Typical Piping for Type NS Steam Coils and Vertical Tubes for Vertical Airflow

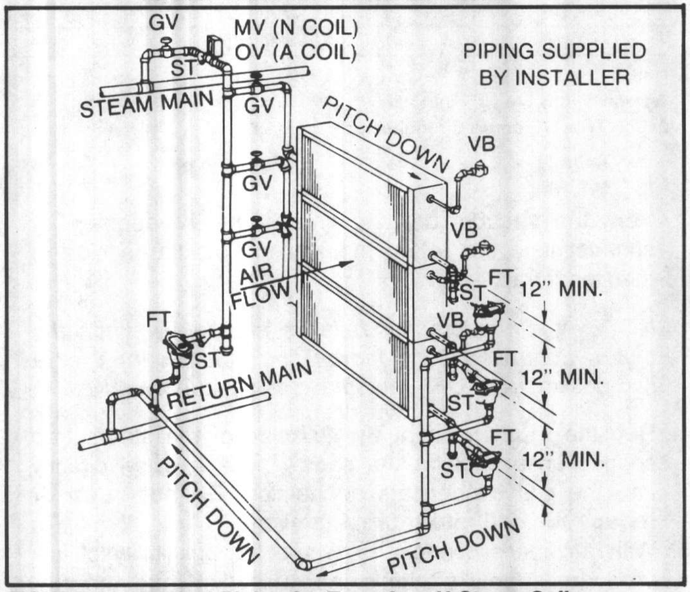


FIGURE 44 - Typical Piping for Type A or N Steam Coils, Horizontal Tubes for Horizontal Airflow

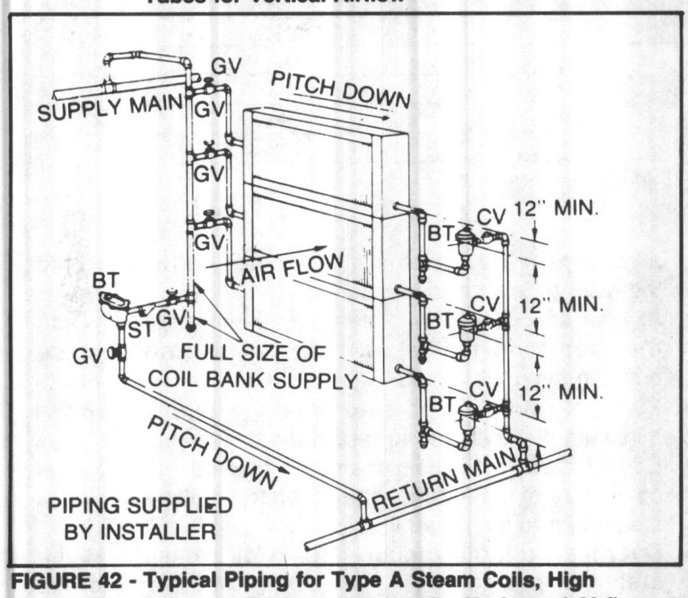


FIGURE 42 - Typical Piping for Type A Steam Coils, High Pressure, Horizontal Tubes for Horizontal Airflow

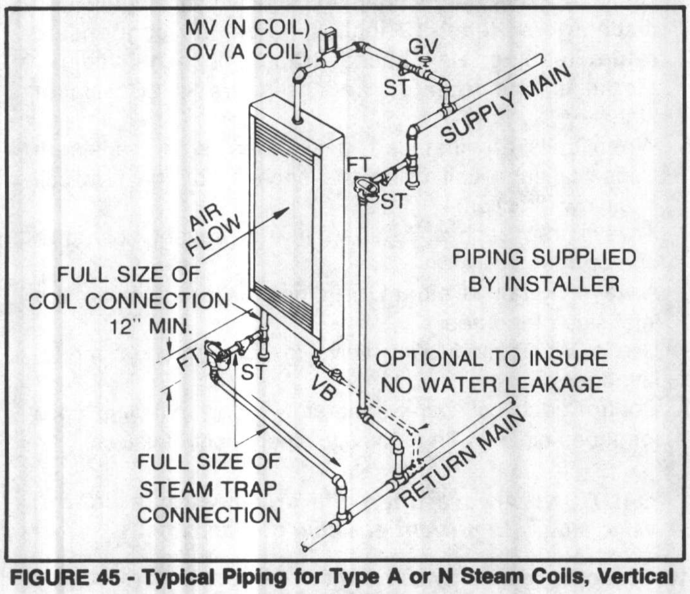


FIGURE 45 - Typical Piping for Type A or N Steam Coils, Vertical Tubes for Horizontal Airflow

HOT WATER COIL PIPING

Refer to Figures 46 to 48 for typical hot water coil piping.

1. Check that the coil is installed correctly, with airflow in the same direction as indicated on the nameplate or coil casing.
2. Type W, WL, DL, and WC hot water coils are self-venting only if the water velocity exceeds 1.5 feet per second. If it is below this rate, vent the coils by either of the following methods:

   a. Install an air vent in the top pipe plug tapping of the return header.
   b. Vent from the top of the return header horizontally to the return piping if the return line rises and is above the top of the coil.

CAUTION: Do not throttle or modulate the water flow for coils that are exposed to freezing air. Coil damage may result from freeze-up.

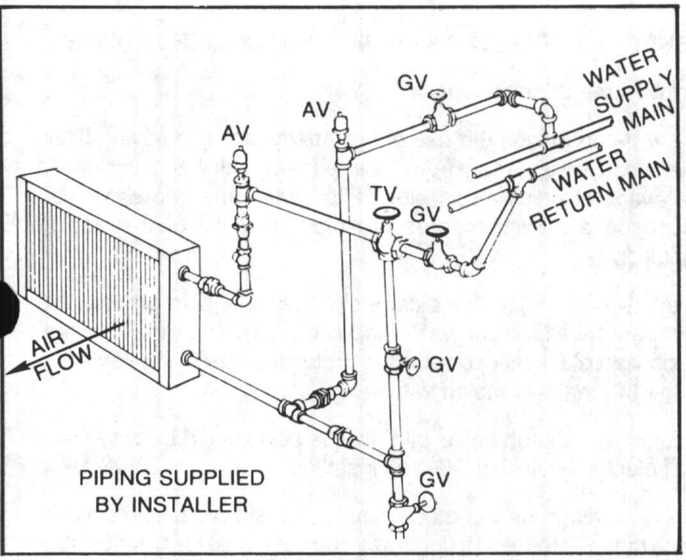


FIGURE 46 - Typical Piping for Type WC Water Coil

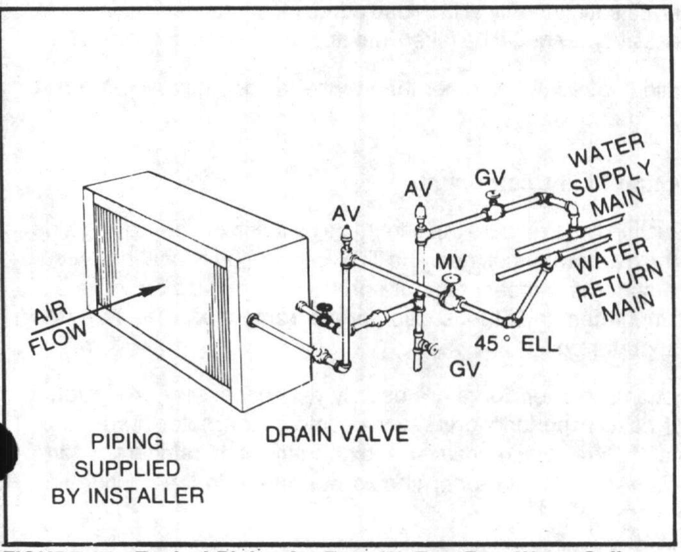


FIGURE 47 - Typical Piping for Type W, Two-Row Water Coil

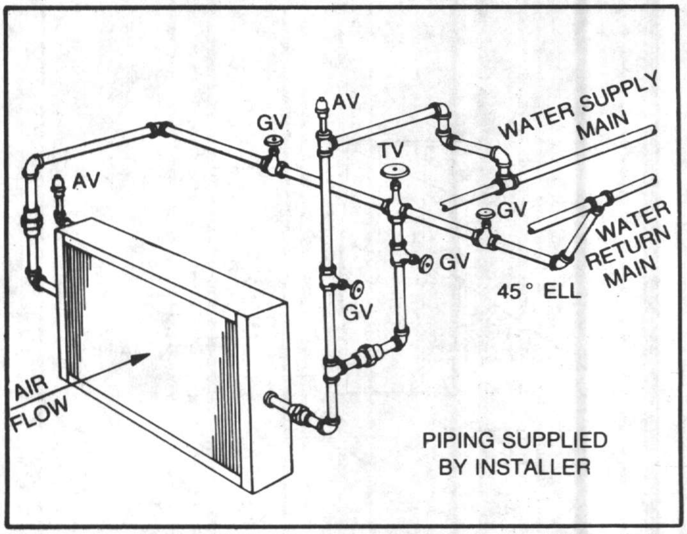


FIGURE 48 - Typical Piping for Type W or WA, 1-Row Water Coil

WATER COOLING COIL PIPING

Refer to Figures 49, 50 and 50A for typical water cooling coil piping.

1. Check that the coil is installed correctly, with airflow in the same direction as indicated on the nameplate or coil casing.
2. Vent both supply and return lines.
3. Install a strainer ahead of the control valve, if used.
4. Install a drain line and shutoff valve in the supply line near the coil.
5. Check for coil fin damage and straighten if necessary.
6. Type W, D, K, DL, WL and LL water coils are self-venting only if the water velocity exceeds 1.5 fps. Type DD and WD coils are self-venting only if the water velocity exceeds 2.5 fps. If water velocity is below these minimum values, vent by one of the following methods.

   a. Install an air vent in the top pipe plug tapping of the return header, or;
   b. When the return line rises above the top of the coil, vent from the top of the return header horizontally to the return piping.

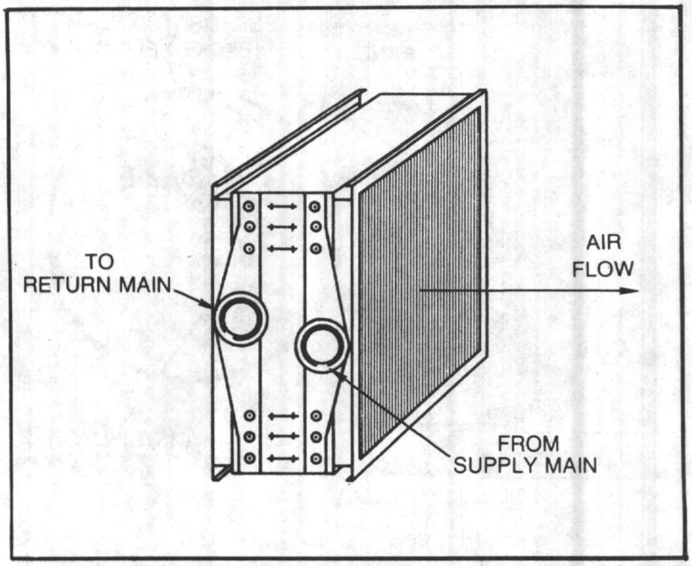


Figure 49 - Typical Piping for Type D, W or K Water Cooling Coils with End Connections.

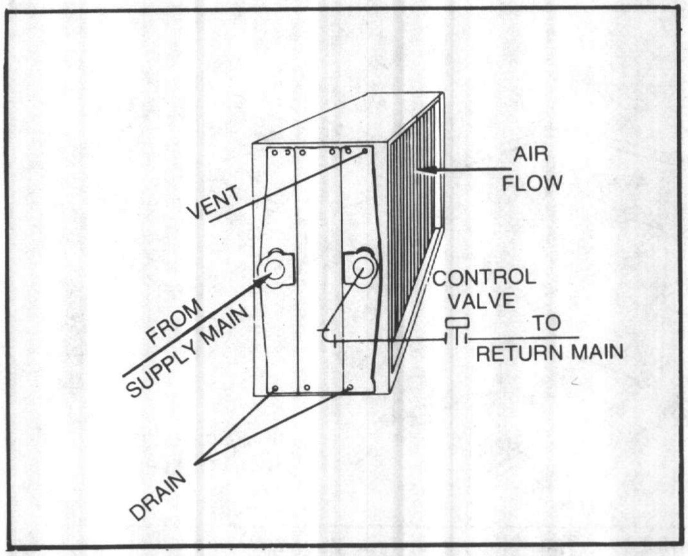


Figure 50 - Typical Piping for Type DD Water Cooling Coil with Center Connections.

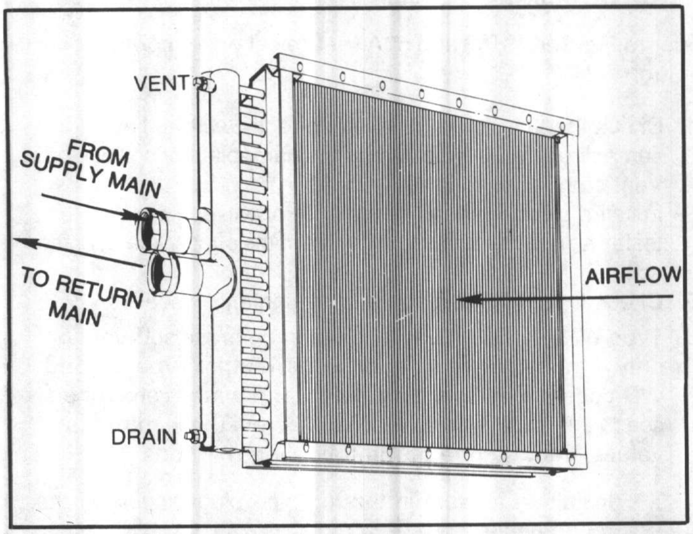


Figure 50A - Typical Piping for 2-Row, Type WL and DL Water Coil with Drain and Vent Locations.

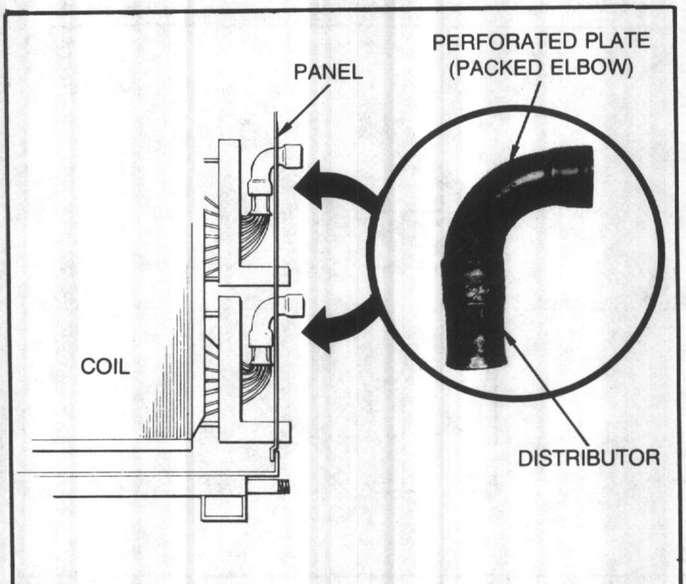


FIGURE 51 - Type F Refrigerant Coil

REFRIGERANT COIL PIPING

NOTE: *This coil has been dehydrated and charged with a holding charge. To prevent leaks and system contamination, do not break the seals until the coil is installed.*

Check that the coil is installed correctly, with airflow in the same direction as indicated on the coil nameplate or casing. The suction connection must be at the bottom of the suction header.

Follow accepted refrigeration piping practices and safety precautions. See Figure 51 for typical refrigerant coil piping. General refrigerant piping recommendations for component selection and line sizing follow. Specific recommendations should be provided with the high-side components, including instructions for pressure testing, evacuation, and system charging.

Leak-test the entire refrigeration system after piping is complete. Charge the unit according to approximate weight requirements and operating pressures. Measure superheat and adjust the thermal expansion valve setting if necessary.

GENERAL REFRIGERANT PIPING RECOMMENDATIONS

Liquid Line Components

Trane recommends the use of a properly sized liquid line filter-drier, installed upstream from the expansion valve and as close to the evaporator coil as possible. Filter-drier selection should be based on a maximum pressure drop of 2 psi at the design condition.

In addition, a moisture indicator/sight glass should be installed between the expansion valve and filter-drier. The moisture indicator/sight glass must be sized to match the size of the liquid line at the thermal expansion valve.

A liquid line shutoff valve with access port should be sized with the selected liquid line OD, and installed close to the condenser.

Other valves, tube bends, and reducers should be minimized, since these items tend to increase pressure drop and reduce subcooling at the expansion valve.

The Thermal Expansion Valve (TEV) must be selected for proper size and capacity. A slightly oversized valve will allow the unit to operate satisfactorily at low-load conditions. The use of a hot gas bypass valve should be taken into account when sizing the TEV.

Liquid line receivers, other than those factory-installed, are **not** recommended.

Suction Line Components

A suction line pressure tap should be installed on the leaving side of the evaporator coil near the TEV sensing bulb location. Accurate superheat measurement and thermal expansion valve adjustment demands that suction pressure be measured near the evaporator coil.

Suction line filter-driers are usually only necessary on systems that have experienced a severe compressor motor burn-out or other failure which results in extremely high refrigerant temperatures. This filter-drier should not be left in the suction line permanently.

Liquid Line Sizing

All compressors have a Refrigerant Charge Limit (RCL) that must not be exceeded. Since the RCL and pressure drop are in direct conflict with each other, Trane recommends that the liquid line be sized as small as possible, while maintaining a low enough pressure drop to ensure 5 degrees F of subcooling at the expansion valve.

Suction Line Sizing

Suction line tubes must be sized to maintain refrigerant vapor velocities that are high enough to ensure oil entrainment under all operating conditions.

Although not harmful, it is not necessary to pitch horizontal suction lines toward the compressor when the refrigerant coil is used with Trane condensing units, which are designed with a gas trap in the suction line just prior to the compressor. This gas trap helps the crankcase heater to stop temperature-induced migration during the off cycle. However, it also eliminates gravity flow to the compressor sump.

WIRING

WARNING: DISCONNECT ELECTRICAL POWER SOURCE BEFORE SERVICING THE UNIT OR CONNECTING ELECTRICAL WIRES. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR ENTANGLEMENT IN MOVING PARTS.

Wiring to the unit fan motor and the spray pump motor (sprayed coil units only) must be provided by the installer and must comply with all national and local electrical codes. The installer must also furnish a fused disconnect switch in compliance with national and local electrical codes.

CAUTION: Use copper conductors only for terminal connections. Use of aluminum or other type of wiring may result in galvanized corrosion or overheating and resultant equipment damage.

Fan motors require motor overload protective devices that are rated or selected in compliance with the National Electric Code. Specific unit and motor connection diagrams are provided on the unit. If wiring directly to the motor, provide a flexible connection at the motor to permit fan belt adjustment. Fractional-horse-power motors may be factory-connected to a terminal box on the unit. If this construction is provided, complete field wiring to this connection box.

INSTALLATION CHECKLIST

Complete this checklist as the unit is being installed to verify that all recommended installation procedures are accomplished before the unit is started. This checklist does not replace the detailed instructions given in appropriate places in the Installation section of this manual. Read the entire section carefully to become familiar with the installation before installing the unit.

WARNING: DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR INSPECTING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR ENTANGLEMENT IN MOVING PARTS.

RECEIVING AND HANDLING

☐ 1. Unit and accessories are inspected for shipping damage or material shortage. Report any claims immediately.

☐ 2. Unit nameplate data agrees with submittal and ordering information.

LIFTING

☐ 1. Center of gravity is approximated.

☐ 2. Proper rigging devices are installed, including slings and spreader bars.

☐ 3. Unit is hoisted to its approximate location.

UNIT LOCATION

☐ 1. Floor or foundation is prepared to support unit weight and to be level.

☐ 2. Sufficient access is provided for unit size, clearances and maintenance access.

☐ 3. Foundation or mounting platform is sized for unit, accessories and mounting legs.

☐ 4. For ceiling-mounted units, suspension frame is selected and prepared.

MOUNTING

- ☐ 1. Vibration isolators are installed and fastened to the floor.
- ☐ 2. Shipping angles are removed.
- ☐ 3. Multi-section units are assembled.

NOTE: *Some units require further assembly after part of the unit is mounted.*

- ☐ 4. Support frame are constructed and attached for ceiling-mounted units.
- ☐ 5. Assembled units are mounted on isolators or ceiling supports.
- ☐ 6. Unit assembly is complete.
- ☐ 7. Mutli-section units are joined with flexible connection material.
- ☐ 8. Tension restraints are installed on high-pressure units.
- ☐ 9. Splash guards are installed where necessary.
- ☐ 10. Unit is fastened to isolators.
- ☐ 11. Unit is level.

ACCESSORIES

- ☐ 1. Bag filter section is installed.
- ☐ 2. Filters are installed.
- ☐ 3. Manometers, if necessary, are installed.
- ☐ 4. Exhaust Air Economizer is installed.
- ☐ 5. All accessories are installed.

FAN MOTOR ASSEMBLY

- ☐ 1. Shafts are properly installed in bearings.
- ☐ 2. Sheaves are properly located on shafts.
- ☐ 3. Shafts are level and parallel.
- ☐ 4. Sheaves are aligned.
- ☐ 5. Belt tension is correct.
- ☐ 6. Belt is at least 1/2-inch from unit flanges or structural supports.
- ☐ 7. **All sheave and bearing set screws are tightened to the correct torques.**
- ☐ 8. Belt guard is installed.

DAMPERS

- ☐ 1. Blow-Thru Mutlizone units — Drive rod assembly is adjusted.
- ☐ 2. Cold deck damper rods are insulated (if necessary).
- ☐ 3. Dampers are set for each zone.
- ☐ 4. Damper operators (furnished by the installer) are installed and adjusted.

INLET VANES

- ☐ 1. Vanes and rod assemblies move freely. Lubricate if necessary.
- ☐ 2. Operators and linkage (furnished by the installer) are installed and adjusted.

DUCTWORK

- ☐ 1. Intake and discharge connections are made with flexible connection.
- ☐ 2. Discharge ductwork is unchanged in size or direction for at least 1-1/2 fan diameters in length.
- ☐ 3. Adequate clearance is allowed between duct connections and dampers.

PIPING

- ☐ 1. Condensate drain lines are trapped, installed and connected to the coil drain pan.
- ☐ 2. Unused drain connections are plugged.
- ☐ 3. Spray section piping is complete for sprayed-coil units.
- ☐ 4. Provisions are made for properly draining and venting all coils.
- ☐ 5. Supply and return coil connections are made.
- ☐ 6. Supply and return piping is complete.

WIRING

- ☐ 1. Supply power is connected to fan motor.
- ☐ 2. Wiring direct to fan motor is flexible connection.
- ☐ 3. If terminal box is provided, field-wiring to terminal box is complete.
- ☐ 4. Supply power is connected to spray pump motor (sprayed-coil units only).
- ☐ 5. Fused disconnect switch is installed within sight of unit.
- ☐ 6. Motor overload protective devices are installed.

START-UP

WARNING: DISCONNECT ELECTRICAL POWER AND ALLOW ALL ROTATING PARTS TO STOP COMPLETELY BEFORE SERVICING OR INSPECTING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK, ENTANGLEMENT IN MOVING PARTS OR PRESSURE DIFFERENTIAL WITHIN THE UNIT.

PREPARATION

Perform the following checks and inspections before operating the unit:

1. **With the system de-energized,** check that the electrical connections are complete and tight at the terminals.
2. Make sure the belt guard is in place.
3. Inspect the fan wheels. They should turn freely in the proper direction of rotation.
4. As mentioned previously in the Installation section, check the bearing and sheave setscrews for proper torque settings. Refer to applicable section in this manual.
5. Inspect fan belt tension and sheave setscrews. Belt tension, sheave alignment and setscrew torques for the motor assembly are given in this manual.
6. Check the piping and valves for leaks. Open or close the valves, depending on their function in the system. Drain lines should be open. If a refrigerant coil is used, the system must be evacuated, leak-tested with dry nitrogen, and charged with refrigerant.
7. Check that the air filters are in place and that all dampers are set properly.
8. Remove all foreign material from the drain pan. Check the drain pan and condensate line to make sure they are not obstructed.
9. All unit access panels must be in place. All screws, nuts and bolts must be tightened to their proper torques.
10. On high-pressure units, the coil piping hole gaskets must be installed properly.
11. If the unit includes fan paralleling control, open it fully.
12. Inspect fan motor and bearing lubrication.

CAUTION: To prevent fan motor or bearing failures, it is necessary that they are lubricated properly. This must be checked before the unit is started for the first time. See the label on the side of the unit, the tag attached to the motor and the Climate Changer Maintenance Manual.

START-UP PROCEDURES

After completing all the items uner "Pre-Start-Up," the unit may be started and the following checks and adjustments performed:

NOTE: *High Pressure units with self-locking collar fan bearings. During start-up check rotation of fan shaft to determine if fan motor is wired correctly. Incorrect rotation of fan may cause premature bearing and shaft failure.*

1. Measure the motor voltage and amps on all phases to insure proper operation. Compare these readings with the motor nameplate.
2. If the unit includes a spray pump, open the spray pump air valve and purge air from the system. Adjust the spray pump valve until the spray pattern diameter equals the finned height of the top cooling coil. The resulting gauge pressure should be between 7 and 10 psig.
3. If the unit includes fan paralleling control (two-fan, blow-thru units only), adjustment may be required. An indication of an incorrect setting is paralleling of the fan (pulsating operation) and erratic fan motor amperage readings. Adjust the fan paralleling control until fan operation is smooth and the amperage reading is steady.

   The fan paralleling control should be closed only far enough to eliminate erratic operation. Rarely should adjustment exceed two inches on either fan. If the devices are closed too far, unit capacity will be reduced.

   Each fan paralleling control device has two rods per fan extending upward through the top of the blow-thru fan section. To adjust fan operation for a smooth airflow condition, the following should be done:

   a. Loosen the locking nut on one rod, lower the rod ½-inch and retighten. Repeat for the other rod on the fan.
   b. If the unstable condition still exists, repeat Step A.
   c. If the unstable condition still exists, relocate the fan paralleling control to the original position and perform Steps A and B on the other fan.
   d. If the unstable condition still exists, lower both fan paralleling devices to 1-inch from the original position. Repeat Steps A, B, and C, using 1-inch as a base reference.

4. Measure voltage at all three wires. Maximum allowable voltage imbalance is two percent. Voltage imbalance is defined as 100 times the sum of the deviation of the three voltages from the average, divided by twice the average voltage. For example, if the three measured voltages are 221, 230 and 227, the average voltage would be 226 volts. The percent of voltage imbalance is then calculated:

   $$\frac{100 \times \{ [226\text{-}221] + [230\text{-}226] + [227\text{-}226] \}}{2 \times 226} = 2.2\% \text{ (Unacceptable)}$$

   In this example, 2.2 percent imbalance is not acceptable and the power company should be notified to correct it.

5. If the fan speed is changed more than 5% from the original designed rpm, or if parts such as shafts, fan wheels, bearings, or other drive components are replaced, the unit vibration should be checked.

   The unit vibration, measured horizontally and vertically directly on the fan shaft bearing (perpendicular to the shaft centerline), should not exceed 0.2 in/sec. or 3.0 mils, whichever is the lower displacement at the unit operating speed.

SHEAVE ALIGNMENT

To prevent interference of the fan frame with the belt, make sure that the belt edge closest to the motor has the proper clearance from the fan frame, as shown in Figure 52.

Align the fan and motor sheaves by using a straightedge as shown in Figure 53. The straightedge must be long enough to span the distance between the outside edges of the sheaves. When the sheaves are aligned, the straightedge will touch both sheaves at points A through D. A string, drawn tight, may be used in the same manner. For uneven width sheaves, place a string in the center groove of both sheaves and pull tight. Adjust sheaves and tighten the sheave setscrews to the proper torques, given in Table 4.

Parallel operation of the fan and motor shafts is necessary to prolong belt life. Place a level on the shafts to check horizontal alignment. Shim if necessary.

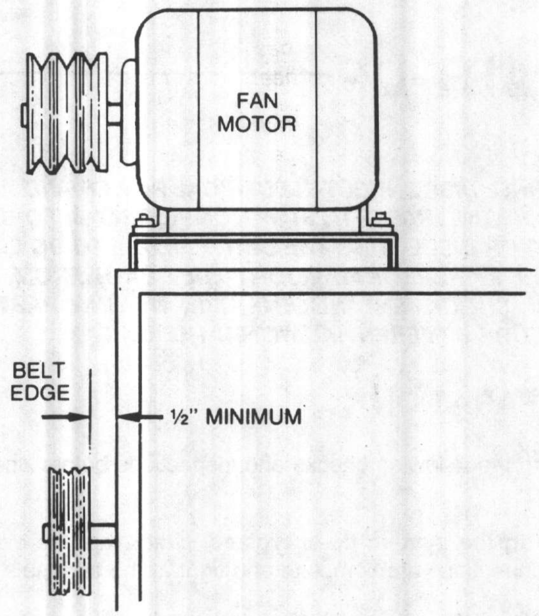


Figure 52 - Minimum Allowable Distance Between Frame Work and Fan Sheave.

FAN ASSEMBLY SETSCREWS

Check and adjust fan wheel, bearing and sheave setscrews whenever a component is removed or an adjustment is made. Refer to Table 4 for recommended Torques.

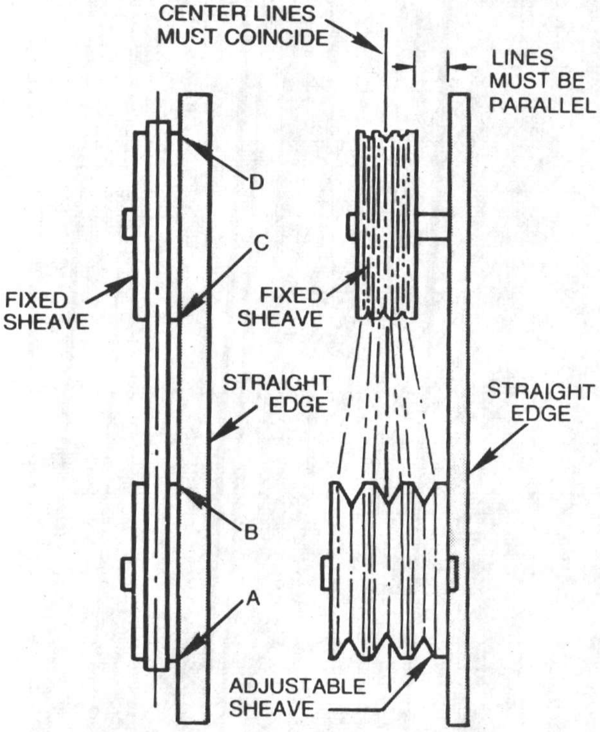


Figure 53 - Sheave Alignment

FAN WHEEL CLAMPS

The clamps that hold the fan hub on the shaft must be properly positioned and tightened to ensure safe fan operation.

NOTE: *On fans that are 20 inches or smaller, the clamps should be replaced whenever the wheel or shaft is replaced.*

On fans that are 20 inches or smaller, locate the two-piece clamp over the hub so that the hub tabs go through the clamp slots. Finger-tighten the two bolts evenly, then torque down both bolts **evenly** in small increments to 25 foot-pounds. The clamp flanges should meet at both bolt locations before 25 foot-pounds is reached.

On fans that are larger than 20 inches, finger-tighten the three bolts evenly, then torque down all three bolts **evenly,** in small increments, to 35 to 40 foot-pounds. Visually check the spacing between the three clamp flanges to make sure they are consistently tightened.

FAN BELT TENSION

NOTE: *Fan belt tension should be checked at least twice during the first days of operation, since there is a rapid decrease in tension until belts are run in.*

WARNING: DISCONNECT ELECTRICAL POWER SOURCE AND ALLOW ALL ROTATING EQUIPMENT TO STOP COMPLETELY BEFORE INSPECTING OR SERVICING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK OR MOVING PARTS.

Proper belt tension is required to ensure maximum bearing and drive component life and is based on fan brake horsepower requirement. Use Chart 1 to find the proper tension and refer to the inset for an example. To use the chart, you must know:

1. Fan design bhp per belt (**not** motor hp)
2. Fan rpm
3. Fan sheave pitch diameter (Figure 54 - found by measuring where the middle of the belt rides in the sheave).
4. Type of belt cross-section (stamped on the belt)

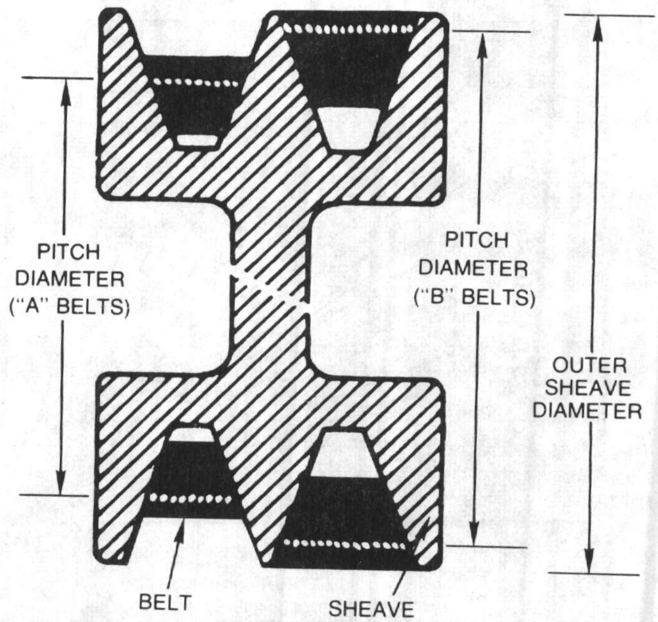


Figure 54 - Fan Sheave Pitch Diameter

As shown in the example of Chart 1, the correction tension (pounds force) is 9.6 pounds, at ½-inch deflection. Deflection is determined by dividing the belt span distance by 64, as shown in Figure 55.

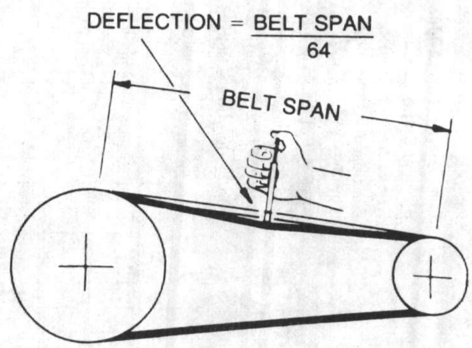
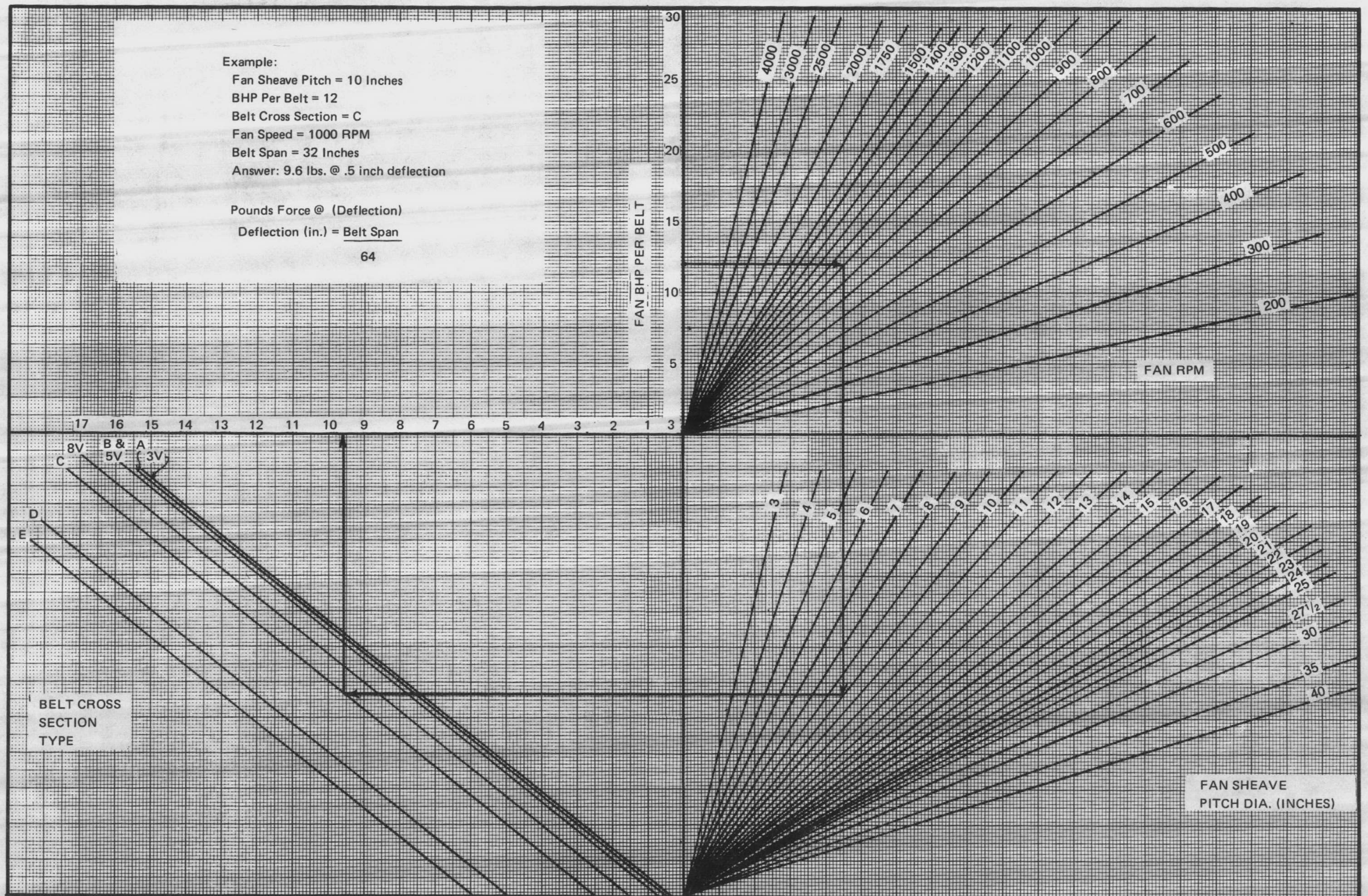


Figure 55 - Belt Tension Measurement

Table 14 — Values for K Factor (Belt Cross-Section Types)

BELT TYPE	A	B	C	D	E	3L	4L	5L	3V	5V	8V	AX	BX	CX	DX
"K" FACTOR	8	13	40	80	95	6	6	6	6	12	25	11	18	54	101

CHART 1 - Belt Tension



To measure belt tension, use a belt tensioner as shown in Figure 56. Determine actual deflection by depressing one belt with the belt tensioner and measuring the deflection relative to the other belts or to belt line. Adjust the belt tension to the correct pounds force and tighten all setscrews to the proper torques.

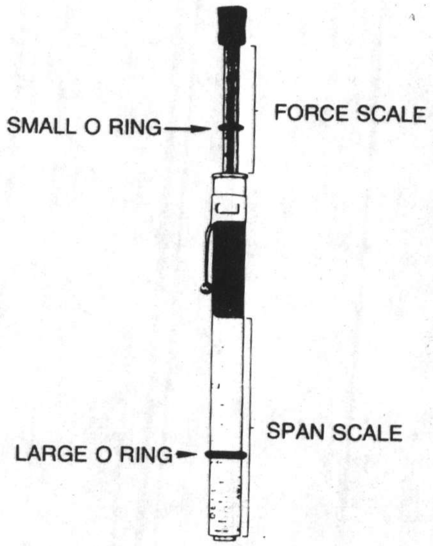


Figure 56 - Belt Tensioner

For belt cross-section types not given in Chart 1, refer to Table 14 and use the following equations to calculate correct belt tension:

$$F = \frac{T + K}{16}$$

where F = force measured in pounds at specific deflection

K = constant determined by belt cross-section type (See Table 14).

$$T = 24{,}750 \times \frac{\text{(fan hp per belt)}}{\text{(belt speed)}}$$

$$\text{Belt speed} = \frac{\text{(fan pitch diameter)}}{12} \times (\pi) \times \text{fan rpm (ft/min)}$$

For example, given the following:

Motor sheave pitch diameter: 16.8 inches, eight groove
Fan sheave pitch diameter: 19.8 inches, eight groove
Fan horsepower: 262.4 bhp
Fan rpm: 983 rpm
Belt type: 8V
Sheave span: 60.9 inches

$$\text{Belt speed} = \frac{19.8}{12} \times 3.14 \times 983 = 5092$$

$$T = 24{,}750 \times \frac{\text{(262.4 bhp/8 belts)}}{5092} = \frac{24{,}750 \times 32.8}{5092} = 159.4 \text{ lbs}$$

$$F = \frac{159.4 + 25}{16} = 11.5 \text{ lbs}$$

$$\text{Also, } D = \frac{\text{Belt span (inches)}}{64} = \frac{60.9}{64} = .95 =$$

approximately 15/16 inches

Therefore, the belt tensioner should read 11.5 pounds force at 15/16-inch deflection. This will yield 159.4 pounds force belt tension.

Belt tensions determined by using Chart 1 and Table 14 are minimum values. The correct operating tension for a V-belt drive is the lowest tension at which the belts will not slip under start-up or peak load conditions. It may be necessary, however, to increase the tension of some drives to reduce excessive belt flopping.

CAUTION: Do not over-tension the belts. Excessive tension will reduce fan and motor bearing life, accelerate belt wear and possibly cause shaft failure.

Remove the belt guard and clean the sheaves and belts with a dry cloth. Oil and gease should be kept away from the belts because they can cause deterioration and slippage. The use of belt dressing is **not** recommended.

For further information on this product or other Trane products, refer to the "Trane Service Literature Catalog", ordering number IDX-IOM-1. This catalog contains listings and prices for all service literature sold by Trane. The catalog may be ordered by sending a $20.00 check to: The Trane Company, Service Literature Sales, 3600 Pammel Creek Road, La Crosse, WI 54601.

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TRANE™

SUBMITTAL DATA

TRANE ORDER # KF4-M374A

ITEM	QTY	COIL TAG	FIN AREA WIDE	FIN AREA LONG	COIL TYPE	ROWS	FIN TYPE	FINS PER FOOT	FIN MAT'L.	TURBS	TUBE MAT'L.	AIR FLOW & CONN	"F" COIL CIRCUITING CIR TYPE	DIST	UPSTREAM SIZE	UPSTREAM CIR	DOWNSTREAM SIZE	DOWNSTREAM CIR	DRAIN HOLES
A	2	ZONE 1	2 18	30	W	01	SF	144	AL	Y	CU.	HR							N
B	2	ZONE 2	1 09	30	W	01	SF	120	AL	Y	CU.	HR							N
C	2	ZONE 3	5 33	30	W	01	SF	144	AL	Y	CU.	HR							N
D	2	ZONE 4	3 24	30	W	01	SF	144	AL	Y	CU.	HR							N

ITEM	COIL TAG	SCFM	MBH	ENTERING AIR TEMP. DB / WB (°F)	LEAVING AIR TEMP. DB / WB (°F)	GPM OR PSIG	ENTERING OR SUCTION (°F)	AIR PRESSURE DROP	WATER PRESSURE DROP (FT.)	REFRIG. TYPE
A	ZONE 1	1200	90.5	64.3	133.8	10.00	180.0	.14	.1	HW
B	ZONE 2	900	50.5	64.3	115.1	6.00	180.0	.24	.1	HW
C	ZONE 3	3900	235.0	64.3	118.7	24.00	180.0	.38	.1	HW
D	ZONE 4	2530	152.5	64.3	119.0	16.00	180.0	.30	.1	HW

SUBMITTAL APPROVAL DRAWINGS

COIL-SM-001.03
HCOL-SU-022.01
HCOL-SU-022.01
HCOL-SU-022.01
HCOL-SU-022.01

SHEET
OF

TAG Zone-1 thru Zone-4

PRINT DATE 8-8-86	FILE NO PL-AH-COIL-COIL-SM-001.03	REPLACES: COIL-SM-001.02	COIL-SM-001.03

TRANE™

Air Heating/Cooling Coils
Mechanical Specifications

SUBMITTAL

General

⅝" Tube Coils

Tubes — Round copper tubes, ⅝" OD arranged in a parallel pattern. Bronze spring turbulators are available for increasing capacities for lower water velocities.

Fins — Sigma-Flo® or Prima-Flo® plate type, configurated, aluminum or copper fins. Fins are positioned continuously across entire coil width and die formed in multiple stages with full fin collars for maximum fin-tube contact and accurate spacing. Fins are mechanically bonded to the tubes for lasting reliability.

Casing — 16-gauge galvanized steel casings, center and end supports are provided on all coils with header heights 33" or less. On 36", 42", and 48" header height coils up to 6 rows and 120" in length, 16-gauge casings with 14-gauge end and center supports are provided. On 36", 42", and 48" header height coils greater than 6 rows or 120" in length, 14-gauge casings, center and end supports are provided. Coated galvanized steel center tube supports are provided on ordering lengths over 42".

U-Bends — Round copper tubes, ⅝" OD, machine die-formed on each end to provide an accurate fit for silver brazed joints.

Headers — Close-grained gray-cast iron headers are provided on all 12" through 33" header height type "W", "D", "AA", "K", "N", "NS", "A", "D", "WD", "P", "WC", "WA" coils. For 36", 42", and 48" header height coils, round copper pipe headers are provided. The copper pipe headers are provided with a female threaded adapter for direct pipe connection.

Testing and Working Pressures — Coils are proof tested at 300 psig and leak tested at 200 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Type F
Coils are proof tested at 450 psig and leak tested at 300 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

½" Tube Coils

Tubes — Round ½-inch OD copper. Tubes expanded into full fin collars for permanent fin-tube bond.

Fins — Delta-Flo™ plate-type configurated aluminum with full fin collars for maximum fin-tube contact and accurate spacing mechanically bonded to tubes for permanent fin-tube bond.

Casings — Galvanized steel, 16-gauge casings on all coils. One or more galvanized steel center tube supports on lengths over 42 inches.

*Air Bypass and Water Carryover Arrestor-Foam sealing strip located between casing bottom channels and fins.

Testing and Working Pressures. Type WL, DL, and LL
Coils are proof tested at 300 psig and leak tested at 200 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Type FD
Coils are proof tested at 450 psig and leak tested at 300 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Headers

Type WL, DL and LL
Round copper tubes with a female threaded adapter for direct pipe connection for 12" through 54-inch header heights.

Coil Types — ⅝"

Type WC — One-row, ⅝" OD tubes, same-end connections, water coil.

Type WA — One or two-row, ⅝" OD tubes, water coil.

Type T — One or two-row, ⅝" OD tubes, single tube continuous circuit, same-end ¾" NPT (male) connections.

Type ST — One or two-row, ⅝" OD tubes, single tube continuous circuit, same-end ¾" NPT (male) connections. Offers same performance as type "T", but with a slip-flange casing designed for low cost installations.

Type A — One-row, ⅝" OD tubes, opposite-end connection steam coil.

Type NS — Steam distributing tube-type with 1" OD condensing tubes, same-end connections.

Type N — Steam distributing tube-type with 1" OD condensing tubes, opposite-end connections.

Type W — Single-row serpentine, general purpose, water coil.

Type D — Single-row serpentine water coil. Cast iron headers provided over entire supply connection end for drainable, positive freeze protection.

Type K — Single-row serpentine water coil. Removable cast iron headers provided at both ends of coil for periodic cleaning of tubes and drainability.

Type P2, P4, P8 — Multi-tube-feed water coils for low gpm applications.

Type DD, WD — Double-row serpentine water coil for high gpm applications.

Type F — Refrigerant cooling coils provided with one piece Venturi style, multi-circuit distributors to assure uniform distribution.

Type H — Refrigerant heat recovery coils. Individual circuits allow for multiple compressors to be piped to a single coil.

Type TT — One or two-row, ⅝" OD tube, dual-tube circuiting water coil.

Type AA One-row, ⅝" OD tubes, alternate tube feed, opposite-end connections steam coil.

Coil Types — ½"

Type WL — Single-row serpentine, general purpose water coil.

Type DL — Single-row serpentine, drainable for positive freeze protection, water coil.

Type LL — Double-row serpentine drainable for positive freeze protection, water coil.

Type FD — Refrigerant cooling coils with one piece, Venturi style, multi-circuit distributors to assure uniform distribution.

TAG Zone-1 thru Zone-4

PRINT DATE: 3-22-85	FILE NO. PL-AH-COIL-HCOL-SU-022.01	REPLACES: HCOL-SU-022.00	HCOL-SU-022.01

TRANE

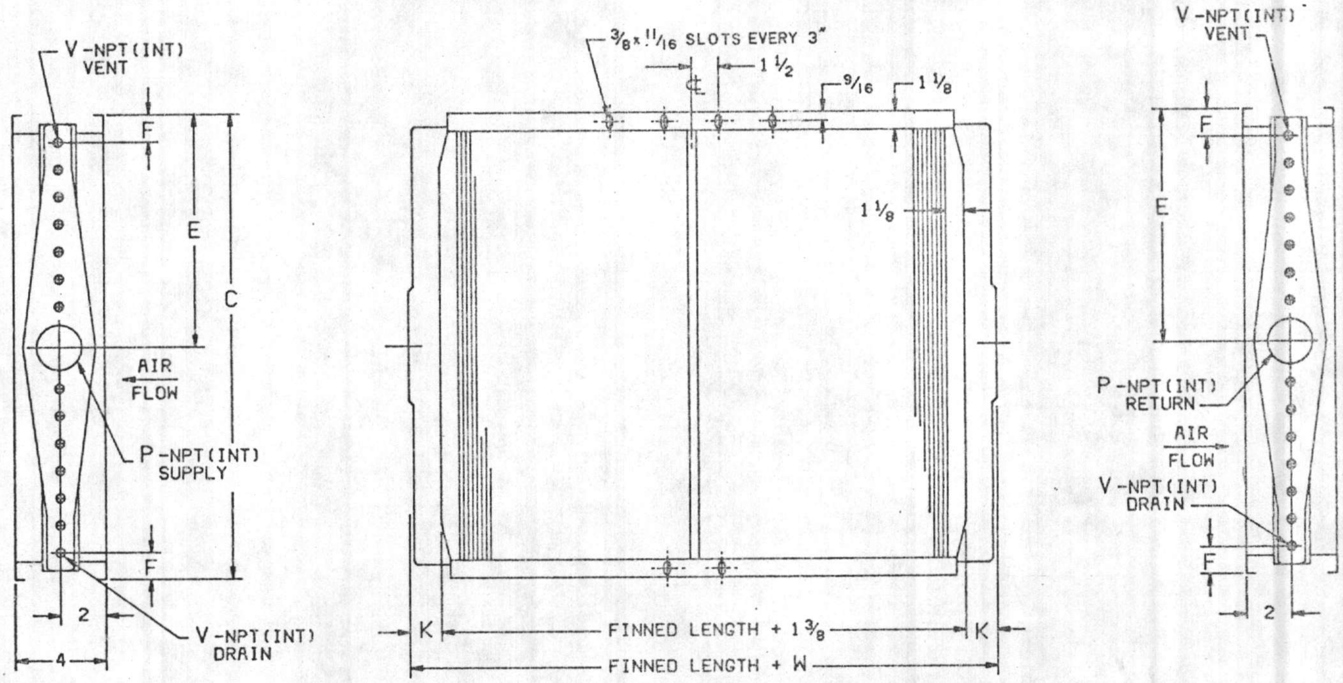
AIR HEATING COIL

TYPE W & WA

1 ROW 6",9",12",18",24",30" & 33" FINNED WIDTHS

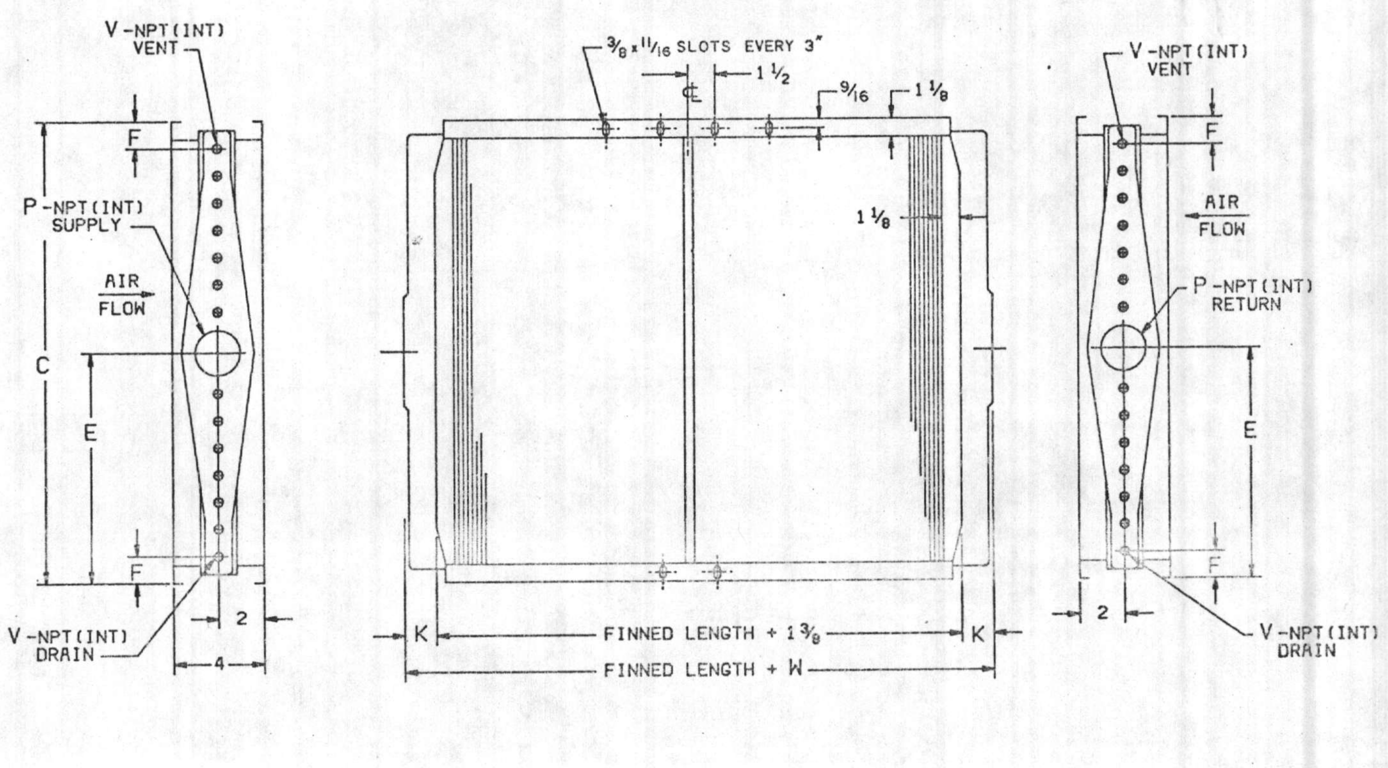
SUBMITTAL

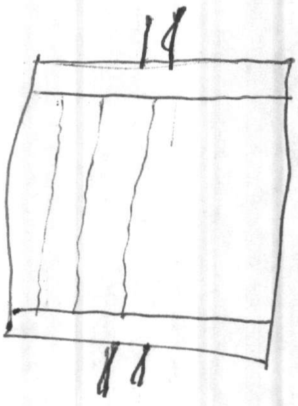
☑ HORIZONTAL AIR FLOW RIGHT HAND SUPPLY

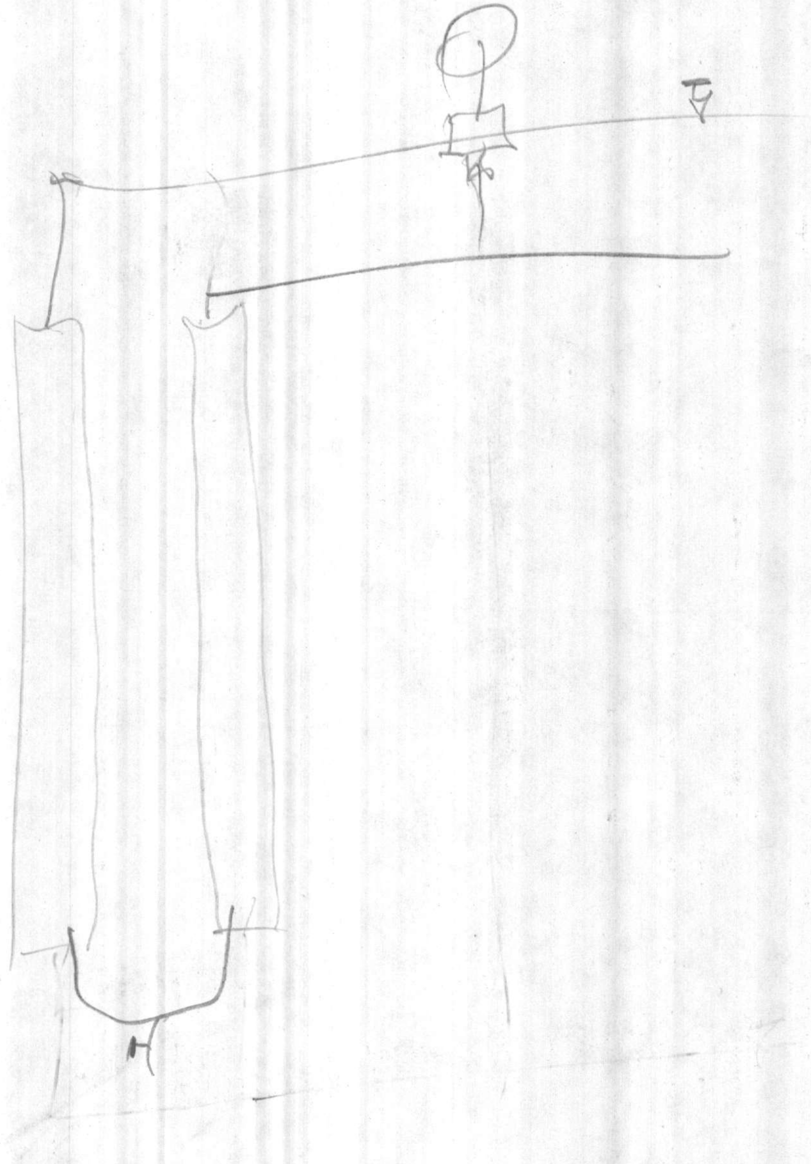


FINNED WIDTH	C	E	F	K	P	V	W
6	7 1/2	3	1 9/16	1 3/8	1	3/4	4 1/8
9	10 1/2	4 1/2	1 9/16	1 3/8	1	3/4	4 1/8
12	13 1/2	6	1 1/2	1 1/2	1 1/4	1/2	4 3/8
18	19 1/2	9 3/4	1 1/2	1 3/4	2 1/2	1/2	4 7/8
24	25 1/2	12 3/4	1 1/2	1 3/4	2 1/2	1/2	4 7/8
30	31 1/2	15 3/4	1 1/2	2	2 1/2	1/2	5 3/8
33	34 1/2	17 1/4	1 1/2	2	2 1/2	1/2	5 3/8

☐ HORIZONTAL AIR FLOW LEFT HAND SUPPLY







TRANE™

SUBMITTAL DATA

TRANE ORDER # KE4-M375A

ITEM	QTY	COIL TAG	FIN AREA WIDE	FIN AREA LONG	COIL TYPE	ROWS	FIN TYPE	FINS PER FOOT	FIN MAT'L.	TURBS	TUBE MAT'L	AIR FLOW & CONN	"F" COIL CIRCUITING CIR TYPE	DIST	UPSTREAM SIZE	UPSTREAM CIR	DOWNSTREAM SIZE	DOWNSTREAM CIR	DRAIN HOLES
A	1	SEE BELOW	24	36	NS	01	SF	72	AL	N	CU.	VUR							N
B	1	SEE BELOW	24	48	NS	01	SF	72	AL	N	CU.	HL							N

ITEM A COIL TAG: (9) NEW STM COIL FOR AHU (11)
ITEM B COIL TAG: DUCT MTG COIL FOR AHU (19)

ITEM	COIL TAG	SCFM	MBH	ENTERING AIR TEMP. DB/WB (°F)	LEAVING AIR TEMP. DB/WB (°F)	GPM OR PSIG	ENTERING OR SUCTION (°F)	AIR PRESSURE DROP	WATER PRESSURE DROP (FT.)	REFRIG. TYPE	SUBMITTAL APPROVAL DRAWINGS
A	SEE ABOVE	6000	100.0	65.0	80.4	30.00	.0	.45	.0	STM	COIL-SM-001.03 HCOL-SU-017.01
B	SEE ABOVE	8000	295.0	65.0	99.0	5.00	.0	.45	.0	STM	HCOL-SU-017.01

SHEET
OF

TRANE™

Air Heating/Cooling Coils
Mechanical Specifications

SUBMITTAL

General

⅝" Tube Coils

Tubes — Round copper tubes, ⅝" OD arranged in a parallel pattern. Bronze spring turbulators are available for increasing capacities for lower water velocities.

Fins — Sigma-Flo® or Prima-Flo® plate type, configurated, aluminum or copper fins. Fins are positioned continuously across entire coil width and die formed in multiple stages with full fin collars for maximum fin-tube contact and accurate spacing. Fins are mechanically bonded to the tubes for lasting reliability.

Casing — 16-gauge galvanized steel casings, center and end supports are provided on all coils with header heights 33" or less. On 36", 42", and 48" header height coils up to 6 rows and 120" in length, 16-gauge casings with 14-gauge end and center supports are provided. On 36", 42", and 48" header height coils greater than 6 rows or 120" in length, 14-gauge casings, center and end supports are provided. Coated galvanized steel center tube supports are provided on ordering lengths over 42".

U-Bends — Round copper tubes, ⅝" OD, machine die-formed on each end to provide an accurate fit for silver brazed joints.

Headers — Close-grained gray-cast iron headers are provided on all 12" through 33" header height type "W", "D", "AA", "K", "N", "NS", "A", "D", "WD", "P", "WC", "WA" coils. For 36", 42", and 48" header height coils, round copper pipe headers are provided. The copper pipe headers are provided with a female threaded adapter for direct pipe connection.

Testing and Working Pressures — Coils are proof tested at 300 psig and leak tested at 200 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Type F
Coils are proof tested at 450 psig and leak tested at 300 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

½" Tube Coils

Tubes — Round ½-inch OD copper. Tubes expanded into full fin collars for permanent fin-tube bond.

Fins — Delta-Flo™ plate-type configurated aluminum with full fin collars for maximum fin-tube contact and accurate spacing mechanically bonded to tubes for permanent fin-tube bond.

Casings — Galvanized steel, 16-gauge casings on all coils. One or more galvanized steel center tube supports on lengths over 42 inches.

*Air Bypass and Water Carryover Arrestor-Foam sealing strip located between casing bottom channels and fins.

Testing and Working Pressures. Type WL, DL, and LL
Coils are proof tested at 300 psig and leak tested at 200 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Type FD
Coils are proof tested at 450 psig and leak tested at 300 psig air pressure under water. The coils are suitable for working pressures and temperatures up to 200 psig and 220 F as standard.

Headers

Type WL, DL and LL
Round copper tubes with a female threaded adapter for direct pipe connection for 12" through 54-inch header heights.

Coil Types — ⅝"

Type WC — One-row, ⅝" OD tubes, same-end connections, water coil.

Type WA — One or two-row, ⅝" OD tubes, water coil.

Type T — One or two-row, ⅝" OD tubes, single tube continuous circuit, same-end ¾" NPT (male) connections.

Type ST — One or two-row, ⅝" OD tubes, single tube continuous circuit, same-end ¾" NPT (male) connections. Offers same performance as type "T", but with a slip-flange casing designed for low cost installations.

Type A — One-row, ⅝" OD tubes, opposite-end connection steam coil.

Type NS — Steam distributing tube-type with 1" OD condensing tubes, same-end connections.

Type N — Steam distributing tube-type with 1" OD condensing tubes, opposite-end connections.

Type W — Single-row serpentine, general purpose, water coil.

Type D — Single-row serpentine water coil. Cast iron headers provided over entire supply connection end for drainable, positive freeze protection.

Type K — Single-row serpentine water coil. Removable cast iron headers provided at both ends of coil for periodic cleaning of tubes and drainability.

Type P2, P4, P8 — Multi-tube-feed water coils for low gpm applications.

Type DD, WD — Double-row serpentine water coil for high gpm applications.

Type F — Refrigerant cooling coils provided with one piece Venturi style, multi-circuit distributors to assure uniform distribution.

Type H — Refrigerant heat recovery coils. Individual circuits allow for multiple compressors to be piped to a single coil.

Type TT — One or two-row, ⅝" OD tube, dual-tube circuiting water coil.

Type AA One-row, ⅝" OD tubes, alternate tube feed, opposite-end connections steam coil.

Coil Types — ½"

Type WL — Single-row serpentine, general purpose water coil.

Type DL — Single-row serpentine, drainable for positive freeze protection, water coil.

Type LL — Double-row serpentine drainable for positive freeze protection, water coil.

Type FD — Refrigerant cooling coils with one piece, Venturi style, multi-circuit distributors to assure uniform distribution.

TAG See Order

PRINT DATE: 3-22-85	FILE NO. PL-AH-COIL-HCOL-SU-017.01	REPLACES: HCOL-SU-017.00	HCOL-SU-017.01

TRANE

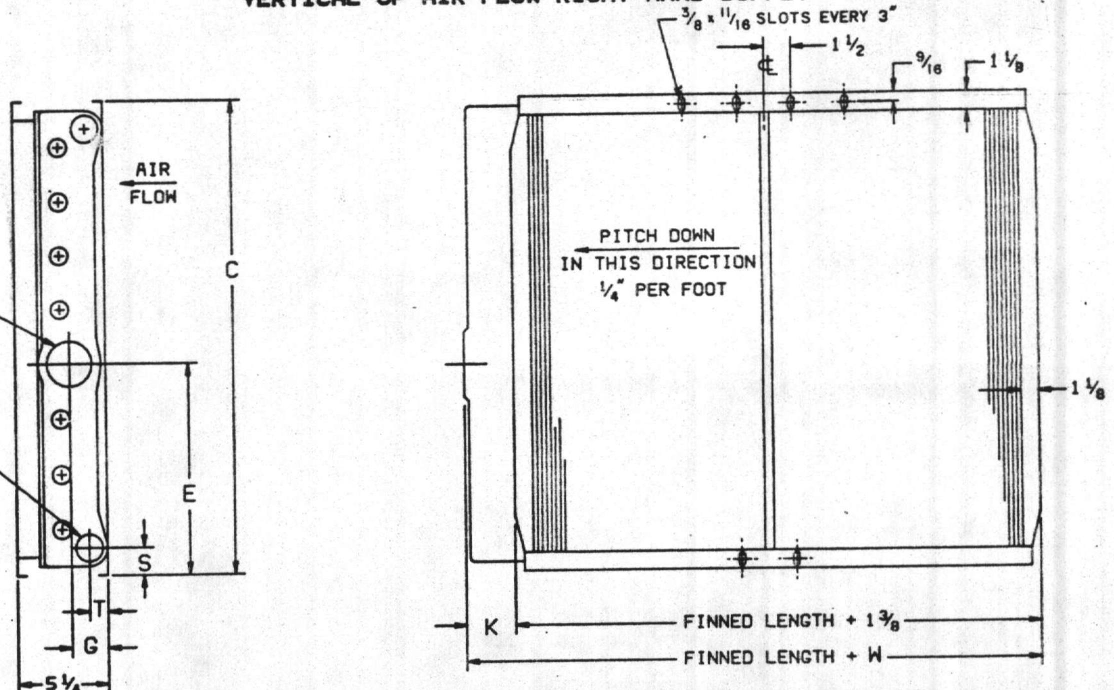
AIR HEATING COIL

TYPE NS

12", 18", 24", 30" AND 33" FINNED WIDTHS

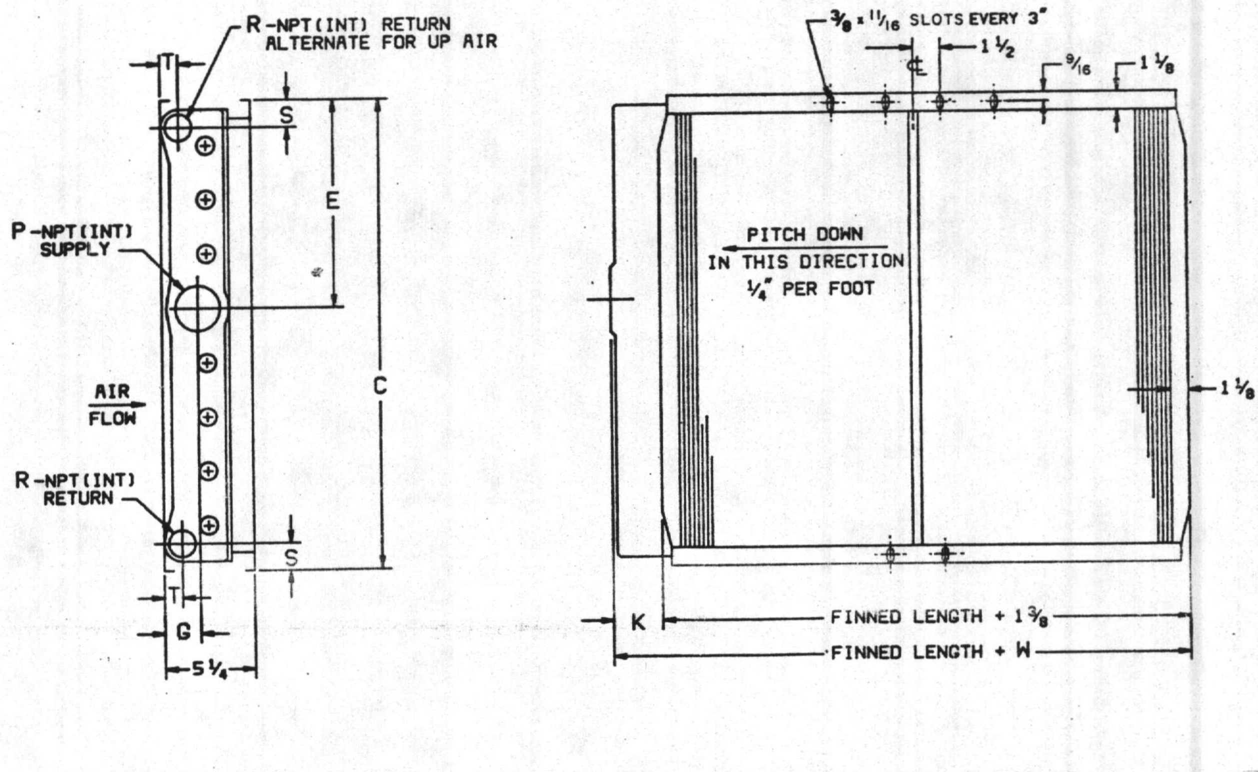
SUBMITTAL

☑ HORIZONTAL AIR FLOW RIGHT HAND SUPPLY OR VERTICAL UP AIR FLOW RIGHT HAND SUPPLY



	FINNED WIDTH	C	E	G	K	P	R	S	T	W
☐	12	13 1/2	5 1/4	2 3/4	2 1/2	1 1/2	1	1 13/16	1 5/16	3 7/8
☐	18	19 1/2	8 1/4	2 1/2	2 1/2	2	1	1 13/16	1 5/16	3 7/8
☑	24	25 1/2	11 1/4	2 1/2	2 7/8	2 1/2	1 1/4	1 1/2	1 1/4	4 1/4
☐	30	31 1/2	14 1/4	2 1/2	3 3/8	3	1 1/4	1 1/2	1 1/4	4 3/4
☐	33	34 1/2	17 1/4	2 1/2	3 3/8	3	1 1/4	1 1/2	1 1/4	4 3/4

☐ HORIZONTAL AIR FLOW LEFT HAND SUPPLY OR VERTICAL UP AIR FLOW LEFT HAND SUPPLY



HEAT TRANSFER SALES, INC.
901-G NORWALK ST.
GREENSBORO, N.C. 27407
PHONE 919-294-3838

SUBMITTAL NO. S1360-6314

03-03-03

DATE: NOVEMBER 14, 1986

JOB: REPLACE AIR COND.
BLDG. AS710
CAMP LEJEUNE, N.C.

CONTRACTOR:

KINSTON PLBG. & HTG.
BOX 637
KINSTON, N.C. 28501

ENGINEER: CHEATHAM & ASSOCS.

THIS ORDER IS BEING HELD FOR APPROVAL AND WILL NOT BE RELEASED UNTIL APPROVED.

H.W. AIR CONTROL SYSTEM
1-15 GALLON ASME EXPANSION TANK
1-439 TANK FITTING
1-440 TANK DRAINER
1-AC-2 1/2F AIR SEPARATOR WITH STRAINER
1-335 3/4" BRONZE PRV

CH.W AIR CONTROL SYSTEM
1-15 GALLON ASME EXPANSION TANK
1-439 TANK FITTING
1-440 TANK DRAINER
1-AC-2 1/2F AIR SEPARATOR WITH STRAINER
1-335 3/4" BRONZE PRV

☑ APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO.
BY F.L. DATE 11-18-86

H.W. PUMP
1-TACO 1614C 1 1/2" INLINE PUMP. OIL LUBRICATED
SLEEVE BEARINGS. 56 GPM @ 20 FT.HD. 1HP
1750 RPM 230/3/60 6.35" DIAMETER IMPELLER

CH.W. PUMP
1-TACO BB2008 2" BASE MOUNTED END SUCTION GREASE
LUBRICATED BALL BEARING PUMP 57 GPM @ 45 FT.HD.
1 1/2 HP 1750 RPM 230/3/60 6.75" DIAMETER IMPELLER.

HEAT EXCHANGER
1-TACO G6208-S 6" DIAMETER 2 PASS 4 FT. LONG 150 PSI
ASME CONSTRUCTION WITH (1) PAIR SADDLES.

(10) SETS OF SUBMITTAL DATA FOR YOUR APPROVAL.

CONTRACTOR [illegible]

[illegible]
BOX 437[illegible]
HOUSTON [illegible]

THIS ORDER IS BEING [illegible]

[illegible]

15 GALLON [illegible]

TANK [illegible]

TANK DRAINER [illegible]

[illegible] STRAINER

BRONZE [illegible]

[illegible]

Taco Submittal Data Information "PS" Expansion Tanks

401-007

SUPERSEDES: SD400-1.3

Job: Replace Air Cond. Bldg. AS710, Camp Lejeune, N.C.

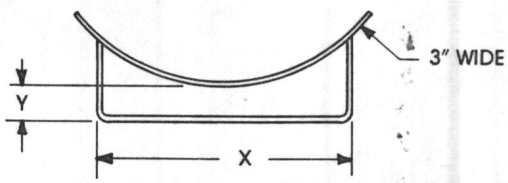
ITEM	LOCATION	MODEL	QUANTITY	GALLONS
		PS015	2	15 Gal.

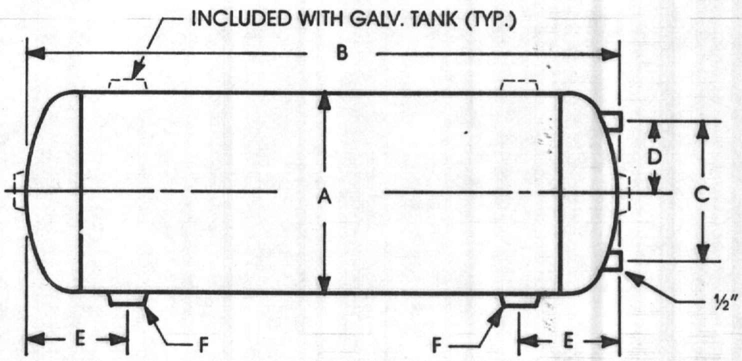
(OPTIONAL) SADDLES

(For Horizontal Installation)

FIG. 1

Tank Dia.	X	Y	Weight In Lbs. Per Pair
14	8	2	8
16	8	2 1/8	8
20	14 5/8	1 1/16	14
24	14 5/8	1 3/4	13
30	14	2 1/2	12 1/2
36	15 1/2	2 7/16	13 1/2





SIZES & DIMENSIONS

Model No.	Capacity Gal.	A	B	C	D	E	F	Approx. Wt. Lbs. Painted	Approx. Wt. Lbs. Galv.
PS015	15	14	25 7/8	10	5	7	1 1/2	49	59
PS030	30	14	49 1/4	10	5	7	1 1/2	88	96
PS040	40	14	64 7/8	10	5	7	1 1/2	114	124
PS060	60	16	74 1/4	12	6	7 1/2	1 1/2	118	132
PS080	80	20	64 1/8	16	8	9	2	160	175
PS100	100	20	79 1/4	16	8	9	2	196	215
PS120	120	24	67	20	10	10	2	213	233
PS135	135	24	74 3/4	20	10	10	2	235	255
PS180	180	30	64 7/8	22	11	12	2	363	286
PS220	220	30	79 1/8	22	11	12	2	433	460
PS240	240	30	85 3/4	22	11	12	2	466	496
PS300	300	36	76 1/2	28	14	13 3/8	2	676	706
PS400	400	36	99 3/4	28	14	13 3/8	2	858	899
PS500	500	36	126 5/8	28	14	13 3/8	2	1069	1120

SPECIFICATIONS

- Manufactured in Accordance with ASME Section VIII.
- Max. Working Pressure — 125 PSIG.
- Max. Operating Temperature — 375°F.

Quality Through Design — COMPARE.

TACO, Inc., 1160 Cranston St., Cranston, RI 02920 (401) 942-8000 Telex: 92-7627
TACO, (Canada) Ltd., 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2 (416) 625-2160 Telex: 06-961179

Taco

SUBMITTAL DATA

NUMBER
SD 100-2.5

Effective: July 1, 1981
Supersedes: SD 100-2.5 dated 4/81

Plant ID 001-311

TACO-TROL TANK FITTINGS

PURPOSE

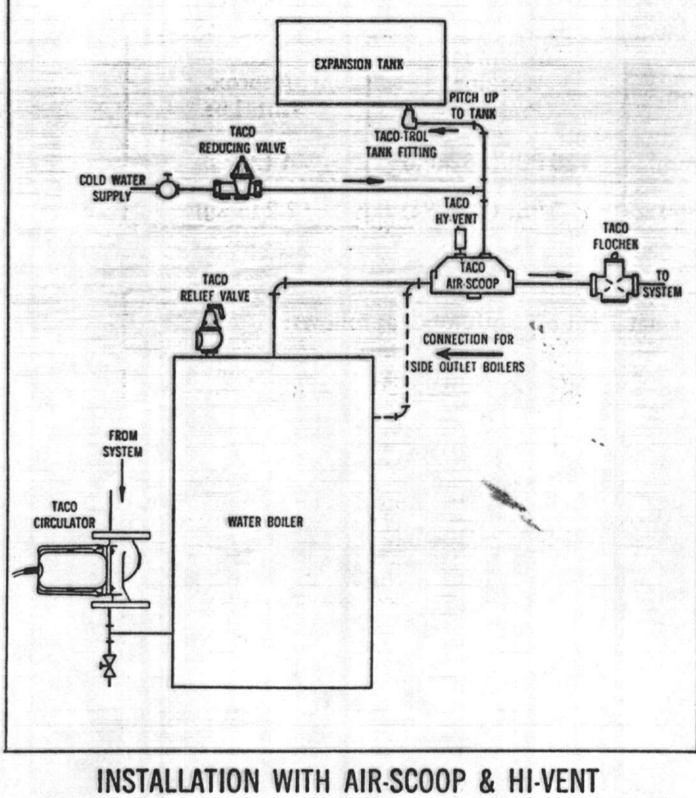
Designed to control the flow of air into the expansion tank while preventing free interchange of water between the expansion tank and the system.

HOW IT WORKS

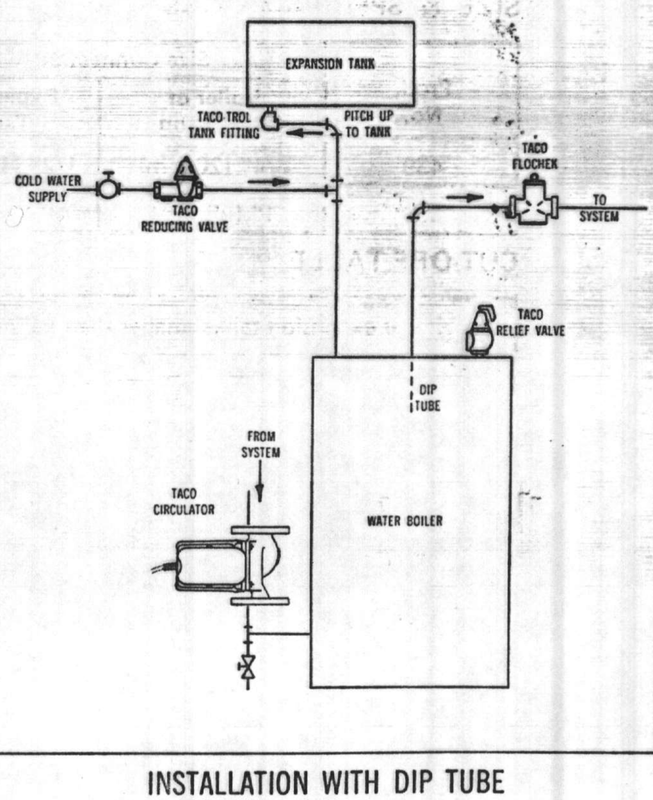
As air enters the fitting, it is directed thru the outer tube to the tank. As the water in the tank cools during an off cycle period of the firing device, water will tend to flow back toward the boiler or system. Because a restriction is built into the fitting, gravity circulation between boiler and tank is virtually eliminated. An inner tube and manual vent are also provided to permit air to escape from the tank during the initial filling and venting of the system.

HOW USED

The Taco-Trol Tank Fitting is screwed directly into the expansion tank and may be piped to an Air-Scoop (air separator or purger) or directly to the boiler if a "dip tube" is used (See Sketch).



INSTALLATION WITH AIR-SCOOP & HI-VENT



INSTALLATION WITH DIP TUBE

Taco, Inc. 1160 Cranston Street, Cranston, Rhode Island 02920 Telephone: (401) 942-8000 Telex: 92-7627
Litho in U.S.A.
Taco (Canada) Ltd. 3090 Lenworth Drive, Mississauga, Ontario Telephone: (416) 625-2160 Telex: 06-961179

INSTALLATION AND FILLING PROCEDURE

INSTALLATION

1— Cut tubes to correct length per dimension table below.

2— Insert Tank Fitting into bottom of expansion tank, using close nipple supplied.

3— Connect Fitting to Air-Scoop Tank Connection or Boiler Dip Tube with ½" (15 mm) pipe: If vertical line is some distance from Fitting, pitch horizontal Line up to Fitting approximately 1/8" (5 mm) per foot (305 mm) of pipe length.

FILLING PROCEDURE

A— Open air vent screw on Taco-Trol Tank Fitting. Close all system vents and fill system. As soon as water flows freely from vent screw opening in Tank Fitting, close the screw tightly.

DO NOT RE-OPEN THIS VENT SCREW EXCEPT TO DRAIN TANK

B— Open system vents and vent all high points.

C— Adjust Pressure Reducing Valve (if required) to provide positive pressure at highest point in system.

D— After system is filled, start circulator. Circulate cold water for several minutes to dislodge air bubbles from system.

E— Stop circulator. Fire Boiler to High Limit shut-off temperature. After firing stops, wait a few minutes, then re-start circulator to permit separated air to enter expansion tank or leave system thru Taco Air-Scoop.

F— Stop circulator and re-vent system high points. Reset all controls for automatic operation. System is now ready for normal operation.

If it is necessary to drain expansion tank for any reason, open air vent screw in Taco-Trol Tank Fitting and open Boiler drain to drain tank.

SIZE & SPECIFICATIONS

Prod. No.	Size Connections		Maximum Working Pressure	Approx. Wht. Lbs.
	Boiler or Air-Scoop	Expansion Tank		
439	3/4" (20 mm)	1/2" (15 mm)	125 PSI (862kPa)	1 (.5 kg)
438	1" (25 mm)	1" (25 mm)	125 PSI (862kPa)	2.2 (1 kg)

CUT-OFF TABLE

For expansion tanks smaller than 24" in diameter cut off both tubes as follows:—

	Tank Diameter	Cut Off Both Tubes
439	24" (610 mm)	None
	20" (508 mm)	2-1/8" (54 mm)
	16" (406 mm)	4-1/4" (108 mm)
	14" (356 mm)	5-5/16" (135 mm)
	12" (305 mm)	6-3/8" (162 mm)

For expansion tanks larger than 24" thru 36" in diameter cut off both tubes as follows:—

	Tank Diameter	Cut Off Both Tubes
438	36" (915 mm)	None
	30" (762 mm)	3-3/16" (80 mm)
	24" (610 mm)	6-3/8" (160 mm)

NOTE: Inner tube must always be 1" (25 mm) longer than outer tube

Taco	SUBMITTAL DATA SHEET	Customer: Kinston Plbg. & HTg. Box 637 Kinston, NC
NUMBER SD 100-2.6	Effective: November 15, 1982 Supersedes: SD100-2.6 dated 4/30/81	Job: Replace Air Cond. Bldg. AS710 Camp Lejeune, NC

TANK DRAINER

PURPOSE

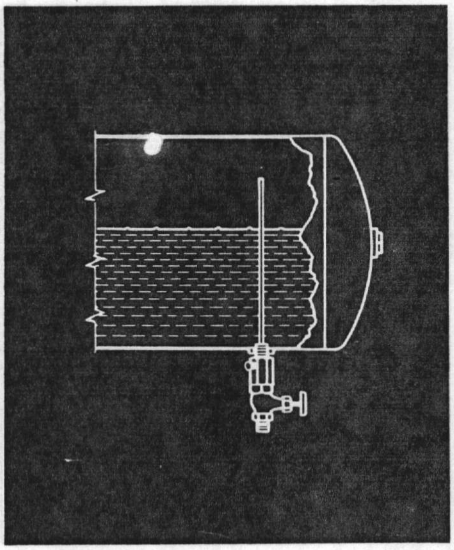
Designed for fast draining of water from water-logged Expansion Tanks.

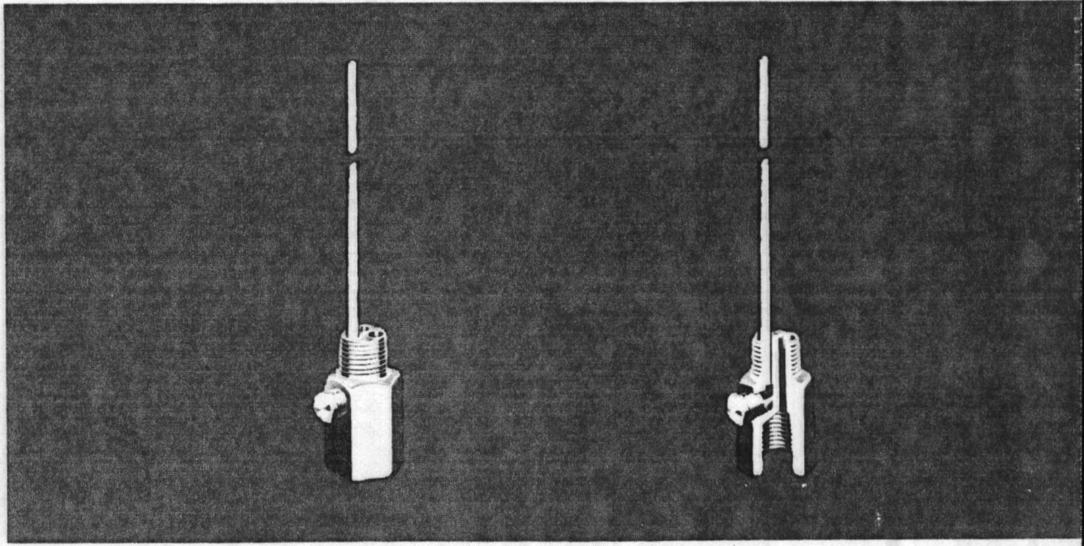
FEATURES

- Low Cost
- Quick Air Charging
- Easily installed
- All brass body
- 11″ (280 mm) long copper tube
- Air charging plug on side, preventing water from soaking installer
- Adaptable to any style drain valve
- Individually boxed for full protection

OPERATION

Removing the plug on side of Tank Drainer permits air to enter into top of Expansion Tank, breaking the vacuum for fast and full flow draining of the Expansion Tank and/or the Heating System.





* DIMENSIONS

PRODUCT NO.	CONN. SIZE	APPROX. SHIPPING WEIGHT EACH		APPROX. SHIPPING WEIGHT 12 PCS.		DIAMETER		LENGTH	
		Lb.	Kg.	Lb.	Kg.	In.	mm	In.	mm
440	1/2″ N.P.T.	.6	.3	8	3.6	1 - 1/8	29	13	330

*CHANGE

F101-009

Taco, Inc. 1160 Cranston Street, Cranston, Rhode Island 02920 Telephone: (401) 942-8000 Telex: 92-7627

Litho in U.S.A.

Taco (Canada) Ltd. 3090 Lenworth Drive, Mississauga, Ontario Telephone: (416) 625-2160 Telex: 06-961179

Submittal Data Information
Air Separator

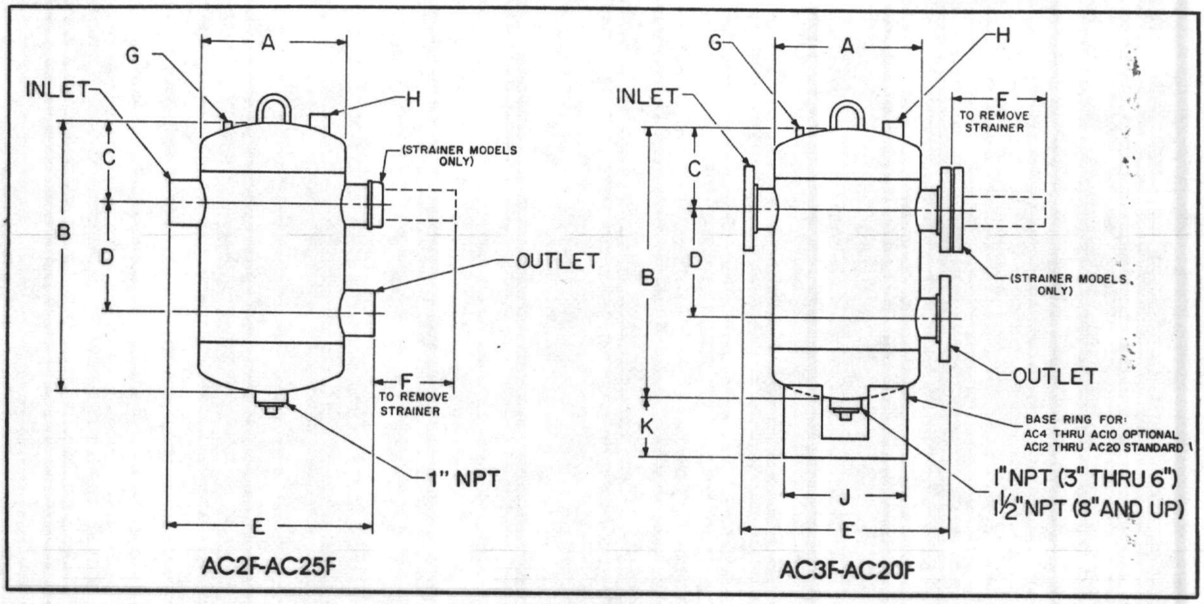
401-001B

Supersedes: 401-001A

Job: Replace Air Cond. Bldg. AS710, Camp Lejeune, NC

ITEM	QUANTITY	MODEL NO.	SIZE
	2	AC25F	2 1/2

DIMENSIONS



PIPE SIZE Inches	PRODUCT NO. less strainer	PRODUCT NO. with strainer	A	B Max	C	D	E	F	G	H	J	K	MAX FLOW (gpm)	STRAINER FREE AREA (sq. in.)	LESS STRAINER C_V FACTOR	WITH STRAINER C_V FACTOR	APPROX. SHIPPING WT. less strainer	APPROX. SHIPPING WT. with strainer
2	AC2	AC2F	8.625	18.00	6.00	5.38	12.00	13	3/4"NPT	3/4"NPT			80	22	86	72	32	37
2 1/2	AC25	AC25F	10.750	20.00	7.00	5.88	16.00	16	3/4"NPT	3/4"NPT			130	34	122	102	72	78
3	AC3	AC3F	12.750	24.25	6.88	10.50	18.00	18	3/4"NPT	1 1/4"NPT			190	51	190	162	92	120
4	AC4	AC4F	16	29.13	8.19	12.75	25.25	19	3/4"NPT	1 1/4"NPT		6 3/4†	330	80	325	272	140	176
5	AC5	AC5F	16	31.25	8.75	13.75	25.25	22	3/4"NPT	1 1/4"NPT		6 3/4†	550	112	510	422	180	228
6	AC6	AC6F	20	36.75	11.00	14.75	29.25	26	3/4"NPT	1 1/4"NPT		6 1/2†	900	180	750	618	240	290
8	AC8	AC8F	20	41.38	12.00	17.38	29.75	28	3/4"NPT	1 1/4"NPT		6 1/2†	1500	246	1260	1060	322	416
10	AC10	AC10F	24	49.50	14.69	20.12	34.75	32	3/4"NPT	1 1/4"NPT		6 3/4†	2600	392	2000	1670	545	670
12	AC12	AC12F	30	56.94	16.85	23.25	42.00	37	3/4"NPT	1 1/2"NPT	22	7 1/2	3400	548	2900	2400	860	1060
14	AC14	AC14F	36	65.00	19.88	25.25	48.75	43	3/4"NPT	1 1/2"NPT	24	7 1/2	4700	732	3500	2850	980	1170
16	AC16	AC16F	36	71.50	21.75	28.00	49.75	44	3/4"NPT	1 1/2"NPT	24	7 1/2	6000	845	4600	3800	1200	1300
18	AC18	AC18F	42	74.81	22.59	29.63	55.75	51	3/4"NPT	1 1/2"NPT	30	7 1/2	8000	1125	5900	4900	1648	1764
20	AC20	AC20F	48	82.81	25.28	32.25	62.25	58	3/4"NPT	1 1/2"NPT	36	7 1/2	10,000	1435	7400	6200	2600	3200

Rated @ 125 PSI @ 375°F

†Optional

COMPARE. YOU'LL TAKE TACO.

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Form No. F401-001 Effective 4/1/86

Submittal Data Information

Pressure Reducing Valves, Dual Controls and Pressure Relief Valve

101-005

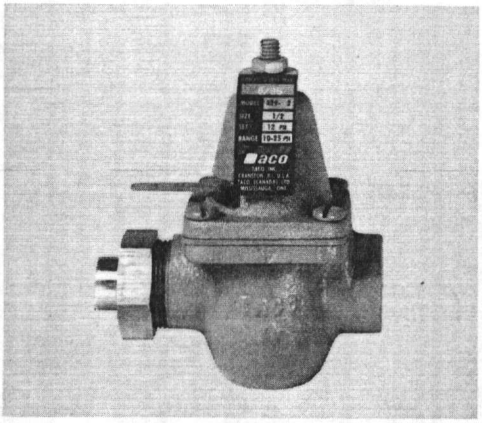
Numbers: 329, 329T, 335, 334, 334T and 333   SUPERSEDES: SD100-2.2

Job: Replace Air Cond. Bldg. AS710, Camp Lejeune, NC

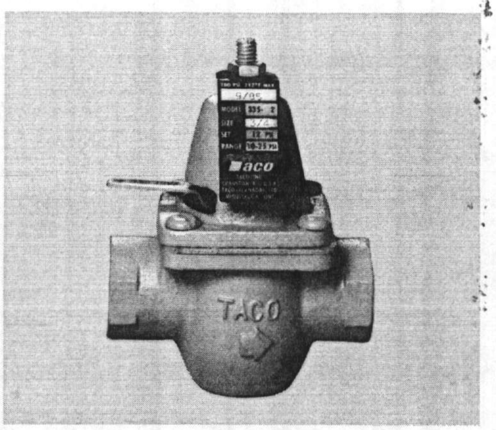
PRESSURE REDUCING VALVES — 329 AND 335

PURPOSE: To automatically feed water to a hot water heating system whenever pressure in the system drops below the pressure setting of the valve

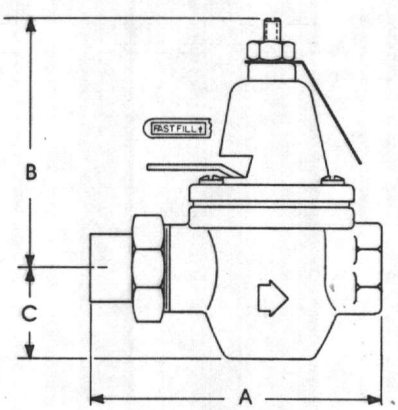
FEATURES:
- Fast fill rate on all models
- Pressure setting adjustment separated from fast fill lever for easy, fast adjustment
- Built-in check to prevent emptying system if incoming pressure fails
- System pressure adjusting range 10 to 25 PSI

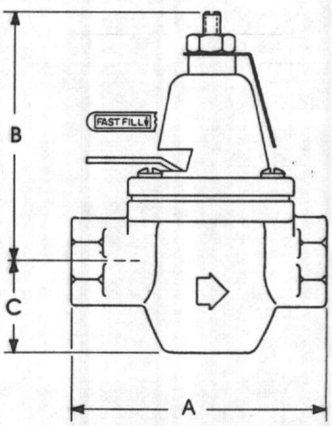


329, 329T



335





PRODUCT NO.	CONSTRUCTION MATERIAL	SIZE & TYPE CONNECTION	MAXIMUM SUPPLY SIDE PRESSURE	MAXIMUM TEMPERATURE	DIMENSIONS, INCHES			SHIPPING WT./LB.	
					A	B	C	EA.	CTN.
329	CAST IRON	½" (15MM) NPT & SWEAT	200 PSI (1380 KPA)	212°F (100°C)	4¼ (108MM)	3¾ (95MM)	1⅜ (35MM)	2.4 (1.1 KG)	30 (14 KG)
329T	CAST IRON	½" (15MM) NPT			4⅜ (111MM)	3¾ (95MM)	1⅜ (35MM)		
335	BRONZE	¾" (20MM) NPT			3¾ (95MM)	3¾ (95MM)	1⅜ (35MM)		

Quality Through Design — COMPARE.

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TACO, (Canada) Ltd., 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2 (416) 625-2160 Telex: 06-961179

Humboldt [illegible]

PRESSURE [illegible] VALVES [illegible]

PURPOSE: To [illegible]

FEATURES: • [illegible]

• [illegible]

• [illegible]

• [illegible]

PRODUCT NO.	CONSTRUCTION MATERIAL	[illegible] CONNECTIONS	[illegible]	MAXIMUM [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

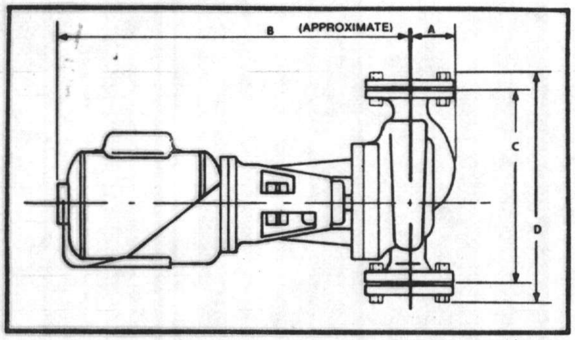
Taco Submittal Data Information 1600 Series Pumps

301-003

MODEL 1615 SUPERSEDES: SD300-1.3

Job: Replace Air Cond. Bldg. AS710, Camp Lejeune

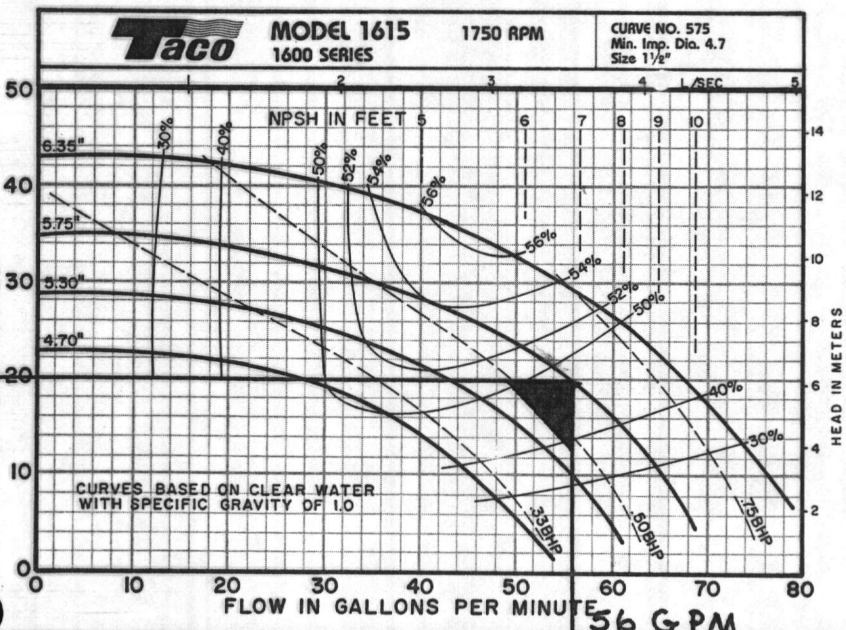
ITEM NO.	MODEL NO.	IMPELLER DIA.	G.P.M.	HEAD IN FT.	H.P.	ELECTRICAL CHARACTERISTICS
	1614C	6.35"	56 GPM	20 FT	1 HP	230/3/60



SIZES & DIMENSIONS:
(APPROXIMATE)

MODEL	Flange Size	H.P. (W)	A	B	C	D
1615	1½	1/3 (249)* ½ (373)* ¾ (560)* 1 (746)*	3⅛ (79)*	18 (457)* 18½ (469)* 19 (483)* 19½ (495)*	13½ (343)*	16⅛ (410)*

*Millimeters



SPECIFICATIONS:

MOTORS
1750 RPM, Three Phase 200V or 230/460V 60C Sleeve Bearing Motors.
Also available in Single Phase with overload protection except 3 HP (2238W).

BODY
Cast Iron with flanged in-line connections. Companion flanges are included.

IMPELLER
Cast Bronze, Closed, Dynamically Balanced.

DRIVE COUPLING
Non-Metallic/Vibration Dampening

SHAFT
Alloy Steel with Cupro-Nickel Sleeve.

FRAME
Sleeve Bearing, Disc Type, Oil lubricated. REMOVABLE BEARING CARTRIDGE FITS ALL MODELS. Dip Stick to measure oil level.

MECHANICAL SEAL
2 Piece Standard—250°F (121°C) Operating Temp.
Hi-Temp—Extra Cost—300°F (149°C) Operating Temp.

WORKING PRESSURE
175 PSI (1207kPa) . . . in accordance with ASA B16.1
NOTE: Flanges are tapped for gauges

Quality Through Design — COMPARE.

TACO, INC. 1160 Cranston St., Cranston, RI 02920 (401) 942-8000 Telex: 92-7627
TACO (Canada) Ltd. 3090 Lenworth Drive, Mississauga, Ontario, Canada Telex: 06-961179

Taco Submittal Data Information Frame Mounted Pumps

301-031

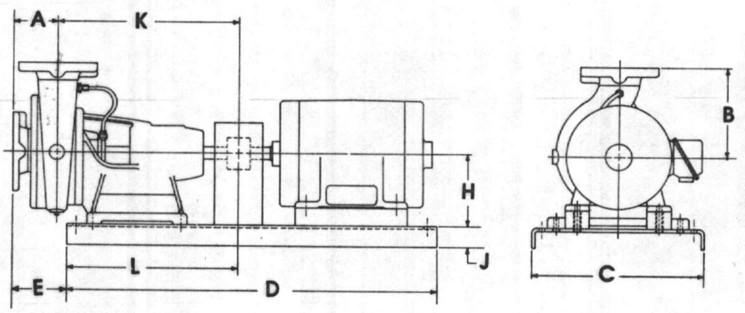
B SIZE FRAME PUMPS SUPERSEDES: NEW

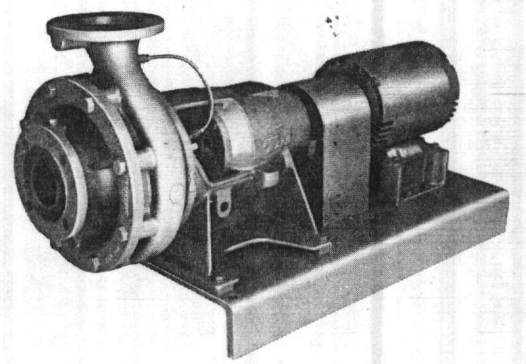
Consult Attached Page For Performance Curves.

Job: Replace Air Cond. Bldg. AS710, Camp Lejeune, NC

ITEM NO.	MODEL NO.	CURVE NO.	IMPELLER DIA.	G.P.M.	HEAD IN FT.	H.P.	R.P.M.	ELECTRICAL CHARACTERISTICS
	BB2008	301-050	6.75"	57 GPM	45'	1½	1750	230/3/60

Pump Related Dimensions





Pump Dimensions

Model No.	A	B	E	K
2008	4 1/8	8 1/2	6	16 9/32
2012	4 13/16	11	6 7/8	16 11/32
2508	4 3/4	8	8 3/32	16 1/4
2510	5	9	7	16 1/4
3008	5	9	7	16 9/32
4006	5 1/2	8 1/2	8	16 25/32

Pump Mounting Dimensions

NEMA FR.	C	D	H	J	L
143/145T	11 3/4	27 3/4	6 1/2	3	12 59/64
182/184T	11 3/4	27 3/4	6 1/2	3	12 59/64
213/215T	13	35 3/8	6 1/2	4	12 59/64
254/256T	13	35 3/8	6 1/2	4	12 59/64
284/286T	18	41	7	4	12 59/64

SPECIFICATIONS

DESCRIPTION	STANDARD	OPTIONAL
Wetted Parts	Cast Iron	Bronze
Impeller	Bronze	Cast Iron
Wear Rings	------	Bronze
Shaft	Alloy Steel	Stainless Steel
Shaft Sleeve		
Mech. Seal	Cupro-Nickel	Stainless Steel
Stuff Box	Stainless Steel	------
Coupler	Woods	------
Coupler Guard	Yes	------
Base Plate	Fabricated Steel	
Bearings	Ball	
Connections	Flanged —ANSI with Gage Tappings	
Mech. Seal	John Crane — Type I	
Flushing Line	Yes	
Working Pressure	125 ANSI (Up to 175 PSI)	
Operating Temp.	250°F	300°F
Motors	Nema Standard	

Quality Through Design — COMPARE.

TACO, INC., 1160 Cranston Street, Cranston, Rhode Island 02920 (401) 942-8000 Telex: 92-7627
TACO (Canada) Ltd., 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2 (416) 625-2160 Telex: 06-961179

Form No. F301-031 Effective 1/24/83

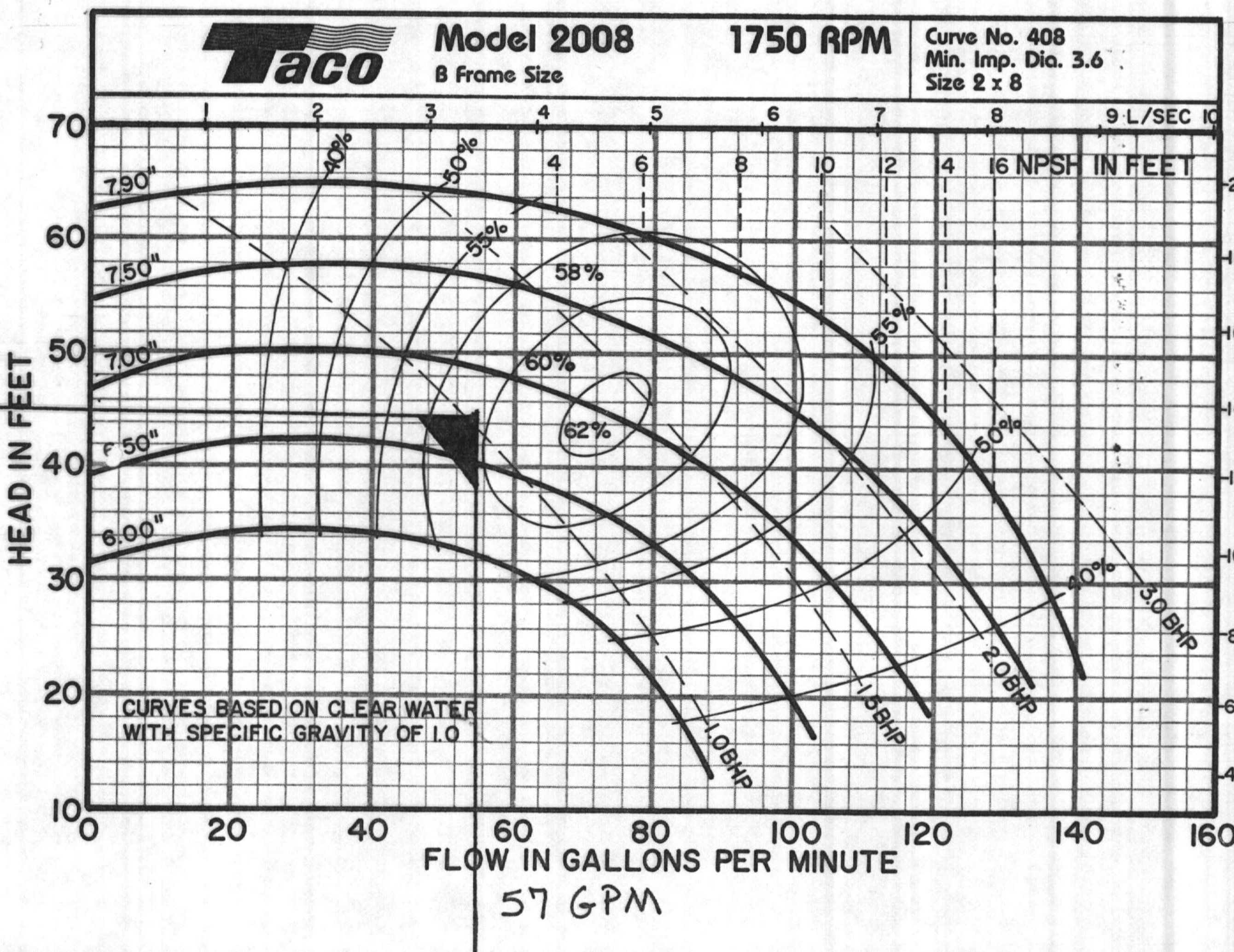
Taco Submittal Data Information End Suction Pumps

301-050

SUPERSEDES: NEW

Job: Replace Air Cond. Bldg. AS710, Camp Lejeune, N.C.

ITEM NO.	IMPELLER DIA.	G.P.M.	HEAD IN FT.	H.P.	ELECTRICAL CHARACTERISTICS
BB2008	6.75"	57 GPM	45 FT	1 1/2 HP	230/3/60



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Taco Submittal Data Information U Tube Heat Exchangers

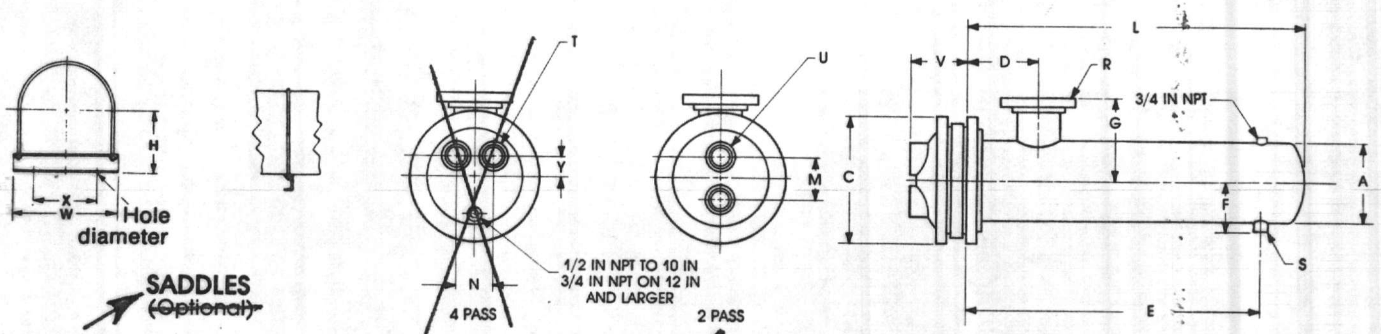
201-008

6" DIAMETER STEAM

SUPERSEDES: SD200-1

Job: BLDG AS 710 CAMP LEJEUNE

Item No.	Model No.	Pass	GPM Tubes	Temp. In	Temp. Out	Steam Pressure Shell	Pressure Drop Tubes	Velocity Tubes
HT. EX. 1	G 6208 S	2	56 GPM	160 °F	180 °F	5 PSIG	1.4 FT.	4.1 fps



DIMENSIONS

6 Inch Diameter

Model Number 2 Pass	Model Number 4 Pass	Cast Iron Heads 2 Pass M	U	4 Pass N	T	Y	V	Dimensions (inches) 2 and 4 Pass A	C	D	E	F	G	L	R	S	Heating Surface (sq. ft.)	Shipping Weight (lbs.)
G6204S	G6404S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	18½	4⅞	4⅞	25	1½T	1T	9.1	120
G6206S	G6406S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	30½	4⅞	4⅞	37	2T	1T	13.8	148
G6208S	G6408S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	42½	4⅞	5¾	49	2½	1T	18.5	182
G6210S	G6410S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	54½	4⅞	5¾	61	2½	1T	23.2	2[illegible]7
G6212S	G6412S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	66½	4⅞	5⁹⁄₁₆	73	3T	1T	27.9	235
G6214S	G6414S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	78½	4⅞	5⁹⁄₁₆	85	3T	1T	32.6	262
G6216S	G6416S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	90½	4⅞	5⁹⁄₁₆	97	3T	1T	37.3	290
G6218S	G6418S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	102½	4⅞	5⁹⁄₁₆	109	3T	1T	42.1	318
G6220S	G6420S	4	2T	3¾	1½T	1¼	3⁷⁄₁₆	6⅝	11	5	114½	4⅞	5⁹⁄₁₆	121	3T	1T	46.8	346

SADDLE DIMENSIONS: H-6⁵⁄₁₆; W-9¼; X-7½; Hole Dia.-⅝.

MATERIALS OF CONSTRUCTION (Unless otherwise indicated, standard will be furnished.)

	Standard	Optional
Shell	Steel	304ss, 316ss
Head	Cast Iron 4-10" Fabricated Steel 12-30"	Fabricated Steel, Cast Bronze, Fabricated 304ss/316ss Cast Bronze, Fabricated 304ss/316ss
Tubes	3/4 x 20 BWG Copper	3/4 x 18 BWG Copper, Steel, 304ss, 316ss, 90/10 Cu Ni, Admiralty
Tube Sheet	Steel	Bronze, Brass, 304ss, 316ss, 90/10 Cu Ni
Separators	Steel	Bronze, Brass, 304ss, 316ss, 90/10 Cu Ni
Working Pressure	150 PSIG (ASME)	Consult Factory
Max. Temperature	375°F	Consult Factory

Quality Through Design — COMPARE.

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TACO, (Canada) Ltd., 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2 (416) 625-2160 Telex: 06-961179

Form No. F201-008 Effective 10/1/84

INSTALLATION AND OPERATION INSTRUCTIONS
NUMBER IS 300-2.2
Effective: September 1, 1982 Supersedes: IS300-4 dated 3/31/68

Plant ID No. 001-922

TACO BASE MOUNTED PUMPS (SLEEVE AND BALL BEARING)

A—INSTALLATION

A1-LOCATION

Locate pump in an easily accessible place with sufficient space around it for maintenance and servicing. On larger pumps allow head room for the use of hoists or overhead cranes. Locate pump on a dry and clean place so that motor will be protected from moisture and dust.

On closed heating systems place compression tank at the suction side of the pump. When pump head is less than 20 feet, it is permissible to connect compression tank to discharge side of pump.

On open systems, install pump close to liquid supply and make suction piping as short and as straight as possible.

A2-FOUNDATION

The foundation serves to carry the pump weight and to absorb vibration. Normally, the foundation is made of concrete block, preferably tied in with the floor or ground. Make the foundation block about 4" longer and 4" wider than the base of the frame. Height of the block may vary from 2/3 to 1 times the *width* of the foundation (Fig. 1). When foundation is poured, provide a hole near each of the four (4) corners. To simplify installation and maintenance use lead Anchors. Place the front Anchor about 2" from the edge of the foundation to clear overhanging casings (Fig. 2).

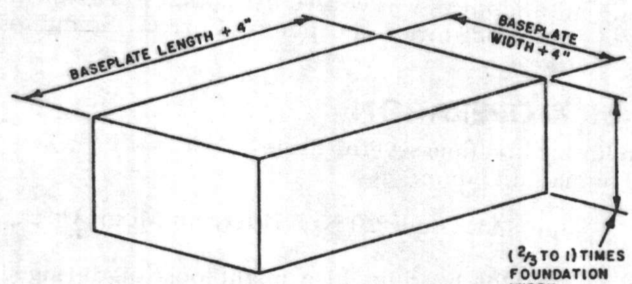


Fig. 1—Foundation Block

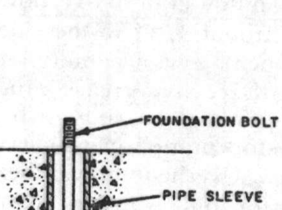


Fig. 2—Foundation Bolt

A3-PIPING

Correct piping is of prime importance for the proper operation and long life of the pump. Stresses induced by piping will cause excessive wear of seals, bearings, and couplings that could ultimately destroy these elements.

Both suction and discharge piping should be suspended close to the pump connections, so that <u>no</u> pipe weight rests on the pump. Pipe flanges and pump flanges should align <u>perfectly</u> before connections are made, piping should <u>never</u> be drawn by force into place.

Thermal expansion of piping requires special attention on heating installations. If no room is provided for pipe expansion, stresses are induced in the piping that will exert a load on the pump. Forces created by pipe stresses can exceed by far the load exerted through pipe and water weight. Stress forces can distort pump, bend shafts, wear out seals, and impeller wear rings, and ultimately burn out bearings. To protect pump from thermal pipe stresses, provide spring hangers and flexible connectors that are suitable to compensate for pipe expansion. (See Fig. 3).

Install gate valves on both suction and discharge side of the pump to allow servicing without draining the system. Also provide a flanged nipple (spool) between gate valve and suction end of the pump to enable you to take the pump apart without disturbing piping (Fig. 3). In order to have them easily accessible, the pump and flange nipples should not be covered with insulation.

On open pumping systems drawing water from a level below the pump (suction lift) install a foot valve with strainer. On open systems where the pump is located below the suction water level (suction head) install a check valve in the discharge line close to the pump.

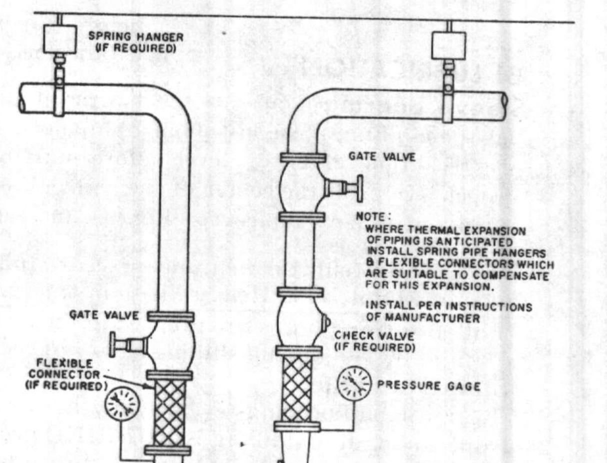


Fig. 3—Typical Installation—Vertical Piping

A—INSTALLATION-Continued

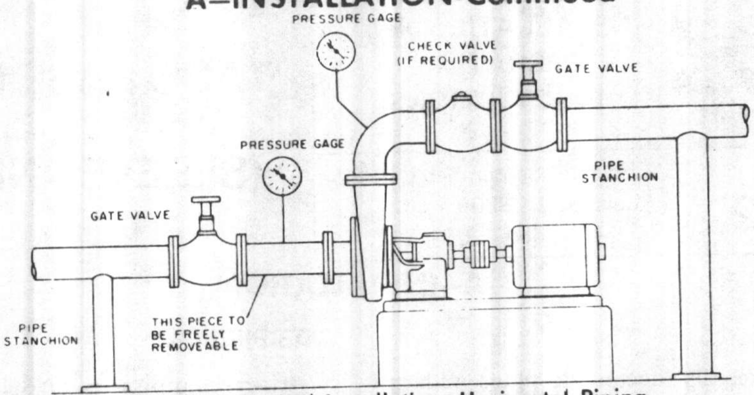


Fig. 3—Typical Installation—Horizontal Piping

A4-PUMP SETTING

When pump is set on its foundation, make sure to have it properly levelled. Place baseplate over foundation bolts provided for it, place shims at corners of baseplate when required and level with a spirit gauge. Tighten baseplate firmly to its foundations. Check also level of suction and discharge flanges.

A5-COUPLING ALIGNMENT

Proper alignment of pump and driver will assure trouble-free operation and long life of the pump. Misalignment will cause rapid wear of seals, couplings, and bearings. All pumps are carefully aligned before leaving the factory. However, experience indicates that alignment invariably changes in shipping and handling. Therefore, it is of utmost importance that alignment be checked at various steps of the installation process. i. e., **after levelling, after piping, and after first few weeks of operation.**

Check alignment by placing a slotted straight edge across the coupling halves at top, bottom, and at the sides. If any light is seen between the straight edge and one of the coupling flanges, it means the unit is out of alignment. (Fig. 4)

If light is seen at top and bottom position of the straight edge, alignment is out of height. Usually shims are placed under the motor feet. Loosen the four motor bolts, remove or add shims as required to correct proper height. Tighten the motor bolts and check to make sure alignment was corrected properly.

If alignment is out on the sides of the coupling, loosen the four motor bolts and lightly tap the motor in the direction required. Tighten the four motor bolts and check to make sure alignment was corrected properly.

As alignment in one direction may alter the alignment in another, be sure to check all alignments made.

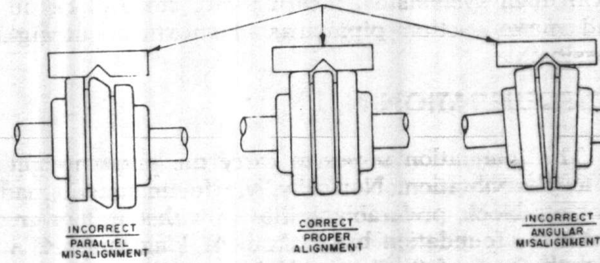


Fig. 4—Coupling Alignment

A6-CONNECTING PIPING

Piping may now be connected to pump. Make sure that pump and pipe flanges are strictly parallel and properly spaced for the gasket that will be used. Also check that pipes are supported properly and do not rest on pump flanges. Never draw pipes by force to pump flanges. Recheck alignment after piping connections are made. If misalignment was caused by piping, it is a sign that pipe stresses distorted the pump. Correct piping to relieve stresses.

B—PUMP START-UP & OPERATION

Before starting up pump for the first time several items are to be checked to avoid damaging pump.

B1-LUBRICATION

Sleeve Bearing pumps are filled with oil at the factory but some oil might be lost during shipment. As a matter of precaution, check oil level before starting up pump. Proper level is at the center of the sight glass. If oil level is too low, remove top cover (Fig. 5) and refill.

Drain and refill oil well once a year. Initial filling is Socony Mobil DTE Heavy Medium Oil, but any premium SAE Grade 20 Non-Detergent Motor Oil can be used.

Motor bearings also might loose oil during shipment. Check oil level as indicated on motor instruction. Electric motors have either an oil cup or a pipe plug for filling. An overflow is located at the side of the bearing area. Before starting unit, fill motor bearing with an oil can until oil flows out of overflow.

Ball Bearing pumps are greased at the factory. Grease will not flow out during shipment, so no checking will be required at startup.

Regrease ball bearings every two years or 3,000 hours of operation. Initial filling is LUBRIKO-grease, Density M31, manufactured by Master Lubricants Company, Philadelphia.

Any general purpose ball bearing grease No. 3 NLGI (National Lubricating Grease Institute) hardness may be used.

To grease bearings open side covers (Fig. 5), slide them about 1/2" to the side and introduce grease thru the opening with a putty knife. Fill grease chamber 2/3 high. Excessive grease causes unnecessary friction and will overheat bearing. If bearings run hot after regreasing, stop pump, open side cover, and wipe out excessive grease. Overheating will then cease.

Motor ball bearings also are greased at the factory. Grease should be replaced as indicated by motor manufacturer's instruction. Normally greasing is required every two years. On electric motors grease is usually introduced through a grease fitting with a grease gun.

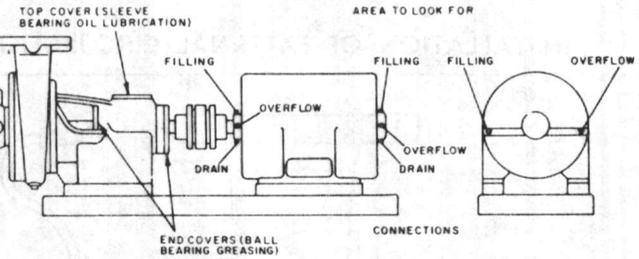


Fig. 5—Lubrication Points

B2-MOTOR WIRING & SENSE OF ROTATION

Check wiring of motor before starting to make sure that connections are wired properly for the voltage in use. Overvoltage can burn out motor windings. Check heater element in magnetic starter to see that it is rated the same as the motor.

AMP RATING FOR 3 PHASE SQUIRREL CAGE INDUCTION MOTORS

Motor HP	220 Volt 1750 RPM	220 Volt 3450 RPM	440 Volt 1750 RPM	440 Volt 3450 RPM
1/4	1.0	–	.5	–
1/3	1.4	–	.7	–
1/2	1.8	–	.9	–
3/4	2.4	2.2	1.2	1.1
1	3.6	3.4	1.8	1.7
1 1/2	4.8	4.6	2.4	2.3
2	6.2	5.6	3.1	2.8
3	9.0	8.0	4.5	4.0
5	14.4	13.4	7.2	6.7
7 1/2	20.0	19.2	10.0	9.6
10	26.4	25.6	13.2	12.8
15	39.0	38.0	19.5	19.0
20	51.0	50.0	25.5	25.0
25	62.0	60.0	31.0	30.0
30	74.0	72.0	37.0	36.0
40	96.0	–	48.0	–
50	120.0	–	60.0	–

Before attempting to check out sense of rotation of pump, fill pump with water to provide lubrication of the seal. **Do not operate pump dry for motor checkout.**

Next throw the switch and see if direction of rotation corresponds with arrows on frame of pump. The direction of rotation is counterclockwise facing the suction end of pump. Direction of rotation of three phase motors can be easily reversed by interchanging two of the three wires at the terminal board of the motor. Reversing of single phase motors is done by interchanging some internal wires or clamps. Instructions for reversing are found either on the motor nameplate or inside the motor terminal cover.

B3-PUMP START-UP

After you have checked lubrication and wiring you are ready to start the pump.

Open the gate valve in the suction side and close the valve on the discharge side. Start motor, wait until unit has come to full speed and then open discharge valve slowly. Do not run pump for more than a few minutes with completely shut valves. If system conditions call for part-time operation against shut valves, install a bypass line from discharge to suction.

B4-MECHANICAL SEAL AND STUFFING BOX CARE

Mechanical Seal (See caution below)*

Mechanical seals are the most delicate component of the pump. Special care has to be given to them to assure trouble-free operation.

The sealing element of a mechanical seal consists of a carbon washer rotating against a stationary ceramic ring.

Surfaces of both are highly lapped to assure sealing. Any dirt that penetrates between the two mating parts will cause a rapid wear of the seal faces and will ultimately result in seal leakage.

New heating systems are usually contaminated by various materials such as construction debris, welding slugs, pipe joint compound, mill scale, etc. It is of utmost importance that such systems be cleaned out thoroughly before putting pump into continuous operation.

Cleaning of a heating system is simple and easy. First flush out system with cold water at city pressure to remove all loose foreign matter that penetrated into the system. Afterwards boil out system with chemicals to remove dirt adhering to pipes.

Chemicals most commonly used for this procedure are sodium triphosphate, sodium carbonate, or caustic soda, but any nonfoaming detergents as used in dishwashers can be applied.

Fill system with clean water, add cleaning chemicals (1) lb. for every 40 to 50 gallons of water, (or Mfrs. Instruction) start pump and heat up system. Let system run for a few hours, then drain and refill with fresh water. Your pumps are now ready for continuous duty. (See caution below).*

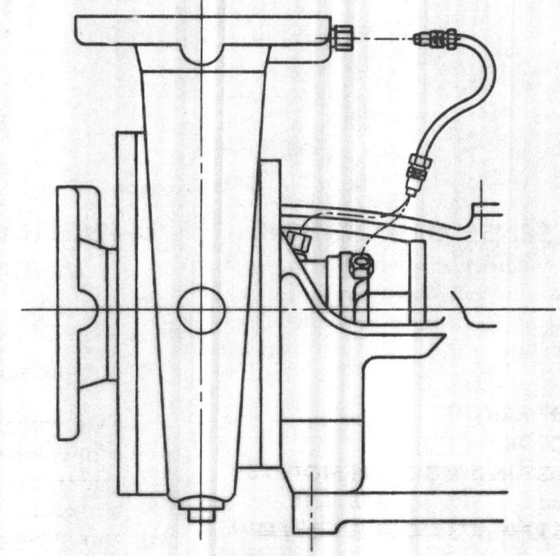
Stuffing boxes are less delicate in operation than mechanical seals. No chemical cleaning is necessary as on mechanical seal pumps, but flushing out with cold water is beneficial on this type of pump too.

After pump is started up adjust gland of stuffing box evenly so that it drips from one to three drops of water per minute. This drip is absolutely essential to prevent damage to packing and shaft sleeve. It also prevents overloading of motor. Excessive dripping may cause air to enter pump under certain conditions.

Sump of pump should be piped to any convenient sewer or drain. A pipe tapping is provided for this purpose at the side of the sump. Never plug this drain tapping.

*CAUTION: The addition of certain chemical additives to systems utilizing TACO Equipment, voids the warranty.

INSTALLATION OF EXTERNAL CIRCULATION TUBE

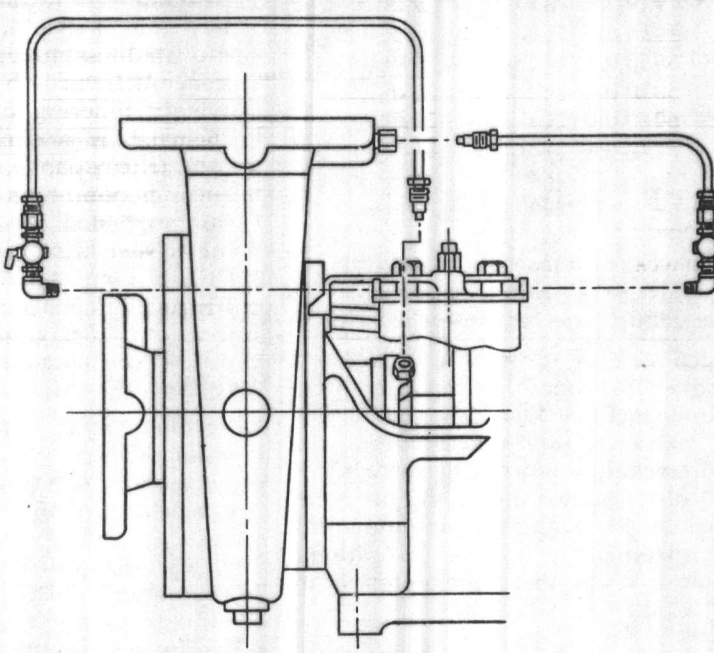


IMPORTANT

Before filling system with water, assemble external circulation tube to pump casing as follows:

1. **Screw nut into body until hand tight.**
2. **With a wrench continue tightening for about one and one-half full additional turns. (It is not necessary to tighten nut all the way down)**

INSTALLATION OF PUROCELL FILTER



IMPORTANT

1. **Attach Filter to the pump by loosening the top bolt on the frame and casing and slip bracket under bolt and tighten.**
2. **If Recirculating line is installed — remove from frame and insert this end into inlet of Filter.**
3. **Attach line from outlet of the filter to seal retainer cap.**

Taco, Inc. 1160 Cranston Street, Cranston, Rhode Island 02920 Telephone: (401) 942-8000 Telex: 92-7627

Litho in U.S.A.

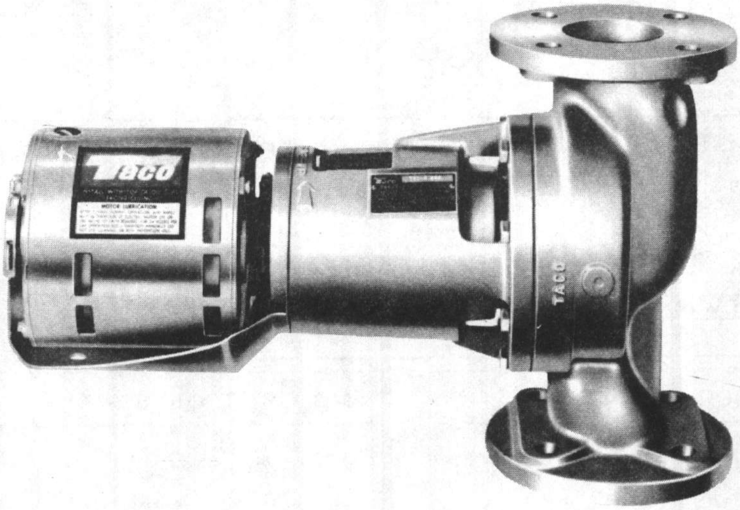
Taco (Canada) Limited 1310 Aimco Blvd., Mississauga, Ontario L4W 1B2 Telephone: 416-625-2160 Telex: 06-961179

Taco	REPLACEMENT PARTS
NUMBER **304-001**	Effective: December 1, 1985 Supersedes: PL300-1 dated: 12/1/84

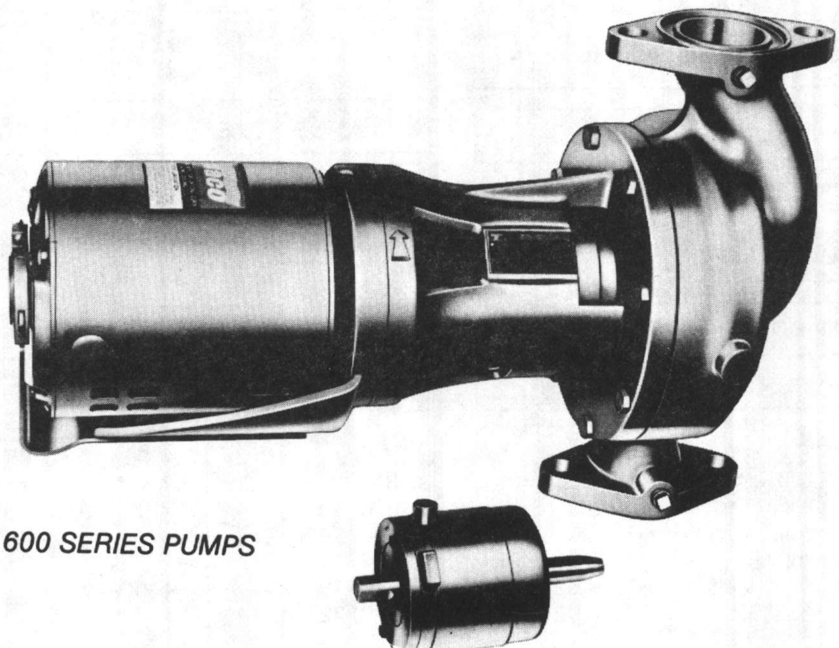
121 THRU 138 PUMPS
1600 SERIES PUMPS

IMPORTANT: When ordering, always specify part number, part name, and complete model number of pump.

CARTRIDGE DESIGN PUMPS

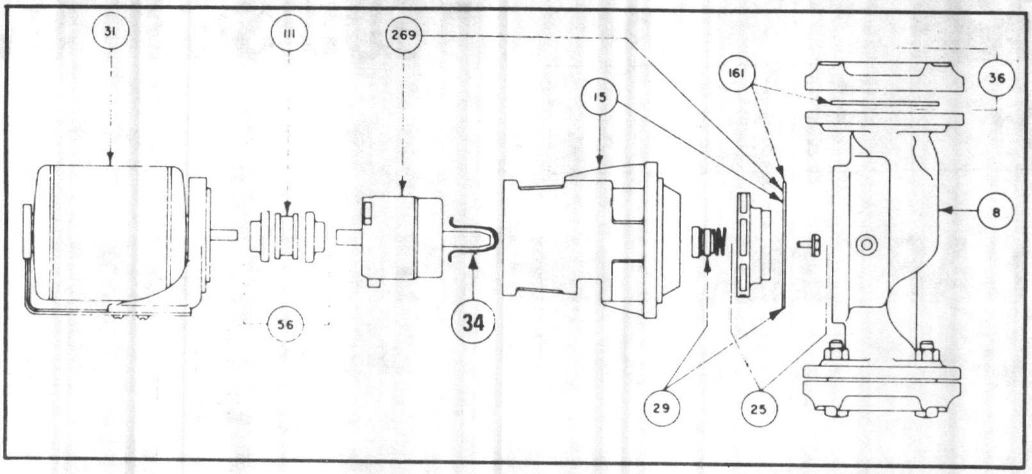


121 — 138 SERIES PUMPS



1600 SERIES PUMPS

REPLACEMENT PARTS FOR (–9) AND SERIAL NUMBER CARTRIDGE DESIGN PUMPS



SERIAL NUMBER CODE

1600 - 4.25

C 1 N 1 N

- N — FLANGE TYPE
- 1 — MOTOR FRAME SIZE
- N — WATER SEAL
- 1 — BRACKET DESIGN
- C — MATERIAL OF CONSTRUCTION

MATERIAL OF CONSTRUCTION	
	X O O O O
A	CAST IRON PUMP AND IMPELLER (3)
B	ALL BRONZE PUMP AND IMPELLER
C	CAST IRON PUMP AND BRONZE IMPELLER

MOTOR FRAME SIZE*		
		O O O X O
1	48 FRAME	(1/4, 1/3, 1/2 HP)
2	56 FRAME	(3/4, 1 HP)
3	56 FRAME	(1 1/2, & 2 HP)
4	56 FRAME	(3 HP)

* Refer to standard motors only. See nameplate for other motors.

BRACKET DESIGN	
	O X O O O
1	ALL CURRENT STYLE PUMPS

WATER SEAL TYPE, ITEM #29	
	O O X O O
N	1600 – 170RP NI – RESIST
H	1600 – 170HRP TUNGSTEN CARBIDE
E	1600 – 170ERP CERAMIC

FLANGE TYPE		
		O O O O X
N	NPT	(STANDARD)
D	DIN	(EXPORT)

ITEM #8 REPLACEMENT BODY

PUMP MOD. NO.	CAST IRON	BRONZE
121	121 – 018RP	121 – 018BRP
122	"	"
131, 32, 33 & 38[1]	133 – 150RP	133 – 150BRP
1600, 10, 11[1]	1610 – 001RP	1610– 001BRP
1602, 1604[2]	N/A	N/A
1612, 14, 15	1614 – 001RP	1614 – 001BRP
1616, 18, 19	1618 – 004RP	1618 – 004BRP
1620, 22, 24	1634 – 001RP	1634 – 001BRP
1630. 1632	"	"
1634, 1635	"	"
1636, 1638	1640 –002RP	1640 – 002BRP
1640, 1641	"	"

ITEM #36 REPLACEMENT FLANGE SET

PUMP MOD. NO.	CAST IRON	BRONZE
121	1600 – 033RP	1600 – 033BRP
122	1600 – 034RP	1600 – 034BRP
131, 32, 33, & 38[1]	"	"
1600, 10, 11[1]	1600 – 031RP	1600 – 031BRP
1602, 1604[2]	"	"
1612, 14, 15	"	"
1616, 18, 19	1600 –032RP	1600 – 032BRP
1620, 22, 24	"	"
1630, 1632	"	"
1634, 1635	"	"
1636, 1638	1600 – 174RP	1600 – 174BRP
1640, 1641	"	"

Note (1) When replacing Item #8 body on 131, 132, 133, 138 and 1600C – 1& –9, you must also order current style impeller.
Note (2) Body for the 1602 & 1604 are no longer available. Consult factory.
Note (3) 121 thru 138 only.

ITEM # 15 REPLACEMENT BRACKET					
PUMP MOD. NO.	MOTOR FRAME SIZE (48)		MOTOR FRAME SIZE (56)		ITEM # 161 GASKET KIT
	CAST IRON	BRONZE	CAST IRON	BRONZE	
121, 122	1600 – 155RP	1600 – 156RP	NA	NA	1600 –050RP
1600, 10, 11	"	"	"	"	"
1602, 1604	1600 – 175RP	1600 – 176BRP	"	"	"
1612, 20, 30	"	"	"	"	"
131, 132	"	"	"	"	"
1615*	–	–	–	–	"
133, 138	NA	N/A	1604 – 023RP	1604 – 024RP	"
1614, 22, 24	"	"	1604 – 023RP	1604 – 024RP	"
1632, 34	"	"	1604 – 023RP	1604 – 024RP	"
1635*	–	–	–		1600 – 050RP
1616, 36	"	"	1604 – 025RP	1604 – 026RP	1618 – 006RP
1619*	–	–	–	–	"
1638, 40, 41	"	"	1604 – 025RP	1604 – 026RP	"

* Select bracket, per motor frame size code in serial number.

ITEM #25 REPLACEMENT IMPELLER ASSEMBLY									
PUMP NO.	(-9) PUMPS	CURRENT	DIA. -9	DIA. CUR.	PUMP NO.	(-9) PUMPS	CURRENT	DIA. -9	DIA. CUR.
121, 122	121 – 142BRP	121 – 142BRP	4.30	4.30	1618	1618 – 001BRP	N/A	7.900	
131	131 – 075BRP	1630 – 023BRP	4.80	4.40	1619*	N/A	1619 – 001BRP		
132	132 – 063BRP	1630 – 022BRP	5.20	4.90	1620	1620 – 022BRP	N/A	5.100	
133	133 – 075BRP	1632 – 022BRP	5.75	5.65	1622	1622 – 020BRP	N/A	5.850	
138	138 – 037BRP	1634 – 023BRP	6.25	6.15	1624	1624 – 040BRP	N/A	6.500	
1600	1600 – 179BRP	1610 – 020BRP	4.75	4.50	1630	1630 – 022BRP	1630 – 022BRP	4.900	
1602	1602 – 025BRP	N/A	5.500		1632	1632 – 022BRP	1632 – 022BRP	5.650	
1604	1604 – 028BRP	N/A	6.200		1634	1634 – 023BRP	1634 – 023BRP	6.150	
1610	1610 – 019BRP	1610 – 019BRP	4.750		1635*	N/A	1635 – 001BRP	–	
1611*	N/A	1611 – 001BRP	–		1636	1636 – 001BRP	1636 – 001BRP	6.400	
1612	1612 – 019BRP	1612 –019BRP	5.750		1638	1638 – 001BRP	1638 – 001BRP	6.900	
1614	1614 – 018BRP	1614 – 018BRP	6.350		1640*	1640 – 001BRP	N/A	7.900	
1615*	N/A	1615 – 001BRP	–		1641*	N/A	1641 – 001BRP	–	
1616	1616 – 002BRP	1616 – 002BRP	7.100						

*When ordering, please advise diameter of impeller.

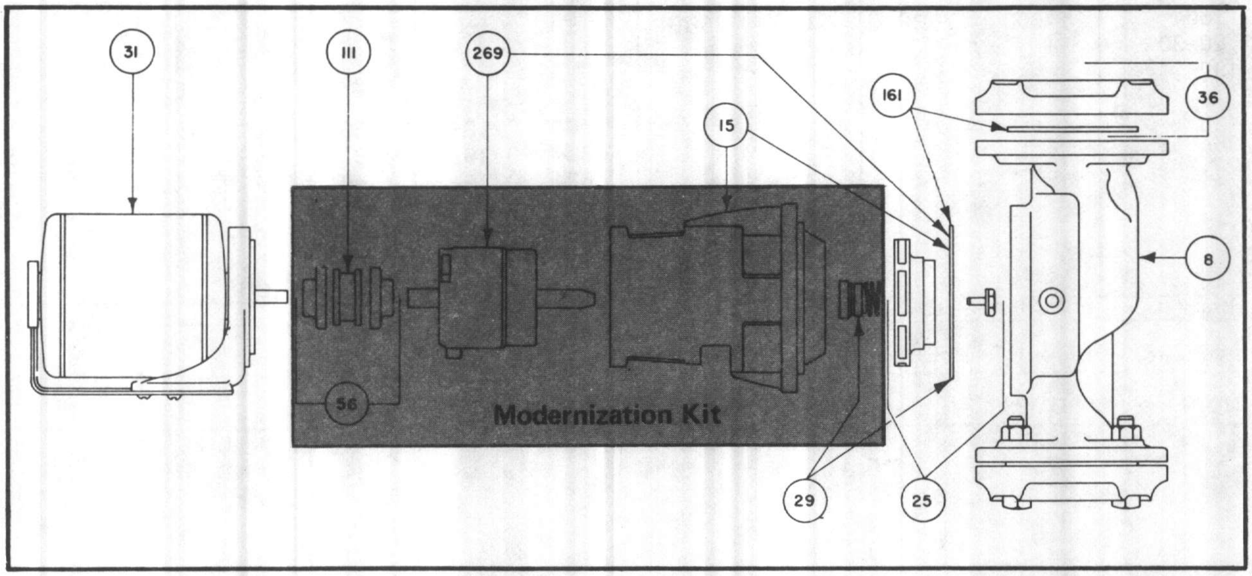
ITEM # 31 REPLACEMENT MOTOR ASSEMBLY*				
HP	115/60/1	115/230/60/1	200/60/3	230/460/60/3
1/4	121 – 151RP	N/A	121 – 148RP	121 – 137RP
1/3	131 – 143RP	N/A	131 – 115RP	131 – 137RP
1/2	N/A	132 – 096RP	132 – 066RP	132 – 097RP
3/4	N/A	133 – 119RP	133 – 140RP	133 – 134RP
1	N/A	138 – 119RP	138 – 148RP	138 – 142RP
1½	N/A	1636 – 013RP	1636 – 019RP	1636 – 010RP
2	N/A	1638 – 012RP	1638 – 015RP	1638 – 010RP
3	N/A	N/A	1640 – 013RP	1640 – 010RP

* When ordering other than standard, refer to nameplate, then consult factory.

ITEM #34 SHAFT SLEEVE	1600 – 205	All –9 and Serial Number Pumps.
ITEM #56 COUPLER	1624 – 053RP	All Inline Pumps ¼ thru 2 HP.
ITEM #56 COUPLER	1624 – 041RP	All Inline Pumps 3 HP.
ITEM #111 RUBBER INSERT	1624 – 004RP	All 4J Couplers.
ITEM #111 RUBBER INSERT	1624 – 020RP	All 3J Couplers.
ITEM #111 RUBBER INSERT	900 – 512	All 5J Couplers.
ITEM #269 CARTRIDGE ASSY.	1600 – 160RP	All -9 and Serial Number Pumps.

REPLACEMENT PARTS FOR OLD STYLE PUMPS AND CIRCULATORS *

*121+122-3-7; 131, 132+133-3-6; 138-1+2; 1600, 1602, 1604, 1610, 1612, 1614, 1620, 1622, 1624, 1630, 1632, 1634-1+-C1.



ITEM # 8	BODY	Same as –9 and Serial Number Pumps.
ITEM # 25	IMPELLER AND SHAFT ASSEMBLY	No longer available . Must purchase Item #74 Modernization Kit listed below, Plus –9 IMPELLER
ITEM # 29	SEAL KIT	Part No. 1600 – 055RP
ITEM # 31	MOTOR ASSEMBLY [1]	Same as –9 and Serial Number Pumps.
ITEM # 36	FLANGE SET	Same as –9 and Serial Number Pumps.
ITEM # 56	COUPLER	Same as –9 and Serial Number Pumps.
ITEM # 111	RUBBER INSERT	Same as –9 and Serial Number Pumps.
ITEM # 161	GASKET KIT	Same as –9 and Serial Number Pumps.

ITEM # 74 MODERNIZATION KIT*

PUMP NO.	MOTOR FRAME SIZE (48)		MOTOR FRAME SIZE (56)		
	CAST IRON	BRONZE	CAST IRON	BRONZE	
121, 122	121 – 154RP	122 – 002RP	N/A	N/A	
131, 132[2]	131 – 144RP	132 – 145RP	133 – 147RP	138 – 153RP	
133, 138	N/A	N/A	"	"	
1600, 1610	121 – 154RP	122 – 022RP	N/A	N/A	
1602, 1604[2]	131 – 144RP	132 – 145RP	133 – 147RP	133 – 147RP	
1612, 1620[2]	"	"	133 – 147RP	138 – 153RP	
1630[2]	"	"	"	"	
1614, 1622	N/A	N/A	"	"	
1624, 1632	N/A	N/A	"	"	
1634	N/A	N/A	"	"	

Note (1) When replacing 1/3 or 1/2 HP 56 Frame (old) motor with a new 48 Frame motor, adapter kit # 1600 – 194RP must be ordered.

Note (2) Select modernization kit per motor frame size. Select impellers per selection chart on previous page, under –9 column

*Change

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REPLACEMENT PARTS LIST

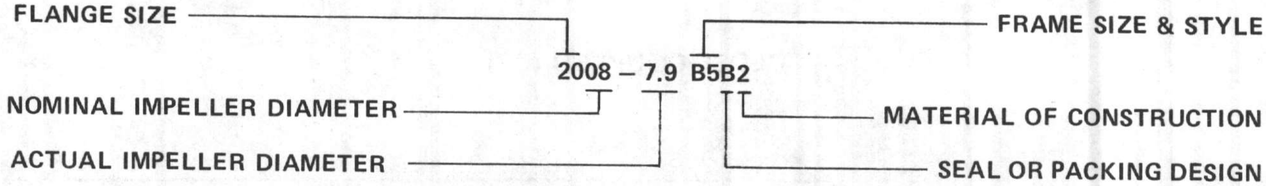
NUMBER
PL300-2.3

Effective: June 1, 1983
Supersedes: PL300-2.3
dated 2/1/81

FOR FOLLOWING MODEL NUMBERS:

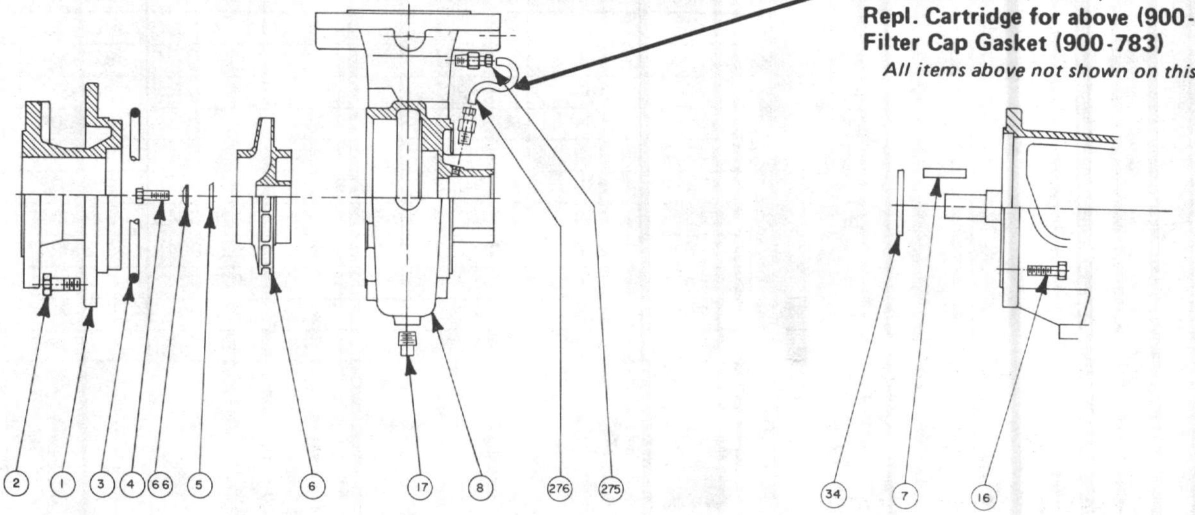
BM or CC: 2-8 2½-8 2½-10 3-8 & 4-6
BM or CC: 2008 2010 2012 2508 2510 3008 & 4006
SB or BB: 2008 2010 2012 2508 2510 3008 & 4006

WHEN SELECTING AND ORDERING PARTS, ALWAYS REFER TO SERIAL NUMBER ON NAME PLATE
—Example—



BASIC PARTS

FILTER KIT (900-1)
Repl. Cartridge for above (900-439)
Filter Cap Gasket (900-783)
All items above not shown on this sheet.



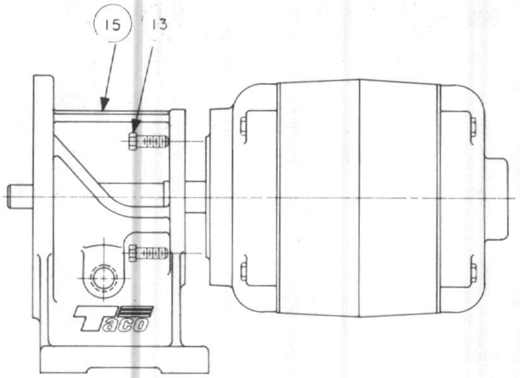
Item No.	No. Reqd.	DESCRIPTION	PART NO. PER PUMP SIZE 2-8 2008	2-12 2012	2½-8 2508	2½-10 2510	3-8 3008	4-6 4006	REMARKS
1	1	Suction Cover	920-003	884-003	928-003	922-003	934-003	938-003	Add 'B' for Brz.
2	8	Suction Cover Bolts	10-216	10-211	10-216	10-211	10-216	10-230	
3	1	Suction Cover 'O' Ring	912-005	868-004	912-005	862-005	912-005	918-005	
4	1	Impeller Bolt (SS)	10-257	10-259	10-257	10-257	10-257	10-257	3/8-16x11/2 SS
5	1	Impeller Washer	926-004	926-004	926-004	926-004	926-004	926-004	
6	1	Impeller	920-002	884-002	928-002	922-002	934-005	938-002	Add 'B' for Brz.
7	1	Impeller Key (SS)	13-104A	13-105A	13-104A	13-104A	13-104A	13-104A	
8	1	Casing	920-001	884-001	928-001	922-001	934-001	938-001	Add 'B' for Brz.
16	4	Casing Bolt	10-201	10-201	10-201	10-201	10-201	10-201	3/8-16x1-1/8
17	1	Drain Plug	16-102	16-104	16-102	16-102	16-102	16-102	3/8 NPT
34	1	Slinger Ring	900-044	900-044	900-044	900-044	900-044	900-044	
66	1	Belleville Washer	900-053	900-053	900-053	900-053	900-053	900-053	
222	1	Fitting	900-566	900-566	900-566	900-566	900-566	900-566	
275	2	Fitting	900-798	900-798	900-798	900-798	900-798	900-798	
276	1	Tube	900-728	900-728	900-728	900-728	900-728	900-728	

(1) Throttle Bushing (Item 10), found in Seal Section, must be ordered with each casing.

FRAME SIZE & STYLE – 0000-00-XX00

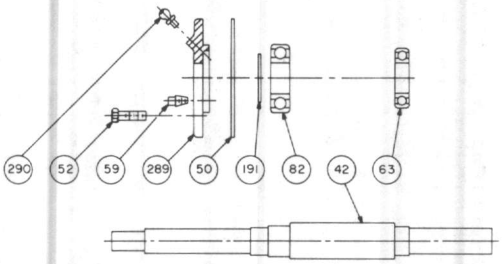
B1	**BALL BEARING DESIGN:**	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name-plate data to insure proper updated nameplate.
B2	**SLEEVE BEARING DESIGN:**	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name-plate data to insure proper updated nameplate.
B3	**SLEEVE BEARING DESIGN:**	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name-plate data to insure proper updated nameplate.
B6	**SLEEVE BEARING DESIGN:**	Update pump with 840-124RP Complete Frame Assembly. Please furnish all name-plate data to insure proper updated nameplate.

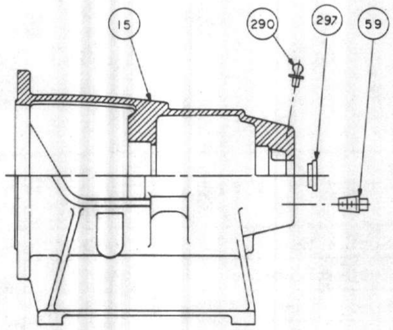
B4 CLOSE COUPLED (CC)



NEMA FRAME Size "T"	NEMA FRAME Size "U"	ITEM 13 FR. BOLT Part No.	ITEM 15 PUMP FR. 1750 "T"	ITEM 15 PUMP FR. 3450 "T"	ITEM 15 PUMP FR. 1750 "U"	ITEM 15 PUMP FR. 3450 "U"
	48	10-201			920-004	920-004
	56	10-201			920-004	920-004
143	182	10-201			920-004	920-004
145	184	10-201	920-004		920-004	920-004
182	213	10-223	928-004		928-004	928-004
184	215	10-223	928-004		928-004	928-004
213	254	10-223	928-004	928-004	928-004	928-004
215	256	10-223	928-004	928-004	928-004	928-004
254	285	10-223		928-004		900-126
256	286	10-223		928-004		900-126
284		10-223		900-126		

B5 BALL BEARING DESIGN:

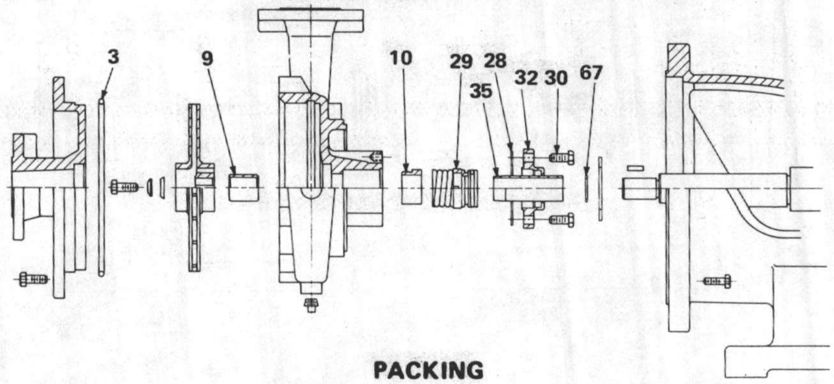




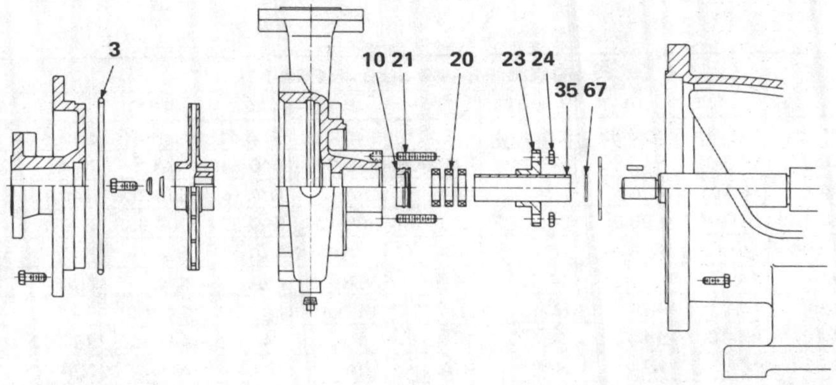
Item No.	No. Req.	DESCRIPTION	PART NO.	REMARKS REMARKS
74	1	Frame Assembly (complete)	840-124RP	
15	1	Frame	840-111	
42	1	Shaft	840-113	Add SS for Stainless Steel
50	1	Bearing Plate Gasket	840-123	
52	4	Bearing Plate Bolt	10-230	3/8 - 16 x 1
59	2	Drain Plug	16-111C	1/8 NPT Brass
63	1	Ball Bearing	840-114	
82	1	Ball Bearing	840-071	
191	1	Retainer Ring	15-105	
289	1	Bearing Cover Plate Assembly	840-120	
290	2	Lubrication Fitting	15-200	
297	1	End Cap	820-368	

SEAL OR PACKING DESIGN – 0000-00-00X0

MECHANICAL SEAL



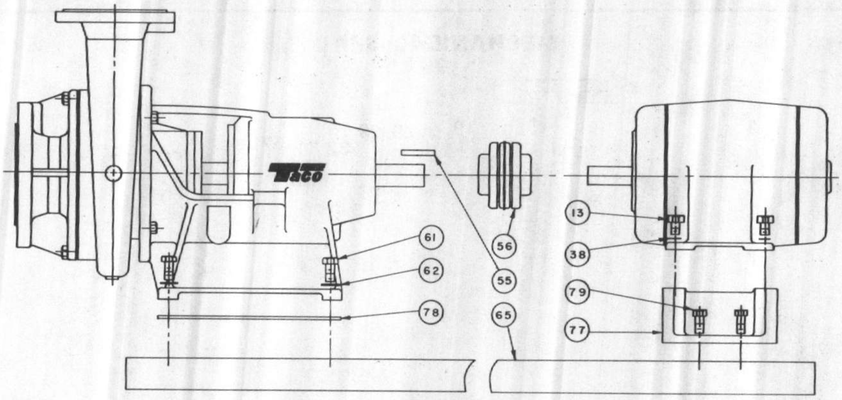
PACKING



TYPE B STANDARD. TYPE D HI-TEMP. TYPE P PACKED. TYPE E CERAMIC.

Item No.	No. Reqd.	DESCRIPTION	SEAL OR PACKING DESIGN				REMARKS
			Type 'B'	Type 'D'	Type 'P'	Type 'E'	
3	1	'O' Ring	*See Page 1*				
9	1	Impeller Spacer	900-026RP	900-026RP	Not Used	900-026RP	
10	1	Throttle Bushing	920-016	920-016	920-008	920-016	
20	1	Packing Set			900-241RP		
21	2	Studs			900-029		
22	1	Filler Ring (Not shown)	Not Used	Not Used	900-030		
23	1	Gland			920-015		Add 'B' For Bronze
24	2	Hex Nuts			12-129		3/8 – 16
28	1	Retainer Cap Gasket	920-014RP	920-014RP		920-014RP	
29	1	Water Seal	900-024RP	900-087RP		900-215RP	
91	1	WATER SEAL KIT	840-128BRP	840-128DRP	Not Used	840-128ERP	Incl. Items No. 28, 29, 35 & 67
30	4	Retainer Cap Bolts	10-208	10-208		10-208	3/8 – 16 x 7/8
32	1	Seal Retainer Cap	920-020	920-020		920-020	
35	1	Sleeve	900-027BRP	900-027BRP	920-006	900-027BRP	
67	1	Sleeve Gasket	920-007RP	920-007RP	920-007RP	920-007RP	

MOTOR PARTS – NOT PART OF SERIAL NUMBER
–Motor Frame Sizes Must be Specified When Ordering Parts Shown Below–



Item No.	No. Reqd.	DESCRIPTION	MOTOR FRAME SIZE (NEMA STD.) 'T'										REMARKS
			143-145T	182T	184T	213T	215T	254T	256T	284T	284TS	286TS	
65	1	Base Plate (1)	820-957	820-957	820-957	840-418	840-418	840-418	840-418	840-419	840-419	840-419	
77	2	Spacer	840-098	840-003	840-004	840-005	840-006	840-041	840-040	N/A	N/A	N/A	
78	2	Frame Spacer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	840-106	840-106	840-106	
56	1	Coupler	900-193	900-206	900-206	900-195	900-195	900-197	900-197	900-538	900-197	900-199	
38	4	Mtr. Lck. Wshr.	14-104	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5/16
38	4	Mtr. Lck. Wshr.	N/A	14-101	14-101	14-101	14-101	N/A	N/A	N/A	N/A	N/A	3/8
38	4	Mtr. Lck. Wshr.	N/A	N/A	N/A	N/A	N/A	14-100	14-100	14-100	14-100	14-100	7/16
62	4	Frm. Lck. Wshr.	14-102	14-102	14-102	14-102	14-102	14-102	14-102	14-102	14-102	14-102	1/2
13	4	Mtr. Hx. Hd. Blt.	10-254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5/16-18x1¼
13	4	Mtr. Hx. Hd. Blt.	N/A	10-221	10-221	10-221	10-221	N/A	N/A	N/A	N/A	N/A	3/8-16x1¼
13	4	Mtr. Hx. Hd. Blt.	N/A	N/A	N/A	N/A	N/A	10-209	N/A	N/A	N/A	N/A	7/16-14x1½
13	4	Mtr. Hx. Hd. Blt.	N/A	N/A	N/A	N/A	N/A	N/A	10-202	10-202	10-202	10-202	7/16-14x1¼
61	4	Fr. Hex. Hd. Blt.	10-238	10-238	10-238	10-238	10-238	10-238	10-238	N/A	N/A	N/A	1/2-13x1-5/8
61	4	Fr. Hex. Hd. Blt.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10-217	10-217	10-217	1/2-13x2½
79	4	Spr. Hx. Hd. Blt.	10-230	10-230	10-230	10-230	10-230	N/A	N/A	N/A	N/A	N/A	3/8-16x1
55	1	Coupler Key	13-100	13-100	13-100	13-100	13-100	13-100	13-100	13-100	13-100	13-100	1/4x1/4x1½
47	1	Coupler Guard	820-796	820-796	820-796	820-796	820-796	820-796	820-796	820-796	820-796	820-796	
48	4	CG. RdHd. Scw.	10-400	10-400	10-400	10-400	10-400	10-400	10-400	10-400	10-400	10-400	1/4-20x3/8
111		Coup. Insert	900-512	900-512	900-512	900-513	900-513	900-514	900-514	900-515	900-514	900-515	

(1) Add "A" to base plate number when coupler guard is to be used.

MATERIALS OF CONSTRUCTION – – – 0000-00-000X

DESCRIPTION	1 STANDARD CONSTRUCTION	2 BRONZE FITTED	3 ALL BRONZE	4 ALL IRON	REMARKS
Casing	Iron	Iron	Bronze	Iron	Add Suffix 'B' for Bronze
Suction Cover	Iron	Iron	Bronze	Iron	Add Suffix 'B' for Bronze
Impeller	Iron	Bronze	Bronze	Iron	Add Suffix 'B' for Bronze
Wear Ring	Bronze	Bronze	Bronze		Only When Required
Seal Retainer Cap	Iron	Iron	Bronze	Iron	Add Suffix 'B' for Bronze
Packing Gland	Iron	Iron	Bronze	Iron	Add Suffix 'B' for Bronze
Throttle Bushing	Bronze	Bronze	Bronze	Iron	Add Suffix 'C' for Iron
Sleeve	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	
Shaft	Steel	Steel	Steel	Steel	Add 'SS' for St. Steel

Taco

INSTRUCTION SHEET

NUMBER **IS-100-1.3**

Effective: May 1, 1981
Supersedes: IS 300-1-1 dated 11/25/68

PUMP SERVICING INSTRUCTIONS – NOS.

121-7	1600-1	1620-1
122-7	1602-1	1622-1
131-6	1604-1	1624-1
132-6	1610-1	1630-1
133-6	1612-1	1632-1
138-2	1614-1	1634-1

Plant ID. No. 001-322

ITEMS TO CHECK BEFORE STARTING

1. Motor and bracket have been properly lubricated at the factory and should not require additional lubricant. Before starting, check oil level in bracket thru sight oil gauge. Level should be between top and center of window. If, for some reason, level is below center of window, see instructions on oil well cover.
2. Check motor and power supply for proper wiring connections and voltage. If motor is damaged due to improper wiring hook-up, guarantee is void.
3. The casing is rotatable and may be installed in a vertical or horizontal pipe. The motor and bracket must be horizontal in all cases with oil well cover facing the ceiling.

LUBRICATION

Motor— Motor is well oiled before shipment in accordance with manufacturer's recommendation and should not require any oil upon arrival. When oil is required, follow instructions attached to the motor end shield plates.

Pump— (For best results TACO-LUBE #12 is recommended. Maintain oil level at all times within limits specified on oil well cover.

MOTOR ALIGNMENT

All circulator motors are aligned within required tolerances when shipped. They normally do not require any attention. If due to rough handling the motor base becomes bent, loosen screws connecting cast iron and steel sections of the motor base and place shims between the two sections until the motor shaft is properly aligned with the pump shaft.

TO REPLACE WATER SEAL AND/OR IMPELLER

1. Stop pump and close suction and discharge valves.
2. Drain water from casing.
3. Remove pipe plug on opposite side of oil gauge and drain oil (water may have gotten into oil reservoir).
4. Remove motor assembly from bracket.
5. Remove bracket from pump body. Loosen set screw and pull out pump end of drive coupling. DO NOT BEND SHAFT.
6. Remove oil well cover, loosen set screw in inside Thrust Collar and while holding Thrust Collar, remove Impeller and Shaft, Thrust Washers and Thrust Collar.
7. Clean bearings and bracket and inspect for possible damage. Clean sight oil gauge.
8. Remove stationary seal from bracket, clean recess and apply a film of light oil to OD of new stationary seat rubber cup, press firmly in place with thumbs. Be certain it is "bottomed" equally, otherwise it might leak.
9. Gently remove old seal parts from shaft with a rotating motion and clean entire shaft with soft clean cloth (Do not use much pressure). Drop new spring and holder onto the shaft.
10. Apply a good film of oil, from the very end of the shaft right down to, and slightly beyond the end of the spring. With the seal in the palm of the hand (seat facing the hand) and with an oscillating motion, press seal over end of shaft then down to free length of the spring. Line up seal, spring and spring holder.
11. Thoroughly clean both seal faces with a soft clean cloth.
12. Remove set screw from Thrust Collar. Apply a film of oil to each side of Thrust Collar, then place a Thrust Collar Washer on each side of the Thrust Collar with the LIGHT COLORED (Cadmium Plated) SIDES facing the Thrust Collar. While holding this 3 Part Assembly (Thrust Collar and two Washers) in the oil reservoir with grooves on OD of Collar facing the Impeller, slide Impeller and Shaft into bracket so that hole in Shaft is directly in line with screw hole in Thrust Collar. Insert and tighten set screw until it bottoms in the hole in the shaft, then turn back 1/16 of a turn. This automatically adjusts the spring tension on seal. THIS LAST OPERATION MUST BE ACCOMPLISHED IMMEDIATELY AFTER OPERATIONS 10 AND 11. IF TOO MUCH TIME ELAPSES, THE OIL MAY BE SQUEEZED OUT FROM UNDER SHAFT SEAL, PREVENTING THE RUBBER PART OF SEAL FROM SLIDING ON SHAFT WHICH IS NECESSARY WHEN PERFORMING OPERATION 12.
13. Re-assemble motor and coupling assembly to bracket and bracket to casing, making certain that casing gasket is in good condition and properly located. Engage teeth of rubber coupling insert with those in the metal ends. Bring all three parts together, then back off one end about 1/32" and tighten. Do not squeeze rubber insert, some pump sizes use A "FIGURE-8" shaped one piece coupler. Install without stretching or compressing.
14. Open valves in suction and discharge lines and vent air thru vent holes, if provided. Start motor for TWO SECONDS, then stop and inspect for water leaks. If any leaks occur, one or more previous operations must be repeated.
15. If no leaks occur, re-fill oil reservoir as previously indicated under LUBRICATION-PUMP and replace oil well cover.
16. Start pump and again check for leaks. (Note: If pump is operated longer than 30 SECONDS without being primed, the mechanical seal could be damaged).

TACO REDUCING VALVE PRESSURE REGULATORS

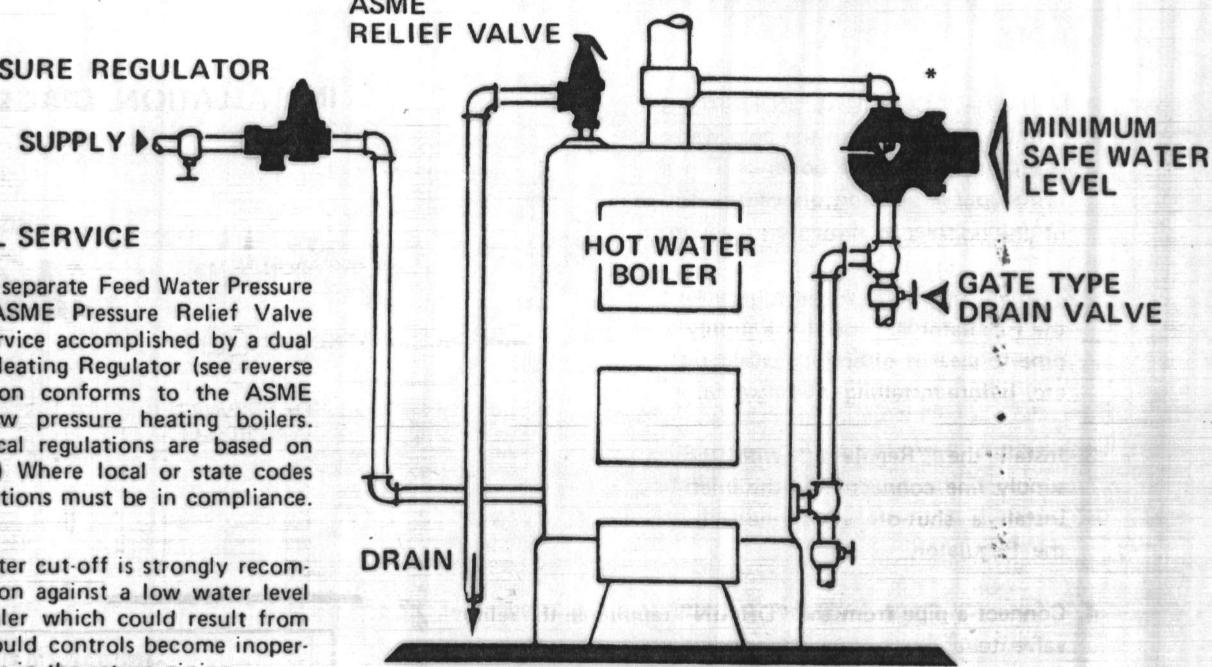
INSTRUCTION SHEET

NUMBER
IS-100-2.2A

Effective: May 1, 1983
Supersedes: IS100-2.2A
dated 8/1/81

INSTRUCTIONS FOR INSTALLING

INSTALLATION DIAGRAM



DUAL CONTROL SERVICE

The installation of a separate Feed Water Pressure Regulator and an ASME Pressure Relief Valve provides the dual service accomplished by a dual control Hot Water Heating Regulator (see reverse side) and, in addition conforms to the ASME requirements for low pressure heating boilers. (Many state and local regulations are based on ASME boiler codes.) Where local or state codes are in effect, installations must be in compliance.

*The use of a low water cut-off is strongly recommended for protection against a low water level condition in the boiler which could result from continuous firing should controls become inoperative or a break occur in the return piping.

FEED WATER PRESSURE REGULATORS

These regulators must be installed in the cold water supply line to the boiler and in a horizontal position. When piping is ready to receive the regulator, flush out the supply pipe to clear it of chips scale, dirt, etc. before installing regulator. Install regulator with the supply line connected to the inlet. Install a shut-off valve ahead of the regulator. Regulator is set to feed water at approximately 15 lbs. pressure. To readjust regulator, follow instruction No. 7 on reverse side of this sheet. These regulators have a strainer screen which should be removed and cleaned at least twice a year.

SERIES WITH FAST FILL AND PURGE LEVER

These valves are equipped with a unique and simple "fast fill and purge lever" . . . which permits rapid filling of the system . . . and sustained flow for air purging.

This advanced design incorporates a removable "push" rod which is actuated by the position of the "purge lever." When the lever is raised to the vertical position, it presses the "push" rod down which manually forces the valve wide open for maximum flow. Returning the lever to its normal position releases tension on the rod permitting the valve to maintain normal pressure in the system automatically.

*LOW WATER CUT-OFF

Install a low water cut-off so that the raised line cast on float chamber body is on a level with the top of the boiler. Top of switch box should be reasonably level. Piping to the top and bottom float chamber connections should conform to that shown on installation diagram. Keep the float chamber clean by periodically opening the valve below the float chamber to flush out mud and sediment. Do this at least once each month.

IMPORTANT:

When water main pressure exceeds 100 lbs. or is variable, a domestic service type water pressure reducing valve should also be installed in addition to this feed valve regulator. This reduces the pressure for accurate, longer life feed valve performance, as well as providing quiet, economical service pressure to the domestic fixtures.

Taco, Inc. 1160 Cranston Street, Cranston, Rhode Island 02920 Telephone: (401) 942-8000 Telex: 92-7627

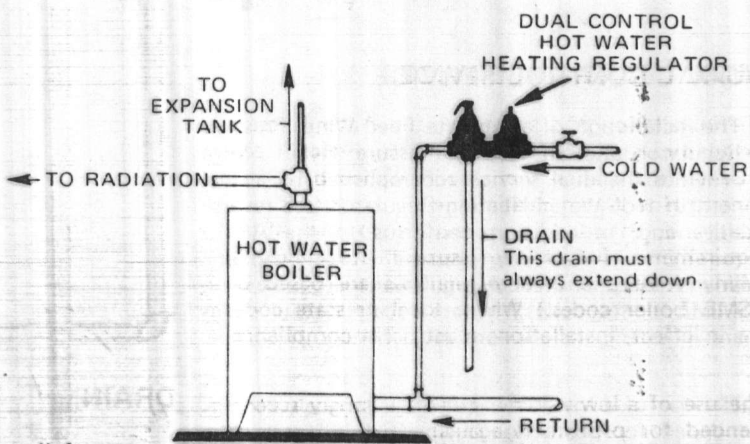
Litho in U.S.A.

Taco (Canada) Ltd. 3090 Lenworth Drive, Mississauga, Ontario Telephone: (416) 625-2160 Telex: 06-961179

TACO HOT WATER
HEATING DUAL CONTROLS

INSTRUCTIONS FOR INSTALLING

INSTALLATION DIAGRAM



IMPORTANT
Please Note Footnote at Bottom of Reverse Side of This Sheet

1. These TACO DUAL CONTROLS must be installed in the cold water supply line to the boiler and in a horizontal position above the top of the boiler as shown on diagram.

2. When the piping is ready to receive the Regulator, flush out the supply pipe to clear it of chips, scale, dirt, etc. before installing the Regulator.

3. Install the "Regulator" with the supply line connected to the inlet. Install a shut-off valve ahead of the Regulator.

4. Connect a pipe from the "DRAIN" tapping in the relief valve to above some convenient open drain such as a floor drain or set tubs. Always obey local regulations.

   Do not install a valve of any kind in this line. This drain must always pitch down from the regulator. No portion of the drain line should be above the regulator. Drain pipe must not be smaller than the drain tapping provided. The relief valve is non-adjustable and set to relieve at 30 lbs.

5. To fill the system, open the shut-off valve ahead of the Regulator. This valve must always be kept open when the system is in operation. Water will flow into the system until it is full and under pressure.

6. The pressure reducing valve of the Regulator is set to deliver water to the boiler at approximately 15 lbs. pressure. This pressure is sufficient for a 3-story building.

7. To reset the reducing valve for higher pressure (when the pressure is not sufficient to lift the water to highest radiation), calculate the number of feet from the regulator to the top of highest radiation. Multiply this by .43 and add 3 lbs. This will give the pressure needed to raise the water to the highest radiator and keep it under pressure — loosen lock nut. Turn adjusting screw clockwise slowly until the gauge indicates the pressure calculated. Then lock adjustment.

8. The regulator screen should be cleaned at beginning of each heating season.

9. The air cushion tank sometimes becomes filled with water (waterlogged). This is usually indicated by dripping of the relief valve when the burner is running. To recharge with air, close gate valve between tank and system and open gate valve in drain pipe. Allow tank to completely drain (this requires from 10 to 15 minutes), then close drain valve and open valve between tank and system.

Taco

INSTRUCTION SHEET

NUMBER
IS-400-1.1(281)

Effective: March 1, 1981
Supersedes: IS400-2-1
dated 7/30/76

AIR CONTROL

1 — Select proper size based on flow (GPM) thru System

Taco Air Control Less Strainer	*Maximum Flow GPM*	*Taco Air Control With Strainer*
AC2	80	AC2F
AC25	130	AC25F
AC3	190	AC3F
AC4	330	AC4F
AC5	550	AC5F
AC6	900	AC6F
AC8	1500	AC8F
AC10	2600	AC10F
AC12	3400	AC12F
AC14	4700	AC14F
AC16	6000	AC16F
AC18	8000	AC18F
AC20	10000	AC20F

2 — Install Air Control in Supply Line between boiler and pump(s) as indicated in Diagram on reverse side.

3 — Install Expansion Tank (s) as close to Air Control as possible with horizontal pipe (if any) pitching up to tank.

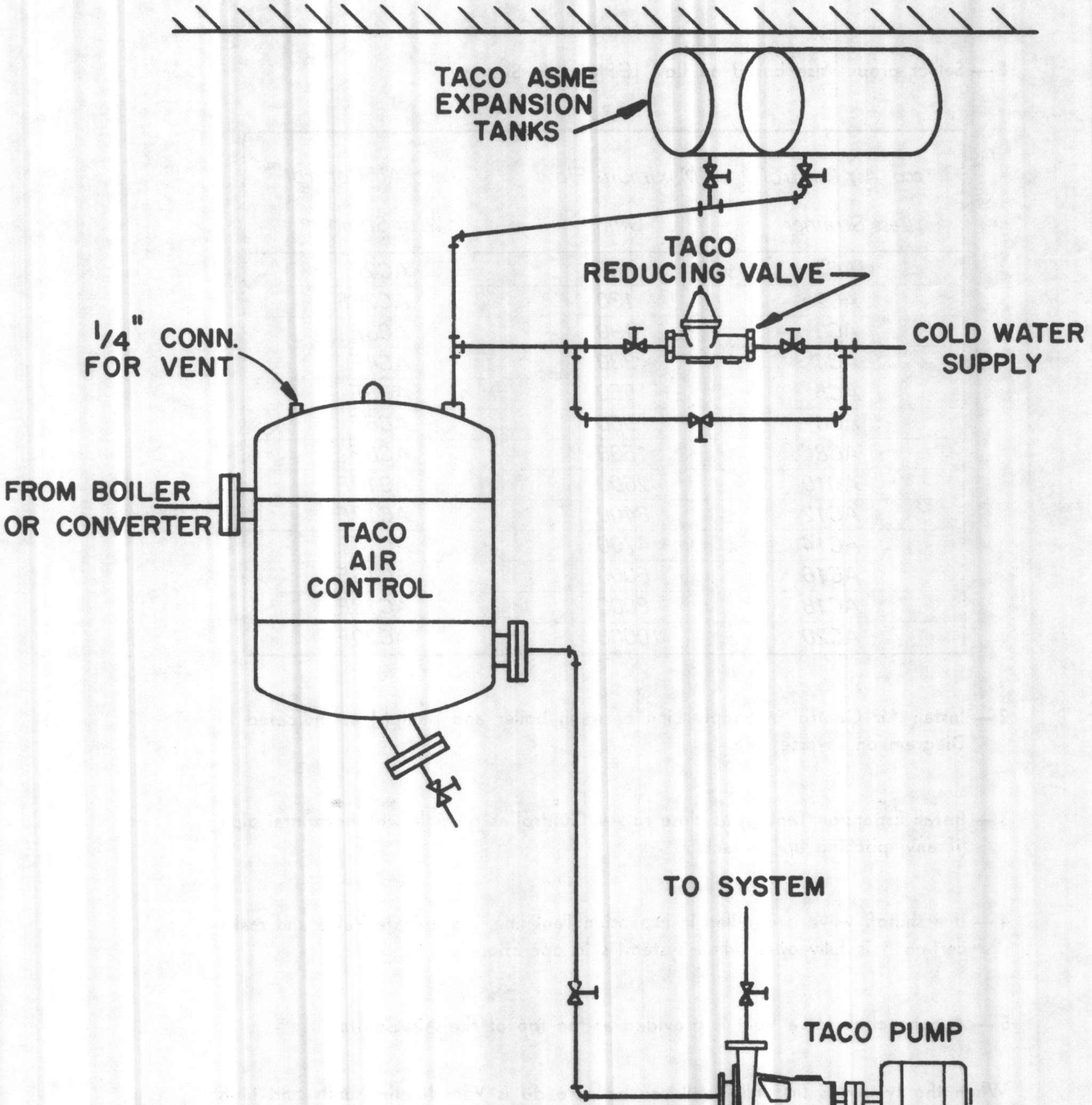
4 — If a shutoff valve is installed in Expansion Tank line, use a Gate Valve and make certain it is fully open when system is in operation.

5 — A connection for a Vent is provided at the top of the Air Control.

When the system is first filled, all you have to do is Vent heating units and high points if necessary for quick filling. Thereafter, any entrained air is separated continuously as water is pumped thru the Air Control.

Taco, Inc. 1160 Cranston Street, Cranston, Rhode Island 02920 Telephone: (401) 942-8000 Telex: 92-7627
Litho in U.S.A.
Taco (Canada) Ltd. 3090 Lenworth Drive, Mississauga, Ontario Telephone: (416) 625-2160 Telex: 06-961179

AIR CONTROL


TACO ASME
EXPANSION
TANKS
TACO
REDUCING VALVE
COLD WATER
SUPPLY
1/4" CONN.
FOR VENT
FROM BOILER
OR CONVERTER
TACO
AIR
CONTROL
TO SYSTEM
TACO PUMP

Taco **Instruction Sheet**

202-001

Heat Exchangers

INSTALLATION

1. Allow sufficient clearance for removal of tube bundle.
2. After initial start and run at operating temperatures and pressures, shut down and tighten head bolts.
3. Make certain that tubing is full of water before introducing steam or hot water into shell, otherwise flashing or noise may occur.

CLEANING

Shell and tube bundle should be flushed out periodically. If cleaning is necessary, remove head and bundle to clean inside of shell and outside of tubes. Replace gaskets if necessary.

If unit is installed in a hard water area, inside of tubing can be cleaned as follows: –

1. Break water connections and plug bottom opening.
2. Fill the tubes with a solution of 1 part muriatic acid to 10 parts of water and allow to stand for 2 hours:
   CAUTION: A longer period may cause damage to the copper tubing.
3. Drain off and flush **thoroughly** with clean water.
4. Re-assemble unit.

NOTE

Commercially available cleaners may also be used.

REPLACEMENT PARTS

When ordering replacement parts specify

1) Complete Model Number
2) Date of Manufacture
3) Special Materials if Required

Normally, the only replacement parts required would be:

1 — Tube Bundle
1 — Set of Gaskets

NOTE: When ordering replacement tube bundles care must be take to insure correct construction and proper materials. **Units** manufactured prior to 1974 should have the prefix RUX.

Example: A replacement bundle for a B10212-L built in 1970 would be a RUX10212-L.

Replacement heads are also available if required.

Quality Through Design — COMPARE.

TACO, INC. 1160 Cranston St., Cranston, RI 02920 (401) 942-8000 Telex: 92-7627
TACO (Canada) Ltd. 3090 Lenworth Drive, Mississauga, Ontario, Canada Telex: 06-961179

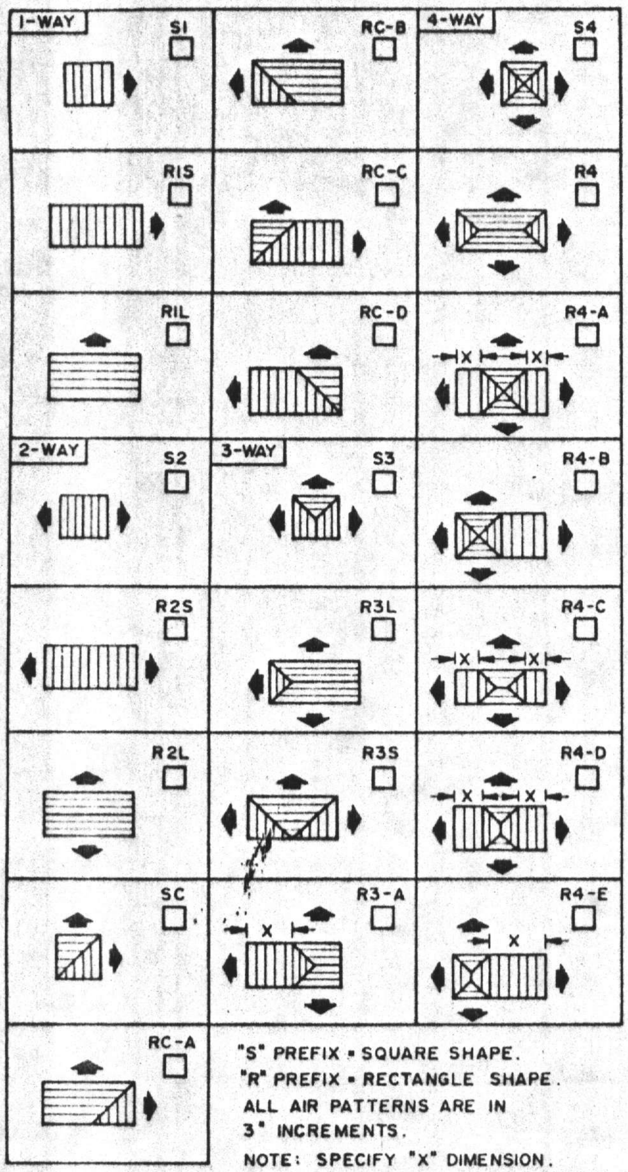
METAL*AIRE

SUBMITTAL SCHEDULE

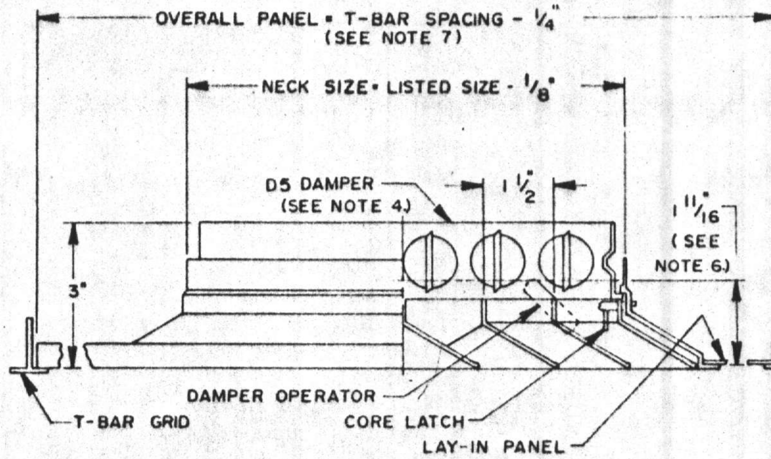
SUBMITTED BY: Hoffman & Hoffman, Inc. 23-2351R DATE: 12/4/86
PROJECT NAME & LOCATION Replace Air Conditioning System, New River & Camp LeJeune
ARCHITECT: ENGINEER:
CONTRACTOR: Kinston Plumbing & Heating Co. CONTR. P.O. NO. 3312

MARK	Area Served	MODEL	NECK Size	Qty.	C.F.M.	Accessories/Remarks
A	AS-710	5000-APD-M6	6"Ø	2	100	OBD, T-Bar, 2'x2'
B	AS-710	5000-APD-M6	8"O	2	125	" " "
C	AS-710	5000-APD-M6	8"Ø	3	175	" " "
D	AS-710	5000-APD-M6	8"Ø	1	200	" " "
E	AS-710	5000-APD-M6	8"Ø	1	225	" " "
F	AS-710	5000-APD-M6	10'Ø	2	250	" " "
G	AS-710	5000-APD-M6	10"Ø	12	250	" " "
H	AS-710	6075-12-SM	168"x2sl.	2	465	Pattern and Volume Control
J	AS-710	6075-12-SM	216"x2sl.	1	600	" " "
K	AS-710	6075-12-SM	372"x2sl.	1	1000	" " "
N	AS-710	V4004D	60x6	4	750	OBD, Extractor
P	AS-710	V4004D	60x6	1	900	" "
Q	AS-710	CC-5	8x8	3	-	
R	AS-710	CC-5	8x8	1	-	
T	AS-710	CC-5	16x16	5	-	
NA	AS-710	OAL4C	32x16	1	-	with Birdscreen & Mill Finish
NA	AS-710	OAL4C	36x24	1	-	" " " "

AIR DISTRIBUTION SUBMITTAL



"S" PREFIX = SQUARE SHAPE.
"R" PREFIX = RECTANGLE SHAPE.
ALL AIR PATTERNS ARE IN 3" INCREMENTS.
NOTE: SPECIFY "X" DIMENSION.



NOTES:

1. CONSTRUCTION: FRAME OF ALUMINUM MATERIAL .055. BLADES OF ALUMINUM MATERIAL .050 THICKNESS.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: DIFFUSER CORE REMOVABLE FOR CONCEALED MTG. BY RELEASING SPRING-LOADED CORE LATCHES (4 PER UNIT)—NO TOOLS REQUIRED.
4. DAMPER: MODEL D-5 OBD FURNISHED WHEN SPECIFIED. (SEE DWG. NO. 6002.) DAMPER SNAPS INTO DIFFUSER COLLAR THROUGH FACE—NO TOOLS REQUIRED.
5. DUCT FABRICATION: DIFFUSER NECK DIM. VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 9"X9" NECK SPECIFIED—DUCT I.D. 9"X9". SERIES 5000 UNITS ARE MOUNTED WITH DUCT OUTSIDE OF NECK.
6. DIMENSION INDICATES: DISTANCE TO BOTTOM OF DUCT SHOULD BE MAINTAINED AS CLOSELY AS POSSIBLE.
7. DIFFUSER NECK: MUST BE 6" LESS THAN SPECIFIED T-BAR MODULE SIZE.
8. MAX. SIZE 42"X 42" FOR 48"X 48" TILE SIZE
   MIN. SIZE 6"X 6" FOR 12"X 12" TILE SIZE.

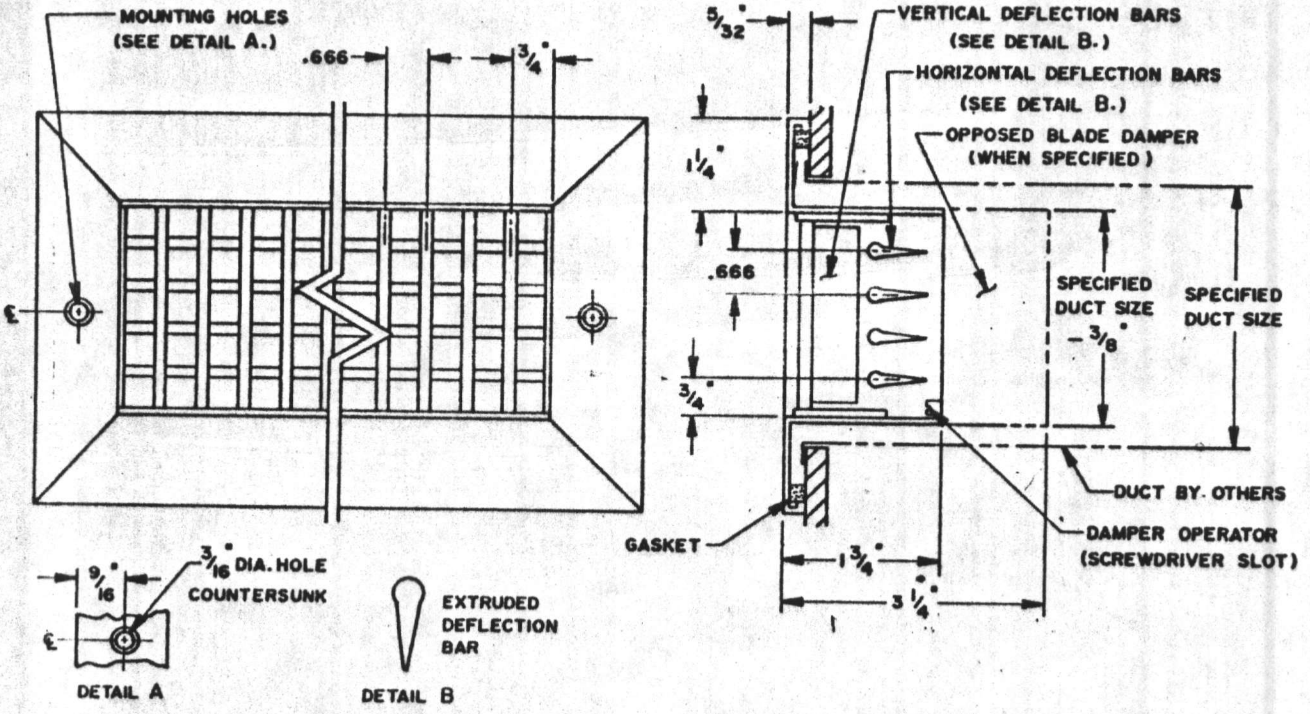
METAL*AIRE®
Aluminum Air Distribution Products

SERIES 5000
MODEL M-6
DIRECTIONAL AIR DIFFUSER
☐ WITH D-5 OB DAMPER

JOB NAME:
LOCATION:
ARCHITECT:
ENGINEER:
CONTRACTOR:
SUBMITTED BY:

DRAWN BY:	JG	**CHK'D. BY:**	KR
DATE:	12 FEB 1970	**DWG. NO.**	1010-2

AIR DISTRIBUTION SUBMITTAL



NOTES:

1. CONSTRUCTION: FRAME OF HEAVY DUTY EXTRUDED ALUMINUM MATERIAL .045 THICKNESS. DEFLECTING BARS OF EXTRUDED ALUMINUM MATERIAL .160 TAPPERED TO A SEMI-AIR-FOIL SHAPE.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: UNIT MOUNTING SCREWS FURNISHED.
4. DAMPER: OPPOSED BLADE DAMPER FURNISHED WHEN SPECIFIED. FOR DETAILS OF DAMPER CONSTRUCTION; SEE DRAWING NO. 6005.
5. FRAME: GASKETED TO PREVENT AIR LEAKAGE AND MINIMIZE SMUDGING.
6. DUCT FABRICATION: UNIT COLLAR OR NECK DIMENSIONS VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 14" X 6" SPECIFIED, DUCT I.D. 14" X 6".

METAL*AIRE®
Aluminum Air Distribution Products

MODEL V4004 OR V4004D

DOUBLE DEFLECTION
SIDEWALL SUPPLY

☐ MODEL V4004 (GRILLE – NO DAMPER)
☐ MODEL V4004D (REGISTER – WITH DAMPER)

JOB NAME:
LOCATION:
ARCHITECT:
ENGINEER:
CONTRACTOR:

SUBMITTED BY:

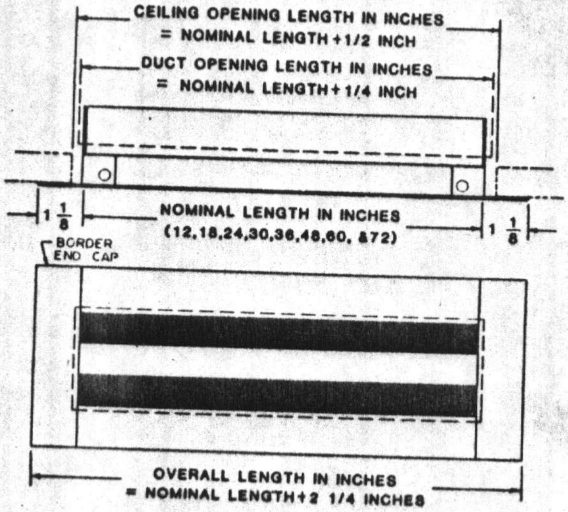
...WN BY:	JG	CHK'D. BY:	KR
...TE:	3 APR 1970	DWG. NO.	4010

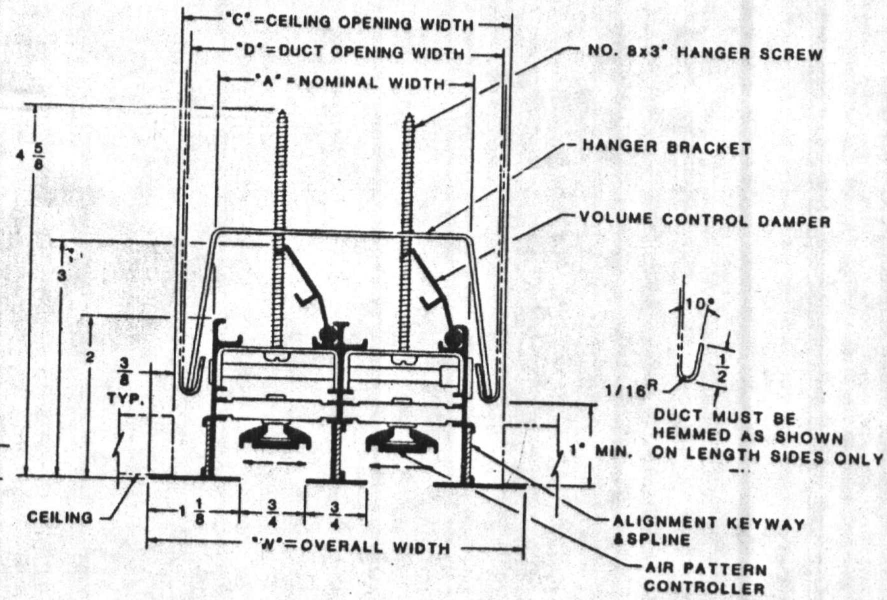
METAL*AIRE® METAL INDUSTRIES, INC., Clearwater, Florida

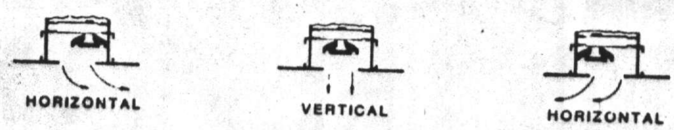
AIR DISTRIBUTION SUBMITTAL

	NO. OF AIR SLOTS							
	1	2	3	4	5	6	7	8
A	1½	3	4½	6	7½	9	10½	12
D	2⅛	3⅝	5⅛	6⅝	8⅛	9⅝	11⅛	12⅝
C	2¼	3¾	5¼	6¾	8¼	9¾	11¼	12¾
W	3	4½	6	7½	9	10½	12	13½

ALL DIMENSIONS IN INCHES







AIR DEFLECTION PATTERNS

NOTES:

1. MATERIAL: DIFFUSERS ARE CONSTRUCTED OF HIGH GRADE ALUMINUM EXTRUSIONS, 6063-T5 ALLOY.
2. FINISH: STANDARD FINISH IS SATIN ALUMINUM ANODIZED ON ALL EXPOSED FACE SURFACES WITH BLACK PATTERN CONTROLLERS (SPECIFY SAB). AN OPTIONAL FINISH OF OFF WHITE WITH BLACK PATTERN CONTROLLERS IS AVAILABLE AT NO ADDITIONAL COST (SPECIFY OWB).
3. AIR PATTERN CONTROLLER: EACH SUPPLY SLOT OF THE DIFFUSER IS FURNISHED WITH A LATERALLY ADJUSTABLE AIR PATTERN CONTROLLER WHICH CAN ADJUST THE DISCHARGE AIR PATTERN A FULL 180° WITHOUT CHANGING THE NC LEVEL, THE STATIC PRESSURE RESISTANCE (P_s), EFFECTIVE OUTLET AREA (A_k), OR THE FACE APPEARANCE OF THE DIFFUSER. PATTERN CONTROLLERS ARE DIMENSIONALLY SHORTENED TO ALLOW ACCESS TO THE HANGER SCREWS THROUGH THE DIFFUSER FACE, AND SLIDING COVER STRIPS ARE FURNISHED TO PRESERVE THE ONE PIECE APPEARANCE OF THE CONTROLLERS.
4. VOLUME CONTROL: EACH SLOT OF THE DIFFUSER IS FURNISHED WITH A SPRING LOADED SINGLE BLADE VOLUME DAMPER WHICH IS ACCESSIBLE THROUGH THE DIFFUSER FACE.
5. SECTION ALIGNMENT: EACH SLOT OF THE DIFFUSER IS EQUIPPED WITH A KEYWAY TO INSURE POSITIVE ALIGNMENT OF MULTIPLE DIFFUSER SECTIONS IN CONTINUOUS RUN APPLICATIONS. INDIVIDUAL SECTIONS ARE EQUIPPED WITH BORDER END CAPS AS SHOWN ABOVE.

METAL★AIRE®
Aluminum Air Distribution Products

JOB NAME: ____________________

LOCATION: ____________________

ARCHITECT: ____________________

ENGINEER: ____________________

CONTRACTOR: ____________________

SERIES 6075
ADJUSTABLE LINEAR SLOT DIFFUSER
TYPE 12-SM

(CHECK ARRANGEMENT REQUIRED)

- ☐ WITH PATTERN CONTROLLER AND DAMPER (STD.) PCD
- ☐ WITH PATTERN CONTROLLER ONLY PC
- ☐ WITH DAMPER ONLY D
- NO PATTERN CONTROLLER, NO DAMPER Ø

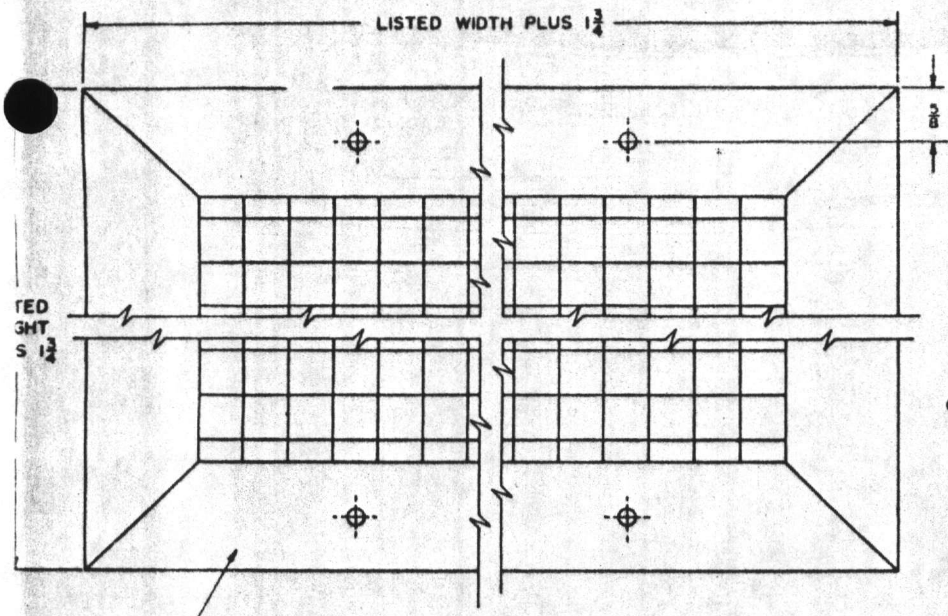
SPECIFY FINISH ____________________

SUBMITTED BY:

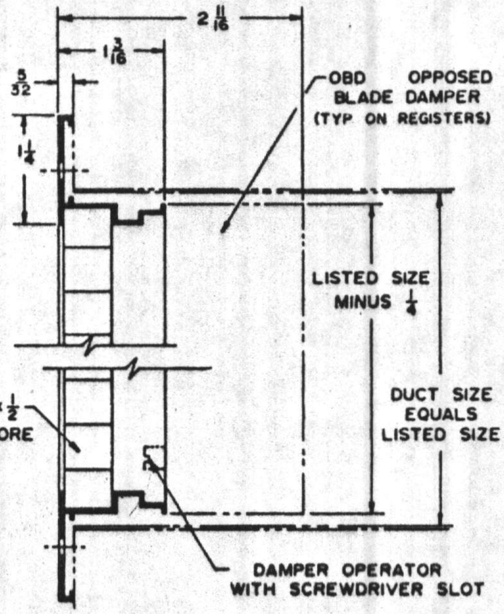
DRAWN BY:	NJB	CHK'D. BY:	EMCA
DATE:	10-21-83	DWG. NO.	6113

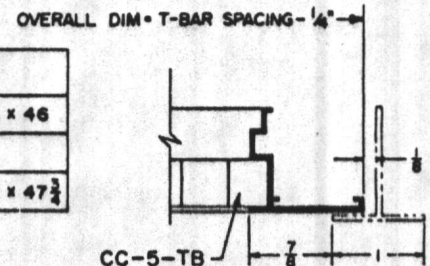
METAL★AIRE® METAL INDUSTRIES, INC., Clearwater, Florida

AIR DISTRIBUTION SUBMITTAL



CC-5
CC-5D
(WITH SCREW HOLES)





CC-5-TB
CC-5D-TB
(WITHOUT SCREW HOLES
FOR LAY-ON T-BAR)

CC-5-TB AND CC-5D-TB LISTED SIZES FOR LAY-ON EXPOSED T-BAR GRID APPLICATIONS						
10 x 10	22 x 10	46 x 10	22 x 22	46 x 22	34 x 34	46 x 46
OVERALL DIMENSIONS						
11 3/4 x 11 3/4	23 3/4 x 11 3/4	47 3/4 x 11 3/4	23 3/4 x 23 3/4	47 3/4 x 23 3/4	35 3/4 x 35 3/4	47 3/4 x 47 3/4

ALL DIMENSIONS IN INCHES.

ES:

1. CONSTRUCTION: 1/2 x 1/2 x 1/2 (.025 IN.) ALUMINUM CUBE CORE MECHANICALLY LOCKED IN (.045 IN.) HEAVY DUTY EXTRUDED ALUMINUM FRAME.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. INSTALLATION: MOUNTING HOLES AND SCREWS FURNISHED AS STANDARD ON MODELS CC-5 AND CC-5D. MOUNTING HOLES AND SCREWS ARE OMITTED WHEN MODELS CC-5-TB OR CC-5D-TB ARE SPECIFIED FOR LAY-ON EXPOSED T-BAR GRID APPLICATIONS.
4. DAMPER: OBD OPPOSED BLADE DAMPERS ARE FURNISHED ON REGISTERS. REFERENCE DRAWING NO. 6006 FOR OBD DETAILS
5. DUCT CONNECTION: GRILLE AND REGISTER NECK DIMENSIONS VARY SLIGHTLY. INSIDE DIMENSIONS OF DUCT CONNECTING COLLARS MUST NOT BE LESS THAN LISTED SIZE DIMENSIONS, VIZ. LISTED SIZE 12 x 12. REQUIRES INSIDE DUCT DIMENSION OF 12 x 12.

METAL*AIRE®
Aluminum Air Distribution Products

CUBE CORE CEILING RETURN GRILLE & REGISTERS

MODEL CC-5 MODEL CC-5D RLAPPING CEILING OPENING	MODEL CC-5-TB MODEL CC-5D-TB AY-ON EXPOSED T-BAR GRID
☐ MODEL CC-5 GRILLE	☐ MODEL CC-5-TB GRILLE
☐ MODEL CC-5D REGISTER	☐ MODEL CC-5D-TB REGISTER
WN BY: RG	CHK'D. BY: EM^{c}A
19 OCT 1973	DWG. NO. 4041

JOB NAME: ______________________

LOCATION: ______________________

ARCHITECT: ______________________

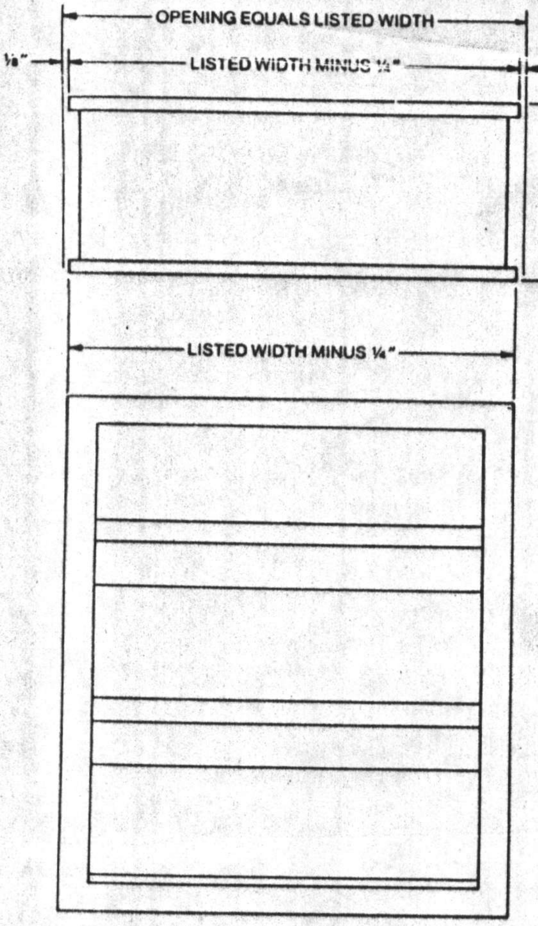
ENGINEER: ______________________

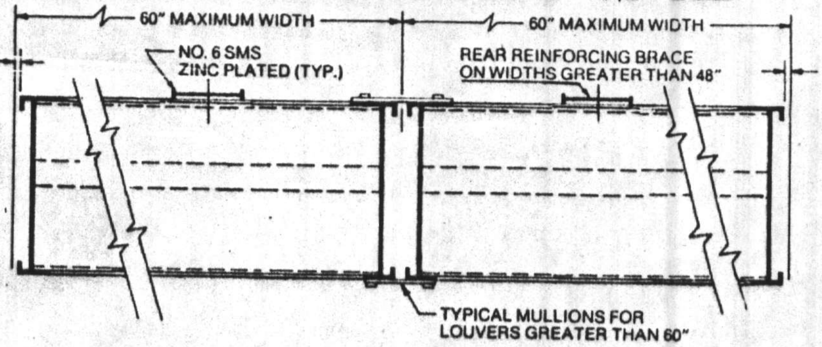
CONTRACTOR: ______________________

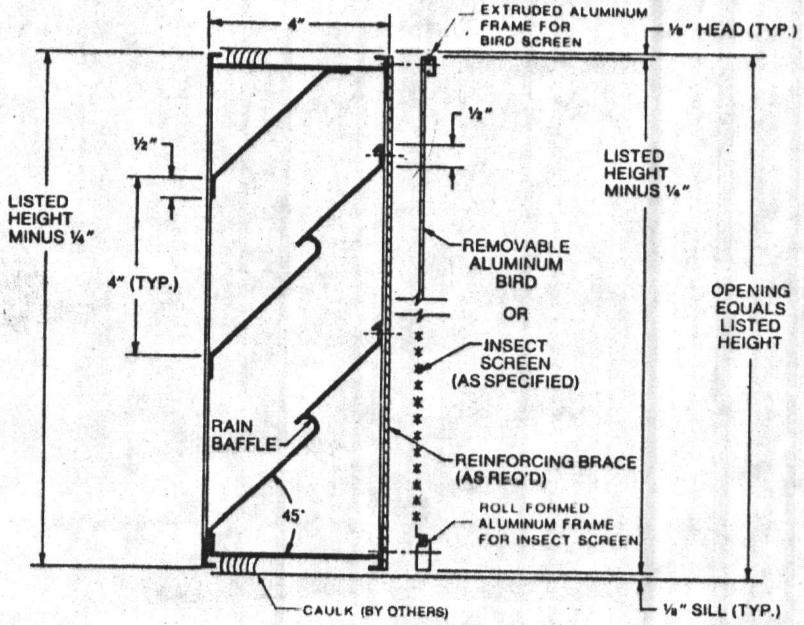
SUBMITTED BY:

METAL*AIRE® METAL INDUSTRIES, INC., Clearwater, Florida

AIR DISTRIBUTION SUBMITTAL







NOTES:

1. DESIGN: 4" DEPTH TYPE "C" CHANNEL FRAME WITH 45° STORM PROOF STYLE BLADES ON 4" CENTERS. BLADES OVERLAP AND ARE EQUIPPED WITH RAIN-BAFFLES AND 1/2" HIGH RETURN BEND AT UPPER EDGE TO INSURE WEATHER PROTECTION.
2. MATERIAL: LOUVER FRAME AND BLADES ARE 12 GA. (.081) TYPE 6063-T5 EXTRUDED ALUMINUM.
3. FINISH: MILL ALUMINUM.
4. SCREENS: EQUIPPED WITH ALUMINUM FRAMES – FACTORY ATTACHED TO LOUVERS WITH SHEET METAL SCREWS. SPECIFY:

   ☐ BS – (BIRD SCREEN) 1/2" DIAMOND MESH, FLAT EXPANDED ALUMINUM (.051")

   ☐ IS – (INSECT SCREEN) 18 X 14 MESH, ALUMINUM WIRE CLOTH

   ☐ WITHOUT SCREEN

   ☐ OTHER SCREENING ____________

5. LOUVER SIZES: LOUVERS AVAILABLE IN SINGLE UNIT SECTIONS FROM 12"W X 12"H TO 60"W X 96"H IN 4" INCREMENTS. LOUVERS ARE FABRICATED 1/4" LESS THAN LISTED W X H SIZES. BLADE WIDTHS GREATER THAN 48" REINFORCED WITH CONCEALED REAR FLAT BRACE. FACE REINFORCEMENT BRACE ALSO AVAILABLE WHEN SPEC'D. LOUVERS EXCEEDING 60" WIDTHS ARE DIVIDED INTO EQUAL SECTIONS AND JOINED TOGETHER WITH MULLIONS. VERTICAL AND HORIZONTAL FLAT MULLIONS FOR MULTIPLE SECTIONS AVAILABLE WHEN SPECIFIED. FRAME CORNERS ARE MITERED AND MECHANICALLY LOCKED FOR MAXIMUM RIGIDITY. SPECIFY:

   ☐ FACE REINFORCING BRACE ☐ FLAT MULLION STRIPS

METAL*AIRE
Aluminum Air Distribution Products

JOB NAME: ____________
LOCATION: ____________
ARCHITECT: ____________
ENGINEER: ____________
CONTRACTOR: ____________

MODEL OAL-4-C

4" DEPTH 45° STATIONARY OUTSIDE AIR LOUVER WITH TYPE "C" CHANNEL FRAME

SUBMITTED BY:

DRAWN BY:	KAR	CHK'D. BY:	ED McA
DATE:	11/11/84	DWG. NO.	2814

TAB PLACEMENT HERE

DESCRIPTION:

Bldgs. 217-18-20

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TRANE™

11-12-86

The Trane Company
Division of American Standard Inc.

La Crosse WI 54601-7599
Clarksville TN 37040

Page Number	Trane Order Number
15	F4M368A

Trane Job Number	Customer Order Number	Number of Prints	Date to Ship	Type of Order
F4-10490	3299	11 LIT 04	00-00-00HA	SUB

Architect

Engineer CHEATHAM & ASSOC., WILMINGTON, NC

Trane Salesman
R CRAWFORD

Job Name/Location
REPLACE AC BLDGS M217,M218,M220
CAMP LEJEUNE, NC

Sold To
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC 28502

Ship To Project
KINSTON PLBG. & HTG. CO.
C/O BLDG. M217, M218, M220
CAMP LEJEUNE, NC
28542

Mark Packages — Project Name

Item	Quantity	Trane Ordering Number	Specifications
10.00	0006	BWA060A300A	5-TON SPLIT HEAT PUMP OUTDOOR UNIT 200/230/60/3
			TAG: HP # 1-6 AND OHP # 1-6
20.00	0006	BWV760P100A	5-TON VERT.FAN-COIL-FILTER UNIT 200/230/60/1
			TAG: HP # 1-6 AND OHP # 1-6
20.01	0006	BAY96X3517A	AIR HANDLER HEATERS 12.83 KW (208) 17.1 KW (240)
			TAG: HP # 1-6 & OHP # 1-6

X APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO
BY JCK DATE 12/5/86

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA
APPROVED
SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-85-C-6336
DATE 12-22-86
S. L. Huguelet
Cheatham & Assoc.
CDR, CEC, USN
Officer in Charge
of Construction

Submittal Approval Drawings
BWA-SQ-202.00* BWA-IN-2
BWV-SQ-218.00 BWV-IN-5

Service Literature

1-30.11-2—(8/86)

Submittal Data

TRANE™

BWA-SQ-202.00

SUBMITTAL

TAG: ______________________________

5-Ton Split System Heat Pump — 3Ø BWA060A

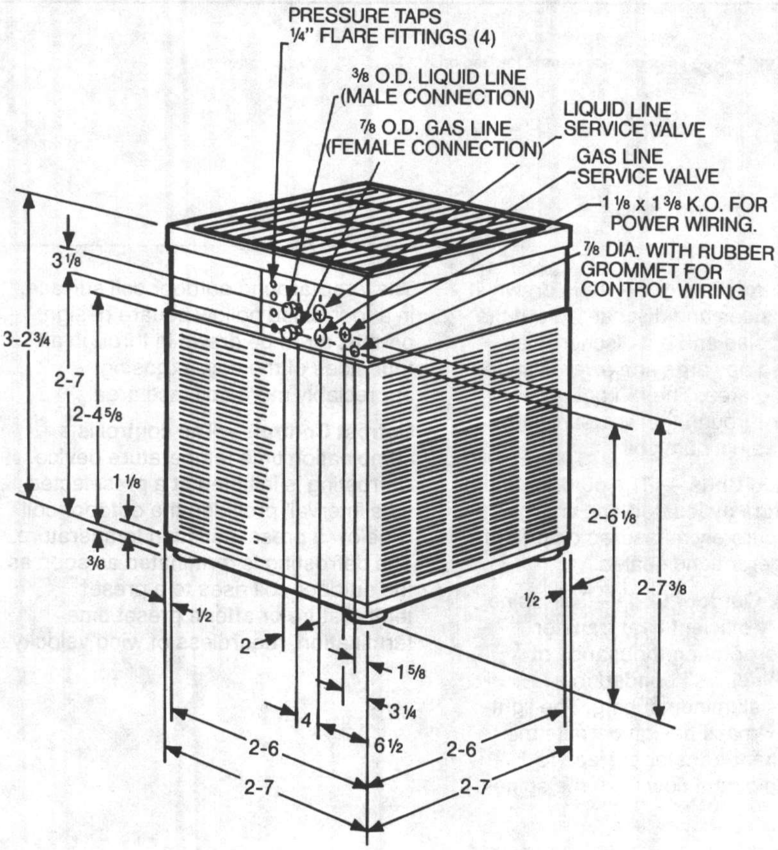


Table 1 Electrical Characteristics

Outdoor Unit	BWA060A300A	BWA060A400A
Power Conns. — V/Ph/Hz	200/230/3/60	460/3/60
Min. Brch. Cir. Ampacity[1]	26.3	11.8
Br. Cir. Prot. Rtg. Max. (Amps)	45	20
Br. Cir. Prot. Rtg. Recmd. (Amps)	45	20

NOTE:
1. Calculated in accordance with National Electric Code. Suitable for use with HACR circuit breakers or fuses.

Table 2 Unit Weights (Lbs.)

Outdoor Unit	BWA060A300A	BWA060A400A
Shipping	292	292
Net	284	284

Table 3 General Data

Outdoor Unit	BWA060A300A	BWA060A400A
Noise Rating No.[2]	8.6	8.6
Compressor	Climatuff™	Climatuff™
No. Used — No. Speeds	1 — 1	1 — 1
Volts/Ph./Hz.	200/230/3/60	460/3/60
RL Amps — LR Amps	19.2 — 125	8.5 — 51
Brch. Cir. Selec. Cur. Amps	19.2	8.5
Outdoor Fan — Type	Propeller	Propeller
Dia. (In.) — No. Used	22 — 1	22 — 1
Type Drive — No. Speeds	Direct — 1	Direct —
CFM @ 0.0 In. WG[3]	4800	4600
No. Motors — HP	1 — 1/2	1 — 1/3
Motor Speed RPM	1075	1075
Volts/Ph./Hz.	230/1/60	460/1/60
FL Amps	2.3	1.2
Outdoor Coil — Type	Spine Fin™	Spine Fin™
Rows — FPI	1 — 20	1 — 20
Face Area (Sq. Ft.)	19.6	19.6
Tube Size (In.)	1/2	1/2
Refrigerant Control	Exp. Valve	Exp. Valve
Refrigerant		
Lbs. — R-22 (OD. Unit)[4]	12 lb. 8 oz.	12 lb. 8 oz.
Factory Supplied	YES	YES
Line Size — In. OD Gas[5]	1-1/8	1-1/8
Line Size — In. OD Liq.[5]	3/8	3/8

NOTES:
1. Rated in accordance with A.R.I. Standard 240.
2. Rated in accordance with A.R.I. Standard 270.
3. Standard Air — Dry Coil — Outdoor.
4. This value approximate. For more precise value see unit nameplate and service instruction.
5. Max. linear length 80 ft.; Max. lift - Suction 60 ft.; Max. lift - Liquid 60 ft. Max. length of precharged tubing 40 ft. For greater length refer to Refrigerant Piping Manual.

SPLIT SYSTEM

Table 4 Outdoor Unit With Heat Pump Coils

	BXA060A	BXA060P	BXA748P	BXF748P	BXH060P
RATINGS (Cooling)[1]					
BTUH	52000	55500	51000	50000	55500
Indoor Airflow (CFM)	1950	2000	1800	1800	2000
System Power (KW)	6.97	7.19	6.86	6.82	7.15
EER/SEER[2]	7.45 / 8.25	7.80 / 8.70	7.40 / 8.30	7.35 / 8.20	7.80 / 8.60
RATINGS (Heating)[1]					
(High Temp.) BTUH	57500	59000	57000	57000	59000
System Power (KW)	5.85	5.70	5.91	5.89	5.69
COP	2.85	3.00	2.80	2.80	3.00

Table 4 Outdoor Unit With Air Handlers

	BWE060C-F	BWE090C-D	BWH748P	BWH754P	BWH760P	BWV748P	BWV754P	BWV760P
RATINGS (Cooling)[1]								
BTUH	57000	57500	52500	55500	55500	52000	55500	55000
Indoor Airflow (CFM)	2000	2155	1800	2000	2000	1800	2000	2000
System Power (KW)	7.39	7.13	6.95	7.16	7.47	7.02	7.32	7.46
EER/SEER[2]	7.80 / 8.40	8.05 / 8.70	7.55 / 8.35	7.80 / 8.50	7.80 / 8.20	7.40 / 8.20	7.80 / 8.30	7.80 / 8.20
RATINGS (Heating)[1]								
(High Temp.) BTUH	60000	58500	58000	59000	59500	58500	59500	59500
System Power (KW)	5.86	5.49	5.79	5.60	5.85	5.81	5.73	5.87
COP	3.00	3.10	2.90	3.05	2.95	2.90	3.00	2.95

NOTES:
1. Rated in accordance with A.R.I. Standard 240.
2. Rated in accordance with U.S. Government standard tests. HSPF is the average design requirement for Region IV.

Mechanical Specifications

Heating and Cooling — A Weathertron® Heat Pump provides both heating and cooling for year-round comfort. Using the automatic thermostat, it changes from cooling to heating or heating to cooling automatically.

Compressor — The BWA — A models are equipped with the Climatuff™ compressor, internal line break overload protection, and internal pressure relief valve. The valve operates on a pressure difference between the discharge and suction pressure to prevent compressor overloading. Additional features are: centrifugal oil pump, "special" steel valves in the valve plate assembly, die-cast aluminum frame, piston(s) and connecting rod(s), hermetically sealed compressor with spade type terminals, sump heat keeps compressor oil free of refrigerant. Internal spring mounts are to reduce vibration and noise.

Top Discharge Design — Air is drawn in on all four sides and discharged out the top. Both noise and hot discharge air are directed upwards and away from the surrounding area. The fan pulls low velocity air through the wrap-around Spine Fin™ aluminum coil.

Pre-charged Units — The outdoor units are all factory evacuated and charged with an accurately measured charge of R-22 refrigerant and sealed.

Spine Fin™ Outdoor Coil — The Spine Fin is a very efficient heat transfer device incorporating thousands of aluminum "spines" bonded to a continuous aluminum tubing. The light-weight, low-mass design permits the Spine Fin heat transfer surface to provide rapid heat flow from the spines.

The wrap-around outdoor coil surface, in a four-sided hollow square design, permits air to be drawn in through all four sides of the coil, exposing appreciably more coil face area.

Defrost Control — The control is a combination time temperature device. Defrosting is initiated at a preselected time interval, provided the outdoor coil is below a preset initiation temperature. The defrosting is terminated as soon as the outdoor coil rises to a preset temperature or after a preset time termination, regardless of wind velocity.

Technical Literature - Printed in U.S.A.

The Trane Company
Light Commercial Unitary Division
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Heat Pump
Model	BWA-Split System 1-1/2 - 20 Tons
Literature Type	SQ
Sequence	202.00
Date	March 1986
File No.	PL-UN-S/SP-BWA-SQ-202.00 386
Supersedes	New

P.I.

BWV-SQ-218.01
SUBMITTAL

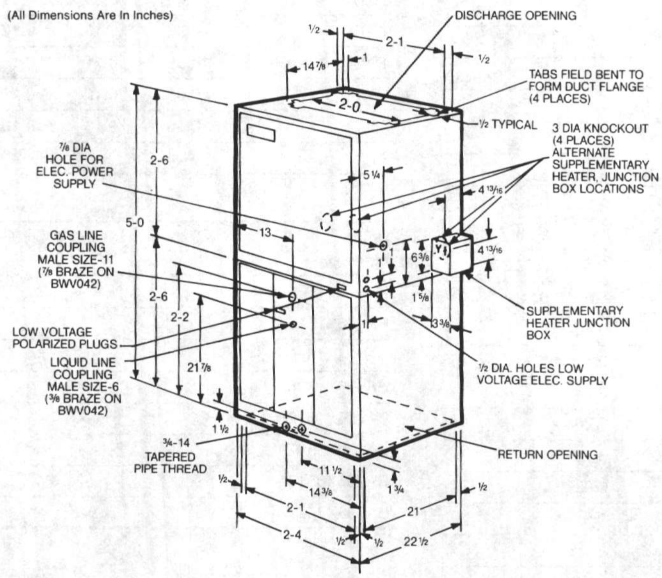
TRANE™

TAG: ____________________

5-Ton Vertical Air Handler BWV760P

AIR HANDLERS

(All Dimensions Are In Inches)



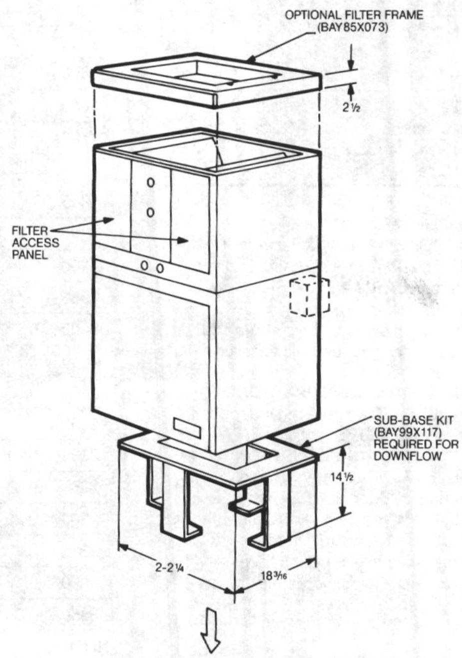


Table 1 Electrical Characteristics

Heater Cat. No.	Capacity KW	Capacity BTUH	Volts/Ph.	Cir. 1 Htr. Amps.	Cir. 1 Min. Circuit Ampacity[1]	Cir. 2 Htr. Amps.	Cir. 2 Min. Circuit Ampacity	Cir. 3 Htr. Amps.	Cir. 3 Min. Circuit Ampacity
BAY96X1509A	8.64	29,500	240/1	36.0	60				
	6.48	22,100	208/1	31.2	54				
BAY96X1514A	14.40	49,100	240/1	36.0	60	24.0	30		
	10.80	36,900	208/1	31.2	54	20.8	26		
BAY96X1520A	20.16	68,800	240/1	36.0	60	48.0	60		
	15.12	51,600	208/1	31.2	54	41.6	52		
BAY96X1526A	25.92	88,500	240/1	36.0	60	48.0	60	24.0	30
	19.44	66,300	208/1	31.2	54	41.6	52	20.8	26
BAY96X1532A	31.68	108,100	240/1	36.0	60	48.0	60	48.0	60
	23.76	81,100	208/1	31.2	54	41.6	52	41.6	52
BAY96X3507A	7.14	24,400	240/3	17.2	30				
	5.36	18,300	208/3	14.9	27				
BAY96X3517A	17.10	58,400	240/3	41.1	60				
	12.83	43,800	208/3	35.6	53				
BAY96X3527A	27.06	92,400	240/3	41.1	60	24.0	30		
	20.30	69,300	208/3	35.6	53	20.8	26		

NOTES:
1. With air handler blower motor included in circuit.
2. For each heater, the number of load switching contactors is the same as the number of power circuits listed (Cir. 1, Cir. 2, Cir. 3). This identifies the number of control steps into which heater assembly can be divided.

Table 2 Unit Weights (Lbs.)

Model	BWV760P100A
Shipping/Net	202 / 196

Table 3 General Data

Model	BWV760P100A
Rated Volts/Ph./Hz.	200/230/1/60
Indoor Coil — Type	Plate Fin
Rows — FPI	4 — 12
Face Area (Sq. Ft.)	7.29
Tube Size (In.)	3/8
Refrigerant Control	Expansion Valve[2]
Drain Conn. Size (In.)	3/4 NPT
Indoor Fan — Type	Centrifugal
Dia. — Width (In.)	12 x 10
No. Used	1
Drive — Speeds (No.)	Direct — 3
No. Motors — HP	1 — 3/4
Motor Speed RPM	1075
Volts/Ph./Hz.	200/230/1/60
FL Amps. — LR Amps.	6.0 — 14.4
Filter — Furnished?	Yes
Type Recommended	
Hi Vel.(No.-Size-Thk.)	2 - 20 x 20 - 1 In.
Refrigerant (R-22)	Holding Charge
Ref. Line Connections	Quick-Attach
Coup. or Conn. Size - In. Gas	-11
Coup. or Conn. Size - In. Liq.	-6

NOTES:
1. These Air Handlers are A.R.I. certified with various Trane Split System Weathertron® Heat Pumps (A.R.I. Standard 240) and Air Conditioners (A.R.I. Standard 210). Refer to the Split System Submittal for performance data.
2. This air handler is equipped with a non-bleed expansion valve and includes Quick Start Kit for installation in outdoor unit.

A.R.I. STANDARD 210 RATING CONDITIONS — Cooling 80 F DB, 67 F WB air entering indoor coil, 95 F DB air entering outdoor air coil.

A.R.I. STANDARD 240 RATING CONDITIONS — (A) Cooling 80 F DB, 67 F WB air entering indoor coil, 95 F DB air entering outdoor coil. (B) High Temperature Heating 47 F DB, 43 F WB air entering outdoor coil, 70 F DB air entering indoor coil. (C) Low Temperature Heating 17 F DB, 15 F WB air entering indoor coil. (D) Rated indoor airflow for heating is the same as for cooling.

Table 4 Indoor Fan Performance

Air Handler Airflow (CFM) vs. External Static Pressure BWV760[1]

	External Static Pressure (In. WG)					
	230 Volts			200 Volts		
CFM	Hi	Med.	Low	Hi	Med.	Low
1250						0.57
1300						0.38
1350						0.00
1400						
1450						
1500						
1550			0.48			
1600			0.32			
1650			0.14			
1700						
1750						
1800					0.50	
1850					0.38	
1900		0.64		0.63	0.26	
1950		0.57		0.55	0.12	
2000	0.63	0.50		0.48		
2050	0.58	0.43		0.41		
2100	0.52	0.36		0.34		
2150	0.47	0.29		0.26		
2200	0.41	0.21		0.18		
2250	0.35	0.13		0.08		
2300	0.29	0.03				
2350	0.23					
2400	0.16					
2450	0.08					

NOTES:
1. Wet coil, filter in place, and no electric heater installed. See airflow resistance table for pressure loss with installation of supplementary heaters.

Table 5 Pressure Drop Characteristics Electric Heaters

	Number of Racks (see tables below)		
	1	2	3
Airflow CFM	Air Pressure Drop (In. WG)		
1100			
1200	0.02	0.05	0.07
1300	0.02	0.06	0.08
1400	0.02	0.07	0.09
1500	0.03	0.08	0.10
1600	0.03	0.09	0.11
1700	0.03	0.10	0.13
1800	0.05	0.11	0.15
1900	0.05	0.12	0.17
2000	0.06	0.13	0.18
2100			

Heater Model No.	No. of Racks
BAY96X1509A	1
BAY96X1514A	2
BAY96X1520A	2
BAY96X1526A	3
BAY96X1532A	4
BAY96X3507A	1
BAY96X3517A	2
BAY96X3527A	3

Mechanical Specifications

General

The BWV760P air handler shall be designed for vertical applications with upflow or downflow capability. In the upflow configuration the unit shall have top discharge, bottom return, and front access. Downflow configurations shall have top return, bottom discharge, front or rear blower section or rear coil section access. Blower coil units must be completely factory assembled including coil, condensate drain pan, fan, motor, secondary transformer, low voltage terminal strip, and polarized plug for low voltage control wiring harness. The discharge opening provides bendable duct locating tabs on all four sides of the opening which may be field formed when connecting ducts.

Casing — Unit shall have rugged sheet metal and steel frame construction and painted with an enamel finish. Casing is insulated and knockouts are provided for electrical power, control wiring and piping connections.

Refrigerant Circuits — Single refrigeration circuit with non-bleed expansion valve, check valve for HP operation, and quick attach fittings for precharged line sets.

Coil — Aluminum fin surface is mechanically bonded to 3/8 inch OD copper tubing. Coils are factory pressure and leak tested.

Fan — Forward curved, dynamically and statically balanced with direct drive, multispeed, dual voltage, polarized plug connection 3/4 HP motor.

Controls — Low voltage terminal board, fan contactor, secondary transformer, polarized plug connections for wiring harness. Quick start kit included for field installation in the outdoor unit.

Accessories

Electric Heaters — Available in a wide range of capacities and voltages with various staging options, single-point electric power connection and plug-in control wiring. Heaters fit inside internal compartment.

Evaporator Defrost Control — Provides the ability to lower low ambient cooling capability by defrosting the indoor coil.

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BWV - Evap. Fan Coil - (S/S or S/P)
Literature Type	SQ
Sequence	218.01
Date	July 1986
File No.	PL-UN-S/S-BWV-SQ-218.01 7/86
Supersedes	BWV-SQ-218.00
Ordering No.	BWV-SQ-218.01

Technical Literature - Printed in U.S.A.

The Trane Company

Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

P.I.

TRANAE INSTALLER'S GUIDE

BWA-IN-2

18-BC28D3
1st Printing, 1985

BWA048,060A;BWA740,750A WEATHERTRON® HEAT PUMPS
(40,000 - 60,000 NOMINAL BTUH OUTDOOR UNITS)

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES.

These instructions do not cover all variations in systems nor provide for every possible contingency to be met in connection with installation. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to The Trane Company, Dealer Products Group.

A. GENERAL

Check for transportation damage after unit is uncrated. Report promptly, to the carrier, any damage found to the unit.

To determine the electrical power requirements of the unit, refer to the nameplate of the unit. The electrical power available must agree with that listed on the nameplate.

The Weathertron® Heat Pump has been designed and manufactured to withstand and operate in severe winter conditions. However, there are precautionary steps which should be taken at the time of installation which will help assure the efficient operation of the unit. **It is recommended that these precautions be taken for units being installed in areas where snow accumulation and prolonged below freezing temperatures occur.**

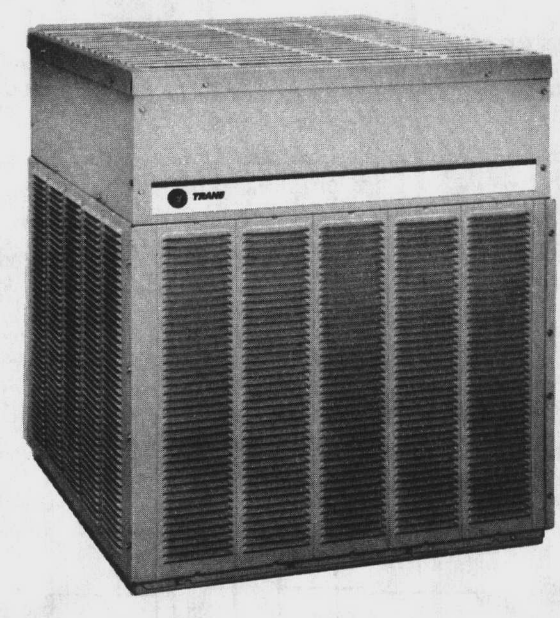
1. *Units should be elevated 8 to 12 inches above the pad or roof top. This additional height will allow better drainage of snow and ice (melted during defrost cycle) prior to its refreezing.* This should prevent a build-up of ice around the unit which occurs when unit is not elevated. **Insure that drain holes in unit base pan are not obstructed preventing draining of defrost water.**

2. If possible avoid locations that are likely to accumulate snow drifts. If not possible, a snow drift barrier should be installed around the unit to prevent a build-up of snow on the sides of the unit. This barrier should be of sufficient distance from the unit to prevent restriction of airflow to and from the unit. Also allow for proper maintenance space. The barrier should be constructed of materials which will blend in with the building design.

3. Avoid locating the unit where condensation and freezing of defrost vapor may annoy customer. For instance, installing the unit under a kitchen or picture window may be annoying to the customer since condensate and fog occuring during the defrost cycle will obstruct the view.

4. Avoid locating the unit under the eaves or other overhead structures as sizable icicles may form and the unit may be damaged by these falling icicles.

1



B. LOCATION & PREPARATION OF THE UNIT

1. The unit should be set on a level, reinforced concrete pad 2" larger than the unit on all sides. (Approximate pad size is 35" x 35" for either unit.)

2. The concrete pad must NOT be in direct contact with any structure. Unit must be positioned a minimum of 12" from any wall or surrounding shrubbery to insure adequate airflow. 30" clearance must be provided in front of control box (access panels) & any other side requiring service access to meet National Electrical Code. Also, the unit location must be far enough away from any structure to prevent roof run-off water from pouring directly on the unit.

3. The top discharge area must be unrestricted above the unit.

4. Mount the unit on mounting pads (shipped with outdoor unit).

5. When the outdoor unit is mounted on a roof, be sure the roof will support the unit's weight. Vibration isolation is recommended to prevent transmission to the building structure.

dwg. no. 21A136364 P02

6. The maximum length of refrigerant lines from outdoor to indoor unit should NOT exceed eighty (80) feet.

7. Maximum difference in **elevation** should not exceed 60 feet.

NOTE: Refer to "Refrigerant Piping Guide" Pub. No. 22-3040 Tab 16 in "APPLICATION MANUAL."

8. Locate and install indoor coil or blower coil in accordance with instruction included with that unit.

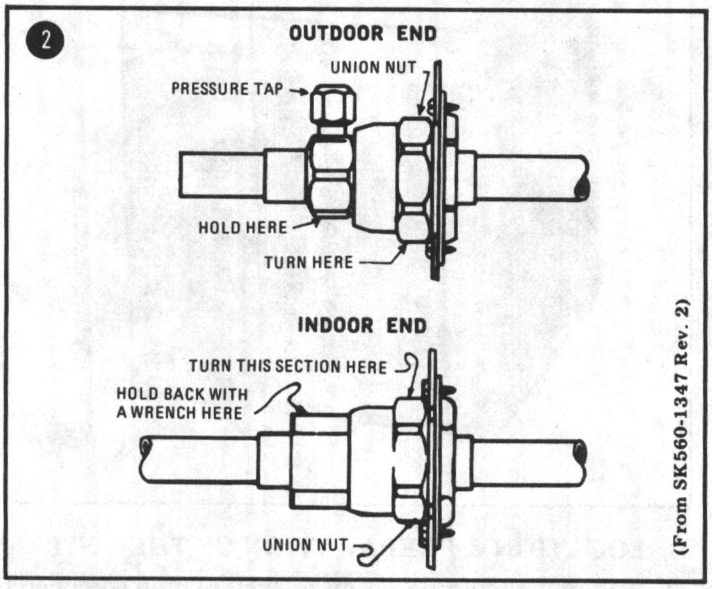
9. A pull-thru hole for the refrigerant lines should be provided of sufficient size to allow the passage of both liquid and suction lines.

10. Determine if adequate power supply is available and correct according to nameplate specifications.

11. Install the unit in accordance with local codes.

C. REFRIGERANT LINES

Standard tire-valve type pressure taps are provided on the precharged lines for installation and service use.



(From SK560-1347 Rev. 2)

Additional tire-valve type pressure taps are provided on the cabinet of outdoor unit for access to the compressor suction and discharge.

The indoor end of recommended refrigerant lines may be straight or with a 90 degree bend, depending upon situation requirements. This should be thoroughly checked out before ordering refrigerant lines.

The suction (gas) line for Weathertron® Heat Pump installation must always be insulated.

The units are factory charged with the system charge required when using 10 feet of connecting line. The precharged lines are provided with the proper charge to accommodate their length. Unit nameplate charge is the total system charge with 25 feet of interconnecting lines.

If refrigerant charge adjustment is considered necessary, make use of the Charge Charts (Operating Instructions) accompanying the outdoor unit.

INSTALLATION

1. Determine the most practical way to run the lines.

2. Consider types of bends to be made and space limitations. *NOTE: Large diameter tubing will be very difficult to rebend once it has been shaped.*

3. Determine the best starting point for routing the refrigerant tubing — INSIDE OR OUTSIDE THE STRUCTURE.

4. Provide a pull-through hole of sufficient size to allow both liquid and suction (gas) lines plus fittings to clear. The location of this hole (if practical) should be just above the wall plate which is resting on the foundation.

5. Be sure the tubing is of sufficient length.

6. Uncoil the tubing — do not kink or dent. The Quik-Attach fittings with pressure tap connect to the outdoor unit.

DO NOT REMOVE DUST PLUGS FROM COUPLINGS BEFORE ROUTING COPPER TUBING.

7. Route the tubing making all required bends and properly secure the tubing before making Quik-Attach connections.

8. To prevent a noise within the building structure due to vibration transmission from the refrigerant lines, the following precautions should be taken:

a. When the refrigerant lines have to be fastened to floor joists or other framing in a structure, use isolation type hangers.

b. Isolation hangers should also be used when refrigerant lines are run in stud spaces or enclosed ceilings.

c. Where the refrigerant lines run through a wall or sill, they should be insulated and isolated.

d. Isolate the lines from all ductwork.

ATTACHING COUPLING (QUIK-ATTACH)

1. Remove the protective plugs from all fittings.

2. Oil the face and threads of the couplings with clean refrigerant oil before mating. Make sure that no dirt, water or other foreign material is permitted to adhere to the mating surfaces of the couplings before the halves are connected.

3. Engage the fittings by hand tightening the union nut until snug.

CAUTION: The male and female Quik-Attach fittings must be properly aligned to prevent cross threading.

4. Continue tightening with a wrench until the coupling halves bottom. A firm metal to metal contact will be felt.

5. Advance the union nut another 1/4 turn. This final turn is necessary to insure a proper metal seal of the coupling halves, forming a leak-proof joint. Do NOT continue to tighten the coupling as distortion of the coupling nut will result in a leak.

CAUTION: Correct tightening of the coupling is very important. Undertightening or overtightening will result in a coupling leak.

NOTE: For attaching the indoor connection, follow the instructions packaged with the indoor unit. See Figure 2 as a reference to the appearance of completed indoor Quik-Attach coupling installation.

D. FIELD FABRICATED REFRIGERANT LINES

The routing of the field fabricated lines is done making the same observations as for the precharged lines.

1. Minimize the use of sharp 90° bends.

2. Cut and fit tubing, then braze using accepted good brazing techniques.

3. Use a DRY NITROGEN PURGE and BRAZING ALLOY without flux for brazing.

4. Insulate the entire suction (gas) line and its fittings.

5. Do NOT allow uninsulated lines to come into contact with each other.

6. Upon completion of installation, evacuate, and/or purge the refrigerant lines before connecting to the outdoor unit. If purging with R-22 refrigerant, connect the indoor fittings and purge from the liquid line through the indoor coil and out the suction (gas) line pressure tap.

7. Using a manifold gauge, connect an external supply of R-22 to the gauge port tap on the liquid line valve. Position R-22 supply container so only the gas is used in purging.

8. Charge connecting lines and indoor coil to the gas pressure of R-22 supply.

9. Leak check brazed line connections using soap bubbles or halogen leak detector. Repair leaks (if any) after relieving pressure.

10. Close manifold gauge valve, depress valve stem in gauge port on suction (gas) line valve and bleed-off gas pressure in connecting lines and indoor coil down to 2 PSIG.

11. Repeat this purging described in steps 6 through 10 two additional times.

NOTE: When the outdoor temperature is below 60°F. and above 40°F., purge the connecting lines and indoor coil four times. When the outdoor temperature is below 40°F., purge the connecting line and indoor coil five times.

If refrigerant lines are to be field fabricated or if precharged lines have been altered in length, it will be necessary to adjust refrigerant to the system upon completion of installation. Use the following table for recommended amount.

Tubing Sizes			Additional
Suction	Liquid	Tubing Length	Refrigerant
1-1/8″	3/8″	15′	5 oz.
1-1/8″	3/8″	25′	12 oz.
1-1/8″	3/8″	32′	18 oz.
1-1/8″	3/8″	40′	24 oz.
7/8″	3/8″	15′	4 oz.
7/8″	3/8″	25′	11 oz.
7/8″	3/8″	32′	16 oz.
7/8″	3/8″	40′	22 oz.
7/8″	5/16″	15′	3 oz.
7/8″	5/16″	25′	8 oz.
7/8″	5/16″	32′	11 oz.
7/8″	5/16″	40′	15 oz.

Tubing lengths in excess of forty (40) feet use the following amount:
1-1/8″ and 3/8″ uses 3 oz. per each 4 ft.
7/8″ and 5/16″ uses 5 oz. per each 10 ft.
7/8″ and 3/8″ uses 7 oz. per each 10 ft.

E. LEAK CHECK

Check for leaks with an electronic leak detector or liquid soap. If no leaks are present, insulate the suction (gas) line fittings and exposed tubing to prevent sweating.

F. ELECTRICAL CONNECTIONS

WARNING: When installing or servicing this equipment, ALWAYS exercise basic safety precautions to avoid the possibility of electric shock.

1. All electrical lines, sizing, protection, and grounding must be in accordance with national and local electrical codes.

2. Install a separate disconnect switch at the outdoor unit.

3. Isolate conduit whenever vibration transmission may cause a noise problem within the building structure.

4. Be sure all connections are made tight and no wires exposed.

5. All electrical accessories must be installed and wired according to the instructions packaged with that accessory, (see typical Hook-Up diagram on page 4).

6. Use color coded, low voltage, multi-wire cable to simplify low voltage connections between outdoor unit, indoor unit and room thermostat for easy identification.

G. ELECTRIC HEATERS

Electric heaters, if used, are to be installed in the air handling device according to the instructions accompanying the air handler and the heaters.

H. OUTDOOR THERMOSTAT

This accessory must be field installed. For data see wiring diagram attached to unit and instruction sheet packaged with outdoor thermostat.

I. DEFROST CONTROL

These units are equipped with a temperature permissive, time initiated, temperature terminated defrost system and are factory set to defrost automatically every 90 minutes. Defrost cycle time may be set for 45 or 90 minutes. If this equipment is installed in or north of Region IV (see map on page 6), reset defrost cycle time to 45 minutes.

J. OPERATIONAL AND CHECKOUT PROCEDURES

Final phases of this installation are the unit Operational and Checkout Procedure which are found on pages 5 & 6 of this instruction.

K. COMPRESSOR SUMP HEAT

After all electrical wiring is complete, SET THE THERMOSTAT SYSTEM SWITCH IN THE OFF POSITION SO COMPRESSOR WILL NOT RUN, and apply power by closing the system main disconnect switch. This will activate the compressor sump heat. Do not change the Thermostat System Switch until power has been applied long enough to evaporate any liquid R-22 in the compressor (30 minutes for each pound of R-22 in the system as shown on the nameplate). Following this procedure will prevent compressor damage at the initial startup.

Record the "POWER APPLIED DATA" on the designated lines below:

Time ________________ A.M./P.M. Date________________

By ______________________________________

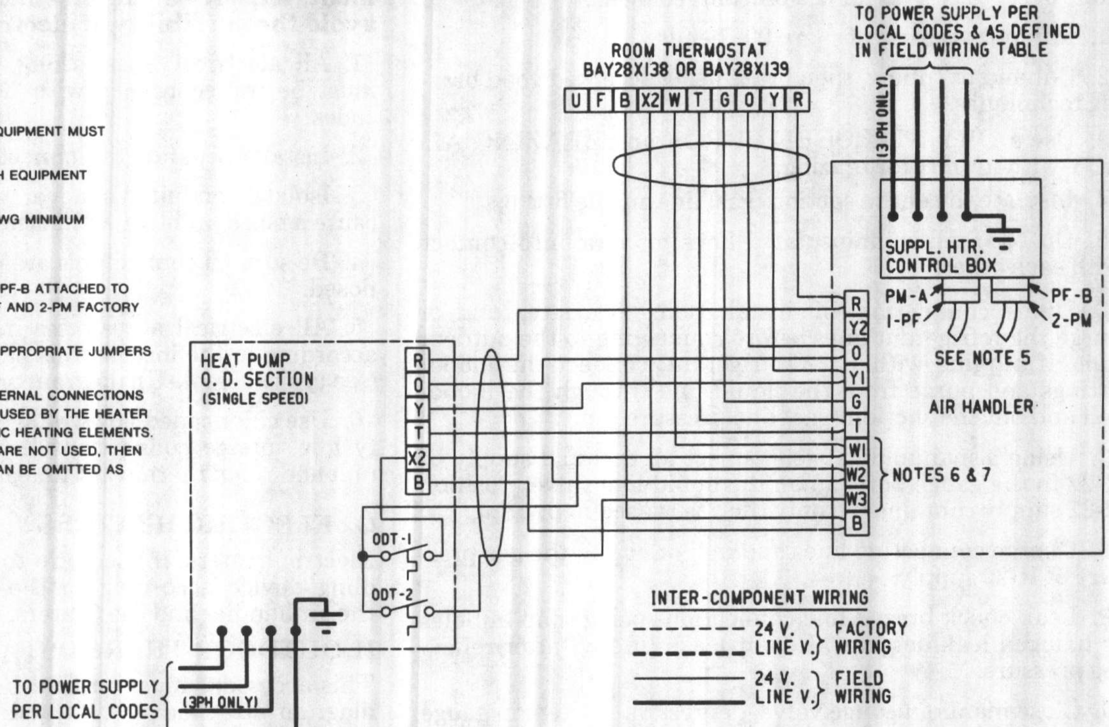
Electrician

(SEE WIRING DIAGRAM ON PAGE 4)

FIELD WIRING DIAGRAM FOR SPLIT SYSTEM WEATHERTRON® HEAT PUMP WITH BWV,BWH — A or P AIR HANDLERS WITH SUPPLEMENTARY HEAT (TRANSFORMER IN INDOOR UNIT)

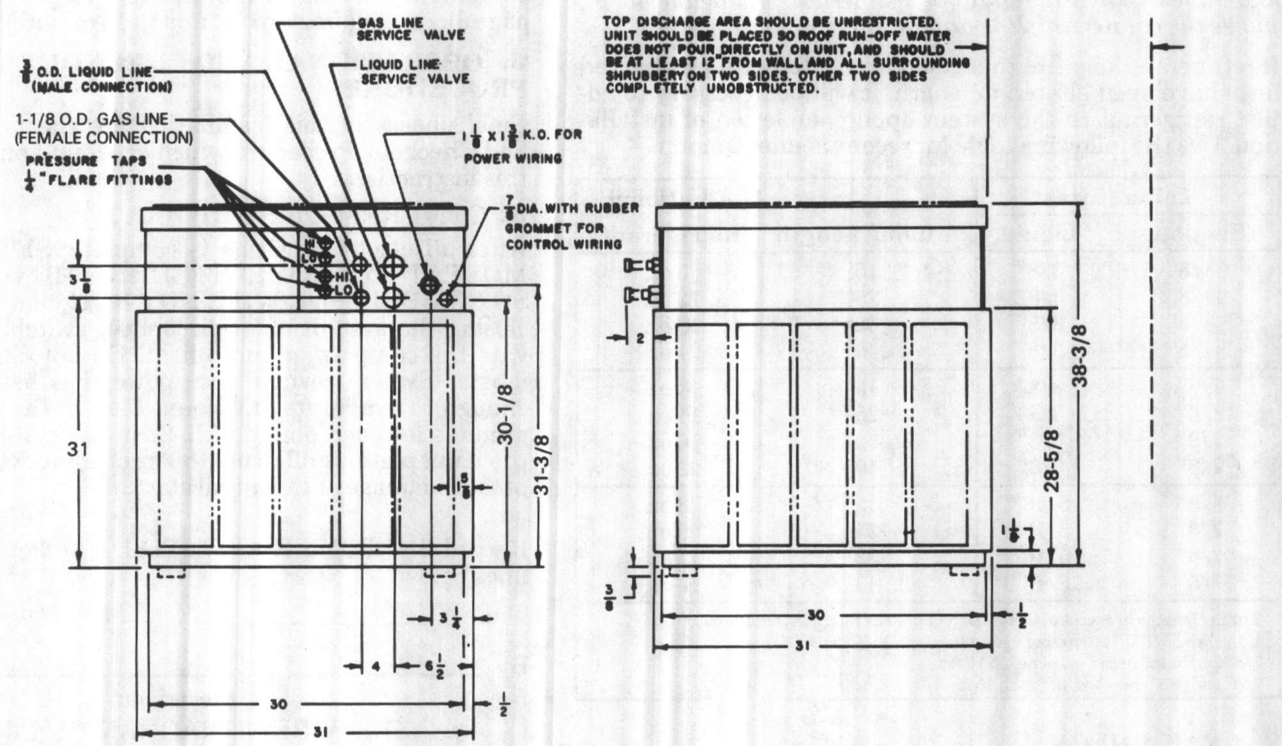
NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 AWG MINIMUM CONDUCTOR.
4. USE COPPER CONDUCTORS ONLY.
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TERMINALS W2 AND W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND & 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND & 3RD (BH & CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 AND W3 CAN BE OMITTED AS APPROPRIATE.



From Dwg. 21B131066 Rev. 0

BWA048,060A; BWA740,750A OUTLINE DRAWING
(ALL DIMENSIONS ARE IN INCHES)



From Dwg. 21C133963 Rev. 3

CHECKOUT PROCEDURE WITH MAIN POWER DISCONNECTS CLOSED (ON)

STEP NO.	TO CHECK	THERMOSTAT SETTINGS (INDOOR)							Supplementary Instruction	COMPONENT OPERATION					I.D. Air Supply	
		Fan Switch		System Switch						Indoor Blower Runs	Outdoor Fan Runs	Compressor Runs	Comp. Sump Heater	Electric Heater Energized		
		Both		BAY28X138		BAY28X139										
		Auto	On	Off	Auto	Heat	Off	Cool							Warm	Cool
1	Thermostat System Switch	X		X			X		–				X			
2	Sump Heater	X		X			X		–				X			
3	Thermostat Fan Switch & I.D. Fan Operation		X	X			X		–	X			X		Room Temp.	
4	Cooling Operation	X			X ↓			X ↓	–	X	X	X	X			X
5	Checking Performance & Charge (If Needed) ⑤	X			X ↓			X ↓	A	X	X	X	X			X
6	Heating Operation	X			X ↑	X ↑			–	X	X	X	X	X ①	X	
7	Defrost Operation Electric Heat During Defrost	X			X ↑	X ↑			B	X		X	X	X ②	③	③
8	Emergency Heat	X			X ↑	X ↑			C	X			X	X ④	X	
9	Inform owner or representative on how to operate system and what to expect of it.															

SUPPLEMENTARY INSTRUCTION

↑ Move "HEAT" temperature selector above room temperature.

↓ Move "COOL" temperature selector below room temperature.

A. Use charts attached to Outdoor unit.

B. Initiate defrost.

C. Move switch from "NORMAL" to "EMERG. HEAT" position.

NOTES

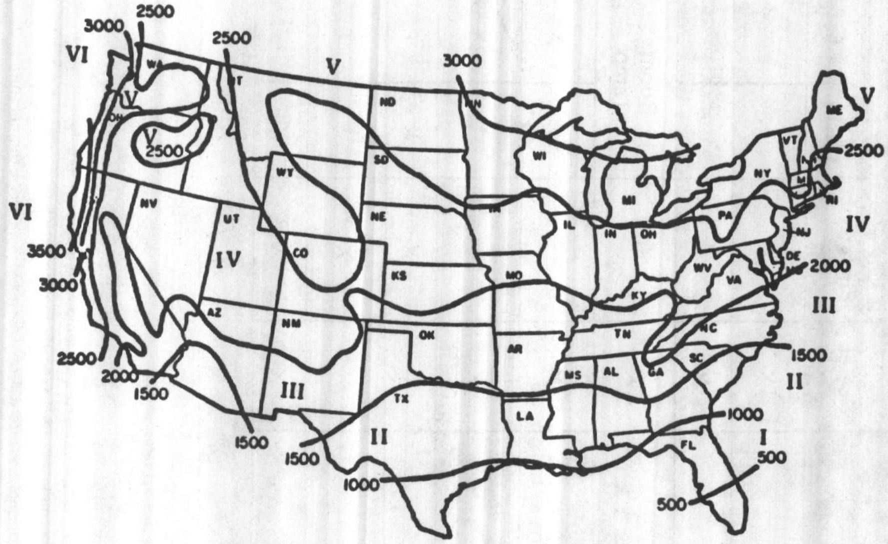
① If Electric Heaters are installed, they will be energized when indoor temperature is 2°F. below setting of indoor thermostat and outdoor temperature is below setting of outdoor thermostats. Blue light on thermostat should come on.

② If Electric Heaters are installed, one heater will be energized. Additional heaters will be energized if outdoor temperature is below setting of outdoor thermostats. Blue light on thermostat should come on.

③ If Electric Heaters are not installed, air supply will be cool.

④ Warm air should begin to circulate from supply grilles, and red light on face of thermostat should come on.

⑤ Performance and Charge may also be checked in Heating Mode.



This map is reasonably accurate for most parts of the United States but is necessarily highly generalized, and consequently not too accurate in mountainous regions, particularly in the Rockies.

CHECKOUT PROCEDURE

After installation has been completed, it is recommended that the entire system be checked against the following list:

1. Refrigerant Line, Leak checked . . . . [ ]
2. Suction Lines and Fittings properly insulated . . . . [ ]
3. Have all Refrigerant Lines been secured and isolated properly? . . . . [ ]
4. Have passages through masonry been sealed? If mortar is used, prevent mortar from coming into direct contact with copper tubing . . . . [ ]
5. Indoor coil drain line drains freely. Pour water into drain pan . . . . [ ]
6. Supply registers and return grilles open and unobstructed . . . . [ ]
7. Return air filter installed . . . . [ ]
8. Thermostat thermometer is accurate. Check against a reliable thermometer. Adjust per instructions with thermostat . . . . [ ]
9. Is correct speed tap being used? (Indoor blower motor) . . . . [ ]

SUPPLEMENTARY HEATERS CHECKOUT PROCEDURES, IF USED

DOES HEATER REQUIRE A SEPARATE CIRCUIT?

1. Be sure the disconnect switch is ''OFF', and safety label (if any) is attached. . . . . [ ]
2. Check on field wiring for sound connections and grounding according to codes. . . . . [ ]
3. Check circuit protection device for proper size per nameplate specifications. . . . . [ ]
4. Check control box panel — in place and secured . . . . [ ]
5. Blower speed must be set in accordance with minimum speed label on blower wrapper. . . . . [ ]

NOTE: OPERATION OF HEATERS MUST BE CHECKED DURING THE OPERATION CHECK OF THE TOTAL SYSTEM.

SYSTEM OPERATIONAL CHECK

IMPORTANT: To prevent compressor damage which may result from the presence of LIQUID refrigerant in the crankcase, these procedures should be followed at initial Start-Up and at anytime the power has been off for 12 hours or more.

1. Before proceeding with this ''Operational Check,'' go to ''Compressor Sump Heat Section'' of this instruction to determine the time compressor heat has been ''ON,'' and make entry on the designated lines, in Step 2.
2. Start-Up Time ________ A.M./P.M. Power Applied Time ________ A.M./P.M.
   Time Lapse ________ Hours ________ Minutes.
3. If Steps 1 and 2 cannot be used, then place thermostat's system switch in the ''OFF'' position and apply power by closing system disconnect switch. This energizes compressor heat and evaporates the liquid in the crankcase. TO EVAPORATE LIQUID ALLOW AT LEAST ONE-HALF HOUR PER POUND (R-22), AS SHOWN ON UNIT NAMEPLATE.
4. Except as required for safety while servicing: DO NOT OPEN SYSTEM DISCONNECT SWITCH.

TRANE™ **INSTALLER'S GUIDE**

BWV-IN-6
18-GC42D1
1st Printing 1983

BWV042A AIR HANDLER

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES.

These instructions do not cover all variations in systems nor provide for every possible contingency to be met in connection with installation. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to The Trane Company, Dealer Products Group, Tyler, Texas.

A. GENERAL

This instruction covers the installation of BWV042A Air Handler. This Air Handler is shipped from the factory for vertical upflow, bottom return and convertible to vertical downflow, top return. ALL configurations have front access.

INSPECTION

Check carefully for any shipping damage. This must be reported to and claims made against the transportation company immediately. Check to be sure all major components are in the unit. Any missing parts should be reported to your supplier at once, and replaced with authorized parts only.

INSTALLATION LIMITATIONS & RECOMMENDATIONS

The general location of the air handler is normally selected by the architect, contractor and/or home owner for the most effective application and satisfaction. For proper installation the following items must be considered.

1. If adequate power is available and correct according to nameplate specifications.

2. Insulate all ducts, particularly if unit is located outside of the conditioned space.

3. It is recommended that the outline drawing (page 2) be studied and dimensions properly noted and checked against selected installation site. By noting in advance which knockouts are to be used, proper clearance allowances can be made for installation and possible future service.

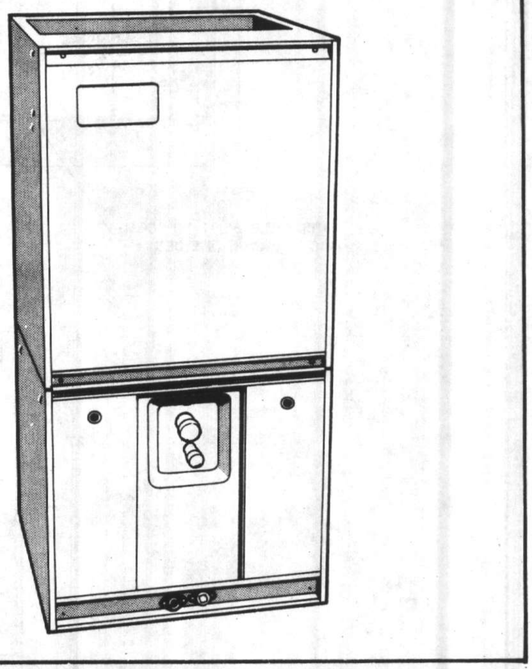
4. When air handler with supplementary heater is to be installed in the downflow position on combustible flooring an accessory sub base (BAY99X112) must be used.

5. If supplementary heat is to be added, power supply should be sufficient to carry the additional load.

6. If the unit is installed without a return air duct, applicable local codes may limit this air handler to installation only in a single story residence.

7. If the outdoor unit is to be installed later, or by others, then installation of the air handler must be made so there is access to the refrigerant lines, or attach refrigerant lines to air handler when installing. Make sure there are provisions for installing the condensate drain lines.

1



8. If side, front or rear return is required, air handler must be elevated. Pedestal (BAY99X113) may be used.

9. When the air handler is installed in the downflow position, external filtering is required. Accessory frame (BAY85X073) is available.

10. Route refrigerant lines away from air handler so they do not interfere with access panels and filters.

CAUTION: When external accessories or supplementary heaters are used the additional height and width requirements must be considered in the overall space needed.

B. UNIT INSTALLATION

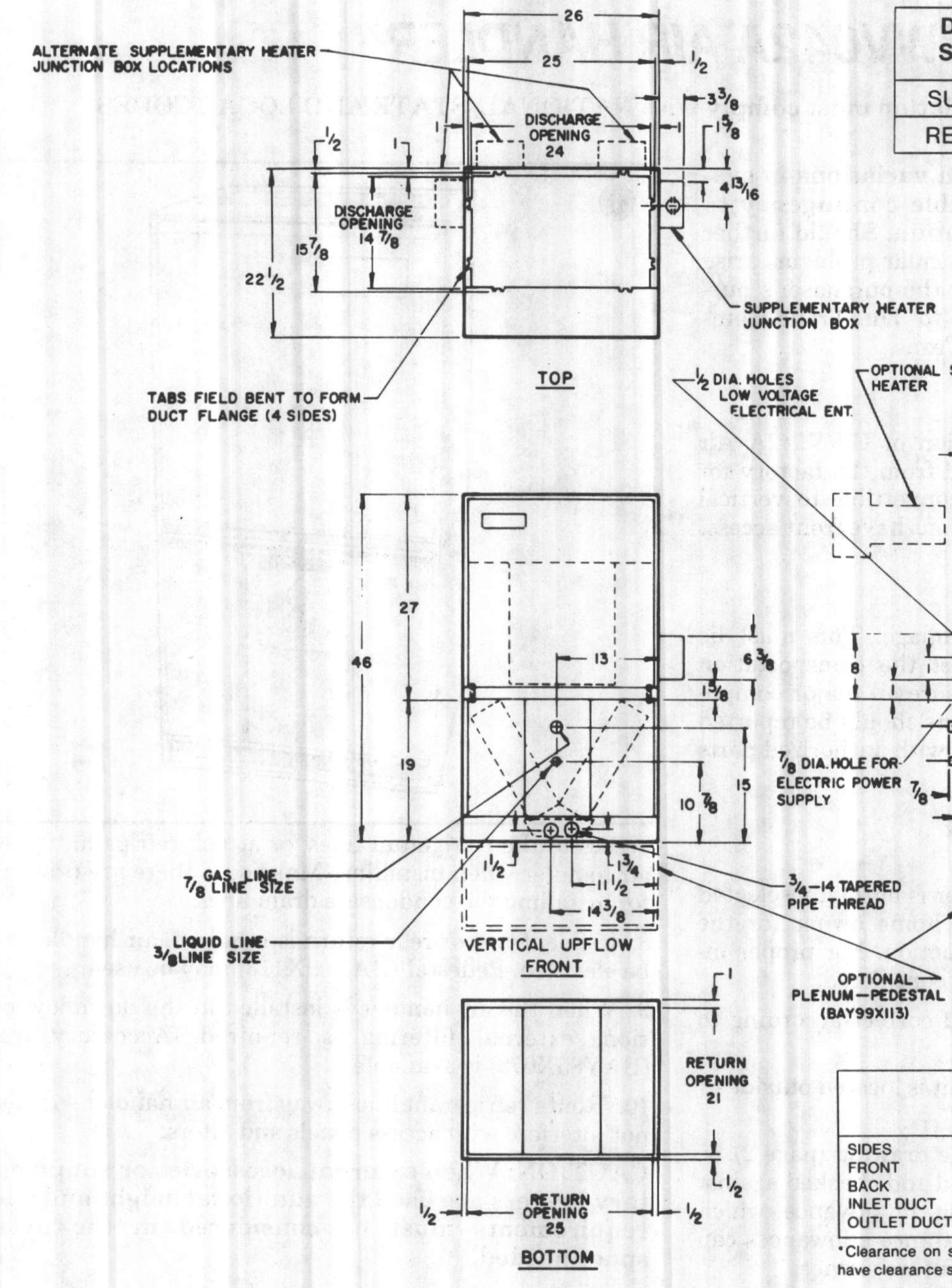
1. VERTICAL UPFLOW

a. Unit is shipped from the factory in this position and internal changes are not required, however remove junction box in heater cavity. (see Fig. 3)

b. Position unit on Pedestal (BAY99X113) or other suitable foundation. If Pedestal is not used a frame strong enough to support the total weight must be provided. Provide a minimum height of 14 inches for proper unrestricted airflow.

dwg. no. 21A309891 P03

BWV042A AIR HANDLER



DUCT SIZES	MODEL NO.
	BWV042A100A
SUPPLY	15-7/8 x 25
RETURN	21 x 25

MINIMUM UNIT CLEARANCE TABLE

	TO COMBUSTIBLE MATERIALS (REQUIRED)	SERVICE CLEARANCE (RECOMMENDED)
SIDES	0"	2"*
FRONT	0"	22-1/2"
BACK	0"	0"*
INLET DUCT	0"	1"
OUTLET DUCT	1"	

*Clearance on surface which has heater junction box attached must have clearance specified plus 10".

From Dwg. 21D309870 Rev. 3

c. If a return duct is connected to the air handler, it must be the same dimensions as shown in outline drawing (see Figure 2).

d. Pedestal and unit should be isolated from foundation using Korfound (or equivalent) isolating material.

2. VERTICAL DOWNFLOW

NOTE: This unit may have shipping clips between the blower and coil compartments located in the right and left hand corners. These may be removed and discarded before starting conversion.

CAUTION: If supplemental heater is used in downflow configuration, Sub-base (BAY99X112) must be used.

a. Unit must be converted for this configuration. Set unit in vertical upflow position (see Fig. 3) and remove junction box in heater cavity.

b. Remove blower access panel.

c. Remove filter access panels. Remove and discard filters.

d. Remove two screws from rear of *Coil Section* securing inside brackets. (see Fig. 3)

e. Remove two "T" clips located between blower and coil compartment. The clips are attached by two screws each located at the front of the unit. (see Fig. 3)

f. Remove blower section from coil section. Rotate blower section 180° and place on floor, supply outlet facing down. (see Fig. 4)

g. Tilt coil section over on its back, refrigerant connections pointing up, insert "T" shaped clips and attach with one screw each. Clip must be inserted from inside coil section through slot, narrow end first. (see Fig. 4)

h. Place coil section on top of blower section and align front "T" clips with holes in the blower compartment and rear brackets with slots in the coil compartment. Secure "T" clips with screws. (see Fig. 4)

i. Secure two rear brackets with one screw each (removed in step d). (see Fig. 4)

j. Replace *only* the filter access panels removed in step c. Do not replace filters.

NOTE: If downflow filter frame accessory (BAY85X073) is used. It may now be attached to the unit. See instructions packed with the accessory.

k. The conversion is now completed and the unit may be located in the final installation position. Proceed with the installation and replace blower access panel when it is completed.

C. REFRIGERANT PIPING

1. Refrigerant connections are made outside the cabinet between the filter access panels.

CAUTION: Refrigerant Piping must be routed such as to maintain service access to blower compartment and provide for easy removal of filter access panels and filters. Additional instructions regarding the routing of refrigerant lines are provided on a tag attached to the unit. Refer to this tag before attaching lines.

2. The refrigerant lines may be in the form of factory precharged Quik-Attach lines or field fabricated lines using Quik-Attach couplings. Lines or fittings with preformed 90° bends must be used.

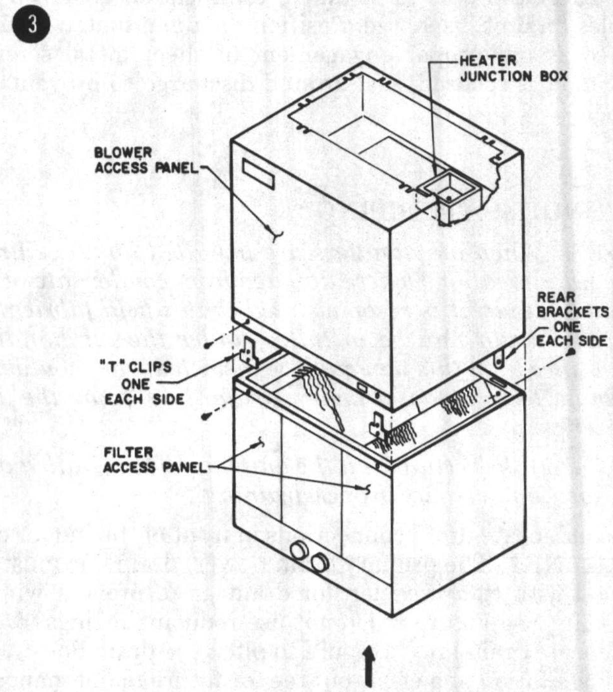
3. Installation of refrigerant lines is covered in the installation instruction packaged with the outdoor unit. Purging, evacuation, leak testing and brazing procedures are included in those instructions. Read those instructions before starting installation of refrigerant lines.

CAUTION: Do not remove sealing caps on ends of air handler refrigerant lines until ready to attach lines to unit.

WARNING: Puncture tube caps on refrigerant "Gas" Line and "Liquid" Line. The removal of all refrigerant pressure from the stub tubes must be complete before attempting to unbraze tube caps.

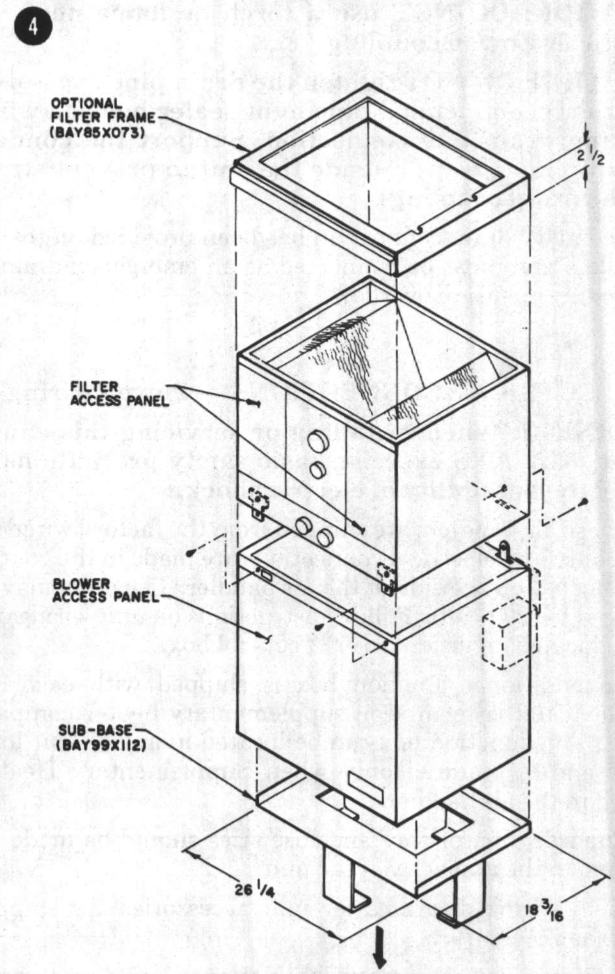
D. DUCT CONNECTIONS

The supply and return air duct should be connected to the unit with flame retardant duct connectors. Tabs for the duct location and connection are provided at the discharge opening of the unit. These tabs must be bent into position (outward) prior to installing duct.



VERTICAL (UPFLOW)

From Dwg. 21C309743 Rev. 0



VERTICAL (DOWNFLOW)

From Dwg. 21C309743 Rev. 0

It is recommended that a 1/2″ flange be provided on the duct. After the duct is installed, tab location is shown by dimples on unit discharge. Position duct and match-drill to tabs to assure proper engagement of sheet metal screws. After duct is secured, seal around discharge to prevent air leakage.

E. CONDENSATE PIPING

NOTE 1. When air handlers are installed above ceilings or in other locations where damage from condensate overflow may occur, it is recommended that a field fabricated auxiliary drain pan be installed under the air handler. Drain lines from this pan must be installed, but should not be connected to the primary drain line from the air handler.

NOTE 2. Make certain that the unit has been installed in a level position to insure proper draining.

The condensate drain connections in front of the indoor coil are 3/4″ NPT. The primary drain (lower) drain line must be trapped with the provision for drainage to prevent winter freeze-up. See Figure 5. Do not use reducing fittings in the condensate drain lines. Be sure to pitch the drain line down. The installation of a clean-out tee for future maintenance is recommended. The condensate drain line must not be connected to closed drain system. Do not trap the auxiliary drain pan pipe. Insulate drain pipes to prevent sweating.

CAUTION: DO NOT use a torch or flame near the plastic drain pan coupling.

CAUTION: DO NOT tighten the drain pipe excessively. It is recommended pipe joint sealer be used when making drain line connection. Support the condensate piping & traps outside the unit to prevent strain on the drain couplings.

A secondary drain connection has been provided on the air handlers and must be connected as an emergency drain to prevent condensate overflow.

F. ELECTRICAL CONNECTIONS — Power Wiring

WARNING: When installing or servicing this equipment, ALWAYS exercise basic safety precautions to avoid the possibility of electric shock.

1. These air handlers are shipped from the factory wired for 230 volts. The electrical connections are made in the control box located on the side of the air handler. The units may be rewired for 200 volts. Follow instructions on unit wiring diagram located on inside cover of control box.

2. An additional junction box is shipped with each Air Handler and is secured in supplementary heater compartment. This junction box can be located in any of four locations and is required only when Supplementary Heat is added to the air handler.

3. The selection of wire and fuse sizes should be made according to the ampacity of the unit.

4. Field wiring diagrams for unit accessories are shipped with the accessory.

5. All wiring must conform to National and Local codes. Ground unit per Local codes using good safety procedure.

G. CONTROL WIRING

1. Connect wiring between indoor unit, outdoor unit and thermostat. The use of color-coded low-voltage wires is recommended.

2. A terminal board is provided on the air handler for connection of low voltage control wiring. It is located beneath the electrical control box. It is intended that all low voltage control wiring originate from this terminal board.

3. Provided on pages 5 and 6 are field wiring diagrams that show the low voltage control wiring hookup for a single speed cooling only system (with supplementary heaters) and a heat pump system (with supplementary heaters). Plug in type electrical connectors are provided for use with supplementary heaters.

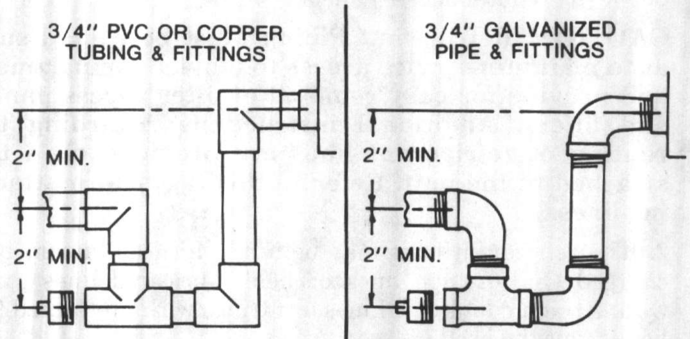
CAUTION: When supplementary heaters are installed, inspect to insure that all packaging material has been removed.

H. OPERATIONAL AND CHECKOUT PROCEDURE

1. Check the Air Handler operation and installation in accordance with the "Checkout Procedure" in this instruction.

2. "Operational Procedure" for the system installation, found with the outdoor unit, will be compatible with this Air Handler.

5 **CONDENSATE DRAIN PIPING**



MATERIALS (3/4″ PVC or copper)

1	TEE
3	90° ELL
1	PLUG
1	4″ NIPPLE
2	2″ NIPPLE
1	3/4″ NPT TO PVC OR COPPER ADAPTER

MATERIALS (3/4″ galvanized)

1	TEE
1	PLUG
3	STREET ELL
1	3-1/2″ NIPPLE

DO NOT USE REDUCING FITTINGS IN THE DRAIN LINES. THE CONDENSATE DRAIN LINE MUST BE:

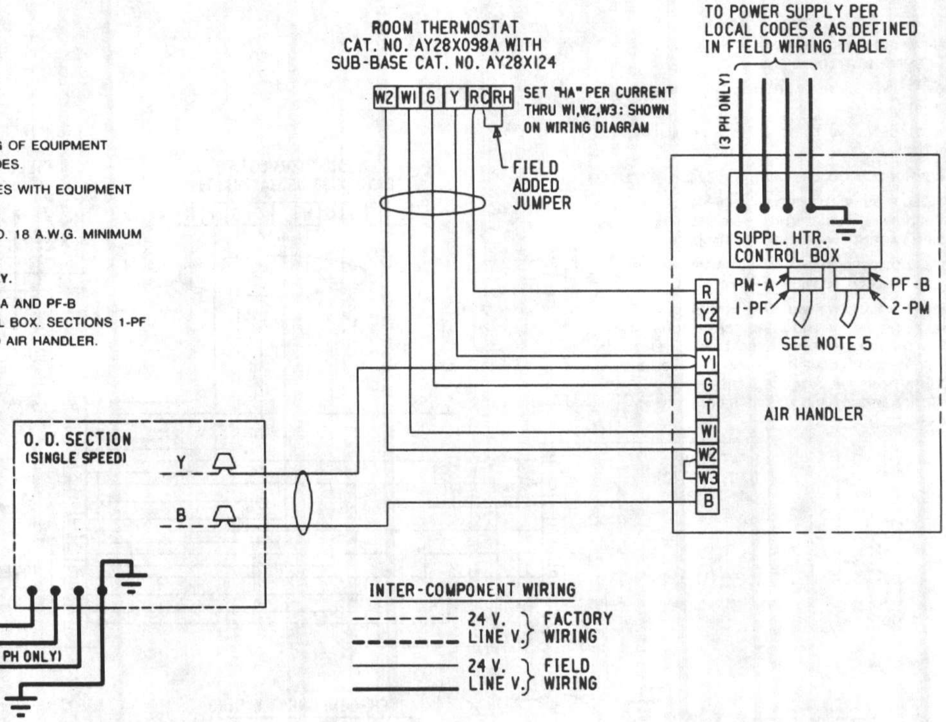
1. MADE OF 3/4″ PIPE SIZE.
2. PITCHED-1/4″ PER FOOT RECOMMENDED TO PROVIDE FREE DRAINAGE TO CONVENIENT DRAIN SYSTEM.
3. TRAPPED-A PIPE TEE AND CLEAN OUT PLUG SHOULD BE INSTALLED.
4. MUST NOT BE CONNECTED TO CLOSED DRAIN SYSTEM.

From Dwg. 21C128186 Rev. 0

FIELD WIRING DIAGRAM FOR BWV042A AIR HANDLER WITH SINGLE-SPEED COOLING UNIT AND AY28X098A THERMOSTAT

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.

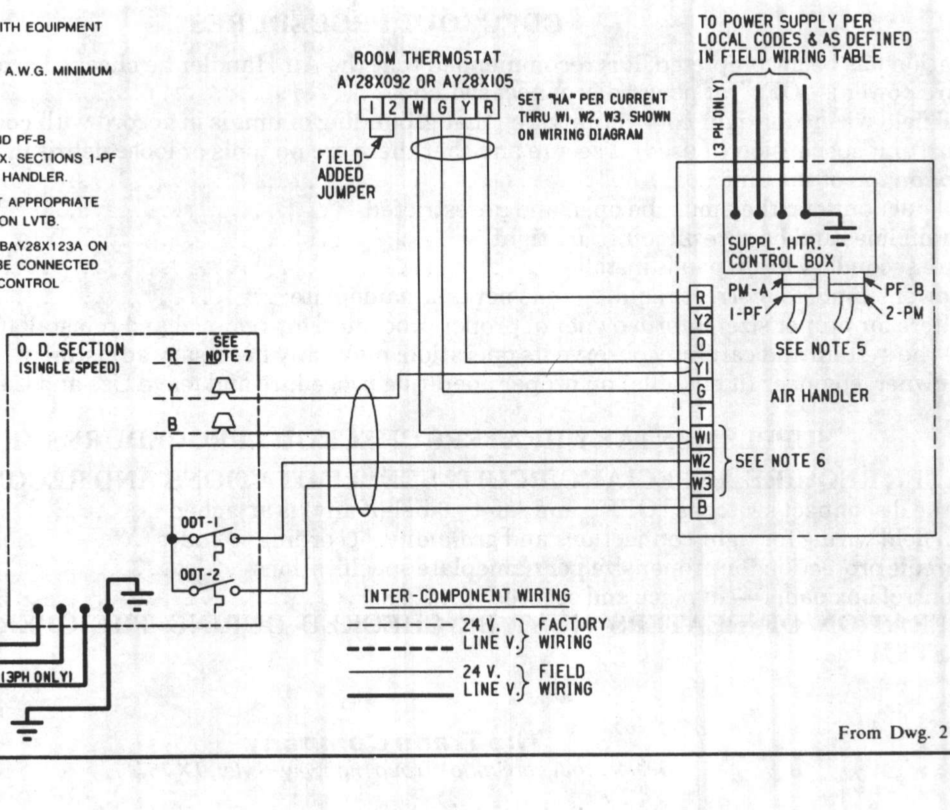


From Dwg. 21B131065 Rev. 0

FIELD WIRING DIAGRAM FOR BWV042A AIR HANDLER WITH SINGLE-SPEED COOLING UNIT AND AY28X092 or AY28X105 THERMOSTATS

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TO USE LOW AMBIENT COOLING KIT BAY28X123A ON 3 PHASE MODELS, "R" LEAD MUST BE CONNECTED TO "Y" LEAD IN ORDER TO SUPPLY CONTROL VOLTAGE FOR KIT.

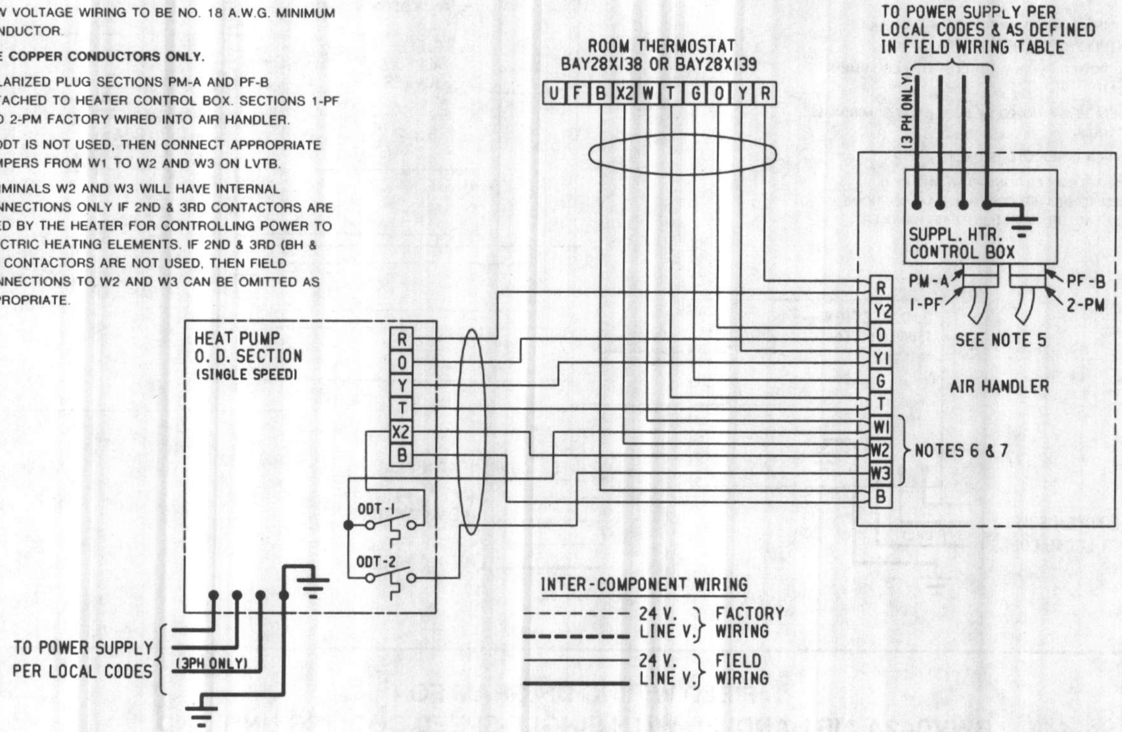


From Dwg. 21B131067 Rev. 0

FIELD WIRING DIAGRAM FOR
BWV042A AIR HANDLER WITH WEATHERTRON® HEAT PUMP

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. USE COPPER CONDUCTORS ONLY.
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TERMINALS W2 AND W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND & 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND & 3RD (BH & CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 AND W3 CAN BE OMITTED AS APPROPRIATE.



From Dwg. 21B131066 Rev. 0

CHECKOUT PROCEDURES

After installation has been completed, it is recommended that the Air Handler be checked against the following checklist.

1. Make sure power is "OFF" at power disconnect switch .... ☐
2. Check all field wiring for tight connections. See that grounding of unit is in accord with code .... ☐
3. Make sure unit suspension (if used) is secure and that there are no tools or loose debris in, around or on top of the unit .... ☐
4. Check all duct outlets; they must be open and unrestricted .... ☐
5. Check drain lines and be sure all joints are tight .... ☐
6. Make sure secondary drain pan is installed .... ☐
7. Check power supply for correct requirements per unit nameplate .... ☐
8. Check filters for proper size. Inform owner of proper procedure for removal and reinstallation .... ☐
9. Energize the system and carefully observe its operation; make any necessary adjustment .... ☐
10. Instruct owner, engineer (if possible) on proper operating procedure and leave Use and Care Manual with owner .... ☐

SUPPLEMENTARY HEATERS CHECKOUT PROCEDURES, IF USED

DOES HEATER REQUIRE A SPECIAL CIRCUIT? SEE "LIMITATIONS AND RECOMMENDATIONS".

1. Be sure the disconnect switch is "OFF", and safety label (if any) is attached .... ☐
2. Check on field wiring for tight connections and grounding according to codes .... ☐
3. Check circuit protection for proper size per nameplate specifications .... ☐
4. Check control box panel — in place and secured .... ☐

NOTE: OPERATION OF HEATERS MUST BE CHECKED DURING THE OPERATION CHECK OF THE TOTAL SYSTEM.

The Trane Company
Dealer Products Group • Troup Highway • Tyler, TX 75711

dwg. no. 21A309891 P03
P.I.

18-HB15D2
1st Printing, 1986

SUPPLEMENTARY HEATERS

EHTR-IN-10A

(This instruction covers installation in BWE—C or BPCB & BTE—B and BWV,BWH—P; BWV,BWH-A; TWV,TWH-P; TWV-E Air Handlers which are equipped with polarized plugs.)

ALL phases of this installation must comply with NATIONAL, STATE AND LOCAL CODES.

These instructions do not cover all variations in systems nor provide for every possible contingency to be met in connection with installation. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to The Trane Company, Dealer Products Group, Tyler, Texas.

A. GENERAL

1. Check Table 1, below to insure heater selected is approved for use with the air handler in which it is to be applied.

2. Check the components received for damage. Report any damage or shortages to transportation company immediately.

3. Be sure power supply agrees with listing shown on heater nameplate.

B. HEATER INSTALLATION IN BTE120, BWE090,120 OR BPCB-B75 & BPCB-C10

NOTE: When the voltage and phase of the heater and the air handler are the same, **only one** *power entry is required to provide power to the equipment. However, when a three phase heater is installed in a single phase air handler, separate power supplies must be provided. In that case omit step 9 below and connect in accordance with the wiring diagram located on the air handler control box cover.*

1. Remove cover(s) from heater control box. Retain screws.

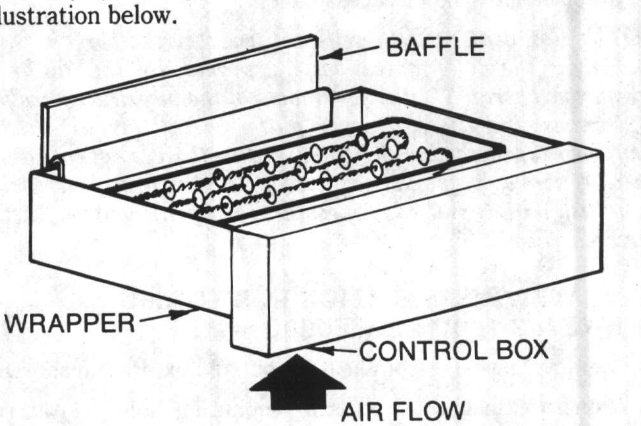
2. Puncture insulation covering mounting holes (4) at rear corners of control box.

3. Remove air handler access panel from air handler.

4. Remove air handler heater cavity cover plate (5 screws) or remove knockout with hammer and chisel if knockout is provided.

5. Remove hole plug, 4 screws and strain relief bushing (if provided) from envelope. Discard strain relief bushing.

6. Assemble baffle (shipped with heater) to wrapper on heater assembly by forcing baffle seam slot over rear lip of wrapper. See illustration below.



HEATER COMPATIBILITY TABLE

HEATER MODEL NO.	KW RATING	BWH739A,P TWH739P	BWV739A,P TWV739P	TWV739E	BWV754A,P BWH754A,P TWV764P TWH764P	BWV042A,P BWV742A,P BWV748A,P	BWH748A,P	BWV760A,P BWH760A,P	BWE060C100F	BWE060C400F	BWE090C100E or BPCB-B75 BWE120C100E or BPCB-C101 BWE060C100T BTE120B100E	BWE090C400E or BPCB-B75N or BPCB-C10N BTE120B400E
BAY96X1509A	8.64	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO
BAY96X1514A	14.40	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO
BAY96X1520A	20.16	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO
BAY96X1526A	25.92	NO	NO	NO	YES	YES	YES	YES	YES	NO	YES	NO
BAY96X1532A	31.68	NO	NO	NO	YES	YES	NO	YES	YES	NO	YES	NO
BAY96X3507A	7.14	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
BAY96X3517A	17.10	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES
BAY96X3527A	27.06	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
BAY96X3537B	37.02	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES
BAY96X4507A	7.14	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES
BAY96X4517A	17.10	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES
BAY96X4527A	27.06	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES
BAY96X4537A	37.02	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	YES

TABLE 1

7. Insert heater into the heater cavity, align screw holes and secure with 4 screws (one in each corner).

8. Connect low voltage polarized plug of air handler to (right hand) polarized plug of heater.

9. Disconnect two (2) halves of high voltage polarized plug of air handler and connect movable half to (left hand) high voltage polarized plug of heater.

NOTE: This will leave the unconnected half secured to the air handler by a bracket. The wire from this half should terminate in the lower section of the air handler control box and should also be unconnected. Install hole plug if knockout has been removed from cabinet side.

10. Replace heater control box cover(s).

11. Remove heater power supply junction box cover plate. Locate and secure junction box to the interior rear corner of the air handler (in the position selected for power entry).

CAUTION: Route wiring between heater and its junction box through nylon clamps provided to prevent contact with blower wheel, pulleys, or shafts.

12. Connect power wiring in junction box and low voltage wiring to terminal boards per the appropriate field wiring diagram in this instruction.

13. Attach cover plate to junction box.

14. Replace air handler access panel.

NOTE: For heaters with self-contained circuit breakers, an opening in the blower access panel is provided so that the breakers may be operated without removal of the panel. Remove four (4) screws and discard cover plate. Install circuit breaker escutcheon (provided with heater) frame (border) opening with four (4) screws previously removed. Cut out fiberglass insulation flush with inside edge of escutcheon opening **after** *installing escutcheon.*

C. HEATER INSTALLATION IN BWE736C; BWE742-760C & BWE060C

1. Remove cover(s) from heater control box. Retain screws.

2. Puncture insulation covering mounting holes (4) at rear inside corners of control box.

3. Remove air handler access panel from air handler.

4. Disconnect 2 polarized plugs and remove bracket with plug halves from air handler. Remove the field connection leads from the control box (also remove the strain relief bushing). Discard the plug bracket and the attached leads.

5. Remove hole plug, 4 screws and strain relief bushing from envelope. Discard strain relief bushing. When heater is installed, power for the air handler is provided from the heater so that only one power entry is required to provide power to the equipment. Install hole plug in 7/8" diameter hole in air handler cabinet adjacent to air handler control box.

6. Remove heater cavity knockout plate (knockout with chisel and hammer).

7. Assemble baffle (shipped with heater) to wrapper on heater assembly by forcing baffle seam slot over rear lip of wrapper. See illustration on front page.

8. Insert heater into air handler heater cavity, align screw holes and secure with 4 screws (one in each corner) provided in envelope.

9. Connect low voltage polarized plug of air handler to (right hand) polarized plug of heater.

10. Disconnect two (2) halves of high voltage polarized plug of air handler and connect movable half to (left hand) high voltage polarized plug of heater.

11. Replace heater control box cover(s).

12. Remove heater power supply junction box cover plate. Locate and secure junction box to the interior rear corner of the air handler (in the position selected for power entry).

13. Connect power wiring in junction box and low voltage wiring to terminal boards per the appropriate field wiring diagram in this instruction.

14. Attach cover plate to junction box.

CAUTION: Make sure wiring is prevented from making contact with blower wheel, pulleys, or shafts.

15. Reinstall air handler access panel.

NOTE: For heaters with self-contained circuit breakers, an opening in the blower access panel is provided so that the breakers may be operated without removal of the panel. Remove four (4) screws and discard cover plate. Install circuit breaker escutcheon (provided with heater) frame (border) opening with four (4) screws previously removed. Cut out fiberglass insulation flush with inside edge of escutcheon opening **after** *installing escutcheon.*

D. HEATER INSTALLATION IN BWV739,754A,P; TWV739,764P; TWV739E; BWV742, 748, 760A,P

1. Remove cover(s) from heater control box. Retain screws.

2. Puncture insulation covering mounting holes (4) at rear inside corners of control box.

3. Remove air handler access panel from air handler.

4. Disconnect 2 polarized plugs and remove bracket with mating halves from air handler. Remove the field connection leads from the control box (also remove the strain relief bushing). Discard the plug bracket and the attached leads.

5. Remove hole plug and 4 screws from envelope. When heater is installed, power for the air handler is provided from the heater so that only one power entry is required to provide power to the equipment. Install hole plug in 7/8" diameter hole in air handler cabinet adjacent to air handler control box.

6. Remove heater cavity knockout plate (knockout with chisel and hammer), and remove junction box shipped with air handler in heater cavity.

7. Assemble baffle (shipped with heater) to wrapper on heater assembly by forcing baffle seam slot over rear lip of wrapper. See illustration on front page.

8. Disassemble power wiring junction box. Retain sheet metal part with connector & wiring attached.

9. Remove knockout from cabinet in one of four power entry locations selected.

10. Remove wire clamp from heater control box securing power wiring to bottom of control box.

11. Insert heater into air handler heater cavity, align screw holes and secure with 4 screws (one in each corner) provided in envelope.

12. Connect low voltage polarized plug of air handler to (right hand) polarized plug of heater.

13. Connect high voltage polarized plug of air handler to (left hand) high voltage polarized plug of heater.

14. Replace heater control box cover(s).

15. Route power wiring with connector plate to rear of cabinet and feed power wiring thru knockout for power entry.

16. Secure heater connector plate with 4 screws to cabinet.

17. Attach junction box to cabinet over power wiring entry with 4 screws.

18. Connect power wiring in junction box and low voltage wiring to terminal boards per the appropriate field wiring diagram.

NOTE: When these air handlers are equipped with supplementary heaters in a downflow application, cable clamp(s) must be used to route heater power supply cables over & away from sheet metal edges of blower housing.

19. If power supply cables are from the right side, assemble (2) clamps around cables and attach with screws to air handler cabinet in locations shown in figure 1. Use (1) clamp removed in D-10 & (1) clamp included with sub-base BAY99X112.

20. If power supply cables are from the right rear, assemble (1) clamp around cables and attach to air handler cabinet with 1 screw in location shown in figure 2.

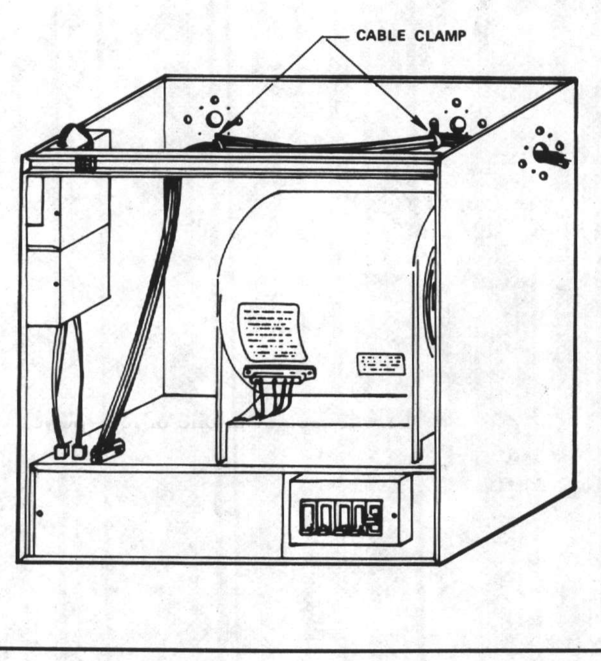
21. Reinstall air handler access panel.

NOTE: For heaters with self-contained circuit breakers, an opening in the blower access panel is provided so that the breakers may be operated without removal of the panel. Remove and discard cover plate. Cut out fiberglass insulation flush with inside edge of escutcheon opening.

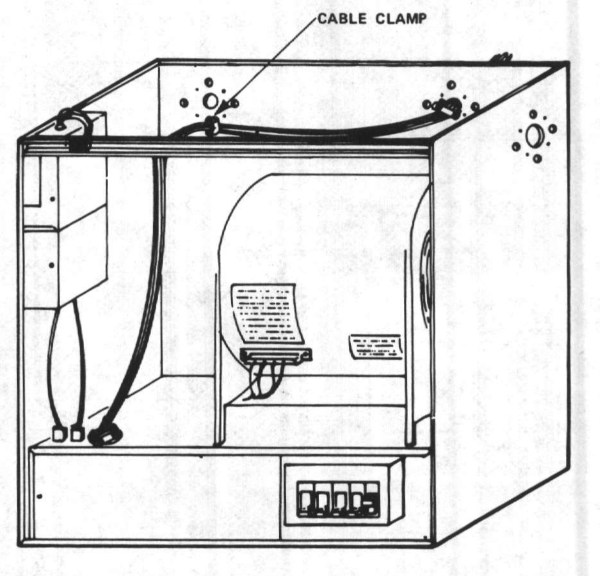
22. Attach cover plate to junction box.

CAUTION: Make sure wiring is prevented from making contact with blower wheel, shafts, and sheet metal edges.

1



2



E. HEATER INSTALLATION IN BWH739,754P (or A); TWH739,764P BWH748,760P (or A)

1. Remove cover(s) from heater control box. Retain screws.

2. Puncture insulation covering mounting holes (4) at rear inside corners of control box.

3. Remove air handler access panel from air handler.

4. Disconnect polarized plug from high voltage junction box and remove 4 screws securing junction box. Discard box with pigtails and plug.

5. Remove hole plug, 4 screws and strain relief bushing from envelope. When heater is installed, power for the air handler is provided from the heater so that only one power entry is required to provide power to the equipment. Install hole plug in 7/8" diameter hole in air handler cabinet adjacent to air handler terminal board.

6. Remove junction box shipped with air handler and remove heater cavity plate with chisel and hammer.

7. Assemble baffle (shipped with heater) to wrapper on heater assembly by forcing baffle seam slot over rear lip of wrapper. See illustration on front page.

8. Disassemble power wiring junction box. Retain sheet metal part with connector & wiring attached.

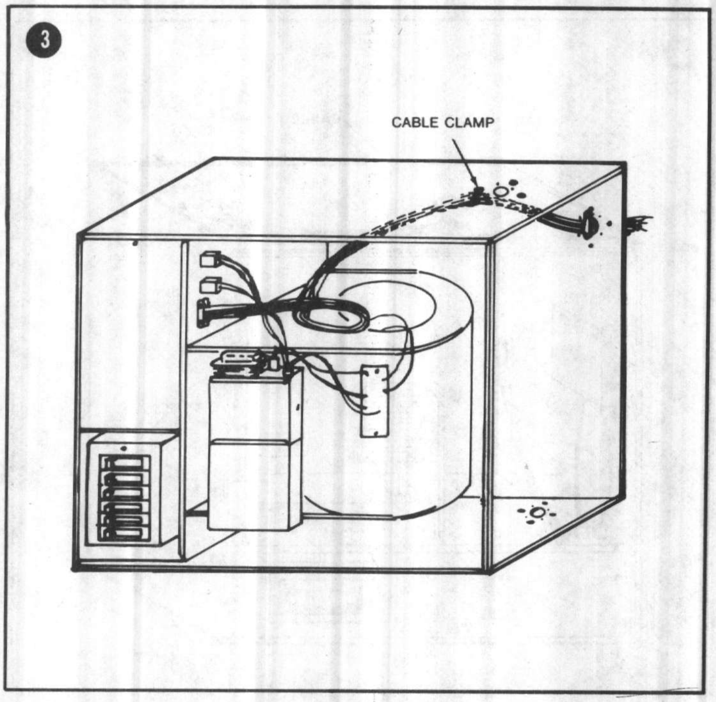
9. Remove knockout from cabinet in one of four power entry locations selected.

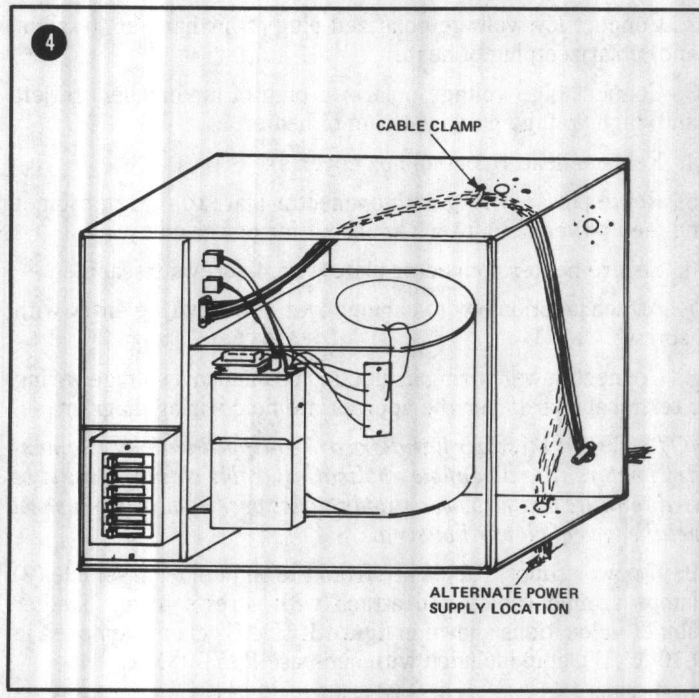
10. Remove wire clamp from heater control box securing power wiring to bottom of control box.

11. Insert heater into air handler heater cavity, align screw holes and secure with 4 screws (one in each corner) provided in envelope.

12. Disconnect low voltage polarized plug from dummy plug in air handler and connect to mating polarized plug of heater.

13. Connect high voltage polarized plug from air handler control box to mating polarized plug of heater.





14. Replace heater control box cover(s).

15. Route power wiring with connector plate to rear of cabinet and feed power wiring thru knockout for power entry.

16. Secure heater connector plate with 4 screws to cabinet.

17. Attach junction box to cabinet over power wiring entry with 4 screws.

18. Connect power wiring in junction box and low voltage wiring to terminal boards per the appropriate field wiring diagram.

19. Attach cover plate to junction box.

20. When these air handlers are equipped with supplementary heaters in an as shipped configuration, route power wiring from heater to junction box (as shown in figure 3) such that wiring is prevented from making contact with blower wheel, shafts and sheet metal edges.

21. When these air handlers are equipped with supplementary heaters in a field converted configuration (rear blower access), assemble cable clamp removed in E-10 around power wiring and attach to air handler cabinet with (1) screw in location shown in figure 4.

CAUTION: Make sure wiring is prevented from making contact with blower wheel, shafts, and sheet metal edges.

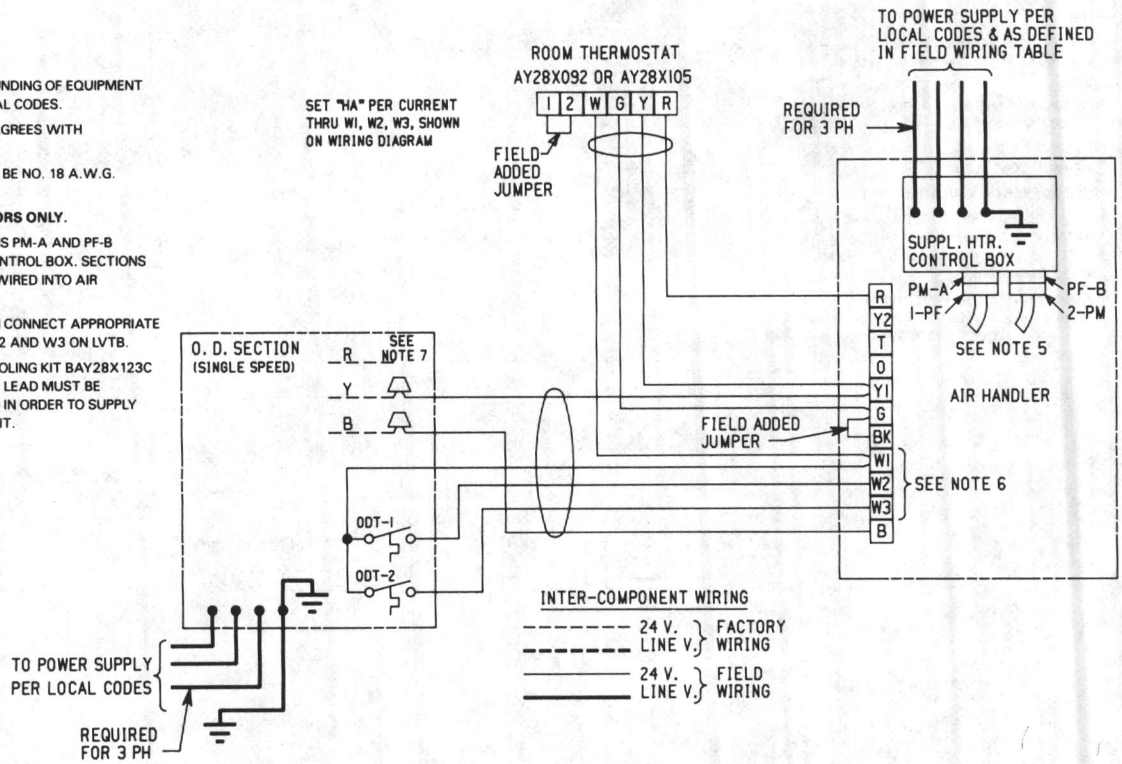
22. Reinstall air handler access panel.

NOTE: For heaters with self-contained circuit breakers, an opening in the blower access panel is provided so that the breakers may be operated without removal of the panel. Remove and discard cover plate. Cut out fiberglass insulation flush with inside edge of escutcheon opening.

TWV,TWH764P AIR HANDLERS WITH SINGLE SPEED COOLING UNITS & AY28X092 OR AY28X105 THERMOSTATS

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TO USE LOW AMBIENT COOLING KIT BAY28X123C ON 3 PHASE MODELS, "R" LEAD MUST BE CONNECTED TO "Y" LEAD IN ORDER TO SUPPLY CONTROL VOLTAGE FOR KIT.

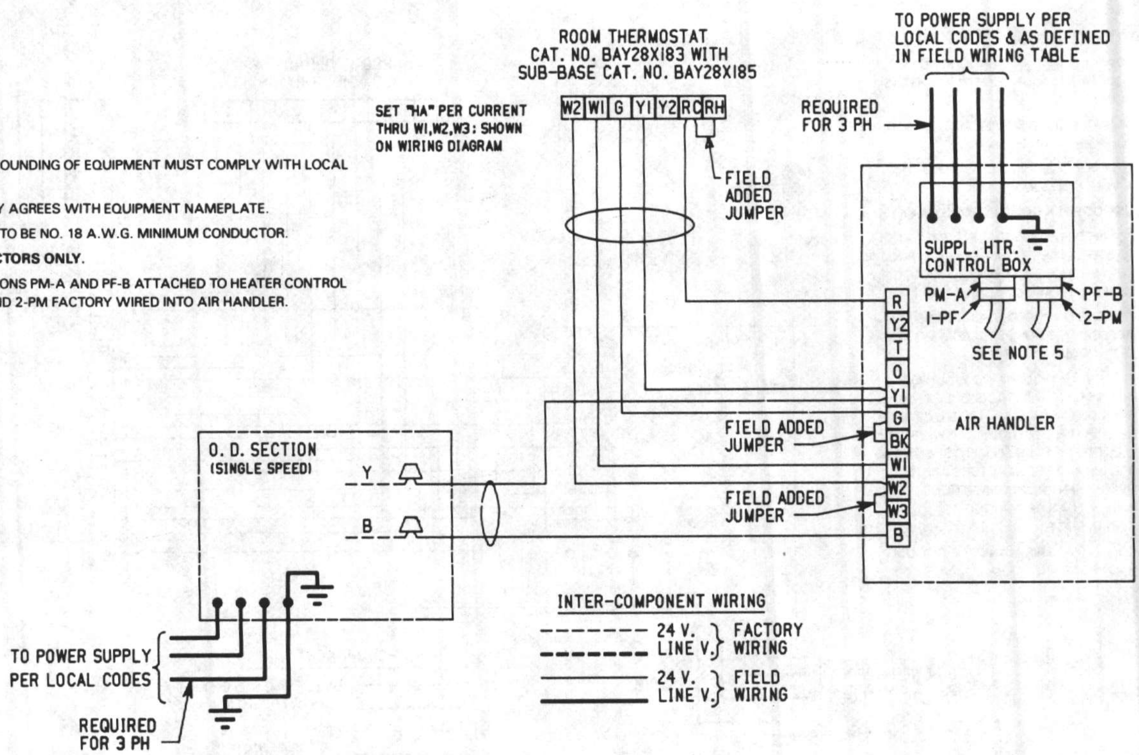


From Dwg. 21B130729 Rev. 4

TWV,TWH764P AIR HANDLERS WITH SINGLE SPEED COOLING UNITS & BAY28X183 THERMOSTAT

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.

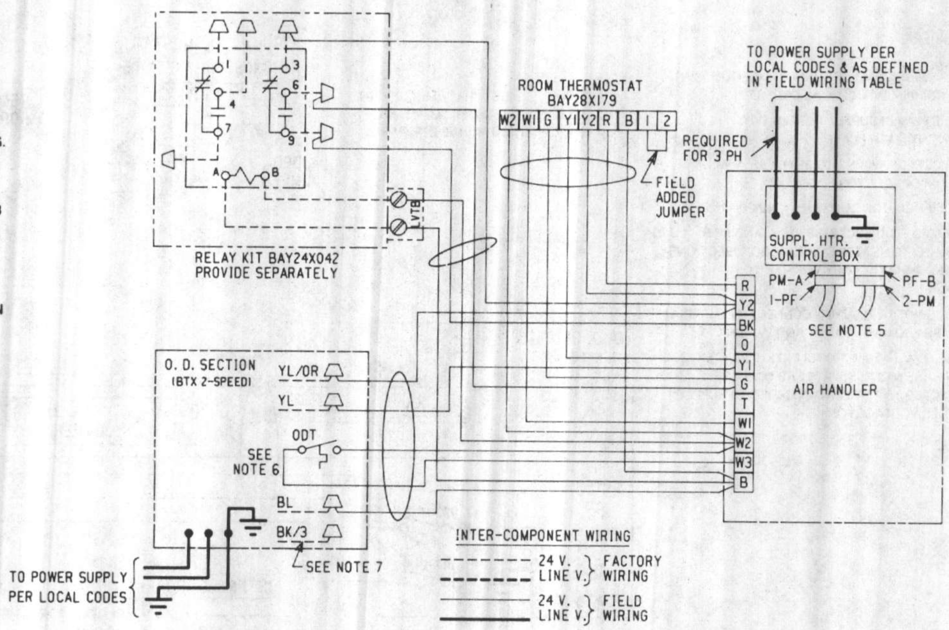


From Dwg. 21B130728 Rev. 5

TWV,TWH764P AIR HANDLERS WITH TWO SPEED COOLING UNITS & BAY28X164 OR BAY28X179 THERMOSTAT

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPER FROM W2 TO W3 ON AIR HANDLER LOW VOLTAGE TERMINAL BOARD.
7. THIS LEAD NOT USED IN THIS APPLICATION.

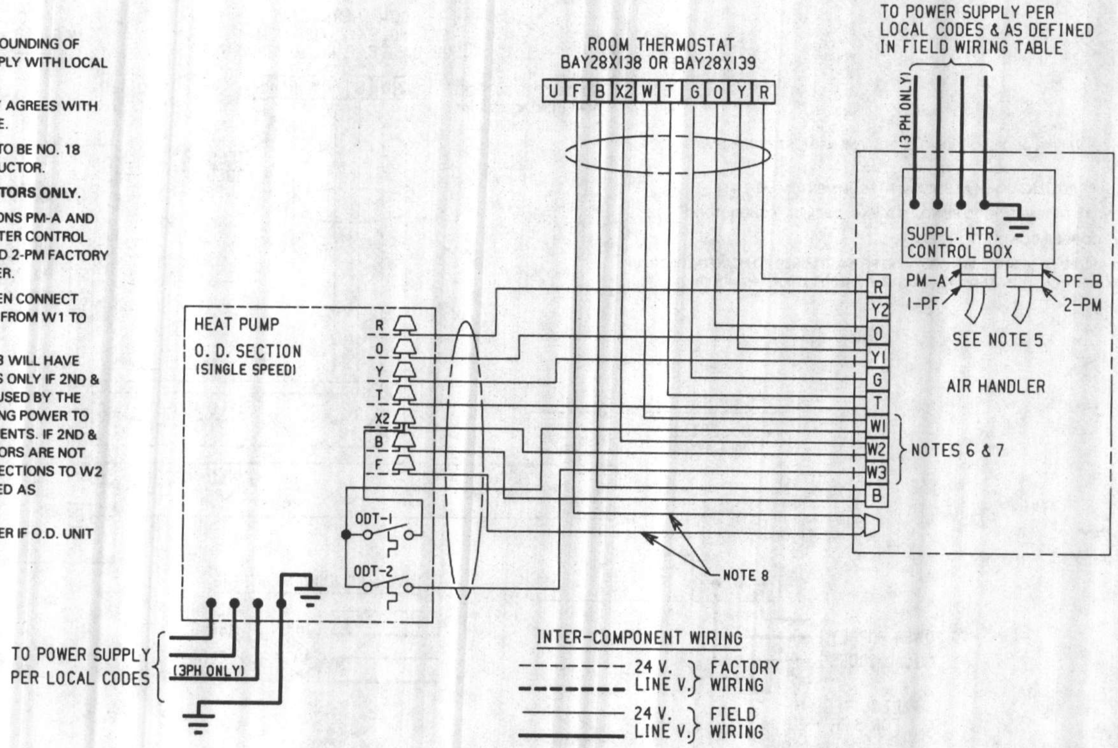


From Dwg. 21B130725 Rev. 4

FIELD WIRING DIAGRAM FOR BWV,BWH,TWV,TWH AIR HANDLERS WITH WEATHERTRON® HEAT PUMP AND SUPPLEMENTARY HEATERS

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TERMINALS W2 AND W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND & 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND & 3RD (BH & CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 AND W3 CAN BE OMITTED AS APPROPRIATE.
8. CONNECT IN THIS MANNER IF O.D. UNIT HAS "F" CONNECTION.



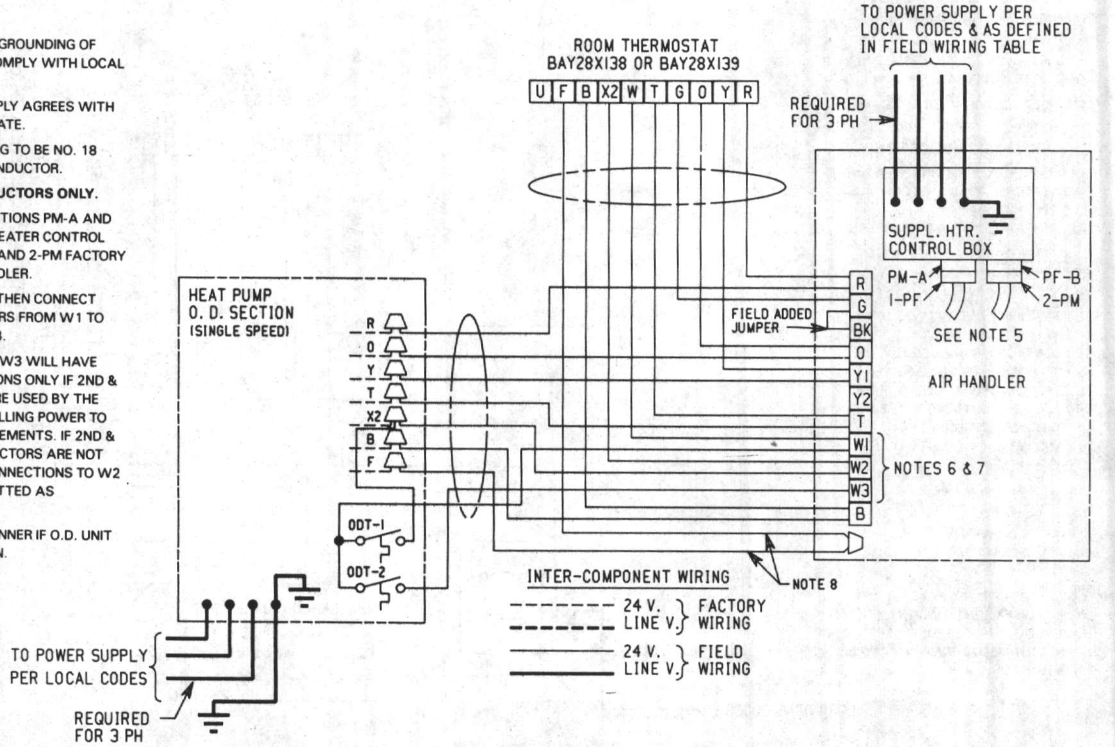
From Dwg. 21B131066 Rev. 1

DATA SUBJECT TO CHANGE WITHOUT NOTICE

TWV,TWH764P TWO SPEED AIR HANDLERS WITH SINGLE SPEED WEATHERTRON® HEAT PUMPS AND SUPPLEMENTARY HEATERS

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TERMINALS W2 AND W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND & 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND & 3RD (BH & CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 AND W3 CAN BE OMITTED AS APPROPRIATE.
8. CONNECT IN THIS MANNER IF O.D. UNIT HAS "F" CONNECTION.

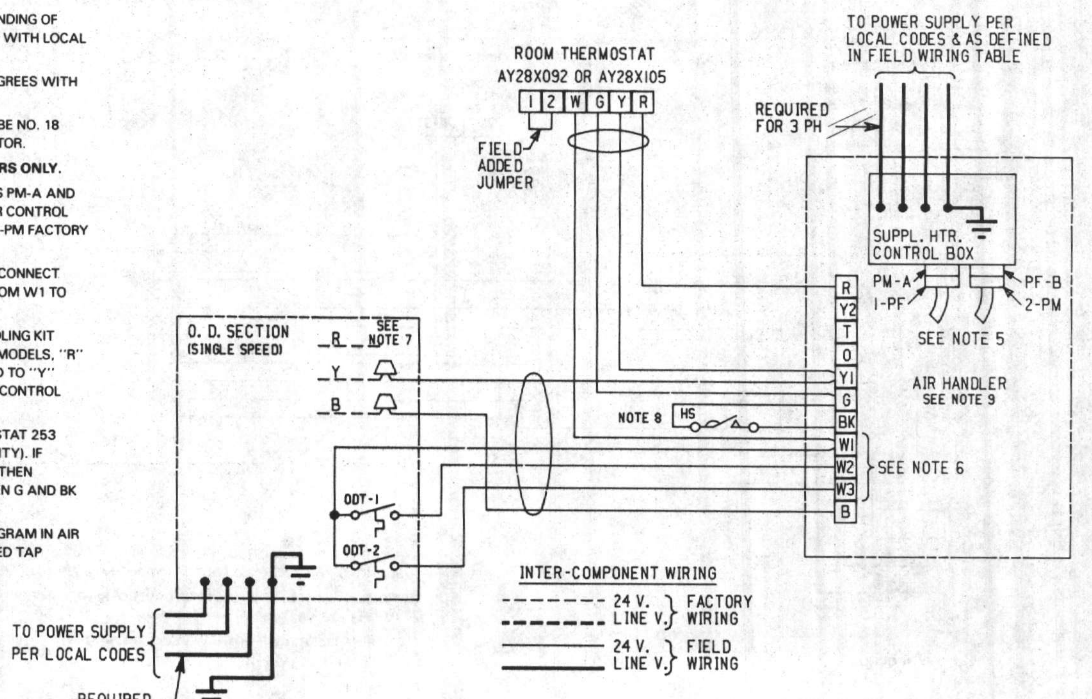


From Dwg. 21B130727 Rev. 5

FIELD WIRING DIAGRAM FOR COOLING MODELS WITH TWV739E (VARIABLE SPEED) AIR HANDLER

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TO USE LOW AMBIENT COOLING KIT BAY28X123C ON 3 PHASE MODELS, "R" LEAD MUST BE CONNECTED TO "Y" LEAD IN ORDER TO SUPPLY CONTROL VOLTAGE FOR KIT.
8. HUMIDISTAT CAT. NO BAYSTAT 253 (CLOSES ON FALL IN HUMIDITY). IF HUMIDISTAT IS NOT USED, THEN CONNECT JUMPER BETWEEN G AND BK ON LVTB.
9. SEE NOTES ON WIRING DIAGRAM IN AIR HANDLER FOR PROPER SPEED TAP SETTINGS.

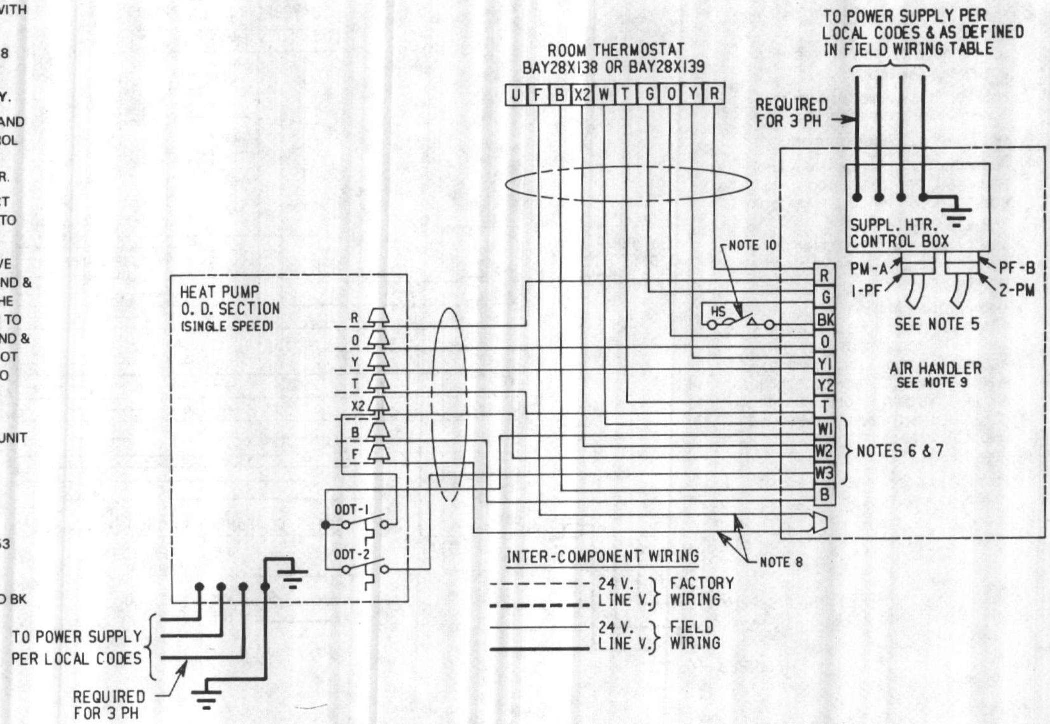


From Dwg. 21B139484 Rev. 1

TWV739E (VARIABLE SPEED) AIR HANDLER WITH SINGLE SPEED HEAT PUMP MODELS AND SUPPLEMENTARY HEATERS

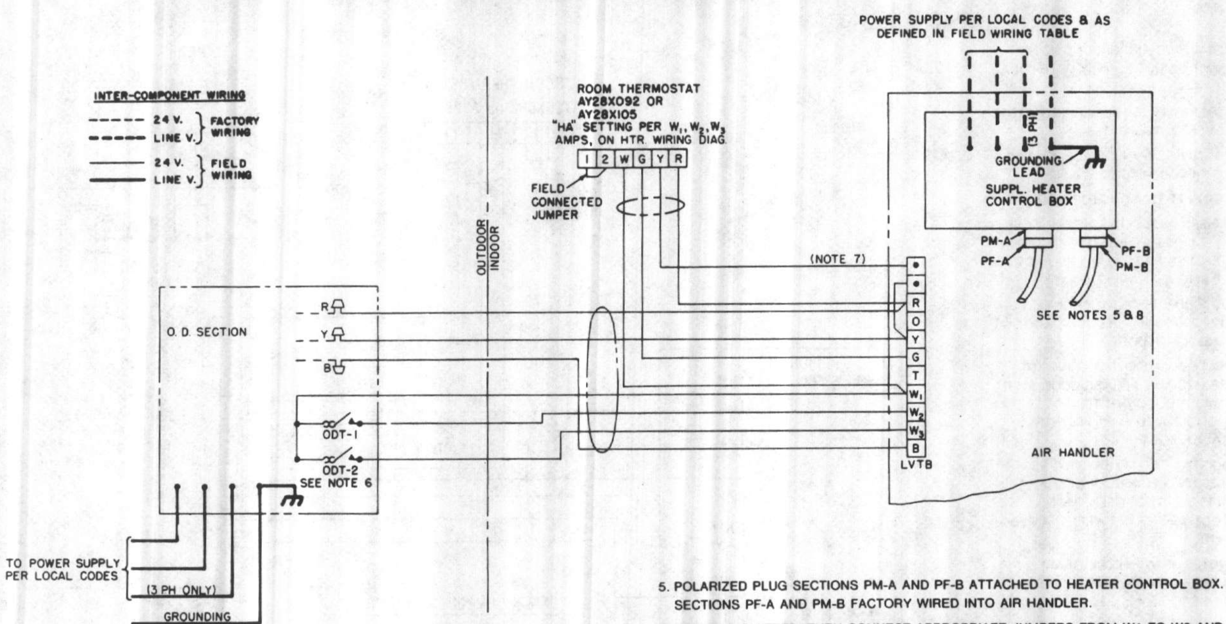
NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TERMINALS W2 AND W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND & 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND & 3RD (BH & CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 AND W3 CAN BE OMITTED AS APPROPRIATE.
8. CONNECT IN THIS MANNER IF O.D. UNIT HAS "F" CONNECTION.
9. SEE NOTES ON WIRING DIA IN AIR HANDLER FOR PROPER SPEED TAP SETTINGS.
10. HUMIDISTAT CAT. NO. BAYSTAT 253 (CLOSES ON FALL IN HUMIDITY). IF HUMIDISTAT IS NOT USED, THEN CONNECT JUMPER BETWEEN G AND BK ON LVTB.



From Dwg. 21B139485 Rev. 1

FIELD WIRING DIAGRAM
BWE — C,BTE — B WITHOUT TRANSFORMER WITH PLUG-IN HEATERS & CONDENSING UNIT WITH TRANSFORMER & O.D. THERMOSTATS

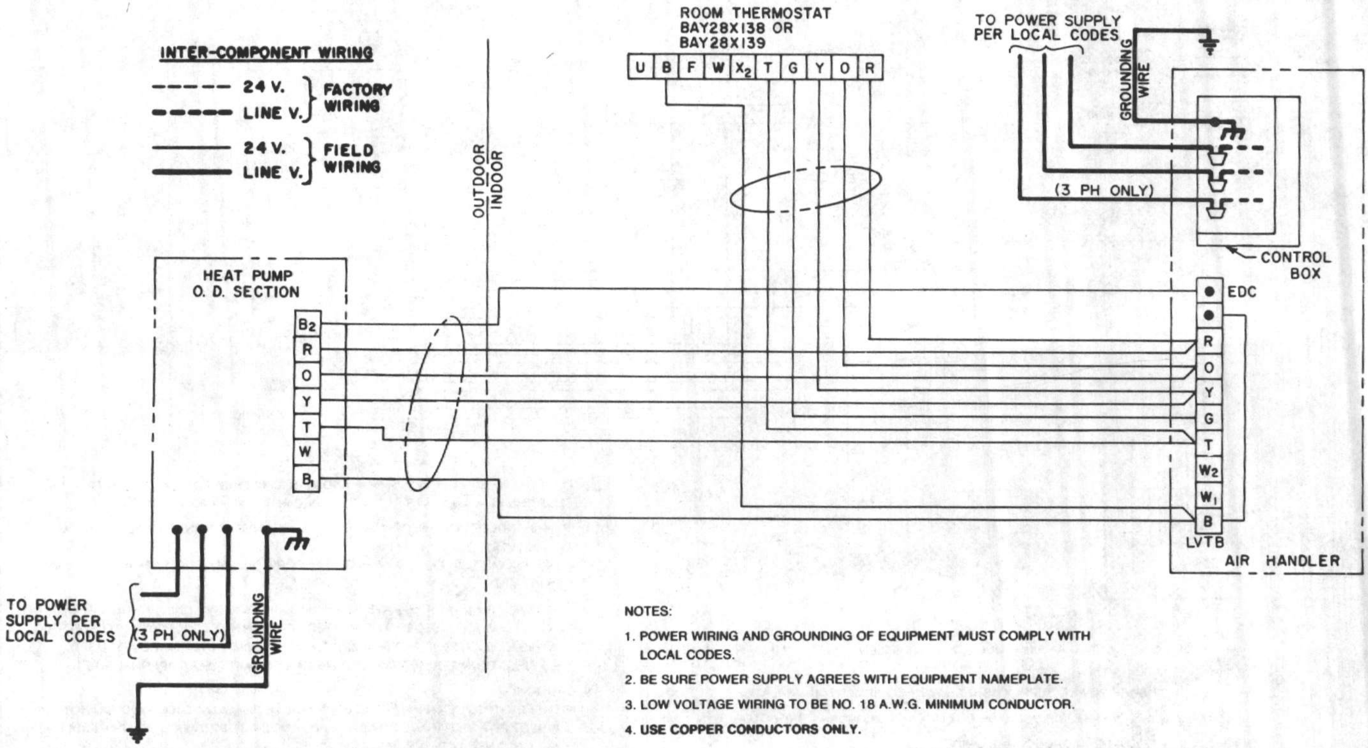


NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS PF-A AND PM-B FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS OMITTED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. IF AIR HANDLER DOES NOT HAVE EDC, THEN CONNECT THIS LEAD TO TERMINAL "Y" ON LVTB.
8. **CAUTION:** IF THREE-PHASE HEATERS ARE USED IN SINGLE PHASE WE090C,120C OR TE120C, DO NOT CONNECT PF-A. SEPARATE POWER SUPPLY MUST BE PROVIDED TO AIR HANDLER IN ACCORDANCE WITH AIR HANDLER WIRING DIAGRAM.

From Dwg. 21C126783 Rev. 1

FIELD WIRING DIAGRAM FOR WEATHERTRON® HEAT PUMPS WITH BWE — C or BPCB AIR HANDLER (NO ELECTRIC HEAT) (TRANSFORMER IN OUTDOOR UNIT)

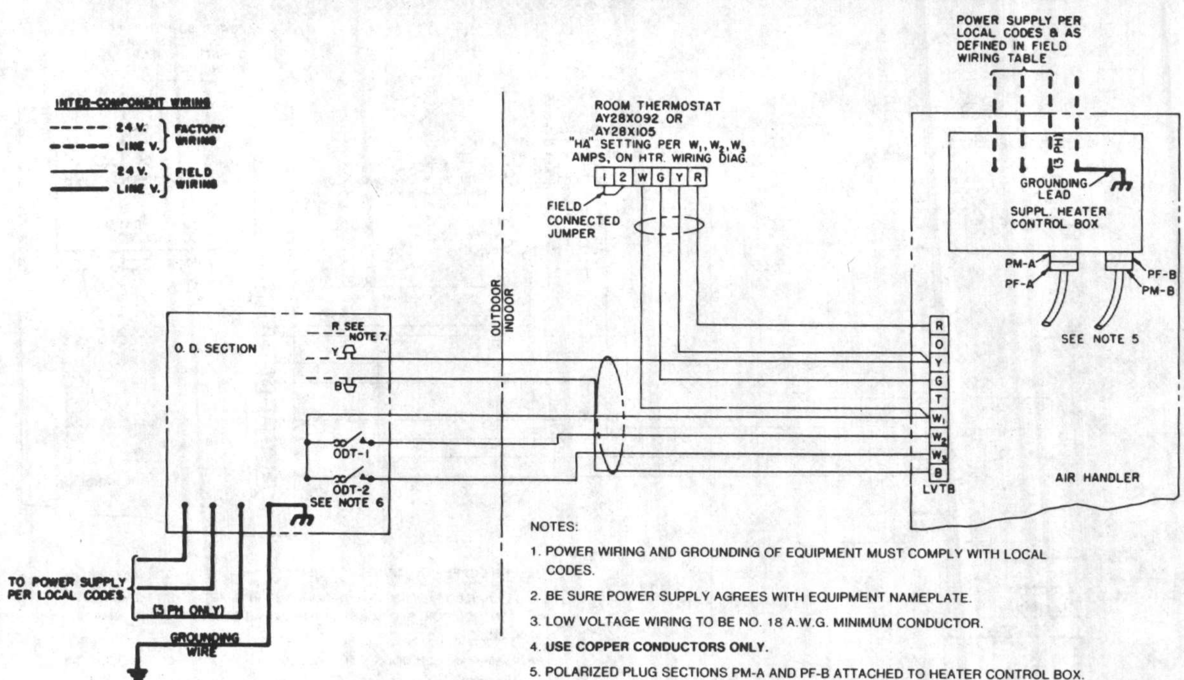


NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. USE COPPER CONDUCTORS ONLY.

From Dwg. 21C128291 Rev. 1

FIELD WIRING DIAGRAM BWE — C WITH TRANSFORMER WITH PLUG-IN HEATERS & CONDENSING UNIT WITHOUT TRANSFORMER & WITH O.D. THERMOSTATS

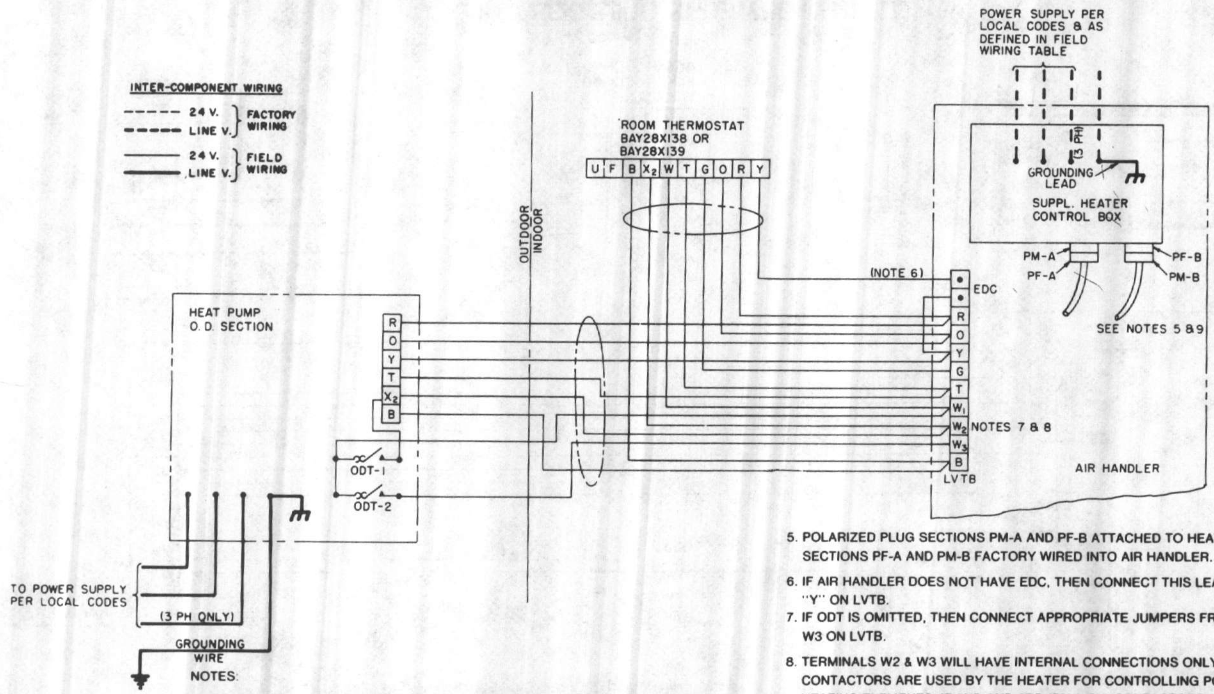


NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. USE COPPER CONDUCTORS ONLY.
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS PF-A AND PM-B FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS OMITTED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TO USE LOW AMBIENT COOLING KIT BAY28X123B ON 3 PHASE MODELS, "R" LEAD MUST BE CONNECTED ON "Y" LEAD IN ORDER TO SUPPLY CONTROL VOLTAGE FOR KIT.

From Dwg. 21C126746 Rev. 2

FIELD WIRING DIAGRAM
BWE — C WITH PLUG-IN HEATERS & HEAT PUMP WITH O.D. THERMOSTATS

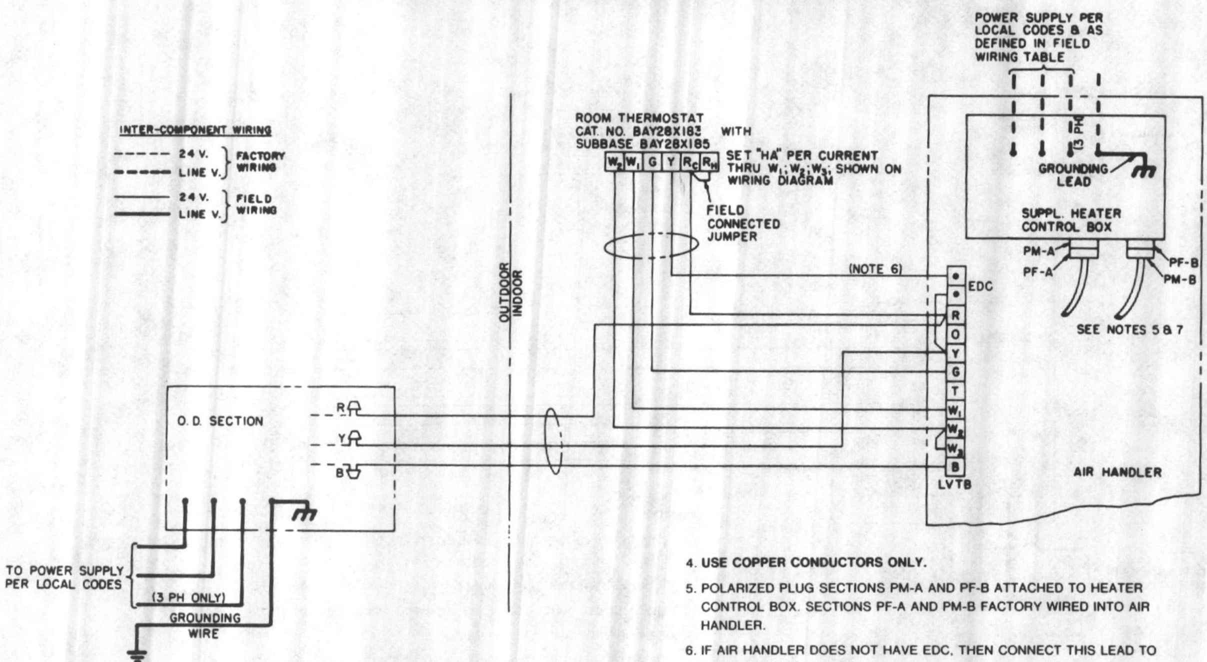


NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS PF-A AND PM-B FACTORY WIRED INTO AIR HANDLER.
6. IF AIR HANDLER DOES NOT HAVE EDC, THEN CONNECT THIS LEAD TO TERMINAL "Y" ON LVTB.
7. IF ODT IS OMITTED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
8. TERMINALS W2 & W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND & 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND AND 3RD (BH & CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 & WE CAN BE OMITTED AS APPROPRIATE.
9. **CAUTION:**
IF THREE-PHASE HEATERS ARE USED IN SINGLE PHASE WE090C,120C, DO NOT CONNECT PF-A. SEPARATE POWER SUPPLY MUST BE PROVIDED TO AIR HANDLER IN ACCORDANCE WITH AIR HANDLER WIRING DIAGRAM.

From Dwg. 21C126747 Rev. 2

FIELD WIRING DIAGRAM
BWE — C,BTE-B WITHOUT TRANSFORMER & CONDENSING UNIT WITH TRANSFORMER AND PLUG-IN 2-STAGE HEAT

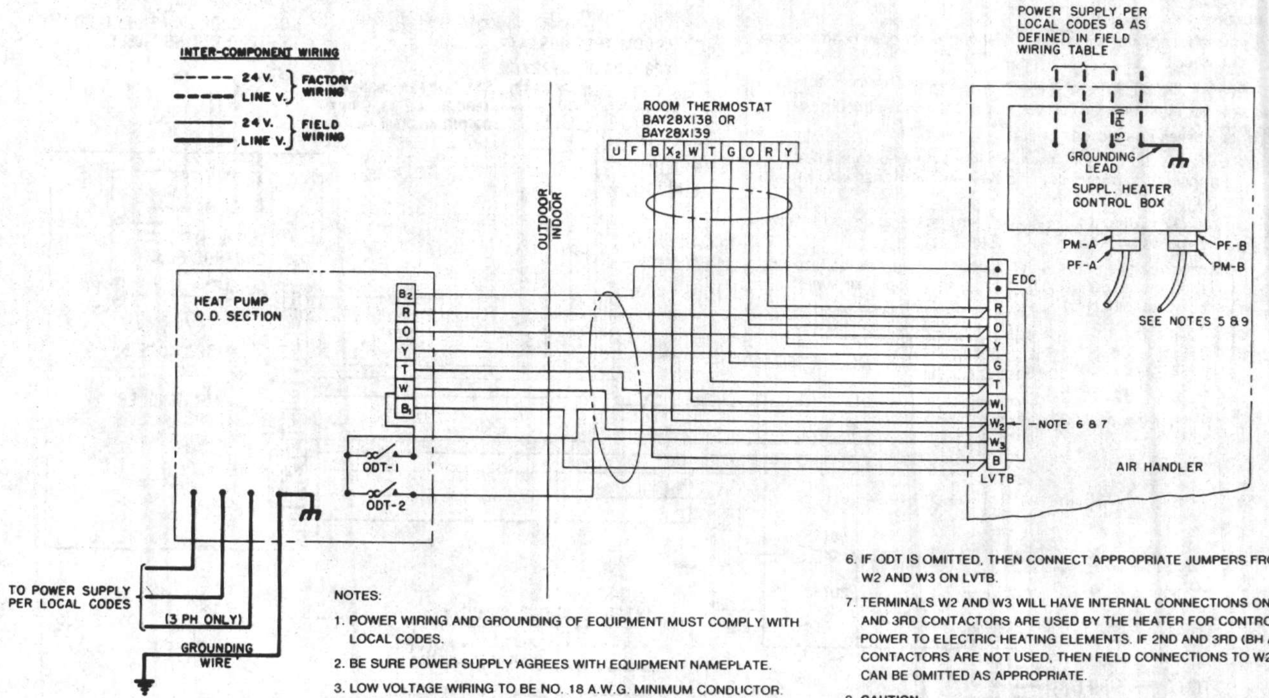


NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS PF-A AND PM-B FACTORY WIRED INTO AIR HANDLER.
6. IF AIR HANDLER DOES NOT HAVE EDC, THEN CONNECT THIS LEAD TO TERMINAL "Y" ON LVTB.
7. **CAUTION:**
IF THREE-PHASE HEATERS ARE USED IN SINGLE PHASE WE090C, 120C OR TE120C, DO NOT CONNECT PF-A. SEPARATE POWER SUPPLY MUST BE PROVIDED TO AIR HANDLER IN ACCORDANCE WITH AIR HANDLER WIRING DIAGRAM.

From Dwg. 21C126784 Rev. 2

FIELD WIRING DIAGRAM FOR WEATHERTRON® HEAT PUMPS WITH BWE — C or BPCB AIR HANDLERS WITH SUPPLEMENTARY HEATERS (TRANSFORMER IN OUTDOOR UNIT)



NOTES:

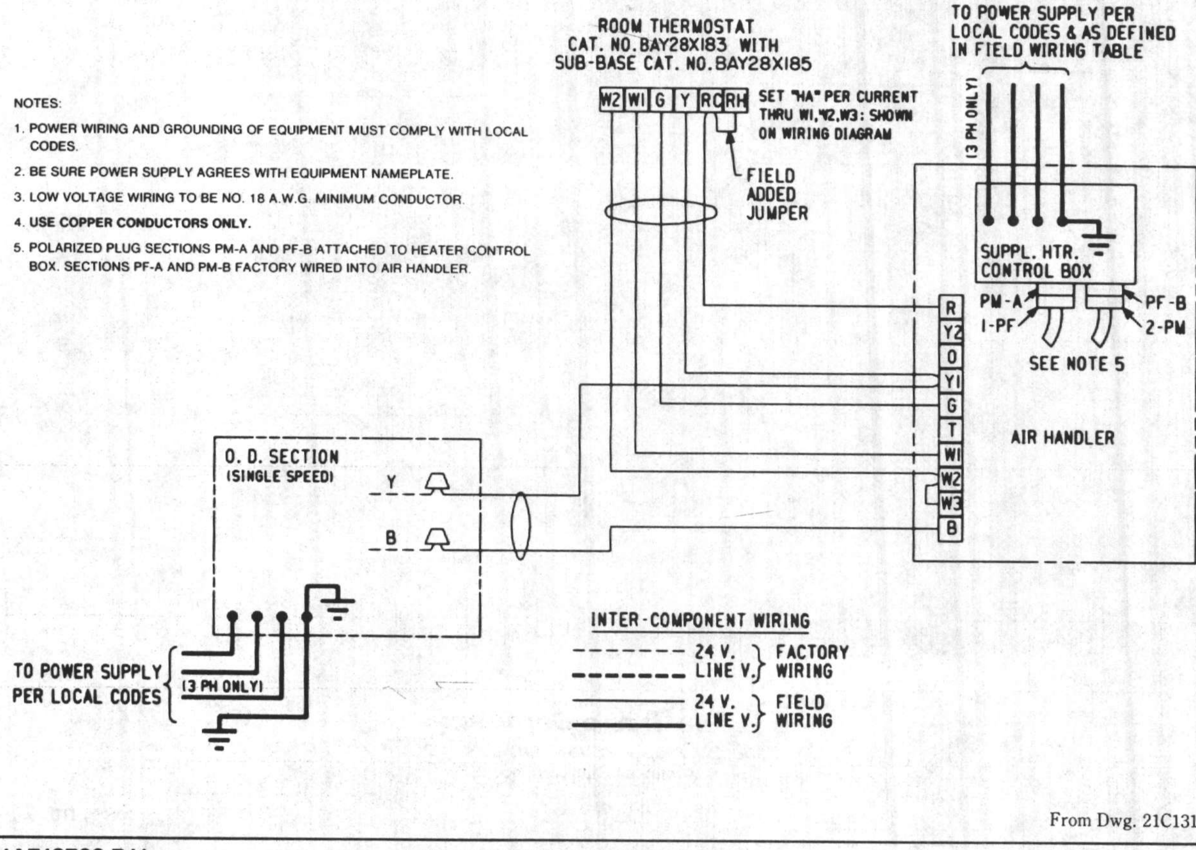
1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS PF-A AND PM-B FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS OMITTED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TERMINALS W2 AND W3 WILL HAVE INTERNAL CONNECTIONS ONLY IF 2ND AND 3RD CONTACTORS ARE USED BY THE HEATER FOR CONTROLLING POWER TO ELECTRIC HEATING ELEMENTS. IF 2ND AND 3RD (BH AND CH) CONTACTORS ARE NOT USED, THEN FIELD CONNECTIONS TO W2 AND W3 CAN BE OMITTED AS APPROPRIATE.
8. **CAUTION:**
   IF THREE-PHASE HEATERS ARE USED IN SINGLE PHASE WE075C, 100C, DO NOT CONNECT PF-A. SEPARATE POWER SUPPLY MUST BE PROVIDED TO AIR HANDLER IN ACCORDANCE WITH AIR HANDLER WIRING DIAGRAM.

From Dwg. 21C128292 Rev. 1

FIELD WIRING DIAGRAM BWV — A,P;BWH — A,P; TWV-P; TWH-P AIR HANDLERS WITH CONDENSING UNIT AND PLUG-IN 2-STAGE HEAT

NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS PF-A AND PM-B FACTORY WIRED INTO AIR HANDLER.

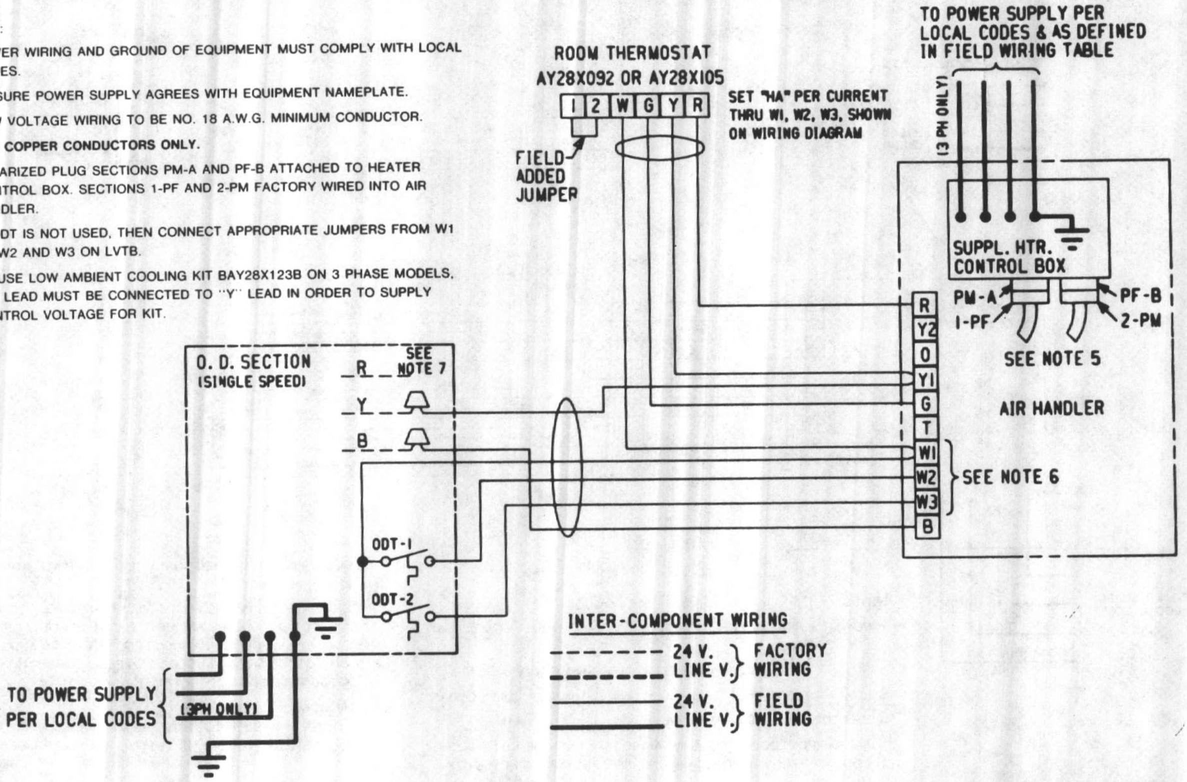


From Dwg. 21C131065 Rev. 1

FIELD WIRING DIAGRAM
BWV — A,P;BWH — A,P; TWV-P; TWH-P AIR HANDLERS
WITH CONDENSING UNIT & WITH O.D. THERMOSTATS

NOTES:

1. POWER WIRING AND GROUND OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE NO. 18 A.W.G. MINIMUM CONDUCTOR.
4. **USE COPPER CONDUCTORS ONLY.**
5. POLARIZED PLUG SECTIONS PM-A AND PF-B ATTACHED TO HEATER CONTROL BOX. SECTIONS 1-PF AND 2-PM FACTORY WIRED INTO AIR HANDLER.
6. IF ODT IS NOT USED, THEN CONNECT APPROPRIATE JUMPERS FROM W1 TO W2 AND W3 ON LVTB.
7. TO USE LOW AMBIENT COOLING KIT BAY28X123B ON 3 PHASE MODELS, "R" LEAD MUST BE CONNECTED TO "Y" LEAD IN ORDER TO SUPPLY CONTROL VOLTAGE FOR KIT.



From Dwg. 21B131067 Rev. 1

The Trane Company

Dealer Products Group • Troup Highway • Tyler, TX 75711

dwg. no. 21A712793 P11
P.I.

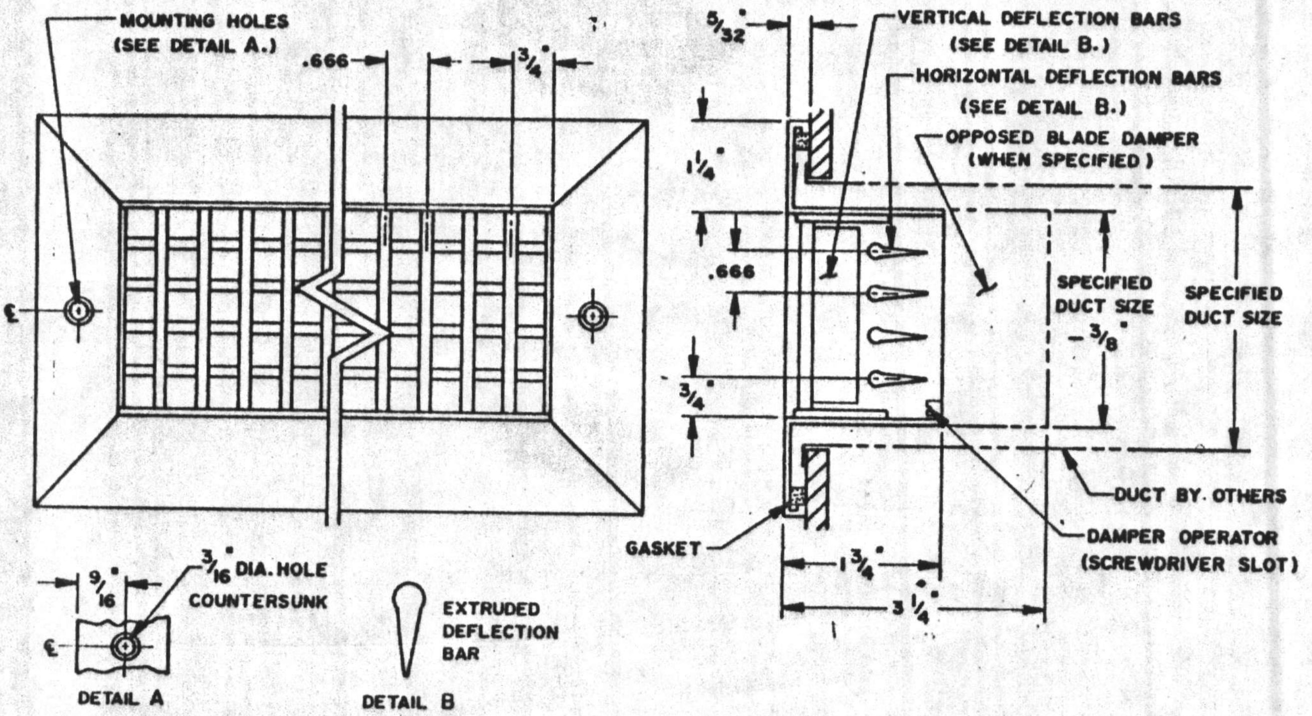
METAL*AIRE

SUBMITTAL SCHEDULE

SUBMITTED BY: Hoffman & Hoffman, Inc. DATE: 12/4/86
PROJECT NAME & LOCATION Replace Air Conditioning System, New River & Camp LeJeune
ARCHITECT: ENGINEER:
CONTRACTOR: Kinston Plumbing & Heating Co. CONTR. P.O. NO. 3312

MARK	Area Served	MODEL	NECK Size	Qty.	C.F.M.	Accessories / Remarks
L	M-217	V4004D	18x8	10	200	OBD, Extractor
M	M-217	V4004D	18x8	8	250	" "
U	M-217	RHD	12x6	2	-	OBD
V	M-217	RHD	24x24	2	-	OBD
NA	M-217	RH	14x26	4	-	Transfer Grille
L	M-218	V4004D	18x8	10	200	OBD, Extractor
M	M-218	V4004D	18x8	8	250	" "
U	M-218	RHD	12x6	2	-	OBD
Y	M-218	RHD	24x24	2	-	OBD
L	M-220	V4004D	18x8	10	200	OBD, Extractor
M	M-220	V4004D	18x8	8	250	" "
U	M-220	RHD	12x6	2	-	OBD
Y	M-220	RHD	24x24	2	-	"
NA	TC-1038	RH	60x32	1	5400	
NA	TC-1059	RH	60x32	1	5585	

AIR DISTRIBUTION SUBMITTAL



NOTES:

1. CONSTRUCTION: FRAME OF HEAVY DUTY EXTRUDED ALUMINUM MATERIAL .045 THICKNESS. DEFLECTING BARS OF EXTRUDED ALUMINUM MATERIAL .160 TAPPERED TO A SEMI-AIR-FOIL SHAPE.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: UNIT MOUNTING SCREWS FURNISHED.
4. DAMPER: OPPOSED BLADE DAMPER FURNISHED WHEN SPECIFIED. FOR DETAILS OF DAMPER CONSTRUCTION SEE DRAWING NO. 6005.
5. FRAME: GASKETED TO PREVENT AIR LEAKAGE AND MINIMIZE SMUDGING.
6. DUCT FABRICATION: UNIT COLLAR OR NECK DIMENSIONS VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 14" X 6" SPECIFIED, DUCT I.D. 14" X 6".

METAL*AIRE®
Aluminum Air Distribution Products

MODEL V4004 OR V4004D

DOUBLE DEFLECTION
SIDEWALL SUPPLY

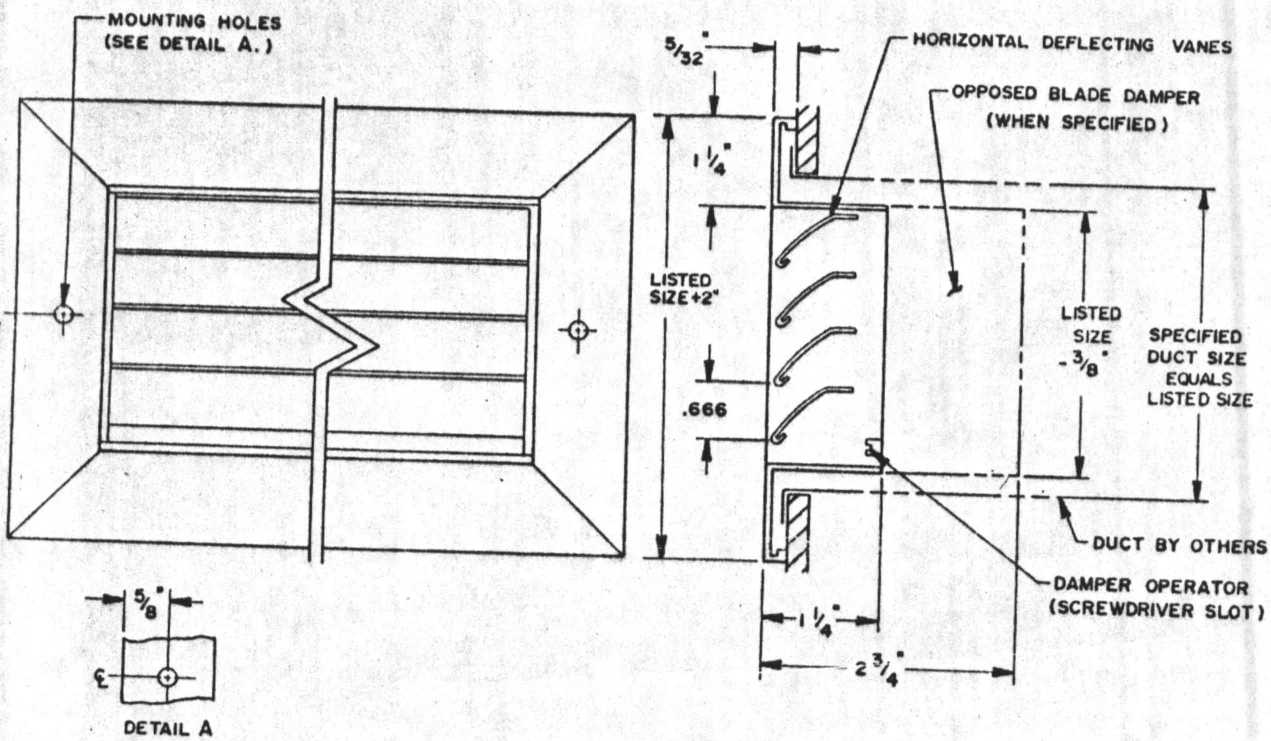
☐ MODEL V4004 (GRILLE - NO DAMPER)
☐ MODEL V4004D (REGISTER - WITH DAMPER)

JOB NAME:
LOCATION:
ARCHITECT:
ENGINEER:
CONTRACTOR:

SUBMITTED BY:

...WN BY:	JG	CHK'D. BY:	KR
...TE:	3 APR 1970	DWG. NO.	4010

AIR DISTRIBUTION SUBMITTAL



NOTES:

1. CONSTRUCTION: FRAME OF ALUMINUM MATERIAL .040 THICKNESS. DEFLECTING VANES ARE .040 ALUMINUM FORMED TO STREAMLINED 45° CURVE. FRAMES ARE 1-PIECE CONSTRUCTION THRU SIZE 14"X14" UNLESS OTHERWISE SPECIFIED. SIZES ABOVE 14"X14" HAVE HEAVY DUTY EXTRUDED ALUMINUM FRAMES.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: UNIT MOUNTING SCREWS FURNISHED.
4. DAMPER: OPPOSED BLADE DAMPER FURNISHED WHEN SPECIFIED. FOR DETAILS OF DAMPER CONSTRUCTION, SEE DRAWING NO. 6006-1.
5. DUCT FABRICATION: UNIT COLLAR OR NECK DIMENSIONS VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 12"X12" SPECIFIED, DUCT I.D. 12"X12".

METAL*AIRE
Aluminum Air Distribution Products

JOB NAME:
LOCATION:
ARCHITECT:
ENGINEER:
CONTRACTOR:

SUBMITTED BY:

MODEL RH OR RHD
45° DEFLECTION
SIDEWALL OR CEILING RETURN

- ☐ MODEL RH (GRILLE - NO DAMPER)
- ☐ MODEL RHD (REGISTER - WITH DAMPER)

AWN BY:	JG	CHK'D. BY:	KR
TE:	15 MAY 1970	DWG. NO.	4024-1

METAL INDUSTRIES INC., Clearwater, Florida **MEMBER: Air Diffusion Council**

TAB PLACEMENT HERE

DESCRIPTION:

Bldgs. 1038 & 1059

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TRANE™ #6336-12, Items 1&2

Page Number	15
Trane Order Number	F4M369A

11-12-86

The Trane Company
Division of American Standard Inc.
La Crosse WI 54601-7599
Clarksville TN 37040

Trane Job Number	Customer Order Number	Number of Prints	Date to Ship	Type of Order
F4-10490	3299	11 LIT 00	00-00-00HA	SUB

Architect

Engineer CHEATHAM & ASSOC., WILMINGTON, NC

Trane Salesman
R CRAWFORD

Job Name/Location
REPLACE AC BLDGS TC1038 & TC1059
CAMP LEJEUNE, NC

Sold To
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC 28502

Ship To Project
KINSTON PLBG. & HTG. CO.
C/O BLDG. TC1038 & TC1059
CAMP LEJEUNE, NC
28542

Mark Packages — Project Name

Item	Quantity	Trane Ordering Number	Specifications
10.00	0001	BTA180D300A	15 TON SPLIT SYSTEM CONDENSING UNIT 208-230/3/60
			TAG: BLDG. TC-1038
20.00	0001	BWV180B300D	15 TON SPLIT SYSTEM COOLING OR HEAT PUMP AIR HANDLER
			TAG: BLDG. TC-1038
30.00	0001	BTA180F300A	15 TON SPLIT SYSTEM CONDENSING UNIT 208-230/3/60
			TAG: BLDG. TC-1059
40.00	0001	BWV180B300D	15 TON SPLIT SYSTEM COOLING OR HEAT PUMP AIR HANDLER
			TAG: BLDG. TC-1059

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA
APPROVED
SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-85-C-6336
DATE 12-22-86
J. L. Herguelet
CDR, CEC, USN
Officer in Charge
of Construction

Cheatham & Assoc.

X APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO.
BY JCK DATE 12/5/86

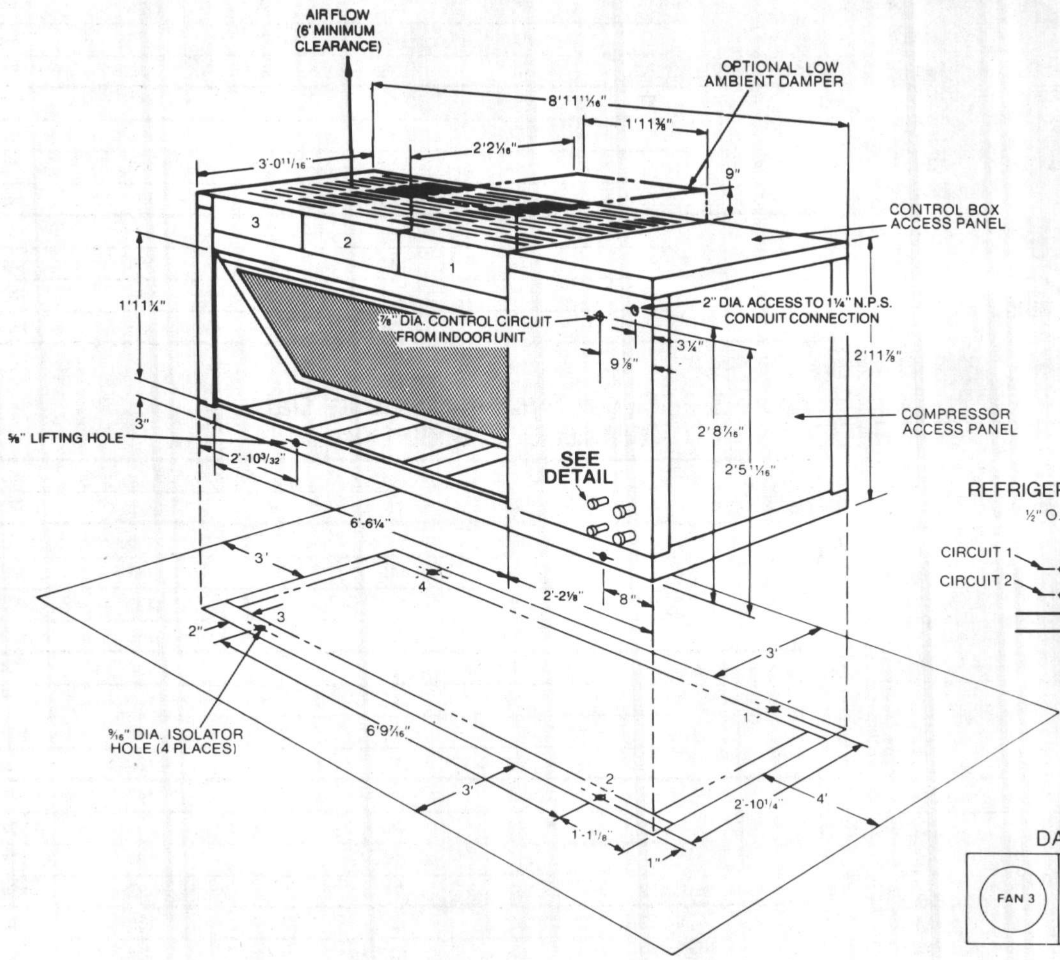
Submittal Approval Drawings			Service Literature
BTA-SQ-210.00	BTA-IN-4	BTA-M-2	BTA-SF-26
BWV-SQ-219.01	BWV-IN-1A	BWA/BTA-M-1A	BWV-SF-1A
BTA-SQ-211.00	BTA-IN-4	BTA-M-2	BTA-SF-28
BWV-SQ-219.01	BWV-IN-1A	BWA/BTA-M-1A	BWV-SF-1A

TRANE™

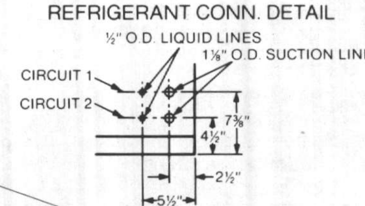
TAG: ____________________

SUBMITTAL

15-Ton Split System Condensing Unit - 30 BTA180D



REFRIGERANT CONN. DETAIL



DAMPER LOCATION

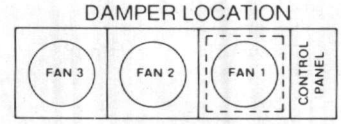


Table 1 Electrical Data

	Unit Characteristics					Compressor Motor				Condenser Fan Motors			
Model	Electrical Characteristics	Allowable Voltage Range	Minimum Circuit Ampacity	Maximum Fuse Size	Recommended Dual-Element Fuse Size	No.	RLA (Ea.)	LRA (Ea.)	Kw (Ea.)	No./Hp	FLA (Ea.)	LRA (Ea.)	Kw (Ea.)
BTA180D3	208-230/60/3	187-254	76	100	80	2	27.1	156	8.9	3/.75	5.0	11.0	0.74
BTA180D4	460/60/3	416-508	36	45	40	2	12.3	79	8.9	3/.75	2.7	5.5	0.74
BTA180DW	575/60/3	520-635	28	35	30	2	9.9	63	8.9	3/.75	1.8	4.4	0.74

NOTES:
1. Allowable voltage range is at unit terminal block.
2. Minimum circuit ampacity (MCA) is 125% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circiut.
3. Maximum fuse size is 225% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
4. Recommended dual element fuse size is 150% of the FLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
5. Local codes may take precedence.
6. Motor electrical information is for each individual motor.
7. Kw values are with matched blower coils at A.R.I. rating conditions of 80 EDB/67 EWB to the evaporator and 95 F ambient.

Table 2 Unit Weights

	BTA180D
Weight	
Shipping (Lbs)	1060
Net (Lbs)	932

Table 3 General Data

	BTA180D
Performance Data	
Gross Capacity at A.R.I. Conditions (MBh)	
Matched Blower Coil[1]	195
Condensing Unit Only	197.0
A.R.I. Cooling with Matched Blower Coil[1]	
Net Cooling Cap. (MBh)	185
Total System Kw	22.6
EER (MBh/Kw)	8.2
Indoor Cfm	6000
A.R.I. Cooling with Matched Furnace Coil	
Net Cooling Cap. (MBh)	—
EER (MBh/Kw)	—
Indoor Cfm	—
A.R.I. Sound Rating (BELS)[3]	—
Operating Data	
Standard Amb. Range (F)	45-115
Low Amb. Option (F)[4]	0
Oper. Charge—R-22 (Oz.)[5]	326
System Data	
Refrigerant Type	R-22
No. of Refrig. Circuits	2
System Capacity Steps (%)	100/50/0
Suction Lines (OD)[6]	1⅜"
Liquid Lines (OD)[6]	½"
Compressor Data	
Number	2
Nominal Size/Type	7½T/H
Unloading Steps (High Rpm/Low Rpm)	None
Outdoor Coil Data	
No. of Coils	2
Dimensions - H x L (In.)	24 x 78
Face Area (Sq Ft)	26.00
Fin Type	3/8 Wavy
Rows/Fins Per Inch	2/168
Tube Size	⅜"
Cond. Charge (Lbs R-22)	44
Outdoor Fan Data	
No. of Fans/Motors	3
Fan Type/Diameter (In.)	Prop/22
Drive/Speed	Dir/Single
Motor: Nominal Hp (each)	¾
Nominal Rpm	1100
Nominal Airflow (Cfm)	12130
Frame Size	48

NOTES:
1. At A.R.I. 210 conditions of 80/67 F (EDB/EWB) and 95 F ambient.
2. At 45 F saturated suction temperature and 95 F ambient.
3. A.R.I. 270 Noise Rating numbers are determined with the unit in the cooling operation at a 95 F outdoor ambient.
4. With optional low ambient control.
5. Operating charge is for condensing unit only (all circuits), and does not include interconnecting lines or evaporator.
6. Max. linear length 80 ft.; Max lift-suction 60 ft.; Max lift liquid 60 ft. For greater length refer to Refrigerant Piping Applications Manual.
7. At conditions of 95 F ambient and 95% full.

Table 4 Gross System Capacity Data — BTA180D At 6000 Cfm

Outdoor DB	Enter WB	Total Cap	Entering DB			
			75	80	85	90
	57	170	165	170	168	169
	62	188	146	176	186	186
	67	206	113	146	175	197
	72	224	81	110	141	175
95	57	159	156	159	157	158
	62	177	141	168	175	175
	67	195	107	142	170	189
	72	213	75	105	139	171
105	57	151	148	150	150	150
	62	167	137	152	165	165
	67	184	103	136	163	180
	72	202	71	101	134	165
115	57	141	140	140	140	140
	62	156	131	153	154	154
	67	172	98	131	168	170
	72	188	66	94	128	158

Table 5 Gross System Capacity Data — BTA180D At 6000 Cfm

Outdoor DB	Enter WB	Total Cap	Entering DB			
			75	80	85	90
85	57	167	162	167	165	165
	62	183	145	172	183	183
	67	201	113	145	173	195
	72	220	81	110	143	173
95	57	156	153	156	154	154
	62	173	142	166	171	171
	67	191	109	141	168	187
	72	209	77	106	138	169
105	57	148	145	148	147	147
	62	163	135	158	161	161
	67	180	104	137	162	176
	72	197	71	101	133	164
115	57	138	137	136	136	136
	62	153	130	149	151	151
	67	168	99	131	155	167
	72	184	66	96	127	157

Table 6 Gross Cooling Capacity Condensing Unit Only — BTA180D At 6000 Cfm

OD Temp.		Suction Reference Temperature Degrees F 30	35	40	45	50	55
65	HP	176.8	183.7	191.0	198.6	206.4	214.5
	Cap	185.7	206.6	228.4	250.9	258.7	297.3
	Kw	15.3	16.0	16.6	17.3	17.8	18.4
75	HP	200.8	208.0	215.5	223.3	231.4	239.6
	Cap	171.0	190.9	211.5	232.6	254.3	276.3
	Kw	16.0	16.8	17.5	18.2	18.8	19.4
85	HP	226.9	234.5	242.3	250.3	258.6	267.2
	Cap	156.0	174.8	194.2	214.1	234.5	255.3
	Kw	16.6	17.4	18.3	19.1	19.8	20.6
95	HP	255.2	263.1	271.2	279.7	288.3	297.4
	Cap	140.5	158.2	176.5	195.3	214.5	234.3
	Kw	17.0	18.0	18.9	19.9	20.8	21.7
105	HP	285.6	293.9	302.5	311.4	320.6	330.2
	Cap	124.7	141.3	158.4	176.2	194.4	213.4
	Kw	17.3	18.5	19.6	20.6	21.7	22.9
115	HP	318.2	327.0	336.1	345.6	355.5	366.1
	Cap	108.5	124.0	140.0	156.8	174.2	192.5
	Kw	17.6	18.8	20.1	21.4	22.7	24.1

NOTES:
1. Performance data calculated at 15 degrees subcooling and degrees superheat.
2. HP = Head Pressure (PSIG)
   Cap = Capacity (MBh)
   Kw = Outdoor Unit Kw

Mechanical Specifications

General

All condensing units shall be assembled on a heavy-gauge integral steel base. Units shall be weatherproofed and include hermetic compressor(s), condensing coils, fans and motors, controls and holding charge of R-22. Units shall have a top control box access panel and removable end panels which allow access to all major components and controls.

Casing

Unit frame shall be a one-piece welded assembly of 18-gauge zinc-coated, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish.

Refrigeration System

BTA180D shall have two separate and independent refrigeration circuits. Each refrigeration circuit shall have an integral subcooling circuit.

Compressor — BTA 180D shall be direct-drive, 3,600 rpm, hermetic reciprocating compressor(s) with centrifugal oil pump; two-point lubrication for each bearing and connecting rod; crankcase heater and well; high strength, ring-type suction and discharge valves; large gas passages and minimum clearance volumes; and rubber-in-shear isolators.

Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Internal temperature and current-sensitive motor overloads protect compressor(s) under loss of charge and other abnormal operating conditions.

Condenser Fans and Motors — Shall be vertical discharge, direct-drive fans, statically and dynamically balanced, with aluminum blades and zinc-plated steel hubs, 1,100 rpm motor with permanently lubricated ball bearings, built-in current and thermal overload protection, and weathertight slingers over bearings.

Condenser Coil — Shall be "V" type, air-cooled. Configuration aluminum fin secondary surface mechanically bonded to primary surface of ⅜-inch OD seamless copper tubing. Subcooling circuit(s) shall be provided as standard for each refrigeration circuit. Factory pressure and leak-tested to 425 psig air pressure. Metal grilles for coil protection optional.

Controls — Shall be 24-volt control circuit includes fusing and control power transformer. Unit shall be wired complete with magnetic contactors for the compressor(s), cooling low ambient fan switches, high pressure cut-out(s), low pressure cut-out(s) and reset relays. Unit shall be completely factory-wired with necessary controls and terminal block for power wiring. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-short cycle timers are available as optional accessories.

Low Ambient Operation — Standard start and operation to approximately 45 F when matched with Trane blower coils. Optional head pressure control damper permits operation to 0 F and includes necessary controls for low ambient operation.

Mechanical Specifications

Accessories

Low Ambient Head Pressure Control Dampers — Shall modulate airflow by means of a direct-acting damper operator which senses head pressure in the liquid line and positions damper blades, allowing enough airflow to maintain proper liquid pressure at lower ambients. Standard unit equipped with dampers shall start and operate satisfactorily to 0 F ambient. Kit consists of 16-gauge damper assembly, R-22 operator, tubing, rubber grommet, and all necessary mounting hardware and instructions.

Coil Guard Package — Shall provide protection from damage to coil surface exterior. Kit shall consist of coil guards and necessary mounting hardware.

Vibration Isolator Packages — Shall reduce transmission of noise and vibration to building structures, equipment and adjacent spaces. Packages shall be available in either neoprene-in-shear or spring-flex types.

Time Delay Timer — Shall prevent compressors in a dual compressor unit from coming on line simultaneously. Timer shall be 24-volt, 50/60 cycle, with a four-minute timing period.

Antishortcycle Timer — Shall prevent rapid on-off compressor cycling in light load conditions by not allowing compressor to operate for a predetermined time upon shutdown. Shall consist of a solid-state timing device, 24-volt, 50/60 cycle with a five-minute fixed-off timing period.

Technical Literature Printed in USA

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BTA — 1½ - 15 Tons
Literature Type	SQ
Sequence	210.00
Date	July 1986
File No.	PL-UN-S/S-BTA-SQ-210.00 7/86
Supersedes	New

BWV-SQ-219.01

SUBMITTAL

TRANE™

TAG: ____________________

15 Ton Vertical Air Handler BWV180B

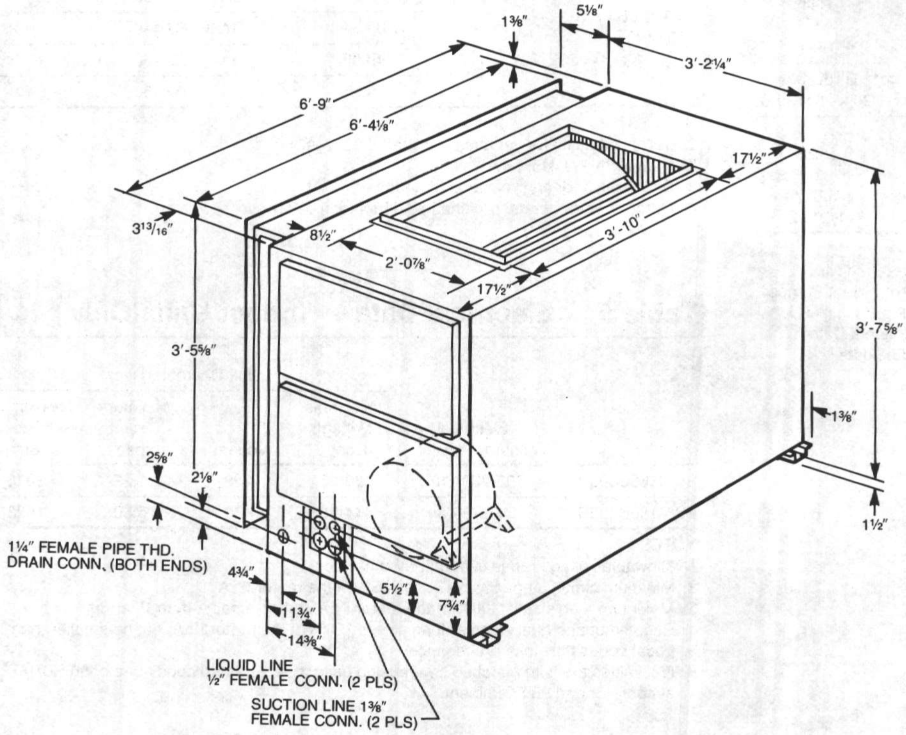


Table 1 Electrical Data — Indoor Unit and Electric Heater With Single Point Power

Model for Use With	Capacity Kw	Capacity MBh	Rated Voltage	Minimum Circuit Ampacity	Minimum Fuse Size
BWV180B300D 200-230/60/3	19.92	68.0	240/60/3	71.0	80
	29.88	102.0	240/60/3	101.0	100
	39.84	136.0	240/60/3	131.0	125
	49.80	170.0	240/60/3	161.0	150
	59.76	204.0	240/60/3	191.0	200
BWV180B400D 460/60/3	19.92	68.0	480/60/3	36.0	40
	29.88	102.0	480/60/3	51.0	50
	39.84	136.0	480/60/3	66.0	60
	49.80	170.0	480/60/3	81.0	80
	59.76	204.0	480/60/3	96.0	90

NOTES:
1. Kw at 208 volts is 75% of Kw at 240 volts.
2. Single power entry electrical calculations:
   Minimum circuit ampacity is 125% of total of electric heat and evaporator fan motor amps.
   Maximum fuse size is 225% of evaporator fan motor FLA plus electric heat amps.
   Recommended fuse size is 150% of evaporator fan motor FLA plus electric heat amps.
   Local codes may take precedence.
3. Single Point Power not available on 69.72 Kw and 79.68 Kw Heaters.

Table 2 Unit Weights (Lbs.)

Model	BWV180B-D
Shipping/Net	786/686

Table 3 General Data

Model	BWV180B-D
Indoor Coil Data	
Configuration	Draw Through
Number of Coils	1
Face Area	20.6
Fin Type	Plate Fin
Rows/Fins Per Inch	4 / 12.5
Tube Size / Material	1/2" / Copper
Refrig. Control	TXV
Drain Connection — Size (In.)	1-1/4 NPT
Indoor Fan Data	
Number of Fans	1
Fan Type / Diameter x Width	FC/15" x 15"
Nominal Hp / Rpm	3 / 1725
Drive	Belt
Number of Motor Speeds	1
Frame Size	182T
Filters — Type included	Throwaway
Filter Size / Number of Filters	20 x 25 x 2 / 6
System Data	
Refrigerant Type	R-22
Number of Refrig. Circuits	2
Suc. Line (In. OD.) Conn. Sz./No.	1-3/8" / 2
Liq. Line (In. OD.) Conn. Sz./No.	1/2" / 2

NOTE:
1. These Air Handlers are A.R.I. certified with various Split System Weathertron® Heat Pumps (A.R.I. Standard 240) and Cooling Units (A.R.I. Standard 210). Refer the Split System Data Submittal Guides for performance data.

Table 4 Electric Heat

Air Handler Model No.	Capacity Kw	Model Number	Stages	Rated Voltage
BWV180B300D 200-230/60/3	9.96	BAYHTRA310	1	240/60/3
	19.92	BAYHTRA320	1	240/60/3
	29.88	BAYHTRA330	2	240/60/3
	39.84	BAYHTRA340	2	240/60/3
	49.80	BAYHTRA350	3	240/60/3
	59.76	BAYHTRA360	3	240/60/3
BWV180B400D 460/60/3	9.96	BAYHTRA410	1	480/60/3
	19.92	BAYHTRA420	1	480/60/3
	29.88	BAYHTRA430	2	480/60/3
	39.84	BAYHTRA440	2	480/60/3
	49.80	BAYHTRA450	3	480/60/3
	59.76	BAYHTRA460	3	480/60/3

NOTES:
1. Derate capacity for variation from rated voltage.
2. Heat MBh = 3.415 x Kw
3. See Table 9 for control steps of heaters.
4. Outdoor thermostats furnished as denoted in Table.

Table 5 Electrical Data — Indoor Units Only

		Unit Characteristics				Indoor Fan Motor		
Model	Electrical Characteristics	Allowable Voltage Range	Voltage	Minimum Circuit Ampacity	Maximum Fuse Size	Hp	FLA	Kw
BWV180B300D	200-230/60/3	180-254	208	11.25	30 (3)	3	9.0	3.00
BWV180B400D	460/60/3	414-506	460	5.50	15 (3)	3	4.4	3.00

NOTES:
1. Allowable voltage range is at unit terminal block.
2. Minimum circuit ampacity (MCA) is 125% of the motor FLA.
3. Maximum fuse size is 300% of the motor FLA, but no smaller than 15 amps.
4. Recommended dual element fuse size is 150% of the motor FLA, but no smaller than 15 amps.
5. Local codes may take precedence.
6. KW values are with matched condensing units at A.R.I. rated conditions of 80 EDB/67 EWB to the evaporator and 95 F. ambient.

Table 6 Electrical Data — Electric Heaters Only

Model for Use With	Capacity Kw	Rated Voltage	Individual Elements	Stages	Minimum Circuit Ampacity	Fuses No. of Sets	Fuses Rating (Amps.)	Amps./Fused Htr. Branch Circuit
	19.92	240/60/3	3	1	60	1	60	(1)48
	29.88	240/60/3	6	2	90	1 1	30 60	(1)24 (1)48
	39.84	240/60/3	6	2	96	2	60	(2)48
BWV180B300D 200-230/60/3	49.80	240/60/3	9	3	150	1 2	30 60	(1)24 (2)48
	59.76	240/60/3	9	3	180	3	60	(3)48
	19.92	480/60/3	3	1	30	1	30	(1)24
	29.88	480/60/3	6	2	45	1	45	(1)36
	39.84	480/60/3	6	2	60	1	60	(1)48
BWV180B400D 460/60/3	49.80	480/60/3	9	3	75	1 1	45 30	(1)36 (1)24
	59.76	480/60/3	9	3	90	1 1	60 30	(1)48 (1)24

NOTE:
1. Minimum circuit ampacity is 125% of total electric heat amps.

Table 7 Electric Heat Capacity Data — Indoor Unit

Electric Heater Kw Input	Electric Heater Voltage	Electric Heater Control Stages	Stage 1 Kw Input	Stage 1 MBh	Stage 2 Kw Input	Stage 2 MBh	Stage 3 Kw Input	Stage 3 MBh	Stage 4 Kw Input	Stage 4 MBh	Total Kw Input	Total MBh
19.92	240/3	1	19.92	68.0							19.92	68.0
29.88	240/3	2	9.96	34.0	19.92	68.0					29.88	102.0
39.84	240/3	2	19.92	68.0	19.92	68.0					39.84	136.0
49.80	240/3	3	9.96	34.0	19.92	68.0	19.92	68.0			49.80	170.0
59.76	240/3	3	19.92	68.0	19.92	68.0	19.92	68.0			59.76	204.0
19.92	480/3	1	19.92	68.0							19.92	68.0
29.88	480/3	2	9.96	34.0	19.92	68.0					29.88	102.0
39.84	480/3	2	19.92	68.0	19.92	68.0					39.84	136.0
49.80	480/3	3	9.96	34.0	19.92	68.0	19.92	68.0			49.80	170.0
59.76	480/3	3	19.92	68.0	19.92	68.0	19.92	68.0			59.76	204.0

NOTES:
1. Derate capacities for variation from rated voltage
2. Heat MBh = 3.415 x KW

Table 8 Indoor Blower Performance BWV180B-D

Wet Coil, 2″ Glass Fiber Filters
Motor Pulley Turns Open (Factory Setting, 4) Blower Speed - Rpm
External Static Pressure (In. of Water) and Brake Horse Power (Bhp)[1]

Airflow Cfm	1 and 965 Press	1 and 965 Bhp	2 and 925 Press	2 and 925 Bhp	3 and 885 Press	3 and 885 Bhp	4 and 845 Press	4 and 845 Bhp	5 and 805 Press	5 and 805 Bhp	6 and 765 Press	6 and 765 Bhp
3500	1.83	2.21	1.66	2.02	1.50	1.88	1.35	1.75	1.20	1.68	1.05	1.62
4000	1.69	2.55	1.52	2.36	1.36	2.20	1.20	2.06	1.05	1.95	0.90	1.86
4500	1.54	2.89	1.37	2.70	1.21	2.54	1.04	2.37	0.89	2.23	0.74	2.12
5000	1.38	3.28	1.21	3.06	1.04	2.89	0.87	2.69	0.72	2.52	0.57	2.39
5500	[2]1.20	3.68	1.03	3.44	0.86	3.24	0.69	3.03	0.54	2.64	0.39	2.68
6000	[3]1.00	4.10	0.83	3.84	0.66	3.59	0.50	3.37	0.35	3.18	0.20	3.00
6500	[4]0.77	4.57	0.60	4.27	0.43	3.98	0.27	3.73	0.12	3.54		
7000	[5]0.50	5.08	0.35	4.72	0.18	4.38	0.02	4.11				
7500	0.20	5.62	0.07	5.22								

NOTES:
1. 3 Hp Motor Limits (Class B insulation):

	Heat Pump 200 V	Heat Pump 230/460 V	Cooling 200 V	Cooling 230/460 V
Voltage	200 V	230/460 V	200 V	230/460 V
Power Limit	3500 W	3950 W	3750 W	4200 W

2. Performance limit for 200 volt motor application with a heat pump. Points under line over motor power limit.
3. Performance limit for 200 volt motor application used for cooling only. Points under line over motor power limit.
4. Performance limit for 230/460 volt motor application with a heat pump. Points under line over motor power limit.
5. Performance limit for 230/460 volt motor application used for cooling only. Points under line over motor power limit.
6. Fan motor heat MBh = 3.15 x fan bhp, also: Kw (Mechanical output) = hp x .7457
Kw (Electrical input) = (hp x .7457)/Motor Efficiency
Motor Efficiency = 80%

Table 9 Air Pressure Drop — Accessories — Electric Heaters

Model	Airflow (Cfm)	240 and 460/3 Voltage Size (Kw) 9.96	19.92	29.88	39.84	49.80	59.76
BWV180B-D	5000	.13	.13	.13	.13	.20	.20
	5500	.08	.08	.15	.15	.23	.23
	6000	.09	.09	.18	.18	.27	.27
	6500	.10	.10	.21	.21	.31	.31
	7000	.12	.12	.24	.24	.36	.36

NOTE:
1. Static pressure in inches of water.

Mechanical Specifications

General

Blower coil units are completely factory assembled including coil, condensate drain pan, fan, motor, filters and controls in an insulated casing for both vertical and horizontal models. UL listed and C.S.A. certified.

Casing

Units have galvanized steel panels and are unpainted. Casing is insulated and knockouts are provided for electrical power, control wiring and piping connections.

Refrigerant Circuits

The air handlers have dual refrigeration circuits. Each refrigerant circuit is controlled by a factory-installed thermal expansion valve.

Coil

Aluminum fin surface is mechanically bonded to 1/2-inch OD copper tubing. Coils are factory pressure and leak tested.

Fan

Forward curved, dynamically and statically balanced with adjustable belt speed drive as standard, fan and motor bearing are permanently lubricated.

Controls

Low voltage terminal board, fan contactor, check valves, evaporator defrost control and plug in module for accessory electric heat control are included.

Filters

Filters are included as standard — Two-inch throwaway.

Accessories

Electric Heaters — Available in a wide range of capacities and voltages with various staging options. Air handlers require accessory heater enclosure.

Single Power Entry Kit — Available for field installation.

DPDT Relay — Permits all stages of electric heat to come on during the defrost mode — bypasses the ODT's.

Technical Literature - Printed in U.S.A.

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BWV - Evap. Fan Coil - (S/SORS/P)
Literature Type	SQ
Sequence	219.01
Date	July 1986
File No.	PL-UN-S/S-BWV-SQ-219.01 7/86
Supersedes	BWV-SQ-219.00
Ordering No.	BWV-SQ-219.01

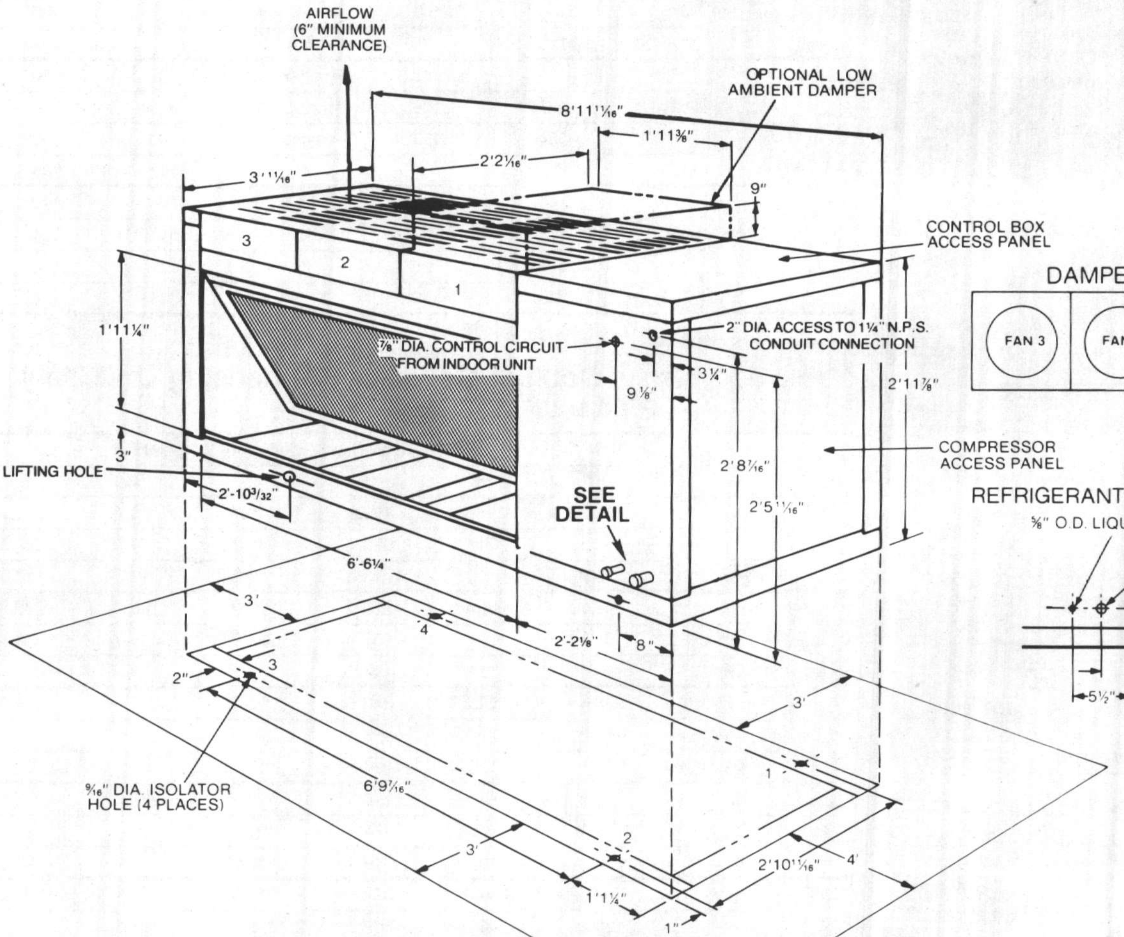
P.I.

TRANE™

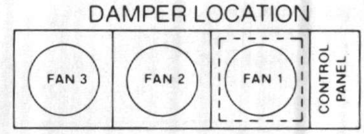
TAG: ____________________

SUBMITTAL

15-Ton Split System Condensing Unit - 3Ø BTA180F



DAMPER LOCATION



REFRIGERANT CONN. DETAIL

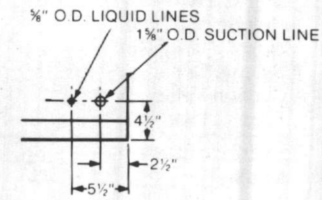


Table 1 Electrical Data — BTA180F

	Unit Characteristics					Compressor Motor				Condenser Fan Motors			
Model	Electrical Characteristics	Allowable Voltage Range	Minimum Circuit Ampacity	Maximum Fuse Size	Recommended Dual-Element Fuse Size	No.	RLA (Ea.)	LRA (Ea.)	Kw (Ea.)	No./Hp	FLA (Ea.)	LRA (Ea.)	Kw (Ea.)
BTA180F3	208-230/60/3	187-254	86	125	90	1	56.4	248	17.8	3/.75	5.0	11.0	0.74
BTA180F4	460/60/3	416-508	44	70	50	1	28.2	124	17.8	3/.75	2.7	5.5	0.74
BTA180FW	575/60/3	520-635	34	50	35	1	22.6	100	17.8	3/.75	1.8	5.4	0.74

NOTES:
1. Allowable voltage range is at unit terminal block.
2. Minimum circuit ampacity (MCA) is 125% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circiut.
3. Maximum fuse size is 225% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
4. Recommended dual element fuse size is 150% of the FLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
5. Local codes may take precedence.
6. Motor electrical information is for each individual motor.
7. Kw values are with matched blower coils at A.R.I. rating conditions of 80 EDB/67 EWB to the evaporator and 95 F ambient.

Table 2 Unit Weights

	BTA180F
Weight	
Shipping (Lbs)	1022
Net (Lbs)	942

Table 3 General Data

	BTA180F
Performance Data	
Gross Capacity at A.R.I. Conditions (MBh)	
Matched Blower Coil[1]	195
Condensing Unit Only	201.0
A.R.I. Cooling with Matched Blower Coil[1]	
Net Cooling Cap. (MBh)	185
Total System Kw	22.6
EER (MBh/Kw)	8.2
Indoor Cfm	6000
A.R.I. Cooling with Matched Furnace Coil	
Net Cooling Cap. (MBh)	—
EER (MBh/Kw)	—
Indoor Cfm	—
A.R.I. Sound Rating (BELS)[3]	—
Operating Data	
Standard Amb. Range (F)	45-115
Low Amb. Option (F)[4]	0
Oper. Charge—R-22 (Oz.)[5]	300
System Data	
Refrigerant Type	R-22
No. of Refrig. Circuits	1
System Capacity Steps (%)	100/50/0
Suction Lines (OD)[6]	1⅝"
Liquid Lines (OD)[6]	⅝"
Compressor Data	
Number	1
Nominal Size/Type	15T/Bristol
Unloading Steps (High Rpm/Low Rpm)	3450/1725
Outdoor Coil Data	
No. of Coils	2
Dimensions - H x L (In.)	24 x 78
Face Area (Sq Ft)	26.00
Fin Type	3/8 Wavy
Rows/Fins Per Inch	3/168
Tube Size	⅜"
Cond. Charge (Lbs R-22)	44
Outdoor Fan Data	
No. of Fans/Motors	3
Fan Type/Diameter (In.)	Prop/22
Drive/Speed	Dir/Single
Motor: Nominal Hp (each)	¾
Nominal Rpm	1100
Nominal Airflow (Cfm)	12130
Frame Size	48

NOTES:
1. At A.R.I. 210 conditions of 80/67 F (EDB/EWB) and 95 F ambient.
2. At 45 F saturated suction temperature and 95 F ambient.
3. A.R.I. 270 Noise Rating numbers are determined with the unit in the cooling operation at a 95 F outdoor ambient.
4. With optional low ambient control.
5. Operating charge is for condensing unit only (all circuits), and does not include interconnecting lines or evaporator.
6. Max. linear length 80 ft.; Max lift-suction 60 ft.; Max lift liquid 60 ft. For greater length refer to Refrigerant Piping Applications Manual.
7. At conditions of 95 F ambient and 95% full.

Table 4 Gross System Capacity Data — BTA180F At 6000 Cfm

Outdoor DB	Enter WB	Total Cap	Entering DB 75	80	85	90
85	57	170	165	170	169	168
	62	188	146	176	186	186
	67	205	113	146	175	197
	72	224	81	110	141	175
95	57	159	156	159	157	157
	62	177	141	168	175	175
	67	195	107	142	170	189
	72	213	75	104	138	171
105	57	151	148	150	150	150
	62	167	136	162	165	165
	67	184	103	136	164	180
	72	202	71	101	133	165
115	57	141	140	140	140	140
	62	156	131	153	154	154
	67	172	98	131	157	170
	72	188	66	94	128	158

Table 5 Gross Cooling Capacity Condensing Unit Only — BTA180F At 6000 Cfm

OD Temp.		Suction Reference Temperature Degrees F 30	35	40	45	50	55
65	HP	175.2	181.8	188.8	196.1	203.7	211.7
	Cap	180.3	200.2	220.9	242.2	264.1	286.5
	Kw	15.3	16.0	16.7	17.5	18.2	19.0
75	HP	199.6	206.4	213.5	221.0	228.8	236.9
	Cap	167.2	185.8	205.1	225.0	245.6	266.6
	Kw	16.0	16.8	17.6	18.4	19.2	20.0
85	HP	226.4	233.4	240.7	248.4	256.4	264.8
	Cap	154.2	171.5	189.5	208.2	227.5	247.5
	Kw	16.6	17.5	18.3	19.2	20.1	20.9
95	HP	255.7	262.9	270.5	278.4	286.7	295.5
	Cap	141.2	157.3	174.1	191.7	210.0	229.1
	Kw	17.2	18.1	19.0	19.9	20.9	21.8
105	HP	287.5	294.9	302.8	311.1	319.9	329.2
	Cap	128.2	143.2	159.0	175.6	193.1	211.6
	Kw	17.6	18.6	19.6	20.6	21.7	22.7
115	HP	321.9	329.7	337.9	346.7	356.1	366.2
	Cap	115.3	129.2	144.1	159.9	176.8	194.9
	Kw	18.0	19.0	20.1	21.2	22.4	23.6

NOTES:
1. Performance data calculated at 15 degrees subcooling and degrees superheat.
2. HP = Head Pressure (PSIG)
Cap = Capacity (MBh)
Kw = Outdoor Unit Kw

Mechanical Specifications

General

All condensing units shall be assembled on a heavy-gauge integral steel base. Units shall be weatherproofed and include hermetic compressor(s), condensing coils, fans and motors, controls and holding charge of R-22. Units shall have a top control box access panel and removable end panels which allow access to all major components and controls.

Casing

Unit frame shall be a one-piece welded assembly of 18-gauge zinc-coated, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish.

Refrigeration System

BTA180F, 15 ton units shall have a single refrigeration circuit.

Compressor — BTA180F units shall be direct drive, two-speed, 3,500/1,750 rpm, hermetic reciprocating compressor with two-stage centrifugal oil pump; belly-band crankcase heater; high strength, ring-type suction and discharge valves; and rubber-in-shear isolators.

Motor shall be suction gas-cooled and shall have voltage utilization range of plus or minus 10 percent of nameplate voltage. Solid-state compressor motor protection module (CMPM) protects compressor against excessive temperature and current overload. CMPM also provides antishortcycle function, compressor is prevented from operating for four minutes (+48 seconds) upon shutdown.

Condenser Fans and Motors — Shall be vertical discharge, direct-drive fans, statically and dynamically balanced, with aluminum blades and zinc-plated steel hubs, 1,100 rpm motor with permanently lubricated ball bearings, built-in current and thermal overload protection, and weathertight slingers over bearings.

Condenser Coil — Shall be "V" type, air-cooled. Configuration aluminum fin secondary surface mechanically bonded to primary surface of ⅜-inch OD seamless copper tubing. Subcooling circuit(s) shall be provided as standard for each refrigeration circuit. Factory pressure and leak-tested to 425 psig air pressure. Metal grilles for coil protection optional.

Controls — Shall be 24-volt control circuit includes fusing and control power transformer. Unit shall be wired complete with magnetic contactors for the compressor(s), cooling low ambient fan switches, high pressure cut-out(s), low pressure cut-out(s) and reset relays. Unit shall be completely factory-wired with necessary controls and terminal block for power wiring. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-short cycle timers are available as optional accessories.

Low Ambient Operation — Standard start and operation to approximately 45 F when matched with Trane blower coils. Optional head pressure control damper permits operation to 0 F and includes necessary controls for low ambient operation.

Accessories

Low Ambient Head Pressure Control Dampers — Shall modulate airflow by means of a direct-acting damper operator which senses head pressure in the liquid line and positions damper blades, allowing enough airflow to maintain proper liquid pressure at lower ambients. Standard unit equipped with dampers shall start and operate satisfactorily to 0 F ambient. Kit consists of 16-gauge damper assembly, R-22 operator, tubing, rubber grommet, and all necessary mounting hardware and instructions.

Coil Guard Package — Shall provide protection from damage to coil surface exterior. Kit shall consist of coil guards and necessary mounting hardware.

Vibration Isolator Packages — Shall reduce transmission of noise and vibration to building structures, equipment and adjacent spaces. Packages shall be available in either neoprene-in-shear or spring-flex types.

Time Delay Timer — Shall prevent compressors in a dual compressor unit from coming on line simultaneously. Timer shall be 24-volt, 50/60 cycle, with a four-minute timing period.

Antishortcycle Timer — Shall prevent rapid on-off compressor cycling in light load conditions by not allowing compressor to operate for a predetermined time upon shutdown. Shall consist of a solid-state timing device, 24-volt, 50/60 cycle with a five-minute fixed-off timing period.

Technical Literature Printed in USA

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BTA — 1½ - 15 Tons
Literature Type	SQ
Sequence	211.00
Date	July 1986
File No.	PL-UN-S/S-BTA-SQ-211.00 7/86
Supersedes	New

TRANE™

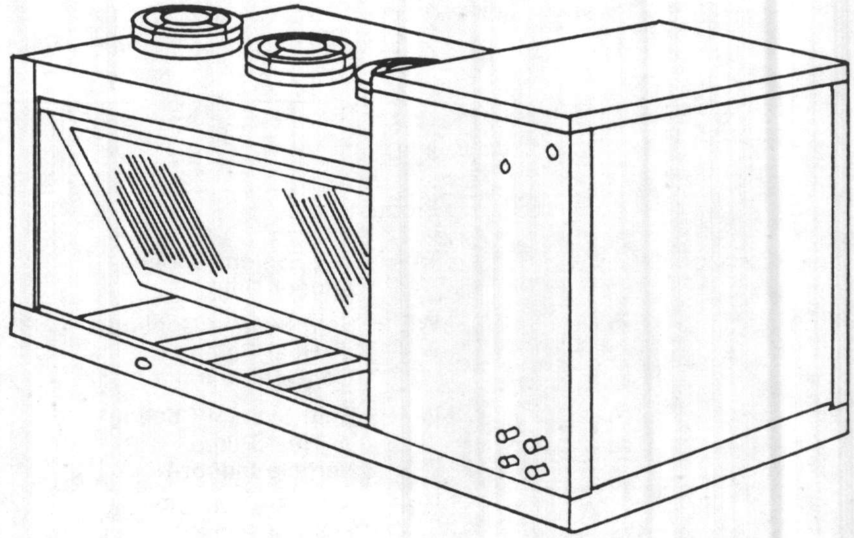
BTA-M-3

OPERATION/MAINTENANCE GUIDE

Split System
Condensing Units

Models
BTA120D-AB
BTA150D-AB
BTA180D-AB
BTA180F-AB

Library	Service Literature
Product Section	Unitary
Product	Split System
Model	BTA
Literature Type	Operation/Maintenance
Sequence	3
Date	December 1986
File No.	SV-UN-S/S-BTA-M-3 12/86
Supersedes	New



22-5327-1

Table of Contents

Unit Model Number Description

Trane LCG products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of this multiple-character number is shown below. It will enable the owner or Service Engineer to define operation, components and applicable accessories for a specific unit.

LCG Unit Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12
B	T	A	1	2	0	D	3	0	0	A	A

Always "B"

Product Type

TA = Split System Cooling, Outdoor Unit

WE = Split System Cooling or Heat Pump, Convertible Indoor Unit

WV = Split System Cooling or Heat Pump, Verticle Indoor Unit

WH = Split System Cooling or Heat Pump, Horizontal Indoor Unit

Cooling Capacity (MBH)

090 = 90 MBH
120 = 120 MBH
180 = 180 MBH
240 = 240 MBH

Major Design Sequence

Electrical Characteristics

3 = 208-230/60/3
4 = 460/60/3
W = 575/60/3

Secondary Capacity and/or Factory Installed Options

00 = Not Used

Minor Design Sequence

Service Digit

General Information

Periodic Maintenance checklists are provided at the beginning of the MAINTENANCE manual for performing recommended maintenance. These checklists should not be substituted for the detailed information given in appropriate sections of this manual.

A Maintenance Log at the end of the "Periodic Maintenance" section enables the operator/serviceman to maintain a record of system operating data.

Operation

Electrical Sequence of Operation

The typical wiring diagrams provided in Figures 1 and 2 should be used only as a reference for the following discussion. For the actual wiring of your specific unit, refer to the wiring diagram pasted on the inside of the unit's control box cover.

System operation is controlled by a two-stage thermostat, depending upon the number of compressors in the system. Closing the unit disconnect switch supplies power to the control power transformer (T1), the compressor crankcase heaters (CCH1 and CCH2), and the line side of all control contactors.

Depending on the thermostat selected, it may be possible to operate the evaporator fan independently of the compressors by placing the thermostat fan switch in the ON position. This energizes the evaporator fan contactor, starting the fan. If the thermostat has a separate fan switch, moving that switch to the AUTO position will cause the evaporator fan to start in conjunction with the compressor whenever the thermostat calls for cooling.

Dual Compressor Operation

Sensing a need for cooling, the first stage cooling contacts of the thermostat will close. This supplies power to the compressor contactor solenoid coil (CC1), provided that the high pressure control, low pressure control, and reset relay contacts are closed.

The contacts of the compressor contactor close, energizing the first stage compressor, provided that the compressor internal motor winding thermostats are closed.

The compressor has only two leads broken by the compressor contactor. The third leg of the contactor energizes the condenser fan motors. The outdoor temperature determines the number of condenser fans that will start. A fan limit control (FLT) is electrically positioned between both fans #1 and #2 and fans #2 and #3. Depending on the position of these controls, one or more fans may start.

As the cooling load increases, the second stage contacts of the thermostat will close. This supplies power to the solenoid coil of the second stage compressor contactor (CC2), staring the second compressor.

Single Compressor, 2-Speed Operation

Sensing a need for cooling, the first stage cooling contacts of the thermostat will close. Assuming that no safety controls have tripped, this supplies power to the low speed compressor contactor coil (CCS) and outdoor fan relay coil (ODR). Safety controls in this circuit include the high pressure control (HPC), low pressure control (LPC), reset relay (RR), and compressor motor protection module (CMPM).

NOTE: *The compressor contactor cannot be re-energized on the BTA180F for four minutes after winding temperatures have returned to normal following cut-out on excessive temperature, current overload, or power interruption to Terminal T1 of the compressor motor protection module. This provides an anti-short cycle feature on the standard unit. The compressor cannot be re-energized for four minutes following termination of the cooling cycle. This is an option on the dual compressor units.*

Energizing the compressor contactor coil (CCS) closes the CCS contacts in the power circuit, and starts the compressor on low speed. Concurrently, outdoor fan relay coil ODR is energized. This starts the outdoor fan motor(s) by closing the ODR contact in the power circuit. The total number of condenser fans which will operate is dependent upon the outdoor ambient and the resulting position of the FLT switches (see Figure 2).

As the cooling load increases, the second stage contacts of the thermostat will close. This supplies power to the control relay coil (CR), which opens one set of contacts and closes the other on this single-pole, double-throw relay. This, in turn, de-energizes the low speed compressor contactor coil (CCS) and supplies power to the "tie point" compressor contactor coil (CCT) through normally closed auxiliary contacts CCS located in the control circuit. Auxiliary control circuit contacts CCT then close, and power is supplied to the high speed compressor contactor coil (CCF). After the low speed compressor contactor contacts (CCS) in the power circuit open, both the "tie point" and high speed compressor contactor contacts (CCT and CCF) close and the compressor motor switches from low to high speed.

It should be noted that the dual compressor contactor is both mechanically and electrically interlocked in order to protect the compressor motor from having both low and high speed windings energized at the same time. Electrically, this is accomplished with a normally closed auxiliary side switch (CCS) on the "tying" compressor contactor coil (CCT), and a double-pole, double-throw auxiliary side switch (CCT) on both the high and low speed compressor contactor coils (CCF and CCS). See Figures 3 and 4 for further details on this electrical connection.

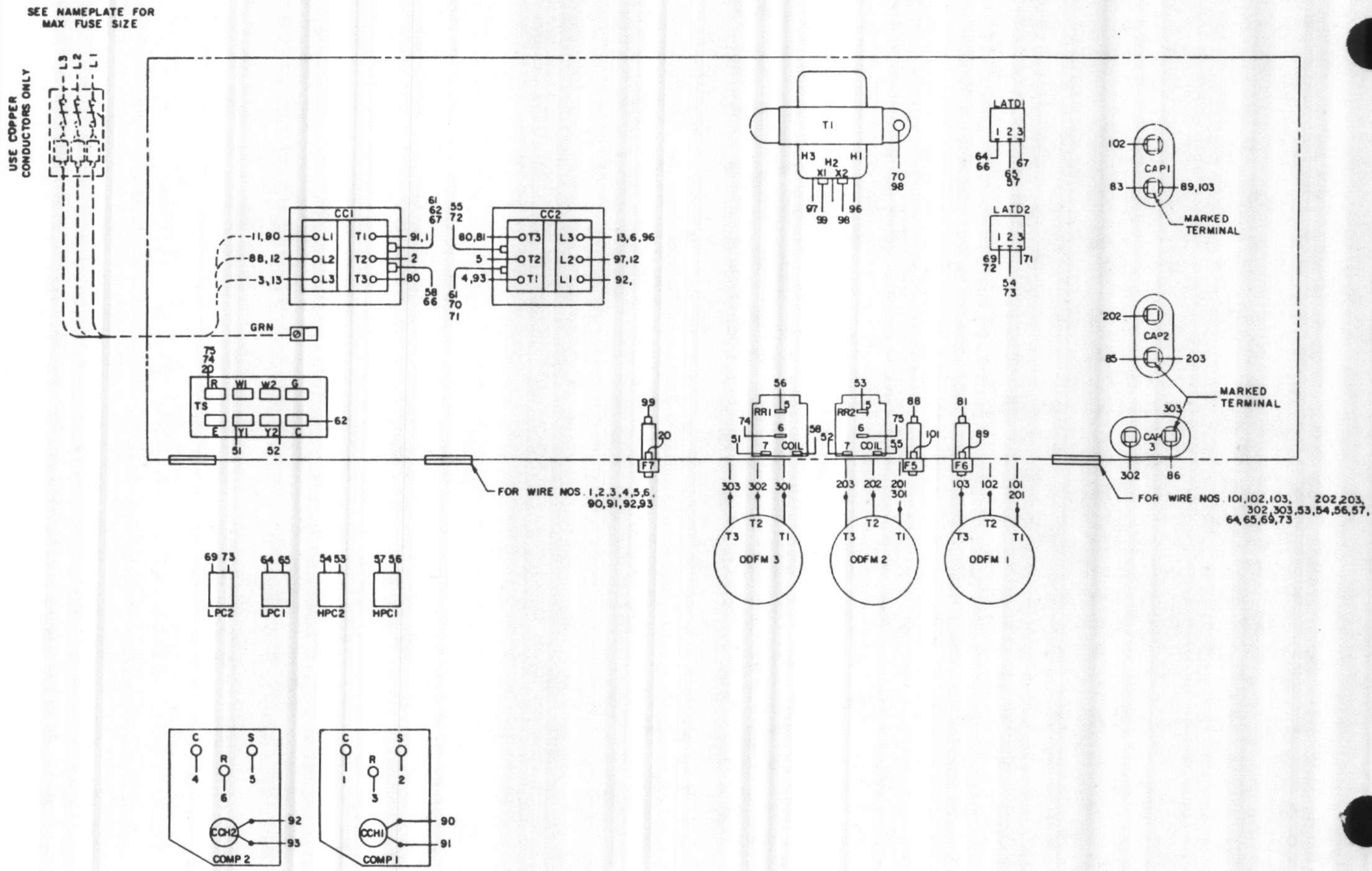
Normally, the compressor will start and operate on low speed before switching to high speed. However, the compressor can start on high speed if the difference between the thermostat setting and the space temperature is great enough. This will be the case in a "pull-down" situation where the unit has been disconnected from normal thermostat control for an extended period of time. It will also occur if the thermostat setting is lowered substantially while the system is off.

NOTE: *The compressor may not start in low speed when a differential pressure greater than 180 psig exists between the high and low side of the refrigerant circuit.*

BTA compressors include two-pole/four-pole motor hookup capability for two speed operation. The compressor operates at approximately 3500 RPM on high speed (two-pole), and at 1750 RPM on low speed (four-pole).

To achieve two speed operation, the motor windings are switched between a parallel connected (high speed) and series connected (low speed) motor winding through the use of low speed, high speed, and tie point contacts on the compressor contactor. This is shown in Figure 3 (high speed) and Figure 4 (low speed).

CAUTION: Extreme care must be taken when making wiring connections in the compressor terminal box. Incorrect hookup can result in immediate compressor failure when power is applied.



(CONTINUED ON NEXT PAGE)

LEGEND	
COMP	COMPRESSOR
CC	COMPRESSOR CONTACTOR
ODFM	OUTDOOR FAN MOTOR
TS	TERMINAL STRIP
TI	TRANSFORMER
F	FUSE
CAP	CAPACITOR
RR	RESET RELAY
HPC	HIGH PRESSURE CONTROL
CCH	CRANKCASE HEATER
LPC	LOW PRESSURE CONTROL
LATD	LOW AMBIENT TIME DELAY
FLT	FAN LIMIT T-STAT

TRANE FORM NO. 6-3563

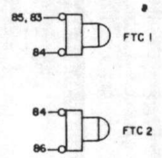
Figure 1 - Typical Unit Wiring Diagram (Dual Compressor Unit Shown)

WARNING

DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

CAUTION

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE



NOTES:

1. SEE NAMEPLATES OF ALL MOTORS FOR VOLTAGE BEFORE CONNECTING TO LINE
2. ALL COMPONENTS AND WIRES SHOWN DOTTED ARE SUPPLIED BY CUSTOMER
3. IF ANY OF THE ORIGINAL WIRES AS SUPPLIED WITH THIS UNIT MUST BE REPLACED, IT MUST BE REPLACED WITH APPLIANCE WIRING MATERIAL RATED 105° C OR EQUIVALENT
4. ALL CUSTOMER WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES
5. ALL 208-230 VOLT UNITS WILL BE FACTORY-WIRED FOR 230 VOLT APPLICATIONS. FOR 208 VOLT APPLICATIONS MOVE LEAD 97 FROM THE 240 VOLT TRANSFORMER TERMINAL TO THE 208 VOLT TERMINAL
6. THREE PHASE MOTORS ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS
7. EVAPORATOR APPLICATION TEMPERATURE RANGE +32°F TO +53.5°F
8. REPLACE F7 FUSE WITH BUSSMAN TYPE GLQ & GMQ 3 AMP 300V FUSES ONLY
9. REPLACE F5 AND F6 FUSES WITH 300V, 30 AMP TYPE SC FUSES ONLY
10. RESET RELAY WILL RESET WHEN POWER IS INTERRUPTED

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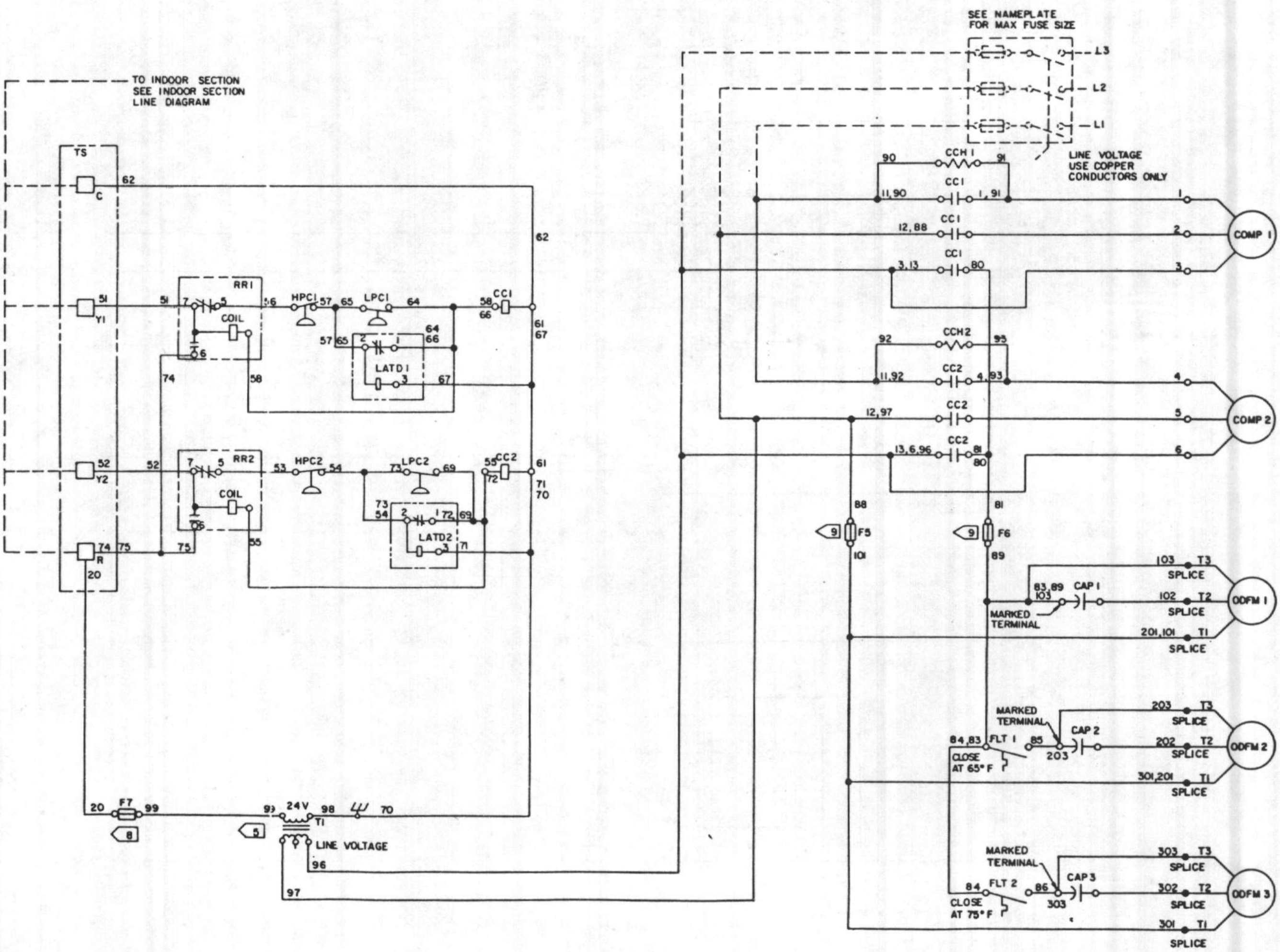

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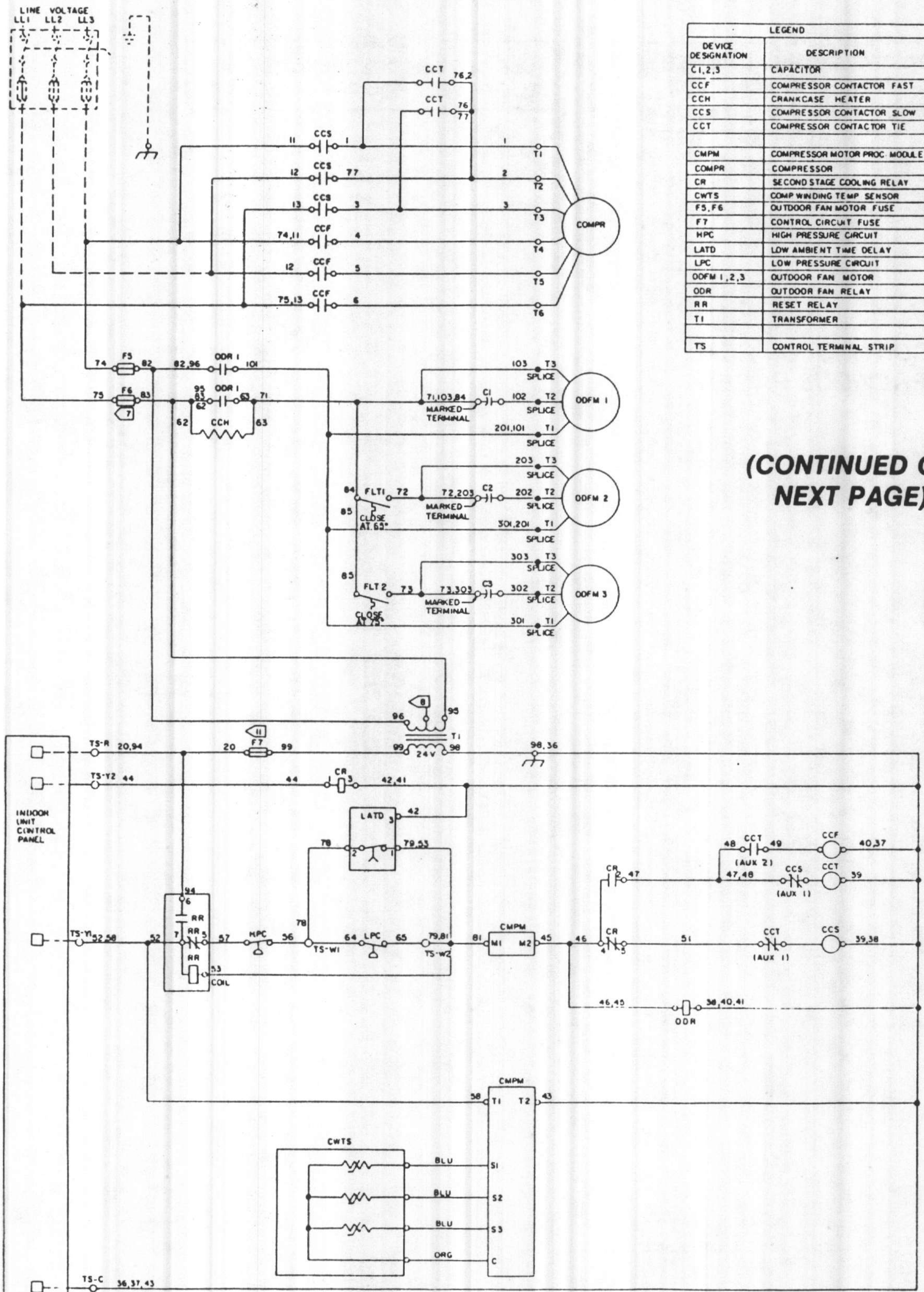

LEGEND	
DEVICE DESIGNATION	DESCRIPTION
C1,2,3	CAPACITOR
CCF	COMPRESSOR CONTACTOR FAST
CCH	CRANKCASE HEATER
CCS	COMPRESSOR CONTACTOR SLOW
CCT	COMPRESSOR CONTACTOR TIE
CMPM	COMPRESSOR MOTOR PROC MODULE
COMPR	COMPRESSOR
CR	SECOND STAGE COOLING RELAY
CWTS	COMP WINDING TEMP SENSOR
F5,F6	OUTDOOR FAN MOTOR FUSE
F7	CONTROL CIRCUIT FUSE
HPC	HIGH PRESSURE CIRCUIT
LATD	LOW AMBIENT TIME DELAY
LPC	LOW PRESSURE CIRCUIT
ODFM 1,2,3	OUTDOOR FAN MOTOR
ODR	OUTDOOR FAN RELAY
RR	RESET RELAY
T1	TRANSFORMER
TS	CONTROL TERMINAL STRIP

(CONTINUED ON NEXT PAGE)

Figure 2 - Typical Unit Wiring Diagram (15 Ton Single Compressor Unit Shown)

NOTES:

1. UNLESS OTHERWISE NOTED, ALL SWITCHES ARE SHOWN AT 25°C (77°F) AT ATMOSPHERIC PRESSURE AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF AND AFTER A NORMAL SHUTDOWN HAS OCCURED. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. DASHED LINE ENCLOSURES AND/OR DASHED DEVICE OUTLINES INDICATE COMPONENTS PROVIDED BY THE FIELD. PHANTOM LINE ENCLOSURES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTIONS. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF THE CONTACTS BY LINE NUMBER, AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.
2. ALL WIRING AND DEVICES SHOWN DASHED TO BE SUPPLIED AND INSTALLED BY THE CUSTOMER IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES.
3. IF ANY OF THE ORIGINAL WIRE, AS SUPPLIED WITH THIS UNIT, MUST BE REPLACED, REPLACE IT WITH APPLIANCE WIRING MATERIAL RATED AT 105°C OR EQUIVALENT.
4. THREE PHASE MOTORS ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS AND HAVE INTERNAL OVERLOAD PROTECTION.
5. FOR REMAINDER OF CONTROL CIRCUITS, SEE ELECTRICAL DIAGRAM LOCATED ON INDOOR UNIT CONTROL PANEL.
6. RESET RELAY WILL RESET WHEN POWER IS INTERRUPTED.
7. REPLACE F5 AND F6 FUSES WITH 300 VOLT, 30 AMP TYPE SC FUSES ONLY.

8. ALL 208-230 VOLT UNITS WILL BE FACTORY WIRED FOR 230 VOLT APPLICATION. FOR 208 VOLT APPLICATIONS MOVE LEAD 95 FROM THE 240 VOLT TRANSFORMER TERMINAL (H3) TO THE 208 VOLT TERMINAL (H2)
9. CMPM IS LOCATED IN THE COMPRESSOR JUNCTION BOX, TEXAS INSTRUMENT PN 15AA 1105A. COMPRESSOR CONTACTOR CANNOT BE RE-ENERGIZED FOR 4 MINUTES AFTER WINDING TEMPERATURES HAVE RETURNED TO NORMAL FOLLOWING CUT-OUT ON EXCESSIVE TEMPERATURE, CURRENT OVERLOAD OR POWER INTERRUPTION TO TERMINAL 'T1'.
10. EVAPORATOR APPLICATION TEMPERATURE RANGE: 32°F TO 53.5°F
11. REPLACE ONLY WITH BUSSMAN GLQ OR GMQ 3AMP 300V FUSES.

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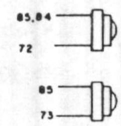

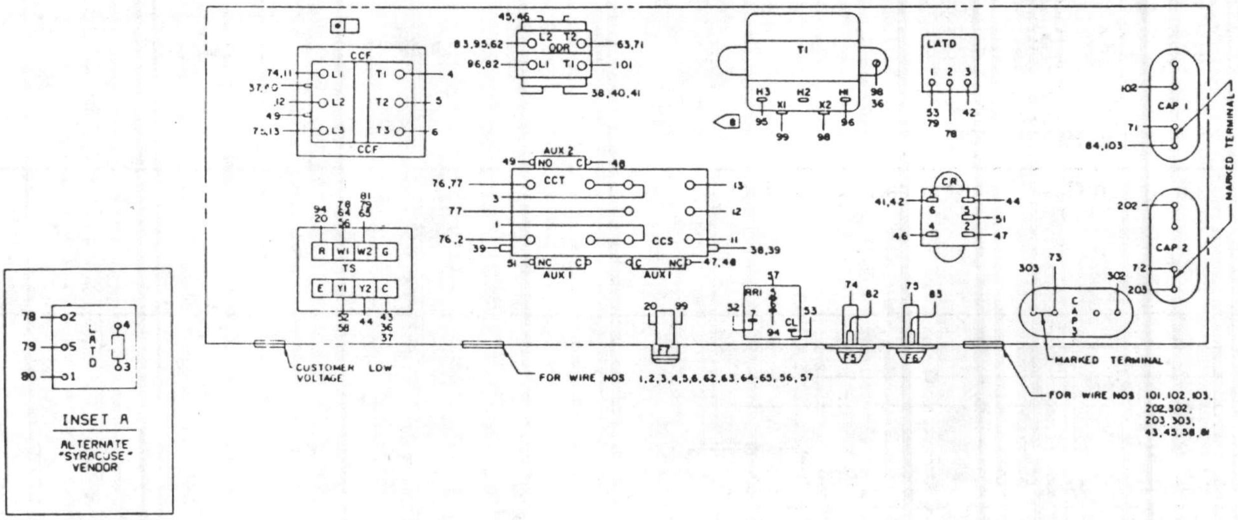

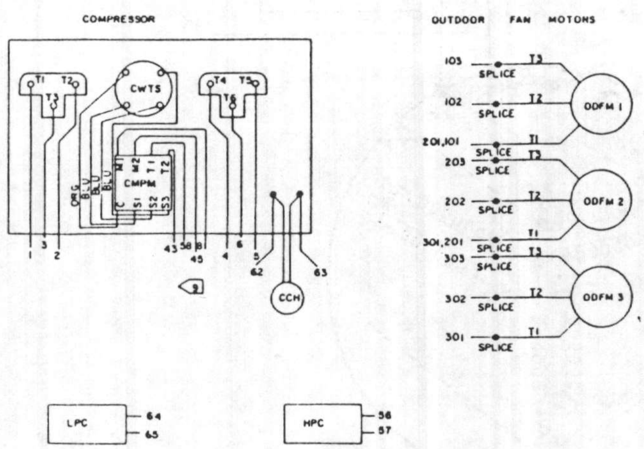

WARNING

DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

CAUTION

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE

IMPORTANT

ANTI-SHORT CYCLE FEATURE IS STANDARD ON THIS UNIT. COMPRESSOR CANNOT BE RE-ENERGIZED FOR 4 MINUTES FOLLOWING TERMINATION OF COOLING CYCLE.

CAUTION

DO NOT ENERGIZE UNTIL UNIT CHECK-OUT AND START-UP PROCEDURE HAS BEEN COMPLETED

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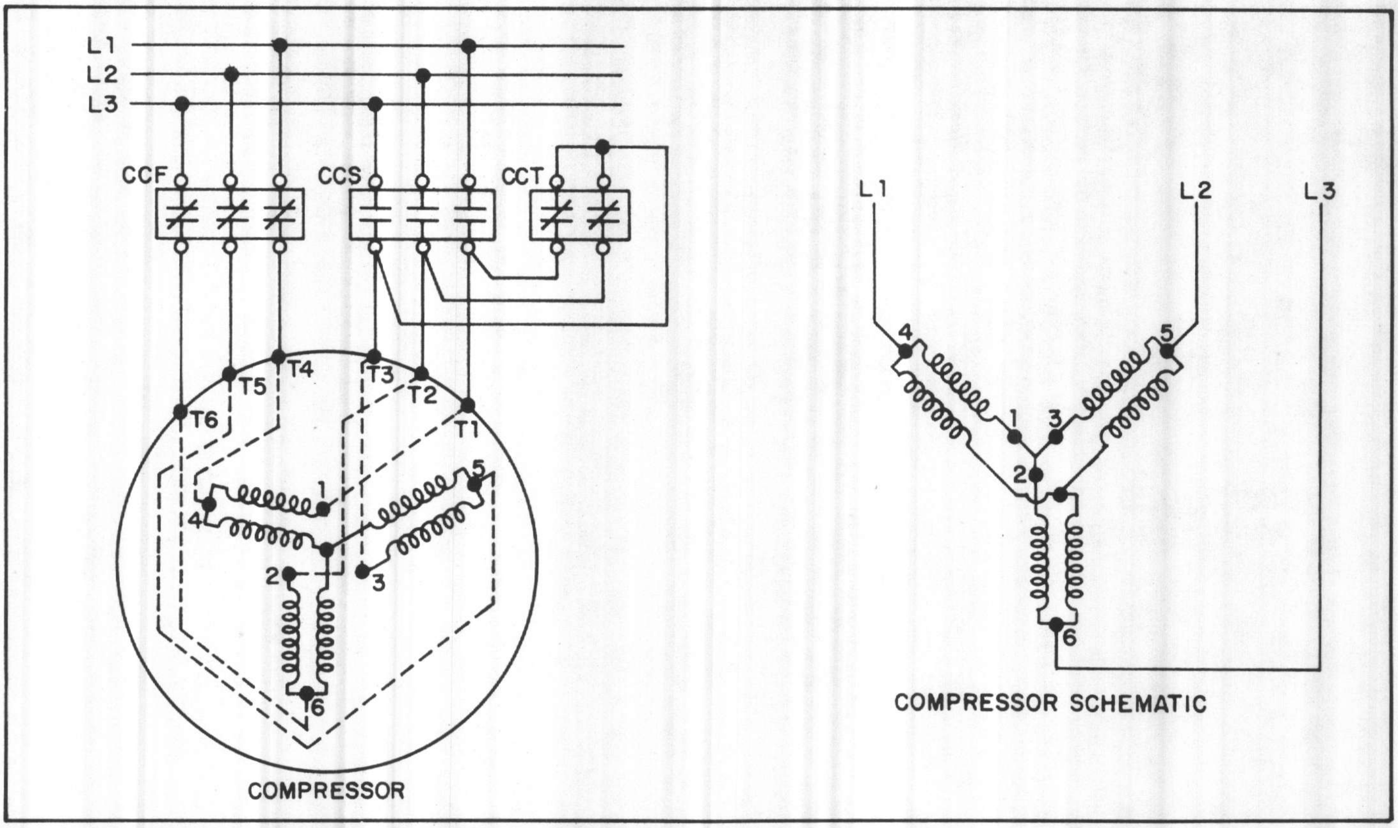


Figure 3 - High Speed Operation (Parallel Connected)

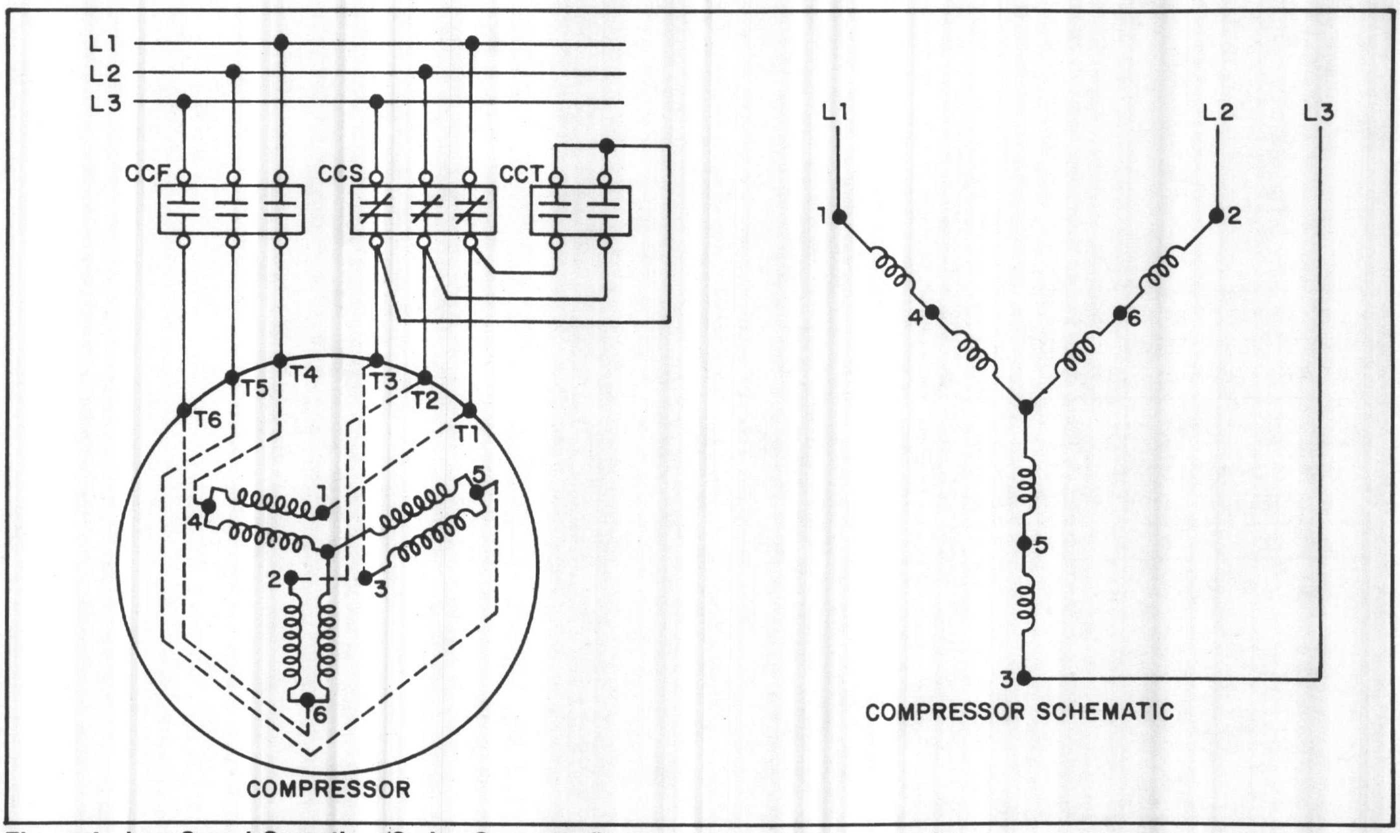


Figure 4 - Low Speed Operation (Series Connected)

Safety Controls

High Pressure Control

BTA150D, BTA180D and BTA180F units have an external high pressure control that prevents excessive compressor discharge pressures. This control opens the electrical control circuit, stopping compressor operation, if the condensing pressure becomes too high. Refer to Table 1 for control settings.

The compressors on BTA120D units are provided with an internal pressure relief valve which automatically vents hot gas onto the winding thermostat whenever condensing pressure becomes excessive. This heat causes the contacts of the winding thermostat to open, and compressor operation ceases until the thermostat cools enough for its contacts to close.

Low Pressure Control

All BTA120-180 units have an external low pressure control that stops compressor operation if the operating pressure is too low. Refer to Table 1 for control settings.

Reset Relay

Whenever the system is stopped by the high or low pressure control, the reset relay locks out the compressor contactor. This prevents the system from recycling until the condition causing the high or low pressure cut-out is corrected, and the relay is manually reset. To reset this relay, turn the room thermostat from COOL to OFF and then back to COOL, or open the unit disconnect switch and reclose it.

Fan Sequencing

Condenser fans are cycled on and off in response to ambient temperature in order to keep the capacity of the condenser relatively constant and to maintain proper system pressures. Figure 5 details the possible condenser fan operating modes.

Motor Overloads

All BTA120-180 units have internal compressor and condenser fan motor overloads. These overloads protect the motors from overheating and automatically reset as soon as they cool.

Condenser Fan Limit Control

The condenser fan limit control (FLT) is a temperature sensor that energizes and de-energizes the condenser fan in response to ambient temperature. As the ambient temperature decreases, the cooling capacity of the condenser increases. The cooling low ambient sensor turns off condenser fans to keep the capacity of the condenser constant and to maintain proper system pressures. Refer to Table 1 for control settings.

Table 1 - Control Settings

CONTROL	CUT-IN	CUT-OUT
High Pressure Control (All Units)	345 PSIG (20)	425 PSIG (±20)
Low Pressure Control (All Units)	48 PSIG (±7)	20 PSIG (±4)
FLT 10 Ton	75 F(±3)	65 F(±3)
FLT 12.5-15 Ton	75 F(±3)	65 F(±3)
FLT 12.5-15 Ton	65 F(±3)	55 F(±3)

FLT = Fan Limit Temperature Control

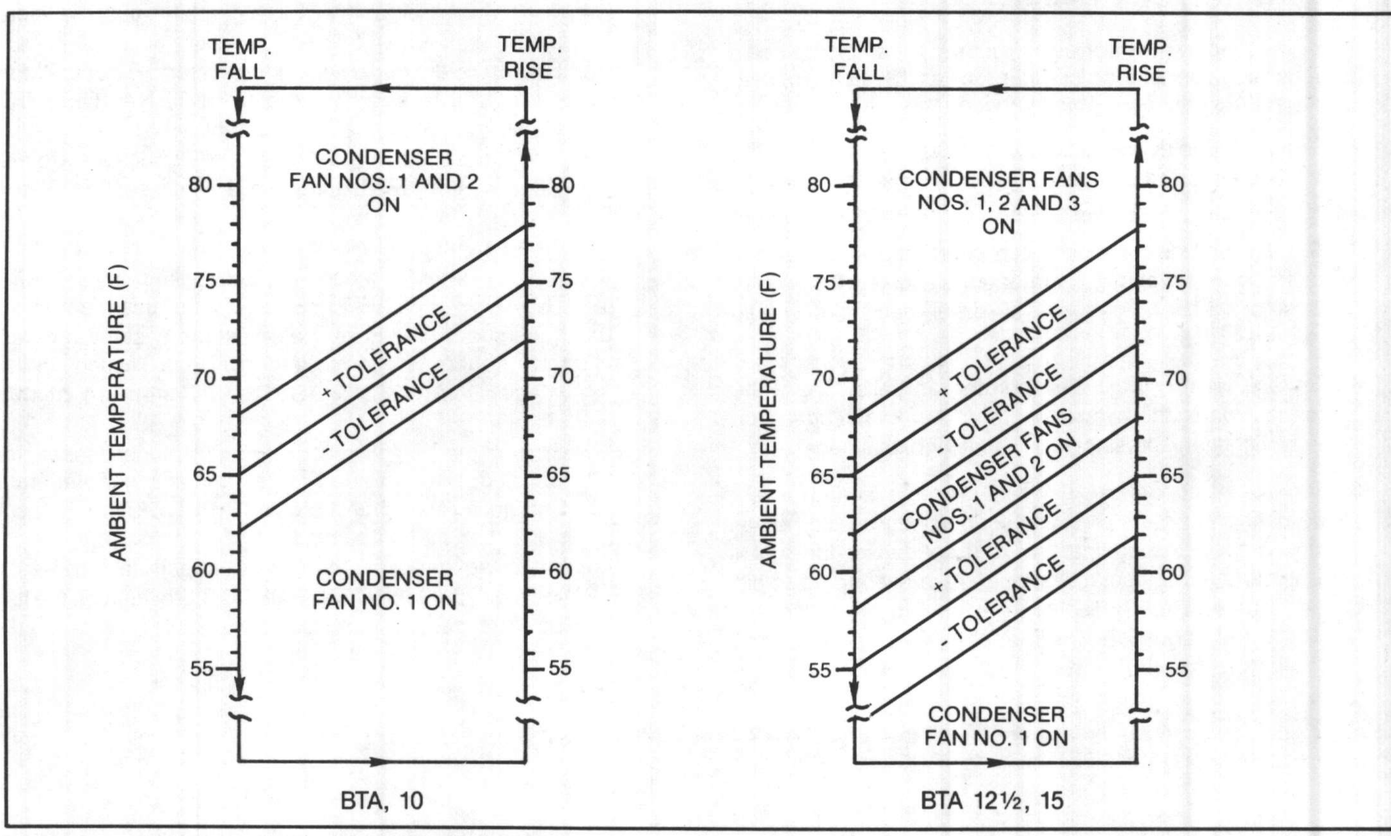


Figure 5 - Condenser Fan Operating Modes

Maintenance

Periodic Maintenance

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure. A MAINTENANCE LOG is provided on page 12 of this manual for recording operating data on a regular basis.

Once a Month

Conduct the maintenance inspections outlined below on a monthly basis during the cooling season.

☐ 1. Inspect the evaporator coil air filters. Clean or replace if necessary.

☐ 2. Inspect the evaporator and condenser coils for dirt and foreign debris. If the coils appear dirty, clean them according to the instructions provided under "Coil Cleaning" in the MAINTENANCE PROCEDURES section of this manual.

Once a Year

The following maintenance practices must be performed at the beginning of each cooling season to ensure efficient unit operation.

WARNING: OPEN THE UNIT DISCONNECT SWITCH AND LOCK IT IN THAT POSITION TO PREVENT ACCIDENTAL START-UP. NEVER OPEN AN ACCESS PANEL TO INSPECT OR SERVICE THE UNIT WITHOUT FIRST OPENING THE DISCONNECT SWITCH. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

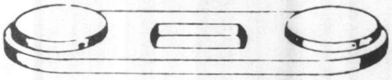
☐ 1. Inspect the evaporator coil air filters. Clean or replace if necessary. Depending on filter type and system application, filters may need to be serviced more frequently.

☐ 2. Clean both the evaporator and condenser coils. Follow the procedures outlined under "Coil Cleaning" in the MAINTENANCE PROCEDURES section of this manual.

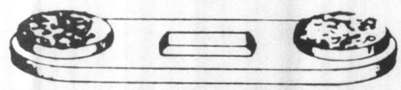
☐ 3. With the unit disconnect switch open, check to see that each condenser and evaporator fan is securely fastened to its motor shaft. All fans should turn freely and airflow should be unobstructed.

☐ 4. Replace worn or frayed evaporator fan belts. Check the belt tension of the evaporator fans. A 1/2-inch deflection under light hand pressure is normal. Tighten if necessary.

☐ 5. Remove the condensing unit control box cover and inspect the panel wiring. All electrical connections should be secure. Inspect the compressor and condenser fan motor contactors. If the contacts appear severely burned or pitted, replace the contactor (refer to Figure 6). Do not clean the contacts. Inspect the condenser fan capacitors for visible damage.



NEW CONTACTS - SMOOTH SURFACES, MAY BE BRIGHT, DULL OR DISCOLORED BY TARNISH



NORMAL WEAR - SURFACES MILDLY PITTED, DISCOLORED AREAS EITHER BLACK, BLUE OR BROWN. 75% OF MASS STILL INTACT. SLIGHT FEATHERING OF EDGES WITH NO LIFTING. CONTACTS STILL SERVICEABLE.

BADLY WORN - SURFACES BADLY ERRODED. EDGES FEATHERED AND LIFTED. REPLACE CONTACTOR.

Figure 6 - Compressor Contactor Replacement Guide

☐ 6. Remove any accumulation of dust and dirt from the condensing unit.

☐ 7. Clean and inspect the drain pan of the evaporator unit. Make sure the drain piping is clear.

☐ 8. Check the superheat and subcooling.
   a. The condenser and evaporator coils must be clean before making the following checks.
   b. Determine the superheat of the system. Refer to "Measuring Superheat" in the MAINTENANCE PROCEDURES section of this manual.
   c. Adjust the superheat if necessary (instructions are provided in the "Measuring Superheat" section of this manual).
   d. When the superheat setting is correct, check the subcooling. Refer to "Measuring Subcooling" in the MAINTENANCE PROCEDURES section of this manual.
   e. If the subcooling is low, leak test the system to determine if there is a leak. Refer to "Leak Testing" in the MAINTENANCE PROCEDURES section of this manual.
   f. Charge the system with refrigerant if necessary. Instructions are provided under "Checking Refrigerant Charge" in the MAINTENANCE PROCEDURES section of this manual.
   g. Enter the operating pressures, superheat, and subcooling in the MAINTENANCE LOG provided on the following page.

Shutdown and Start-Up

Shutdown: Short Duration

The system can be shutdown for periods of short duration, such as over the weekend, by moving the thermostat selector switch to the OFF position and the fan switch to the AUTO position.

NOTE: *The unit disconnect switch should remain closed. This will permit the crankcase heater to continue to function, preventing refrigerant from condensing in the compressor oil sump.*

Start-Up: Short Duration

The system is returned to operation after a shutdown of short duration, such as over a weekend, by adjusting the thermostat setting to the desired temperature, placing the thermostat selector switch in the COOL or AUTO position, and setting the fan switch in either the AUTO or ON position.

Shutdown: Seasonal

For seasonal shutdown, open the unit electrical disconnect switch to prevent the unit from starting accidently.

Start-Up: Seasonal

To start the system after an extended period of shutdown, complete the following procedures.

1. Perform all of the "Once A Year" checks listed in the PERIODIC MAINTENANCE section of this manual.
2. Move the thermostat selector switch to OFF.
3. Close the electrical disconnect switch to the condensing unit. This will energize the compressor crankcase heater. If operating properly, the crankcase should be hot to the touch. Wait a minimum of eight hours before turning the room thermostat to the COOL position.

CAUTION: Failure to wait eight hours before turning the room thermostat to COOL may result in damage to the compressor bearings.

4. Start a dual compressor system by adjusting the thermostat setting to the desired temperature, placing the thermostat selector switch in the COOL or AUTO position, and placing the fan switch in either the AUTO or ON position.
5. Adjust the thermostat setting on a single compressor unit so that the compressor will be operating at high speed. Place the thermostat selector switch in either the COOL or AUTO position, and the fan switch in either the AUTO or ON position.
6. Place a clamp-on ammeter on each compressor lead and check the motor amperage. Amperage draw should not be greater than the "Maximum Allowable Amps" given in Table 9.
7. Place the clamp-on ammeter around either of the two leads from each outdoor fan motor run capacitor to determine if the run capacitor is open and must be replaced. The amp draw should not be greater than the nameplate rating for the condenser fan motors.
8. Lower the thermostat setting to the desired temperature.

Maintenance Procedures

This section of the manual describes specific maintenance procedures which must be performed as a part of the unit's maintenance program. Before performing any of these operations, however, be sure that power to the unit is disconnected unless otherwise instructed.

WARNING: WHEN MAINTENANCE CHECKS AND PROCEDURES MUST BE COMPLETED WITH THE ELECTRICAL POWER ON, CARE MUST BE TAKEN TO AVOID CONTACT WITH ENERGIZED COMPONENTS OR MOVING PARTS. FAILURE TO EXERCISE CAUTION WHEN WORKING WITH ELECTRICALLY-POWERED EQUIPMENT MAY RESULT IN SERIOUS INJURY OR DEATH.

Coil Cleaning

Condenser coils must be cleaned **at least once each year**, or more frequently if the unit is located in a "dirty" environment, to help maintain proper unit operating efficiency and reliability. The relationship between regular coil maintenance and efficient unit operation is outlined below:

1. Clean condenser coils minimize compressor head pressure and amperage draw, and promote system efficiency.
2. Clean evaporator coils minimize water carry-over and help eliminate frosting and/or compressor flood back problems.
3. Clean coils minimize required fan brake horsepower and maximize efficiency by keeping coil static pressure loss at a minimum.
4. Clean coils keep motor temperatures and system pressures within safe operating limits for good reliability.

Specific instructions for cleaning condenser coils are provided in the following paragraphs. Follow these instructions as closely as possible to avoid potential damage to the coils.

To clean refrigerant coils, the following equipment is required: a soft brush and either a garden pump-up sprayer or a high pressure sprayer. In addition, a high quality detergent must be used: suggested brands include SPREX A.C., OAKITE 161, OAKITE 166, and COILOX. Follow the manufacturer's recommendations for mixing to make sure the detergent is alkaline with a pH value less than 8.5.

1. Disconnect power to the unit.

WARNING: OPEN UNIT DISCONNECT SWITCH. FAILURE TO DISCONNECT UNIT FROM ELECTRICAL POWER SOURCE MAY RESULT IN SEVERE ELECTRICAL SHOCK, AND POSSIBLE INJURY OR DEATH.

2. Remove enough panels from the unit to gain access to the coil.
3. Protect all electrical devices such as motors and controllers from dust and water spray.
4. Straighten coil fins with a fin rake, if necessary.

MAINTENANCE LOG

DATE	AMBIENT TEMP. (F)	EVAPORATOR ENTERING AIR		COMPRESSOR (HIGH SPEED)		COMPRESSOR (LOW SPEED)		SUPERHEAT		SUBCOOLING (F)
		DRY BULB	WET BULB	SUCTION PRESSURE	DISCHARGE PRESSURE	SUCTION PRESSURE	DISCHARGE PRESSURE	CIRCUIT NO. 1 (F)	CIRCUIT NO. 2 (F)	

5. Use a soft brush to remove loose dirt and debris from both sides of the coil.

6. Mix the detergent with water according to the manufacturer's instructions. The detergent-and-water solution may be heated to a maximum of 150 F to improve its cleansing ability.

WARNING: DO NOT HEAT THE DETERGENT-AND-WATER SOLUTION TO TEMPERATURES IN EXCESS OF 150 F. HIGH-TEMPERATURE LIQUIDS SPRAYED ON THE COIL EXTERIOR WILL RAISE THE PRESSURE WITHIN THE COIL AND MAY CAUSE IT TO BURST, RESULTING IN POSSIBLE INJURY TO SERVICE PERSONNEL AND EQUIPMENT DAMAGE.

7. Place the detergent-and-water solution in the sprayer. If a high-pressure sprayer is used, be sure to follow these guidelines:

   - Minimum nozzle spray angle is 15 degrees.
   - Spray the solution perpendicular (at a 90 degree angle) to the coil face.
   - Keep the sprayer nozzle at least six inches from the coil.
   - Sprayer pressure must not exceed 600 psi.

CAUTION: Do not spray motors or other electrical components. Moisture can cause component failure.

8. Spray the leaving air side of the coil first, then spray the entering air side of the coil. Allow the detergent-and-water solution to stand on the coil for five minutes.

9. Rinse both sides of the coil with cool, clean water.

10. Inspect the coil. If it still appears to be dirty, repeat Steps 7, 8 and 9.

11. Replace all unit panels and parts, and restore electrical power to the unit.

12. Remove the protective covers installed in Step 3.

Control Testing

The following procedures can be used to check the operation of the high and low pressure controls. To determine operating pressures, attach gauges to the compressor suction and discharge access valves.

High Pressure Control

1. Open the unit electrical disconnect switch.

2. Disconnect the low voltage lead(s) from the condenser fan relay coil(s). This will de-energize the condenser fans.

3. On BTA150D-BTA180D units only, disconnect Y2 on the control box terminal strip when checking the high pressure control for Compressor No. 1. This will prevent the second compressor from running while checking the control in the first compressor circuit.

4. Close the unit disconnect switch and start the unit. On BTA180F units operate the compressor on high speed.

CAUTION: Be prepared to open the unit disconnect switch immediately if the compressor continues to run after the discharge pressure exceeds the high pressure control cutout range. Failure to do so could damage the system.

5. Observe the rising discharge pressure. When the pressure reaches 425 psig (±20) as shown in Table 1, the compressor should shut off. If the pressure reaches 445 psig without the high pressure switch breaking, immediately open the unit disconnect switch. Check to make sure that the high pressure control attached to liquid line No. 1 is wired to low voltage circuit No. 1. Replace the faulty high pressure control.

6. On BTA150D-BTA180D units, repeat Steps 1 through 5 to test the high pressure control in the second compressor circuit. In place of Step 3, however, reconnect Y2 and disconnect Y1 on the control box terminal strip. This will prevent Compressor No. 1 from running while the control for the second compressor circuit is being tested.

7. Open the unit disconnect switch.

8. Reconnect the wires removed in Step 2 on single compressor units, on in Steps 2 and 6 on dual compressor units.

9. Allow the discharge pressure(s) to drop below the cut-in setting in Table 1, and close the unit disconnect switch. This will also close the reset relay that locked out the compressor contactor when the high pressure control tripped.

10. The unit should start. If not, allow the discharge pressure to decrease further and repeat Step 9.

Low Pressure Control

1. Open the unit electrical disconnect switch.

2. Disconnect the wire that goes to the indoor blower coil from either Terminal T or R on the control box terminal strip. This will de-energize the evaporator fans.

3. On BTA120D-BTA180D units only, disconnect Y2 on the control box terminal strip when checking the low pressure control for Compressor No. 1. This will prevent the second compressor from running while checking the control in the first compressor circuit.

4. Remove the wires from Terminal 2 on the low ambient time delay relay(s). Insulate the wire terminals with electrical tape.

5. Close the unit disconnect switch and start the unit.

CAUTION: Be prepared to open the unit disconnect switch immediately if the compressor continues to run after the suction pressure drops below the low pressure control cutout range. Failure to do so could damage the compressor.

6. Observe the decreasing suction pressure. When the pressure drops to 20 psig (±4) as shown in Table 1, the compressor should shut off. If the pressure reaches 15 psig without the low pressure switch breaking, immediately open the unit disconnect switch. Replace the faulty low pressure control.

7. On BTA120D-BTA180D units, repeat Steps 1 through 6 to test the low pressure control in the second compressor circuit. In place of Step 3, however, reconnect Y2 and disconnect Y1 on the control box terminal strip. This will prevent Compressor No. 1 from running while the control for the second compressor circuit is being tested.

8. Open the unit disconnect switch.

9. Reconnect the wires removed in Steps 2 and 4 on single compressor units, or in Steps 2, 4, and 7 on dual compressor units.

10. Allow the suction pressure(s) to rise above the cut-in setting in Table 1, and close the unit disconnect switch. This will also close the reset relay that locked out the compressor contactor when the low pressure control tripped.

11. The unit should start. If not, allow the suction pressure to rise further and repeat Step 10.

Evacuation

For field evacuation, use a rotary-style vacuum pump capable of pulling a vacuum of 100 microns or less.

When hooking the vacuum pump to a refrigeration system, it is important to manifold the pump to both the high and low side of the system (liquid line access valve and compressor suction access valve). Follow the pump manufacturer's directions as to the proper methods of using the vacuum pump.

CAUTION: Do not, under any circumstances, use a megohm meter or apply power to the windings of a compressor while it is under a deep vacuum. In the rarified atmosphere of a vacuum, the motor windings can be damaged.

The lines used to connect the pump to the system should be copper and of the largest diameter that can practically be used. Using larger line sizes with minimum flow resistance can significantly reduce evacuation time. Rubber or synthetic hoses are not recommended for unit evacuation because they have moisture absorbing characteristics which result in excessive rates of outgassing and pressure rise during the standing vacuum test. This makes it impossible to determine if the unit has a leak, excessive residual moisture, or a continual or high rate of pressure increase due to the hoses.

An electronic micron vacuum gauge should be installed in the common line ahead of the vacuum pump shutoff valve, as shown in Figure 7. Close Valves B and C, and open Valve A. After several minutes, the gauge reading will indicate the minimum blank-off pressure the pump is capable of pulling. Rotary pumps should produce vacuums of less than 100 microns.

Open Valves B and C. Evacuate the system to a pressure of 500 microns or less. Once 500 microns or less is obtained, with Valve A closed, a time versus pressure rise should be performed. The maximum allowable rise over a 15 minute period is 200 microns. If the pressure rise is greater than 200 microns but levels off to a constant value, excessive moisture is present. If the pressure steadily continues to rise, a leak is indicated. Figure 8 illustrates three possible results of the time versus temperature rise check.

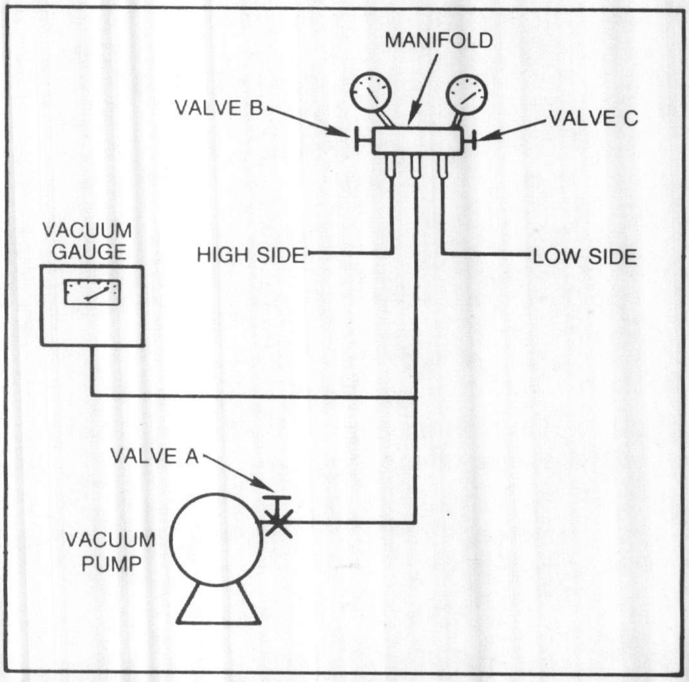


Figure 7 - Vacuum Pump Hook-Up

LEAK TESTING

When leak testing the unit, the following safety precautions must be observed:

WARNING: DO NOT WORK IN A CLOSED AREA WHERE REFRIGERANT OR NITROGEN MAY BE LEAKING. A SUFFICIENT QUANTITY OF VAPORS MAY BE PRESENT TO CAUSE PERSONAL INJURY. PROVIDE ADEQUATE VENTILATION.

WARNING: DO NOT USE OXYGEN, ACETYLENE, OR AIR IN PLACE OF REFRIGERANT AND DRY NITROGEN FOR LEAK TESTING. A VIOLENT EXPLOSION WILL RESULT WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

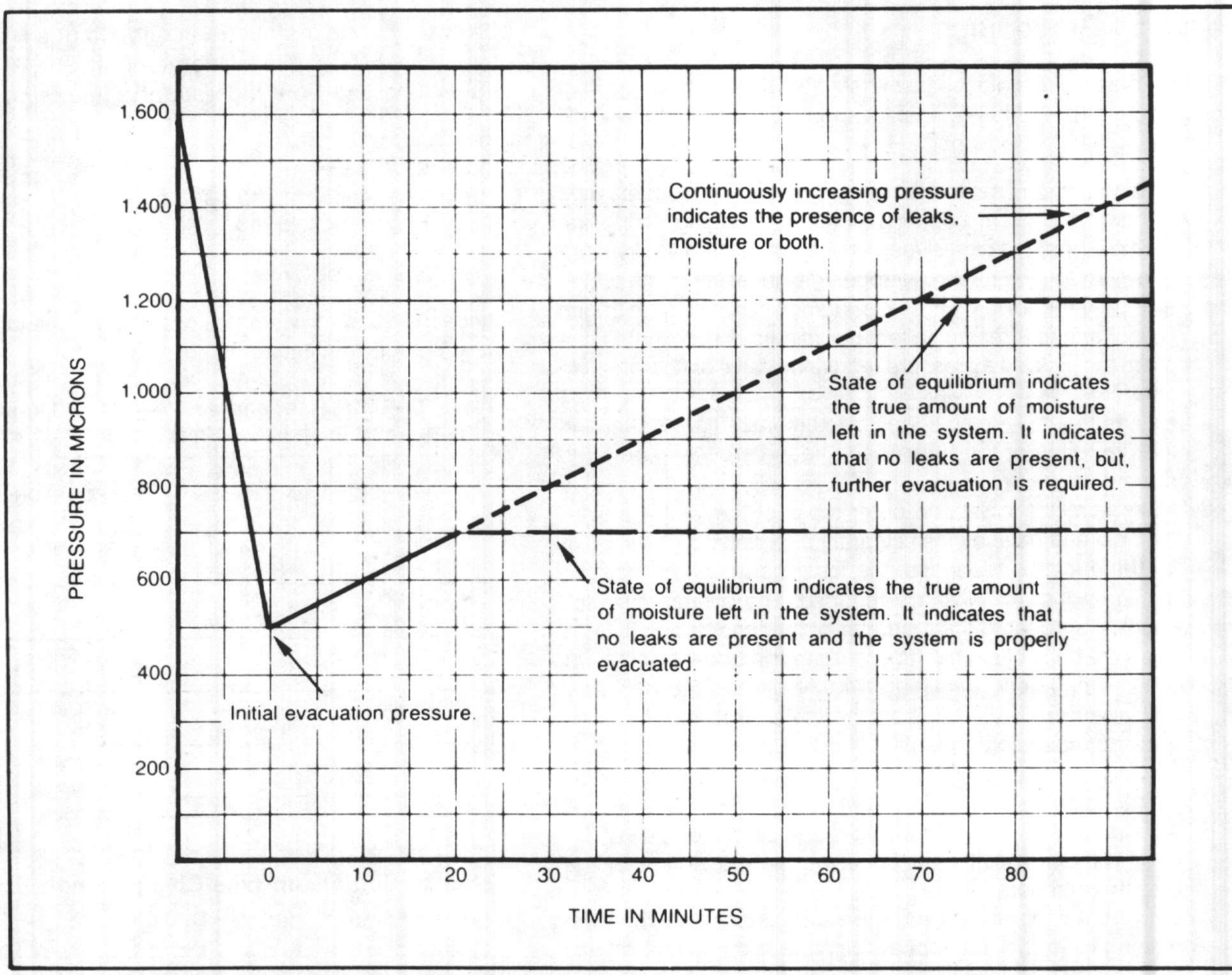


Figure 8 - Time vs. Pressure Rise after Evacuation

WARNING: ALWAYS USE A PRESSURE REGULATOR, VALVES, AND GAUGES TO CONTROL DRUM AND LINE PRESSURES WHEN PRESSURE TESTING THE SYSTEM. EXCESSIVE PRESSURES MAY CAUSE LINE RUPTURES, EQUIPMENT DAMAGE, OR AN EXPLOSION WHICH COULD RESULT IN PERSONAL INJURY OR DEATH.

Leak test the liquid line, evaporator, and suction line at pressures dictated by local codes.

CAUTION: Do not exceed 200 psig when leak testing the system.

1. Charge enough refrigerant into the system to raise the pressure to 100 psig.
2. Use a halogen leak detector or halide torch to check for leaks. Be thorough in this test, checking the interconnecting piping joints, the evaporator unit, and the condensing unit.
3. If a leak is found during the testing, release the test pressure, break the connection, and remake it as a new joint. Refer to the "Brazing Procedures" in this section of the manual for proper brazing techniques.
4. If no leak is found, use nitrogen to increase the test pressure to 150 psig, and repeat the leak test. Soap bubbles should be used to check for leaks when nitrogen is added. If a leak is found after increasing the pressure to 150 psig with nitrogen, release the test pressure and repair the leak.
5. Retest the system to make sure the new connection is solid.
6. If a leak is suspected after the system has been fully charged with refrigerant, use a halogen leak detector, halide torch, or soap bubbles to check for leaks.

Brazing Procedures

Proper brazing techniques are essential when installing refrigerant piping. The following factors should be kept in mind when forming sweat connections.

1. When copper is heated in the presence of air, copper oxide forms. To prevent copper oxide from forming inside the tubing during brazing, sweep an inert gas, such as dry nitrogen, through the tubing. Nitrogen displaces air in the tubing and prevents oxidation of the interior surfaces. A nitrogen flow of one to three cubic feet per minute is sufficient to displace the air. Use a pressure regulating valve or flow meter to control the flow.
2. Ensure that the tubing surfaces to be brazed are clean, and that the ends of the tubes have been carefully reamed to remove any burrs.
3. Make sure the inner and outer tubes of the joint are symmetrical and have a close clearance, providing an easy slip fit. If the joint is too loose, the tensile strength of the connection will be significantly reduced. The overlap distance should be equal to the diameter of the inner tube.
4. Wrap the body of each refrigerant line component with a wet cloth to keep it cool during brazing. Also move line insulation and tube grommets away from the joints. Excessive heat can damage these components.
5. If flux is used, apply it sparingly to the joint. Excess flux will contaminate the refrigerant system.
6. Apply heat evenly over the length and circumference of the joint. The entire joint should become hot enough to melt the brazing material.
7. Begin brazing when the joint is hot enough to melt the brazing rod. The hot copper tubing, not the flame, should melt the rod.
8. Continue to apply heat around the circumference of the joint until the brazing material is drawn into the joint by capillary action, making a mechanically sound and gas-tight connection. Remove the brazing rod as soon as a complete fillet is formed to avoid possible restriction in the line.
9. Visually inspect the connection after brazing to locate any pin holes or crevices in the joint. The use of a mirror may be required, depending on joint location.

Refrigerant Charging

Once the system is properly installed, leak tested and evacuated, refrigerant charging can begin. Liquid refrigerant must be charged into the system through the liquid line access valve, with the compressor shut off.

Refrigerant should be charged into the system by weight. Use an accurate scale or a charging cylinder to determine the exact weight of the refrigerant entering the system. Failure to use either a scale or charging cylinder can lead to under-charging or overcharging, resulting in unreliable operation.

The weights of refrigerant required for the evaporator unit and the condensing unit are given in Table 2. The weight of refrigerant required for the system piping can be determined by measuring the refrigerant lines and using the data in Table 3. The total system operating charge is calculated by adding the charge weight requirements of each part of the system. Refer to the following example.

EXAMPLE: The installation consists of a BTA180D condensing unit, a BWV180B evaporator unit, and 30 feet of 1/2 inch liquid line and 1-3/8 inch suction line.

BTA180D	=163 oz./circuit
BWV180D	= 94 oz./circuit
Liquid Line (1.137 oz./ft.) x (30 ft.)	= 34 oz./circuit
Suction Line (.203 oz./ft.) x (30 ft.)	= 6 oz./circuit
Total Charge Per Circuit	255 oz./circuit

Since the 15 ton system has two circuits, the total system operating charge required is 510 oz.

Table 2 - Refrigerant charge Weights for Condensing and Evaporator Units

CONDENSING UNIT	CHARGE (IN OUNCES OF R-22)	EVAPORATOR UNIT	CHARGE (IN OUNCES OF R-22)
BTA120D	268 (134/circuit)	BTE120B	112 (56/circuit)
BTA150D	256 (128/circuit)	BWE090C (Two)	158 (79/circuit)
		BWV180B	188 (94/circuit)
BTA180D	326 (163/circuit)	BWE090C (Two)	158 (79/circuit)
		BWV180B	188 (94/circuit)
BTA180F	326	BWV180B	188 (94/circuit)

Table 3 - Refrigerant Line Charge Weights (Ounces/Foot)

TUBE O.D. (INCHES)	LIQUID LINE	SUCTION LINE
3/8	0.610	
1/2	1.137	
5/8	1.827	
3/4	2.738	0.056
7/8		0.078
1 1/8		0.133
1 3/8		0.203
1 5/8		0.288

WARNING: DO NOT APPLY FLAME TO A REFRIGERANT DRUM IN AN ATTEMPT TO INCREASE THE DRUM PRESSURE. UNCONTROLLED HEAT MAY CAUSE EXCESSIVE DRUM PRESSURES AND AN EXPLOSION MAY RESULT.

WARNING: SHOULD LIQUID REFRIGERANT COME IN CONTACT WITH THE SKIN, THE INJURY SHOULD BE TREATED AS IF THE SKIN HAS BEEN FROSTBITTEN OR FROZEN. SLOWLY WARM THE AFFECTED AREA WITH LUKEWARM WATER.

Proceed as follows to charge the system with refrigerant.

1. Charge liquid refrigerant into the liquid line of the No. 1 compressor circuit, using the liquid line access valve. The vacuum within the system will draw some of the required refrigerant into the system. If the pressure within the system equalizes with the pressure in the charging cylinder before the required charge has been drawn in, proceed to Step 2.

   NOTE: On 10, 12.5, and 15 ton units, this charging process must be repeated for compressor circuit No. 2.

2. If the system cannot be completely charged by liquid refrigerant entering the system liquid line as outlined in Step 1, complete the process by charging **gaseous refrigerant** into the suction line. However, at least part of the charge must be in the system prior to starting the compressor. Proceed as follows:

   a. Close the liquid line valve on the manifold gauge set.

   b. Connect the manifold gauge set to the suction and discharge access valves (shown in Figure 9). The manifold valves should be closed.

   c. Turn the refrigerant drum upright so that gaseous refrigerant is drawn off the top.

   d. Start the unit by following the procedures outlined in the INITIAL START-UP section of this manual.

   e. With the condensing unit operating, slowly open the suction line valve on the manifold gauge set. The remainder of the refrigerant will be drawn into the system.

CAUTION: Do not allow liquid refrigerant to enter the suction line. Excessive liquid will damage the compressor.

Checking Refrigerant Charge

Before taking measurements to determine if the system is correctly charged with refrigerant, verify that all other aspects of the system operation are proper. The following conditions must be checked and satisfied.

1. Check the evaporator and condenser fans to ensure that they are rotating in the proper direction, that the fan blades do not have dirt buildup, and that each fan is turning at the proper RPM. Make sure that the evaporator fan RPM is correct for the airflow desired and for the external static pressure being imposed by the duct system.
2. Make sure the evaporator air filters are clean.
3. Check the evaporator and condenser coils to ensure that they are clean, that the fins are straight, and that there are no obstructions to airflow.
4. Measure the suction line superheat and adjust the expansion valve, if necessary. (Refer to "Measuring Superheat" in the MAINTENANCE PROCEDURES section of this manual.) The expansion valve superheat setting must be between 12 and 16 F.

Visually inspect the liquid line sight glass to see if clear liquid is present. Bubbles in the liquid line sight glass indicate either low refrigerant charge, excess liquid line pressure drop, or excess liquid line heat gain.

CAUTION: A clear sight glass does NOT necessarily mean the system has sufficient refrigerant.

After verifying that the system is operating properly, determine if the refrigerant charge is correct. This is accomplished by checking both system operating pressures **and** subcooling leaving the condensing unit.

CAUTION: It is not sufficient to check only operating pressures or only subcooling. Both must be in the acceptable range in order to establish correct system charge.

Operating Pressures:

Measure the suction and discharge line pressures and compare these readings with the normal operating pressures listed in Figures 10-13 and Tables 4-6. Refer to "Operating Pressures" in the MAINTENANCE PROCEDURES section of this manual.

Subcooling:

Determine the system subcooling. (Refer to "Measuring Subcooling" in the MAINTENANCE PROCEDURES section of this manual.) If the system is properly charged, subcooling at the liquid line access valve should be 14 to 19 F.

The system is low on refrigerant if: 1) the suction and discharge pressures are lower than the normal operating pressures as determined from Figures 10-13 and Tables 4-6 **and** 2) liquid subcooling is low (less than 14-19 F on Dual Compressor Units and less than 18-30 F on Single Compressor Units.

The system is overcharged with refrigerant if: 1) the suction and discharge pressures are higher than normal operating pressures **and** 2) liquid subcooling is high (greater than 14-19 F on Dual Compressor Units and greater than 18-50 F on Single Compressor Units.

CAUTION: If both the suction and discharge pressures are low but subcooling is in the acceptable range, the system has a problem other than a shortage of refrigerant. Do not add refrigerant. Refer to the TROUBLESHOOTING section of this manual.

Adding Refrigerant:

Use the suction line access valve to add refrigerant to a system with a low charge, making sure that only refrigerant vapor enters the suction line. Continue to add refrigerant until the subcooling is between 14 and 19 F. At this point, the operating pressures should be within the limits defined by Figures 10-13 and Tables 4-6.

Removing Refrigerant:

If the system is overcharged, some refrigerant must be removed to lower the subcooling to the 14-19 F range. Refrigerant should be discharged from the system slowly to keep oil loss at a minimum. The liquid line access valve can be depressed to remove refrigerant. However, refrigerant should not be discharged into the atmosphere.

WARNING: DO NOT ALLOW REFRIGERANT TO COME IN CONTACT WITH THE SKIN. IF THIS OCCURS, THE INJURY SHOULD BE TREATED AS IF THE SKIN HAS BEEN FROSTBITTEN OR FROZEN. SLOWLY WARM THE AFFECTED AREA WITH LUKEWARM WATER.

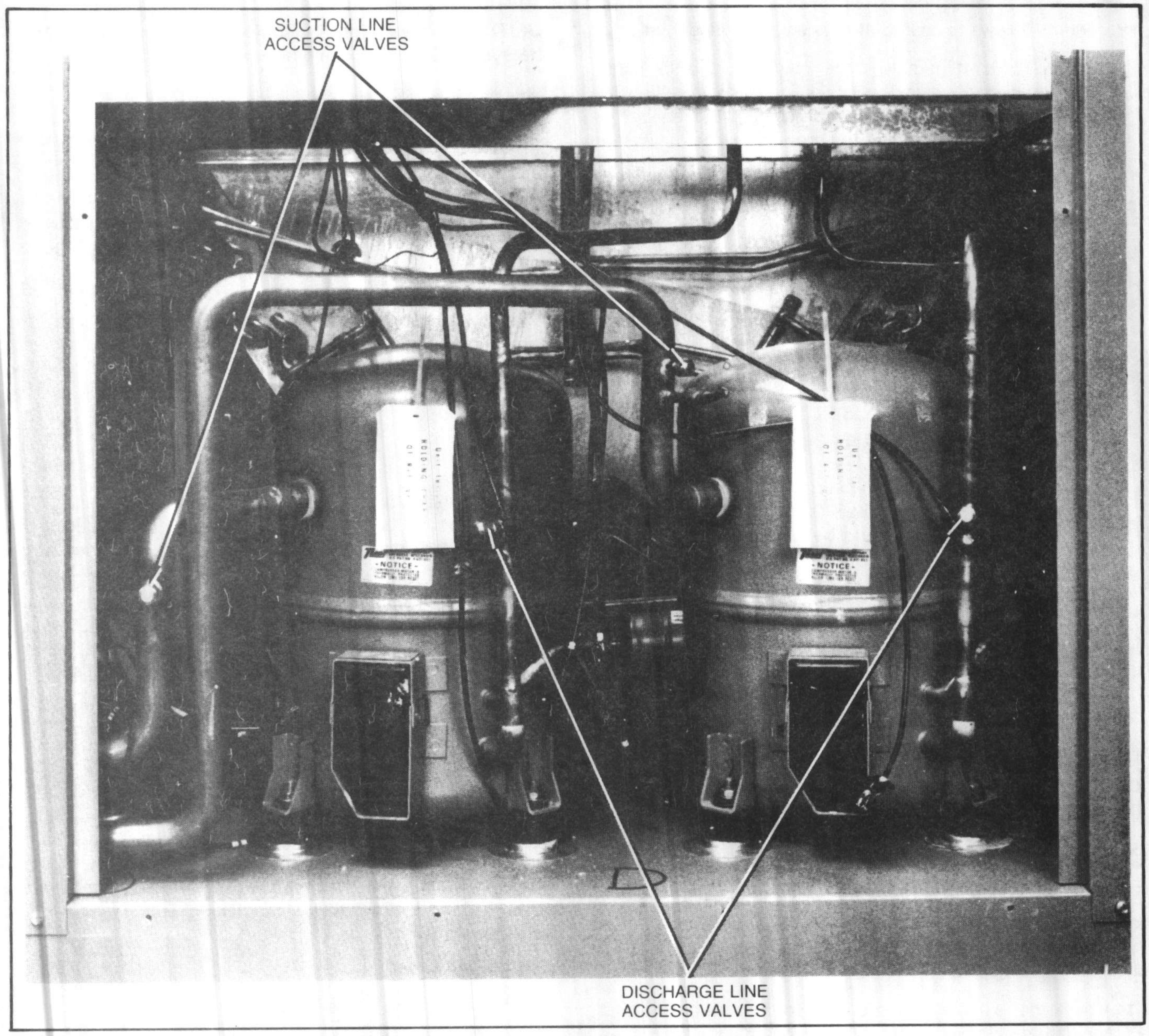


Figure 9 - Compressor Suction and Discharge Access Valves (Dual Compressor Unit Shown)

Operating Pressures

Operating pressure data can be used to determine if the system is operating properly. System malfunctions — such as low airflow, line restrictions, incorrect refrigerant charge, malfunctioning expansion valve, damaged compressor, and so on — will result in pressure variations which are outside the normal range. If the condensing unit and evaporator are checked individually, as described below, the operating pressures can be used to determine which side of the system (high side or low side) is malfunctioning. In addition, the relationship of suction vs. discharge pressure, as well as whether these pressures are higher or lower than expected, will provide valuable clues for determining the specific problem(s).

CAUTION: Operating pressure data, by itself, cannot be used to accurately charge a system. Charging by weight is preferred. If this is not feasible, a combination of operating pressures and subcooling measurement is necessary to properly charge the system. Refer to "Checking Refrigerant Charge" in the MAINTENANCE section of this manual.

Unfortunately, many application variables exist which affect operating pressures. These include indoor dry bulb and wet bulb temperature, outside dry bulb temperature, suction line pressure drop, and evaporator airflow. Since these variables can give misleading results, it is not recommended that operating pressures be used as the sole check of system operation. Further, the following conditions must be satisfied before checking system operating pressures.

1. The outdoor ambient temperature must be between 65 and 105 F. At ambient temperatures outside of this range, meaningful operating pressures cannot be measured.

2. The relative humidity of the air entering the evaporator must be above 40%. If it is less than 40%, meaningful operating pressures cannot be measured.

3. **All** condenser fans must be operating. If necessary, jumper the low ambient fan switches. Be sure to remove the jumpers when the measurements are completed.

4. Do not take measurements if the system includes a low ambient damper and/or hot gas bypass.

Use the following procedure to check operating pressures.

1. Condensing Unit Performance:
   a. Measure pressures (psig) at the suction and discharge line access valves next to the compressor.
   b. Measure the dry bulb air temperature (F) entering the condenser coil.
   c. If the outside ambient is between 65 and 105 F, enter the appropriate graph in Figures 10-13 at the measured suction pressure and condenser ambient. Read the corresponding discharge pressure.
   d. The measured discharge pressure should be within ± 7 psi of the graph pressure. If the difference is greater than ± 7 psi, the **condensing unit** performance is unacceptable. Refer to the TROUBLESHOOTING section of this manual.

Table 4 - Compressor Suction Pressures (psig)

			CONDENSER AMBIENT, F														
			65			75			85			95			105		
CON-		EVAP.	WET BULB, F			WET BULB, F			WET BULB, F			WET BULB, F			WET BULB, F		
DENSING	EVAP-	AIRFLOW	57	65	72	57	65	72	57	65	72	57	65	72	57	65	72
UNIT	ORATOR	(SCFM)	COMPRESSOR SUCTION PRESSURE (PSIG)														
BTA120D	BTE120B	4000	59	69	79	60	71	81	62	72	83	63	74	84	65	76	86
BTA150D	(2) BWE090C	5000	59	69	79	61	71	81	62	73	83	64	75	85	66	77	87
	BWV180B	5000	61	71	82	62	73	84	64	75	85	66	77	87	68	79	90
BTA180D	(2) BWE090C	6000	58	68	78	60	70	80	61	72	82	63	74	84	65	76	86
	BWV180B	6000	60	70	80	61	72	82	63	74	84	65	76	86	66	77	88
BTA180F	BWV180B	6000	57	67	76	59	69	78	61	71	81	63	73	83	65	75	86

NOTES:
1. Table only good for relative humidity of air entering evaporator greater than 40%.
2. Interpolation between wet bulb temperatures is allowable. Do not extrapolate outside range given.

2. Evaporator Performance:
   a. Measure the actual **wet bulb** temperature (F) of the air entering the evaporator. Be sure to measure the mixed air condition if outside air is being ducted in.
   b. Find the correct combination of condensing unit and evaporator in Table 4. Match the condenser entering air temperature (measured in Step 1b) with the evaporator wet bulb temperature (measured in Step 2a) to determine the correct suction pressure.
   c. Use Table 5 to correct the suction pressure (from Table 4) for the line sizes used in your installation.
   d. Use Table 6 to correct the suction pressure (from Step 2c) for the airflow of your evaporator.
   e. The measured suction pressure at the compressor should be within ± 2 psi of the corrected pressure from Tables 4-6. If not, improper **system** operation is indicated. Refer to the TROUBLESHOOTING section of this manual.

CAUTION: Table 4 is not accurate if the relative humidity of evaporator entering air is less than 40%, or if an evaporator/condensing unit combination other than those listed is used.

Table 5 - Suction Pressure Correction for Line Size (PSI)

CONDENSING	7/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA120D	+0.4	−1.0	−2.4	−3.6	−4.7	−5.8
BTA150D	+0.6	−1.6	−3.6	−5.4	−6.9	−8.4
BTA180D	+0.3	−2.5	−5.0	−7.1	−8.9	−10.6
CONDENSING	1-1/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA120D	+0.4	0	−0.4	−0.8	−1.1	−1.5
BTA150D	+0.6	0	−0.6	−1.2	−1.8	−2.3
BTA180D	+0.3	−0.5	−1.3	−2.0	−2.7	−3.4
CONDENSING	1-3/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA120D	+0.4	+0.3	+0.1	0	−0.2	−0.3
BTA150D	+0.6	+0.4	+0.2	0	−0.3	−0.5
BTA180D	+0.3	0	−0.2	−0.5	−0.8	−1.1
BTA180F	−0.7	−1.7	−2.6	−3.4	−4.2	−4.9
CONDENSING	1-5/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA180F	+0.4	0	−0.4	−0.8	−1.2	−1.6

*0 and 125 feet provided for interpolation purposes only.

Table 6 - Suction Pressure Correction for Airflow (PSI)

COND.	PERCENT OF RATED EVAPORATOR AIRFLOW								
UNIT	-20%	-15%	-10%	-5%	0%	+5%	+10%	+15%	+20%
BTA120D	-2.8	-2.0	-1.3	-0.6	0	+0.6	+1.1	+1.6	+2.1
BTA150D	-2.6	-1.9	-1.2	-0.6	0	+0.5	+1.0	+1.5	+1.9
BTA180D	-2.6	-1.9	-1.2	-0.6	0	+0.5	+1.0	+1.4	+1.9
BTA180F	-2.5	-1.8	-1.2	-0.6	0	+0.5	+1.0	+1.4	+1.8

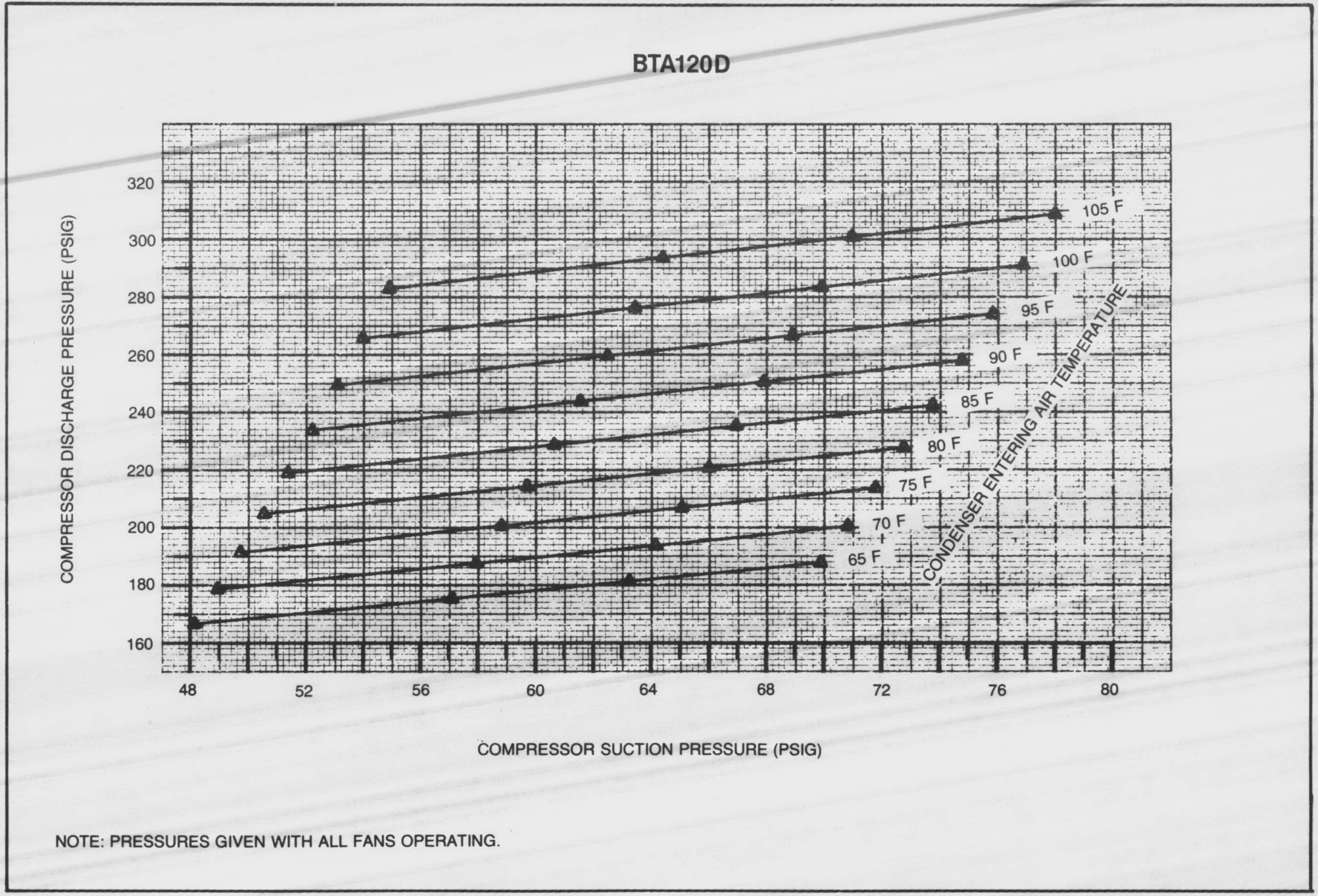
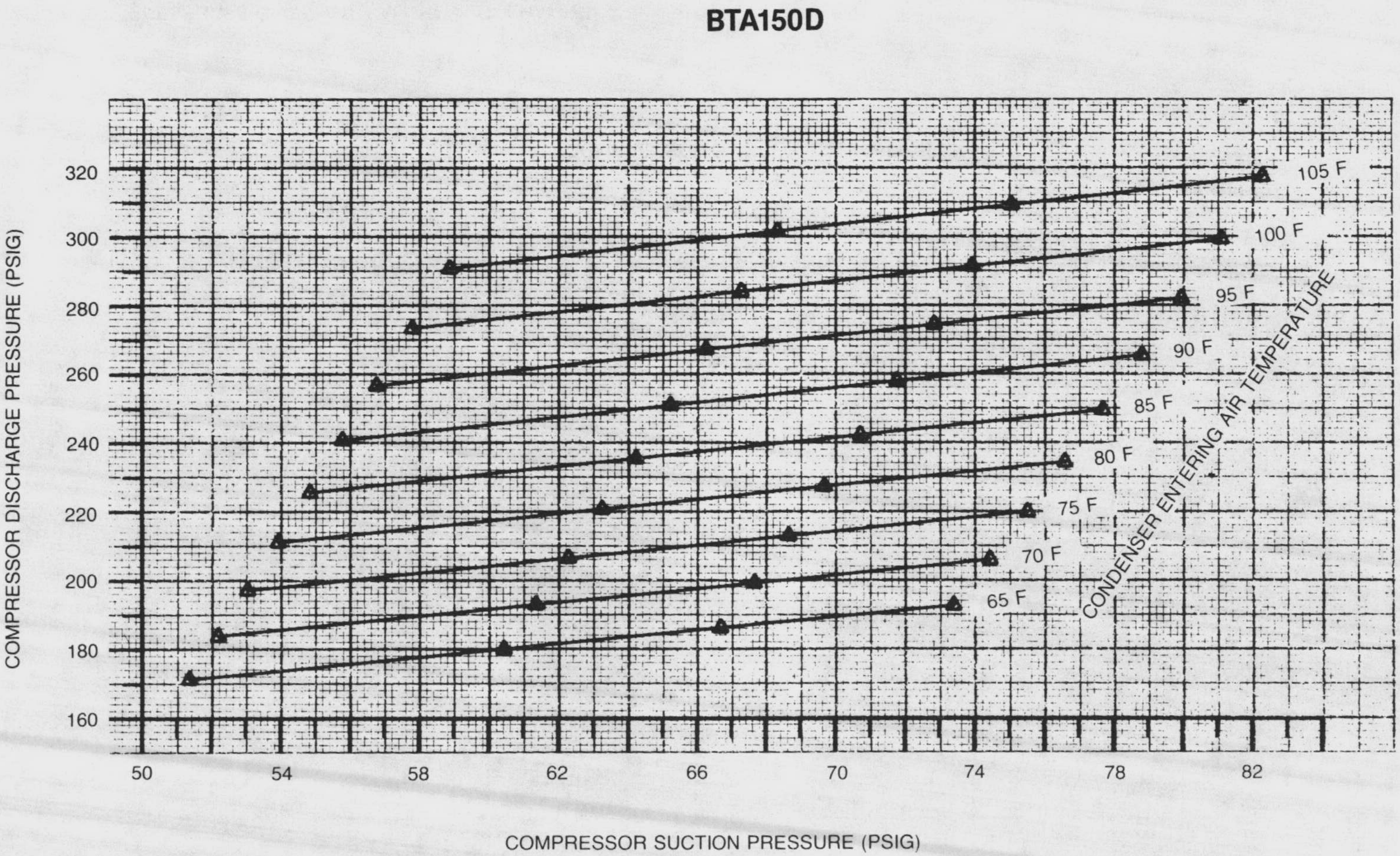


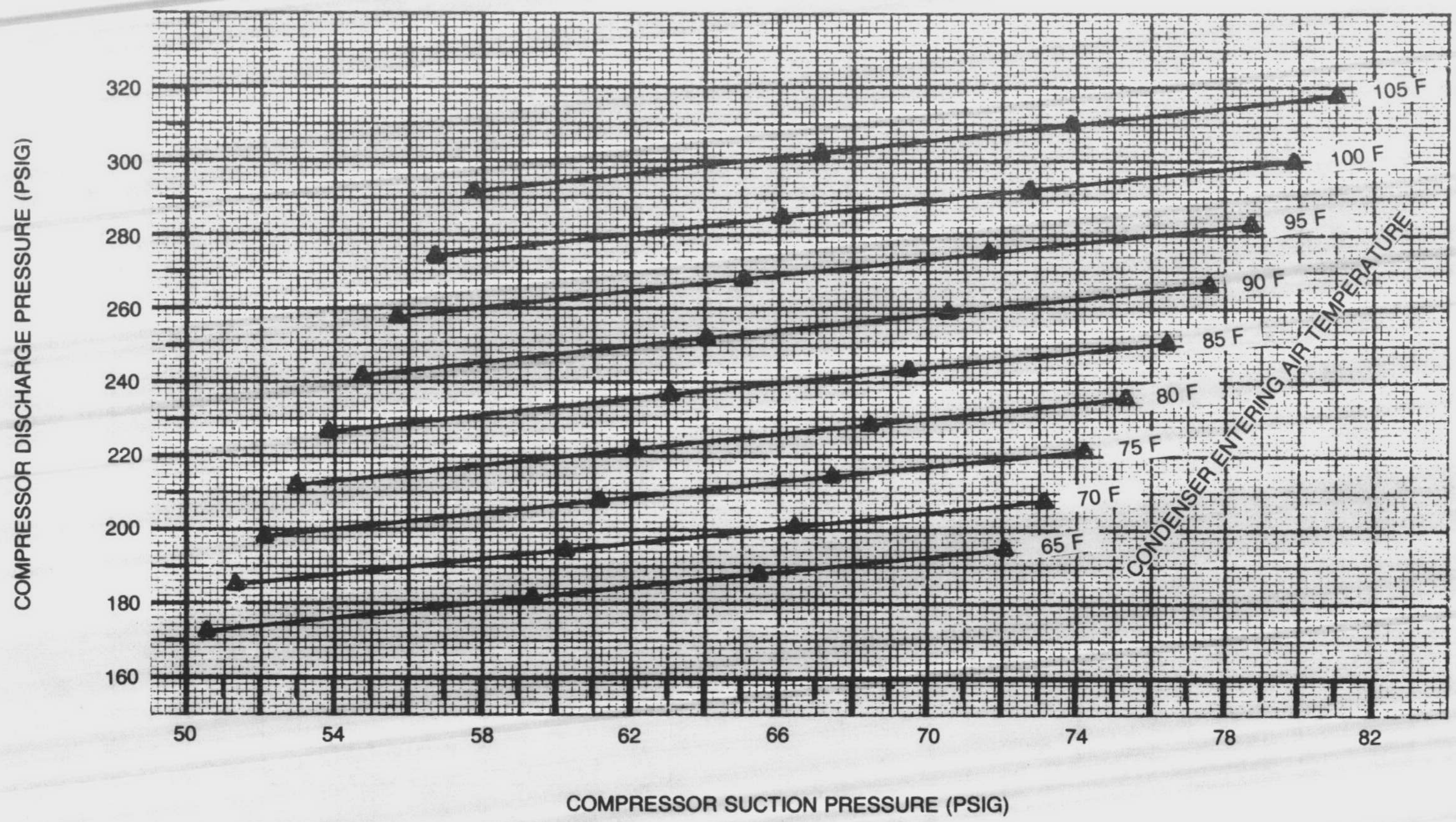
Figure 10 · BTA120D Operating Pressures



NOTE: PRESSURES GIVEN WITH ALL FANS OPERATING.

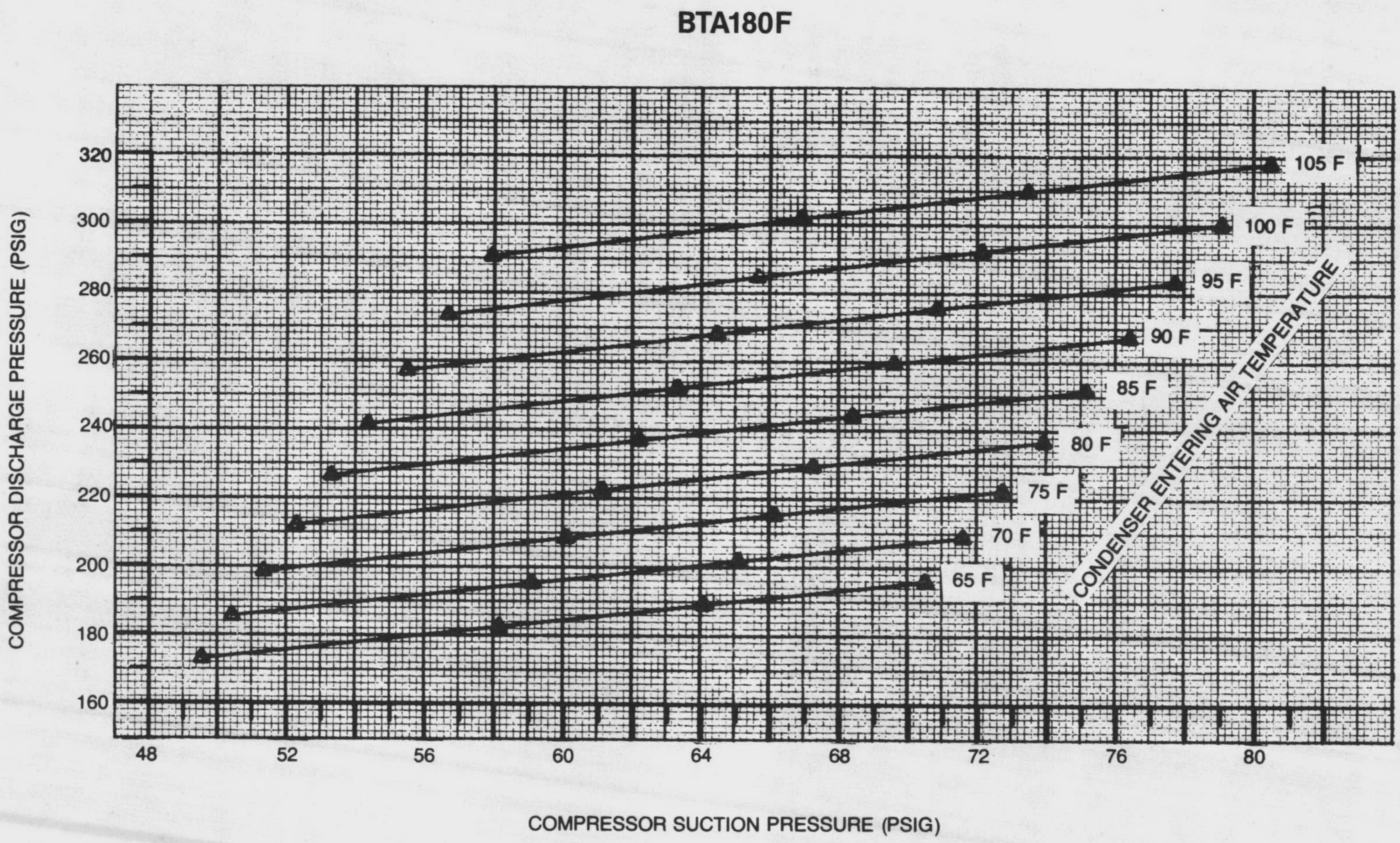
Figure 11 · BTA150D Operating Pressures

BTA180D



NOTE: PRESSURES GIVEN WITH ALL FANS OPERATING.

Figure 12 - BTA180D Operating Pressures



NOTE: PRESSURES GIVEN WITH ALL FANS OPERATING.

Figure 13 - BTA180F Operating Pressures

Measuring Superheat

The "safe" setting range for suction gas superheat on Trane equipment is 12 to 16 degrees at the evaporator. Settings within this range will allow for measurement error. Superheats below 12 degrees can cause refrigerant flood back which could lead to serious compressor damage. Superheat readings above the 16 degree measurement reduce system efficiency by reducing the effective evaporator surface.

To determine suction gas superheat, the pressure at the outlet of the evaporator must be measured and then converted to saturated vapor temperature by using a Refrigerant-22 pressure/temperature chart. The saturated vapor temperature can then be subtracted from the actual suction temperature, which is measured on the suction line close to the expansion valve bulb. The difference between the two temperatures is known as suction gas superheat. On most Trane fan/coil units an access valve has been provided close to the expansion valve bulb. To obtain an accurate reading, this access valve must be utilized when determining suction gas superheat.

Instruments to Use:

1. The gauge used to measure suction pressure should be of the best quality available. Gauges permanently installed on the equipment should not be used. A good quality gauge on a standard refrigerant manifold set is recommended.

2. To measure suction temperature, an electronic temperature tester will be sufficient. Testers manufactured by Robinnaire, Annie, and Thermal are among those available. Glass thermometers do not have sufficient contact area to give accurate readings.

Procedure:

In most cases it is desirable to use a single distributor evaporator with the BTA condensing unit, thereby utilizing one expansion valve. When the system has only one expansion valve, the following procedure should be used for measuring superheat.

1. Cut the suction line insulation to gain access to the suction line. If armaflex is used, it is best to cut around the circumference of the tubing.
2. Clean the line carefully and attach the electronic temperature sensor. Black electrical tape works well when securing the sensor of the temperature tester to the suction line. (Make sure the sensor is making good contact with the tube.)
3. Rejoin the armaflex and seal with plastic tape to prevent sensor contact with ambient air.

   NOTE: *For measurement accuracy the temperature sensor* ***must*** *be installed and insulated properly. Make sure the armaflex extends at least six inches on both sides of the sensor location. Seal both ends of the armaflex to keep ambient air from getting under the insulation and affecting the temperature readings.*

4. Install a pressure gauge to monitor suction pressure.
5. Operate the system for approximately 10 to 15 minutes to be sure that the expansion valve has time to stabilize.
6. To measure superheat, compare the saturated vapor temperature of the refrigerant converted from the suction pressure reading (see Table 7) to the actual temperature measured at the line by the electronic tester. Proper suction superheat is 12 to 16 degrees.

EXAMPLE:
Suction Pressure = 66.0 psig
Suction Temperature = 52 F
Suction Pressure converted to Saturated Vapor Temperature (from Table 11) = 38 F
Suction Superheat = (Actual Line Temp.) – (Saturated Vapor Temp.)
= (52 F) – (38 F)
= 14 F

If initial suction superheat readings fall below 12 degrees, the adjusting stem on the expansion valve should be adjusted clockwise to close the valve, limiting the flow of refrigerant to the evaporator and thus increasing superheat. Adjustment should be made a half turn at a time. Conversely, if the initial suction superheat reading is greater than 16 degrees, the adjusting stem on the expansion valve should be adjusted counterclockwise to open the valve, increasing the flow of refrigerant to the evaporator and thus decreasing superheat. Adjustments should be made until an acceptable reading is obtained. The system should be allowed to restabilize for 10 minutes after each adjustment.

Table 7 · Pressure/Temperature Conversions for Calculating Suction Line Superheat

SATURATED TEMPERATURE	PRESSURE USING REFRIGERANT-22
30	54.9
31	56.2
32	57.5
33	58.8
34	60.1
35	61.5
36	62.8
37	64.2
38	65.6
39	67.1
40	68.5
41	70.0
42	71.4
43	73.0
44	74.5
45	76.0
46	77.6
47	79.2
48	80.8
49	82.4
50	84.0

Measuring Subcooling

The following conditions must be satisfied before checking subcooling.

1. The outdoor ambient temperature must be between 65 and 105 F. At ambient temperatures outside of this range, meaningful operating pressures cannot be measured.
2. The relative humidity of the air entering the evaporator must be above 40%. If it is less than 40%, meaningful operating pressures cannot be measured.
3. The compressor must be operating on high speed.
4. **All** condenser fans must be operating. If necessary, jumper the low ambient fan switches. Be sure to remove the jumpers when the measurements are completed.
5. Do not take measurements if the system includes a low ambient damper and/or hot gas bypass.

The proper setting range for liquid subcooling is 18 to 30 F on BTA180F units. Determine the system subcooling as follows:

1. Measure the liquid line pressure at the liquid line access valve installed inside the condensing unit. Convert this pressure reading to saturated temperature by using a Refrigerant-22 pressure/temperature chart (refer to Table 8).
2. Measure the actual liquid line temperature on the liquid line close to the access valve. To ensure an accurate reading, clean the line thoroughly where the electronic temperature sensor will be attached. Glass thermometers do not have sufficient contact area to give accurate readings. After securing the sensor to the line, wrap the sensor and line with insulation to prevent contact with ambient air.
3. Determine the system subcooling by subtracting the actual liquid line temperature (measured in Step 2) from the saturated liquid temperature (calculated in Step 1).
4. If the system is properly charged, subcooling at the liquid line access valve should be 18-30 F on BTA180F units and 14-19 F on BTA120D-BTA180D units.

Table 8 - Pressure/Temperature Conversion for Calculating Liquid Line Subcooling

SATURATED TEMPERATURE	PRESSURE USING REFRIGERANT-22
70	121.4
75	132.2
80	143.6
85	155.7
90	168.4
95	181.8
100	195.9
105	210.8
110	226.4
115	242.7
120	259.9
125	277.9
130	296.8
135	316.6
140	337.2
145	358.9
150	381.5

Table 9 - Maximum Allowable Amps

Condensing Unit	Electrical Characteristics	Allowable** Voltage Range	Max. Allowable Amps Matched Evap.	Max. Allowable Amps Oversized* Evap.
BTA120D300	208-230/60/3	187-253	24	—
BTA120D400	460/60/3	416-506	11	—
BTA120DW00	575/60/3	520-635	9	—
BTA150D300	208-230/60/3	187-253	—	30
BTA150D400	460/60/3	416-506	—	13
BTA150DW00	575/60/3	520-635	—	11
BTA180D300	208-230/60/3	187-253	31	36
BTA180D400	460/60/3	416-506	14	16
BTA180DW00	575/60/3	520-635	11	13
BTA180F300	208-230/60/3	187-253	66	67
BTA180F400	460/60/3	416-506	33	34
BTA180FW00	575/60/3	520-635	27	27

*Evaporator one size larger than condensing unit.
**Allowable voltage range at the unit terminal block.

Troubleshooting

The Troubleshooting Chart on the following pages is provided to serve as an aid for identifying the cause of any system malfunctions that may occur. The chart is divided into three columns:

— the "SYMPTOM" column describes the behavior the unit is exhibiting;
— the "PROBABLE CAUSE" column identifies possible sources of malfunction;
— the "RECOMMENDED ACTION" column indicates the procedures required to correct the malfunction.

If operating difficulties are encountered, make the following preliminary checks before referring to the Troubleshooting Chart:

- ☐ Check the thermostat to ensure that it is properly set, receiving control power, and "making/breaking" on a call for heating or cooling.
- ☐ Verify that the unit is receiving electrical supply power, and that the fuses are intact.
- ☐ Check the filters to make sure they are positioned properly, and free of dirt and debris.

After completing the checks listed above, inspect the system for other obvious causes of trouble such as broken fan belts, a clogged condenser coil, or restricted air ducts. If everything appears to be in order, but the unit still fails to operate properly, refer to the appropriate section of the Troubleshooting Chart.

NOTE: *The Troubleshooting Chart which follows is provided solely as a guide for determining the cause of mechanical failure or malfunction. When mechanical problems do occur, Trane recommends that trained service personnel be contacted to help ensure proper diagnosis and repair of the unit.*

WARNING: OPEN THE UNIT DISCONNECT SWITCH AND LOCK IT IN THAT POSITION TO PREVENT ACCIDENTAL START-UP. NEVER OPEN AN ACCESS PANEL TO INSPECT OR SERVICE THE UNIT WITHOUT FIRST OPENING THE DISCONNECT SWITCH. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
A. Compressor does not start, and does not hum. Condenser fans do not operate.	1. No power to unit.	1. Check for the following: a. Disconnect switch open. b. Fuses blown.
	2. No call for cooling.	2. Check for the following: a. Defective thermostat. b. Broken or improper control wiring. c. Blown control power fuse.
	3. Anti-recycle timer has not timed out (if installed).	3. Wait at least five minutes for the anti-recycle timer to time out.
	4. Compressor motor protection module cut out.	4. Check motor windings for open circuit after allowing cool-down time. Refer to Symptom F, "Compressor motor protection module cut out".
	5. Unit locked out by reset relay.	5. Check for the following: a. Excessive discharge pressure. Refer to Symptom L, "Discharge pressure too high". b. Defective high pressure control. c. Low suction pressure. Refer to Symptom I, "Suction pressure too low". d. Defective low pressure control. e. Defective reset relay contacts.
AA. Compressor does not start, and does not hum. Condenser fans operate.	1. Compressor contactor will not close.	1. Check for the following: a. Defective compressor contactor. b. Improper wiring.
	2. Defective compressor.	2. Replace faulty compressor.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
B. Compressor hums, but will not start.	1. Low voltage at the compressor.	1. Check for the following: a. A single blown fuse. b. Low line voltage. c. Defective compressor contactor. d. Loose wiring connections.
	2. Defective compressor.	2. Check for the following: a. Open motor winding. b. Excessive amp draw on all phases.
C. Compressor fails to switch to high speed.	1. No call for second stage of cooling.	1. Check for the following: a. Setpoint too low. b. Defective thermostat. c. Broken or improper control wiring.
	2. Compressor contactor will not close.	2. Same as AA-1.
	3. Defective compressor.	3. Same as AA-2.
D. Compressor short cycles.	1. Intermittent contact in control circuit.	1. Check for the following: a. Defective relay contacts. b. Loose wiring connections.
	2. Poor thermostat placement.	2. Refer to "Thermostat Installation" in the ELECTRICAL WIRING section of this manual.
	3. Defective anti-recycle timer.	3. Replace compressor motor protection module.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
E. Compressor runs continuously.	1. Unit undersized for load (cannot maintain space temperature).	1. Check for cause of excessive load.
	2. Compressor fails to switch to high speed.	2. Refer to Symptom C.
	3. Thermostat setpoint too low.	3. Readjust thermostat.
	4. Defective thermostat or control wiring (conditioned space too cold).	4. Replace thermostat. Replace or repair control wiring.
	5. Welded contacts on compressor contactor.	5. Repair or replace contactor.
	6. Leaky valves in compressor (indicated by operation at abnormally low discharge and high suction pressures).	6. Replace compressor.
	7. Shortage of refrigerant (indicated by reduced capacity coupled with high superheat, low subcooling, and low suction pressure).	7. Find and repair refrigerant leak. Recharge system.
F. Compressor motor protection module cut out.	1. Excessive load on evaporator (indicated by high supply air temperature).	1. Check for the following: a. Excessive airflow. b. High return air temperature.
	2. Lack of motor cooling (indicated by excessive superheat).	2. Check for the following: a. Improper expansion valve setting. b. Faulty expansion valve. c. Restriction in liquid line.
	3. Improper voltage at compressor.	3. Check for the following: a. Low or unbalanced line voltage. b. Loose power wiring. c. Defective compressor contactor.
	4. Internal parts of compressor damaged.	4. Replace compressor.
G. Compressor is noisy.	1. Internal parts of compressor damaged or broken (compressor knocks).	1. Replace compressor.
	2. Liquid floodback (indicated by abnormally cold suction line).	2. Check and adjust superheat.
	3. Liquid refrigerant in the compressor at start-up (indicated by an abnormally cold compressor shell).	3. Replace crankcase heater.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
H. System short of capacity.	1. Low refrigerant charge (indicated by low subcooling and high superheat).	1. Add refrigerant.
	2. Clogged filter drier (indicated by temperature change in refrigerant line through drier).	2. Replace filter drier or core of drier.
	3. Incorrect thermostatic expansion valve setting.	3. Readjust expansion valve.
	4. Expansion valve stuck or obstructed (indicated by high superheat and high space temperature).	4. Repair or replace expansion valve.
	5. Low evaporator airflow.	5. Check filters. Adjust airflow.
	6. Noncondensibles in system.	6. Evacuate and recharge system.
	7. Leaky valves in compressor (indicated by operation at abnormally low discharge and high suction pressures).	7. Replace compressor.
I. Suction pressure too low.	1. Shortage of refrigerant (indicated by high superheat and low subcooling).	1. Find and repair refrigerant leak. Recharge system.
	2. Thermostat set too low (indicated by low discharge pressure and low space temperature).	2. Readjust thermostat.
	3. Low airflow.	3. Check for clogged filters, incorrect fan speed, or high duct static pressure.
	4. Clogged filter drier.	4. Check for frosting on filter drier. Replace if necessary.
	5. Expansion valve power assembly has lost charge.	5. Repair or replace expansion valve power head assembly.
	6. Obstructed expansion valve (indicated by high superheat).	6. Clean or replace valve.
J. Suction pressure too high.	1. Excessive cooling load (indicated by high supply air temperatures).	1. See Symptom E, "Compressor runs continuously".
	2. Overfeeding of expansion valve (indicated by abnormally low superheat and liquid flooding to compressor).	2. Adjust superheat setting and check to see that remote bulb is properly attached to suction line.
	3. Suction valves broken in open position (indicated by noisy compressor).	3. Replace compressor.
	4. Compressor on low speed.	4. Refer to Symptom C.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
K. Discharge pressure too low.	1. Shortage of refrigerant (indicated by low subcooling and high superheat plus bubbles in sight glass).	1. Repair leak and recharge system.
	2. Broken or leaky compressor discharge valves (indicated by suction and discharge pressures that equalize rapidly after shutdown).	2. Replace compressor.
	3. Condenser fan control stuck in closed position (contacts closed when temperature is below 60 F).	3. Replace defective control.
	4. Unit running below minimum operating ambient.	4. Provide adequate heat pressure controls or a unit ambient lockout switch.
	5. Low ambient damper stuck open (indicated by low discharge pressure).	5. Repair or replace damper operator.
L. Discharge pressure too high.	1. Too little or too warm condenser air; restricted air flow.	1. Clean coil. Check fan and motors for proper operation.
	2. Air or noncondensible gas in system (indicated by exceptionally hot condenser and excessive discharge pressure).	2. Evacuate and recharge system.
	3. Overcharge of refrigerant (indicated by high subcooling, low superheat, and high suction pressure).	3. Remove excess refrigerant.
	4. Excessive system load.	4. Reduce load.
	5. Defective condenser fan or fan control (indicated by one fan off and high condenser pressure).	5. Repair or replace fan or control.
	6. Defective or inoperative low ambient dampers.	6. Repair or replace defective parts.

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

AN AMERICAN—
STANDARD
COMPANY

BTA-M-3

Technical Literature Printed in USA

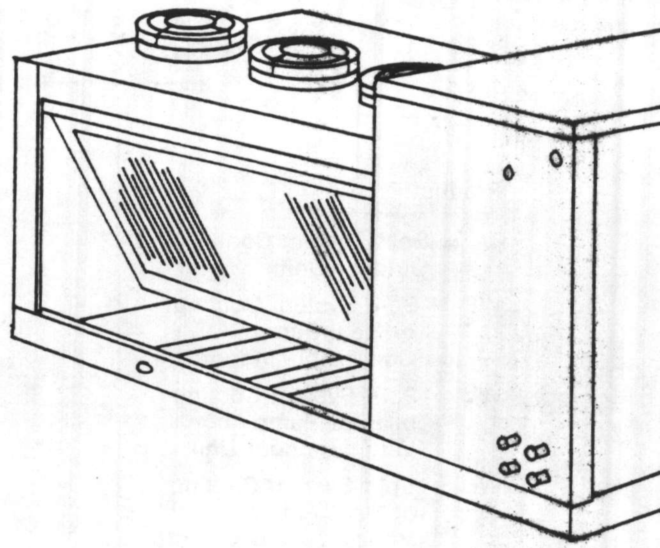
TRANE™

INSTALLER'S GUIDE

Split System Condensing Units

Models
BTA120D-AB
BTA150D-AB
BTA180D-AB
BTA180F-AB

Library	Service Literature
Product Section	Unitary
Product	Split System
Model	BTA
Literature Type	Installation
Sequence	5
Date	December 1986
File No.	SV-UN-S/S-BTA-IN-5 12/86
Supersedes	New



Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

Table of Contents

Unit Model Number Description

Trane LCG products are identified by a multiple-character model number that precisely identifies a particular type of unit. A[illegible] explanation of this multiple-character number is shown below. It will enable the owner or Service Engineer to define operation, components and applicable accessories for a specific unit.

LCG Unit Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12
B	T	A	1	2	0	D	3	0	0	A	A

Digit 1 — Always "B"

Digits 2, 3 — **Product Type**

TA = Split System Cooling, Outdoor Unit
WE = Split System Cooling or Heat Pump, Convertible Indoor Unit
WV = Split System Cooling or Heat Pump, Verticle Indoor Unit
WH = Split System Cooling or Heat Pump, Horizontal Indoor Unit

Digits 4, 5, 6 — **Cooling Capacity (MBH)**

090 = 90 MBH
120 = 120 MBH
180 = 180 MBH
240 = 240 MBH

Digit 7 — Major Design Sequence

Digit 8 — **Electrical Characteristics**

3 = 208-230/60/3
4 = 460/60/3
W = 575/60/3

Digits 9, 10 — **Secondary Capacity and/or Factory Installed Options**

00 = Not Used

Digit 11 — Minor Design Sequence

Digit 12 — Service Digit

General Information

Model BTA Condensing Units are designed for outdoor mounting with a vertical air discharge. They are usually installed on concrete slabs at ground level, but can also be used on a flat roof or a sloping roof with a properly built-up platform (making a level installation possible). Each unit is leak tested and evacuated at the factory, and shipped with a holding charge of Refrigerant-22. An access panel on the end of the unit provides access to the compressor section and access to the control box.

An Installation Checklist is provided at the end of this manual and should be completed after all installation procedures have been accomplished. This checklist should not be substituted for the detailed information given in appropriate sections of this manual.

Installation

Unit Installation

BTA unit dimensions, weights, and clearances are shown in Figures 1 through 3. Figure 4 illustrates various components of the split system condensing unit.

Receiving

When the unit is delivered to the jobsite, inspect all components for damage. Manually rotate the condenser fans to be sure they revolve freely. Report any damage or material shortage to the carrier and record this information on the bill of lading. File damage claims with the carrier, and notify the appropriate Trane sales office before installing a damaged unit. Any material shortages should also be reported directly to the Trane sales office.

Compare the electrical data on the unit nameplate with the ordering and shipping information to verify that the correct unit has been received.

Unit wiring diagrams and installation-operation-maintenance literature are shipped with the unit. Before unit start-up, read the provided literature to become familiar with the unit and its operation.

Location and Clearances

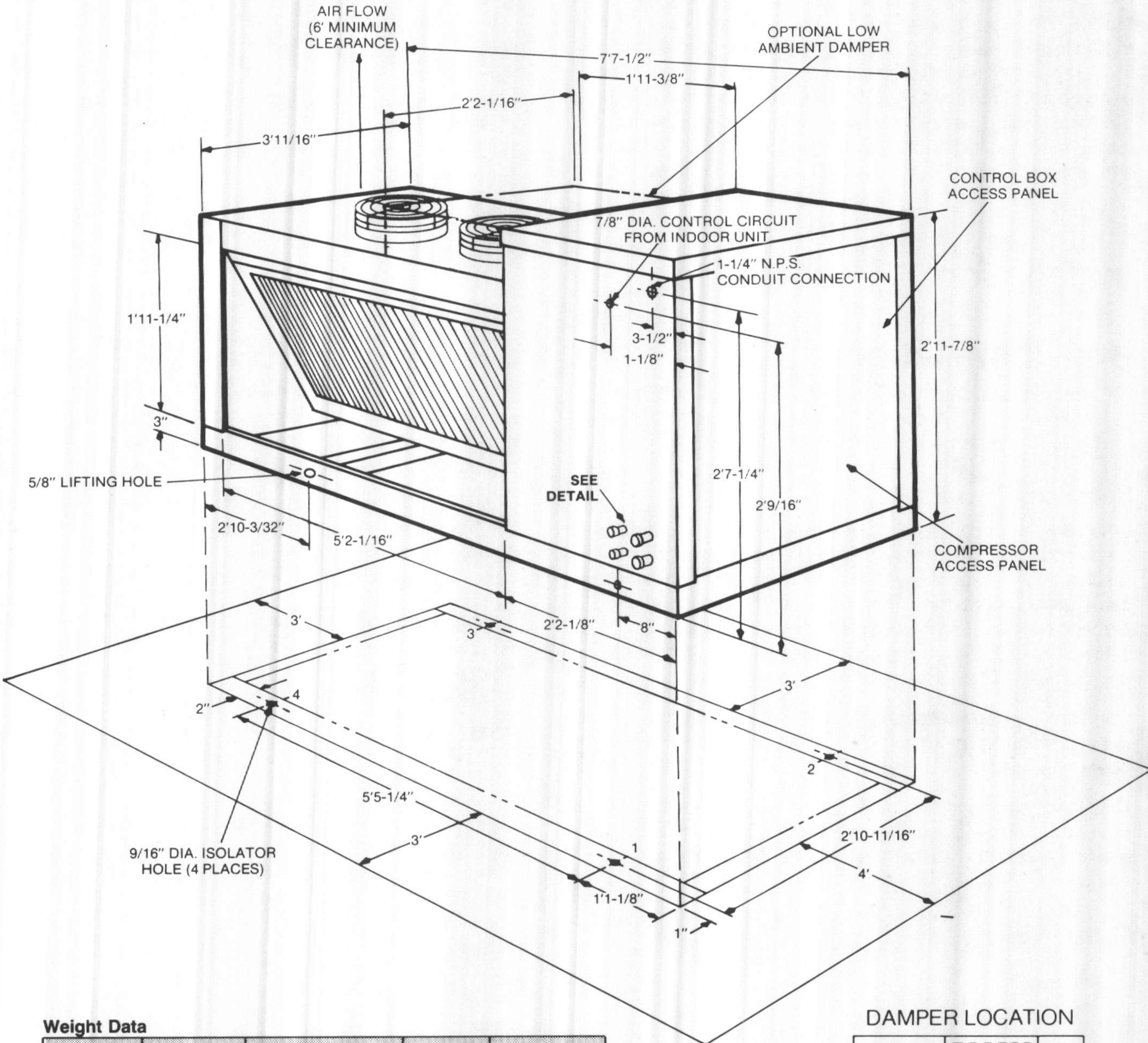
Select a location for the condensing unit where air will flow, without obstruction, upward through the coil and away from the fan discharge. Limit the length of refrigerant piping by locating the condensing unit as close to the evaporator as possible.

CAUTION: If the condensing unit must be placed under an overhang, take the necessary steps to avoid the recirculation of warm discharged air. Failure to do so will hinder the performance of the condensing unit and lead to unit damage.

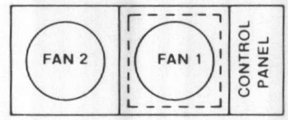
Suggested air flow clearances and service clearances are given in Figures 1 through 3. If the unit is placed under an overhang, allow at least six feet of clearance above the unit to prevent recirculation of hot discharge air.

NOTE: *Four feet of service clearance must always be provided on the compressor end of the unit.*

Allow sufficient space to install a liquid line shutoff valve with an access port next to the condensing unit. The access port will be needed to measure subcooling, as discussed in the MAINTENANCE manual.



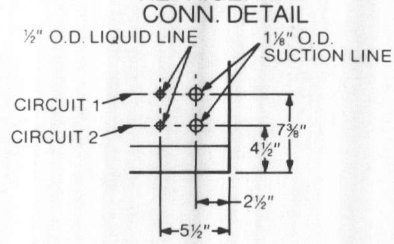
DAMPER LOCATION



Weight Data

MODEL	NO. OF COMPS.	WEIGHT CONCENTRATED ON LEG (LBS) 1	2	3	4	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
BTA120D	Two 5-Ton	226	228	124	100	830	678

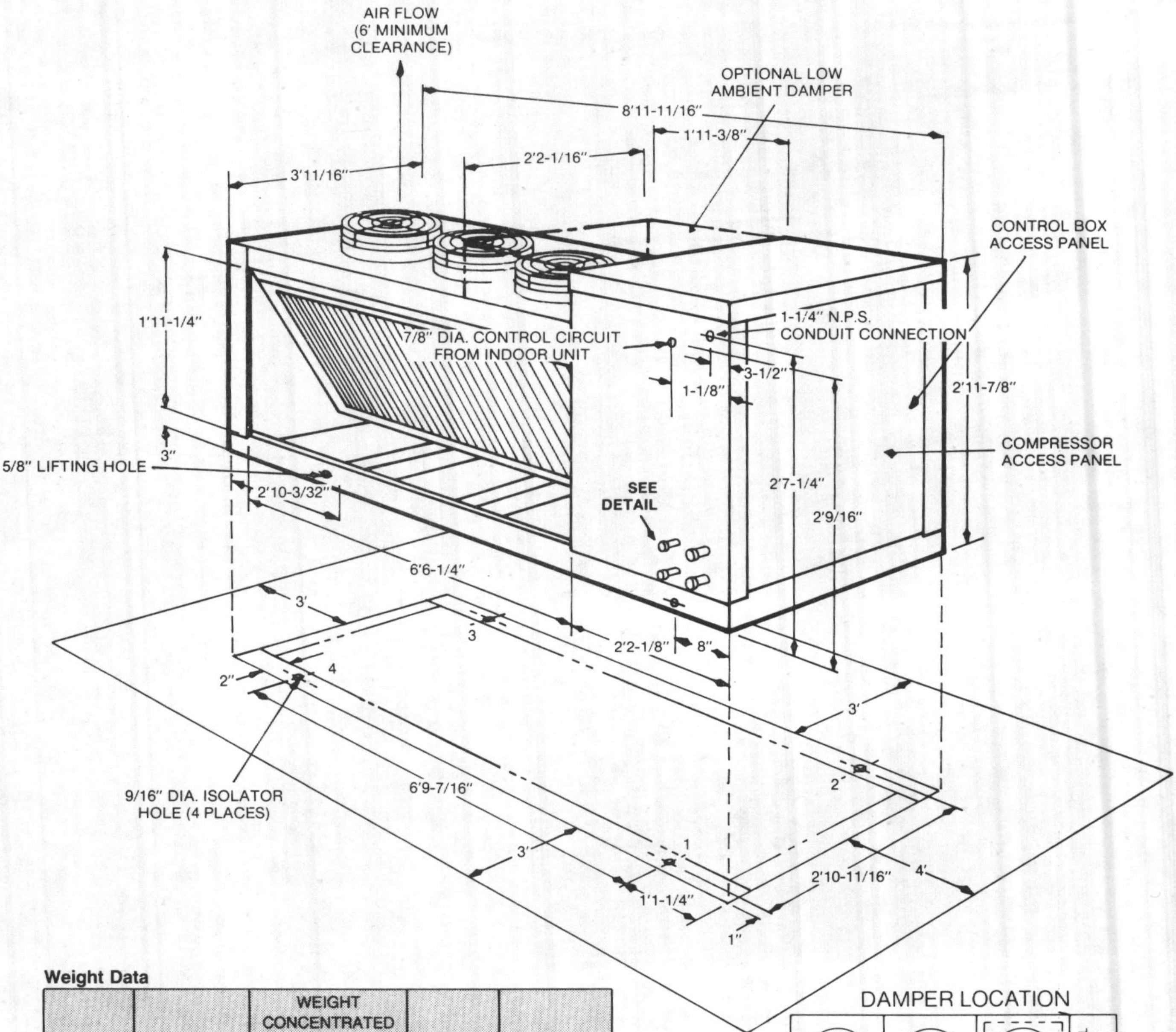
REFRIGERANT
CONN. DETAIL



Clearance Data

MODEL	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIR FLOW CLEARANCES: SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION: MAX. PIT DEPTH	COIL CLEARANCE
BTA120D	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"

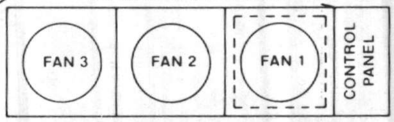
Figure 1 - Dimensions, Weights, and Clearances for BTA120D Units



Weight Data

MODEL	NO. OF COMPS.	WEIGHT CONCENTRATED ON LEG (LBS) 1	2	3	4	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
BTA150D	Two 6.25-Ton	256	259	138	119	960	772
BTA180D	Two 7.50-Ton	270	272	158	140	1020	840

DAMPER LOCATION



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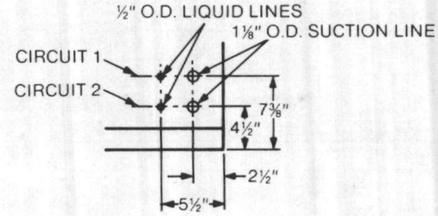
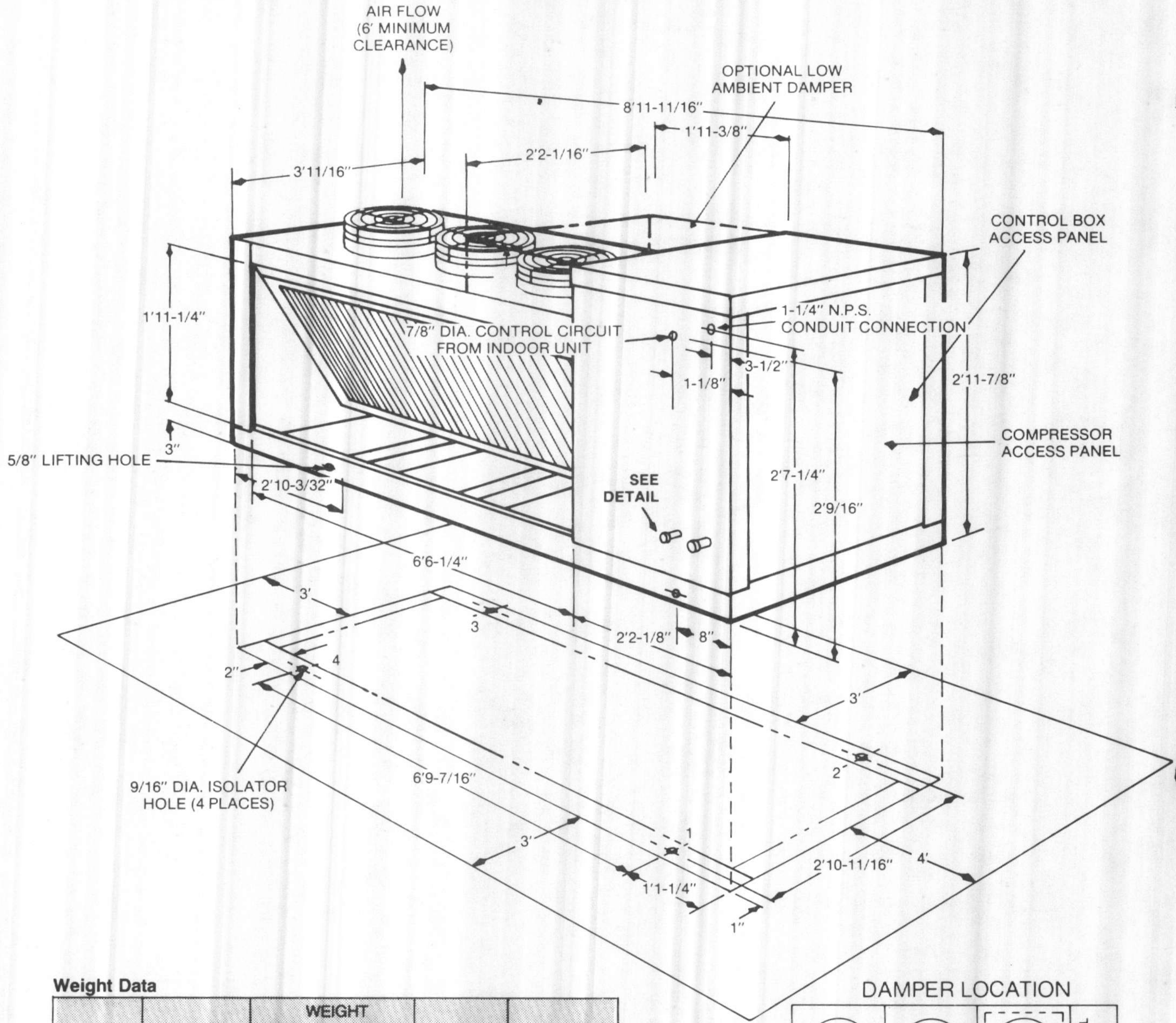


Clearance Data

MODEL	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIR FLOW CLEARANCES: SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION: MAX. PIT DEPTH	COIL CLEARANCE
BTA150D	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"
BTA180D	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"

Figure 2 - Dimensions, Weights, and Clearances for BTA150D and 180D Units



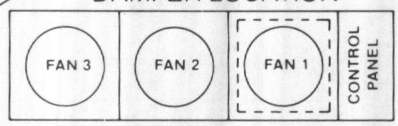
Weight Data

MODEL	NO. OF COMPS.	WEIGHT CONCENTRATED ON LEG (LBS) 1	2	3	4	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
BTA180F	One 15-Ton	271	273	158	140	1022	842

Clearance Data

MODEL	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIR FLOW CLEARANCES: SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION: MAX. PIT DEPTH	COIL CLEARANCE
BTA180F	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"

DAMPER LOCATION



REFRIGERANT CONN. DETAIL

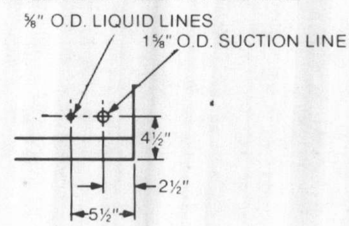


Figure 3 - Dimensions, Weights, and Clearances for BTA180F Units

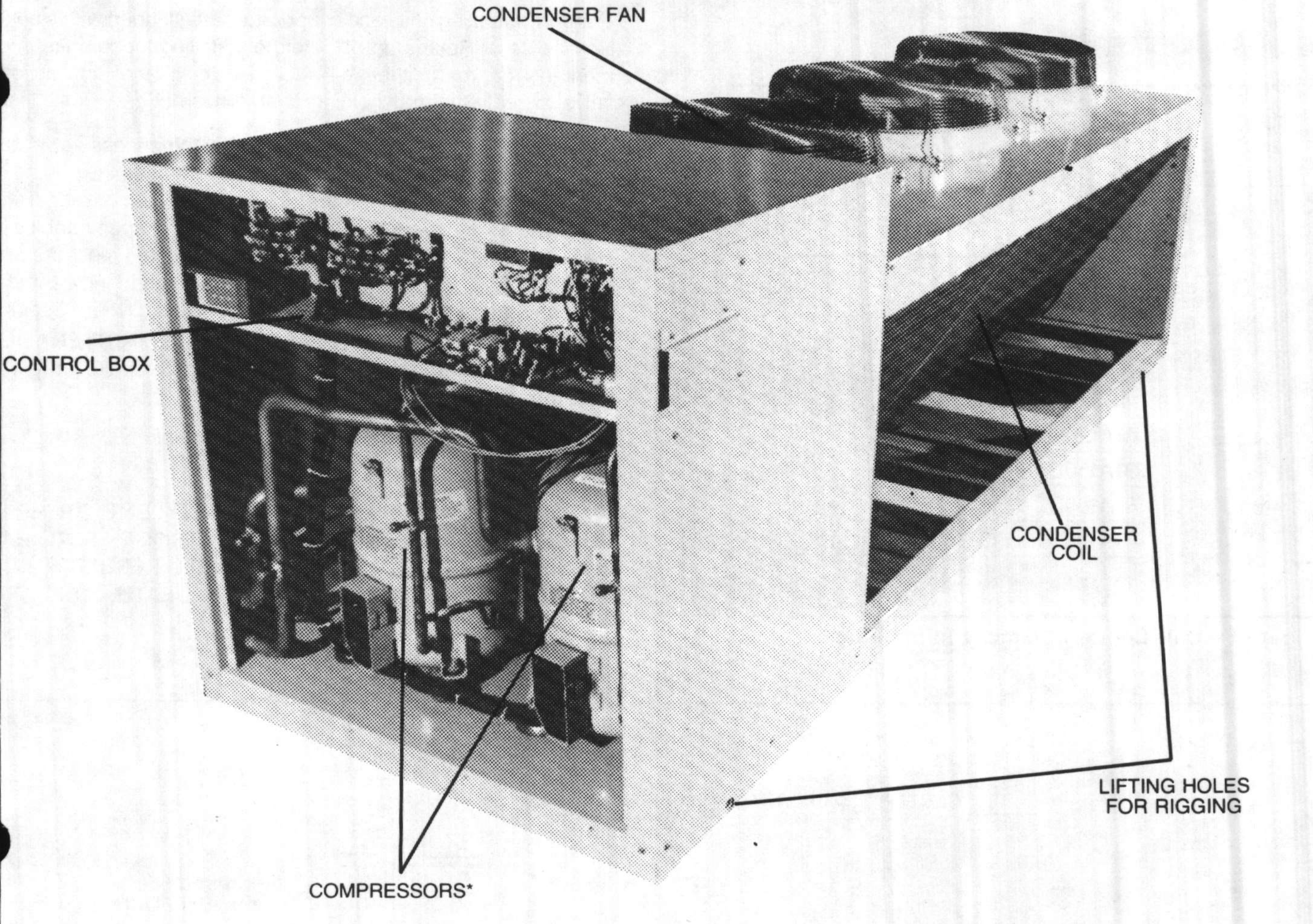


Figure 4 - BTA Component Identification

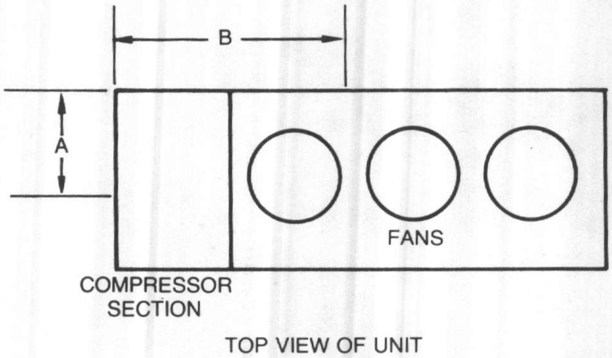
Foundation

If the unit is to be set on the ground, provide a four inch thick, level concrete slab for mounting. In rooftop applications, make sure the roof is strong enough to support the unit. Check with a roofing contractor for proper waterproofing installation practices to ensure that the roof does not develop leaks as a result of unit weight, vibration, and hot weather.

Rigging

Rig the unit using either belt or cable slings. The slings must be fastened to the unit at the four holes in the base rail of the unit, as shown in Figure 6. Use spreaders to protect the top of the unit when it is lifted. The point where the slings meet at the lifting hook must be at least six feet above the unit. Refer to Figure 5 for center of gravity information, and to Figure 6 for proper rigging procedures.

WARNING: TO PREVENT OVERSTRESSING THE BASE RAILS, THE UNIT SHOULD BE RIGGED AS SHOWN IN FIGURE 6 AND LIFTED AS SMOOTHLY AS POSSIBLE. FAILURE TO DO SO COULD RESULT IN SERIOUS PERSONAL INJURY AND DAMAGE TO THE UNIT.



MODEL	A	B
BTA120D	18.5"	33"
BTA150D	18.5"	39"
BTA180D	18.5"	41"
BTA180F	18"	40"

Figure 5 - Unit Center of Gravity Information

Pre-Installation Leak Test

Trane condensing units and evaporators are shipped with a holding charge of Refrigerant-22. Before installing these units, momentarily depress either the suction or discharge line access valve to verify that this holding charge has not been lost.

If no refrigerant escapes when depressing the access valve, the condensing unit should be leak tested to determine the source of refrigerant loss. Pressurize the unit to 100 psi with refrigerant, and use a halogen leak detector, halide torch, or soap bubbles to check for leaks. If a leak is found, release the test pressure and repair the leak. If no leak is found, use nitrogen to increase the test pressure to 150 psi and repeat the leak test. When repairing leaks, refer to "Brazing Procedures" in the MAINTENANCE PROCEDURES manual. Retest the unit to make sure the problem has been corrected.

NOTE: *It may be difficult to pressurize the unit to 100 psi with refrigerant if the ambient temperature is below 60 F.*

WARNING: DO NOT USE OXYGEN, ACETYLENE, OR AIR IN PLACE OF REFRIGERANT AND DRY NITROGEN FOR LEAK TESTING. A VIOLENT EXPLOSION WILL RESULT WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

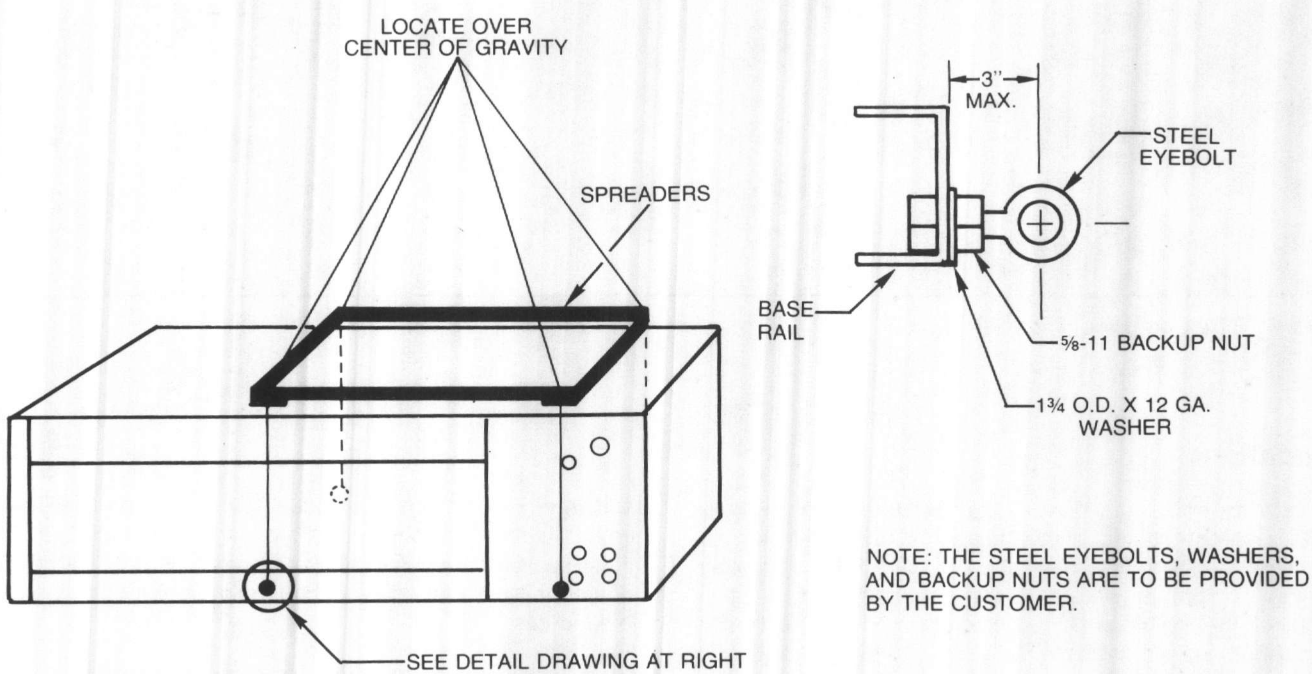


Figure 6 - Rigging the Unit

Refrigerant Piping

It is essential that refrigerant piping be properly sized and applied since these factors have a significant effect on system performance and reliability. On self-contained units, proper piping design is insured by the equipment manufacturer. However, split systems must operate with interconnecting lines which are selected and applied by the installer. If the interconnecting piping does not follow recommended guidelines, any system will be plagued by erratic performance, compressor failures, and other problems.

NOTE: *The piping should be sized and laid out according to the job plans and specifications. This should have been completed when components were selected for the system.*

Recommended Line Sizes

The interconnecting line sizes recommended by Trane are listed in Table 1. These tube sizes are within the velocity, pressure drop, and refrigerant charge limitations necessary for proper system operation. (The refrigerant charge limit is the maximum system charge recommended for a particular compressor, and is determined by the design of the compressor.) The line lengths in Table 1 are based on pressure drop and refrigerant charge limitations in the **liquid line**. Pressure drop limits assume that equivalent length equals two times the physical length. In most applications, this is a reasonable assumption. However, actual pressure drop must be calculated if one or more of the following situations exists:

1. LONG RISER: Installations with liquid line risers have an added pressure drop of 0.5 psi per foot of riser. If the riser is long, the system may require a larger diameter and/or shorter liquid line to ensure subcooling at the expansion valve.
2. EXCESSIVE BENDS, REDUCERS, VALVES: A larger than normal number of tube bends, reducers, and/or valves may increase equivalent length and pressure drop above the assumption of two times the physical length. Actual pressure drop should be calculated for these situations.

Trane recommends sizing the liquid line diameter as small as possible, while maintaining pressure drop within acceptable limits. This will minimize system charge and, therefore, have the general effect of increasing compressor life.

Trane recommends the use of Type L (medium wall) refrigerant tubing. Only refrigeration grade copper tubing should be used since it is available cleaned, dehydrated, and capped to avoid contamination prior to installation. Copper tubing used for plumbing usually has oil, grease, or other contaminants on the interior wall, and these can cause serious operating problems if not removed prior to installation. Tube size recommendations in this manual are based on Type L (medium wall) tubing.

Table 1 - Interconnecting Line Sizes

	LENGTH OF INTERCONNECTING LINES (FEET)							
CONDENSING	0-20		21-40		41-60		61-80	
UNIT	LINE SIZE — O.D. (INCHES)							
UNIT	LIQ.	SUCT.	LIQ.	SUCT.	LIQ.	SUCT.	LIQ.	SUCT.
BTA120D†	3/8	7/8	3/8	1-1/8	1/2	1-1/8	1/2	1-1/8
BTA150D†	3/8	7/8	3/8	1-1/8	1/2	1-1/8	1/2	1-3/8
BTA180D†	1/2	1-1/8	1/2	1-1/8	1/2	1-1/8	1/2	1-3/8
BTA180F	5/8	1-3/8	5/8	1-3/8	5/8	1-5/8		

NOTES:
1. For line lengths and risers greater than maximum recommended in table, refer to the Trane Refrigeration Manual.
2. Use type L (medium wall) A.C.R. copper tubing.
†2 line sets required.

Refrigerant Piping Guidelines

A. Maximum recommended line lengths:
Maximum linear length .... 80 Ft. (w/o accumulator)
Maximum suction line lift .... 60 Ft.
Maximum liquid line lift .... 60 Ft.

B. Maximum allowable pressure drops (R-22):
Suction line .... 3 psi
Liquid line .... 35 psi

Route refrigerant piping for minimum linear length, minimum number of bends and fittings (no reducers) and minimum amount of line exposed to outdoor ambients.

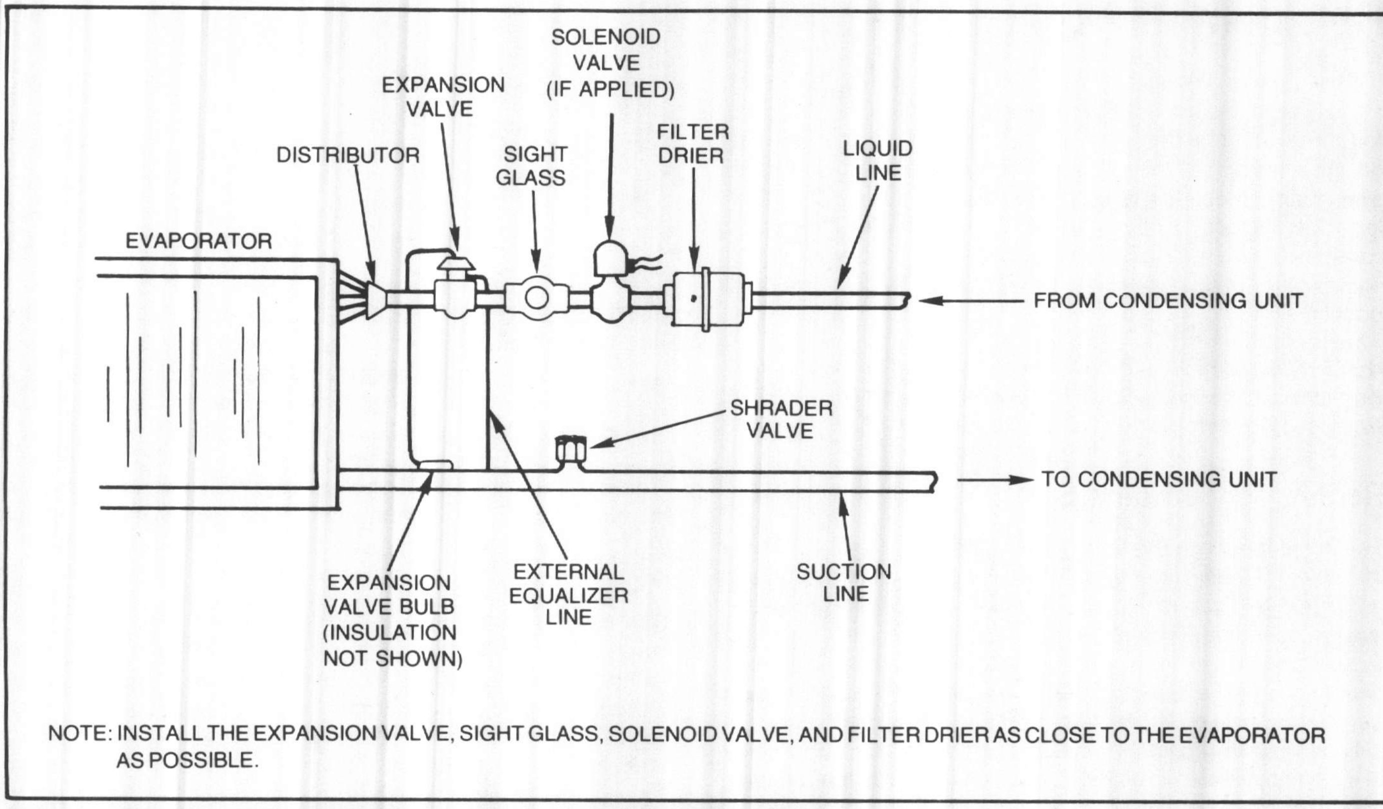


Figure 7 · Diagram of Refrigerant Piping Components in Liquid Line

Liquid Line Components

A properly sized liquid line filter drier must be installed upstream from the expansion valve. In addition, a moisture indicator/sight glass should be installed between the expansion valve and filter drier. Both of these components should be installed at the evaporator close to the expansion valve, as shown in Figure 7.

A shut-off valve (with access port) should be sized with the liquid line O.D. selected, and installed close to the condenser. Other valves, tube bends, and reducers should be minimized since these items tend to increase pressure drop and reduce subcooling at the expansion valve.

Liquid line receivers are not recommended on 10 to 15 ton systems since they increase the refrigerant charge.

The following points should be considered when connecting the evaporator to the BTA180F condensing unit.

1. It is recommended that the full evaporator coil be used during low speed compressor operation because of efficiency considerations.
2. In some installations, insufficient moisture removal may result when the full evaporator coil is used with the compressor on low speed.
3. In instances where the importance of moisture removal overrides efficiency considerations, one-half of the evaporator coil capacity can be shut off when the compressor switches to low speed.
4. If solenoid valves are required, they should be installed between the filter drier and sightglass in order to shutoff one-half of the evaporator coil capacity. On units where the solenoid valves are factory installed, the sightglass can be installed between the unit and filter drier. However, all of these components should be installed close to the expansion valve, and no more than one-half of the coil capacity should be shut off.

Suction Line Components

Trane does not recommend the use of suction line accumulators on 10 to 15 ton single compressor units because accumulators of sufficient size and quality are not available.

Suction line filter driers are not recommended as standard components when installing BTA condensing units. They may be necessary on systems that have experienced a compressor burn-out (refer to Trane Service Bulletin No. HCOM-SB-45).

On 10 to 15 ton systens, a suction line shut-off valve installed in the interconnecting tubing has little value, and is not recommended due to pressure drop considerations. Increased suction line pressure drop has a significant effect on system capacity and efficiency.

Risers and Tube Routing

Liquid Line

Liquid line riser lengths are limited only by the additional pressure drop (0.5 psi/ft) which results from the liquid column. No limit exists on the length of liquid line drops, and no special line sloping considerations are necessary.

Normally it is not necessary or desirable to insulate liquid lines. In most applications, the ambient temperature is lower than the refrigerant temperature, and has the desirable effect of increasing subcooling at the expansion valve. However, liquid lines routed through extremely high ambient environments (such as a boiler room) may reduce subcooling below acceptable levels. To minimize this loss, liquid lines passing through extremely warm spaces should be insulated. Increasing the liquid line size only tends to aggravate this problem.

Suction Line

The suction line sizes recommended in Table 1 will result in sufficient refrigerant vapor velocity to ensure good oil entrainment. It is also important to utilize good tube routing practices in order to ensure proper oil return to the compressor.

It is recommended that horizontal suction lines be pitched toward the compressor.

Insulate the suction line with 1/2-inch thick, closed cell neoprene insulation such as armaflex or similar material.

Brazing and Leak Testing

For proper brazing techniques when installing refrigerant piping, refer to "Brazing Procedures" in the MAINTENANCE manual.

After completing the installation of all refrigerant piping, the system should be thoroughly checked for possible leaks. Refer to "Leak Testing" in the MAINTENANCE manual.

Electrical Wiring

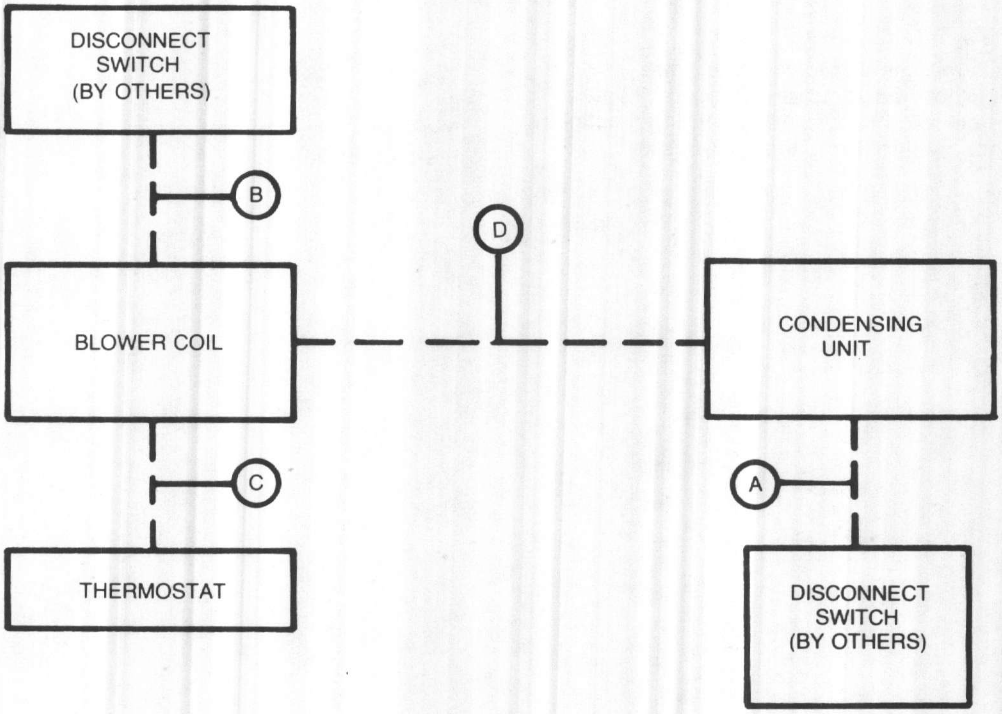
WARNING: OPEN THE ELECTRICAL POWER DISCONNECT SWITCH AND SECURE IN THAT POSITION BEFORE INSTALLING OR SERVICING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK.

Install all field wiring, including the unit electrical ground, in accordance with the National Electrical Code and applicable local codes. Figure 8 provides a block diagram of the electrical connections to be made by the customer or installing contractor.

NOTE: *When connecting wires at the terminal block, make sure that all lugs are tight. Also check the terminal block and compressor contactor lugs that were wired at the factory.*

The unit wiring diagram is pasted on the back of the control box cover. Refer to Figures 1 and 2 for the locations of holes provided for electrical conduit entry on the unit. The locations of the electrical panel components are shown on the unit wiring diagram.

Table 2 lists the electrical characteristics for BTA120D to BTA180D, BTA180F units.



FIELD WIRING WHEN USED WITH A BACA UNIT:
A — 3 power wires, line voltage
B — 3 power wires, line voltage
C — Cooling only thermostat: 4 wires, 24 volts
— One-stage electric heat: add 1 additional wire, 24 volts
— Two-stage electric heat: add 2 additional wires, 24 volts
D — 4 wires, 24 volts

NOTE: Wiring shown with dash lines is to be furnished and installed by the customer. All customer-supplied wiring must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.

Figure 8 · Electrical Connections by Customer

Table 2 - Electrical Characteristics for BTA120D to BTA180D, BTA180F Units

Model	Unit Characteristics					Compressor Motor				Condenser Fan Motor			
	Electrical Characteristics [7]	Allowable Voltage	Min. Circuit Range [3,6]	Max. Fuse Amp. [2,6]	Recm'd Dual Element Fuse Size [4,6]	No.	RLA (Ea) [1]	LRA (Ea) [1]	KW (Ea) [1,5]	NO/ HP	FLA (Ea) [1]	LRA (Ea) [1]	KW (Ea) [1,5]
BTA120D300	208-230/60/3	187-254	53	70	60	2	19.0	115	6.0	2/.75	5.0	11.0	0.77
BTA120D400	460/60/3	416-508	29	35	35	2	10.6	50	6.0	2/.75	2.7	5.5	0.77
BTA120DW00	575/60/3	520-536	23	30	25	2	8.5	45	6.0	2/.75	1.8	4.4	0.77
BTA150D300	208-230/60/3	187-254	65	80	80	2	23.6	142	7.3	3/.50	4.1	9.5	0.60
BTA150D400	460/60/3	416-508	30	40	35	2	10.7	71	7.3	3/.50	2.1	4.8	0.60
BTA150DW00	575/60/3	520-635	24	30	30	2	8.6	57	7.3	3/.50	1.6	3.8	0.60
BTA180D300	208-230/60/3	187-254	73	100	80	2	27.1	156	8.9	3/.50	4.1	9.5	0.62
BTA180D400	460/60/3	416-508	34	45	40	2	12.3	79	8.9	3/.50	2.1	4.8	0.62
BTA180DW00	575/60/3	520-635	27	35	30	2	9.9	63	8.9	3/.50	1.6	3.8	0.62
BTA180F300	208-230/60/3	187-254	83	125	100	1	56.4	248	17.8	3/.50	9.5	9.5	0.62
BTA180F400	460/60/3	416-508	42	60	50	1	28.2	124	17.8	3/.50	4.8	4.8	0.62
BTA180FW00	575/60/3	520-635	33	50	40	1	22.6	100	17.8	3/.50	3.8	3.8	0.62

NOTES:
1. Electrical information is for each individual motor.
2. Maximum fuse size permitted by N.E.C. 440-22 is 225% of one compressor motor RLA plus the total RLA of the remaining motors in the circuit.
3. Minimum circuit ampacity is 125% of the RLA of one compressor motor plus the total RLA of the remaining motors in the circuit.
4. Recommended dual element fuse size is 150% of the RLA of one compressor motor plus the total RLA of the remaining motors in the circuit.
5. KW values are taken at conditions of 45 F saturated suction temperature at the compressor and 95 F ambient.
6. Local codes may take precedence.
7. Allowable range at unit terminal block.
8. Data given at high speed.

CAUTION: Use only copper conductors for supply power power wiring. Do not use aluminum conductors. Unit terminals are not designed to accept other than copper conductors.

NOTE: *For 208 volt operation, reconnect the control power transformer as shown on the unit wiring diagram. Cap the unused transformer lead with a wire nut.*

Fuses

Refer to the unit wiring diagram pasted on the inside of the control box cover for condenser fan and control circuit fuse specifications.

Thermostat Installation

Recommended wire sizes and lengths for installing the unit thermostat are provided in Table 3. The total resistance of these low voltage wires must not exceed one ohm. Any resistance in excess of one ohm may cause the control circuit to malfunction.

When selecting a thermostat location, be sure to choose a site in a frequently occupied area with good air circulation at an average temperature. The thermostat should be positioned approximately five feet above the floor and **must be level**.

Avoid mounting the thermostat in areas subject to the following:
— drafts or "dead" spots behind doors or in corners;
— hot or cold air from ducts;
— radiant heat from the sun, or from appliances;
— concealed pipes and chimneys;
— unheated or uncooled surfaces behind the thermostat, such as outside walls;
— in an area where the thermostat will be affected by a unit in another zone.

CAUTION: If an energy management device, time clock, or other power consuming device is used, a separate power supply must be provided for that device. Do not use the unit control circuitry, or damage to the unit may result.

Table 3 - Recommended Thermostat Wire Size

WIRE SIZE	MAXIMUM WIRE LENGTH
22 Gauge	30 Ft.
20 Gauge	50 Ft.
18 Gauge	75 Ft.
16 Gauge	125 Ft.
14 Gauge	200 Ft.

Table 4 - Air Handler Motor Electrical Data

Unit Model Number	Unit Electrical Characteristics	No. of Motors	Hp (Ea.)	Speed (Rpm)	FLA		LRA	
					200/230V	460V	200/230V	460V
BWE090C100E	200-230/60/1	1	1	3450	6.3	—	45.0	—
BWE090C400E	200-230 & 460/60/3	1	1	1725	3.8	1.9	21.2	10.6
BWE120C100E	200-230/60/1	1	2	3450	11.5	—	61.0	—
BWE120C400E	200-230 & 460/60/3	1	1½	1725	5.0	2.5	37.4	18.7
BTE120C100E	200-230/60/1	1	2	3450	11.5	—	61.0	—
BTE120C400E	200-230 & 460/60/3	1	1½	1725	5.0	2.5	37.4	18.7

Table 5 - BWH and BWV Unit Electrical Data

Unit Model Number	Unit Characteristics		Indoor Fan Motor			
	Electrical Characteristics	Voltage Utilization Range	No. Req'd.	Hp (Ea.)	Speed (Rpm)	FLA
BWH180B300C BWV180B300C	200-230/60/3	180-254	1	3	1725	9.0
BWH180B400C BWV180B400C	460/60/3	414-506	1	3	1725	4.4
BWH240B300C BWV240B300C	200-230/60/3	180-254	1	5	1725	15.2
BWH240B400C BWV240B400C	460/60/3	415-506	1	5	1725	6.6

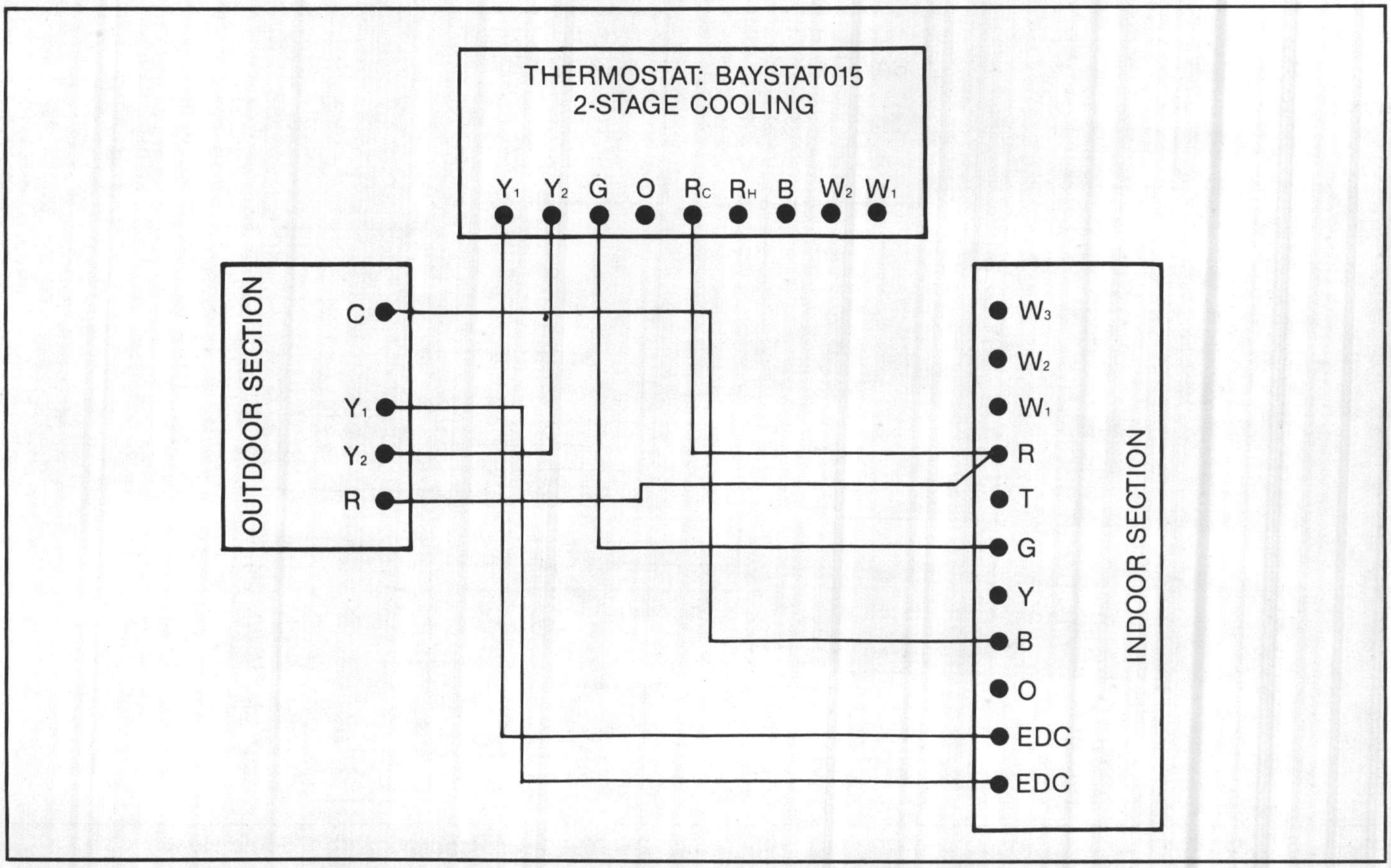


Figure 9 · Field Wiring for BTA120D with BTE120B Air Handler No Electric Heat

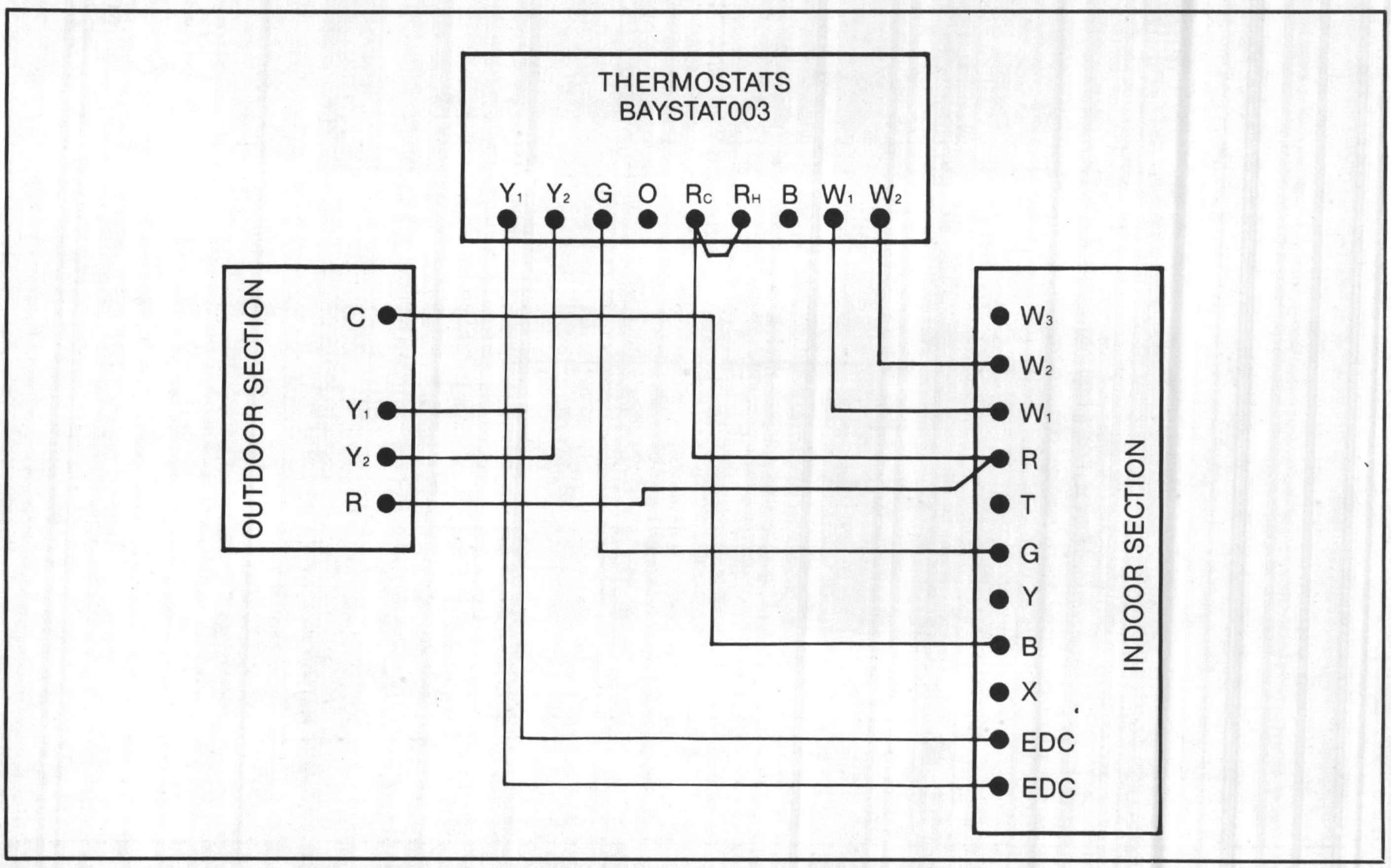


Figure 10 · Field Wiring for BTA120D with BTE120B Air Handler With Electric Heat

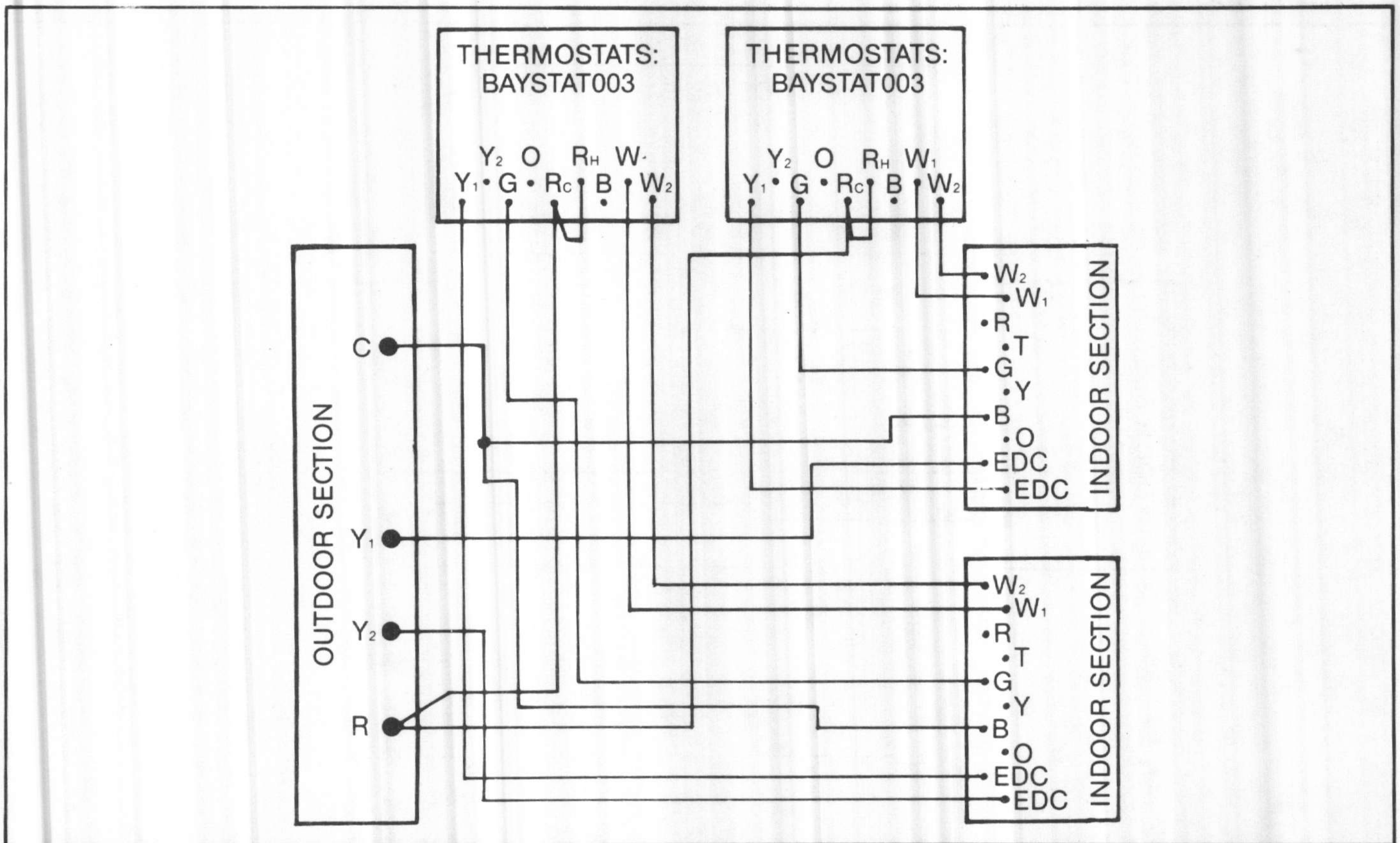
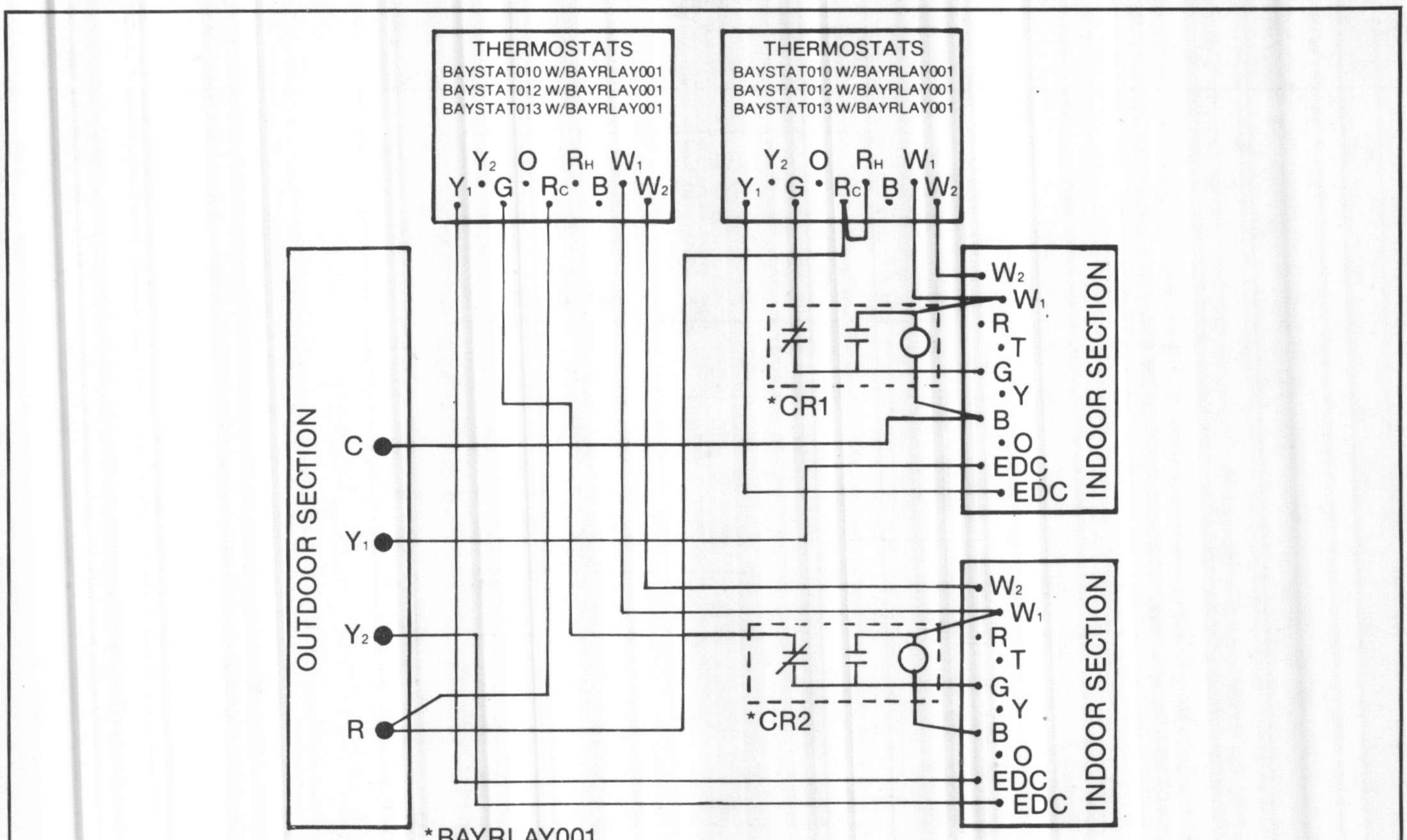


Figure 11 · Field Wiring for BTA150D and BTA180D With Two (2) BWE090C Air Handlers With Electric Heat



NOTES:
1. For low ambient operation, consult Trane representative.
2. For 1-step electric heat, omit wires between W_2 on thermostats and indoor units.

Figure 12 · Field Wiring for BTA150D and BTA180D With Two (2) BWE090C Air Handlers

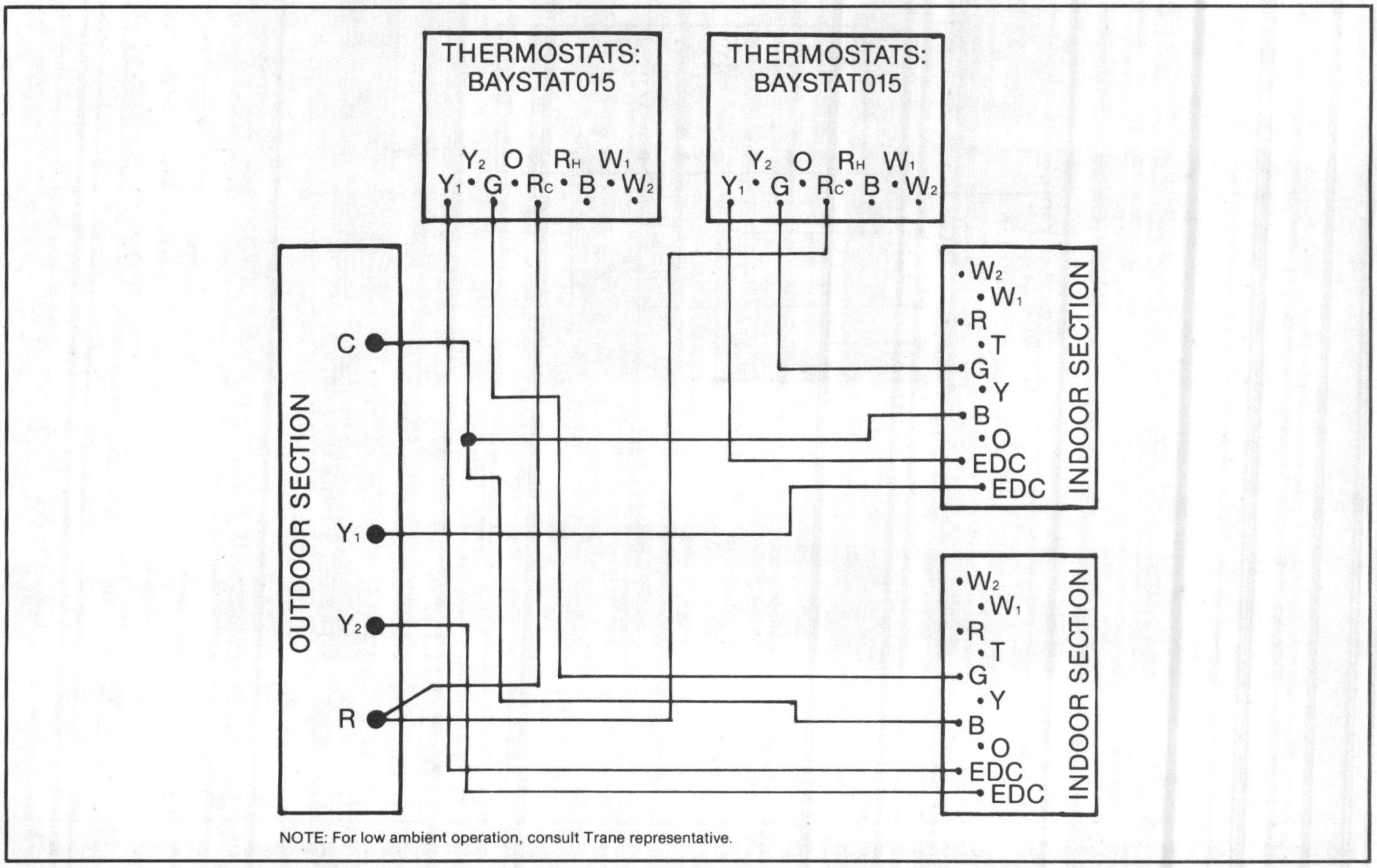


Figure 13 - Field Wiring for BTA150D and BTA180D With Two (2) BWE090C Air Handlers Without Electric Heat

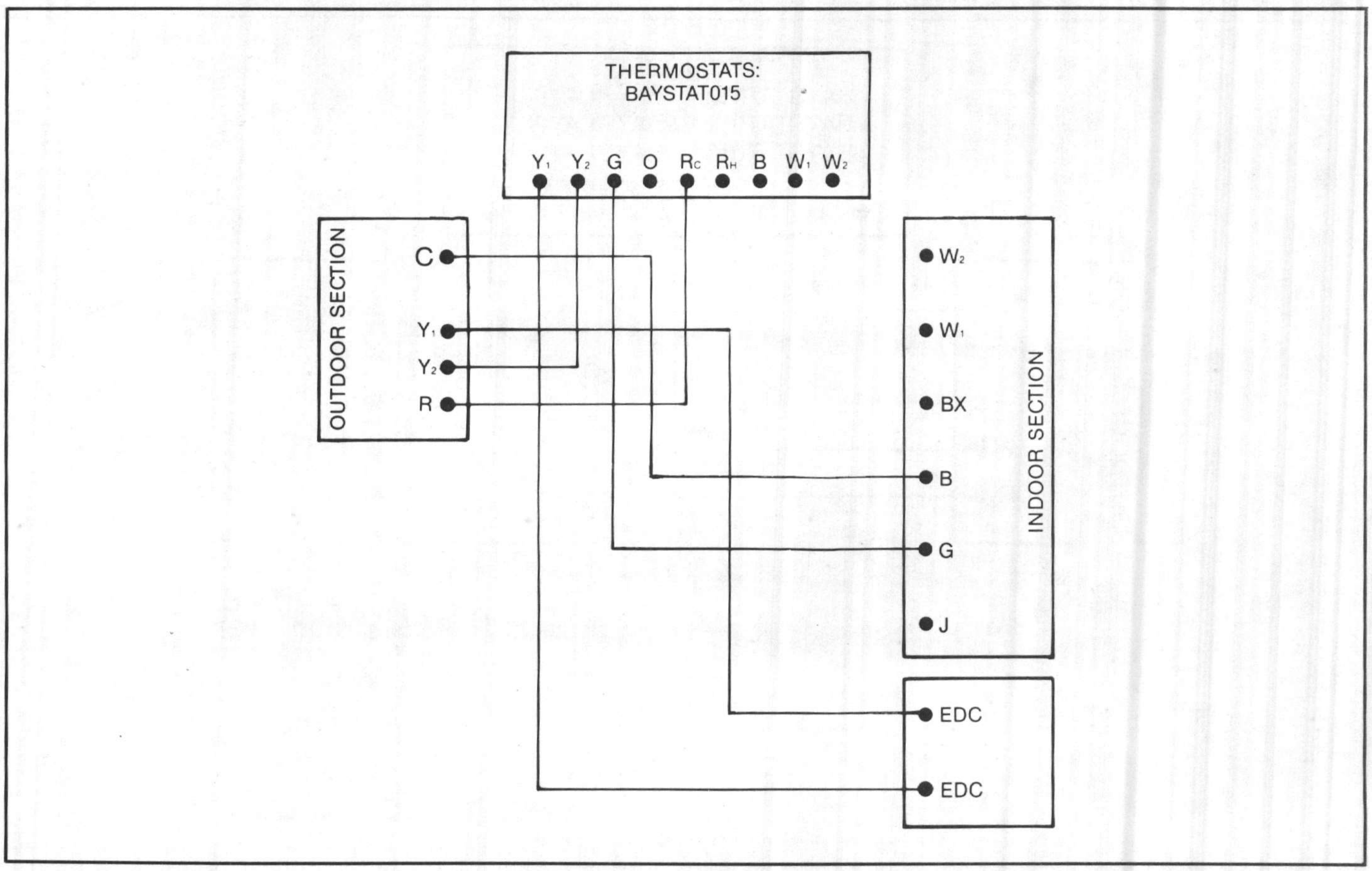


Figure 14 - Field Wiring for BTA150D, BTA180D and BTA180F With the BWV180B, BWH180B Air Handlers Without Electric Heat

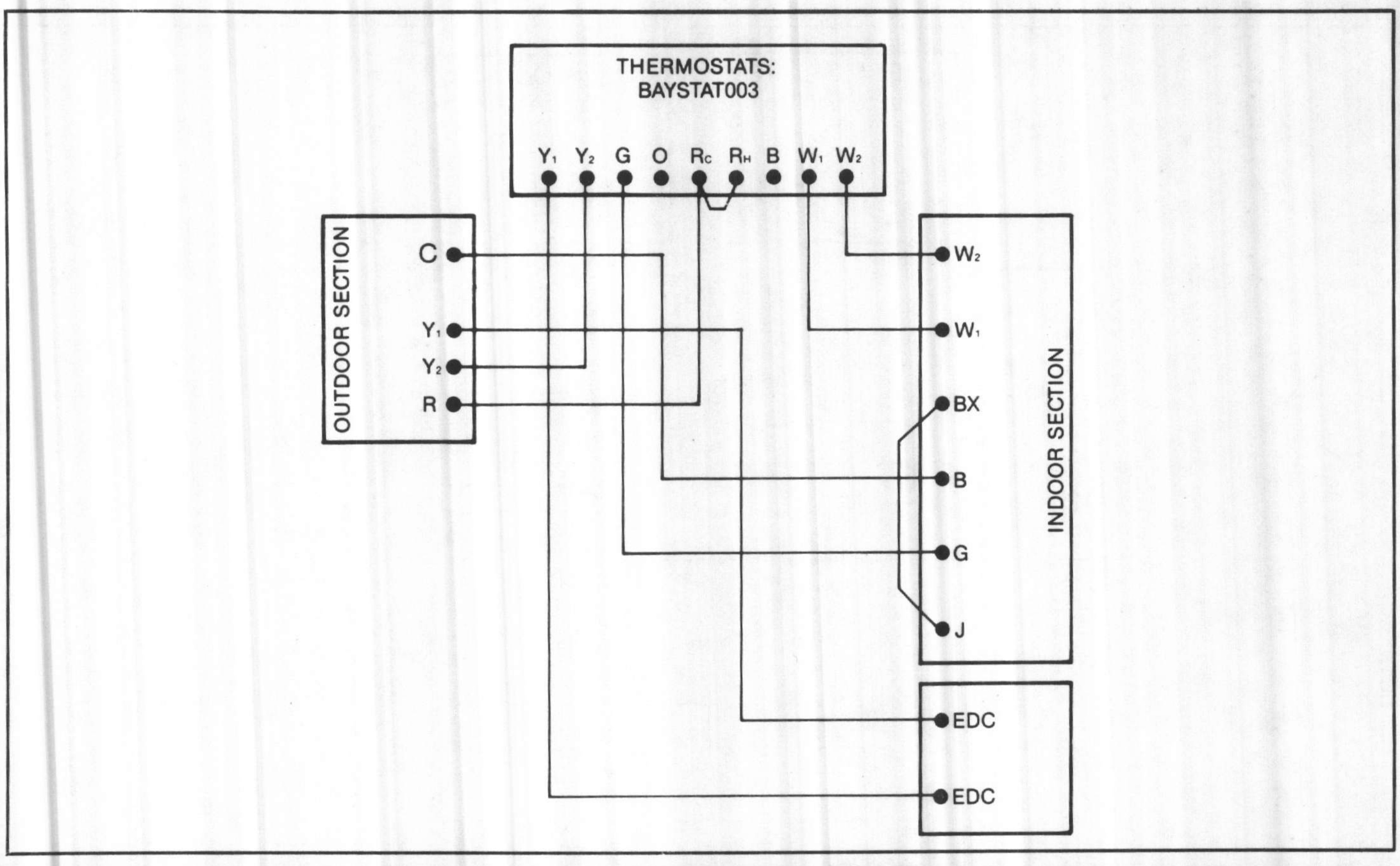


Figure 15 - Field Wiring for BTA150D, BTA180D and BTA180F With the BWV180B, BWH180B Air Handlers With Electric Heat

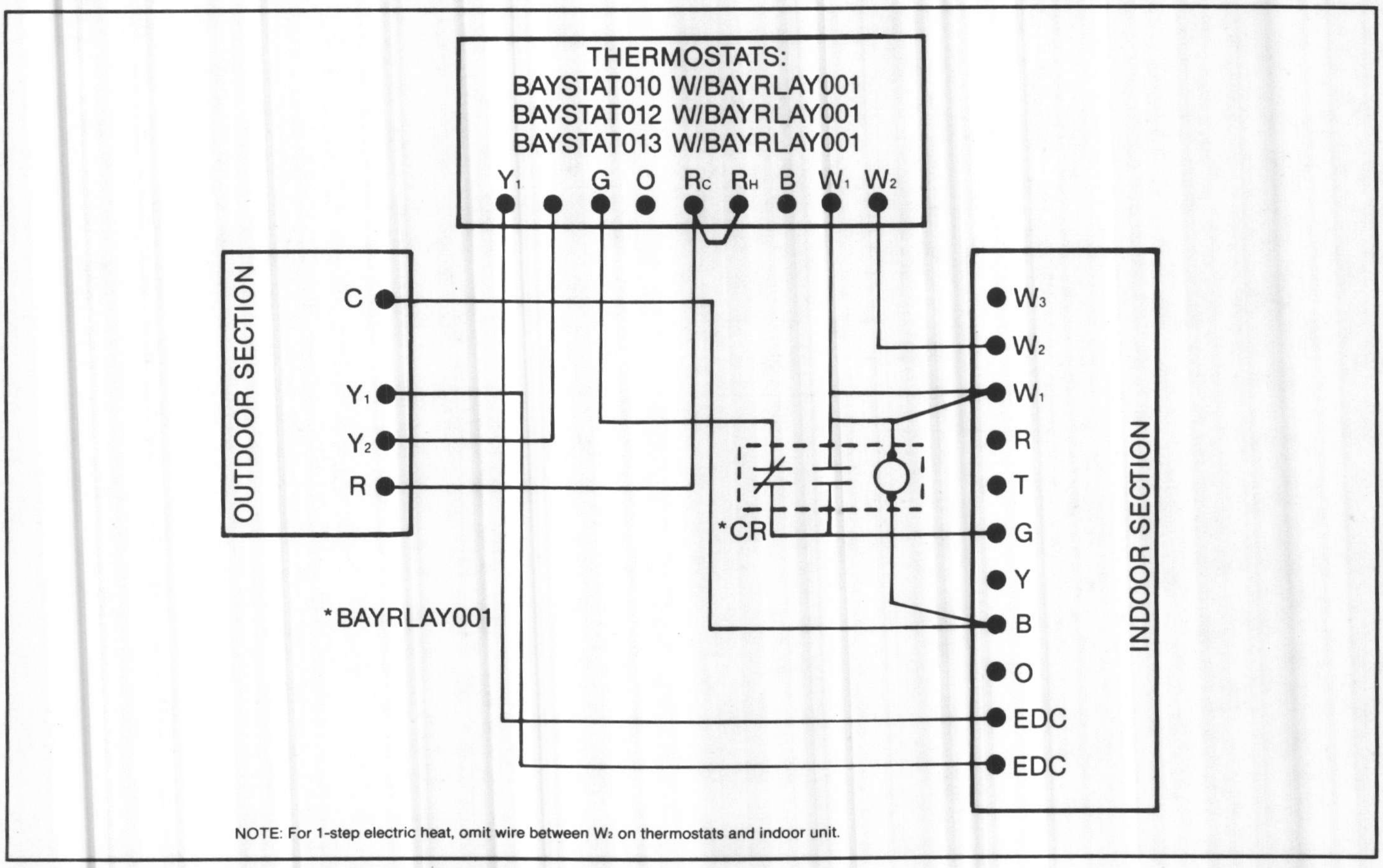


Figure 16 - Field Wiring for BTA120D With BTE120B Air Handler

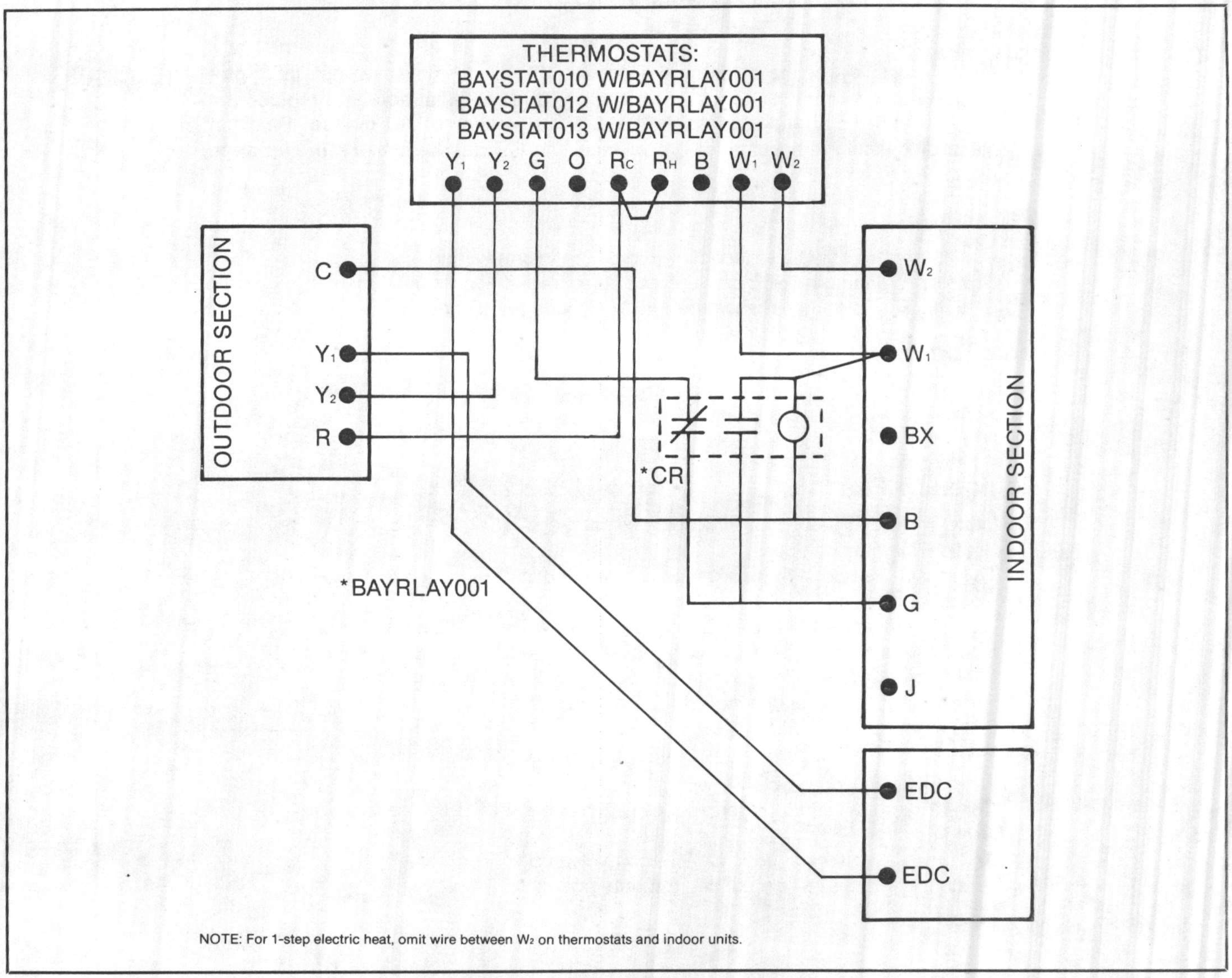


Figure 17 - Field Wiring for BTA150D, BTA180D and BTA180F With the BWV180B, BWH180F Air Handlers

Installation Checklist

Complete this checklist as the unit is installed to verify that all recommended installation procedures are accomplished before the unit is started. **This checklist does not replace the detailed instructions provided in the INSTALLATION section of this manual**. Read the entire section carefully to become familiar with the installation procedures **before** installing the unit.

Receiving

- ☐ Unit nameplate data corresponds with ordering information.
- ☐ Unit inspected for shipping damage and claim filed, if necessary.
- ☐ Unit checked for material shortage and any shortages reported.

Unit Location

- ☐ Condenser air clearances over unit good.
- ☐ Service clearances around unit good.
- ☐ Unit secured in correct location.

Refrigerant Piping

- ☐ Liquid line sized properly and within recommended maximum line length.
- ☐ Suction line sized properly.
- ☐ Thermostatic expansion valve properly sized and installed close to evaporator.
- ☐ Liquid line filter drier installed near expansion valve.
- ☐ Sight glass installed in liquid line between evaporator and filter drier.
- ☐ Liquid line access valve installed in liquid line close to condenser.
- ☐ Low ambient accessories installed, if necessary.
- ☐ Check all unit and piping connections for leaks.

Electrical Wiring

- ☐ Field installed wiring complies with all applicable codes.
- ☐ Compressor contactor and terminal block lugs checked for tightness.
- ☐ Thermostat properly mounted and wired.
- ☐ Any other accessories properly installed and wired.
- ☐ Grounding wires securely bonded to earth ground.

Start-Up

Pre-Start Checks

Before starting the unit, complete the procedures outlined below to make sure the unit is properly installed and ready for start-up.

WARNING: OPEN THE UNIT DISCONNECT SWITCH AND LOCK IT IN THAT POSITION TO PREVENT ACCIDENTAL START-UP. NEVER OPEN AN ACCESS PANEL TO INSPECT OR SERVICE THE UNIT WITHOUT FIRST OPENING THE DISCONNECT SWITCH. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

☐ 1. Inspect all electrical connections to be sure that the wires are securely attached to their terminals. Make sure that all wires are clear of any rotating parts, such as fan blades.

☐ 2. Check the condenser and evaporator fans. Fan blades must be secure on the motor shafts and must rotate freely. Airflow must be unobstructed.

☐ 3. Make sure the evaporator air filters are clean.

☐ 4. Check the evaporator and condenser coils to ensure that they are clean, that the fins are straight, and that there are no obstructions to airflow.

☐ 5. Check the voltage at the line side of the disconnect switch. It should be within 10 percent of the unit nameplate voltage.

Evacuation

After completing the "Pre-Start Checks," use a vacuum pump to remove air, moisture, and contaminants from the system. The system should be evacuated to a pressure of 500 microns or less. Refer to "Evacuation Procedures" in the MAINTENANCE manual.

Refrigerant Charging

With the system properly evacuated, determine the required charge of Refrigerant-22 and charge the system as outlined under "Refrigerant Charging" in the MAINTENANCE manual.

Oil Charge

The compressors on BTA120D to BTA180D, BTA180F units ship with a sufficient oil charge for systems that stay within the maximum line lengths listed in Table 1. As long as the maximum line length is not exceeded, the compressor will have adequate oil.

Initial Start-Up

Normally it is not necessary to energize the crankcase heater prior to intital start-up. However, if more than 30 minutes passes between refrigerant charging and initial start-up, a significant amount of refrigerant could migrate to the compressor. When there is a time lapse between charging and start-up, the crankcase heater should be energized for a minimum of eight hours before starting the unit.

CAUTION: Failure to energize the crankcase heater and wait eight hours before starting the unit may result in excessive foaming at start-up and possible damage to the compressor bearings.

Set the room thermostat as follows to start the unit:

1. Turn the thermostat selector switch to either COOL or AUTO, depending on the thermostat;
2. Place the thermostat fan switch in the AUTO position;
3. Set the thermostat at a point below room temperature.

The unit will operate automatically in response to cooling needs, as determined by the thermostat setting.

Compressor Motor Checks

With the compressor operating, check the amp draw. The amperage should not exceed the "Maximum Allowable Amps" listed in Table 7. The amp draw may be less than the value listed in the table.

Voltage at the compressor terminals must be within the "Allowable Voltage Range" listed in Table 7. If not, check the voltage at the unit terminal block and at the disconnect switch to determine if voltage problems are being caused by feeder line, loose terminals, or defective unit wiring.

Table 7 - Maximum Allowable Amp Draw

Condensing Unit	Electrical Characteristics	Allowable** Voltage Range	Max. Allowable Amps Matched Evap.	Max. Allowable Amps Oversized* Evap.
BTA120D300	208-230/60/3	187-253	24	—
BTA120D400	460/60/3	416-506	11	—
BTA120DW00	575/60/3	520-635	9	—
BTA150D300	208-230/60/3	187-253	—	30
BTA150D400	460/60/3	416-506	—	13
BTA150DW00	575/60/3	520-635	—	11
BTA180D300	208-230/60/3	187-253	31	36
BTA180D400	460/60/3	416-506	14	16
BTA180DW00	575/60/3	520-635	11	13
BTA180F300	208-230/60/3	187-254	66	67
BTA180F400	460/60/3	416-508	33	34
BTA180FW00	575/60/3	520-635	27	27

*Evaporator one size larger than condensing unit.
**Allowable voltage range at the unit terminal block.
***Compressor operating at high speed.

Voltage Imbalance Check

Voltage imbalance on three phase systems can cause motor overheating and eventual failure. Maximum allowable imbalance is two percent, which must be measured at the compressor terminals. Voltage imbalance is defined as 100 times the maximum deviation of the three voltages from the average, without regard to sign, divided by the average voltage. For example, if the three measured voltages are 221, 230 and 227, the average voltage would be:

$$\frac{221 + 230 + 227}{3} = 226 \text{ volts}$$

and the percent voltage imbalance would be:

$$\frac{100 \times (226\text{-}221)}{226} = 2.2\%$$

In this example, 2.2 percent imbalance is not acceptable and could result in as much as 20 percent current imbalance. This will increase the motor winding temperature, and thus decrease the life of the motor.

If more than 2.0 percent imbalance exists, check the voltage readings at the disconnect switch to determine if the imbalance is present in the incoming power lines. If so, the power company should be notified to correct it. If the imbalance is due to problems within the unit, check the unit electrical wiring connections.

Operating Pressures

Install pressure gauges on the discharge and suction line access valves next to the compressor. When the unit reaches stabilized operation, suction and discharge pressures can be read. Refer to "Operating Pressures" in the MAINTENANCE manual to compare the measured pressures with the normal system operating pressures.

Start-Up Log

DATE ____________

I. NAMEPLATE INFORMATION

Model No. ____________ Serial No. ____________

Voltage ____________ RLA ____________

II. COMPRESSOR(S)

A. VOLTAGE AT COMPRESSOR TERMINALS

Comp. No. 1: T1 ________ T2 ________ T3 ________

Comp. No. 2: T1 ________ T2 ________ T3 ________

Voltage Imbalance: Comp. No. 1 ________ Comp. No. 2 ________

B. AMP DRAW

Comp. No. 1: L1 ________ L2 ________ L3 ________

Comp. No. 2: L1 ________ L2 ________ L3 ________

III. OPERATING CONDITIONS

A. COMPRESSOR NO. 1

Discharge Pressure ________ Suction Pressure ________

Liquid Line Pressure ________ Suction Line Temp. ________

Liquid Line Temp. ________ Superheat ________

Subcooling ________ Evap. Entering Air Temp. (DB/WB) ________

Ambient Temp. ________ Evap. Discharge Air Temp. (DB/WB) ________

B. COMPRESSOR NO. 2

Discharge Pressure ________ Suction Pressure ________

Liquid Line Pressure ________ Suction Line Temp. ________

Liquid Line Temp. ________ Superheat ________

Subcooling ________ Evap. Entering Air Temp. (DB/WB) ________

Ambient Temp. ________ Evap. Discharge Air Temp. (DB/WB) ________

IV. CONTROLS

Fans Operating (Yes or No): Fan No. 1 ________ No. 2 ________ No. 3 ________

Crankcase Heater Operating (Yes or No): Comp. No. 1 ________ Comp. No. 2 ________

V. REFRIGERANT PIPING

Evacuation Level ________ System Charge ________

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040
BTA-IN-5

AN AMERICAN—
STANDARD
COMPANY

Technical Literature Printed in USA

TAB PLACEMENT HERE

DESCRIPTION:

Bldg. T.C. 910

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Confidential Records Management, Inc.
New Bern, NC
1-888-622-4425
9/08

SEQUENCE OF OPERATION

FOR

BUILDING TC-910

TYPICAL FOR 2 SYSTEMS

System mode of operation will be selected at sub-base switch, heat-off-cool and fan, on-auto. Fan will run continuous when on or cycle with heating or cooling as selected. When heat is selected thermostat T-1 will modulate N.C. steam valve. Thermostat TSO-1 sensing heating coil temperature will cycle fan. When cool is selected thermostat T-2 will cycle fan and 2 stage condensing unit.

EQUIPMENT SCHEDULE

CUSTOMER: Kinston Plumbing & Heating

JOB NAME: Replace A/C Systems
Bldgs. AS-710, TC-910

DATE: April 27, 1987

REF. # TC-4622/E-1447

MARK	QTY.	PART NUMBER	FEATURES	FUNCTION	LOCATION
			BUILDING TC-910		
T-1	2	TP-8101	55-85°F	Heating Thermostat	In space
V-1	1	VS-9223-211-4-4	½", NC	Steam Control Valve	At Steam Coil
V-1	1	VS-9223-211-4-8	1", NC	Steam Control Valve	At Steam Coil
SB-1	2	AT-603	Sub Base	ON/AUTO-HEAT/OFF/COOL	On T-1
SB-1	2	AT-609-351		Legend Plate	On SB-1
T-2	2	TC-1153	75-105°F	Cooling Thermostat	w/T-1
R-1	2	AE-304	DPDT, 24 VAC	Heat Relay	Near V-1
R-1	2	AE-300		Enclosure	w/R-1
R-2	2	PRD5AYO	SPDT, 24 VAC	Cool Relay	In AHU
TSO-1	2	TC-2974	Strap-on	Fan control thermostat	On pipe entering steam coil

TRANE™ #6336-12, Items 3 & 4

11-12-86

The Trane Company
Division of American Standard Inc.

La Crosse WI 54601-7599
Clarksville TN 37040

Page Number	Trane Order Number
15	F4M370A

Trane Job Number	Customer Order Number	Number of Prints	Date to Ship	Type of Order
F4-10490	3299	11 LIT 04	00-00-00HA	SUB

Architect

Engineer CHEATHAM & ASSOC., WILMINGTON, NC

Trane Salesman: R CRAWFORD

Job Name/Location: REPLACE AC BLDGS TC910
CAMP LEJEUNE, NC

Sold To
KINSTON PLUMBING & HEATING CO, INC
P.O. BOX 637
KINSTON, NC 28502

Ship To Project
KINSTON PLBG. & HTG. CO.
C/O BLDG. TC-910
CAMP LEJEUNE, NC
28542

Mark Packages — Project Name

Item	Quantity	Trane Ordering Number	Specifications
10.00	0001	BTA180D300A	15 TON SPLIT SYSTEM CONDENSING UNIT 208-230/3/60
			TAG: BLDG. TC-910, ITEMS 11 & 12
20.00	0001	BWV180B300D	15 TON SPLIT SYSTEM COOLING OR HEAT PUMP AIR HANDLER
			TAG: BLDG. TC-910, ITEMS 11 & 12
30.00	0001	BTA240C300M	20-TON CONDENSING UNIT 208-230/60/3
			TAG: BLDG. TC-910, ITEMS 19 & 20
40.00	0001	BWV240B300D	20 TON SPLIT SYSTEM COOLING OR HEAT PUMP AIR HANDLER
			TAG: BLDG. TC-910, ITEMS 19 & 20

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-85-C-6336

DATE 12-22-86

S. L. Huguelet
CDR, CEC, USN
Officer in Charge
of Construction

Cheatham & Assoc.

☒ APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED
☐ REVISE & SUBMIT
KINSTON PLUMBING & HEATING CO.
BY [signature] DATE 12/5/86

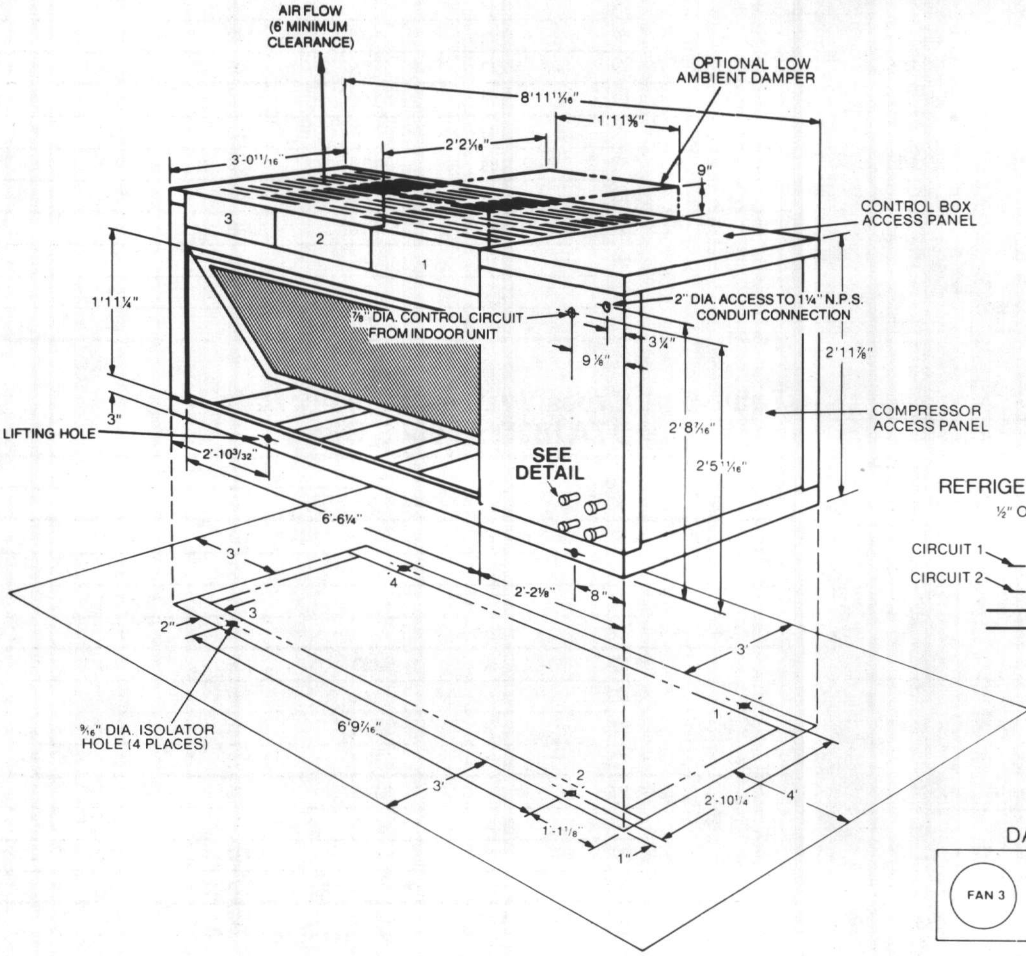
Submittal Approval Drawings			Service Literature	
BTA-SG-210.00	BTA-IN-4	BTA-M-2		BTA-SF-26
BWV-SQ-219.01	BWV-IN-1A	BWA/BTA-M-1A		BWV-SF-1A
BTA-SG-207.01	BTA-IN-1A	BTA-M-1A	BTA-IW-1A	BTA-SF-7B
BWV-SQ-220.01	BWV-IN-1A	BWA/BTA-M-1A		BWV-SF-4A

TRANE™

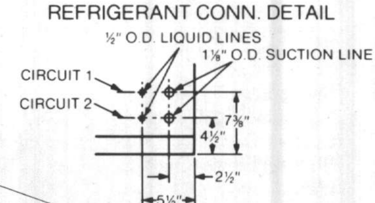
TAG: ______________________________

SUBMITTAL

15-Ton Split System Condensing Unit - 30 BTA180D



REFRIGERANT CONN. DETAIL



DAMPER LOCATION

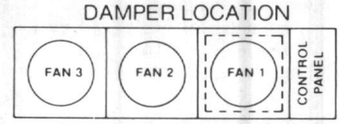


Table 1 Electrical Data

	Unit Characteristics					Compressor Motor				Condenser Fan Motors			
Model	Electrical Characteristics	Allowable Voltage Range	Minimum Circuit Ampacity	Maximum Fuse Size	Recommended Dual-Element Fuse Size	No.	RLA (Ea.)	LRA (Ea.)	Kw (Ea.)	No./Hp	FLA (Ea.)	LRA (Ea.)	Kw (Ea.)
BTA180D3	208-230/60/3	187-254	76	100	80	2	27.1	156	8.9	3/.75	5.0	11.0	0.74
BTA180D4	460/60/3	416-508	36	45	40	2	12.3	79	8.9	3/.75	2.7	5.5	0.74
BTA180DW	575/60/3	520-635	28	35	30	2	9.9	63	8.9	3/.75	1.8	4.4	0.74

NOTES:
1. Allowable voltage range is at unit terminal block.
2. Minimum circuit ampacity (MCA) is 125% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circiut.
3. Maximum fuse size is 225% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
4. Recommended dual element fuse size is 150% of the FLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
5. Local codes may take precedence.
6. Motor electrical information is for each individual motor.
7. Kw values are with matched blower coils at A.R.I. rating conditions of 80 EDB/67 EWB to the evaporator and 95 F ambient.

Table 2 Unit Weights

	BTA180D
Weight	
Shipping (Lbs)	1060
Net (Lbs)	932

Table 3 General Data

	BTA180D
Performance Data	
Gross Capacity at A.R.I. Conditions (MBh)	
Matched Blower Coil[1]	195
Condensing Unit Only	197.0
A.R.I. Cooling with Matched Blower Coil[1]	
Net Cooling Cap. (MBh)	185
Total System Kw	22.6
EER (MBh/Kw)	8.2
Indoor Cfm	6000
A.R.I. Cooling with Matched Furnace Coil	
Net Cooling Cap. (MBh)	—
EER (MBh/Kw)	—
Indoor Cfm	—
A.R.I. Sound Rating (BELS)[3]	—
Operating Data	
Standard Amb. Range (F)	45-115
Low Amb. Option (F)[4]	0
Oper. Charge—R-22 (Oz.)[5]	326
System Data	
Refrigerant Type	R-22
No. of Refrig. Circuits	2
System Capacity Steps (%)	100/50/0
Suction Lines (OD)[6]	1⅜"
Liquid Lines (OD)[6]	½"
Compressor Data	
Number	2
Nominal Size/Type	7½T/H
Unloading Steps (High Rpm/Low Rpm)	None
Outdoor Coil Data	
No. of Coils	2
Dimensions - H x L (In.)	24 x 78
Face Area (Sq Ft)	26.00
Fin Type	3/8 Wavy
Rows/Fins Per Inch	2/168
Tube Size	⅜"
Cond. Charge (Lbs R-22)	44
Outdoor Fan Data	
No. of Fans/Motors	3
Fan Type/Diameter (In.)	Prop/22
Drive/Speed	Dir/Single
Motor: Nominal Hp (each)	¾
Nominal Rpm	1100
Nominal Airflow (Cfm)	12130
Frame Size	48

NOTES:
1. At A.R.I. 210 conditions of 80/67 F (EDB/EWB) and 95 F ambient.
2. At 45 F saturated suction temperature and 95 F ambient.
3. A.R.I. 270 Noise Rating numbers are determined with the unit in the cooling operation at a 95 F outdoor ambient.
4. With optional low ambient control.
5. Operating charge is for condensing unit only (all circuits), and does not include interconnecting lines or evaporator.
6. Max. linear length 80 ft.; Max lift-suction 60 ft.; Max lift liquid 60 ft. For greater length refer to Refrigerant Piping Applications Manual.
7. At conditions of 95 F ambient and 95% full.

Table 4 Gross System Capacity Data — BTA180D At 6000 Cfm

Outdoor DB	Enter WB	Total Cap	Entering DB 75	80	85	90
	57	170	165	170	168	169
	62	188	146	176	186	186
	67	206	113	146	175	197
	72	224	81	110	141	175
95	57	159	156	159	157	158
	62	177	141	168	175	175
	67	195	107	142	170	189
	72	213	75	105	139	171
105	57	151	148	150	150	150
	62	167	137	152	165	165
	67	184	103	136	163	180
	72	202	71	101	134	165
115	57	141	140	140	140	140
	62	156	131	153	154	154
	67	172	98	131	168	170
	72	188	66	94	128	158

Table 5 Gross System Capacity Data — BTA180D At 6000 Cfm

Outdoor DB	Enter WB	Total Cap	Entering DB 75	80	85	90
85	57	167	162	167	165	165
	62	183	145	172	183	183
	67	201	113	145	173	195
	72	220	81	110	143	173
95	57	156	153	156	154	154
	62	173	142	166	171	171
	67	191	109	141	168	187
	72	209	77	106	138	169
105	57	148	145	148	147	147
	62	163	135	158	161	161
	67	180	104	137	162	176
	72	197	71	101	133	164
115	57	138	137	136	136	136
	62	153	130	149	151	151
	67	168	99	131	155	167
	72	184	66	96	127	157

Table 6 Gross Cooling Capacity Condensing Unit Only — BTA180D At 6000 Cfm

OD Temp.		Suction Reference Temperature Degrees F 30	35	40	45	50	55
65	HP	176.8	183.7	191.0	198.6	206.4	214.5
	Cap	185.7	206.6	228.4	250.9	258.7	297.3
	Kw	15.3	16.0	16.6	17.3	17.8	18.4
75	HP	200.8	208.0	215.5	223.3	231.4	239.6
	Cap	171.0	190.9	211.5	232.6	254.3	276.3
	Kw	16.0	16.8	17.5	18.2	18.8	19.4
85	HP	226.9	234.5	242.3	250.3	258.6	267.2
	Cap	156.0	174.8	194.2	214.1	234.5	255.3
	Kw	16.6	17.4	18.3	19.1	19.8	20.6
95	HP	255.2	263.1	271.2	279.7	288.3	297.4
	Cap	140.5	158.2	176.5	195.3	214.5	234.3
	Kw	17.0	18.0	18.9	19.9	20.8	21.7
105	HP	285.6	293.9	302.5	311.4	320.6	330.2
	Cap	124.7	141.3	158.4	176.2	194.4	213.4
	Kw	17.3	18.5	19.6	20.6	21.7	22.9
115	HP	318.2	327.0	336.1	345.6	355.5	366.1
	Cap	108.5	124.0	140.0	156.8	174.2	192.5
	Kw	17.6	18.8	20.1	21.4	22.7	24.1

NOTES:
1. Performance data calculated at 15 degrees subcooling and degrees superheat.
2. HP = Head Pressure (PSIG)
   Cap = Capacity (MBh)
   Kw = Outdoor Unit Kw

Mechanical Specifications

General

All condensing units shall be assembled on a heavy-gauge integral steel base. Units shall be weatherproofed and include hermetic compressor(s), condensing coils, fans and motors, controls and holding charge of R-22. Units shall have a top control box access panel and removable end panels which allow access to all major components and controls.

Casing

Unit frame shall be a one-piece welded assembly of 18-gauge zinc-coated, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish.

Refrigeration System

BTA180D shall have two separate and independent refrigeration circuits. Each refrigeration circuit shall have an integral subcooling circuit.

Compressor — BTA 180D shall be direct-drive, 3,600 rpm, hermetic reciprocating compressor(s) with centrifugal oil pump; two-point lubrication for each bearing and connecting rod; crankcase heater and well; high strength, ring-type suction and discharge valves; large gas passages and minimum clearance volumes; and rubber-in-shear isolators.

Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Internal temperature and current-sensitive motor overloads protect compressor(s) under loss of charge and other abnormal operating conditions.

Condenser Fans and Motors — Shall be vertical discharge, direct-drive fans, statically and dynamically balanced, with aluminum blades and zinc-plated steel hubs, 1,100 rpm motor with permanently lubricated ball bearings, built-in current and thermal overload protection, and weathertight slingers over bearings.

Condenser Coil — Shall be "V" type, air-cooled. Configuration aluminum fin secondary surface mechanically bonded to primary surface of ⅜-inch OD seamless copper tubing. Subcooling circuit(s) shall be provided as standard for each refrigeration circuit. Factory pressure and leak-tested to 425 psig air pressure. Metal grilles for coil protection optional.

Controls — Shall be 24-volt control circuit includes fusing and control power transformer. Unit shall be wired complete with magnetic contactors for the compressor(s), cooling low ambient fan switches, high pressure cut-out(s), low pressure cut-out(s) and reset relays. Unit shall be completely factory-wired with necessary controls and terminal block for power wiring. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-short cycle timers are available as optional accessories.

Low Ambient Operation — Standard start and operation to approximately 45 F when matched with Trane blower coils. Optional head pressure control damper permits operation to 0 F and includes necessary controls for low ambient operation.

Mechanical Specifications

Accessories

Low Ambient Head Pressure Control Dampers — Shall modulate airflow by means of a direct-acting damper operator which senses head pressure in the liquid line and positions damper blades, allowing enough airflow to maintain proper liquid pressure at lower ambients. Standard unit equipped with dampers shall start and operate satisfactorily to 0 F ambient. Kit consists of 16-gauge damper assembly, R-22 operator, tubing, rubber grommet, and all necessary mounting hardware and instructions.

Coil Guard Package — Shall provide protection from damage to coil surface exterior. Kit shall consist of coil guards and necessary mounting hardware.

Vibration Isolator Packages — Shall reduce transmission of noise and vibration to building structures, equipment and adjacent spaces. Packages shall be available in either neoprene-in-shear or spring-flex types.

Time Delay Timer — Shall prevent compressors in a dual compressor unit from coming on line simultaneously. Timer shall be 24-volt, 50/60 cycle, with a four-minute timing period.

Antishortcycle Timer — Shall prevent rapid on-off compressor cycling in light load conditions by not allowing compressor to operate for a predetermined time upon shutdown. Shall consist of a solid-state timing device, 24-volt, 50/60 cycle with a five-minute fixed-off timing period.

Technical Literature Printed in USA

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BTA — 1½ - 15 Tons
Literature Type	SQ
Sequence	210.00
Date	July 1986
File No.	PL-UN-S/S-BTA-SQ-210.00 7/86
Supersedes	New

BWV-SQ-219.01

SUBMITTAL

TRANE™

TAG: ______________________________

15 Ton
Vertical Air Handler
BWV180B

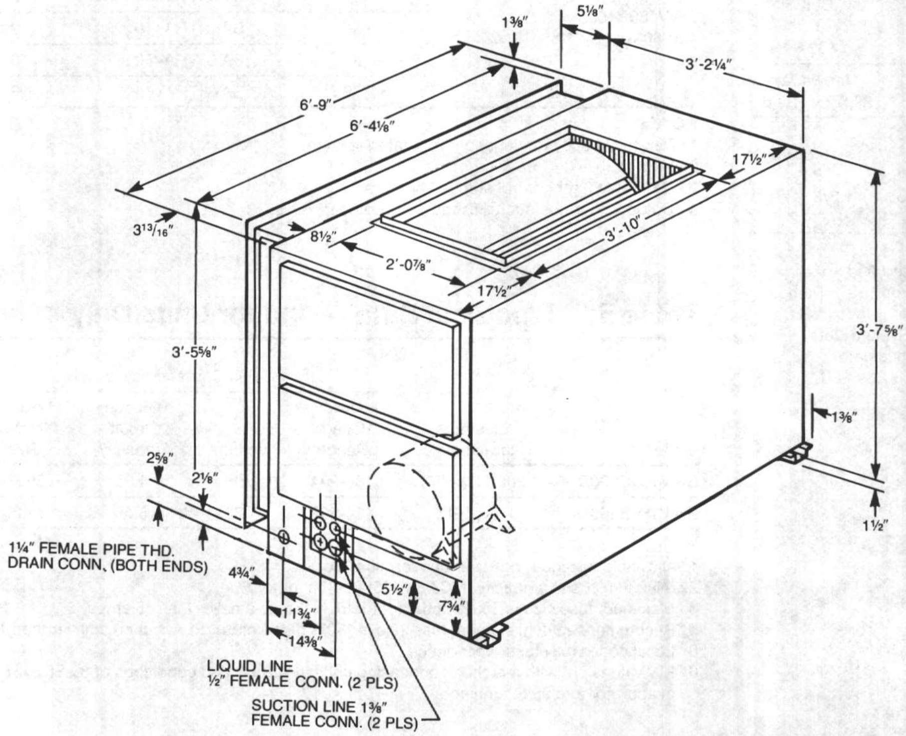


Table 1 Electrical Data — Indoor Unit and Electric Heater With Single Point Power

Model for Use With	Capacity Kw	Capacity MBh	Rated Voltage	Minimum Circuit Ampacity	Minimum Fuse Size
BWV180B300D 200-230/60/3	19.92	68.0	240/60/3	71.0	80
	29.88	102.0	240/60/3	101.0	100
	39.84	136.0	240/60/3	131.0	125
	49.80	170.0	240/60/3	161.0	150
	59.76	204.0	240/60/3	191.0	200
BWV180B400D 460/60/3	19.92	68.0	480/60/3	36.0	40
	29.88	102.0	480/60/3	51.0	50
	39.84	136.0	480/60/3	66.0	60
	49.80	170.0	480/60/3	81.0	80
	59.76	204.0	480/60/3	96.0	90

NOTES:
1. Kw at 208 volts is 75% of Kw at 240 volts.
2. Single power entry electrical calculations:
   Minimum circuit ampacity is 125% of total of electric heat and evaporator fan motor amps.
   Maximum fuse size is 225% of evaporator fan motor FLA plus electric heat amps.
   Recommended fuse size is 150% of evaporator fan motor FLA plus electric heat amps.
   Local codes may take precedence.
3. Single Point Power not available on 69.72 Kw and 79.68 Kw Heaters.

Table 2 Unit Weights (Lbs.)

Model	BWV180B-D
Shipping/Net	786/686

Table 3 General Data

Model	BWV180B-D
Indoor Coil Data	
Configuration	Draw Through
Number of Coils	1
Face Area	20.6
Fin Type	Plate Fin
Rows/Fins Per Inch	4 / 12.5
Tube Size / Material	1/2" / Copper
Refrig. Control	TXV
Drain Connection — Size (In.)	1-1/4 NPT
Indoor Fan Data	
Number of Fans	1
Fan Type / Diameter x Width	FC/15" x 15"
Nominal Hp / Rpm	3 / 1725
Drive	Belt
Number of Motor Speeds	1
Frame Size	182T
Filters — Type included	Throwaway
Filter Size / Number of Filters	20 x 25 x 2 / 6
System Data	
Refrigerant Type	R-22
Number of Refrig. Circuits	2
Suc. Line (In. OD.) Conn. Sz./No.	1-3/8" / 2
Liq. Line (In. OD.) Conn. Sz./No.	1/2" / 2

NOTE:
1. These Air Handlers are A.R.I. certified with various Split System Weathertron® Heat Pumps (A.R.I. Standard 240) and Cooling Units (A.R.I. Standard 210). Refer the Split System Data Submittal Guides for performance data.

Table 4 Electric Heat

Air Handler Model No.	Capacity Kw	Model Number	Stages	Rated Voltage
BWV180B300D 200-230/60/3	9.96	BAYHTRA310	1	240/60/3
	19.92	BAYHTRA320	1	240/60/3
	29.88	BAYHTRA330	2	240/60/3
	39.84	BAYHTRA340	2	240/60/3
	49.80	BAYHTRA350	3	240/60/3
	59.76	BAYHTRA360	3	240/60/3
BWV180B400D 460/60/3	9.96	BAYHTRA410	1	480/60/3
	19.92	BAYHTRA420	1	480/60/3
	29.88	BAYHTRA430	2	480/60/3
	39.84	BAYHTRA440	2	480/60/3
	49.80	BAYHTRA450	3	480/60/3
	59.76	BAYHTRA460	3	480/60/3

NOTES:
1. Derate capacity for variation from rated voltage.
2. Heat MBh = 3.415 x Kw
3. See Table 9 for control steps of heaters.
4. Outdoor thermostats furnished as denoted in Table.

Table 5 Electrical Data — Indoor Units Only

	Unit Characteristics					Indoor Fan Motor		
Model	Electrical Characteristics	Allowable Voltage Range	Voltage	Minimum Circuit Ampacity	Maximum Fuse Size	Hp	FLA	Kw
BWV180B300D	200-230/60/3	180-254	208	11.25	30 (3)	3	9.0	3.00
BWV180B400D	460/60/3	414-506	460	5.50	15 (3)	3	4.4	3.00

NOTES:
1. Allowable voltage range is at unit terminal block.
2. Minimum circuit ampacity (MCA) is 125% of the motor FLA.
3. Maximum fuse size is 300% of the motor FLA, but no smaller than 15 amps.
4. Recommended dual element fuse size is 150% of the motor FLA, but no smaller than 15 amps.
5. Local codes may take precedence.
6. KW values are with matched condensing units at A.R.I. rated conditions of 80 EDB/67 EWB to the evaporator and 95 F. ambient.

Table 6 Electrical Data — Electric Heaters Only

Model for Use With	Capacity Kw	Rated Voltage	Individual Elements	Stages	Minimum Circuit Ampacity	Fuses No. of Sets	Fuses Rating (Amps.)	Amps./ Fused Htr. Branch Circuit
	19.92	240/60/3	3	1	60	1	60	(1)48
	29.88	240/60/3	6	2	90	1 1	30 60	(1)24 (1)48
	39.84	240/60/3	6	2	96	2	60	(2)48
BWV180B300D 200-230/60/3	49.80	240/60/3	9	3	150	1 2	30 60	(1)24 (2)48
	59.76	240/60/3	9	3	180	3	60	(3)48
	19.92	480/60/3	3	1	30	1	30	(1)24
	29.88	480/60/3	6	2	45	1	45	(1)36
	39.84	480/60/3	6	2	60	1	60	(1)48
BWV180B400D 460/60/3	49.80	480/60/3	9	3	75	1 1	45 30	(1)36 (1)24
	59.76	480/60/3	9	3	90	1 1	60 30	(1)48 (1)24

NOTE:
1. Minimum circuit ampacity is 125% of total electric heat amps.

Table 7 Electric Heat Capacity Data — Indoor Unit

Electric Heater			Stage 1		Stage 2		Stage 3		Stage 4		Total	
Kw Input	Voltage	Control Stages	Kw Input	MBh	Kw Input	MBh	Kw Input	MBh	Kw Input	MBh	Kw Input	MBh
19.92	240/3	1	19.92	68.0							19.92	68.0
29.88	240/3	2	9.96	34.0	19.92	68.0					29.88	102.0
39.84	240/3	2	19.92	68.0	19.92	68.0					39.84	136.0
49.80	240/3	3	9.96	34.0	19.92	68.0	19.92	68.0			49.80	170.0
59.76	240/3	3	19.92	68.0	19.92	68.0	19.92	68.0			59.76	204.0
19.92	480/3	1	19.92	68.0							19.92	68.0
29.88	480/3	2	9.96	34.0	19.92	68.0					29.88	102.0
39.84	480/3	2	19.92	68.0	19.92	68.0					39.84	136.0
49.80	480/3	3	9.96	34.0	19.92	68.0	19.92	68.0			49.80	170.0
59.76	480/3	3	19.92	68.0	19.92	68.0	19.92	68.0			59.76	204.0

NOTES:
1. Derate capacities for variation from rated voltage
2. Heat MBh = 3.415 x KW

Table 8 Indoor Blower Performance BWV180B-D

	Wet Coil, 2″ Glass Fiber Filters — Motor Pulley Turns Open (Factory Setting, 4) Blower Speed - Rpm											
	1 and 965		2 and 925		3 and 885		4 and 845		5 and 805		6 and 765	
Airflow Cfm	External Static Pressure (In. of Water) and Brake Horse Power (Bhp)[1]											
	Press	Bhp	Press	Bhp	Press	Bhp	Press	Bhp	Press	Bhp	Press	Bhp
3500	1.83	2.21	1.66	2.02	1.50	1.88	1.35	1.75	1.20	1.68	1.05	1.62
4000	1.69	2.55	1.52	2.36	1.36	2.20	1.20	2.06	1.05	1.95	0.90	1.86
4500	1.54	2.89	1.37	2.70	1.21	2.54	1.04	2.37	0.89	2.23	0.74	2.12
5000	1.38	3.28	1.21	3.06	1.04	2.89	0.87	2.69	0.72	2.52	0.57	2.39
5500	[2]1.20	3.68	1.03	3.44	0.86	3.24	0.69	3.03	0.54	2.64	0.39	2.68
6000	[3]1.00	4.10	0.83	3.84	0.66	3.59	0.50	3.37	0.35	3.18	0.20	3.00
6500	[4]0.77	4.57	0.60	4.27	0.43	3.98	0.27	3.73	0.12	3.54		
7000	[5]0.50	5.08	0.35	4.72	0.18	4.38	0.02	4.11				
7500	0.20	5.62	0.07	5.22								

NOTES:
1. 3 Hp Motor Limits (Class B insulation):

	Heat Pump		Cooling	
Voltage	200 V	230/460 V	200 V	230/460 V
Power Limit	3500 W	3950 W	3750 W	4200 W

2. Performance limit for 200 volt motor application with a heat pump. Points under line over motor power limit.
3. Performance limit for 200 volt motor application used for cooling only. Points under line over motor power limit.
4. Performance limit for 230/460 volt motor application with a heat pump. Points under line over motor power limit.
5. Performance limit for 230/460 volt motor application used for cooling only. Points under line over motor power limit.
6. Fan motor heat MBh = 3.15 x fan bhp, also: Kw (Mechanical output) = hp x .7457
Kw (Electrical input) = (hp x .7457)/Motor Efficiency
Motor Efficiency = 80%

Table 9 Air Pressure Drop — Accessories — Electric Heaters

Model	Airflow (Cfm)	240 and 460/3 Voltage Size (Kw) 9.96	19.92	29.88	39.84	49.80	59.76
BWV180B-D	5000	.13	.13	.13	.13	.20	.20
	5500	.08	.08	.15	.15	.23	.23
	6000	.09	.09	.18	.18	.27	.27
	6500	.10	.10	.21	.21	.31	.31
	7000	.12	.12	.24	.24	.36	.36

NOTE:
1. Static pressure in inches of water.

Mechanical Specifications

General

Blower coil units are completely factory assembled including coil, condensate drain pan, fan, motor, filters and controls in an insulated casing for both vertical and horizontal models. UL listed and C.S.A. certified.

Casing

Units have galvanized steel panels and are unpainted. Casing is insulated and knockouts are provided for electrical power, control wiring and piping connections.

Refrigerant Circuits

The air handlers have dual refrigeration circuits. Each refrigerant circuit is controlled by a factory-installed thermal expansion valve.

Coil

Aluminum fin surface is mechanically bonded to 1/2-inch OD copper tubing. Coils are factory pressure and leak tested.

Fan

Forward curved, dynamically and statically balanced with adjustable belt speed drive as standard, fan and motor bearing are permanently lubricated.

Controls

Low voltage terminal board, fan contactor, check valves, evaporator defrost control and plug in module for accessory electric heat control are included.

Filters

Filters are included as standard — Two-inch throwaway.

Accessories

Electric Heaters — Available in a wide range of capacities and voltages with various staging options. Air handlers require accessory heater enclosure.

Single Power Entry Kit — Available for field installation.

DPDT Relay — Permits all stages of electric heat to come on during the defrost mode — bypasses the ODT's.

Technical Literature - Printed in U.S.A.

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BWV - Evap. Fan Coil - (S/SORS/P)
Literature Type	SQ
Sequence	219.01
Date	July 1986
File No.	PL-UN-S/S-BWV-SQ-219.01 7/86
Supersedes	BWV-SQ-219.00
Ordering No.	BWV-SQ-219.01

P.I.

BTA-SQ-207.01

SUBMITTAL

TRANE™

TAG: ____________________

20-Ton Split System Condensing Unit-3Ø BTA240C

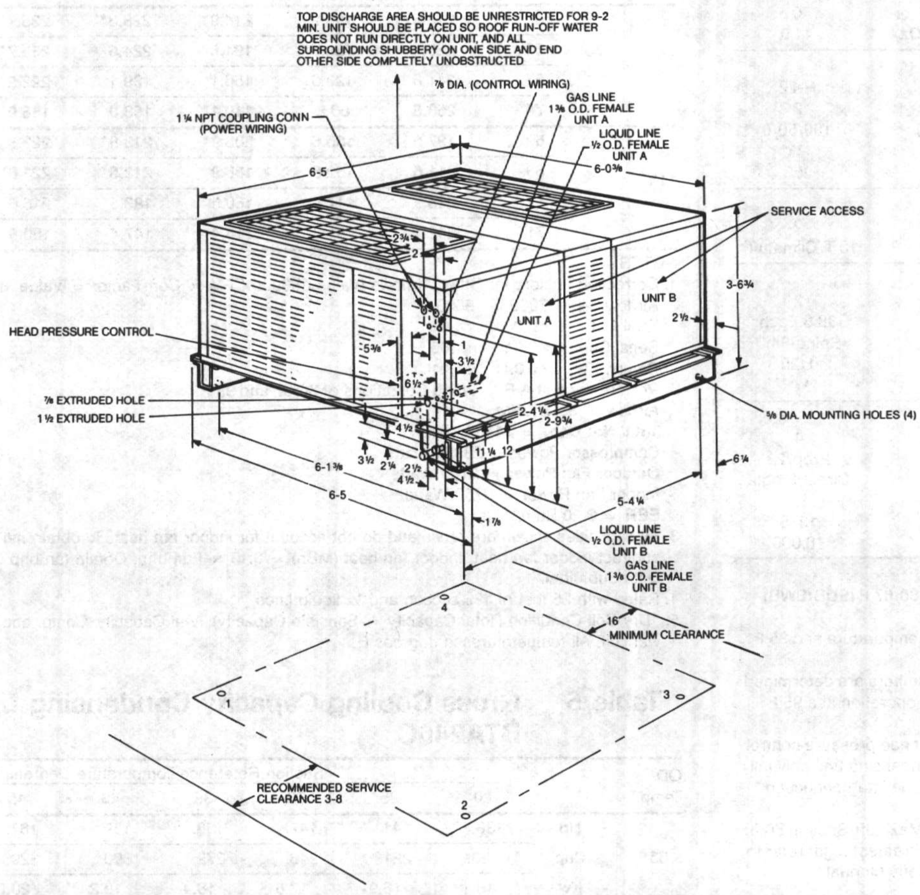


Table 1 BTA Unit Electrical Data

Model Number	Unit Characteristics: Electrical Characteristics	Allowable Voltage Range	Min. Circuit Amps[1]	Max. Fuse Size[2]	Compressor Motor: Qty	RLA	LRA	Kw	Outdoor Fan Motor: Qty	Hp	FLA (Ea.)	Voltage
BTA240C300M	200-230/60/3	180-254	56	80	2	38	200	11.8	4	1/2	3.8	200-230/60/1
BTA240C400M	460/60/3	414-506	25	40	2	17	105	11.8	4	1/2	1.4	460/60/1

NOTES:

1. Two power supplies required - MCA is for each circuit.
2. Required for each power supply.
3. Allowable voltage range is at unit terminal block.
4. Minimum circuit ampacity (MCA) is 125% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
5. Maximum fuse size is 225% of the RLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
6. Recommended dual element fuse size is 150% of the FLA of one compressor motor plus the total RLA (FLA) of remaining motors in the circuit.
7. Local codes may take precedence.
8. Motor electrical information is for each individual motor.
9. Kw values are with matched blower coils at A.R.I. rating conditions of 80 EDB 67 EWB to the evaporator and 95 F ambient.

Table 2 Unit Weight (lbs)

BTA240C	Shipping/Net 1186/1098

Table 3 General Data

	BTA240C
Performance Data	
Gross Capacity at A.R.I. Conditions (MBh)	
Matched Blower Coil[1]	256.8
Condensing Unit Only[2]	255
A.R.I. Cooling With Matched Blower Coil[1]	
Net Cooling Capacity (MBh)	244
Total System Kw	29.7
EER (Mbh/Kw)	8.20
Indoor CFM	8000
A.R.I. Sound Rating (BELS)[3]	9.2
Operating Data	
Standard Ambient Range (F)	20-115
Low Ambient Option (F)[4]	0
Operating Charge—R-22 (Oz)[5]	44.0
System Data	
Refrigerant Type	R-22
No. Of Refrig. Circuits	2
System Capacity Steps (%)	100/50/0
Suction Lines (O.D.)[6]	1⅜"
Liquid Lines (O.D.)[6]	½"
Compressor Data	
Number	2
Nominal Size/Type	10 T/Climatuff™
Outdoor Coil Data	
No. of Coils	2
Face Area (Sq. Ft.)	38.5 Each
Fin Type	Spine-Fin™
Rows/Fins Per Inch	1/20
Tube Size	½"
Outdoor Fan Data	
No. of Fans/Motors	4
Fan Type/Diameter (In.)	Prop/22
Drive/Speed	Direct/Single
Motor: Nominal HP (each)	½
Nominal Rpm	1075
Nominal Airflow (CFM)	18,000

NOTES:
1. At A.R.I. 210 conditions of 80/67 F (EDB/EWB) and 95 F ambient.
2. At 45 F saturated suction temperature and 95 F ambient.
3. A.R.I. 270 Noise Rating numbers are determined with the unit in the cooling operation at a 95 F outdoor ambient.
4. With optional low ambient head pressure control.
5. Operating charge is for condensing unit only (all circuits), and does not include interconnecting lines or evaporator.
6. Max. Linear Length 80 ft; Max. Lift-Suction 60 ft; Max. Lift. Liquid 60 ft. For greater length refer to refrigerant piping Applications Manual.

Table 4 Cooling Capacities — BTA240C With BWH240B At 8000 CFM

Outdoor DB	Enter WB	Total Cap.	Sensible Capacity For Indicated Entering Dry Bulb Temps. 72	76	80	84	88	Comp. Kw
85	59	235.7	202.2	235.2	246.8*	258.0*	269.1*	20.41
	63	252.5	169.4	202.5	235.6	258.0*	269.1*	21.23
	67	270.5	133.9	167.0	200.1	233.1	266.2	22.10
	71	288.8	97.6	130.7	163.7	196.8	229.9	22.99
95	59	223.7	196.9	225.8*	242.0*	252.8*	263.6*	22.08
	63	239.6	164.1	197.2	230.3	247.4*	257.8*	22.93
	67	256.8	128.7	161.7	194.8	227.9	257.8*	23.85
	71	274.2	92.4	125.5	158.6	191.6	224.7	24.78
105	59	210.6	191.2	214.9*	225.3*	235.7*	245.7*	23.86
	63	225.6	158.5	191.5	224.6	235.7*	245.7*	24.74
	67	241.8	123.0	156.1	189.1	222.2	245.7*	25.70
	71	258.3	86.8	119.1*	153.0	186.0	219.1	26.67
115	59	197.5	185.6	203.9*	213.8*	223.8*	233.4*	25.66
	63	211.6	152.8	185.9	213.8*	223.8*	233.4*	26.56
	67	226.9	117.4	150.5	183.5	216.6	233.4*	27.55
	71	242.4	81.3	114.4	147.4	180.5	213.6	28.55

NOTES:
1. Correction Factors for Other Airflows (Value at 8000 CFM × Corr Factor = Value at New Airflow)

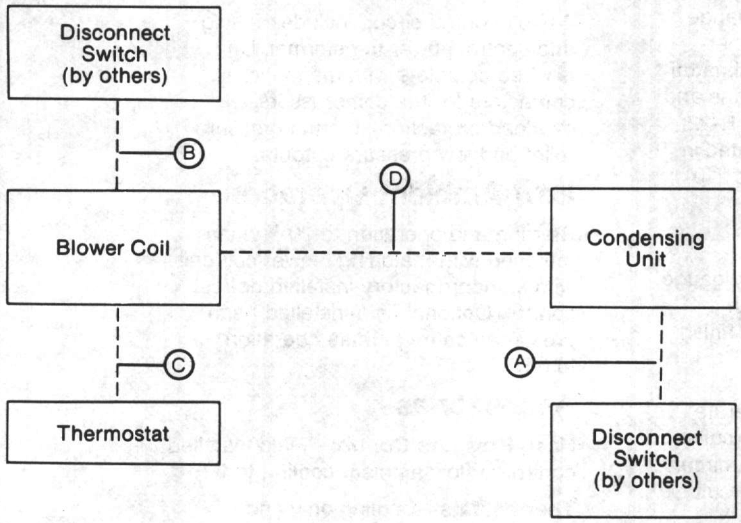
Airflow	7000	9000
Total Cap.	×0.98	×1.01
Sens. Cap.	×0.94	×1.06
Compr. Kw	×0.99	×1.01

2. Performance at A.R.I. Rating Conditions of 80/67 and 95 F.
   Airflow = 8000 CFM
   Total Net Cap. = 244000 Btuh
   Compressor Power = 23850 Watts
   Outdoor Fan Power = 2100 Watts
   Indoor Fan Power = 3750 Watts
   EER = 8.20 Btuh/Watt
3. All capacities shown are gross and do not account for indoor fan heat. To obtain net cooling capacities subtract indoor fan heat. Indoor fan heat (MBh) = 3.15 × Fan bhp. Obtain fan bhp from Blower Coil Data Submittal.
4. Rated with 25 feet of 1⅜ suction and ½ liquid lines.
5. *Dry Coil Condition (Total Capacity = Sensible Capacity) Total Capacity, Comp. and Kw are valid only for wet coil. All temperatures in degrees F.

Table 5 Gross Cooling Capacity Condensing Unit Only — BTA240C

OD Temp.		Suction Reference Temperature Degrees F 20	25	30	35	40	45	50	55
55	Hp	136.	141.	147.	153.	159.	167.	175.	183.
	Cap	198.	221.	246.	272.	300.	329.	361.	394.
	Kw	16.1	16.9	17.6	18.4	19.2	20.0	20.8	21.7
65	Hp	158.	163.	169.	176.	183.	191.	199.	208.
	Cap	186.	208.	231.	256.	283.	311.	341.	373.
	Kw	17.1	18.0	18.8	19.7	20.6	21.5	22.4	23.5
75	Hp	181.	187.	194.	201.	208.	217.	226.	235.
	Cap	173.	194.	217.	240.	266.	293.	321.	351.
	Kw	18.1	19.0	20.0	20.9	21.9	23.0	24.1	25.3
85	Hp	208.	214.	221.	228.	236.	245.	254.	265.
	Cap	161.	181.	202.	225.	249.	274.	301.	329.
	Kw	19.0	20.1	21.1	22.2	23.3	24.5	25.8	27.1
95	Hp	237.	243.	250.	258.	267.	276.	286.	296.
	Cap	148.	167.	187.	209.	231.	255.	280.	306.
	Kw	19.9	21.1	22.2	23.4	24.7	26.0	27.4	28.9
105	Hp	268.	275.	283.	291.	300.	309.	319.	330.
	Cap	136.	154.	173.	192.	214.	236.	259.	283.
	Kw	20.8	22.0	23.3	24.6	26.0	27.5	29.1	30.8
115	Hp	302.	310.	318.	326.	335.	345.	355.	367.
	Cap	124.	141.	158.	177.	196.	217.	238.	260.
	Kw	21.6	22.9	24.3	25.8	27.3	29.0	30.8	32.6

NOTES:
1. Performance data calculated at 15 deg. subcooling and 15 deg. superheat.
2. HP = Head Pressure, PSIG
   Cap = Capacity, MBh
   Kw = Outdoor Unit Kw



FIELD WIRING WHEN USED WITH A BWV/BWH UNIT:
A—6 power wires, line voltage
B—3 power wires, line voltage for blower coil, no electric heat
—6 power wires, line voltage for blower coil and electric heat
—3 power wires, line voltage for blower coil and electric heat with single point power kit
C—Cooling only Thermostat, 7 wires, 24 volt
—Electric heat and relay BAY24X042 add 2 wires, 24 volt
D—5 wires, 24 volts

NOTES:
1. Wiring shown with dash lines is to be furnished and installed by the customer. All customer-supplied wiring must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.
2. Field wiring for specific combinations of equipment can be found in BTA-IW-1.

Mechanical Specifications

General

Units are assembled on heavy-gauge steel mounting/lifting rails, weather-proofed and include hermetic Climatuff™ compressors, Spine-Fin™ coil, fans and motors and operating charge of R-22, UL listed, C.S.A. certified and rated in accordance with A.R.I. Standard 210 and 270.

Casing

Unit casing constructed of heavy-gauge, galvanized steel and painted with a weather-resistant baked enamel finish.

Refrigerant Circuits

Condensing units have two separate and independent refrigeration circuits. A refrigerant filter dryer for each circuit is provided as standard. Each circuit has a liquid line service valve with gauge port and also a gas line service valve with gauge port. Also included are pressure tap ports in suction and discharge gas lines of the refrigerant system.

Compressors

Two direct-drive, 3600 rpm, hermetic reciprocating compressors with centrifugal oil pump providing positive lubrication to moving parts. Crankcase heater and internal pressure relief valve included for maximum protection. Compressor overload protection, solid-state on 20 ton models. Has internal spring isolation and sound muffling to minimize vibration transmission and noise.

Condenser Fans

Vertical discharge, direct-drive fans statically and dynamically balanced with aluminum blades and steel hubs, 1075 rpm motor with permanently lubricated bearings with built-in current and thermal overload protection.

Outdoor Coil

All aluminum Spine-Fin™ mechanically bonded to 1/2 inch OD seamless aluminum tubing for maximum heat transfer and reliability. Coils are lab tested to withstand 2,000 pounds of pressure per square inch.

Controls

24-Volt control circuit includes fusing and control power transformer. Unit is wired complete with magnetic contactors for the compressors, overload protection, internal pressure relief and low pressure cutouts.

Low Ambient Operation

Starting and operation to 20 F when matched with matching blower coil unit with standard factory-installed defrost control. Optional field-installed head pressure control permits operation to 0 F.

Accessories

Head Pressure Control—Field installed control for low ambient cooling to 0 F.

Thermostats—Cooling only and heating/cooling (manual and automatic changeover). Sub-base to match thermostat and locking thermostat cover. Programmable Night Setback Thermostat.

Hot Gas Bypass Kit—Assembly kit includes shutoff valve, hot gas bypass valve, and desuperheating expansion valve.

Outdoor Thermostat—Supplemental heat outdoor ambient lockout from 46 to -10 F.

Antirecycle Timers—Prevents excessive cycling of compressors using a 5 to 7 minute time delay relay.

Technical Literature - Printed in U.S.A.

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BTA-1-1/2-15 Tons
Literature Type	SQ
Sequence	207.01
Date	July 1986
File No.	PL-UN-S/S-BTA-SQ-207.01 7/86
Supersedes	BTA-SQ-207.00
Ordering No.	BTA-SQ-207.01

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TRANE™

BWV-SQ-220.01

TAG: ______________________________

SUBMITTAL

20 Ton Vertical Air Handler BWV240B

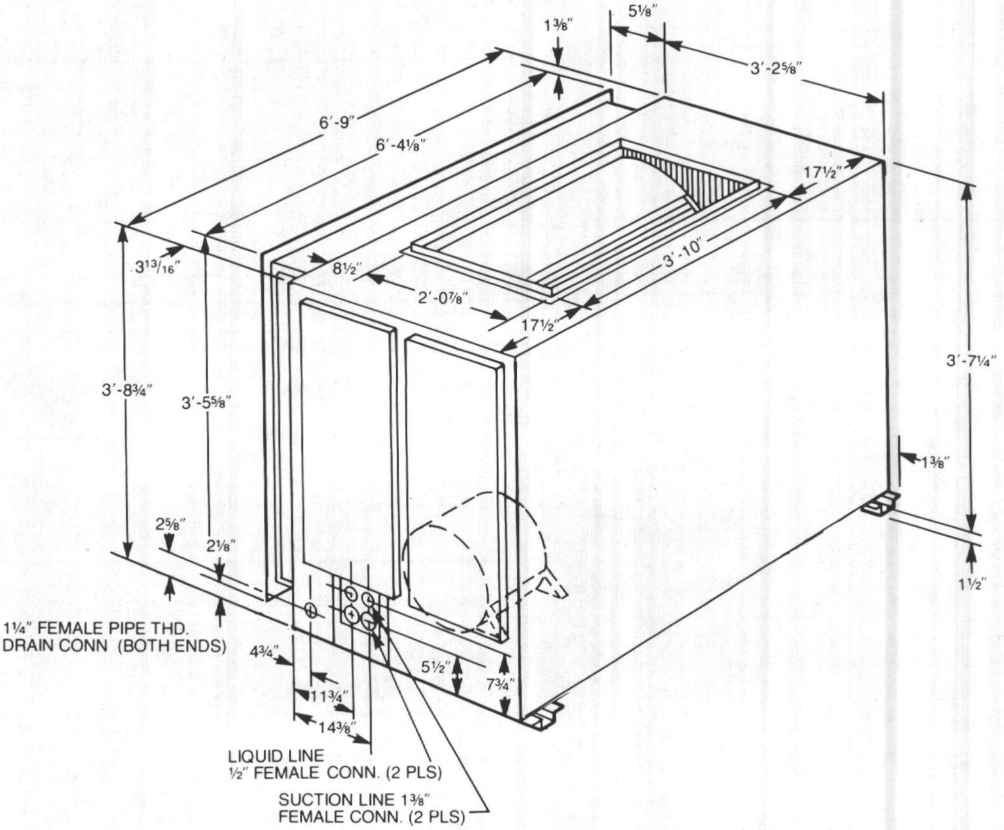


Table 1 Wiring Data (Unit And Heater W/Single Circuit Power)

Model For Use With	Capacity Kw	Capacity MBh	Rated Voltage	Minimum Circuit Ampacity	Minimum Fuse Size
BWV240B300D 200-230/60/3	19.92	68.0	240/60/3	78.0	100
	29.88	102.0	240/60/3	108.0	125
	39.84	136.0	240/60/3	138.0	150
	49.80	170.0	240/60/3	168.0	175
	59.76	204.0	240/60/3	198.0	200
BWV240B400D 460/60/3	19.92	68.0	480/60/3	38.0	50
	29.88	102.0	480/60/3	53.0	60
	39.84	136.0	480/3/60	68.0	70
	49.80	170.0	480/3/60	83.0	80
	59.76	204.0	480/3/60	98.0	100

NOTES:
1. Kw at 208 volts is 75% of Kw at 240 volts.
2. Single power entry electrical calculations:
   Minimum circuit ampacity is 125% of total of electric heat and evaporator fan motor amps.
   Maximum fuse size is 225% of evaporator fan motor FLA plus electric heat amps.
   Recommended fuse size is 150% of evaporator fan motor FLA plus electric heat amps.
   Local codes may take precedence.
3. Single Point Power not available on 69.72 Kw and 79.68 Kw Heaters.

Table 2 Unit Weights

Model	BWV240B
Shipping (Lbs.)	870
Net (Lbs.)	770

Table 3 General Data

Model	BWV240B-D
Indoor Coil Data	
Configuration	Draw Through
Number of Coils	1
Face Area	20.6
Fin Type	Plate Fin
Rows / Fins Per Inch	4 / 12.5
Tube Size / Material	½" / Copper
Refrig. Control	TXV
Drain Connection — Size (In.)	1¼ NPT
Indoor Fan Data	
Number of Fans	1
Fan Type / Diameter x Width	FC / 18" x 18"
Nominal Hp / Rpm	5 / 1725
Drive	Belt
Number of Motor Speeds	1
Frame Size	184T
Filters	
Filter Type Included	Throwaway
Filter Size / Number of Filters	20 x 25 x 2 / 6
System Data	
Refrigerant Type	R-22
Number of Refrig. Circuits	2
Suction Line (In. OD) Conn. Size/Number	1⅜" / 2
Liquid Line (In. OD) Conn. Size/Number	½" / 2

NOTE:
These Air Handlers are A.R.I. certified with various Split System Weathertron® Heat Pumps (A.R.I. Standard 240) and Cooling Units (A.R.I. Standard 210). Refer the Split System Data Submittal Guides for performance data.

Table 4 Electrical Data — Indoor Units Only

	Unit Characteristics					Indoor Fan Motor		
Model	Electrical Characteristics	Allowable Voltage Range	Voltage	Minimum Circuit Ampacity	Maximum Fuse Size	No./Hp	FLA	Kw
BWV240B300D	200-230/60/3	180-254	208	19.00	60 (3)	5	15.2	3.75
BWV240B400D	460/60/3	414-506	460	8.25	25 (3)	5	6.6	3.75

NOTES:
1. Allowable voltage range is at unit terminal block.
2. Minimum circuit ampacity (MCA) is 125% of the motor FLA.
3. Maximum fuse size is 300% of the motor FLA, but no smaller than 15 amps.
4. Recommended dual element fuse size is 150% of the motor FLA, but no smaller than 15 amps.
5. Local codes may take precedence.
6. Kw values are with matched condensing units at A.R.I. rated conditions of 80 EDB/67 EWB to the evaporator and 95 F ambient.

Table 5 Electrical Data — Electric Heaters Only

						Fuses		
Model For Use With	Capacity Kw	Rated Voltage	Individual Elements	Stages	Minimum Circuit Ampacity	No. of Sets	Rating (Amps)	Amps/Fused Htr. Branch Circuit
BWV240B300D 200-230/60/3	19.92	240/60/3	3	1	60	1	60	(1) 48
	29.88	240/60/3	6	2	90	1 1	30 60	(1) 24 (1) 48
	39.84	240/60/3	6	2	96	2	60	(2) 48
	49.80	240/60/3	9	3	150	1 2	30 60	(1) 24 (2) 48
	59.76	240/60/3	9	3	180	3	60	(3) 48
	69.72	240/60/3	12	4	210	1 3	30 60	(1) 24 (3) 48
	79.68	240/60/3	12	4	240	4	60	(4) 48
BWV240B400D 460/60/3	19.92	480/60/3	3	1	30	1	30	(1) 24
	29.88	480/60/3	6	2	45	1	45	(1) 36
	39.84	480/60/3	6	2	60	1	60	(1) 48
	49.80	480/60/3	9	3	75	1 1	45 30	(1) 36 (1) 24
	59.76	480/60/3	9	3	90	1 1	60 30	(1) 48 (1) 24
	69.72	480/60/3	12	4	105	1 1	45 60	(1) 36 (1) 48
	79.68	480/60/3	12	4	120	2	60	(2) 48

NOTE:
Minimum circuit ampacity is 125% of total electric heat amps.

Table 6 Electric Heat

Air Handler Model No.	Capacity Kw	Model Number	Stages	Rated Voltage
BWV240B300D 200-230/60/3	9.96	BAYHTRA310	1	240/60/3
	19.92	BAYHTRA320	1	240/60/3
	29.88	BAYHTRA330	2	240/60/3
	39.84	BAYHTRA340	2	240/60/3
	49.80	BAYHTRA350	3	240/60/3
	59.76	BAYHTRA360	3	240/60/3
BWV240B300D 200-230/60/3	69.72	BAYHTRA370	4	240/60/3
	79.68	BAYHTRA380	4	240/60/3
BWV240B400D 460/60/3	9.96	BAYHTRA410	1	480/60/3
	19.92	BAYHTRA420	1	480/60/3
	29.88	BAYHTRA430	2	480/60/3
	39.84	BAYHTRA440	2	480/60/3
	49.80	BAYHTRA450	3	480/60/3
	59.76	BAYHTRA460	3	480/60/3
BWV240B400D 460/60/3	69.72	BAYHTRA470	4	480/60/3
	79.58	BAYHTRA480	4	480/60/3

NOTES:
1. Derate rate capacity for variation from rated voltage.
2. Heat MBh = 3.415 x kw
3. Outdoor thermostats furnished as denoted in Table.
4. Single power entry not available.

Table 7 Indoor Blower Performance BWV240B-D

Wet Coil, 2" Glass Fiber Filters

Airflow, Cfm	Press (2 and 800)	Bhp (2 and 800)	Press (2 and 770)	Bhp (2 and 770)	Press (3 and 740)	Bhp (3 and 740)	Press (4 and 710)	Bhp (4 and 710)	Press (5 and 680)	Bhp (5 and 680)	Press (6 and 650)	Bhp (6 and 650)
	Motor Pulley Turns Open (Factory Setting, 3) and Blower Speed-Rpm; External Static Pressure (In. of Water) and Brake Horse Power (Bhp)[1]											
5000	1.50	3.02	1.40	2.79	1.29	2.56	1.17	2.44	1.05	2.31	0.92	2.20
5500	1.45	3.32	1.34	3.06	1.23	2.81	1.11	2.67	0.98	2.55	0.85	2.43
6000	1.38	3.61	1.28	3.33	1.17	3.07	1.04	2.92	0.91	2.79	0.77	2.65
6500	1.30	3.95	1.19	3.63	1.08	3.34	0.95	3.18	0.81	3.02	0.68	2.88
7000	1.20	4.29	1.10	3.94	0.98	3.61	0.85	3.44	0.71	3.28	0.57	3.13
7500	1.10	4.63	0.98	4.27	0.86	3.92	0.72	3.74	0.59	3.56	0.46	3.39
8000	0.98	5.00	0.85	4.61	0.72	4.23	0.59	4.03	0.46	3.84	0.33	3.65
8500	0.84	5.38	0.70	4.97	0.57	4.57	0.43	4.35	0.31	4.13	0.19	3.93
9000 [2,3]	0.69	5.79	0.54	5.36	0.40	4.94	0.27	4.69	0.15	4.46	0.03	4.23
9500 [4]	0.52	6.23	0.36	5.80	0.20	5.38	0.09	5.07				
10000 [5]	0.32	6.69	0.16	6.28	0.00	5.87						

NOTES:

1. 5 Hp Motor Limits (Class B Insulation):

	Heat Pump 200 V	Heat Pump 230/460 V	Cooling 200 V	Cooling 230/460 V
Voltage	200 V	230/460 V	200 V	230/460 V
Power Limit	4800 W	5500 W	5100 W	5800 W

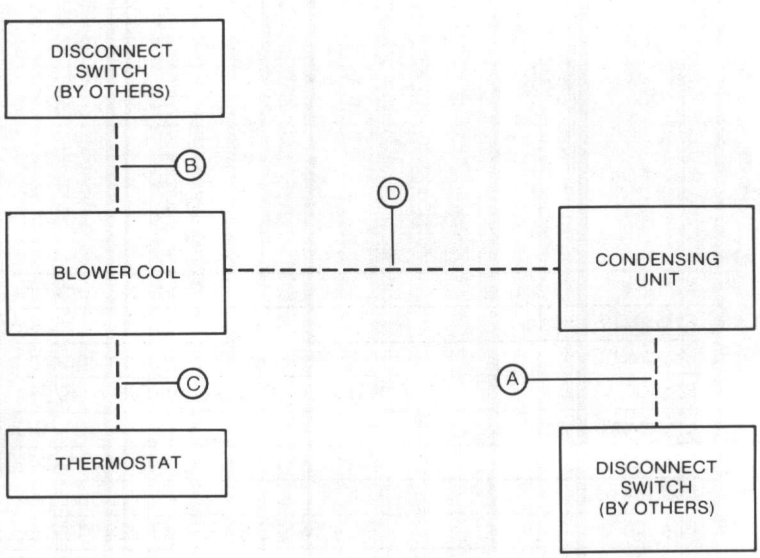
2. Performance limit for 200 volt motor application with a heat pump. Points under line over motor power limit.
3. Performance limit for 200 volt motor application used for cooling only. Points under line over motor power limit.
4. Performance limit for 230/460 volt motor application with a heat pump. Points under line over motor power limit.
5. Performance limit for 230/460 volt motor application used for cooling only. Points under line over motor power limit.
6. Fan motor heat MBh = 3.15 x fan bhp, also:
   Kw (Mechanical output) = hp x .7457
   Kw (Electrical input) = (hp x .7457)/Motor Efficiency
   Motor Efficiency = 80%

Table 8 Air Pressure Drop — Accessories — Electric Heaters

Model	Airflow Cfm	9.96	19.92	29.88	39.84	49.80	59.76	69.72	79.68
		240 and 460/3 Voltage, Size (Kw)							
BWV240B-D	7000	.12	.12	.24	.24	.36	.36	.48	.48
	7500	.13	.13	.27	.27	.40	.40	.53	.53
	8000	.15	.15	.30	.30	.45	.45	.60	.60
	8500	.17	.17	.34	.34	.51	.51	.68	.68
	9000	.19	.19	.38	.38	.57	.57	.76	.76

NOTE:
Static pressure in inches of water.

Field Wiring



Field Wiring when used with a BTA Outdoor Cooling Unit:

A — 6 power wires, line voltage
B — 3 power wires, line voltage
— 6 power wires, line voltage for blower coil and electric heat
— 3 power wires, line voltage for blower coil and electric heat with single point poiwer kit
C — Cooling only Thermostat, 7 wires, 24 volt
— Electric and relay BAY24X042 add 2 wires, 24 volt
D — 5 wires, 24 volt

NOTES:
1. Wiring shown with dashed lines is to be furnished and installed by the customer. All customer-supplied wiring must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.
2. Field wiring for specific combinations of equipment can be found in BTA-IW-1A.

Mechanical Specifications

General

Blower coil units are completely factory assembled including coil, condensate drain pan, fan, motor, filters and controls in an insulated casing for both vertical and horizontal models. UL listed and C.S.A. certified.

Casing

Units have galvanized steel panels and are unpainted. Casing is insulated and knockouts are provided for electrical power, control wiring and piping connections.

Refrigerant Circuits

The air handlers have dual refrigeration circuits. Each refrigerant circuit is controlled by a factory-installed thermal expansion valve.

Coil

Aluminum fin surface is mechanically bonded to ½-inch OD copper tubing. Coils are factory pressure and leak tested.

Fan

Forward curved, dynamically and statically balanced with adjustable belt speed drive as standard, fan and motor bearing are permanently lubricated.

Controls

Low voltage terminal board, fan contactor, check valves, evaporator defrost control and plug in module for accessory electric heat control are included.

Filters

Filters are included as standard— Two-inch throwaway.

Accessories

Electric Heaters — Available in a wide range of capacities and voltages with various staging options. Air handlers require accessory heater enclosure.

Single Power Entry Kit — Available for field installation.

DPDT Relay — Permits all stages of electric heat to come on during the defrost mode — bypasses the ODT's.

Technical Literature Printed in USA

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

Library	Product Literature
Product Section	Unitary
Product	Split System Air Conditioning
Model	BWV-Evap. Fan-Coil (S/S or S/SP)
Literature Type	SQ
Sequence	220.01
Date	July 1986
File No.	PL-UN-S/S-BWV-SQ-220.01 7/86
Supersedes	BWV-SQ-220.00

TRANE™

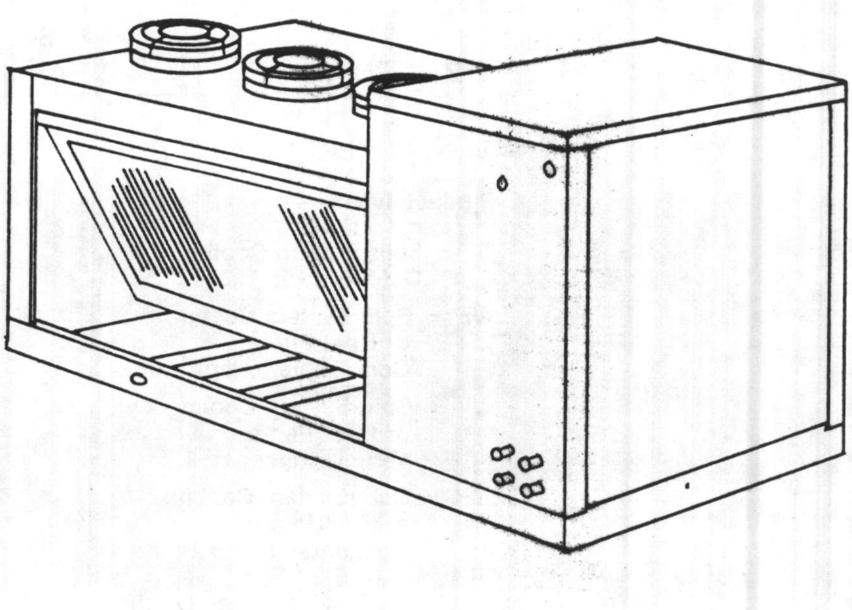
BTA-IN-5

INSTALLER'S GUIDE

Split System Condensing Units

Models
BTA120D-AB
BTA150D-AB
BTA180D-AB
BTA180F-AB

Library	Service Literature
Product Section	Unitary
Product	Split System
Model	BTA
Literature Type	Installation
Sequence	5
Date	December 1986
File No.	SV-UN-S/S-BTA-IN-5 12/86
Supersedes	New



Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

18-AC60D4

Table of Contents

Unit Model Number Description

Trane LCG products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of this multiple-character number is shown below. It will enable the owner or Service Engineer to define operation, components and applicable accessories for a specific unit.

LCG Unit Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12
B	T	A	1	2	0	D	3	0	0	A	A

Digit 1 — Always "B"

Digits 2, 3 — Product Type

- TA = Split System Cooling, Outdoor Unit
- WE = Split System Cooling or Heat Pump, Convertible Indoor Unit
- WV = Split System Cooling or Heat Pump, Verticle Indoor Unit
- WH = Split System Cooling or Heat Pump, Horizontal Indoor Unit

Digits 4, 5, 6 — Cooling Capacity (MBH)

- 090 = 90 MBH
- 120 = 120 MBH
- 180 = 180 MBH
- 240 = 240 MBH

Digit 7 — Major Design Sequence

Digit 8 — Electrical Characteristics

- 3 = 208-230/60/3
- 4 = 460/60/3
- W = 575/60/3

Digits 9, 10 — Secondary Capacity and/or Factory Installed Options

- 00 = Not Used

Digit 11 — Minor Design Sequence

Digit 12 — Service Digit

General Information

Model BTA Condensing Units are designed for outdoor mounting with a vertical air discharge. They are usually installed on concrete slabs at ground level, but can also be used on a flat roof or a sloping roof with a properly built-up platform (making a level installation possible). Each unit is leak tested and evacuated at the factory, and shipped with a holding charge of Refrigerant-22. An access panel on the end of the unit provides access to the compressor section and access to the control box.

An Installation Checklist is provided at the end of this manual and should be completed after all installation procedures have been accomplished. This checklist should not be substituted for the detailed information given in appropriate sections of this manual.

Installation

Unit Installation

BTA unit dimensions, weights, and clearances are shown in Figures 1 through 3. Figure 4 illustrates various components of the split system condensing unit.

Receiving

When the unit is delivered to the jobsite, inspect all components for damage. Manually rotate the condenser fans to be sure they revolve freely. Report any damage or material shortage to the carrier and record this information on the bill of lading. File damage claims with the carrier, and notify the appropriate Trane sales office before installing a damaged unit. Any material shortages should also be reported directly to the Trane sales office.

Compare the electrical data on the unit nameplate with the ordering and shipping information to verify that the correct unit has been received.

Unit wiring diagrams and installation-operation-maintenance literature are shipped with the unit. Before unit start-up, read the provided literature to become familiar with the unit and its operation.

Location and Clearances

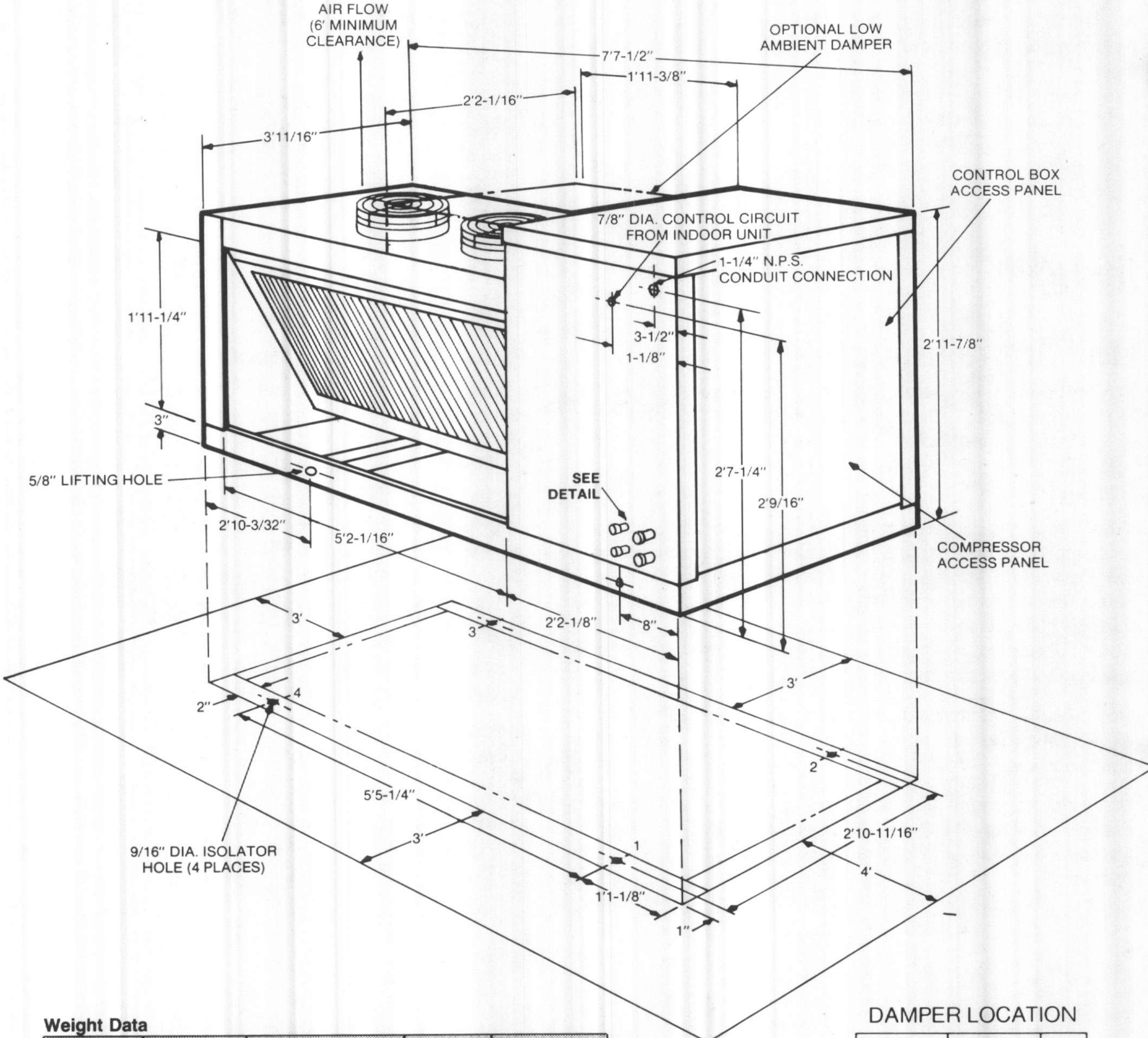
Select a location for the condensing unit where air will flow, without obstruction, upward through the coil and away from the fan discharge. Limit the length of refrigerant piping by locating the condensing unit as close to the evaporator as possible.

CAUTION: If the condensing unit must be placed under an overhang, take the necessary steps to avoid the recirculation of warm discharged air. Failure to do so will hinder the performance of the condensing unit and lead to unit damage.

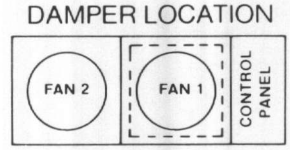
Suggested air flow clearances and service clearances are given in Figures 1 through 3. If the unit is placed under an overhang, allow at least six feet of clearance above the unit to prevent recirculation of hot discharge air.

NOTE: *Four feet of service clearance must always be provided on the compressor end of the unit.*

Allow sufficient space to install a liquid line shutoff valve with an access port next to the condensing unit. The access port will be needed to measure subcooling, as discussed in the MAINTENANCE manual.



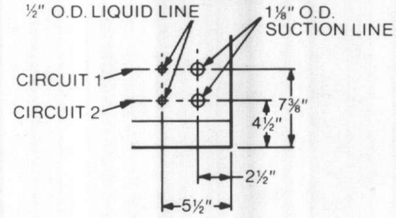
DAMPER LOCATION



Weight Data

MODEL	NO. OF COMPS.	WEIGHT CONCENTRATED ON LEG (LBS)				SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
		1	2	3	4		
BTA120D	Two 5-Ton	226	228	124	100	830	678

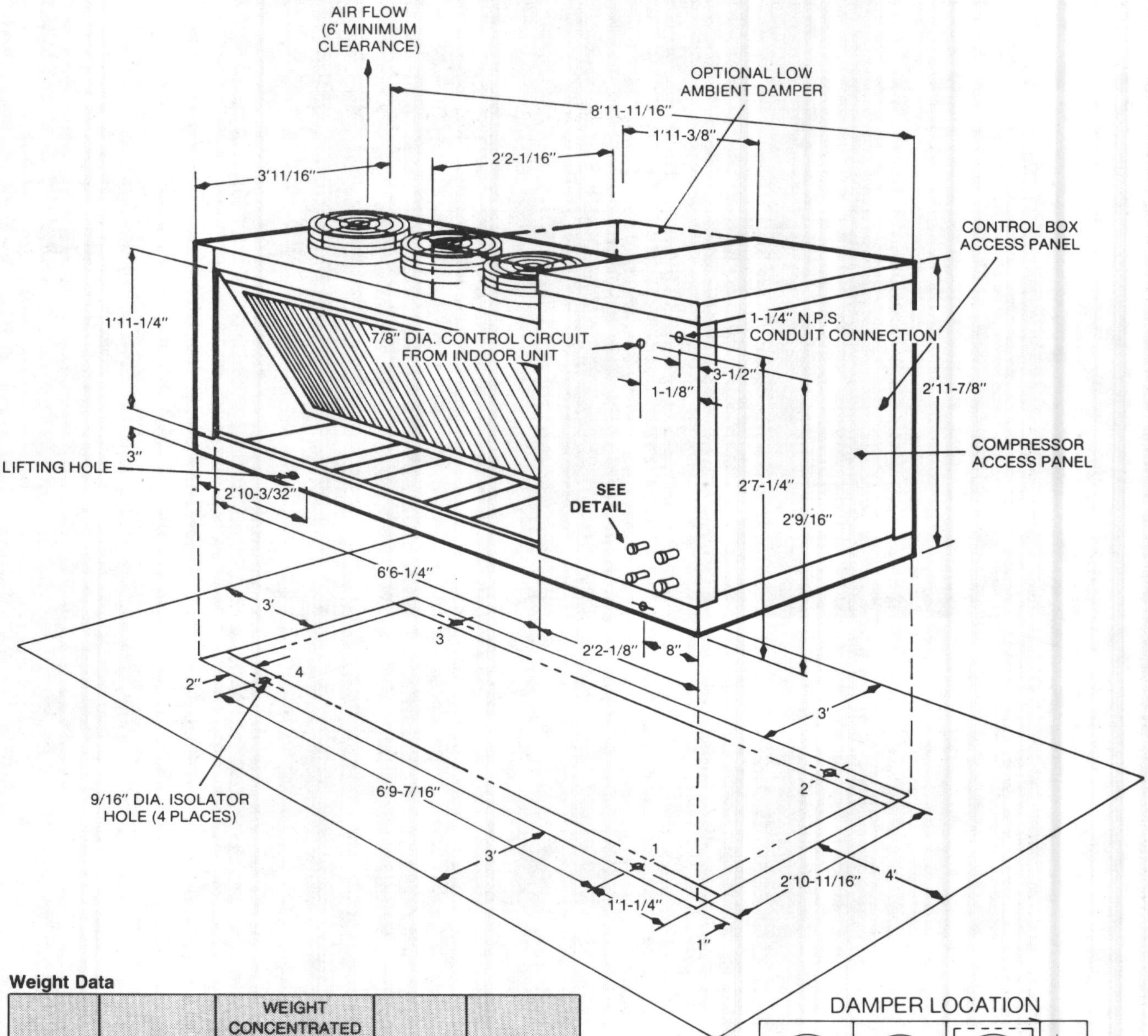
REFRIGERANT
CONN. DETAIL



Clearance Data

MODEL	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIR FLOW CLEARANCES			
		SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION	
				MAX. PIT DEPTH	COIL CLEARANCE
BTA120D	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"

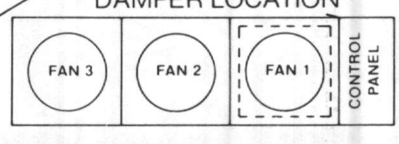
Figure 1 - Dimensions, Weights, and Clearances for BTA120D Units



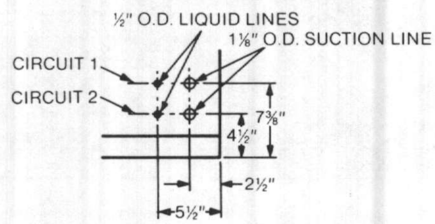
Weight Data

MODEL	NO. OF COMPS.	WEIGHT CONCENTRATED ON LEG (LBS) 1	2	3	4	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
BTA150D	Two 6.25-Ton	256	259	138	119	960	772
BTA180D	Two 7.50-Ton	270	272	158	140	1020	840

DAMPER LOCATION



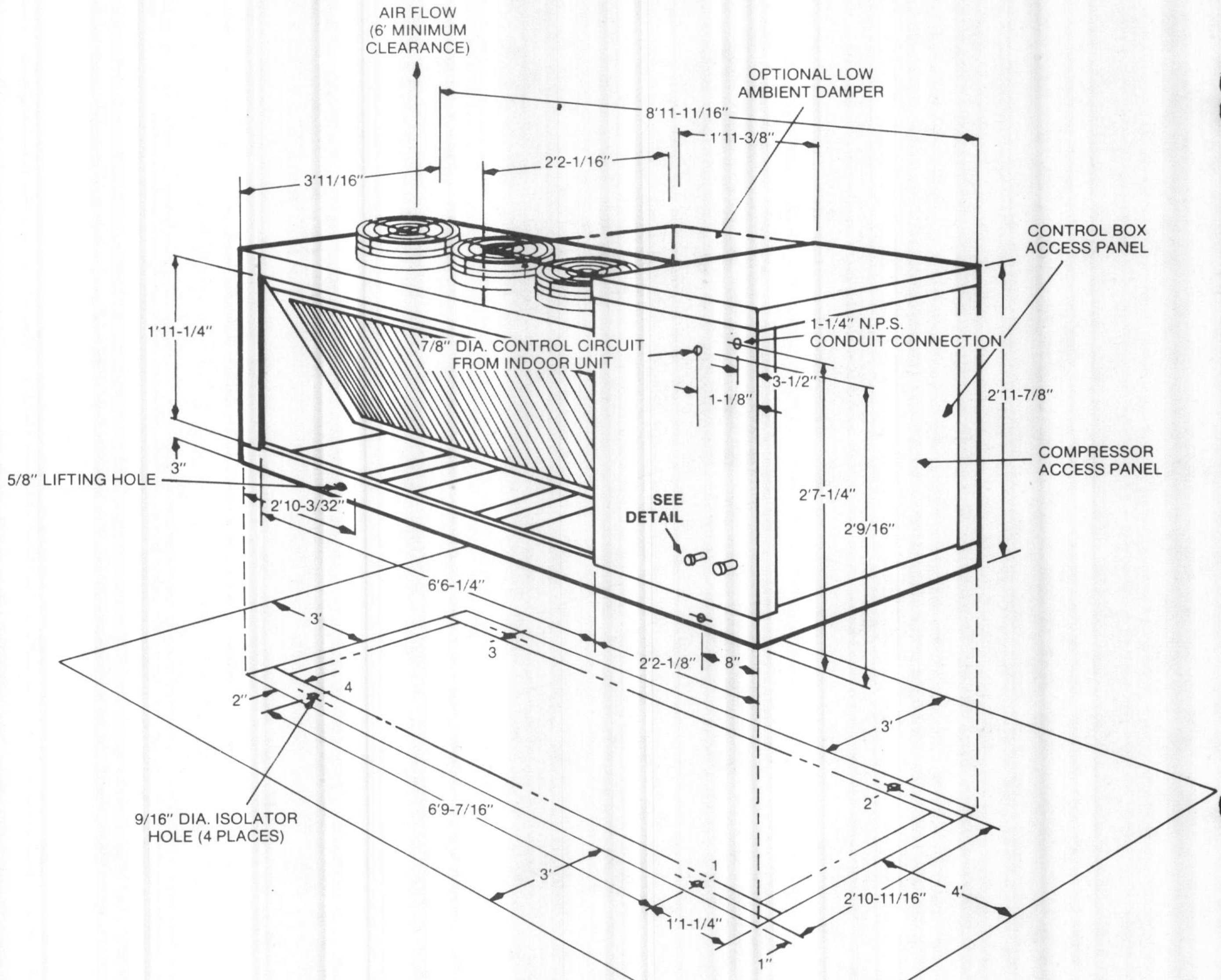
REFRIGERANT CONN. DETAIL



Clearance Data

MODEL	SUGGESTED SERVICE CLEARANCE	SUGGESTED AIR FLOW CLEARANCES: SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	PIT INSTALLATION: MAX. PIT DEPTH	PIT INSTALLATION: COIL CLEARANCE
BTA150D	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"
BTA180D	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"

Figure 2 - Dimensions, Weights, and Clearances for BTA150D and 180D Units



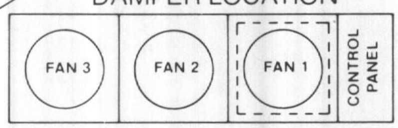
Weight Data

MODEL	NO. OF COMPS.	WEIGHT CONCENTRATED ON LEG (LBS) 1	2	3	4	SHIPPING WEIGHT (LBS)	OPERATING WEIGHT (LBS)
BTA180F	One 15-Ton	271	273	158	140	1022	842

Clearance Data

		SUGGESTED AIR FLOW CLEARANCES			
				PIT INSTALLATION	
MODEL	SUGGESTED SERVICE CLEARANCE	SINGLE UNIT INSTALLATION	SIDE BY SIDE UNIT INSTALLATION	MAX. PIT DEPTH	COIL CLEARANCE
BTA180F	4'-0"	3'-0"	6'-0"	3'-0"	6'-0"

DAMPER LOCATION



REFRIGERANT CONN. DETAIL

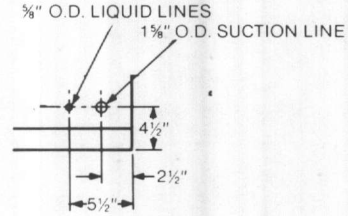


Figure 3 - Dimensions, Weights, and Clearances for BTA180F Units

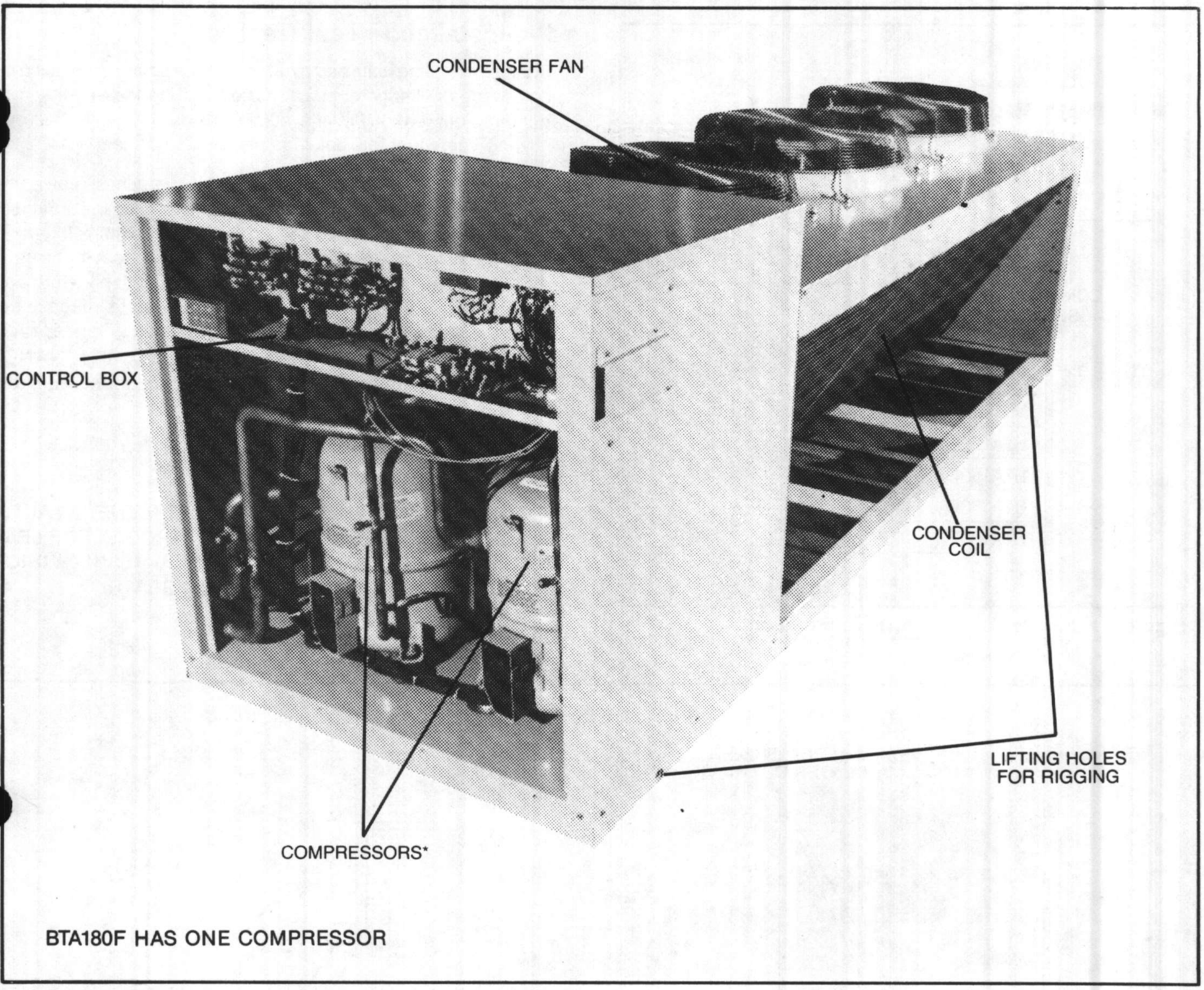


Figure 4 - BTA Component Identification

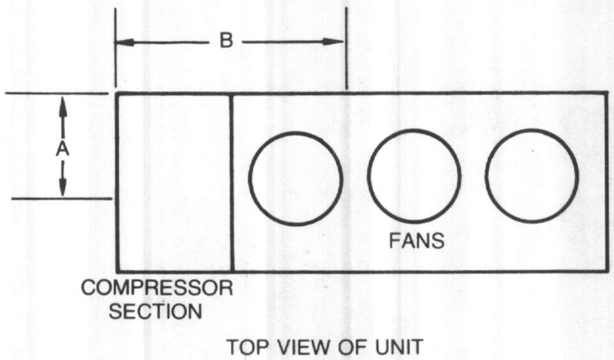
Foundation

If the unit is to be set on the ground, provide a four inch thick, level concrete slab for mounting. In rooftop applications, make sure the roof is strong enough to support the unit. Check with a roofing contractor for proper waterproofing installation practices to ensure that the roof does not develop leaks as a result of unit weight, vibration, and hot weather.

Rigging

Rig the unit using either belt or cable slings. The slings must be fastened to the unit at the four holes in the base rail of the unit, as shown in Figure 6. Use spreaders to protect the top of the unit when it is lifted. The point where the slings meet at the lifting hook must be at least six feet above the unit. Refer to Figure 5 for center of gravity information, and to Figure 6 for proper rigging procedures.

WARNING: TO PREVENT OVERSTRESSING THE BASE RAILS, THE UNIT SHOULD BE RIGGED AS SHOWN IN FIGURE 6 AND LIFTED AS SMOOTHLY AS POSSIBLE. FAILURE TO DO SO COULD RESULT IN SERIOUS PERSONAL INJURY AND DAMAGE TO THE UNIT.



MODEL	A	B
BTA120D	18.5"	33"
BTA150D	18.5"	39"
BTA180D	18.5"	41"
BTA180F	18"	40"

Figure 5 · Unit Center of Gravity Information

Pre-Installation Leak Test

Trane condensing units and evaporators are shipped with a holding charge of Refrigerant-22. Before installing these units, momentarily depress either the suction or discharge line access valve to verify that this holding charge has not been lost.

If no refrigerant escapes when depressing the access valve, the condensing unit should be leak tested to determine the source of refrigerant loss. Pressurize the unit to 100 psi with refrigerant, and use a halogen leak detector, halide torch, or soap bubbles to check for leaks. If a leak is found, release the test pressure and repair the leak. If no leak is found, use nitrogen to increase the test pressure to 150 psi and repeat the leak test. When repairing leaks, refer to "Brazing Procedures" in the MAINTENANCE PROCEDURES manual. Retest the unit to make sure the problem has been corrected.

NOTE: *It may be difficult to pressurize the unit to 100 psi with refrigerant if the ambient temperature is below 60 F.*

WARNING: DO NOT USE OXYGEN, ACETYLENE, OR AIR IN PLACE OF REFRIGERANT AND DRY NITROGEN FOR LEAK TESTING. A VIOLENT EXPLOSION WILL RESULT WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

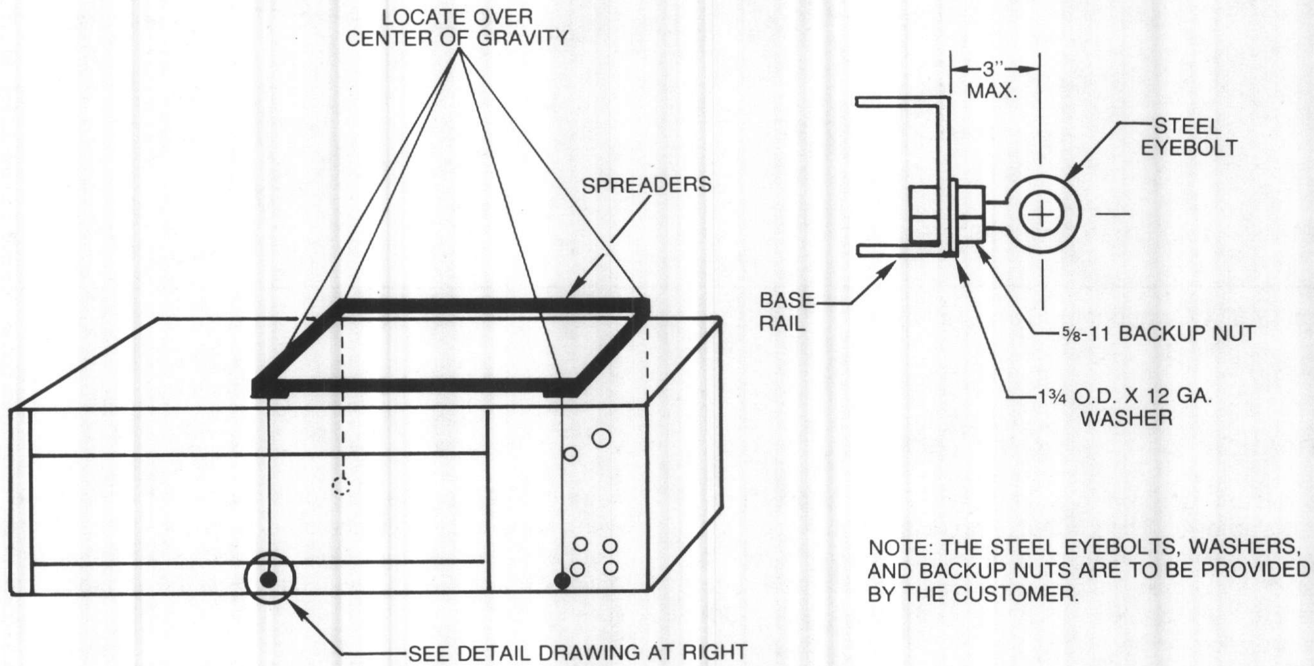


Figure 6 · Rigging the Unit

Refrigerant Piping

It is essential that refrigerant piping be properly sized and applied since these factors have a significant effect on system performance and reliability. On self-contained units, proper piping design is insured by the equipment manufacturer. However, split systems must operate with interconnecting lines which are selected and applied by the installer. If the interconnecting piping does not follow recommended guidelines, any system will be plagued by erratic performance, compressor failures, and other problems.

NOTE: *The piping should be sized and laid out according to the job plans and specifications. This should have been completed when components were selected for the system.*

Recommended Line Sizes

The interconnecting line sizes recommended by Trane are listed in Table 1. These tube sizes are within the velocity, pressure drop, and refrigerant charge limitations necessary for proper system operation. (The refrigerant charge limit is the maximum system charge recommended for a particular compressor, and is determined by the design of the compressor.) The line lengths in Table 1 are based on pressure drop and refrigerant charge limitations in the **liquid line**. Pressure drop limits assume that equivalent length equals two times the physical length. In most applications, this is a reasonable assumption. However, actual pressure drop must be calculated if one or more of the following situations exists:

1. LONG RISER: Installations with liquid line risers have an added pressure drop of 0.5 psi per foot of riser. If the riser is long, the system may require a larger diameter and/or shorter liquid line to ensure subcooling at the expansion valve.
2. EXCESSIVE BENDS, REDUCERS, VALVES: A larger than normal number of tube bends, reducers, and/or valves may increase equivalent length and pressure drop above the assumption of two times the physical length. Actual pressure drop should be calculated for these situations.

Trane recommends sizing the liquid line diameter as small as possible, while maintaining pressure drop within acceptable limits. This will minimize system charge and, therefore, have the general effect of increasing compressor life.

Trane recommends the use of Type L (medium wall) refrigerant tubing. Only refrigeration grade copper tubing should be used since it is available cleaned, dehydrated, and capped to avoid contamination prior to installation. Copper tubing used for plumbing usually has oil, grease, or other contaminants on the interior wall, and these can cause serious operating problems if not removed prior to installation. Tube size recommendations in this manual are based on Type L (medium wall) tubing.

Table 1 - Interconnecting Line Sizes

	LENGTH OF INTERCONNECTING LINES (FEET)							
CONDENSING	0-20		21-40		41-60		61-80	
UNIT	LINE SIZE — O.D. (INCHES)							
UNIT	LIQ.	SUCT.	LIQ.	SUCT.	LIQ.	SUCT.	LIQ.	SUCT.
BTA120D†	3/8	7/8	3/8	1-1/8	1/2	1-1/8	1/2	1-1/8
BTA150D†	3/8	7/8	3/8	1-1/8	1/2	1-1/8	1/2	1-3/8
BTA180D†	1/2	1-1/8	1/2	1-1/8	1/2	1-1/8	1/2	1-3/8
BTA180F	5/8	1-3/8	5/8	1-3/8	5/8	1-5/8		

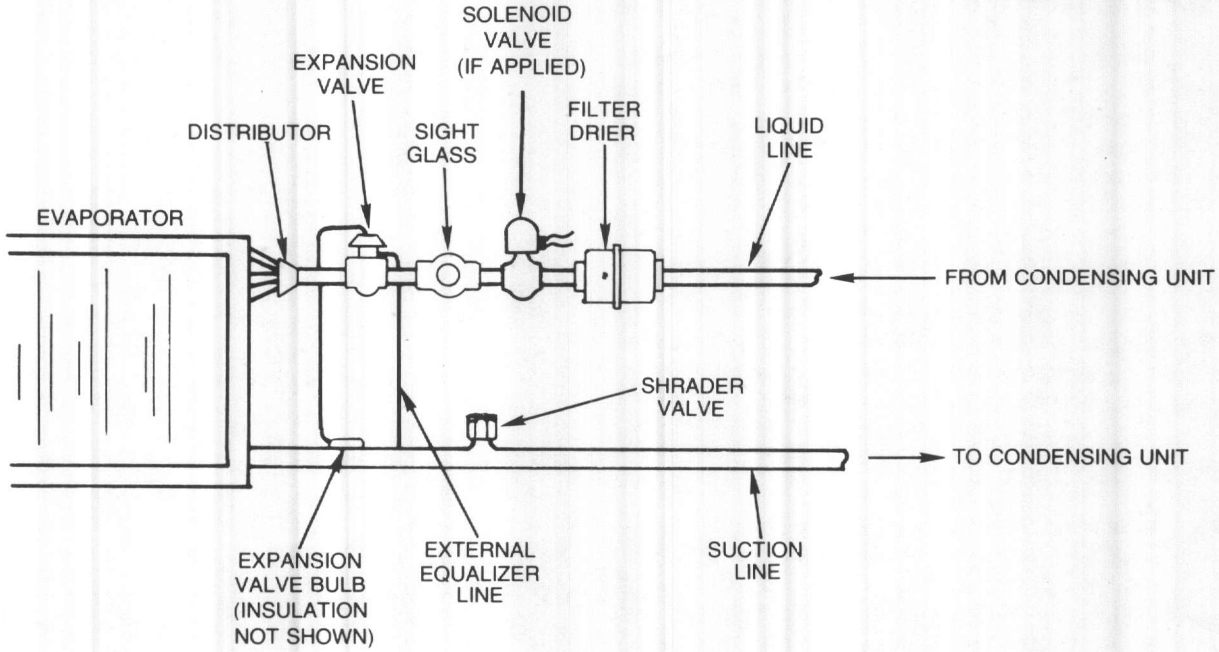
NOTES:
1. For line lengths and risers greater than maximum recommended in table, refer to the Trane Refrigeration Manual.
2. Use type L (medium wall) A.C.R. copper tubing.
†2 line sets required.

Refrigerant Piping Guidelines

A. Maximum recommended line lengths:
Maximum linear length ....80 Ft. (w/o accumulator)
Maximum suction line lift ....60 Ft.
Maximum liquid line lift ....60 Ft.

B. Maximum allowable pressure drops (R-22):
Suction line ....3 psi
Liquid line ....35 psi

Route refrigerant piping for minimum linear length, minimum number of bends and fittings (no reducers) and minimum amount of line exposed to outdoor ambients.



NOTE: INSTALL THE EXPANSION VALVE, SIGHT GLASS, SOLENOID VALVE, AND FILTER DRIER AS CLOSE TO THE EVAPORATOR AS POSSIBLE.

Figure 7 - Diagram of Refrigerant Piping Components in Liquid Line

Liquid Line Components

A properly sized liquid line filter drier must be installed upstream from the expansion valve. In addition, a moisture indicator/sight glass should be installed between the expansion valve and filter drier. Both of these components should be installed at the evaporator close to the expansion valve, as shown in Figure 7.

A shut-off valve (with access port) should be sized with the liquid line O.D. selected, and installed close to the condenser. Other valves, tube bends, and reducers should be minimized since these items tend to increase pressure drop and reduce subcooling at the expansion valve.

Liquid line receivers are not recommended on 10 to 15 ton systems since they increase the refrigerant charge.

The following points should be considered when connecting the evaporator to the BTA180F condensing unit.

1. It is recommended that the full evaporator coil be used during low speed compressor operation because of efficiency considerations.
2. In some installations, insufficient moisture removal may result when the full evaporator coil is used with the compressor on low speed.
3. In instances where the importance of moisture removal overrides efficiency considerations, one-half of the evaporator coil capacity can be shut off when the compressor switches to low speed.
4. If solenoid valves are required, they should be installed between the filter drier and sightglass in order to shutoff one-half of the evaporator coil capacity. On units where the solenoid valves are factory installed, the sightglass can be installed between the unit and filter drier. However, all of these components should be installed close to the expansion valve, and no more than one-half of the coil capacity should be shut off.

Suction Line Components

Trane does not recommend the use of suction line accumulators on 10 to 15 ton single compressor units because accumulators of sufficient size and quality are not available.

Suction line filter driers are not recommended as standard components when installing BTA condensing units. They may be necessary on systems that have experienced a compressor burn-out (refer to Trane Service Bulletin No. HCOM-SB-45).

On 10 to 15 ton systens, a suction line shut-off valve installed in the interconnecting tubing has little value, and is not recommended due to pressure drop considerations. Increased suction line pressure drop has a significant effect on system capacity and efficiency.

Risers and Tube Routing

Liquid Line

Liquid line riser lengths are limited only by the additional pressure drop (0.5 psi/ft) which results from the liquid column. No limit exists on the length of liquid line drops, and no special line sloping considerations are necessary.

Normally it is not necessary or desirable to insulate liquid lines. In most applications, the ambient temperature is lower than the refrigerant temperature, and has the desirable effect of increasing subcooling at the expansion valve. However, liquid lines routed through extremely high ambient environments (such as a boiler room) may reduce subcooling below acceptable levels. To minimize this loss, liquid lines passing through extremely warm spaces should be insulated. Increasing the liquid line size only tends to aggravate this problem.

Suction Line

The suction line sizes recommended in Table 1 will result in sufficient refrigerant vapor velocity to ensure good oil entrainment. It is also important to utilize good tube routing practices in order to ensure proper oil return to the compressor.

It is recommended that horizontal suction lines be pitched toward the compressor.

Insulate the suction line with 1/2-inch thick, closed cell neoprene insulation such as armaflex or similar material.

Brazing and Leak Testing

For proper brazing techniques when installing refrigerant piping, refer to "Brazing Procedures" in the MAINTENANCE manual.

After completing the installation of all refrigerant piping, the system should be thoroughly checked for possible leaks. Refer to "Leak Testing" in the MAINTENANCE manual.

Electrical Wiring

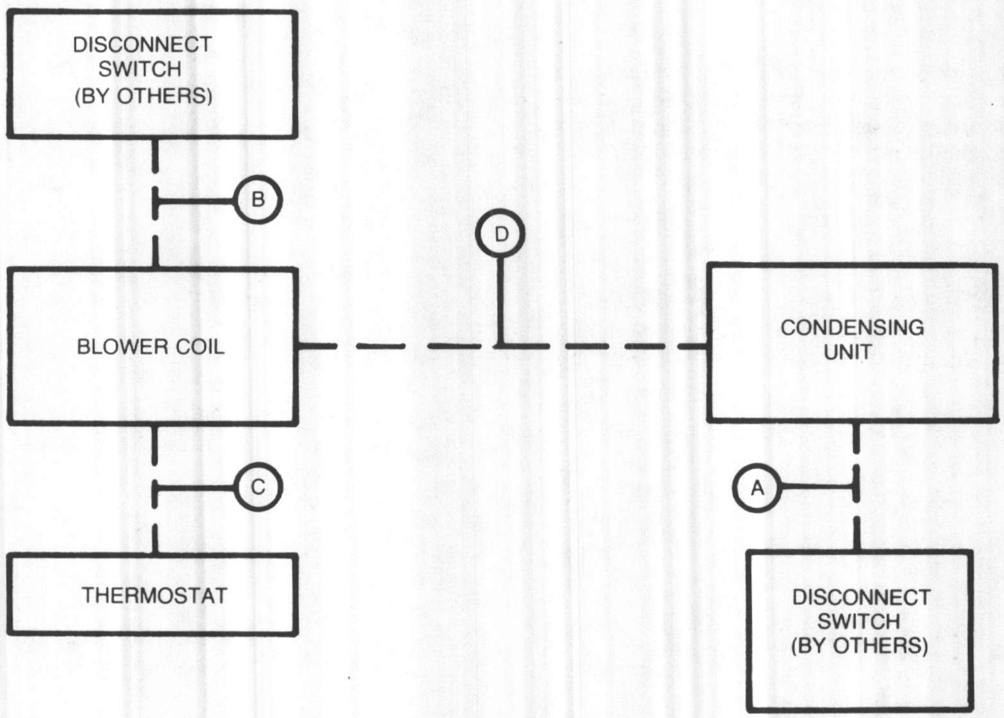
WARNING: OPEN THE ELECTRICAL POWER DISCONNECT SWITCH AND SECURE IN THAT POSITION BEFORE INSTALLING OR SERVICING THE UNIT. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK.

Install all field wiring, including the unit electrical ground, in accordance with the National Electrical Code and applicable local codes. Figure 8 provides a block diagram of the electrical connections to be made by the customer or installing contractor.

NOTE: *When connecting wires at the terminal block, make sure that all lugs are tight. Also check the terminal block and compressor contactor lugs that were wired at the factory.*

The unit wiring diagram is pasted on the back of the control box cover. Refer to Figures 1 and 2 for the locations of holes provided for electrical conduit entry on the unit. The locations of the electrical panel components are shown on the unit wiring diagram.

Table 2 lists the electrical characteristics for BTA120D to BTA180D, BTA180F units.



FIELD WIRING WHEN USED WITH A BACA UNIT:
A — 3 power wires, line voltage
B — 3 power wires, line voltage
C — Cooling only thermostat: 4 wires, 24 volts
— One-stage electric heat: add 1 additional wire, 24 volts
— Two-stage electric heat: add 2 additional wires, 24 volts
D — 4 wires, 24 volts

NOTE: Wiring shown with dash lines is to be furnished and installed by the customer. All customer-supplied wiring must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.

Figure 8 - Electrical Connections by Customer

Table 2 - Electrical Characteristics for BTA120D to BTA180D, BTA180F Units

	Unit Characteristics					Compressor Motor				Condenser Fan Motor			
Model	[7] Electrical Characteristics	Allowable Voltage	[3,6] Min. Circuit Range	[2,6] Max. Fuse Amp.	[4,6] Recm'd Dual Element Fuse Size	No.	[1] RLA (Ea)	[1] LRA (Ea)	[1,5] KW (Ea)	NO/ HP	[1] FLA (Ea)	[1] LRA (Ea)	[1,5] KW (Ea)
BTA120D300	208-230/60/3	187-254	53	70	60	2	19.0	115	6.0	2/.75	5.0	11.0	0.77
BTA120D400	460/60/3	416-508	29	35	35	2	10.6	50	6.0	2/.75	2.7	5.5	0.77
BTA120DW00	575/60/3	520-536	23	30	25	2	8.5	45	6.0	2/.75	1.8	4.4	0.77
BTA150D300	208-230/60/3	187-254	65	80	80	2	23.6	142	7.3	3/.50	4.1	9.5	0.60
BTA150D400	460/60/3	416-508	30	40	35	2	10.7	71	7.3	3/.50	2.1	4.8	0.60
BTA150DW00	575/60/3	520-635	24	30	30	2	8.6	57	7.3	3/.50	1.6	3.8	0.60
BTA180D300	208-230/60/3	187-254	73	100	80	2	27.1	156	8.9	3/.50	4.1	9.5	0.62
BTA180D400	460/60/3	416-508	34	45	40	2	12.3	79	8.9	3/.50	2.1	4.8	0.62
BTA180DW00	575/60/3	520-635	27	35	30	2	9.9	63	8.9	3/.50	1.6	3.8	0.62
BTA180F300	208-230/60/3	187-254	83	125	100	1	56.4	248	17.8	3/.50	9.5	9.5	0.62
BTA180F400	460/60/3	416-508	42	60	50	1	28.2	124	17.8	3/.50	4.8	4.8	0.62
BTA180FW00	575/60/3	520-635	33	50	40	1	22.6	100	17.8	3/.50	3.8	3.8	0.62

NOTES:
1. Electrical information is for each individual motor.
2. Maximum fuse size permitted by N.E.C. 440-22 is 225% of one compressor motor RLA plus the total RLA of the remaining motors in the circuit.
3. Minimum circuit ampacity is 125% of the RLA of one compressor motor plus the total RLA of the remaining motors in the circuit.
4. Recommended dual element fuse size is 150% of the RLA of one compressor motor plus the total RLA of the remaining motors in the circuit.
5. KW values are taken at conditions of 45 F saturated suction temperature at the compressor and 95 F ambient.
6. Local codes may take precedence.
7. Allowable range at unit terminal block.
8. Data given at high speed.

CAUTION: Use only copper conductors for supply power power wiring. Do not use aluminum conductors. Unit terminals are not designed to accept other than copper conductors.

NOTE: *For 208 volt operation, reconnect the control power transformer as shown on the unit wiring diagram. Cap the unused transformer lead with a wire nut.*

Fuses

Refer to the unit wiring diagram pasted on the inside of the control box cover for condenser fan and control circuit fuse specifications.

Thermostat Installation

Recommended wire sizes and lengths for installing the unit thermostat are provided in Table 3. The total resistance of these low voltage wires must not exceed one ohm. Any resistance in excess of one ohm may cause the control circuit to malfunction.

When selecting a thermostat location, be sure to choose a site in a frequently occupied area with good air circulation at an average temperature. The thermostat should be positioned approximately five feet above the floor and **must be level**.

Avoid mounting the thermostat in areas subject to the following:
— drafts or "dead" spots behind doors or in corners;
— hot or cold air from ducts;
— radiant heat from the sun, or from appliances;
— concealed pipes and chimneys;
— unheated or uncooled surfaces behind the thermostat, such as outside walls;
— in an area where the thermostat will be affected by a unit in another zone.

CAUTION: If an energy management device, time clock, or other power consuming device is used, a separate power supply must be provided for that device. Do not use the unit control circuitry, or damage to the unit may result.

Table 3 - Recommended Thermostat Wire Size

WIRE SIZE	MAXIMUM WIRE LENGTH
22 Gauge	30 Ft.
20 Gauge	50 Ft.
18 Gauge	75 Ft.
16 Gauge	125 Ft.
14 Gauge	200 Ft.

Table 4 - Air Handler Motor Electrical Data

Unit Model Number	Unit Electrical Characteristics	No. of Motors	Hp (Ea.)	Speed (Rpm)	FLA		LRA	
					200/230V	460V	200/230V	460V
BWE090C100E	200-230/60/1	1	1	3450	6.3	—	45.0	—
BWE090C400E	200-230 & 460/60/3	1	1	1725	3.8	1.9	21.2	10.6
BWE120C100E	200-230/60/1	1	2	3450	11.5	—	61.0	—
BWE120C400E	200-230 & 460/60/3	1	1½	1725	5.0	2.5	37.4	18.7
BTE120C100E	200-230/60/1	1	2	3450	11.5	—	61.0	—
BTE120C400E	200-230 & 460/60/3	1	1½	1725	5.0	2.5	37.4	18.7

Table 5 - BWH and BWV Unit Electrical Data

Unit Model Number	Unit Characteristics		Indoor Fan Motor			
	Electrical Characteristics	Voltage Utilization Range	No. Req'd.	Hp (Ea.)	Speed (Rpm)	FLA
BWH180B300C BWV180B300C	200-230/60/3	180-254	1	3	1725	9.0
BWH180B400C BWV180B400C	460/60/3	414-506	1	3	1725	4.4
BWH240B300C BWV240B300C	200-230/60/3	180-254	1	5	1725	15.2
BWH240B400C BWV240B400C	460/60/3	415-506	1	5	1725	6.6

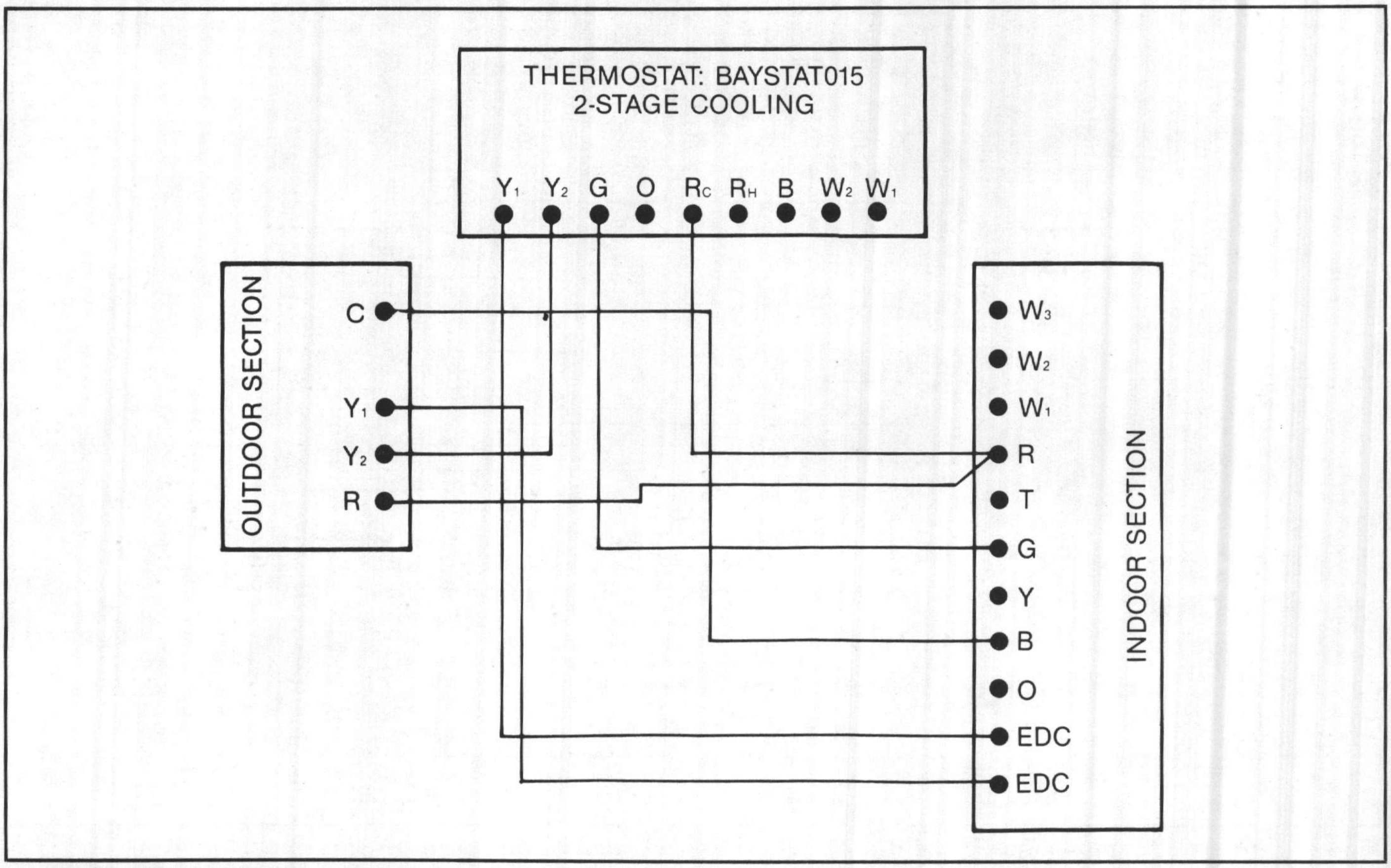


Figure 9 - Field Wiring for BTA120D with BTE120B Air Handler No Electric Heat

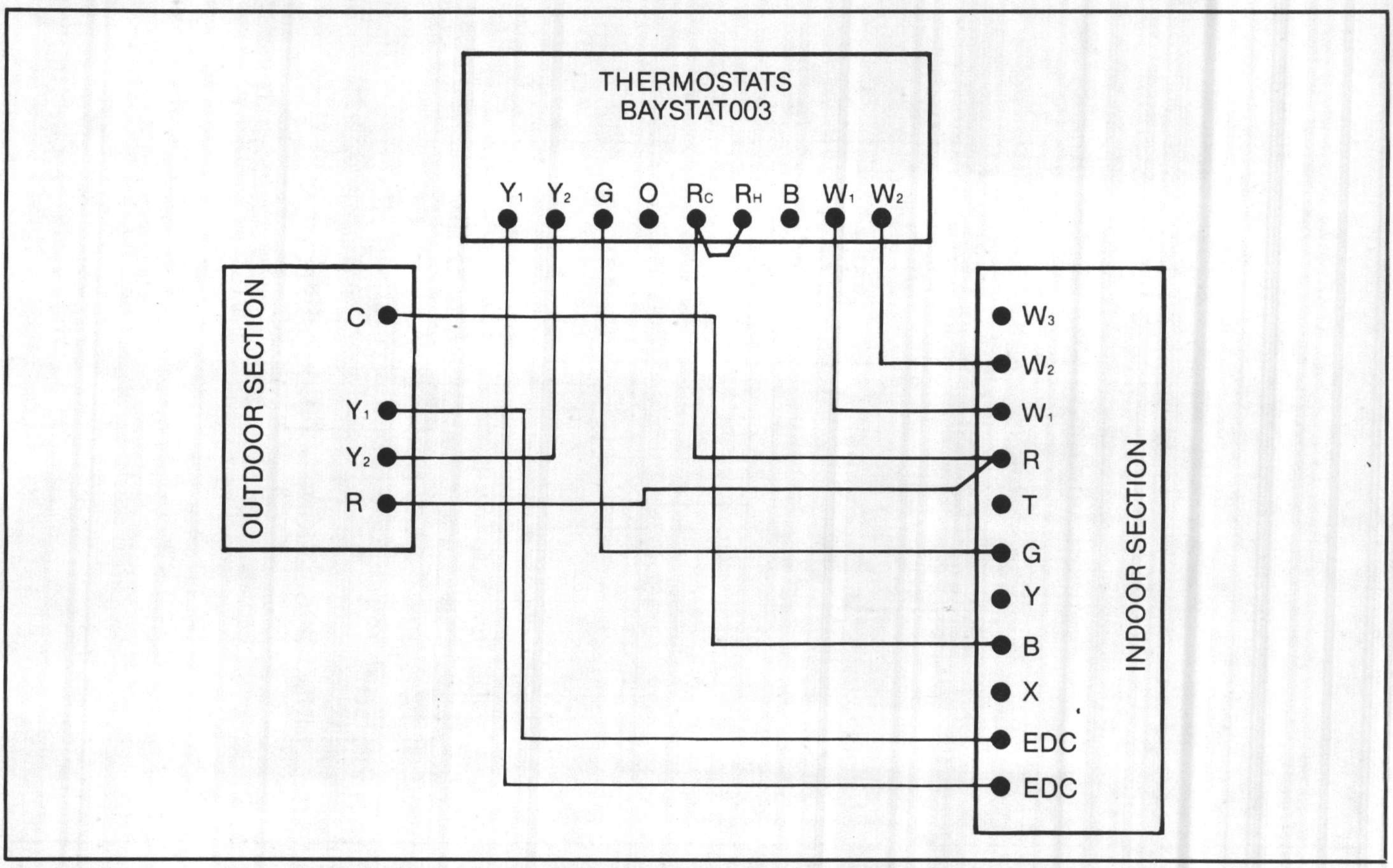


Figure 10 - Field Wiring for BTA120D with BTE120B Air Handler With Electric Heat

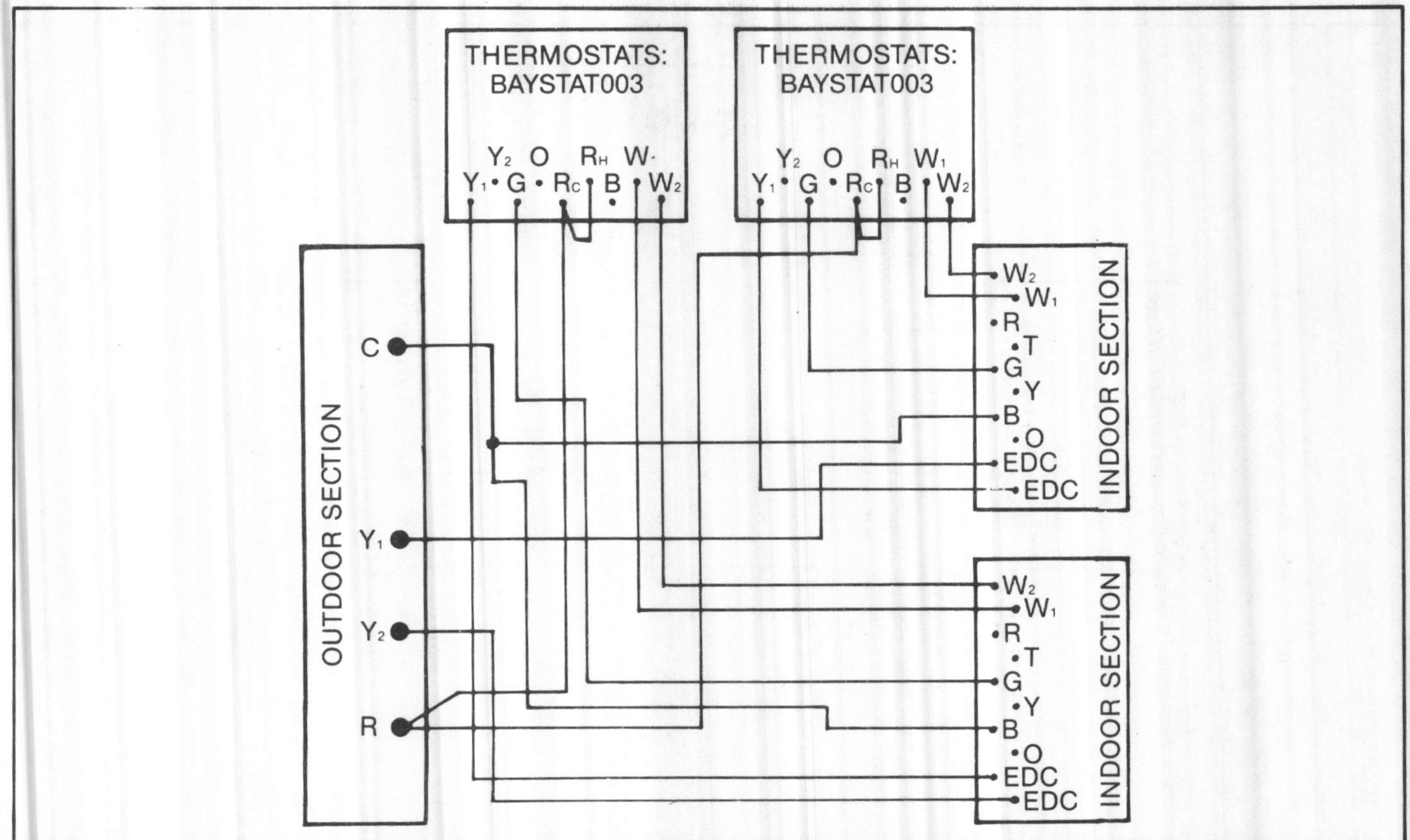
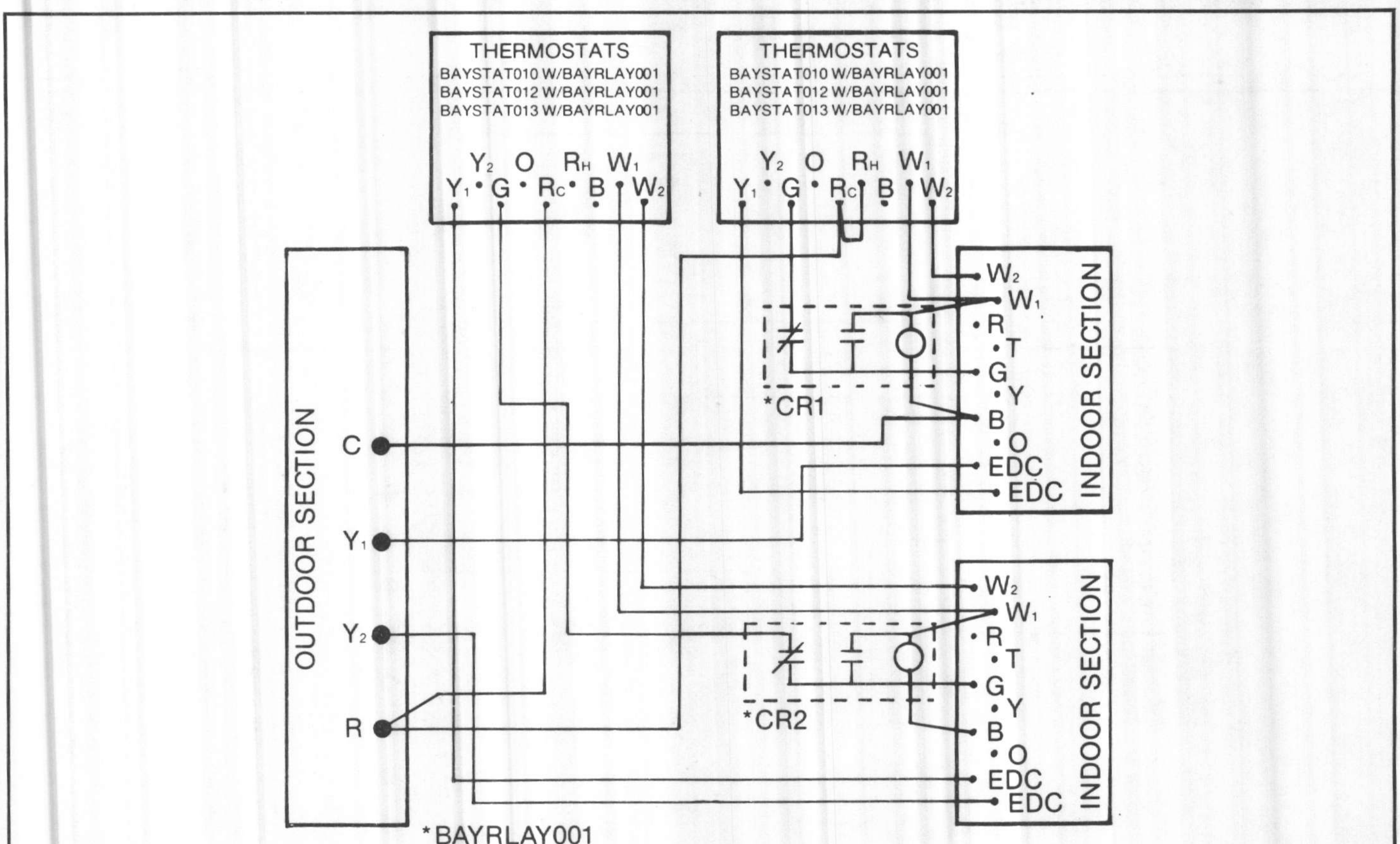


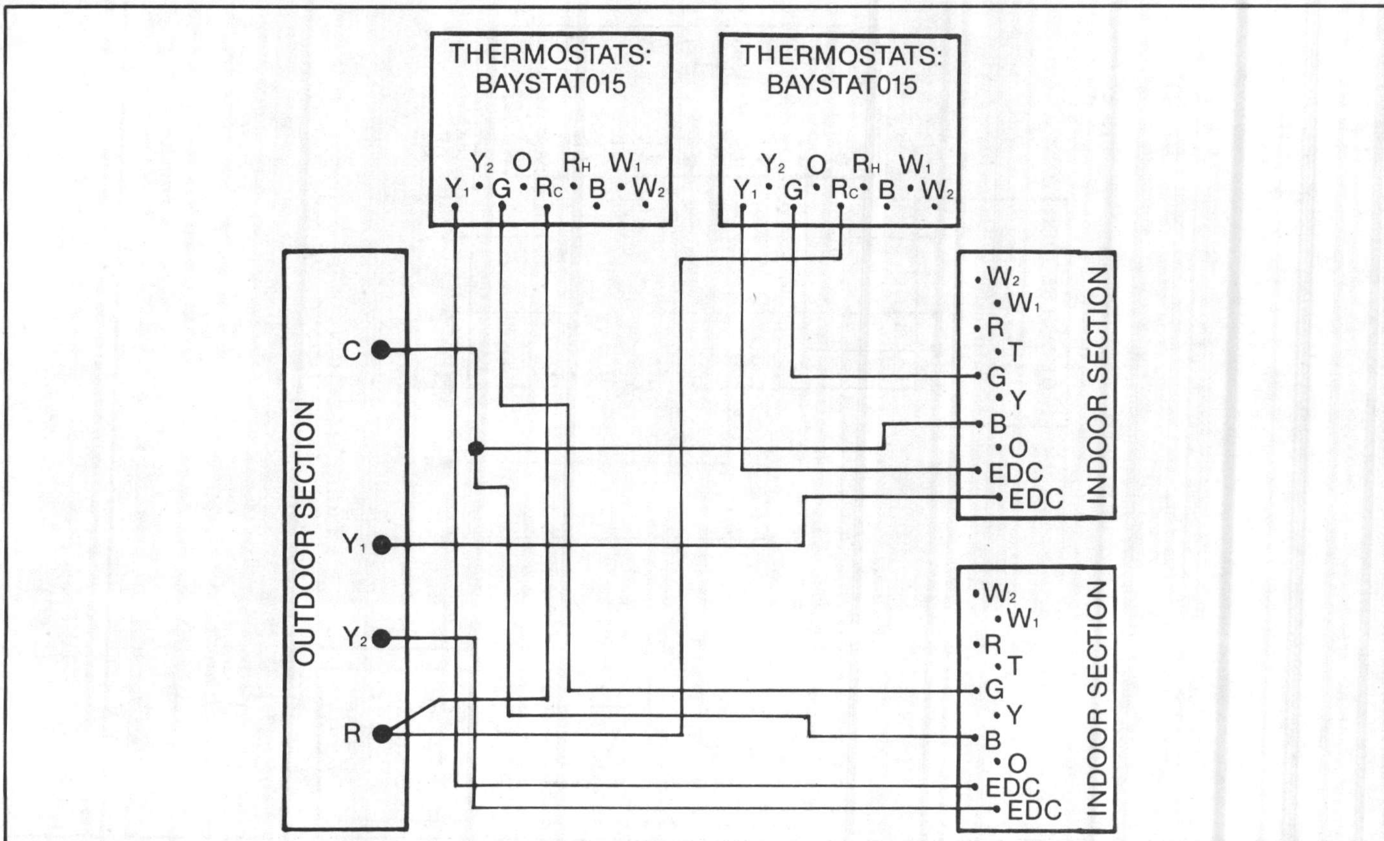
Figure 11 - Field Wiring for BTA150D and BTA180D With Two (2) BWE090C Air Handlers With Electric Heat



NOTES:

1. For low ambient operation, consult Trane representative.
2. For 1-step electric heat, omit wires between W_2 on thermostats and indoor units.

Figure 12 - Field Wiring for BTA150D and BTA180D With Two (2) BWE090C Air Handlers



NOTE: For low ambient operation, consult Trane representative.

Figure 13 - Field Wiring for BTA150D and BTA180D With Two (2) BWE090C Air Handlers Without Electric Heat

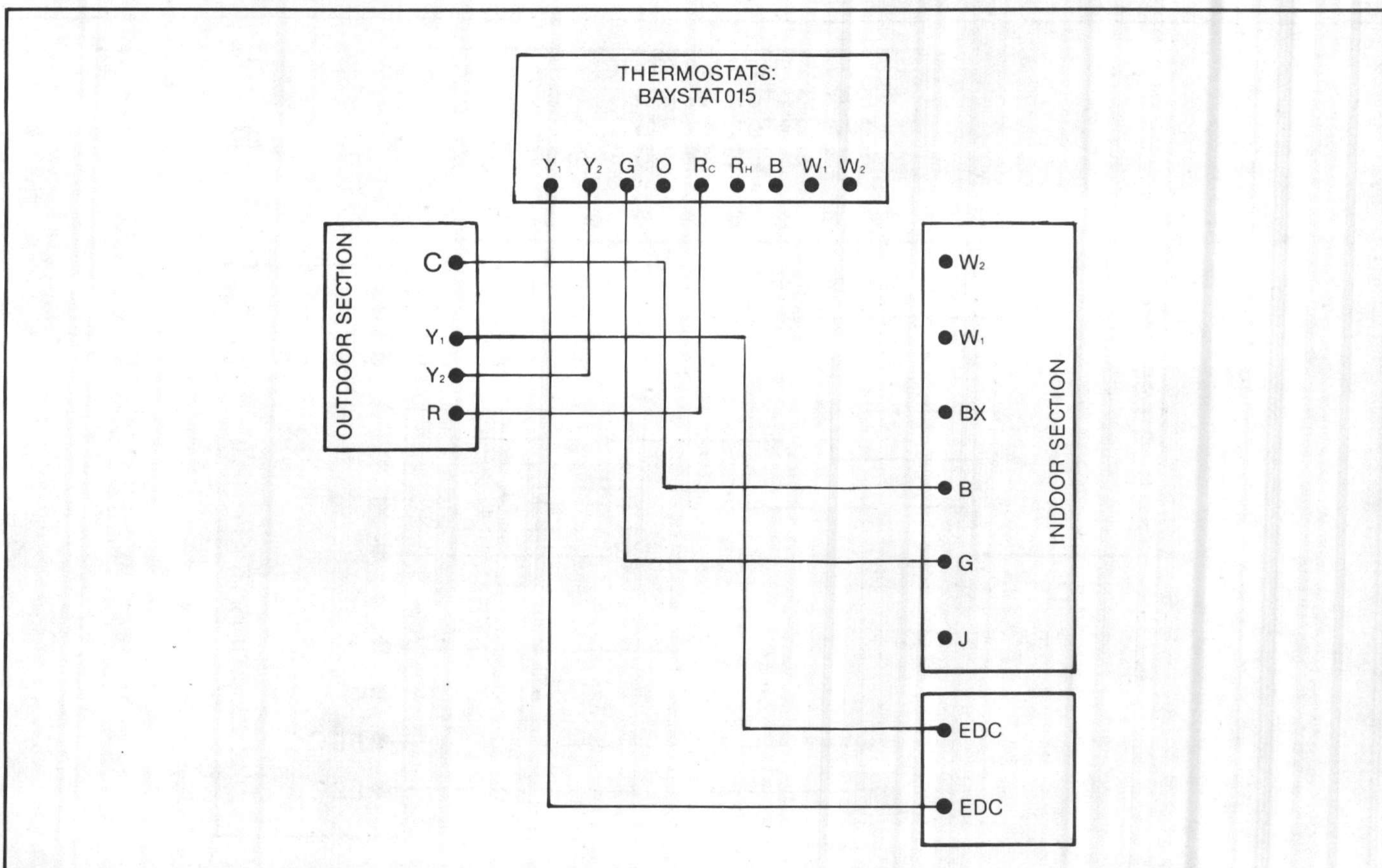


Figure 14 - Field Wiring for BTA150D, BTA180D and BTA180F With the BWV180B, BWH180B Air Handlers Without Electric Heat

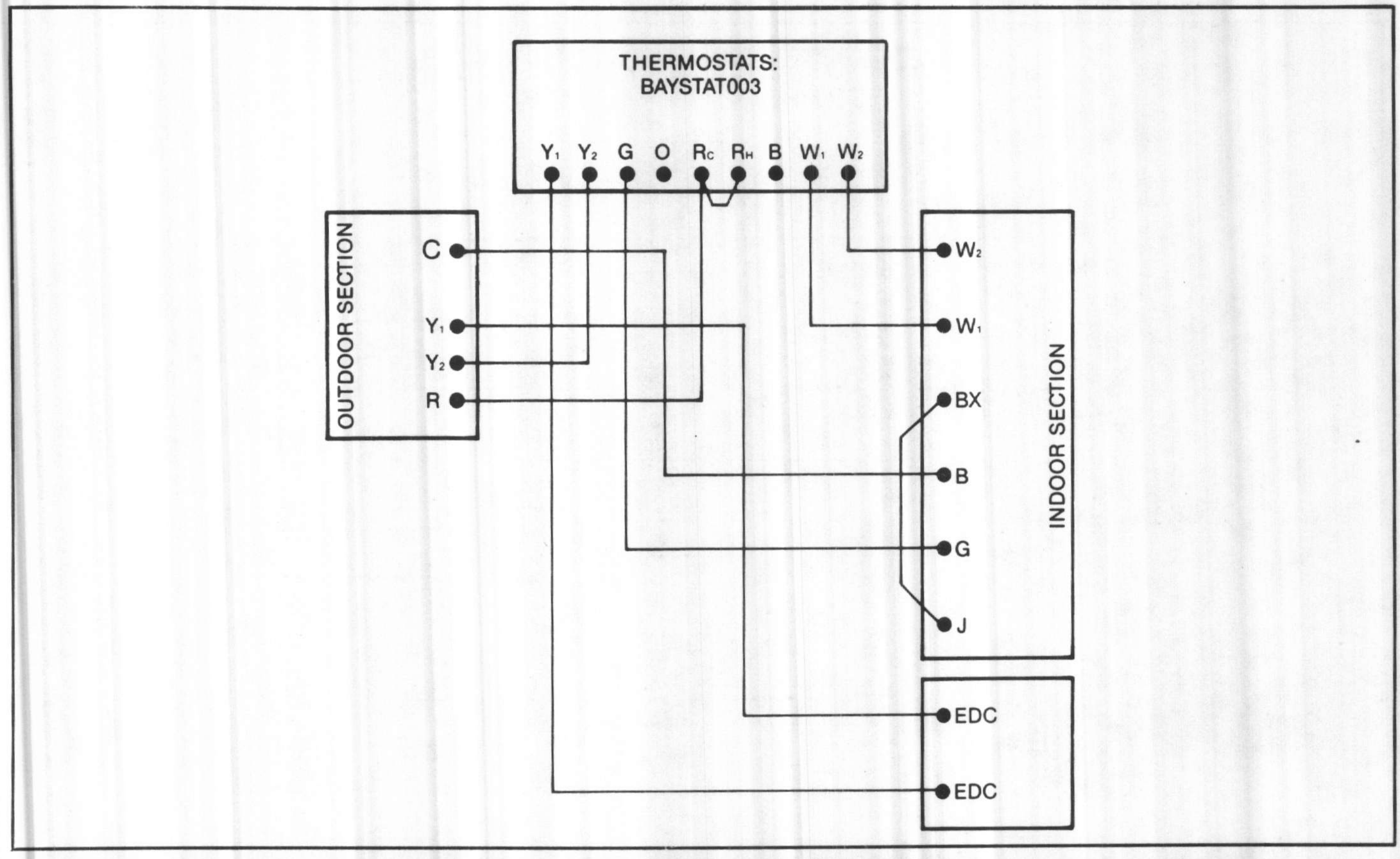


Figure 15 - Field Wiring for BTA150D, BTA180D and BTA180F With the BWV180B, BWH180B Air Handlers With Electric Heat

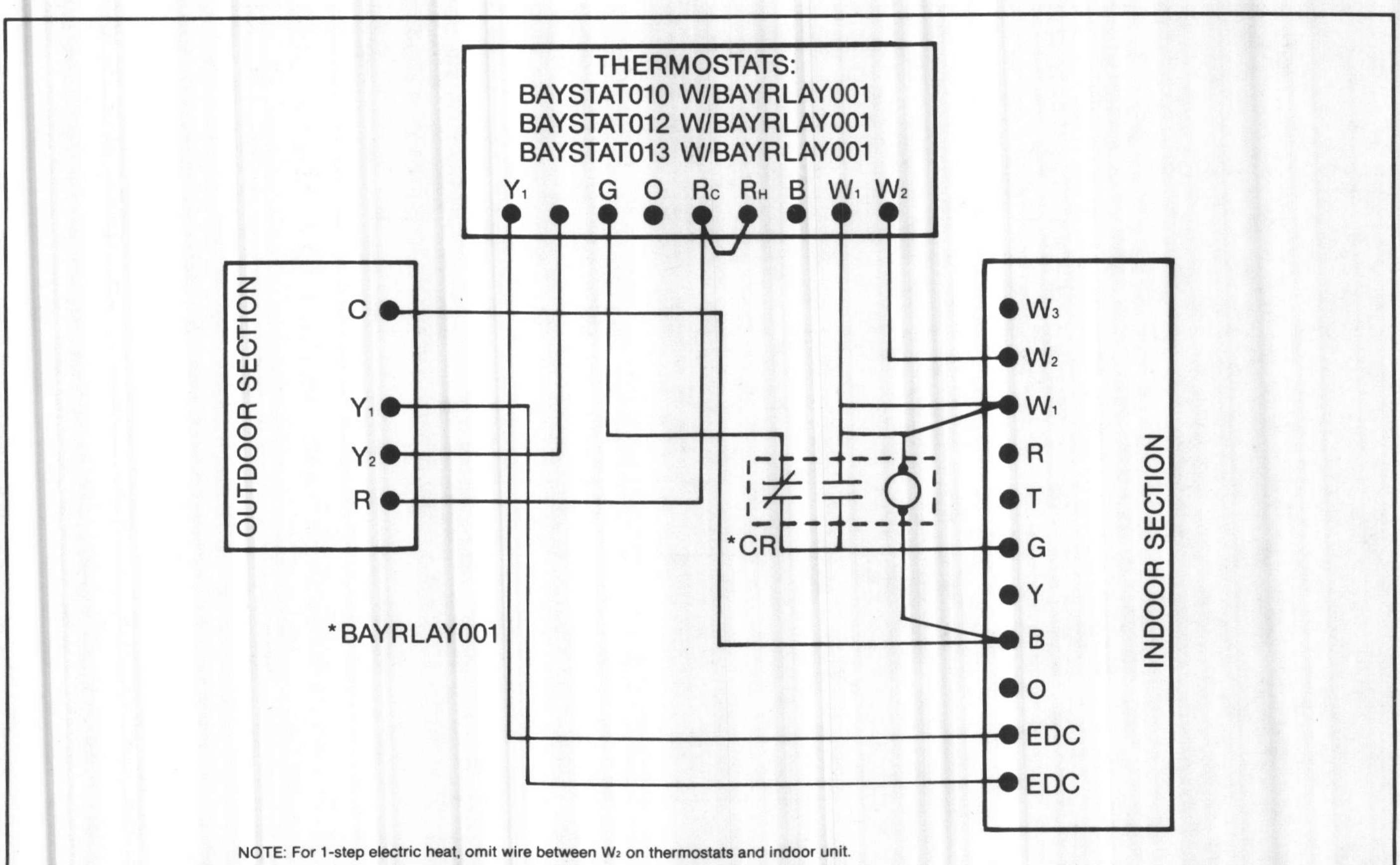


Figure 16 - Field Wiring for BTA120D With BTE120B Air Handler

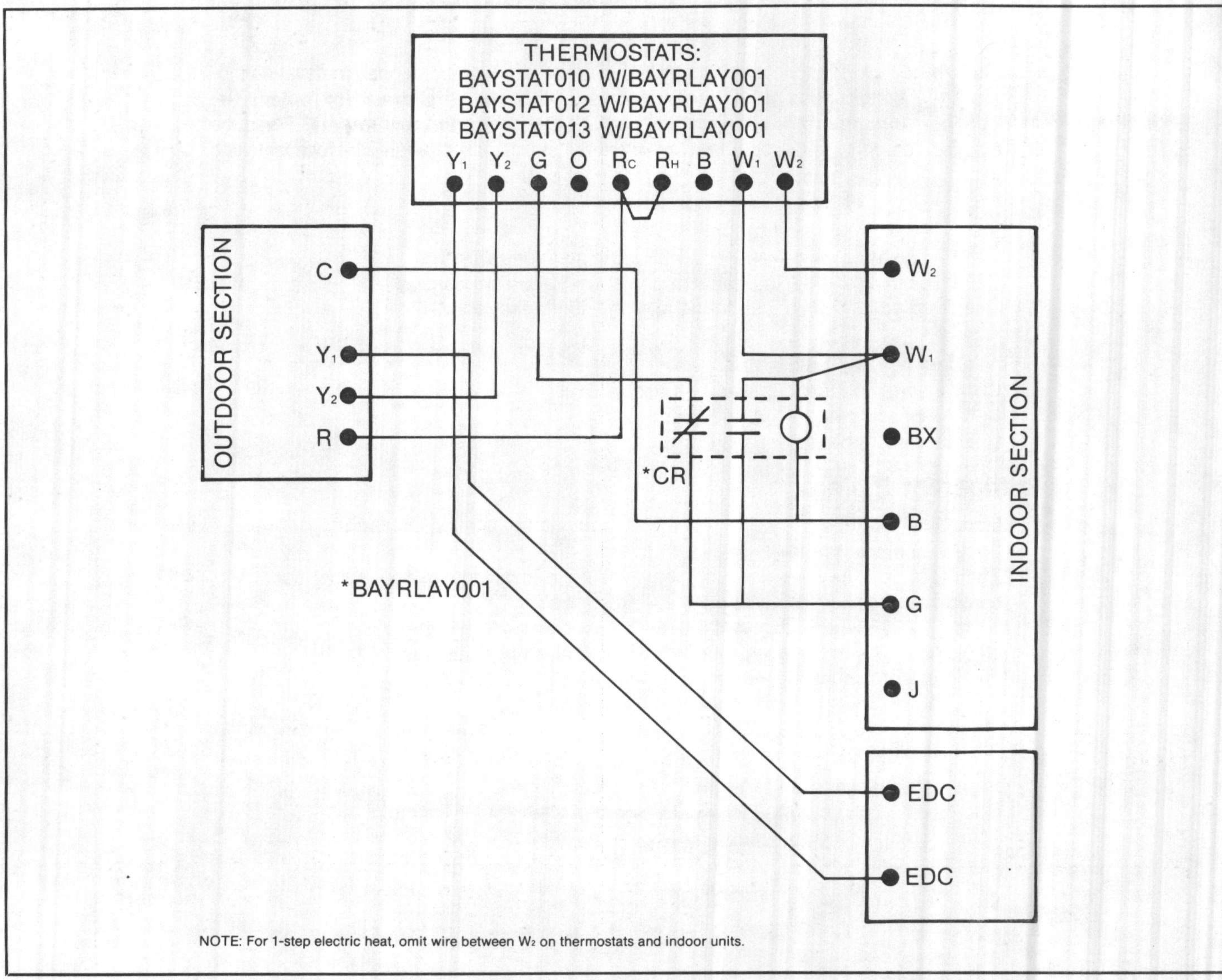


Figure 17 - Field Wiring for BTA150D, BTA180D and BTA180F With the BWV180B, BWH180F Air Handlers

Installation Checklist

Complete this checklist as the unit is installed to verify that all recommended installation procedures are accomplished before the unit is started. **This checklist does not replace the detailed instructions provided in the INSTALLATION section of this manual**. Read the entire section carefully to become familiar with the installation procedures **before** installing the unit.

Receiving

- ☐ Unit nameplate data corresponds with ordering information.
- ☐ Unit inspected for shipping damage and claim filed, if necessary.
- ☐ Unit checked for material shortage and any shortages reported.

Unit Location

- ☐ Condenser air clearances over unit good.
- ☐ Service clearances around unit good.
- ☐ Unit secured in correct location.

Refrigerant Piping

- ☐ Liquid line sized properly and within recommended maximum line length.
- ☐ Suction line sized properly.
- ☐ Thermostatic expansion valve properly sized and installed close to evaporator.
- ☐ Liquid line filter drier installed near expansion valve.
- ☐ Sight glass installed in liquid line between evaporator and filter drier.
- ☐ Liquid line access valve installed in liquid line close to condenser.
- ☐ Low ambient accessories installed, if necessary.
- ☐ Check all unit and piping connections for leaks.

Electrical Wiring

- ☐ Field installed wiring complies with all applicable codes.
- ☐ Compressor contactor and terminal block lugs checked for tightness.
- ☐ Thermostat properly mounted and wired.
- ☐ Any other accessories properly installed and wired.
- ☐ Grounding wires securely bonded to earth ground.

Start-Up

Pre-Start Checks

Before starting the unit, complete the procedures outlined below to make sure the unit is properly installed and ready for start-up.

WARNING: OPEN THE UNIT DISCONNECT SWITCH AND LOCK IT IN THAT POSITION TO PREVENT ACCIDENTAL START-UP. NEVER OPEN AN ACCESS PANEL TO INSPECT OR SERVICE THE UNIT WITHOUT FIRST OPENING THE DISCONNECT SWITCH. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

☐ 1. Inspect all electrical connections to be sure that the wires are securely attached to their terminals. Make sure that all wires are clear of any rotating parts, such as fan blades.

☐ 2. Check the condenser and evaporator fans. Fan blades must be secure on the motor shafts and must rotate freely. Airflow must be unobstructed.

☐ 3. Make sure the evaporator air filters are clean.

☐ 4. Check the evaporator and condenser coils to ensure that they are clean, that the fins are straight, and that there are no obstructions to airflow.

☐ 5. Check the voltage at the line side of the disconnect switch. It should be within 10 percent of the unit nameplate voltage.

Evacuation

After completing the "Pre-Start Checks," use a vacuum pump to remove air, moisture, and contaminants from the system. The system should be evacuated to a pressure of 500 microns or less. Refer to "Evacuation Procedures" in the MAINTENANCE manual.

Refrigerant Charging

With the system properly evacuated, determine the required charge of Refrigerant-22 and charge the system as outlined under "Refrigerant Charging" in the MAINTENANCE manual.

Oil Charge

The compressors on BTA120D to BTA180D, BTA180F units ship with a sufficient oil charge for systems that stay within the maximum line lengths listed in Table 1. As long as the maximum line length is not exceeded, the compressor will have adequate oil.

Initial Start-Up

Normally it is not necessary to energize the crankcase heater prior to intital start-up. However, if more than 30 minutes passes between refrigerant charging and initial start-up, a significant amount of refrigerant could migrate to the compressor. When there is a time lapse between charging and start-up, the crankcase heater should be energized for a minimum of eight hours before starting the unit.

CAUTION: Failure to energize the crankcase heater and wait eight hours before starting the unit may result in excessive foaming at start-up and possible damage to the compressor bearings.

Set the room thermostat as follows to start the unit:

1. Turn the thermostat selector switch to either COOL or AUTO, depending on the thermostat;
2. Place the thermostat fan switch in the AUTO position;
3. Set the thermostat at a point below room temperature.

The unit will operate automatically in response to cooling needs, as determined by the thermostat setting.

Compressor Motor Checks

With the compressor operating, check the amp draw. The amperage should not exceed the "Maximum Allowable Amps" listed in Table 7. The amp draw may be less than the value listed in the table.

Voltage at the compressor terminals must be within the "Allowable Voltage Range" listed in Table 7. If not, check the voltage at the unit terminal block and at the disconnect switch to determine if voltage problems are being caused by feeder line, loose terminals, or defective unit wiring.

Table 7 - Maximum Allowable Amp Draw

Condensing Unit	Electrical Characteristics	Allowable** Voltage Range	Max. Allowable Amps Matched Evap.	Oversized* Evap.
BTA120D300	208-230/60/3	187-253	24	—
BTA120D400	460/60/3	416-506	11	—
BTA120DW00	575/60/3	520-635	9	—
BTA150D300	208-230/60/3	187-253	—	30
BTA150D400	460/60/3	416-506	—	13
BTA150DW00	575/60/3	520-635	—	11
BTA180D300	208-230/60/3	187-253	31	36
BTA180D400	460/60/3	416-506	14	16
BTA180DW00	575/60/3	520-635	11	13
BTA180F300	208-230/60/3	187-254	66	67
BTA180F400	460/60/3	416-508	33	34
BTA180FW00	575/60/3	520-635	27	27

*Evaporator one size larger than condensing unit.
**Allowable voltage range at the unit terminal block.
***Compressor operating at high speed.

Voltage Imbalance Check

Voltage imbalance on three phase systems can cause motor overheating and eventual failure. Maximum allowable imbalance is two percent, which must be measured at the compressor terminals. Voltage imbalance is defined as 100 times the maximum deviation of the three voltages from the average, without regard to sign, divided by the average voltage. For example, if the three measured voltages are 221, 230 and 227, the average voltage would be:

$$\frac{221 + 230 + 227}{3} = 226 \text{ volts}$$

and the percent voltage imbalance would be:

$$\frac{100 \times (226-221)}{226} = 2.2\%$$

In this example, 2.2 percent imbalance is not acceptable and could result in as much as 20 percent current imbalance. This will increase the motor winding temperature, and thus decrease the life of the motor.

If more than 2.0 percent imbalance exists, check the voltage readings at the disconnect switch to determine if the imbalance is present in the incoming power lines. If so, the power company should be notified to correct it. If the imbalance is due to problems within the unit, check the unit electrical wiring connections.

Operating Pressures

Install pressure gauges on the discharge and suction line access valves next to the compressor. When the unit reaches stabilized operation, suction and discharge pressures can be read. Refer to "Operating Pressures" in the MAINTENANCE manual to compare the measured pressures with the normal system operating pressures.

Start-Up Log

DATE ____________

I. NAMEPLATE INFORMATION

Model No. ____________ Serial No. ____________

Voltage ____________ RLA ____________

II. COMPRESSOR(S)

A. VOLTAGE AT COMPRESSOR TERMINALS

Comp. No. 1: T1 ________ T2 ________ T3 ________

Comp. No. 2: T1 ________ T2 ________ T3 ________

Voltage Imbalance: Comp. No. 1 ________ Comp. No. 2 ________

B. AMP DRAW

Comp. No. 1: L1 ________ L2 ________ L3 ________

Comp. No. 2: L1 ________ L2 ________ L3 ________

III. OPERATING CONDITIONS

A. COMPRESSOR NO. 1

Discharge Pressure ________ Suction Pressure ________

Liquid Line Pressure ________ Suction Line Temp. ________

Liquid Line Temp. ________ Superheat ________

Subcooling ________ Evap. Entering Air Temp. (DB/WB) ________

Ambient Temp. ________ Evap. Discharge Air Temp. (DB/WB) ________

B. COMPRESSOR NO. 2

Discharge Pressure ________ Suction Pressure ________

Liquid Line Pressure ________ Suction Line Temp. ________

Liquid Line Temp. ________ Superheat ________

Subcooling ________ Evap. Entering Air Temp. (DB/WB) ________

Ambient Temp. ________ Evap. Discharge Air Temp. (DB/WB) ________

IV. CONTROLS

Fans Operating (Yes or No): Fan No. 1 ________ No. 2 ________ No. 3 ________

Crankcase Heater Operating (Yes or No): Comp. No. 1 ________ Comp. No. 2 ________

V. REFRIGERANT PIPING

Evacuation Level ________ System Charge ________

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040
BTA-IN-5

AN AMERICAN—
STANDARD
COMPANY

Technical Literature Printed in USA

TRANE™

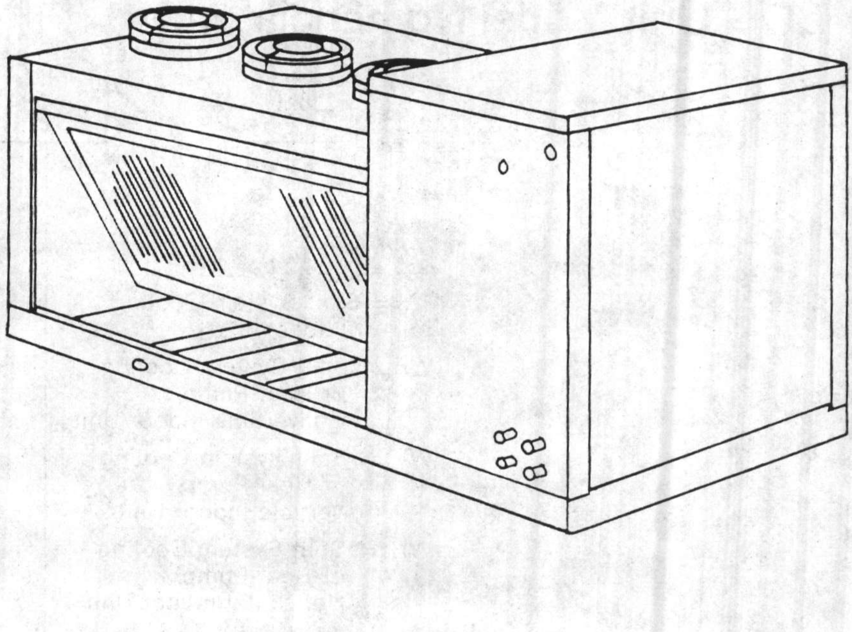
BTA-M-3

OPERATION/MAINTENANCE GUIDE

Split System Condensing Units

Library	Service Literature
Product Section	Unitary
Product	Split System
Model	BTA
Literature Type	Operation/Maintenance
Sequence	3
Date	December 1986
File No.	SV-UN-S/S-BTA-M-3 12/86
Supersedes	New

Models
BTA120D-AB
BTA150D-AB
BTA180D-AB
BTA180F-AB



Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

22-5327-1

Table of Contents

Unit Model Number Description

Trane LCG products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of this multiple-character number is shown below. It will enable the owner or Service Engineer to define operation, components and applicable accessories for a specific unit.

LCG Unit Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12
B	T	A	1	2	0	D	3	0	0	A	A

Digit 1 — Always "B"

Digits 2, 3 — Product Type

TA = Split System Cooling, Outdoor Unit

WE = Split System Cooling or Heat Pump, Convertible Indoor Unit

WV = Split System Cooling or Heat Pump, Verticle Indoor Unit

WH = Split System Cooling or Heat Pump, Horizontal Indoor Unit

Digits 4, 5, 6 — Cooling Capacity (MBH)

090 = 90 MBH
120 = 120 MBH
180 = 180 MBH
240 = 240 MBH

Digit 7 — Major Design Sequence

Digit 8 — Electrical Characteristics

3 = 208-230/60/3
4 = 460/60/3
W = 575/60/3

Digits 9, 10 — Secondary Capacity and/or Factory Installed Options

00 = Not Used

Digit 11 — Minor Design Sequence

Digit 12 — Service Digit

General Information

Periodic Maintenance checklists are provided at the beginning of the MAINTENANCE manual for performing recommended maintenance. These checklists should not be substituted for the detailed information given in appropriate sections of this manual.

A Maintenance Log at the end of the "Periodic Maintenance" section enables the operator/serviceman to maintain a record of system operating data.

Operation

Electrical Sequence of Operation

The typical wiring diagrams provided in Figures 1 and 2 should be used only as a reference for the following discussion. For the actual wiring of your specific unit, refer to the wiring diagram pasted on the inside of the unit's control box cover.

System operation is controlled by a two-stage thermostat, depending upon the number of compressors in the system. Closing the unit disconnect switch supplies power to the control power transformer (T1), the compressor crankcase heaters (CCH1 and CCH2), and the line side of all control contactors.

Depending on the thermostat selected, it may be possible to operate the evaporator fan independently of the compressors by placing the thermostat fan switch in the ON position. This energizes the evaporator fan contactor, starting the fan. If the thermostat has a separate fan switch, moving that switch to the AUTO position will cause the evaporator fan to start in conjunction with the compressor whenever the thermostat calls for cooling.

Dual Compressor Operation

Sensing a need for cooling, the first stage cooling contacts of the thermostat will close. This supplies power to the compressor contactor solenoid coil (CC1), provided that the high pressure control, low pressure control, and reset relay contacts are closed.

The contacts of the compressor contactor close, energizing the first stage compressor, provided that the compressor internal motor winding thermostats are closed.

The compressor has only two leads broken by the compressor contactor. The third leg of the contactor energizes the condenser fan motors. The outdoor temperature determines the number of condenser fans that will start. A fan limit control (FLT) is electrically positioned between both fans #1 and #2 and fans #2 and #3. Depending on the position of these controls, one or more fans may start.

As the cooling load increases, the second stage contacts of the thermostat will close. This supplies power to the solenoid coil of the second stage compressor contactor (CC2), staring the second compressor.

Single Compressor, 2-Speed Operation

Sensing a need for cooling, the first stage cooling contacts of the thermostat will close. Assuming that no safety controls have tripped, this supplies power to the low speed compressor contactor coil (CCS) and outdoor fan relay coil (ODR). Safety controls in this circuit include the high pressure control (HPC), low pressure control (LPC), reset relay (RR), and compressor motor protection module (CMPM).

NOTE: *The compressor contactor cannot be re-energized on the BTA180F for four minutes after winding temperatures have returned to normal following cut-out on excessive temperature, current overload, or power interruption to Terminal T1 of the compressor motor protection module. This provides an anti-short cycle feature on the standard unit. The compressor cannot be re-energized for four minutes following termination of the cooling cycle. This is an option on the dual compressor units.*

Energizing the compressor contactor coil (CCS) closes the CCS contacts in the power circuit, and starts the compressor on low speed. Concurrently, outdoor fan relay coil ODR is energized. This starts the outdoor fan motor(s) by closing the ODR contact in the power circuit. The total number of condenser fans which will operate is dependent upon the outdoor ambient and the resulting position of the FLT switches (see Figure 2).

As the cooling load increases, the second stage contacts of the thermostat will close. This supplies power to the control relay coil (CR), which opens one set of contacts and closes the other on this single-pole, double-throw relay. This, in turn, de-energizes the low speed compressor contactor coil (CCS) and supplies power to the "tie point" compressor contactor coil (CCT) through normally closed auxiliary contacts CCS located in the control circuit. Auxiliary control circuit contacts CCT then close, and power is supplied to the high speed compressor contactor coil (CCF). After the low speed compressor contactor contacts (CCS) in the power circuit open, both the "tie point" and high speed compressor contactor contacts (CCT and CCF) close and the compressor motor switches from low to high speed.

It should be noted that the dual compressor contactor is both mechanically and electrically interlocked in order to protect the compressor motor from having both low and high speed windings energized at the same time. Electrically, this is accomplished with a normally closed auxiliary side switch (CCS) on the "tying" compressor contactor coil (CCT), and a double-pole, double-throw auxiliary side switch (CCT) on both the high and low speed compressor contactor coils (CCF and CCS). See Figures 3 and 4 for further details on this electrical connection.

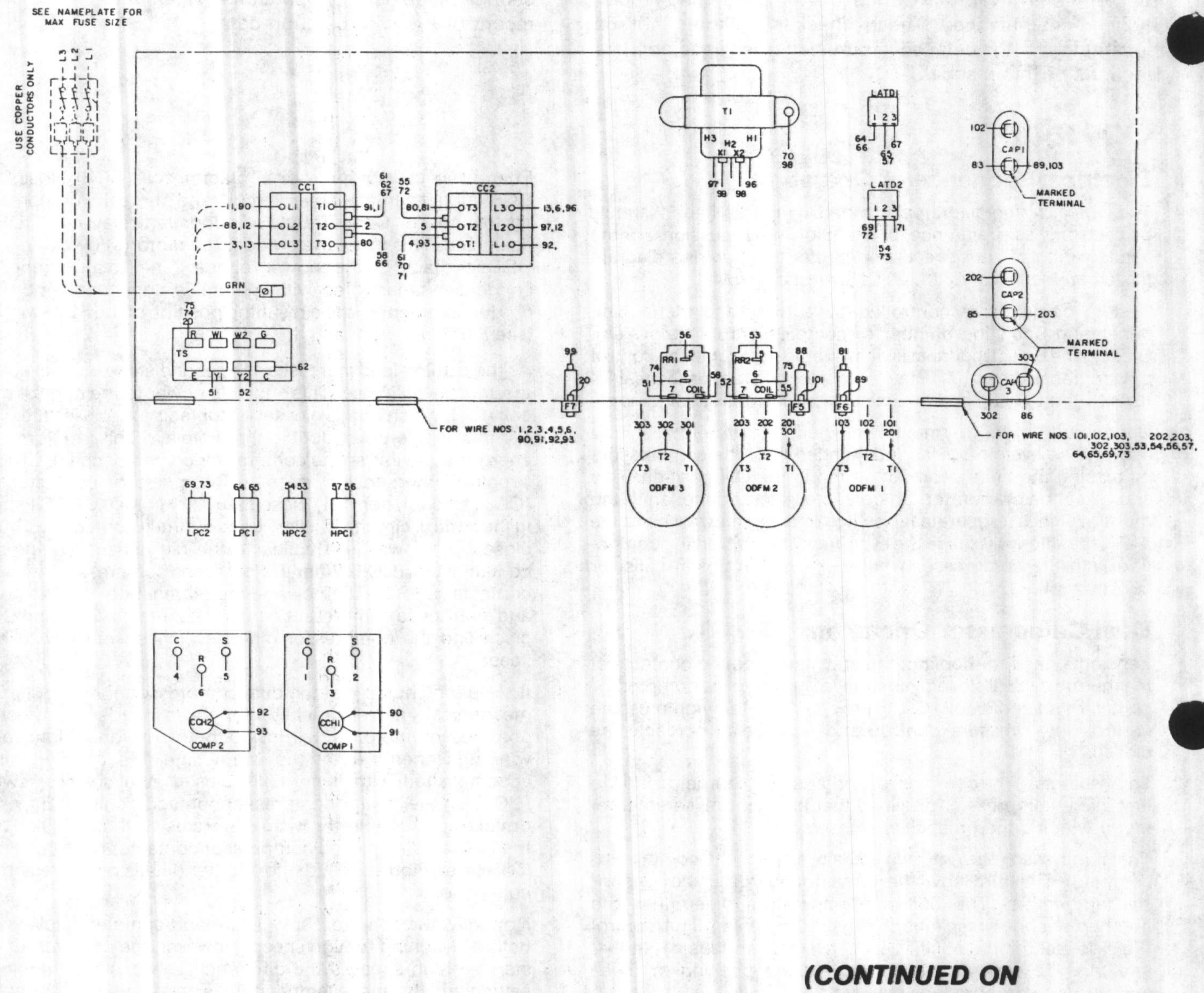
Normally, the compressor will start and operate on low speed before switching to high speed. However, the compressor can start on high speed if the difference between the thermostat setting and the space temperature is great enough. This will be the case in a "pull-down" situation where the unit has been disconnected from normal thermostat control for an extended period of time. It will also occur if the thermostat setting is lowered substantially while the system is off.

NOTE: *The compressor may not start in low speed when a differential pressure greater than 180 psig exists between the high and low side of the refrigerant circuit.*

BTA compressors include two-pole/four-pole motor hookup capability for two speed operation. The compressor operates at approximately 3500 RPM on high speed (two-pole), and at 1750 RPM on low speed (four-pole).

To achieve two speed operation, the motor windings are switched between a parallel connected (high speed) and series connected (low speed) motor winding through the use of low speed, high speed, and tie point contacts on the compressor contactor. This is shown in Figure 3 (high speed) and Figure 4 (low speed).

CAUTION: Extreme care must be taken when making wiring connections in the compressor terminal box. Incorrect hookup can result in immediate compressor failure when power is applied.



(CONTINUED ON NEXT PAGE)

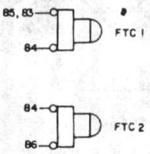
LEGEND	
COMP	COMPRESSOR
CC	COMPRESSOR CONTACTOR
ODFM	OUTDOOR FAN MOTOR
TS	TERMINAL STRIP
T1	TRANSFORMER
F	FUSE
CAP	CAPACITOR
RR	RESET RELAY
HPC	HIGH PRESSURE CONTROL
CCH	CRANKCASE HEATER
LPC	LOW PRESSURE CONTROL
LATD	LOW AMBIENT TIME DELAY
FLT	FAN LIMIT T-STAT

TRANE FORM NO. 6-3563

Figure 1 - Typical Unit Wiring Diagram (Dual Compressor Unit Shown)

WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE



NOTES:

1. SEE NAMEPLATES OF ALL MOTORS FOR VOLTAGE BEFORE CONNECTING TO LINE
2. ALL COMPONENTS AND WIRES SHOWN DOTTED ARE SUPPLIED BY CUSTOMER
3. IF ANY OF THE ORIGINAL WIRES AS SUPPLIED WITH THIS UNIT MUST BE REPLACED, IT MUST BE REPLACED WITH APPLIANCE WIRING MATERIAL RATED 105° C OR EQUIVALENT
4. ALL CUSTOMER WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES
5. ALL 208-230 VOLT UNITS WILL BE FACTORY WIRED FOR 230 VOLT APPLICATIONS. FOR 208 VOLT APPLICATIONS MOVE LEAD 97 FROM THE 240 VOLT TRANSFORMER TERMINAL TO THE 208 VOLT TERMINAL
6. THREE PHASE MOTORS ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS
7. EVAPORATOR APPLICATION TEMPERATURE RANGE +32°F TO +53.5°F
8. REPLACE F7 FUSE WITH BUSSMAN TYPE GLQ & GMQ 3 AMP 300V FUSES ONLY
9. REPLACE F5 AND F6 FUSES WITH 300 V, 30 AMP TYPE SC FUSES ONLY
10. RESET RELAY WILL RESET WHEN POWER IS INTERRUPTED

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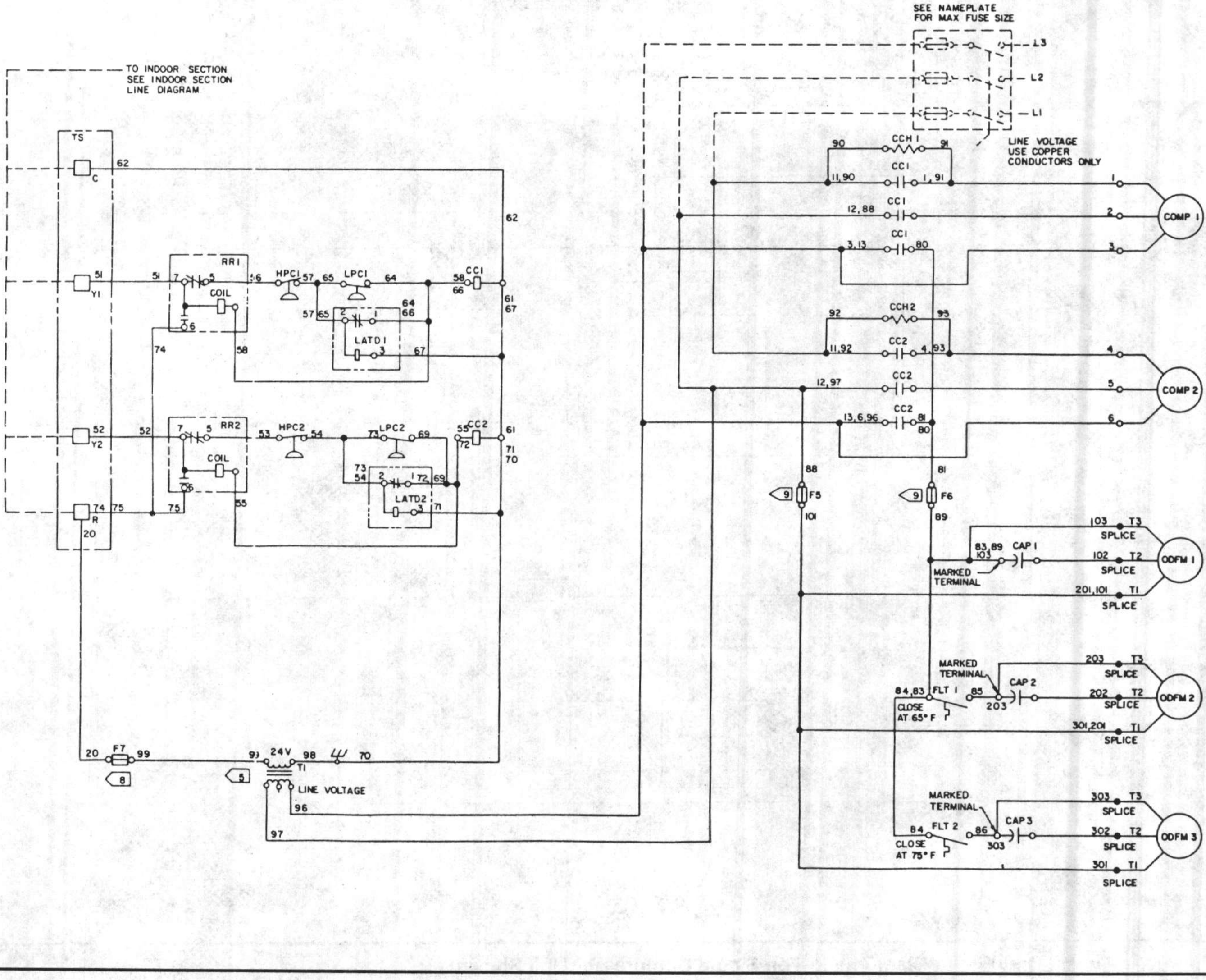

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LEGEND	
DEVICE DESIGNATION	DESCRIPTION
C1,2,3	CAPACITOR
CCF	COMPRESSOR CONTACTOR FAST
CCH	CRANKCASE HEATER
CCS	COMPRESSOR CONTACTOR SLOW
CCT	COMPRESSOR CONTACTOR TIE
CMPM	COMPRESSOR MOTOR PROC MODULE
COMPR	COMPRESSOR
CR	SECOND STAGE COOLING RELAY
CWTS	COMP WINDING TEMP SENSOR
F5,F6	OUTDOOR FAN MOTOR FUSE
F7	CONTROL CIRCUIT FUSE
HPC	HIGH PRESSURE CIRCUIT
LATD	LOW AMBIENT TIME DELAY
LPC	LOW PRESSURE CIRCUIT
ODFM 1,2,3	OUTDOOR FAN MOTOR
ODR	OUTDOOR FAN RELAY
RR	RESET RELAY
T1	TRANSFORMER
TS	CONTROL TERMINAL STRIP

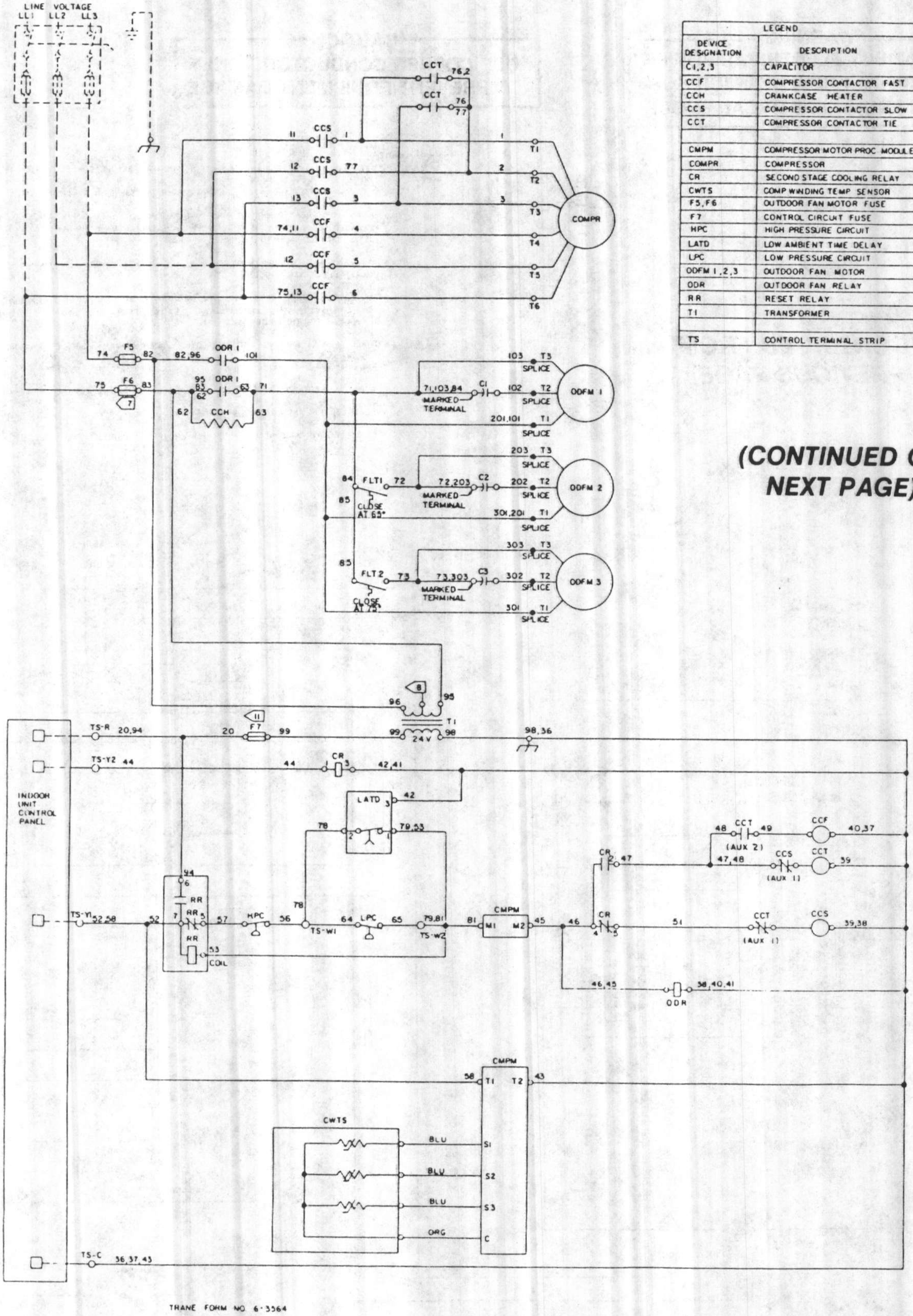

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Figure 2 - Typical Unit Wiring Diagram (15 Ton Single Compressor Unit Shown)

NOTES:

1 UNLESS OTHERWISE NOTED, ALL SWITCHES ARE SHOWN AT 25°C (77°F) AT ATMOSPHERIC PRESSURE AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF AND AFTER A NORMAL SHUTDOWN HAS OCCURED. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. DASHED LINE ENCLOSURES AND/OR DASHED DEVICE OUTLINES INDICATE COMPONENTS PROVIDED BY THE FIELD. PHANTOM LINE ENCLOSURES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTIONS. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF THE CONTACTS BY LINE NUMBER, AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.

2 ALL WIRING AND DEVICES SHOWN DASHED TO BE SUPPLIED AND INSTALLED BY THE CUSTOMER IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES.

3 IF ANY OF THE ORIGINAL WIRE, AS SUPPLIED WITH THIS UNIT, MUST BE REPLACED, REPLACE IT WITH APPLIANCE WIRING MATERIAL RATED AT 105°C OR EQUIVALENT.

4 THREE PHASE MOTORS ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS AND HAVE INTERNAL OVERLOAD PROTECTION.

5 FOR REMAINDER OF CONTROL CIRCUITS, SEE ELECTRICAL DIAGRAM LOCATED ON INDOOR UNIT CONTROL PANEL.

6 RESET RELAY WILL RESET WHEN POWER IS INTERRUPTED.

7 REPLACE F5 AND F6 FUSES WITH 300 VOLT, 30 AMP TYPE SC FUSES ONLY

8 ALL 208-230 VOLT UNITS WILL BE FACTORY WIRED FOR 230 VOLT APPLICATION. FOR 208 VOLT APPLICATIONS MOVE LEAD 95 FROM THE 240 VOLT TRANSFORMER TERMINAL (H3) TO THE 208 VOLT TERMINAL (H2)

9 CMPM IS LOCATED IN THE COMPRESSOR JUNCTION BOX, TEXAS INSTRUMENT PN 15AA 1105A. COMPRESSOR CONTACTOR CANNOT BE RE-ENERGIZED FOR 4 MINUTES AFTER WINDING TEMPERATURES HAVE RETURNED TO NORMAL FOLLOWING CUT-OUT ON EXCESSIVE TEMPERATURE, CURRENT OVERLOAD OR POWER INTERRUPTION TO TERMINAL 'T1'.

10. EVAPORATOR APPLICATION TEMPERATURE RANGE:
32°F TO 53.5°F

11 REPLACE ONLY WITH BUSSMAN GLQ OR GMQ 3AMP 300V FUSES.

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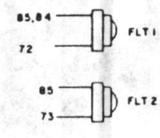
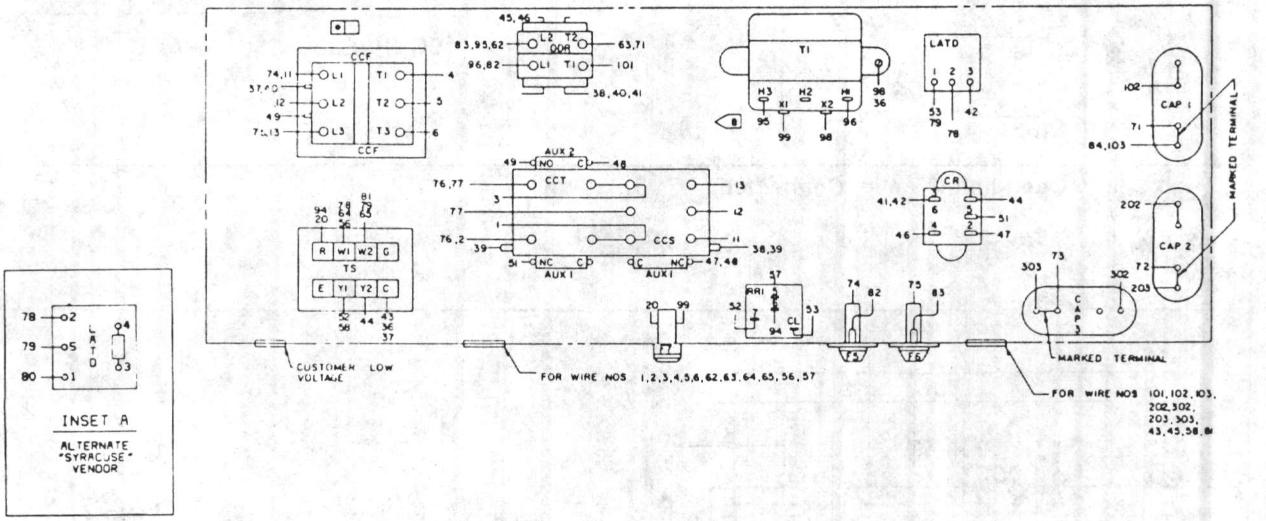
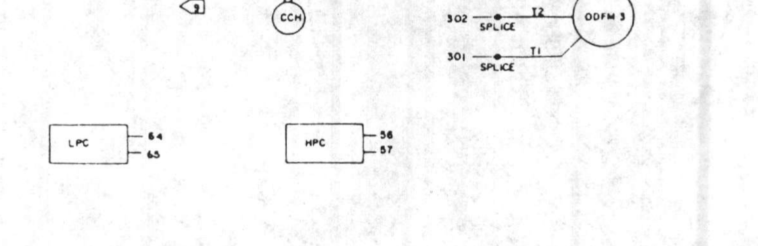




WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE



IMPORTANT
ANTI-SHORT CYCLE FEATURE IS STANDARD ON THIS UNIT. COMPRESSOR CANNOT BE RE-ENERGIZED FOR 4 MINUTES FOLLOWING TERMINATION OF COOLING CYCLE.

CAUTION
DO NOT ENERGIZE UNTIL UNIT CHECK-OUT AND START-UP PROCEDURE HAS BEEN COMPLETED

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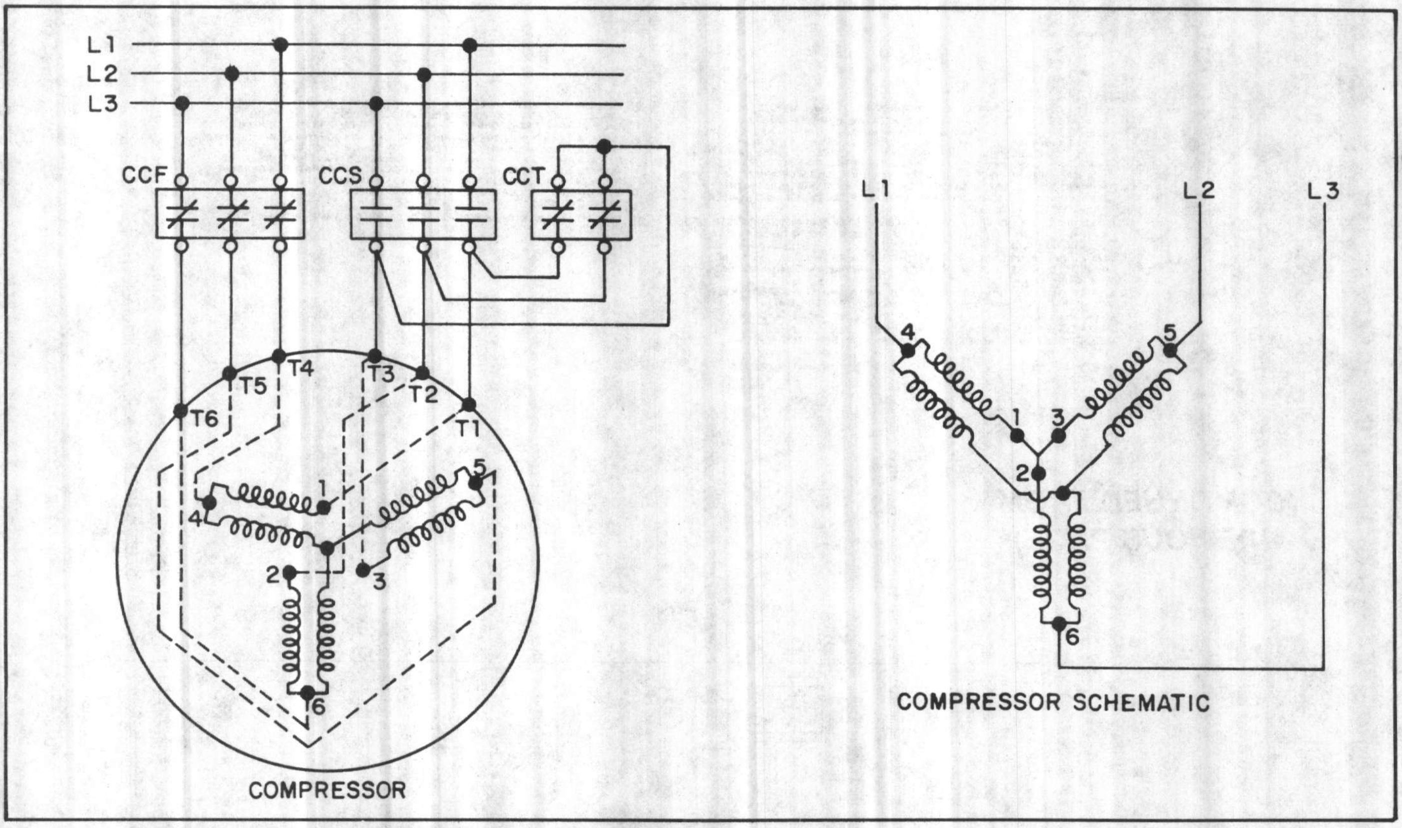

Figure 3 · High Speed Operation (Parallel Connected)

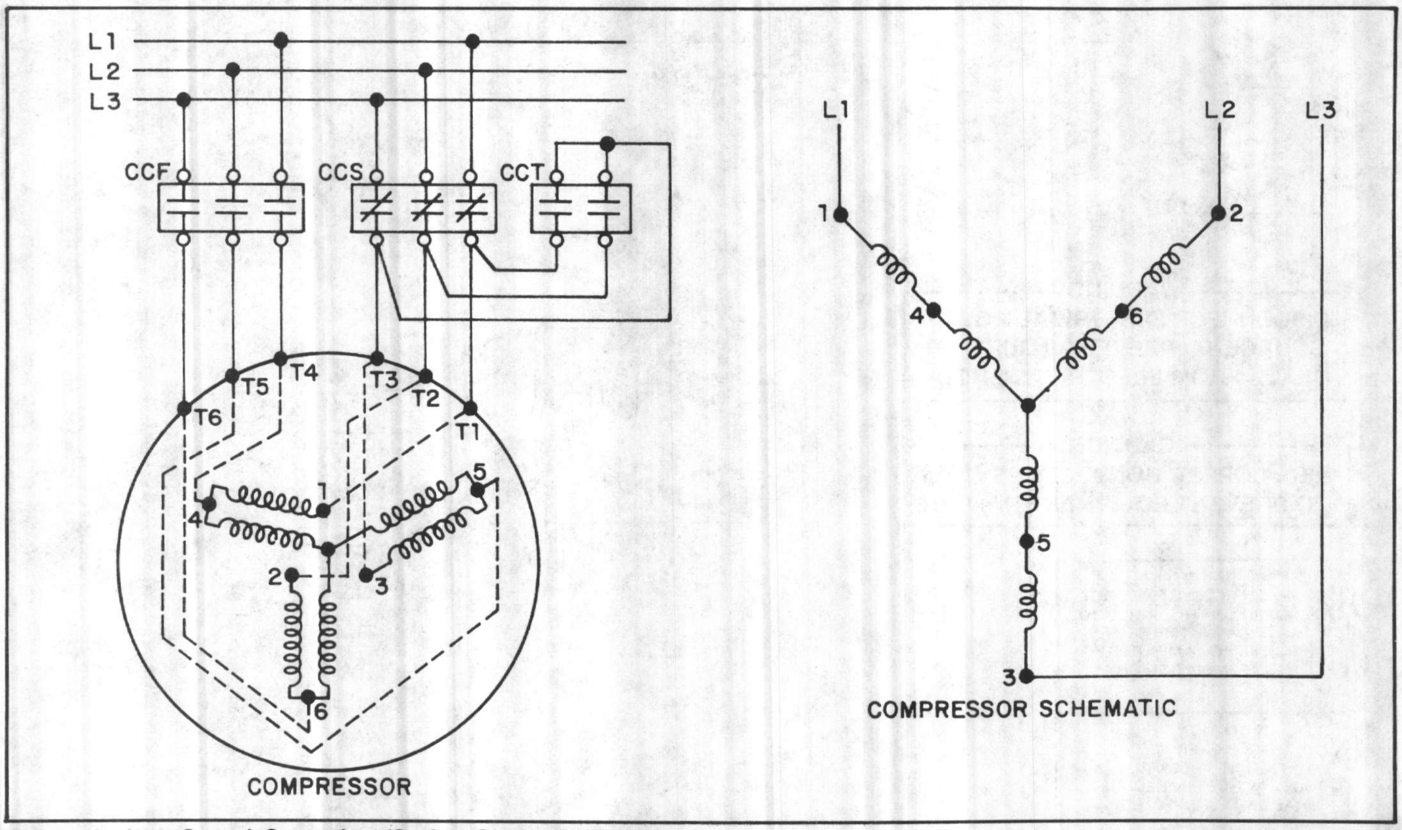

Figure 4 · Low Speed Operation (Series Connected)

Safety Controls

High Pressure Control

BTA150D, BTA180D and BTA180F units have an external high pressure control that prevents excessive compressor discharge pressures. This control opens the electrical control circuit, stopping compressor operation, if the condensing pressure becomes too high. Refer to Table 1 for control settings.

The compressors on BTA120D units are provided with an internal pressure relief valve which automatically vents hot gas onto the winding thermostat whenever condensing pressure becomes excessive. This heat causes the contacts of the winding thermostat to open, and compressor operation ceases until the thermostat cools enough for its contacts to close.

Low Pressure Control

All BTA120-180 units have an external low pressure control that stops compressor operation if the operating pressure is too low. Refer to Table 1 for control settings.

Reset Relay

Whenever the system is stopped by the high or low pressure control, the reset relay locks out the compressor contactor. This prevents the system from recycling until the condition causing the high or low pressure cut-out is corrected, and the relay is manually reset. To reset this relay, turn the room thermostat from COOL to OFF and then back to COOL, or open the unit disconnect switch and reclose it.

Fan Sequencing

Condenser fans are cycled on and off in response to ambient temperature in order to keep the capacity of the condenser relatively constant and to maintain proper system pressures. Figure 5 details the possible condenser fan operating modes.

Motor Overloads

All BTA120-180 units have internal compressor and condenser fan motor overloads. These overloads protect the motors from overheating and automatically reset as soon as they cool.

Condenser Fan Limit Control

The condenser fan limit control (FLT) is a temperature sensor that energizes and de-energizes the condenser fan in response to ambient temperature. As the ambient temperature decreases, the cooling capacity of the condenser increases. The cooling low ambient sensor turns off condenser fans to keep the capacity of the condenser constant and to maintain proper system pressures. Refer to Table 1 for control settings.

Table 1 - Control Settings

CONTROL	CUT-IN	CUT-OUT
High Pressure Control (All Units)	345 PSIG (20)	425 PSIG (±20)
Low Pressure Control (All Units)	48 PSIG (±7)	20 PSIG (±4)
FLT 10 Ton	75 F(±3)	65 F(±3)
FLT 12.5-15 Ton	75 F(±3)	65 F(±3)
FLT 12.5-15 Ton	65 F(±3)	55 F(±3)

FLT = Fan Limit Temperature Control

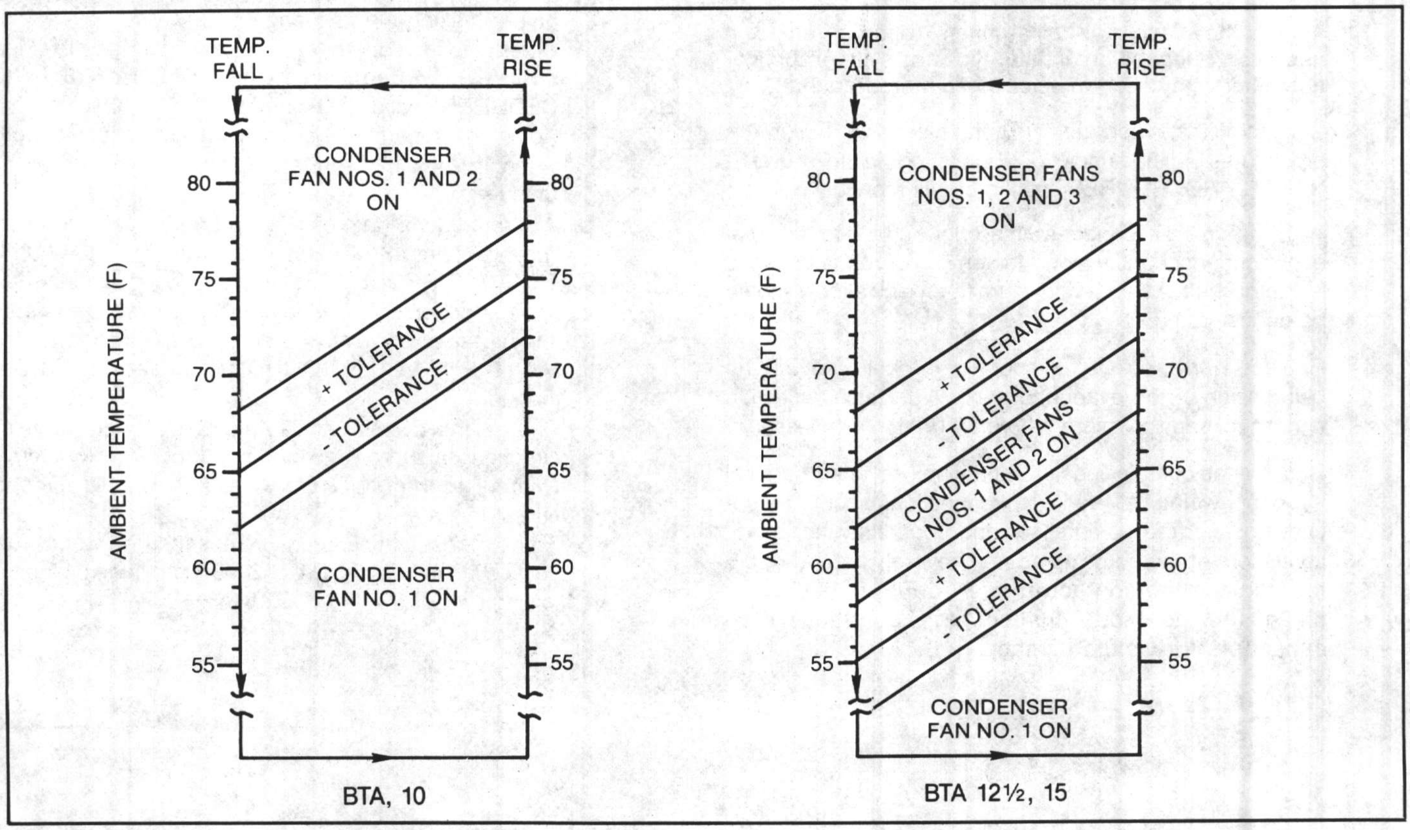

Figure 5 - Condenser Fan Operating Modes

Maintenance

Periodic Maintenance

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure. A MAINTENANCE LOG is provided on page 12 of this manual for recording operating data on a regular basis.

Once a Month

Conduct the maintenance inspections outlined below on a monthly basis during the cooling season.

☐ 1. Inspect the evaporator coil air filters. Clean or replace if necessary.

☐ 2. Inspect the evaporator and condenser coils for dirt and foreign debris. If the coils appear dirty, clean them according to the instructions provided under "Coil Cleaning" in the MAINTENANCE PROCEDURES section of this manual.

Once a Year

The following maintenance practices must be performed at the beginning of each cooling season to ensure efficient unit operation.

WARNING: OPEN THE UNIT DISCONNECT SWITCH AND LOCK IT IN THAT POSITION TO PREVENT ACCIDENTAL START-UP. NEVER OPEN AN ACCESS PANEL TO INSPECT OR SERVICE THE UNIT WITHOUT FIRST OPENING THE DISCONNECT SWITCH. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

☐ 1. Inspect the evaporator coil air filters. Clean or replace if necessary. Depending on filter type and system application, filters may need to be serviced more frequently.

☐ 2. Clean both the evaporator and condenser coils. Follow the procedures outlined under "Coil Cleaning" in the MAINTENANCE PROCEDURES section of this manual.

☐ 3. With the unit disconnect switch open, check to see that each condenser and evaporator fan is securely fastened to its motor shaft. All fans should turn freely and airflow should be unobstructed.

☐ 4. Replace worn or frayed evaporator fan belts. Check the belt tension of the evaporator fans. A 1/2-inch deflection under light hand pressure is normal. Tighten if necessary.

☐ 5. Remove the condensing unit control box cover and inspect the panel wiring. All electrical connections should be secure. Inspect the compressor and condenser fan motor contactors. If the contacts appear severely burned or pitted, replace the contactor (refer to Figure 6). Do not clean the contacts. Inspect the condenser fan capacitors for visible damage.

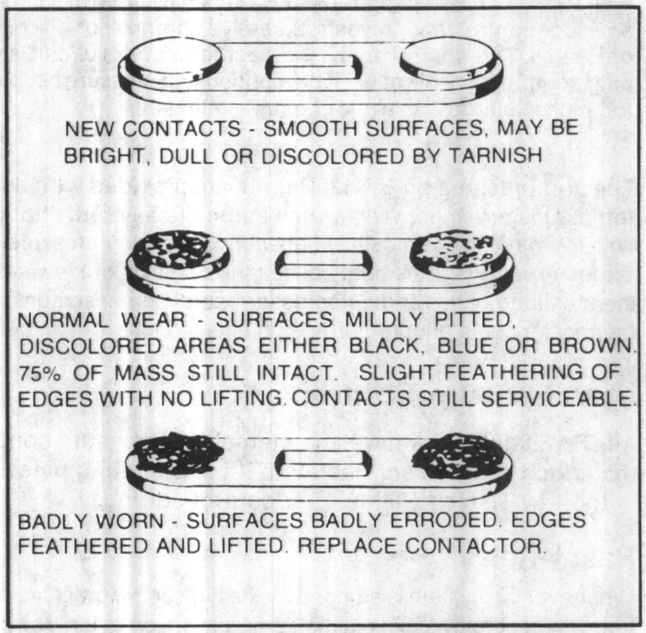

Figure 6 - Compressor Contactor Replacement Guide

☐ 6. Remove any accumulation of dust and dirt from the condensing unit.

☐ 7. Clean and inspect the drain pan of the evaporator unit. Make sure the drain piping is clear.

☐ 8. Check the superheat and subcooling.
   a. The condenser and evaporator coils must be clean before making the following checks.
   b. Determine the superheat of the system. Refer to "Measuring Superheat" in the MAINTENANCE PROCEDURES section of this manual.
   c. Adjust the superheat if necessary (instructions are provided in the "Measuring Superheat" section of this manual).
   d. When the superheat setting is correct, check the subcooling. Refer to "Measuring Subcooling" in the MAINTENANCE PROCEDURES section of this manual.
   e. If the subcooling is low, leak test the system to determine if there is a leak. Refer to "Leak Testing" in the MAINTENANCE PROCEDURES section of this manual.
   f. Charge the system with refrigerant if necessary. Instructions are provided under "Checking Refrigerant Charge" in the MAINTENANCE PROCEDURES section of this manual.
   g. Enter the operating pressures, superheat, and subcooling in the MAINTENANCE LOG provided on the following page.

Shutdown and Start-Up

Shutdown: Short Duration

The system can be shutdown for periods of short duration, such as over the weekend, by moving the thermostat selector switch to the OFF position and the fan switch to the AUTO position.

NOTE: *The unit disconnect switch should remain closed. This will permit the crankcase heater to continue to function, preventing refrigerant from condensing in the compressor oil sump.*

Start-Up: Short Duration

The system is returned to operation after a shutdown of short duration, such as over a weekend, by adjusting the thermostat setting to the desired temperature, placing the thermostat selector switch in the COOL or AUTO position, and setting the fan switch in either the AUTO or ON position.

Shutdown: Seasonal

For seasonal shutdown, open the unit electrical disconnect switch to prevent the unit from starting accidently.

Start-Up: Seasonal

To start the system after an extended period of shutdown, complete the following procedures.

1. Perform all of the "Once A Year" checks listed in the PERIODIC MAINTENANCE section of this manual.
2. Move the thermostat selector switch to OFF.
3. Close the electrical disconnect switch to the condensing unit. This will energize the compressor crankcase heater. If operating properly, the crankcase should be hot to the touch. Wait a minimum of eight hours before turning the room thermostat to the COOL position.

CAUTION: Failure to wait eight hours before turning the room thermostat to COOL may result in damage to the compressor bearings.

4. Start a dual compressor system by adjusting the thermostat setting to the desired temperature, placing the thermostat selector switch in the COOL or AUTO position, and placing the fan switch in either the AUTO or ON position.
5. Adjust the thermostat setting on a single compressor unit so that the compressor will be operating at high speed. Place the thermostat selector switch in either the COOL or AUTO position, and the fan switch in either the AUTO or ON position.
6. Place a clamp-on ammeter on each compressor lead and check the motor amperage. Amperage draw should not be greater than the "Maximum Allowable Amps" given in Table 9.
7. Place the clamp-on ammeter around either of the two leads from each outdoor fan motor run capacitor to determine if the run capacitor is open and must be replaced. The amp draw should not be greater than the nameplate rating for the condenser fan motors.
8. Lower the thermostat setting to the desired temperature.

Maintenance Procedures

This section of the manual describes specific maintenance procedures which must be performed as a part of the unit's maintenance program. Before performing any of these operations, however, be sure that power to the unit is disconnected unless otherwise instructed.

WARNING: WHEN MAINTENANCE CHECKS AND PROCEDURES MUST BE COMPLETED WITH THE ELECTRICAL POWER ON, CARE MUST BE TAKEN TO AVOID CONTACT WITH ENERGIZED COMPONENTS OR MOVING PARTS. FAILURE TO EXERCISE CAUTION WHEN WORKING WITH ELECTRICALLY-POWERED EQUIPMENT MAY RESULT IN SERIOUS INJURY OR DEATH.

Coil Cleaning

Condenser coils must be cleaned **at least once each year**, or more frequently if the unit is located in a "dirty" environment, to help maintain proper unit operating efficiency and reliability. The relationship between regular coil maintenance and efficient unit operation is outlined below:

1. Clean condenser coils minimize compressor head pressure and amperage draw, and promote system efficiency.
2. Clean evaporator coils minimize water carry-over and help eliminate frosting and/or compressor flood back problems.
3. Clean coils minimize required fan brake horsepower and maximize efficiency by keeping coil static pressure loss at a minimum.
4. Clean coils keep motor temperatures and system pressures within safe operating limits for good reliability.

Specific instructions for cleaning condenser coils are provided in the following paragraphs. Follow these instructions as closely as possible to avoid potential damage to the coils.

To clean refrigerant coils, the following equipment is required: a soft brush and either a garden pump-up sprayer or a high pressure sprayer. In addition, a high quality detergent must be used: suggested brands include SPREX A.C., OAKITE 161, OAKITE 166, and COILOX. Follow the manufacturer's recommendations for mixing to make sure the detergent is alkaline with a pH value less than 8.5.

1. Disconnect power to the unit.

WARNING: OPEN UNIT DISCONNECT SWITCH. FAILURE TO DISCONNECT UNIT FROM ELECTRICAL POWER SOURCE MAY RESULT IN SEVERE ELECTRICAL SHOCK, AND POSSIBLE INJURY OR DEATH.

2. Remove enough panels from the unit to gain access to the coil.
3. Protect all electrical devices such as motors and controllers from dust and water spray.
4. Straighten coil fins with a fin rake, if necessary.

MAINTENANCE LOG

DATE	AMBIENT TEMP. (F)	EVAPORATOR ENTERING AIR		COMPRESSOR (HIGH SPEED)		COMPRESSOR (LOW SPEED)		SUPERHEAT		SUBCOOLING (F)
		DRY BULB	WET BULB	SUCTION PRESSURE	DISCHARGE PRESSURE	SUCTION PRESSURE	DISCHARGE PRESSURE	CIRCUIT NO. 1 (F)	CIRCUIT NO. 2 (F)	

5. Use a soft brush to remove loose dirt and debris from both sides of the coil.

6. Mix the detergent with water according to the manufacturer's instructions. The detergent-and-water solution may be heated to a maximum of 150 F to improve its cleansing ability.

WARNING: DO NOT HEAT THE DETERGENT-AND-WATER SOLUTION TO TEMPERATURES IN EXCESS OF 150 F. HIGH-TEMPERATURE LIQUIDS SPRAYED ON THE COIL EXTERIOR WILL RAISE THE PRESSURE WITHIN THE COIL AND MAY CAUSE IT TO BURST, RESULTING IN POSSIBLE INJURY TO SERVICE PERSONNEL AND EQUIPMENT DAMAGE.

7. Place the detergent-and-water solution in the sprayer. If a high-pressure sprayer is used, be sure to follow these guidelines:

   - Minimum nozzle spray angle is 15 degrees.
   - Spray the solution perpendicular (at a 90 degree angle) to the coil face.
   - Keep the sprayer nozzle at least six inches from the coil.
   - Sprayer pressure must not exceed 600 psi.

CAUTION: Do not spray motors or other electrical components. Moisture can cause component failure.

8. Spray the leaving air side of the coil first, then spray the entering air side of the coil. Allow the detergent-and-water solution to stand on the coil for five minutes.

9. Rinse both sides of the coil with cool, clean water.

10. Inspect the coil. If it still appears to be dirty, repeat Steps 7, 8 and 9.

11. Replace all unit panels and parts, and restore electrical power to the unit.

12. Remove the protective covers installed in Step 3.

Control Testing

The following procedures can be used to check the operation of the high and low pressure controls. To determine operating pressures, attach gauges to the compressor suction and discharge access valves.

High Pressure Control

1. Open the unit electrical disconnect switch.

2. Disconnect the low voltage lead(s) from the condenser fan relay coil(s). This will de-energize the condenser fans.

3. On BTA150D-BTA180D units only, disconnect Y2 on the control box terminal strip when checking the high pressure control for Compressor No. 1. This will prevent the second compressor from running while checking the control in the first compressor circuit.

4. Close the unit disconnect switch and start the unit. On BTA180F units operate the compressor on high speed.

CAUTION: Be prepared to open the unit disconnect switch immediately if the compressor continues to run after the discharge pressure exceeds the high pressure control cutout range. Failure to do so could damage the system.

5. Observe the rising discharge pressure. When the pressure reaches 425 psig (±20) as shown in Table 1, the compressor should shut off. If the pressure reaches 445 psig without the high pressure switch breaking, immediately open the unit disconnect switch. Check to make sure that the high pressure control attached to liquid line No. 1 is wired to low voltage circuit No. 1. Replace the faulty high pressure control.

6. On BTA150D-BTA180D units, repeat Steps 1 through 5 to test the high pressure control in the second compressor circuit. In place of Step 3, however, reconnect Y2 and disconnect Y1 on the control box terminal strip. This will prevent Compressor No. 1 from running while the control for the second compressor circuit is being tested.

7. Open the unit disconnect switch.

8. Reconnect the wires removed in Step 2 on single compressor units, on in Steps 2 and 6 on dual compressor units.

9. Allow the discharge pressure(s) to drop below the cut-in setting in Table 1, and close the unit disconnect switch. This will also close the reset relay that locked out the compressor contactor when the high pressure control tripped.

10. The unit should start. If not, allow the discharge pressure to decrease further and repeat Step 9.

Low Pressure Control

1. Open the unit electrical disconnect switch.

2. Disconnect the wire that goes to the indoor blower coil from either Terminal T or R on the control box terminal strip. This will de-energize the evaporator fans.

3. On BTA120D-BTA180D units only, disconnect Y2 on the control box terminal strip when checking the low pressure control for Compressor No. 1. This will prevent the second compressor from running while checking the control in the first compressor circuit.

4. Remove the wires from Terminal 2 on the low ambient time delay relay(s). Insulate the wire terminals with electrical tape.

5. Close the unit disconnect switch and start the unit.

CAUTION: Be prepared to open the unit disconnect switch immediately if the compressor continues to run after the suction pressure drops below the low pressure control cutout range. Failure to do so could damage the compressor.

6. Observe the decreasing suction pressure. When the pressure drops to 20 psig (±4) as shown in Table 1, the compressor should shut off. If the pressure reaches 15 psig without the low pressure switch breaking, immediately open the unit disconnect switch. Replace the faulty low pressure control.

7. On BTA120D-BTA180D units, repeat Steps 1 through 6 to test the low pressure control in the second compressor circuit. In place of Step 3, however, reconnect Y2 and disconnect Y1 on the control box terminal strip. This will prevent Compressor No. 1 from running while the control for the second compressor circuit is being tested.

8. Open the unit disconnect switch.

9. Reconnect the wires removed in Steps 2 and 4 on single compressor units, or in Steps 2, 4, and 7 on dual compressor units.

10. Allow the suction pressure(s) to rise above the cut-in setting in Table 1, and close the unit disconnect switch. This will also close the reset relay that locked out the compressor contactor when the low pressure control tripped.

11. The unit should start. If not, allow the suction pressure to rise further and repeat Step 10.

Evacuation

For field evacuation, use a rotary-style vacuum pump capable of pulling a vacuum of 100 microns or less.

When hooking the vacuum pump to a refrigeration system, it is important to manifold the pump to both the high and low side of the system (liquid line access valve and compressor suction access valve). Follow the pump manufacturer's directions as to the proper methods of using the vacuum pump.

CAUTION: Do not, under any circumstances, use a megohm meter or apply power to the windings of a compressor while it is under a deep vacuum. In the rarified atmosphere of a vacuum, the motor windings can be damaged.

The lines used to connect the pump to the system should be copper and of the largest diameter that can practically be used. Using larger line sizes with minimum flow resistance can significantly reduce evacuation time. Rubber or synthetic hoses are not recommended for unit evacuation because they have moisture absorbing characteristics which result in excessive rates of outgassing and pressure rise during the standing vacuum test. This makes it impossible to determine if the unit has a leak, excessive residual moisture, or a continual or high rate of pressure increase due to the hoses.

An electronic micron vacuum gauge should be installed in the common line ahead of the vacuum pump shutoff valve, as shown in Figure 7. Close Valves B and C, and open Valve A. After several minutes, the gauge reading will indicate the minimum blank-off pressure the pump is capable of pulling. Rotary pumps should produce vacuums of less than 100 microns.

Open Valves B and C. Evacuate the system to a pressure of 500 microns or less. Once 500 microns or less is obtained, with Valve A closed, a time versus pressure rise should be performed. The maximum allowable rise over a 15 minute period is 200 microns. If the pressure rise is greater than 200 microns but levels off to a constant value, excessive moisture is present. If the pressure steadily continues to rise, a leak is indicated. Figure 8 illustrates three possible results of the time versus temperature rise check.

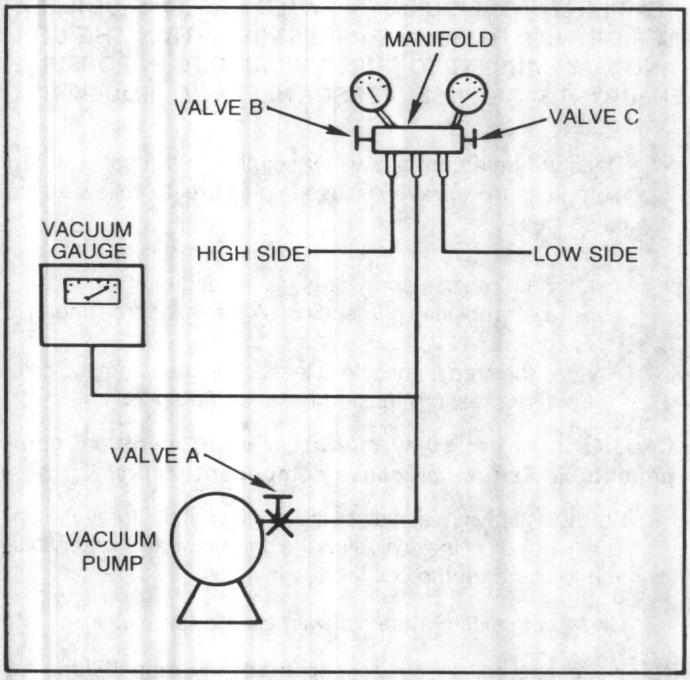

Figure 7 - Vacuum Pump Hook-Up

LEAK TESTING

When leak testing the unit, the following safety precautions must be observed:

WARNING: DO NOT WORK IN A CLOSED AREA WHERE REFRIGERANT OR NITROGEN MAY BE LEAKING. A SUFFICIENT QUANTITY OF VAPORS MAY BE PRESENT TO CAUSE PERSONAL INJURY. PROVIDE ADEQUATE VENTILATION.

WARNING: DO NOT USE OXYGEN, ACETYLENE, OR AIR IN PLACE OF REFRIGERANT AND DRY NITROGEN FOR LEAK TESTING. A VIOLENT EXPLOSION WILL RESULT WHICH COULD CAUSE SERIOUS INJURY OR DEATH.

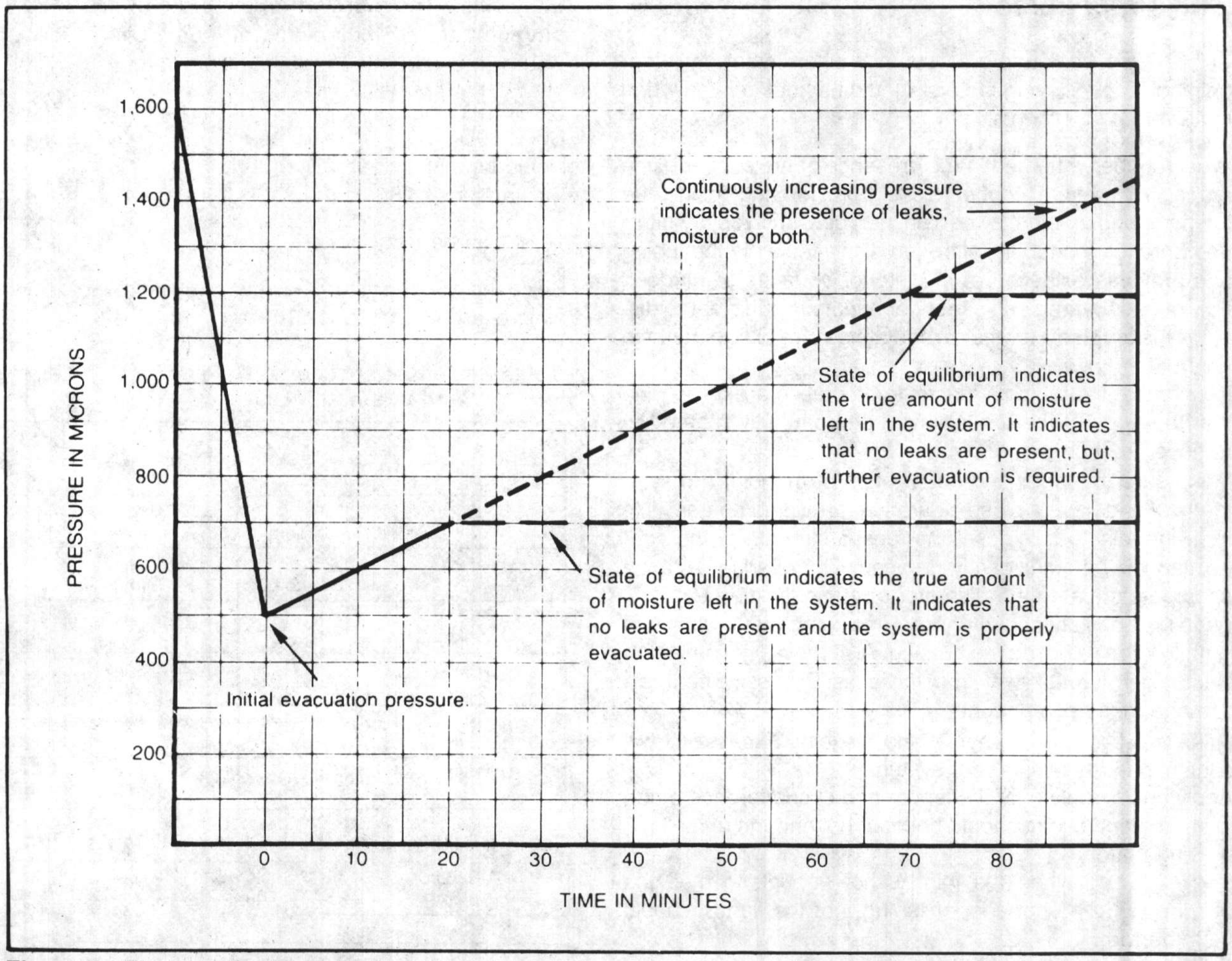

Figure 8 · Time vs. Pressure Rise after Evacuation

WARNING: ALWAYS USE A PRESSURE REGULATOR, VALVES, AND GAUGES TO CONTROL DRUM AND LINE PRESSURES WHEN PRESSURE TESTING THE SYSTEM. EXCESSIVE PRESSURES MAY CAUSE LINE RUPTURES, EQUIPMENT DAMAGE, OR AN EXPLOSION WHICH COULD RESULT IN PERSONAL INJURY OR DEATH.

Leak test the liquid line, evaporator, and suction line at pressures dictated by local codes.

CAUTION: Do not exceed 200 psig when leak testing the system.

1. Charge enough refrigerant into the system to raise the pressure to 100 psig.

2. Use a halogen leak detector or halide torch to check for leaks. Be thorough in this test, checking the interconnecting piping joints, the evaporator unit, and the condensing unit.

3. If a leak is found during the testing, release the test pressure, break the connection, and remake it as a new joint. Refer to the "Brazing Procedures" in this section of the manual for proper brazing techniques.

4. If no leak is found, use nitrogen to increase the test pressure to 150 psig, and repeat the leak test. Soap bubbles should be used to check for leaks when nitrogen is added. If a leak is found after increasing the pressure to 150 psig with nitrogen, release the test pressure and repair the leak.

5. Retest the system to make sure the new connection is solid.

6. If a leak is suspected after the system has been fully charged with refrigerant, use a halogen leak detector, halide torch, or soap bubbles to check for leaks.

Brazing Procedures

Proper brazing techniques are essential when installing refrigerant piping. The following factors should be kept in mind when forming sweat connections.

1. When copper is heated in the presence of air, copper oxide forms. To prevent copper oxide from forming inside the tubing during brazing, sweep an inert gas, such as dry nitrogen, through the tubing. Nitrogen displaces air in the tubing and prevents oxidation of the interior surfaces. A nitrogen flow of one to three cubic feet per minute is sufficient to displace the air. Use a pressure regulating valve or flow meter to control the flow.
2. Ensure that the tubing surfaces to be brazed are clean, and that the ends of the tubes have been carefully reamed to remove any burrs.
3. Make sure the inner and outer tubes of the joint are symmetrical and have a close clearance, providing an easy slip fit. If the joint is too loose, the tensile strength of the connection will be significantly reduced. The overlap distance should be equal to the diameter of the inner tube.
4. Wrap the body of each refrigerant line component with a wet cloth to keep it cool during brazing. Also move line insulation and tube grommets away from the joints. Excessive heat can damage these components.
5. If flux is used, apply it sparingly to the joint. Excess flux will contaminate the refrigerant system.
6. Apply heat evenly over the length and circumference of the joint. The entire joint should become hot enough to melt the brazing material.
7. Begin brazing when the joint is hot enough to melt the brazing rod. The hot copper tubing, not the flame, should melt the rod.
8. Continue to apply heat around the circumference of the joint until the brazing material is drawn into the joint by capillary action, making a mechanically sound and gas-tight connection. Remove the brazing rod as soon as a complete fillet is formed to avoid possible restriction in the line.
9. Visually inspect the connection after brazing to locate any pin holes or crevices in the joint. The use of a mirror may be required, depending on joint location.

Refrigerant Charging

Once the system is properly installed, leak tested and evacuated, refrigerant charging can begin. Liquid refrigerant must be charged into the system through the liquid line access valve, with the compressor shut off.

Refrigerant should be charged into the system by weight. Use an accurate scale or a charging cylinder to determine the exact weight of the refrigerant entering the system. Failure to use either a scale or charging cylinder can lead to under-charging or over-charging, resulting in unreliable operation.

The weights of refrigerant required for the evaporator unit and the condensing unit are given in Table 2. The weight of refrigerant required for the system piping can be determined by measuring the refrigerant lines and using the data in Table 3. The total system operating charge is calculated by adding the charge weight requirements of each part of the system. Refer to the following example.

EXAMPLE: The installation consists of a BTA180D condensing unit, a BWV180B evaporator unit, and 30 feet of 1/2 inch liquid line and 1-3/8 inch suction line.

BTA180D	= 163 oz./circuit
BWV180D	= 94 oz./circuit
Liquid Line (1.137 oz./ft.) x (30 ft.)	= 34 oz./circuit
Suction Line (.203 oz./ft.) x (30 ft.)	= 6 oz./circuit
Total Charge Per Circuit	255 oz./circuit

Since the 15 ton system has two circuits, the total system operating charge required is 510 oz.

Table 2 - Refrigerant charge Weights for Condensing and Evaporator Units

CONDENSING UNIT	CHARGE (IN OUNCES OF R-22)	EVAPORATOR UNIT	CHARGE (IN OUNCES OF R-22)
BTA120D	268 (134/circuit)	BTE120B	112 (56/circuit)
BTA150D	256 (128/circuit)	BWE090C (Two)	158 (79/circuit)
		BWV180B	188 (94/circuit)
BTA180D	326 (163/circuit)	BWE090C (Two)	158 (79/circuit)
		BWV180B	188 (94/circuit)
BTA180F	326	BWV180B	188 (94/circuit)

Table 3 - Refrigerant Line Charge Weights (Ounces/Foot)

TUBE O.D. (INCHES)	LIQUID LINE	SUCTION LINE
3/8	0.610	
1/2	1.137	
5/8	1.827	
3/4	2.738	0.056
7/8		0.078
1 1/8		0.133
1 3/8		0.203
1 5/8		0.288

WARNING: DO NOT APPLY FLAME TO A REFRIGERANT DRUM IN AN ATTEMPT TO INCREASE THE DRUM PRESSURE. UNCONTROLLED HEAT MAY CAUSE EXCESSIVE DRUM PRESSURES AND AN EXPLOSION MAY RESULT.

WARNING: SHOULD LIQUID REFRIGERANT COME IN CONTACT WITH THE SKIN, THE INJURY SHOULD BE TREATED AS IF THE SKIN HAS BEEN FROSTBITTEN OR FROZEN. SLOWLY WARM THE AFFECTED AREA WITH LUKEWARM WATER.

Proceed as follows to charge the system with refrigerant.

1. Charge liquid refrigerant into the liquid line of the No. 1 compressor circuit, using the liquid line access valve. The vacuum within the system will draw some of the required refrigerant into the system. If the pressure within the system equalizes with the pressure in the charging cylinder before the required charge has been drawn in, proceed to Step 2.

   NOTE: *On 10, 12.5, and 15 ton units, this charging process must be repeated for compressor circuit No. 2.*

2. If the system cannot be completely charged by liquid refrigerant entering the system liquid line as outlined in Step 1, complete the process by charging **gaseous refrigerant** into the suction line. However, at least part of the charge must be in the system prior to starting the compressor. Proceed as follows:

   a. Close the liquid line valve on the manifold gauge set.

   b. **Connect the manifold gauge set to the suction and discharge access valves (shown in Figure 9). The manifold valves should be closed.**

   c. Turn the refrigerant drum upright so that gaseous refrigerant is drawn off the top.

   d. Start the unit by following the procedures outlined in the INITIAL START-UP section of this manual.

   e. With the condensing unit operating, slowly open the suction line valve on the manifold gauge set. The remainder of the refrigerant will be drawn into the system.

CAUTION: Do not allow liquid refrigerant to enter the suction line. Excessive liquid will damage the compressor.

Checking Refrigerant Charge

Before taking measurements to determine if the system is correctly charged with refrigerant, verify that all other aspects of the system operation are proper. The following conditions must be checked and satisfied.

1. Check the evaporator and condenser fans to ensure that they are rotating in the proper direction, that the fan blades do not have dirt buildup, and that each fan is turning at the proper RPM. Make sure that the evaporator fan RPM is correct for the airflow desired and for the external static pressure being imposed by the duct system.
2. Make sure the evaporator air filters are clean.
3. Check the evaporator and condenser coils to ensure that they are clean, that the fins are straight, and that there are no obstructions to airflow.
4. Measure the suction line superheat and adjust the expansion valve, if necessary. (Refer to "Measuring Superheat" in the MAINTENANCE PROCEDURES section of this manual.) The expansion valve superheat setting must be between 12 and 16 F.

Visually inspect the liquid line sight glass to see if clear liquid is present. Bubbles in the liquid line sight glass indicate either low refrigerant charge, excess liquid line pressure drop, or excess liquid line heat gain.

CAUTION: A clear sight glass does NOT necessarily mean the system has sufficient refrigerant.

After verifying that the system is operating properly, determine if the refrigerant charge is correct. This is accomplished by checking both system operating pressures **and** subcooling leaving the condensing unit.

CAUTION: It is not sufficient to check only operating pressures or only subcooling. Both must be in the acceptable range in order to establish correct system charge.

Operating Pressures:

Measure the suction and discharge line pressures and compare these readings with the normal operating pressures listed in Figures 10-13 and Tables 4-6. Refer to "Operating Pressures" in the MAINTENANCE PROCEDURES section of this manual.

Subcooling:

Determine the system subcooling. (Refer to "Measuring Subcooling" in the MAINTENANCE PROCEDURES section of this manual.) If the system is properly charged, subcooling at the liquid line access valve should be 14 to 19 F.

The system is low on refrigerant if: 1) the suction and discharge pressures are lower than the normal operating pressures as determined from Figures 10-13 and Tables 4-6 **and** 2) liquid subcooling is low (less than 14-19 F on Dual Compressor Units and less than 18-30 F on Single Compressor Units.

The system is overcharged with refrigerant if: 1) the suction and discharge pressures are higher than normal operating pressures **and** 2) liquid subcooling is high (greater than 14-19 F on Dual Compressor Units and greater than 18-50 F on Single Compressor Units.

CAUTION: If both the suction and discharge pressures are low but subcooling is in the acceptable range, the system has a problem other than a shortage of refrigerant. Do not add refrigerant. Refer to the TROUBLESHOOTING section of this manual.

Adding Refrigerant:

Use the suction line access valve to add refrigerant to a system with a low charge, making sure that only refrigerant vapor enters the suction line. Continue to add refrigerant until the subcooling is between 14 and 19 F. At this point, the operating pressures should be within the limits defined by Figures 10-13 and Tables 4-6.

Removing Refrigerant:

If the system is overcharged, some refrigerant must be removed to lower the subcooling to the 14-19 F range. Refrigerant should be discharged from the system slowly to keep oil loss at a minimum. The liquid line access valve can be depressed to remove refrigerant. However, refrigerant should not be discharged into the atmosphere.

WARNING: DO NOT ALLOW REFRIGERANT TO COME IN CONTACT WITH THE SKIN. IF THIS OCCURS, THE INJURY SHOULD BE TREATED AS IF THE SKIN HAS BEEN FROSTBITTEN OR FROZEN. SLOWLY WARM THE AFFECTED AREA WITH LUKEWARM WATER.

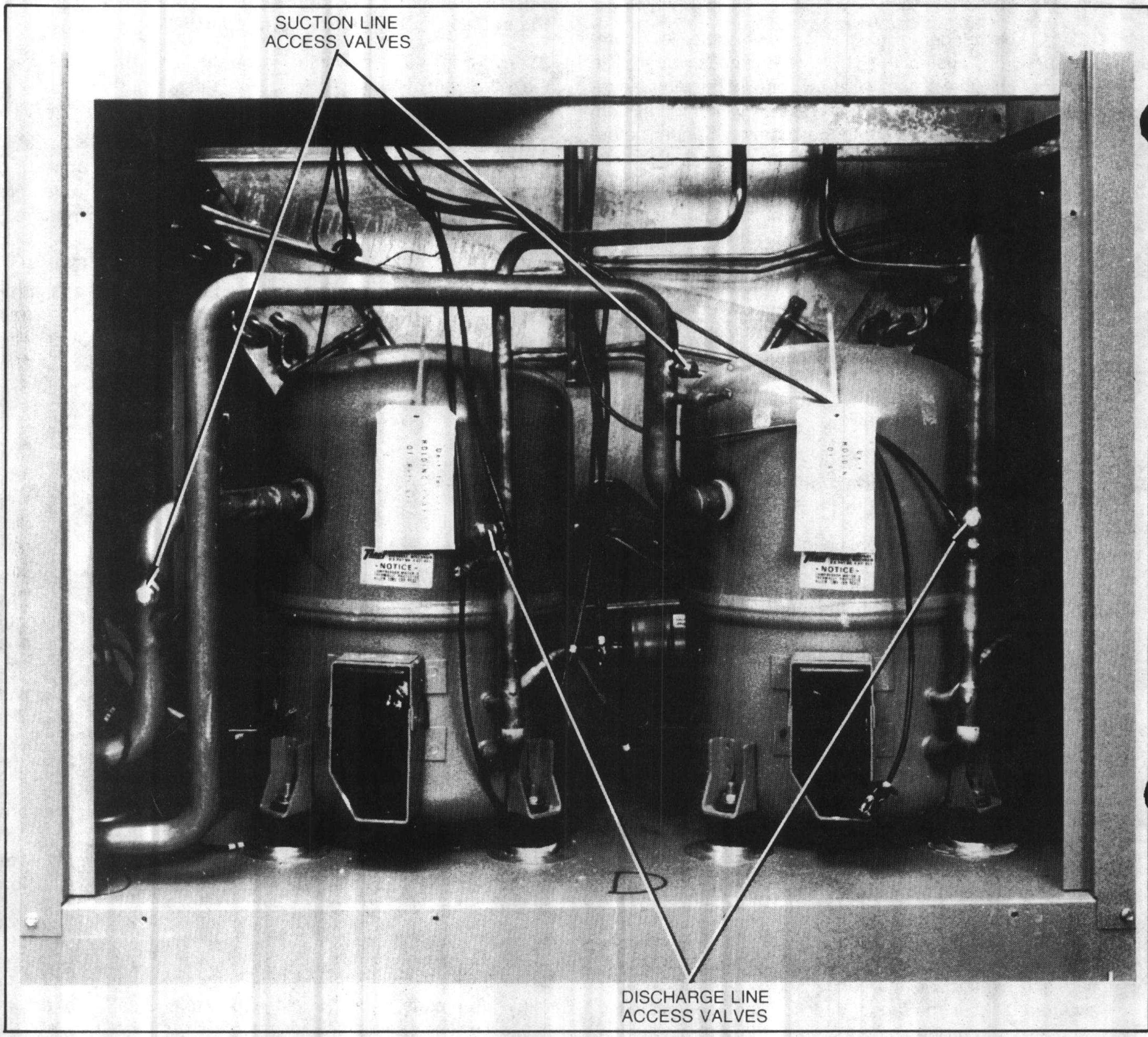

Figure 9 - Compressor Suction and Discharge Access Valves (Dual Compressor Unit Shown)

Operating Pressures

Operating pressure data can be used to determine if the system is operating properly. System malfunctions — such as low airflow, line restrictions, incorrect refrigerant charge, malfunctioning expansion valve, damaged compressor, and so on — will result in pressure variations which are outside the normal range. If the condensing unit and evaporator are checked individually, as described below, the operating pressures can be used to determine which side of the system (high side or low side) is malfunctioning. In addition, the relationship of suction vs. discharge pressure, as well as whether these pressures are higher or lower than expected, will provide valuable clues for determining the specific problem(s).

CAUTION: Operating pressure data, by itself, cannot be used to accurately charge a system. Charging by weight is prefered. If this is not feasible, a combination of operating pressures and subcooling measurement is necessary to properly charge the system. Refer to "Checking Refrigerant Charge" in the MAINTENANCE section of this manual.

Unfortunately, many application variables exist which affect operating pressures. These include indoor dry bulb and wet bulb temperature, outside dry bulb temperature, suction line pressure drop, and evaporator airflow. Since these variables can give misleading results, it is not recommended that operating pressures be used as the sole check of system operation. Further, the following conditions must be satisfied before checking system operating pressures.

1. The outdoor ambient temperature must be between 65 and 105 F. At ambient temperatures outside of this range, meaningful operating pressures cannot be measured.
2. The relative humidity of the air entering the evaporator must be above 40%. If it is less than 40%, meaningful operating pressures cannot be measured.
3. **All** condenser fans must be operating. If necessary, jumper the low ambient fan switches. Be sure to remove the jumpers when the measurements are completed.
4. Do not take measurements if the system includes a low ambient damper and/or hot gas bypass.

Use the following procedure to check operating pressures.

1. Condensing Unit Performance:
   a. Measure pressures (psig) at the suction and discharge line access valves next to the compressor.
   b. Measure the dry bulb air temperature (F) entering the condenser coil.
   c. If the outside ambient is between 65 and 105 F, enter the appropriate graph in Figures 10-13 at the measured suction pressure and condenser ambient. Read the corresponding discharge pressure.
   d. The measured discharge pressure should be within ±7 psi of the graph pressure. If the difference is greater than ±7 psi, the **condensing unit** performance is unacceptable. Refer to the TROUBLESHOOTING section of this manual.

Table 4 - Compressor Suction Pressures (psig)

			CONDENSER AMBIENT, F														
			65			75			85			95			105		
CON-		EVAP.	WET BULB, F			WET BULB, F			WET BULB, F			WET BULB, F			WET BULB, F		
DENSING	EVAP-	AIRFLOW	57	65	72	57	65	72	57	65	72	57	65	72	57	65	72
UNIT	ORATOR	(SCFM)	COMPRESSOR SUCTION PRESSURE (PSIG)														
BTA120D	BTE120B	4000	59	69	79	60	71	81	62	72	83	63	74	84	65	76	86
BTA150D	(2) BWE090C	5000	59	69	79	61	71	81	62	73	83	64	75	85	66	77	87
	BWV180B	5000	61	71	82	62	73	84	64	75	85	66	77	87	68	79	90
BTA180D	(2) BWE090C	6000	58	68	78	60	70	80	61	72	82	63	74	84	65	76	86
	BWV180B	6000	60	70	80	61	72	82	63	74	84	65	76	86	66	77	88
BTA180F	BWV180B	6000	57	67	76	59	69	78	61	71	81	63	73	83	65	75	86

NOTES:
1. Table only good for relative humidity of air entering evaporator greater than 40%.
2. Interpolation between wet bulb temperatures is allowable. Do not extrapolate outside range given.

2. Evaporator Performance:
   a. Measure the actual **wet bulb** temperature (F) of the air entering the evaporator. Be sure to measure the mixed air condition if outside air is being ducted in.
   b. Find the correct combination of condensing unit and evaporator in Table 4. Match the condenser entering air temperature (measured in Step 1b) with the evaporator wet bulb temperature (measured in Step 2a) to determine the correct suction pressure.
   c. Use Table 5 to correct the suction pressure (from Table 4) for the line sizes used in your installation.
   d. Use Table 6 to correct the suction pressure (from Step 2c) for the airflow of your evaporator.
   e. The measured suction pressure at the compressor should be within ±2 psi of the corrected pressure from Tables 4-6. If not, improper **system** operation is indicated. Refer to the TROUBLESHOOTING section of this manual.

CAUTION: Table 4 is not accurate if the relative humidity of evaporator entering air is less than 40%, or if an evaporator/condensing unit combination other than those listed is used.

Table 5 - Suction Pressure Correction for Line Size (PSI)

CONDENSING	7/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA120D	+0.4	−1.0	−2.4	−3.6	−4.7	−5.8
BTA150D	+0.6	−1.6	−3.6	−5.4	−6.9	−8.4
BTA180D	+0.3	−2.5	−5.0	−7.1	−8.9	−10.6
CONDENSING	1-1/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA120D	+0.4	0	−0.4	−0.8	−1.1	−1.5
BTA150D	+0.6	0	−0.6	−1.2	−1.8	−2.3
BTA180D	+0.3	−0.5	−1.3	−2.0	−2.7	−3.4
CONDENSING	1-3/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA120D	+0.4	+0.3	+0.1	0	−0.2	−0.3
BTA150D	+0.6	+0.4	+0.2	0	−0.3	−0.5
BTA180D	+0.3	0	−0.2	−0.5	−0.8	−1.1
BTA180F	−0.7	−1.7	−2.6	−3.4	−4.2	−4.9
CONDENSING	1-5/8" O.D. SUCTION LINE LENGTH, FEET					
UNIT	0*	25	50	75	100	125*
BTA180F	+0.4	0	−0.4	−0.8	−1.2	−1.6

*0 and 125 feet provided for interpolation purposes only.

Table 6 - Suction Pressure Correction for Airflow (PSI)

COND.	PERCENT OF RATED EVAPORATOR AIRFLOW								
UNIT	-20%	-15%	-10%	-5%	0%	+5%	+10%	+15%	+20%
BTA120D	-2.8	-2.0	-1.3	-0.6	0	+0.6	+1.1	+1.6	+2.1
BTA150D	-2.6	-1.9	-1.2	-0.6	0	+0.5	+1.0	+1.5	+1.9
BTA180D	-2.6	-1.9	-1.2	-0.6	0	+0.5	+1.0	+1.4	+1.9
BTA180F	-2.5	-1.8	-1.2	-0.6	0	+0.5	+1.0	+1.4	+1.8

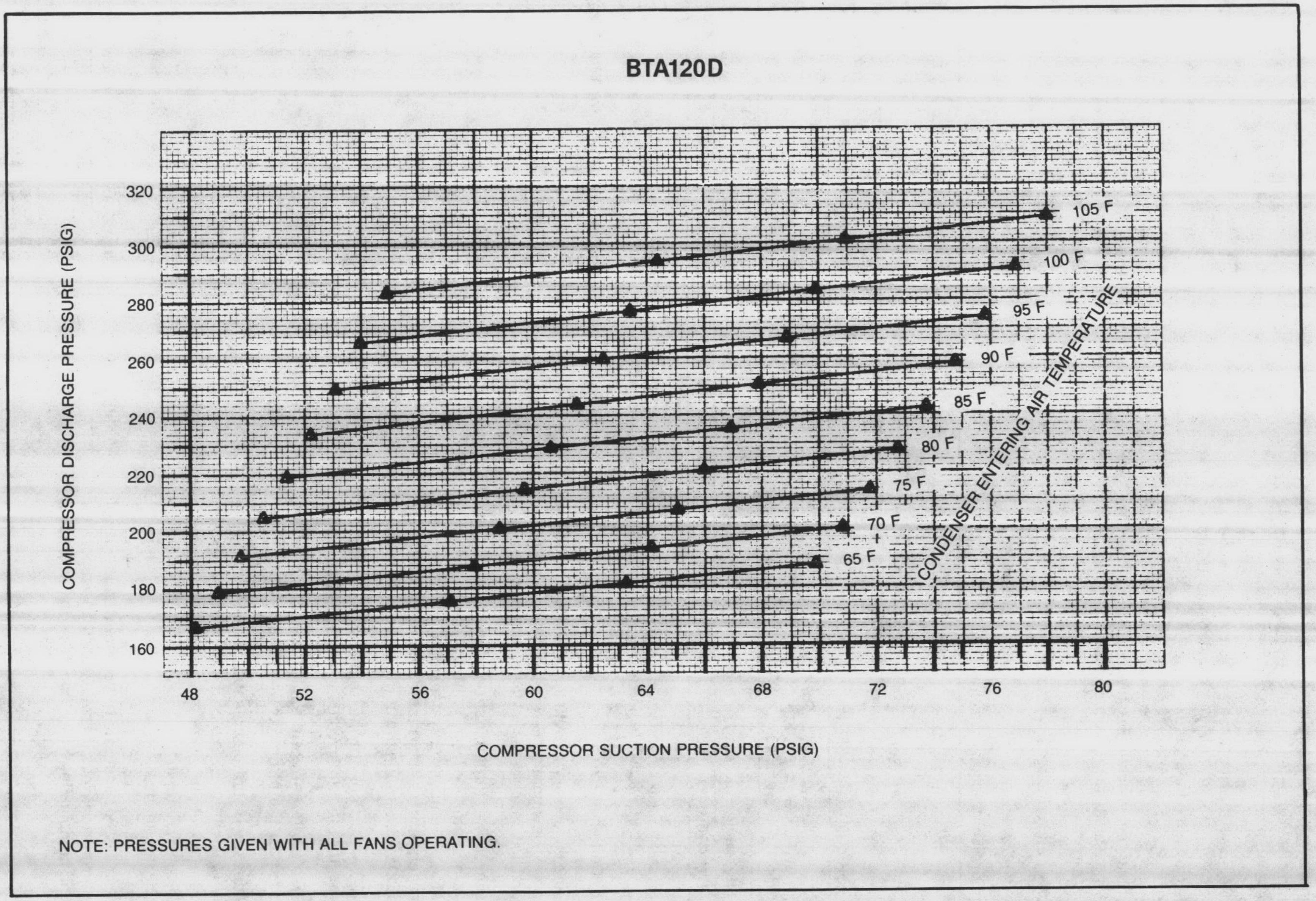

Figure 10 · BTA120D Operating Pressures

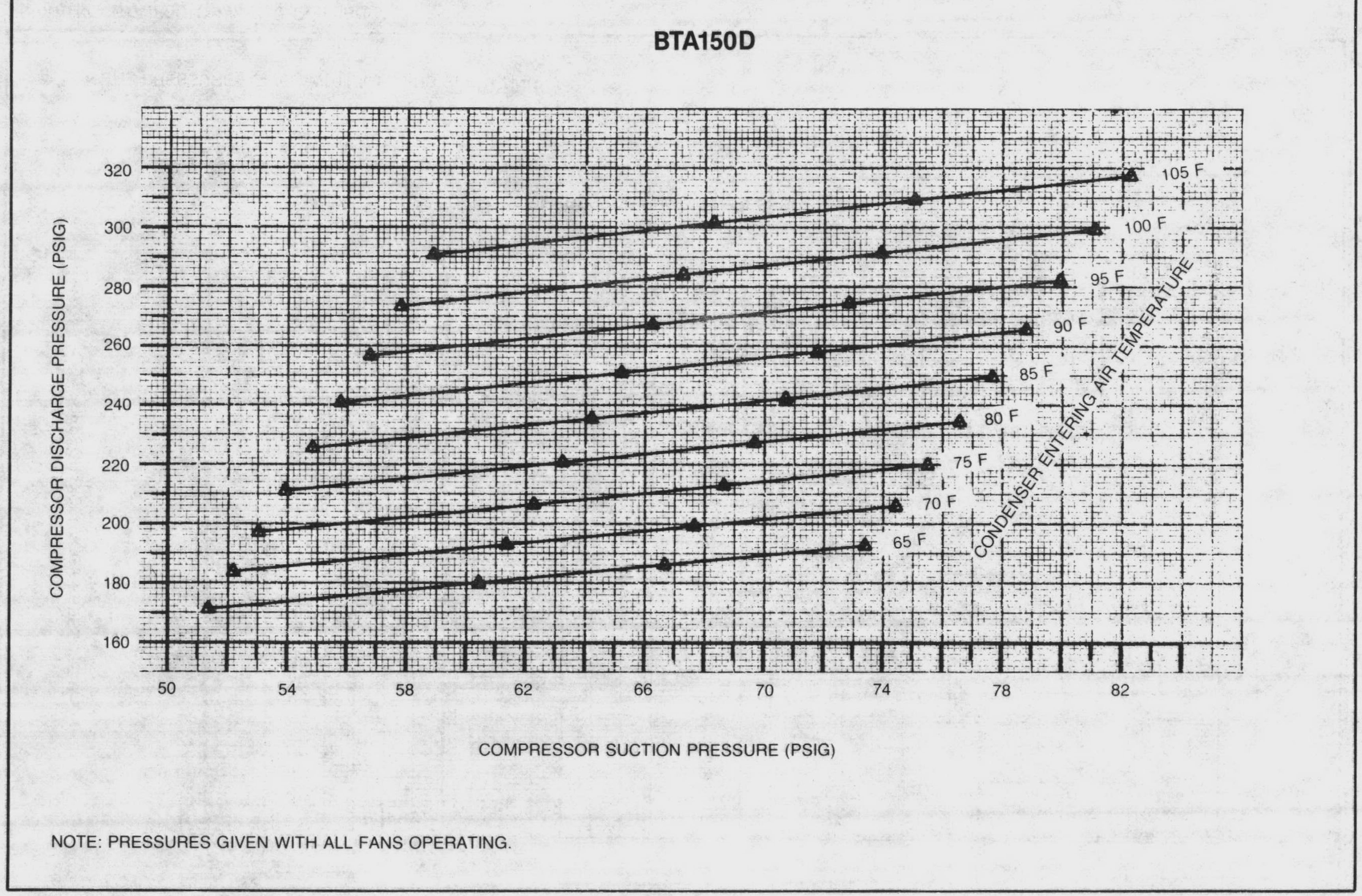

Figure 11 · BTA150D Operating Pressures

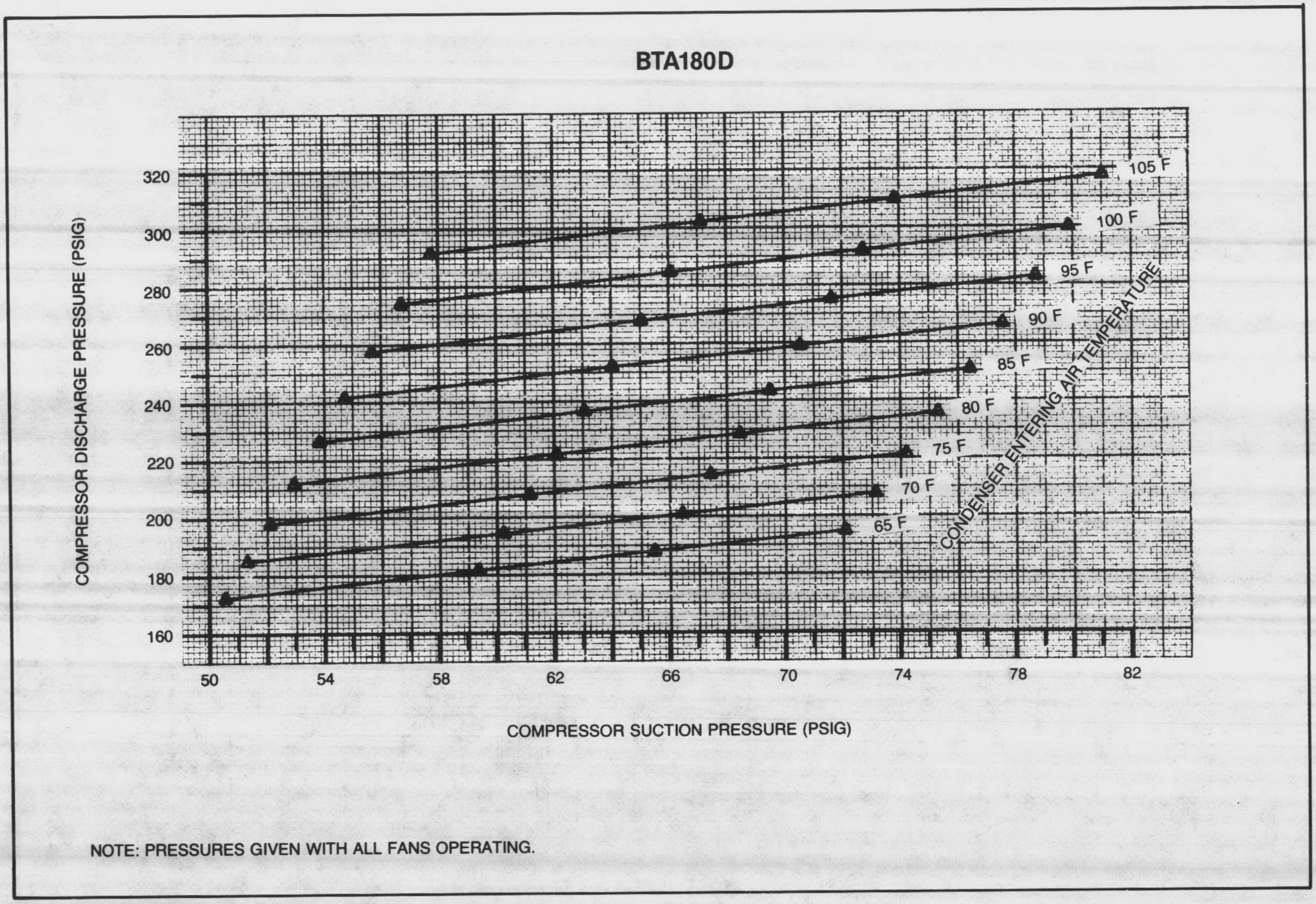

Figure 12 · BTA180D Operating Pressures

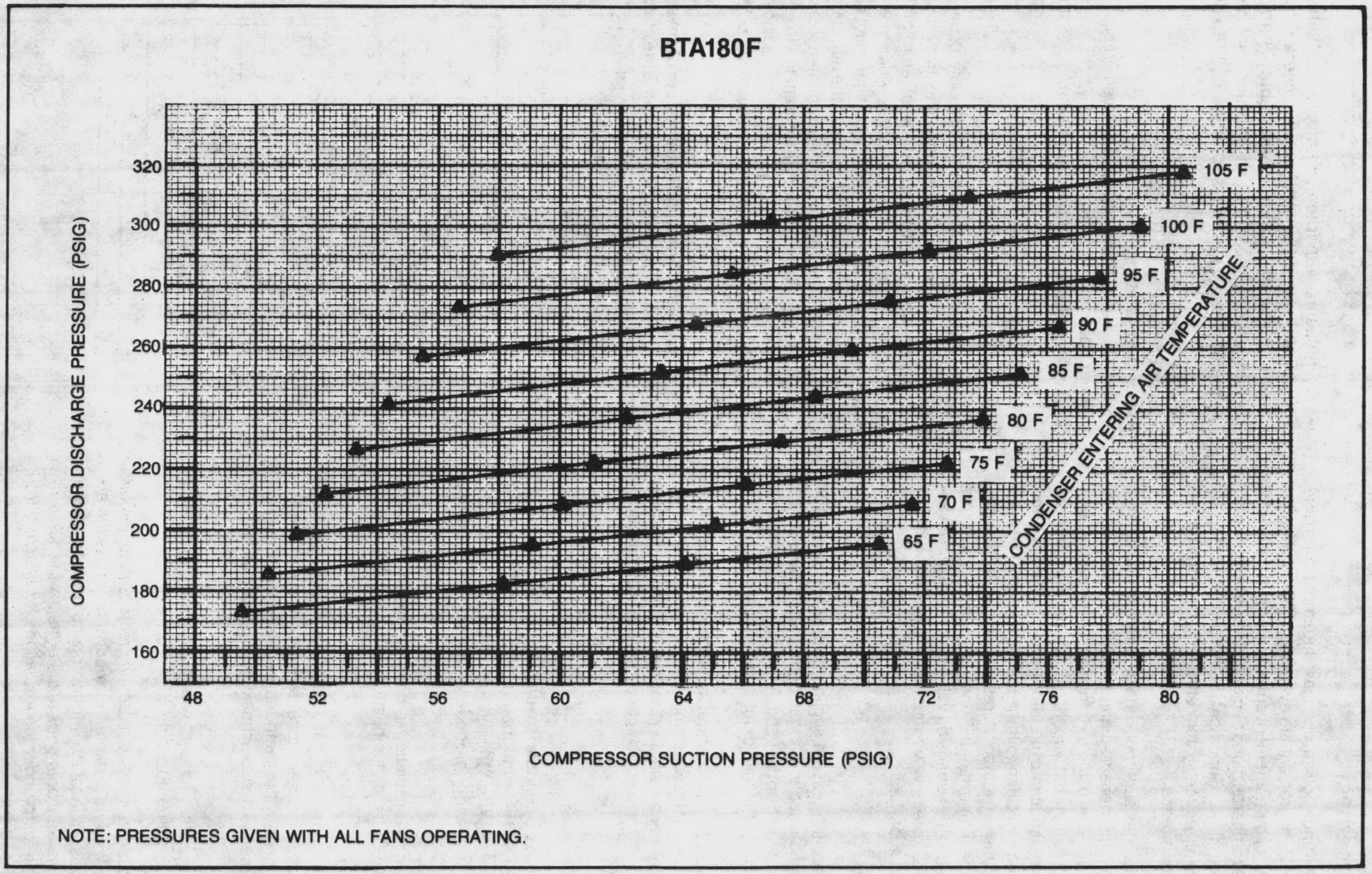

Figure 13 · BTA180F Operating Pressures

Measuring Superheat

The "safe" setting range for suction gas superheat on Trane equipment is 12 to 16 degrees at the evaporator. Settings within this range will allow for measurement error. Superheats below 12 degrees can cause refrigerant flood back which could lead to serious compressor damage. Superheat readings above the 16 degree measurement reduce system efficiency by reducing the effective evaporator surface.

To determine suction gas superheat, the pressure at the outlet of the evaporator must be measured and then converted to saturated vapor temperature by using a Refrigerant-22 pressure/temperature chart. The saturated vapor temperature can then be subtracted from the actual suction temperature, which is measured on the suction line close to the expansion valve bulb. The difference between the two temperatures is known as suction gas superheat. On most Trane fan/coil units an access valve has been provided close to the expansion valve bulb. To obtain an accurate reading, this access valve must be utilized when determining suction gas superheat.

Instruments to Use:

1. The gauge used to measure suction pressure should be of the best quality available. Gauges permanently installed on the equipment should not be used. A good quality gauge on a standard refrigerant manifold set is recommended.

2. To measure suction temperature, an electronic temperature tester will be sufficient. Testers manufactured by Robinnaire, Annie, and Thermal are among those available. Glass thermometers do not have sufficient contact area to give accurate readings.

Procedure:

In most cases it is desirable to use a single distributor evaporator with the BTA condensing unit, thereby utilizing one expansion valve. When the system has only one expansion valve, the following procedure should be used for measuring superheat.

1. Cut the suction line insulation to gain access to the suction line. If armaflex is used, it is best to cut around the circumference of the tubing.

2. Clean the line carefully and attach the electronic temperature sensor. Black electrical tape works well when securing the sensor of the temperature tester to the suction line. (Make sure the sensor is making good contact with the tube.)

3. Rejoin the armaflex and seal with plastic tape to prevent sensor contact with ambient air.

   NOTE: *For measurement accuracy the temperature sensor* ***must*** *be installed and insulated properly. Make sure the armaflex extends at least six inches on both sides of the sensor location. Seal both ends of the armaflex to keep ambient air from getting under the insulation and affecting the temperature readings.*

4. Install a pressure gauge to monitor suction pressure.

5. Operate the system for approximately 10 to 15 minutes to be sure that the expansion valve has time to stabilize.

6. To measure superheat, compare the saturated vapor temperature of the refrigerant converted from the suction pressure reading (see Table 7) to the actual temperature measured at the line by the electroni[c] tester. Proper suction superheat is 12 to 16 degrees.

EXAMPLE:
Suction Pressure = 66.0 psig
Suction Temperature = 52 F
Suction Pressure converted to Saturated Vapor Temperature (from Table 11) = 38 F
Suction Superheat = (Actual Line Temp.) − (Saturated Vapor Temp.)
= (52 F) − (38 F)
= 14 F

If initial suction superheat readings fall below 12 degrees, the adjusting stem on the expansion valve should be adjusted clockwise to close the valve, limiting the flow of refrigerant to the evaporator and thus increasing superheat. Adjustment should be made a half turn at a time. Conversely, if the initial suction superheat reading is greater than 16 degrees, the adjusting stem on the expansion valve should be adjusted counterclockwise to open the valve, increasing the flow of refrigerant to the evaporator and thus decreasing superheat. Adjustments should be made until an acceptable reading is obtained. The system should be allowed to restabilize for 10 minutes after each adjustment.

Table 7 - Pressure/Temperature Conversions for Calculating Suction Line Superheat

SATURATED TEMPERATURE	PRESSURE USING REFRIGERANT-22
30	54.9
31	56.2
32	57.5
33	58.8
34	60.1
35	61.5
36	62.8
37	64.2
38	65.6
39	67.1
40	68.5
41	70.0
42	71.4
43	73.0
44	74.5
45	76.0
46	77.6
47	79.2
48	80.8
49	82.4
50	84.0

Measuring Subcooling

The following conditions must be satisfied before checking subcooling.

1. The outdoor ambient temperature must be between 65 and 105 F. At ambient temperatures outside of this range, meaningful operating pressures cannot be measured.
2. The relative humidity of the air entering the evaporator must be above 40%. If it is less than 40%, meaningful operating pressures cannot be measured.
3. The compressor must be operating on high speed.
4. **All** condenser fans must be operating. If necessary, jumper the low ambient fan switches. Be sure to remove the jumpers when the measurements are completed.
5. Do not take measurements if the system includes a low ambient damper and/or hot gas bypass.

The proper setting range for liquid subcooling is 18 to 30 F on BTA180F units. Determine the system subcooling as follows:

1. Measure the liquid line pressure at the liquid line access valve installed inside the condensing unit. Convert this pressure reading to saturated temperature by using a Refrigerant-22 pressure/temperature chart (refer to Table 8).
2. Measure the actual liquid line temperature on the liquid line close to the access valve. To ensure an accurate reading, clean the line thoroughly where the electronic temperature sensor will be attached. Glass thermometers do not have sufficient contact area to give accurate readings. After securing the sensor to the line, wrap the sensor and line with insulation to prevent contact with ambient air.
3. Determine the system subcooling by subtracting the actual liquid line temperature (measured in Step 2) from the saturated liquid temperature (calculated in Step 1).
4. If the system is properly charged, subcooling at the liquid line access valve should be 18-30 F on BTA180F units and 14-19 F on BTA120D-BTA180D units.

Table 8 - Pressure/Temperature Conversion for Calculating Liquid Line Subcooling

SATURATED TEMPERATURE	PRESSURE USING REFRIGERANT-22
70	121.4
75	132.2
80	143.6
85	155.7
90	168.4
95	181.8
100	195.9
105	210.8
110	226.4
115	242.7
120	259.9
125	277.9
130	296.8
135	316.6
140	337.2
145	358.9
150	381.5

Table 9 - Maximum Allowable Amps

Condensing Unit	Electrical Characteristics	Allowable** Voltage Range	Max. Allowable Amps Matched Evap.	Max. Allowable Amps Oversized* Evap.
BTA120D300	208-230/60/3	187-253	24	—
BTA120D400	460/60/3	416-506	11	—
BTA120DW00	575/60/3	520-635	9	—
BTA150D300	208-230/60/3	187-253	—	30
BTA150D400	460/60/3	416-506	—	13
BTA150DW00	575/60/3	520-635	—	11
BTA180D300	208-230/60/3	187-253	31	36
BTA180D400	460/60/3	416-506	14	16
BTA180DW00	575/60/3	520-635	11	13
BTA180F300	208-230/60/3	187-253	66	67
BTA180F400	460/60/3	416-506	33	34
BTA180FW00	575/60/3	520-635	27	27

*Evaporator one size larger than condensing unit.
**Allowable voltage range at the unit terminal block.

Troubleshooting

The Troubleshooting Chart on the following pages is provided to serve as an aid for identifying the cause of any system malfunctions that may occur. The chart is divided into three columns:

— the "SYMPTOM" column describes the behavior the unit is exhibiting;
— the "PROBABLE CAUSE" column identifies possible sources of malfunction;
— the "RECOMMENDED ACTION" column indicates the procedures required to correct the malfunction.

If operating difficulties are encountered, make the following preliminary checks before referring to the Troubleshooting Chart:

☐ Check the thermostat to ensure that it is properly set, receiving control power, and "making/breaking" on a call for heating or cooling.

☐ Verify that the unit is receiving electrical supply power, and that the fuses are intact.

☐ Check the filters to make sure they are positioned properly, and free of dirt and debris.

After completing the checks listed above, inspect the system for other obvious causes of trouble such as broken fan belts, a clogged condenser coil, or restricted air ducts. If everything appears to be in order, but the unit still fails to operate properly, refer to the appropriate section of the Troubleshooting Chart.

NOTE: *The Troubleshooting Chart which follows is provided solely as a guide for determining the cause of mechanical failure or malfunction. When mechanical problems do occur, Trane recommends that trained service personnel be contacted to help ensure proper diagnosis and repair of the unit.*

WARNING: OPEN THE UNIT DISCONNECT SWITCH AND LOCK IT IN THAT POSITION TO PREVENT ACCIDENTAL START-UP. NEVER OPEN AN ACCESS PANEL TO INSPECT OR SERVICE THE UNIT WITHOUT FIRST OPENING THE DISCONNECT SWITCH. FAILURE TO DO SO MAY RESULT IN INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
A. Compressor does not start, and does not hum. Condenser fans do not operate.	1. No power to unit.	1. Check for the following: a. Disconnect switch open. b. Fuses blown.
	2. No call for cooling.	2. Check for the following: a. Defective thermostat. b. Broken or improper control wiring. c. Blown control power fuse.
	3. Anti-recycle timer has not timed out (if installed).	3. Wait at least five minutes for the anti-recycle timer to time out.
	4. Compressor motor protection module cut out.	4. Check motor windings for open circuit after allowing cool-down time. Refer to Symptom F, "Compressor motor protection module cut out".
	5. Unit locked out by reset relay.	5. Check for the following: a. Excessive discharge pressure. Refer to Symptom L, "Discharge pressure too high". b. Defective high pressure control. c. Low suction pressure. Refer to Symptom I, "Suction pressure too low". d. Defective low pressure control. e. Defective reset relay contacts.
AA. Compressor does not start, and does not hum. Condenser fans operate.	1. Compressor contactor will not close.	1. Check for the following: a. Defective compressor contactor. b. Improper wiring.
	2. Defective compressor.	2. Replace faulty compressor.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
B. Compressor hums, but will not start.	1. Low voltage at the compressor.	1. Check for the following: a. A single blown fuse. b. Low line voltage. c. Defective compressor contactor. d. Loose wiring connections.
	2. Defective compressor.	2. Check for the following: a. Open motor winding. b. Excessive amp draw on all phases.
C. Compressor fails to switch to high speed.	1. No call for second stage of cooling.	1. Check for the following: a. Setpoint too low. b. Defective thermostat. c. Broken or improper control wiring.
	2. Compressor contactor will not close.	2. Same as AA-1.
	3. Defective compressor.	3. Same as AA-2.
D. Compressor short cycles.	1. Intermittent contact in control circuit.	1. Check for the following: a. Defective relay contacts. b. Loose wiring connections.
	2. Poor thermostat placement.	2. Refer to "Thermostat Installation" in the ELECTRICAL WIRING section of this manual.
	3. Defective anti-recycle timer.	3. Replace compressor motor protection module.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
E. Compressor runs continuously.	1. Unit undersized for load (cannot maintain space temperature).	1. Check for cause of excessive load.
	2. Compressor fails to switch to high speed.	2. Refer to Symptom C.
	3. Thermostat setpoint too low.	3. Readjust thermostat.
	4. Defective thermostat or control wiring (conditioned space too cold).	4. Replace thermostat. Replace or repair control wiring.
	5. Welded contacts on compressor contactor.	5. Repair or replace contactor.
	6. Leaky valves in compressor (indicated by operation at abnormally low discharge and high suction pressures).	6. Replace compressor.
	7. Shortage of refrigerant (indicated by reduced capacity coupled with high superheat, low subcooling, and low suction pressure).	7. Find and repair refrigerant leak. Recharge system.
F. Compressor motor protection module cut out.	1. Excessive load on evaporator (indicated by high supply air temperature).	1. Check for the following: a. Excessive airflow. b. High return air temperature.
	2. Lack of motor cooling (indicated by excessive superheat).	2. Check for the following: a. Improper expansion valve setting. b. Faulty expansion valve. c. Restriction in liquid line.
	3. Improper voltage at compressor.	3. Check for the following: a. Low or unbalanced line voltage. b. Loose power wiring. c. Defective compressor contactor.
	4. Internal parts of compressor damaged.	4. Replace compressor.
G. Compressor is noisy.	1. Internal parts of compressor damaged or broken (compressor knocks).	1. Replace compressor.
	2. Liquid floodback (indicated by abnormally cold suction line).	2. Check and adjust superheat.
	3. Liquid refrigerant in the compressor at start-up (indicated by an abnormally cold compressor shell).	3. Replace crankcase heater.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
H. System short of capacity.	1. Low refrigerant charge (indicated by low subcooling and high superheat).	1. Add refrigerant.
	2. Clogged filter drier (indicated by temperature change in refrigerant line through drier).	2. Replace filter drier or core of drier.
	3. Incorrect thermostatic expansion valve setting.	3. Readjust expansion valve.
	4. Expansion valve stuck or obstructed (indicated by high superheat and high space temperature).	4. Repair or replace expansion valve.
	5. Low evaporator airflow.	5. Check filters. Adjust airflow.
	6. Noncondensibles in system.	6. Evacuate and recharge system.
	7. Leaky valves in compressor (indicated by operation at abnormally low discharge and high suction pressures).	7. Replace compressor.
I. Suction pressure too low.	1. Shortage of refrigerant (indicated by high superheat and low subcooling).	1. Find and repair refrigerant leak. Recharge system.
	2. Thermostat set too low (indicated by low discharge pressure and low space temperature).	2. Readjust thermostat.
	3. Low airflow.	3. Check for clogged filters, incorrect fan speed, or high duct static pressure.
	4. Clogged filter drier.	4. Check for frosting on filter drier. Replace if necessary.
	5. Expansion valve power assembly has lost charge.	5. Repair or replace expansion valve power head assembly.
	6. Obstructed expansion valve (indicated by high superheat).	6. Clean or replace valve.
J. Suction pressure too high.	1. Excessive cooling load (indicated by high supply air temperatures).	1. See Symptom E, "Compressor runs continuously".
	2. Overfeeding of expansion valve (indicated by abnormally low superheat and liquid flooding to compressor).	2. Adjust superheat setting and check to see that remote bulb is properly attached to suction line.
	3. Suction valves broken in open position (indicated by noisy compressor).	3. Replace compressor.
	4. Compressor on low speed.	4. Refer to Symptom C.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
K. Discharge pressure too low.	1. Shortage of refrigerant (indicated by low subcooling and high superheat plus bubbles in sight glass).	1. Repair leak and recharge system.
	2. Broken or leaky compressor discharge valves (indicated by suction and discharge pressures that equalize rapidly after shutdown).	2. Replace compressor.
	3. Condenser fan control stuck in closed position (contacts closed when temperature is below 60 F).	3. Replace defective control.
	4. Unit running below minimum operating ambient.	4. Provide adequate heat pressure controls or a unit ambient lockout switch.
	5. Low ambient damper stuck open (indicated by low discharge pressure).	5. Repair or replace damper operator.
L. Discharge pressure too high.	1. Too little or too warm condenser air; restricted air flow.	1. Clean coil. Check fan and motors for proper operation.
	2. Air or noncondensible gas in system (indicated by exceptionally hot condenser and excessive discharge pressure).	2. Evacuate and recharge system.
	3. Overcharge of refrigerant (indicated by high subcooling, low superheat, and high suction pressure).	3. Remove excess refrigerant.
	4. Excessive system load.	4. Reduce load.
	5. Defective condenser fan or fan control (indicated by one fan off and high condenser pressure).	5. Repair or replace fan or control.
	6. Defective or inoperative low ambient dampers.	6. Repair or replace defective parts.

The Trane Company
Light Commercial Group
Guthrie Highway
Clarksville, TN 37040

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COMPANY

BTA-M-3

Technical Literature Printed in USA

TRANE™

BWV-IN-1A

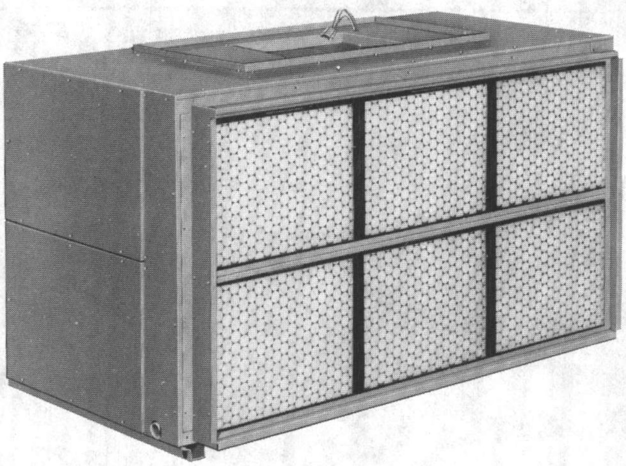
INSTALLER'S GUIDE

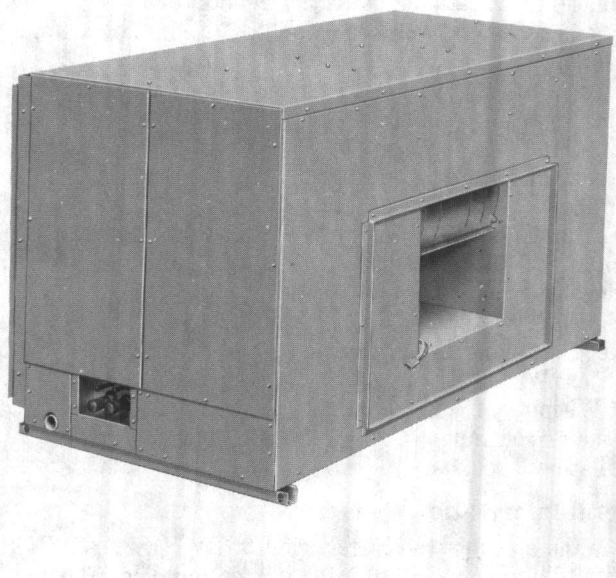
Split System Cooling or Heat Pump Indoor Unit 180-240 MBh

Library	Service Literature
Product Section	Unitary
Product	Heat Pumps, Evaporator Fan-Coil
Model	BWV/BWH
Literature Type	Installer's Guide
Sequence	1A
Date	March 1986
File No.	SV-UN-HPMP-BWV-IN-1A 3/86
Supersedes	BWV-IN-1 8/85

Horizontal Models:
BWH180B-C
BWH240B-C
BWH180B-D
BWH240B-D

Vertical Models:
BWV180B-C
BWV240B-C
BWV180B-D
BWV240B-D

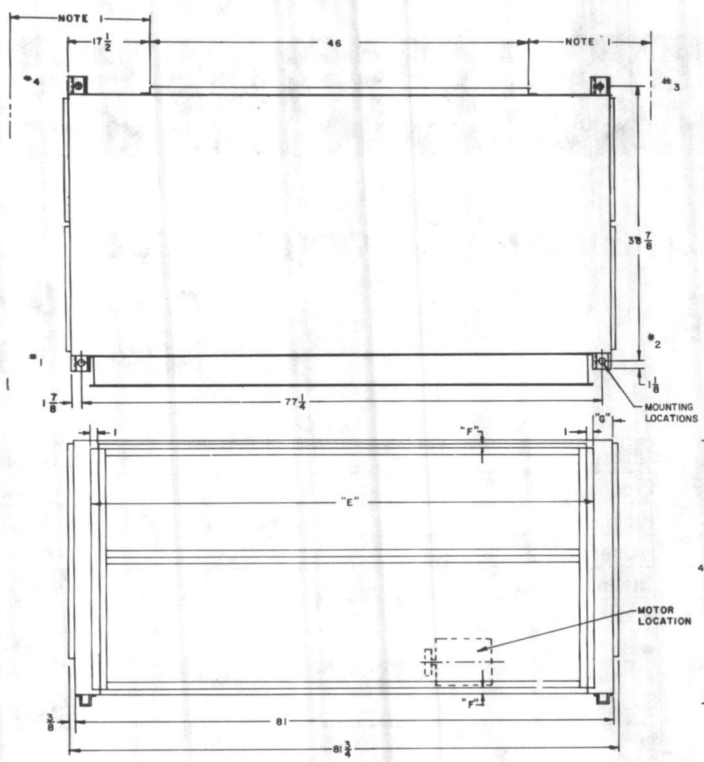




Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

18-GC60D2
Dwg. No. A723794P01
2nd Printing 1986

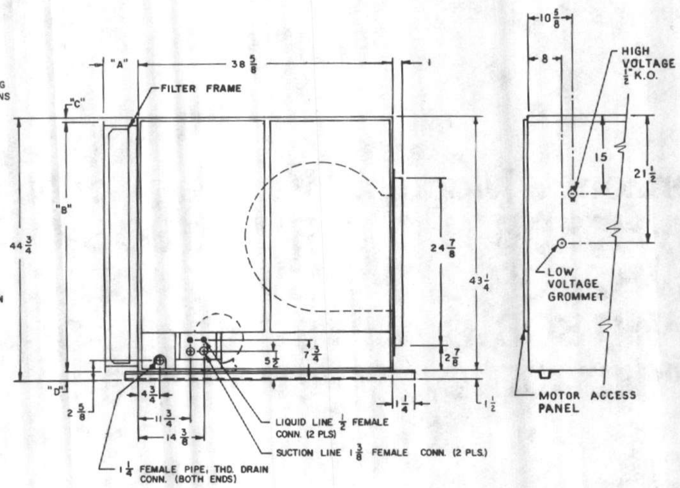
Literature Change History
BWV-IN-1A (March 1986)
Revised manual for models carrying CSA certification.



Model Number	Dimension (In.) A	B	C	D	E	F	G
BWH180B	51/8	415/8	3/4	11/2	761/8	3/4	33/16
BWH240B	51/8	415/8	3/4	17/16	761/8	3/4	33/16

Unit Weight Data (LBS).

Model Number	Shipping Weight	Unit Net Weight	Weight Distribution #1	#2	#3	#4
BWH180B	786	686	173	193	168	151
BWH240B	870	770	193	218	190	168



From Dwg. 21C723976 Rev. 0

Figure 1 — BWV180B and BWV240B Unit Dimensions, Connection Locations and Unit Weights and Weight Distribution

Table of Contents

General Information

This manual covers the installation of BWH180B, BWV180B BWH240B, and BWV240B indoor air handlers. The model BWH air handler is designed for horizontal application; the model BWV is intended for vertical upflow applications. All models are equipped for side access.

NOTE: It is not the intention of this manual to attempt to cover all possible variations in systems that may occur or to provide comprehensive information concerning every possible contingency that may be encountered during an installation. If additional information is required or if specific problems arise that are not fully discussed in this manual, contact your local Trane representative for information.

Model Number	Dimension (In.)						
	A	B	C	D	E	F	G
BWV180B	5 1/8	41 5/8	3/4	1 1/2	76 1/8	3/4	3 3/16
BWV240B	5 1/8	41 5/8	3/8	13/16	76 1/8	3/4	3 3/16

Unit Weight Data (LBS).

Model Number	Shipping Weight	Unit Net Weight	Weight Distribution			
			#1	#2	#3	#4
BWV180B	786	686	173	193	168	151
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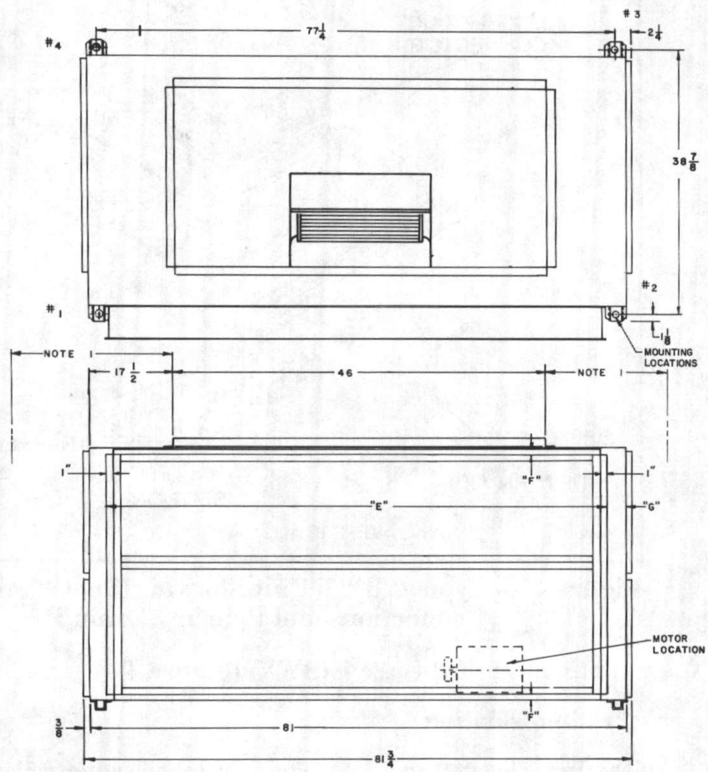
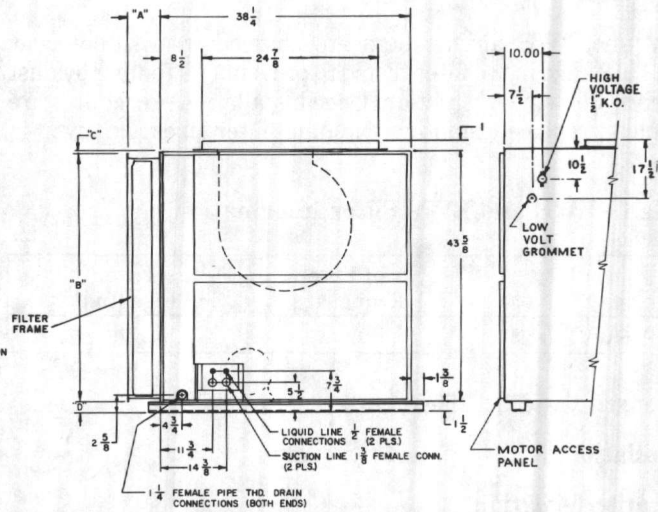




From Dwg. 21C723975 Rev. 0

Figure 2 — BWH180B and BWH240B Unit Dimensions, Connection Locations and Unit Weights and Weight Distribution.

Inspection

Check the unit carefully for shipping damage. Report any damage immediately to and file a claim with the carrier. Check the unit nameplate to confirm that the proper unit has shipped. Available power supply must be compatible with electrical characteristics specified on component nameplates.

Installation Limitations and Recommendations

Model BWH and BWV air handlers are designed for indoor installation only. The general location of the air handler is normally determined by the architect, contractor and/or buyer. For proper installation, the items that follow must be considered.

A. Available power supply must agree with electrical data on the component nameplates.

B. If external accessories are installed on the unit, additional clearances must be provided. Accessory installation instructions are provided with the accessory.

C. All ductwork should be properly insulated to prevent condensation and heat loss.

D. Refrigerant gas piping must be properly insulated.

CAUTION: Properly insulate all refrigerant gas piping to prevent possible damage due to condensation and to prevent capacity loss and possible compressor damage.

Lifting Recommendations

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Because of placement of internal components, the unit weight may be unevenly distributed. Approximate unit weights are given in Figures 1 and 2.

The crated unit can be moved using a forklift of suitable capacity. For lifting the unit into an elevated mounting position, run lifting straps or slings under the unit and attach securely to the lifting device. Use spreader bars to protect the unit casing from damage. Test-lift the unit to determine proper balance and stability.

CAUTION: Use spreader bars to prevent lifting straps from damaging the unit. Install spreader bars between lifting straps. This will prevent the straps from crushing the unit cabinet or damaging the unit finish.

WARNING: On-site lifting equipment must be capable of lifting the weight of the unit with an adequate safety factor. The use of under-capacity lifting devices may result in personal injury or death and can seriously damage the unit.

Positioning

The final position of the unit must be dictated by required service access to the unit, unit weight distribution over structural supports and by the locations of electrical, refrigerant and condensate drainage connections.

Ductwork

If the unit is located outside the conditioned space, insulate all ductwork. Determine how return air will be ducted to the unit. Be sure the dimensions of the connecting return and the dimensions of the return opening in the unit are compatible (Figures 1, 2 and 4).

Filters

BWV and BWH air handlers are shipped with throw-away filters installed in the filter frame to prevent coil fouling by dust or debris during construction. Once installation procedures are complete, replace the filters. Nominal filter sizes are given in Table 1.

Table 1 - BWH and BWV Filter Information

	No. of Filters Required	Filter Size (In.)[1]
BWH/BWV180-240B	6	20 x 25 x 2

Notes:
1. Length x width x thickness.

Installation

Vibration Isolation

To obtain optimum vibration isolation, use a suspension or floor mounting kit to isolate the unit from the structure. Isolation is usually accomplished through the use of spring or rubber isolators. (Figure 3) Isolator selection is dependent upon total unit weight, including accessories. Approximate unit weights are provided in Figures 1 and 2. Accessory weights are given in the accessory installation instructions.

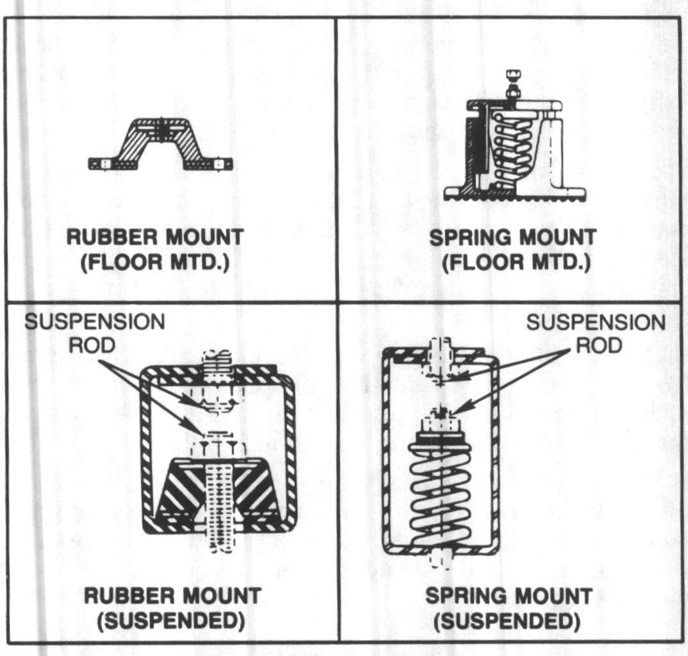


Figure 3 — Typical BWH-BWV Floor and Suspension Type Vibration Isolators

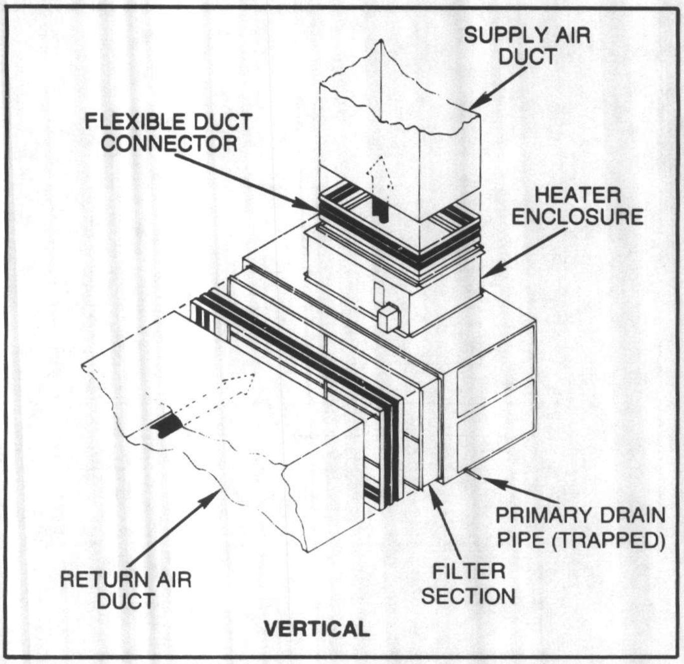


Figure 4 — Typical BWV Unit Showing Duct Connections and Primary Drain Pan

Mounting Vertical Upflow (BWV) (Figure 4)

Vibration Isolation

If the unit is located on a flat surface, install vibration isolators under the unit base to minimize and prevent moisture accumulation. Also, install isolators between the unit and any contact with the structure.

NOTE: Be certain to select proper size vibration isolators. Over or undersizing will negate effective isolation.

Auxiliary Drain Pan

If the unit is located in a position where condensate overflow may cause property damage, field fabricate and install a coated auxiliary drain pan under the unit. This drain pan should extend approximately two inches beyond the unit cabinet at all points (Figure 5). The drain pan will remove excess condensation due to extremely humid conditions and overflow that can result from a plugged primary drain line. Install a drain line for the auxiliary drain pan but do not connect the auxiliary drain line into the trapped primary drain pipe.

NOTE: Do not install a trap in the auxiliary drain line. This minimizes the likelihood of both drain lines becoming restricted.

Elevated Mounting Frame

To elevate the unit in the vertical upflow position, construct a mounting frame sufficiently strong to support unit weight (including accessories and ducting).

Horizontal (BWH) Units (Figure 5)

Unit Position

Locate and secure the unit in position. Hanging rails or channels and suspension rods should be purchased locally.

Vibration Isolation

Install vibration isolators between the unit and any contact with the structure.

NOTE: Be certain to select proper size vibration isolators. Over or undersizing isolators will negate effective isolation.

Auxiliary Drain Pan

Field fabricate and install an auxiliary drain pan under the unit as previously described under "Vertical Upflow Units". Refer to Figure 5.

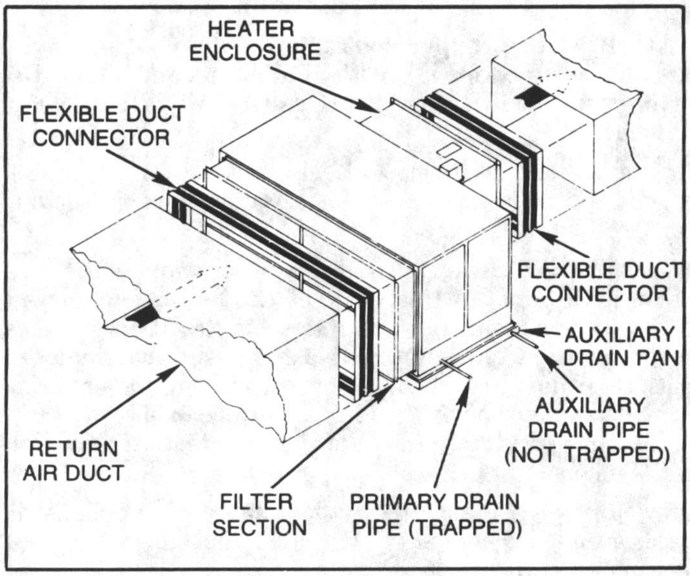
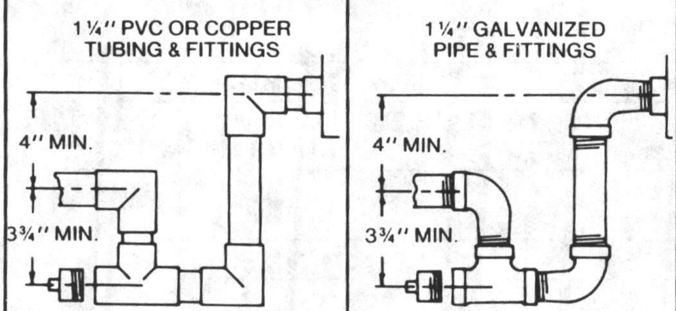


Figure 5 — Typical BWH Unit Showing Duct Connections, Primary and Secondary Drain Pans and Drain Line Locations



MATERIALS

1	TEE
3	90° ELL
1	PLUG
1	7″ NIPPLE
2	3″ NIPPLE
1	1¼″ NPT TO PVC OR COPPER ADAPTOR

MATERIALS

1	TEE
1	PLUG
3	STREET ELL
1	6″ NIPPLE

Figure 6 — Details of Two Typical Condensate Drain Line Trap Assemblies

Condensate Piping (All Units)

Primary condensate drain connections are located on both sides of the air handler (Figures 1 and 2). Drain connection sizes are 1-1/4″ FPT. Drain lines should be 1-1/4″ PVC, copper or galvanized pipe. Do not use reducer fittings in the drain lines. Pitch drain lines in the desired direction of flow at the rate of 1/4-inch per running foot of line. The line should be trapped with a cleanout plug (Figure 6). Do not connect drain lines to a closed drain system.

NOTE: If either drain connection is not used, plug the unused opening.

NOTE: Do not trap drain line from the auxiliary drain pan.

Refrigerant Piping

Refrigerant piping is usually installed in conjunction with installation of the system outdoor unit. Refrigerant connection locations are shown in Figures 1 and 2. Access holes are provided in the unit cabinet. Model BWH and BWV air handlers are dual circuited units. Both liquid line connections are 1/2-inch female sweat type. Both suction connections are 1-3/8-inch sweat type. The suction lines must be insulated. Refer to the outdoor unit installation instructions for specific information pertaining to installing and brazing refrigerant lines and leak testing, evacuating and charging each refrigerant circuit.

NOTE: Adhere to the following guideline when installing refrigerant piping:

Maximum linear length . . . . 80 Ft.
(without accumulator)
Maximum suction line lift . . . . 60 Ft.
Maximum liquid line lift . . . . 60 Ft.

If any application exceeds these guidelines, consult with your local Trane representative before installing the unit.

Carefully observe the following points when installing and brazing refrigerant piping at the air handler.

1. Each refrigerant circuit contains a holding charge of R-22. Release this charge before applying heat to the refrigerant connections by puncturing the seal caps on the connections.

CAUTION: Do not attempt to braze connections until the holding charge is released. This may generate excessive pressure in the circuit and result in damage to the coil or expansion valve.

CAUTION: Do not remove the seal caps from refrigerant connections until prepared to braze refrigerant lines to the connections. Excessive exposure to atmosphere may allow moisture or dirt to contaminate the system, damaging valve seats and causing ice formation in system components.

2. Each refrigerant circuit is equipped with an expansion valve. Remove each expansion valve sensing bulb from the suction line before brazing the suction line connections. Once refrigerant connections are complete, install the sensing bulbs on the suction lines at a point one foot outside the air handler cabinet. Clamp the bulbs securely to the top of the suction lines (1-3/8″ OD.) not more than 45 degrees from top center.

CAUTION: Remove the sensing bulbs from their locations on the suction lines before brazing suction line connections. Heat generated during brazing could damage the sensing bulb or expansion valves.

CAUTION: Be certain that sensing bulbs make good contact on suction lines. Inadequate heat transfer between the bulbs and the suction line may result in erratic control or liquid floodback to the compressor.

CAUTION: Insulate both expansion valve sensing bulbs and both suction lines from ambient air. Ambient interference may result in erratic system control.

CAUTION: Be certain to install the sensing bulb for Circuit 1 expansion valve on the Circuit 1 suction line. The suction line connections and sensing bulbs are labelled. "No. 1" and "No. 2". Install No. 2 sensing bulb on the No. 2 suction line.

Blower Setup and Adjustment

BWH and BWV units ship with the blower drive belt installed on the blower pulley only. Install and adjust belt as follows:

1. Remove blower access panels.

2. Loosen the motor bracket "L" bolts until belt can be replaced on both blower and motor pulleys. Turn lower nuts down away from the motor bracket. Tighten upper nuts to increase belt tension. Belt tension is correct when 10 pounds of downward force applied to the top of the belt halfway between the pulleys causes the belt to deflect downward one inch.

3. Tighten hold-down and adjusting nuts.

4. Replace blower access panels.

Electrical Wiring

BWV and BWH field wiring consists of providing supply power to the unit and low voltage system interconnection wiring.

Unit Power Supply

The installer must provide a line voltage circuit to the unit control box. Power supply must agree with electrical data on the unit nameplate. This line must include a fused disconnect switch in a location convenient to the unit.

CAUTION: All wiring must comply with applicable local and national (NEC) codes. Type and location of fused disconnect switches must comply with all applicable codes.

Apply the adhesive warning sticker provided with the unit to the cover of the disconnect switch.

Refer to the field wiring diagrams in the outdoor unit Interconnecting Wiring Booklet for unit power requirements. The blower motor is three-phase on all units but voltage rating may be 200, 230 or 460 volts. Select wire sizes and circuit fusing by referring to the field wiring diagrams and Table 2. Field wiring diagrams for accessories are shipped with the accessory.

CAUTION: Use copper conductors only. Unit terminals are not designed for use with aluminum conductors. Use of improper wiring materials can result in equipment damage.

Ground the unit according to local codes and provide flexible conduit if codes require and/or if vibration transmission may cause noise problems.

WARNING: Open electrical disconnect switch before servicing. All parts of this product capable of conducting electrical current are grounded. If grounding wires, screws, straps, clips, nuts or washers used to complete a path to ground are removed for any reason, they must be replaced and properly grounded. Failure to observe these points may result in personal injury or death due to electrical shock.

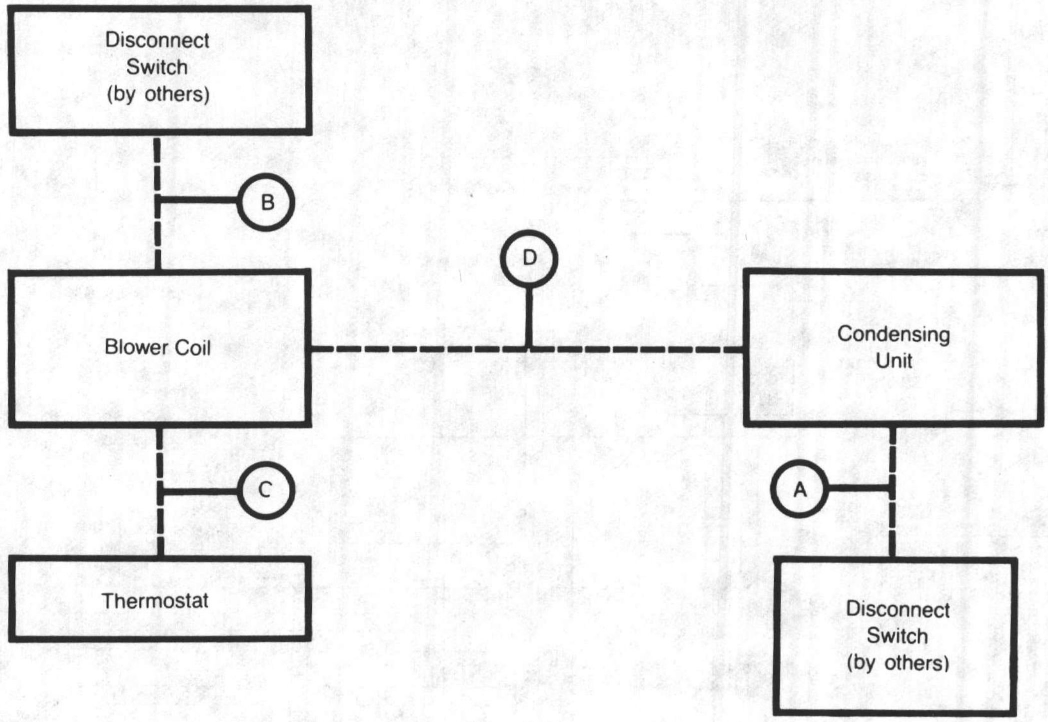
Provide supply power to the outdoor unit as described in the outdoor unit Interconnecting Wiring and Installer's Guide.

Low Voltage Wiring

Mount the indoor thermostat in accordance with the thermostat or outdoor unit installation instructions. Color coded, weatherproof wiring should be installed according to the field wiring diagram provided with the outdoor unit.

Table 2 - BWH and BWV Unit Electrical Data

Unit Model Number	Unit Characteristics		Indoor Fan Motor			
	Electrical Characteristics	Voltage Utilization Range	No. Req'd.	HP (EA.)	Speed (RPM)	FLA
BWH180B3 BWV180B3	200/230/60/3	180-254	1	3	1725	9.0/8.8
BWH180B4	460/60/3	414-506	1	3	1725	4.4
BWV180B4 BWH240B3 BWV240B3	200/230/60/3	180-254	1	5	1725	15.2
BWH240B4 BWV240B4	460/60/3	415-506	1	5	1725	6.6

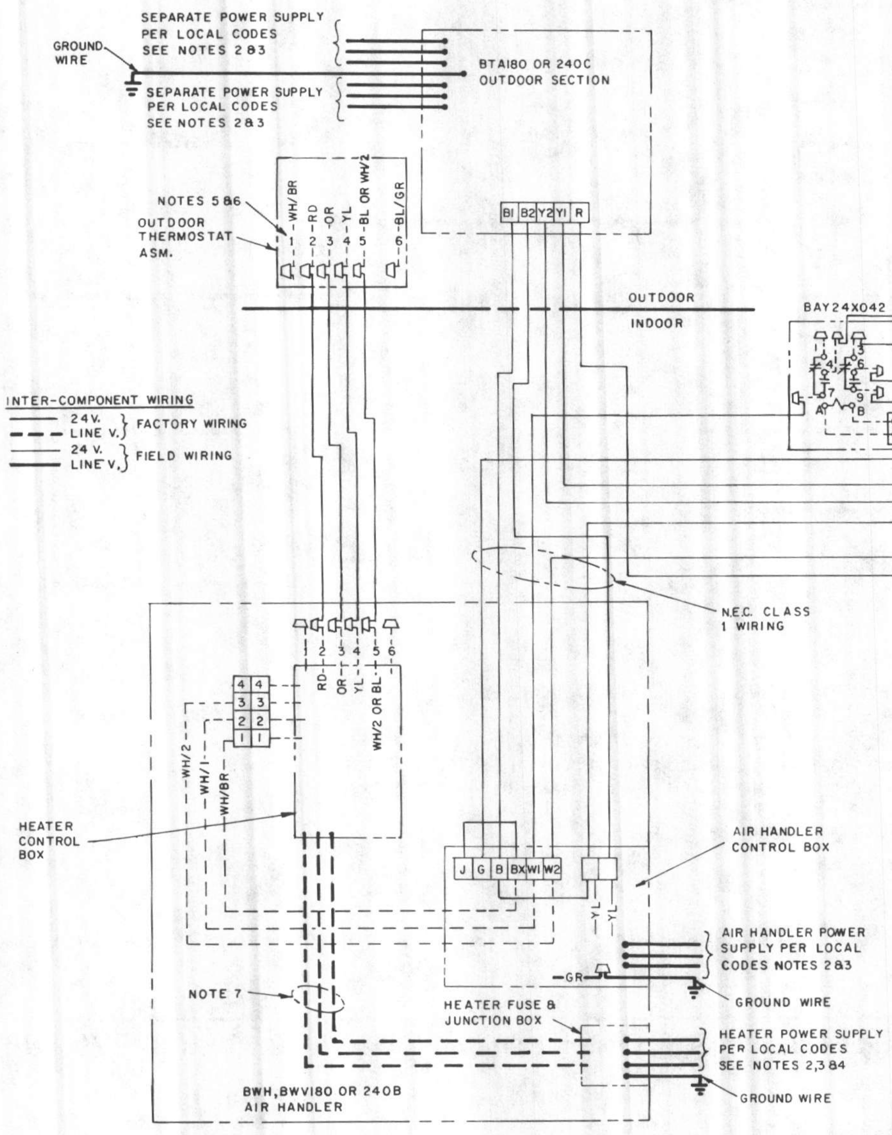


FIELD WIRING WHEN USED WITH A BTA OUTDOOR COOLING UNIT:
A — 6 power wires, line voltage
B — 3 power wires, line voltage for blower coil, no electric heat
— 6 power wires, line voltage for blower coil and electric heat
— 3 power wires, line voltage for blower coil and electric heat with single point power kit
C — Cooling only Thermostat, 7 wires, 24 volt
— Electric and relay BAY24X042, add 2 wires, 24 volt
D — 5 wires, 24 volt

NOTES:

1. Wiring shown with dash lines is to be furnished and installed by the customer. All customer-supplied wiring must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.
2. Field wiring for specific combinations of equipment can be found in BTA-W-1.

Figure 7 — Typical Electrical Connections by Customer for a BTA180,240C with a BWV/BWH180,240B

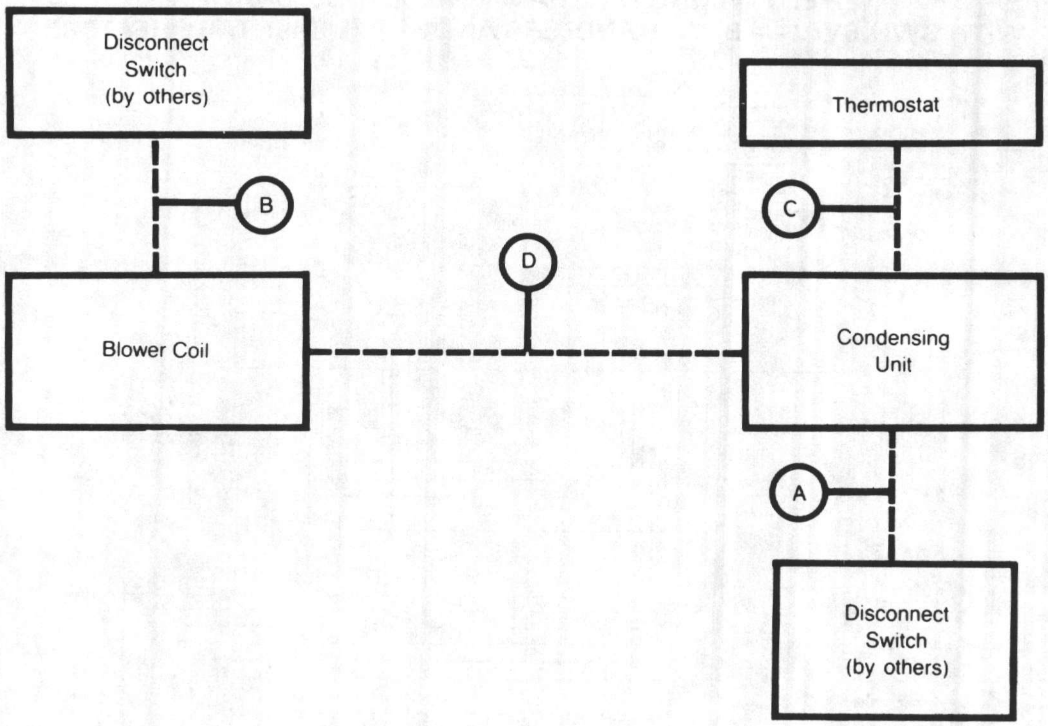


NOTES:

1. LOW VOLTAGE (24V) FIELD WIRING MUST BE 18 AWG MINIMUM.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
4. SEE HEATER WIRING DIAGRAM FOR TOTAL LINE CURRENT OF HEATER.
5. NUMBERS REFER TO TERMINALS OF POLARIZED PLUGS FURNISHED WITH HEATERS THAT HAVE OUTDOOR THERMOSTATS. CUT OFF PLUGS, AND CONNECT LEADS AS SHOWN.
6. QUANTITY OF LEADS VARIES FROM NONE (NO OUTDOOR THERMOSTATS) TO SIX (THREE OUTDOOR THERMOSTATS). DEPENDING ON HEATER MODEL. SEE HEATER WIRING DIAGRAM.
7. QUANTITY OF CONDUCTORS VARIES FROM 3 TO 9 DEPENDING ON HEATER MODEL.

From Dwg. 21C720257 Rev. 0

Figure 8 — Typical Interconnecting Wiring for a BTA180,240C with a BWV/BWH180,240B



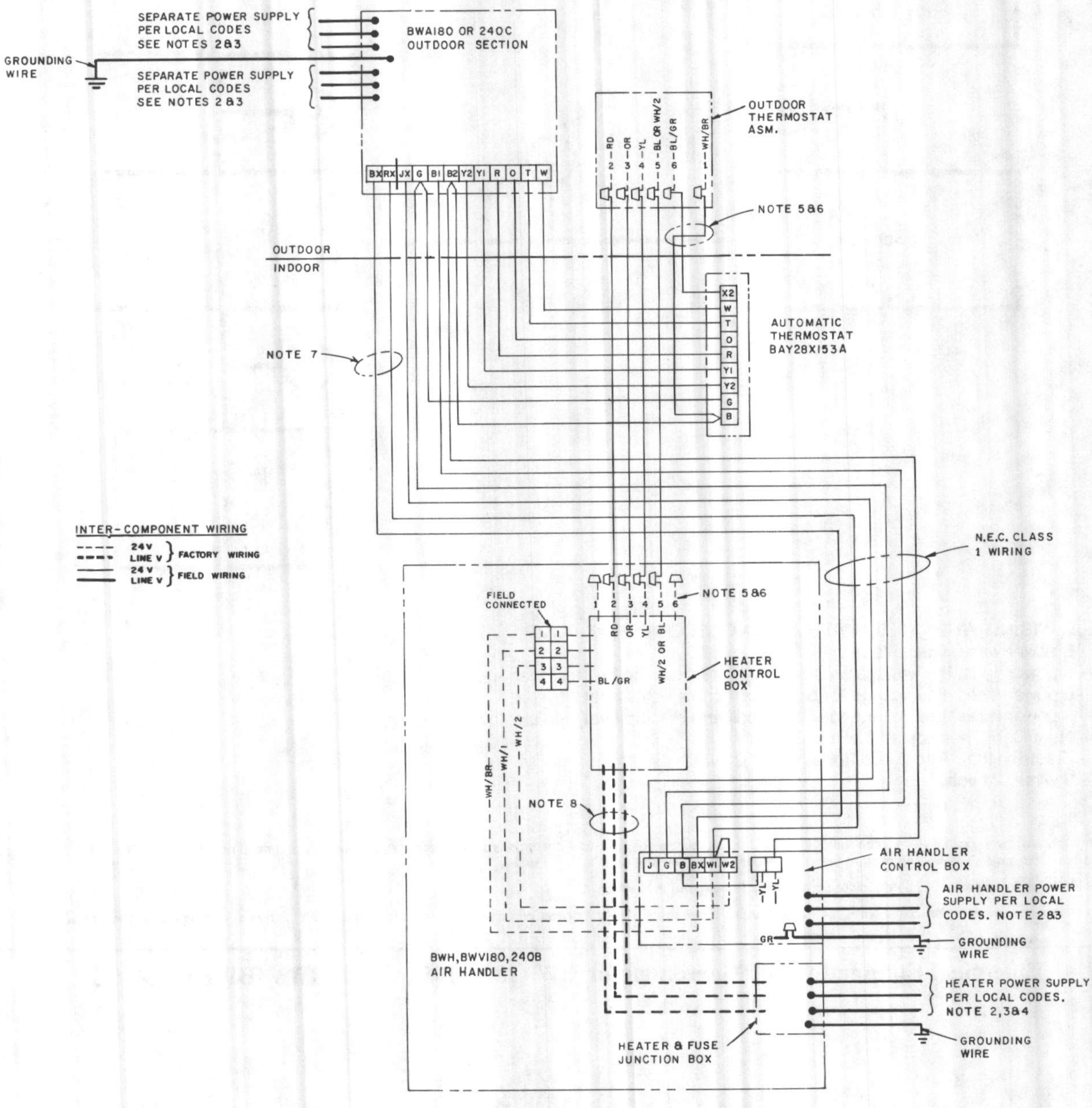
FIELD WIRING WHEN USED WITH A BWA OUTDOOR HEAT PUMP:
A — 6 power wires, line voltage
B — 3 power lines, line voltage for standard blower coil, no electric heat
— 6 power wires, line voltage for blower coil and electric heat
— 3 power wires, line voltage for blower coil and electric heat with single point power kit
C — Heat/Cool Thermostat: 8 wires, 24 volts
— Electric Heat: Add 2 additional wires, 24 volt[3]
D — 6 wires, 24 volt

NOTES:

1. Wiring shown with dash lines is to be furnished and installed by the customer. All customer supplied must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.
2. Field Wiring for specific combinations of equipment can be found in BWA-IW-1.
3. If outdoor thermostats are used 2 wires, 24 volt are required per stage of electric heat. Wires are connected from the O.D.T. to heater control box in the air handler.

Figure 9 — Electrical Connections by Customer for BWA180,240C with a BWV/BWH180,240B

FIELD WIRING DIAGRAM FOR BWA180,240C WITH BWH,BWV — B AIR HANDLERS AND SUPPLEMENTARY HEATERS



NOTES:

1. LOW VOLTAGE (24V) FIELD WIRING MUST BE #18 AWG MINIMUM.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
4. SEE HEATER WIRING DIAGRAM FOR TOTAL LINE CURRENT OF HEATER.
5. NUMBERS REFER TO TERMINALS OF POLARIZED PLUGS FURNISHED WITH HEATERS THAT HAVE OUTDOOR THERMOSTATS. CUT OFF PLUGS, AND CONNECT LEADS AS SHOWN.
6. QUANTITY OF LEADS VARIES FROM NONE (NO OUTDOOR THERMOSTATS) TO SIX (THREE OUTDOOR THERMOSTATS), DEPENDING ON HEATER MODEL. SEE HEATER WIRING DIAGRAM.
7. WIRING TO TERMINALS "BX" AND "RX" MUST BE SEPARATED FROM OTHER LOW VOLTAGE WIRING TO PREVENT INTERCONNECTION OF SEPARATE N.E.C. CLASS 2 LOW VOLTAGE CIRCUITS. N.E.C. CLASS 1 WIRING MAY BE USED FOR THIS PURPOSE.
8. QUANTITY OF CONDUCTORS VARIES FROM 3 TO 9, DEPENDING ON HEATER MODEL.

From Dwg. 21C719895 Rev. 0

Figure 10 — Typical Interconnecting Wiring for BWA with BWV/BWH Air Handler, Thermostat, and Electric Heat

Filters

Turn unit disconnect switch to OFF position, open filter access door (either side of unit) and remove filters. Filters must be replaced once unit is checked for proper operation.

CAUTION: Do not operate the unit without filters in place.

Checkout Procedure

Complete the "Installation Checklist" at the end of this manual once installation is accomplished. All operational checks (unit running) must be made after the outdoor unit is installed and system interconnection is complete. Refer to the outdoor unit installation instructions for operational checkout procedure.

Installation Checklist

Complete this checklist once the unit is installed to verify that all recommended procedures have been accomplished before starting the system. Operational check cannot be performed until the outdoor unit is installed and system interconnection is complete.

☐ Open unit electrical power disconnect switch.

☐ Inspect all field wiring connections (including electric heaters if used). All connections should be clean, tight and electrically insulated.

☐ Inspect unit ground connection(s). Grounds must comply with all applicable codes.

☐ Inspect unit suspension arrangement (if used). Unit position must be secure. Remove any tools or debris found in or near the unit.

☐ Inspect duct outlets. Outlets must be unrestricted.

☐ Inspect unit drain lines. Pipe connections must be tight and drain line unrestricted (check with water).

☐ Check Positioning of secondary drain pan (if used).

☐ Inspect for proper filters securely installed. All cabinet panels must be secured.

☐ Check for proper belt tension and pulley adjustment.

The Trane Company
Light Commercial Unitary Division
Guthrie Highway
Clarksville, TN 37040

Technical Literature Printed in U.S.A.
P.I.

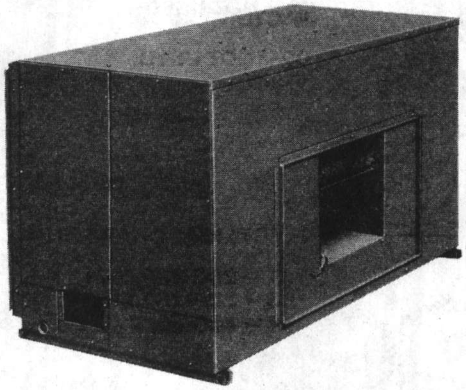
TRANE™ **BTA-M-IA**

OPERATION/MAINTENANCE GUIDE

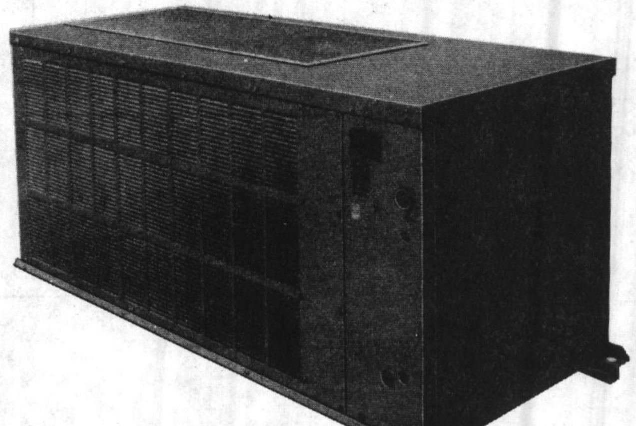
Models:
BTA090C-L
BTA120C-L
BTA180C-L
BTA240C-L
BTA090C-M
BTA120C-M
BTA180C-M
BTA240C-M

Split System Cooling

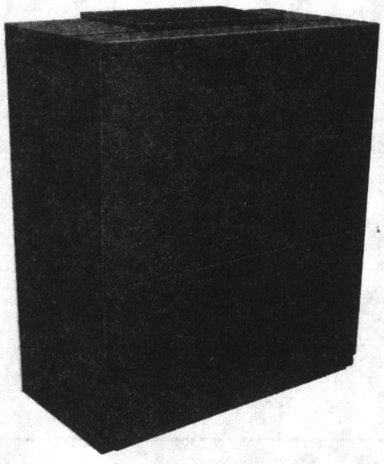
Library	Service Literature
Product Section	Unitary
Product	Split System
Model	BTA
Literature Type	Oper./Maint.
Sequence	1A
Date	March 1986
File No.	SV-UN-S/S-BTA-M-IA 3/86
Supersedes	BTA-M-I 7/85



MODELS BWH,BWV240B



MODELS BTA090,120C



MODELS BWE090,120C

MODELS BTA180,240C

22-5307-1
Dwg.No. A723711 P01
2nd Printing 1986

Unit Model Number Description

Trane LCUD products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of this multiple-character number is shown below. It will enable the owner or Service Engineer to define operation, components and applicable accessories for a specific unit.

LCUD UNIT MODEL NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12
B	T	A	1	2	0	C	3	0	0	L	A

ALWAYS "B"

PRODUCT TYPE

TA = SPLIT SYSTEM COOLING, OUTDOOR UNIT

WE = SPLIT SYSTEM COOLING OR HEAT PUMP, CONVERTIBLE INDOOR UNIT

WV = SPLIT SYSTEM COOLING OR HEAT PUMP, VERTICAL INDOOR UNIT

WH = SPLIT SYSTEM COOLING OR HEAT PUMP, HORIZONTAL INDOOR UNIT

COOLING CAPACITY (MBH)

090 = 90 MBH
120 = 120 MBH
180 = 180 MBH
240 = 240 MBH

MAJOR DESIGN SEQUENCE

ELECTRICAL CHARACTERISTICS

1 = 200-230/60/1
3 = 200-230/60/3
4 = 460/60/3

SECONDARY CAPACITY AND/OR FACTORY INSTALLED OPTIONS

00 = NOT USED

MINOR DESIGN SEQUENCE

SERVICE DIGIT

General Information

***Note:** "Warnings" and "Cautions" appear at appropriate places in this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The Trane Company assumes no liability for installations or servicing performed by unqualified personnel.*

Literature Change History
BTA-M-1A (March 1986)
Revised manual for models carrying CSA Certification.

Sequence Of Operation

GENERAL

Operation of the unit heating and cooling cycles is controlled by the position of the system switch on the room thermostat. Once the system switch is placed in either the HEAT or COOL position, unit operation is automatic. An automatic changeover thermostat when in the AUTO position automatically changes to heat or cool with sufficient room temperature change.

Evaporator Fan

The evaporator fan is controlled by an ON/AUTO switch on the room thermostat. With the switch positioned at AUTO and the unit operating in the cooling mode, fan operation coincides with the thermostat calling for cooling. When the fan switch is positioned at ON, fan operation is continuous.

COOLING MODE

With the room thermostat system switch positioned at COOL and the fan switch at AUTO, the compressor contactor energizes on a call for cooling. When the contacts of the compressor contactor close, operation of the compressor and condenser fan begins.

The evaporator fan contactor also energizes on a call for cooling and initiates evaporator fan operation.

Note: *With the thermostat fan switch in the ON position, the evaporator fan will operate continuously, regardless of compressor or condenser fan operation.*

SAFETY CONTROLS

Winding Thermostat

The winding thermostats are placed within the windings of the compressor, condenser and evaporator motors. They are designed to stop motor operation if the temperature of the motor rises excessively. Control reset is automatic after the thermostat has cooled sufficiently to close its contacts.

High Pressure Relief

The compressor is provided with an internal pressure relief valve that automatically vents hot gas on the winding thermostat when excessive pressures are experienced. Compressor operation will cease until the winding thermostat cools and resets its contacts.

Overloads

The compressor is protected from overload current damage by internal thermal overload devices. All condenser and evaporator fan motors contain overload protectors.

Maintenance

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure.

Monthly

Conduct the following maintenance inspections once per month.

WARNING: OPEN AND LOCK UNIT DISCONNECT TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

☐ Inspect air filters and clean if necessary.

☐ Check unit wiring to be sure all connections are tight and that the wiring insulation is intact.

☐ Check drain pans and condensate piping to insure they are free of obstacles.

☐ Manually rotate the condenser fan to insure proper operation. Inspect the fan mounting hardware for tightness.

☐ Inspect the evaporator and condenser coils for dirt and debris. If the coils appear dirty, clean them.

☐ With the unit operating in the cooling mode, check the suction and discharge pressures and compare them with the values provided in "Pressure Curve". Record these readings on the "Maintenance Log".

☐ Observe evaporator fan operation and correct any unusual or excessive vibration. Clean blower wheels as needed.

Annually

The following maintenance procedures must be performed at the beginning of each cooling season to insure efficient unit operation.

WARNING: OPEN AND LOCK UNIT DISCONNECT TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

☐ Perform all of the monthly maintenance inspections.

☐ With the unit operating, check unit superheat and record the reading in the "Maintenance Log".

☐ Remove any accumulation of dust and/or dirt from the unit casing.

☐ Remove corrosion from any surface and repaint. Check the gasket around the control panel door to be sure it fits correctly and is in good condition to prevent water leakage.

☐ Inspect the evaporator fan belt. If it is worn or frayed, replace it.

☐ Inspect the control panel wiring to insure that all connections are tight and that the insulation is intact.

☐ Lubricate the evaporator fan motor bearings with a non-detergent, 20-weight oil. (To insure good bearing lubrication, condenser fan motor bearings should be lubricated once every six months). Note: Some motors are permanently lubricated.

☐ Check all refrigerant piping and fittings for leaks.

Maintenance Log[1]

DATE	AMBIENT TEMP. (F)	EVAPORATOR ENTERING AIR		COMPRESSOR		SUPERHEAT	SUBCOOLING
		DRY BULB	WET BULB	SUCTION PRESS.	DISCHARGE PRESS.	CIRCUIT NO. 1 (F)	CIRCUIT NO. 1 (F)

NOTES:
1. Perform each inspection once per month (during cooling season) while unit is operating.

Troubleshooting Chart — Probable Cause

System Faults	POWER SUPPLY	GROUND FAULT	HIGH VOLTAGE WIRING	COMPRESSOR IOL OPEN	RUN CAPACITOR	START CAPACITOR	START RELAY	CONTACTOR CONTACTS	LOW VOLTAGE WIRING	CONTROL TRANSFORMER	THERMOSTAT	CONTACTOR COIL	LOW VOLTAGE FUSE	STUCK COMPRESSOR	INEFFICIENT COMP.	REF. UNDERCHARGE	REF. OVERCHARGE	EXCESSIVE EVAP. LOAD	NONCONDENSABLES	RES. O.D. AIRFLOW	O.D. AIR RECIRCULATION	FAULTY TXV	SUPERHEAT	RES. I.D. AIRFLOW	REF. CIR. RESTRICTIONS	LOW PRESSURE CONTROL	HIGH PRESSURE CONTROL
REFRIGERANT CIRCUIT																											
Head Pressure Too High																	P		S	P	S				S		
Head Pressure Too Low															S	P						S	S		S		
Suction Pressure Too High															S		P		P		S	S	S				
Suction Pressure Too Low																P			S			S	S	P	S		
Liquid Refrig. Floodback (TXV)																						P	S				
Liquid Refrig. Floodback (Cap. Tube)																	P			S	S		S	P			
I.D. Coil Frosting																P				S	S		S	P			
Compressor Runs Inadequate or No Cooling/Htg.															S	P		S	S				S	P	S		
ELECTRICAL																											
Compressor & O.D. Fan Won't Start	P	P	P					S	S	P	S	P	P													S	S
Compressor Will Not Start But O.D. Fan Runs			P	S	P	S	S	S						P													
O.D. Fan Won't Start		S	P		P			S																			
Compressor Hums But Won't Start		S			P	S	S	S						P	S												
Compressor Short Cycles			P	S	P	S	S	S						P	S	P	P	S		S			S	P	S	S	
I.D. Blower Won't Start	P	S	P						S	P	S		S														
Comp. Runs Continuously								S			P				S	S		P									

S Secondary Causes **P** Primary Causes

The Trane Company
Light Commercial Unitary Division
Guthrie Highway
Clarksville, TN 37040

Technical Literature Printed in USA
P.I.

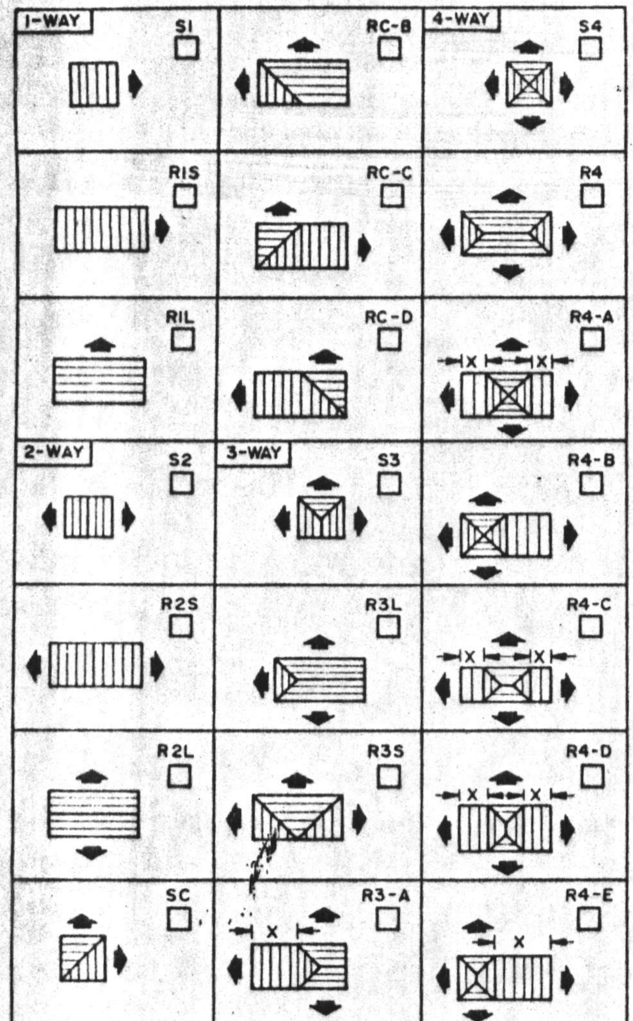
METAL*AIRE
SUBMITTAL SCHEDULE

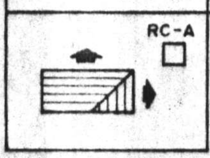
SUBMITTED BY: Hoffman & Hoffman, Inc. DATE: 12/4/86
PROJECT NAME & LOCATION Replace Air Conditioning System, New River & Camp LeJeune
ARCHITECT: ENGINEER:
CONTRACTOR: Kinston Plumbing & Heating Co. CONTR. P.O. NO. 3312

MARK	Area Served	MODEL	NECK Size	Qty.	C.F.M.	Accessories/Remarks
NA	TC-910	5000-APD-M6	6"Ø	2	--	OBD, T-Bar, 2'x2'
NA	TC-910	5000-APD-M6	8"Ø	1	--	" " "
NA	TC-910	V4004D	48x12	3	--	OBD
NA	TC-910	V4004D	32x10	1	--	"
NA	TC-910	V4004D	28x14	1	--	"
NA	TC-910	LS3D	24x12	3	--	OBD, 3-Way

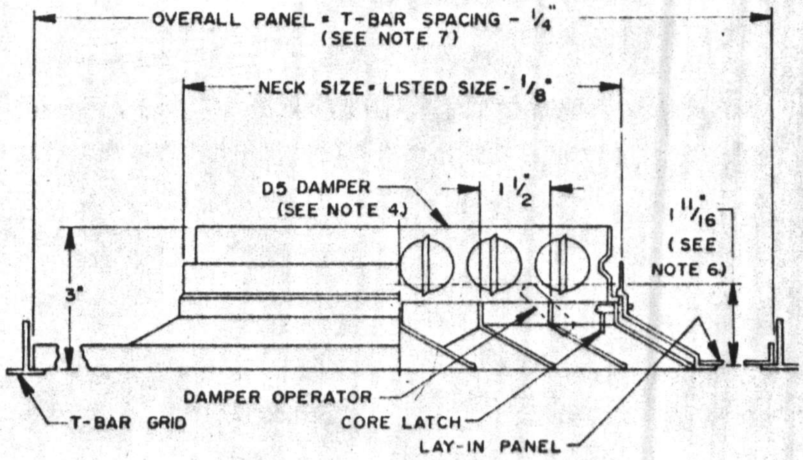
METAL INDUSTRIES, INC. M*I CLEARWATER, FLORIDA

AIR DISTRIBUTION SUBMITTAL





"S" PREFIX = SQUARE SHAPE.
"R" PREFIX = RECTANGLE SHAPE.
ALL AIR PATTERNS ARE IN 3" INCREMENTS.
NOTE: SPECIFY "X" DIMENSION.



NOTES:

1. CONSTRUCTION: FRAME OF ALUMINUM MATERIAL .055. BLADES OF ALUMINUM MATERIAL .050 THICKNESS.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: DIFFUSER CORE REMOVABLE FOR CONCEALED MTG. BY RELEASING SPRING-LOADED CORE LATCHES (4 PER UNIT)—NO TOOLS REQUIRED.
4. DAMPER: MODEL D-5 OBD FURNISHED WHEN SPECIFIED. (SEE DWG. NO. 6002.) DAMPER SNAPS INTO DIFFUSER COLLAR THROUGH FACE—NO TOOLS REQUIRED.
5. DUCT FABRICATION: DIFFUSER NECK DIM. VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 9"X9" NECK SPECIFIED—DUCT I.D. 9"X9". SERIES 5000 UNITS ARE MOUNTED WITH DUCT OUTSIDE OF NECK.
6. DIMENSION INDICATES: DISTANCE TO BOTTOM OF DUCT SHOULD BE MAINTAINED AS CLOSELY AS POSSIBLE.
7. DIFFUSER NECK: MUST BE 6" LESS THAN SPECIFIED T-BAR MODULE SIZE.
8. MAX. SIZE 42"X 42" FOR 48"X 48" TILE SIZE.
   MIN. SIZE 6"X 6" FOR 12"X 12" TILE SIZE.

METAL*AIRE®
Aluminum Air Distribution Products

SERIES 5000
MODEL M-6
DIRECTIONAL AIR DIFFUSER
☐ WITH D-5 OB DAMPER

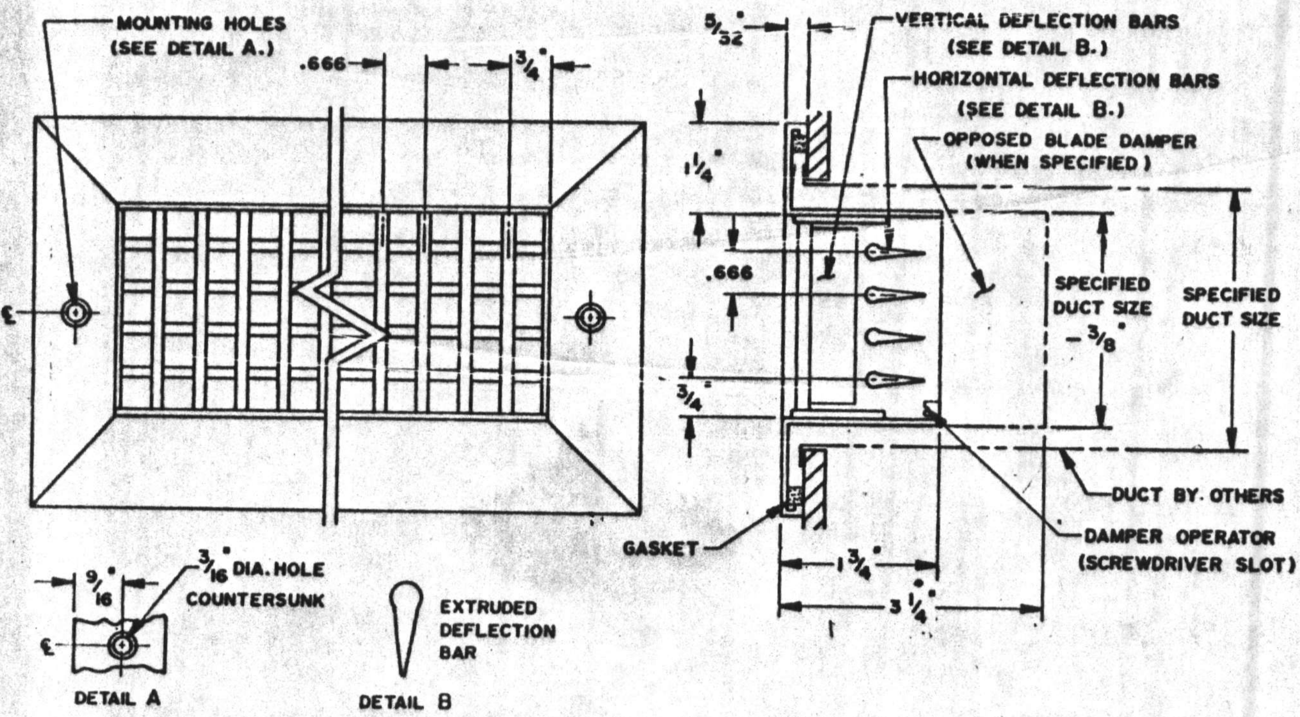
JOB NAME: ____________
LOCATION: ____________
ARCHITECT: ____________
ENGINEER: ____________
CONTRACTOR: ____________

SUBMITTED BY:

DRAWN BY:	JG	CHK'D. BY:	KR
DATE:	12 FEB 1970	DWG. NO.	1010-2

METAL*AIRE® METAL INDUSTRIES, INC., Clearwater, Florida

AIR DISTRIBUTION SUBMITTAL



NOTES:

1. CONSTRUCTION: FRAME OF HEAVY DUTY EXTRUDED ALUMINUM MATERIAL .045 THICKNESS. DEFLECTING BARS OF EXTRUDED ALUMINUM MATERIAL .160 TAPPERED TO A SEMI-AIR-FOIL SHAPE.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: UNIT MOUNTING SCREWS FURNISHED.
4. DAMPER: OPPOSED BLADE DAMPER FURNISHED WHEN SPECIFIED. FOR DETAILS OF DAMPER CONSTRUCTION SEE DRAWING NO. 6005.
5. FRAME: GASKETED TO PREVENT AIR LEAKAGE AND MINIMIZE SMUDGING.
6. DUCT FABRICATION: UNIT COLLAR OR NECK DIMENSIONS VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 14" X 6" SPECIFIED, DUCT I.D. 14" X 6".

METAL*AIRE®
Aluminum Air Distribution Products

MODEL V4004 OR V4004D

DOUBLE DEFLECTION
SIDEWALL SUPPLY

☐ MODEL V4004 (GRILLE - NO DAMPER)
☐ MODEL V4004D (REGISTER - WITH DAMPER)

JOB NAME:
LOCATION:
ARCHITECT:
ENGINEER:
CONTRACTOR:

SUBMITTED BY:

WN BY:	JG	CHK'D. BY:	KR
TE:	3 APR 1970	DWG. NO.	4010

METAL*AIRE® METAL INDUSTRIES, INC., Clearwater, Florida

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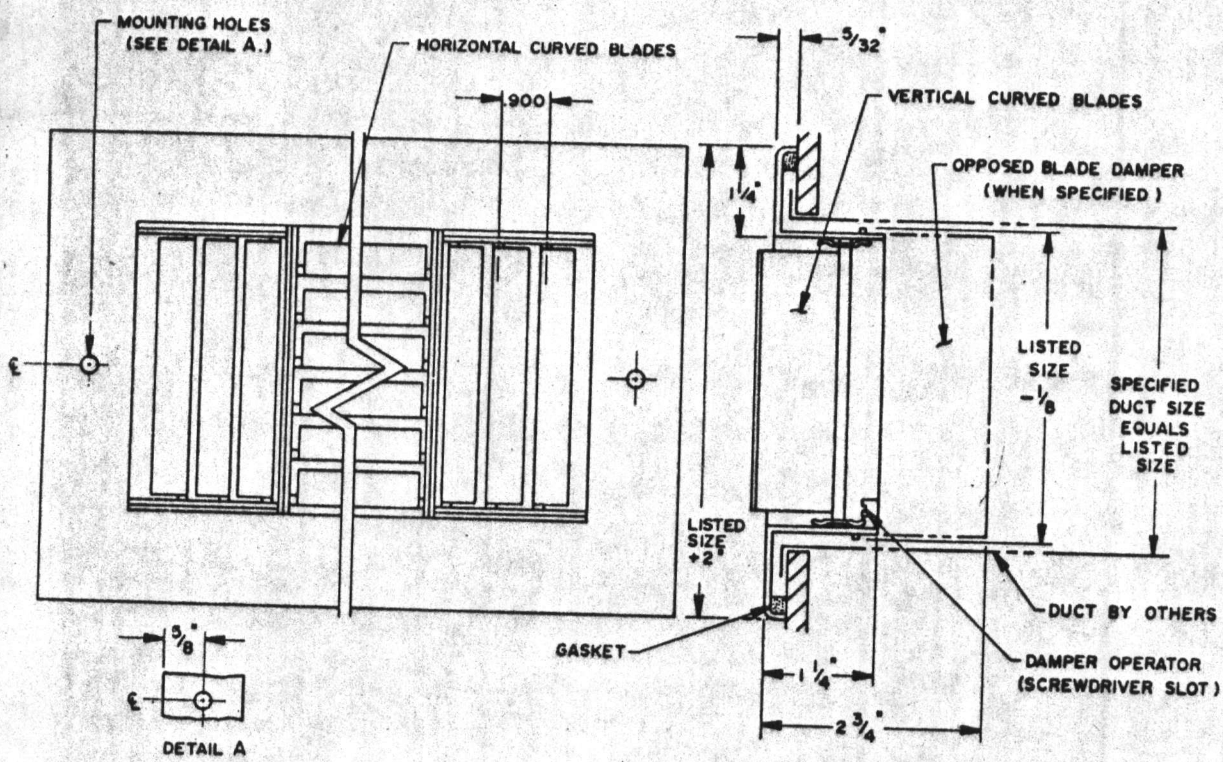

NOTES:

1. CONSTRUCTION: FRAME OF .040 ALUMINUM MATERIAL. BLADES OF .032 ALUMINUM MATERIAL. FRAMES ARE 1-PIECE CONSTRUCTION THRU SIZE 14" X 14". SIZES ABOVE 14" X 14" HAVE HEAVY-DUTY EXTRUDED ALUMINUM FRAMES.
2. FINISH: SATIN ALUMINUM ENAMEL.
3. MOUNTING: UNIT MOUNTING SCREWS FURNISHED.
4. DAMPER: OPPOSED BLADE DAMPER FURNISHED WHEN SPECIFIED. FOR DETAILS OF DAMPER CONSTRUCTION SEE DRAWING NO. 6006-1.
5. FRAME: GASKETED TO PREVENT AIR LEAKAGE AND MINIMIZE SMUDGING.
6. DUCT FABRICATION: UNIT COLLAR OR NECK DIMENSIONS VARY SLIGHTLY, THEREFORE DUCTS MUST BE FABRICATED TO SPECIFIED NOMINAL SIZE, I.E., 14" X 6" SPECIFIED, DUCT I.D. 14" X 6"

METAL*AIRE®
Aluminum Air Distribution Products

MODEL LS3 OR LS3D

CURVED BLADE SUPPLY

☐ MODEL LS3 (GRILLE-NO DAMPER)
☐ MODEL LS3D (REGISTER-WITH DAMPER)

DRAWN BY:	J.E.W.	CHK'D. BY:	E.MCA
DATE:	9/16/83	DWG. NO.	4136

JOB NAME:
LOCATION:
ARCHITECT:
ENGINEER:
CONTRACTOR:

SUBMITTED BY: