

Number One
Air Conditioning
Maker

Carrier

Advance Product Data

Carrier Parkway • Syracuse, N.Y. 13221

CARRIER

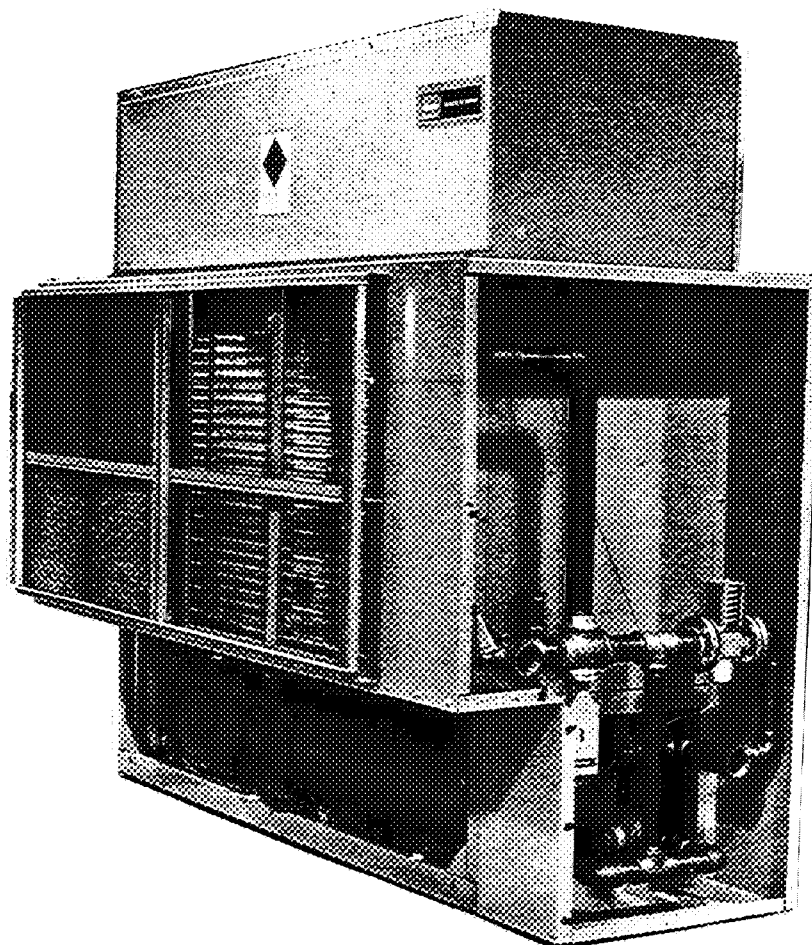
MODU-VAC

50BJ 016-064

WITH

NOMINAL 15-60 TONS

HYDRONIC ECONOMIZER



Book	1
Tab	2a

12/83

PC 111

Form 50BJ-1APD New

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Printed in U.S.A.

Catalog No. 525-092

Modu-Vac, the single packaged indoor cooling unit especially designed for VAV application, now is available with factory installed "Hydronic Economizer".

"Hydronic Economizer" is a unit accessory that will consist of a pre-cooling water coil and accessory controls that will use cooling tower water, when cold enough, to pre-cool the air before it re-enters the Modu-Vac unit. That will enable mechanical refrigeration to shut down, and save energy.

Modu-Vac contains a microprocessor as it's VAV controller. That means that "Hydronic Economizer" is fully integrated. An integrated economizer allows the simultaneous operation of both mechanical refrigeration and economizer to achieve maximum energy savings.

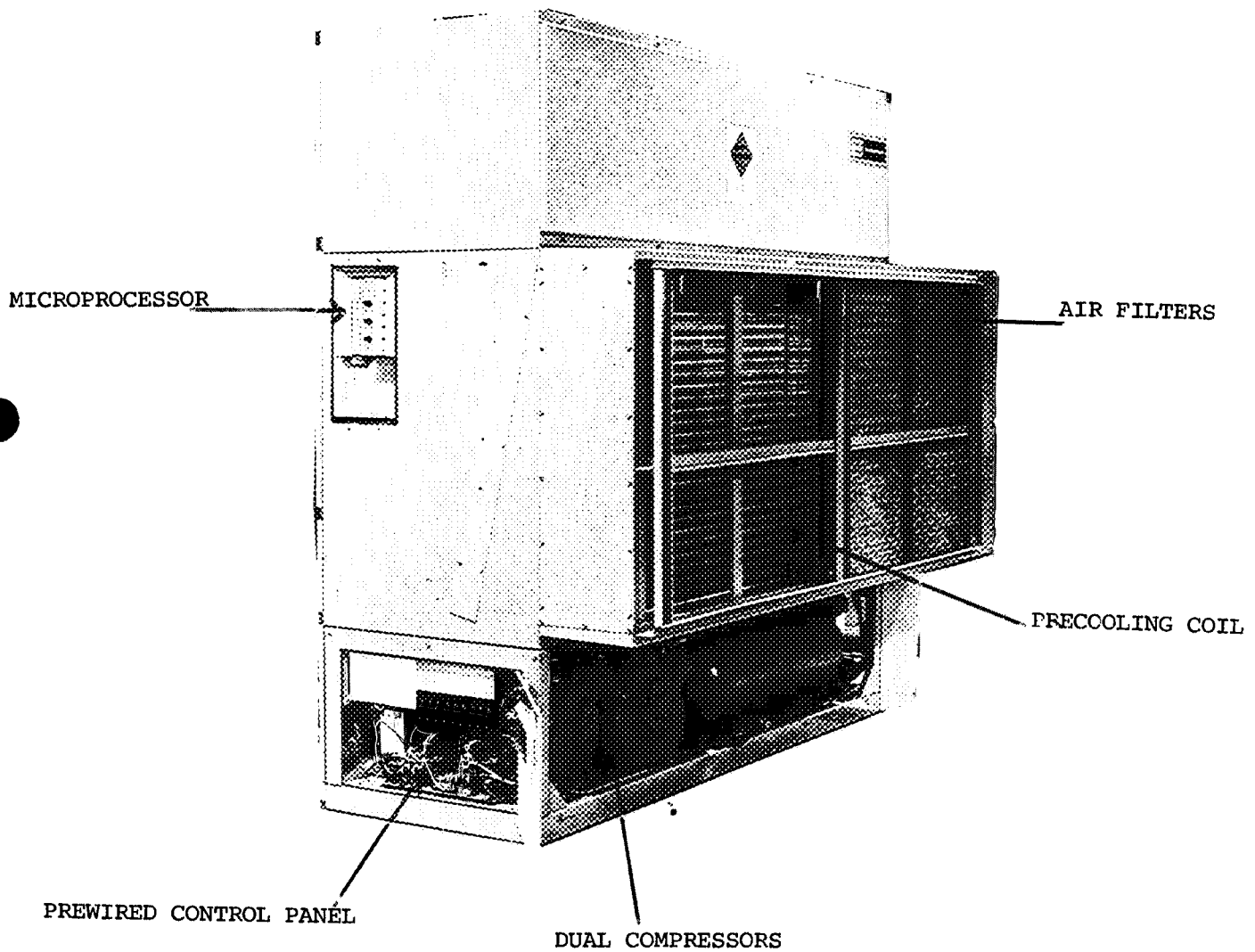
Modu-Vac, in 20-60 ton sizes, contains two compressors for maximum steps of unloading. So, with multiple compressors and integrated "Hydronic Economizer", the part and full load energy story belongs to Modu-Vac!

APPLICATION NOTES

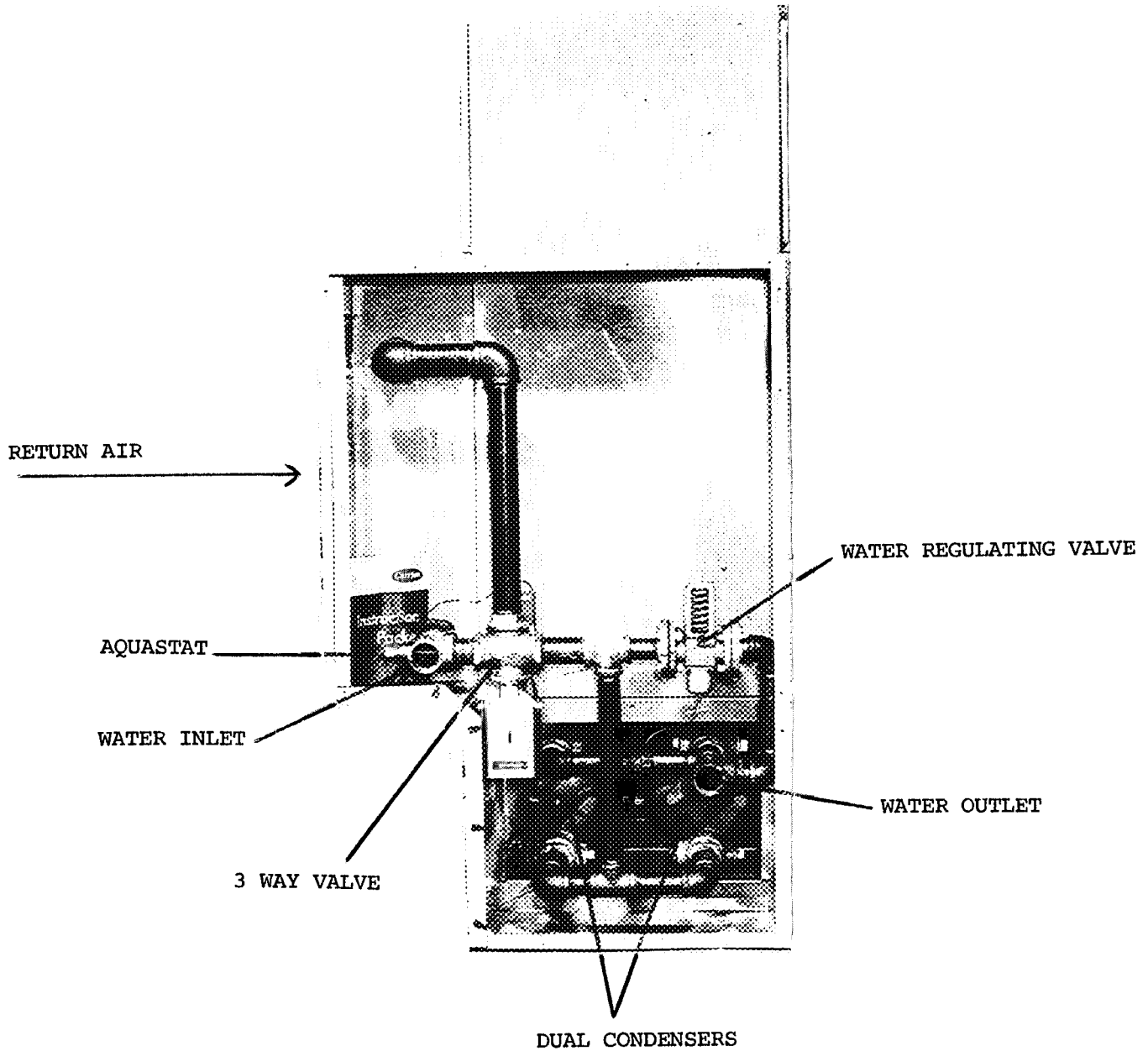
Proper condenser water treatment and maintenance is strongly recommended to assure reliable, economical performance.

Condenser entering water temperatures should not be allowed to drop below 45°F, nor should water flow exceed 3 gpm/ton nor go below 1.5 gpm/ton.

COMPONENT LOCATIONS

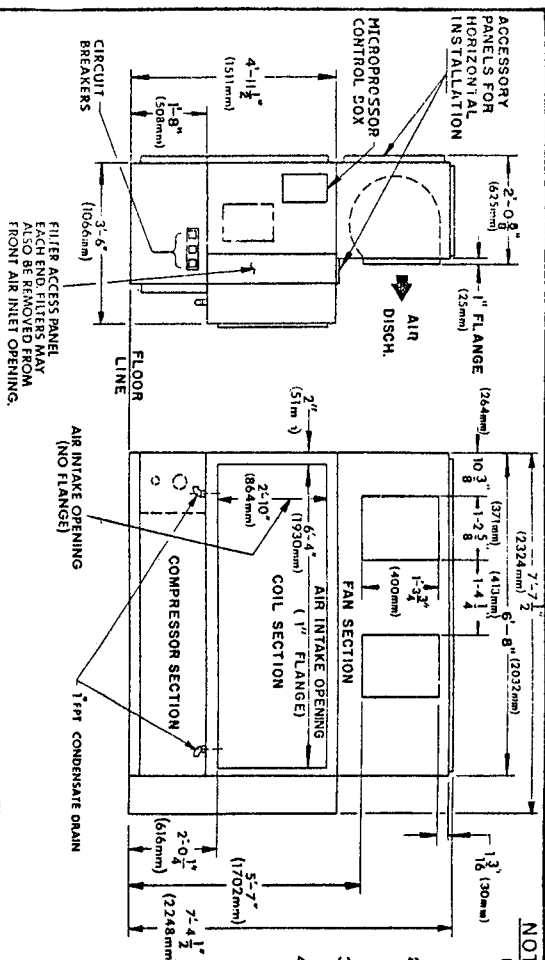


COMPONENT LOCATIONS



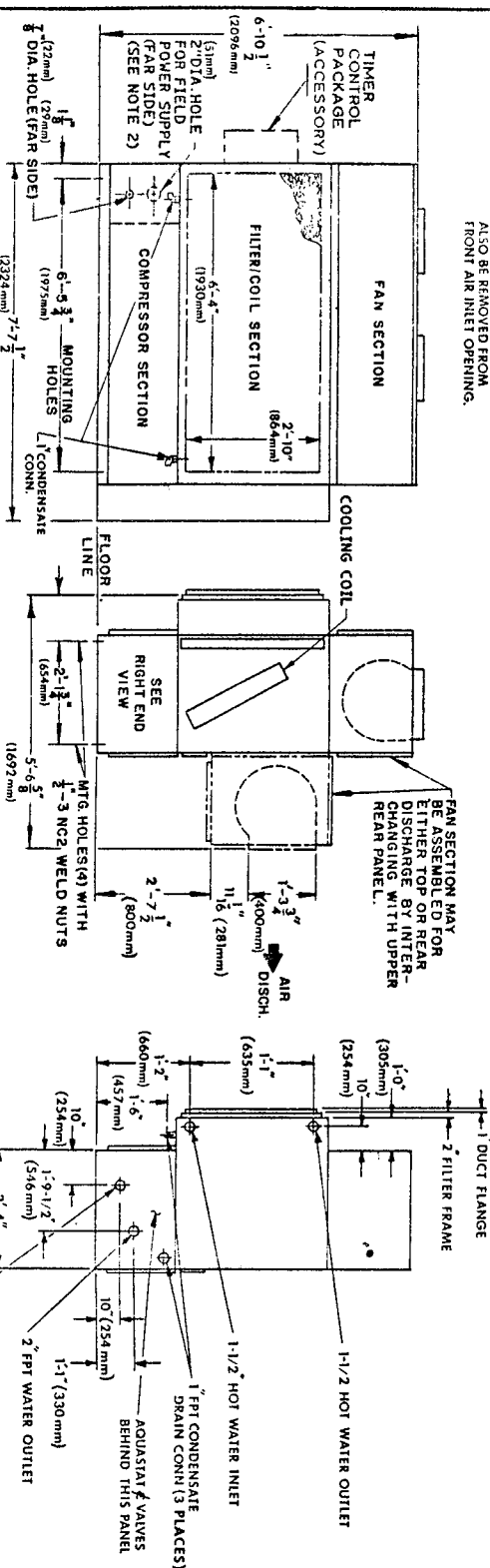
PHYSICAL DIMENSIONS

CODE: 0B, CATALOG NO.



NOTES

1. THE APPROXIMATE NET WEIGHT OF THE BASE UNIT INCLUDING FAN SECTION AND DRIVE IS AS FOLLOWS—
50B.016—2220 LBS. 50B.024—2800 LBS.
2. FOR FRONT ELECTRICAL CONNECTIONS, INTERCHANGE FRONT AND REAR COMPRESSOR SECTION PANELS.
3. HOLES ARE PROVIDED IN RIGHT END COMPRESSOR SECTION PANEL TO ACCEPT PIPE SIZES SHOWN.
4. ALLOW THREE FEET SERVICE CLEARANCE ON THE LEFT SIDE AND FRONT AND TWO FEET ON THE RIGHT SIDE AND BACK.



MARK FOR:		COOLING PERFORMANCE		HEATING PERFORMANCE	
UNIT NO.	GTH	SH	WATER ENT TEMP.	PRECOOL COIL	MODEL NO.
LOCATION	COMPR KW	ENT AIR DB	WATER ENT TEMP.	GTH	TYPE
	W/B	LV AIR DB	TEMP AIR ENT	BTUH	ENT AIR DB
	CFM	EXT SP	HP	GPM	LV
MODEL NO.	EL EC CHAR	REF	FOUL FACT.	TEMP WATER ENT.	GPM
DATE	SUPPLIES			STEAM PRESS.	
50B4 016/024 SINGLE-PACKAGE COOLING UNIT WITH HYDRONIC ECONOMIZER					
JOB NAME					
JOB LOCATION					
BUYER					
BUYER NO.					
CARRIER NO.					
DATE					
REV.					

Carrier

CARRIER AIR CONDITIONING COMPANY
DIVISION OF CARRIER CORPORATION, SYRACUSE, N.Y.
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50B4

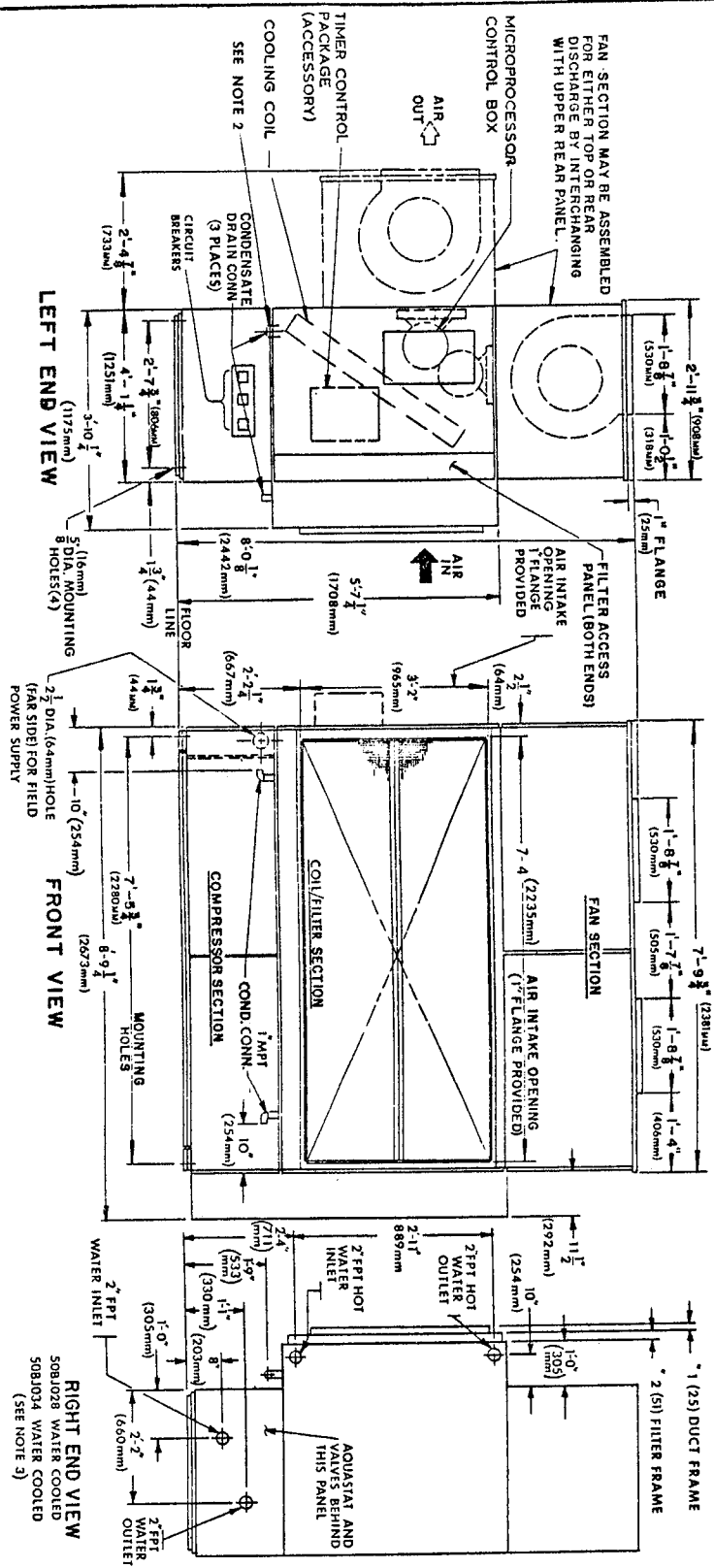
PHYSICAL DIMENSIONS

CODE: 08

NOTES:

1. THE APPROXIMATE NET WEIGHT OF THE BASE UNIT INCLUDING FAN SECTION AND DRIVE IS AS FOLLOWS:
 WATER COOLED 50BJ028 185 LBS.
 50BJ034 215 LBS.
2. PROVIDE OPENING IN UNIT PANEL FOR CONDENSATE CONNECTION TO SUIT INSTALLATION.
3. HOLES ARE PROVIDED IN RIGHT END COMPRESSOR SECTION. PANEL TO ACCEPT PIPE SIZES SHOWN.
4. ALLOW THREE FEET SERVICE CLEARANCE ON THE LEFT SIDE AND FRONT AND TWO FEET ON THE RIGHT SIDE AND BACK.

PRELIMINARY



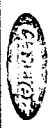
MARK FOR:		COOLING PERFORMANCE		HEATING PERFORMANCE	
UNIT NO.	SH	WATER ENT TEMP	PRECOOL COIL	MODEL NO.	JOB NAME
LOCATION	ENT. AIR DB	TEMP AIR ENT	TYPE	ROWS	JOB LOCATION
CFM	WB	TEMP WATER ENT	BTUH	ENT AIR DB	BUYER
MODEL NO.	EXT SP	PSI DROP	WATER ENT	LV	BUYER NO.
DATE	REF	FOUL FACT.	STEAM PRESS.		CARRIER NO.
50BJ 028 & 034 SINGLE-PACKAGE COOLING WITH HYDRONIC ECONOMIZER					
DIMENSIONS CERTIFIED BY					
REV.					

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50BJ

PHYSICAL DIMENSIONS

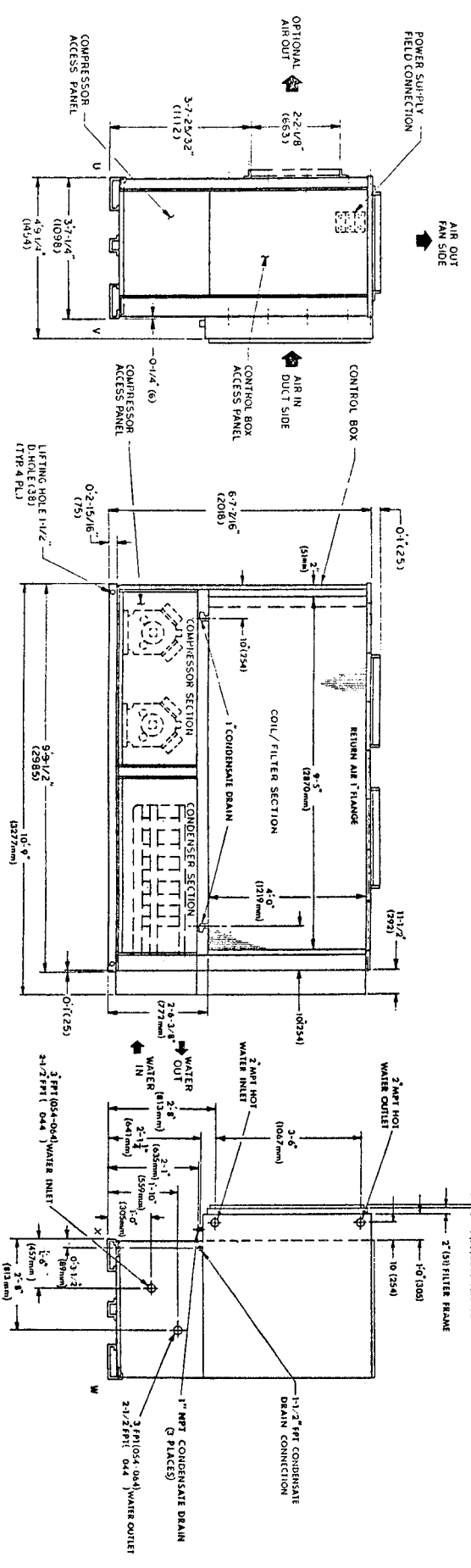
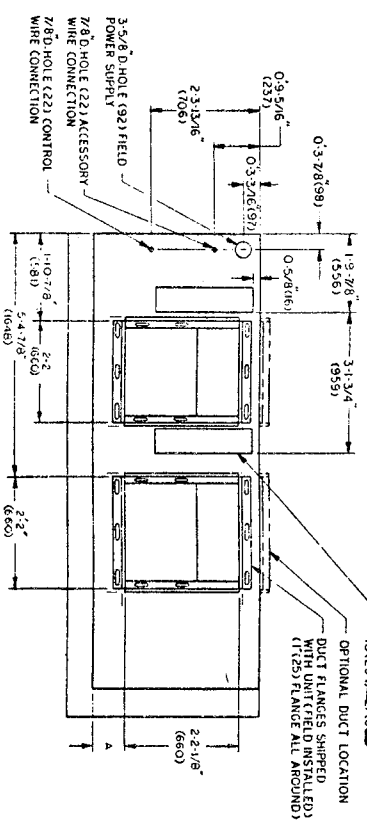


Carrier Corporation, Syracuse, New York
50BU

UNIT	OPERATING WEIGHT		CORNER WEIGHT			
	LBS	KG	LBS	KG	LBS	KG
50BU04						
50BU05.4						
50BU06.4						

UNIT	A
STANDARD TOP AIR OUT	0-8-3/16" (208)
OPTIONAL TOP AIR OUT	1-4" (102)

PRELIMINARY



- NOTES:
- 1. DIMENSIONS IN () ARE IN MM UNLESS OTHERWISE SPECIFIED.
 - 2. ALLOW 4" SERVICE CLEARANCE ON THE FRONT AND SIDES OF THE UNIT. ALLOW 3" OPTIONAL SERVICE CLEARANCE ON THE BACK SIDE OF THE UNIT.

50BU/BT 04-06.4 COOLING UNIT WITH HYDRONIC ECONOMIZER

DATE 9-30-83
SUPERSEDES

SELECTION PROCEDURE (WITH EXAMPLE)

I. Determine design conditions.

Given:

Total Cooling Capacity (TC/Btuh)	750,000
Sensible Cooling Capacity (SHC/Btuh)	615,000
Evaporator Air Quantity (cfm)	24,000
Entering Air Conditions (tedb)	82
(tewb)	67
Entering Condenser Water Temp. (tew)	85
Economizer Coil and Filter Pressure Drop (in. w.g.)	.5
External Static Pressure (in. w.g.)	1.5

- (A) Go to pages 8-11 in the 50BJ,BK-2P Catalogue. Enter the top and left side of the gross cooling capacity tables of the 50BJ unit whose capacity is closest to the required capacity. Read down and across to obtain the following data:

Unit Selection - 50BJ064 selected at 24,000 cfm of 82/67 ent. air.

TC	= 762,000
SHC	= 625,624 (corrected for 82F Db)
Compressor Power Input	= 53.5 KW
Condenser:	
(tew)	85F
(gpm)	180

Refer to table 1 for total system (condensers, hydronic coil, and valves) water side pressure drop. At 180 gpm total pressure drop is 29 feet.

II. Determine required fan rpm and bhp.

- (A) Enter table 2 and determine the static pressure drop across the pre-cooling coil and filters (.46). Add this value to the system E.S.P. (1.5). Total ESP now equals $.46 + 1.5 = 1.96$, say 2.0.
- (B) Enter the Evaporator Fan Performance curve in 50BJ,BK-2P for the selected unit at given air quantity (24,000 cfm) and external static pressure (2.0"). Find that for a 50BJ064 unit, fan rpm is 1005 and required bhp 24.5.
- (C) In the unit Physical Data table, check the factory included indoor evaporator fan pulley speed ratings - 922 or 1032 rpm and nominal Hp (25) for the selected unit size. The standard 25 Hp motor is acceptable. Refer to 50BJ,BK-2P page 17 for required alternate pulleys.

PRECOOLING COIL CAPACITY 50BJ016

EWT		CFM							
		3000		4500		6000		7500	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	22	110	90	143	118	170	140	190	155
	45	116	95	158	129	192	158	220	181
55	22	68	64	90	84	106	100	120	112
	45	73	68	99	93	121	100	139	130
65	22	39	39	51	51	61	61	68	68
	45	41	41	56	56	68	68	79	79
75	22	13	13	18	18	20	20	23	23
	45	14	14	20	20	23	23	26	26

PRECOOLING COIL CAPACITY 50BJ024

EWT		CFM							
		4000		6000		8000		10000	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	30	146	119	191	157	226	186	262	215
	60	157	130	213	174	260	214	303	248
55	30	93	87	122	115	146	137	164	159
	60	98	92	134	126	163	153	190	178
65	30	53	53	69	69	83	83	93	93
	60	55	55	76	76	92	92	107	107
75	30	18	18	24	24	28	28	32	32
	60	19	19	25	25	31	31	36	36

PRECOOLING COIL CAPACITY 50BJ028

EWT		CFM							
		5000		7500		10000		12500	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	38	182	149	239	196	283	232	316	259
	75	194	159	264	216	321	263	369	302
55	38	114	107	150	146	177	166	198	186
	75	122	114	165	155	201	189	231	217
65	38	65	65	85	85	101	101	113	113
	75	69	69	94	94	114	114	131	131
75	38	22	22	29	29	34	34	38	38
	75	23	23	32	32	39	39	44	44

PRECOOLING COIL CAPACITY 50BJ034

		CFM							
EWT		6000		9000		12000		15000	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	44	214	175	276	226	325	266	366	300
	90	229	188	306	251	372	305	431	353
55	44	134	126	173	162	204	191	229	215
	90	143	135	192	180	233	219	270	253
65	44	76	76	98	98	116	116	131	131
	90	81	81	109	109	133	133	154	154
75	44	26	26	33	33	39	39	44	44
	90	27	27	37	37	45	45	52	52

PRECOOLING COIL CAPACITY 50BJ044

EWT		CFM							
		8000		12000		16000		20000	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	60	296	242	389	319	464	380	524	429
	120	313	257	426	349	521	427	605	496
55	60	185	174	243	229	291	273	328	308
	120	196	184	267	251	326	306	378	356
65	60	105	105	138	138	165	165	186	186
	120	111	111	152	152	185	185	215	215
75	60	35	35	47	47	56	56	63	63
	120	37	37	51	51	63	63	73	73

PRECOOLING COIL CAPACITY 50BJ054

EWT		CFM							
		10000		15000		20000		25000	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	75	338	277	434	356	506	414	561	460
	150	367	300	490	402	588	482	669	549
55	75	212	199	272	256	317	298	352	331
	150	229	215	307	288	368	346	420	394
65	75	120	120	155	155	181	181	200	200
	150	130	130	175	175	210	210	239	239
75	75	41	41	53	53	61	61	68	68
	150	44	44	59	59	71	71	81	81

PRECOOLING COIL CAPACITY 50BJ064

EWT		CFM							
		16000		20000		22000		24000	
T°F	GPM	TC	SHC	TC	SHC	TC	SHC	TC	SHC
45	90	467	383	531	435	557	457	581	476
	180	521	427	603	495	642	527	674	553
55	90	293	275	333	313	350	328	364	342
	180	326	306	378	355	403	378	423	397
65	90	167	167	190	190	199	199	207	207
	180	185	185	215	215	229	229	241	241
75	90	53	53	64	64	67	67	70	70
	180	63	63	73	73	78	78	81	81

RATINGS BASED ON 80° DB/67° WB ENTERING AIR TEMPERATURE

TC = TOTAL CAPACITY (MBH)
 SHC = SENSIBLE CAPACITY MBH
 EWT = ENTERING WATER TEMPERATURE (F)

TABLE 1

TOTAL SYSTEM WATER SIDE PRESSURE DROP (FT. W.G.)

50BJ	GPM/TON			
	1.5	2	2.5	3
016	6.5	9.5	14	19
024	8.0	12.5	18.5	26
028	8.0	12.5	19	26
034	8.5	14	21	28.5
044	11	18.5	27.5	37
054	14	23	35	50.5
064	8.5	14	21	29

NOTE: Interpolation is permissible. Do not extrapolate.

TABLE 2

ECONOMIZER AIR SIDE PRESSURE DROP (IN. W.G.)

50BJ	CFM	ΔP		CFM	ΔP
016	3000	.06	044	8000	.08
	4500	.12		12000	.16
	6000	.20		16000	.25
	7500	.28		20000	.36
024	4000	.09	054	10000	.12
	6000	.20		15000	.23
	8000	.29		20000	.36
	10000	.39		25000	.48
028	5000	.09	064	16000	.26
	7500	.17		20000	.36
	10000	.28		22000	.41
	12500	.39		24000	.46
034	6000	.12			
	9000	.18			
	12000	.34			
	15000	.39			

TABLE 3

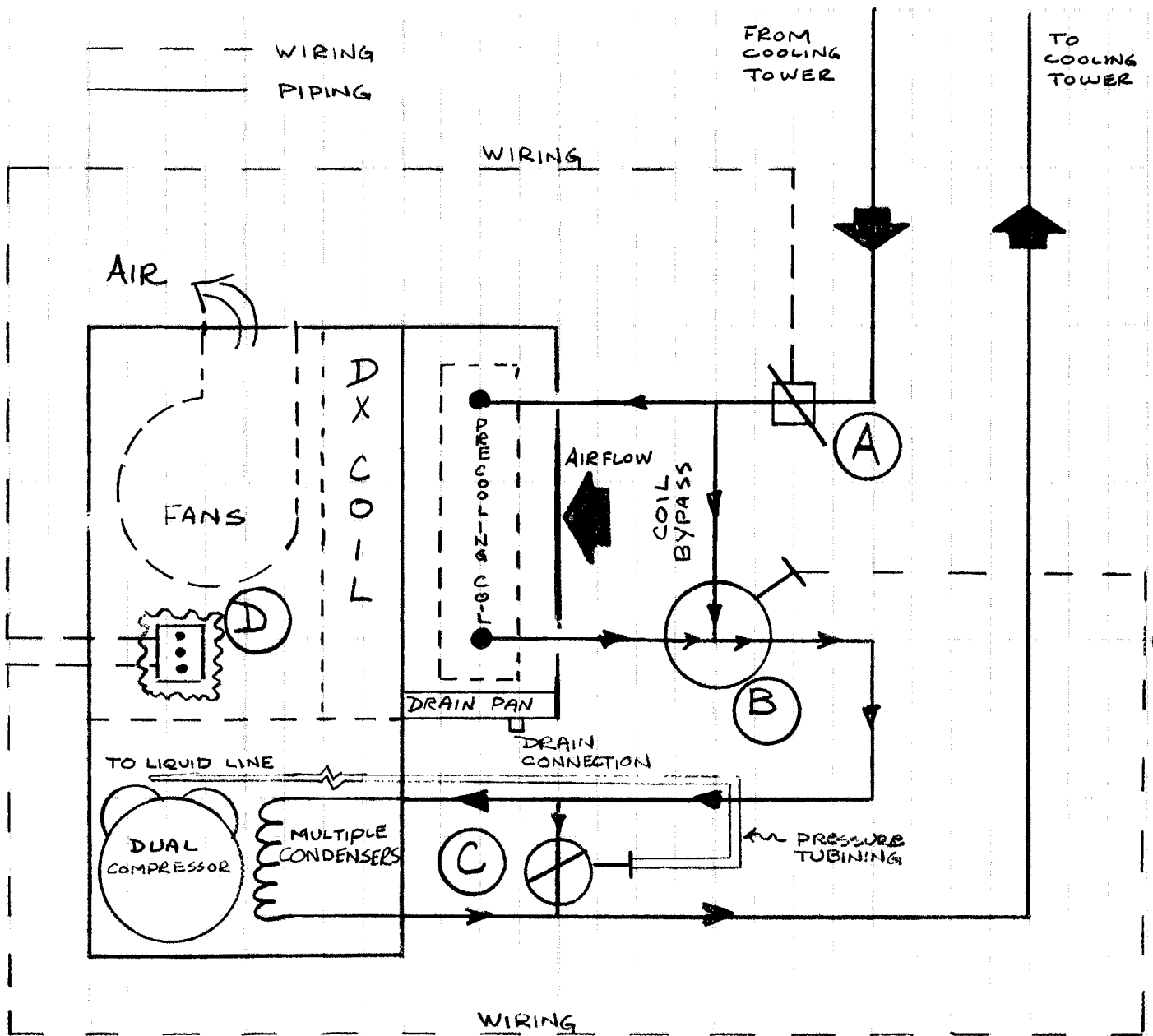
ACCESSORY HOT WATER HEATING COIL CAPACITY

50BJ	CFM	TC	LAT	GPM	Δ P AIR (IN. W.G.)	Δ P WATER (FT.)
016	6000	180	107	12	.12	1.5
024	8000	240	107	16	.17	2.0
028	10000	300	107	20	.13	2.0
034	12000	360	107	24	.17	2.5
044	16000	480	107	32	.12	1.5
054	20000	600	107	40	.16	2.0
064	24000	720	107	48	.22	2.5

RATINGS BASED ON 180° EWT, 150° LWT, AND 80° EAT.

TC = TOTAL CAPACITY (MBH)
LAT = LEAVING AIR TEMPERATURE (F)
EWT = ENTERING WATER TEMPERATURE (F)
LWT = LEAVING WATER TEMPERATURE (F)
EAT = ENTERING AIR TEMPERATURE (F)

TYPICAL PIPING



- A - CHANGEOVER AQUA-STAT/SENSES CHANGEOVER
- B - THREE-WAY VALVE/ENERGIZES PRE-COOLING COIL
- C - TWO-WAY VALVE/MAINTAINS HEAD PRESSURE
- D - MICROPROCESSOR/"THE LOGICAL CONTROLLER"

"NOT TO SCALE"

OPERATING SEQUENCE

Pt. A (Aqua-stat) is pre-set for a desired changeover water temperature (approx. 45° - 75°).

Pt. D (microprocessor) is pre-set for a desired leaving air temperature, from the unit (e.g. 55° Db).

Unit Start-up

The microprocessor will use economizer if the condenser water is less than or equal to pre-set changeover temperature.

Unit Operation

When T° condenser water is less than or equal to the pre-set changeover temperature:

The changeover Aqua-stat at Pt. A will signal the microprocessor at Pt. D that economizer cooling is now possible. The microprocessor will signal the three-way valve at Pt. B to change position and allow flow through the pre-cooling coil. That coil will pre-cool the air before it reaches the DX cooling coil. If additional cooling capacity is needed, the microprocessor will stage on compressor steps, to maintain desired leaving air temperature. The two-way valve at Pt. C will automatically maintain unit head pressure, if needed. The unit is now in the "Integrated Economizer" mode.

When T° condenser water goes above the pre-set changeover temperature:

The three-way valve at Pt. B will move to it's bypass position. The water from the cooling tower will by-pass the pre-cooling coil and be used only for the condensers. Normal mechanical cooling will be utilized.

GUIDE SPECIFICATIONS

Hydronic Economizer coil shall have aluminum plate fins mechanically bonded to seamless 1/2" copper tubing. The coil shall be 4 rows with 10 fins per inch. Dual condensate drains are provided (only 1 required) in addition to the base unit condensate drain. A (high velocity) filter section and filters are provided. The filter section contains a 1" duct flange. Controls consist of a 3-way valve, reverse acting 2-way valve, and an aquastat. The unit microprocessor shall control the modulation of the 3-way valve. The entire economizer piping section is enclosed in a sheet metal cabinet - painted to match the base unit. All components, piping, and necessary wiring shall be factory installed. Optional heating coil shall be factory installed.