



RecipPak LIQUID CHILLERS WATER COOLED - RECIPROCATING HERMETIC

INSTALL., OPER., MAINT.

Supersedes: 150.24-NM27 (1295)

Form 150.24-NM27 (298)

MODELS

60 HZ

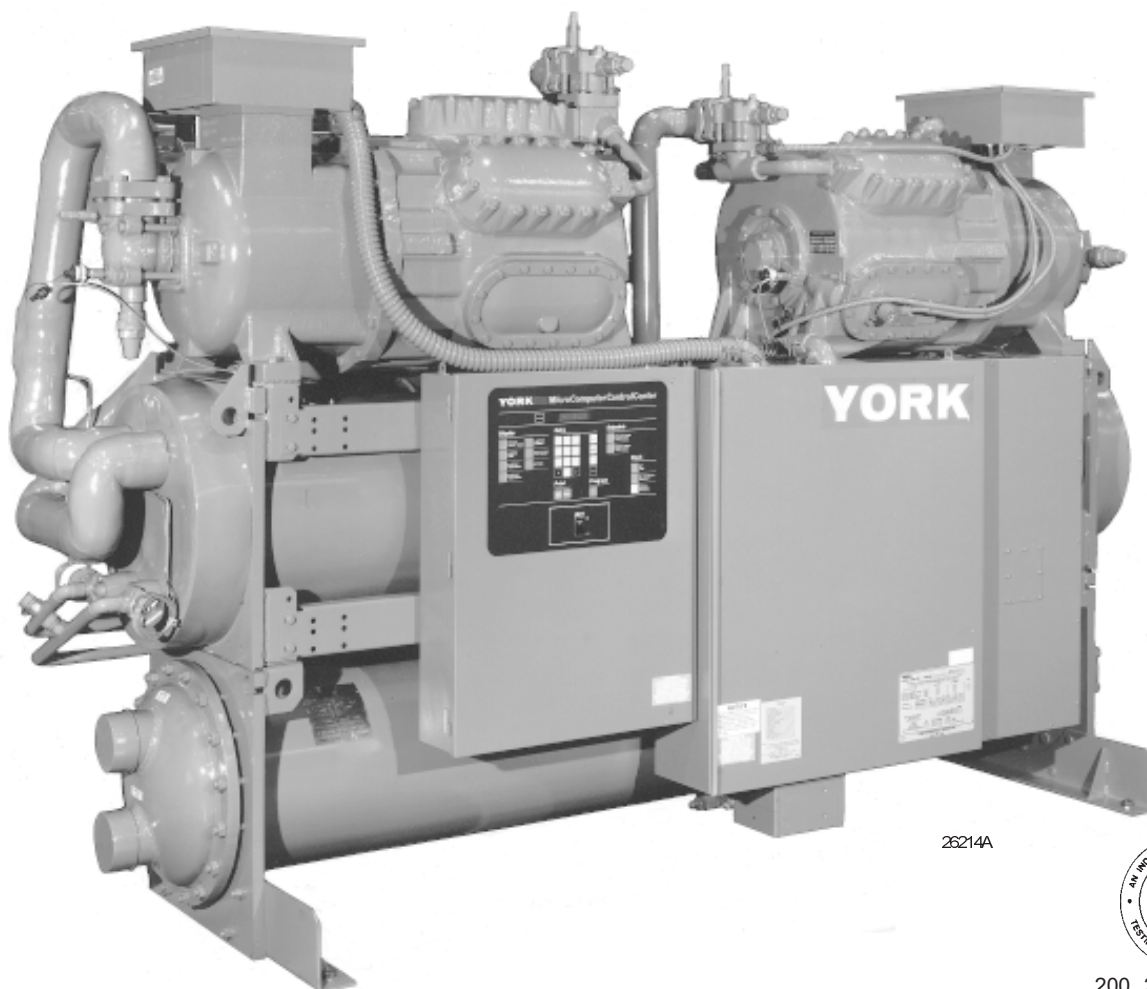
YCWJ45EE0, YCRJ45E00,
YCWJ55HE0, YCRJ55H00,
YCWJ56HF0, YCRJ56H00,
YCWJ66KH0, YCRJ66K00,
YCWJ67KH0, YCRJ67K00,
YCWJ77KH0, YCRJ77K00,
YCWJ88MH0, YCRJ88M00
YCWJ99MJ0, YCRJ99M00

STYLE "A"*

50 HZ

YCWJ56EE0, YCRJ56E00,
YCWJ66HE0, YCRJ66H00,
YCWJ67HF0, YCRJ67H00,
YCWJ77KH0, YCRJ77K00,
YCWJ78KH0, YCRJ78K00,
YCWJ88KH0, YCRJ88K00,
YCWJ99MH0, YCRJ99M00

STYLE "A"*



26214A



200, 230, 460-3-60

*With EPROM

031-01652-001
or
031-01096-001

(Standard, Brine & Metric Models, Combined)

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WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH OR SERIOUS INJURY

may result if personnel fail to observe safety precautions.

Work on electronic equipment should not be undertaken unless the individual(s) have been trained in the proper maintenance of equipment and is (are) familiar with its potential hazards.

Shut off power to equipment before beginning work and follow lockout procedures. When working inside equipment with power off, take care to discharge every capacitor likely to hold dangerous potential.

Be careful not to contact high voltage connections when installing or operating this equipment.

LOW VOLTAGE

DO NOT be misled by the term "low voltage".
Voltages as low as 50 volts may cause death.

GENERAL INFORMATION

GENERAL DESCRIPTION

YORK YCWJ45EE0 – YCWJ99MJ0 and YCRJ45E00 – YCRJ99M00 Series Packaged Liquid Chillers are of the semi-hermetic type. Each unit includes dual refrigerant circuits, accessible hermetic motor-compressors, a direct expansion type liquid cooler, a shell and tube condenser, refrigerant piping and feed controls, a microprocessor control center, and power panel.

Each unit is fully assembled on a steel base, piped, insulated, wired and are fully charged with refrigerant.

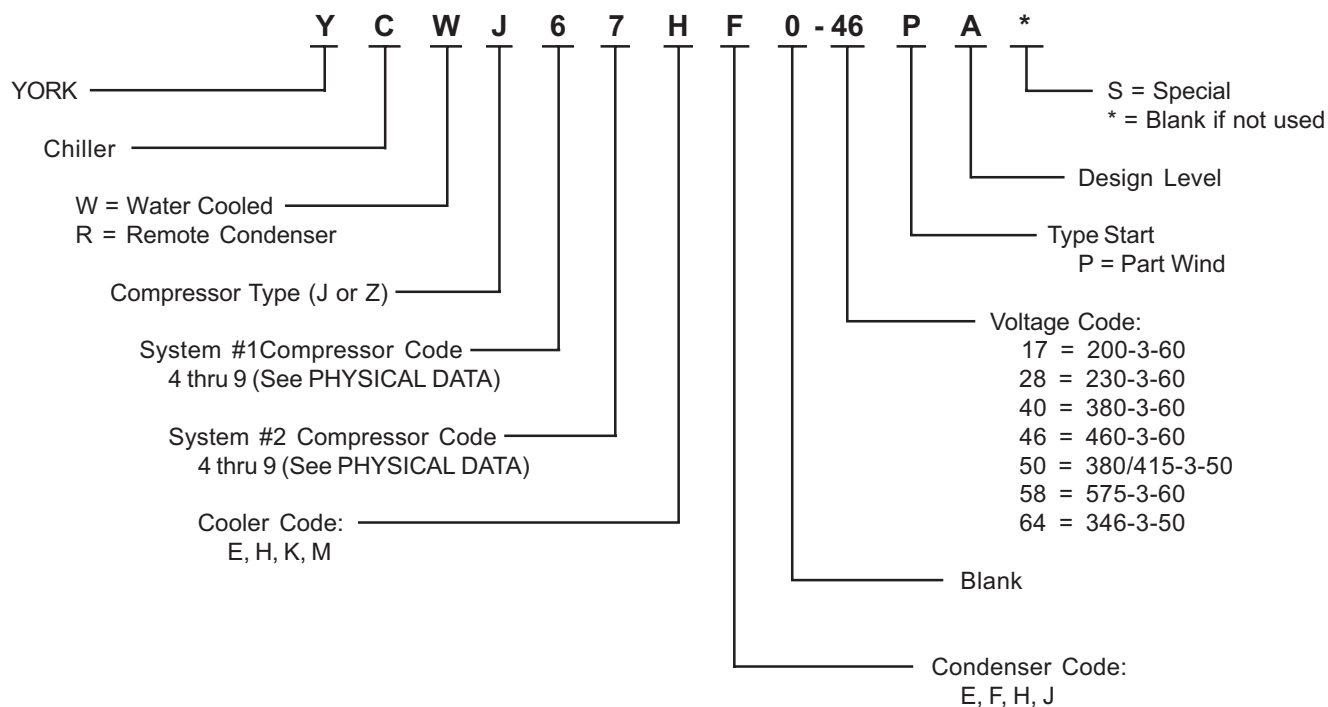
YCR models for remote condenser application are furnished less condenser, and with a refrigerant holding charge.

CODE STATUS

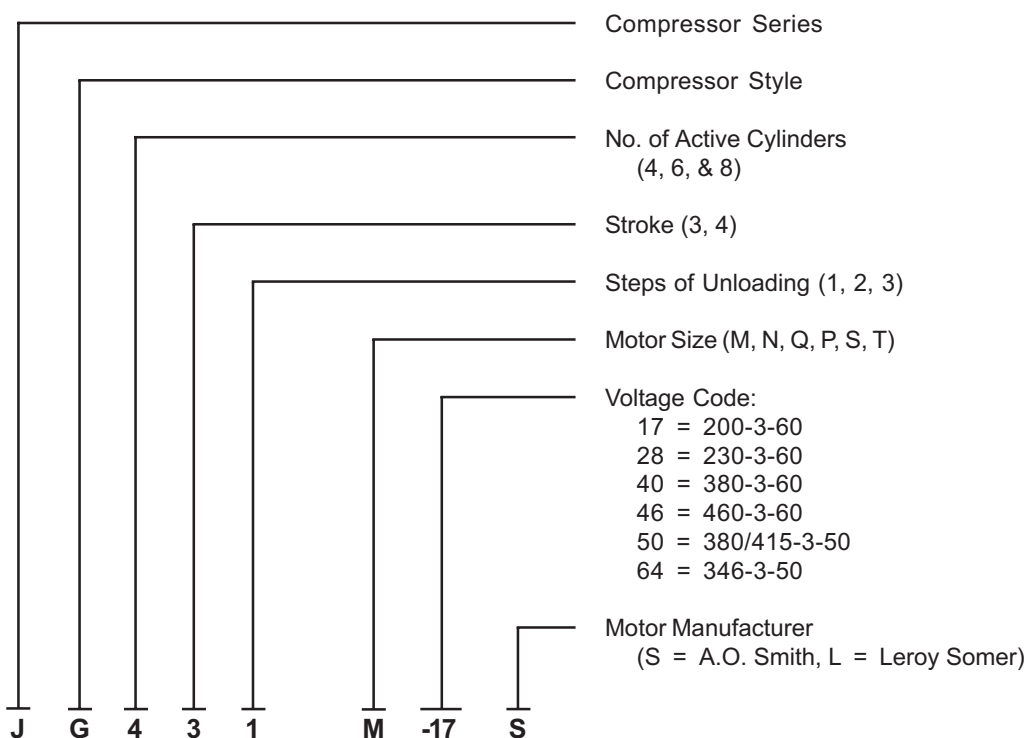
The units are designed in accordance with U.L. (200, 230, 460-3-60), N.E.C., ASHRAE/ANSI STANDARD 15, and ASME Codes.

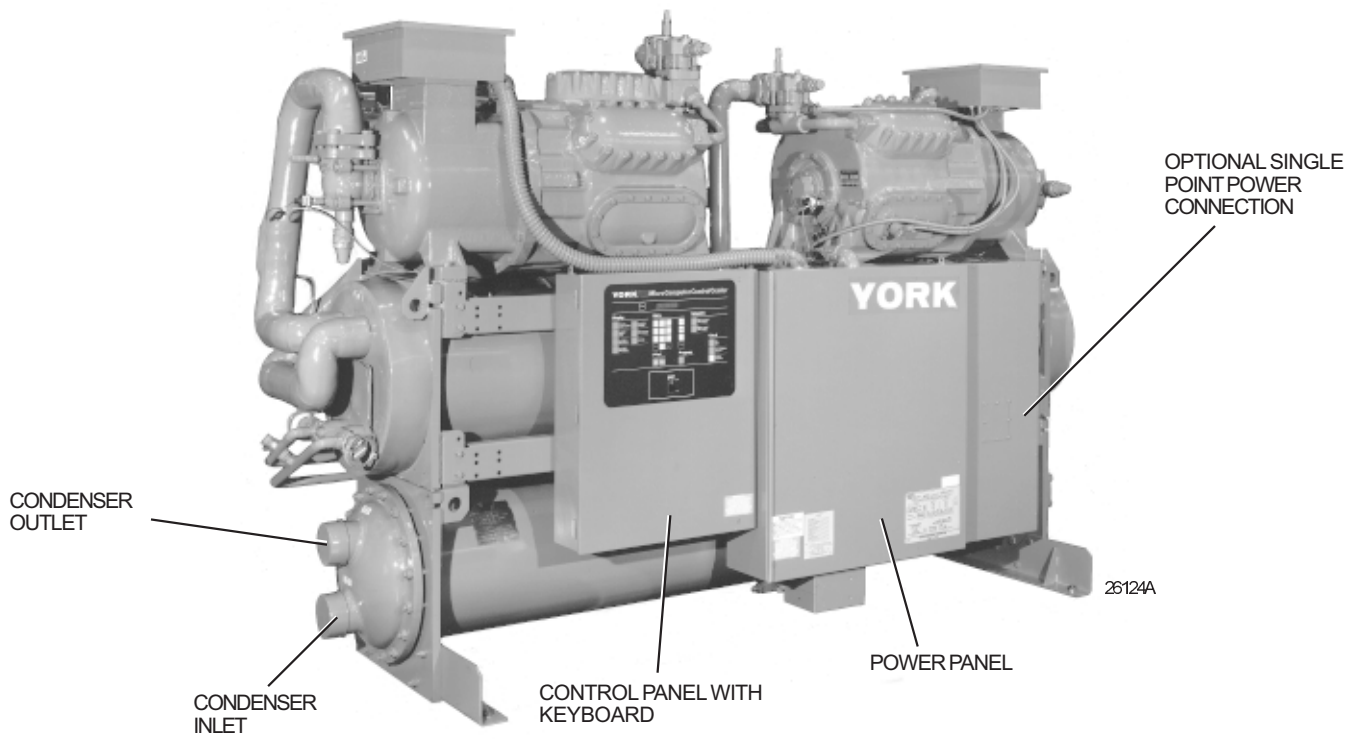
UNIT NOMENCLATURE

The model number denotes the following characteristics of the unit:

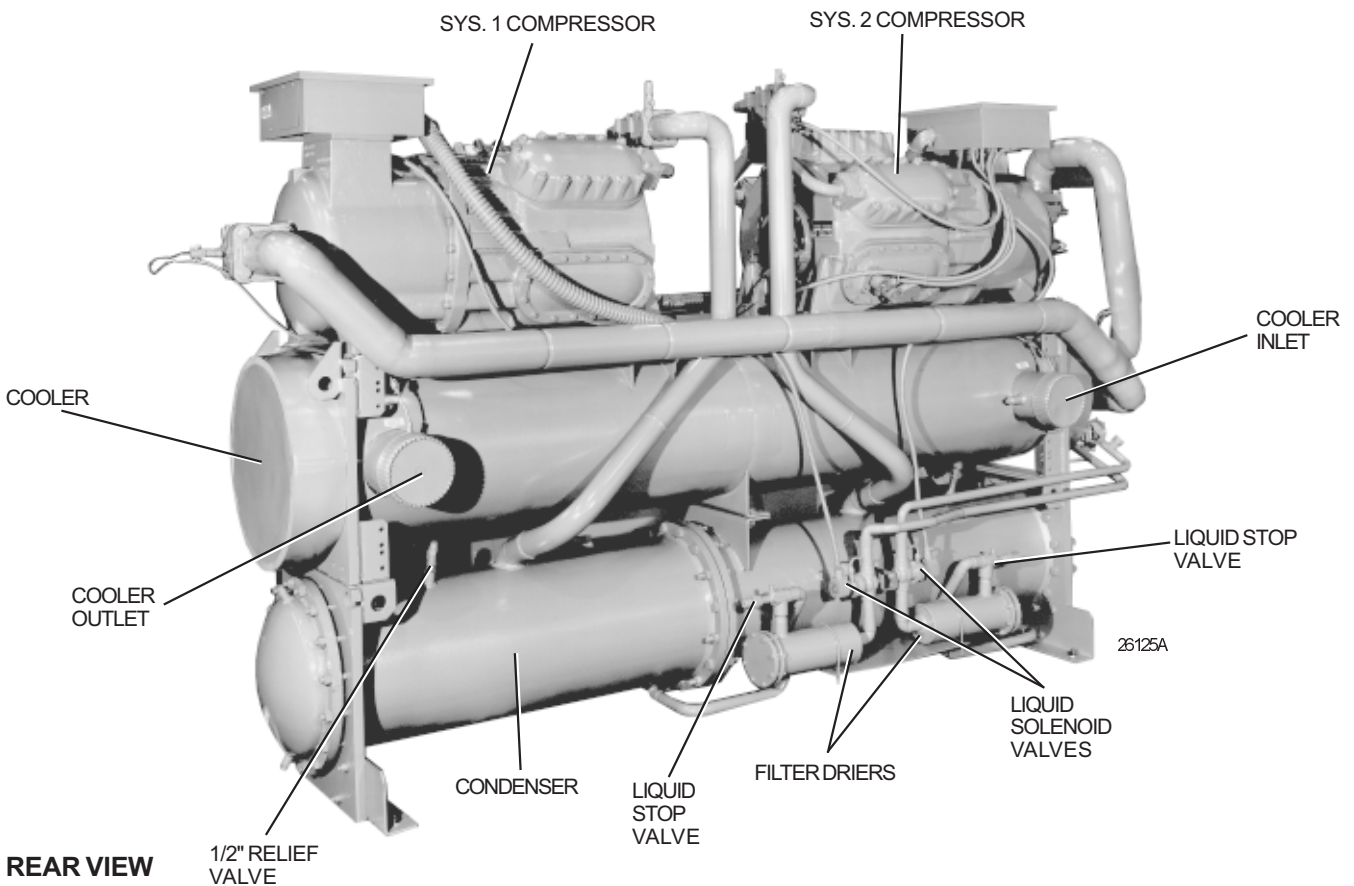


COMPRESSOR NOMENCLATURE J MODELS



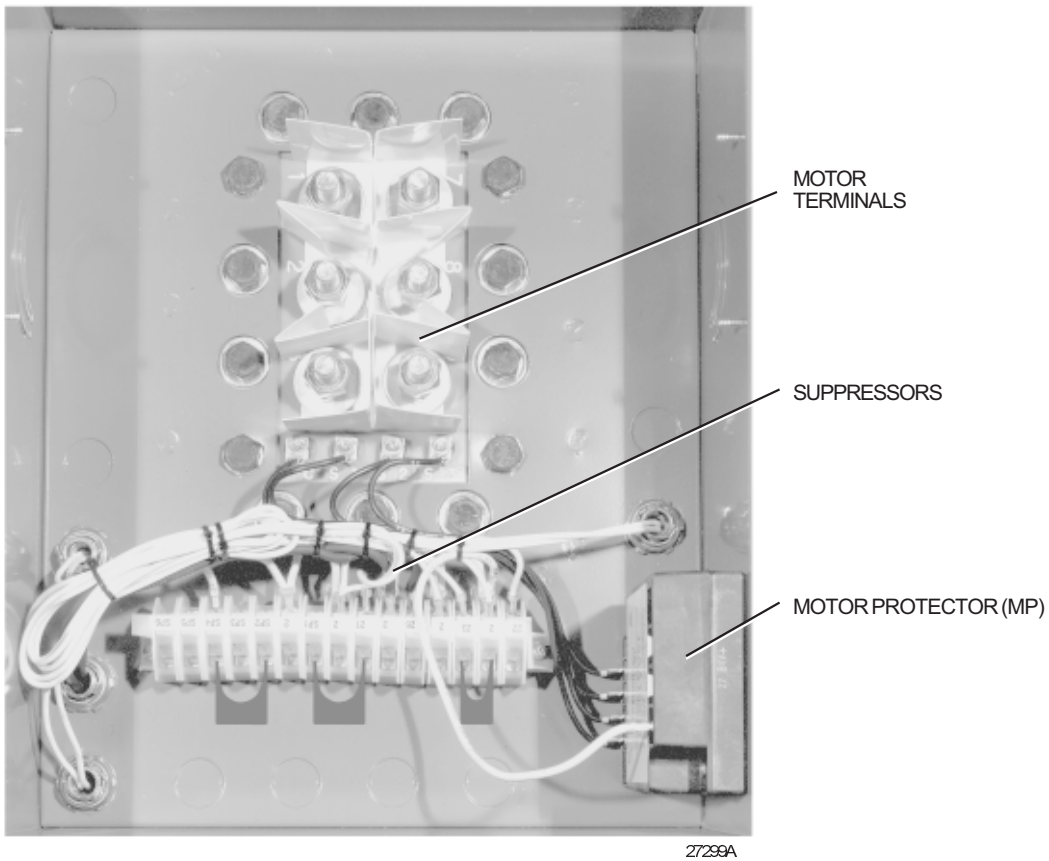


FRONT VIEW

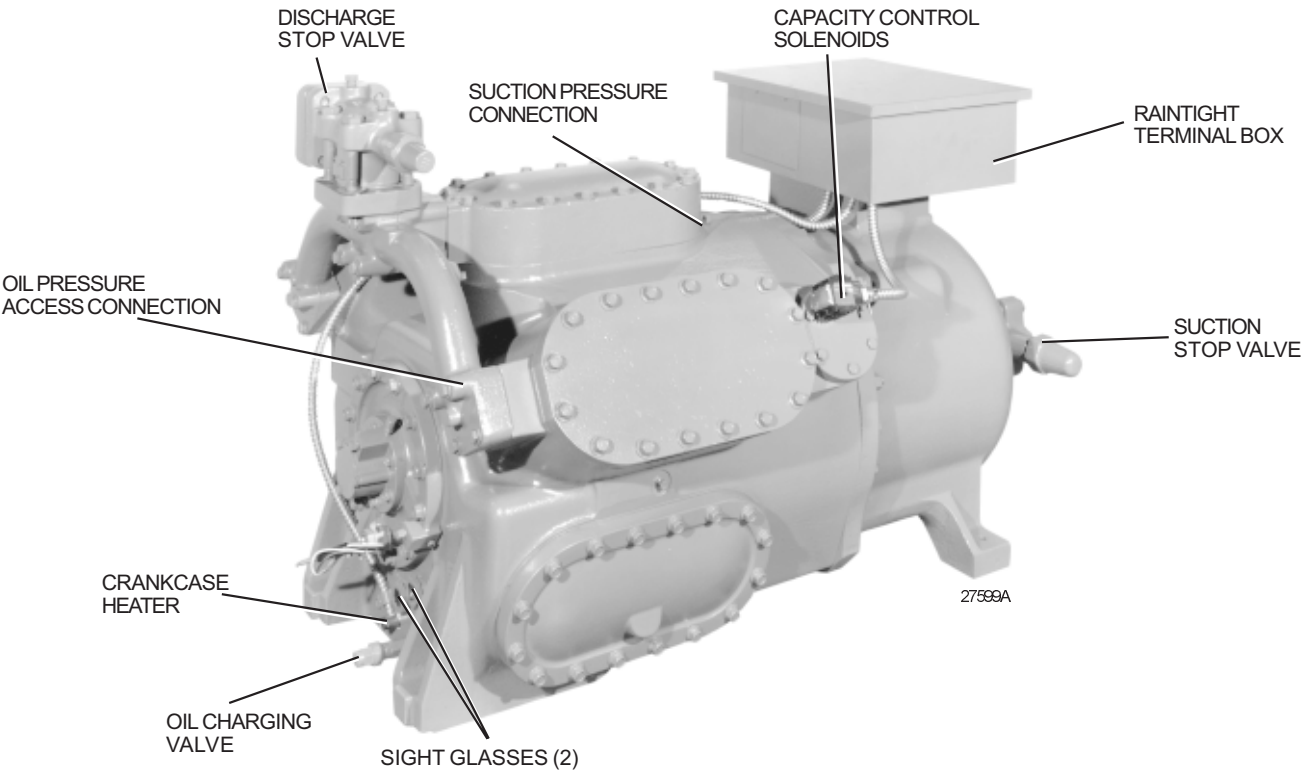


REAR VIEW

FIG. 1 – UNIT COMPONENTS



**COMPRESSOR
TERMINAL BOX**



**8 CYLINDER
MODEL J "G" COMPRESSOR**

FIG. 1A – COMPRESOR COMPONENTS

OPERATIONAL LIMITATIONS

VOLTAGE LIMITATIONS

The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.

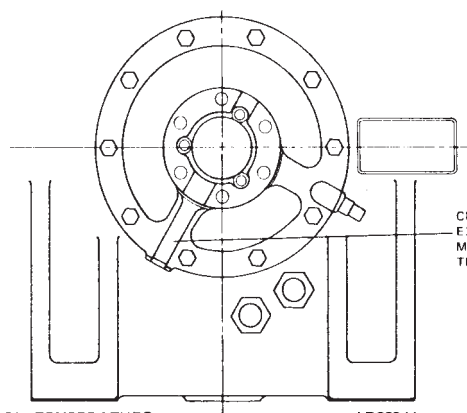
NOMINAL VOLTAGE	VOLTAGE	
	MIN.	MAX.
200-3-60	180	220
230-3-60	207	253
380-3-60	355	415
460-3-60	414	506
380/415-3-50	342	440
346-3-50	311	381
575-3-60	517	633

OPERATING LIMITATIONS

Maximum Compressor Ratio	9.5:1
Maximum Operating Differential (PSI)	325
Maximum Suction Pressure (PSIG)	84
Maximum Discharge Temp. (°F)	275
Minimum Superheat At Compressor	5°F
Minimum Oil Pressure (above suction pressure)	20 psi
Oil Temperature (Max.) ¹	160°F *
Maximum Sat. Discharge Temp. ²	150°F
Maximum Ambient	115°F
Minimum Ambient	40°F
Minimum Leaving Liquid Temp. ³	40°F
Maximum Leaving Liquid Temp.	50°F *

NOTES:

1. Measured externally on pump suction boss as shown below.
 2. May be lower due to motor selection.
See Rating in Form 150.24-EG2.
 3. 15°F on Brine application.
 4. Standard units can not be operated below 40°F leaving chilled liquid.
- * These may be higher for heat recovery or other special units.



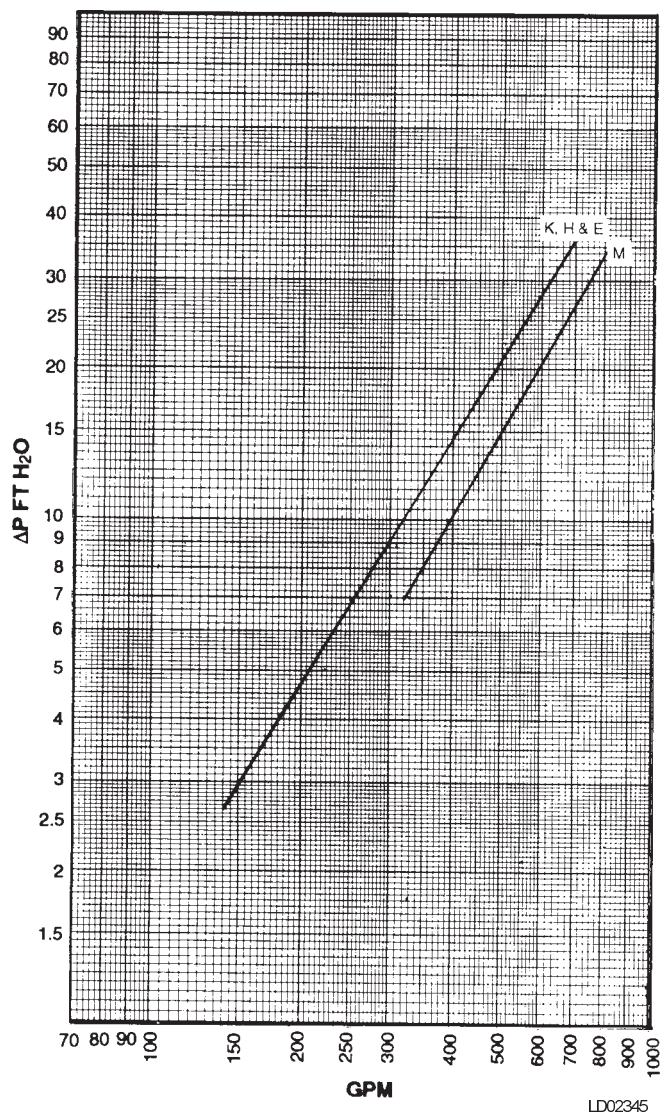
CHECKING OIL TEMPERATURE

LD02344

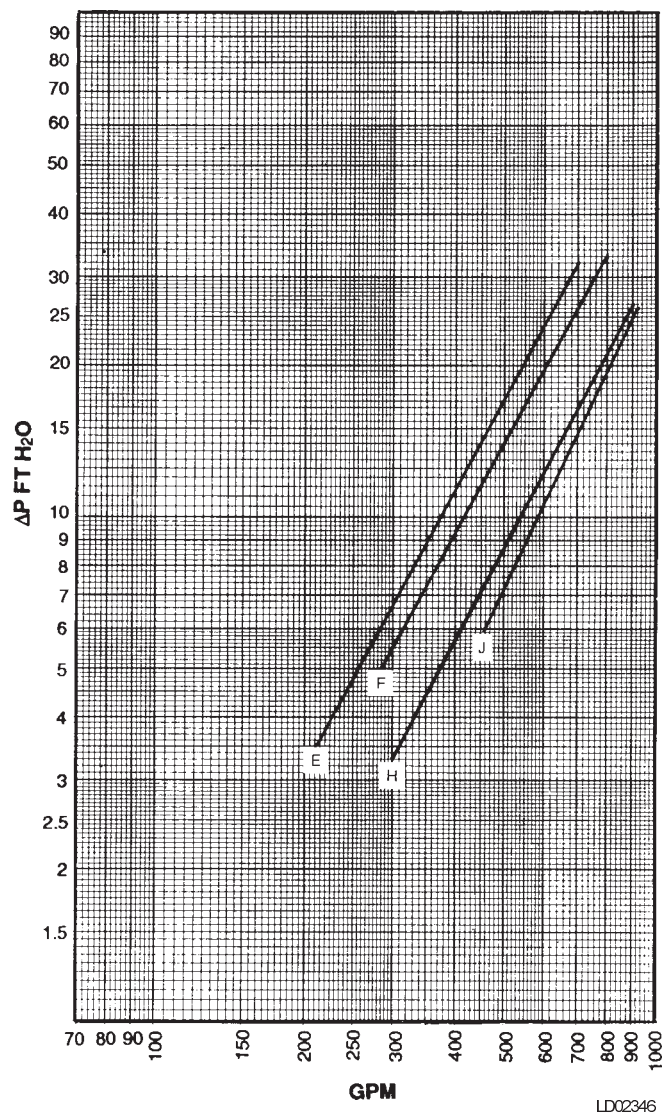
YCWJ & YCRJ Models

DESCRIPTION	YCWJ (60 HZ)	45EE0	55HE0	56HF0	66KH0	67KH0	77KH0	88MH0	99MJ0
	YCWJ (50 HZ)	56HE0	66HE0	67HF0	77KH0	78KH0	88KH0	99MH0	—
	YCRJ (60 HZ)	45E00	55H00	56H00	66K00	67K00	77K00	88M00	99M00
	YCRJ (50 HZ)	56E00	66H00	67H00	77K00	78K00	88K00	99M00	—
Min. Cooler Water Flow (GPM)		195	140	140	245	245	245	315	315
Max. Cooler Water Flow (GPM)		535	535	535	696	696	696	803	803
Min. Condenser Water Flow (GPM)		211	211	285	300	300	300	300	470
Max. Condenser Water Flow (GPM)		704	704	800	1200	1200	1200	1200	1400
Min. Leaving Liquid Temp. (°F) *		40	40	40	40	40	40	40	40
Max. Leaving Liquid Temp. (°F)		50	50	50	50	50	50	50	50
Min. Entering Condenser Water Temp. (°F)		70	70	70	70	70	70	70	70
Max. Entering Condenser Water Temp. (°F)		110	110	110	110	110	110	110	110
Max. Saturated Discharge Temp. (°F) (YCRJ)		142	142	142	142	142	142	142	142
Min. Equipment Room Temp. (°F)		40	40	40	40	40	40	40	40
Max. Equipment Room Temp. (°F)		115	115	115	115	115	115	115	115

COOLER PRESSURE DROP



CONDENSER PRESSURE DROP



PRESSURE DROP KEY

MODEL YCWI56EE0

LETTER FOR COOLER

LETTER FOR CONDENSER

CAUTION: Excessive flow will cause damage to the cooler. Do not exceed max. cooler GPM Special care should be taken when multiple chillers are fed by a single pump.

FIG. 2 – COOLER WATER PRESSURE DROP

PHYSICAL DATA (YCWJ & YCRJ Models)

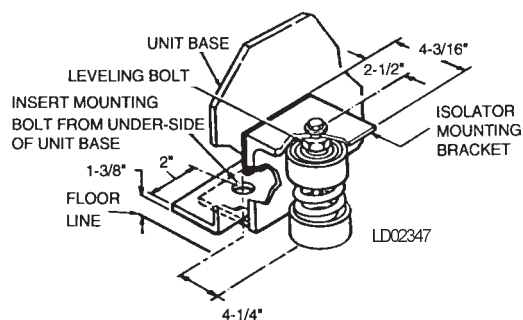
MODEL	60 HZ	YCWJ	45E00	55HE0	56HF0	66KH0	67KH0	77KH0	88MH0	99MJ0
		YCRJ	45E00	55H00	56H00	66K00	67K00	77K00	88M00	99M00
	50 HZ	YCWJ	56EE0	66HE0	67HF0	77KH0	78KH0	88KH0	99MH0	—
		YCRJ	56E00	66H00	67H00	77K00	78K00	88K00	99M00	—
COMPRESSOR										
YCWJ	60 HZ	SYS 1	G43-M(60HP)	G44-M(60HP)	G44-M(60HP)	G63-N(70HP)	G63-N(70HP)	G64-Q(90HP)	G83-Q(90HP)	G84-T(135HP)
		SYS 2	G44-M(60HP)	G44-M(60HP)	G63-N(70HP)	G63-N(70HP)	G64-Q(70HP)	G64-Q(90HP)	G83-Q(90HP)	G84-T(135HP)
	50 HZ	SYS 1	G44-N(58HP)	G63-P(67HP)	G63-P(67HP)	G64-Q(75HP)	G64-Q(75HP)	G83-S(96HP)	G84-T(113HP)	—
		SYS 2	G63-P(67HP)	G63-P(67HP)	G64-Q(75HP)	G64-Q(75HP)	G83-S(96HP)	G83-S(96HP)	G84-T(113HP)	—
YCRJ	60 HZ	SYS 1	G43-M(60HP)	G44-N(70HP)	G44-N(70HP)	G63-P(80HP)	G63-P(80HP)	G64-S(115HP)	G83-S(115HP)	G84-V(160HP)
		SYS 2	G44-N(70HP)	G44-N(70HP)	G63-P(80HP)	G63-P(80HP)	G64-S(115HP)	G64-S(115HP)	G83-S(115HP)	G84-V(160HP)
	50 HZ	SYS 1	G44-P(67HP)	G63-Q(75HP)	G63-Q(75HP)	G64-S(96HP)	G64-S(96HP)	G83-T(113HP)	G83-T(113HP)	—
		SYS 2	G63-Q(75HP)	G63-Q(75HP)	G64-S(96HP)	G64-S(96HP)	G83-T(113HP)	G83-T(113HP)	G83-T(113HP)	—
UNIT CAPACITY CONTROL	60 HZ		5 Steps	5 Steps	6 Steps	7 Steps	7 Steps	7 Steps	10 Steps	10 Steps
	50HZ		6 Steps	7 Steps	7 Steps	7 Steps	7 Steps	10 Steps	10 Steps	—
COOLER – DUAL CIRCUIT										
DWP REF. SIDE (PSIG)			235	235	235	235	235	235	235	235
DWP WATER SIDE (PSIG)			150	150	150	150	150	150	150	150
DIA.x LENGTH			14"x8"	16"x8"	16"x8"	18"x8"	18"x8"	18"x8"	20"x8"	20"x8"
WATER VOLUME (GALS.)			38	48	48	60	60	60	70	70
CONDENSER ²										
DWP REF. SIDE (PSIG)			350	350	350	365	365	365	365	365
DWP WATER SIDE (PSIG)			150	150	150	150	150	150	150	150
DIA.x LENGTH			16"x8"	16"x8"	16"x8"	18"x8"	18"x8"	18"x8"	18"x8"	18"x8"
WATER VOLUME (GALS.)			26	26	30	32	32	32	32	37
WEIGHTS (LBS.)										
YCWJ	SHIPPING		7,650	7,750	7,800	7,850	8,050	7,850	10,300	10,500
	OPERATING		8,200	8,450	8,550	8,700	8,900	8,700	11,200	11,450
YCRJ	SHIPPING		6,000	6,100	6,100	6,150	6,350	6,150	8,250	8,500
	OPERATING		6,400	6,600	6,600	6,750	7,000	6,750	9,050	9,250
REFRIG. CHARGE (LBS. R-22)	YCWJ	SYS 1	70	85	85	85	99	143	143	148
		SYS 2	85	105	105	105	122	143	143	148
	YCRJ ³		14	14	14	14	16	21	21	21

NOTES:

- 3.0 Gal. Oil/Compressor
- YCWJ Models only
- YCRJ Models shipped with holding charge. This is lbs. per circuit.

WEIGHT DISTRIBUTION AND ISOLATOR LOCATIONS FOR EACH MODEL

MOUNTING DETAIL FOR SPRING ISOLATORS (OPTIONAL)



WATER COOLED

ALL YCWJ & YCRJ Models except
YCWJ88MH0 & J99MJ0 & YCRJ88M00 - J99M00

REMOTE CONDENSER

YCWJ88MH0 - J99MJ0
& YCRJ88M00 - J99M00

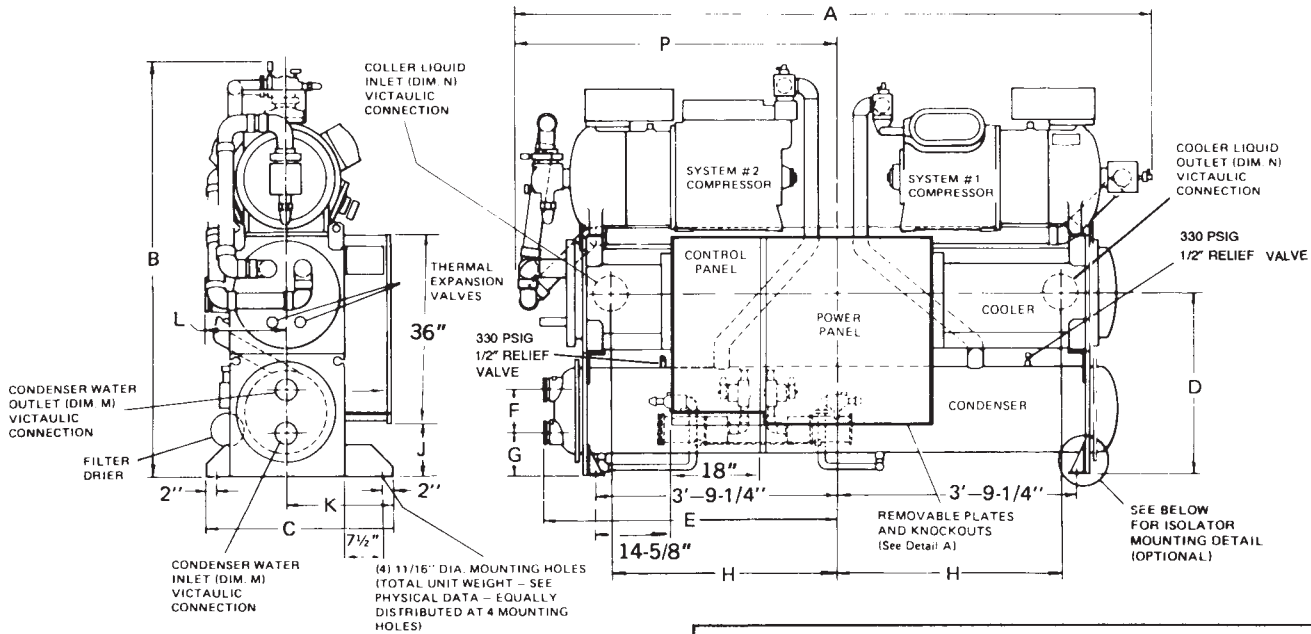
AWC	DIMENSIONS (in.)					
	L	W	T	R	S	V
	6-1/4"	4"	1/4"	5"	9/16"	5/8"

TYPE & SIZE	DEFLECTION	MAX. LOAD	SPRING COLOR	
	in.	lbs.	OUTER	INNER
AWC-1600	1.0	1600	GRAY	—
AWC-1625	1.0	2050	GRAY	RED
AWC-1628	1.0	2500	GRAY	GREEN

MODEL NO.	HZ	WATER COOLED					
		LOAD POINTS				WEIGHT	
		A	B	C	D	SHIPPING	OPERATING
YCWJ45EE0	60	2,050	2,050	2,050	2,050	7,650	8,200
Isolator		AWCB-1625					
YCWJ55HE0	60	2,113	2,113	2,113	2,113	7,750	8,450
Isolator		AWCB-1628					
YCWJ56HF0	60	2,138	2,138	2,138	2,138	7,800	8,550
Isolator		AWCB-1628					
YCWJ66KH0	60	2,175	2,175	2,175	2,175	7,850	8,700
Isolator		AWCB-1628					
YCWJ67KH0	60	2,225	2,225	2,225	2,225	8,050	8,900
Isolator		AWCB-1628					
YCWJ77KH0	60	2,575	2,575	2,575	2,575	9,450	10,300
Isolator		AWCB-1628					
YCWJ88MH0	60	2,800	2,800	2,800	2,800	10,300	11,200
Isolator		AWCB-1632					
YCWJ99MJ0	60	2,863	2,863	2,863	2,863	10,500	11,450
Isolator		AWCB-1632					
YCWJ56EE0	50	2,050	2,050	2,050	2,050	7,650	8,200
Isolator		AWCB-1625					
YCWJ66HE0	50	2,113	2,113	2,113	2,113	7,750	8,450
Isolator		AWCB-1628					
YCWJ67HF0	50	2,138	2,138	2,138	2,138	7,800	8,550
Isolator		AWCB-1628					
YCWJ77KH0	50	2,175	2,175	2,175	2,175	9,450	10,300
Isolator		AWCB-1628					
YCWJ78KH0	50	2,225	2,225	2,225	2,225	8,050	8,900
Isolator		AWCB-1628					
YCWJ88KH0	50	2,575	2,575	2,575	2,575	9,450	10,450
Isolator		AWCB-1628					
YCWJ99MH0	50	2,800	2,800	2,800	2,800	10,300	11,200
Isolator		AWCB-1632					

MODEL NO.	HZ	REMOTE CONDENSER					
YCWJ45E00	60	1600	1600	1600	1600	6,000	6,400
Isolator		AWCB-1600					
YCWJ55H00	60	1625	1625	1625	1625	5,950	6,500
Isolator		AWCB-1625					
YCWJ56H00	60	1650	1650	1650	1650	6,100	6,600
Isolator		AWCB-1625					
YCWJ66K00	60	1688	1688	1688	1688	6,150	6,750
Isolator		AWCB-1625					
YCWJ67K00	60	1750	1750	1750	1750	6,350	7,000
Isolator		AWCB-1625					
YCWJ77K00	60	1688	1688	1688	1688	6,150	6,750
Isolator		AWCB-1625					
YCWJ88M00	60	2263	2263	2263	2263	8,250	9,050
Isolator		AWCB-1628					
YCWJ99M00	60	2313	2313	2313	2313	8,500	9,250
Isolator		AWCB-1628					
YCWJ56E00	50	1600	1600	1600	1600	6,000	6,400
Isolator		AWCB-1600					
YCWJ66H00	50	1625	1625	1625	1625	5,950	6,500
Isolator		AWCB-1625					
YCWJ67H00	50	1650	1650	1650	1650	6,100	6,600
Isolator		AWCB-1625					
YCWJ77K00	50	1688	1688	1688	1688	6,150	6,750
Isolator		AWCB-1625					
YCWJ78K00	50	1750	1750	1750	1750	6,350	7,000
Isolator		AWCB-1625					
YCWJ88K00	50	1688	1688	1688	1688	7,800	8,450
Isolator		AWCB-1625					
YCWJ99M00	50	2263	2263	2263	2263	8,500	9,250
Isolator		AWCB-1628					

DIMENSIONS WATER COOLED – YCWJ MODELS



CLEARANCES (All Models) – Minimum YORK required clearances are as follows:

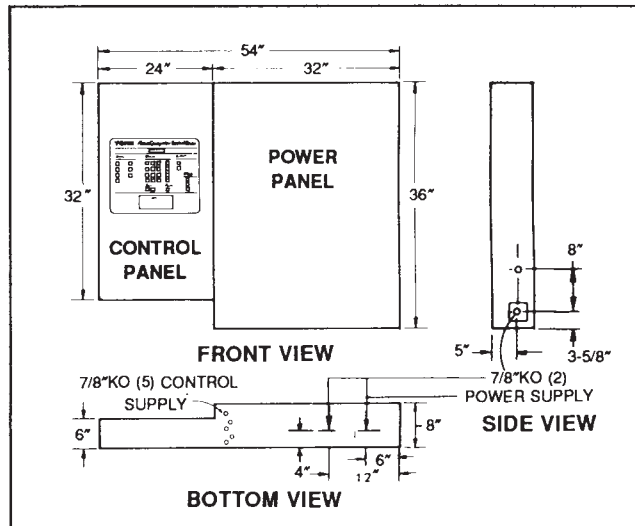
Rear to wall 2'-0"

Front to wall 2'-8"

Tube cleaning & removal 8'-0" (Either End)

Top 2'-0"

**CONTROL PANEL
WATER COOLED
&
REMOTE CONDENSER
DETAIL A**



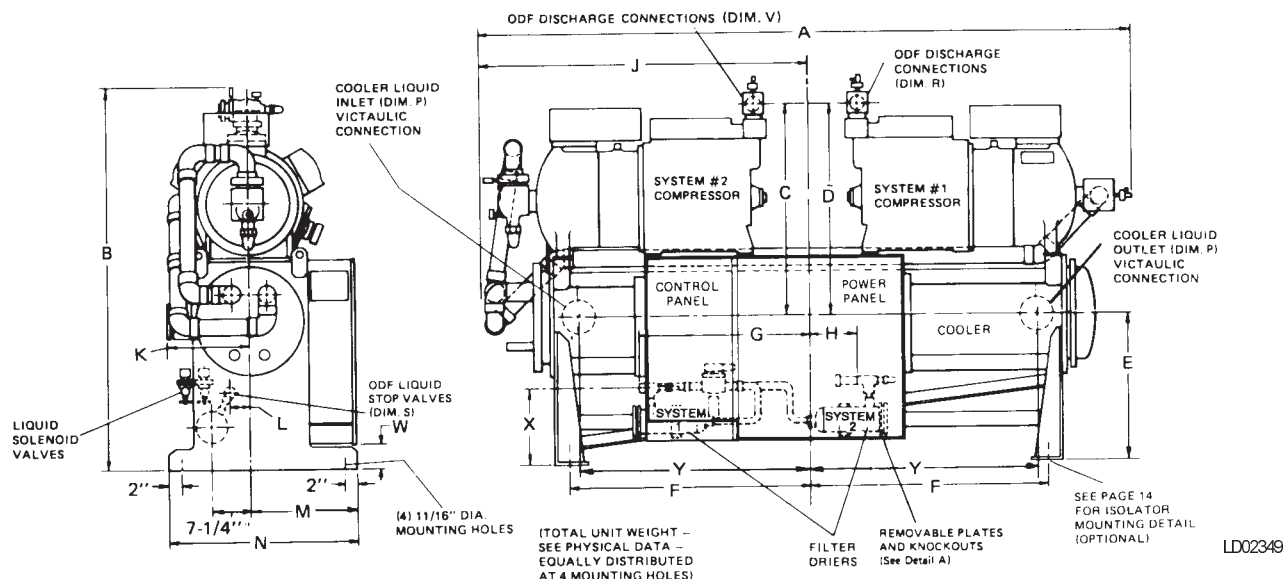
LDC02348

MODEL (60HZ)	A	B	C	D	E	F	G	H	J	K	L	M	N	P
YCWJ45EE0	10'-0-3/8"	6'-1-7/16"	2'-11"	2'-9-1/8"	4'-7-3/16"	8-1/4"	8-1/4"	3'-6-1/2"	7-5/8"	1'-7-3/4"	1'-3-1/2"	5"	6"	4'-11-11/16"
YCWJ55HE0	10'-0-3/8"	6'-3-7/16"	2'-11"	2'-10-1/8"	4'-7-3/16"	8-1/4"	8-1/4"	3'-5-1/2"	9-5/8"	1'-7-3/4"	1'-3-1/8"	5"	8"	4'-11-11/16"
YCWJ56HF0	10'-0-3/8"	6'-7-3/16"	2'-11"	2'-10-1/8"	4'-7-3/16"	8-1/4"	8-1/4"	3'-5-1/2"	9-5/8"	1'-7-3/4"	1'-3-1/8"	5"	8"	4'-11-11/16"
YCWJ66KH0	10'-0-3/8"	6'-10-7/8"	3'-1"	3'-2-1/4"	4'-8-1/2"	9"	9-7/8"	3'-5-1/2"	1'-1-7/8"	1'-8"	1'-3-1/2"	6"	8"	4'-11-11/16"
YCWJ67KH0	10'-0-3/8"	6'-9-7/8"	3'-1"	3'-2-1/4"	4'-8-1/2"	9"	9-7/8"	3'-5-1/2"	1'-1-7/8"	1'-8"	1'-3-1/2"	6"	8"	4'-11-11/16"
YCWJ77KH0	10'-0"	6'-10-7/8"	3'-1"	3'-2-1/4"	4'-8-1/2"	9"	9-7/8"	3'-5-1/2"	1'-1-7/8"	1'-8"	1'-3-1/2"	6"	8"	4'-11-11/16"
YCWJ88MH0	10'-0"	9'-1-1/8"	3'-2-3/4"	3'-2-3/4"	4'-6-1/4"	9"	9-7/8"	3'-5-1/2"	1'-3-11/16"	1'-9"	1'-4-1/2"	6"	8"	5'-1-9/16"
YCWJ99MJ0	10'-0"	9'-1-1/8"	3'-2-3/4"	3'-2-3/4"	4'-6-1/4"	9"	9-7/8"	3'-5-1/2"	1'-3-11/16"	1'-9"	1'-4-1/2"	6"	8"	5'-1-9/16"

MODEL (50HZ)	A	B	C	D	E	F	G	H	J	K	L	M	N	P
YCWJ56E00	10'-0-3/8"	6'-1-7/16"	2'-11"	2'-9-1/8"	4'-7-3/16"	8-1/4"	8-1/4"	3'-6-1/2"	7-5/8"	1'-7-3/4"	1'-3-1/2"	5"	6"	4'-11-11/16"
YCWJ66H00	10'-0-3/8"	6'-3-7/16"	2'-11"	2'-10-1/8"	4'-7-3/16"	8-1/4"	8-1/4"	3'-5-1/2"	9-5/8"	1'-7-3/4"	1'-3-1/8"	5"	8"	4'-11-11/16"
YCWJ77H00	10'-0-3/8"	6'-7-3/16"	2'-11"	2'-10-1/8"	4'-7-3/16"	8-1/4"	8-1/4"	3'-5-1/2"	9-5/8"	1'-7-3/4"	1'-3-1/8"	5"	8"	4'-11-11/16"
YCWJ77K00	10'-0-3/8"	6'-10-7/8"	3'-1"	3'-2-1/4"	4'-8-1/2"	9"	9-7/8"	3'-5-1/2"	1'-1-7/8"	1'-8"	1'-3-1/2"	6"	8"	4'-11-11/16"
YCWJ78K00	10'-0-3/8"	6'-9-7/8"	3'-1"	3'-2-1/4"	4'-8-1/2"	9"	9-7/8"	3'-5-1/2"	1'-1-7/8"	1'-8"	1'-3-1/2"	6"	8"	4'-11-11/16"
YCWJ88M00	10'-0"	6'-10-7/8"	3'-1"	3'-2-1/4"	4'-8-1/2"	9"	9-7/8"	3'-5-1/2"	1'-1-7/8"	1'-8"	1'-3-1/2"	6"	8"	4'-11-11/16"
YCWJ99M00	10'-0"	9'-1-1/8"	3'-2-3/4"	3'-2-3/4"	4'-6-1/4"	9"	9-7/8"	3'-5-1/2"	1'-3-11/16"	1'-9"	1'-4-1/2"	6"	8"	5'-1-9/16"

DIMENSIONS

REMOTE CONDENSER – YCRJ MODELS



MODEL(60 HZ)	A	B	C	D	E	F	G	H	J	K	L
YCRJ45E00	9'-11-7/8"	5'-8-7/8"	2'-9-7/16"	2'-9-7/16"	2'-8-3/8"	3'-9-5/16"	2'-6"	9"	4'-11-11/16"	1'-3-1/2"	3-3/4"
YCRJ55H00	9'-11-7/8"	5'-10-7/8"	2'-10-7/16"	2'-10-7/16"	2'-9-3/4"	3'-9-5/16"	2'-6"	9"	4'-11-11/16"	1'-3-1/8"	3-3/4"
YCRJ56H00	9'-11-7/8"	6'-2-5/8"	3'-2-3/16"	2'-10-7/16"	2'-9-3/4"	3'-9-5/16"	2'-6"	9"	4'-11-11/16"	1'-3-1/8"	3-3/4"
YCRJ66K00	10'-2"	6'-7-1/4"	3'-3-3/16"	3'-3-3/16"	3'-1-3/8"	3'-9-5/16"	2'-11"	1'-1"	5'-1-1/2"	1'-4"	3-3/4"
YCRJ67K00	10'-2"	6'-7-1/4"	3'-3-3/16"	3'-3-3/16"	3'-1-3/8"	3'-9-5/16"	2'-11"	1'-1"	5'-1-1/2"	1'-4"	3-3/4"
YCRJ77K00	10'-2"	6'-7-1/4"	3'-3-3/16"	3'-3-3/16"	3'-1-3/8"	3'-9-5/16"	2'-4-7/16"	2'-1-1/2"	5'-1-1/2"	1'-4"	4-7/8"
YCRJ88M00	10'-2"	6'-10-3/16"	3'-4"	4'-3-1/2"	3'-2-3/8"	3'-9-5/16"	2'-4-7/16"	2'-1-1/2"	5'-1-1/2"	1'-4-1/2"	10"
YCRJ99M00	10'-2"	6'-10-3/16"	3'-4"	4'-3-1/2"	3'-2-3/8"	3'-9-5/16"	2'-4-7/16"	2'-1-1/2"	5'-1-1/2"	1'-4-1/2"	10"

MODEL(60 HZ)	M	N	P	R	S	T	U	V	W	X	Y
YCRJ45E00	1'-7-3/4"	2'-11"	6"	2'-5/8"	1'-3/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-6-1/2"
YCRJ55H00	1'-7-3/4"	2'-11"	8"	2'-5/8"	1'-3/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-6-1/2"
YCRJ56H00	1'-7-3/4"	2'-11"	6"	2'-5/8"	1'-3/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-6-1/2"
YCRJ66K00	1'-8"	3'-1"	8"	2'-5/8"	1'-5/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-5-1/2"
YCRJ67K00	1'-8"	3'-1"	8"	2'-5/8"	1'-5/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-5-1/2"
YCRJ77K00	1'-8"	3'-1"	8"	2'-5/8"	1'-5/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	2'-1/2"	3'-5-1/2"
YCRJ88M00	1'-8-7/8"	3'-2-3/4"	8"	3'-1/8"	1'-5/8"	3'-0"	3'-1/8"	3'-6-1/2"	1'-5-1/2"	2'-2-1/2"	3'-5-1/2"
YCRJ99M00	1'-8-7/8"	3'-2-3/4"	8"	3'-1/8"	1'-5/8"	3'-0"	3'-1/8"	3'-6-1/2"	1'-5-1/2"	2'-2-1/2"	3'-5-1/2"

MODEL(50 HZ)	A	B	C	D	E	F	G	H	J	K	L
YCRJ56E00	9'-11-7/8"	6'-0-5/8"	3'-1-3/16"	2'-9-7/16"	2'-8-3/8"	3'-9-5/16"	2'-6"	9"	4'-11-11/16"	1'-3-1/2"	3-3/4"
YCRJ66H00	9'-11-7/8"	6'-2-5/8"	3'-2-3/16"	3'-2-3/16"	2'-9-3/4"	3'-9-5/16"	2'-6"	9"	4'-11-11/16"	1'-3-1/8"	3-3/4"
YCRJ67H00	9'-11-7/8"	6'-2-5/8"	3'-2-3/16"	3'-2-3/16"	2'-9-3/4"	3'-9-5/16"	2'-6"	9"	4'-11-11/16"	1'-3-1/8"	3-3/4"
YCRJ77K00	10'-2"	6'-2-1/4"	3'-3-3/16"	3'-3-3/16"	3'-1-3/8"	3'-9-5/16"	2'-11"	1'-1"	5'-1-1/2"	1'-4"	3-3/4"
YCRJ78K00	10'-2"	6'-8-11/16"	3'-4"	3'-3-3/16"	3'-1-3/8"	3'-9-5/16"	2'-11"	1'-1"	5'-1-1/2"	1'-4"	3-3/4"
YCRJ88M00	10'-2"	6'-8-11/16"	3'-4"	3'-4"	3'-1-3/8"	3'-9-5/16"	2'-4-7/16"	2'-1-1/2"	5'-1-1/2"	1'-4"	4-7/8"
YCRJ99M00	10'-2"	6'-10-3/16"	3'-4-1/2"	3'-4-1/2"	3'-2-3/8"	3'-9-5/16"	2'-4-7/16"	2'-1-1/2"	5'-1-1/2"	1'-4-1/2"	10"

MODEL(50 HZ)	M	N	P	R	S	T	U	V	W	X	Y
YCRJ56E00	1'-7-3/4"	2'-11"	6"	2'-5/8"	1'-3/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-6-1/2"
YCRJ66H00	1'-7-3/4"	2'-11"	8"	2'-5/8"	1'-3/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-6-1/2"
YCRJ67H00	1'-7-3/4"	2'-11"	8"	2'-5/8"	1'-3/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-6-1/2"
YCRJ77K00	1'-8"	3'-1"	8"	2'-5/8"	1'-5/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-5-1/2"
YCRJ78K00	1'-8"	3'-1"	8"	2'-5/8"	1'-5/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	1'-8"	3'-5-1/2"
YCRJ88M00	1'-8"	3'-1"	8"	3'-1/8"	1'-5/8"	2'-4"	2'-5/8"	3'-6-1/2"	1'-5-1/2"	2'-1/2"	3'-5-1/2"
YCRJ99M00	1'-8-7/8"	3'-2-3/4"	8"	3'-1/8"	1'-5/8"	3'-0"	3'-1/8"	3'-6-1/2"	1'-5-1/2"	2'-2-1/2"	3'-5-1/2"

ELECTRICAL DATA (YCWJ MODELS)

UNIT			SYSTEM #1							
CHILLER MODEL YCWJ	VOLT CODE	VOLTAGE V-PH-HZ	MIN. ¹ CIR. AMP.	DUAL ELEM FUSE		NON- FUSED ⁴ DISC.SW	INCOMING WIRE SIZE ⁶	MAX SIZE CKT BKR HACR TYPE ⁵	RLA	PW/LRA
				MIN. ²	MAX. ³					
45EE0	-17	200-3-60	218	300	350	400	(2) #4-250MCM	350	174	731
45EE0	-28	230-3-60	189	225	300	200	(2) #4-250MCM	300	151	636
45EE0	-40	380-3-60	116	150	200	200	(2) #4-250MCM	200	92	358
45EE0	-46	460-3-60	96	125	150	100	(2) #4-250MCM	150	76	318
56EE0	-50	380/415-3-50	106	150	175	100	(2) #4-250MCM	175	84	367
45EE0	-58	575-3-60	77	100	125	100	(2) #4-250MCM	125	61	254
56EE0	-64	346-3-50	116	150	200	200	(2) #4-250MCM	200	92	400
55HE0	-17	200-3-60	251	300	450	400	(2) #4-250MCM	450	200	731
55HE0	-28	230-3-60	226	300	400	400	(2) #4-250MCM	400	180	636
55HE0	-40	380-3-60	132	175	225	200	(2) #4-250MCM	225	105	385
55HE0	-46	460-3-60	113	150	200	200	(2) #4-250MCM	200	90	318
66HE0	-50	380/415-3-50	126	150	225	200	(2) #4-250MCM	225	100	410
55HE0	-58	575-3-60	88	110	150	100	(2) #4-250MCM	150	70	254
66HE0	-64	346-3-50	138	175	225	200	(2) #4-250MCM	225	110	412
56HF0	-17	200-3-60	251	300	450	400	(2) #4-250MCM	450	200	731
56HF0	-28	230-3-60	226	300	400	400	(2) #4-250MCM	400	180	636
56HF0	-40	380-3-60	132	175	225	200	(2) #4-250MCM	225	105	385
56HF0	-46	460-3-60	113	150	200	200	(2) #4-250MCM	200	90	318
67HF0	-50	380/415-3-50	126	150	225	200	(2) #4-250MCM	225	100	410
56HF0	-58	575-3-60	88	110	150	100	(2) #4-250MCM	150	70	254
67HF0	-64	346-3-50	138	175	225	200	(2) #4-250MCM	225	110	412
66KH0	-17	200-3-60	291	350	500	400	(2) #4-250MCM	500	232	865
66KH0	-28	230-3-60	258	350	450	400	(2) #4-250MCM	450	206	752
66KH0	-40	380-3-60	151	200	250	200	(2) #4-250MCM	250	120	412
66KH0	-46	460-3-60	129	175	225	200	(2) #4-250MCM	225	103	376
77KH0	-50	380/415-3-50	149	200	250	200	(2) #4-250MCM	250	119	482
66KH0	-58	575-3-60	99	125	175	100	(2) #4-250MCM	175	79	300
77KH0	-64	346-3-50	164	200	250	200	(2) #4-250MCM	250	131	572
67KH0	-17	200-3-60	291	350	500	400	(2) #4-250MCM	500	232	865
67KH0	-28	230-3-60	258	350	450	400	(2) #4-250MCM	450	206	752
67KH0	-40	380-3-60	151	200	250	200	(2) #4-250MCM	250	120	412
67KH0	-46	460-3-60	129	175	225	200	(2) #4-250MCM	225	103	376
78KH0	-50	380/415-3-50	149	200	250	200	(2) #4-250MCM	250	119	482
67KH0	-58	575-3-60	99	125	175	100	(2) #4-250MCM	175	79	300
78KH0	-64	346-3-50	164	200	250	200	(2) #4-250MCM	250	131	572
77KH0	-17	200-3-60	376	450	600	400	(2) 1/0-500MCM	600	300	1101
77KH0	-28	230-3-60	331	400	500	400	(2) #4-250MCM	500	264	976
77KH0	-40	380-3-60	198	250	350	200	(2) #4-250MCM	350	158	591
77KH0	-46	460-3-60	166	200	250	200	(2) #4-250MCM	250	132	488
88KH0	-50	380/415-3-50	186	225	300	200	(2) #4-250MCM	300	148	585
77KH0	-58	575-3-60	132	175	225	200	(2) #4-250MCM	225	105	390
88KH0	-64	346-3-50	203	250	350	200	(2) #4-250MCM	350	162	668
88MH0	-17	200-3-60	469	600	800	600	(2) 1/0-500MCM	800	375	1101
88MH0	-28	230-3-60	408	500	700	400	(2) #4-250MCM	700	326	976
88MH0	-40	380-3-60	241	300	400	400	(2) #4-250MCM	400	192	591
88MH0	-46	460-3-60	204	250	350	200	(2) #4-250MCM	350	163	488
99MH0	-50	380/415-3-50	236	300	400	400	(2) #4-250MCM	400	188	760
88MH0	-58	575-3-60	159	200	250	200	(2) #4-250MCM	250	127	390
99MH0	-64	346-3-50	258	350	450	400	(2) #4-250MCM	450	206	917
99MH0	-40	380-3-60	296	400	500	400	(2) #4-250MCM	500	236	997
99MH0	-46	460-3-60	244	300	400	400	(2) #4-250MCM	400	195	830
99MH0	-58	575-3-60	196	250	350	200	(2) #4-250MCM	350	156	664

NOTES:

1. Minimum Circuit Ampacity (MCA) is based on 125% of the rated load amps for the largest motor plus 100% of the loaded amps for all other loads included in the circuit, per N.E.C. Article 430-24. If a Factory Mounted Control Transformer is provided, add the following to the system #1 MCA values in the YCA Tables: -17, add 10 amps; -28, add 9 amps; -46, add 4 amps; -58, add 3 amps.
2. Minimum fuse size is based on 150% of the largest motor RLA plus 100% of the remaining RLAs. (U.L. Standard 1995, Section 36.1). It is not recommended in applications where brown-outs, frequent starting and stopping of the unit, and/or operation at ambient temperatures in excess of 95°F is anticipated.
3. Maximum dual element fuse size is based on 225% maximum plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C 440-22.
4. The recommended disconnect switch is based on a minimum of 115% of the summation rated load amps of all the loads included in the circuit, per N.E.C. 440-12A1.

SYSTEM #2							
MIN. ¹ CIR. AMP.	DUAL ELEM FUSE		NON- FUSED ⁴ DISC.SW	INCOMING WIRE SIZE ⁶	MAX SIZE CKT BKR HACR TYPE ⁵	RLA	PW/LRA
	MIN. ²	MAX. ³					
251	300	450	400	(2) #4-250MCM	450	200	731
226	300	400	400	(2) #4-250MCM	400	180	636
132	175	225	200	(2) #4-250MCM	225	105	385
113	150	200	200	(2) #4-250MCM	200	90	318
126	150	225	200	(2) #4-250MCM	225	100	410
88	110	150	100	(2) #4-250MCM	150	70	254
138	175	225	200	(2) #4-250MCM	225	110	412
251	300	450	400	(2) #4-250MCM	450	200	731
226	300	400	400	(2) #4-250MCM	400	180	636
132	175	225	200	(2) #4-250MCM	225	105	385
113	150	200	200	(2) #4-250MCM	200	90	318
126	150	225	200	(2) #4-250MCM	225	100	410
88	110	150	100	(2) #4-250MCM	150	70	254
138	175	225	200	(2) #4-250MCM	225	110	412
291	350	500	400	(2) #4-250MCM	500	232	865
258	350	450	400	(2) #4-250MCM	450	206	752
151	200	250	200	(2) #4-250MCM	250	120	412
129	175	225	200	(2) #4-250MCM	225	103	376
149	200	250	200	(2) #4-250MCM	250	119	482
99	125	175	100	(2) #4-250MCM	175	79	300
164	200	250	200	(2) #4-250MCM	250	131	572
291	350	500	400	(2) #4-250MCM	500	232	865
258	350	450	400	(2) #4-250MCM	450	206	752
151	200	250	200	(2) #4-250MCM	250	120	412
129	175	225	200	(2) #4-250MCM	225	103	376
149	200	250	200	(2) #4-250MCM	250	119	482
99	125	175	100	(2) #4-250MCM	175	79	300
164	200	250	200	(2) #4-250MCM	250	131	572
376	450	600	400	(2) 1/0-500MCM	600	300	1101
331	400	500	400	(2) #4-250MCM	500	264	976
198	250	350	200	(2) #4-250MCM	350	158	591
166	200	250	200	(2) #4-250MCM	250	132	488
186	225	300	200	(2) #4-250MCM	300	148	585
132	175	225	200	(2) #4-250MCM	225	105	390
203	250	350	200	(2) #4-250MCM	350	162	668
376	450	600	400	(2) 1/0-500MCM	600	300	1101
331	400	500	400	(2) #4-250MCM	500	264	976
198	250	350	200	(2) #4-250MCM	350	158	591
166	200	250	200	(2) #4-250MCM	250	132	488
186	225	300	200	(2) #4-250MCM	300	148	585
132	175	225	200	(2) #4-250MCM	225	105	390
203	250	350	200	(2) #4-250MCM	350	162	668
469	600	800	600	(2) 1/0-500MCM	800	375	1101
408	500	700	400	(2) #4-250MCM	700	326	976
241	300	400	400	(2) #4-250MCM	400	192	591
204	250	350	200	(2) #4-250MCM	350	163	488
236	300	400	400	(2) #4-250MCM	400	188	760
159	200	250	200	(2) #4-250MCM	250	127	390
258	350	450	400	(2) #4-250MCM	450	206	917
296	400	500	400	(2) #4-250MCM	500	236	997
244	300	400	400	(2) #4-250MCM	400	195	830
196	250	350	200	(2) #4-250MCM	350	156	664

CONTROL POWER SUPPLY

UNIT VOLTAGE	CONTROL POWER SUPPLY	MIN. CIRCUIT AMPACITY	MAX. DUAL- ELEMENT FUSE SIZE	NON-FUSE DISC. SWITCH SIZE
Standard Models Without Transformers	115-160	20A	20A, 250V	30A, 240V

LEGEND

VOLT	= Voltage
MCA	= Minimum Circuit Ampacity
DIS	= Disconnect
ACL	= Across-the-Line
PW	= Part Wind
N/A	= Not Available
RLA	= Running Load Amps
FLA	= Full Load Amps
ACL/LRA	= Across-the-Line Inrush Amps
PW/LRA	= Part Wind Inrush Amps
CKT BRK	= Circuit Breaker
HACR	= Heating, Air Conditioning, and Refrigeration

- Maximum HACR is based on 225% maximum plus 100% of the rated load amps for all loads included in the circuit, per circuit, per U.L. 1995 Fig 36.2.
- The "INCOMING WIRE RANGE" is the minimum and maximum wire size that can be accommodated by the unit wiring lugs. The (1), (2), (3), or (4) preceding the wire range indicates the number of termination points available per phase of the wire range specified. The (1-3) preceding the wire range indicates that a single double-barreled lug is available per phase that can accept up to three wires of the wire range specified. "(1) #1-600MCM OR (2) #1-250MCM" indicates that a single lug is supplied and it will accept a single wire up to 600MCM or 2 wires up to 250MCM. Actual wire size and number of wires per phase must be determined based on ampacity and job requirements using N.E.C. wire sizing information. The above recommendations are based on the National Electrical Code and using copper connectors only. Field wiring must also comply with local codes.
- A ground lug is provided for each compressor system to accommodate field grounding conductor per N.E.C. Article 250-54. A control circuit grounding lug is also supplied. Incoming ground wire range is #6 - #2/0.

ELECTRICAL DATA (YCRJ MODELS)

UNIT			SYSTEM #1							
CHILLER MODEL YCWJ	VOLT CODE	VOLTAGE V-PH-HZ	MIN. ¹ CIR. AMP.	DUAL ELEM FUSE		NON- FUSED ⁴ DISC.SW	INCOMING WIRE SIZE ⁶	MAX SIZE CKT BKR HACR TYPE ⁵	RLA	PW/LRA
				MIN. ²	MAX. ³					
45E00	-17	200-3-60	244	300	400	400	(2) #4-250MCM	400	195	731
45E00	-28	230-3-60	213	300	350	200	(2) #4-250MCM	350	170	636
45E00	-40	380-3-60	123	150	200	200	(2) #4-250MCM	200	98	385
45E00	-46	460-3-60	107	150	175	100	(2) #4-250MCM	175	85	318
56E00	-50	380/415-3-50	121	150	200	200	(2) #4-250MCM	200	96	410
45E00	-58	575-3-60	82	100	125	100	(2) #4-250MCM	125	65	254
56E00	-64	346-3-50	132	175	225	200	(2) #4-250MCM	225	105	412
55H00	-17	200-3-60	291	350	500	400	(2) #4-250MCM	500	232	865
55H00	-28	230-3-60	258	350	450	400	(2) #4-250MCM	450	206	752
55H00	-40	380-3-60	151	200	250	200	(2) #4-250MCM	250	120	412
55H00	-46	460-3-60	129	175	225	200	(2) #4-250MCM	225	103	482
66H00	-50	380/415-3-50	149	200	250	200	(2) #4-250MCM	250	119	367
55H00	-58	575-3-60	99	125	175	100	(2) #4-250MCM	175	79	300
66H00	-64	346-3-50	164	200	250	200	(2) #4-250MCM	250	131	572
56H00	-17	200-3-60	291	350	500	400	(2) #4-250MCM	500	232	865
56H00	-28	230-3-60	158	350	450	400	(2) #4-250MCM	450	206	752
56H00	-40	380-3-60	151	200	250	200	(2) #4-250MCM	250	120	412
56H00	-46	460-3-60	129	175	225	200	(2) #4-250MCM	225	103	482
57H00	-50	380/415-3-50	149	200	250	200	(2) #4-250MCM	250	119	367
56H00	-58	575-3-60	99	125	175	100	(2) #4-250MCM	175	79	300
57H00	-64	346-3-50	164	200	250	200	(2) #4-250MCM	250	131	572
66K00	-17	200-3-60	346	450	600	400	(2) #4-250MCM	600	276	950
66K00	-28	230-3-60	301	400	500	400	(2) #4-250MCM	500	240	826
66K00	-40	380-3-60	174	225	300	200	(2) #4-250MCM	300	139	467
66K00	-46	460-3-60	151	200	250	200	(2) #4-250MCM	250	120	413
77K00	-50	380/415-3-50	177	225	300	200	(2) #4-250MCM	300	141	585
66K00	-58	575-3-60	116	150	200	200	(2) #4-250MCM	200	92	330
77K00	-64	346-3-50	194	250	300	200	(2) #4-250MCM	300	155	668
67K00	-17	200-3-60	346	450	600	400	(2) #4-250MCM	600	276	950
67K00	-28	230-3-60	301	400	500	400	(2) #4-250MCM	500	240	826
67K00	-40	380-3-60	174	225	300	200	(2) #4-250MCM	300	139	467
67K00	-46	460-3-60	151	200	250	200	(2) #4-250MCM	250	120	413
78K00	-50	380/415-3-50	177	225	300	200	(2) #4-250MCM	300	141	585
67K00	-58	575-3-60	116	150	200	200	(2) #4-250MCM	200	92	330
78K00	-64	346-3-50	194	250	300	200	(2) #4-250MCM	300	155	668
77K00	-17	200-3-60	428	600	700	400	(2) 1/0-500MCM	700	342	1322
77K00	-28	230-3-60	368	450	600	400	(2) 1/0-500MCM	600	294	1150
77K00	-40	380-3-60	219	300	350	400	(2) #4-250MCM	350	175	696
77K00	-46	460-3-60	184	225	300	200	(2) #4-250MCM	300	147	575
88K00	-50	380/415-3-50	191	250	300	200	(2) #4-250MCM	300	152	760
77K00	-58	575-3-60	147	175	250	200	(2) #4-250MCM	250	117	460
88K00	-64	346-3-50	209	250	350	200	(2) #4-250MCM	350	167	917
88M00	-17	200-3-60	469	600	800	600	(2) 1/0-500MCM	800	375	1322
88M00	-28	230-3-60	408	500	700	400	(2) 1/0-500MCM	700	326	1150
88M00	-40	380-3-60	241	300	400	400	(2) #4-250MCM	400	192	696
88M00	-46	460-3-60	204	250	350	200	(2) #4-250MCM	350	163	575
99M00	-50	380/415-3-50	236	300	400	400	(2) #4-250MCM	400	188	760
88M00	-58	575-3-60	159	200	250	200	(2) #4-250MCM	250	127	460
99M00	-64	346-3-50	258	350	450	400	(2) #4-250MCM	450	206	917
99M00	-40	380-3-60	312	400	500	400	(2) #4-250MCM	500	249	997
99M00	-46	460-3-60	258	350	450	400	(2) #4-250MCM	450	206	830
99M00	-58	575-3-60	207	250	350	200	(2) #4-250MCM	350	165	664

See Notes on pages 12-13.

SYSTEM #2								
MIN. ¹ CIR. AMP.	DUAL ELEM FUSE		NON- FUSED ⁴ DISC.SW	INCOMING WIRE SIZE ⁶	MAX SIZE CKT BKR HACR TYPE ⁵	RLA	PW/LRA	
	MIN. ²	MAX. ³						
291	350	500	400	(2) #4-250MCM	500	232	865	
258	350	450	400	(2) #4-250MCM	450	206	752	
151	200	250	200	(2) #4-250MCM	250	120	412	
129	175	225	200	(2) #4-250MCM	225	103	376	
149	200	250	200	(2) #4-250MCM	250	119	482	
99	125	175	100	(2) #4-250MCM	175	79	300	
164	200	250	200	(2) #4-250MCM	250	131	572	
291	350	500	400	(2) #4-250MCM	500	232	865	
258	350	450	400	(2) #4-250MCM	450	206	752	
151	200	250	200	(2) #4-250MCM	250	120	412	
129	175	225	200	(2) #4-250MCM	225	103	376	
149	200	250	200	(2) #4-250MCM	250	119	482	
99	125	175	100	(2) #4-250MCM	175	79	300	
164	200	250	200	(2) #4-250MCM	250	131	572	
346	450	600	400	(2) #4-250MCM	600	276	950	
301	400	500	400	(2) #4-250MCM	500	240	826	
174	225	300	200	(2) #4-250MCM	300	139	467	
151	200	250	200	(2) #4-250MCM	250	120	413	
177	225	300	200	(2) #4-250MCM	300	141	585	
116	150	200	200	(2) #4-250MCM	200	92	330	
194	250	300	200	(2) #4-250MCM	300	155	668	
346	450	600	400	(2) #4-250MCM	600	276	950	
301	400	500	400	(2) #4-250MCM	500	240	826	
174	225	300	200	(2) #4-250MCM	300	139	467	
151	200	250	200	(2) #4-250MCM	250	120	413	
177	225	300	200	(2) #4-250MCM	300	141	585	
116	150	200	200	(2) #4-250MCM	200	92	330	
194	250	300	200	(2) #4-250MCM	300	155	668	
428	600	700	400	(2) 1/0-500MCM	700	342	1322	
368	450	600	400	(2) 1/0-500MCM	600	294	1150	
219	300	350	400	(2) #4-250MCM	350	175	696	
184	225	300	200	(2) #4-250MCM	300	147	575	
191	250	300	200	(2) #4-250MCM	300	152	760	
147	175	250	200	(2) #4-250MCM	250	117	460	
209	250	350	200	(2) #4-250MCM	350	167	917	
428	600	700	400	(2) 1/0-500MCM	700	342	1322	
368	450	600	400	(2) 1/0-500MCM	600	294	1150	
219	300	350	400	(2) #4-250MCM	350	175	696	
184	225	300	200	(2) #4-250MCM	300	147	575	
191	250	300	200	(2) #4-250MCM	300	152	760	
147	175	250	200	(2) #4-250MCM	250	117	460	
209	250	350	200	(2) #4-250MCM	350	167	917	
469	600	800	600	(2) 1/0-500MCM	800	375	1322	
408	500	700	400	(2) 1/0-500MCM	700	326	1150	
241	300	400	400	(2) #4-250MCM	400	192	696	
204	250	350	200	(2) #4-250MCM	350	163	575	
236	300	400	400	(2) #4-250MCM	400	188	760	
159	200	250	200	(2) #4-250MCM	250	127	460	
258	350	450	400	(2) #4-250MCM	450	206	917	
312	400	500	400	(2) #4-250MCM	500	249	997	
258	350	450	400	(2) #4-250MCM	450	206	830	
207	250	350	200	(2) #4-250MCM	350	165	664	

See Notes on pages 12-13.

ELECTRICAL DATA (YCWJ MODELS)

SINGLE POINT POWER SUPPLY (OPTIONAL)

CHILLER MODEL YCWJ	VOLT CODE	VOLTAGE V-PH-HZ	MIN. ¹ CIR. AMP.	DUAL ELEM FUSE		NON- FUSED ⁴ DISC.SW	MAX SIZE CKT BKR HACR TYPE ⁵	INCOMING WIRE SIZE ⁶	
				MIN. ²	MAX. ³			SINGLE POINT	YORK SUPPL. DISCONNECT
45EE0	-17	200-3-60	425	500	500	600	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
45EE0	-28	230-3-60	377	450	500	400	500	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
45EE0	-40	380-3-60	224	250	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
45EE0	-46	460-3-60	189	225	250	200	250	(1) #6-350MCM	(1) #6-350MCM
56EE0	-50	380/415-3-50	210	250	250	400	250	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
45EE0	-58	575-3-60	149	175	200	200	200	(1) #6-350MCM	(1) #6-350MCM
56EE0	-64	346-3-50	230	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
55HE0	-17	200-3-60	451	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
55HE0	-28	230-3-60	406	450	500	600	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
55HE0	-40	380-3-60	237	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
55HE0	-46	460-3-60	203	225	250	400	250	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
66HE0	-50	380/415-3-50	226	250	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
55HE0	-58	575-3-60	158	175	225	200	225	(1) #6-350MCM	(1) #6-350MCM
66HE0	-64	346-3-50	248	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
56HF0	-17	200-3-60	491	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
56HF0	-28	230-3-60	438	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
56HF0	-40	380-3-60	256	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
56HF0	-46	460-3-60	219	250	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
67HF0	-50	380/415-3-50	249	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
56HF0	-58	575-3-60	169	200	225	200	225	(1) #6-350MCM	(1) #6-350MCM
67HF0	-64	346-3-50	274	350	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
66KH0	-17	200-3-60	523	600	700	600	700	(1-3) #6-350MCM	(1-2) 4/0-500MCM
66KH0	-28	230-3-60	464	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
66KH0	-40	380-3-60	271	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
66KH0	-46	460-3-60	232	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
77KH0	-50	380/415-3-50	268	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
66KH0	-58	575-3-60	178	200	250	200	250	(1) #6-350MCM	(1) #6-350MCM
77KH0	-64	346-3-50	295	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
67KH0	-17	200-3-60	608	700	800	800	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
67KH0	-28	230-3-60	537	600	700	600	700	(1-3) #6-350MCM	(1-4) 4/0-500MCM
67KH0	-40	380-3-60	318	400	400	400	400	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
67KH0	-46	460-3-60	269	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
78KH0	-50	380/415-3-50	305	350	400	400	400	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
67KH0	-58	575-3-60	211	250	250	400	250	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
78KH0	-64	346-3-50	334	400	450	400	450	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
77KH0	-17	200-3-60	676	800	800	800	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
77KH0	-28	230-3-60	595	700	800	800	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
77KH0	-40	380-3-60	356	400	500	400	500	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
77KH0	-46	460-3-60	298	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
88KH0	-50	380/415-3-50	334	400	450	400	450	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
77KH0	-58	575-3-60	237	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
88KH0	-64	346-3-50	365	450	500	400	500	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
88MH0	-17	200-3-60	844	1000	1200	1000	1200	(1-3) #6-350MCM	(1-4) 1/0-350MCM
88MH0	-28	230-3-60	734	1000	1000	800	1000	(1-3) #6-350MCM	(1-4) 1/0-350MCM
88MH0	-40	380-3-60	433	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
88MH0	-46	460-3-60	367	450	500	400	500	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
99MH0	-50	380/415-3-50	424	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
88MH0	-58	575-3-60	286	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
99MH0	-64	346-3-50	464	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
99MJ0	-40	380-3-60	532	600	700	600	700	(1-3) #6-350MCM	(1-2) 4/0-500MCM
99MJ0	-46	460-3-60	439	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
99MJ0	-58	575-3-60	352	400	500	400	500	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM

See Notes on pages 12-13.

ELECTRICAL DATA (YCRJ MODELS)

SINGLE POINT POWER SUPPLY (OPTIONAL)

CHILLER MODEL YCRJ	VOLT CODE	VOLTAGE V-PH-HZ	MIN. ¹ CIR. AMP.	DUAL ELEM FUSE		NON- FUSED ⁴ DISC.SW	MAX SIZE CKT BKR HACR TYPE ⁵	INCOMING WIRE SIZE ⁶	
				MIN. ²	MAX. ³			SINGLE POINT	YORK SUPPL. DISCONNECT
45E00	-17	200-3-60	486	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
45E00	-28	230-3-60	428	500	500	600	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
45E00	-40	380-3-60	249	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
45E00	-46	460-3-60	214	250	250	400	250	(1) #6-350MCM	(1) #6-350MCM
56E00	-50	380/415-3-50	245	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
45E00	-58	575-3-60	164	200	225	200	225	(1) #6-350MCM	(1) #6-350MCM
56E00	-64	346-3-50	269	350	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
55H00	-17	200-3-60	523	600	700	600	700	(1-3) #6-350MCM	(1-4) 1/0-350MCM
55H00	-28	230-3-60	464	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
55H00	-40	380-3-60	271	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
55H00	-46	460-3-60	232	300	300	400	300	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
66H00	-50	380/415-3-50	268	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
45E00	-58	575-3-60	178	200	250	200	250	(1) #6-350MCM	(1) #6-350MCM
66H00	-64	346-3-50	295	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
56H00	-17	200-3-60	578	700	700	600	700	(1-3) #6-350MCM	(1-4) 1/0-350MCM
56H00	-28	230-3-60	507	600	700	600	700	(1-3) #6-350MCM	(1-4) 1/0-350MCM
56H00	-40	380-3-60	294	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
56H00	-46	460-3-60	254	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
67H00	-50	380/415-3-50	296	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
56H00	-58	575-3-60	195	225	250	200	250	(1) #6-350MCM	(1) #6-350MCM
67H00	-64	346-3-50	325	400	400	400	400	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
66K00	-17	200-3-60	622	700	800	800	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
66K00	-28	230-3-60	541	600	700	600	700	(1-3) #6-350MCM	(1-4) 1/0-350MCM
66K00	-40	380-3-60	313	350	450	400	450	(1-3) #6-350MCM	(1-2) 4/0-500MCM
66K00	-46	460-3-60	271	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
77K00	-50	380/415-3-50	318	400	450	400	450	(1-3) #6-350MCM	(1-2) 4/0-500MCM
66K00	-58	575-3-60	208	250	250	400	250	(1) #6-350MCM	(1) #6-350MCM
77K00	-64	346-3-50	349	400	500	400	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
67K00	-17	200-3-60	704	800	1000	800	1000	(1-3) #6-350MCM	(1-4) 1/0-350MCM
67K00	-28	230-3-60	608	700	800	800	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
67K00	-40	380-3-60	358	400	450	400	450	(1-3) #6-350MCM	(1-2) 4/0-500MCM
67K00	-46	460-3-60	304	350	400	400	400	(1-3) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
78K00	-50	380/415-3-50	332	400	450	400	450	(1-3) #6-350MCM	(1-2) 4/0-500MCM
67K00	-58	575-3-60	239	300	300	400	300	(1) #6-350MCM	(1) #6-350MCM
78K00	-64	346-3-50	364	450	500	400	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
77K00	-17	200-3-60	770	1000	1000	800	1000	(1-3) #6-350MCM	(1-4) 1/0-350MCM
77K00	-28	230-3-60	662	800	800	800	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
77K00	-40	380-3-60	394	450	500	600	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
77K00	-46	460-3-60	331	400	450	400	450	(1-3) #6-350MCM	(1-2) 4/0-500MCM
88K00	-50	380/415-3-50	343	400	450	400	450	(1-3) #6-350MCM	(1-2) 4/0-500MCM
77K00	-58	575-3-60	264	300	350	400	350	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
88K00	-64	346-3-50	376	450	500	400	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
88M00	-17	200-3-60	844	1000	1200	1000	1200	(1-3) #6-350MCM	(1-4) 1/0-350MCM
88M00	-28	230-3-60	734	1000	1000	800	1000	(1-3) #6-350MCM	(1-4) 1/0-350MCM
88M00	-40	380-3-60	433	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
88M00	-46	460-3-60	367	450	500	400	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM
99M00	-50	380/415-3-50	424	500	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
88M00	-58	575-3-60	286	350	400	400	400	(1) #6-350MCM	(1) #1-600MCM OR (2) #1-250MCM
99M00	-64	346-3-50	464	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
99M00	-40	380-3-60	561	700	800	600	800	(1-3) #6-350MCM	(1-4) 1/0-350MCM
99M00	-46	460-3-60	464	600	600	600	600	(1-3) #6-350MCM	(1-2) 4/0-500MCM
99M00	-58	575-3-60	372	450	500	400	500	(1-3) #6-350MCM	(1-2) 4/0-500MCM

See Notes on pages 12-13.

INSTALLATION

GENERAL

CAUTION:

To protect warranty, this equipment must be installed and serviced by an authorized YORK service mechanic or a qualified service person experienced in chiller installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cutout settings, design working pressures and ventilation requirements consistent with the amount and type of refrigerant charge.

Lethal voltages exist within the control panel. Before servicing, open and tag all disconnect switches.

INSTALLATION CHECK LIST

The following items, 1 thru 7, must be checked before placing units into operation.

1. Inspect unit for shipping damage.
2. Rig unit per Fig. 3.
3. Open unit only to install water piping system. Do not remove protective covers from water connections until piping is ready for attachment. Check water piping to insure cleanliness.
4. Pipe unit using good piping practice (see ASHRAE handbook or sections 215 and 195 of YORK Service Manuals for detailed piping.)
5. Make sure refrigerant piping and system are free of moisture and scale. (YCR Models.)
6. Check for leaks; evacuate unit. (YCR Models.)
7. Check to see that unit is installed and operated within LIMITATIONS shown on page 6.

The following paragraphs outline procedures to be followed.

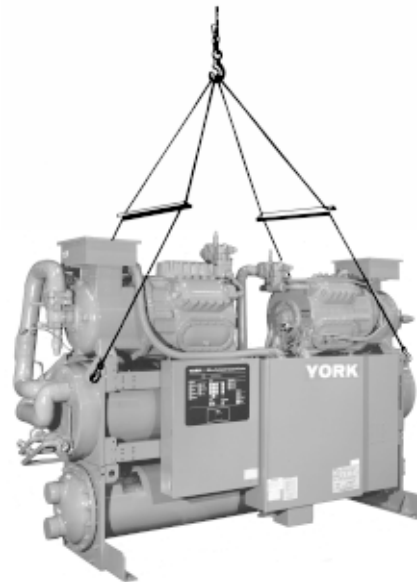
INSPECTION

As soon as it is received, the unit should be inspected for any damage done in transit. If damage is evident, it should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing at once. (See YORK Service Policy and Procedures – Shipping Damage Claims, Form 50.15-NM.)

HANDLING

Each chiller is skidded at the factory. Care should be used during handling to avoid damage to the control panel, solenoid valves, transducers, refrigerant piping, etc.

Normally, the chiller can be moved into position using a lift truck or pipe rollers. If the unit must be lifted by means of a crane or hoist, use the four lugs provided. (See Fig. 3.) Spreader bars should be used to avoid damaging the unit with the lifting chains.



26124A(R)

FIG. 3 – RIGGING THE UNIT

LOCATION

The packaged liquid chillers may be located on the ground floor on a flat and level concrete foundation, provided by the purchaser, capable of supporting 150% of the operating weight. If the unit is mounted on an upper floor, care must be exercised to isolate the unit and piping from the walls and ceiling.

Standard packaged water chillers are constructed for general purpose, indoor application (40°F to 115°F, ambient) and are not intended for wet, corrosive, or explosive atmospheres. Installation should allow for water drain, ventilation, and clearance for service, including tube pulling. Any questionable application situations should be referred to the factory for guidance.

For installation in equipment rooms adjacent to or near noise-critical areas, common walls should be of adequate sound attenuating construction, all doors should be tightly gasketed, and unit should have vibration isolators.

LOW AMBIENT LOCATIONS

The standard 350 watt crankcase heaters used with the compressors are suitable for normal standby system pressures and the ambient temperatures expected in an indoor engine room heated in the winter. For unheated engine rooms additional crankcase heat often is needed to maintain crankcase oil temperatures at levels which will prevent dilution of oil by the refrigerant to the point that adequate lubrication on startup is endangered. A crankcase temperature of 100°F to 120°F should be maintained.

FOUNDATION AND MOUNTING

GROUND – If the unit is to be located on an earth floor, it should be placed on a level concrete slab extending 6" to 8" above the level of the floor (see Fig. 4).

BASEMENT - Remove a portion of the basement floor so that a concrete base can be poured resting on the ground, extending 6" to 8" above the basement floor and having sufficient space on all sides to install corkboard as shown in Fig. 4.

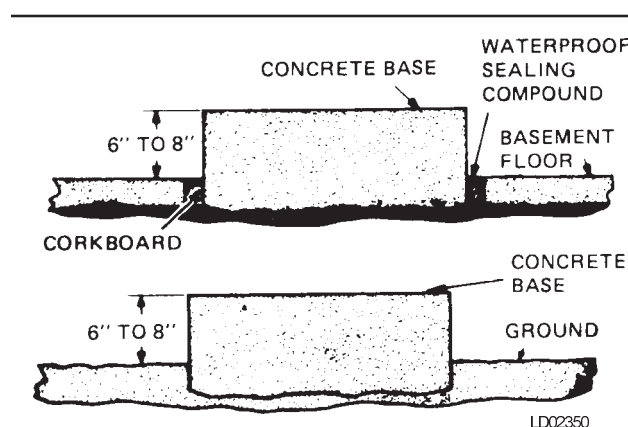


FIG. 4 – FOUNDATIONS

Vibration Isolators (Optional)

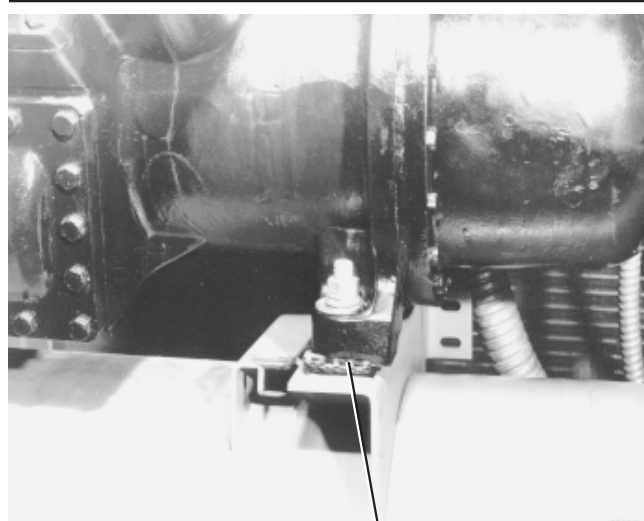
When ordered, four (4) vibration isolators will be furnished with the unit. They are of the level adjusting spring type and all four isolators are of identical capacity. They should be mounted at the corners of the unit base as shown in DIMENSIONS.

Fasten the isolator mounting bracket underneath the unit base (It will be necessary to raise the unit to do this.) Note that the bolt should be inserted from the bottom of the mounting bracket.

The isolator should be fastened to the mounting bracket by the cap screw inserted through the hole in the mounting bracket into the tapped hole in the top of the isolator leveling bolt. Leveling of the unit is accomplished by turning the leveling bolt. After the unit is level, tighten the cap screw.

COMPRESSOR MOUNTING

The compressors are mounted on (4) isolator pads (one under each compressor foot). (See Fig. 5). The mounting bolts are not to be loosened or adjusted at installation.



COMPRESSOR MOUNTING PAD

25112A

FIG. 5 – COMPRESSOR MOUNTING PAD

FIELD WATER PIPING

GENERAL – When the unit has been located in its final position, the unit liquid piping may be connected. Normal installation precautions should be observed in order to receive maximum operating efficiencies. Piping should be kept free of all foreign matter. All condenser and liquid cooler piping must comply in all respects with local plumbing codes and ordinances.

Since elbows, tees and valves decrease pump capacity, all piping should be kept as simple as possible.

Hand stop valves should be installed in all lines to facilitate servicing.

Piping to the inlet and outlet connections of the chiller and condenser may include high-pressure rubber hose or piping loops to insure against transmission of vibration. This is optional and the necessary components must be obtained in the field. The unit must not be subjected to the weight of the connecting piping.

Drain connections should be provided at all low points to permit complete drainage of condenser, liquid cooler and piping system.

A strainer, preferably 40 mesh, **MUST** be installed in the cooler and condenser inlet lines, just ahead of the cooler and condenser.

A small valve or valves should be installed at the highest point or points in the chilled liquid piping to allow any trapped air to be purged. Vent and drain connections should be extended beyond the insulation to make them accessible. Chiller piping as well as the circulating pump may be insulated as required to prevent condensation from forming.

CHILLED LIQUID PIPING

The piping to and from the cooler must be designed to suit the individual installation. It is important that the following considerations be observed:

1. The chilled liquid piping system should be laid out so that the circulating pump discharge is into the cooler. The suction for this pump should be taken from the piping system return line and not the cooler.
2. It is recommended that all chilled liquid piping be thoroughly flushed to free it from foreign material before the system is placed into operation. Use care not to flush any foreign material into or through the cooler.
3. As an aid to servicing, thermometers and pressure gauges should be installed in the inlet and outlet water lines. One connection point (plugged) is provided in each cooler nozzle. Thermometers and gauges are not furnished with the unit and are to be furnished by other suppliers.
4. A chilled water flow switch, (either by YORK or others) **MUST** be installed in the leaving water piping of the cooler. There should be a straight horizontal run of at least 5 diameters on each side of the switch. Adjust the flow switch paddle to the size of pipe in which it is to be installed. (See manufacturer's instructions furnished with switch). The switch is to be wired to terminals in the control panel as shown in the WIRING DIAGRAM.

CONDENSER WATER PIPING

Water cooled condensers may be piping for well water or for use in conjunction with a water cooling tower.

1. WELL WATER – If well water with a temperature below 55°F is used to cool the condenser, some means must be provided to maintain adequate condenser pressure for proper operation of the expansion valve. One way to control condenser pressure is to use an automatic water regulating valve to maintain a minimum leaving water temperature of 65°F.

The regulator should be installed in the entering water line; however, the outlet piping leaving the condenser should contain a vertical rise approximately 3" higher than the top of the condenser before an elbow is installed to continue the piping to an open drain. The reason for the vertical riser is to create a trap which will prevent water from draining out of the condenser at each shut down. This aids in preventing unnecessary and premature fouling of the condenser due to drying of the tubes (with subsequent rapid build up of foreign material) during shutdown periods.

It should be determined that the maximum water pressure at the condenser does not exceed the maximum design working pressure of the condenser (150 PSIG).

In order to insure quiet and satisfactory operation of the water regulating valve, the manufacturer may limit the working pressure to which the valve can be subjected.

Where excessive water pressures are encountered, a pressure reducing valve should be installed ahead of the water regulating valve to permit reduction of the condenser water pressure in accordance with the requirements of the condenser and/or water regulating valve.

2. WATER COOLING TOWER PIPING – When installing these chillers with a cooling tower, some means of controlling head pressure must be provided if operation with entering condenser water temperature below 55°F is required. Water flow through the cooling tower should be constant, while at the same time, it must be possible to vary the water flow through the condenser to keep the condensing pressure and temperature constant regardless of load and outside temperature and wet bulb conditions to assure proper operation of the thermal expansion valve or valves. This may be accomplished by installing a 3-way water regulating valve as shown in Fig. 6. The valve should be set to maintain 65°F minimum leaving condenser water temperature.

The use of a three way water regulating valve with bypass is highly recommended since it maintains constant condensing pressure regardless of outside temperature conditions and insures proper operation of the cooler expansion valve.

It is important to follow the instructions of the water regulating valve manufacturer in regard to installation recommendations and valve adjustment procedures.

Thermometer wells should be located at the condenser inlet and outlet to aid in performance and service work.

REMOTE CONDENSER APPLICATION

The "YCR" units are sold less the self-contained shell and tube condenser for use with remote condensers, which may be of the air cooled type. The following guidelines should be followed:

1. Remote refrigerant lines shall not exceed 100 ft. of equivalent length each for discharge and liquid to achieve listed ratings.
2. Liquid lines and discharge lines shall be steel and sized to match the connection sizes shown in DIMENSIONS.
3. Minimum capacity is as shown in PHYSICAL DATA.
4. Liquid chiller, air cooled condenser and connecting lines are located on the same elevation with horizontal runs only or with condenser at elevated position and proper means provided for head control and prevention of operating problems associated with low ambients. Vertical discharge pipes must be properly sized to ensure oil return. In some installations, particularly ones with compressors unloading to a small percentage of full load, it may be necessary to use a double pipe riser.
5. Piping shall be as direct as possible limited by Items #1 and #4. Any other configurations shall be referred to YORK for application information.
6. Do not use a liquid receiver unless proper refrigerant subcooling is maintained at the expansion valve. One way to achieve this subcooling is to locate an air-cooled heat-exchanger between the receiver and the expansion valve. This heat exchanger should cool refrigerant liquid to at least 10°F below the saturation temperature. Another way to assure subcooling is to locate the receiver at least 15 feet above the expansion valve. This arrangement provides a liquid column which raises the pressure of the refrigerant above the saturation pressure and thus assures proper subcooling at the expansion valve.
7. The condenser must provide liquid subcooling of 10°F measured at the condenser outlet.
8. Remote air cooled condensers with reciprocating water chillers require the proper design of interconnecting piping using accepted refrigeration piping practice (as outlined in ASHRAE handbooks) and proper head pressure control measures for all ambient temperatures that could occur. For multiple units, additional measures must be taken as necessary for satisfactory performance.

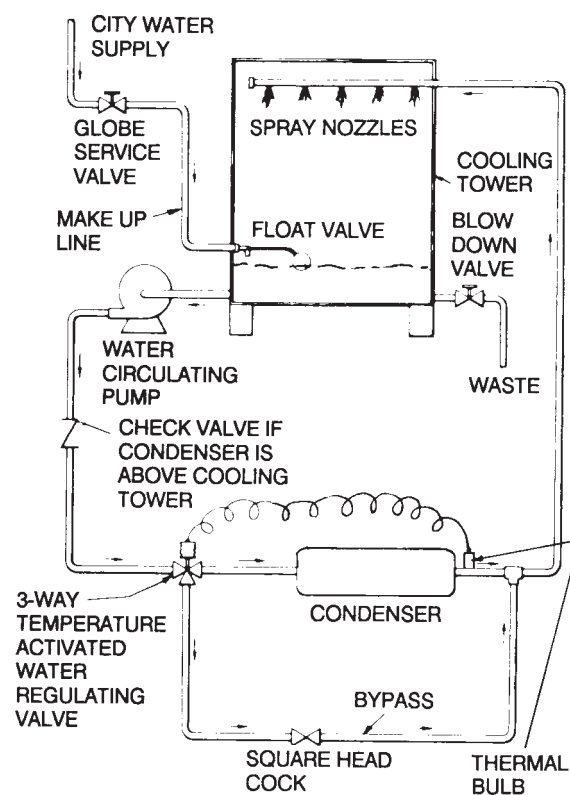


FIG. 6 – CONDENSER WATER PIPING - COOLING TOWER

LD02351

9. Minimum saturated condensing temperature to achieve ratings is 80°F. The air cooled condenser fan controls or other appropriate head pressure control devices must be provided using accepted refrigerant system practice.
10. Use discharge line check valves recommended in Chapter 26 of ASHRAE Systems Handbook.
11. Piping must utilize appropriate supports and anchoring to prevent the amplification of compressor discharge gas pulsations and mechanical vibrations. Allowance should be made for thermal expansion and contraction using appropriate elbows and three dimensional piping configurations.
12. There must be a minimum of 15 pipe diameters of piping between the compressor and the first pipe support on both the discharge and suction lines. The piping must be fully supported by appropriate hangers, etc. without imposing its weight or moments on the compressor.
13. Suction and discharge lines should be supported on 5-foot intervals. Small refrigerant or control piping should be supported at 3-foot intervals. Controls must be independently mounted; not supported by the control piping. A thin layer of resilient material (such as

1/16" or 1/8" thick neoprene) should be used between the pipe and a pipe support. This will prevent metal-to-metal contact and possible chatter between the pipe and its supports. Supports must be installed in such a way as to prevent transmission of excessive vibration to building structures.

14. Where pipe passes through a wall, the space between the pipe and the wall must be filled with a resilient material such as cork, fiberglass, etc. The pipe must not touch the wall.
15. A relatively large mass of pipe (such as a common discharge or suction header or trap on a parallel system or a discharge oil separator) must be held rigidly in three coordinate directions so it is immovable. Vibration must be effectively isolated from the building structure with appropriate resilient materials.
16. A discharge muffler (if used) should be in a horizontal line, after the first support, as close to the unit as possible and should be placed between the compressor and discharge oil separator (which is generally used with refrigeration systems only). The oil return line from a separator must not drop straight down into the compressor crankcase but must have a 2-foot minimum horizontal run before it enters the compressor to allow flexibility.
17. Under no circumstances should a suction or discharge connection to a compressor run directly in a straight line to a rigid connection or support in a horizontal plane perpendicular to the crankshaft axis. Torsional movement, vibration effects and thermal growth could prove too severe.

The preceding comments will assist the piping designer and installer but are not necessarily all inclusive of what may be needed to avoid problems: The contractor has the responsibility for correcting field problems with piping and the potential liability for injury to personnel. He, therefore, should consult the following two ANSI and ASHRAE documents for his design and installation practices:

- a. ASHRAE Standard Safety Code for Mechanical Refrigeration ANSI/ASHRAE 15- 1978. The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., 345 East 47th Street, New York, NY 10017.
- b. American National Standard Code for Pressure Piping, ANSI B31.5 - 1974. The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017.

Since "YCR" chillers are shipped containing Refrigerant-22 as a holding charge, the compressor discharge valve and the liquid stop valve should be kept closed until the remote condenser and all refrigerant piping are installed, tested and properly evacuated for removal of moisture as explained under FIELD REFRIGERANT PIPING opposite.

HIGH SIDE EQUIPMENT

The proper selection of remote condensers, receivers and relief valves must be made for use in conjunction with condenserless "YCR" model chillers. To comply with the ANSI B9.1 Safety Code, the following must be adhered to.

$$\text{HPCO setting (PSIG)} = \frac{90\% \text{ of pressure relief device setting on the high side}}{}$$

The mechanical HP cut-out in the YCW chiller is set for 270 PSIG, corresponding to a maximum design pressure of 300 PSIG. To permit operation and permit startup at high ambients and chilled water temperatures, up to 150°F saturated compressor discharge, the YCR model chiller has its HP cut-out set at 360 PSIG ± 10 PSIG.

Per ANSI B9.1, the maximum setting of the HP cut-out is 90% of the relief device setting or shell design working pressure (DWP), whichever is smaller. Whereas 300 PSIG DWP receivers and relief devices are adequate for models operating up to 120°F condensing temperature, YCR models which operate at higher condensing pressures must have minimum DWP and relief settings of 450 psi ($405 \div .9$)

FIELD REFRIGERANT PIPING "YCR" (REMOTE CONDENSER TYPE) UNITS

INTERNAL DRYNESS AND CLEANLINESS – It is essential that unit compressors be installed and operated in a refrigerant piping system which is thoroughly dry and clean. Compressors are internally clean, free of moisture and ready for satisfactory operation when they leave the factory. However, if they are installed or operated in a refrigerant system which is contaminated with moisture and/or foreign material, they may be damaged seriously. The dryness and cleanliness of the refrigerant system in which the compressor will operate is beyond the control of the manufacturer since the remote condenser and the associated refrigerant discharge and liquid piping is installed in the field.

It is the responsibility of field personnel to see that refrigerant systems are installed dry and clean and that they are maintained this way during operation.

EFFECTS OF MOISTURE AND AIR – If the system contains moisture, corrosion of internal parts may take place.

Moisture build-up in a system is frequently gradual. A corrosive condition can exist before the moisture content has built up to the point where freeze-up of the expansion device may be possible. Moisture in the system can combine with Refrigerant-22 to form acid. The acid corrodes the internal parts of the system, particularly compressor parts. This can be a factor in causing motor burnouts. Frequently, these parts become corroded to the point where they are unfit for further use. Also, sludge is formed, which causes driers and screens to become plugged. The extent of corrosion when present depends on the amount of acid, the operating temperature and the length of time the system has been operating in an acid-forming condition.

Air and moisture are closely associated: when air exists in the system, moisture is usually present.

Air raises the operating discharge pressure, which results in un-economical operation and higher compressor operating temperatures. The adverse effects of air and moisture are more serious at high temperatures, the latter being the direct result of high condensing pressures, which in turn, may be caused by the presence of air in the system.

FOREIGN MATERIAL – Dirt, rust, scale and any foreign material may damage compressor parts and must be prevented from reaching these parts. Refrigerant-22 acts as a solvent and may loosen foreign material from the interior surfaces of the piping. Care must be taken to prevent this material from being flushed back through the suction connection and into the compressor. All piping should be thoroughly cleaned at the time of installation to eliminate foreign material at its source.

INSTALLATION – It is important that all precautions be taken to avoid the entrance of moisture and foreign material **DURING** the installation procedure. Pipes, coil connections, or any refrigerant-containing portions of the system should not be allowed to remain open even for an overnight period. All such openings should be plugged or temporarily sealed. The compressor discharge stop valves and the refrigerant liquid stop valve should remain closed during fabrication of the condenser piping system. They should be opened just before the system is evacuated, tested and charged with refrigerant. Filter drier cores should not be exposed to the air for more than 10 minutes.

“YCR” models must include discharge line mufflers. The mufflers should be mounted in the discharge line as close to the unit as possible. They can be mounted vertically or horizontally but should never be installed in a riser. One side of the muffler is stamped TOP for horizontal mounting. The mufflers should always be pitched toward the condenser.

“YCR” models with optional Hot Gas Bypass (Loadmaster) require field piping to be completed to the discharge side of the system piping.

LOW AMBIENT APPLICATION

Starting

When chillers are applied with air-cooled or evaporative condensers, provisions are necessary to allow starting at lower than design outside ambient since the evaporator is usually pumped down and there may not be sufficient pressure at the outside ambient to supply liquid to the evaporator.

Operation

Full capacity may be required at lower than design ambient. Then it is necessary to maintain system head pressure for proper expansion valve pressure differential for satisfactory evaporator feeding. This may be accomplished with an air cooled condenser or evaporative condenser by any appropriate means such as: A damper control system or fan cycling on the air-cooled or evaporative condenser or by backing up liquid in the condenser. Water cooled condensers are usually controlled by a pressure regulating valve throttling the cooling water or by a cooling tower bypass valve. If this is overlooked, a problem is almost a certainty in multiple chiller installations and likely on single unit applications.

TESTING

“YCW” models are shipped fully charged with refrigerant. “YCR” models are shipped with a refrigerant holding charge.

For field installed “YCR” models, it is recommended that the holding charge be released and the entire system (chiller, condenser and associated piping) be evacuated, tested and dehydrated before charging refrigerant. In this case, the connection for evacuating and charging may be attached to the charging port of the refrigerant liquid stop valve as explained under **CHARGING CONNECTIONS**. Also, it will be necessary to hold the liquid line solenoid valve in the open position by energizing it from an outside source of current.

Before the evacuation process can proceed, the refrigerant-containing portions of the system must be free of leakage. It is recommended that a pressure of 150 PSIG (Refrigerant-22 and dry nitrogen) be applied to the system for testing. This may be accomplished by connecting a cylinder of Refrigerant-22 to the charging port of the condenser liquid stop valve and bleeding in enough refrigerant gas to bring the system pressure to approximately 25 PSIG. At this point a rapid inspection for major leaks should be made. If any are found, the pressure

should be released and the leaks repaired. If not, raise the system pressure to approximately 150 PSIG by introducing dry nitrogen. The dry nitrogen cylinder must be equipped with a pressure regulating valve set at 150 PSIG for this procedure. If any apparent leakage should develop during this procedure, the pressure should be removed and the leaks repaired before raising the system pressure further. The dry nitrogen cylinder should be disconnected as soon as the pressure within the system has been raised to the desired maximum. Then the system should be thoroughly and carefully tested in the conventional way with a leak detector used in accordance with the manufacturer's instructions.

CHARGING CONNECTIONS

The seal capped refrigerant liquid stop valve (see DIMENSIONS) is provided with a capped port through which refrigerant may be charged into the system. This port is closed when the stem of the valve is screwed all the way toward the open or back-seated position, and opens as the stem is moved toward the closed position.

A length of copper tubing equipped with flare connections may be used as a charging connection. The charging connection may be attached to a refrigerant cylinder, an absolute pressure gauge and charging panel, or a vacuum pump as required for evacuating the system or charging it with refrigerant. A dry nitrogen cylinder (with its pressure regulating valve) may be connected by means of a tee into the charging connection for convenience during the testing procedure.

Refrigerant charging connections should either be evacuated with the system piping or be purged of air by blowing a small quantity of refrigerant through them.

VACUUM DEHYDRATION

NOTE: The operating of hermetic compressors in a vacuum may damage the motor and cause it to fail immediately or within a short time. For this reason the compressor should never be operated during the evacuation procedure.

Dehydration, or removal of water or moisture from the refrigerant system after installation has been completed, may be accomplished readily by the evacuation method. This method consists basically of applying a deep vacuum to the refrigerant-containing portions of the system after the system has been thoroughly leak tested and made tight. During the evacuation procedure, as the pressure within the system is reduced, the boiling (or vaporizing) point of any water or moisture within the system is also reduced as shown by TABLE 1.

It should be noted, that under unusual circumstances, a possibility exists for freezing water inside the system.

Such moisture or free water may be removed by the Double Evacuation procedure as explained in Paragraph 4 of EVACUATING PROCEDURE.

STANDARDS – To be considered dry and free of moisture a refrigerant system must be capable of sustaining a pressure of .019 lb. per sq. in. absolute, or (1000 microns) absolute pressure, or better, as shown by TABLE 1 with the vacuum pump valved off. This is equivalent to 29.882 in. vacuum gauge pressure and to a boiling point of water of 1°F. This condition may be considered satisfactory for standard moisture evacuation purposes for field-erected refrigerant systems.

VACUUM PUMP, COMPRESSOR AND MOTOR – A good quality vacuum pump capable of creating a vacuum of less than 1000 microns, or 1 mm of mercury absolute pressure is necessary. **THE COMPRESSOR MUST NEVER BE USED FOR THIS PURPOSE.**

ABSOLUTE PRESSURE GAUGE – It is not satisfactory nor accurate to attempt to read pressures in the range of the required 29.882 inches of vacuum with an ordinary compound gauge for several reasons. First, as shown by TABLE 1, it is necessary to be able to read very closely the increments of pressure below 28.94" vacuum (78°F), at which point, moisture removal may only be starting. Lower readings in small increments are necessary as shown, and it is not possible to make them accurately with the ordinary gauge. Second, these gauges quickly lose calibration and become inaccurate. Third, to be of value, the gauge pressure readings, even if accurate, would have to be corrected in terms of the barometric pressure at the time and location at which the reading is taken. (Standard Tables of pressure and boiling points of water are made up in terms of atmospheric pressure at sea level or 14.696 PSIA as shown.)

The absolute pressure gauge is unaffected by barometric pressure and readings may be taken quickly and accurately.

Instead of indicating how far the system pressure is below atmospheric, as would a compound service gauge, these devices indicate how far this pressure is above a perfect vacuum.

For convenience in reading, these gauges are graduated to read absolute pressure in microns or in millimeters of mercury. Equivalent boiling points of water and gauge pressures in inches vacuum are shown in TABLE 1. Note that one millimeter of mercury is equal to 1000 microns.

It is recommended that a good quality absolute pressure gauge be used in accordance with the Manufacturer's instructions. Recommended gauges are the Zimmerli Absolute Pressure Gauge, the Stokes McLeod Gauge or the Meriam closed end U-tube type. The latter gauge is illustrated by Fig. 7.

TABLE 1 – SYSTEM PRESSURES*

	GAUGE	ABSOLUTE				Boiling Temperatures of Water	
		PSIA	kPa	Millimeters of Mercury (Hg)	Microns	°F	°C
	PSIG						
Atmospheric Pressure At Sea Level – 14.696 psia.	250	264.7	1823				
	200	214.7	1479				
	100	114.7	790				
	0						
Inches Mercury (Hg) below one atmosphere (gauge)	10.24"	14.696	101.3	760	760,000	212	100
	22.05"	9.629	66.3	500	500,000	192	86.9
	25.98"	3.865	26.6	200	200,000	151	66.1
	27.95"	1.935	13.3	100	100,000	124	51.1
	28.94"	.968	6.7	50	50,000	101	38.3
	29.53"	.481	3.3	25	25,000	78	25.6
	29.72"	.192	1.3	10	10,000	52	11.1
	29.842"	.099	.68	5	5,000	35	1.7
	29.882"	.039	.27	2	2,000	15	-9.4
	29.901"	.019	.13	1.0	1,000	+1	-17.2
	29.917"	.010	.069	.5	500	-11	-23.9
	29.919"	.002	.014	.1	100	-38	-38.9
	29.9206"	.001	.0069	.05	50	-50	-45.5
	29.921"	.0002	.0014	.01	10	-70	-56.6
	0	0	0	0	0		

*Based Upon Standard Atmosphere

Standard Atmosphere = 14.696 psia.

= Atmospheric Pressure at Sea Level

= 760 mm Hg. Absolute Pressure at 32°F

= 29.921 inches Hg.

Notes:

PSIG. = lbs. per sq. in. gauge pressure

= Pressure above atmospheric

PSIA. = lbs. per sq. in. Absolute Pressure

= Sum of Gauge plus Atmospheric Pressure

Hg. = Mercury

kPa = kilopascals

Water
Freezes
Recommended
Field
Evacuation
Conditions

EVACUATING PROCEDURE

With the system at zero pounds pressure and the vacuum pump, the absolute pressure gauge and the refrigerant charging cylinder connected to the evacuating and charging panel or equivalent as shown in Fig. 7 and the panel connected to the refrigerant circuit, proceed as follows:

1. Open the valve B to the vacuum pump and the inlet valve on the vacuum pump. Also open the valve A to the absolute pressure gauge and the valve C to the system charging port. Keep the refrigerant charging cylinder valve closed.
2. Open the vacuum pump discharge valve and start the pump. If the pump is stopped for any reason after a low vacuum has been reached, the pump inlet valve should be closed to avoid the possibility of oil from the pump being drawn into the refrigerant system.
3. Operate the vacuum pump until an absolute pressure of 1000 microns or less is reached; the lower the pressure, the dryer the system will be. (See TABLE 1.)

The system must be free of leaks and moisture for this pressure to be reached and sustained with the valve B closed.

4. **DOUBLE EVACUATION** – The system pressure should be reduced with the vacuum pump to an absolute pressure of approximately ten thousand (10,000) microns or ten (10) millimeters. Then stop evacuating by closing valve B and break the vacuum with dry nitrogen. This may be done by connecting a cylinder of dry nitrogen as explained in CHARGING CONNECTIONS by means of a tee in the refrigerant charging line, the latter being connected to the system charging port in the refrigerant liquid stop valve. Allow the dry nitrogen to flow into the system until the pressure reaches zero pound or slightly above. Stop the dry nitrogen flow, open valve B and continue the evacuating procedure.

Since dry nitrogen can hold a large quantity of moisture before becoming saturated, it becomes an effective vehicle for carrying, in vapor form, any remaining moisture to the vacuum pump so that it may be removed from the system. Moisture removal is progressively more complete when the system is "swept" two or more times with dry nitrogen as explained above.

The Double or even Triple evacuation procedure should be used in systems that are very wet or those which present problems when attempting to pull the pressure down to 1000 microns absolute pressure.

- When a satisfactory low pressure has been reached, indicating that the system is dry, the vacuum pump inlet valve should be closed, the vacuum observed for sustained condition, and the pump removed from the system after an initial quantity of refrigerant sufficient to create a positive pressure in the entire system has been charged from a weighed cylinder.

REFRIGERANT CHARGING PROCEDURE – REMOTE CONDENSER-“YCR” TYPE

After the condenser, receiver and associated piping have been installed, tested and dehydrated as previously described, the system may be charged with refrigerant as follows:

- With a positive Refrigerant-22 pressure on the system, connect a charging cylinder with a known weight of Refrigerant-22 by means of a suitable charging connection to the charging port on the refrigerant liquid stop valve as explained in CHARGING CONNECTIONS.
- Open the compressor suction and discharge stop valves.
- Turn the stem of the refrigerant liquid stop valve in a closing direction. (This opens the charging port.)
- Open the refrigerant charging cylinder valve and allow the system to accept as much refrigerant as it will. If additional refrigerant is required to fully charge the system, refer to Refrigerant Quantity in the OPERATION section of this book.

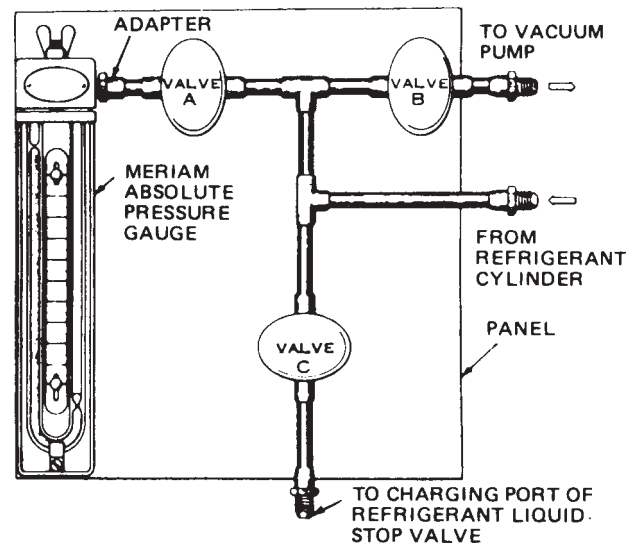
COMPRESSOR INSULATION

In high humidity environments, compressor sweating may be noted. In most applications, this is of no concern. However, if it is undesirable, it is the responsibility of the installer to make provisions to field insulate the compressor or install a factory insulation kit when they become available. Contact YORK Factory Marketing for availability.

ELECTRICAL WIRING

Liquid Chillers are shipped with all factory mounted controls wired for operation.

Field Wiring – Power wiring must be provided through a fused disconnect switch or HACR circuit breaker to the unit terminals (or optional molded case disconnect



LD02352

FIG. 7 – TYPICAL ABSOLUTE PRESSURE GAUGE AND CHARGING PANEL

switch) in accordance with N.E.C. or local code requirements. Minimum circuit ampacity and maximum dual element fuse size are given on pages 10 and 11. A 115-1-60/50, 20 amp source must be supplied for the control panel through a fused disconnect when a control panel transformer (optional) is not provided. Refer to Wiring Diagram.

Affiliated apparatus, such as a chilled water flow switch, auxiliary contacts from the chilled water pump starter, alarms, etc., should be interlocked into the control panel circuit. These field modifications may be made as shown on the WIRING DIAGRAM.

MULTIPLE UNITS

For increased compressor protection and to reduce power inrush at start-up on multiple chiller installations, provisions must be made to prevent simultaneous startup of two or more units. Also, some method must be employed to automatically cycle one or more of the units on or off to permit more efficient operation at part load conditions. A sequencing kit may be acquired through your local YORK representative.

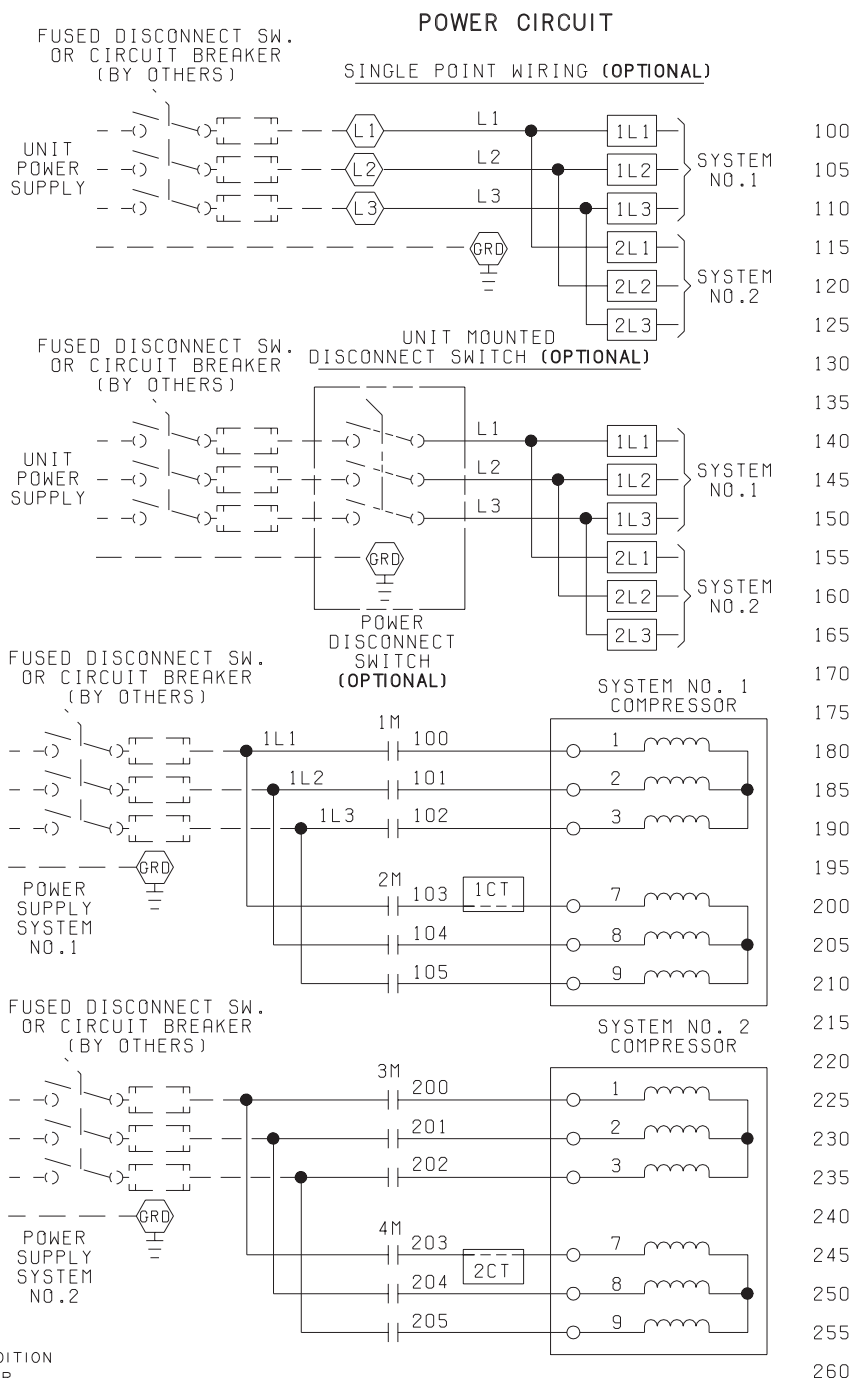
RELIEF VALVES

An internal relief valve(s) is installed internally in each compressor. A second relief valve is installed in each refrigerant circuit of the condenser. In the latter part of the year 1997, a third integral internal relief valve is built into the liquid line solenoid valve of each system. All relief valves are resealable type safety devices.

WIRING DIAGRAM (With or Without I/O Expansion Board)

LEGEND

1CT-2CT	CURRENT TRANSFORMERS
2FU,3FU	TRANSFORMER FUSE (OPTIONAL)
1FU	CONTROL FUSE 5A
1M-4M	COMPRESSOR CONTACTORS
J/P	RECEPTACLES/PLUGS
1T	CONTROL TRANSFORMER 1KVA (OPTIONAL)
2T	MICRO PANEL TRANSFORMER
TB1-TB3	TERMINAL BLOCKS
TS	TRANSIENT SUPPRESSORS
—	WIRING AND/OR COMPONENTS BY YORK
- - -	WIRING AND/OR COMPONENTS BY OTHERS
- - - -	OPTIONAL WIRING AND/OR COMPONENTS (PER ELEMENTARY DIAGRAM)
—	OPTIONAL WIRING AND/OR COMPONENTS (PER PANEL INTERNAL CONNECTION DIAGRAM)
□	TERMINAL BLOCK FOR YORK CONNECTIONS ONLY
⬡	TERMINAL BLOCK FOR CUSTOMER CONNECTIONS
△	TERMINAL BLOCK FOR CUSTOMER LOW VOLTAGE (CLASS 2) CONNECTIONS. SEE NOTE 3.



NOTES:

- FIELD WIRING TO BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE NATIONAL ELECTRICAL CODE AS WELL AS ALL OTHER APPLICABLE CODES AND SPECIFICATIONS.
- NUMBERS ALONG THE RIGHT SIDE OF A DIAGRAM ARE LINE IDENTIFICATION NUMBERS. THE NUMBERS AT EACH LINE INDICATE THE LINE NUMBER LOCATION OF RELAY CONTACTS. AN UNDERLINED CONTACT LOCATION SIGNIFIES A NORMALLY CLOSED CONTACT. NUMBERS ADJACENT TO CIRCUIT LINES ARE THE CIRCUIT IDENTIFICATION NUMBERS.
- CONTACTS MUST BE SUITABLE FOR SWITCHING 24VDC. (GOLD CONTACTS RECOMMENDED). WIRING SHALL NOT BE RUN IN THE SAME CONDUIT WITH ANY LINE VOLTAGE WIRING.
- TO CYCLE UNIT ON AND OFF AUTOMATICALLY WITH CONTACTS OTHER THAN THOSE SHOWN, INSTALL A CYCLING DEVICE IN SERIES WITH THE FLOW SWITCH (FLSW). SEE NOTE 3 FOR CONTACT RATING AND WIRING SPECIFICATIONS.
- TO STOP UNIT (EMERGENCY STOP) WITH CONTACTS OTHER THAN THOSE SHOWN, INSTALL THE STOP CONTACT BETWEEN TERMINALS 5 AND 1. IF A STOP DEVICE IS NOT INSTALLED, A JUMPER MUST BE CONNECTED BETWEEN TERMINALS 5 AND 1. DEVICE MUST HAVE A MINIMUM CONTACT RATING OF 100VA AT 115VOLTS A.C.
- CONTACTS ARE RATED AT 115V, 100VA, RESISTIVE LOAD ONLY, AND MUST BE SUPPRESSED AT LOAD BY USER.
- SEE APPLICATION GUIDE WHEN OPTIONAL EQUIPMENT IS USED.
- HIGH PRESSURE CUTOFF (IHPCO & 2HPCO):
YCW UNITS (WITH CONDENSER) 270 PSIG OFF. RESET @ 210 PSIG.
YCR UNITS (WITH REMOTE CONDENSER) 405 PSIG OFF. RESET @ 330 PSIG.

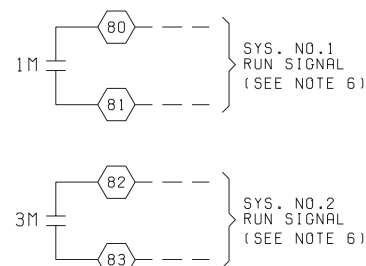


FIG. 8 – ELEMENTARY DIAGRAM

CONTROL CIRCUIT (Without I/O Expansion Board)

CONTROL POWER SUPPLY

UNIT VOLTAGE	CONTROL POWER SUPPLY	MIN. CIRCUIT AMPACITY	MAX. DUAL ELEMENT FUSE SIZE	NON-FUSED DISC. SWITCH SIZE
Standard Models Without Transformers	115-1-50-50/60	20A	20A, 250V	30A, 240V

CAUTION: No Controls (relays, etc.) should be mounted in the Smart Panel enclosure or connected to power supplies in the control panel. Additionally, control wiring not connected to the Smart Panel should not be run through the cabinet. This could result in nuisance faults.

CAUTION: Any inductive devices (relay) wired in series with the flow switch for start/stop, into the Alarm circuitry, or pilot relays for condensor pump starters wired through motor contactor auxiliary contacts must be suppressed with YORK P/N 031-00808-000 suppressor across the relay/contactor coil.

Any contacts connected to flow switch inputs or BAS inputs on terminals 13-19 of TB3 or in any other input terminals, must be supplied with a YORK P/N 031-00808-000 suppressor across the relay/contactor coil which activates the contacts.

CAUTION: Control wiring connected to the control panel should never be run in the same conduit with power wiring.

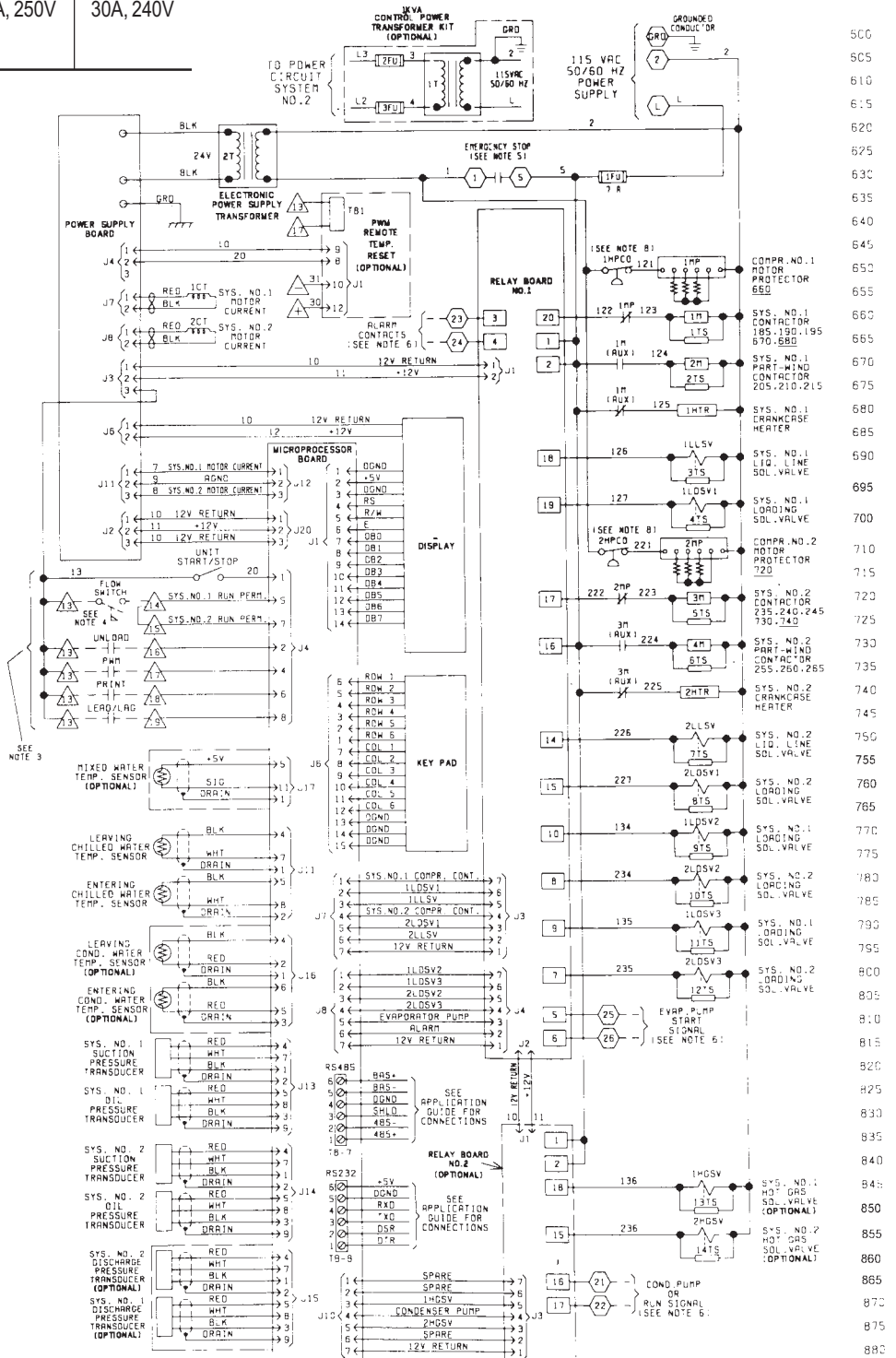
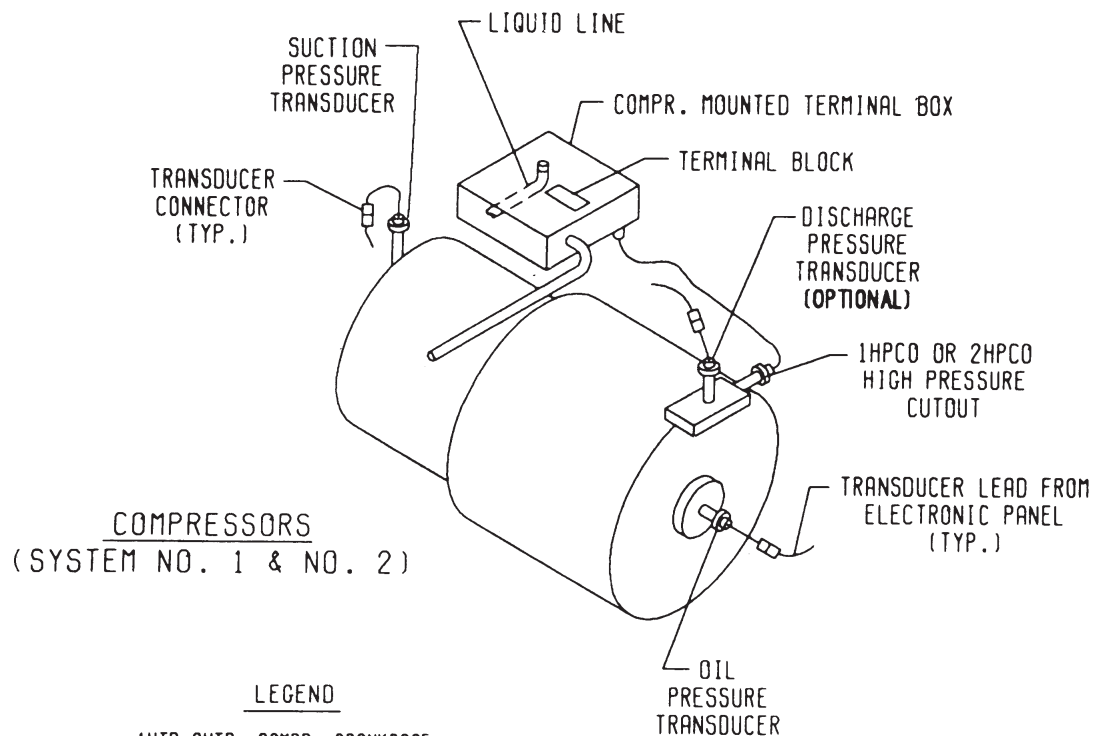


FIG. 8 – ELEMENTARY DIAGRAM (Cont'd)



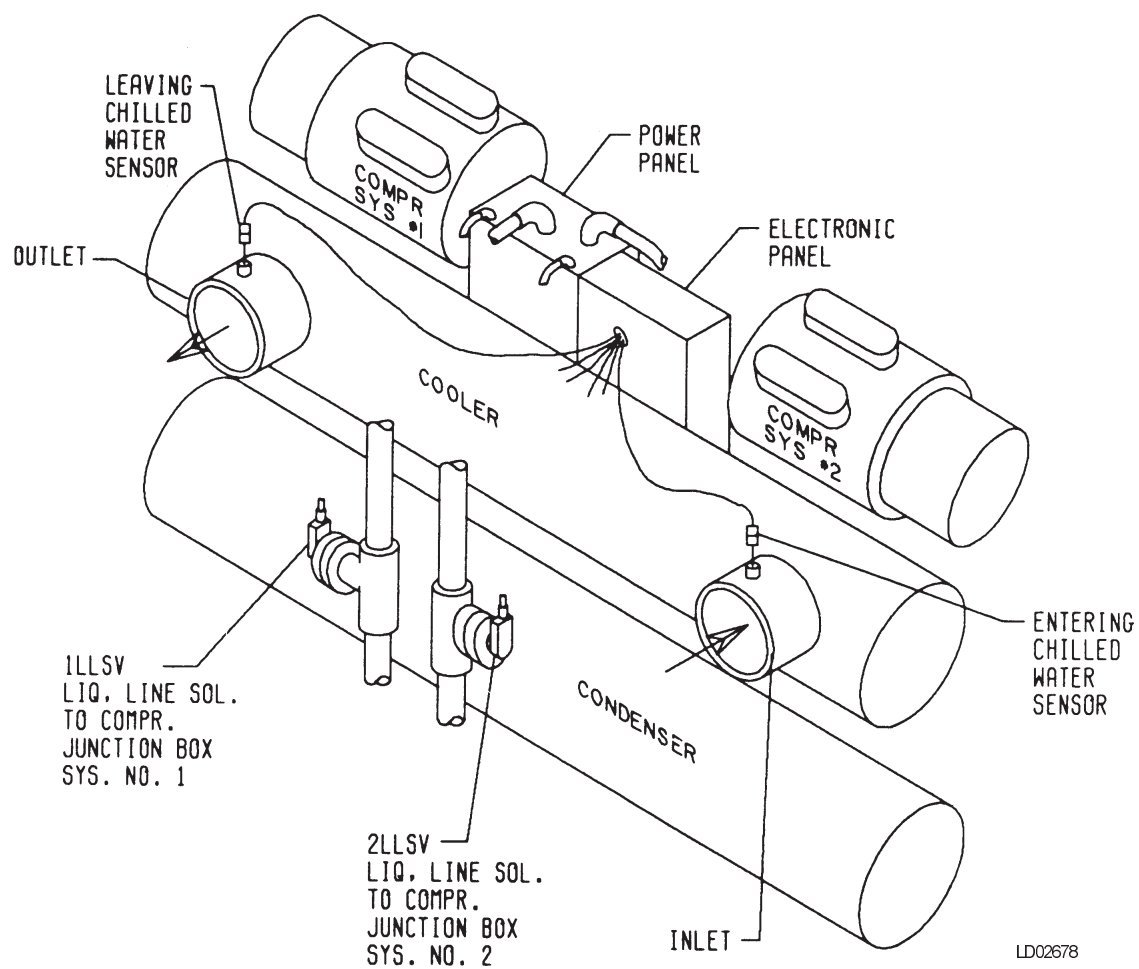


COMPRESSORS
(SYSTEM NO. 1 & NO. 2)

LEGEND

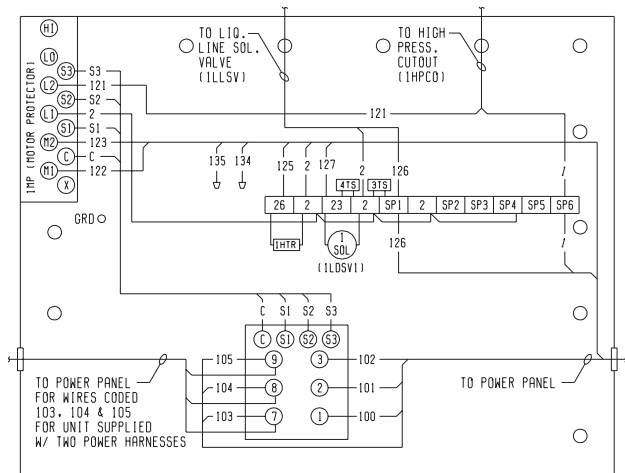
1HTR, 2HTR	COMPR. CRANKCASE HEATER
1LDSV1, 1LDSV2, 1LDSV3	UNIT IDENT. COMPR. LOADING SOLENOID VALVE SYS. NO. 1
2LDSV1, 2LDSV2, 2LDSV3	UNIT IDENT. COMPR. LOADING SOLENOID VALVE SYS. NO. 2
1SOL, 2SOL, 3SOL	COMPR. IDENT. LOADING SOLENOID VALVE SYS. NO. 1 & NO. 2
TS	TRANSIENT SUPPRESSOR

FIG. 9 – SYSTEM WIRING

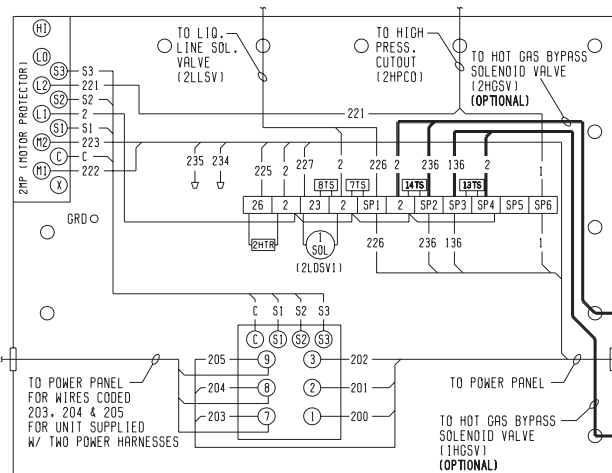


LD02678

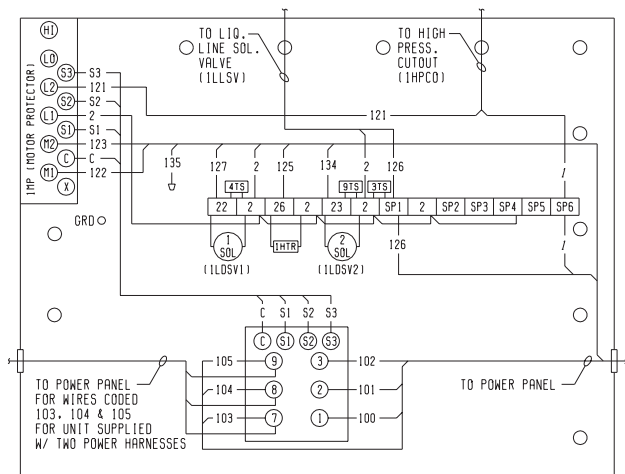
MOTOR TERMINAL BOX WIRING WITH MODEL 15AA MOTOR PROTECTOR



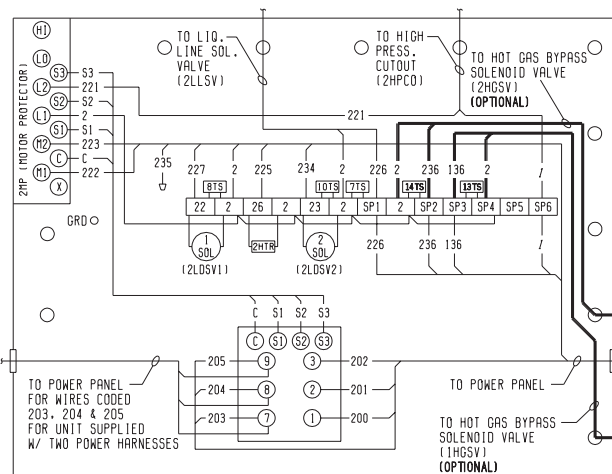
4 CYL. "J" COMPRESSOR TERMINAL BOX SYSTEM NO. 1
(UNIT WITH STANDARD UNLOADING)



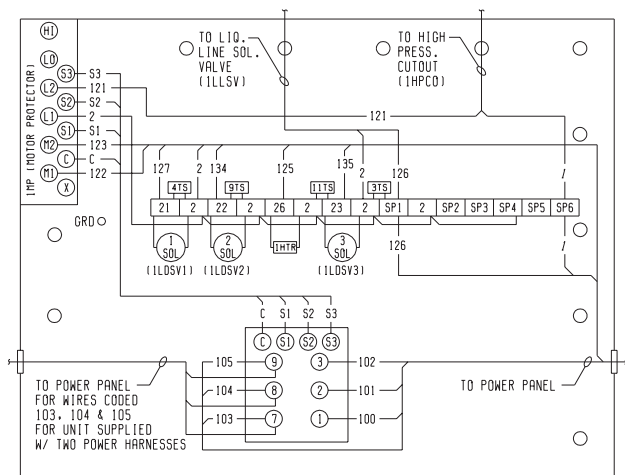
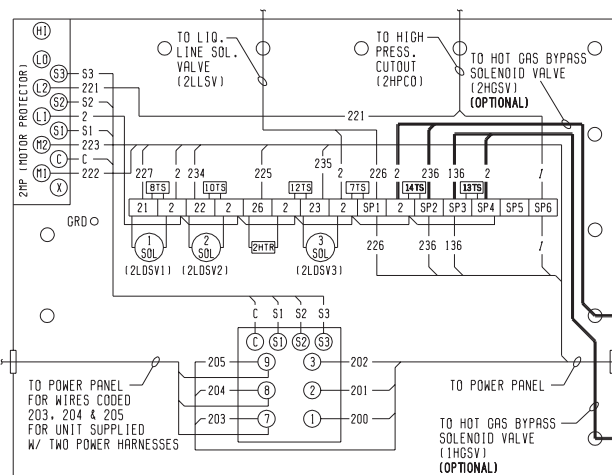
4 CYL. "J" COMPRESSOR TERMINAL BOX SYSTEM NO. 2
(UNIT WITH STANDARD UNLOADING
WITH OR WITHOUT OPTIONAL HOT GAS)



6 CYL. "J" COMPRESSOR TERMINAL BOX SYSTEM NO. 1
(UNIT WITH STANDARD UNLOADING)

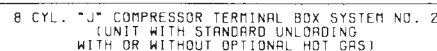
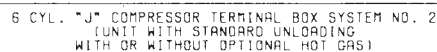
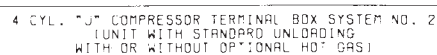


6 CYL. "J" COMPRESSOR TERMINAL BOX SYSTEM NO. 2
(UNIT WITH STANDARD UNLOADING
WITH OR WITHOUT OPTIONAL HOT GAS)

8 CYL. "J" COMPRESSOR TERMINAL BOX SYSTEM NO. 1
(UNIT WITH STANDARD UNLOADING)

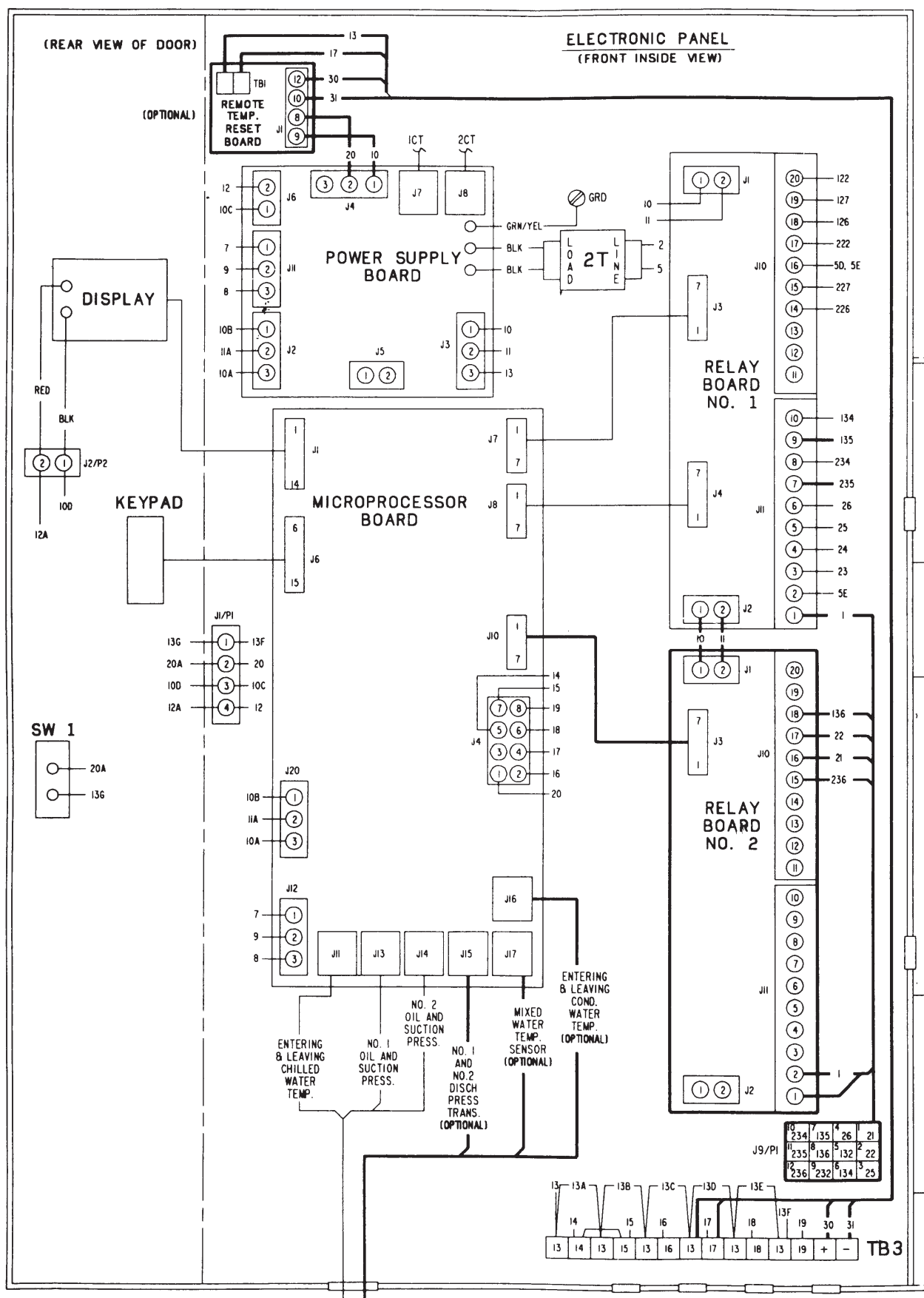
8 CYL. "J" COMPRESSOR TERMINAL BOX SYSTEM NO. 2
(UNIT WITH STANDARD UNLOADING
WITH OR WITHOUT OPTIONAL HOT GAS)

FIG. 9 – SYSTEM WIRING (Cont'd)



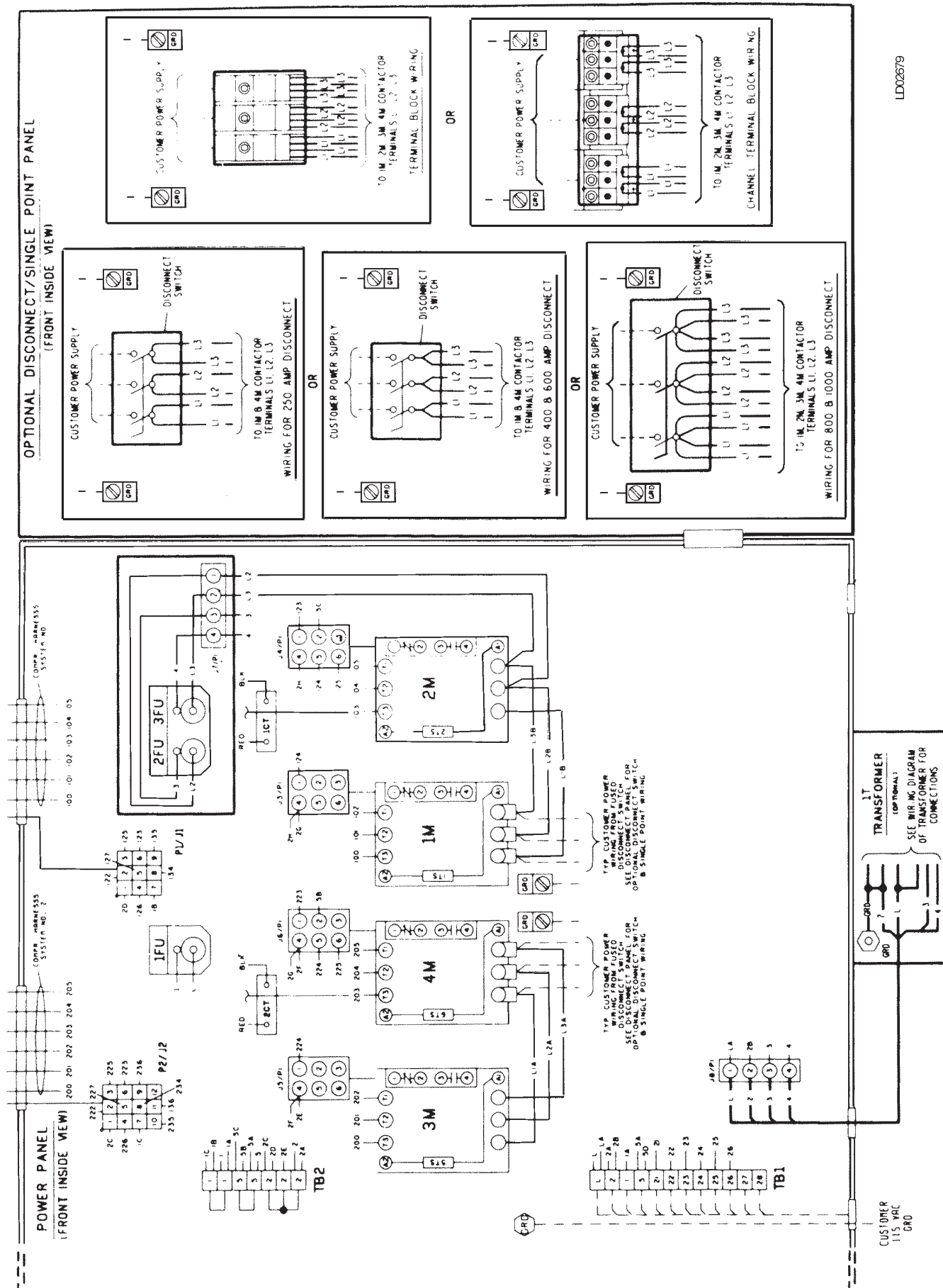
33

MICROPANEL CONNECTION DIAGRAM (WITHOUT EXPANSION BOARD)

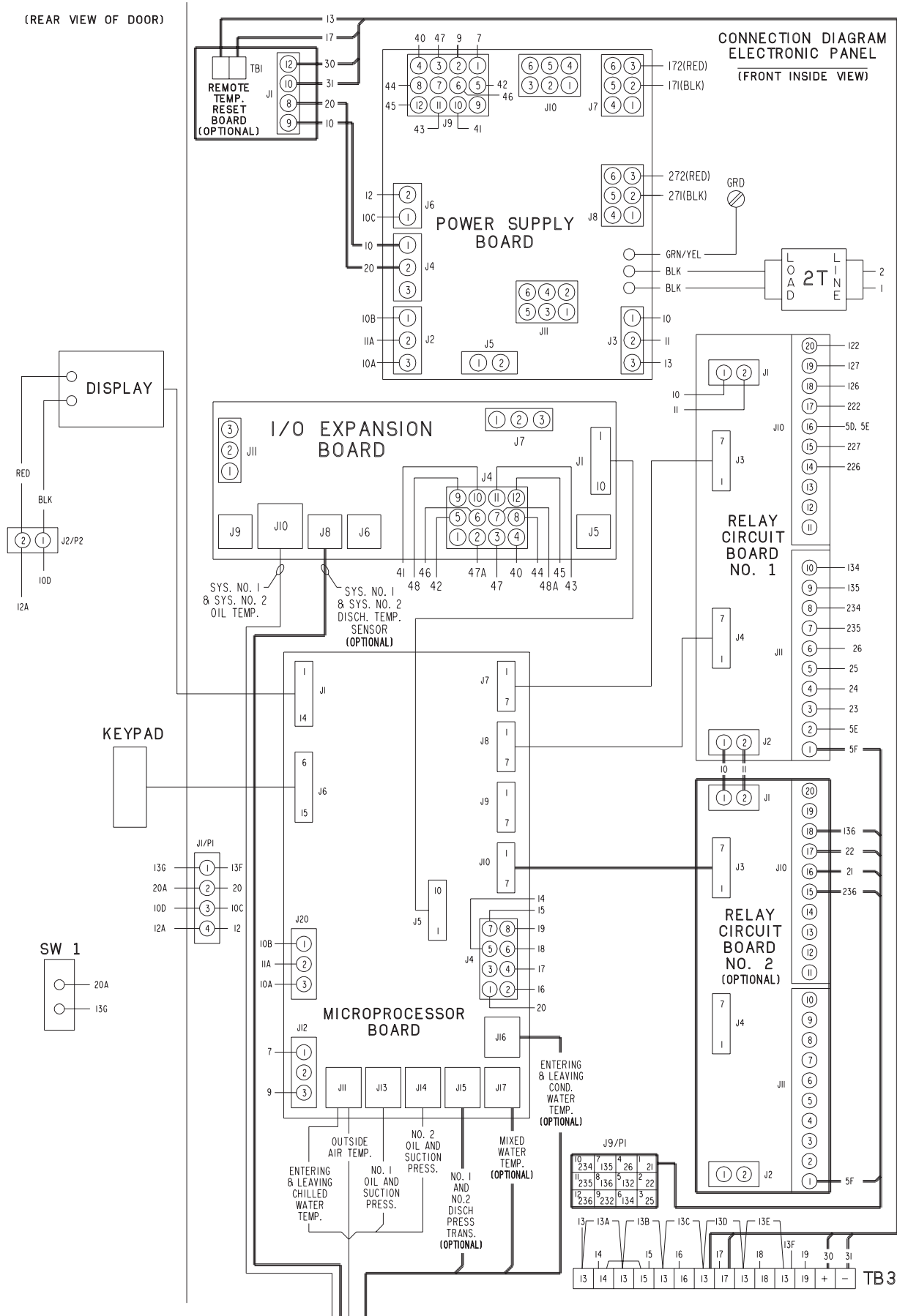


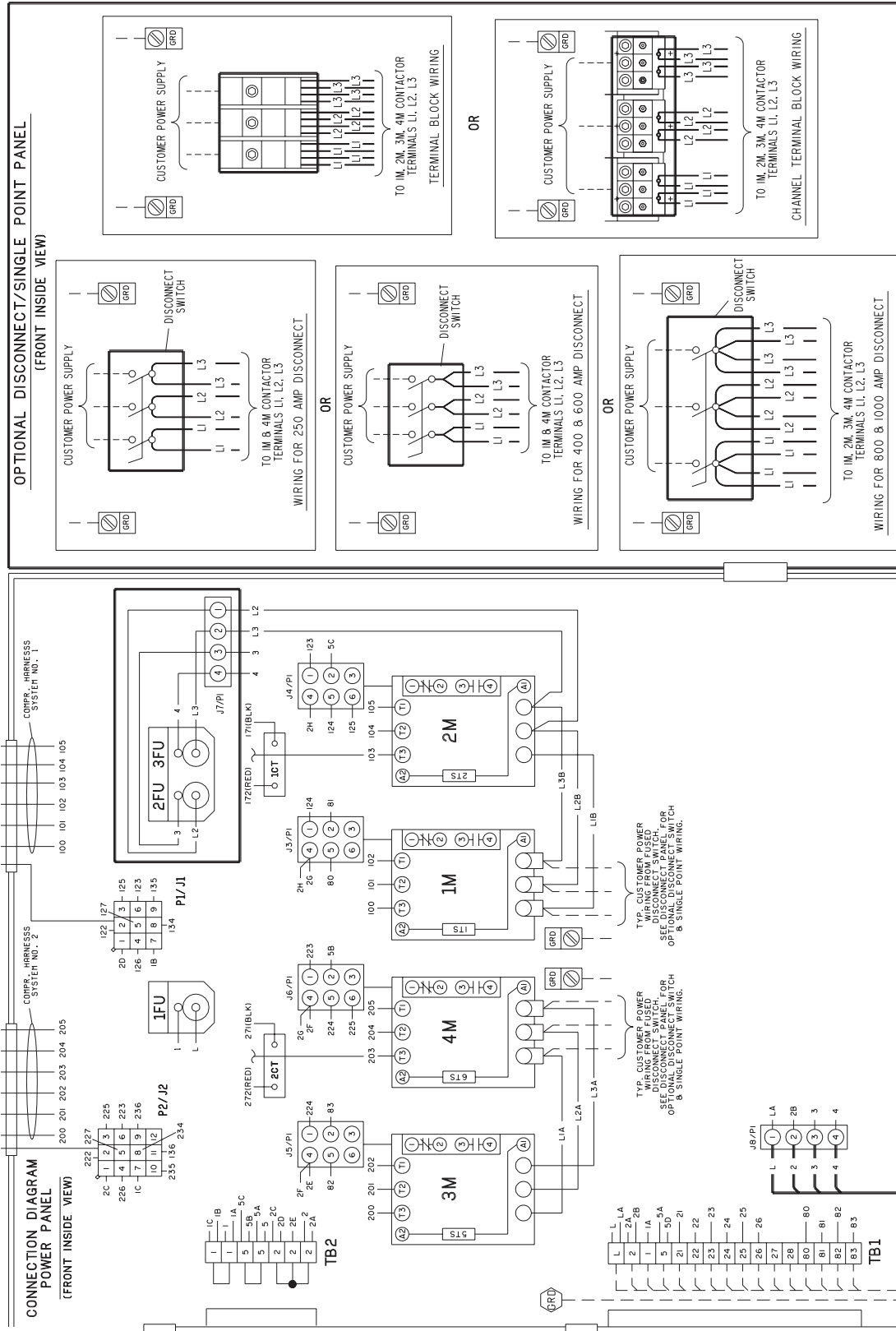
LD02358

FIG. 10 – CONNECTION DIAGRAM



MICROPANEL CONNECTION DIAGRAM (With I/O Expansion Board)





LD02108

UNIT CONTROLS AND OPERATION

YORK MICROCOMPUTER CONTROL CENTER

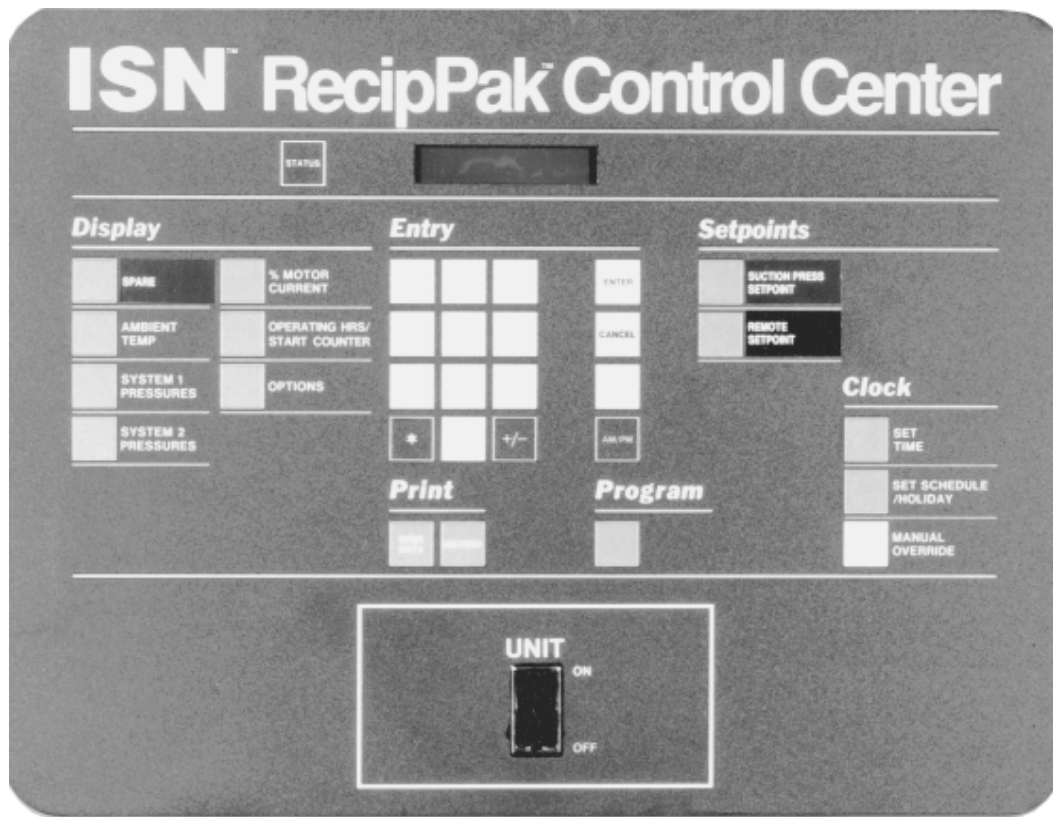


FIG. 11 – MICROCOMPUTER CONTROL CENTER

26572A(D)

INTRODUCTION

The YORK MicroComputer Control Center is a micro-processor based control system capable of multi-circuit control to maintain chilled liquid temperature.

A 40 character display (2 lines of 20 characters) allows the operator to display system operating parameters as well as access programmed information already in memory. A keypad for programming and accessing setpoints, pressures, temperatures, motor current, cut-outs, daily schedule, options, and fault information is provided.

A master ON/OFF switch is available to activate or de-activate the chiller system. Separate system (SYS) switches for each refrigerant system (up to 4) are provided on the Microprocessor Board.

Remote cycling, unloading, and chilled water temperature reset can be accomplished by user supplied dry contacts.

Compressor starting/stopping and loading/unloading decisions are performed by the Microprocessor to maintain leaving water temperatures. These decisions are a

function of temperature deviation from setpoint and rate of change of temperature.

MICROPROCESSOR BOARD

The Microprocessor Board is the controller and decision maker in the control panel. System inputs from pressure transducers, temperature sensors, and C.T.'s are connected directly to the Microprocessor Board. The Microprocessor Board circuitry multiplexes these analog inputs, digitizes them, and constantly scans them to keep a constant watch on the chiller operating conditions. From this information, the Microprocessor then issues commands to the Relay Output Board to control contactors, solenoids, etc. for water temperature control and to react to safety conditions.

Keypad commands are acted upon by the micro to change setpoints, cut-outs, scheduling, operating requirements, and to provide displays.

A +12V REG supply voltage from the Power Supply Board is converted to +5V REG by a voltage regulator located on the Microprocessor Board. This voltage is used to operate integrated circuitry on the board.

Four system switches located on the Microprocessor Board activate or deactivate the individual systems (compressors).

POWER SUPPLY BOARD

The on-board switching power supply converts 24VAC from the 2T transformer to +12V REG which is supplied to the Microprocessor Board, Relay Board, and 40 Character Display to operate integrated circuitry.

A rectifier and filtering circuit for each motor current circuit rectifies and filters these signals to variable DC. These signals are then fed to the Microprocessor Board.

RELAY OUTPUT BOARD

This board converts 0-12VDC logic level outputs from the Microprocessor Board to 120VAC levels used by motor contactors, solenoid valves, etc. to control system operation. The common side of all relays on the Relay Output Board is converted to +12V REG.

The open collector outputs of the Microprocessor Board energize the DC relays by pulling the other side of the relay coil to ground. When not energized, both sides of the relay coils will be at +12VDC potential.

I/O EXPANSION BOARD

Introduced in the latter part of 1997, the I/O Expansion Board allows the Micro to receive additional analog inputs from Oil Temperature Sensors and optional Discharge Temperature Sensors.

These inputs are multiplexed and sent to the microprocessor board to allow the micro to monitor these inputs for display and as safeties.

CURRENT TRANSFORMER (C.T.)

A C.T. on the 3 ϕ power wiring of each motor sends AC signals proportional to motor current to the Power Supply Board which rectifies and filters the signal to variable DC voltage (analog). This analog level is then fed to the Microprocessor Board to allow it to monitor motor current.

40 CHARACTER DISPLAY

The 40 Character Display (2 lines of 20 characters) is a liquid crystal display used for displaying system parameters and operator messages. The display has a lighted background for night viewing as well as a special feature which intensifies the display for viewing in direct sunlight.

KEYPAD

An operator keypad allows complete control of the system from a central location. The keypad offers a multitude of commands available to access displays, program setpoints, and initiate system commands.

BATTERY BACK-UP

The Microprocessor Board contains a Real Time Clock integrated circuit chip with an internal battery back-up. The purpose of this battery back-up is to assure any programmed values (setpoints, clock, cut-outs, etc.) are not lost during a power failure regardless of the time involved in a power outage or shutdown period.

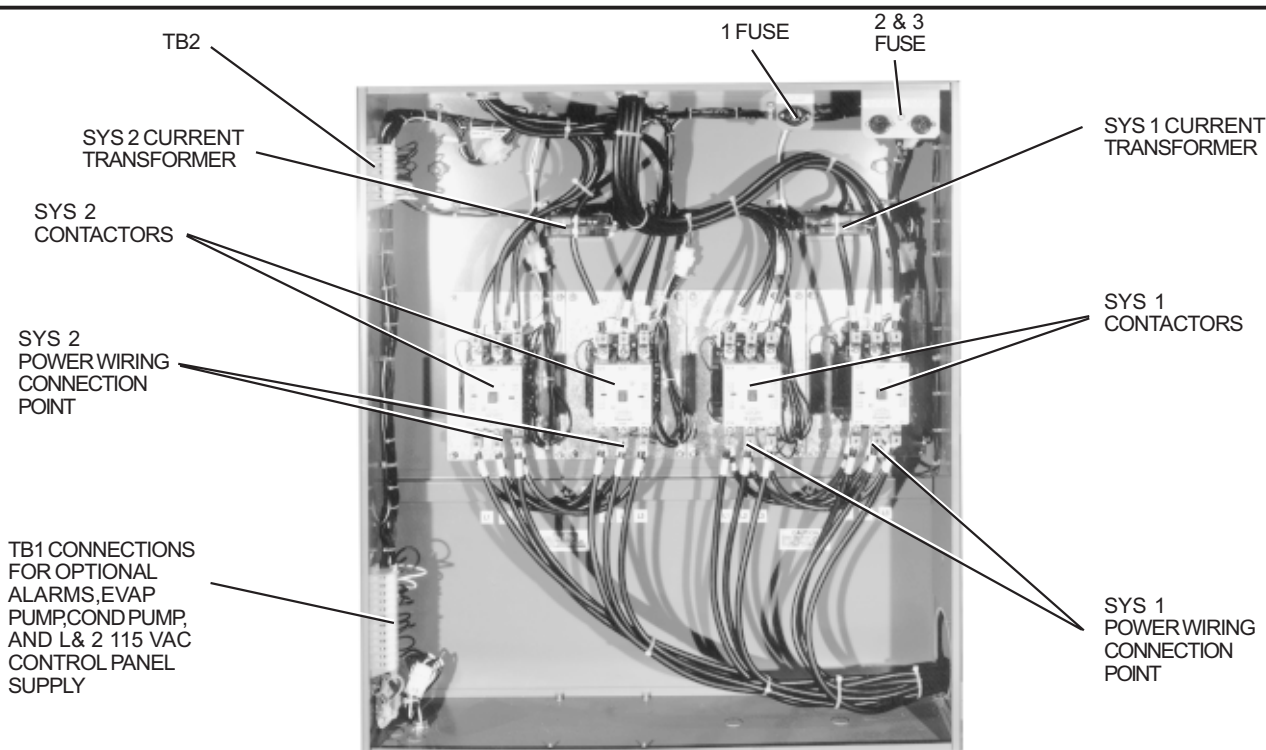


FIG. 12 – POWER PANEL

26126A

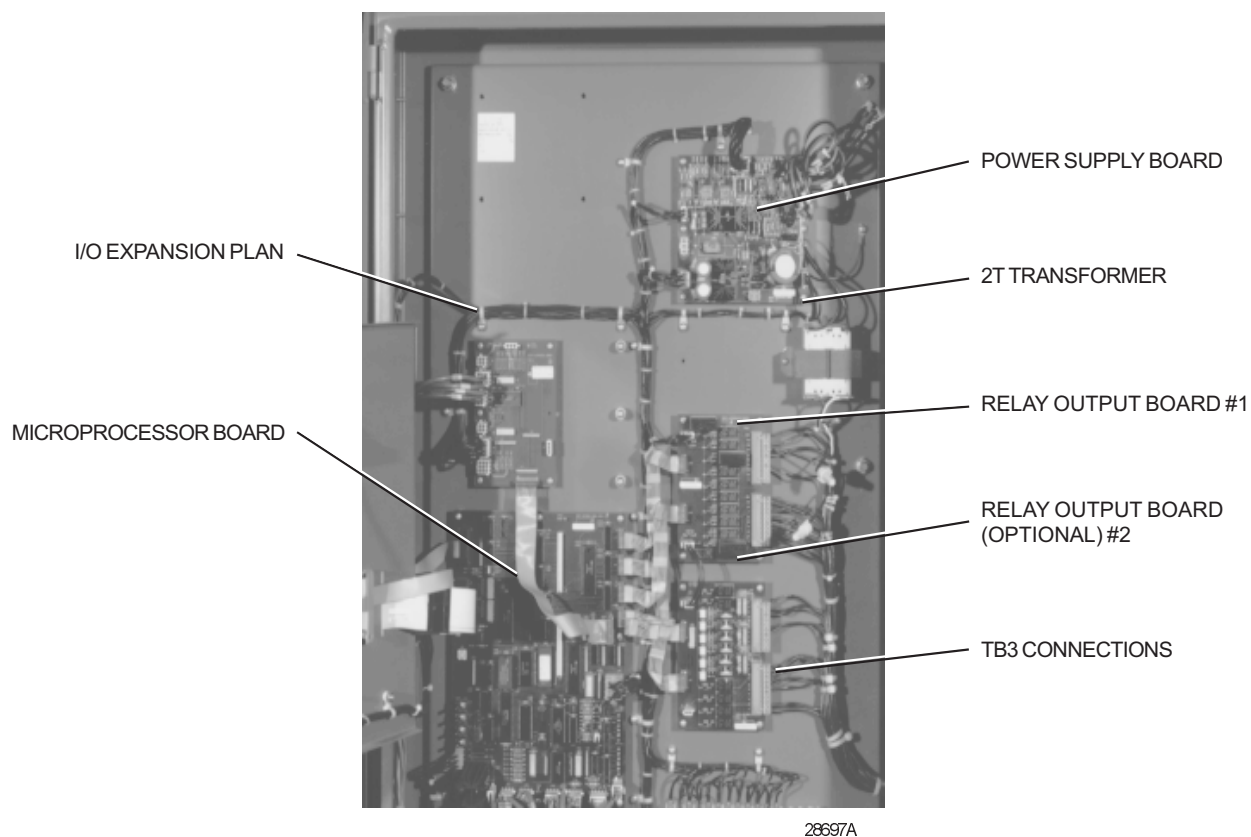


FIG. 13 – CONTROL PANEL (INTERIOR) (With I/O Expansion Board)

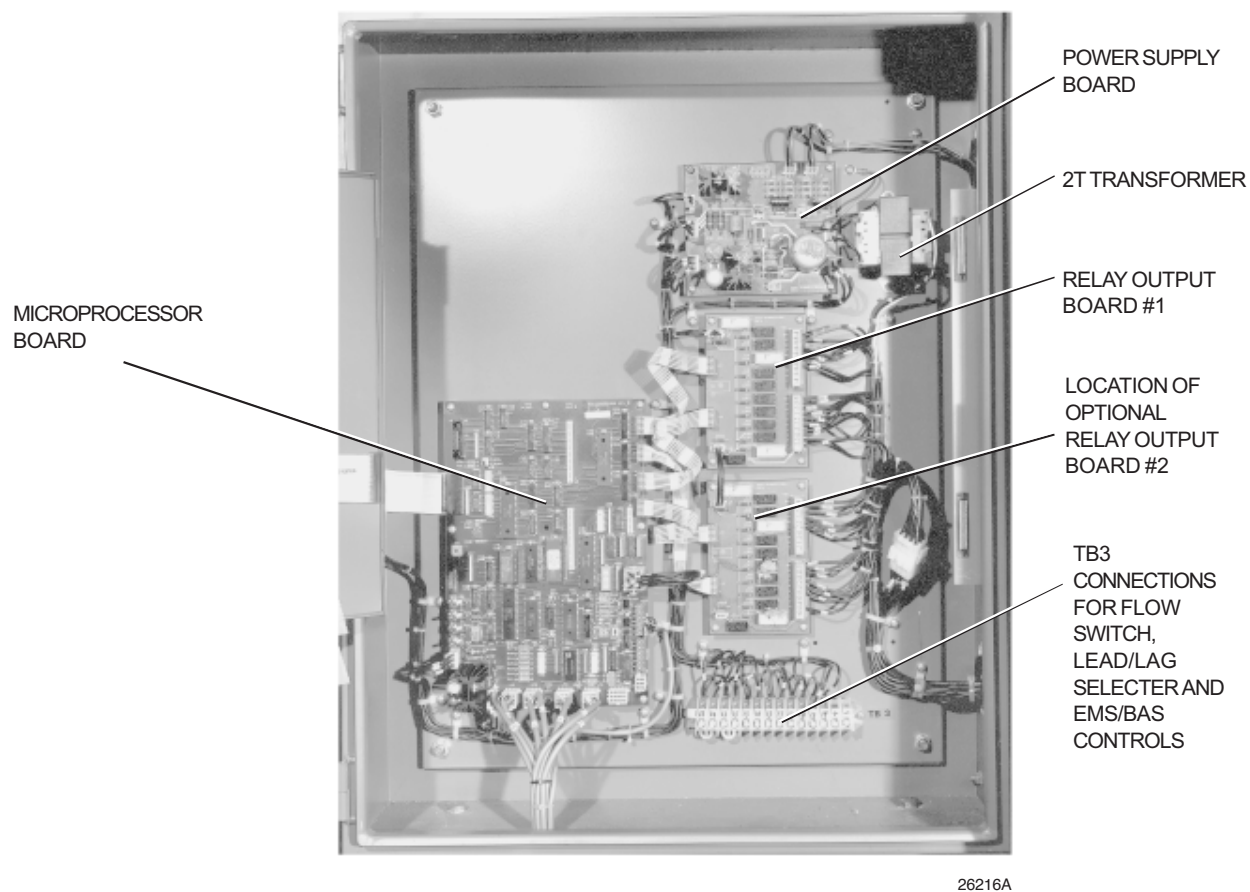


FIG. 14 – CONTROL PANEL (INTERIOR) (Without I/O Expansion Board)

“DISPLAY” KEYS



26572A(D)

GENERAL

The DISPLAY keys allow the user to retrieve system pressures, system motor currents, chilled liquid temperatures, outdoor ambient temperature, compressor running times, number of compressor starts, and option information on the chiller package. This data is useful for monitoring chiller operation, diagnosing potential future problems, troubleshooting, and commissioning the chiller.

Displayed data will be real-time data displayed on a “40” character display consisting of 2 lines of 20 characters. The display will update all information at a rate of about “2” seconds.

When a DISPLAY pushbutton is pressed, the corresponding message will be displayed and will remain on the display until another pushbutton is pressed.

Display Messages may show characters indicating “greater than” (>) or “less than” (<). These characters indicate the actual values are greater than or less than the limit values which are being displayed.

If a message is required to be updated faster than every 2 seconds, the appropriate key for the desired display may be pushed and held. Updating will be at .4 second intervals.

Each of the keys and an example of the typical corresponding display messages will be discussed in the text which follows.

* Discharge Pressure Readout is an option. Without this option, the display will read a fixed value.

Chilled Liquid Temps

**CHILLED
LIQUID TEMPS**

A display indicating chiller leaving and return water temperature is provided when this pushbutton is pressed.

```
L W T   =   4 9 . 2   D E G F
R W T   =   5 2 . 0   D E G F
```

The minimum limit on the display is “8.7 DEG F”. The maximum limit on the display is “84.5 DEG F”.

Ambient Temp

**AMBIENT
TEMP**

The outdoor ambient temperature is displayed when this pushbutton is pressed.

```
O U T S I D E   A M B I E N T   A I R
=   7 5 . 9   D E G F
```

The minimum limit on the display is “0 DEG F”. The maximum limit on the display is “133.8 DEG F”. This display does not apply to indoor chillers and will not display a fixed value.

System 1 Pressures

**SYSTEM 1
PRESSURES**

Oil pressure, suction pressure, and discharge* pressure on System 1 will be displayed when this pushbutton is pressed.

```
S Y S   # 1   O I L   =   7 2   P S I D
S P   =   6 0 , D P   =   2 2 9   P S I G
```

The minimum limits are:

Oil Pressure: 0 PSID
Suction Pressure: 0 PSIG
Discharge Pressure: 0 PSIG

The maximum limits are:

Oil Pressure: 200 PSID
Suction Pressure: 200 PSIG
Discharge Pressure: 400 PSIG

System 2 Pressures

SYSTEM 2 PRESSURES

Oil pressure, suction pressure, and discharge* pressure on System 2 will be displayed when this pushbutton is pressed.

S	Y	S	#	2	O	I	L	=	6	3	P	S	I	D
S	P	=	6	1	D	P	=	1	3	3	P	S	I	G

The minimum limits are:

Oil Pressure: 0 PSID
Suction Pressure: 0 PSIG
Discharge Pressure: 0 PSIG

The maximum limits are:

Oil Pressure: 200 PSID
Suction Pressure: 200 PSIG
Discharge Pressure: 400 PSIG

% Motor Current

% MOTOR CURRENT

Motor currents for both System 1 and 2 are displayed when this pushbutton is pushed.

The minimum limit on the display is "0% FLA". The maximum limit on the display is "115% FLA".

I	M	T	R	1	=	5	7	%	F	L	A
I	M	T	R	2	=	6	5	%	F	L	A

Operating Hours Start Counter

OPERATING HOURS START COUNTER

Accumulated running hours on each compressor is displayed. The counters for an individual system count to a total of 99,999 hours before rollover. Accumulated starts on each compressor are also displayed. A total of 99,999

H	R	S	1	=	1	4	3	,	2	=	3	8	2
S	T	R	1	=	2	5	,	2	=	3	7		

starts can be logged on a system before the counter will rollover.

The numbers "1" and "2" on the display message indicate compressor #1 and compressor #2.

These counters are zeroed at the factory or will indicate only run time and number of starts logged during factory testing at the time of shipment.

Options

OPTIONS

The OPTIONS key provides a display of options which have been selected by the user. These options are selected by the S1 Dip Switch on the Microprocessor Board (Fig. 15). Proper programming of the switch is important during commissioning of the chiller. The OPTIONS display allows a means of verifying the Dip Switch positions without looking at or handling the Microprocessor Board. It also eliminates visual inspection of the sometimes difficult to determine Dip Switch position.

When the OPTIONS KEY is pressed, the following message will first be displayed for 3 seconds:

T	H	E	F	O	L	L	O	W	I	N	G
A	R	E	P	R	O	G	R	A	M	M	E

"8" Option Messages will then follow. Each will be displayed for 3 seconds before the next display is automatically indexed. When all messages are displayed, the display message will automatically change to show a chiller "STATUS" message, just as if the Status key was pressed.

Refer to Table 2 for a list of the displays and the corresponding switch positions in the order they appear. Two possible messages may appear for each of the eight messages depending on the Dip Switch position.

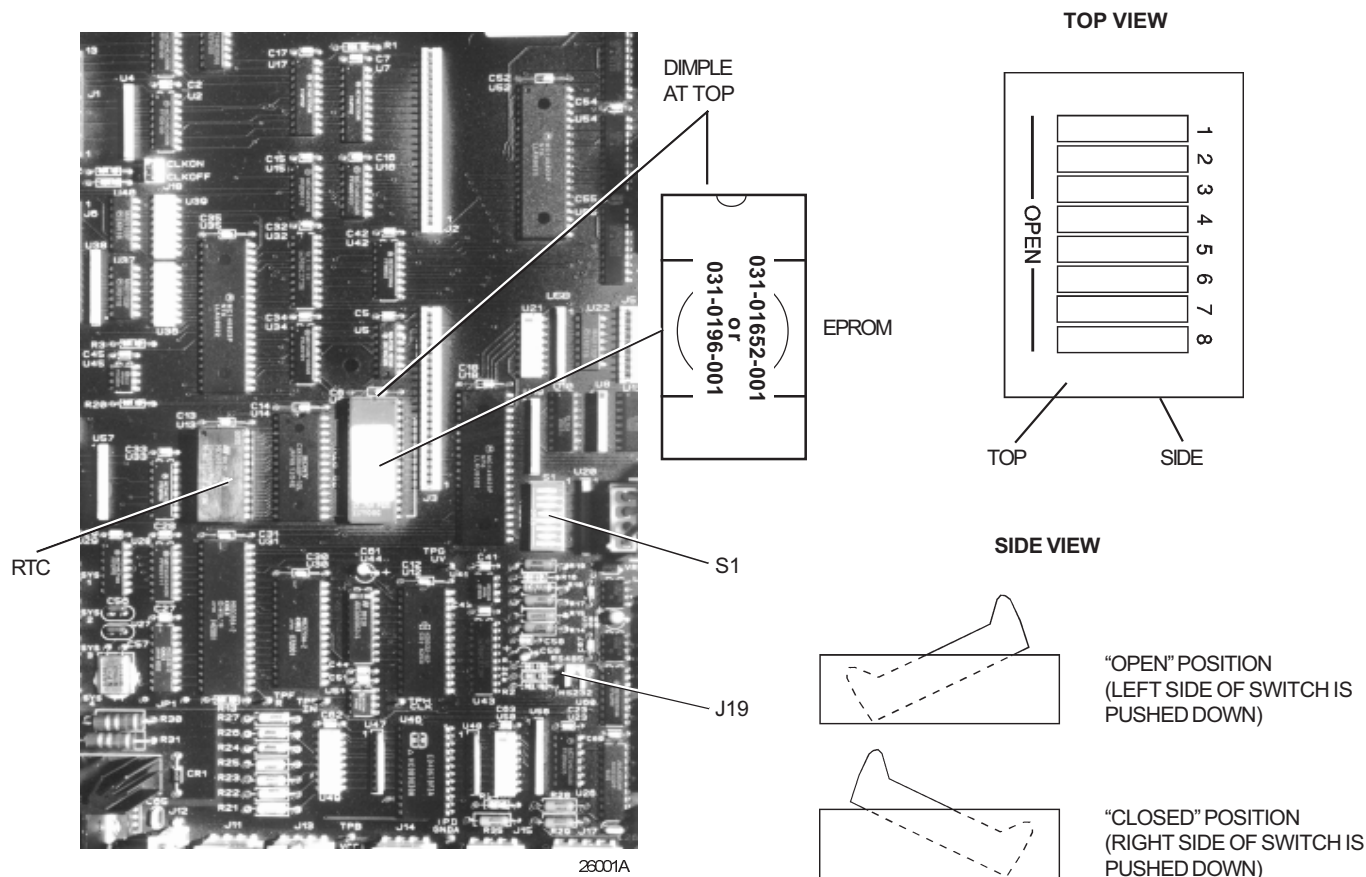
A detailed explanation of the meaning of each message and a guide to programming the associated switch is provided on page 44.

Fig. 15 shows the location and verification of switch positioning of S1.

* Discharge Pressure Readout is an option. Without this option, the display will read a fixed value.

TABLE 2 – SWITCH POSITION AND DISPLAY

DISPLAY/ SWITCH	SWITCH “OPEN” MESSAGE	SWITCH “CLOSED” MESSAGE
1	COMFORT COOLING	BRINE & PROCESS DUTY
2	STANDARD AMBIENT	LOW AMBIENT CONTROL
3	LOCAL CONTROL MODE	REMOTE CONTROL MODE
4	RETURN WATER CONTROL	LEAVING WATER CONTROL
5	ENGLISH UNITS READOUT	METRIC UNITS READOUT
6	STANDARD CONDENSER FAN CONTROL	SHARED CONDENSER FAN CONTROL
7	MANUAL LEAD / LAG	AUTOMATIC LEAD / LAG
8	AMBIENT & DISCH PR FAN CONTROL	DISCHARGE PRESSURE FAN CONTROL

**FIG. 15 – DIP SWITCH LOCATION AND POSITION**

LD01098

SWITCH 1

OPEN:

COMFORT
COOLING

The chilled liquid temperature setpoint can only be programmed from 40-70°F. *

CLOSED:

BRINE & PROCESS
DUTY

The chilled liquid temperature setpoint can be programmed from 15-70°F. *

SWITCH 2

OPEN:

STANDARD
AMBIENT

Do not use.

CLOSED:

LOW AMBIENT
CONTROL

This must be programmed for the chiller to operate.

SWITCH 3

OPEN:

LOCAL CONTROL
MODE

This mode allows a Remote Control Center or an ISN Panel to only view chiller operating conditions. It will not allow changes to any chiller controls or setpoints.

CLOSED:

REMOTE CONTROL
MODE

This mode should be selected in typical applications. It will allow a Remote Control Center or an ISN Panel to not only view chiller operating conditions but will also allow the remote panel to change chiller controls and setpoints.

SWITCH 4

OPEN:

RETURN WATER
CONTROL

Chiller control will be from return water temperature.

CLOSED:

LEAVING WATER
CONTROL

Chiller control will be from leaving water temperature.

SWITCH 5

OPEN:

ENGLISH UNITS
READOUT

Display messages will show units of measure in English units (°F, PSI, etc.).

CLOSED:

METRIC UNITS
READOUT

Display messages will show units of measure in Metric units (°C, kPa, etc.).

SWITCH 6

OPEN:

STANDARD CONDENSER
FAN CONTROL

Switch #6 positioning on YCW & YCR water cooled chillers does not affect operation.

CLOSED:

SHARED CONDENSER
FAN CONTROL

Switch #6 positioning on YCW & YCR water cooled chillers does not affect operation.

* Positioning of this switch also affects the range of adjustments on the Suction Pressure Cut-out (page 54) and the Low Leaving Water Temp Cut-out (page 53).

SWITCH 7**OPEN:**

M A N U A L
L E A D / L A G

SYS 1 can be selected as the lag compressor by closing a user supplied contact between terminals 13 and 19. See Page 83.

CLOSED:

A U T O M A T I C
L E A D / L A G

In this mode the micro determines which compressor is assigned to the lead and the lag. A new lead/lag assignment is made whenever both compressors shut down. The micro will then assign the "lead" to the compressor with the shortest anti-recycle time.

SWITCH 8**OPEN:**

A M B I E N T & D I S C H P R
F A N C O N T R O L

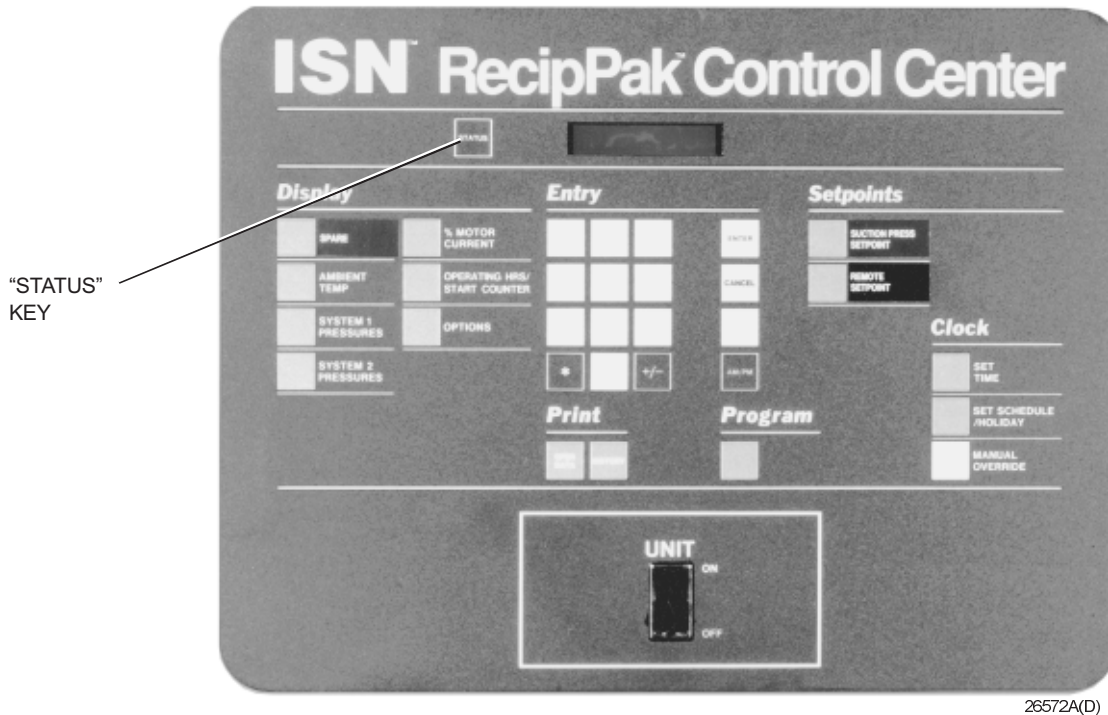
Switch #8 positioning on YCW & YCR water cooled chillers does not affect operation.

CLOSED:

D I S C H A R G E P R E S S U R E
F A N C O N T R O L

Switch #8 positioning on YCW & YCR water cooled chillers does not affect operation.

“STATUS” KEY



26572A(D)

GENERAL

Pressing the STATUS key will enable the operator to determine current chiller operating status as a whole and as individual systems. The messages displayed will include running status, cooling demand, fault status, external cycling device status, and anti-recycle timer status. The display will be a single message relating to the highest priority message as determined by the micro. Status messages fall into the categories of General and Fault Status with each of the categories discussed below.

GENERAL STATUS MESSAGE

Each of the general status messages with a description of its meaning will follow. In the case of messages which apply to individual systems, SYS 1 and SYS 2 messages will both be displayed and may be different. “X”s in the sample displays indicate numerical values will appear in actual displays.

UNIT SWITCH IS IN
THE OFF POSITION

This message informs the operator that the “UNIT” switch on the Control Panel is in the OFF position which will not allow the chiller to run.

DAILY SCHEDULE
SHUTDOWN

The DAILY SCHEDULE SHUTDOWN message indicates that the schedule programmed into the “CLOCK” “SET SCHEDULE/HOLIDAY” is keeping the chiller from running.

SYS # 1	NO RUN PERM
SYS # 2	NO RUN PERM

Run Permissive is an indicator that an external cycling contact (i.e. flow switch) connected to terminals 13 and 14 is open, or a system switch(es) on the Microprocessor Board is in the OFF position. Whenever the contact is open or a switch is OFF, the NO RUN PERM will be displayed.

SYS # 1	NO COOL LOAD
SYS # 2	NO COOL LOAD

This message informs the operator that the chilled liquid temperature is below the point (determined by the setpoint and control range) that the micro will bring the lead system on, or that the micro has not loaded the system far enough into the loading sequence to be ready to bring the lag system ON. The lag system will display this message until the loading sequence is ready for the lag system to start (TEMPERATURE DEMAND in the OPER DATA displays must be “5” or above before cooling load is established for the lag system to run).

SYS # 1	COMP RUNNING
SYS # 2	COMP RUNNING

The COMP RUNNING message indicates that the respective compressor is running due to demand.

SYS # 1	A R	T M R	X X X	S
SYS # 2	A R	T M R	X X X	S

The anti-recycle timer message shows the amount of time left on the respective anti-recycle timer. This message is displayed when demand requires the respective system to start but is being held off due to the timer.

SYS # 1	A C	T M R	X X	S
SYS # 2	A C	T M R	X X	S

The anti-coincident timer is a software feature that guards against 2 compressors starting simultaneously. This assures instantaneous starting current does not become excessively high due to simultaneous starts. The micro limits the time between compressor starts to 1 minute regardless of demand of the anti-recycle timer being timed out. The time shown on the anti-coincident timer is the time left on the timer before the respective system will start. Demand must be present for the message to be displayed and will only appear when the anti-recycle timer has timed out.

* *

SYS # 1	C R N T	L I M I T I N G
SYS # 2	C R N T	L I M I T I N G

This display informs the operator that the micro is limiting the loading of the system based on motor current. By programming the AVERAGE CURR UNLOAD point, the micro will limit the loading of the compressor whenever motor current rises above the programmed value.

This feature reduces the chance of a system faulting on high motor current, motor protector due to motor overheating, or high discharge pressure which causes high motor current. The feature also assures that motor life is not compromised. Typically, the AVERAGE CURR UNLOAD is programmed for 100% to assure that the compressor is allowed to load to its rated FLA.

*

SYS # 1	S U C T	L I M I T I N G
SYS # 2	S U C T	L I M I T I N G

The Suction Pressure Limiting message indicates a system is being unloaded by the micro even though demand requires loading. This safety assures that refrigerant returning to the compressor provides proper motor cooling, assuring that motor life is not compromised. This safety will only activate when the chilled liquid temperature is excessively high. Unloading will take place when suction pressure exceeds the user programmable threshold of 80-105 PSIG. Reloading will take place when suction pressure drops to 10 PSIG below the safety threshold.

SYS # 1	D S C H	L I M I T I N G
SYS # 2	D S C H	L I M I T I N G

Discharge Pressure Limiting takes affect when discharge pressure nears the point at which the high pressure cut-out will shut the system down causing total loss of cooling. When this message appears, discharge pressure has exceeded the user programmable threshold and the micro is unloading the affected system to prevent shutdown on a manual high pressure cut-out. Reloading will take place when discharge pressure has dropped 60 PSIG below the threshold.

Optional discharge pressure transducers must be installed for this feature to operate. This is accomplished by adding the Discharge Pressure Readout option.

* *

SYS # 1	P U M P I N G	D O W N
SYS # 2	P U M P I N G	D O W N

The PUMPING DOWN message indicates that the respective compressor is presently in the process of pumping the system down. The compressor will either be in a recycling pumpdown or in a pumpdown prior to shutdown when this message is displayed. The message will disappear when the compressor shuts off.

MANUAL OVERRIDE

If the MANUAL OVERRIDE key is pressed, the STATUS display will display the message shown above. This will indicate that the Daily Schedule is being ignored and the chiller will start-up when water temperature allows, UNIT Switch permits, and SYSTEM Switches permit.

This is a priority message and cannot be overridden by anti-recycle messages, fault messages, etc. when in the STATUS Display mode. Therefore, do not expect to see any other STATUS messages when in the MANUAL OVERRIDE mode. MANUAL OVERRIDE is to only be used in emergencies or for servicing.

FAULT STATUS MESSAGES

Whenever a fault message appears, the safety thresholds on the chiller have been exceeded and the entire chiller or a single system will be shut down and locked out. A detailed explanation of the shutdown thresholds and associated information related to each fault is covered in the SYSTEM SAFETIES section (Page 68).

Chiller shutdown faults will shut the entire chiller down and lock it out, while system shutdown faults will only shut down and lock out the affected system (compressor).

A list of the fault messages are shown on the next two pages:

* This message only applies to chillers with 031-01096-001 and early versions of 031-01652-001 EPROMs.

** This message only applies to chillers with later versions of 031-01652-001 (CRCP Version) EPROMs.

CHILLER FAULTS

CHILLER FAULT :
LOW AMBIENT TEMP

CHILLER FAULT :
LOW WATER TEMP

CHILLER FAULT :
HIGH AMBIENT TEMP

CHILLER FAULT :
115VAC UNDER VOLTAGE

SYSTEM FAULTS

SYS # 1 HIGH DSCH

SYS # 2 HIGH DSCH

SYS # 1 LOW OIL PRESS

SYS # 2 LOW OIL PRESS

SYS # 1 LOW SUCTION

SYS # 2 LOW SUCTION

SYS # 1 MOTOR CURRENT

SYS # 2 MOTOR CURRENT

SYS # 1 LLSV NOT ON

SYS # 2 LLSV NOT ON

These Fault Messages apply only to chillers with 031-01096-001 and early versions of 031-01652-001 EPROMs.

CHILLER FAULTS

CHILLER FAULT : LOW AMBIENT TEMP

CHILLER FAULT : LOW WATER TEMP

CHILLER FAULT : HIGH AMBIENT TEMP

CHILLER FAULT : 115VAC UNDER VOLTAGE

SYSTEM FAULTS

SYS # 1	MOTOR CURRENT
SYS # 2	MOTOR CURRENT

SYS # 1	HIGH DSCH
SYS # 2	HIGH DSCH

SYS # 1	LOW OIL PRESS
SYS # 2	LOW OIL PRESS

SYS # 1	HIGH OIL TEMP
SYS # 2	HIGH OIL TEMP

SYS # 1	LOW SUCTION
SYS # 2	LOW SUCTION

SYS # 1	OIL TEMP INHIB
SYS # 2	OIL TEMP INHIB

SYS # 1	H I MTR CURRENT
SYS # 2	H I MTR CURRENT

SYS # 1	PUMPDOWN FAIL
SYS # 2	PUMPDOWN FAIL

These Fault Messages apply only to chillers with later versions of 031-01652-001 (CRCP Versions) EPROMs. Also, Oil Temp faults only apply to chillers built after the later part of 1997 which have oil temp. sensors and I/O Expansion Board installed.

“ENTRY” KEYS



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GENERAL

The ENTRY key allows the user to change numerical values programmed in as chiller setpoints, cut-outs, clock, etc.

Numerical Keypad

1	2	3
4	5	6
7	8	9
*	0	+/-

The NUMERICAL keypad provides all keys needed to program numerical values as required.

The “*” Key is used to designate holidays when programming special start and stop times for designated holidays in the SET SCHEDULE/HOLIDAY display.

The “+/-” key allows programming -°C setpoints and cut-outs in the metric display mode.

Enter Key

ENTER

The ENTER key must be pushed after any change is made to setpoints, cut-outs or the system clock. Pressing this key tells the micro to accept the new values into memory.

If this is not done, the new numbers entered will be lost and the original values will be returned.

The ENTER key is also used to scroll through available data after any one of the following keys is pressed:

PROGRAM
SET SCHEDULE/HOLIDAY
OPER DATA
HISTORY

Cancel Key

CANCEL

The CANCEL key allows the user to change errors in the data being programmed into memory.

When the CANCEL key is pressed, any data which has been keyed in, but not entered, will be erased. The original values will re-appear on the display and the cursor will return to the first character to be programmed in the display message.

AM/PM Key

AM/PM

The AM/PM key allows the user to change AM/PM while programming the correct time in the SET TIME display. The same key allows changing the AM/PM schedule while programming daily chiller start and stop times in the SET SCHEDULE/HOLIDAY display.

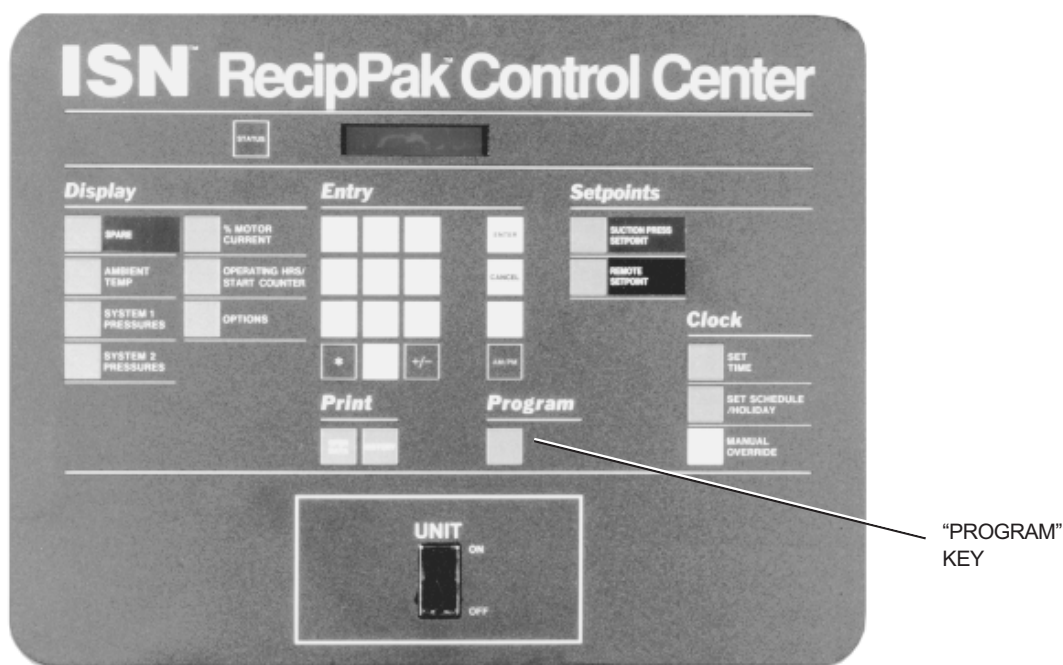
Advance Day Key

ADVANCE
DAY

The ADVANCE DAY key advances the day when the SET TIME display is being programmed. The day is normally advanced to correspond to the current day of the week. The day will advance a day at a time, each time the key is pressed.

“PROGRAM” KEY

PROGRAMMING USER PROGRAMMABLE SAFETIES AND LIMITS



26572A(D)

GENERAL

Pushing the PROGRAM key allows the user to program “11” system operating limits. These limits include cutout points for safeties, anti-recycle timer duration, and the reaction time of the microprocessor to abrupt changes in the chilled water temperatures.

After the PROGRAM key is pressed, the micro will first respond by displaying the DISCHARGE CUT-OUT. As the “11” limits are displayed, they may be reprogrammed using the “12” ENTRY keys. New values will be programmed into memory when the ENTER key is pushed. The ENTER key must also be used to advance the display the operator views the “10” system operating limits. Each time the key is pushed, the display will advance to the next limit.

If the operator attempts to enter an unacceptable value, the micro will respond with a momentary message indicating the value selected has been ignored. This error message is shown:

**OUT OF RANGE
TRY AGAIN!**

The “11” programmable limit displays are shown and described below along with the range of values which the microprocessor will accept for each limit. *THESE VALUES MUST BE CHECKED AND PROPERLY PROGRAMMED WHEN COMMISSIONING THE CHILLER. FAILURE TO PROPERLY PROGRAM THESE VALUES*

MAY CAUSE DAMAGE TO THE CHILLER OR OPERATION PROBLEMS.

DISCHARGE CUT-OUT

**DISCHARGE CUT OUT
= 395 PSIG**

The DISCHARGE CUT-OUT is a microprocessor back-up for the mechanical high pressure cut-out located in each refrigerant circuit. Typically YCR chillers should have the cut-out set at 360 PSIG. Chillers with water-cooled condensers normally require the cut-out to be set at 270 PSIG.

NOTE: In some water cooled condenser installations, the possibility exists for the condenser water pump or the cooling tower to not be in operation when the chiller starts. This causes the discharge pressure to rise so rapidly that even though the mechanical high pressure cut-out is shutting down the compressor, the flywheel effect may cause the pressure to continue to rise causing the relief valve to open with a subsequent refrigerant loss. By programming the cut-out at slightly below typical manual cut-out of 270 PSIG, refrigerant loss due to system operation problems will be eliminated.

To program the DISCHARGE CUT-OUT, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 200-399 PSIG for this cut-out. For this cut-out to be functional, the Discharge Pressure Readout Option must be installed.

NOTE: It is required to first key in "0" when programming this cut-out (Example: 0270 PSIG).

More details on this safety are outlined in the SYSTEM SAFETIES section.

OUTSIDE AIR TMP LOW CUT-OUT

OUTSIDE AIR TMP LOW
CUT OUT = 25.0 F

The OUTSIDE AIR TMP LOW CUT-OUT does not apply to indoor chillers, however it must be properly programmed or it will not allow the chiller to operate. Improper programming will cause the chiller to lock out on a Low Ambient Fault.

The Low Ambient Cut-out **MUST** be programmed to 00.0 to allow the chiller to operate. A programmed cut-out of any other value will prevent operation and cause a Low Ambient Fault.

The micro will accept a range of programmable values between 00.0° - 50.0°F for this cut-out, if S1 Dip Switch #2 on the Microprocessor Board is in the CLOSED position. As mentioned above, the programmed value **MUST** be 00.0. In the OPEN position, a fixed 25°F cut-out is recognized and will prevent the cut-out from being programmed properly.

To program the OUTSIDE AIR TMP LOW CUT-OUT, key in 00.0 and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

If for some reason the chiller shows a Fault on low ambient, reprogram the cut-out for 00.0. After the cutout is reprogrammed, remove control panel power for about 10 seconds. The fault will clear after power is re-applied.

OUTSIDE AIR TMP HIGH CUT-OUT

OUTSIDE AIR TMP HIGH
CUT OUT = 130.0 F

The OUTSIDE AIR TMP HIGH CUT-OUT is selectable to establish the high ambient cut-out point. If the ambient rises above this point, the chiller will shut down. Restart can occur when temperature drops below the cut-out. This only applies to outdoor air-cooled chillers.

This cut-out is normally set at 130.0°F to allow operation to the absolute maximum temperature capability of the electro-mechanical components.

To program the OUTSIDE AIR TMP HIGH CUT-OUT, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 100.0° - 130.0°F for this cut-out.

NOTE: This cut-out does NOT apply to YCW & YCR indoor chillers.

DISCHARGE PRESSURE UNLOAD

DISCHARGE PRESSURE
UNLOAD = 360 PSIG

The DISCHARGE PRESSURE UNLOAD point is a programmable limit to keep the system from faulting on the high discharge pressure cut-out should a system problem or chiller problem occur. A typical problem would be if the cooling tower would become dirty on a water-cooled system. Pressure would rise and eventually cause the chiller to fault causing total loss of cooling. By unloading the compressors at high discharge pressures, the chiller is allowed to continue to run automatically at reduced capacity until the dirty cooling tower can be attended to.

When the unload point is reached, the micro will automatically totally unload the affected compressor. Typical maximum programmed limits would be 340 PSIG for YCR chillers with 360 PSIG high pressure cut-outs and 250 PSIG for water-cooled chillers with 270 PSIG cut-outs.

Reloading will occur when the discharge pressure drops to 60 PSIG below the programmed unload pressure and will increment one stage at a time as dictated by the loading timers.

To program the DISCHARGE PRESSURE UNLOAD, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 200-390 PSIG for the unload point. For this feature to be functional, the Discharge Pressure Readout Option must be installed.

NOTE: It is required to first key in a "0" when programming this cut-out (Example: 0255 PSIG).

AVERAGE CURRENT UNLOAD

* *

AVERAGE CURRENT
UNLOAD = 100 %FLA

The purpose of AVERAGE CURRENT UNLOAD is to provide adequate motor cooling and to prevent the motor from faulting on high motor current. The motor current unload feature only unloads a compressor by a **single step**. This provides more cooling to the motor and at the same time still attempts to pull the water temperature down.

Unloading will only occur when a compressor is running with at least one step of loading above a fully unloaded state. This feature will not, under any circumstances, shut a compressor off.

Whenever Motor Current Unloading is activated, the compressor will stay in the unloaded state for 5 minutes. After the 5 minute time period, the micro will look at motor current once again. If motor is 25% below the programmed Motor Current Unload point, the compressor will be allowed to reload, if water temperature allows.

To program the Motor Current Unload, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 80-105% for the unload point. A setting of 100% is recommended for the unload point.

NOTE: When programming values from 80-99%, it is first required to key in a "0". Example: 090%.

SUCTION PRESSURE UNLOAD

*

SUCTION PRESSURE
UNLOAD = 090 PSIG

The SUCTION PRESSURE UNLOAD point is a programmable limit designed to assure that suction gas returning to the compressor is cool enough to provide adequate compressor cooling.

If the suction pressure rises to the suction pressure unload pressure, the micro will automatically totally unload the affected compressor which reduces motor heating.

Reloading will occur when the suction pressure drops to 10 PSIG below the programmed unload pressure and will increment one stage at a time as dictated by the loading timers.

This safety will only come into action on a very hot water start with related high system suction pressure. Its sole purpose is to prolong motor life.

To program the SUCTION PRESSURE UNLOAD, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 80-105 PSIG for the unload point.

NOTE: When programming values from 80-99 PSIG, it is required to first key in a "0". Example: 085 PSIG.

RATE CONTROL TEMP

RATE CONTROL TEMP
= 08.0 F

The RATE CONTROL TEMP establishes a temperature range over which the micro may override normal system loading timers and react to actual rate of change of return and leaving water temperature. This temperature range is slightly above the setpoint with its band width being programmable. This control works in conjunction with the RATE SENSITIVITY which is also programmable.

These controls allow the chiller to adapt to a full range of applications. Depending on how the controls are set up, the chiller can be adapted to provide maximum response, demand limiting/energy saving, or reduced loader and compressor cycling. **Typically this value should be programmed for 00.1°F. When programming values like 00.1°F, it is first required to key in "00". Example: 00.1°F.** Additional details for programming this control will be discussed in the SELECTION OF RETURN OR LEAVING CHILLED LIQUID CONTROL Section (Page 57).

ANTI RECYCLE TIME

ANTI RECYCLE TIME
= 600 SECS

The ANTI RECYCLE TIME selection allows the user to select the compressor anti-recycle time to best suit his needs. Motor heating is a result of inrush current when the motor is started. This heat must be dissipated before another start takes place or motor damage may result. The anti-recycle timer assures the motor has sufficient time to cool before it is again restarted.

An adjustable timer allows for the motor cooling required, but gives the user the ability to extend the timer to cut down on cycling. In some applications fast compressor start response is necessary, in others it is not. These needs should be kept in mind and the timer should be adjusted for the longest period of time tolerable. Although 300 seconds is adequate motor cooling time, longer periods will allow even more heat dissipation, reduce cycling, and possibly increase motor life.

To program the ANTI-RECYCLE TIME, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 300-600 seconds for this operating control.

LEAVING WATER TEMP CUT-OUT

LEAVING WATER TEMP
CUTOUT = 36.0 F

* This message only applies to chillers with 031-01096-001 and early versions of 031-01652-001 EPROMs.

** This message only applies to chillers with later versions of 031-01652-001 (CRCP Version) EPROMs.

The LEAVING WATER TEMP CUT-OUT protects the chiller from an evaporator freeze-up should the chilled liquid temp drop below the freeze point. This situation could occur under low flow conditions or if the micro panel SETPOINT values are improperly programmed. Anytime the leaving chilled liquid temperature (water or glycol) drops to the cut-out point, the chiller will shut down. Restart will occur when temperature rises above the cut-out if the anti-recycle timers are satisfied.

For chilled water applications (comfort cooling, SW1 OPEN), the cut-out is automatically set at 36.0°F. This covers applications where leaving water temperatures are not designed to go below 40.0°F. If chilled liquid (glycol) temperatures are required below 40°F, the cutout should be programmed for 4°F below the desired leaving chilled liquid temperature.

To program the LEAVING WATER TEMP CUT-OUT the BRINE & PROCESS MODE (SW1 CLOSED) must be selected, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next programmable limit.

The micro will accept a range of programmable values between 08.0° - 36.0°F for this cut-out.

SUCTION PRESSURE CUT-OUT

**S U C T I O N P R E S S U R E
C U T O U T = 4 4 P S I G**

The SUCTION PRESSURE CUT-OUT protects the chiller from an evaporator freeze-up should the system attempt to run with a low refrigerant charge. Anytime the suction pressure drops below the cut-out point, the system will shut down.

NOTE: There are some exceptions, where suction pressure is permitted to temporarily drop below the cut-out point. Details are outlined in the SYSTEM SAFETIES section.

For chilled water applications, the cut-out should be set at 44 PSIG. If glycol or brine is utilized with leaving water temperature designs below 40°F, the cut-out should be adjusted according to concentration. A rule-of-thumb cut-out design is to drop the cut-out 1 PSIG below 44 PSIG for every degree of leaving glycol below 40°F. In other words, 30° glycol requires a 34 PSIG suction pressure cut-out.

To program the SUCTION PRESSURE CUT-OUT, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next programmable limit.

The micro will accept a range of programmable values between 20-70 PSIG for this cut-out. In the COMFORT COOLING MODE (SW1 OPEN), the cut-out is adjustable from 44-70 PSIG. In the BRINE & PROCESS MODE (SW1 CLOSED), the cut-out is adjustable from 20-70 PSIG.

RATE SENSITIVITY

**R A T E S E N S I T I V I T Y
= 5 . 0 F / M I N .**

The RATE SENSITIVITY establishes the rate of change of return or leaving water temperature where the micro will over-ride the normal 30-150 seconds per stage loading rate which is based on error between setpoint and actual temperature.

The RATE SENSITIVITY is active when the leaving chilled liquid temperature is in the RATE CONTROL TEMP RANGE. In this range, if water temperature is dropping faster than the RATE SENSITIVITY setting, the micro will not load any more stages because water temperature is dropping quickly. This provides demand limiting and reduces loader/compressor cycling and overshoot. If quick response is needed, RATE SENSITIVITY can be programmed accordingly. When temperatures are in the RATE CONTROL TEMP RANGE, loading will occur in intervals according to both rate of water temperature change and error in water temperature versus setpoint. This will override the typical 30-150 seconds per stage based on error in setpoint versus actual water temperatures. If water temperature is dropping faster than the RATE SENSITIVITY, no further loading will result and in some cases, the chiller will unload to slow temperature drop.

RATE SENSITIVITY is also active in the CONTROL RANGE in RETURN OR LEAVING WATER CONTROL. Further loading will not occur if water temperature is dropping too fast regardless of whether temperature calls for further loading.

Typically this value should be programmed for 5.0°F. Additional details of programming this control will be discussed in the SELECTION OF RETURN OR LEAVING CHILLED LIQUID CONTROL Section (Page 57).

NUMBER OF LOAD STEPS

**N U M B E R O F L O A D S T E P S
= 0 5 (E N T E R 5 , 7 O R 1 0)**

The number of steps of loading must be programmed to assure proper loading sequence and temperature control. This is done at the factory, but should be checked against the table below:

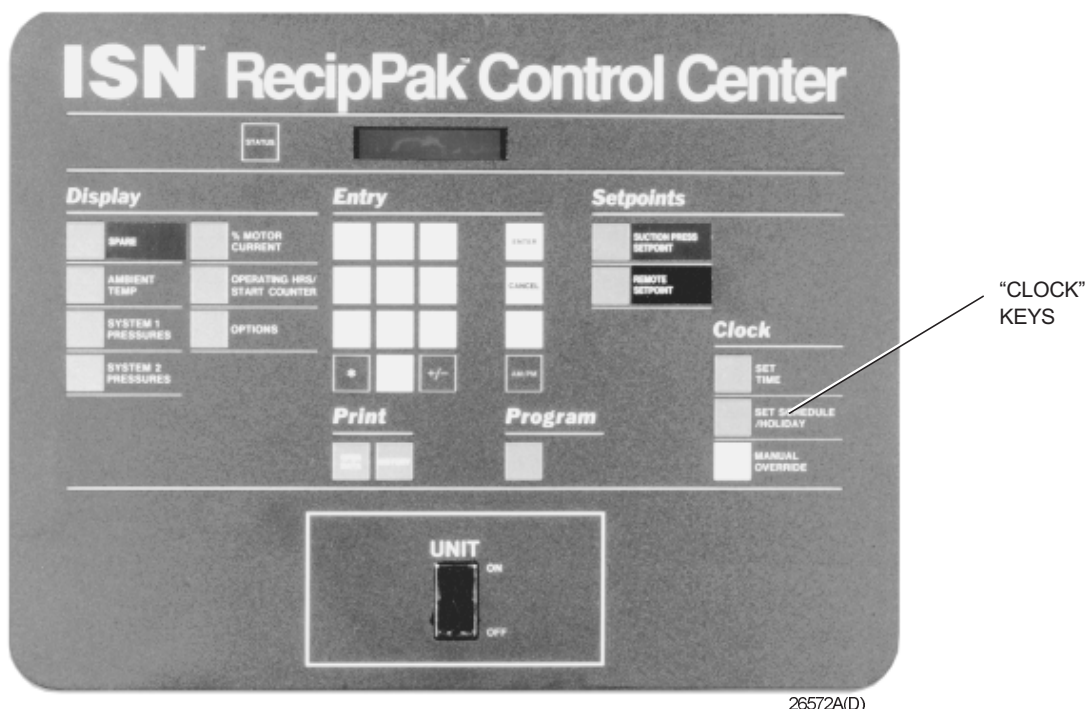
	J45	J55	J56	J66	J67	J77	J88	J99
Standard	5 Steps	5 Steps	7 Steps	7 Steps	7 Steps	7 Steps	10 Steps	10 Steps
Optional	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTE: Optional unloading is not available. Hot Gas Bypass (Loadminder) should not be counted for programming purposes.

The YCW/YCR J56 must be programmed for 7 steps; however, it is only capable of 6 steps of unloading since the 4 cyl. compressor has a single unloading solenoid.

Program the number of steps as required. If 5 or 7 steps is programmed, the "0" key (05 or 07) must be pressed first.

“CLOCK” KEYS PROGRAMMING THE SYSTEM CLOCK AND DAILY START/STOP SCHEDULE



26572A(D)

GENERAL

The “CLOCK” is an internal system feature that allows the microprocessor to continuously monitor the time of the day. The micro will display actual time as well as the day of the week and the date when programmed. This feature allows the microprocessor to provide an internal automatic time clock feature for starting and stopping the chiller for each individual day of the week. Also provided is a “HOLIDAY” feature which allows special start/stop programming for designated holidays.

The internal clock and schedule programming eliminates the need for an external time clock. Automatic chiller start and stop will occur according to the programmed schedule.

If the user desires not to utilize the schedule feature, the SET SCHEDULE/HOLIDAY can be programmed to run the chiller on demand as long as the “UNIT” and “SYS” switches are ON.

Typical display messages will be shown which apply to each key.

PROGRAMMING THE DAY, TIME AND THE DATE

Set Time



A message showing the day, time and date will be displayed when the SET TIME key is pressed.

T O D A Y I S S U N 1 1 : 1 2 A M
0 2 / 1 4 / 9 8

To program the day, time and date, first press the ADVANCE DAY key until the appropriate day of the week is displayed. The day will advance each time the key is pressed.

The cursor will already be below the first digit of the time. Key in the new time, if required. Be sure to key in a “0” before the other digits for times before 10 o’clock., i.e. 08:01.

After the time is keyed in, the cursor will advance to the AM/PM designation. To reprogram, press the AM/PM key. When the key is pressed, the display will change to the opposite time period. If no change is required, begin keying in the required date (the cursor will automatically skip to the first digit of the date [month] when a “number key” is pressed and the number will be placed in the first position).

NOTE: The AM/PM key can only be pressed once. If an error is made, press the CANCEL key and begin again.

The date may be keyed in after AM/PM. The sequence of the message display is month, day and year. Two digits must be entered for each of these items. Therefore, a leading “0” may be required.

Once the desired information is keyed in, it may be stored in memory by pressing the ENTER key. After the ENTER key is pressed, the cursor will move under the "T" of TODAY.

The micro will accept any valid time or date. If an out of range value is entered, the micro will display the following message for 3 seconds before it reverts back to the SET TIME display message to let the user know that another try at reprogramming is necessary.

OUT OF RANGE
TRY AGAIN!

PROGRAMMING THE DAILY START/STOP AND HOLIDAY SCHEDULE

Set Schedule/Holiday

SET SCHEDULE
/HOLIDAY

Messages showing the start/stop schedule of each day of the week as well as the holiday start/stop schedule can be displayed after the SET SCHEDULE/HOLIDAY key is pressed. The display can be scrolled through day-by-day simply by repetitively pressing the ENTER or ADVANCE DAY key. A typical daily schedule display is shown below:

MON START = 06 : 00 AM
STOP = 05 : 30 PM

To reprogram any of the daily schedules, key in the new START time. To change the AM/PM associated with the START time, press the "AM/PM" key. This will change the AM/PM message to the opposite time period. The "AM/PM" key can only be pressed once. If an error is made, press CANCEL and begin reprogramming again.

After the START time and the associated AM/PM have been programmed, the cursor will move to the STOP time. Key in the STOP TIME and press the "AM/PM" key if AM/PM requires changing.

When the ENTER key is pressed, the new START/STOP time is entered and the display will scroll to the next day. If an unacceptable time is entered, the following message will be displayed.

OUT OF RANGE
TRY AGAIN!

For ease of programming, any values "ENTERED" for MONDAY will **automatically** be put in for the other days of the week. Be aware of this anytime the MONDAY SCHEDULE is changed, since it changes times previously programmed into other days. For scrolling through the days to view times programmed use the ADVANCE DAY KEY, not the ENTER KEY. This will assure that

after viewing MONDAY, that the ENTER KEY is not pressed changing times programmed for the rest of the week.

If the chiller is not cycled by the DAILY SCHEDULE, but is required to run whenever the system switches are on, all 00.00's should be programmed into the daily schedule. This can be done manually for each day or by pressing CANCEL and ENTER when the MONDAY START/STOP schedule appears.

NOTE: This will have no effect on the holiday schedule.

Continue to program each day as needed. After MON through SUN has been entered, the HOLIDAY message will be displayed.

HOL START = 08 : 30 AM
STOP = 12 : 00 PM

The Holiday (HOL) START/STOP allows the user to designate a specific day(s) for special requirements. This is provided so that day(s) needing special start/stop requirements can be programmed without disturbing the normal working schedule.

The start/stop times for the Holiday schedule are programmed just as for any other day.

NOTE: Only one start/stop time can be programmed which will apply to each of the "HOLIDAY" days selected.

After the ENTER key is pressed, a new message will be displayed to designate which days of the week are to be holidays.

S M T* W T F S
HOLIDAY NOTED BY *

In the above sample display, an * designates Tuesday as a holiday.

When the display appears, the cursor will first stop behind Sunday. To designate a day as a holiday, press the "*" key. If a day is not to be a holiday, press the "0" key. Whenever the "*" or the "0" keys are pressed, the cursor will advance to the next day. After all the holiday days are programmed, press ENTER to store the new data into memory. The display will then advance to the beginning of the Daily Schedule (MON).

The Holiday Schedule is only executed once by the micro before it is erased from memory. This is done because in most cases a special Holiday Schedule is only necessary once in a several month period. It also eliminates the need for operator intervention to erase the schedule after the holiday passes.

If an error is made while programming, press CANCEL. This will clear all programmed (*) "holiday" days. The schedule can then be reprogrammed.

The "0" key will not cancel out a "*" and cannot be used for correcting a programming error.

Manual Override



When the MANUAL OVERRIDE key is pressed, the Daily Schedule programmed into the chiller will be ignored and the chiller will start-up when water temperature allows, unit switch permits, and system switches permit.



Once activated, MANUAL OVERRIDE is only active for a period of 30 minutes. It is for servicing only and is designed so that if let on accidentally, the microprocessor will automatically return to the Daily Schedule.

SELECTION OF RETURN OR LEAVING CHILLED LIQUID CONTROL

GENERAL

The user has the ability to select the type of chilled liquid temperature control by choosing either Return or Leaving Temperature Control. This provides the ability to fine tune the method of control for comfort cooling or batch/process cooling loads.

In many cases, comfort cooling will be best controlled by RETURN WATER CONTROL. This will assure a minimum of cycling compressors/loaders with stable leaving chilled liquid temperatures as long as water flow GPM is held constant and the Control Range (CR) is correctly programmed.

LEAVING WATER CONTROL is also suitable for comfort cooling, but may produce slightly more cycling depending upon the RATE SENSITIVITY programmed. Optional stages of loading are recommended to reduce cycling. In most cases, Leaving Water Control will be more precise unless compressor cycling is encountered. "Anticipation" and timers are built into the microprocessor's control algorithms to eliminate compressor and loader cycling enabling LEAVING WATER CONTROL to be used in most applications. The control algorithm utilizes "PID" control.

For batch and process applications, LEAVING WATER CONTROL will allow for precise temperature control. In these applications chilled liquid temperature control is more important than compressor/loader cycling. When LEAVING WATER CONTROL is utilized, it is recommended to have optional steps of loading on each compressor. This assures minimum tonnage per step which reduces the possibility of compressor and loader cycling that is critical to precisely controlling temperature.

RETURN WATER CONTROL may also be used on batch and process application and should provide adequate control. However, it will prove to be less responsive with slightly more leaving chilled liquid temperature variation. RETURN WATER CONTROL may become necessary to use if too much compressor cycling is noted with corresponding water temperature fluctuation when in Leaving Water Control.

After determining the mode of control best suited for the application (RETURN OR LEAVING WATER CONTROL), the micro panel must be interrogated to determine whether it is programmed for RETURN or LEAVING WATER CONTROL. This can be accomplished by pressing the OPTION key in the DISPLAY section of the keypad. This allows the user to determine the present mode of control without gaining access to the Microprocessor Board and visually checking the sometimes difficult to determine Dip Switch position. When the OPTION key is pressed, a message "THE FOLLOWING ARE PROGRAMMED" will appear on the display for 3 seconds. The display will then scroll through the 8 dip switch selections, each appearing for 3 seconds. The 4th display will tell the user whether leaving or return temperature is programmed on Switch 4. The 4th display message will read either "RETURN WATER CONTROL" or "LEAVING WATER CONTROL" and will appear for 3 seconds. The display will then scroll through the 8 dip switch selections, each appearing for 3 seconds.

If a change is required, position Switch #4 on dip switch S1 on the Microprocessor Board (Fig. 15) as indicated:

RWT CONTROL: SW 4 OPEN
(left side pushed down)

LWT CONTROL: SW 4 CLOSED
(right side pushed down)

NOTE: In LWT CONTROL, water temperature may undesirably rise when a compressor cycles off and cannot restart because the anti-recycle timer is still timing out. The effects can be reduced by programming the anti-recycle timer (Page 46) for a minimum of 300 seconds if it isn't already programmed for 300 seconds. If problems still arise, switch to RWT CONTROL.

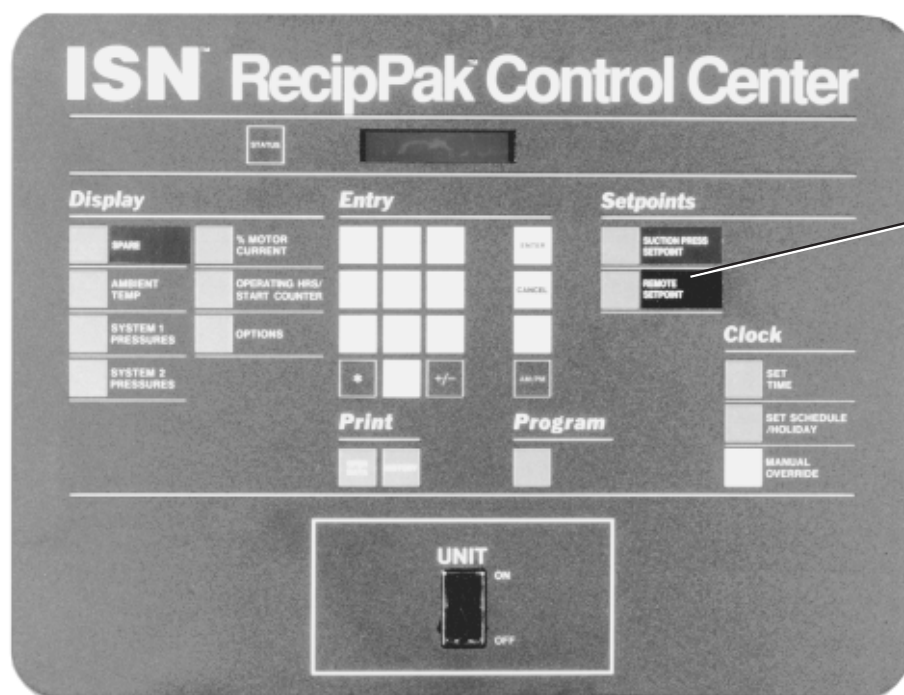
Once the dip switch #4 on the Microprocessor Board is properly positioned, the user will be able to view the ap-

propriate display when the CHILLED LIQUID TEMP/RANGE is pressed. This display will show one of the following messages depending upon S1 positioning:

RETURN WATER
TEMP CONTROL

LEAVING WATER
TEMP CONTROL

“SETPOINTS” KEYS PROGRAMMING CHILLED LIQUID SETPOINTS AND REMOTE RESET TEMP RANGE



26572A(D)

GENERAL

After Return or Leaving Chilled Liquid Control is selected according to the user's application and Switch #4 of Dip Switch S1 on the Micro Board is properly configured to select Return or Leaving control, the chilled liquid setpoints can then be programmed into the control panel. Switch #4 of S1 must be properly programmed or an incorrect display message will appear when the CHILLED LIQUID TEMP/RANGE key is pressed. SEE "SELECTION OF RETURN OR LEAVING CHILLED LIQUID CONTROL" Page 50 if needed.

If remote temperature setpoint is being utilized, the REMOTE RESET TEMP RANGE must be programmed. The following information will cover programming both return and leaving control. Refer to either the RETURN

or LEAVING WATER CONTROL section as required below. Programming the REMOTE RESET TEMP RANGE is discussed later in this manual on Page 75.

PROGRAMMING RETURN WATER CONTROL

Chilled Liquid Temp/Range

CHILLED LIQUID
TEMP/RANGE

When the CHILLED LIQUID TEMP/RANGE key is pressed, the following message will be displayed for 3 seconds indicating Dip Switch S1, Switch #4 on the Microprocessor Board is programmed properly:

RETURN WATER
TEMP CONTROL

If this message is incorrect, see the "SELECTION OF RETURN OR LEAVING CHILLED LIQUID CONTROL" section (Page 50) for instructions to reprogram the Microprocessor Dip Switch S1, Switch #4.

The display will then scroll to a second message & hold:

```

      L W T =  4 4 . 0  F
C R =  4 4 . 0  T O  5 4 . 0  F
  
```

This message will display the user's "Design Leaving Water temperature" (LWT) Setpoint (44.0°F in the sample above). Even though return water temperature control is being utilized, the object is to provide constant design leaving water temperature. It is the "Design Leaving Water Temperature" Setpoint (LWT) which **must** be programmed into the microprocessor.

Also included in this message is the "CONTROL RANGE" (CR). The "CONTROL RANGE" is the temperature range which loading/unloading will take place. The lower limit of the CONTROL RANGE is always equal to the setpoint and automatically appears when the setpoint is keyed in. The upper limit of the CR must be programmed.

In the above sample message, with a "CR = 44.0 to 54.0 °F", the chiller will be completely off at a **return** water temperature of 44.0°F and fully loaded at a **return** water temperature of 54.0°F. Partial loading will occur in equal temperature intervals between 44° and 54°. Unloading will occur as return temperature drops below 54°F with the chiller cycling completely off at 44°F. These temperatures provide a Control Range differential of 54.0 - 44.0 = 10.0°F.

Once the upper limit of the CR is programmed, the "CONTROL RANGE" (CR) differential **Must Always** equal the actual water temperature drop (ΔT) across the evaporator with the chiller completely loaded. Keep this in mind when programming the high end of the CR. In many cases, due to improper flows, actual temperature drop occurs across the evaporator (ΔT) will not equal design. For proper operation, adjust flow as needed or program the "CONTROL RANGE" as needed. However accomplished, the "CONTROL RANGE" differential **Must** equal the evaporator temperature drop when fully loaded or leaving water temperatures well above or well below the desired setpoint will result.

To program the Chilled Liquid Setpoints, press the CHILLED LIQUID TEMP/RANGE key. The display will first exhibit a message that "RETURN WATER TEMP CONTROL" is selected and 3 seconds later automatically scroll to the next display of LWT and CR. The cursor will stop at the first digit of LWT. Key in the "Design Leaving Water Temperature" (LWT) that is required in the system. See the following:

Design Leaving
Water Temperature

```

      L W T =  4 4 . 0  F
C R =  4 4 . 0  T O  5 4 . 0  F
  
```

After the Design Leaving Water Temperature (LWT) is keyed in, the lower limit of the CR (Control Range) in the display message will automatically change to a value identical to the "LWT". See below:

```

      L W T =  4 4 . 0  F
C R =  4 4 . 0  T O  5 4 . 0  F
  
```

The lower limit of the CR will
always automatically equal LWT.

The cursor will advance to the final entry which is the upper limit of the CR (Control Range). This value **must** be programmed to equal the design LWT plus the CR differential (ΔT across the evaporator fully loaded). In the above examples it would be 44.0 + 10.0 = 54.0°F.

Key in the upper limit of the CR and press ENTER. Otherwise the new values will not be entered into memory. After pressing the ENTER key, the display will continue to show the LWT and Control Range message until another key is pressed.

The micro will accept a range of programmable LWT values from 10.0 - 70.0°F (See "SWITCH 1", Page 38). It will also accept a value for the upper limit of the CR of 4 - 20°F above the LWT Setpoint.

If brine or glycol is used in the system, chilled liquid temperatures below 40°F may be desired. To program setpoints below 40°F, Dip Switch S1, Switch #1 on the Microprocessor Board must be properly programmed. (See Page 37, Fig. 15). If the switch is incorrect, when setpoints below 40°F are entered as well as when unacceptable values are entered, the following message will be displayed.

```

O U T   O F   R A N G E
T R Y   A G A I N !
  
```

Loading and unloading occurs in defined increments throughout the Control Range, according to the difference between return water temperature and the LWT setpoint. Loading is limited by a 60 second timer, while unloading is not.

Loading may be inhibited or unloading may occur if the micro senses that the Rate Sensitivity is exceeded in the Control Range or Rate Control Range to prevent overshoot. This action will override incremental loading.

Further details regarding loading/unloading and Rate Control will follow.

**PROGRAMMING
RETURN WATER RATE CONTROL**

Programmable RATE CONTROL is designed to limit compressor/loader cycling thus saving energy and reducing wear on mechanical components. It also reduces the possibility of “overshoot”. RATE CONTROL will allow the micro to react to fast changes in water temperature beyond normal responses dictated by the difference between actual return water temperature and setpoint.

RATE CONTROL requires programming the temperature range (RATE CONTROL TEMP) above the CONTROL RANGE (CR) where rate control is desired. Additionally, the actual rate of change (RATE SENSITIVITY) of water temperature which the micro uses as a control reference must also be programmed.

Refer to Fig. 16 as you read the following text. A typical leaving water temperature setpoint of 45°F is used with a 45° - 55°F CONTROL RANGE. A RATE CONTROL TEMP OF 65°F, which is typical (10° above the high end of the Control Range), is shown.

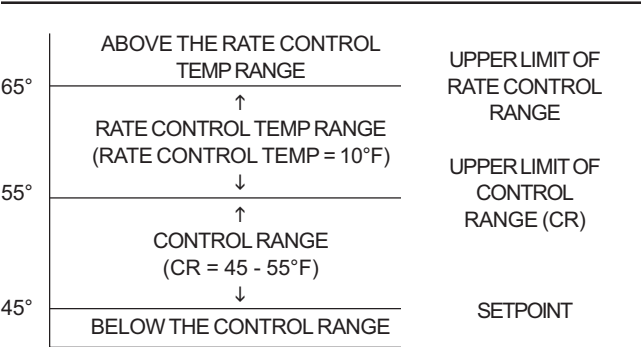


FIG. 16 – RETURN WATER TEMPERATURE CONTROL

The RATE CONTROL TEMP establishes a temperature range (0.1° - 20°F) above the “Upper Limit of CONTROL RANGE” where the micro will limit loading, or unload if the rate of change of water temperature reduction exceeds the programmed RATE SENSITIVITY. In Fig. 16 a RATE CONTROL TEMP of 10°F is used.

In the CONTROL RANGE and RATE CONTROL RANGE loading/unloading will normally occur according to de-

viation from setpoint. “Rate Control” will function to prevent loading if the water temperature change (leaving or return) exceeds the RATE SENSITIVITY, even though deviation from setpoint requires loading. This will reduce the chance of overshoot.

Above the RATE CONTROL TEMP RANGE, the micro will attempt to load the chiller every 60 seconds per stage. This allows the chiller to gain control of the water temperature as quickly as possible.

Since RWT Control utilizes the buffering of the water loop and a wide control (loading/unloading) range, compressor/loader cycling is reduced, wear and tear on mechanical parts is reduced, and pulldown demand is automatically limited. This makes the selection of RATE CONTROL TEMP and RATE SENSITIVITY values less critical unless short water loops are encountered.

Before programming the RATE CONTROL TEMP, the user should first determine if typically the normal fastest allowable pulldowns are required or whether pulldown demand limiting is desired. Programmable values from 00.1° - 20°F are possible.

For normal pulldowns, and quick response, a RATE CONTROL TEMP of 0.1°F is appropriate unless excessive overshoot is noted.

For demand limiting, energy efficiency, and minimum cycling, RATE CONTROL TEMPS of 10° - 20°F are advisable with temperatures around 20°F most appropriate. This will cause the control to react to water temperature rate of change well before the water temperature drops into the CONTROL RANGE. This is also a must for small water loops. However, if problems arise where the chiller does not load and pull temperature down, select 0.1°F.

To program the RATE CONTROL TEMP, first press the PROGRAM key. Repetitively press the ENTER key until the display below appears.



Key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 0.1° - 20°F.

NOTE: When programming values between 0.1° - 9.9°F, it is required to first key in a “0” or “00”. Example: 05.9 °F.

The next item which will require programming is the RATE SENSITIVITY. The RATE SENSITIVITY is a means of “overriding” the loading/unloading timers when water temperatures are in the RATE CONTROL RANGE or the CONTROL RANGE. This allows the micro to react to abrupt downward changes in leaving or return water temperatures. The ability to respond to “rate of change” variations in water temperatures gives the micro “anticipation” capabilities to reduce the possibility of “overshoot” in leaving water temperature.

In demand limiting applications, to avoid cycling or to avoid overshoot, RATE SENSITIVITY should be low. This allows the micro to go into rate control to prevent loading whenever water temperatures drop faster than the programmed RATE SENSITIVITY. Rate Control can go into effect whenever water temperatures are in RATE CONTROL RANGE or the CONTROL RANGE. For these applications, a 3°-5°F/min. RATE SENSITIVITY is recommended. This is also a must for small water loops. However, if problems arise where the chiller does not load and pull temperature down, select 5.0°F/min.

NOTE: Too small of a RATE SENSITIVITY value selection may prevent loading due to varying flows or if the water system allows a slug of cold water to enter which falsely fools the micro into thinking the RATE SENSITIVITY has been exceeded, preventing loading and allowing leaving water temperature to rise above the desired temperature. In some cases, unloading or compressor shutdown may result.

For normal comfort cooling, batch, or process applications, select a high RATE SENSITIVITY of 5.0°F/min. Before RATE CONTROL can go into effect, the water temperature would have to change at a very high rate to exceed the RATE SENSITIVITY value programmed. This will assure normal loading will occur. 5.0°F/min. also works well in comfort cooling applications. **If unsure of a RATE SENSITIVITY selection, use 5.0.F/min.**

To program the RATE SENSITIVITY, first press the PROGRAM key. Repetitively press the ENTER key until the display below appears.

```
R A T E   S E N S I T I V I T Y
=   5 . 0   F / M I N
```

Key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 0.5° - 5.0°F/min.

PROGRAMMING LEAVING WATER CONTROL

Chilled Liquid Temp/Range

When the CHILLED LIQUID TEMP/RANGE key is pressed, the following message will be displayed for 3 seconds indicating Dip Switch S1, Switch #4 on the Microprocessor Board is programmed properly:

```
L E A V I N G   W A T E R
T E M P   C O N T R O L
```

If this message is incorrect, see the “SELECTION OF RETURN OR LEAVING CHILLED LIQUID CONTROL” Section (Page 50) for instructions to reprogram the Microprocessor Dip Switch S1, Switch #4.

The display will then scroll to a second message & hold:

```
L W T =   4 4 . 0   F
C R =   4 4 . 0   T O   4 6 . 0   F
```

This message will display the Low-Limit Water Temperature (LWT) and the Control Range (CR). In the sample above, the LWT is 44.0°F and the CR is 44° - 46°F.

The Control Range (CR) is the variation in leaving water temperature which is acceptable in the system application. As long as leaving water temperature stays between the low limit and midpoint of the Control Range (CR), the Microprocessor will consider the temperature acceptable and will not initiate any loading/unloading reaction unless “Rate Control” requires. The Low-Limit Water Temperature (LWT) is the minimum acceptable leaving water temperature in the Control Range (CR), not the actual user desired leaving water temperature setpoint.

The desired leaving water temperature is known as the “Target” temperature which is the temperature the micro will attempt to control too. The “Target” temperature is not programmable, but it is always the midpoint of the Control Range (CR). Example: A control range of 44° - 46°F will have a “Target” Temp of 45°F, which should equal the desired system leaving water temperature. As mentioned before, the micro will be satisfied with a leaving temperature between 44° - 45°F unless the rate control is exceeded. The microprocessor’s rate control is designed to be less responsive in the upper half of the Control Range (i.e. 45° - 46°F) than in the lower half (i.e. 44° - 45°F). This is to prevent overshoot.

To program the Low-Limit Water Temperature (LWT) and the Control Range (CR), press the CHILLED LIQUID

TEMP/RANGE key. This display will first exhibit a message that "LEAVING WATER TEMP CONTROL" is selected and 3 seconds later automatically scroll to the next display of LWT and CR. The cursor will stop at the first digit of LWT. Key in the Low-Limit Water Temperature (LWT) that is acceptable in the system. See below:

Low-Limit Water Temperature (LWT)

```

      LWT =  4 4 . 0  F
CR =  4 4 . 0  TO  4 6 . 0  F
  
```

The micro will accept a range of programmable values from 10.0 - 70.0°F (See "SWITCH 1", Page 38). If brine or glycol is used in the system, chilled liquid temperatures below 40°F may be desired.

To program setpoints below 40°F, Dip Switch S1, Switch #1 on the Microprocessor Board must be properly programmed. (See Page 38). If the switch is incorrect, when setpoints below 40°F are entered as well as when unacceptable values are entered, the following message will be displayed:

```

OUT OF RANGE
TRY AGAIN !
  
```

After the Low-Limit Water Temperature (LWT) is keyed in, the lower limit of the CR (Control Range) in the display message will automatically change to a value identical to the "LWT". See below:

```

      LWT =  4 4 . 0  F
CR =  4 4 . 0  TO  4 6 . 0  F
  
```

The lower limit of the CR will
always automatically equal LWT

The cursor will advance to the final entry which is the upper limit of the CR (Control Range). This value is programmed for the highest leaving water temperature which is acceptable in the system application. Typically 2°F above the Low-Limit Water Temperature is appropriate. The micro will accept a value 1° – 5°F above the LWT for this value. 2°F above the LWT is the default value.

Key in the upper limit of the CR and press the ENTER

key. Otherwise the new values will not be entered into memory. After pressing the ENTER key, the display will continue to show the LWT and Control Range message until another key is pressed.

CAUTION: *Too small of a CR selection will cause compressor/loader cycling. If compressor cycling occurs, leaving water temperature may vary considerably as a result of a compressor that cannot restart due to the anti-recycle timer. To eliminate this, increase the ΔT (temperature differential) of the CR and/or program the anti-recycle timer for a minimum of 300 seconds if it isn't already programmed for 300 seconds.*

NOTE: *Whenever reprogramming the LWT & CR, keep in mind that the desired leaving water temp. or "target": should be midpoint of the CR.*

Normal pulldown loading is limited by a 150 sec. loading timer between stages with loading occurring whenever leaving water temperature is in the upper half of the CONTROL RANGE or above.

Below the Control Range, unloading will occur at 20 sec. intervals until temperatures fall back into the Control Zone. Unloading is controlled by a 20 sec. timer.

The Rate Control software may prevent loading or cause unloading in the Rate Control Range or Control Range if temperature drops faster than 2X the programmed Rate Sensitivity. This is to prevent overshoot.

In the lower half of the Control Range between the Low Limit and the Target, Rate Control will cause unloading if temperature falls faster than 1X the programmed Rate Sensitivity. As before, this is to prevent overshoot.

Further details loading/unloading and Rate Control will follow:

PROGRAMMING LEAVING WATER RATE CONTROL

Programmable RATE CONTROL is designed to limit compressor/loader cycling thus saving energy and reducing wear on mechanical components. It also reduces the possibility of "overshoot". RATE CONTROL will allow the micro to react to fast changes in water temperature beyond normal responses dictated by leaving water temperature and setpoint.

RATE CONTROL requires programming the temperature range (RATE CONTROL TEMP) above the CONTROL RANGE (CR) where rate control is desired. Additionally, the actual rate of change (RATE SENSITIVITY) of water temperature which the micro uses as a control reference must also be programmed.

Refer to Fig. 17 as you read the following text. A typical low limit water temperature of 44°F is used with a 44°-46°F CONTROL RANGE (CR). A RATE CONTROL TEMP of 10°F, which is typical (10° above upper limit of the Control Range), is shown.

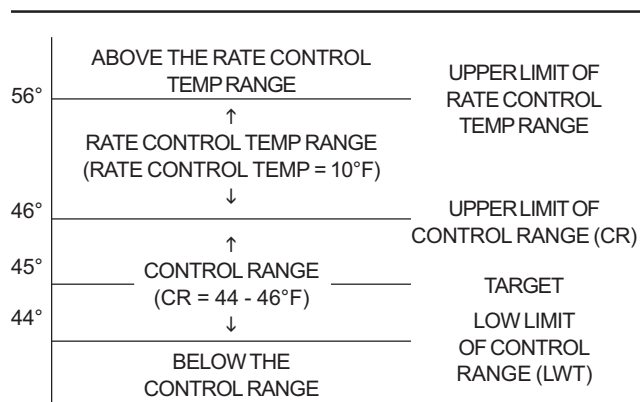


FIG. 17 – LEAVING WATER TEMPERATURE CONTROL

The RATE CONTROL TEMP establishes a temperature range (0.1 - 20°F) above the "Upper Limit of CONTROL RANGE" where the micro will limit loading if the rate of change of water temperature exceeds the RATE SENSITIVITY. In the Rate Control Range, the micro will prevent loading or may cause unloading if the temperature drop exceeds 2X the Rate Sensitivity regardless of whether the 150 sec. loading timer and the deviation from setpoint is calling for loading.

At temperatures below the CONTROL RANGE, unloading will occur to bring temperatures back to within the CONTROL RANGE. The unloading timer will cause unloading at 20 sec. intervals until temperatures fall back into the CONTROL RANGE.

In the lower half of the Control Range between the Low Limit Water Setpoint (LWT) and the "Target" Temperature (Desired Leaving Water Temperature), Rate Control software will cause unloading if temperature drops faster than 1X the Rate Sensitivity. Otherwise, no other loading or unloading will result in this temperature range.

In the upper half of the Control Range between the TARGET and the High Limit of the Control Range and in the Rate Control Range, loading will take place in 150 sec. intervals until temperature drops below the TARGET temperature. The Rate Control software may prevent loading

or initiate unloading if temperature drops faster than 2X the programmed Rate Sensitivity.

Above the RATE CONTROL TEMP RANGE, the micro will attempt to load the chiller at 150 seconds intervals. This allows the chiller to gain control of the water temperature as quickly as possible while still avoiding overshoot and limiting pulldown demand as temperature drops and rate control is implemented.

Since LWT Control does not have the water loop for buffering after a load/unload response and utilizes a narrow control (loading/unloading) range, compressor/loader cycling can be a problem. This makes the selection of RATE CONTROL TEMP and RATE SENSITIVITY values very critical.

Before programming the RATE CONTROL TEMP, the user should first determine if typically the fastest allowable pulldowns are required or whether pulldown demand limiting is desired. Programmable values from 0.1-20°F are possible.

For normal pulldowns, and quick response, a RATE CONTROL TEMP of 0.1°F is appropriate unless excessive overshoot is noted.

For demand limiting, energy efficiency, elimination of overshoot, and minimum cycling, RATE CONTROL TEMPS of 10°-20°F are advisable. This will cause the controls to react to water temperature rate of change well before the water temperature drops into the CONTROL RANGE. This may be required for small water loops. However, if problems arise where the chiller does not load and pull temperature down, select 0.1°F.

To program the RATE CONTROL TEMP, first press the PROGRAM key. Repetitively press the ENTER key until the display below appears.

R A T E C O N T R O L T E M P
= 1 0 . 0 F

Key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 0.1-20°F.

NOTE: When programming values between 0.1-9.9°F, it is required to first key in a "0" or "00". Example: 0.5°-9.9°F

The next item which will require programming is the RATE SENSITIVITY.

The RATE SENSITIVITY is a means of “overriding” the loading/unloading timers when water temperatures are in the RATE CONTROL RANGE or the CONTROL RANGE. This allows the micro to react to abrupt downward changes in leaving or return water temperatures. The ability to respond to “rate of change” variations in water temperatures gives the micro “anticipation” capabilities to reduce the possibility of “overshoot” in leaving water temperature.

In demand limiting applications, to avoid cycling, or to avoid overshoot, a low RATE SENSITIVITY may be selected. This allows the micro to go into rate control to prevent loading or cause unloading whenever water temperatures drop faster than the programmed RATE SENSITIVITY. Rate Control can go into effect whenever water temperatures are in RATE CONTROL RANGE or the CONTROL RANGE. For these applications, a 3° - 5°F/min. RATE SENSITIVITY is recommended. This may be needed for small water loops. However, if problems arise where the chiller does not load or abruptly turns a compressor off and fails to pull temperature down, select 5.0°F/min.

NOTE: Too small of a RATE SENSITIVITY Selection may prevent loading due to varying flows or if the water system allows a slug of cold water to enter which falsely fools the micro into thinking the RATE SENSITIVITY has been exceeded, preventing loading and allowing leaving water temperature to rise above the desired temperature.

For normal comfort cooling, batch, or process applications, select a high RATE SENSITIVITY of 5.0°F/min. Before Rate Control can go into effect, the water temperature would have to change at a very high rate to exceed the RATE SENSITIVITY value programmed. This will assure normal loading will occur at the fastest possible speed. In most applications, 5.0°F/min. is suggested. **If unsure of a RATE SENSITIVITY selection, use 5.0°F/min.**

To program the RATE SENSITIVITY, first press the PROGRAM key. Repetitively press the ENTER key until the display below appears.

R A T E S E N S I T I V I T Y
= 5 . 0 F / M I N .

Key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The micro will accept a range of programmable values between 0.5-5.0°F/min.

LOADING AND UNLOADING RETURN WATER TEMPERATURE CONTROL

In return water temperature control, loading and unloading will take place according to the difference between the leaving water temperature setpoint and the actual return water temperature. By programming the CONTROL RANGE equal to the actual temperature drop across the evaporator fully loaded, the microprocessor will be able to maintain the desired leaving water temperature by controlling off of the return water temperature (RWT). Simply, the micro will know that the chiller should be fully loaded when the RWT is equal to the SETPOINT + CONTROL RANGE. As the RWT drops, the micro will unload the chiller which reduces the capacity (temperature drop across the evaporator). This maintains the leaving water temperature at the desired setpoint.

Normal loading will occur at intervals of 60 seconds, according to temperatures determined by the formula below.

Loading may be prevented due to the rate control circuitry. Anytime the return water temperature falls within the CONTROL RANGE or the RATE CONTROL RANGE, RATE CONTROL is in effect and loading may be prevented, if water temperature changes faster than the rate sensitivity. Loading will never occur in intervals faster than 60 sec. under any circumstances. This prevents cycling of the compressors and loaders.

Unloading occurs on temperature drop at temperatures determined by the formula below. Internal timers have no effect on unloading.

The micro is capable of providing 5, 7, or 10 steps of loading/unloading although 10 steps is not possible with the type compressors utilized. The chiller **MUST** be programmed for the number of steps which were ordered. Otherwise, improper operation and water temperature control problems will result.

The temperature between stages of loading/unloading is equal to the CONTROL RANGE divided by the number of stages. For example:

CONTROL RANGE = 10°F
Number of Stages = 5

$10^{\circ}\text{F} \div 5 = 2^{\circ}\text{F}$ between stages

In this example, the micro will add a stage of loading each time the return water temperature rises 2°F assuming loading timers and rate control software allows.

The micro will unload a stage 2°F below the temperature at which it was loaded assuming unloading timers and rate control software allows.

NOTE:

The micro controls loading and unloading on a 10 STEP scale regardless of the number of stages present. Therefore, loading and unloading responses on 5 Step (standard) chillers may appear delayed (time between stages increased) when missing steps are activated or deactivated by the micro.

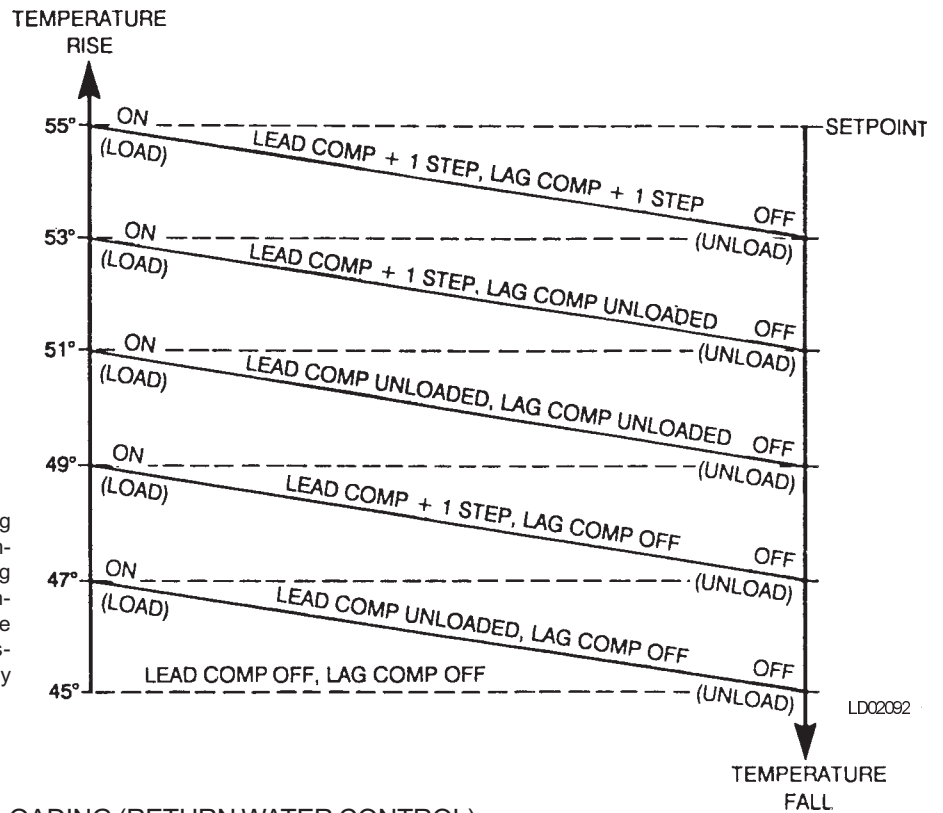


FIG. 18 – 5 STEP LOADING/UNLOADING (RETURN WATER CONTROL)

7 STEP

NOTE:

1. The "Lead Comp + 2 Steps, Lag Comp Off" Step is skipped on a temperature drop.
2. The micro controls loading and unloading on a 10 STEP scale regardless of the number of stages present. Therefore, loading and unloading responses on 7 Step (optional) chillers may appear delayed (time between stages increased) when missing steps are activated or deactivated by the micro.

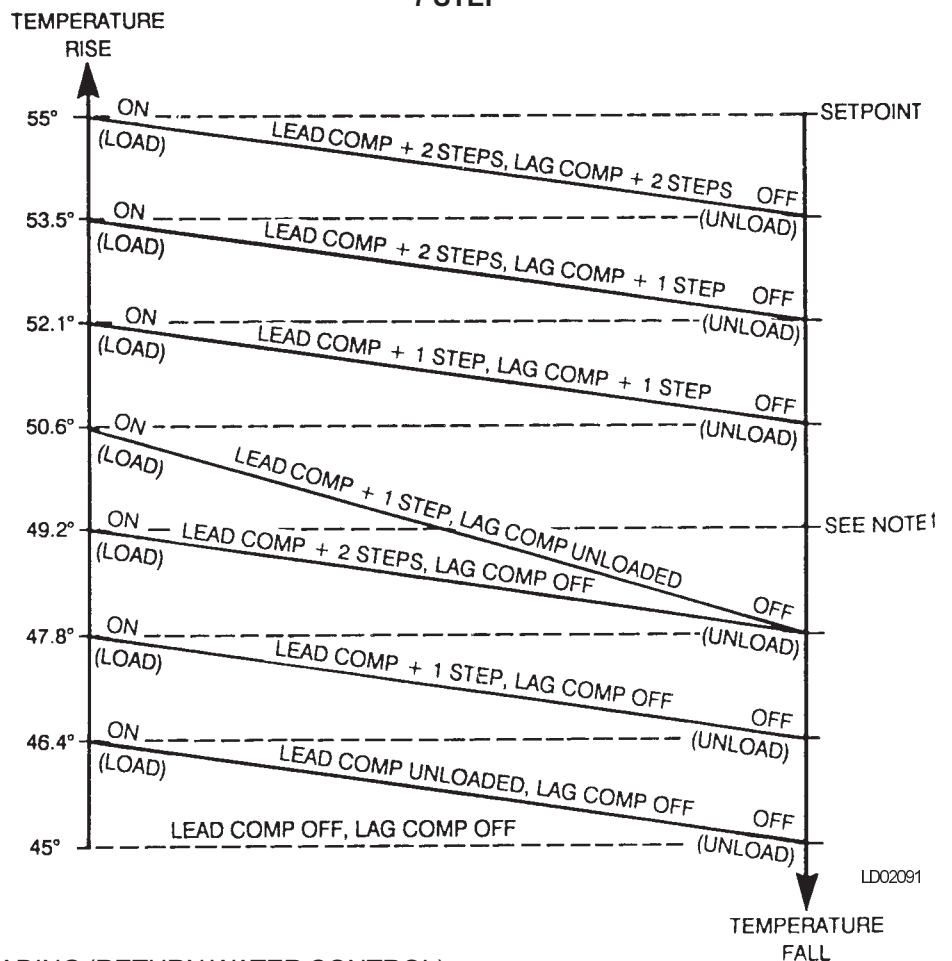
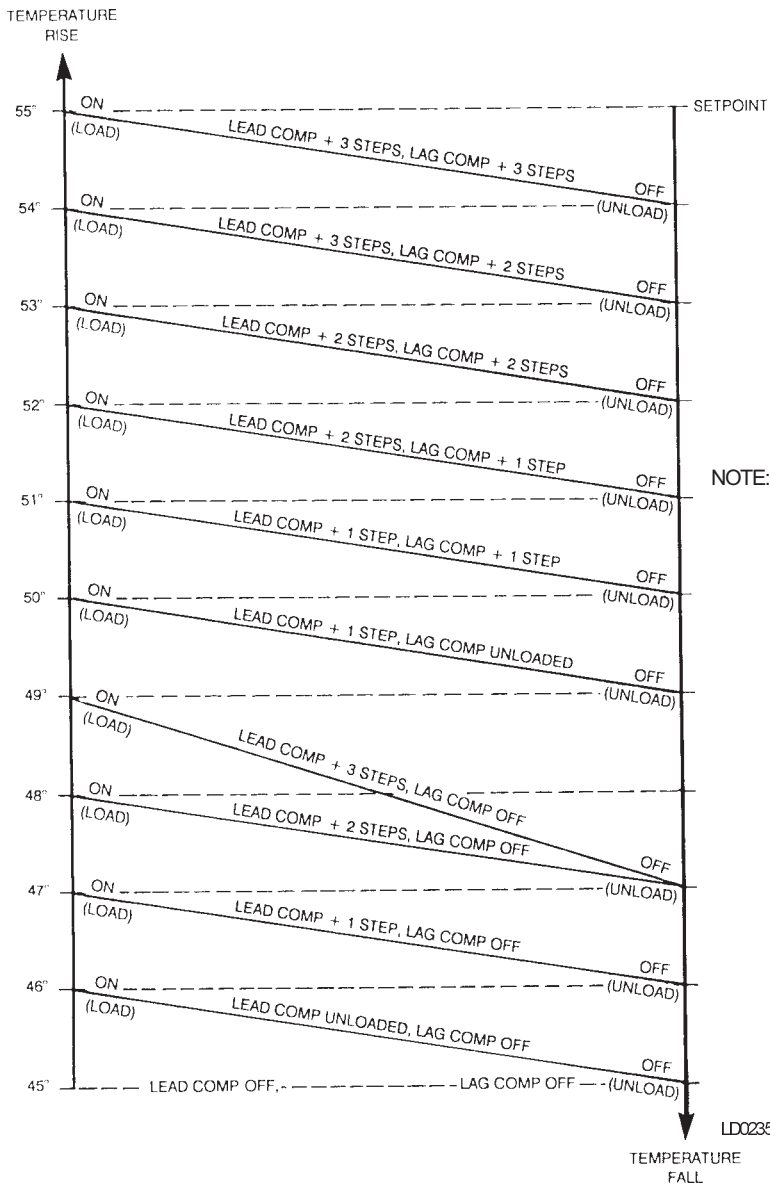


FIG. 19 – 7 STEP LOADING/UNLOADING (RETURN WATER CONTROL)

10 STEP



NOTE: The "Lead Comp + 2 Steps, Lag Compr Off" Step is skipped on a temperature drop.

FIG. 20 – 10 STEP LOADING/UNLOADING (RETURN WATER CONTROL)

Listed in Fig. 18, 19 and 20 are the loading and unloading sequences for 5, 7, and 10 steps of control. A typical setpoint of 45°F with a cooling range of 10°F is shown for example purposes. The chiller will be completely loaded at a return water temperature of 55°F and will be completely off at a temperature of 45°F, thus maintaining a leaving water temperature of 45°F. As mentioned before, loading/unloading timers as well as rate control software must be satisfied before loading/unloading will occur. This reduces the possibility of cycling.

LOADING AND UNLOADING LEAVING WATER TEMPERATURE CONTROL

In leaving water temperature control, loading and unloading will take place as needed to keep water temperature in the CONTROL RANGE between the TARGET and LOW LIMIT WATER TEMPERATURE. As mentioned earlier in this manual, the CONTROL RANGE is

the temperature range of leaving water temperature that is acceptable to the user and has been previously programmed into memory using the CHILLED LIQUID TEMP RANGE KEY. Usually this is a window of water temperatures of about 2° - 3°F. The micro will cause loading and unloading actions to occur as needed to keep leaving water temperatures in the lower half of this range. Refer to Fig. 21 to aid in understanding the loading and unloading scheme performed by the microprocessor.

ABOVE THE RATE CONTROL RANGE	
RATE CONTROL TEMP RANGE	UPPER LIMIT OF CONTROL RANGE
CONTROL RANGE (CR)	TARGET
BELOW THE CONTROL RANGE	LOW LIMIT WATER TEMPERATURE

FIG. 21 – LEAVING WATER TEMPERATURE CONTROL

Within the lower half of the CONTROL RANGE, the micro-processor may call for further unloading if the Rate Sensitivity is exceeded. If temperature drop exceeds 1X the Rate Sensitivity, the micro will unload the chiller to prevent overshoot.

Normal unloading will occur if leaving water temperature should fall into the temperature range "BELOW THE CONTROL RANGE" which is below the programmed LOW LIMIT WATER TEMPERATURE. The microprocessor will unload the chiller in 20 sec. intervals until water temperature rises back into the CONTROL RANGE.

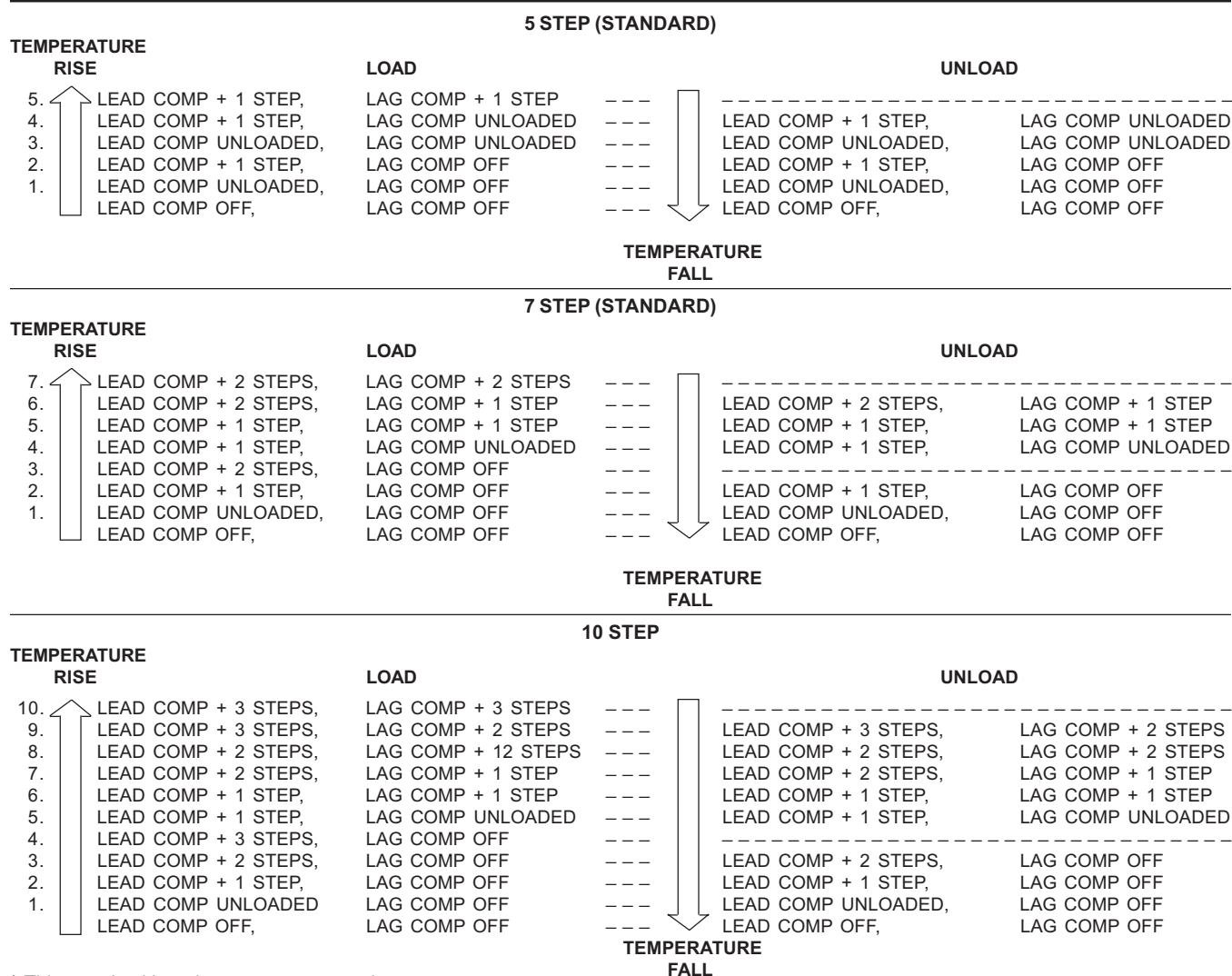
If leaving water temperature rises to the upper half of CONTROL RANGE or above, the microprocessor will load the chiller as needed in 150 sec. intervals until temperatures fall into the lower half of the CONTROL RANGE. If the rate of drop in water temperature exceeds 2X the programmed Rate Sensitivity, no further loading or unloading will result since the micro sees the temperature

dropping at an excessive rate anticipating temperature will soon fall into the CONTROL RANGE.

The micro is capable of providing 5, 7, or 10 steps of loading/unloading although 10 steps is not available with the compressors utilized. The chiller MUST be programmed for the number of steps were ordered. Otherwise, improper operation and water temperature control problems will result.

NOTE: The micro controls loading and unloading responses on a 10 step scale regardless of the number of stages present. Therefore, loading and unloading responses on 5 and 7 step chillers may appear delayed (time between steps increased) when missing steps are activated or de-activated by the micro, 5 STEP CONTROL IS STANDARD.

Fig. 22 shows the loading and unloading sequences for 5, 7 and 10 steps of control.



* This step is skipped on a temperature drop.

FIG. 22 – LEAVING WATER CONTROL LOADING/UNLOADING

“SYSTEM SAFETIES”

There are three types of System Safeties: The Manual Reset type, the Automatic Reset type, and Anticipation Safety Controls. These safeties protect the chiller from damage anytime a safety threshold is exceeded by either shutting the system(s) down or by altering system loading. Continuous monitoring by the microprocessor assures that instantaneous reactions result. A status display message will indicate when a system(s) or the entire chiller is shut down due to a fault or when Anticipation safeties are operating.

An explanation of these safeties will follow.

MANUAL RESET SAFETIES (3 Faults and Lockout)

A Manual Reset Safety will shut the affected system down whenever the safety threshold is exceeded. Automatic restart will occur after the first 2 shutdowns when the anti-recycle timer times out, if temperature demand exists. After any combination of 3 Manual Reset Safety in a 90 minute time period, the affected system will shut down and lock out on a FAULT.

After a system has shut down 3 times and locked out, a fault display indicating the last system fault will appear on the STATUS display message. This is accessible by pressing the STATUS key.

To reset a locked out system, turn the affected system switch on the Microprocessor Board (Page 72) to the OFF position.

CAUTION: *Before resuming a locked out system to service, a thorough investigation of the cause of the fault should be made. Failure to repair the cause of the fault while manually allowing repetitive restarts may cause further expensive damage to the system.*

Each of the Manual Reset Safeties will be discussed in detail below.

MOTOR CURRENT (Low Motor Current, Motor Protector, and Mechanical High Pressure Cutout Safety)

This safety combines several safeties into one. The micro monitors for low motor current as sensed by the C.T., the mechanical motor protector, and the high pressure cutout.

An example of the fault display is shown below:

S	Y	S	#	1	M	O	T	O	R	C	U	R	R	E	N	T
S	Y	S	#	2	M	O	T	O	R	C	U	R	R	E	N	T

Monitoring motor current assures that motor life is not compromised due to low motor current. Low motor current may be caused by loss or low voltage on the high voltage supply which could quickly result in motor failure. Low motor current may also result from low refrigerant charge. This assures that the compressor does not run with a low suction pressure condition while the low pressure bypass is de-activated.

The micro begins monitoring for low motor current after 4 seconds after a compressor starts. If after 4 seconds the motor current drops below 15% FLA, the micro will shut the compressor down.

NOTE: *Do not confuse FLA and RLA. FLA (full load amps) is approximately 1.2 x RLA. RLA (running load amps) specified on the motor nameplate, is typical current demand under rated operating conditions in a fully loaded system. Therefore, do not expect to see 100% FLA when the system is fully loaded. In this condition, currents may run approximately 65-85% FLA.*

Three internal temperature sensors are built into the motor stator. These sensors are wired into the motor protector module located inside the motor terminal box. As the motor windings heat and cool, the resistance of the motor temperature sensors will change. If the windings overheat, the change in resistance in the sensors will be sensed by the motor protector module. The module will open its MP contacts breaking the 115VAC fed to the motor contactor. When the motor contactor de-energizes, motor current falls to zero. The low motor current is sensed by the microprocessor and the system is shut down.

Two types of motor protector modules may be encountered.

Robert Shaw MP 50 types will “automatically reset” and allow restart once the motor has cooled after a trip-out.

Texas Instrument (Klixon) requires a manual reset after a trip-out. Once tripped, this Motor Protector Module will not reset unless power (115VAC) is removed for at least 5 seconds from the Control Panel. Therefore, after 2 more start attempts, the micro will lock out on a low motor current safety and requires 115VAC control power to be removed and reapplied along with manual reset via the system switch.

A mechanical high pressure cut-out is located on each compressor discharge or in the compressor head. This is the primary high pressure safety in the system. Any microprocessor controls are secondary.

Anytime discharge pressure exceeds 270 PSIG (water cooled, YCW) or 360 PSIG (remote air cooled, YCR), the contacts in the high pressure cut-out will open which removes 115VAC from the motor protector module. When 115VAC control power is lost to the module, the module’s MP contacts open breaking the 115VAC fed to the motor contactor. The motor contactor de-energizes and motor current falls to zero. The low motor current is sensed by the microprocessor and the system is shut down. For more information, see MOTOR CURRENT SAFETY (Page 51).

Auto-restart will be permitted after a shutdown when discharge pressure drops to below 210 PSIG (YCW) or 285 PSIG (YCR) which allows the mechanical high pressure cut-out to reset and its contacts to close. This re-ap-

plies 115VAC to the motor protector closing the MP contact. A fault lock-out will result if safety thresholds are exceeded three times in a 90 minute period.

Suction Pressure Safety

The Suction Pressure Safety assures that the system is not run under low refrigerant conditions or due to a problem which will not allow proper refrigerant flow.

For the first 30 seconds of operation, the low suction pressure bypass is in operation. After 30 seconds of operation, the micro begins monitoring suction pressure and continues to do so as long as the compressor runs. For operation periods of 30 seconds to 240 seconds, suction pressure must be greater than 50% of the Suction Pressure Cut-out. After 240 seconds, suction pressure must be greater than the cut-out.

NOTE: *A transient timer is built into software to assure that short term fluctuations in suction pressure due to fan cycling, loading, etc. do not cause nuisance trips on low suction pressure.*

After the system has pumped down and suction pressure reaches cut-out plus 5 PSIG, the transient timer is readied for action. If suction pressure drops below the cut-out point, the 120 second transient timer begins timing. As long as suction pressure doesn't drop below 50% of cut-out during the 120 second period and rises above cut-out before the timer times out, the system will continue to run.

The Suction Pressure Safety Cut-out is programmable by the user (page 54). An example of a suction pressure fault message is shown below:

S Y S # 1	L O W	S U C T I O N
S Y S # 2	L O W	S U C T I O N

Discharge Pressure Safety

The Discharge Pressure Safety assures that the system pressure does not exceed safe working limits which could open a relief valve or other pressure relief device causing refrigerant loss.

This safety is a back-up for the mechanical safety in the system. Anytime the cut-out point is exceeded, the system will shut down.

The Discharge Pressure Safety Cut-out is programmable by the user (Page 51). An example of a discharge pressure fault display message is shown below.

S Y S # 1	H I G H	D S C H
S Y S # 2	H I G H	D S C H

NOTE: *This safety is only operable if optional discharge pressure transducers are installed.*

Oil Pressure Safety

The Oil Pressure Safety assures that the compressor's mechanical components receive proper lubrication. The micro begins monitoring compressor oil pressure after 4 seconds of operation. For operating periods of 4 seconds to 30 seconds, oil pressure must be greater than 5 PSID. From 30 seconds to 240 seconds, oil pressure must be greater than 20 PSID. After 240 seconds, oil pressure must be greater than 25 PSID for as long as the compressor continues to run. If the required oil pressure limits are not met, the system will shut down.

The micro computes "differential oil pressure" by measuring oil pump pressure and subtracting suction pressure (Oil - Suction = Oil PSID).

An example of an oil pressure fault display message is shown below.

S Y S # 1	L O W	O I L	P R E S S
S Y S # 2	L O W	O I L	P R E S S

Pumpdown Safety *

The Pumpdown Safety assures that a compressor does not run unless it completes a proper pumpdown. This prevents operation of a refrigerant system which has a leaking liquid line solenoid valve.

On start-up, the system must pump down to the Suction Pressure Cut-out within 300 seconds or the system will shut down.

An example of the Pump down fault display message is shown below.

S Y S # 1	L L S V	N O T	O N
S Y S # 2	L L S V	N O T	O N

NOTE: *LLSV refers to liquid line solenoid valve.*

High Oil Temp Safety * *

This safety protects the compressor from catastrophic failure by sensing when an internal problem occurs that causes high internal compressor temperatures. It also protects the compressor from overheating due to improper cooling from hot suction gas, high water temperatures, or high discharge pressures.

The compressor will shut down whenever the sump temperature exceeds 180°F for the first minute of operation or 160°F after one minute of operation.

An example of Oil Temp Inhibit safety display is shown below:

S Y S # 1	H I G H	O I L	T E M P
S Y S # 2	H I G H	O I L	T E M P

* This safety applies to chillers with 031-01096-001 and early versions of 031-01652-001 EPROMs.

** This safety applies to chillers with later versions of 031-01652-001 (CRCP Version) EPROMs, I/O Expansion Board, and Oil Temp Sensors.

MANUAL RESET SAFETIES (1 Fault and Lockout)

A Manual Reset Safety will shut the affected system down and lock it out whenever the safety threshold is exceeded.

After a system has shut down and locked out, a fault display indicated the last system fault will appear on the STATUS display message. This is accessible by pressing the STATUS key.

To reset a locked out system, turn to affected system switch on the Microprocessor Board (Page 81) to the OFF position.

CAUTION: *Before returning a locked out system to service, a thorough investigation of the cause of the fault should be made. Failure to repair the cause of the fault while manually allowing repetitive restarts may cause further expensive damage to the system.*

Each of the Manual Reset Safeties will be discussed in detail below.

High Motor Current Safety

The High Motor Current Safety assures that motor life is not diminished due to operating beyond the current rating of the motor. The micro begins monitoring motor current after 3 seconds of operation. If motor current exceeds 120% FLA after 3 seconds of operation, the compressor will shut down. After 4 seconds of operation, motor current must be less than 115% FLA as long as the compressor continues to run. This safety applies to all chillers with all versions of 031-01652-001 EPROMs.

An example of the High Motor Current display is shown below:

S	Y	S	#	1	H	I	G	H	M	T	R	C	U	R	R
S	Y	S	#	2	H	I	G	H	M	T	R	C	U	R	R

NOTE: *Do not confuse FLA and RLA. FLA (full load running amps) is approximately 1.2 x RLA. RLA (running load amps) specified on the motor nameplate, is typical current demand under rated operating conditions in a fully loaded system. Therefore, do not expect to see 100% FLA when the system is fully loaded. In this condition, currents may run approximately 65-86% FLA.*

INDIVIDUAL SYSTEM START INHIBIT SAFETIES

An Individual System Start Inhibit Safety will inhibit the respective system from starting when a safety threshold is exceeded and allows automatic restart after the condition causing the inhibit clears. Restart will occur only after anti-recycle timers are satisfied and demand requires.

When the chiller is shut down on one of these safeties, a message will appear on the STATUS display informing the operator of the problem. This is accessible by pressing the STATUS key.

Low Oil Temperature Inhibit Safety *

Low oil temperature assures the compressor is not allowed to start until the oil is free of liquid refrigerant. This is accomplished by assuring that the oil temperature is a minimum of 15°F above ambient temperature.

In effect, this safety assures that the compressor oil heater is operating and that it has been on long enough after power application for all refrigerant to have been expelled from the oil.

NOTE: *This safety will only be operational if the chiller is equipped with an I/O Expansion Board.*

An example of the Low Oil Temp Safety is shown below:

S	Y	S	#	1	O	I	L	T	E	M	P	I	N	H	I	B
S	Y	S	#	2	O	I	L	T	E	M	P	I	N	H	I	B

* This safety applies to chillers with 031-01652-001 (CRCP Version) EPROMs, I/O Expansion Boards, and Oil Temp Sensors.

AUTOMATIC RESET SAFETIES

An Automatic Reset Safety will shut the entire chiller down on a fault when the safety threshold is exceeded and allows automatic restart after the condition causing the shutdown clears. Restart will occur only after anti-recycle timers are satisfied and demand requires.

A reset hysteresis is built in so repetitive faulting and clearing will not occur in a short time period. An example would be if ambient temperature dropped below the cut-out, temperature would have to rise 5°F above the cut-out before the fault lockout would clear and restart can occur.

When the chiller is shut down on one of these safeties, a message will appear on the STATUS display informing the operator of the problem. This is accessible by pressing the STATUS key.

Details concerning each of the three Automatic Reset Safeties follow.

Low Water Temperature Safety

The Low Water Temperature Safety assures that the evaporator is not damaged from freezing due to improperly set control points. Whenever the chilled liquid temperature drops below the programmable cut-out, the chiller will shut down. Restart will not occur until temperature rises 5°F above the cut-out point, load demand requires, and anti-recycle timers allow.

The Low Water Temperature Safety Cut-out is programmable by the user (Page 53). An example of the Low Water Temperature Fault display message is shown below:

CHILLER FAULT :
LOW WATER TEMP

Low Ambient Temperature Safety

The Low Ambient Temperature Safety assures that the chiller does not run in low ambients where potential damage could result due to low system pressures.

NOTE: This safety should not affect the operation of indoor YCW & YCR water cooled chillers.

The Low Ambient Cut-out is programmable by the user (Page 52). An example of the Low Ambient Temperature Fault display message is shown below:

CHILLER FAULT :
LOW AMBIENT TEMP

High Ambient Temperature Safety

The High Ambient Temperature Safety assures that the chiller does not run in ambients above 130°F where potential malfunction of system mechanical and electrical components may result. Whenever the outdoor ambient exceeds 130°F (non-programmable) the chiller will shut down. Restart will not occur until temperature drops to 2°F below the cut-out point, load demand requires, and anti-recycle timers allow.

NOTE: This safety should not affect the operation of indoor YCW & YCR water cooled chillers.

The High Ambient Cut-out is programmable (Page 52) for chiller cut-out at temperatures below 130°F (100° -130°F). An example of the High Ambient Temperature Fault display message is shown below:

CHILLER FAULT :
HIGH AMBIENT TEMP

Under Voltage Safety

The Under Voltage Safety assures that the system is not operated at voltages where malfunction of the microprocessor could result in system damage. Whenever the microprocessor senses an onboard power supply failure, the chiller is shut down. Restart will occur when power is restored. The microprocessor circuitry is capable of operating at voltages 10% below the nominal 115VAC supply to the panel.

An example of the Under Voltage Safety display message is shown below:

CHILLER FAULT :
115VAC UNDER VOLTAGE

Flow Switch

The microprocessor monitors the closure of the flow switch to assure that water flow is present in the evaporator which prevents freeze-ups. The flow switch “dry” contacts are connected between terminals 13 & 14 of the TB3 Terminal Block (Fig. 14). If the flow switch opens, the chiller will shut down and the following status message will be displayed.

SYS # 1 NO RUN PERM
SYS # 2 NO RUN PERM

Closure of the flow switch, when flow is present, will cause the message to disappear and auto-restart will occur.

CAUTION: NEVER BYPASS A FLOW SWITCH. THIS WILL CAUSE DAMAGE TO THE CHILLER AND VOID ANY WARRANTIES.

Power Failure Safety

Whenever power is removed or lost and then reapplied, auto-restart will occur after a 2 minute anti-recycle timer elapses. This is the same anti-recycle timer which is

programmable from 5-10 minutes; however, it automatically is set to 2 minutes after a power failure.

This safety assures that the motor has a minimum of 2 minutes to cool under any circumstances allowing much of the internal heating due to starting to be dissipated before another start occurs.

ANTICIPATION SAFETY CONTROLS

Anticipation controls are built into the software to prevent safety shutdowns by automatically overriding temperature controls if system pressures near safety thresholds. This allows the chiller to continue to run under reduced capacity to avoid total loss of cooling resulting from a lockout on a safety.

Anticipation safeties monitor suction and discharge pressure and unload the compressors as needed. The micro will display a message on the STATUS DISPLAY whenever these controls are in operation.

Suction Pressure Unloading *

If suction pressure exceeds the value programmed by the user (Page 53), the micro will unload the affected compressor. Automatic reloading will occur when pressure drops 10 PSI below the programmed value. This value assures that the motor will receive proper cooling from the refrigerant which promotes longer motor life.

An example of the message displayed when suction pressure unloading is in effect is shown below:

S Y S # 1	S U C T	L I M I T I N G
S Y S # 2	S U C T	L I M I T I N G

Current Limiting * *

If current exceeds the value programmed by the user (Page 42), the micro will unload the affected compressor.

Whenever Current Limiting is activated, the compressor will stay in the unloaded state for 5 minutes. After the 5 minute time period, the micro will look at motor current once again. If motor is 25% below the programmed Motor Current Unload point, the compressor will be allowed to reload, if water temperature allows.

This safety assures that the motor will receive proper cooling from the refrigerant which promotes longer motor life.

An example of the message displayed when Current Limiting is in effect is shown below:

S Y S # 1	C U R R	L I M I T I N G
S Y S # 2	C U R R	L I M I T I N G

Discharge Pressure Unloading

If discharge pressure exceeds the value programmed by the user (Page 52), the micro will unload the affected compressor. Automatic reloading will occur when pressure

sure drops 60 PSI below the programmed value. This feature reduces the chance of faulting on the high discharge pressure cut-out.

On water cooled chillers, this safety reduces the chance of tripping the relief valve due to a very high rate of rise in pressure resulting from a controls problem which would cause condenser water flow to be interrupted. In this case, the pressure rise is so fast, refrigerant loss may occur through the relief valve even though the high pressure cut-out has opened and the compressor is in the midst of stopping.

An example of the message displayed when discharge pressure unloadings in effect is shown below:

S Y S # 1	D S C H	L I M I T I N G
S Y S # 2	D S C H	L I M I T I N G

INTERNAL TIMERS AND PUMPDOWN CONTROLS

Anti-Recycle Timer

Anytime a compressor shuts down for any reason, restart cannot occur until the programmable Anti-recycle Timer (Page 53) has timed out (timer starts with the compressor start). Even though the Anti-recycle timer has timed out, a minimum of 2 minute (2-minute start-up timer) must always elapse after a compressor stop before it may restart.

If a power failure occurs, the anti-recycle timers will reset to 2 minutes after power is re-applied.

If the anti-recycle timer is preventing a start, the timer position in seconds may be viewed by pressing the STATUS key. A sample display is shown below.

S Y S # 1	A R	T M R	1 0 2	S
S Y S # 2	A R	T M R	1 0 2	S

Anti-Coincidence Timer

The Anti-Coincidence Timer assures that 2 compressors can never start simultaneously. This assures that excessive current demand will never result. A one minute time delay will always separate compressor starts.

The Anti-Coincidence Timer can be viewed, when it is active, by pressing the STATUS key. A sample display is shown below.

S Y S # 1	C O M P	R U N N I N G
S Y S # 2	A C	T M R 5 6 S

Pumpdown Controls (Non-Recycling Pumpdown EPROMS) * * *

Each compressor is controlled by a pumpdown on start-up feature which eliminates the need for recycling pumpdown. On start-up, the compressor will pumpdown to the programmed suction pressure cut-out before the liquid line solenoid is energized. This assures that liquid slugging does not occur. Manual pumpdown from the keypad is not possible.

* This safety applies to chillers with 031-01096-001 EPROMs only.

** This safety applies to chillers with 031-01652-001 EPROMs only.

*** Non-recycling pumpdown on start-up applies to chillers with 031-01096-001 and earlier versions of 031-01652-001 EPROMs.

PUMPDOWN CONTROLS (Recycling Pumpdown EPROMs) *

Pumpdown control will pump down a system to the suction pressure cut-out whenever the compressor shuts down on a normal shutdown. Additionally, a recycling pumpdown is employed on an as needed basis to assure that liquid does not accumulate in the evaporator on an OFF system, while cold chilled liquid is flowing through the evaporator. Since pumpdown at start-up is not employed, the liquid line solenoid valve will open immediately when a compressor starts.

“Pumpdown on shutdown” will pump a system down whenever a system shuts down, except in two circumstances. A pumpdown will not occur whenever a fault causes a shutdown or when “UNIT” rocker switch is turned off. Pumpdown will continue until the suction pressure falls below the suction pressure cut-out. If the pressure never drops below the cut-out, pumpdown will continue until a 3 minute timer has expired.

During pumpdown, the following STATUS message will be displayed:

S Y S # 1	P U M P I N G	D O W N
S Y S # 2	P U M P I N G	D O W N

The PUMPING DOWN message indicates that the respective compressor is presently in the process of pumping the system down. The compressor will either be in a recycling pumpdown or in a pumpdown prior to shutdown when this message is displayed. The message will disappear when the compressor shuts off.

“Recycling pumpdown” is initiated while a compressor is off, able to run, and is in a “No Cooling Load” state. It can be initiated 45 minutes after either of the following two conditions are met:

1. Sat Suction Temp > LCHWT – 1.5°F
and
Ambient Temp > LCHWT – 6°F
2. The compressor has been idle for 2 hours and Suction Pressure is greater than the cut-out.

The 45 minute timer assures that excessive pumpdowns do not occur.

After 120 pumpdowns, uninterrupted by a cooling start, the system will cease to pump down. Pumpdowns will begin again after a cooling start occurs. This is to prevent oil loss in the system. However, if one system reaches 120 pumpdowns while the other system is running for cooling, the running (lead) compressor will be shut off if the off (lag) compressor is available for start. At this point, the lead compressor will pump down and shut off while the lag compressor starts and assumes the lead. The previous running compressor will now have 120 pumpdowns available.

A pumpdown failure fault will occur if a system performs 3 unsuccessful pumpdowns in a row. “Unsuccessful” assumes that the system was not able to pump down to the suction pressure cut-out in 3 minutes. The system will require a manual reset to restart. The following is an example of this safety message.

NOTE: Under some circumstances, a pumpdown may occur when a compressor is called to come on for cooling. If this occurs, the compressor will restart to provide cooling after the pumpdown is complete and the anti-recycle timer times out.

Recycling pumpdown will increase the number of starts logged in the micropanel; however, it will have no effect upon the life of the compressors.

Pumpdown Safety **

The Pumpdown Safety assures that a compressor does not run unless it completes a proper pumpdown. This prevents operation of a refrigerant system which has a leaking liquid line solenoid valve.

On shutdown, the system must pump down to the suction pressure cut-out within 300 seconds or the system will shut down. If the system performs 3 unsuccessful pumpdowns in a row, the system will fault and lock out.

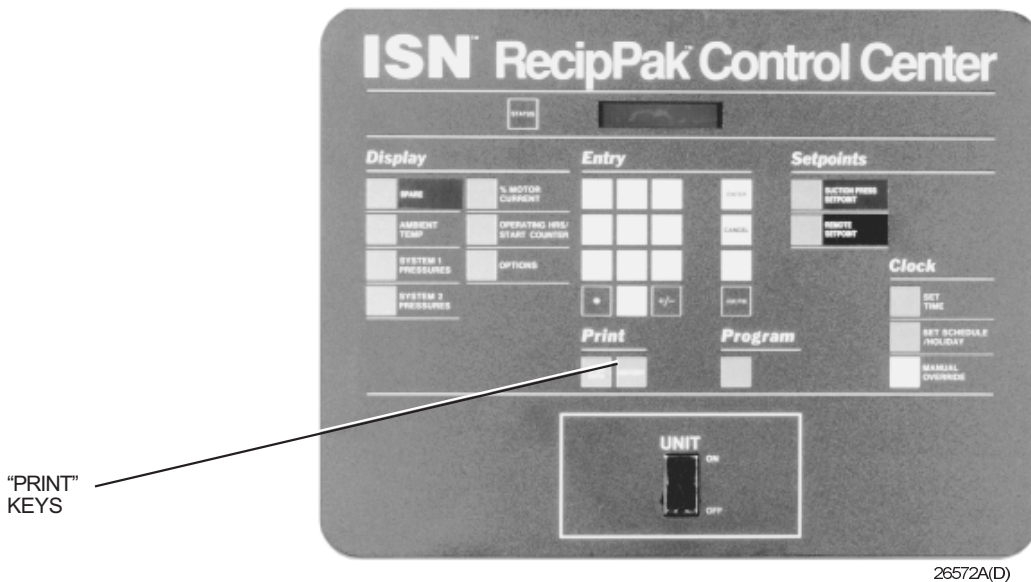
An example of the pumpdown fault display message is shown below:

S Y S # 1	P U M P D O W N	F A I L
S Y S # 2	P U M P D O W N	F A I L

* Recycling Pumpdown control applies to chillers with 031-01652-001 (CRCP Version) EPROMs.

** The Pumpdown Safety only applies to chillers with 031-01652-001 (CRCP Version) EROMs.

“PRINT” KEYS



GENERAL

The PRINT keys allow the operator to obtain a remote print-out of real-time system operating data and a print-out of system data at the “instant of the fault” on the last three faults which occurred on the chiller.

If a remote printer is not being used, or the desire is to obtain data locally at the panel, the same keys allow access to identical fault data. Identical and additional real-time information is available by using a combination of the PRINT keys and the other keys on the keypad.

An explanation of the use of the keys for remote printer or local data retrieval will follow. An optional printer (Page 95) will be required for remote printout.

NOTE: *Some of the information that may be recovered (i.e. fan operation, discharge pressures, stages of loading etc.) may not apply to the chiller. The micro is capable of operating these items and displaying information relating to them regardless of whether they are present on the chiller.*

REMOTE PRINTOUT

Oper Data

**OPER
DATA**

The OPER DATA key allows the operator to remotely obtain a printout of current system operating parameters. When the key is pressed, a snapshot will be taken of system operating conditions and panel programming selections. This data will be temporarily stored in memory and transmission of this data will begin to the remote printer. As the data is transmitted, it will be erased from memory.

A sample printout is shown in Fig. 23.

YORK INTERNATIONAL CORPORATION RECIPROCATING WATER CHILLERS	
SYSTEM STATUS 8:45AM 4/17/98	
SYS 1	COMPRESSOR RUNNING
SYS 2	ANTI-COIN TIMER 13 SEC
RETURN WATER TEMP	65.0 DEGF
LEAVING WATER TEMP	54.0 DEGF
LOW WATER CUTOUT	36.0 DEGF
SETPOINT TEMP	45.0 DEGF
OUTSIDE AIR TEMP	75.0 DEGF
LOW AMBIENT CUTOUT	10.0 DEGF
LOW PRESSURE CUTOUT	44 PSIG
LEAD SYSTEM	SYS 1
CONTROL TYPE	LCHWT
COOLING RANGE	45.0 TO 47.0 DEGF
SYSTEM 1 DATA	
COMPRESSOR STATUS	ON
MOTOR AMPS	50 %FLA
SUCTION PRESSURE	61 PSIG
DISCHARGE PRESSURE	143 PSIG
OIL PRESSURE	75 PSID
LIQUID LINE SOLENOID	OFF
RUN PERMISSIVE	ON
STAGES OF LOADING	1
FORWARD FANS	OFF
REVERSE FANS	OFF
HOT GAS BYPASS VALVE	OFF
SYSTEM 2 DATA	
COMPRESSOR STATUS	ON
MOTOR AMPS	0 %FLA
SUCTION PRESSURE	61 PSIG
DISCHARGE PRESSURE	80 PSIG
OIL PRESSURE	1 PSID
LIQUID LINE SOLENOID	OFF
RUN PERMISSIVE	ON
STAGES OF LOADING	1
FORWARD FANS	1
REVERSE FANS	OFF
HOT GAS BYPASS VALVE	OFF
S M T W T F S *=HOLIDAY	
SUN	START=06:00AM STOP=11:00PM
MON	START=06:00AM STOP=11:00PM
TUE	START=06:00AM STOP=11:00PM
WED	START=06:00AM STOP=11:00PM
THU	START=06:00AM STOP=11:00PM
FRI	START=06:00AM STOP=11:00PM
SAT	START=06:00AM STOP=11:00PM
HOL	START=00:00AM STOP=00:00AM

FIG. 23 – OPERATING DATA PRINTOUT

History

HISTORY

The HISTORY key allows the operator to remotely obtain a printout of information relating to the last 3 Safety Shutdowns which occurred. The information is stored at the instant of the fault regardless of whether the fault caused a lockout to occur. The information is also not affected by power failures (long term internal memory battery back-up is built into the circuit board) or manual resetting of a fault lock-out.

When the HISTORY key is pressed, a Printout is transmitted of all system Operating conditions which were stored at the "instant the fault occurred" for each of the 3 SAFETY SHUTDOWN BUFFERS. There is one buffer

(storage area) for data related to each of the last 3 safety shutdowns.

The printout will begin with the most recent fault which occurred. The most recent fault will always be stored as SAFETY SHUTDOWN NO. 1 (See printout Fig. 24). Identically formatted fault information will then be printed for SAFETY SHUTDOWN NO. 2 and SAFETY SHUTDOWN NO. 3.

Information contained in the SAFETY SHUTDOWN Buffers is very important when attempting to troubleshoot a system problem. This data reflects the system conditions at the instant the fault occurred and often reveals other system conditions which actually caused the safety threshold to be exceeded. (See Fig. 24)

YORK INTERNATIONAL CORPORATION RECIPROCATING WATER CHILLERS		YORK INTERNATIONAL CORPORATION RECIPROCATING WATER CHILLERS		YORK INTERNATIONAL CORPORATION RECIPROCATING WATER CHILLERS	
SYSTEM STATUS NUMBER 1 8:48AM 4/17/98		SYSTEM STATUS NUMBER 2 8:47AM 4/17/98		SYSTEM STATUS 8:47AM 4/17/98	
SYS 1 STATUS:	NO FAULTS	SYS 1 STATUS:	NO FAULTS	SYS 1 STATUS:	NO FAULTS
SYS 2	MOTOR CURRENT SHUTDOWN	SYS 2	MOTOR CURRENT SHUTDOWN	SYS 2	MOTOR CURRENT SHUTDOWN
RETURN WATER TEMP	65.0 DEGF	RETURN WATER TEMP	65.0 DEGF	RETURN WATER TEMP	65.0 DEGF
LEAVING WATER TEMP	54.0 DEGF	LEAVING WATER TEMP	54.0 DEGF	LEAVING WATER TEMP	54.0 DEGF
LOW WATER CUTOUT	36.0 DEGF	LOW WATER CUTOUT	36.0 DEGF	LOW WATER CUTOUT	36.0 DEGF
SETPOINT TEMP	45.0 DEGF	SETPOINT TEMP	45.0 DEGF	SETPOINT TEMP	45.0 DEGF
OUTSIDE AIR TEMP	75.0 DEGF	OUTSIDE AIR TEMP	75.0 DEGF	OUTSIDE AIR TEMP	75.0 DEGF
LOW AMBIENT CUTOUT	10.0 DEGF	LOW AMBIENT CUTOUT	10.0 DEGF	LOW AMBIENT CUTOUT	10.0 DEGF
LOW PRESSURE CUTOUT	44 PSIG	LOW PRESSURE CUTOUT	44 PSIG	LOW PRESSURE CUTOUT	44 PSIG
LEAD SYSTEM	SYS 1	LEAD SYSTEM	SYS 1	LEAD SYSTEM	SYS 1
CONTROL TYPE	LCHWT	CONTROL TYPE	LCHWT	CONTROL TYPE	LCHWT
COOLING RANGE	45.0 TO 47.0 DEGF	COOLING RANGE	45.0 TO 47.0 DEGF	COOLING RANGE	45.0 TO 47.0 DEGF
SYSTEM 1 DATA		SYSTEM 1 DATA		SYSTEM 1 DATA	
COMPRESSOR STATUS	ON	COMPRESSOR STATUS	ON	COMPRESSOR STATUS	ON
MOTOR AMPS	50 %FLA	MOTOR AMPS	50 %FLA	MOTOR AMPS	50 %FLA
SUCTION PRESSURE	61 PSIG	SUCTION PRESSURE	61 PSIG	SUCTION PRESSURE	61 PSIG
DISCHARGE PRESSURE	143 PSIG	DISCHARGE PRESSURE	143 PSIG	DISCHARGE PRESSURE	143 PSIG
OIL PRESSURE	75 PSID	OIL PRESSURE	75 PSID	OIL PRESSURE	75 PSID
LIQUID LINE SOLENOID	OFF	LIQUID LINE SOLENOID	ON	LIQUID LINE SOLENOID	ON
RUN PERMISSIVE	ON	RUN PERMISSIVE	ON	RUN PERMISSIVE	ON
STAGES OF LOADING	1	STAGES OF LOADING	1	STAGES OF LOADING	1
FORWARD FANS	2	FORWARD FANS	2	FORWARD FANS	2
REVERSE FANS	OFF	REVERSE FANS	OFF	REVERSE FANS	OFF
HOT GAS BYPASS VALVE	OFF	HOT GAS BYPASS VALVE	OFF	HOT GAS BYPASS VALVE	OFF
SYSTEM 2 DATA		SYSTEM 2 DATA		SYSTEM 2 DATA	
COMPRESSOR STATUS	ON	COMPRESSOR STATUS	ON	COMPRESSOR STATUS	ON
MOTOR AMPS	0 %FLA	MOTOR AMPS	0 %FLA	MOTOR AMPS	0 %FLA
SUCTION PRESSURE	61 PSIG	SUCTION PRESSURE	61 PSIG	SUCTION PRESSURE	61 PSIG
DISCHARGE PRESSURE	80 PSIG	DISCHARGE PRESSURE	80 PSIG	DISCHARGE PRESSURE	80 PSIG
OIL PRESSURE	1 PSID	OIL PRESSURE	1 PSID	OIL PRESSURE	1 PSID
LIQUID LINE SOLENOID	OFF	LIQUID LINE SOLENOID	OFF	LIQUID LINE SOLENOID	OFF
RUN PERMISSIVE	ON	RUN PERMISSIVE	ON	RUN PERMISSIVE	ON
STAGES OF LOADING	1	STAGES OF LOADING	1	STAGES OF LOADING	1
FORWARD FANS	1	FORWARD FANS	1	FORWARD FANS	1
REVERSE FANS	OFF	REVERSE FANS	OFF	REVERSE FANS	OFF
HOT GAS BYPASS VALVE	OFF	HOT GAS BYPASS VALVE	OFF	HOT GAS BYPASS VALVE	OFF

NOTE: In actual print-outs, this would be one continuous print-out.

FIG. 24 – HISTORY PRINTOUT

LOCAL DISPLAY READOUT

Oper Data

The OPER DATA key also allows the user to scroll through additional real time display information about the chiller system which is not available from the DISPLAY keys. This information covers a wide range of data which includes fan status, loading status, liquid line solenoid status, run time, etc. A total of 20 different displays are offered.

NOTE: Some of the information that may be recovered (i.e. fan operation, discharge pressures, stages of loading, etc.) may not apply to the chiller. The micro is capable of operating these items and displaying information relating to them regardless of whether they are present on the chiller.

When the OPER DATA key is pressed, the following message will appear: **NOTE: Depending upon the EPROM installed, the sequence of messages may vary.**

P R E S S E N T E R T O
D I S P L A Y D A T A

Repetitively pressing the ENTER key allows the operator to scroll through the 20 available displays.

In the information that follows, a sample message along with an explanation of its meaning is provided for all 20 messages.

S Y S 1 L I Q U I D L I N E
S O L E N O I D S T A T U S O F F

“OFF”: SYS 1 Liquid Line Solenoid De-energized (Closed).

“ON”: SYS 1 Liquid Line Solenoid Energized (Open).

S Y S 1 S T A G E S O F
L O A D I N G 2

This message informs the operator of the number of stages of loading which are active on SYS 1.

S Y S 1 F O R W A R D F A N S
S T A T U S

This message informs the operator of the number of forward running fans which are active on SYS 1. This does not apply to YCW and YCR chillers.

S Y S 1 R E V E R S E F A N
S T A T U S O F F

This message informs the operator whether the reversing fan is active on SYS 1. This does not apply to YCW and YCR chillers.

S Y S 1 H O T G A S B Y P A S S
V A L V E S T A T U S O F F

This message informs the operator whether the Hot Gas Solenoid is ON or OFF. The micro will activate the Hot Gas signal regardless of whether or not this option is installed.

S Y S 1 R U N T I M E
2 0 0 S E C S

The Run Time for SYS 1 since the last start is displayed.

S Y S 2 L I Q U I D L I N E
S O L E N O I D S T A T U S O N

“OFF”: Sys 2 Liquid Line Solenoid De-energized (Closed).

“ON”: Sys 2 Liquid Line Solenoid Energized (Open).

S Y S 2 S T A G E S O F
L O A D I N G 1

This message informs the operator of the number of stages of loading which are active on SYS 2.

S Y S 2 F O R W A R D F A N S
S T A T U S O F F

This message informs the operator of the number of forward running fans which are active on SYS 2. This does not apply to YCW and YCR chillers.

S Y S 2 R E V E R S E F A N
S T A T U S O F F

This message informs the operator whether the reversing fan is active on SYS 2. This does not apply to YCW and YCR chillers.

S Y S 2 H O T G A S B Y P A S S
V A L V E S T A T U S O N

This message informs the operator whether the Hot Gas Solenoid is ON or OFF. The Micro will activate the Hot Gas signal regardless of whether or not this option is installed.

S Y S 2 R U N T I M E
0 S E C S

The Run Time for SYS 2 since the last start is displayed.

L O A D T I M E R
1 4 0 S E C S

This message provides a real time display of the time left on the Load Timer. The Load Timer is a constantly recycling timer that the micro utilizes in conjunction with "rate control" and "temperature deviation from setpoint" to determine when loading should occur.

U N L O A D T I M E R
1 2 2 S E C S

This message provides a real time display of the time left on the Unload Timer. The Unload Timer is a constantly recycling timer that the micro utilizes in conjunction with "rate control" and "temperature deviation from setpoint" to determine when unloading should occur.

T E M P E R A T U R E D E M A N D
4

This message informs the operator what stage of loading the chiller system is presently on as a result of commands from the microprocessor. This is a coded number and the steps must be decoded to be meaningful. The decoding varies according to the number of stages programmed (Page 54). Tables for decoding the display message are shown below:

5 STAGE

STEP

0: Both Compressors OFF

*1: Lead Compr Unloaded, Lag Compr OFF

*2: Lead Compr Unloaded, Lag Compr OFF

*3: Lead Compr Loaded, Lag Compr OFF

*4: Lead Compr Loaded, Lag Compr OFF

*5: Lead Compr Unloaded, Lag Compr Unloaded

*6: Lead Compr Unloaded, Lag Compr Unloaded

*7: Lead Compr Loaded, Lag Compr Unloaded

*8: Lead Compr Loaded, Lag Compr Unloaded

*9: Lead Compr Loaded, Lag Compr Loaded

*10: Lead Compr Loaded, Lag Compr Loaded

* On some "STEPS", actual Loading will NOT change.

7 STAGE

STEP

0: Both Compressors OFF

1: Lead Compr Unloaded, Lag Compr OFF

*2: Lead Compr 1 Stage Loading, Lag Compr OFF

*3: Lead Compr 1 Stage Loading, Lag Compr OFF

4: Lead Compr 2 Stages Loading, Lag Compr OFF

5: Lead Compr 1 Stage Loading,
Lag Compr Unloaded

*6: Lead Compr 1 Stage Loading,
Lag Compr 1 Stage Loading

*7: Lead Compr 1 Stage Loading,
Lag Compr 1 Stage Loading

*8: Lead Compr 1 Stage Loading,
Lag Compr 1 Stage Loading

9: Lead Compr 2 Stages Loading,
Lag Compr 1 Stage Loading

10: Lead Compr 2 Stages Loading,
Lag Compr 2 Stages Loading

10 STAGE

STEP

0: Both Compressors OFF

1: Lead Compr Unloaded, Lag Compr OFF

2: Lead Compr 1 Stage Loading, Lag Compr OFF

3: Lead Compr 2 Stages Loading, Lag Compr OFF

4: Lead Compr 3 Stages Loading, Lag Compr OFF

5: Lead Compr 2 Stages Loading,
Lag Compr Unloaded

6: Lead Compr 1 Stage Loading,
Lag Compr 1 Stage Loading

7: Lead Compr 2 Stages Loading,
Lag Compr 1 Stage Loading

8: Lead Compr 2 Stages Loading,
Lag Compr 2 Stages Loading

9: Lead Compr 3 Stages Loading,
Lag Compr 2 Stages Loading

10: Lead Compr 3 Stages Loading,
Lag Compr 3 Stages Loading

T E M P E R A T U R E R A T E
- 1 . 5 D E G F / M I N

This message provides a real time display of the average rate of change of leaving chilled water as seen by the micro. A (-) or (+) sign is also shown to indicate a temperature fall or a temperature rise.

LEAD SYSTEM IS
SYSTEM NUMBER 1

This message informs the operator which system is in the lead.

EVAPORATOR WATER
PUMP STATUS ON

This message informs the operator that the micro has commanded the auxiliary contacts (optional) for the chilled water pump to close.

EVAPORATOR HEATER
STATUS OFF

This message informs the operator that the micro senses the outdoor ambient temperature is below 40°F and is commanding the Evaporator Heater to turn on. Once turned on, the heater will turn off at 45°F.

CONDENSER WATER
PUMP STATUS OFF

This message informs the operator that the micro has commanded the auxiliary contacts (optional) for the condenser water pump to close.

History

The HISTORY key also allows the user to scroll through the SAFETY SHUTDOWN buffers to display information relating to the last 3 Safety Shutdowns which occurred. Information contained in the SAFETY SHUTDOWN Buffers is very important when attempting to troubleshoot a system problem. This data reflects system conditions at the **instant** the fault occurred.

Information is stored in the SAFETY SHUTDOWN Buffers on every fault regardless of whether the fault caused a Lockout to occur. The information is also not affected by power failures (long term internal memory battery back-up is built into the circuit board) or manual resetting of a fault lock-out.

When the HISTORY key is passed, the following message will appear.

DISPLAY SAFETY SHUT-
DOWN NO. 1 (1 TO 3)

The operator must then select which SAFETY SHUTDOWN Buffer which is desired. When deciding this, keep in mind that Buffer No. 1 is always the most recent fault. As new fault information is stored, it is always placed in Buffer No. 1, No. 1 is loaded to No. 2, No. 2 is loaded to No. 3, and information previously in No. 3 is discarded.

To select a buffer, simply press the "1", "2", or "3" ENTRY key and press ENTER. Repetitively pressing the ENTER key will allow the operator to scroll through the information available in the SAFETY SHUTDOWN Buffer.

In the information that follows, a sample message along with an explanation is provided for all available messages.

SHUTDOWN OCCURRED
3 : 2 4 P M 6 / 3 / 9 8

This message informs the operator of the time and date of the fault.

SYS # 1 LOW OIL PRESS
SYS # 2 NO FAULTS

This message informs the operator of the nature of the fault which occurred.

RETURN WATER TEMP
5 2 . 7 DEG F

This message indicates the Return Water Temperature at the time of the fault.

LEAVING WATER TEMP
4 4 . 3 DEG F

This message indicates the Leaving Water Temperature at the time of the fault.

LOW WATER CUTOUT
3 6 . 0 DEG F

This display shows the Low Water Cut-out (Leaving) which was programmed at the time of the fault.

SETPOINT TEMP
4 4 . 0 DEG F

This display shows the Setpoint Temp which was programmed at the time of the fault.

OUTSIDE AIR TEMP
7 7 . 6 DEG F

This message indicates the Outdoor Ambient Temperature at the time of the fault.

LOW AMBIENT CUTOUT
3 5 . 0 PSIG

This display shows the Low Ambient Cut-out programmed at the time of the fault.

LOW PRESSURE CUTOUT
44 PSIG

This display shows the Low Pressure Cut-out programmed at the time of the fault.

LEAD SYSTEM
SYS 1

This message indicates which system was in the lead at the time of the fault.

CONTROL TYPE
LCHWT

This message indicates the type of chilled water control selected at the time of the fault. LCHWT = Leaving Water Control. ECHWT = Entering or Return Water Control.

COOLING RANGE
45.0 TO 47.0 DEGF

This display shows the Cooling Range (CONTROL RANGE, CR) which was selected at the time of the fault.

ENTERING COND WATER
80.1

This message indicated the entering condenser water temperature at the time of the fault. A fixed value will be displayed if the optional sensor is not installed.

LEAVING COND WATER
90.5

This message indicates the leaving condenser water temperature at the time of the fault. A fixed value will be displayed if the optional sensor is not installed.

SYS 1 COMPRESSOR
ON

This message indicates whether Compressor 1 was ON or OFF at the time of the fault.

SYS 1 MOTOR AMPS
74 %FLA

This message indicates SYS 1 motor current at the time of the fault.

SYS 1 SUCTION PRESS
59 PSIG

This display shows the suction pressure of SYS 1 at the time of the fault.

SYS 1 DSCH PRESS
220 PSIG

This message indicates SYS 1 discharge pressure at the time of the fault. This display will be a fixed value unless the Discharge Pressure Readout is installed.

SYS 1 OIL PRESSURE
70 PSID

This display shows the oil pressure of SYS 1 at the time of the fault.

SYS 1 LIQ LINE
ON

This display informs the operator whether SYS 1 liquid line solenoid was energized (ON) or de-energized (OFF) at the time of the fault.

SYS 1 RUN PERMISSIVE
ON

This message informs the operator if SYS 1 Run Permissive (flow switch, remote START/STOP) was in the RUN mode (ON) or (STOP) mode (OFF).

SYS 1 LOADING STAGES
1

This message indicates the number of stages which were loaded on SYS 1 at the time of the fault.

SYS 1 FORWARD FANS
2

This display indicates the number of fans on SYS 1 which were running forward at the time of the fault. *

* The software designed to control fans whether or not they are present on the chiller as is the case on water cooled indoor units. If an indoor unit exists, ignore this display.

SYS 1 REVERSE FANS
OFF

This message indicates the number of fans on SYS 1 which were running in the reverse direction at the time of the fault. *

SYS 1 HOT GAS VALVE
OFF

This display indicates whether the Hot Gas Solenoid Valve was energized on SYS 1 at the time of the fault.

NOTE: The micro will attempt to control the Hot Gas, Solenoid Valve regardless of whether the option is installed.

SYS 2 COMPRESSOR
OFF

This message indicates whether Compressor 2 was ON or OFF at the time of the fault.

SYS 2 MOTOR AMPS
60 % FLA

This message indicates SYS 2 motor current at the time of the fault.

SYS 2 SUCTION PRESS
62 PSIG

This display shows the suction pressure of SYS 2 at the time of the fault.

SYS 2 DSCH PRESS
240 PSIG

This message indicates SYS 2 discharge pressure at the time of the fault. This display will be a fixed value unless the Discharge Pressure Readout is installed.

SYS 2 OIL PRESSURE
74 PSID

This display shows the oil pressure of SYS 2 at the time of the fault.

SYS 2 LIQ LINE
ON

This display informs the operator whether SYS 2 liquid line solenoid was energized (ON) or de-energized (OFF) at the time of the fault.

SYS 2 RUN PERMISSIVE
ON

This message informs the operator if SYS 2 Run Permissive (flow switch, remote START/STOP) was in the RUN mode (ON) or STOP mode (OFF).

SYS 2 LOADING STAGES
1

This message indicates the number of stages which were loaded on SYS 2 at the time of the fault.

SYS 2 FORWARD FANS
OFF

This display indicates the number of fans on SYS 2 which were running forward at the time of the fault.*

SYS 2 REVERSE FANS
OFF

This message indicates the number of fans on SYS 2 which were running in the reverse direction at the time of the fault. *

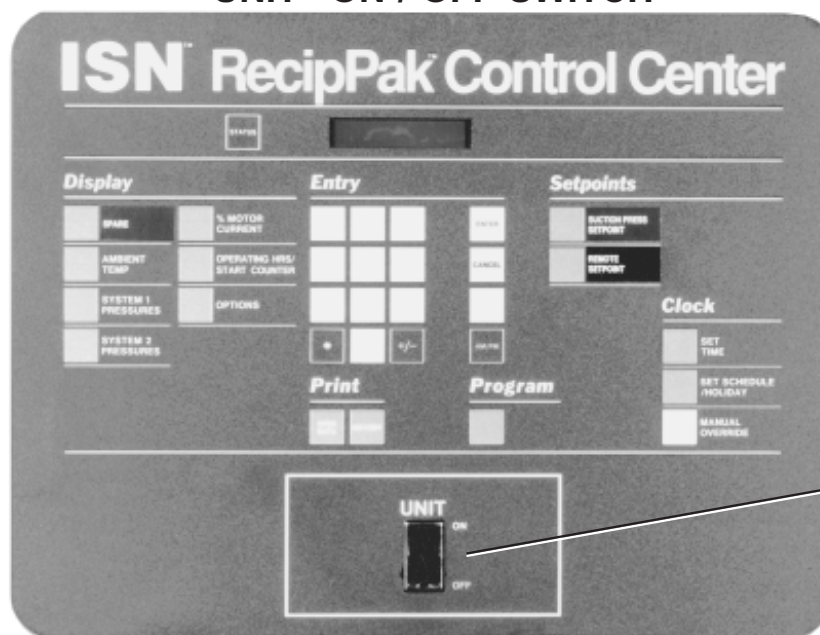
SYS 2 HOT GAS VALVE
OFF

This display indicates whether the Hot Gas Solenoid Valve was energized on SYS 2 at the time of the fault.

NOTE: The micro will attempt to control the Hot Gas Solenoid Valve regardless of whether the option is installed.

* The software designed to control fans whether or not they are present on the chiller as is the case on water cooled indoor units. If an indoor unit exists, ignore this display.

“UNIT” ON / OFF SWITCH



26572A(D)

UNIT ON/OFF SWITCH

A master UNIT ON/OFF switch is located on the keypad. This rocker switch allows the operator to turn the entire chiller OFF if desired. The switch must be placed in the ON position for the chiller to operate.

Whenever the switch is placed in the OFF position, a STATUS display indicating the condition will be displayed. This message is shown below.

UNIT SWITCH IS IN
THE OFF POSITION

SYSTEM SWITCHES

SYSTEM SWITCHES 1-4 are located on the Microprocessor Board (See Fig. 25). These allow the operator to selectively turn a given system on or off as desired. On a 2 system chiller, switches 3 & 4 should be OFF. The System Switch for a designated system must be ON (Switch to right) for the system to operate.

Whenever a switch is placed in the OFF position, a STATUS display indicating the condition will be displayed indicating that the system does not have a Run Permissive signal. A sample of this message is shown below.

SYS # 1 NO RUN PERM
SYS # 2 NO RUN PERM

NOTE: This message will not appear if Anti-recycle or Anti-coincident timers are in effect and are being displayed.

ALARM CONTACTS (ANNUNCIATION ALARM)

“Dry” contacts connected to terminals 23 and 24 (Fig. 26) are supplied, which will transition to function as a warning whenever a fault shutdown occurs on any system or if power is lost to the control panel. The dry contacts are normally open (N.O.) and will close when control power is applied to the panel, if no fault conditions are present. If power is not lost or a fault lockout occurs, the contact will open.

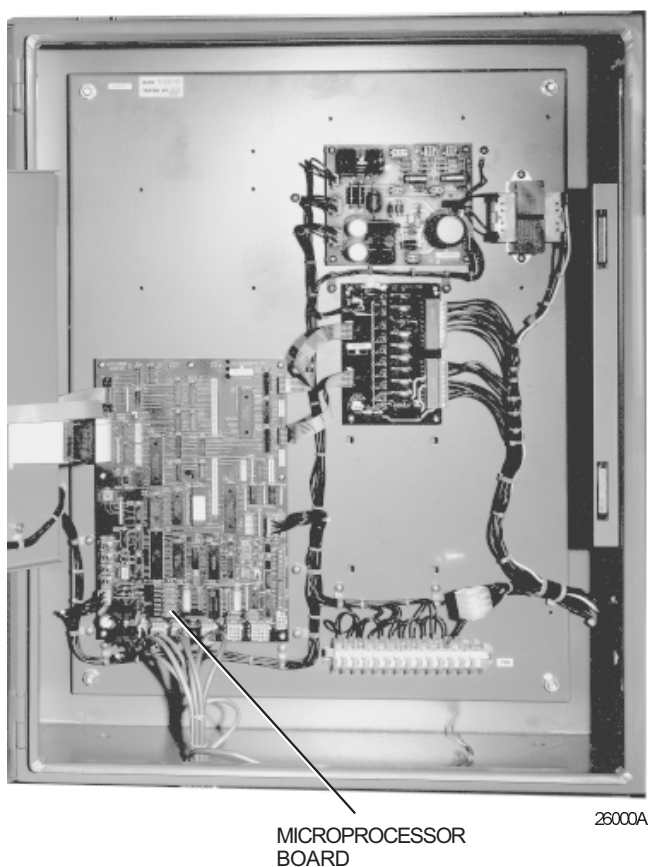
A 28VDC or 120VAC external alarm circuit (by others) may be wired into the YORK supplied alarm contacts. Any inductive load devices (relay, contactor), supplied by the user which are connected to the dry contacts, MUST be suppressed at the load. Use YORK P/N 031-00808-000 suppressor (not supplied). Failure to do this will result in nuisance faults and possible damage to the chiller.

CAUTION: If the alarm circuit is applied in an application used for critical duty (such as process duty or cooling other critical equipment) and the alarm circuit should fail to function, YORK will not be liable for damages.

LEAD/LAG COMPRESSOR SELECTION

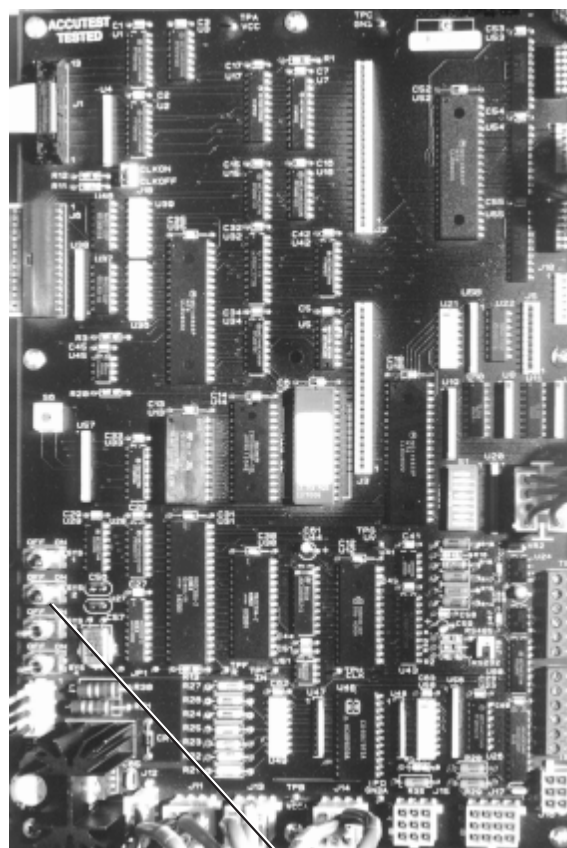
The Chiller can be set up for AUTO or MANUAL Lead/Lag. This is accomplished by properly configuring the S1 Dip Switches on the Microprocessor Board. Details for configuring the switches are discussed in the DISPLAY KEY Section of the IOM under the “OPTIONS” key.

When AUTO Lead/Lag is utilized, the micro attempts to balance run time between the two compressors. A number of conditions can occur which will prevent this from happening. Factors determining lead/lag selection and the resulting lead/lag determination are discussed below:



MICROPROCESSOR
BOARD

26000A



SYSTEM SWITCHES 1-4
ON MICROPROCESSOR BOARD

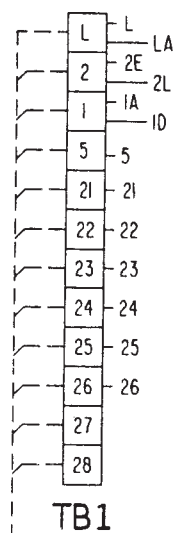
26001A

FIG. 25 – LOCATION OF THE MICROPROCESSOR BOARD

1. The micro automatically defaults the lead to SYS 1 and the lag to SYS 2 if both compressors are ready to start (Anti-recycle Timers timed out) and compressors have equal run time.
2. If both compressors are ready to start (Anti-recycle Timers timed out), the compressor with the lowest run hours will start first.
3. If both compressors are waiting to start (Anti-recycle Timers are not timed out), the micro will assign the lead to the compressor with the shortest anti-recycle time in an effort to provide cooling quickly.
4. If the lead compressor is locked out, faulted and waiting to restart, SYS switch on the micro board is off, or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This is true regardless of whether the lag compressor is on or off.

If MANUAL Lead/Lag is selected, an external “dry” contact (switch) must be wired into the chiller. This contact is field supplied. With the contact open, SYS 1 is placed in the lead. When the contact is closed, SYS 2 will be the lead system.

Manual Lead/Lag selection will be automatically overridden by the micro to allow the lag compressor in a mod-



LD02092

FIG. 26 – ALARM CONTACT CONNECTION LOCATION

ule to automatically become the lead anytime the selected lead compressor shuts down due to a lockout, lead system faults and is waiting to restart, lead system switch on the Micro Board is in the OFF position, or if a run permissive is keeping the lead system off. Automatic

switchover in the "MANUAL" mode is provided to try to maintain chilled liquid temperature as close to setpoint as possible.

The "dry" contact for manual lead/lag selection is wired into terminals 13 and 19 on the TB3 Terminal block. The location of these terminals is shown in Fig. 27.

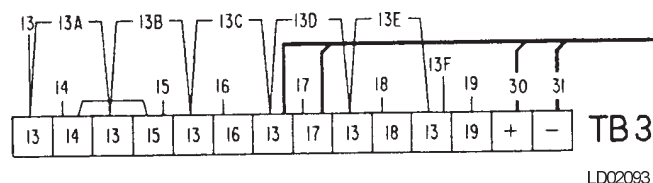


FIG. 27 – LEAD/LAG CONTACT CONNECTION LOCATION

MEMORY BATTERY BACK-UP

The Microprocessor board contains a Real Time Clock (RTC) I.C. Chip with an internal battery back-up. The battery back-up assures that any programmed values, clock, all fault information, accumulated information such as starts/run time, etc. stored in the RTC memory is not lost when a power failure occurs regardless of the time period.

The battery is a 10-year lithium type. The life of the battery with power removed will depend upon whether the Real Time Clock's internal clock circuit is energized. With the clock OFF, approximately 10 years can be expected, with the clock ON, approximately 5 years.

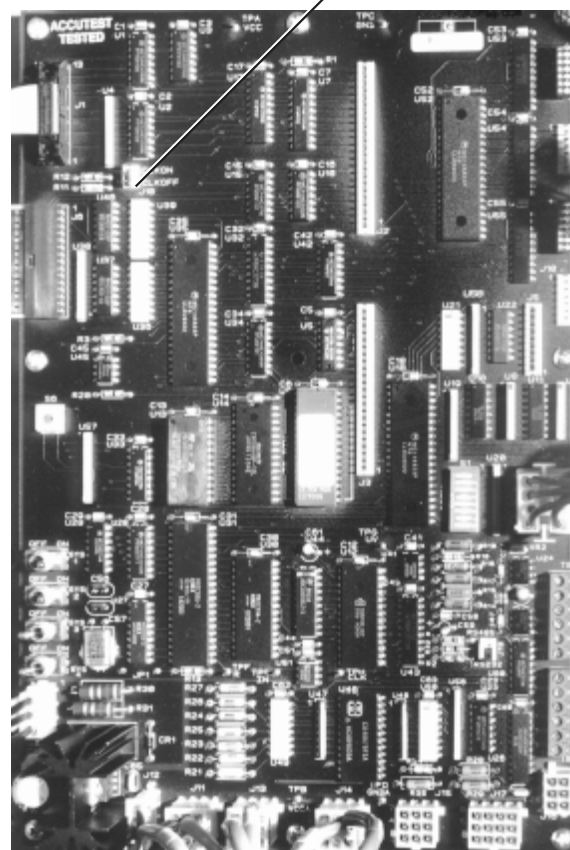
The clock is turned ON and OFF by a jumper on the Microprocessor Board. While a chiller is operating, the clock must be ON. Otherwise the internal clock on the microprocessor will not be active and the micro cannot keep track of time, although all other functions will operate normally. This could result in the chiller not starting due to the time frozen on the clock falling outside the START/STOP time window that is programmed in the DAILY SCHEDULE.

If the chiller is shut down for extended periods of months, it may be desirable to disable the clock to save battery life. The clock can then be reactivated and reprogrammed when the chiller is returned to service.

NOTE: ALL PROGRAMMED VALUES AND STORED DATA, OTHER THAN THE INTERNAL CLOCK TIME-KEEPING, WILL BE MAINTAINED IN MEMORY REGARDLESS OF WHETHER THE CLOCK IS ON OR OFF AND REGARDLESS OF THE LENGTH OF THE POWER FAILURE.

To disable the clock, place the jumper (Fig. 28) in the OFF position. To activate it, place the jumper in the ON position.

CLOCK JUMPER



26001A

FIG. 28 – CLOCK JUMPER

On power-up, the microprocessor will check the Real Time Clock (RTC Chip) battery to assure that the internal battery is still operational. This is accomplished by performing an RTC RAM location check. As long as the battery checks out, the microprocessor will continue on with business without interruption.

If a check is made and the battery has failed, the microprocessor will not allow the chiller to run and the following STATUS message will appear:

!! WARNING !!
!! LOW BATTERY !!

The only way to run the chiller is to press the MANUAL OVERRIDE key. Under low battery conditions, the manual override key will function differently than it normally does in service situations where it overrides the daily schedule for only 30 min. In a low battery condition, the MANUAL OVERRIDE key will zero out the daily schedule to allow unlimited operation regardless of the time on the internal clock. Default values will also be loaded into memory for all setpoints and cut-outs. These may require reprogramming to assure they meet chiller operating requirements. In addition, the low battery message which is displayed for this condition will disappear.

NOTE: *If a power failure should again occur, the above process will again need to be repeated to bring the chiller back on line.*

In the unlikely event the low battery message should ever appear, it will require the RTC Chip U13 on the Microprocessor Board (Fig. 15) to be replaced. Care should be taken to assure that the chip is properly installed. Pin 1 (dimple in the top of the chip) must be oriented as shown (Fig. 15). The part number for the RTC Chip is 031-00955-000.

CRANKCASE HEATER

The crankcase heater for a compressor will be ON whenever the compressor is not running. The heater is interlocked into the compressor motor contactor and is not controlled by the microprocessor.

The purpose of the crankcase heater is to prevent the migration of refrigerant to the crankcase during shutdown assuring proper lubrication of the compressor on start-up.

Anytime power is removed from the chiller for more than an hour, the crankcase heater should be left on for 24 hours prior to start. This can be accomplished by applying 115VAC to the control panel.

EVAPORATOR HEATER

The evaporator heater prevents water standing in the evaporator from freezing. Whenever outdoor ambient temperature drops below 40°F, the microprocessor will turn the evaporator ON. If temperature rises above 45°F, the heater will be turned off.

METRIC DISPLAY

The control panel is capable of providing displays of pressure and temperature in metric values. Temperatures will be displayed in °C and pressures in kPa.

A Metric to English temperature conversion table is provided on the rear cover of this manual. Pressure can be converted from PSI to KPa using the formula $\text{PSI} \times 6.89 = \text{kPa}$.

To obtain panel displays in metric, Switch 5 of Dip Switch S1 on the Microprocessor Board must be placed in the OPEN position (Page 43). The positioning of this switch can then be verified by pushing the OPTIONS key and verifying that "METRIC UNITS READOUT" is programmed (Page 44).

EMS/BAS CONTROLS

The microprocessor is capable of REMOTE START/STOP, REMOTE UNLOADING (Pulldown demand limit-

ing), and REMOTE SETPOINT RESET. These functions can be easily utilized by connecting user supplied "dry" contacts to the terminals on the TB3 Terminal Block.

REMOTE START/STOP BY A CYCLING DEVICE OR TIME CLOCK

Remote START/STOP is accomplished by connecting a time clock or other "dry" contact in series with the flow switch on terminals 13 & 14. See Fig. 14 for the location of the terminals. The contact must be closed to allow the chiller to run. Any time the contact opens, the chiller will shut down and the following status message will be displayed.

S Y S # 1	N O	R U N	P E R M
S Y S # 2	N O	R U N	P E R M

Wiring from these contacts should not exceed 25 ft. and should be run in grounded conduit that does not carry any wiring other than control wiring. Additionally, if an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a user supplied YORK P/N 031-00808 suppressor.

REMOTE SETPOINT RESET (REMOTE RESET TEMP RANGE)

Remote Setpoint Reset allows resetting the setpoint upward from the programmed value in memory. This is accomplished by connecting a "dry" contact between terminals 13 & 17. See Fig. 14 for the location of these terminals. Closing the contact for a defined period of time allows reset of the setpoint upward by up to 40°F above the setpoint programmed in memory.

The maximum desired reset must be programmed into memory and can be a value of 02 to 40°F. This value will vary according to the user's requirements. To program the reset, press the REMOTE SETPOINT TEMP RANGE key. The following message will appear.

R E M	S E T P O I N T	=	4 0 . 0
R E M	R A N G E	=	2 0 D E G F

The display will indicate the REM SETPOINT which is always equal to the chilled liquid setpoint plus the offset from the reset signal. The display will also show the REM RANGE which is the same as the maximum reset required. Key in the maximum reset for the REM RANGE and press the ENTER Key to store the new value in memory.

Once the maximum reset is programmed, it will require a contact closure of 21 seconds to achieve the maximum reset. Closure for less than 21 seconds will provide a smaller reset. For noise immunity, the micro will ignore closures of less than 1 second.

To compute the offset for a given timer closed, use the formula below:

$$1. \frac{\text{Programmed max. reset}}{20 \text{ seconds}} = \text{Reset per sec.}$$

$$2. (\text{Time Closed} - 1) \text{ Reset per sec.} = \text{Reset}$$

Example:

Programmed max reset = 30°; Time Closed = 9 sec.

$$1. \frac{30^\circ}{20 \text{ sec.}} = 1.5^\circ \text{ per sec.}$$

$$2. (9 \text{ sec.} - 1 \text{ sec.}) 1.5^\circ \text{ per sec.} = 12^\circ = \text{Reset}$$

To determine the new setpoints, add the reset to the setpoint programmed into memory. In the example above, if the programmed setpoint = 44°F, the new setpoint after the 9 second contact closure would be 44°F + 12°F = 56°F. This new setpoint can be viewed on the display by pressing the REMOTE RESET TEMP/RANGE key.

To maintain a given offset, the micro must be refreshed every 30 seconds - 30 minutes with a contact closure of the required time period. It will not accept a refresh sooner than 30 seconds after the end of the last PWM signal, but must be refreshed before a period of 30 minutes expires from the end of the last PWM signal.

After 30 minutes, if no refresh is provided, the setpoint will change back to its original value. A refresh is nothing more than a contact closure for the period required for the desired offset.

NOTE: After an offset signal, the new setpoint may be viewed on the REMOTE RESET TEMP RANGE DISPLAY. However, if this display is being viewed when the reset pulse occurs, the setpoint will not change on the display. To view the new offset, first press any other display key on the keypad and then press the REMOTE RESET TEMP RANGE key. The new setpoint will then appear.

Wiring from these contacts should not exceed 25 ft. and should be run in grounded conduit that does not carry any wiring other than control wiring. Additionally, if an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a user supplied YORK P/N 031-00808 suppressor.

NOTE: Remote Setpoint Reset will not operate when a Remote Control Center Option Kit is connected to the Micro Panel. The Remote Control Center will always determine the setpoint.

REMOTE UNLOADING

The microprocessor is capable of remote unloading or pulldown demand limiting in two steps. The first step shuts down the lag system. The second step unloads

the lead system to its minimum step of capacity which places the entire system at minimum possible capacity.

To shut down the lag compressor, a “dry” contact should be connected between terminals 13 & 16. See Fig. 14 for the location of these terminals. When the contact is closed, the lag compressor will shut down.

Before the lead system can be unloaded to its minimum step of capacity, the lag compressor must already be disabled with a “dry” contact closure between terminal 13 & 16 as described in the preceding paragraph.

With contacts on Terminals 13 & 16 closed, the lead system can be unloaded to its minimum step of capacity by closing a “dry” contact connected between terminals 13 & 17. See Fig. 14 for location of this terminal. The lead system will remain totally unloaded as long as the contacts remain closed on both 13 & 16 and 13 & 17. It should be noted that terminals 13 & 17 are normally used for Remote Setpoint Reset. However, it is assumed that if the lag system is purposely being shut down, Remote Setpoint Reset and temperature control is of no importance. This is generally true since capacity control of the load is lost when a large portion of the capacity is disabled.

CAUTION: Two cautions should be observed when using these functions. Observing these cautions will assure that undesirable operation does not result.

1. Terminals 13 & 17 contact should always be closed after or simultaneous with those on 13 & 16, when unloading of the lead system is desired. Otherwise, the microprocessor may mistake the closed contacts on 13 & 17 as a signal for a setpoint reset.
2. Terminal 13 & 17 contact should always be opened before or simultaneous with those on 13 & 16 when loading is desired. Otherwise, the microprocessor may mistake the closed contacts on 13 & 17 as a signal for a setpoint reset.

EVAPORATOR WATER PUMP CONTACT

This control provides a “dry” contact which can be used to turn on the evaporator water pump. The contact will be closed by the micro before the micro brings a compressor on. The micro will not bring a compressor on until a “RUN PERMISSIVE” signal is established by a flow switch contact closure. If no daily schedule is set (all times = 00.00), the evaporator water pump contact will transition as soon as a System Switch on the microprocessor board is placed in the ON position.

If a daily schedule is programmed, the evaporator water pump contacts will transition when the daily schedule dictates.

If MANUAL OVERRIDE is selected, the evaporator water pump contacts will immediately transition.

Connections to this contact can be made on Terminals 25 and 26 of TB1 in the power panel. The location of these terminals is shown in Fig. 29.

If a power failure occurs which shuts the entire chiller down, the contacts will not be allowed to close again until 30 seconds after power is restored. This prevents rapid cycling of the chilled water pump.

NOTE: Any inductive devices (contactor/relay coil) connected to these contacts must be suppressed with YORK P/N 031-00808 supplied by others. Otherwise nuisance faults may occur.

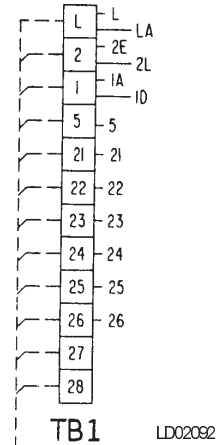


FIG. 29 – EVAPORATOR WATER PUMP CONTACT CONNECTION POINT

COMPRESSOR CAPACITY CONTROL

The function of the compressor capacity control system is to automatically adjust the compressor pumping capacity to balance with the cooling load at a predetermined leaving water temperature and to permit the compressor to start under partial load.

The compressor capacity control system is actuated by means of gas pressure from the discharge side of the compressor. Gas pressure to the unloader piston unloads the associated cylinders and release of this pressure loads them. Control of the gas pressure is through capacity control solenoids on the compressor. The compressor is loaded when the solenoid is de-energized, and unloaded when the solenoid is energized.

Capacity is reduced by unloading one or more banks of cylinders. Some cylinder banks are not equipped with unloaders. This prevents the possibility of overheating, since a definite minimum volume of cool refrigerant gas flows through the compressor at all times during operation regardless of load conditions.

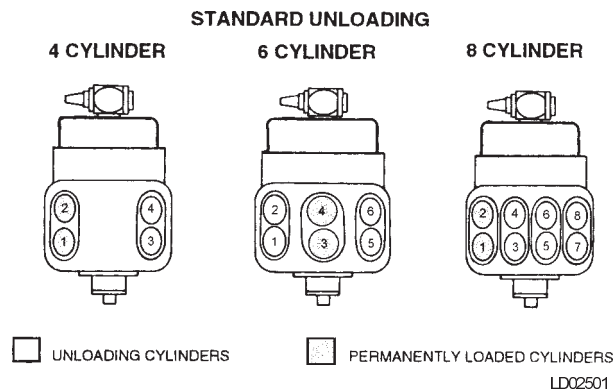
UNLOADING

When the solenoid valve is energized, discharge gas pressure is applied to the top of the unloader piston, forcing it down. The bottom end of the piston seats against the recessed opening to the suction plenum, effectively blocking the flow of suction gas into the cylinders (blocked suction unloading). The cylinders are now unloaded.

CHILLER YCWJ	MODEL YCRJ	SYS	# OF CYLINDERS	# OF UNLOADING STEPS	
				STANDARD	OPTIONAL
45EE0	45E00	1	4	5	N/A
55HE0	55H00	2	4		
56HE0	56H00	1	4	6	N/A
		2	6		
66KH0	66K00	1	6		
67KH0	67K00	2	6	7	N/A
77KH0	77K00				
88MH0	88M00	1	8	10	N/A
99MJ0	99M00	2	8		

LOADING

When the solenoid valve is de-energized, gas pressure on top of the unloader piston is relieved to the suction plenum. This forces the piston up, uncovering the recessed opening which allows the suction gas to flow through the port and into the cylinders. The cylinders are now loaded.



NOTE: 6 cylinder compressors are equipped with 3 cylinder banks. Cylinders 3 & 4 are permanently loaded cylinders and have no unloading solenoids. If "optional" unloading is supplied, Cylinders 1 & 2 are the first cylinders to load while cylinders 5 & 6 the last to load. This provides three steps of compressor loading / unloading. Unloading occurs in the reverse sequence. In the "standard" loading / unloading scheme where the compressor has 2 steps of loading / unloading, the wiring to the unloading solenoid for cylinders 1 & 2 is unconnected, effectively making 1 & 2 permanently loaded cylinders.

8 cylinder compressors are equipped with 4 cylinder banks. Cylinders 1 & 2 are permanently loaded cylinders and have no unloading solenoids. If "optional" unloading is supplied, Cylinders 5 & 6 are the first cylinders to load, Cylinders 3 & 4 the next to load, and 7 & 8 the last to load. This provides 4 steps of loading / unloading. Unloading occurs in the reverse sequence. In the "standard" loading / unloading scheme where the compressor has 2 steps of loading / unloading, the wiring to the unloading solenoids for cylinders 5 & 6 is unconnected, effectively making 5 & 6 permanently loaded solenoids. In addition, the solenoids for cylinders 3 & 4 and solenoids for cylinders 7 & 8 are wired together to function as a single step of loading / unloading.

SYSTEM START-UP CHECKLIST

CHECKING THE SYSTEM 24 HOURS PRIOR TO INITIAL START-UP (NO POWER)

JOB NAME: _____ SALES ORDER #: _____
LOCATION: _____
SOLD BY: _____
INSTALLING _____ CONTRACTOR: _____
START-UP: _____ TECHNICIAN/ COMPANY: _____
DATE: _____

CHILLER MODEL #: _____ SERIAL #: _____
--

COMPRESSOR #1 MODEL #: _____ SERIAL #: _____ COMPRESSOR #2 MODEL #: _____ SERIAL #: _____
--

Unit Checks

- ☐ 1. Inspect the unit for shipping or installation damage.
- ☐ 2. Assure that all piping has been completed.
- ☐ 3. Check that the unit is properly charged and that there are no piping leaks.
- ☐ 4. Suction and discharge stop valves and the refrigerant liquid stop valves are open (ccw).

CAUTION: Compressor lubrication circuit must be primed with YORK "C" oil prior to start-up. Priming should be done through the Schrader fitting at the compressor oil pump. Stroke oil pump 10 times to prime the lubrication circuit.

- ☐ 5. The compressor oil level must be maintained between the middle of the upper and middle of the lower sight glass at all operating conditions. At part load operating conditions, it is not abnormal for the oil level to be in the lower sight glass. If it is necessary to add oil, connect a YORK oil pump to the oil charging valve, but do not tighten the flare nut on the delivery tubing. With the bottom (suction end) of the pump submerged in oil to avoid the entrance of air, operate the pump until oil drips from the flare nut joint, allowing the air to be expelled, and tighten the flare nut. Open the compressor oil charging valve and pump in oil until the oil reaches the proper level as describe above. Close the compressor oil charging valve.
- ☐ 6. Assure water pumps are on. Check and adjust water pump flow rate and pressure drop across cooler.
- ☐ 7. Check panel to see that it is free of foreign material (wires, metal chips, etc.).
- ☐ 8. Visually inspect wiring (power & control). Must meet NEC and all local codes. (See Fig. 12-14)
- ☐ 9. Check for proper size fuses in main and control power circuits.
- ☐ 10. Verify that field wiring matches the 3-phase power requirements of the compressor. See nameplate. (See Fig. 12)
- ☐ 11. Assure 115VAC Control Power to TB1 has 30A minimum capacity. (See Fig. 12)
- ☐ 12. Be certain all control bulbs are inserted completely in their respective wells and are coated with heat conductive compound.

PANEL CHECKS

(POWER ON-BOTH SYSTEM SWITCHES "OFF")

- ☐ 1. Apply 3-phase power and verify its value. (See Fig. 12). Record the voltage: ϕA _____ VAC
 ϕB _____ VAC
 ϕC _____ VAC
- ☐ 2. Apply 115 VAC and verify its value on the terminal block in the lower left of the Power Panel. Make the measurement between terminals 5 and 2. Should be 115 VAC $\pm$ 10%. (See Fig. 12).
 _____ VAC
- ☐ 3. Assure crankcase heaters are on. Allow crankcase heaters to remain on a minimum of 24 hours before start-up. This is important to as-

sure no refrigerant is in the oil at start-up!

- ☐ 4. Program the Dip Switches on the Microprocessor Board (Page 43) and verify the selection by pressing the OPTIONS key.

Switch 3 should always be closed.

Switch 6 should always be open.

NOTE: *It is IMPORTANT that all switches are properly programmed. Otherwise, undesirable operation will result.*

- ☐ 5. Press the PROGRAM key and program each of the 11 limits and record them.

They are as follows:

- ☐ Discharge Cut-out _____ PSIG
- ☐ Outside Air Temp Low Cut-out _____ °F
- ☐ Outside Air Temp High Cut-out _____ °F
- ☐ Discharge Pressure
Unload Pressure _____ PSIG
- ☐ Suction Pressure
Unload Pressure _____ PSIG
- ☐ Leaving Water Temp Cut-out _____ °F
- ☐ Suction Pressure Cut-out _____ PSIG
- ☐ Rate Control Temp _____ °F
- ☐ Anti Recycle Time _____ SEC
- ☐ Rate Sensitivity _____ °F/MIN
- ☐ Number of Load Steps _____

See page 44 for assistance in programming these values.

- ☐ 6. Program the date and time by first assuring that the CLK jumper J18 on the Microprocessor Board (Fig. 28) is in the ON position (Top 2 pins).

Press the SET TIME key and set the date and time (Page 55).

- ☐ 7. Program the Daily and Holiday Start/Stop Schedule by pressing the SET SCHEDULE/HOLIDAY key (Page 56).

- ☐ 8. Program the Chilled Liquid Setpoint and Control Range by pressing the CHILLED LIQUID TEMP/RANGE key (Page 58).

- ☐ 9. If the Remote Reset is to be used, the maximum reset must be programmed. This can be programmed by pressing the REMOTE RESET TEMP RANGE key (Page 84).

INITIAL START-UP

After the operator has become thoroughly familiar with the control panel and has performed the preceeding checks 24 hours prior to start-up, the unit can be put into operation.

- ☐ Place the System Switches to the ON position. See the OPERATING SEQUENCE for unit operation.

- ☐ The compressor will start and a flow of liquid should be noted in the liquid indicator. After several minutes of operation, the bubbles will disappear and there will be a solid column of liquid when the unit is operating normally. On start-up, foaming of the oil may be evident in the compressor oil sight glass. After the water temperature has been pulled down to operating conditions, the oil should be clear. Normal operation of the unit is evidenced by a hot discharge line (discharge superheat should not drop below 50°F) clear oil in the compressor crankcase, solid liquid refrigerant in the liquid indicator and usually no more than 2 PSIG variation in suction pressure for any given set of operating conditions.

- ☐ Allow the compressor to run for a short time, being ready to stop it immediately if any unusual noise or other adverse condition should develop. When starting the compressor, always make sure the oil pump is functioning properly. Compressor oil pressure must be as described in the SYSTEM SAFETIES Section, page 69.

- ☐ Check the system operating parameters. Do this by selecting various readouts such as pressures and temperatures. Compare these to test gauge readings.

CHECKING SUPERHEAT AND SUBCOOLING

The subcooling should always be checked when charging the system with refrigerant and/or before setting the superheat.

When the refrigerant charge is correct, there will be no bubbles in the liquid sightglass with the system operating under full load conditions, and there will be 10°F to 15°F subcooled liquid refrigerant leaving the condenser.

An overcharged system should be guarded against. Evidences of overcharge are as follows:

- a. If a system is overcharged, the discharge pressure will be higher than normal. (Normal discharge/condensing pressure can be found in refrigerant temperature/pressure chart; use entering air temperature +30°F for normal condensing temperatures.)
- b. The temperature of the liquid refrigerant out of the condenser should not be more than 15°F less than

the condensing temperature. (The temperature corresponding to the condensing pressure from refrigerant temperature/pressure chart).

The subcooling temperature should be taken by recording the temperature of the liquid line at the outlet of the condenser and recording the liquid line pressure at the liquid stop valve with the system fully loaded after steady state operation has been established and converting it to a temperature from temperature/pressure chart. Be sure to insulate the thermometer or thermocouple attached to the piping.

Example:

LIQUID LINE PRESSURE	
202 PSIG converted to	102°F
Minus Liquid Line Temperature	- 90°F
Subcooling =	12°F

Record: SYS 1 _____ SYS 2 _____

The proper refrigerant charge is attained when subcooling is measured at 10 - 15°F. Add charge as needed to increase subcooling and remove charge as necessary to reduce subcooling. Whenever removing charge, be sure to recover it into an approved container.

After the subcooling is set at 10-15°F by adding or removing charge and steady state fully loaded operation is established, system superheat should also be adjusted for 10-15°F. A factory recommended superheat setting of 15°F is appropriate for systems that operate over a variety of ambient temperatures, chilled liquid temperatures, and loading conditions. It also compensates for gauge and temperature sensor inaccuracy. When measuring superheat, be sure to insulate a thermometer or thermocouple attached to the piping to assure a true temperature is measured.

The superheat is the difference between the actual temperature of the returned refrigerant gas entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart. The suction temperature should be taken 6" before the compressor service valve, and the suction pressure is taken at the compressor suction service valve.

Example:

Suction Temperature	46°F
Minus Suction Pressure 56 PSIG	
Converted to Temperature	- 31°F
Superheat =	15°F

Superheat SYS 1 _____ SYS 2 _____

Normally, the thermal expansion valve need not be adjusted in the field. If, however, an adjustment is to be made, the expansion valve adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and return to settled operation.

Proper subcooling and superheat will assure optimum performance and reliability of the system. Checks should always be made when commissioning a chiller and on a yearly basis.

If the unit has been functioning satisfactorily during the initial operating period, it is ready for continuous operation.

- ☐ Leak check compressors, fittings, and piping to assure no leaks are present from improper handling.

OPERATING SEQUENCE UTILIZING RETURN WATER CONTROL

NOTE: The Operating Sequence described below relates to operation after power has been applied on a hot water start such as start-up commissioning or a hot water start at the beginning of the day. It also assumes that 10 steps of loading are available and programmed. If less than 10 steps are available, no chiller response will take place at some of the operating points described.

1. For the system compressors to run, all Manual Reset Cut-outs must be reset, the Flow Switch must be closed, the System Switches must be ON, the Daily Schedule must be scheduling the chiller to run, and temperature demand must be present.
2. As long as power is applied, the Crankcase Heaters will be on and stay on as long as the compressors are not running.
3. If power has just been applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure. **NOTE:** Compressor Crankcase Heaters should be on for a period of 24 hours prior to commissioning. Failure to allow the heater sufficient time to warm the oil may damage the compressor due to liquid refrigerant in the oil.
4. **At the end of the 2 minute timer**, the microprocessor will check for cooling demand as well as check to see if any system safeties have been exceeded. If all conditions allow for start, the lead compressor will start unloaded. Coincident with the start, the programmable anti-recycle timer will be set and

begin counting downward to "0". The liquid line solenoid of the compressor will open.

5. **After 4 seconds of run time**, the motor current of the lead compressor must be >14% FLA and <115% FLA. Oil pressure must be >5 PSID. If these conditions are not met, the lead compressor will shut down.
6. **After 30 seconds of run time**, the oil pressure of the lead compressor must be a >20 PSID and the suction pressure must be a >50% of cut-out. If these conditions are not met, the lead compressor will shut down.
7. **After 1 minute of run time**, the lead compressor will load the 1st step, if cooling demand (temperature and rate control) requires.
8. **After 2 minutes of run time**, the lead compressor will load the 2nd step, if cooling demand (temperature and rate control) requires.
9. **After 3 minutes of run time**, the lead compressor will load the 3rd step, if temperature demand (temperature and rate control) requires.
10. **After 4 minutes of operation**, the oil pressure of the lead compressor must be >25 PSID and the suction pressure must be > cut-out. If these conditions are not met, the lead compressor will shut down. If cooling demand requires (temperature and rate control), the lag compressor will start unloaded and its anti-recycle counter will begin counting back to "0". The liquid line solenoid will open. The lead compressor will unload 2 steps to its 1st step of 3 loading steps.
11. **After 4 minutes and 4 seconds of run time**, the motor current of the lag compressor must be >14% FLA and <115% FLA. Oil pressure must be >5 PSID. If these conditions are not met, the lag compressor will shut down.
12. **After 4 minutes and 30 seconds of run time**, the oil pressure of the lag compressor must be >20 PSID and the suction pressure must be >50% cut-out. If these conditions are not met, the lag compressor will shut down.
13. **After 5 minutes of run time**, the lag compressor will load to the 1st step of loading, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 1st step of loading.
14. **After 6 minutes of run time**, the lead compressor will load its 2nd step of loading, if cooling demand requires (temperature and rate control). The lag com-

pressor remains unchanged at the 1st step of loading.

15. **After 7 minutes of run time**, the lag compressor will load to its 2nd step of loading, if cooling demand requires.
16. **After 8 minutes of operation**, the oil pressure of the lag compressor must be >25 PSID and the suction pressure must be > cut-out. If these conditions are not met, the lag compressor will shut down (temperature and rate control). The lead compressor will load to its 3rd and final step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 2nd step of loading.
17. **After 9 minutes of run time**, the lag compressor will load to its 3rd and final step, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 3rd step of loading.

OPERATING SEQUENCE UTILIZING LEAVING WATER CONTROL

NOTE: The operating sequence described below relates to operation after power has been applied on a hot water start such as at start-up commissioning or a hot water start at the beginning of the day. It also assumes that 10 steps of loading are available and programmed. If less than 10 steps are available, no chiller response will take place at some of the operating points described.

1. For the system compressors to run, all Manual Reset Cut-outs must be reset, the Flow Switch must be closed, any Remote Cycling Contacts must be closed, the System Switches must be ON, the Daily Schedule must be scheduling the chiller to run, and temperature demand must be present.
2. As long as power is applied, the Crankcase Heaters will be on and stay on as long as the compressors are not running.
3. If power has just been applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure. NOTE: Compressor Crankcase Heaters should be on for a period of 24 hours prior to commissioning. Failure to allow the heater sufficient time to warm the oil may damage the compressor due to liquid refrigerant in the oil.
4. At the end of the 2 minute timer, the microprocessor will check for cooling demand as well as check

to see if any system safeties have been exceeded. If all conditions allow for start, the lead compressor will start unloaded coincident with the start, the programmable anti-recycle timer will be set and begin counting downward to "0". The liquid line solenoid of the lead compressor will be open.

5. **After 4 seconds of run time**, the motor current of the lead compressor must be >14% FLA and <115% FLA. Oil pressure must be >5 PSID. If these conditions are not met, the lead compressor will shut down.
6. **After 30 seconds of run time**, the oil pressure of the lead compressor must be >20 PSID and the suction pressure must be >50% of cut-out. If these conditions are not met, the lead compressor will shut down.
7. **After 2 minutes and 30 seconds of run time**, the lead compressor will load the 1st step, if cooling demand (temperature and rate control) requires.
8. **After 4 minutes of operation**, the oil pressure of the lead compressor must be >25 PSID and the suction pressure must be > cut-out. If these conditions are not met, the lead compressor will shut down.
9. **After 5 minutes of run time**, the lead compressor will load the second step, if cooling demand (temperature and rate control) requires.
10. **After 7 minutes and 30 seconds of run time**, the lead compressor will load its 3rd step if temperature demand (temperature and rate control) requires.
11. **After 10 minutes of run time**, if cooling demand requires (temperature and rate control), the lag compressor will start unloaded and its anti-recycle counter will begin counting back to "0". The liquid line solenoid will open. The lead compressor will unload two steps to its 1st step of 3 loading steps.
12. **After 10 minutes and 4 seconds of run time**, the motor current of the lag compressor must be >14% FLA and <115% FLA. Oil pressure must be >5 PSID. If these conditions are not met, the lag compressor will shut down.
13. **After 10 minutes and 30 seconds of run time**, the oil pressure of the lag compressor must be >20 PSID and the suction pressure must be >50% cut-out. If these conditions are not met, the lag compressor will shut down.
14. **After 12 minutes and 30 seconds of run time**, the lag compressor will load to the 1st step of loading, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 1st step of loading.
15. **After 14 minutes of operation**, the oil pressure of the lag compressor must be >25 PSID and the suction pressure must be > cut-out. If these conditions are not met, the lag compressor will shut down.
16. **After 15 minutes of run time**, the lead compressor will load to its 2nd step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 1st step of loading.
17. **After 17 minutes and 30 seconds of run time**, the lag compressor will load to its 2nd step of loading, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 2nd step of loading.
18. **After 20 minutes of run time**, the lead compressor will load to its 3rd and final step of loading, if cooling demand requires (temperature and rate control). The lag compressor remains unchanged at the 2nd step of loading.
19. **After 22 minutes and 30 seconds of run time**, the lag compressor will load to its 3rd and final step, if cooling demand requires (temperature and rate control). The lead compressor remains unchanged at the 3rd step of loading.

PREVENTATIVE MAINTENANCE

It is the responsibility of the owner to provide the necessary daily, monthly and yearly maintenance requirements of the system.

IMPORTANT

If a system failure occurs due to improper maintenance during the warranty period; YORK will not be liable for costs incurred to return the system to satisfactory operation. The following is intended only as a guide and covers only the chiller unit components. It does not cover other related system components which may or may not be furnished by YORK. System components should be maintained according to the individual manufacturers' recommendations as their operation will affect the operation and life of the chiller.

DAILY MAINTENANCE

It is recommended that the following items be checked daily.

1. Oil Level – Correct oil level is when oil appears in either of the compressor oil sight glasses after the unit has been in operation for about two hours. If it is necessary to add oil after this operating period, see item #3 under the ANNUAL MAINTENANCE section.
2. Oil Pressure – Oil pressure should be a minimum of 50 psi above suction pressure. Typical pressure is 65-70psi.
3. Compressor Superheat – Correct superheat is 10°-15°F measured at the compressor.
4. Operating Pressures and Temperatures – Check to see that operating pressures and temperatures are within the LIMITATIONS shown in this book.

WEEKLY MAINTENANCE

It is recommended that the following items be checked weekly.

1. All items listed under DAILY MAINTENANCE.
2. Color of Compressor Oil – New oil is clear, and if the system is not contaminated with moisture and/or foreign material, should retain its new appearance for a reasonable length of operating time. Discoloration of the oil, either turning darker brown or in some cases lighter, is an indication of contamination, basically due to moisture. If it is necessary to change oil refer to item #3 under the ANNUAL MAINTENANCE section.

3. Check the refrigerant circuit for leaks.
4. Operating Pressures and Temperatures – Check to see that operating pressures and temperatures are within the LIMITATIONS shown in this book.

ANNUAL MAINTENANCE

It is recommended that the following items be checked annually.

1. All items under WEEKLY MAINTENANCE.
2. Operating Controls – Check to see if controls are set and operating within the proper limits. See Unit Controls and OPERATION section of this book.
3. Compressor Oil – Drain, inspect and refill with new oil. This requires pumping out the compressor. If possible, this should be done after the unit has been in operation for some time, when the oil in the crankcase will contain the least amount of refrigerant. To pump out the compressor, proceed as follows:
 - A. Close the suction stop valve.
 - B. Open the discharge stop valve two turns of the stem.
 - C. Operate the compressor until 15 to 20 inches vacuum is obtained. Do this by disconnecting the wiring to LLSV and repeatedly starting the compressor. Recycle 115VAC power to the Logic Panel to reduce anti-recycle time to 2 min. if needed. The compressor should in no case be operated under vacuum conditions for longer than 10 to 15 seconds.
 - D. Stop the compressor and immediately close the discharge stop valve. The procedures outlined in steps (b) and (c) above should be repeated if the suction pressure rises rapidly to 15 PSIG or more which would indicate considerable refrigerant remaining in the crankcase oil. Do not expect to retain 0 PSIG since some refrigerant will continually be released from the oil in the crankcase.
 - E. After pumping down the compressor, wait until the pressure builds up to 2 or 3 PSIG before opening up any part of the hermetic compressor.
 - F. Open the oil drain valve slowly and drain as much oil from the compressor as possible.
 - G. Examine the oil for any metal particles which would indicate wear on the bearings, crankshaft or connecting rods. If metal particles are found, the need

for closer examination by factory service personnel is indicated.

- H. If the oil is clean and free of metal particles, refill the compressor with YORK "C" oil. To add oil or to fill the compressor crankcase, connect the delivery tube of the YORK Hand Oil Pump. YORK Part No. 470-10654 or equal to the compressor oil charging and drain valve. Expel all air from the delivery tube by pumping it full of oil, allowing a few drips to drip out before tightening the flare nut to the oil charging valve. Then open the oil charging valve and pump oil into the crankcase to the proper level. It is necessary that the suction end of the hand oil pump be kept submerged under the oil level in the container at all times, to avoid entrance of air into the compressor.

- I. Before opening the suction or discharge stop valves, connect a vacuum pump to the pumpout port in the discharge stop valve. (Pumpout port is port on valve

stem side of valve). With the vacuum line shutoff valve open, run the vacuum pump until a vacuum of at least 1000 microns is reached. Stop the vacuum pump, close the shut-off valve and open the discharge valve fully before disconnecting the line from the vacuum pump. Disconnect the vacuum pump and replace the plug in the pumpout port.

NOTE: *If suction or discharge valves are not seated properly, a 1000 micron vacuum can not be obtained. Do not evacuate for long periods of time.*

- J. Be sure both discharge and suction stop valves are open before operating the unit.

4. Suction and Discharge Valves and Springs – The condition of the suction and discharge valves and springs should be checked by YORK service personnel on a yearly basis or every 5000 hours, whichever comes first.

OPTIONS

This section is devoted to options which may be ordered or retrofitted to the unit. Listed below are the options which are covered in this section.

1. CONDENSER WATER PUMP CONTACT/ RUN STATUS OPTION
2. CONDENSER WATER TEMP READOUT
3. HOT GAS BYPASS (LOADMINDER) OPTION
4. DISCHARGE PRESSURE READOUT OPTION
5. LOCAL PRINTER OPTION
6. BAS INTERFACE OPTION (REMOTE RESET OPTION)

CONDENSER WATER PUMP CONTACT / RUN STATUS OPTION

This option provides a "dry" contact which can be used to turn on the condenser water pump, other device, or indicate run status. The contact closes whenever one of the compressors start.

Connections to this contact can be made on Terminals 21 and 22 of TB1 in the power panel. The location of these terminals is shown in Fig. 30.

This option utilizes a second Relay Output Board and associated wiring. The part number for the Field Mounted Pump Control Kit is 471-01232-101. This kit is not required if a second Relay Output Board is already installed.

NOTE: *Any inductive devices (contactor/relay coil) connected to these contacts must be suppressed with YORK P/N 031-00808-000 supplied by others. Otherwise, nuisance faults may occur.*

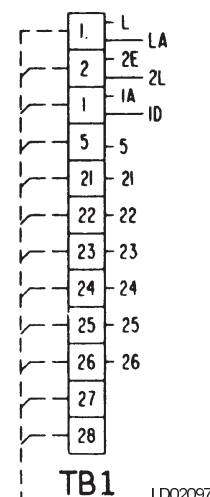


FIG. 30 – CONDENSER WATER PUMP CONTACT CONNECTION POINT

CONDENSER WATER READOUT OPTION

This option provides a micropanel display of entering and leaving condenser water temperature.

Temperature sensors, wiring, connectors, and pins are supplied to field wire the sensors into the J16 plug on the Microprocessor board. A label is also supplied to indicate the key on the keypad which allows viewing of these temperatures. This key is located directly below the "Options" key.

Temperature wells are field supplied according to the size of the piping.

Shown below is a sample display

E	C	O	N	D	W	T	=	8	5	D	E	G	F
L	C	O	N	D	W	T	=	7	5	D	E	G	F

HOT GAS BYPASS (LOADMINDER) OPTION

General

The Hot Gas Bypass Option is available as a factory installed option to prevent compressor cycling and water temperature fluctuation at low load. This is accomplished by providing further capacity reduction below the last step of compressor cylinder unloading by introducing an artificial load to the cooler, which keeps the compressor on the line. The option will provide hot gas bypass on both compressors enabling hot gas to be active regardless of which compressor is in the lead.

NOTE: The microprocessor will only activate the hot gas on the lead compressor.

"YCR" models with optional Hot Gas Bypass (Loadminder) require field piping to be completed to the discharge side of the system piping.

The hot gas bypass consists of a pilot operated regulating valve with an integral solenoid. The pilot operated solenoid is controlled by the microprocessor according to water temperature. The regulating valve, which becomes activated when the solenoid is energized, is controlled by suction pressure to modulate the flow of gas in a bypass connected from the compressor discharge to the cooler inlet. The following text will explain how the hot gas solenoid is activated by the microprocessor in both return and in leaving water control.

LWT Control Hot Gas Operation

The hot gas solenoid is energized when the leaving water temperature falls below the "Target" water temperature, if the compressor is on its minimum stage of loading. Hot gas may then be fed according to the suction pressure and the pressure regulating valve setting. Once activated, the micro will keep the solenoid energized until the leaving water temperature rises above the high limit of the Control Range or until the load becomes so low that the hot gas can no longer keep temperature within the control range and the micro turns the compressor off. Details for setting the pressure regulator follow.

RWT Control Hot Gas Operation

The hot gas solenoid is energized if the compressor is on its minimum stage of loading and the return water temperature falls below the following point:

$$ULCR - CR + CR/20$$

Where: UCLR = Upper Limit of Control Range
CR = Control Range Differential

Example: In a typical system that requires a 45°F leaving water temperature, we will have a 10° control range (CR) differential which gives us an Upper Limit of Control Range (ULCR) of 55°F. Therefore, plugging the numbers into the formula:

$$55 - 10 + (10/20) = 45-1/2^\circ\text{F}$$

The hot gas solenoid will be activated at 45-1/2°F in the example above and hot gas may then be fed according to the suction pressure and the pressure regulated valve setting. Once activated, the micro will keep the solenoid energized until the return water temperature rises above the temperature designated by the formula:

$$ULCR - CR + CR/10$$

Where: UCLR = Upper Limit of Control Range
CR = Control Range Differential

$$\text{Example: } 55 - 10 + 10/10 = 46^\circ\text{F}$$

If temperature continues to drop while the Hot Gas is energized, the Hot Gas will be de-energized when the compressor cycles off on temperature.

Procedure For Setting The Hot Gas Regulator (Ref. Fig. 31)

1. If desired, set the control panel data to show suction pressure.

2. Adjust the pilot power assembly adjustment screw ② to approximately the middle of its adjustment range.
3. The chiller must be running and stabilized on the minimum stage capacity. In establishing this condition, it may be necessary to deactivate the regulator by de-energizing the solenoid ①.
4. Adjust the adjustment screw ② in the clockwise direction to open the valve at a higher pressure (sooner) or in the counterclockwise direction to open the valve at a lower pressure (slower response). The valve is feeding when the valve outlet feels warm to the touch.

The adjustment is correct when system suction pressure rises to a point nearly equal to normal running pressure at the midpoint in the "Control Zone".

5. Further minor adjustment may be necessary to be certain that the valve opens fully before the temperature point at which the compressor stops due to a fall in Return or Leaving Water Temp.
6. Repeat this procedure on the other system.

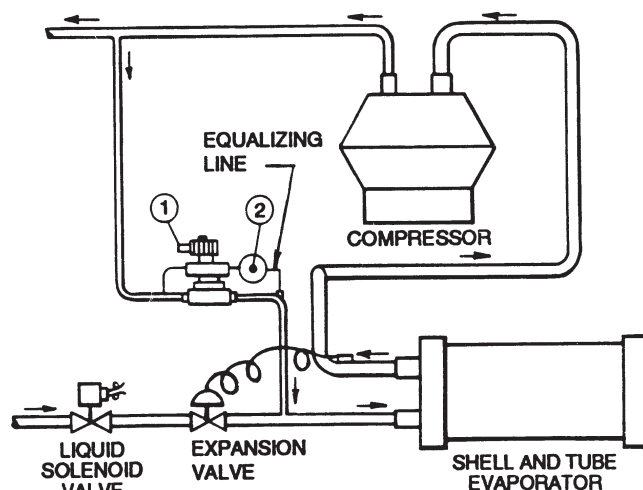
NOTE: *HOT GAS should not be considered as an additional step of unloading when programming the number of steps of loading/unloading.*

FIELD INSTALLATION

If it becomes necessary to field install the Hot Gas (Loadminder) Option, two kits are required. Order the kit from Table 3.

TABLE 3

KIT, HOT GAS BYPASS	
MODEL	PART NO.
YCWJ45EE	375-05358-001
YCWJ55HE	375-05358-001
YCWJ56HF	375-05358-001
YCWJ66KH	375-05358-001
YCWJ67KH	375-05358-002
YCWJ77KH	375-05358-003
YCWJ88MH	375-05358-003
YCWJ99MJ	375-05358-004
YCRJ45E0	375-05886-001
YCRJ55H0	375-05886-001
YCRJ56H0	375-05886-001
YCRJ66H0	375-05886-001
YCRJ67K0	375-05886-002
YCRJ77K0	375-05886-002
YCRJ88M0	375-05886-003
YCRJ99M0	375-05886-004



LD02099

FIG. 31 – PIPING DIAGRAM

In addition, a 471-01232-101 kit must also be ordered. The 471-01232-101 kit consists of a second Relay Output Board. It is not required if two Relay Boards are already installed in the control panel.

DISCHARGE PRESSURE READOUT OPTION

The Discharge Pressure Read-out Option P/N 471-01266-131 allows the user to obtain control panel displays of discharge pressure. Additionally, other displays such as fault information will then hold relevant discharge pressure information useful in diagnosing problems.

The discharge pressure unloading feature also becomes usable when this option is installed (Page 52) as well as fan cycling by discharge pressure.

The kit consists of discharge pressure transducers for each system, wire harnesses, and associated mounting hardware.

LOCAL PRINTER OPTION

The Micro Panel is capable of supplying a print-out of chiller conditions or fault shutdown information at any given time. This allows operator and service personnel to obtain data and system status with the touch of the keypad. In addition to manual print selection, the micro panel will provide an automatic print-out whenever a fault occurs. An explanation of the keypad use to obtain a print-out is discussed in the "PRINT" KEY Section on Page 74.

YORK recommends the field tested WEIGH-TRONIX IMP-24, Model 2600 printer. This is a compact low cost printer that is ideal for service work and data logging. Paper is in the form of a compact roll and is easily handled compared to larger printers using wider business form

style paper. The paper is 2.25" wide desk-top calculator paper that can be easily and inexpensively purchased at most stationery stores. Shown in Fig. 32 and 33 is the WEIGH-TRONIX printer and a typical sample print-out.

The WEIGH-TRONIX IMP-24 Model 2600 printer can be purchased for approximately \$150.00. Contact Weigh-Tronix for purchase information:

Weigh-Tronix
2320 Airport Blvd.
Santa Rosa, Ca. 95402
Phone: 1-800-358-9110 or 1-707-527-5555
(International Orders Only)

NOTE: The print-out is made to be universal to all types of chillers both air and water cooled with or without options. Items may be indicated on the print-out which may not be present on the chiller.

Installation Limitations

The following limitations must be adhered to. Failure to do so may result in improper printer and/or chiller operation.

- 1. The printer option is adaptable to all versions and revisions of Microprocessor boards and EPROM's. No modifications are necessary to the panel.
- 2. Maximum cable length between the printer and the Microprocessor Board is 25 feet. Twisted pair shielded cable is required.
- 3. The printer must be supplied a 115 VAC source.
- 4. The printer may be left connected to the micro panel.



FIG. 32 – WEIGH-TRONIX IMP-24 MODEL 2600 PRINTER

YORK INTERNATIONAL CORPORATION RECIPROCATING WATER CHILLERS		
SYSTEM STATUS 8:45AM 6/3/98		
SYS 1	COMPRESSOR RUNNING	
SYS 2	ANTI-COIN TIMER 13 SEC	
RETURN WATER TEMP	65.0	DEGF
LEAVING WATER TEMP	54.0	DEGF
LOW WATER CUTOUT	36.0	DEGF
SETPOINT TEMP	45.0	DEGF
OUTSIDE AIR TEMP	75.0	DEGF
LOW AMBIENT CUTOUT	10.0	DEGF
LOW PRESSURE CUTOUT	44	PSIG
LEAD SYSTEM	SYS 1	
CONTROL TYPE	LCHWT	
COOLING RANGE	45.0 TO 47.0	DEGF
SYSTEM 1 DATA		
COMPRESSOR STATUS		ON
MOTOR AMPS	50	%FLA
SUCTION PRESSURE	61	PSIG
DISCHARGE PRESSURE	143	PSIG
OIL PRESSURE	75	PSID
LIQUID LINE SOLENOID		OFF
RUN PERMISSIVE		ON
STAGES OF LOADING		1
FORWARD FANS		OFF
REVERSE FANS		OFF
HOT GAS BYPASS VALVE		OFF
SYSTEM 2 DATA		
COMPRESSOR STATUS		ON
MOTOR AMPS	0	%FLA
SUCTION PRESSURE	61	PSIG
DISCHARGE PRESSURE	80	PSIG
OIL PRESSURE	1	PSID
LIQUID LINE SOLENOID		OFF
RUN PERMISSIVE		ON
STAGES OF LOADING		1
FORWARD FANS		1
REVERSE FANS		OFF
HOT GAS BYPASS VALVE		OFF
S M T W T F S *=HOLIDAY		
SUN	START=06:00AM	STOP=11:00PM
MON	START=06:00AM	STOP=11:00PM
TUE	START=06:00AM	STOP=11:00PM
WED	START=06:00AM	STOP=11:00PM
THU	START=06:00AM	STOP=11:00PM
FRI	START=06:00AM	STOP=11:00PM
SAT	START=06:00AM	STOP=11:00PM
HOL	START=00:00AM	STOP=00:00AM

FIG. 33 – PRINTOUT

Parts

The following parts are required:

1. Weigh-Tronix IMP-24, Model 2600 printer.
2. 2.25" wide desk top calculator paper.
3. 25 ft. Twisted Pair Shielded Cable (minimum 3 conductor), #18 AWG Stranded, 300V min. insulation.
4. (1 ea.) 25-pin Cannon connector and shell. Connector: Cannon P/N DB-25P or equivalent. Shell: Cannon P/N DB-C2-J9.

Assembly and Wiring

All components should be assembled and wired as follows in Fig. 34. Strip the outside insulation back several inches and individual wires about 3/8" to connect the cable at the Micro Logic Board. Connect the shield of the cable as shown on the Micro Logic Board. Do not connect at the printer end of the cable.

Printer Configuration

2 Switches on the printer must be properly configured. Remove the paper roll to access these switches. Place the switches in the following position:

SW. 1 OFF
SW. 2 ON

Obtaining a Print-out

A print-out of current operating data may be obtained by pressing the OPER DATA key. A snapshot will be taken by the micro of current operating conditions. These conditions will be stored in memory until they can be transmitted to the printer and printed. A sample print-out is shown in Fig. 23 on page 74.

A print-out of the fault shutdown history may be obtained by pressing the HISTORY key. A print-out showing the last 3 faults with all system conditions at the time of the fault will be transmitted. A sample print-out is shown in Fig. 24 on page 75.

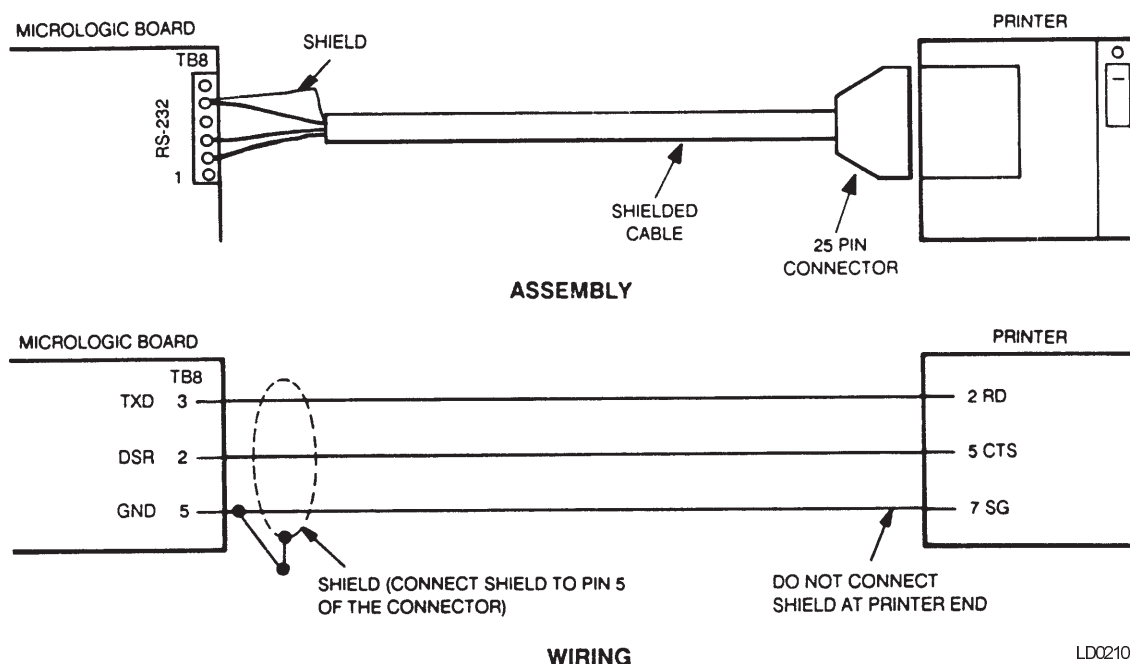


FIG. 34 – ASSEMBLY AND WIRING

An automatic print-out will be sent to the printer whenever the chiller shuts down on a fault, regardless of whether the fault causes a system or the entire chiller to lockout or whether restart is permitted. This is the same print-out that is obtained when the OPER DATA Key is pressed; however, it will be a snap-shot of system operating conditions at the instant fault occurred. Additionally, the Status indication that is noted in the print-out will note the specific fault that occurred.

Using Other Printers

Control codes vary from printer to printer. This will result in unusual formatting of printed data from many printers. In addition, "handshaking" lines and "handshaking" sequence will differ between printers. This makes the equipment susceptible to operation problems or miswiring which may cause damage to the printer or the Microprocessor Board. YORK assumes no responsibility for assistance or damage in the use of non-specified printers.

Warranty

YORK assumes no warranty responsibility in the use of the printer. This includes damages to the printer and the Microprocessor Boards or chiller operation problems which may result.

BAS INTERFACE OPTION (REMOTE RESET OPTION)

The Remote Reset Option allows resetting of the water temperature setpoint using a 0-10VDC input, a 4-20mA input, or a dry contact. The electronic circuitry in the option converts the signals mentioned above into pulse width modulated (PWM) signals which the microprocessor can understand. Whenever an offset is called for, the change may be noted by the user by pressing the REMOTE RESET TEMP/RANGE Key on the Keypad. All refresh requirements normally associated with PWM inputs will be automatically taken care of by the electronics in the option.

It is important to note that the maximum offset, when this option is installed, is 20°F. This is due to the electronic's limitation of maximum 11 sec. pulse. If a greater than 20°F offset is required, a user supplied PWM signal of up to 21 sec. is needed and the Remote Reset Option cannot be installed.

The Remote Reset Option P/N 471-01232-181 consists of a Remote Reset printed circuit board, a mounting bracket and associated wiring. Each of the 3 signal types will require individual jumpering of the printed circuit board. This will be discussed in the following text.

0-10VDC

Jumpers JU2 and JU4 must be IN. All other jumpers should be OUT. Program the REMOTE TEMP SETPOINT RANGE (page 75) for 40°F which will allow a 20°F offset with an input of 10VDC. The temperature will be offset linearly according to the voltage (0-10VDC) applied.

The 0-10VDC signal should be connected to the + and - terminals on the TB3 Terminal Block at the right of the Microprocessor Board. Be sure polarity is correct.

**CAUTION: THE 0-10VDC INPUT SIGNAL WIRING
MUST NOT BE EARTH GROUNDED!**

4-20mA

Jumpers JU3 and JU5 must be IN. All other jumpers should be OUT. Program the REMOTE TEMP SETPOINT RANGE (page 75) for 40°F which will allow a 20°F offset with an input of 20mA. There will be no offset with an input of 4mA. The temperature will be offset linearly according to the current (4-20mA) applied.

The 4-20mA input signal should be connected to the + and - terminals on the TB3 Terminal Block at the right of the Microprocessor Board. Be sure polarity is correct.

**CAUTION: THE 4-20mA INPUT SIGNAL WIRING
MUST NOT BE EARTH GROUNDED!**

Dry Contact

A dry contact may also be used to offset temperature. This allows a single offset whenever the contact is closed. The offset is determined by the adjustment of the R11 potentiometer on the Remote Reset Board. Adjust the potentiometer as needed to obtain the desired offset.

Jumper JU1 must be IN. All other jumpers must be OUT. Program the REMOTE RESET TEMP SETPOINT RANGE (page 84) for 40°F which will allow the R11 pot to be adjusted for an offset of as much as 20°F when the contact is closed.

The dry contact should be connected directly to the P1-1 (J1-1) and P1-2 (J1-2) terminals on the Remote Reset Board (Fig. 35).

NOTE: The coil of the controls used for reset must be suppressed. Use YORK PIN 031-00808-000 suppressor.

The Remote Setpoint Reset will not operate when a Remote Control Center Option is connected to the Micropanel. The Remote Control Center will always determine the setpoint.

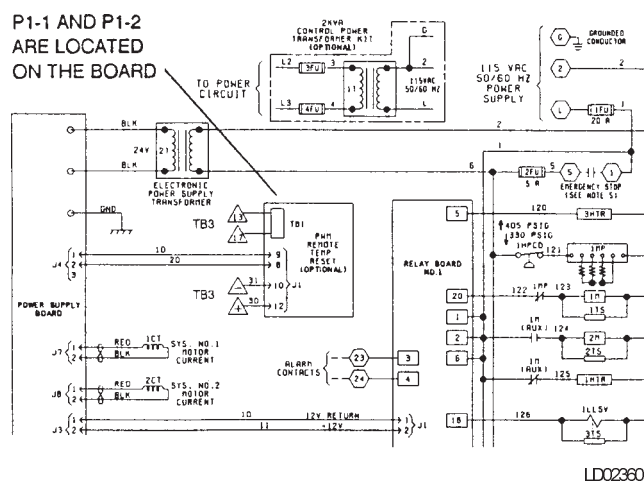


FIG. 35 – REMOTE RESET BOARD

TROUBLESHOOTING CHART

PROBLEM	CAUSE	SOLUTION
No display on panel Unit will not operate	1. No 115VAC to 2T. 2. No 24VAC to Power Supply Board. 3. 2T defective, no 24VAC output. 4. No +12V output from Power Supply Board. <i>Contact YORK Service Before Replacing Circuit Boards!</i>	1. Checking wiring and fuses (1 FU and 2 FU). Check emergency stop contacts $\triangle 5$ to $\triangle 1$. 2. Check wiring 2T to Power Supply Board. 3. Replace 2T. 4. Replace Power Supply Board or isolate excessive load on the board.
“NO RUN PERM”	1. No flow. 2. Flow switch installed improperly. 3. Defective flow switch. 4. Remote cycling device open. 5. “System” switch in the OFF position.	1. Check chilled liquid flow. 2. Check that flow switch is installed according to manufacturer's Instructions. 3. Replace flow switch. 4. Check cycling devices connected to terminals 13 & 14 of the TB3 Terminal Block. 5. Place switches to the ON position.
“MOTOR CURRENT” FAULT Motor Contactor may or may not Energize	CONTACTOR DOES NOT ENERGIZE 1. External high pressure switch tripped. 2. External motor protector tripped. 3. Defective relay output board.	1. Check external high pressure switch, cooling tower operation, and discharge pressure stored in memory. 2. Check for defective External motor protector, wiring and motor problems. Assure that motor protector is not tripped due to external high pressure switch. 3. Replace relay output board.
	CONTACTOR ENERGIZES 1. Improper system high voltage. 2. Defective contactor contacts and contactor. 3. Faulty high voltage wiring. 4. High motor current stored in memory. 5. Defective current transformer (CT). <i>Contact YORK Service Before Replacing Circuit Boards or C.T.'s!</i>	1. Check system high voltage supply. 2. Check contacts and contactor. 3. Check wiring. 4. Loose calibration resistors in J9 (SYS 1) or J10 (SYS 2) of power supply board. 5. CT resistance 42-44Ω.
“LOW OIL PRESS” FAULT	1. Low oil charge. 2. Too much refrigerant-in oil, particularly on start-up. 3. Liquid Line Solenoid Valve (LLSV) not operating. 4. Suction Press. Transducer or wiring defective. 5. Oil Press. Transducer or wiring - defective.	1. Oil level should be visible in sight glass at all times. Add YORK “C” oil if necessary. 2. Check crankcase oil heater operation. (350 Watt heater should be “ON” when unit is “OFF”. Measure heater current. (Should be min. 2 amps.) 3. Check wiring and LLSV. 4. Compare display to a gauge (SYS OFF). Replace defective component. 5. Compare suction and oil gauges to display. Replace defective component.

PROBLEM	CAUSE	SOLUTION
“Low Suction” Fault	1. Improper Suction Pressure Cut-out adjustment. 2. Low refrig. charge. 3. Fouled filter drier. 4. Thermal expansion valve adjustment/failure. 5. Reduced flow of chilled liquid through cooler. 6. Defective suction press. transducer. 7. Fouled compressor suction strainer. 8. Faulty wiring to transducer.	1. Adjust per recommended settings and restart unit. 2. Repair leak/add refrigerant. 3. Change drier core. 4. Adjust compressor suction superheat to 11°F (6.1°C) or replace power element (or valve). 5. Check GPM (See OPERATING LIMITATIONS) Check operation of pump. Clean pump strainer, purge chilled liquid system of air. 6. Compare display to gauge. Replace transducer. 7. Remove and clean strainer. 8. Check wiring.
“High Dsch” Fault Cuts out on High Discharge Pressure as sensed by Microprocessor via high discharge pressure transducer. <i>NOTE: If external H.P. Cut-out Switch opens, a “Motor Current” Fault will result.</i>	1. Cooling tower operational problems 2. Too much refrigerant. 3. Air in Refrigerant System. 4. Defective discharge pressure transducer. 5. Assure Programmable H.P. Cut-out is correctly set. 6. Assure OAT sensor is reading properly.	1. Check fans, fuses and contactors. 2. Remove refrigerant. 3. Evacuate and recharge. 4. Replace discharge pressure transducer. 5. Adjust per recommended settings and restart unit. 6. Place a thermometer next to the sensor and compare reading to the display. Operation should not suffer if thermometer is $\pm 10^{\circ}\text{F}$.

PROBLEM	CAUSE	SOLUTION																																														
“Chiller Fault: Low Water Temp” Low water temperature shutdown.	1. RWT Control ONLY: Control range is too small and does not match actual ΔT across evaporator under full load conditions. 2. Check LWT cut-out point on panel. 3. Defective LWT or RWT sensor. (Assure the sensor is properly installed in the bottom of the well with a generous amount of heat conductive compound). NOTE: It is not unusual to find up to a ±2°F difference between the display and a thermometer located in waterpiping.	1. Flow is lower than design. Increase flow or increase the control range to match actual evaporator ΔT. 2. Adjust if necessary, and restart unit. (See Page 46). 3. Check according to following table (use digital volt meter)* Replace if necessary. <table><thead><tr><th>TEMP</th><th>VOLTAGE (DC)</th></tr></thead><tbody><tr><td>20.0°F</td><td>1.65</td></tr><tr><td>22.0°F</td><td>1.71</td></tr><tr><td>25.0°F</td><td>1.82</td></tr><tr><td>27.0°F</td><td>1.88</td></tr><tr><td>30.0°F</td><td>1.99</td></tr><tr><td>33.0°F</td><td>2.09</td></tr><tr><td>36.0°F</td><td>2.22</td></tr><tr><td>38.0°F</td><td>2.28</td></tr><tr><td>41.0°F</td><td>2.37</td></tr><tr><td>43.0°F</td><td>2.43</td></tr><tr><td>46.0°F</td><td>2.54</td></tr><tr><td>48.0°F</td><td>2.60</td></tr><tr><td>50.0°F</td><td>2.67</td></tr><tr><td>53.0°F</td><td>2.77</td></tr><tr><td>55.0°F</td><td>2.83</td></tr><tr><td>57.0°F</td><td>2.89</td></tr><tr><td>59.0°F</td><td>2.95</td></tr><tr><td>61.0°F</td><td>3.02</td></tr><tr><td>63.0°F</td><td>3.08</td></tr><tr><td>65.0°F</td><td>3.14</td></tr><tr><td>67.0°F</td><td>3.20</td></tr><tr><td>70.0°F</td><td>3.28</td></tr></tbody></table> * Check voltage on Microprocessor Board. LWT: J11-7 to J11-1 RWT: J11-8 to J11-1	TEMP	VOLTAGE (DC)	20.0°F	1.65	22.0°F	1.71	25.0°F	1.82	27.0°F	1.88	30.0°F	1.99	33.0°F	2.09	36.0°F	2.22	38.0°F	2.28	41.0°F	2.37	43.0°F	2.43	46.0°F	2.54	48.0°F	2.60	50.0°F	2.67	53.0°F	2.77	55.0°F	2.83	57.0°F	2.89	59.0°F	2.95	61.0°F	3.02	63.0°F	3.08	65.0°F	3.14	67.0°F	3.20	70.0°F	3.28
TEMP	VOLTAGE (DC)																																															
20.0°F	1.65																																															
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48.0°F	2.60																																															
50.0°F	2.67																																															
53.0°F	2.77																																															
55.0°F	2.83																																															
57.0°F	2.89																																															
59.0°F	2.95																																															
61.0°F	3.02																																															
63.0°F	3.08																																															
65.0°F	3.14																																															
67.0°F	3.20																																															
70.0°F	3.28																																															
Low Compressor Oil Level (Particularly on start-up)	1. Low oil charge. 2. Excessive flood back of liquid refrigerant.	1. Oil level should be visible in either sight glass at all times. Add YORK “C” oil if necessary. 2. Adjust Thermal Expansion Valve (TXV) or replace power element. Check TXV bulb location. Should be located on suction line at least 8"-10" from nearest elbow. Bulb should be at 4 o'clock or 8 o'clock position, have good contact with suction line and be well insulated.																																														
Crankcase Heater won't Energize (Should energize anytime unit is “OFF”) (Min. current draw = 2 amps)	1. Open in 115VAC wiring to heater. 2. Defective heater. 3. Auxilliary contacts of compressor contactor defective.	1. Check wiring. 2. Replace heater. 3. Replace contactor.																																														

PROBLEM	CAUSE	SOLUTION
Compressor won't load (Solenoid valve de-energizes to load compressor)	1. Suction pressure > programmed unload point or operating limitations have been exceeded. 2. Discharge pressure > programmed load point or operating limitations have been exceeded. 3. Demand not great enough. 4. Defective loading solenoid. 5. Faulty wiring to loading solenoid. 6. Defective water temperature sensor. 7. Defective evaporator or optional discharge transducer.	1. Excessive load. Check OPERATING LIMITATIONS. Check programmed unloading point. 2. Check OPERATING LIMITATIONS. Check programmed unloading point. 3. OK. Become familiar with control operation. 4. Replace compressor loading solenoid. 5. Check wiring. 6. Compare sensor with a thermometer. Variation of sensor vs thermometer of $\pm 2^{\circ}\text{F}$ is not unusual. Replace if necessary. 7. Replace transducer after verifying with a gauge.
Lack of Cooling Effect	1. Fouled evaporator surface. 2. Faulty compressor suction and/or discharge valves.	1. Contact the local YORK service representative. 2. Contact the local YORK service representative.

TEMPERATURE CONVERSION TABLES

The numbers in bold-face type in the center column refer to the temperature, either in Centigrade or Fahrenheit, which is to be converted to the other scale. Converting Fahrenheit to Centigrade the equivalent temperature will be found in the left column. If converting Centigrade to Fahrenheit, the equivalent temperature will be found in the column on the right.

TEMPERATURE			TEMPERATURE			TEMPERATURE			TEMPERATURE		
°C	°C or °F	°F	°C	°C or °F	°F	°C	°C or °F	°F	°C	°C or °F	°F
-40.0	-40	-40.0	-6.7	+20	+68.0	+26.7	+80	+176.0	+60.0	+140	+284.0
-39.4	-39	-38.2	-6.1	+21	+69.8	+27.2	+81	+177.8	+60.6	+141	+285.8
-38.9	-38	-36.4	-5.5	+22	+71.6	+27.8	+82	+179.6	+61.1	+142	+287.6
-38.3	-37	-34.6	-5.0	+23	+73.4	+28.3	+83	+181.4	+61.7	+143	+289.4
-37.8	-36	-32.8	-4.4	+24	+75.2	+28.9	+84	+183.2	+62.2	+144	+291.2
-37.2	-35	-31.0	-3.9	+25	+77.0	+29.4	+85	+185.0	+62.8	+145	+293.0
-36.7	-34	-29.2	-3.3	+26	+78.8	+30.0	+86	+186.8	+63.3	+146	+294.8
-36.1	-33	-27.4	-2.8	+27	+80.6	+30.6	+87	+188.6	+63.9	+147	+296.6
-35.6	-32	-25.6	-2.2	+28	+82.4	+31.1	+88	+190.4	+64.4	+148	+298.4
-35.0	-31	-23.8	-1.7	+29	+84.2	+31.7	+89	+192.2	+65.0	+149	+300.2
-34.4	-30	-22.0	-1.1	+30	+86.0	+32.2	+90	+194.0	+65.6	+150	+302.0
-33.9	-29	-20.2	-0.6	+31	+87.8	+32.8	+91	+195.8	+66.1	+151	+303.8
-33.3	-28	-18.4	0.0	+32	+89.6	+33.3	+92	+197.6	+66.7	+152	+305.6
-32.8	-27	-16.6	+0.6	+33	+91.4	+33.9	+93	+199.4	+67.2	+153	+307.4
-32.2	-26	-14.8	+1.1	+34	+93.2	+34.4	+94	+201.2	+67.8	+154	+309.2
-31.7	-25	-13.0	+1.7	+35	+95.0	+35.0	+95	+203.0	+68.3	+155	+311.0
-31.1	-24	-11.2	+2.2	+36	+96.8	+35.6	+96	+204.8	+68.9	+156	+312.8
-30.6	-23	-9.4	+2.8	+37	+98.6	+36.1	+97	+206.6	+69.4	+157	+314.6
-30.0	-22	-7.6	+3.3	+38	+100.4	+36.7	+98	+208.4	+70.0	+158	+316.4
-29.4	-21	-5.8	+3.9	+39	+102.2	+37.2	+99	+210.2	+70.6	+159	+318.2
-28.9	-20	-4.0	+4.4	+40	+104.0	+37.8	+100	+212.0	+71.1	+160	+320.0
-28.3	-19	-2.2	+5.0	+41	+105.8	+38.3	+101	+213.8	+71.7	+161	+321.8
-27.8	-18	-0.4	+5.5	+42	+107.6	+38.9	+102	+215.6	+72.2	+162	+323.6
-27.2	-17	+1.4	+6.1	+43	+109.4	+39.4	+103	+217.4	+72.8	+163	+325.4
-26.7	-16	+3.2	+6.7	+44	+111.2	+40.0	+104	+219.2	+73.3	+164	+327.2
-26.1	-15	+5.0	+7.2	+45	+113.0	+40.6	+105	+221.0	+73.9	+165	+329.0
-25.6	-14	+6.8	+7.8	+46	+114.8	+41.1	+106	+222.8	+74.4	+166	+330.8
-25.0	-13	+8.6	+8.3	+47	+116.6	+41.7	+107	+224.6	+75.0	+167	+332.6
-24.4	-12	+10.4	+8.9	+48	+118.4	+42.2	+108	+226.4	+75.6	+168	+334.4
-23.9	-11	+12.2	+9.4	+49	+120.2	+42.8	+109	+228.2	+76.1	+169	+336.2
-23.3	-10	+14.0	+10.0	+50	+122.0	+43.3	+110	+230.0	+76.7	+170	+338.0
-22.8	-9	+15.8	+10.6	+51	+123.8	+43.9	+111	+231.8	+77.2	+171	+339.8
-22.2	-8	+17.6	+11.1	+52	+125.6	+44.4	+112	+233.6	+77.8	+172	+341.6
-21.7	-7	+19.4	+11.7	+53	+127.4	+45.0	+113	+235.4	+78.3	+173	+343.4
-21.1	-6	+21.2	+12.2	+54	+129.2	+45.6	+114	+237.2	+78.9	+174	+345.2
-20.6	-5	+23.0	+12.8	+55	+131.0	+46.1	+115	+239.0	+79.4	+175	+347.0
-20.0	-4	+24.8	+13.3	+56	+132.8	+46.7	+116	+240.8	+80.0	+176	+348.8
-19.4	-3	+26.6	+13.9	+57	+134.6	+47.2	+117	+242.6	+80.6	+177	+350.6
-18.9	-2	+28.4	+14.4	+58	+136.4	+47.8	+118	+244.4	+81.1	+178	+352.4
-18.3	-1	+30.2	+15.0	+59	+138.2	+48.3	+119	+246.2	+81.7	+179	+354.2
-17.8	0	+32.0	+15.6	+60	+140.0	+48.9	+120	+248.0	+82.2	+180	+356.0
-17.2	+1	+33.8	+16.1	+61	+141.8	+49.4	+121	+249.8	+82.8	+181	+357.8
-16.7	+2	+35.6	+16.7	+62	+143.6	+50.0	+122	+251.6	+83.3	+182	+359.6
-16.1	+3	+37.4	+17.2	+63	+145.4	+50.6	+123	+253.4	+83.9	+183	+361.4
-15.6	+4	+39.2	+17.8	+64	+147.2	+51.1	+124	+255.2	+84.4	+184	+363.2
-15.0	+5	+41.0	+18.3	+65	+149.0	+51.7	+125	+257.0	+85.0	+185	+365.0
-14.4	+6	+42.8	+18.9	+66	+150.8	+52.2	+126	+258.8	+85.6	+186	+366.8
-13.9	+7	+44.6	+19.4	+67	+152.6	+52.8	+127	+260.6	+86.1	+187	+368.6
-13.3	+8	+46.4	+20.0	+68	+154.4	+53.3	+128	+262.4	+86.7	+188	+370.4
-12.8	+9	+48.2	+20.6	+69	+156.2	+53.9	+129	+264.2	+87.2	+189	+372.2
-12.2	+10	+50.0	+21.1	+70	+158.0	+54.4	+130	+266.0	+87.8	+190	+374.0
-11.7	+11	+51.8	+21.7	+71	+159.8	+55.0	+131	+267.8	+88.3	+191	+375.8
-11.1	+12	+53.6	+22.2	+72	+161.6	+55.6	+132	+269.6	+88.9	+192	+377.6
-10.6	+13	+55.4	+22.8	+73	+163.4	+56.1	+133	+271.4	+89.4	+193	+379.4
-10.0	+14	+57.2	+23.3	+74	+165.2	+56.7	+134	+273.2	+90.0	+194	+381.2
-9.4	+15	+59.0	+23.9	+75	+167.0	+57.2	+135	+275.0	+90.6	+195	+383.0
-8.9	+16	+60.8	+24.4	+76	+168.8	+57.8	+136	+276.8	+91.1	+196	+384.8
-8.3	+17	+62.6	+25.0	+77	+170.6	+58.3	+137	+278.6	+91.7	+197	+386.6
-7.8	+18	+64.4	+25.6	+78	+172.4	+58.9	+138	+280.4	+92.2	+198	+388.4
-7.2	+19	+66.2	+26.1	+79	+174.2	+59.4	+139	+282.2	+92.8	+199	+390.2



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