GCS11-1853/2753 SERIES UNITS

FIGURE 1

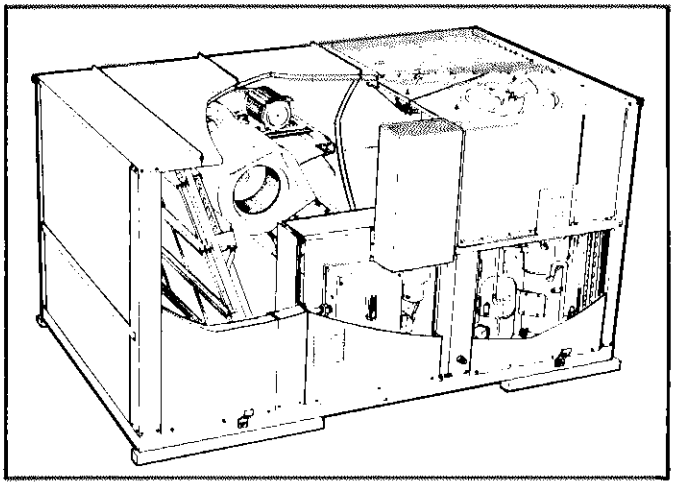

TABLE 1

Option	Model No.		Availability
	GCS11-1853	GCS11-2753	
Power Saver	PSD11-185	PSD11-275	Factory or Field Installed
Minimum Fresh Air Dampers (Manual)	OAD11-185	OAD11-275	Field Installed Only
Automatic Fresh Air Damper Kit For OAD11	99C94	99C94	Field Installed Only

TABLE 1 — CONTINUED

Option	Model No.		Availability
	GCS11-1853	GCS11-2753	
Gravity Exhaust Dampers	GED11-185	GED11-275	Field Installed Only
Power Exhaust Dampers	PED11-185	PED11-275	Field Installed Only
Roof Mounting Frame	RMF11-185	RMF11-275	Field Installed Only
Horizontal Roof Mounting Frame	RMFH11-185	RMFH11-275	Field Installed Only
Mounting Frame Adaptor to RMF3	RMFA11-185	RMFA11-185	Field Installed Only
Ceiling Supply And Return Transition	SRT11-185	SRT11-275	Field Installed Only
Ceiling Supply And Return Step-down Diffuser	RTD11-185	RTD11-275	Field Installed Only
Ceiling Supply & Return Flush Diffuser	FD11-185	FD11-275	Field Installed Only
Low Ambient Kit	91C79	91C79	Field Installed Only
Remote Status Panel	SP11	SP11	Field Installed Only
Remote Switching Status Panel	SSP11	SSP11	Field Installed Only

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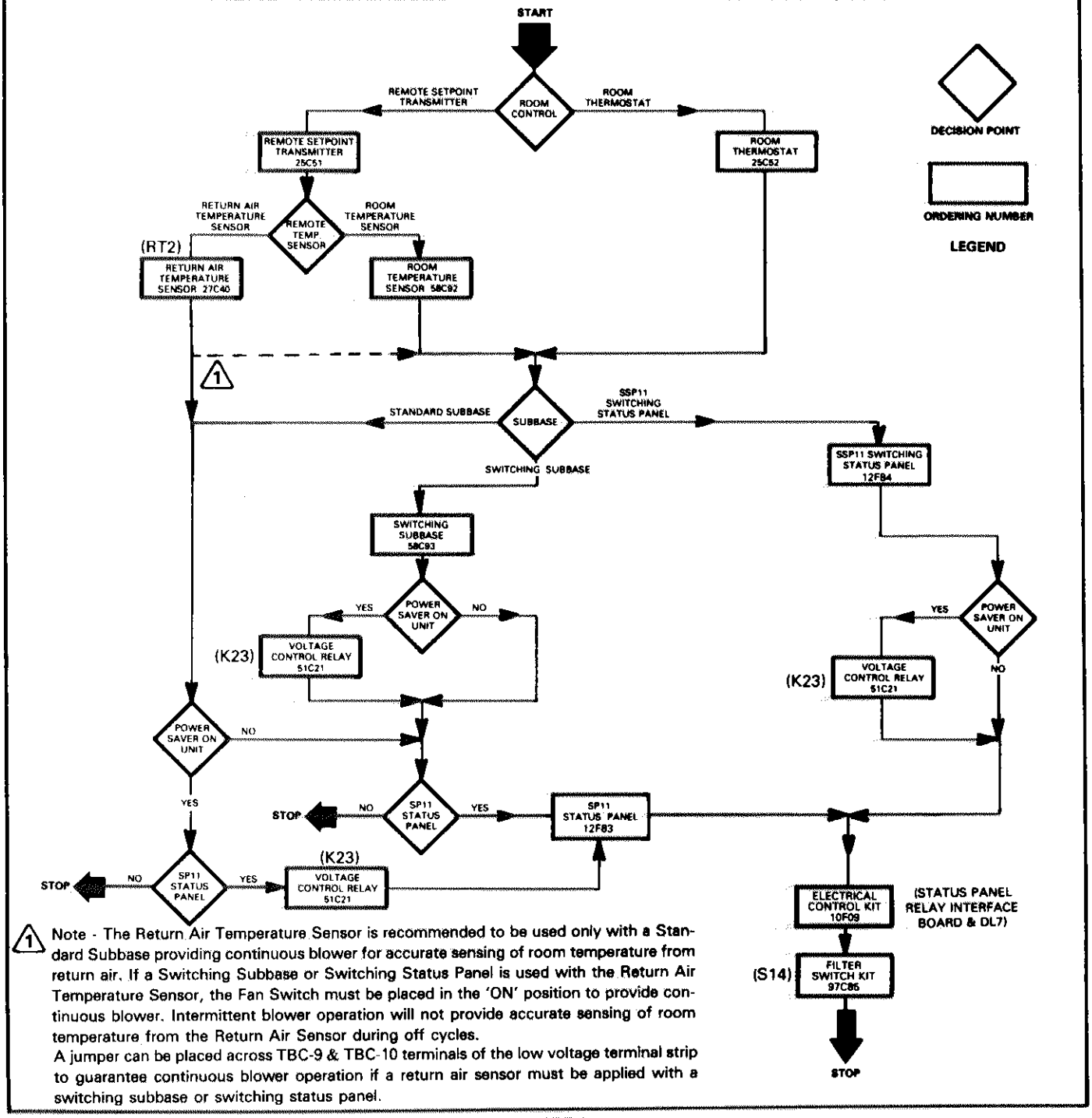
1 - INTRODUCTION

Production of the GCS11-15 and 20 ton models started in early 1982. Figure 1 shows a unit cutaway and options are given in Table 1.

Units are designed for rooftop installation with either bottom or horizontal discharge. The RMF11-185 or 275 mounting frames are used for bottom discharge applications. Horizontal discharge requires only the use of the RMF H11-185 or 275 mounting frames. The RMFA11-185 and 275 adaptor mounting frames allow unit installation on an existing RMF3 roof mounting frame in retrofit applications.

The GCS11 incorporates the "Honeywell Single Zone Solid State Control System". Figure 2 illustrates the compatible control options and lists the corresponding ordering numbers.

GCS11 CONTROL OPTION CHART FOR "HONEYWELL SINGLE ZONE SOLID STATE CONTROL SYSTEM"



1 Note - The Return Air Temperature Sensor is recommended to be used only with a Standard Subbase providing continuous blower for accurate sensing of room temperature from return air. If a Switching Subbase or Switching Status Panel is used with the Return Air Temperature Sensor, the Fan Switch must be placed in the 'ON' position to provide continuous blower. Intermittent blower operation will not provide accurate sensing of room temperature from the Return Air Sensor during off cycles.
A jumper can be placed across TBC-9 & TBC-10 terminals of the low voltage terminal strip to guarantee continuous blower operation if a return air sensor must be applied with a switching subbase or switching status panel.

FIGURE 2

II - UNIT INFORMATION

A — Specifications (-1 Series Units)

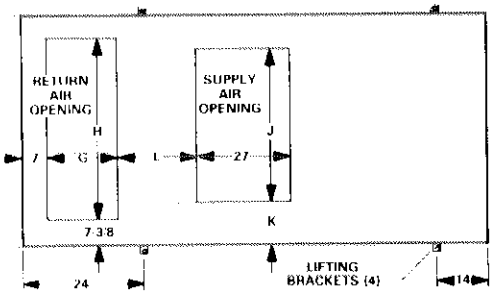
Model No.		GCS11-1853-300	GCS11-1853-400	GCS11-2753-350	GCS11-2753-450
Single Stage Heating Capacity Natural Gas Only	Btuh Input	300,000	----	350,000	----
	Btuh Output	249,000	----	290,500	----
	A.G.A. Thermal Efficiency	83%	----	83%	----
Two Stage Heating Capacity Natural & **LPG	Btuh Input (low)	----	240,000	----	270,000
	Btuh Output (low)	----	194,400	----	221,400
	Btuh Input (high)	----	400,000	----	450,000
	Btuh Output (high)	----	324,000	----	369,000
	A.G.A. Thermal Efficiency	----	81%	----	82%
*At ARI Standard 210 Test Conditions	Total cooling capacity (Btuh)	180,000		240,000	
	Total unit watts	21,820		28,800	
	†EER (Btuh/Watts)	8.2		8.3	
	Dehumidifying capacity	27%		26%	
★ARI Standard 270 SRN		23		23	
Refrigerant (22) charge		26 lbs. — 8 oz.		39 lbs. — 8 oz.	
Evaporator Blower	Blower wheel nominal diam. x width (in.)	(2) 15 x 9		(2) 15 x 15	
	Motor horsepower (minimum maximum)	3 — 5		3 — 5	
Evaporator Coil	Net face area (sq. ft.)	17.2		23.5	
	Tube diam. (in.) & No. of rows	1/2 — 3		1/2 — 3	
	Fins per inch	13		15	
Condenser Coil	Net face area (sq. ft.)	31.9 (total)		38.9	
	Tube diam. (in.) & No. of rows	(1) 3/8 — 3 & (1) 3/8 — 4		3/8 — 4	
	Fins per inch	20		20	
Condenser Fans	Diameter (in.) & No. of blades	(1) 24 — 4 and (1) 26 — 5		(2) 26 — 5	
	Air volume (cfm) (factory setting)	(1) 4400 and (1) 6700		(2) 7000	
	Motor horsepower	(1) 1/2 and (1) 1		(2) 1	
	Motor watts (factory setting)	(1) 550 and (1) 1100		(2) 1100	
Gas Supply Connection fpt (in.)	Natural	3/4		3/4	1
	**LPG	3/4		----	1
Recommended Gas Supply Pressure (wc. in.)	Natural	7		7	
	**LPG	11		11	
Condensate drain size mpt (in.)		(2) 1-1/4 & (2) 3/8		(2) 1-1/4 & (2) 3/8	
No. & size of filters (in.)		(9) 16 x 20 x 1		(11) 16 x 20 x 1	
Net weight of basic unit (lbs.) (1 Package)		2500		3100	

B — Electrical Data (-1 Series Units)

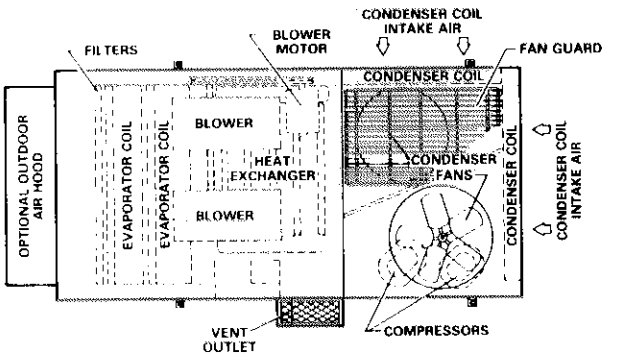
Model No.		GCS11-1853						GCS11-2753					
Line voltage data — 60 Hz — 3 phase		200V		230V		460V		200V		230V		460V	
Compressors (2)	Rated load amps (total)	54		54		26.8		72		72		35.6	
	Locked rotor amps (total)	387.0		387.0		198.0		466.0		466.0		232.0	
Condenser Fan Motors (2)	Full load amps (total)	9.4		8.2		4.2		12.8		10.4		5.6	
	Locked rotor amps (total)	21.2		20.2		9.8		30.0		28.0		13.2	
Evaporator Blower Motor	Horsepower	3	5	3	5	3	5	3	5	3	5	3	5
	Full load amps (total)	11.4	16.2	10.0	14.6	5.0	7.3	11.4	16.2	10.0	14.6	5.0	7.3
	Locked rotor amps (total)	65	100	56	90	28	45	65.0	100	56	90	28	45
Optional Exhaust Fan Motors	(No.) Horsepower	(2) — 1/4		(2) — 1/4		(2) — 1/4		(3) — 1/4		(3) — 1/4		(3) — 1/4	
	Full load amps (total)	2.8		2.8		1.42		4.20		4.20		2.13	
	Locked rotor amps (total)	6.50		6.50		2.60		9.75		9.75		3.90	
Recommended Max. Fuse Size (Amps)	Less Exhaust Fans	110	125	110	110	50	60	125	125	125	125	60	70
	With Exhaust Fans	110	125	110	110	60	60	125	150	125	125	70	70
Unit Power Factor	Less Exhaust Fans	.87	.87	.87	.87	.87	.87	.88	.88	.88	.88	.88	.88
	With Exhaust Fans	.88	.88	.88	.88	.88	.88	.89	.89	.89	.89	.89	.89
Minimum Circuit Ampacity	Less Exhaust Fans	83.8	88.6	81.2	85.8	40.5	42.8	105.2	110	101.4	106	50.6	53
	With Exhaust Fans	86.6	91.4	84.0	88.6	41.9	43.9	109.4	114.2	105.6	110.2	52.8	55.1

*Refer to National Electric Code manual to determine wire, fuse and disconnect size requirements.
NOTE — Extremes of operating range are plus and minus 10% of line voltage.

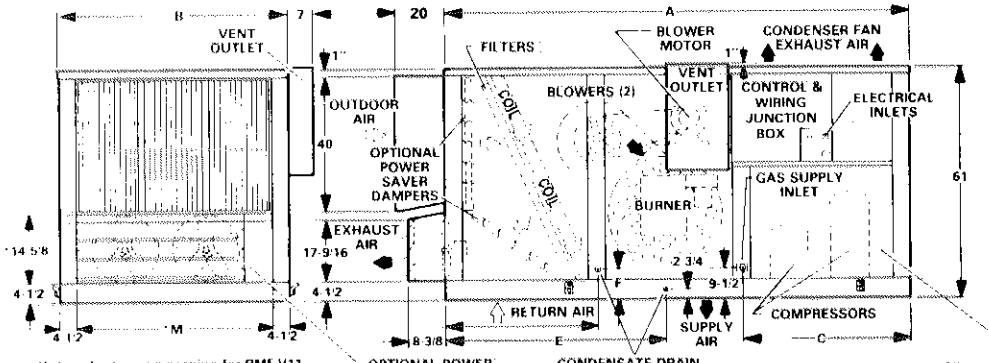
C - Dimensions



TOP VIEW BASE SECTION



TOP VIEW



*Optional return air opening for RMF H11 over/under end duct connection.

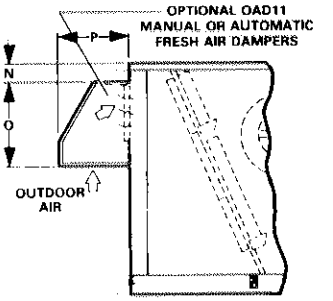
OPTIONAL POWER EXHAUST DAMPERS (GCS11 2753 has 3 exhaust fans.)

CONDENSATE DRAIN (Both Sides)

NOTE Route Electrical Lines to Allow Adequate Clearance For Removal of Condensing Section Access Panel.

EXHAUST & OUTDOOR AIR INTAKE VIEW

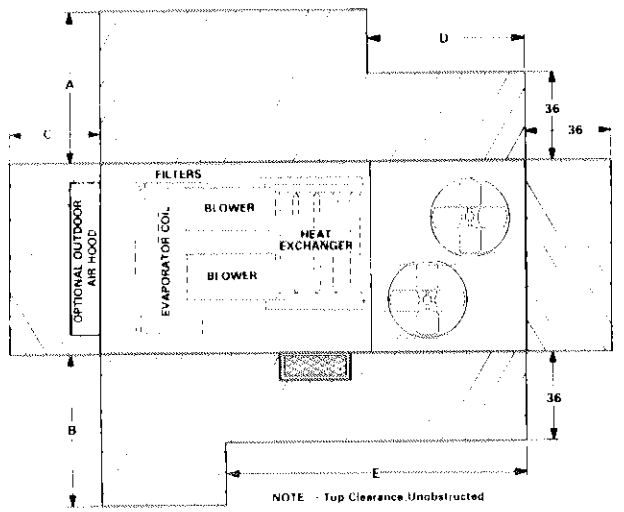
FRONT VIEW



FRONT VIEW WITH OPTIONAL FRESH AIR DAMPERS

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P
GCS11 1853	116-1/2	68	42-1/4	32 7/8	54-1/8	8 5/16	18	53 5/8	47	10-1/2	19 1/4	58-3/4	1-5/8	27-1/2	22-1/4
GCS11 2753	142	78	61-7/8	41	60-1/16	2 3/4	22-1/2	63-5/8	53	12-1/2	20-3/4	68-3/4	7-3/8	33-1/4	24-1/4

D - Installation Clearances



Model No.	A	B	C	D	E
GCS11-1853	68	68	42	44	84
GCS11-2753	78	78	42	62	102

Note - Top Clearances Unobstructed

E - Burner Ratings

BURNER MODEL	GAS TYPE	ALTITUDE	AGA				CGA			
			INPUT (BTUH)		OUTPUT (BTUH)		INPUT (BTUH)		OUTPUT (BTUH)	
PG3-300	Natural	----	300,000		249,000		----		----	
PG3-350	Natural	0-2000	350,000		290,500		350,000		294,000	
		2000-4500	----		----		315,000		264,600	
			MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.
†PG3-400/240	Natural or L.P.	0-2000	400,000	240,000	324,000	----	400,000	220,000	328,000	----
		2000-4500	----	----	----	----	360,000	220,000	295,200	----
†PG3-450/270	Natural or L.P.	0-2000	450,000	270,000	369,000	----	450,000	270,000	369,000	----
		2000-4500	----	----	----	----	405,000	270,000	332,100	----

†2 Stage Burner

F - Blower Performance

GCS11-1853 BLOWER PERFORMANCE

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT — (Inches Water Gauge)																			
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5800	580	1.65	620	1.80	660	2.05	690	2.25	730	2.45	760	2.65	790	2.90	820	3.10	840	3.30	860	3.50
6000	590	1.75	635	2.00	675	2.20	710	2.45	745	2.65	775	2.85	805	3.10	830	3.30	855	3.60	875	3.80
6200	610	1.85	650	2.10	690	2.40	730	2.65	760	2.85	790	3.10	820	3.30	840	3.50	870	3.90	890	4.10
6400	630	2.05	665	2.30	705	2.60	745	2.85	775	3.10	805	3.35	835	3.60	855	3.80	885	4.20	910	4.40
6600	650	2.30	680	2.50	720	2.80	760	3.10	790	3.35	820	3.60	850	3.90	870	4.10	900	4.50	930	4.75
6800	670	2.55	700	2.75	740	3.05	775	3.35	805	3.60	835	3.85	865	4.25	885	4.40	920	4.80	950	5.25
7000	690	2.80	720	3.00	760	3.35	795	3.60	820	3.85	850	4.15	880	4.60	900	4.90	940	5.30	970	5.75
7200	710	3.00	740	3.25	780	3.60	810	3.90	835	4.10	865	4.50	895	4.90	925	5.20	960	5.70	----	
7400	730	3.20	760	3.50	800	3.90	830	4.25	850	4.40	880	4.85	910	5.20	950	5.70			----	

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT — (Inches Water Gauge)																			
	1.00		1.10		1.20		1.30		1.40		1.50									
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP								
5800	880	3.75	910	4.05	950	4.50	970	4.90	1000	5.30	1020	5.70								
6000	900	4.10	930	4.45	965	4.90	990	5.35	1020	5.75	----									
6200	920	4.45	950	4.85	980	5.30	1010	5.70	----		----									
6400	940	4.85	970	5.30	1000	5.70	----		----		----									
6600	960	5.30	990	5.75	----		----		----		----									
6800	975	5.75	----		----		----		----		----									
7000	----		----		----		----		----		----									
7200	----		----		----		----		----		----									
7400	----		----		----		----		----		----									

NOTE All Cfm data is measured external to the unit with the air filters in place.

GCS11-2753 BLOWER PERFORMANCE

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT — (Inches Water Gauge)																			
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7600	530	1.70	575	1.95	620	2.30	670	2.65	700	2.90	730	3.10	760	3.30	790	3.50	820	3.70	850	3.95
7800	540	1.80	590	2.10	635	2.40	680	2.85	710	3.05	740	3.25	770	3.45	800	3.65	830	3.85	860	4.15
8000	555	1.95	600	2.25	650	2.65	690	3.00	720	3.20	750	3.40	780	3.60	810	3.80	840	4.00	870	4.35
8200	570	2.10	615	2.40	665	2.85	700	3.15	730	3.35	760	3.55	790	3.75	820	3.95	850	4.20	880	4.60
8400	580	2.20	630	2.60	675	3.00	710	3.30	740	3.50	770	3.70	800	3.90	830	4.10	860	4.40	890	4.80
8600	595	2.30	645	2.80	690	3.25	720	3.45	750	3.65	780	3.85	810	4.05	840	4.25	870	4.55	900	4.95
8800	610	2.60	660	3.10	700	3.40	730	3.60	760	3.80	790	4.00	820	4.20	850	4.40	880	4.70	910	5.20
9000	630	2.85	675	3.25	710	3.60	740	3.75	770	4.00	800	4.20	830	4.40	860	4.60	890	5.00	920	5.40
9200	645	3.05	690	3.50	720	3.75	750	3.95	780	4.15	810	4.40	840	4.55	870	4.80	900	5.30	930	5.60
9400	665	3.35	700	3.70	730	3.90	760	4.10	790	4.35	820	4.60	850	4.70	880	5.00	910	5.50	----	
9600	680	3.60	710	3.85	740	4.05	770	4.25	800	4.50	830	4.75	860	4.90	890	5.25	920	5.75	----	
9800	690	3.75	720	4.00	750	4.25	780	4.45	810	4.65	840	4.90	870	5.10	900	5.50	----		----	
10,000	700	3.95	730	4.20	760	4.45	790	4.65	825	4.90	850	5.10	880	5.30	910	5.75	----		----	

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT — (Inches Water Gauge)																			
	1.00		1.10		1.20		1.30		1.40		1.50									
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP								
7600	870	4.15	900	4.50	930	4.80	960	5.00	990	5.15	1020	5.30								
7800	880	4.40	910	4.70	940	5.05	970	5.15	1000	5.35	1030	5.50								
8000	890	4.55	920	4.90	950	5.25	980	5.35	1010	5.55	1040	5.75								
8200	900	4.75	930	5.10	960	5.35	990	5.55	1020	5.75	----									
8400	910	5.00	940	5.35	970	5.55	1000	5.75	----		----									
8600	920	5.20	950	5.55	980	5.75	----		----		----									
8800	930	5.45	960	5.75	----		----		----		----									
9000	940	5.70	----		----		----		----		----									
9200	----		----		----		----		----		----									
9400	----		----		----		----		----		----									
9600	----		----		----		----		----		----									
9800	----		----		----		----		----		----									
10,000	----		----		----		----		----		----									

NOTE All Cfm data is measured external to the unit with the air filters in place.

G - Power Exhaust Fans Performance

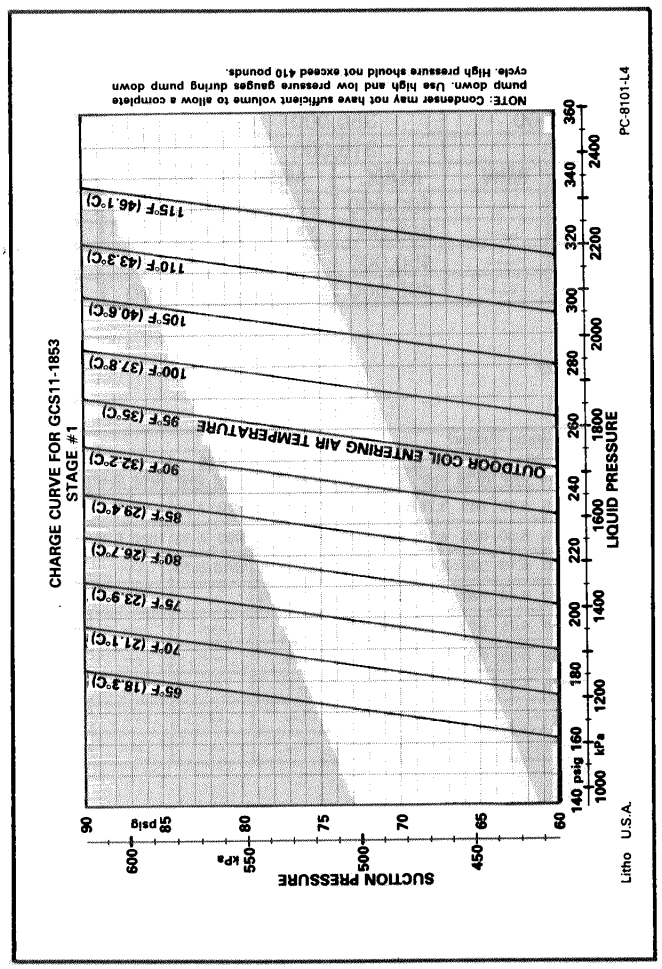
GCS11-1853

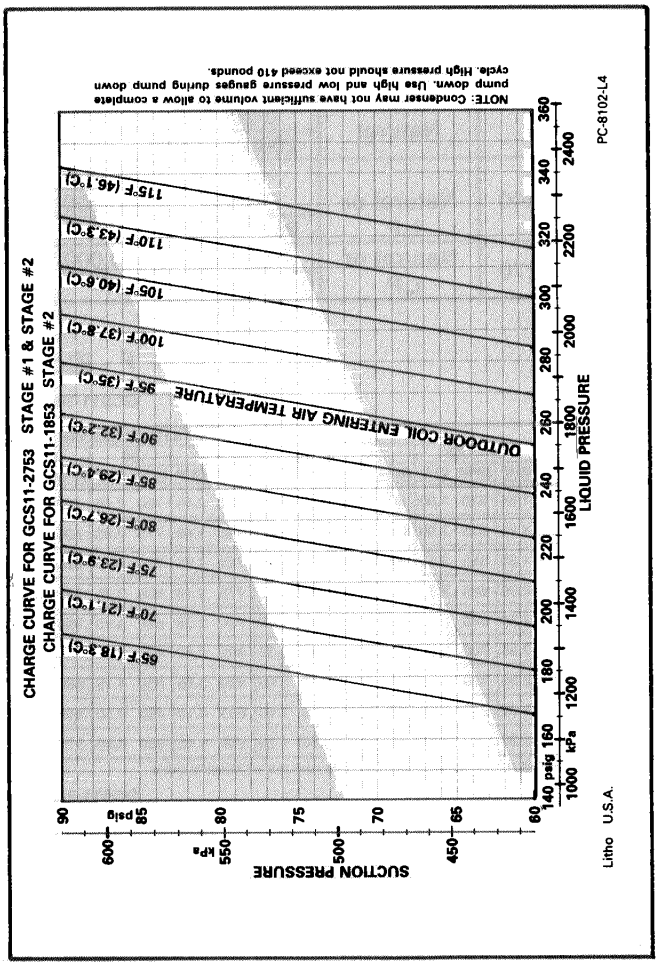
Air Volume (Cfm Exhausted)	Return Air System Static Pressure (Inches Water Gauge)
5050	0
4750	.05
4400	.10
4100	.15
3750	.20
3450	.25

GCS11-2753

Air Volume (Cfm Exhausted)	Return Air System Static Pressure (Inches Water Gauge)
7050	0
6550	.05
6100	.10
5600	.15
5100	.20
4600	.25

H - Pressure Curves

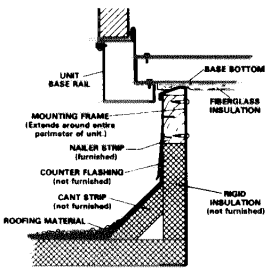


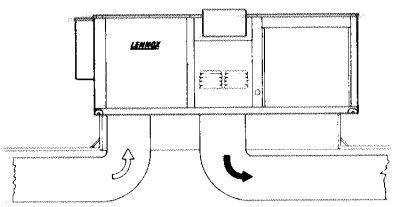


I - RMF11 Roof Mounting Frame

RMF11 ROOF MOUNTING FRAME WITH DOUBLE DUCT OPENING

TYPICAL FLASHING DETAIL FOR RMF 11 ROOF MOUNTING FRAME

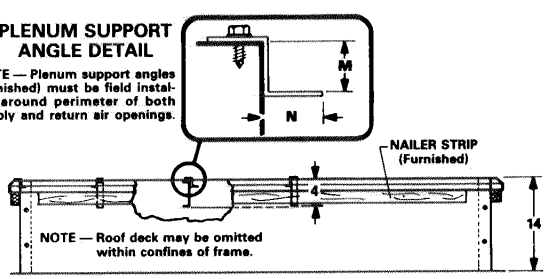


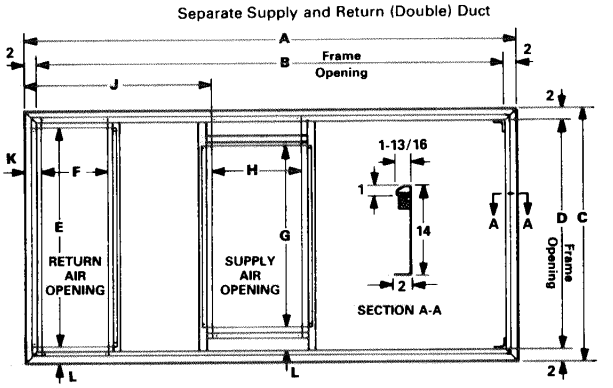


Separate Supply and Return (Double) Duct

PLENUM SUPPORT ANGLE DETAIL

NOTE — Plenum support angles (furnished) must be field installed around perimeter of both supply and return air openings.

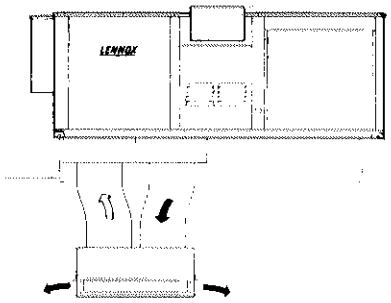




Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N
RMF11-185	108-1/8	104-1/8	59-5/8	55-5/8	54-1/4	18-5/8	47-5/8	27-5/8	40-3/8	2-11/16	4	5/8	11/16
RMF11-275	133-11/16	129-11/16	69-5/8	65-5/8	64-1/4	23-1/8	53-5/8	27-5/8	45-3/4	2-11/16	6	5/8	11/16

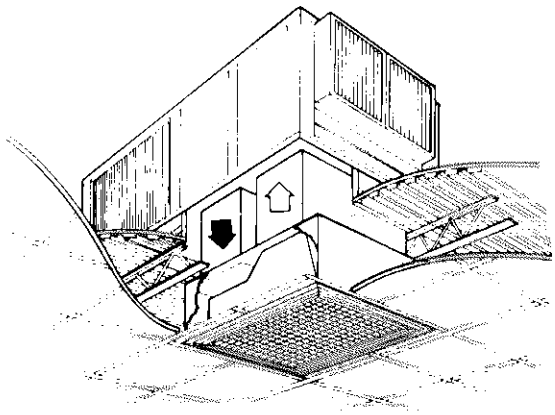
J - RMF 11 With Combination Ceiling Supply And Return

STEP DOWN DIFFUSER

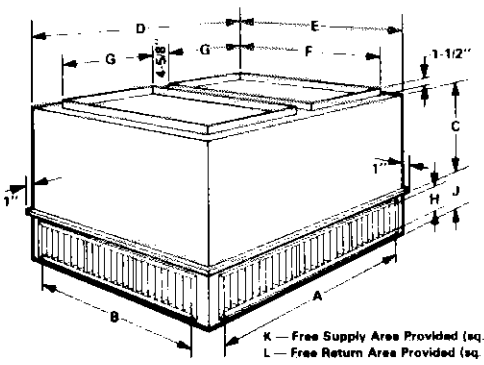


Combination Supply and Return Air Ceiling Diffuser
Stepdown or Flush Grille

FLUSH DIFFUSER

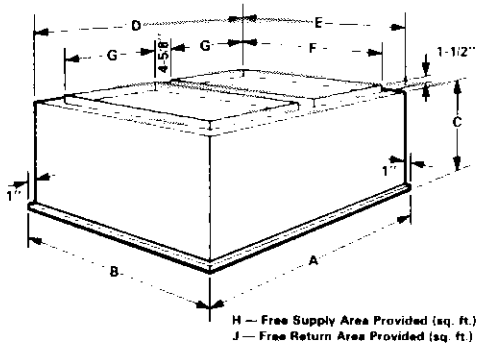


RTD11-185 & RTD11-275
STEP-DOWN CEILING DIFFUSER



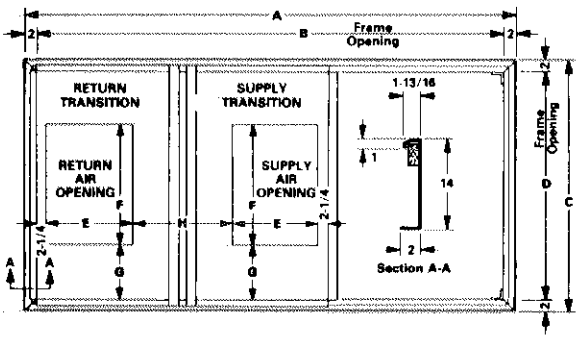
Model No.	A	B	C	D	E	F	G	H	J	K	L
RTD11-185	44	44	26-1/8	45-5/8	45-5/8	36	18	6	7-3/4	6.01	12.35
RTD11-275	55	55	31-1/2	57-5/8	57-5/8	48	24	7	8-7/8	8.77	19.04

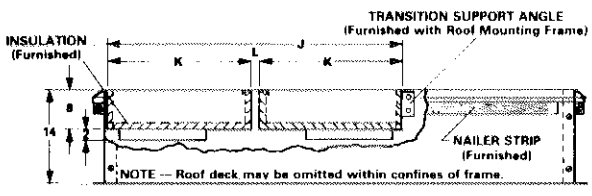
FD11-185 & FD11-275
FLUSH CEILING DIFFUSER



Model No.	A	B	C	D	E	F	G	H	J
FD11-185	47-5/8	47-5/8	30	45-5/8	45-5/8	36	18	4.35	6.63
FD11-275	59-5/8	59-5/8	36	57-5/8	57-5/8	48	24	5.45	12.57

RMF 11 ROOF MOUNTING FRAME WITH FD11 & RTD11-185 & 275 CEILING SUPPLY AND RETURN TRANSITIONS

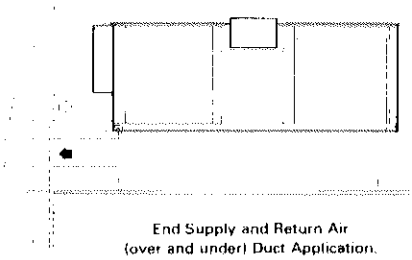




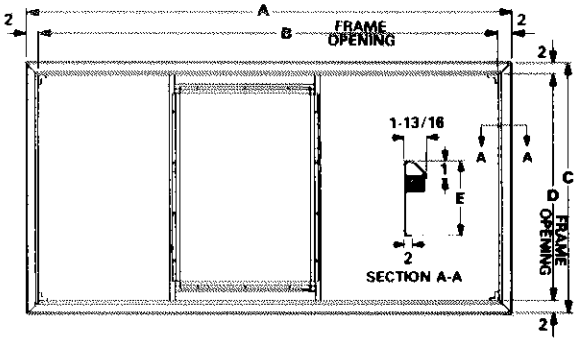
Model No.	A	B	C	D	E	F	G	H	J	K	L
RMF11-185	108-1/8	104-1/8	59-5/8	55-5/8	18	36	9-13/16	25-3/4	66-1/4	32-7/8	1/2
RMF11-275	133-11/16	129-11/16	69-5/8	65-5/8	24	48	8-13/16	19-3/4	72-1/4	35-7/8	1/2

K - RMFH11 Horizontal Mounting Frame

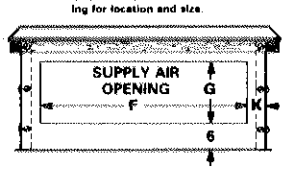
RMF H11 HORIZONTAL MOUNTING FRAME

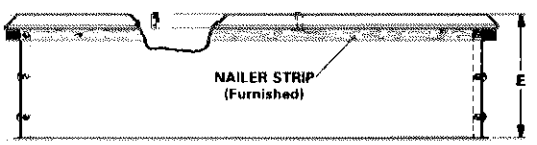


End Supply and Return Air
(over and under) Duct Application.



NOTE - Return air duct connection is to unit. Refer to unit dimension drawing for location and size.

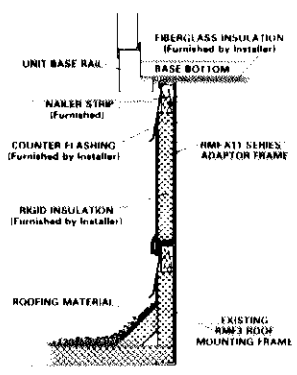




Model No.	A	B	C	D	E	F	G	K
RMFH11-185	108-1/8	104-1/8	59-5/8	55-5/8	30	48	17	3-13/16
RMFH11-275	133-11/16	129-11/16	69-5/8	65-5/8	30	58	17	3-13/16

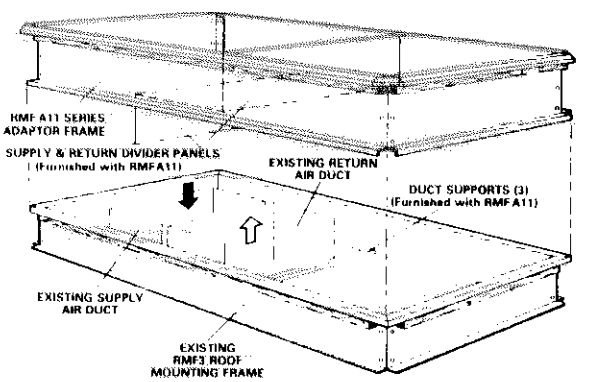
L - RMFA11 Adaptor Mounting Frame

TYPICAL FLASHING DETAIL FOR RMFA11 AND RMF3 ROOF MOUNTING FRAME

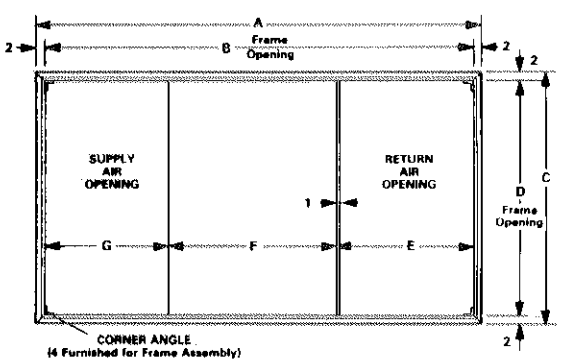


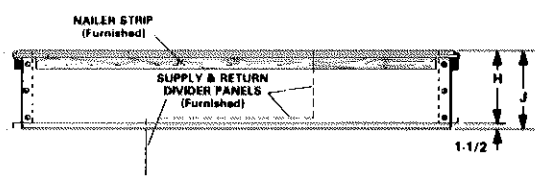
NOTE — RMF 11-953 frame shown. Other sizes similar.

RMFA11 ROOF MOUNTING FRAME WITH RMF3 ROOF MOUNTING FRAME



RMFA11 ADAPTOR MOUNTING FRAME





Model No.	A	B	C	D	E	F	G	H	J
RMFA11-185	108-1/8	104-1/8	59-5/8	55-5/8	36	34-5/8	32-1/2	18	19-1/2
RMFA11-275	133-11/16	129-11/16	69-5/8	65-5/8	42-3/8	44-9/16	32-1/2	22	23-1/2

M - Power Supply Wiring

The power supply entrance panel is located on the front of the unit above the compressor compartment. Power supply wiring enters through the large conduit knockout. Refer to the GCS11 dimension drawing. The unit rating plate lists the minimum circuit ampacity and maximum fuse size. Use copper conductors only. Power supply is connected to high voltage terminal block (TB-B) in main control box, Figure 3.

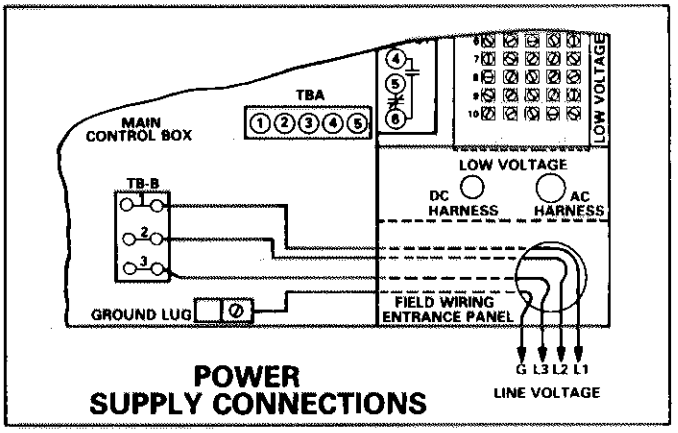


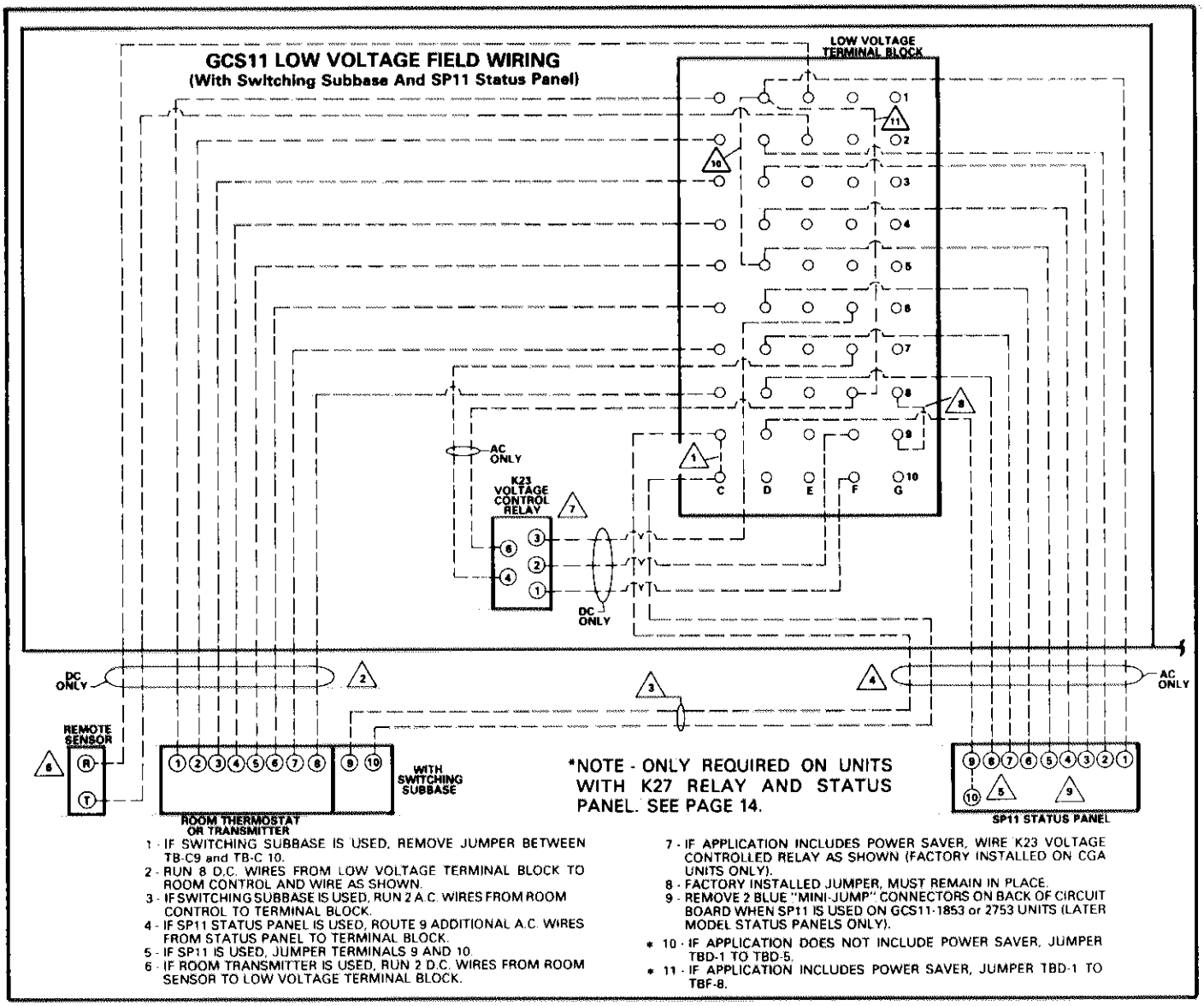
FIGURE 3

N - Low Voltage Field Wiring

1 - Low voltage connections are made at the terminal block (TB-C) located in the low voltage junction box.

2 - If switching subbase or switching status panel is used, remove jumper between TBC-9 and TBC-10.

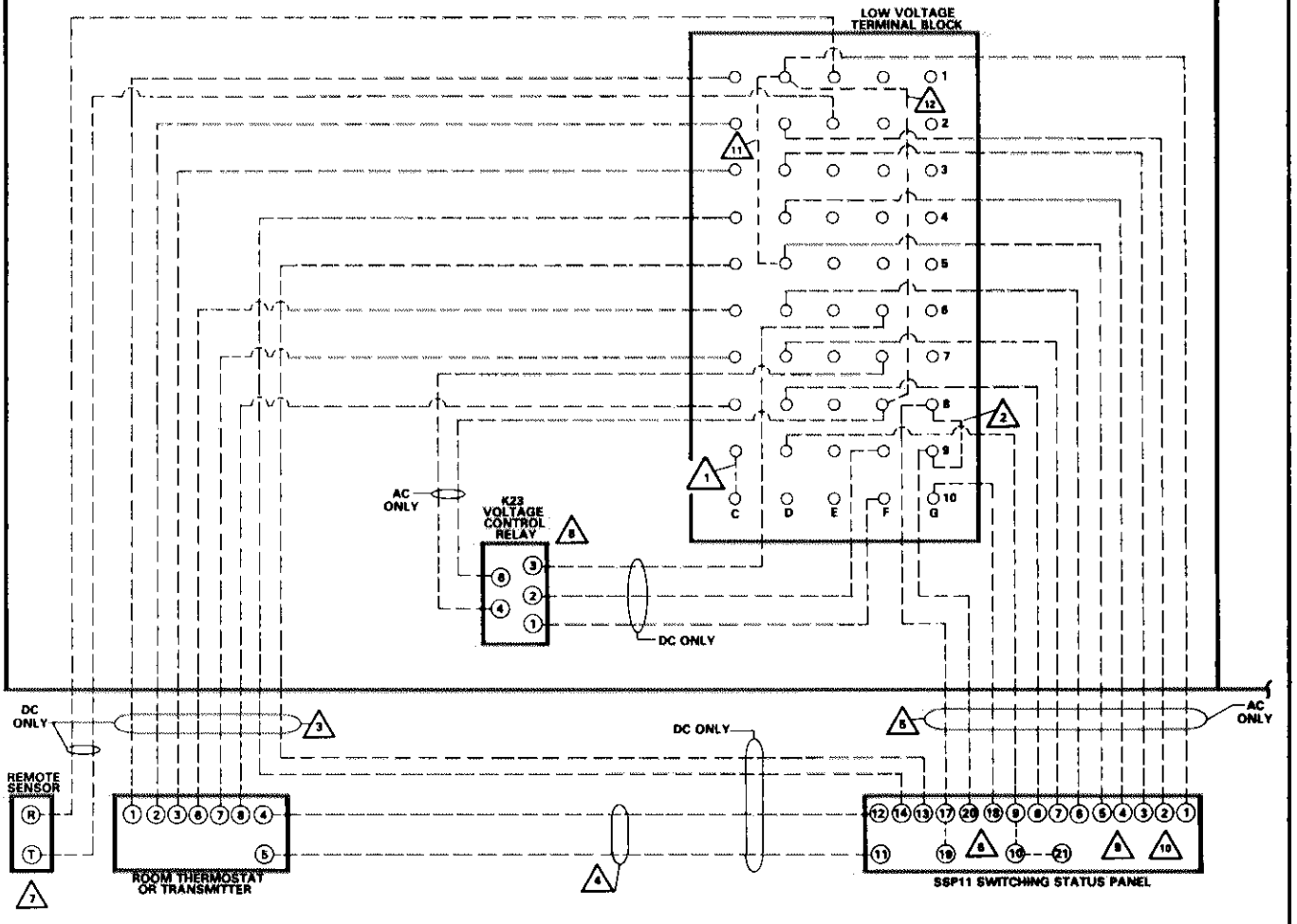
3 - Figure 4 illustrates field wiring for room thermostat or transmitter, switching subbase and status panel. Figure 5 illustrates field wiring for room thermostat or transmitter and switching status panel. Separate knockouts are provided for entrance to the unit of low voltage AC and DC wiring. DO NOT route DC wires in the same conduit or raceway as AC wires. AC will interfere with DC ramp signals.



1 - IF SWITCHING SUBBASE IS USED, REMOVE JUMPER BETWEEN TB-C9 and TB-C 10.
2 - RUN 8 D.C. WIRES FROM LOW VOLTAGE TERMINAL BLOCK TO ROOM CONTROL AND WIRE AS SHOWN.
3 - IF SWITCHING SUBBASE IS USED, RUN 2 A.C. WIRES FROM ROOM CONTROL TO TERMINAL BLOCK.
4 - IF SP11 STATUS PANEL IS USED, ROUTE 9 ADDITIONAL A.C. WIRES FROM STATUS PANEL TO TERMINAL BLOCK.
5 - IF SP11 IS USED, JUMPER TERMINALS 9 AND 10.
6 - IF ROOM TRANSMITTER IS USED, RUN 2 D.C. WIRES FROM ROOM SENSOR TO LOW VOLTAGE TERMINAL BLOCK.
7 - IF APPLICATION INCLUDES POWER SAVER, WIRE K23 VOLTAGE CONTROLLED RELAY AS SHOWN (FACTORY INSTALLED ON CGA UNITS ONLY).
8 - FACTORY INSTALLED JUMPER, MUST REMAIN IN PLACE.
9 - REMOVE 2 BLUE "MINI-JUMP" CONNECTORS ON BACK OF CIRCUIT BOARD WHEN SP11 IS USED ON GCS11-1853 or 2753 UNITS (LATER MODEL STATUS PANELS ONLY).
* 10 - IF APPLICATION DOES NOT INCLUDE POWER SAVER, JUMPER TBD-1 TO TBD-5.
* 11 - IF APPLICATION INCLUDES POWER SAVER, JUMPER TBD-1 TO TBF-8.

FIGURE 4

GCS11 LOW VOLTAGE FIELD WIRING
(With SSP11 Switching Status Panel)



1 - REMOVE JUMPER BETWEEN TB-C9 AND TB-C10.
2 - REMOVE JUMPER BETWEEN TB-G 8 AND TB-G9.
3 - RUN 8 D.C. WIRES FROM LOW VOLTAGE TERMINAL BLOCK TO ROOM CONTROL. CONNECT 6 WIRES TO ROOM CONTROL AND ROUTE 2 WIRES TO SSP11 SWITCHING STATUS PANEL.
4 - RUN 2 ADDITIONAL WIRES BETWEEN ROOM CONTROL AND SSP11.
5 - RUN 12 A.C. WIRES SSP11 TO TERMINAL BLOCK.
6 - JUMPER TERMINALS AT SSP11 AS SHOWN.
7 IF ROOM TRANSMITTER IS USED, RUN 2 D.C. WIRES FROM REMOTE SENSOR TO LOW VOLTAGE TERMINAL BLOCK.
8 - IF APPLICATION INCLUDES POWER SAVER, WIRE K23 VOLTAGE CONTROLLED RELAY AS SHOWN (FACTORY INSTALLED ON CGA UNITS ONLY).
9 - REMOVE INTERNAL YELLOW JUMPER WIRE (CUT OUT).
10 - REMOVE 2 BLUE "MINI-JUMP" CONNECTORS ON BACK OF LED CIRCUIT BOARD WHEN SSP11 IS USED ON GCS11-1853 OR 2753 UNITS (REQUIRED ON LATER MODEL STATUS PANELS ONLY).
* 11 - IF APPLICATION DOES NOT INCLUDE POWER SAVER, JUMPER TBD-1 TO TBD-5.
* 12 - IF APPLICATION INCLUDES POWER SAVER, JUMPER TBD-1 TO TBF-8.

*NOTE - ONLY REQUIRED ON UNITS WITH K27 RELAY AND STATUS PANEL. SEE PAGE 14.

FIGURE 5

III - GCS11 COMPONENTS

Table 2 on Pages 11 through 15 list the GCS11-1853 & 2753 electrical components by their key numbers and then gives a brief description and general location. Figure 6 illustrates these general locations.

Table 2 also lists control setpoints (if applicable). Key number labels are mounted next to each component for identification. Both the unit schematic diagram and the repair parts listing, key the components.

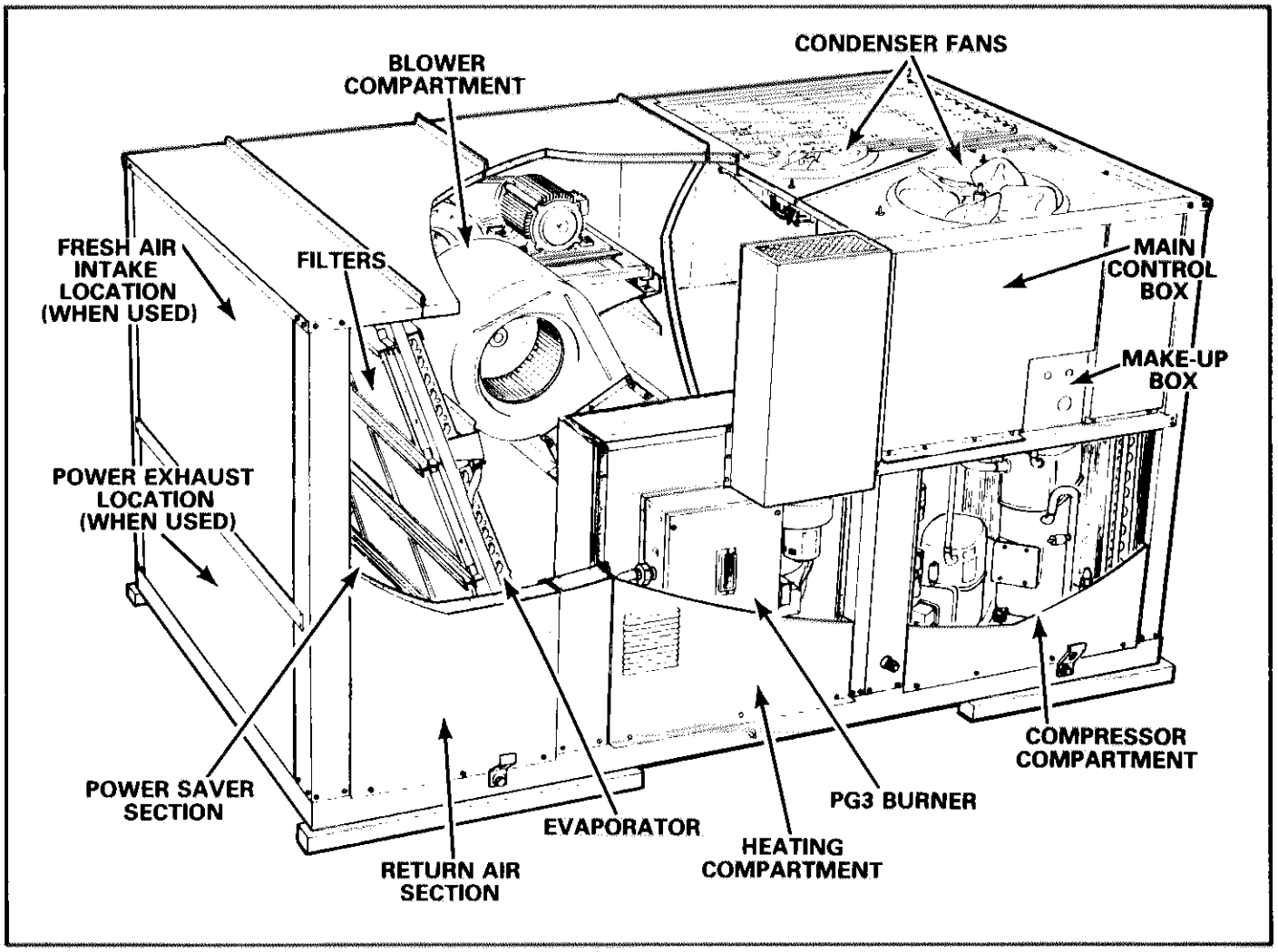


FIGURE 6

TABLE 2

COMPONENT	DESCRIPTION AND FUNCTION	LOCATION	SETTING
A1	Logic Panel — Receives the signal from room thermostat and balances this against the system output as determined by the discharge sensor; then initiates the heating or cooling modes as needed. Also modulates power saver closed with discharge temperatures between 62° and 50°F.	Main Control Box	----
A2	Primary Control — On a heating demand, as verified by the combustion air switch, A2 simultaneously energizes gas valve and provides ignition spark. If flame is not established, control locks out.	Main Control Box	----
A3	Room Thermostat or Transmitter — Generates heating and cooling ramp signals based on the temperature deviation from the dual setpoint adjustments and a thermistor. Thermistor is internal to thermostat and remote to transmitter.	Remote	Adj. 55° — 85°
B1 (1853)	Compressor No. 1, nominal 5 ton — Initiates DX cooling.	Compressor Compartment	----
B1 (2753)	Compressor No. 1, nominal 10 ton — Initiates DX cooling.	Compressor Compartment	----
B2	Compressor No. 2, nominal 10 ton — 2nd Stage DX cooling.	Compressor Compartment	----

TABLE 2 — CONTINUED

COMPONENT	DESCRIPTION AND FUNCTION	LOCATION	SETTING
B3	Indoor Blower Motor — Provides air supply through unit.	Blower Compartment	----
B4 & B5	Condenser Fan No. 1 & No. 2 — Draws air across outdoor coil for heat transfer in the refrigeration cycle.	Compressor Compartment	----
B6	Power Saver Motor — Used with the power saver option. Modulates outdoor dampers and return air dampers.	Return Air Section	---- ----
B6	Outdoor Air Damper Motor — Used with motorized outdoor air damper option to open or close outdoor dampers.	Fresh Air Intake	----
B8	Combustion Air Motor — Provides combustion air to the power burner.	PG3 Burner	----
B9, B10 & B11	Exhaust Fan Motors — Used with power exhaust option. 1853 units use B9 & B10; 2753 units use B9, B10 & B11.	Return Air Section	----
C1	Capacitors (2) — Condenser fans.	Compressor Compartment	----
C3, C4 & C5	Capacitors — Power exhaust fans.	Return Air Section	----
CB-1	Circuit Breaker — Located in 24VAC circuit to A1 Logic Panel. Protects panel from current surges.	Make-up Box	----
CMC1	Clock Timer — Used for night setback option. 24 hour skip-a-day clock programs daily schedule. Any day or days can be omitted.	Remote	----
CR	Diode — Light Emitting; status panel operating mode indicators.	Status Panel	----
DL1	Blower Delay Relay — On a heating demand following DL2 prepurge, DL1 energizes K3 limit blower relay to start blower motor during periods of intermittent operation. DL1 is an electronic time delay relay.	Main Control Box	30 Sec. On Time; 240 Sec. Off between on cycles.
DL2	Purge Delay Relay — DL2 is energized on a heating demand through its N.C. contacts. The "on time" delay permits a purge period to vent out combustion chamber before an ignition attempt is made. Not used on FM/IRI units. DL2 is a thermal time delay relay on A.G.A. units and an electronic time delay relay on C.G.A. units.	Main Control Box	A.G.A. UNITS: 20-70 Sec. On Time 20-80 Sec. Off Time C.G.A. UNITS: 45 Sec. On Time 0 Sec. Off Time
DL4	Low Ambient Time Delay — Used with low ambient option. N.C. contacts with K14 contacts bypass the low pressure switch (S9-2753 units or S10-1853 units) to allow compressor startup under low ambient conditions.	Low Ambient Kit Compressor Compartment	30 Sec.
DL5 (1853)	Time Delay — Compressor No. 1. Allows compressor to start immediately on demand and locks out compressor for 2 minutes following demand off cycle or intermittent power failure. DL5 is an electronic time delay.	Main Control Box	Open for 2 min. following any off cycle
DL5 (2753) & DL6 (1853 & 2753)	Solid State Compressor Motor Protector — Opens compressor control circuit to de-energize compressor if winding temperatures exceed preset limits as indicated by sensors buried in motor windings or discharge temp. exceeds preset limits.	Main Control Box	----
DL7	No Heat Delay Relay — This solid state delay provides a 180 second time period at the beginning of a heating cycle before the "no heat" circuit to status panel is energized, through K20, DL7 and K21-1.	Main Control Box	180 Sec.
F1	Fuse — 230VAC control circuit protection.	Make-up Box	*2.5A-MDA-250V
F2	Fuse — 120VAC control circuit protection.	Make-up Box	**1.25A-MDA-250V
GV1, GV2 & GV3	Gas Valves — Solenoid operated, 120VAC	Heating Compartment	----
HR1 & HR2	Crankcase Heaters — Self regulating insertion well mounted type. Operate at line voltage of compressors. 5 ton compressor uses one heater. Each 10 ton compressor uses two (50 watt) heaters each.	Compressors 1 & 2	50 Watt each
JP1	Jack Plug — Power saver harness.	Return Air Section	----
JP2	Jack Plug — Power exhaust fan harness.	Return Air Section	----
JP3	Jack Plug — Low ambient kit harness.	Compressor Compartment	----
JP4 & JP5	Jack Plug — Status panel relay interface board harnesses (2).	Main Control Box	----
K1	Blower Contactor — Energizes blower motor.	Main Control Box	----
K2	Night Relay — Activates the night setback mode when optional clock timer contacts make.	Main Control Box	----

*Use 3.2A-MDA-250V for GCS11-1853-400 and GCS11-2753-450 C.G.A. approved units.

**Use 4.0A-MDA-250V for GCS11-1853-400 and GCS11-2753-450 C.G.A. approved units.

TABLE 2 — CONTINUED

COMPONENT	DESCRIPTION AND FUNCTION	LOCATION	SETTING
K3	Limit Blower Relay — Energizes K1 to start blower motor. When de-energized, it drives power saver motor B6 closed.	Main Control Box	----
K4	Exhaust Fan Relay — Energizes exhaust fan motors B9, B10 & B11 when the exhaust fan switch S8 is closed and the main blower is operating.	Return Air Section	----
K5	Burner Relay — K5 is energized on a heating demand through DL2 purge relay N.C. contacts. N.O. K5-3 contacts close to latch in the relay until the heating demand is over. N.O. K5-1 contacts close to energize B8 combustion air motor. N.O. K5-2 contacts also close to permit an ignition attempt after DL2 N.O. contacts make. K5 is not used on FM/IRI units.	Main Control Box	----
K6	Heat Limit Relay — K6 coil is energized if either S4 pri. limit or S5 sec. limit open on high temperature. K6-1 N.O. contacts close to energize K3 limit blower relay starting the main blower until the limit temperature returns to normal.	Main Control Box	----
K7	Blower Delay Relay — Following a heating demand and DL2 purge delay time, K7-120V coil is energized through DL2 N.O. contacts and K5-2 burner relay N.O. contacts. K7-1 N.O. contacts close to energize DL1-24V blower delay to operate main blower circuit. K7 is not a time delay relay. "Delay" for K7 refers to function of energizing DL1 blower delay relay circuit.	Main Control Box	----
K8	No. 1 Compressor Contactor — Energizes compressor No. 1.	Main Control Box	----
K9	No. 2 Compressor Contactor — Energizes compressor No.2	Main Control Box	----
K11	Blower Relay — K11 is energized on a cooling demand. N.O. K11-1 contacts close to then energize K3. K3 brings on blower motor contactor K1.	Main Control Box	----
K14	Low Ambient Relay — Used with low ambient option. K14 is energized with the compressor contactor. It latches on through its N.O. contacts and DL4 N.C. contacts bypassing the low pressure switch to allow compressor startup. After 30 second delay, DL4 N.C. contacts open and the low pressure switch is back into the control circuit.	Low Ambient Kit Compressor Compartment	----
K15	No. 1 Condenser Fan Contactor — Energizes condenser fan for compressor No. 1.	Main Control Box	----
K16	No. 2 Condenser Fan Contactor — Energizes condenser fan for compressor No. 2.	Main Control Box	----
K17	Cool 1 Readout Relay — Compressor No. 1 circuit. Part of status panel relay interface board. When K17 is energized with K22 the status panel indicates green for compressor 1 operation. If a safety circuit switch opens K17 drops out and the green indication changes to red with only K22 energized.	Main Control Box	----
K18	Cool 2 Readout Relay — Compressor No. 2 circuit. Part of status panel relay interface board. When K18 is energized with K19 the status panel indicates green for compressor 2 operation. If a safety circuit switch opens K19 drops out and the green indication changes to red with only K18 energized.	Main Control Box	----
K19	Cool 2 Readout Relay — Compressor No. 2 circuit. Part of status panel relay interface board. See K18 description for function of K19.	Main Control Box	----
K20	Heat Readout Relay — Heating Circuit. Part of status panel relay interface board. With a heating demand K20 is energized and through its contacts the status panel indicates green for heat mode operation.	Main Control Box	----
K21	No Heat Readout Relay — Heating circuit. Part of status panel relay interface board. K21 is energized with the gas valve following a heat demand. Its N.C. contacts open preventing the no heat indication circuit from operating. If the gas valve and K21 are not energized during the DL7-180 second delay period following a heat demand the red 'no heat' indication is given at the status panel.	Main Control Box	----
K22	Cool 1 Readout Relay — Compressor No. 1 circuit. Part of status panel relay interface board. See K17 description for function of K22.	Main Control Box	----
K23	Voltage Controlled Relay — Performs 2 functions; energizes K27 to operate blower during power saver operation when unit is on intermittent blower/and lights the 'cool mode' indicator on the status panel (SP11 or SSP11) to indicate when power saver is operating. K23 coil is operated from the DC cooling signal.	Main Control Box	ON AT: 3.5 — 4.8VDC OFF AT: 2.3 — 3.5VDC

TABLE 2 — CONTINUED

COMPONENT	DESCRIPTION AND FUNCTION	LOCATION	SETTING	
* K27	Blower Control Relay — K23 N.O. contacts close to energize K27 coil. When the unit is on intermittent blower operation K27 contacts energize K3 relay to operate the blower during power saver operation.	Main Control Box	----	
K32	Damper Relay — Used with motor driven outside air dampers only. K32 de-energizes the damper motor allowing it to spring return, closing the outside air dampers during night setback and when the main blower is off.	Outside Air Damper Assembly	----	
----	Humid Climate Option — This field provided and field installed relay eliminates power saver operation during excessive humidity conditions.	Field Installed	----	
PV1	Pilot Gas Valve — Solenoid operated, 120VAC.	Heating Compartment	----	
R1	Night Heating Operation Resistor — Used in night setback option to determine degree of heating setback.	Make-up Box TB-E Strip	(5°, 10° or 15°F)	
R2	Night Cool Setup Resistor — Used in night setback option to determine degree of cooling setup.	Make-up Box TB-E Strip	(5°, 7°, 9°, 10°, 13°, 15°F) or cooling lockout	
R3	Minimum Position Potentiometer — Allows adjustment of power saver motor to hold at desired minimum fresh air opening.	Power Saver	----	
R4	Minimum Position Potentiometer — Same as R3 above, except remote mounted. (Disconnect R3 when R4 is used.)	Remote	----	
R5	Readout Resistor — Used in compressor 1 readout circuit. Provides circuit path for red status panel indication when a safety circuit switch opens.	Make-up Box TB-F Strip	10K Ohms ± 5% 1/2 Watt	
R6	Readout Resistor — Used in compressor 2 readout circuit. Provides circuit path for red status panel indication when a safety circuit switch opens.	Make-up Box TB-F Strip	10K Ohms ± 5% 1/2 Watt	
RT1	Discharge Sensor — Sends a dc voltage to logic panel which is equivalent to the discharge temperature.	Heating Compartment	----	
RT2	Remote Room Sensor (optional) — This is the thermistor that is used with the room transmitter option.	Remote	----	
S1	No. 1 High Pressure Switch — Shuts off compressor (B1) control circuit when refrigerant pressure rises above setting. Must be manually reset.	Compressor Compartment	410 psig Out	
S2	No. 2 High Pressure Switch — Shuts off compressor (B2) control circuit when refrigerant pressure rises above setting. Must be manually reset.	Compressor Compartment	410 psig Out	
S4	Primary Limit — At excessive unit temperatures S4 de-energizes heating control circuit. In addition it also keeps K3 energized to maintain blower operation until control resets.	Heating Compartment	**140°F Out 105°F In	
S5	Secondary Limit — This added limit also de-energizes heating control circuit at excessive unit temperatures. It also keeps K3 energized to maintain blower operation unit control resets.	Blower Compartment	1853	140°F Out 105°F In
			2753	130°F Out 95°F In
S6	Compressor Monitor — Shuts off all cooling compressor operation when ambient temperature drops below setting. Factory set at 55°F.	Main Control Box	Adj. 20° to 90°F 3-1/2°F differential	
S7	Low Ambient Thermostat — Locks out compressor No. 1 on 1853 units and compressor No. 2 on 2753 units during unit operation at low ambients. One compressor only is permitted to operate at low ambients. Factory set at 55°F.	Low Ambient Kit Compressor Compartment	Adj. 20° to 90°F 3-1/2°F differential	
S8	Exhaust Fan Switch — Mercury switch mounted on power saver motor. Energizes K4 exhaust fan relay to operate exhaust fans when return air dampers are closed. (Included with power exhaust fan option).	Power Saver Motor	----	

*Note - K27 was not used on units built before 1983. K23 N.O. contacts were used to directly energize K3 relay coil to energize the blower during power saver operation. On the earlier units K23 contacts only controlled the blower relay K3 (in place of the current K27 contacts); the modification to later units allows K23 to also light the cool mode indicator on the status panel when power saver only is operating.

**On GCS11-2753-450 use 160°F Out 125°F In

TABLE 2 — CONTINUED

COMPONENT	DESCRIPTION AND FUNCTION	LOCATION	SETTING
S9	No. 1 Low Pressure Switch — Shuts off compressor (B1) control circuit when suction pressure drops below setpoint. Automatically resets.	Compressor Compartment	25 ± 5 psig - Out 55 ± 5 psig - In
S10	No. 2 Low Pressure Switch — Shuts off compressor (B2) control circuit when suction pressure drops below setpoint. Automatically resets.	Compressor Compartment	25 ± 5 psig - Out 55 ± 5 psig - In
S11	Low Ambient Pressure Switch — Cycles K16 condenser fan No. 2 contactor on 1853 units and K15 condenser fan No. 1 contactor on 2753 units during unit operation at low ambients. Shuts off fan when head pressure drops below setting.	Low Ambient Kit Compressor Compartment	140 psig Out 275 psig In (135 psig differential)
S12	Low Gas Pressure Switch — Used only on FM/IRI units. Senses regulated gas pressure, opens circuit to primary control preventing operation if pressure is too low.	Heating Compartment	----
S13	Enthalpy Control (Used with power saver) — Senses heat content of outside air. When heat content rises above setpoint, control switches to close outdoor dampers to minimum position.	Fresh Air Intake	"A" Adj.
S14	Filter Switch — Used with optional status panel. Indicates restricted air flow through the filters.	Blower Compartment	----
S15	Combustion Air Switch — S15 must close before primary control can be energized. Assures combustion chamber purge and presence of combustion air.	PG3 Burner	----
S16	High Gas Pressure Switch — Used only on FM/IRI units. Senses regulated gas pressure, opens circuit to primary control preventing operation if pressure is too high.	Heating Compartment	----
S18	Low Ambient Heating Thermostat — Used only on C.G.A. units certified for operation in ambient temperatures to −60°F. Cuts out heating operation below −60°F.	Heating Compartment	----
T1	Power Transformer — On 460V & 575V units, T1 drops line voltage to 230V for the control circuit supply voltage.	Compressor Compartment	----
T3	Thermostat Transformer — Provides 24V power to thermostat circuit.	Main Control Box	----
T4	Power Saver Transformer — Provides 24 volts to power saver motor (B6). Has multi-tap leads to choose between 200V & 230V input when field installing.	Return Air Section	----
T5	120V Control Transformer — Provides 120VAC for compressor circuit controls and heating circuit controls.	Main Control Box	----
T6	Ignition Transformer — Used only on FM/IRI units. Provides ignition spark for gas heating on demand from primary control.(Used with Fireye & Honeywell Controls).	PG3 Burner	----
T7	Exhaust Fan Motor Transformer — Used only on 575 volt units. Drops line voltage to 230V to power optional exhaust fan motors.	Return Air Compartment	----
TB-A	High Voltage Terminal Block — 1 Phase 230 volt control.	Main Control Box	----
TB-B	High Voltage Terminal Block — 3 phase line voltage connection.	Main Control Box	----
TB-C,D,E,F & G	Low Voltage Terminal Block — Field wiring connections.	Make-up Box	----
TB-H	Power Exhaust Fan Terminal Strip — Transformer connections, when used.	*Return Air Section	----

*Exhaust Fan Control Box.

A - Main control Box

Figure 7 identifies the components in the main control box. Note that DL7 and the Status Panel Relay Interface Board are used only when either the SP11 or SSP11 status panel is applied with the unit; these are field installed items. The control box contains JP4 and JP5 wiring harnesses that plug directly into the relay board. JP3 in the bottom panel of the box is for plug in of a field installed low ambient kit.

The **Compressor Monitor (S6)** is located in the upper right hand corner of the main control box. The sensing bulb routes outside the box into the compressor compartment for sensing ambient temperature. S6 is adjustable from 20°F to 90°F with a 3-1/2°F differential. It is factory set at 55°F. Both compressors are locked out whenever the ambient temperature drops below the setpoint. When a low ambient kit is used S6 is adjusted in the field to the lowest temperature compressor operation is desired.

B - Low Voltage Junction Box

Figure 7 shows the low voltage junction box in the main control box. It contains the field wiring terminal block, TBC. K23 voltage controlled relay (used with power saver) is located to the left of TBC, standard on CGA units and field installed on all other units. Also accessable in the low voltage junction box are control circuit fuse holders (F1-230VAC and F2-120VAC) and a manual reset circuit breaker CB1 in the 24VAC control power circuit to the logic panel.

The low voltage field wiring connects to the TBC terminal block. The terminals are identified by both letters and numbers in columns and rows. The columns are labeled "C" through "G" and the rows are numbered "1" through "10". For example, to find TBD-5, locate column labeled "D" and then go down to row number "5". This terminal designation system is used throughout the unit wiring diagrams.

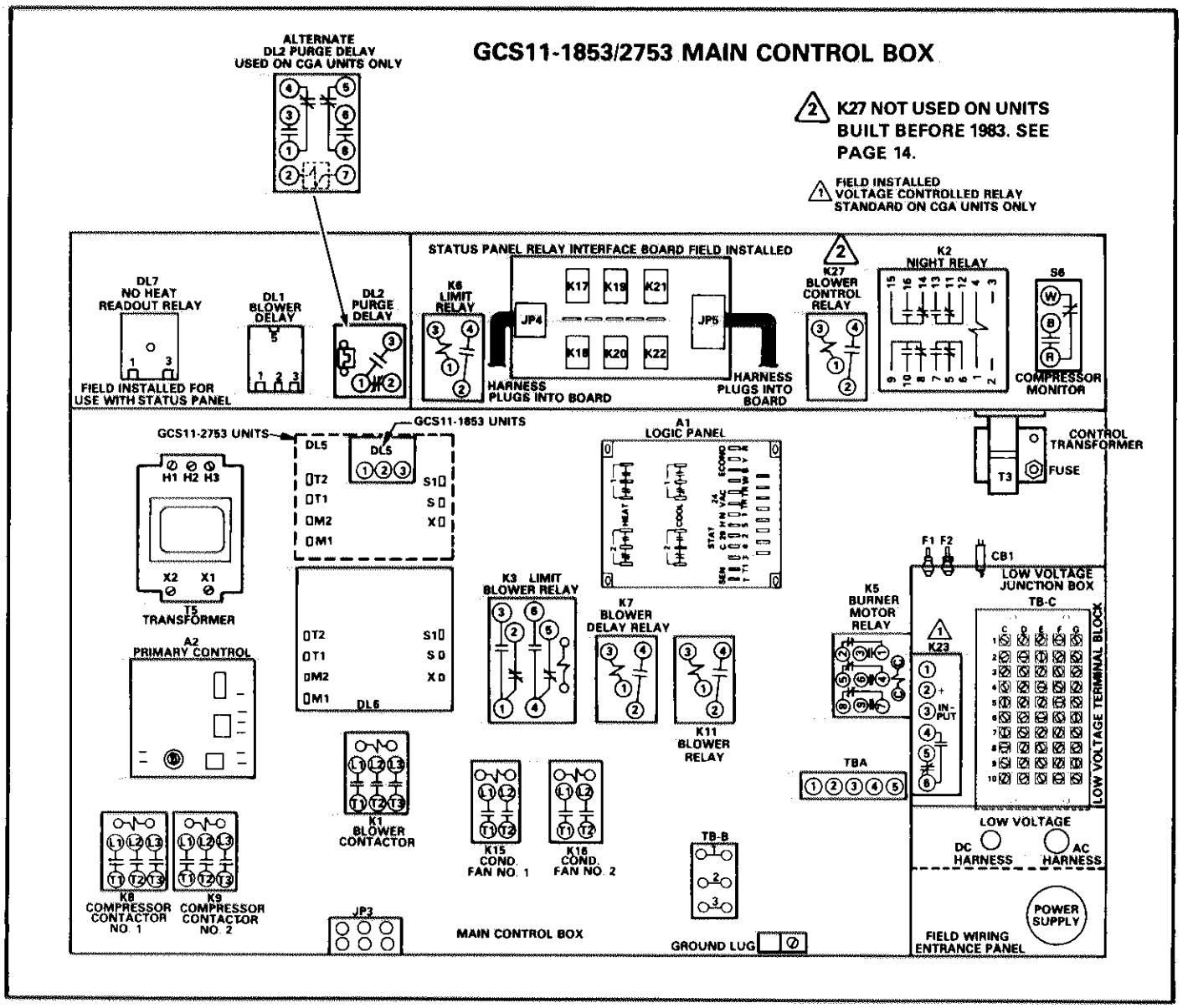


FIGURE 7

C - Compressor Compartment (Figures 8 & 9)

Figures 8 and 9 show the compressor compartments for the GCS11-1853 and the GCS11-2753 units respectively.

1 - The 1853 units use one 5 ton compressor and one 10 ton compressor for 3 stages of cooling:

Stage 1 - Compressor 1 only operating, 5 tons cooling.
Stage 2 - Compressor 2 only operating, 10 tons cooling.
Stage 3 - Compressors 1 & 2 operating, 15 tons cooling.

2 - The 2753 units use two 10 ton compressors for 2 stages of cooling:
Stage 1 - Compressor 1 only operating, 10 tons cooling.
Stage 2 - Compressors 1 & 2 operating, 20 tons cooling.

3 - The 5 ton compressor is protected with an internal line break overload. This device detects motor winding temperature to protect compressor from excessive heat and/or current draw. This compressor is also protected by an internal pressure relief valve set to open at discharge and suction differential of 450 ± 50 psig. In addition the compressor has a 50 watt insertion type self regulating crankcase heater. The heater operates at the line voltage rating of the compressor.

4 - The 10 ton Tecumseh compressors do not have internal overloads. They are protected by an external solid state protection module, located in the main control box. This device connects to four thermistor sensors wired in series in the compressor. Three of the sensors are buried in the motor windings to sense overheating of the motor. The fourth sensor monitors discharge line temperature internal to the compressor. The protection module is also wired into the compressor control circuit to de-energize the compressor contactor if abnormal temperatures are sensed.

The 10 ton compressors have an internal pressure relief valve set to open at a discharge and suction differential of 450 ± 50 psig. Each compressor uses (2) 50 watt insertion type self regulating crankcase heaters. They operate at the line voltage rating of the compressor. The 10 ton compressors also have a built-in accumulator with a 30 pound refrigerant capacity.

5 - Each refrigerant circuit includes high and low pressure switches for compressor protection. The high pressure switch opens at 410 ± 10 psig and must be manually reset. The low pressure switch cuts out at 25 ± 5 psig and automatically resets at 55 ± 5 psig.

6 - The low ambient kit control box is mounted in the compressor compartment and plugs into JP3 of the main control box. The pressure switch in the low ambient kit senses discharge pressure from the connection made to the discharge line service valve.

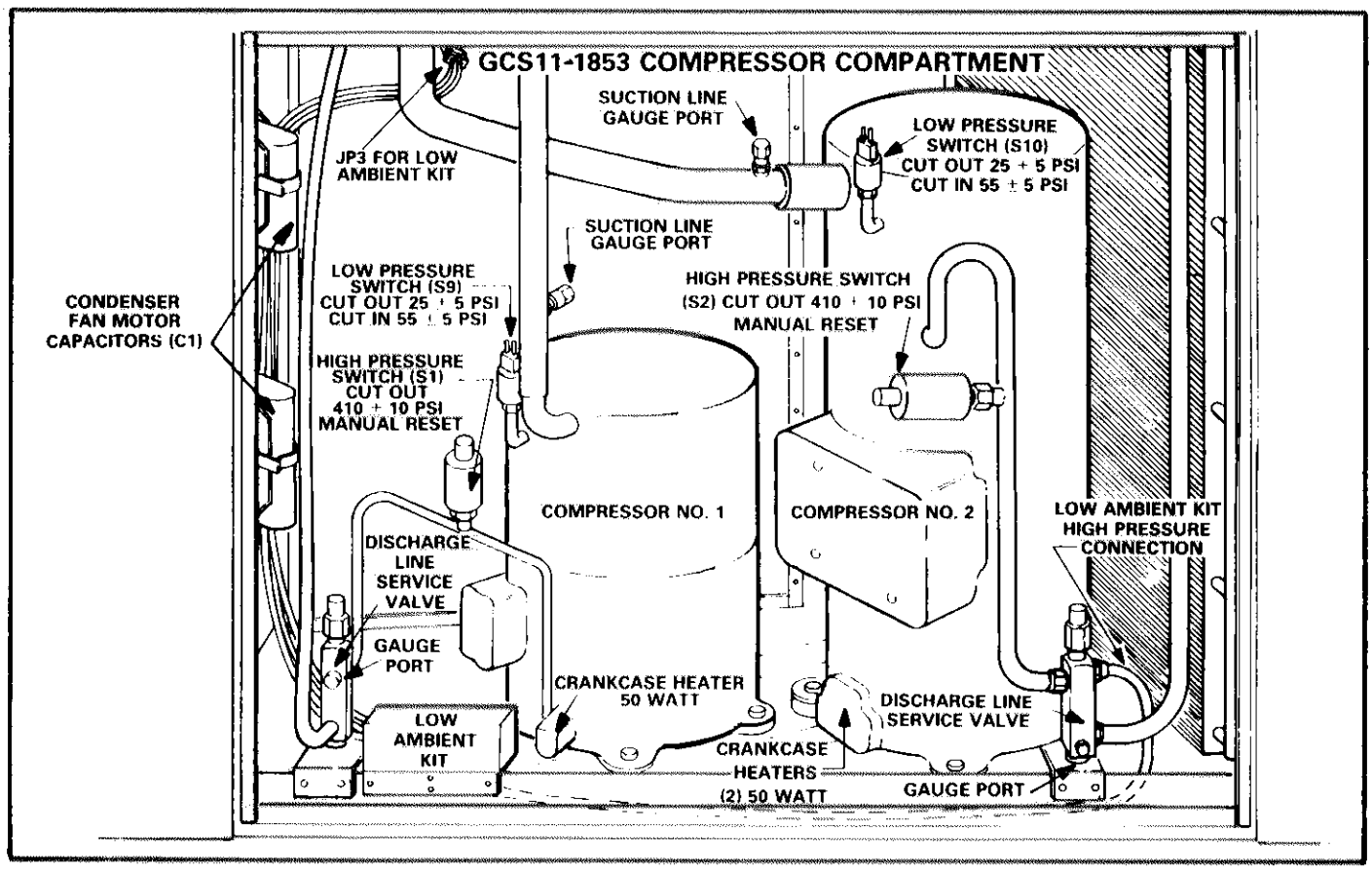


FIGURE 8

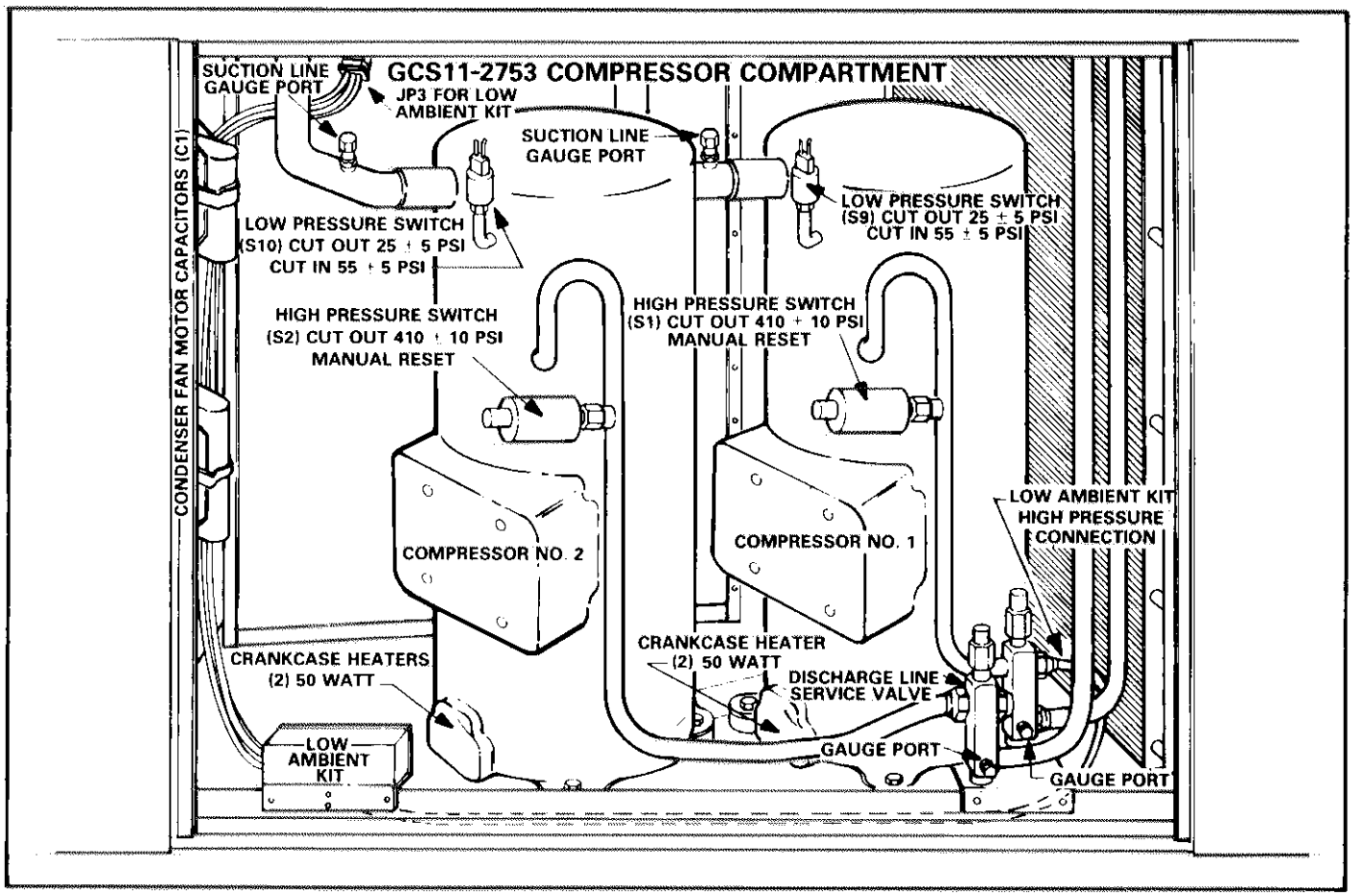
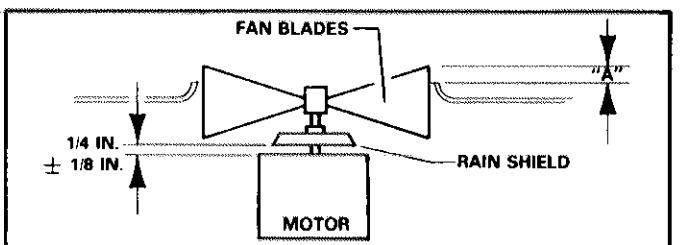


FIGURE 9

7 - The condenser fan draws air through the outdoor coil and discharges it out the top of unit. For fan service access, remove bolts securing fan assembly. Figure 10 gives the dimensions for location of fan blades in orifice panel. The 1853 unit has one 24-1/4 inch orifice and one 26-1/2 inch orifice for the 5 and 10 ton compressors respectively. The 2753 unit uses two 26-1/2 inch orifices for the two 10 ton compressors.

8 - The condenser fan motor capacitors (C1) are also located in the compressor compartment.

9 - Discharge line service valves with gauge ports are provided for each compressor. These are both backseating and frontseating valves. The suction lines to each compressor have a gauge port fitting with valve core.



GCS11 UNIT	ORIFICE I.D.	DIMENSION "A"
1853	24-1/4"	1-3/8"
1853	26-1/2"	1"
2753	26-1/2"	1"

CONDENSER FAN ASSEMBLY

FIGURE 10

D - Heating Compartment

GCS11-1853 and 2753 units use PG3 power burners and GX11 heat exchangers. Basically, the heating components provide fuel supply, combustion air supply, ignition source and proof of flame. Figure 11 identifies the components in the heat section and Figure 12 illustrates the PG3 burner components.

1 - Three basic types of burner manifold arrangements are used. Figures 13, 14 and 15 identify these and give the burner usage. Basically all versions have a redundant solenoid gas valve, except for the PG3-450/270 C.G.A. approved burner. The photographs show the physical piping arrangement for one burner of each type.

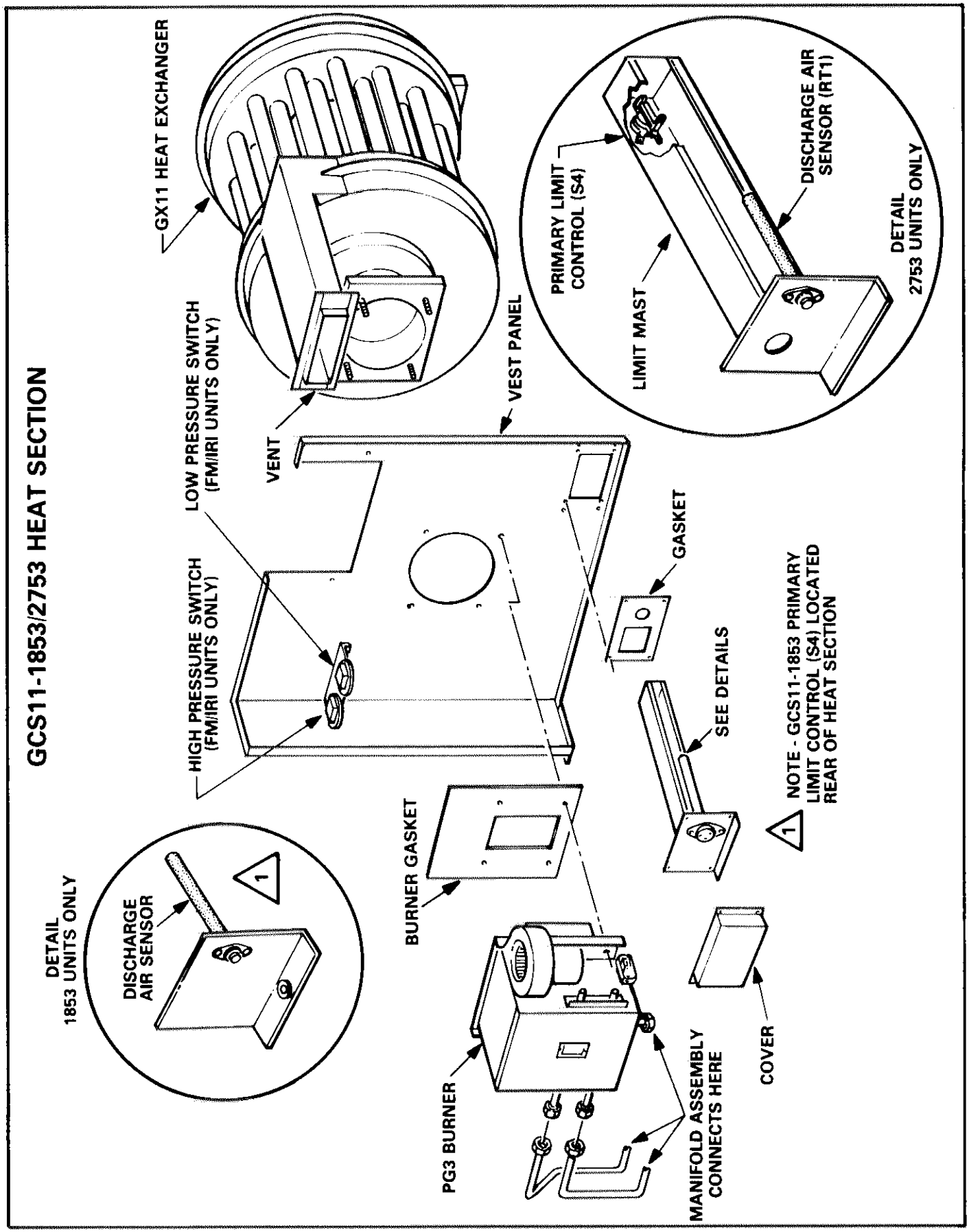

GCS11-1853/2753 HEAT SECTION
GX11 HEAT EXCHANGER
LOW PRESSURE SWITCH (FM/IRI UNITS ONLY)
VENT
VEST PANEL
HIGH PRESSURE SWITCH (FM/IRI UNITS ONLY)
GASKET
SEE DETAILS
BURNER GASKET
PG3 BURNER
MANIFOLD ASSEMBLY CONNECTS HERE
COVER
1
NOTE - GCS11-1853 PRIMARY LIMIT CONTROL (S4) LOCATED REAR OF HEAT SECTION
DETAIL 1853 UNITS ONLY
DISCHARGE AIR SENSOR
PRIMARY LIMIT CONTROL (S4)
LIMIT MAST
DISCHARGE AIR SENSOR (RT1)
DETAIL 2753 UNITS ONLY

FIGURE 11

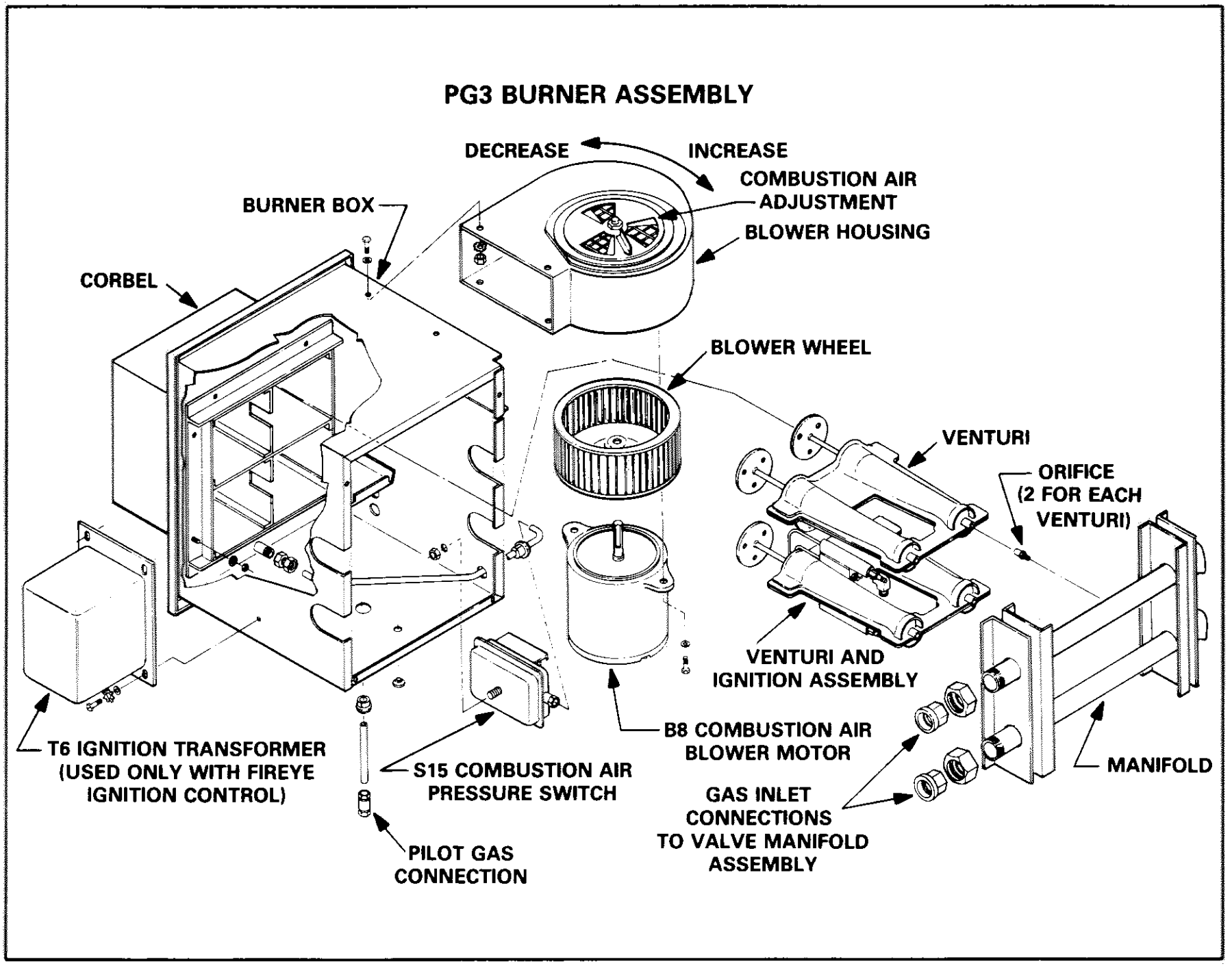

PG3 BURNER ASSEMBLY
DECREASE
INCREASE
COMBUSTION AIR
ADJUSTMENT
BLOWER HOUSING
BURNER BOX
CORBEL
BLOWER WHEEL
VENTURI
ORIFICE
(2 FOR EACH
VENTURI)
VENTURI AND
IGNITION ASSEMBLY
T6 IGNITION TRANSFORMER
(USED ONLY WITH FIREYE
IGNITION CONTROL)
S15 COMBUSTION AIR
PRESSURE SWITCH
B8 COMBUSTION AIR
BLOWER MOTOR
MANIFOLD
GAS INLET
CONNECTIONS
TO VALVE MANIFOLD
ASSEMBLY
PILOT GAS
CONNECTION

FIGURE 12

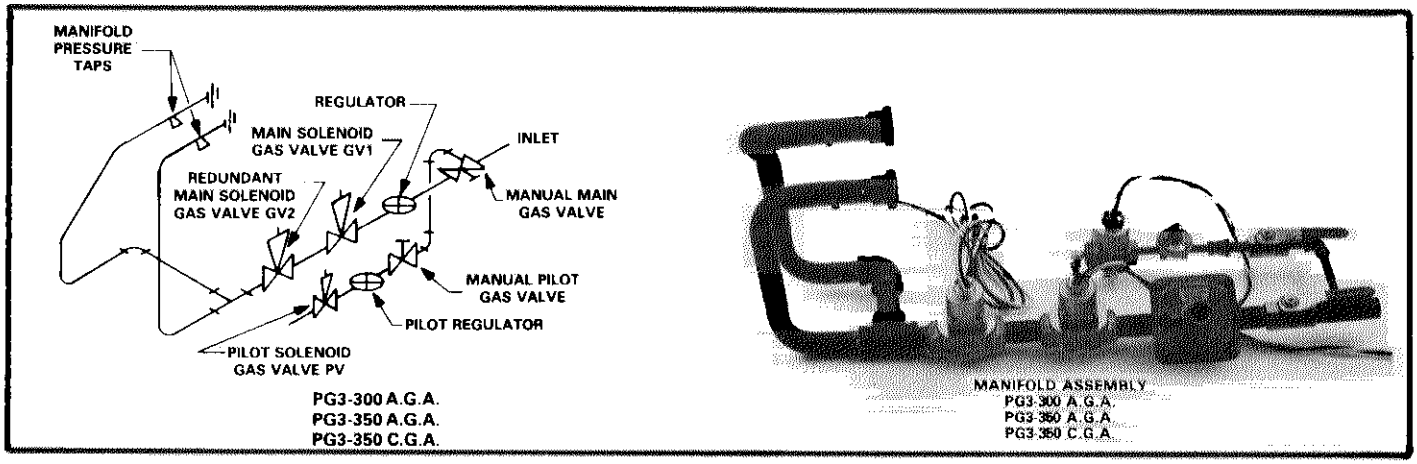


FIGURE 13

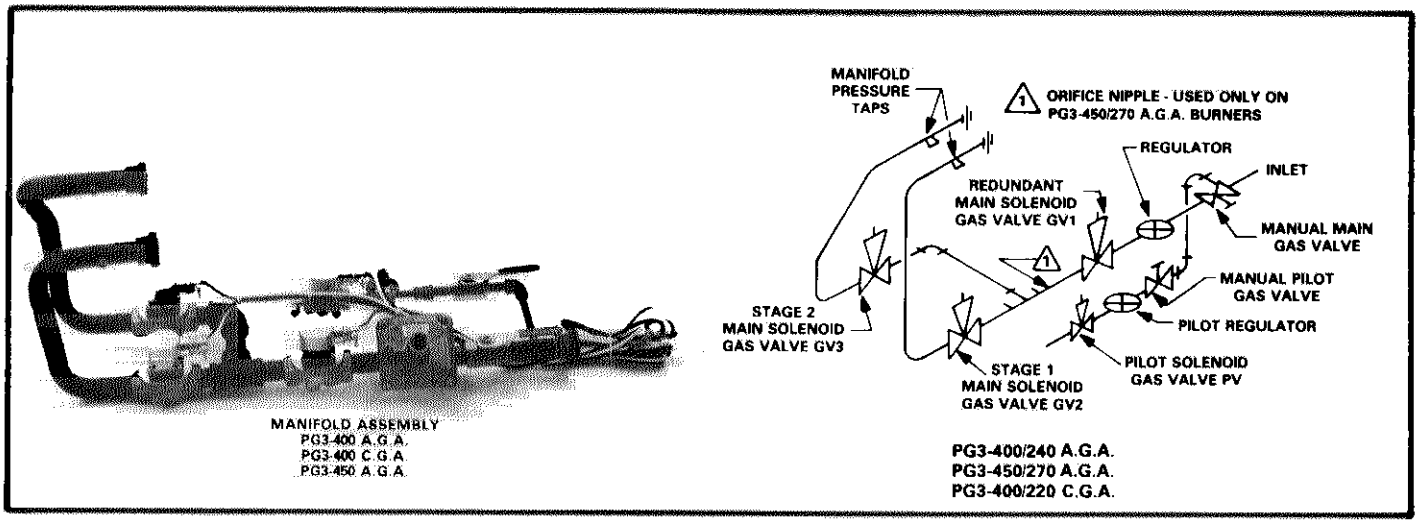


FIGURE 14

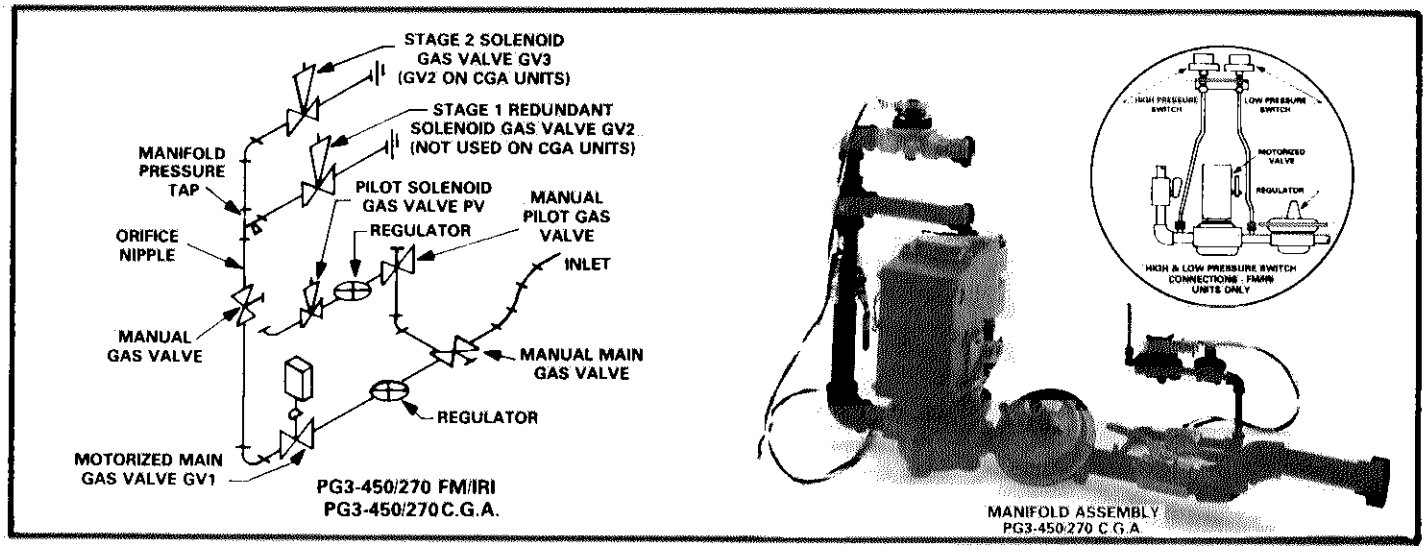


FIGURE 15

E - Blower Compartment

Figure 16 is a rear view of the 2753 unit showing the blower compartment. Refer to the cutaway, Figure 6, for a front view of the blower compartment.

1 - The secondary limit S5 is located on the outlet of the blower scroll.

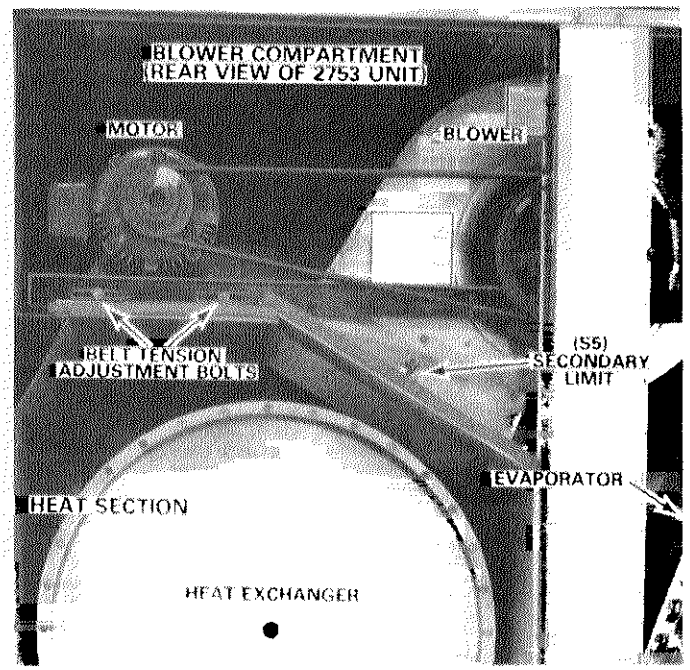


FIGURE 16

2 - Table 3 lists the drive kit options.

Note - Maximum usable hp of motors furnished by Lennox are shown in table. If other motors of comparable hp are used be sure to keep within the service factor limitations outlined on the motor nameplate. In Canada nominal horsepower is maximum usable horsepower.

TABLE 3

Model No.	Nominal Motor Hp	Maximum Usable Hp	Rpm Range of All Available Drive Setups
GCS11-1853	3	3.45	625 — 780
	5	5.75	815 — 970
GCS11-2753	3	3.45	585 — 760
	5	5.75	790 — 965

IV - REFRIGERATION SYSTEM

1 - Each unit utilizes two compressors in separate refrigerant circuits. Standard cooling refrigerant flow circuitry is used between the compressor, condenser, expansion valve and evaporator coil. Thermal expansion valves are used with superheat factory set at 10°F. Compressor operation below 55° requires addition of a low ambient kit.

2 - The evaporator coils are face split for maximum dehumidification and are located upstream of the heat section.

3 - Each unit is furnished with a normal operating pressure curve. The curve utilizes suction pressure, discharge pressure and outdoor temperature comparison. To use

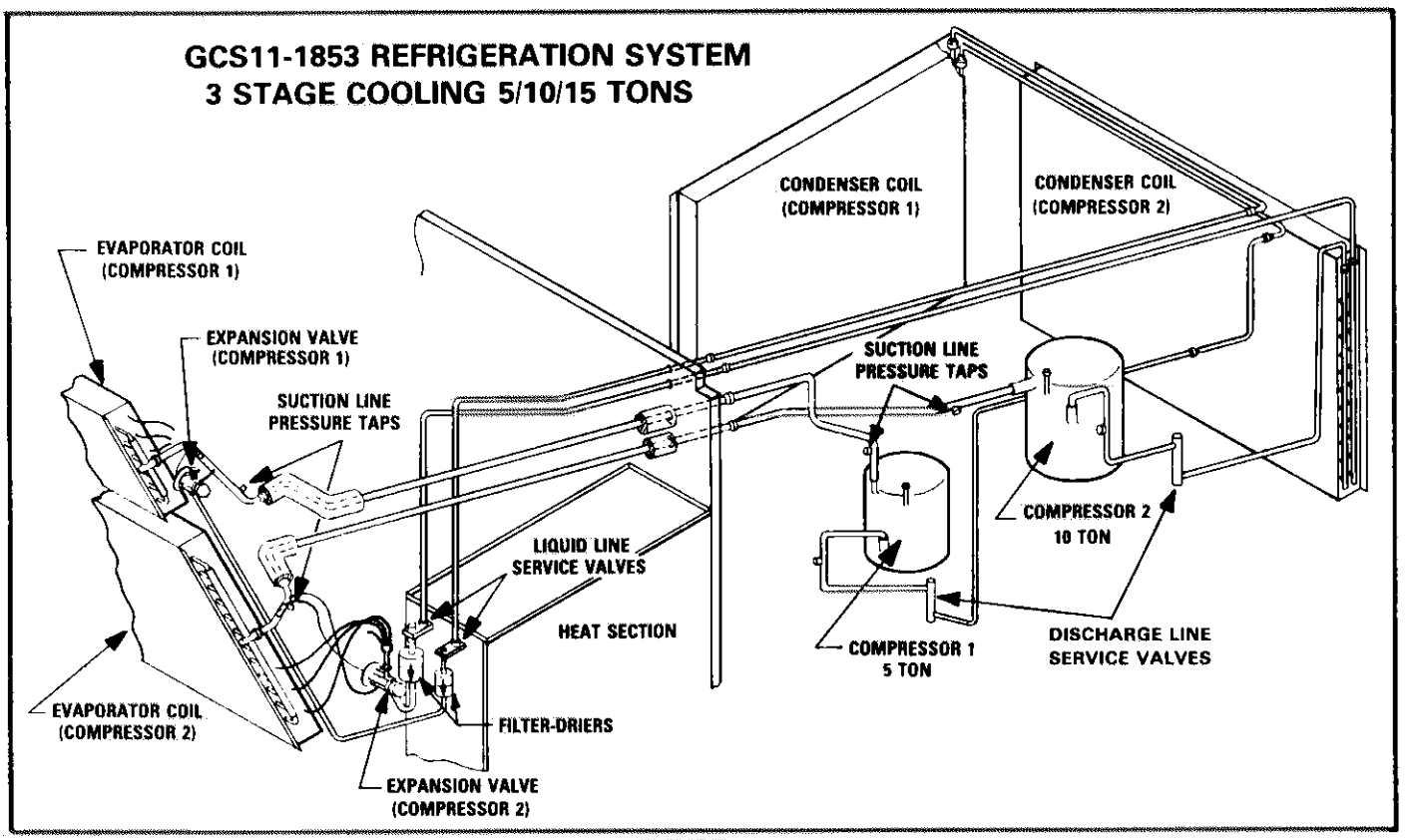


FIGURE 17

the chart, first check suction pressure, then move over to the outdoor temperature and finally down to the discharge pressure. If the discharge pressure is within five pounds of this reading, the unit is properly charged, providing the three conditions meet in the unshaded area of the chart. If they meet in the shaded area, there is something wrong with the system and further checks are needed. Always replace access panels and seal around gauge hoses when monitoring refrigerant pressures.

4 - Refer to Figures 17 and 18 for cooling system component arrangements of the 1853 and 2753 units.

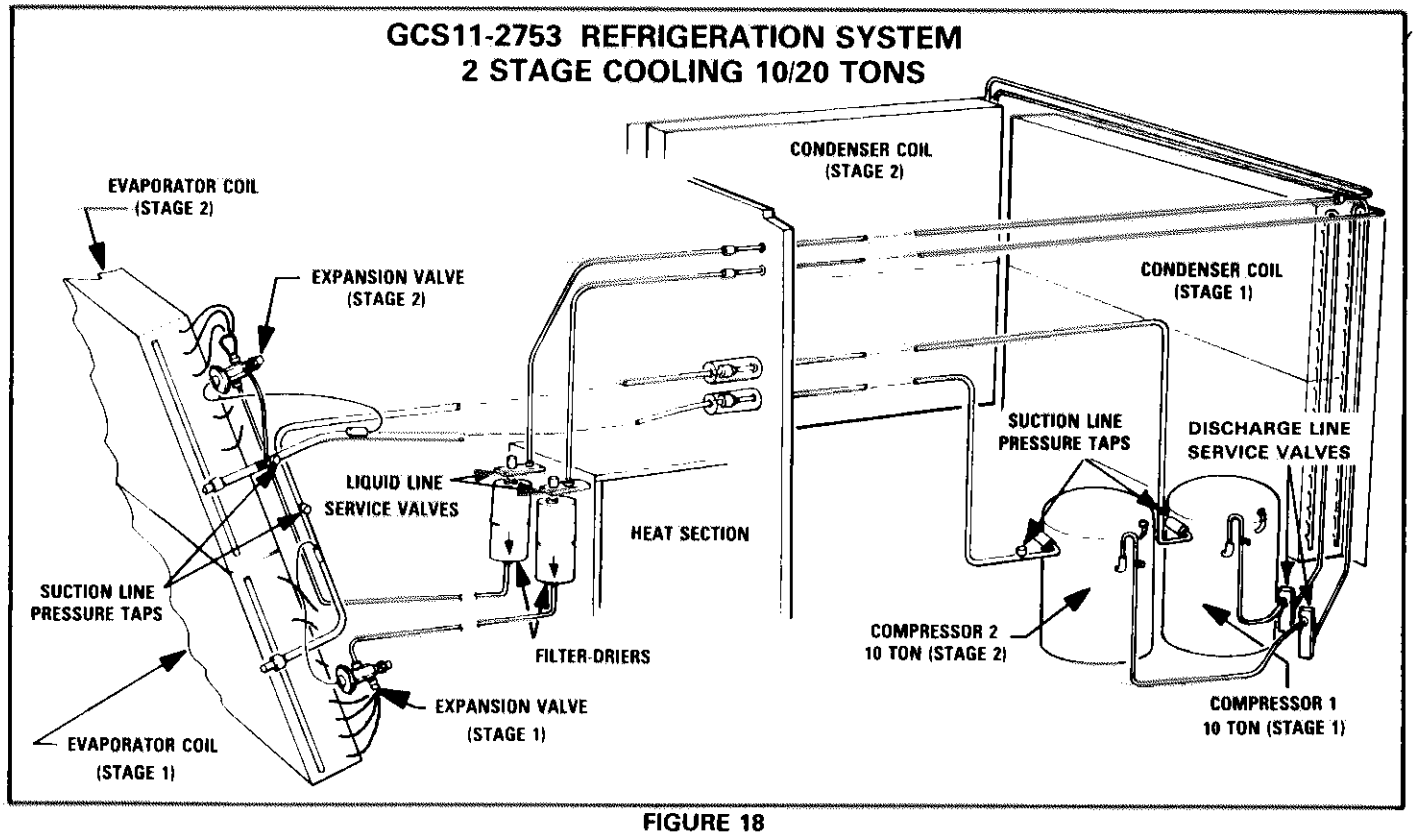


FIGURE 18

V - HEATING SYSTEM

A - A.G.A./C.G.A./FM/IRI Usage

1 - A.G.A. units use a separate regulator and a redundant main solenoid gas valve. One additional valve is used for single stage operation and two for two stage operation. The redundant valve assures gas shutoff in the event that one solenoid valve sticks open.

2 - C.G.A. units use a separate regulator but do not use a redundant valve. One solenoid gas valve is used per heating stage; two stages maximum. The C.G.A. '450/270' burner uses a motorized valve for first stage and a solenoid valve for second stage.

3 - FM and IRI units use a motorized valve as a redundant valve and two additional solenoid valves; one for first stage and one for second stage. A separate regulator is also used.

4 - All A.G.A., C.G.A., FM and IRI units have manual main shutoff valves on the manifold and the pilot gas components - regulator and solenoid pilot valve.

B - Gas Piping

Before connecting piping, check with gas company or authorities having jurisdiction for local codes or requirements. A manual main shut off valve and union should be installed in gas line external to unit. Union must be of the ground joint type. See Figure 19. Installer must also provide 1/8 inch N.P.T. plugged tap in field piping. Tap must be accessible for test gauge connection. A drip leg must be installed on all vertical pipe runs.

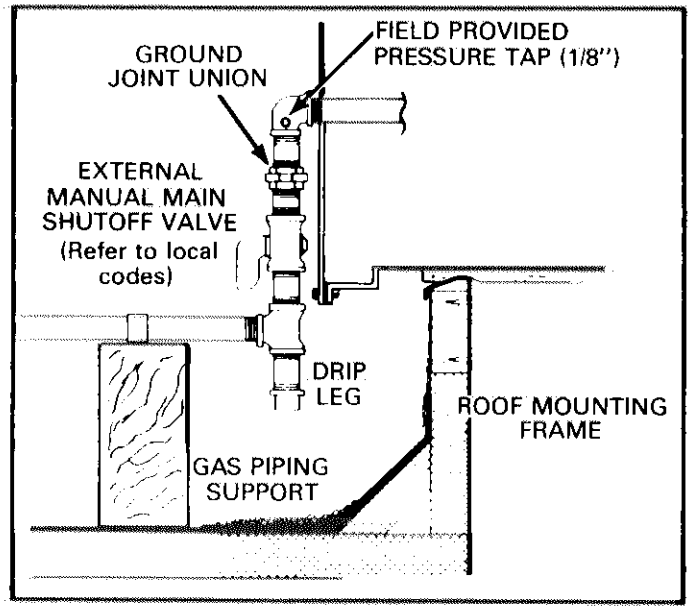


FIGURE 19

C - PG3 Power Burner

The PG3 burner is available in four sizes as indicated in the burner rating table on page 5. The PG3-300 and PG3-350 models are characterized by a low temperature rise. The PG3-400/240 and PG3-450/270 models are two staged. These PG3 burners use an intermittent pilot system with flame proving to ignite the main burner.

On an initial heating demand prepurge of the heat exchanger is provided by a combustion air blower. The pilot valve is then energized as the primary control provides sparking at the electrodes to light the pilot flame. When the pilot is proven by flame rectification the main gas valves are opened by the primary control. Gas flows from the manifold through the orifices into the venturi where it is mixed with air in the correct proportion for proper combustion (air provided by combustion air blower). Existing pilot flame ignites the fuel mixture. The resulting burner flame is adjusted to combustion chamber for uniform heat distribution by flame spreaders. The flame may be observed through a window in the burner box cover. On two stage burners, second stage is ignited by first stage burner flame.

D - LP Conversion Kits

All A.G.A PG3 burners are factory shipped in the GCS11 for natural gas only. LP changeover kits are available for the PG3-400/240 and PG3-450/270 size burners. See table 4 for kits and usage.

TABLE 4

LP CONVERSION KITS		
USAGE	***PG3-400/240**	**PG3-450/270**
C.G.A.	LB-48737CE	LB-48737CF
FM/IRI	----	LB-48737CK
A.G.A.	LB-48737CA	LB-48737CB

*Note - The C.G.A. burner is a PG3-400/220.

PG3-300 and PG3-350 size burners are only approved for natural gas. All C.G.A. units are shipped to the field with LP components installed.

Basically the LP kits include 4 burner orifices, pilot orifice, main regulator spring and pilot regulator spring. The kits for the A.G.A. and FM/IRI PG3-450/270 burners also include an orifice nipple that installs in the manifold. Table 5 lists the kit orifice sizes.

TABLE 5

LP CONVERSION KIT ORIFICE SIZES				
Burner PG3-	**LB-48737 Kit No. Suffix**	**Orifice Drill Size**		
		Burner	**Nipple**	**Pilot**
400/220 C.G.A.	CE	#32	----	#68
450/270 C.G.A.	CF	#30	----	#68
400/240 A.G.A.	CA	#32	----	#68
450/270 A.G.A.	CB	#30	15/32"	#68
450/270 FM/IRI	CK	#30	15/32"	#68

E - High Altitude Derate

On A.G.A. and FM/IRI burners it may be necessary to derate the unit. If the heating value of the gas does not exceed values listed in Table 6, derating is not required. Should the heating value of the gas exceed the table values, or if the elevation is greater than 6,000 feet above sea level, it will be necessary to derate the unit. Lennox requires that derate be based on 4% per thousand feet above sea level. Thus at an altitude of 4,000 feet, if the heating value of the gas exceeds 1,000 Btu/ft³, unit will require a 16% derate. Table 7 lists the existing standard natural gas PG3 orifices for A.G.A. and FM/IRI burners.

TABLE 6

Elevation Sea Level (Feet)	Maximum Heating Value (Btu/ft³)
5001 — 6000	900
4001 — 5000	950
3001 — 4000	1000
2001 — 3000	1050
Sea Level — 2000	1100

TABLE 7

STANDARD NATURAL GAS ORIFICE SIZES				
Burner PG3-	**Usage**	**Orifice Drill Size**		
		Burner	**Nipple**	**Pilot**
300	A.G.A.	#18	----	#53
350	A.G.A.	#12	----	#53
400/240	A.G.A.	#3	----	#53
450/270	A.G.A.	"E"	9/16"	#53
450/270	FM/IRI	"E"	9/16"	#53

All C.G.A. units are shipped to the field derated for altitude. Table 8 references the high altitude kits and orifice sizes for C.G.A. units.

TABLE 8

HIGH ALTITUDE KIT ORIFICE SIZES (C.G.A.)				
C.G.A. Burner PG3-	**Gas Type**	**LB-48737 Kit No. Suffix**	**Orifice Drill Size**	
			Burner	**Pilot**
400/220	Nat.	CC	#7	----
400/220	LP	CG	#35	#68
450/270	Nat.	CD	"B"	----
450/270	LP	CH	#31	#68
350	Nat.	CJ	#16	----

F - GX11 Heat Exchanger

Heat exchanger condensate connections are provided on both sides of unit. Condensate must be routed away from heat exchanger and protected from freezing.

The heat exchanger drain MUST NOT be tied into the evaporator condensate drain or capped.

If it should be necessary to clean the flue gas passageways, use the following steps:

1 - Remove the heat exchanger rear access panel.
2 - Unscrew cap screws and remove heat exchanger breeching. See Figure 20.
3 - Slide flue baffles from heat exchanger tubes.
4 - Clean flue passageways with a wire brush.
5 - Replace gasket and reassemble heat exchanger.

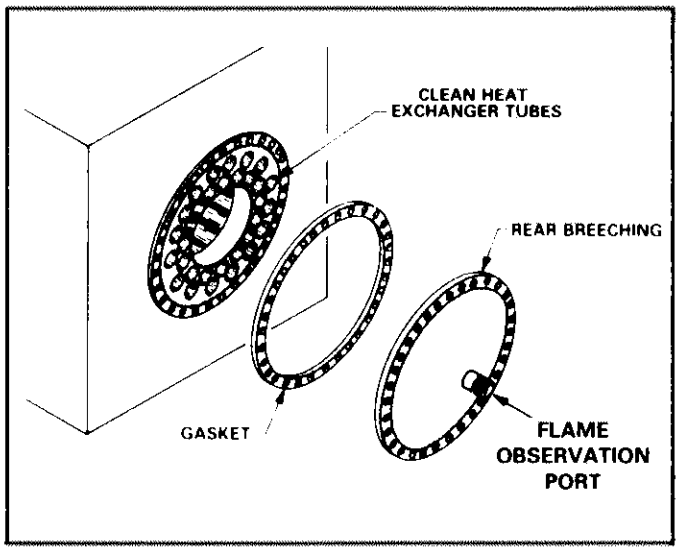


FIGURE 20

G - Primary Control

The GCS11-1853 and 2753 units use proof-of-flame-intermittent pilot ignition controls. The A.G.A. and C.G.A. units use a Fenwal 05-143 control board as the standard ignition system. FM/IRI units only use a Fireye TFM3 system.

1 - Fenwal 05-143 Primary Control (One-recycle)

Following the initial heating demand as verified by S15 combustion air switch and DL2 prepurge delay of 20 to 70 seconds (45 seconds on C.G.A. units) power is applied to the primary control. A 10 second trial-for-ignition is initiated starting sparking at the electrodes and opening the pilot gas valve. Once pilot flame is established and proven by flame rectification, the sparking is stopped. The flame and sensor become part of an electronic circuit which allows the main gas valve to be energized by the control. The existing pilot flame lights the main burner. This sequence prevents the main gas valve from opening unless pilot flame is established.

The 05-143 has a built in high voltage pilot ignition source eliminating the need for a separate ignition transformer.

If pilot flame is not established during the 10 second trial-for-ignition period the control will lockout requiring manual reset.

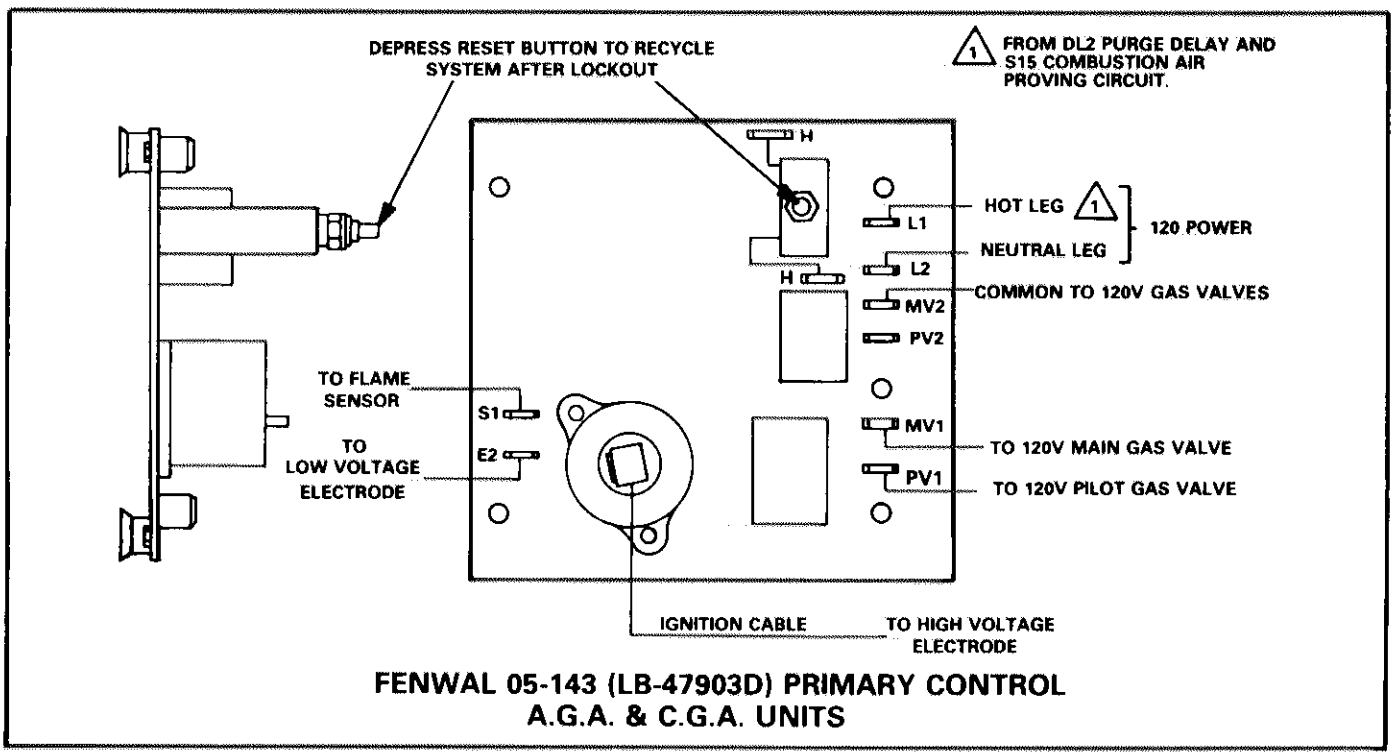
In the event of pilot flame outage during a heating cycle, the control de-energizes the main gas valve and provides one-recycle trial-for-ignition before locking out (10 seconds).

To recycle the system after a lockout depress the manual reset button, see Figure 21. The reset breaker connects to terminals H-H. *CAUTION: CONTROL BOARD MUST ALWAYS BE OPERATED WITH RESET BREAKER IN PLACE. NEVER REPLACE BREAKER WITH JUMPER OR FUSE, UNSAFE OPERATION WILL RESULT.* Figure 21 illustrates the 05-143 board wiring and corresponding voltages. Incoming power connects to L1 and L2. The neutral leg MUST connect to L2.

2 - Fireye TFM3 Primary Control (Non-recycle)

The TFM 3 requires a separate ignition transformer (T6) to provide high voltage sparking for pilot ignition.

Following the initial heating demand as verified by S15



FENWAL 05-143 (LB-47903D) PRIMARY CONTROL
A.G.A. & C.G.A. UNITS

FIGURE 21

combustion air switch power is applied to the primary control. The control begins a 90 second prepurge cycle followed by a 10 to 12 second trial-for-ignition (opening pilot valve and energizing T6 ignition transformer). When the pilot flame is established and proven by flame rectification, T6 ignition transformer is de-energized. The flame and sensor become part of the electronic circuit allowing the main gas valve to be energized. The existing pilot lights the main burner.

If pilot flame is not established during the 10-12 second trial-for-ignition period the control will lockout requiring manual reset.

The TFM3 control is non-recycle. Failure of pilot flame during a heating cycle will cause the control to lockout requiring manual reset.

To recycle the system after a lockout depress the manual reset button shown in Figure 22. Figure 22 illustrates the TFM3 chassis and subbase with corresponding wiring and voltages. Incoming power connects to terminals 7 and 2. The neutral leg must connect to terminal 2.

3 - Electrode Setting

Figure 23 shows the PG3 venturi with ignition assembly and electrode setting dimensions. The Fenwal spark gap is 1/8 inch and the Fireye spark gap is 1/16 inch.

H - Start-Up and Shut-Down Procedures

1 - Start-Up

Close manual main gas valve(s) and pilot valve. Set room thermostat to lowest setting. Wait at least 5 minutes and then open gas valves. Set room thermostat to desired temperature. If a switching subbase or switching status panel is used, be sure the system switch is set to "Heat." On a heating demand, the pilot should light followed by the main burner. If it does not, repeat preceding steps.

2 - Safety Shutdown

Turn off power to unit. Close manual main gas valve(s) and pilot valve. DO NOT ATTEMPT TO RELIGHT BURNER WITH A HOT COMBUSTION CHAMBER. Wait a minimum of 5 minutes to allow heat exchanger time to purge unburned gases before trying to restart.

3 - Extended Period Shutdown

To shutdown unit for an extended period of time, set thermostat at lowest setting and turn off power to unit. Close all gas valves both internal and external to the unit to guarantee no gas leak into combustion chamber. All access panels, covers and vent caps must be in place and secured. Refer to step 1 to reactivate unit.

I - Gas Pressure Adjustment

1 - Check gas line pressure with unit firing at maximum rate. A minimum of 6 inches w.c. for natural gas or 10 inches w.c. for LP gases should be maintained. On multiple unit installations, check each unit in sequence, beginning with the one closest to the supply gas main and progressing to the one furthest from the main. Line pressure should be a nominal 7 inches w.c. for natural gas or a nominal 11 inches w.c. for LP gas with all units firing on high stage.

2 - After line pressure has been checked and adjusted, check manifold pressure during high fire operation. Refer to Figures 13, 14 and 15 on page 21 for location of manifold pressure taps to take readings. The readings must correspond to Table 9.

3 - To check for proper gas flow to combustion chamber, determine the Btuh input from the GCS11 rating plate. Divide this input rating by the Btuh per cubic foot of available gas. This is the number of cubic feet of gas required per hour. Next determine the flow of gas through gas meter for 2 minutes and multiply by 30 to calculate the

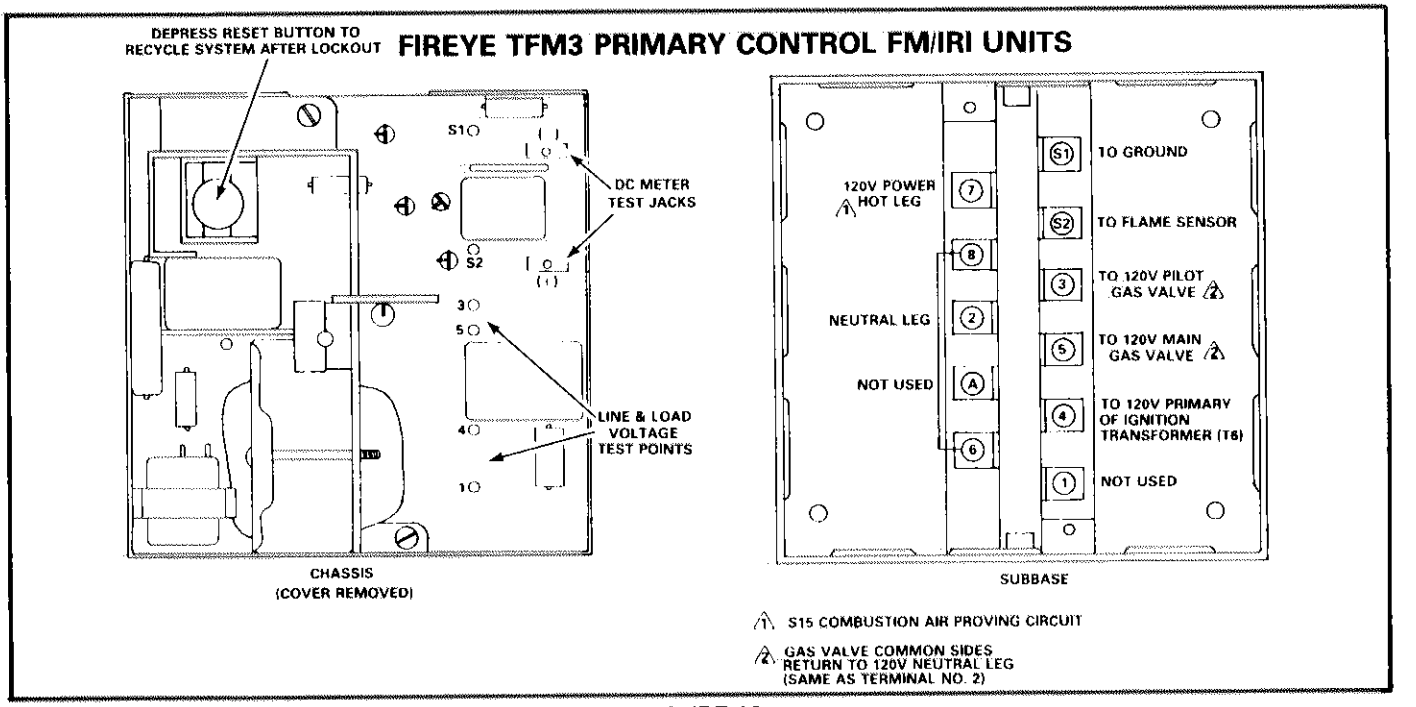


FIGURE 22

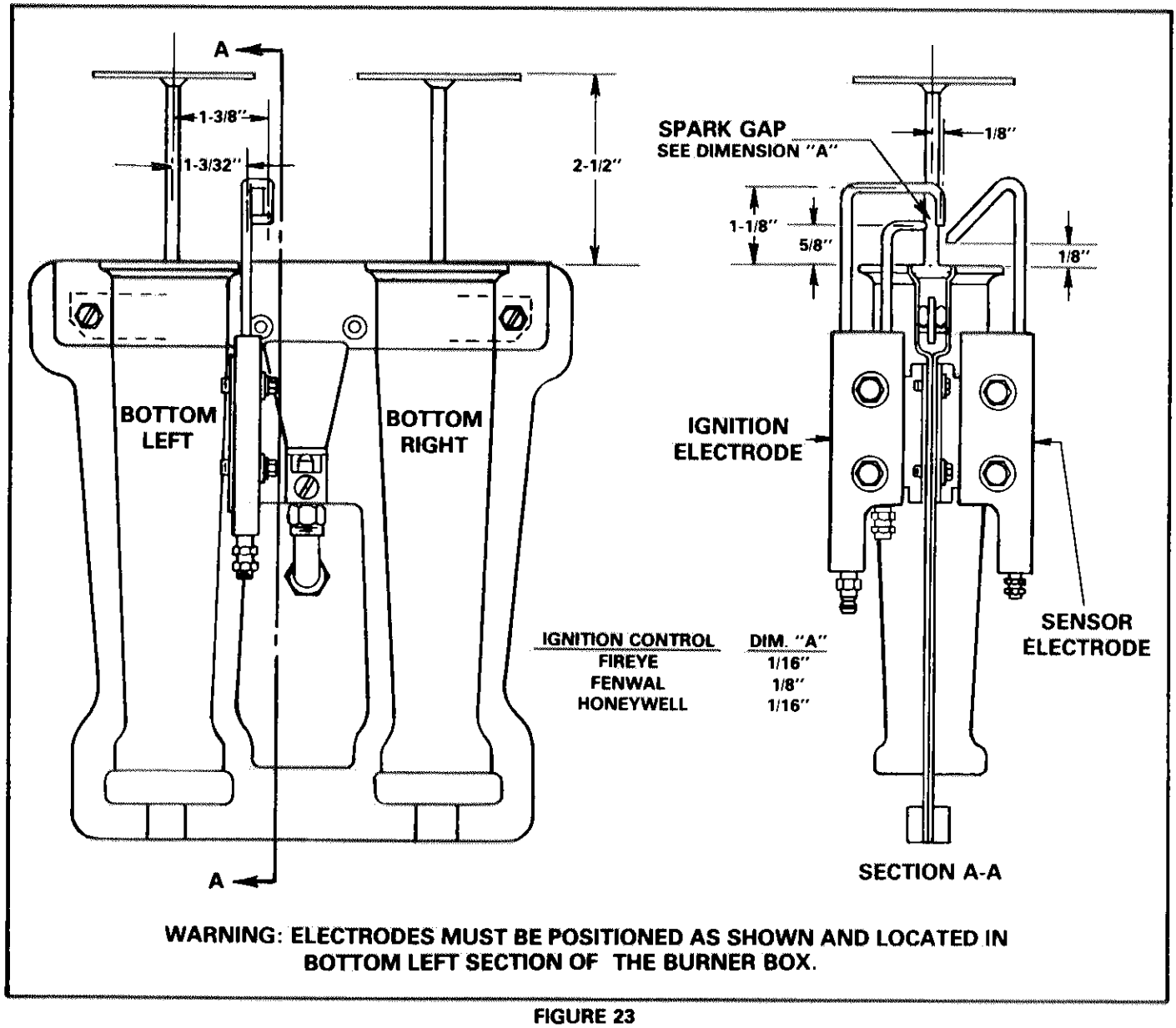


FIGURE 23

actual gas flow to burner. Gas input should not exceed burner rating. If it does, make necessary adjustments.

TABLE 9

MANIFOLD PRESSURE - HIGH FIRE			
UNIT		NATURAL GAS	L.P. GASES
AGA	GCS11-1853-300	3.8	----
	GCS11-1853-400/240	2.4	10.7
	GCS11-2753-350	3.4	----
	GCS11-2753-450/270	2.3	9.7
IRI/FM	GCS11-2753-450/270	2.1	9.6
CGA	GCS11-1853-400/220	2.4	10.7
	GCS11-2753-350	3.4	----
	GCS11-2753-450/270	2.7	9.6

J - Burner Flame

The natural gas flame is totally blue. The LP gas flame is basically blue, but may have slight yellow streaking. Figure 24 illustrates the burner flame.

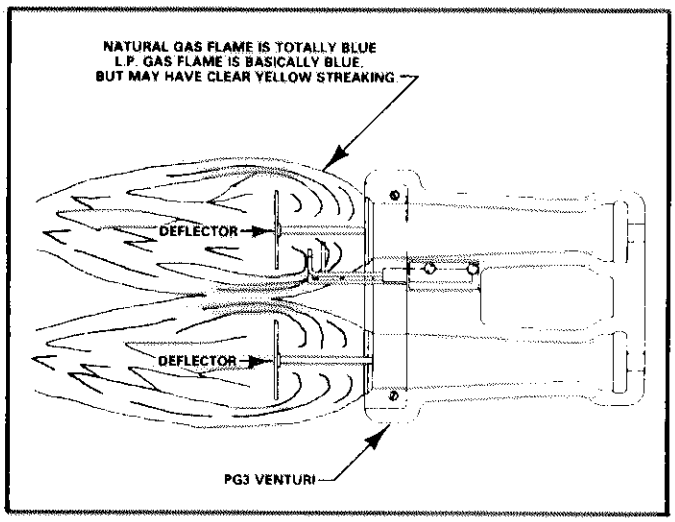


FIGURE 24

The combustion air is factory set for normal operation. Minor changes in the air adjustment may be necessary to compensate for the heating value of the gas. A combustion air adjustment shutter is provided on combustion blower. Loosen lockscrew and move lever to desired position. See Figure 25.

For efficient operation keep combustion air blower wheel clean. Remove combustion air blower assembly and clean wheel blades with a small brush.

VI - BLOWER OPERATION AND ADJUSTMENTS

A - Blower Operation

1 - **Units with standard room control non-switching subbase:**
Blower operates continuously in normal operation. Units with optional night operation controls will have intermittent blower operating during night control period.

2 - **Units with switching subbase or switching status panel:**
Both switching subbase at thermostat or switching status panel have a "FAN" switch and a "SYSTEM" switch.

Blower operation is controlled only by the "FAN" switch. It has two positions, "AUTO" and "ON." In the "ON" position the blower operates continuously; intermittent blower will only occur if optional night operation controls are installed. During night operation the blower will cycle with demand.

With "FAN" switch in the "AUTO" position, the blower cycles with demand. If the application includes a power saver, a field installed K23 Voltage Controlled Relay starts blower for power saver operation prior to demand for mechanical cooling (K23 is factory installed on C.G.A. units).

The "SYSTEM" switch has "OFF-HEAT-AUTO-COOL" positions. The "OFF" position does not stop the blower when the "FAN" switch is in the "ON" position. The "FAN" switch must be in the "AUTO" position for the blower to remain off with the "SYSTEM" switch in the "OFF" position.

3 - If either or both primary (S4) and secondary (S5) heating limit controls open on high temperature, the blower is energized continuously until the limit controls return to normal. This limit function operates the blower independently of "FAN" or "SYSTEM" switch positions and day or night operation.

B - Determining Unit CFM

1 - The following measurements must be made with a dry indoor coil. Run blower without a heating or cooling demand. The air filters must be in place while taking measurements.

2 - Measure static pressure external to unit.

3 - Measure the indoor blower motor RPM.

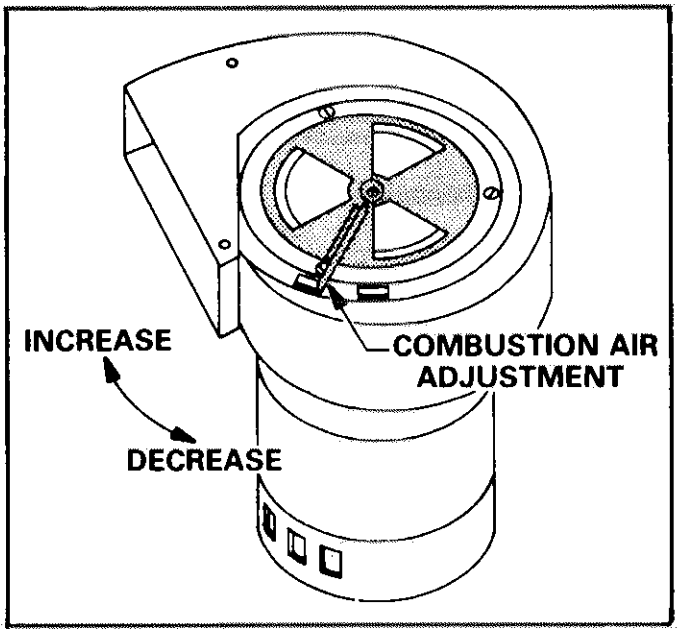


FIGURE 25

4 - Refer to Blower Performance Chart. Use the static pressure and RPM readings to determine unit CFM.

5 - The CFM can be adjusted at the motor pulley. Loosen the allen screw, and then turn adjustable sheave clockwise to increase CFM or counter-clockwise to decrease CFM. See Figure 26.

C - Blower Belt Adjustment

Maximum life and wear can be obtained from the belt only if proper pulley alignment and belt tension are maintained. Initially, tension new belt after a run in period of 24-48 hours. This allows belt to stretch and seat in the grooves. To adjust belt tension, loosen 4 locking bolts and slide motor bracket right or left. See Figure 26.

VII - THERMOSTAT OR TRANSMITTER OPERATION

A room control installed with a standard subbase allows only heating and cooling setpoint adjustment. The temperature gap between the setpoint levers represents the "no load" band where no heating or cooling can occur. With levers positioned side by side, the no load band is 3°F. With levers wide apart, the no load band is 30°F.

A room control installed with an optional switching subbase or optional switching status panel will allow heating and cooling setpoint adjustment, system function selection and blower operating control. The system function switch is manually set for the desired operation mode:

HEAT — Heat only.
COOL — Cooling only.
AUTO — System automatically provides heating or cooling on demand.
OFF — Heating-Cooling System Off.

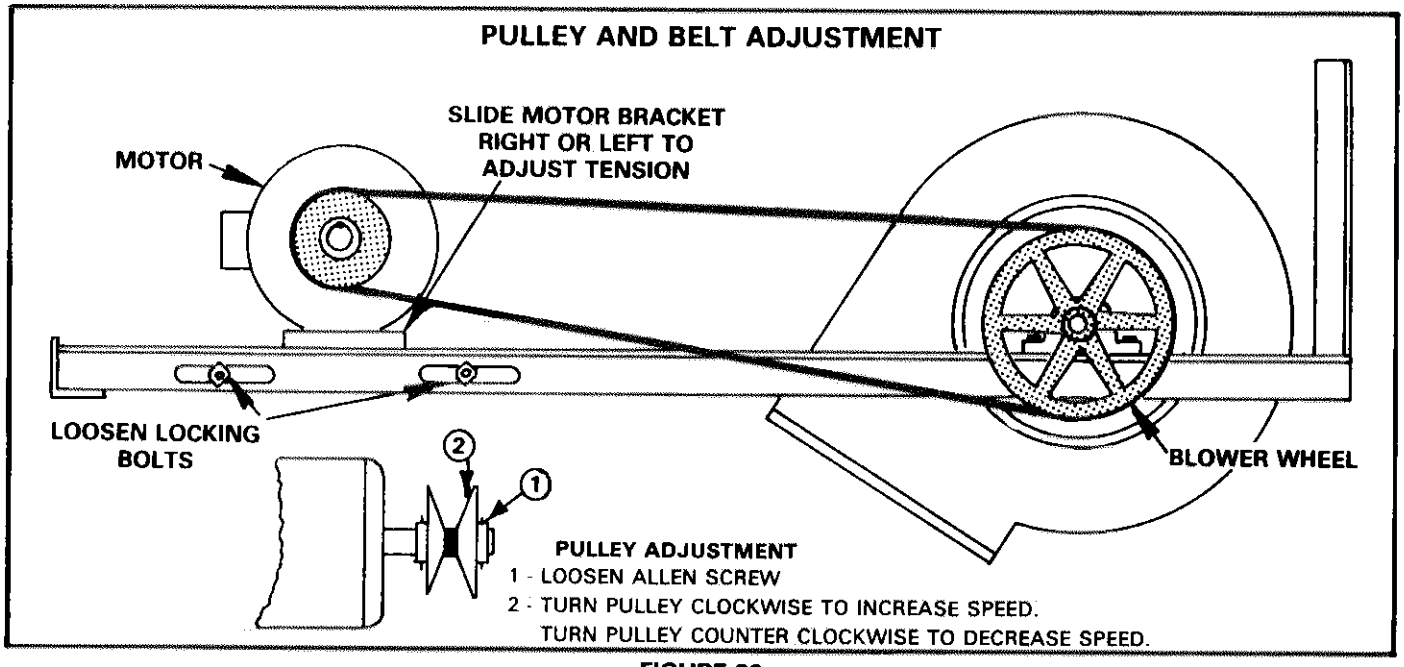


FIGURE 26

The fan switch manually sets to desired position:

AUTO — Blower cycles with demand.
ON — Blower runs continuously.

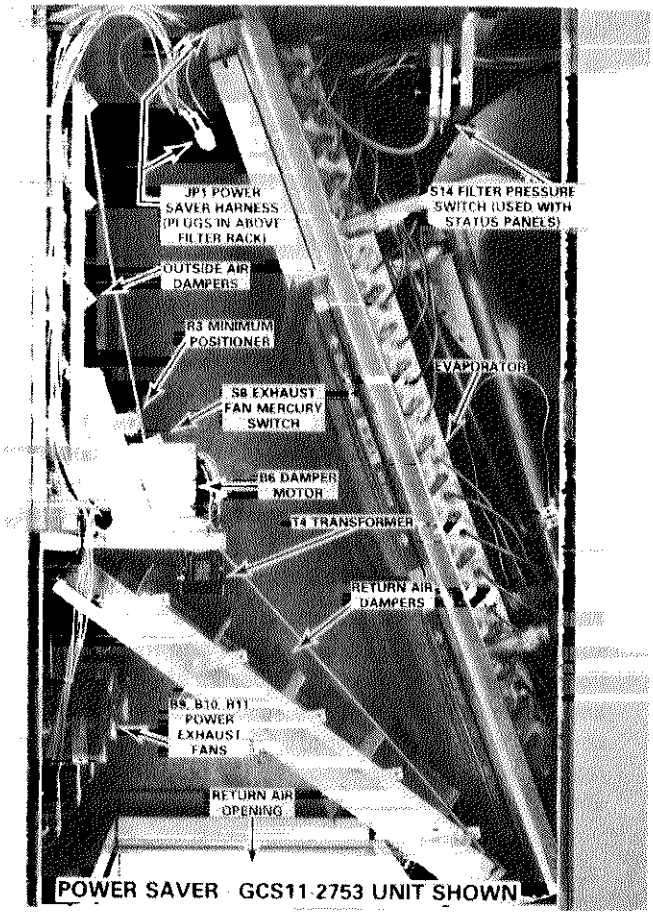


FIGURE 27

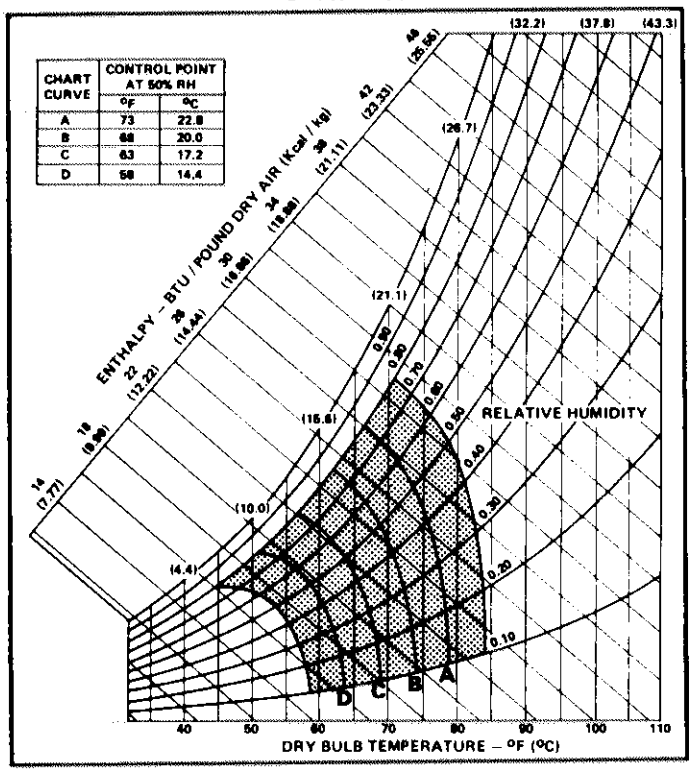
VIII - GCS11 UNIT OPTIONS

A - Power Saver (Figure 27)

1 - The power saver motor modulates in response to the cooling ramp signal, discharge low limit feature, and enthalpy control setting. The range is 1.5 to 4VDC. The outside dampers are in minimum position at 1.5 volts and are open at 4 volts.

2 - The enthalpy control is located in the outdoor air inlet of unit. It senses the total heat content of the outside air including latent heat. If the heat content rises above control setpoint, the power saver dampers drive to minimum position. The recommended set point is "A" as shown in Chart A. If power saver is allowing air which is too warm or humid to enter system, set control to a lower setpoint. Refer to Chart A.

CHART A



3 - The power saver motor includes a spring return feature which closes motor on a power failure. The motor stroke is 160 degrees as shown in Figure 28 and the timing is 40 seconds. With R-W terminals shorted or B leg open, the motor drives outside dampers closed. With R-B terminals shorted or W leg open, the motor drives outside dampers open.

4 - Dampers are factory adjusted. The dampers rotate 90 degrees. If adjustment is needed, drive the dampers closed and adjust each blade individually.

5 - Adjust minimum positioner with outside dampers at minimum position (turn enthalpy control to "D"). Rotate screw clockwise to open dampers or counterclockwise to close dampers. Return enthalpy control back to normal setting.

If desired a remote minimum positioner may be used in place of the one at motor bracket. Simply disconnect existing minimum positioner and wire the new one with "W" lead to TBE-7, jumper "R" lead to "B" lead and connect to TBE-8. The remote minimum positioner rotates counterclockwise to open and clockwise to close.

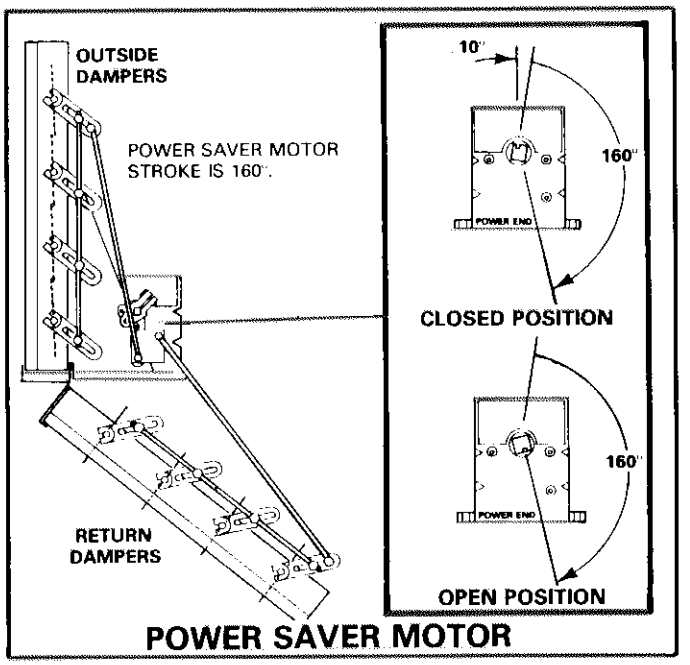


FIGURE 28

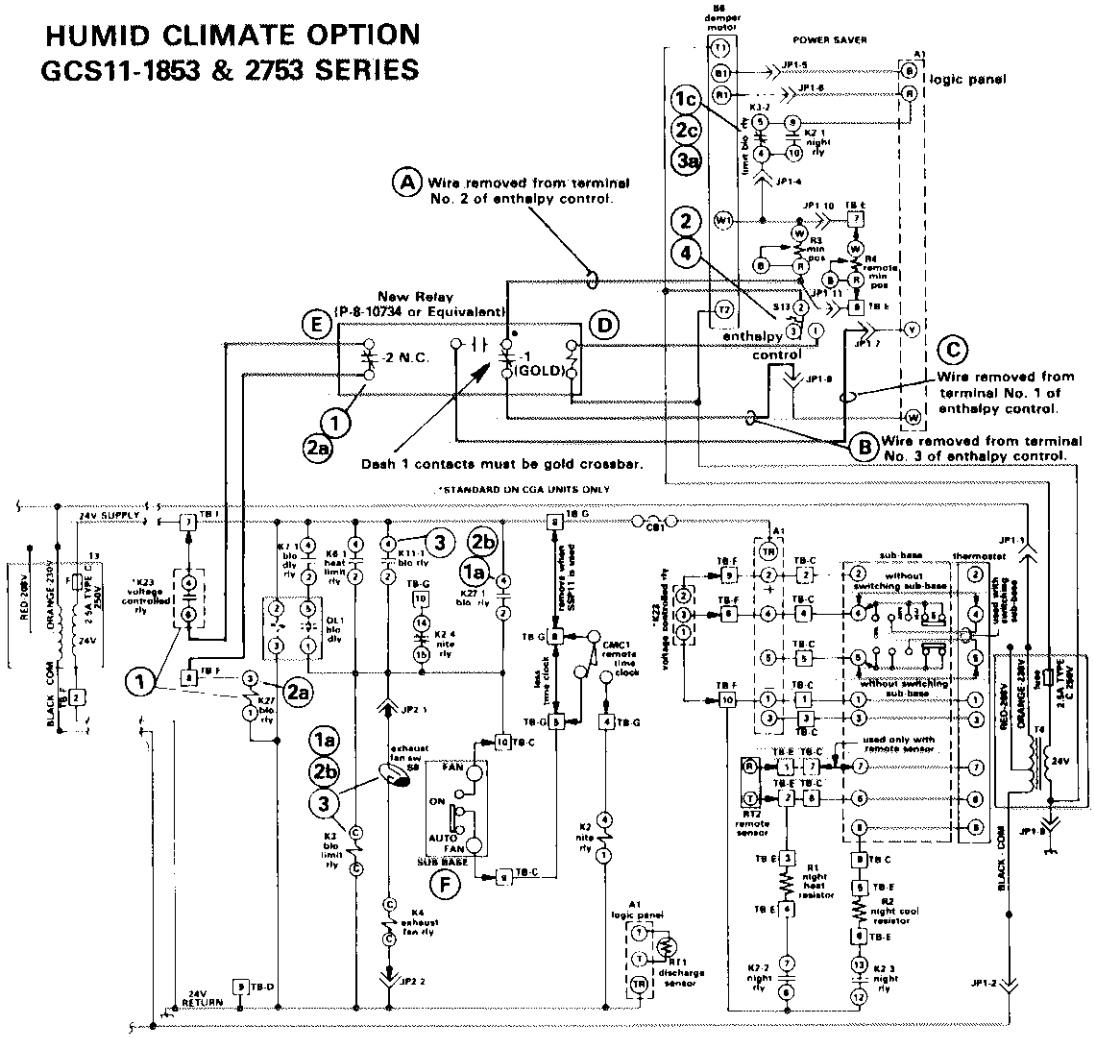
6 - If the GCS11 application includes a power saver and any one or combination of the following options — switching subbase, SP11 status panel or SSP11 switching status panel — a K23 Voltage Controlled relay must be field installed. The main function of K23 is to start the blower during power saver operation when the fan switch is set to "Auto." The blower is started at 3.5-4.8VDC (cooling ramp signal) and cycled off at 2.3-3.5VDC. The secondary function of K23 is to light the status panel "cool mode" LED to indicate power saver operation. A unit with a standard nonswitching subbase, SP11 and power saver requires K23 only to operate the "cool mode" indicator during power saver operation. K23 is factory installed on C.G.A. units only.

7 - Humid Climate Option:

In very humid climates it may be desirable to eliminate power saver operation during high humidity conditions. This would keep the outside dampers closed and blower motor stopped until there was a mechanical cooling demand. On a mechanical cooling demand, the outside dampers would open to minimum position for ventilation and the blower would run. During favorable conditions the power saver would function normally.

This can be accomplished with the use of a switching subbase or switching status panel and the field installation of an additional relay. Figure 29 shows the hook-up and explains the sequence of operation. The enthalpy control is rewired to control the new relay coil and the relay contacts are inserted into the control circuit to provide the above functions.

HUMID CLIMATE OPTION
GCS11-1853 & 2753 SERIES



INSTALLATION

A - Remove wire from terminal No. 2 of enthalpy control and connect to common of gold crossbar contacts on relay.

B - Remove wire from terminal No. 3 of enthalpy control and connect to N.C. side of gold crossbar contacts on relay.

C - Remove wire from terminal No. 1 of enthalpy control and connect to N.O. side of gold crossbar contacts on relay.

D - Connect relay coil through enthalpy control terminals 1 and 2 to the power saver transformer T4 (24VAC)

E - Connect -2 N.C. contacts of relay in series with K23 voltage control relay N.O. contacts.

F - Place 'FAN' switch in 'AUTO' position on switching subbase or switching status panel.

OPERATION

1 - Power saver demand (K23 energized) during low humidity conditions energizes K27 blower relay through K23 contacts and the -2 N.C. contacts of the new relay.

a - K27-1 N.O. contacts close to energize K3 blower relay and provide power to the exhaust fan mercury switch, S8, when used.

b - K3-1 N.O. contacts (not shown) close to energize the blower contactor, K1.

c - K3-2 N.C. contacts open allowing power saver motor to modulate.

2 - During excessive humidity conditions, enthalpy control contacts 1 to 2 close energizing the new relay.

a - The relay's -2 N.C. contacts open to de-energize K27.

b - K27-1 contacts open, dropping out K3 blower relay (and exhaust fan circuit when used). Consequently the blower is stopped.

c - K3-2 N.C. contacts are now closed causing the power saver motor to drive the outside dampers closed.

3 - On a compressor demand K11-1 blower relay contacts will close energizing K3 blower relay, starting the blower. (Power is also provided to the exhaust fan circuit, when used, but the fans will remain off with the outside air dampers closed. The exhaust fan mercury switch, S8 on the damper motor shaft controls K4 relay to operate the fans only when outside dampers are open.)

a - K3-2 contacts open. Power saver motor opens to minimum position. The signal opening the motor feeds from terminal Y of A1 logic panel through the new relay -1 N.O. contacts (closed) to terminal R/B of min. pos. potentiometer and on into W1 of the damper motor.

4 - When outside air is again suitable for cooling, enthalpy control opens contacts 1-2 to de-energize relay, returning system to power saver operation.

FIGURE 29

B - Gravity & Power Exhaust Dampers

On GCS11 applications including a power saver, gravity or power exhaust dampers may be used for system pressure relief. The dampers are mounted in the lower half of the return air section. Refer to the dimension drawings and figures 6 and 27 for location. When a horizontal discharge mounting frame is used exhaust dampers and fans if used are mounted in the side of the return air plenum.

The power exhaust damper fan motors (2 on 1853 units and 3 on 2753 units) are controlled by S8 mercury switch on the power saver motor. When the return air dampers are closed and the main blower is on, the fans operate. The fans do not require any field adjustment. Figure 30 shows the correct position of the mercury switch (S8) and crank arm on auxiliary end of the power saver motor with the motor in the fully closed position (outdoor air dampers closed).

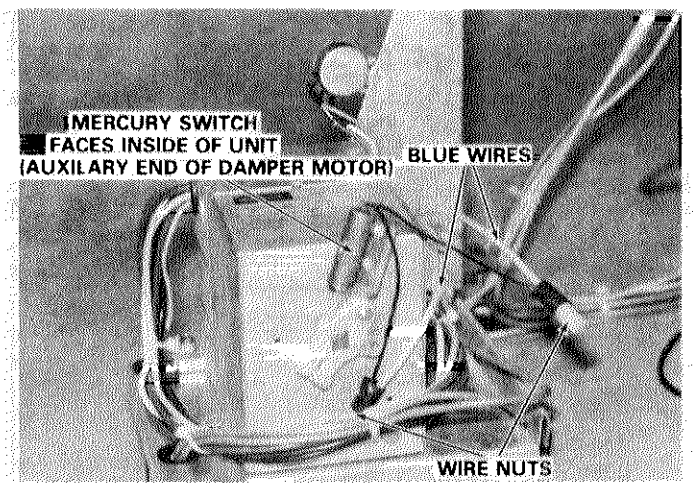


FIGURE 30

Figure 30.5 gives dimension for position of exhaust fan blades in orifice panel.

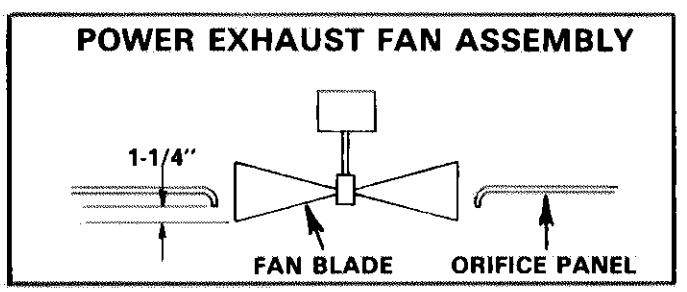


FIGURE 30.5

C - Minimum Fresh Air Dampers

The OAD11-185 and 275 minimum fresh air damper assembly is externally mounted on the fresh air intake end of unit using filler panels, see Figure 31. The dampers may be manually adjusted for minimum air requirements to a fixed position; the linkage is locked to hold position. Refer to Table 10 for damper blade angle corresponding to percentage of fresh air.

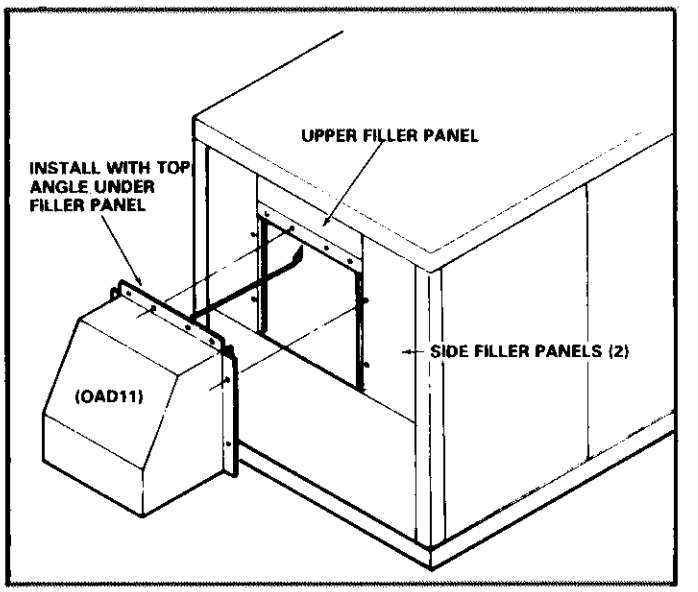


FIGURE 31

An automatic fresh air damper kit is added to the manual damper assembly to motorize the dampers. The motor opens the dampers to the minimum position during unit operation. During night operation and when the main blower is off, the motor is de-energized by K32 relay and spring returns the dampers closed. The fresh air percentage is adjusted as in Table 10. Figure 32 shows the damper motor kit components and dimensions for positioning the crank arm and ball joint on the motor in the closed position. Figure 33 is a damper end view of the fresh air assembly showing location of motor kit. A harness from the motor kit plugs into the unit wiring above the filter rack in the return air section.

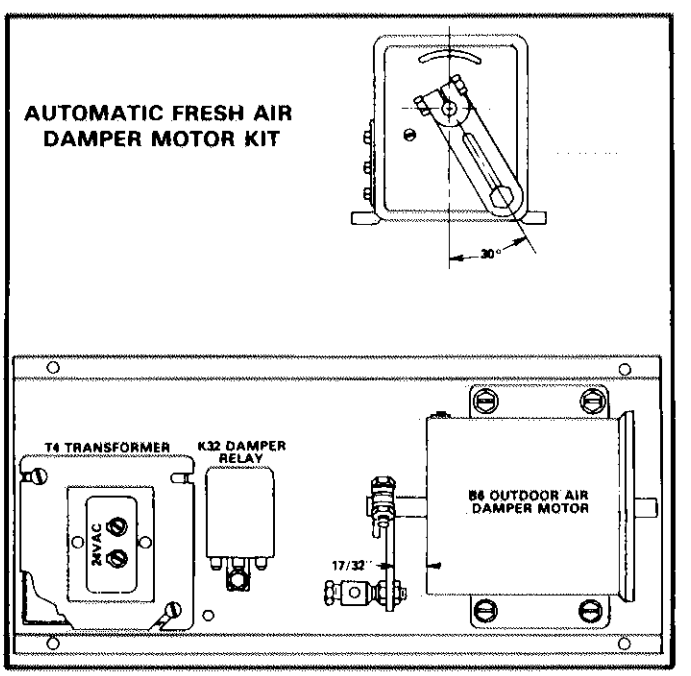


FIGURE 32

TABLE 10

Damper Blade Angle	Return Air Duct Static Pressure					
	0" (0mm)		.25" (6mm)		.5" (13mm)	
	PSD11	OAD11	PSD11	OAD11	PSD11	OAD11
5°	13%	12%	20%	18%	30%	27%
10°	26	21	34	27	46	37
15°	37	27	46	33	57	41
20°	48	31	57	37	66	43
25°	58	34	66	38	74	44
30°	69	37	75	41	81	45
35°	79	40	84	43	88	46
40°	90	45	92	46	94	47

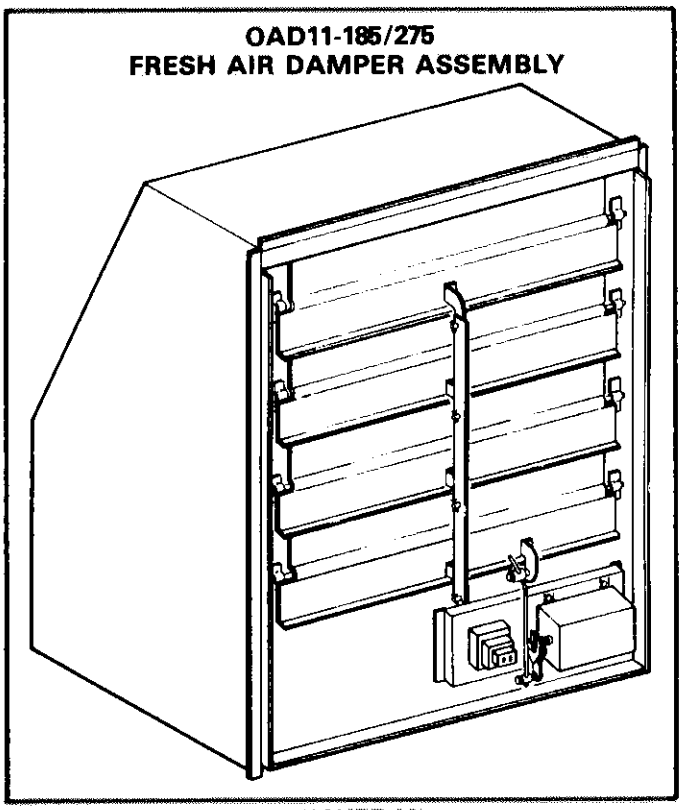


FIGURE 33

D - Low Ambient Kit

This kit allows cooling operation at outdoor ambients below 55°F. It provides a 30 second low pressure switch bypass (DL4 delay relay) during compressor startup and also contains a pressure switch (S11) for cycling condenser fan to maintain adequate head pressure. A low ambient thermostat (S7 - factory set at 55°F) is used to lockout one compressor during low ambient operation. On the 1853 units the 5 ton compressor No. 1 is locked out and the 10 ton compressor No. 2 runs with the low ambient controls tied into its circuitry. On the 2753 units both compressors are 10 ton, No. 2 is locked out and No. 1 runs with the low ambient controls tied into its circuitry. When the kit is installed the S6 compressor monitor in the main control box is used to set the low ambient limit for compressor operation. S6 can be readjusted from factory setting of 55°F down to 20°F. A typical setting for cutout of low ambient compressor operation is 35°F.

The field wiring consists of removing the jumper plug from the JP3 jack located on the bottom of the main control box and inserting the low ambient kit wiring harness plug into JP3. The pressure switch sensing line from the kit is connected to the respective compressor discharge line service valve (Refer to Figures 8 and 9).

Figure 34 shows the low ambient kit component arrangement. The pressure switch S11 is used to cycle the condenser fan contactor; the pressure switch setpoints are:

Cut In	275 psig
Differential	135 psig
Cut Out	140 psig

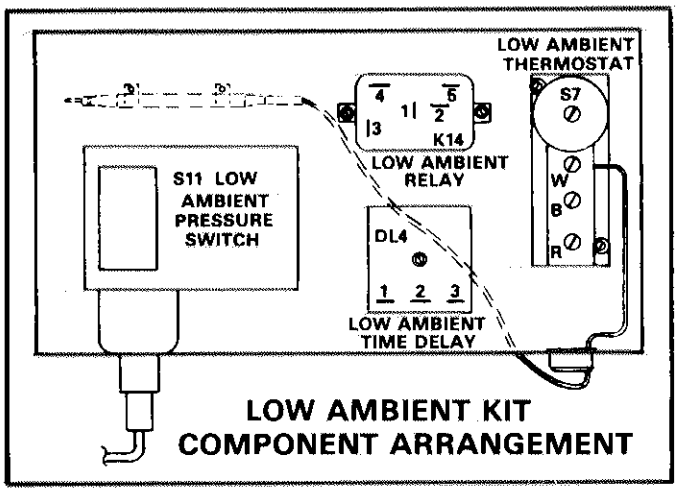


FIGURE 34

E - Night Operation

The GCS11-1853/2753 units contain controls required for night operation with a remote time clock. Terminals are provided on the low voltage terminal block for connection of wiring to contacts of a remote mounted time clock. Power for the clock motor is provided separate from the GCS11 at the remote location; 120VAC. See Figure 35.

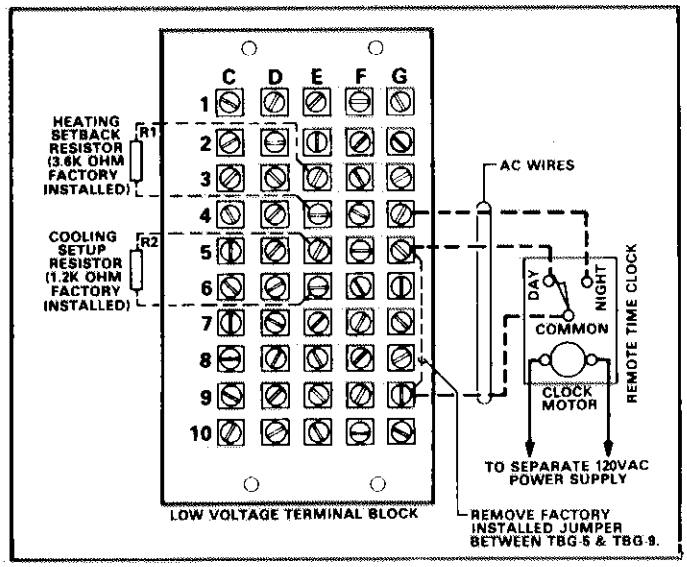


FIGURE 35

The amount of heating setback or cooling setup is determined by separate resistors located on the low voltage terminal block, see Figure 35. The resistor can be substituted according to Table 11 to obtain the desired setting. Substitute resistors must be within 10% tolerance.

If a field supplied remote time clock is used with either a 120VAC or 230VAC motor, it must have "low level-pilot duty S.P.D.T. contacts" with an approximate 1 amp rating. Not tungsten contacts with a 40 amp rating as found with most "off the shelf" time clocks. Tungsten contacts develop too high contact resistance over a period of time preventing the low current 24 volt relays in the unit from operating.

TABLE 11

°F	Night Setback (R1)	Cool Setup (R2)
5	7.5K	20K
7	----	18K
9	----	16K
10	3.6K*	15K
13	----	13K
15	2K	12K
Cool Lockout	----	1.2K**

**This resistor is factory installed for heating. There is a 7.5K resistor taped to side of low voltage junction box.*

***This resistor is factory installed for cooling. Establishing a cooling setup value with a resistor of less than 1.2K ohm resistance will limit the maximum heat setback value to 12°F.*

F - Status Panels

The status panels allow remote monitoring of system operation. Two types of panels are available. The SP11, Figure 36, provides system readout only. The SSP11 switching status panel, Figure 37, is a combination of switching subbase and status panel functions. The SSP11 also has an "After Hours Timer" to override the unoccupied mode (night heating setback/cooling setup).

1 - Indications & Functions

a. The "Cool Mode" LED lights green to indicate power saver "free cooling" operation when unit includes power saver option. Otherwise the LED indicates mechanical cooling operation.

b. The "Heat Mode" LED lights green during normal heating operation.

c. The "Compressor 1" and "Compressor 2" LED's are green when the respective compressors are running. Either light will turn red if a compressor safety switch opens during a compressor demand.

d. The "No Heat" LED lights red on a loss of heat during a heating demand.

e. The "Filter" LED lights red when the filter pressure switch contacts close indicating a dirty filter.

f. The "System" switch on the SSP11 has five positions to indicate the following functions:
   OFF - System off.
   HEAT - Heating only.
   AUTO - System Automatically provides heating or cooling on demand.
   COOL - Cooling only.
   EM HEAT - (Emergency heat) Not applicable, but if placed in this position the unit operates in the normal heating only mode.

g. The "Fan" switch on the SSP11 has two positions to indicate the following functions:
   AUTO - Blower cycles with demand.
   ON - Blower runs continuously.

h. The "After Hours Timer" on the SSP11 provides override of unoccupied mode operation (night heating setback/cooling setup) from 0 to 12 hours. In the occupied (day) mode the after hours timer has no effect on unit operation. The unit must be in the unoccupied (night) mode to activate the timer. Set the potentiometer for the number of hours desired override and push the momentary start button. The unit will revert to the occupied mode operation for the set number of hours.

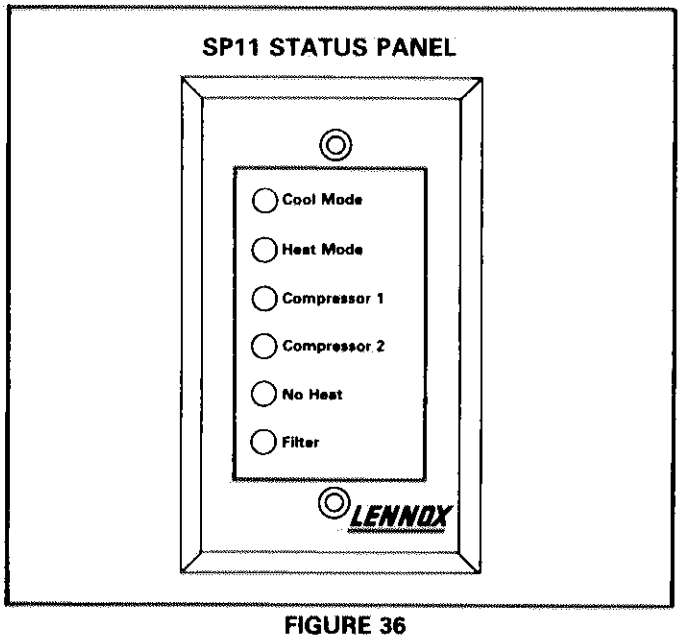


FIGURE 36

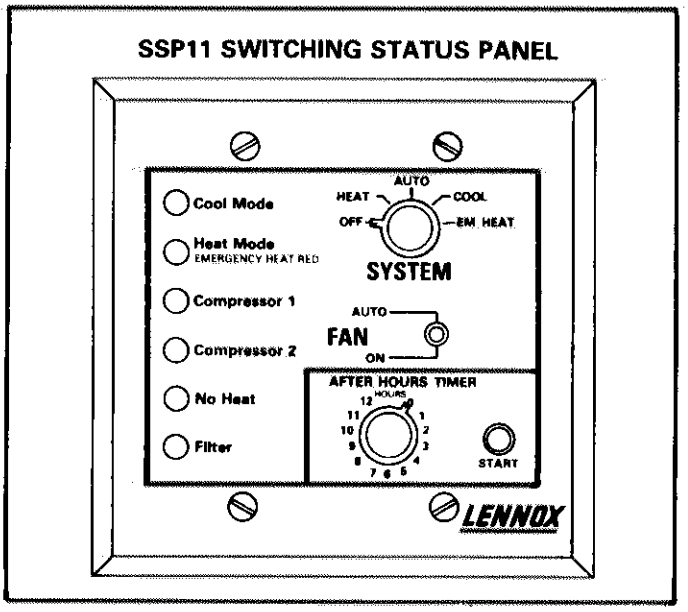


FIGURE 37

2 - Wiring

Application of either the SP11 or SSP11 to the GCS11-1853 and 2753 series requires addition to the unit of an Electric Control Kit (includes a relay interface board and delay relay). The relay interface board is shown in Figure 38. It mounts and connects with two plug in harnesses in the main control box (refer to Figure 7). The delay relay (DL7) also mounts in the main control box.

The status panel wiring connections are made at a numbered terminal strip on back of panel (SSP11 panels have two terminal strips). These are push on terminal strips. They may be removed by pulling evenly away from the panel for testing, wiring or panel replacement. See Figure 39 for SP11 panel and Figure 40 for SSP11 panel.

When either status panel is used with the GCS11-1853 or 2753 units, two blue "mini-jumps" on the back of panel must be removed, see Figures 39 and 40. Failure to remove the "mini-jumps" will not damage the panels but may cause improper readout indications. Early model status panels did not have the "mini-jumps", no modification is needed if used.

When the SSP11 switching status panel is used on the GCS11-1853 and 2753 units, a yellow jumper wire between the two circuit boards must be cut out. See Figure 40 (this is the only jumper between the circuit boards). Removal of this wire prevents the "Heat Mode" light from changing to red if the "System" switch is placed in the emergency heat ("EM HEAT") position. This function is not applicable to GCS11 units and removal of the wire prevents confusion. (If the switch is placed in the "EM HEAT" position the unit operates heating normally with a green "Heat Mode" indication.)

3 - Basic Operation

The status panels operate from the 24VAC (T3 Transformer) control circuit in the GCS11 unit. The heating and cooling logic panel control circuits (C1, C2, H1, H2 etc.) operate at 120VAC. Refer to unit schematics on Pages 38 through 41. Conversion of the 120VAC circuit signals is accomplished with the relay interface board containing relays K17, K18, K19, K20, K21 and K22. These relays have 120VAC coils connected to the 120VAC circuits. The relay contacts are powered from the 24VAC side of T3 transformer and used to feed 24VAC signals to the status panel.

The TB-F strip of the unit low voltage terminal block has resistors R5 and R6 factory installed. They provide a circuit required for operation of the compressor 1 and 2 LED's in the red mode. Without R5 and R6 the LED's will not light red if a compressor safety switch opens during cooling demand. If the resistors require replacement use Lennox part number 99C0201 or resistors of the following value: 1/2 watt, 10K ohms, 5% tolerance.

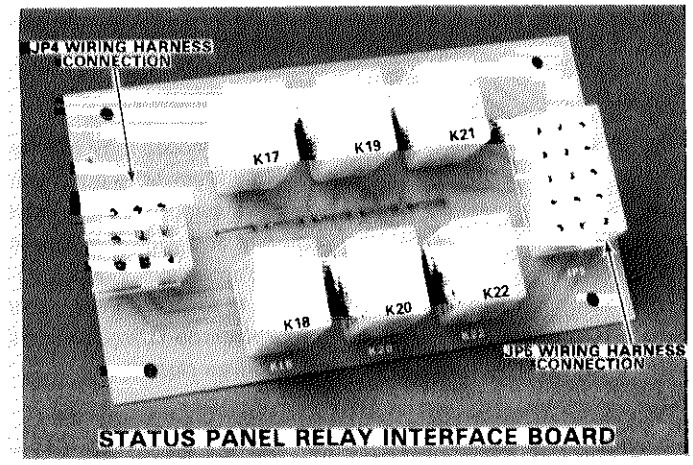


FIGURE 38

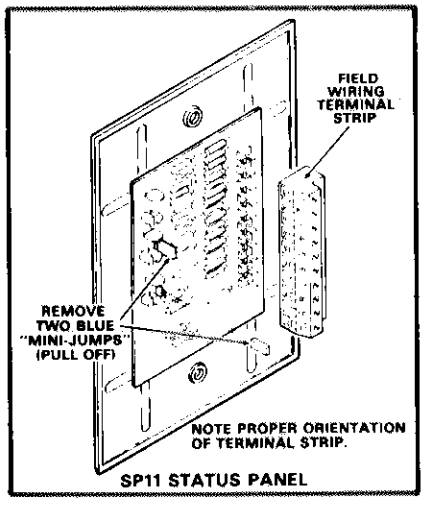


FIGURE 39

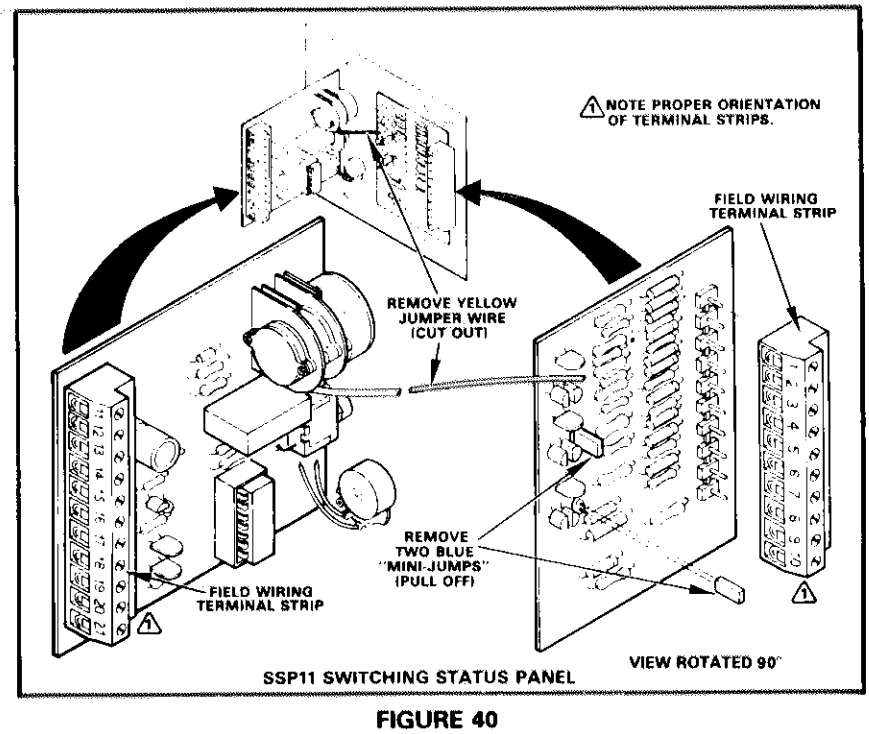
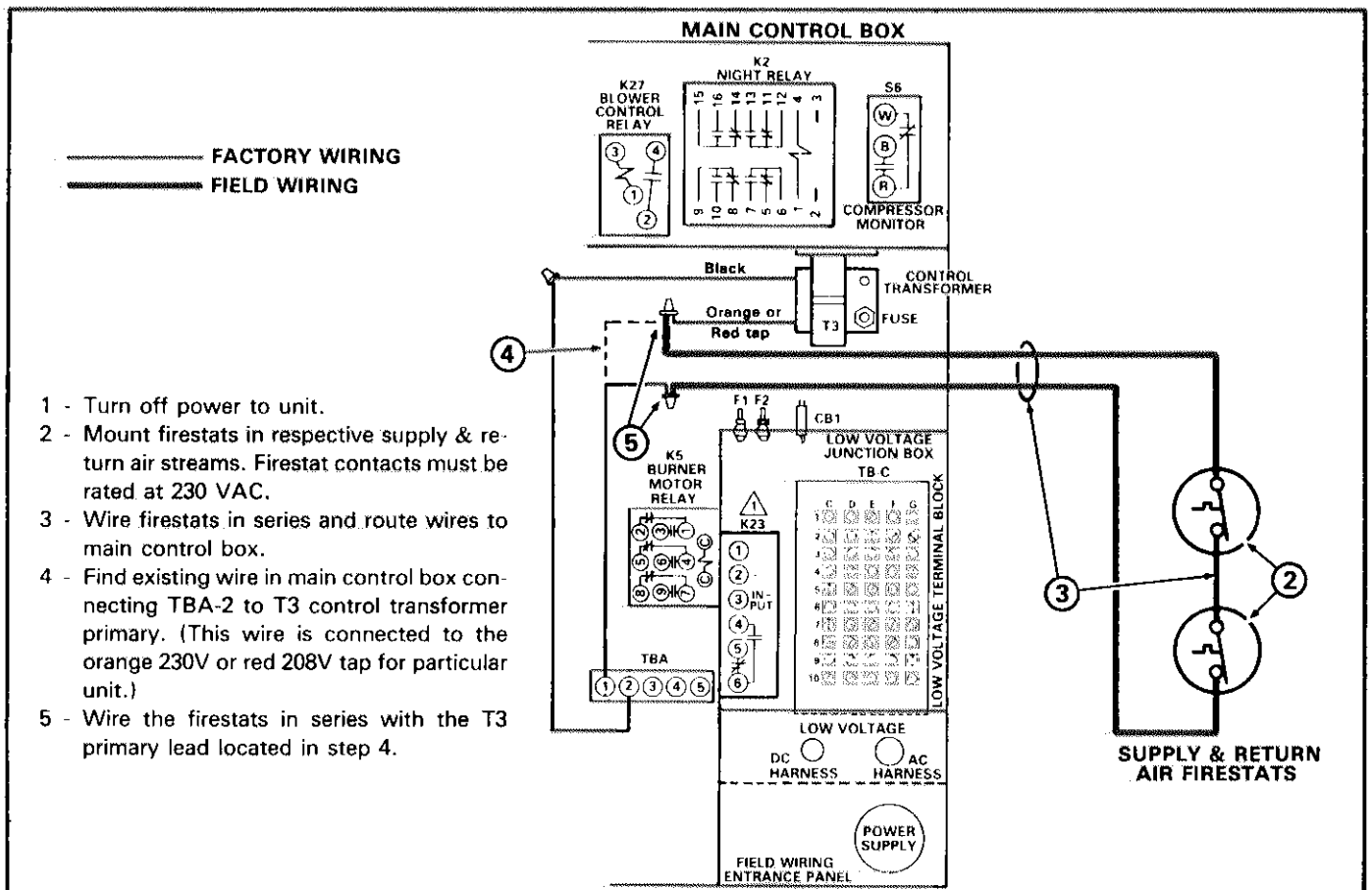


FIGURE 40

IX - FIRESTATS

Some local codes may require the installation of supply air and return air firestats to automatically shut down the equipment at excessive temperatures. These field provided firestats must be mounted and wired per local codes. Manual reset type controls must be accessible. Figure 41 is the recommended method for connection of firestats. When either or both firestats open, the control circuit is de-energized and the unit shuts down and the power saver drives closed.



APPLICATION OF FIRESTATS TO GCS11-1853 & 2753 UNITS

FIGURE 41

X - GENERAL SCHEMATIC INFORMATION

1 - The unit schematic wiring diagram format incorporates horizontal power lines separating line voltage motors, compressors and electric elements (below the lines) from the control circuit (above the lines).

2 - The graphic symbols for components and code lettering used are recommended by the "International Electrotechnical Commission" (IEC) as selected from the "American National Standard" (ANSI) and "IEEE Standard" (Institute of Electrical and Electronics Engineers) of Graphic Symbols for Electrical and Electronics Diagrams. Refer to Figure 42 for code and symbol identification.

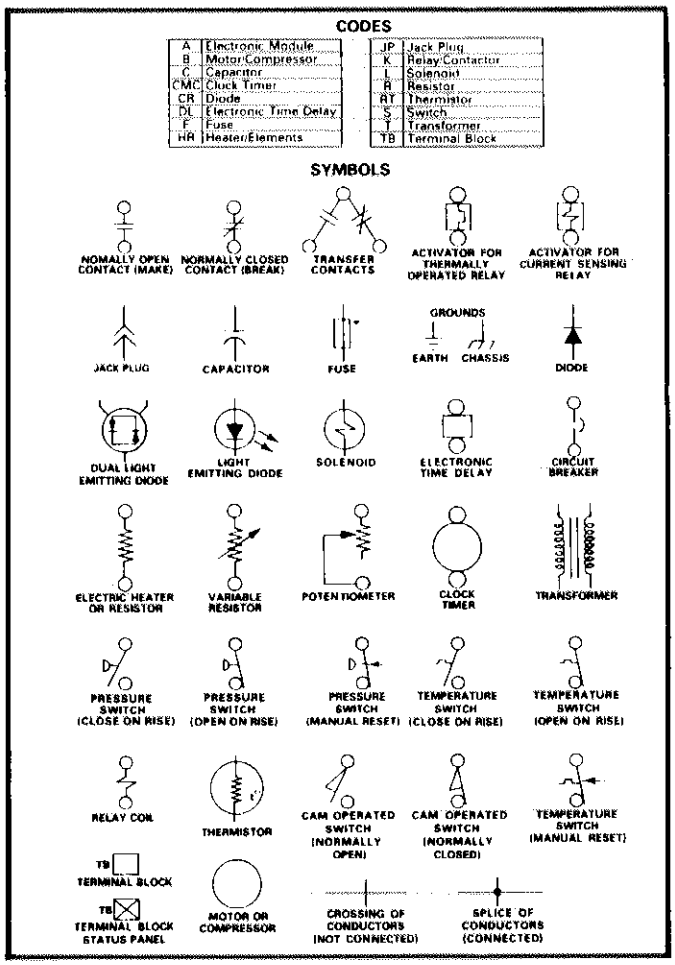


FIGURE 42

3 - Terminal numbers on jack plugs are located by a ridge on the corner of the plug called "Key." Refer to Figure 43 for proper numbering sequence. Jack plugs are shown in the schematic circuit by both jack plug number and terminal number. For example JP2-5 indicates jack plug number 2 and terminal number 5.

4 - Optional circuits are shown with the arrow connections. For example the power transformer (T1) shown in the unit schematic is only used in "G" and "J" voltages.

5 - Solid lines around a control indicate a complete control. Dashed lines around a control indicate only a part of a control. For example the primary control is shown with a solid line in the schematic, while the logic panel (A1) is dashed.

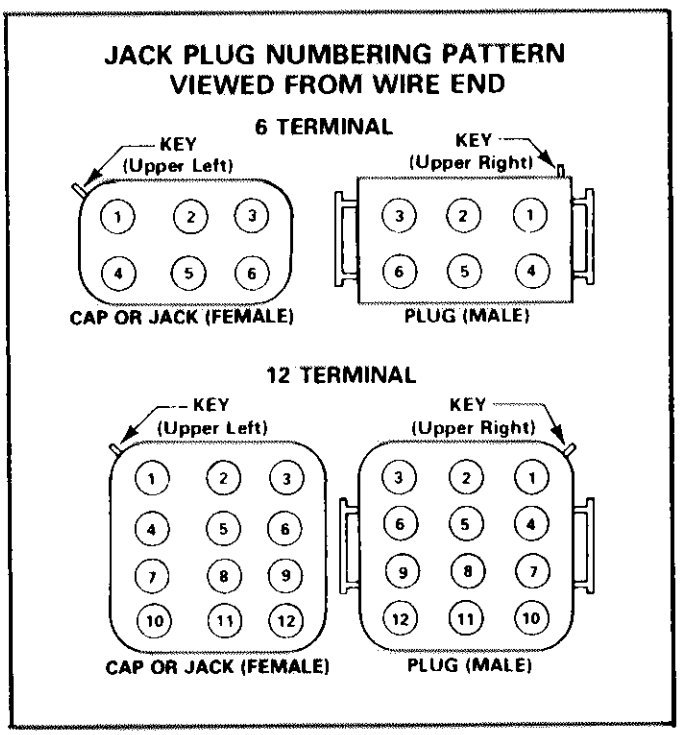
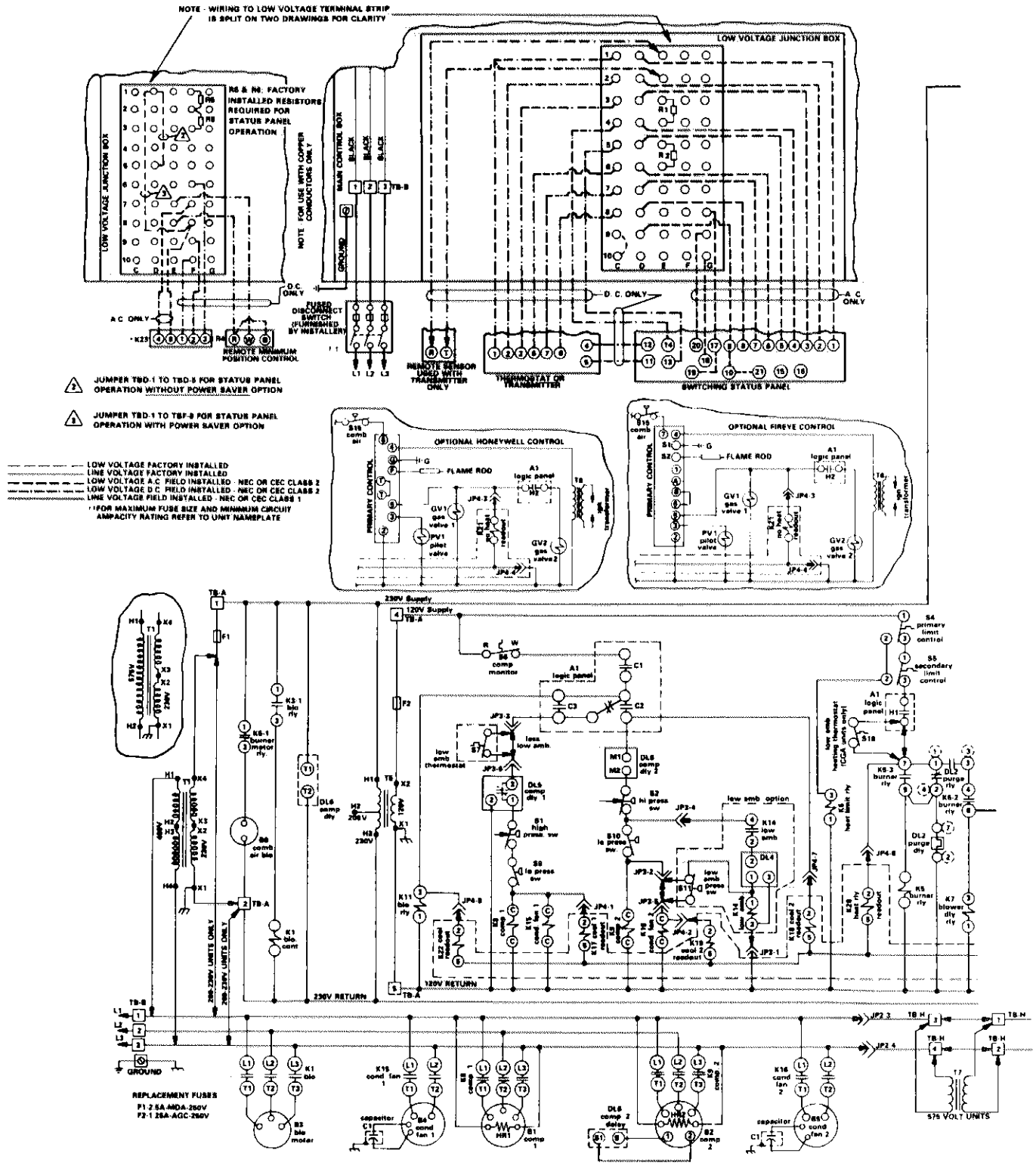
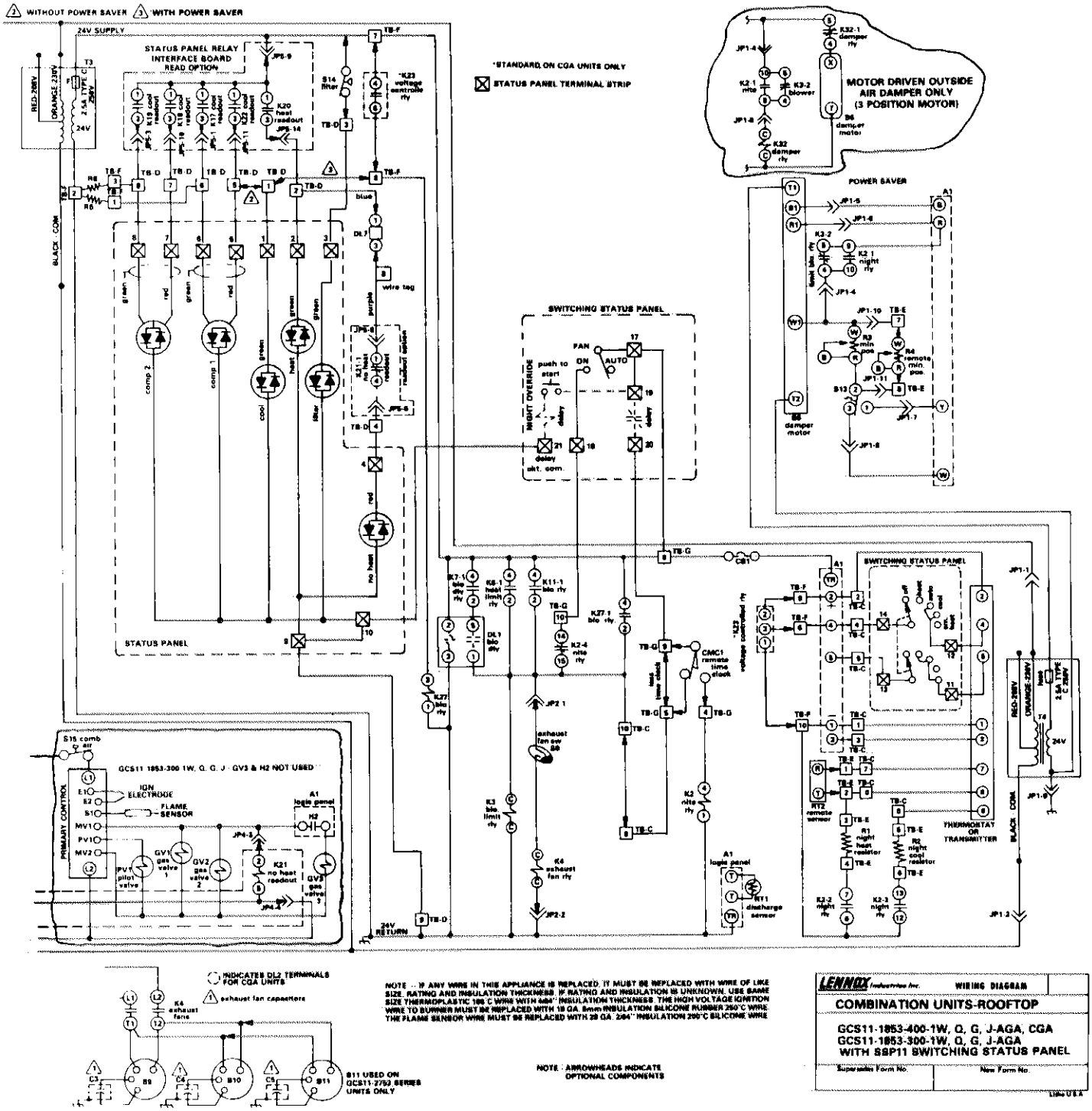


FIGURE 43

6 - Pages 38 and 39 show a complete GCS11 unit schematic for an application including SSP11 switching status panel and power saver. Pages 40 and 41 show another GCS11 unit schematic for switching subbase, SP11 status panel and power saver.


NOTE - WIRING TO LOW VOLTAGE TERMINAL STRIP IS SPLIT ON TWO DRAWINGS FOR CLARITY
LOW VOLTAGE JUNCTION BOX
R5 & R6: FACTORY INSTALLED RESISTORS REQUIRED FOR STATUS PANEL OPERATION
NOTE: FOR USE WITH COPPER CONDUCTORS ONLY
MAIN CONTROL BOX
BLACK
BLACK
BLACK
GROUND
TB-B
D.C. ONLY
A.C. ONLY
FUSED DISCONNECT SWITCH (FURNISHED BY INSTALLER)
REMOTE MINIMUM POSITION CONTROL
REMOTE SENSOR USED WITH TRANSMITTER ONLY
THERMOSTAT OR TRANSMITTER
SWITCHING STATUS PANEL
JUMPER TBD-1 TO TBD-5 FOR STATUS PANEL OPERATION WITHOUT POWER SAVER OPTION
JUMPER TBD-1 TO TBF-9 FOR STATUS PANEL OPERATION WITH POWER SAVER OPTION
LOW VOLTAGE FACTORY INSTALLED
LINE VOLTAGE FACTORY INSTALLED
LOW VOLTAGE A.C. FIELD INSTALLED - NEC OR CEC CLASS 2
LOW VOLTAGE D.C. FIELD INSTALLED - NEC OR CEC CLASS 2
LINE VOLTAGE FIELD INSTALLED - NEC OR CEC CLASS 1
FOR MAXIMUM FUSE SIZE AND MINIMUM CIRCUIT AMPACITY RATING REFER TO UNIT NAMEPLATE
OPTIONAL HONEYWELL CONTROL
OPTIONAL FIREYE CONTROL
PRIMARY CONTROL
FLAME ROD
230V Supply
120V Supply
230V RETURN
120V RETURN
low smb option
208-230V UNITS ONLY
GROUND
REPLACEMENT FUSES
F1-2.5A-MDA-250V
F2-1.25A-AGC-250V
575 VOLT UNITS

GCS11 WITH SSP11 SWITCHING STATUS PANEL AND POWER SAVER



NOTE - IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING AND INSULATION THICKNESS. IF RATING AND INSULATION IS UNKNOWN, USE SAME SIZE THERMOPLASTIC 105°C WIRE WITH 0.4mm" INSULATION THICKNESS. THE HIGH VOLTAGE IGNITION WIRE TO BURNER MUST BE REPLACED WITH 18 GA. 8mm INSULATION SILICONE RUBBER 260°C WIRE. THE FLAME SENSOR WIRE MUST BE REPLACED WITH 20 GA. 2.0M" INSULATION 200°C SILICONE WIRE

NOTE - ARROWHEADS INDICATE OPTIONAL COMPONENTS

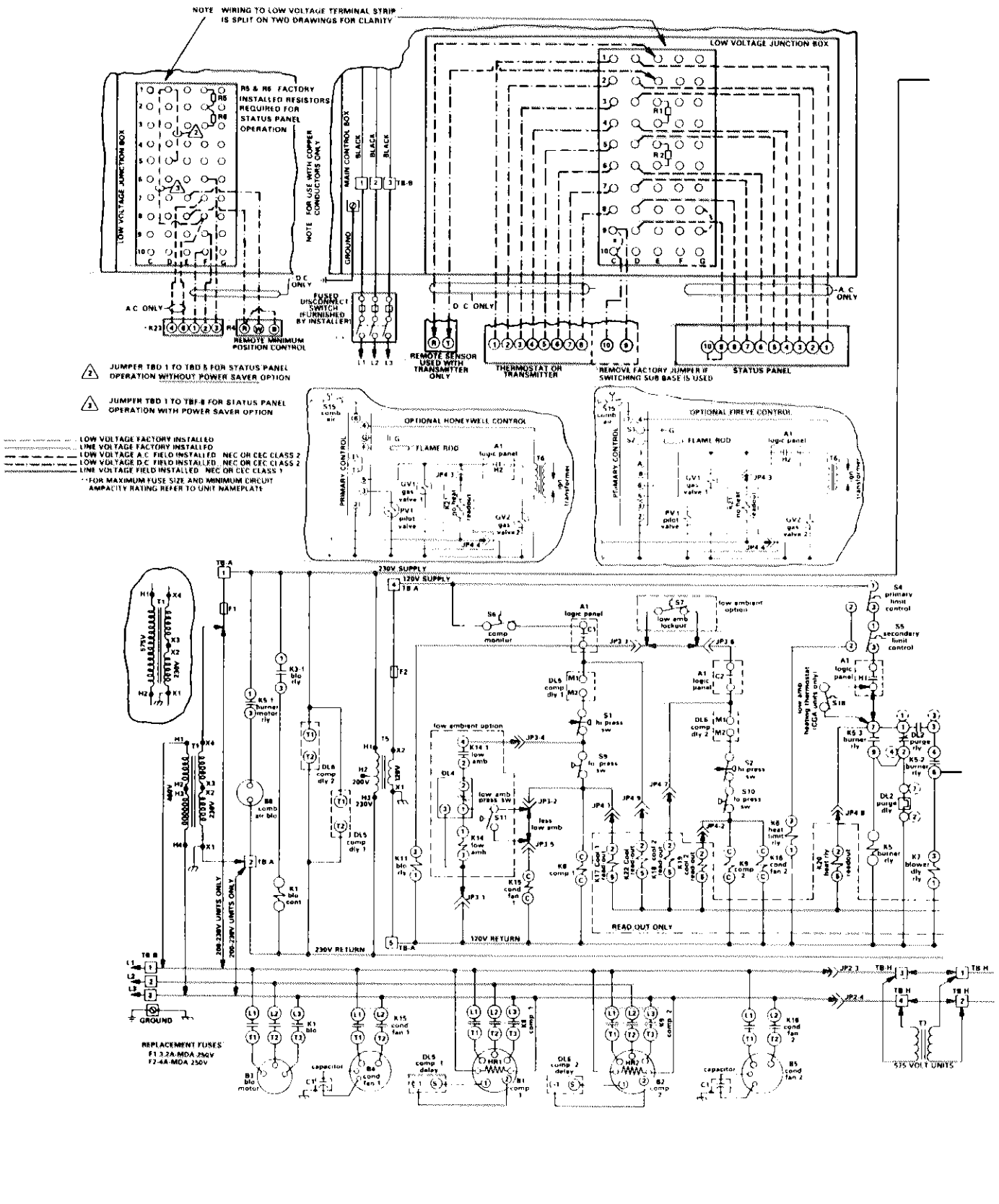
LENNOX Industries Inc. — WIRING DIAGRAM

COMBINATION UNITS-ROOFTOP

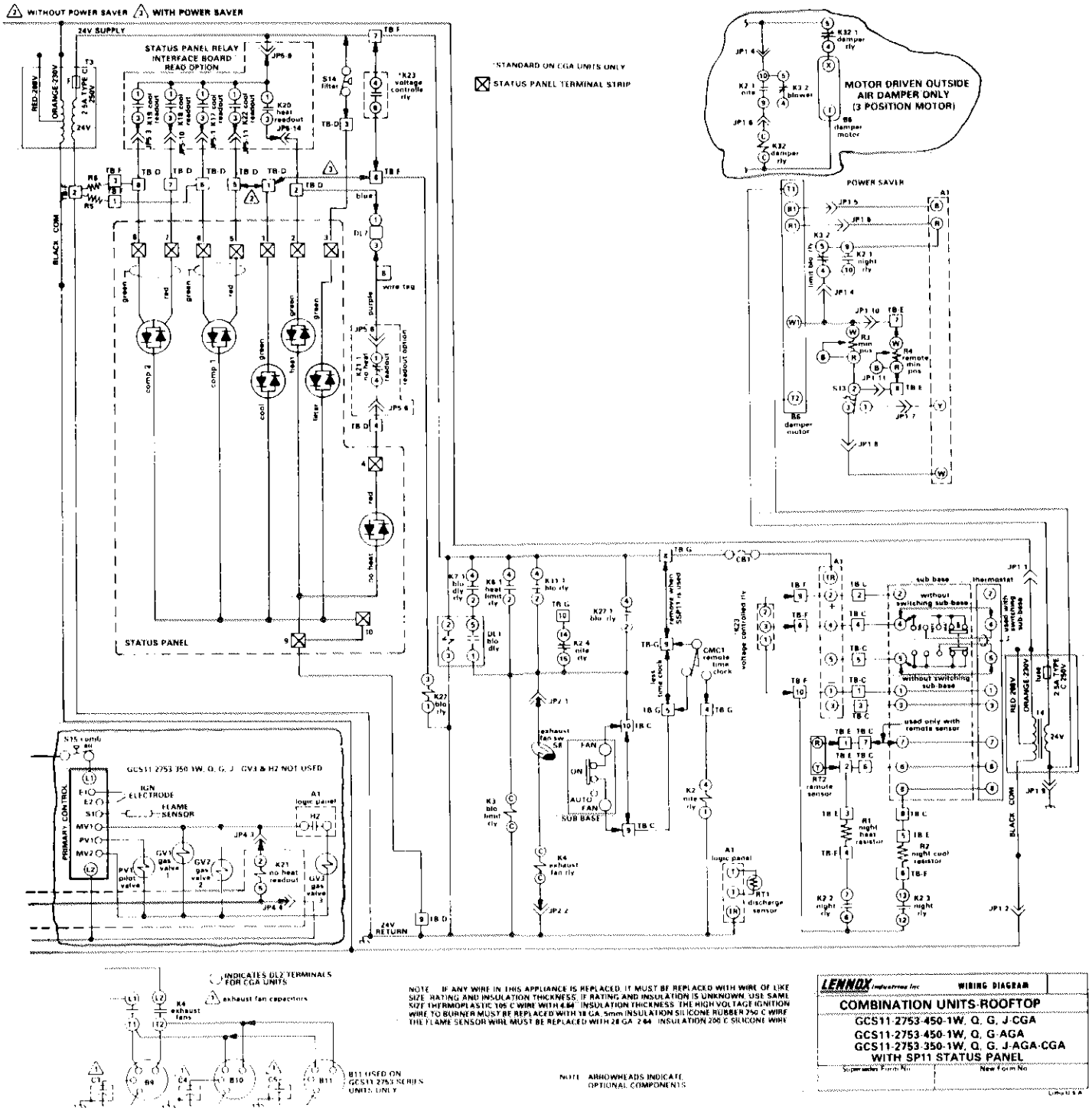
GCS11-1853-400-1W, Q, G, J-AGA, CGA
GCS11-1853-300-1W, Q, G, J-AGA
WITH SSP11 SWITCHING STATUS PANEL

Supersedes Form No.	New Form No.

Litho U.S.A.


NOTE WIRING TO LOW VOLTAGE TERMINAL STRIP IS SPLIT ON TWO DRAWINGS FOR CLARITY
LOW VOLTAGE JUNCTION BOX
R5 & R6 FACTORY INSTALLED RESISTORS REQUIRED FOR STATUS PANEL OPERATION
NOTE FOR USE WITH COPPER CONDUCTORS ONLY
MAIN CONTROL BOX
GROUND
BLACK
BLACK
TB-B
A.C. ONLY
D.C. ONLY
FUSED DISCONNECT SWITCH (FURNISHED BY INSTALLER)
REMOTE MINIMUM POSITION CONTROL
REMOTE SENSOR USED WITH TRANSMITTER ONLY
THERMOSTAT OR TRANSMITTER
REMOVE FACTORY JUMPER IF SWITCHING SUB BASE IS USED
STATUS PANEL
JUMPER TBD 1 TO TBD 8 FOR STATUS PANEL OPERATION WITHOUT POWER SAVER OPTION
JUMPER TBD 1 TO TBF 8 FOR STATUS PANEL OPERATION WITH POWER SAVER OPTION
LOW VOLTAGE FACTORY INSTALLED
LINE VOLTAGE FACTORY INSTALLED
LOW VOLTAGE A.C. FIELD INSTALLED NEC OR CEC CLASS 2
LOW VOLTAGE D.C. FIELD INSTALLED NEC OR CEC CLASS 2
LINE VOLTAGE FIELD INSTALLED NEC OR CEC CLASS 1
FOR MAXIMUM FUSE SIZE AND MINIMUM CIRCUIT AMPACITY RATING REFER TO UNIT NAMEPLATE
OPTIONAL HONEYWELL CONTROL
OPTIONAL FIREYE CONTROL
PRIMARY CONTROL
FLAME ROD
230V SUPPLY
120V SUPPLY
120V RETURN
230V RETURN
READ OUT ONLY
GROUND
REPLACEMENT FUSES
F1 3.2A-MDA 250V
F2 4A-MDA 250V
575 VOLT UNITS

GCS11 WITH SP11 STATUS PANEL AND POWER SAVER



XI - SEQUENCE OF OPERATION

A - GCS11-2753 Operation Flow Chart - Figure 44

This chart is used to show the overall unit functions required to supply power and control blowers, compressors, fans, gas valves and other components in the system. The chart is keyed by number to the following description of operating characteristics.

1 - High voltage power provided from the disconnect is used to power all control transformers and system contactors.

2 - A separate 24 volt transformer (T4) is used to operate the power saver motor.

3 - A 24 volt transformer T3 provides control power for operation of the logic panel A1, time clock day and night functions and switching functions of K6, K7, K11, K23, K27 and DL1 relays.

4 - A 120 volt transformer T5 provides 120 VAC control power for operation of cooling and heating controls through C1, C2, H1 and H2 of the logic panel.

5 - Cooling or heating demand D.C. voltage ramps are generated through the room thermostat and sent to the logic panel A1.

6 - Logic panel A1 modulating power saver signal is generated on first need for cooling above 1.5 VDC on the cooling ramp. The signal to 'open' goes to the power saver controls.

7 - Upon further increase in cooling demand, the logic panel closes switches C1 and C2 for compressor operation.

8 - The compressors will be energized if the ambient temperature is above the setpoint of the compressor monitor, S6. (Adjustable 20 to 90°F)

9 - The limit blower relay K3 energizes the 230 VAC blower contactor K1 to operate the supply air blower.

10 - K3 is energized for blower and power saver operation by one or more of five control paths as follows.

11 - The time clock in the 'DAY' position provides power to the fan switch on the thermostat subbase. The fan switch in the 'ON' position operates the blower continuously by energizing K3 limit blower relay. (The 'AUTO' position allows intermittent operation through the remaining four control paths.)

12 - For intermittent blower operation, K3 is energized through K23 and K27 to operate the blower during a power saver cooling cycle. (K23 is energized when the cooling signal increases to 4 VDC for full open power saver).

13 - For intermittent blower operation, K3 is energized through K11 to operate the blower during a mechanical cooling cycle. (K11 is energized when C1 of the logic panel is on for stage 1 mechanical cooling.)

14 - For intermittent blower operation, K3 is energized through K7 and DL1 to operate the blower during a heating cycle. (K7 is energized through K5 burner relay when H1 of the logic panel is on for stage 1 heating.)

15 - For intermittent blower operation following high temperature cutout of S4 primary or S5 secondary heating limit controls, K3 is energized through K6 heat limit relay. (K6 is energized directly from either S4 or S5 above 150°F cutout temperature.)

16 - The time clock 'NIGHT' position allows only intermittent supply air blower operation. (Continuous blower is only possible through the 'DAY' position path to energize K3.)

The 'NIGHT' position energizes K2 night relay. K2 closes the power saver, sets up the cooling setpoint and sets back the heating setpoint.

17 - Heating stages are controlled by H1 and H2 switches on the logic panel.

18 - K5 burner relay is energized from T5 through S4 and S5 limits and H1 upon a demand for heating. K5 energizes B8 combustion air motor, DL2 purge delay and K7 blower relay.

19 - Following the DL2 purge delay time of 20 to 70 seconds the primary control is energized through S7 combustion air pressure switch.

20 - The primary control starts sparking at the electrodes, opens PV1 pilot gas valve and proves pilot flame. When pilot is proven the primary control then opens first stage GV1 and GV2 main gas valves and provides power to H2 of the logic panel for second stage operation. The pilot flame ignites first stage burner.

21 - H2 of the logic panel energizes GV3 second stage gas valve. Second stage burner is ignited from the first stage burner flame.

B - GCS11-1853 Operation

The 1853 units follow the same operation flow as illustrated in the 2753 flow chart; Figure 44, except for compressor stages. The Logic Panel used in 1853 units controls three cooling stages through C1, C2 and C3. The two compressors are staged as follows:

Stage 1 = C1 on - Compressor 1 only (5 Ton)
Stage 2 = C1 & C2 on - Compressor 2 only (10 Ton)
Stage 3 = C1, C2 & C3 on - Compressors 1 & 2 (15 Tons)

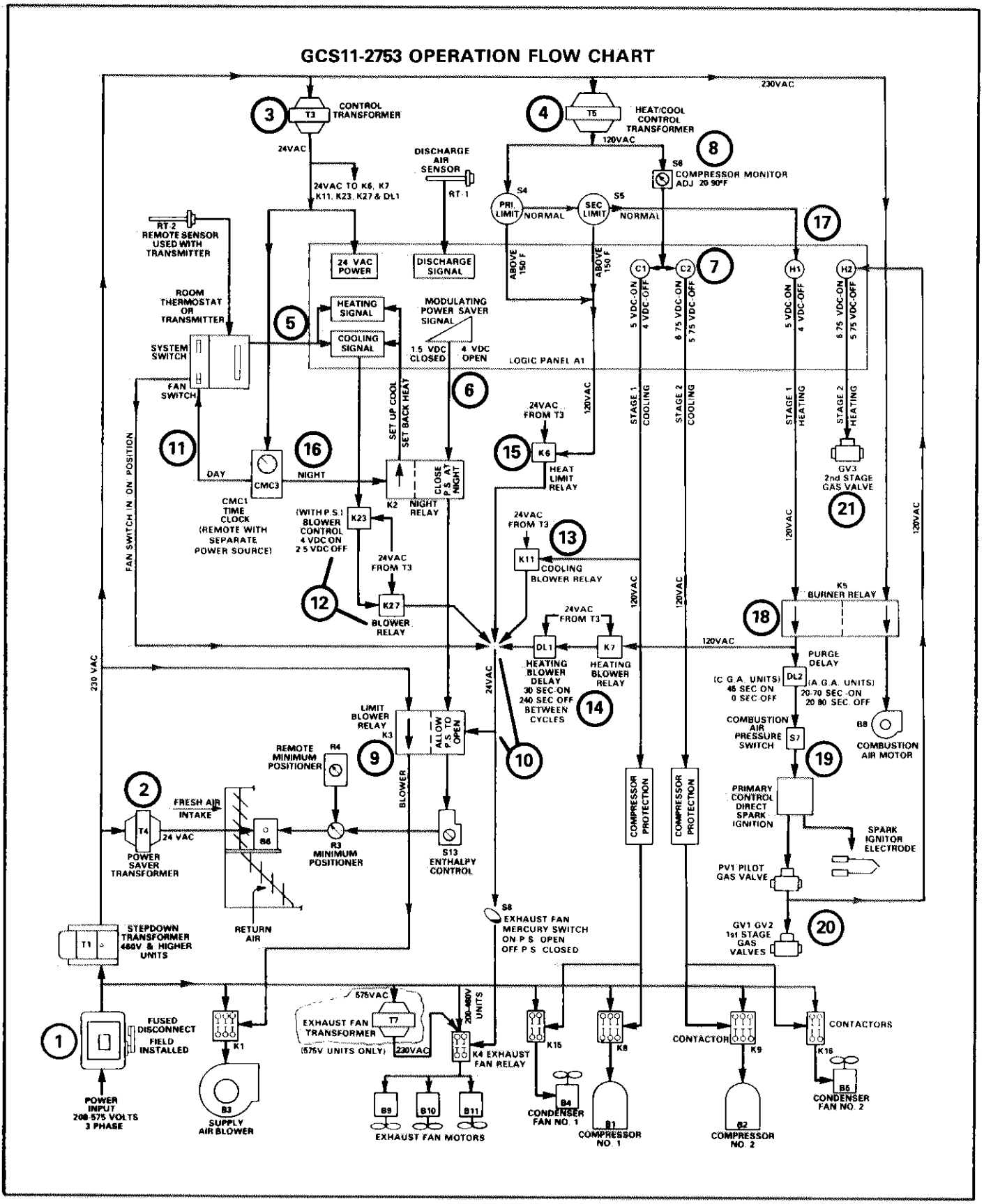

GCS11-2753 OPERATION FLOW CHART
230VAC
3
T3
CONTROL TRANSFORMER
24VAC
24VAC TO K6, K7 K11, K23, K27 & DL1
4
T5
HEAT/COOL CONTROL TRANSFORMER
120VAC
8
S6
COMPRESSOR MONITOR ADJ 20-90°F
DISCHARGE AIR SENSOR
RT-1
S4
PRI. LIMIT
NORMAL
S5
SEC. LIMIT
NORMAL
17
RT-2 REMOTE SENSOR USED WITH TRANSMITTER
24 VAC POWER
DISCHARGE SIGNAL
ABOVE 150 F
C1
C2
7
H1
H2
ROOM THERMOSTAT OR TRANSMITTER
5
HEATING SIGNAL
COOLING SIGNAL
MODULATING POWER SAVER SIGNAL
1.5 VDC CLOSED
4 VDC OPEN
LOGIC PANEL A1
5 VDC-ON
4 VDC-OFF
6.75 VDC-ON
5.75 VDC-OFF
SYSTEM SWITCH
FAN SWITCH
6
SET UP COOL
SET BACK HEAT
24VAC FROM T3
120VAC
STAGE 1 COOLING
STAGE 2 COOLING
STAGE 1 HEATING
STAGE 2 HEATING
11
FAN SWITCH IN 'ON' POSITION
16
15
K6
HEAT LIMIT RELAY
GV3 2nd STAGE GAS VALVE
21
DAY
NIGHT
CMC1 TIME CLOCK (REMOTE WITH SEPARATE POWER SOURCE)
CLOSE P.S. AT NIGHT
K2 NIGHT RELAY
(WITH P.S.) BLOWER CONTROL 4 VDC ON 2.5 VDC OFF
K23
24VAC FROM T3
13
K11
COOLING BLOWER RELAY
K5 BURNER RELAY
18
12
K27
BLOWER RELAY
24VAC FROM T3
DL1
K7
HEATING BLOWER DELAY 30 SEC. ON 240 SEC. OFF BETWEEN CYCLES
HEATING BLOWER RELAY
14
120VAC
PURGE DELAY
DL2
(C.G.A. UNITS) 45 SEC. ON 0 SEC. OFF
(A.G.A. UNITS) 20-70 SEC. ON 20-80 SEC. OFF
230 VAC
24VAC
LIMIT BLOWER RELAY
K3
ALLOW P.S. TO OPEN
COMBUSTION AIR PRESSURE SWITCH
S7
B8
COMBUSTION AIR MOTOR
9
10
19
REMOTE MINIMUM POSITIONER
R4
2
FRESH AIR INTAKE
T4
24 VAC
POWER SAVER TRANSFORMER
B6
R3 MINIMUM POSITIONER
S13 ENTHALPY CONTROL
BLOWER
COMPRESSOR PROTECTION
PRIMARY CONTROL DIRECT SPARK IGNITION
SPARK IGNITOR ELECTRODE
PV1 PILOT GAS VALVE
S8
EXHAUST FAN MERCURY SWITCH ON P.S. OPEN OFF P.S. CLOSED
GV1 GV2 1st STAGE GAS VALVES
20
RETURN AIR
T1
STEPDOWN TRANSFORMER 460V & HIGHER UNITS
575VAC
200-460V UNITS
K1
K15
K8
CONTACTOR
K9
CONTACTORS
K16
1
FUSED DISCONNECT FIELD INSTALLED
EXHAUST FAN TRANSFORMER
T7
(575V UNITS ONLY)
230VAC
K4 EXHAUST FAN RELAY
B5
CONDENSER FAN NO. 2
POWER INPUT 208-575 VOLTS 3 PHASE
B3
SUPPLY AIR BLOWER
B9
B10
B11
EXHAUST FAN MOTORS
B4
CONDENSER FAN NO. 1
B1
COMPRESSOR NO. 1
B2
COMPRESSOR NO. 2

FIGURE 44

XII - MAINTENANCE

A - Lubrication

Always relubricate motors according to manufacturer's lubrication instructions on each motor. If no instructions are provided, use the following as a guide:

1 - Indoor Blower Motor Bearings - Bearings are prelubricated. For extended bearing life, relubricate at least once every two years with a lithium base grease, such as Westinghouse 53701RW, Chevron BRB2 (Standard Oil) or Andok 260 (Exxon). To relubricate, replace top plugs with standard grease fittings. Remove lower outlet plugs and add grease with handgun until new grease appears at bottom outlets. Run motor for a short time before replacing bottom plugs.

2 - Condenser Fan Motors - Some motors employ ball bearings which need no further lubrication. Check motor for particular lubrication requirements.

B - Filters

Inspect filters at least twice annually. Units equipped with optional status panel will indicate when filters are dirty or plugged resulting in restricted air flow. Replace the 16 in. x 20 in. x 1 in. frame type filters with equivalent filters available from your Lennox dealer.

C - Outdoor Coil

Annually rinse the outdoor fin coil with water to remove dirt or other accumulation.

D - Compressor Oil Charge

The GCS11-1853-1 and 2753-1 units use Tecumseh compressors. The five ton compressors are factory charged with 65 ounces of Suniso 3GS oil.

The ten ton compressors are factory charged with 140 ounces of Exxon 2978 white oil.

GCS11-1853/2753 NO HEATING OR INSUFFICIENT HEATING TROUBLESHOOTING FLOW CHART

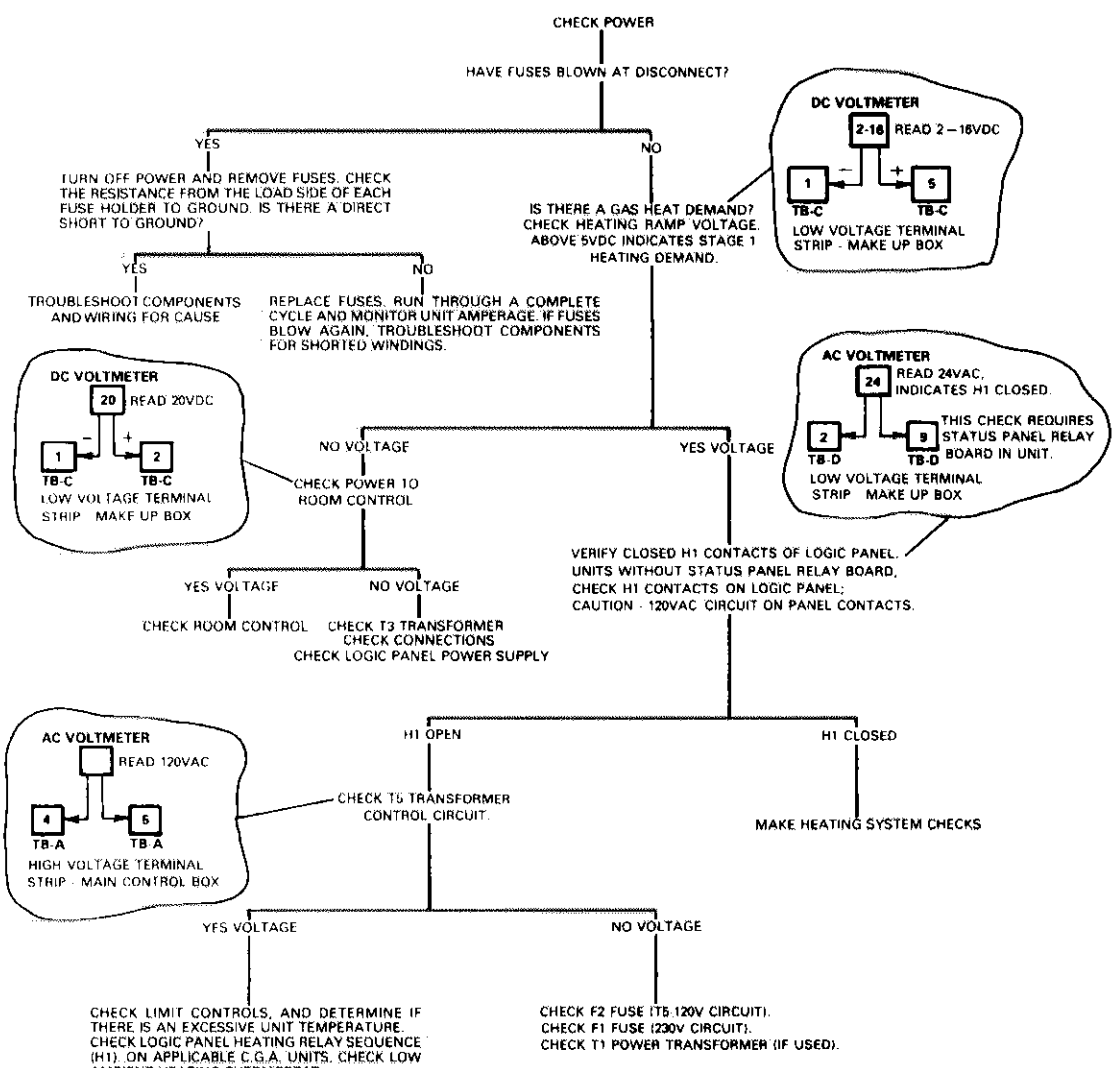


FIGURE 45

XIII - TROUBLESHOOTING

Many problems can be determined at the unit low voltage junction box by making AC and DC voltage checks or using the SA11 Service Analyzer or both. The main control box is adjacent to the junction box allowing easy access for high voltage checks.

Before condemning any components, be sure all terminal connections are tight in the circuit. This is particularly important on DC voltages, especially thermostat connections.

A - Heating-Cooling Troubleshooting Flow Charts

Perform checks outlined in the flow charts, Figure 45 and Figure 46. Checks that can be made at the terminal blocks show the block and terminal designations for meter test points and voltage reading.

Some checks at the low voltage terminal block require the status

GCS11-1853/2753 NO COOLING OR INSUFFICIENT COOLING TROUBLESHOOTING FLOW CHART

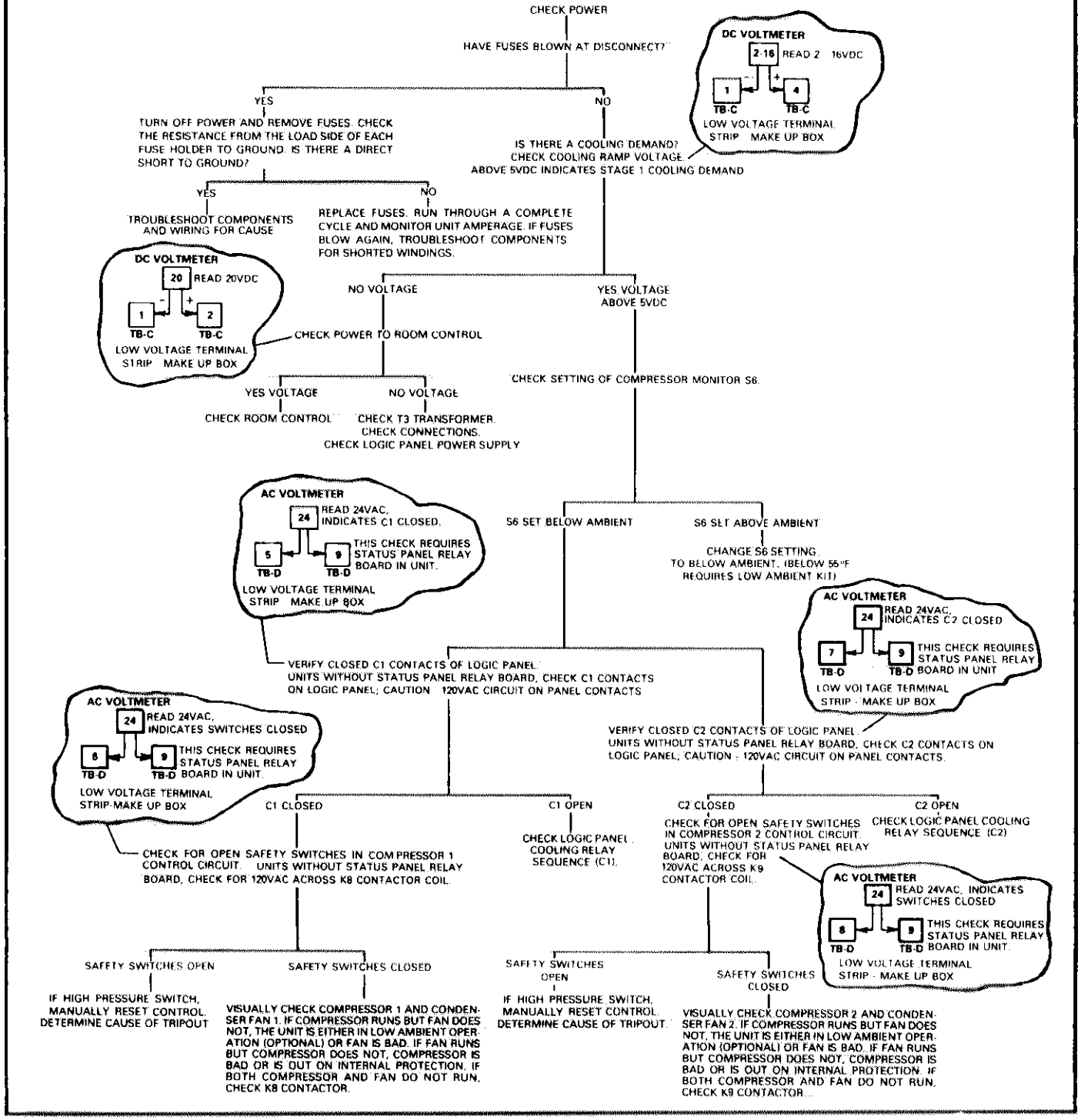


FIGURE 46

panel relay interface board installed in the main control box. If the unit is used with the SP11 or SSP11 the board will be in place and all checks can be made at the low voltage terminal strip. If the unit does not use the SP11 or SSP11 alternate high voltage checks can be made in the main control box (or a status panel relay board can be temporarily plugged in and removed when testing is completed). The Lennox Part Number of the status panel relay board is LB-48292B.

B - SA11-2 Service Analyzer - Figure 47

The SA11-2 Service Analyzer is used on the GCS11-1853 and 2753 units by adding an inline plug adaptor kit between the field wiring and low voltage terminal strip. The field thermostat wiring can then be unplugged from two jacks and the service analyzer plugged in providing control and monitoring of unit functions with the analyzer. When troubleshooting and checkout is completed, thermostat wiring is plugged back inline; adaptor kit plugs are left as a permanent part of low voltage wiring for future checkout with analyzer.

Note: When using the SA11 Service Analyzer on a unit without a status panel (SP11 or SSP11) a status panel relay interface board must be temporarily installed in the main control box. This allows the SA11 compressor and heat lights to operate. Without the relay board, only the Power Light, thermostat simulator, heat/off/cool switch and fan switch on the SA11 are functional.

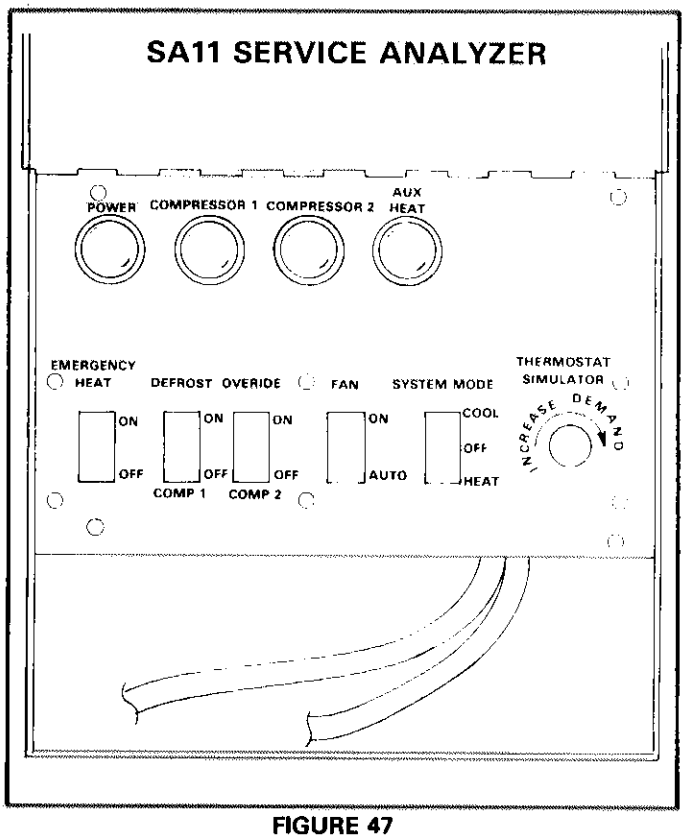


FIGURE 47

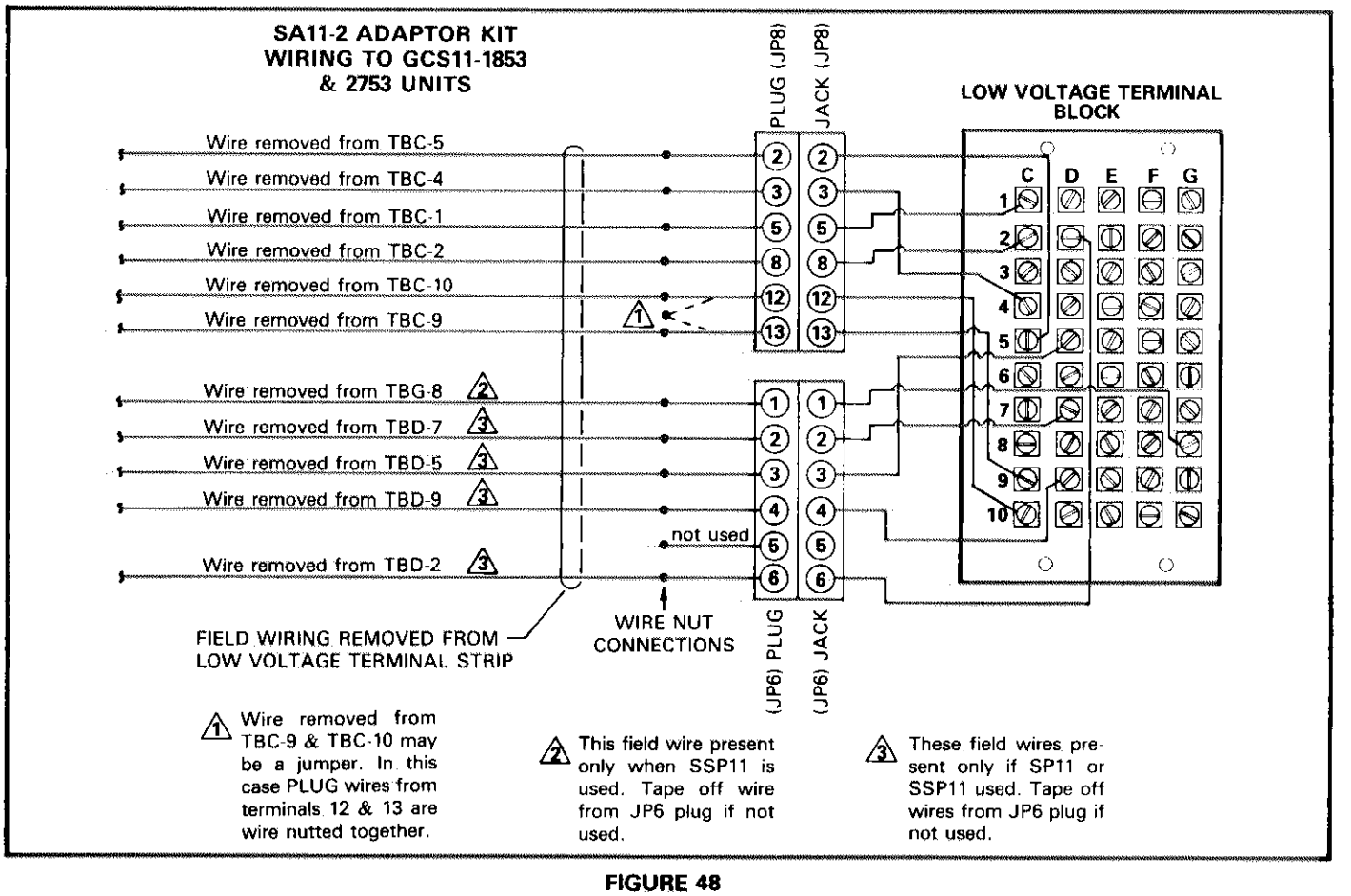


FIGURE 48

The SA11-2 Adaptor Kit Lennox Part Number is LB-50691. It consists of JP6 and JP8 prewired jack plugs. The female jacks have wires with eyelets for connection to the 50 pole terminal strip. The male plugs have wires with stripped ends for connection to the low voltage field wiring as it is removed from the terminal strip. Refer to Figure 48 for wiring of the SA11-2 Adaptor Kit.

Refer to Table 12 to use the SA11 with the GCS11-1853 and 2753 units for checkout and locating possible problems. If desired, a DC voltmeter can be connected as shown in the Heating and Cooling troubleshooting flow charts to monitor the demand signals as the SA11 thermostat simulator is used.

TABLE 12

SA11 SERVICE ANALYZER TROUBLESHOOTING CHART FOR GCS11-1853 AND 2753 SERIES UNITS

Remarks and/or Conditions: If SSP11 switching status panel is used on unit, place SSP11 fan switch in 'AUTO' position to allow SA11 control of fan. Place Night Setback Timeclock, if used, in 'DAY' position.

SA11 COMPONENT	FUNCTION	INDICATION	POSSIBLE PROBLEM CAUSES
Power Light	Senses 24VAC from TBG-8 to common TBD-9. (through JP6-1 & JP6-4)	Power light ON when power is turned on to unit. (T3 transformer powered)	If power light is not ON, check: 1. Unit power. 2. T3-24VAC Transformer fuse (on transformer). 3. F1-230VAC fuse (In makeup box). 4. T1 power transformer (used only on 460 & 575 volt units).
Fan Switch	Connects TBC-9 to TBC-10. (through JP8-13 & JP8-12)	ON position - continuous blower, except during night setback. AUTO position - intermittent blower on heating or cooling demand.	If blower is not energized in the ON position; check: 1. K3 limit blower relay 2. K1 blower contactor 3. Blower Motor
System Mode Switch	Connects DC cool signal to TBC-4 (through JP8-3) or DC heat signal to TBC-5 (through JP8-2); from simulator.	OFF position - no signal to unit. COOL position - cooling signal through simulator to unit. HEAT position - heating signal through simulator to unit.	If unit logic panel does not respond in heat or cool modes, check: 1. CB1 circuit breaker (In make up box) 2. 24VDC across TBC-1 (−) and TBC-2 (+), if absent checkout logic panel if 24VAC to panel is okay.
Thermostat Simulator	Varies DC voltage signal for heating or cooling mode from zero to full demand.	Full CCW - zero demand. Full CW - full demand.	
Compressor 1 Light	Senses 24VAC readout from TBD-5 to common TBD-9 (through JP6-3 & JP6-4)	Compressor 1 Light ON when logic panel calls for comp. 1 operation by closing C1 switch. S6 comp. monitor must be closed. (K22 cool readout relay energized)	If Compressor 1 light is ON, & comp. 1 does not start, check: 1. Low ambient thermostat S7 (1853 units only, if used). 2. Compressor Delay 1 - DL5. 3. High pressure switch S1. 4. Low pressure switch S9. 5. Compressor 1 contactor K8. 6. Compressor 1.
Compressor 2 Light	Senses 24VAC readout from TBD-7 to common TBD-9. (through JP6-2 & JP6-4)	Compressor 2 Light ON when logic panel calls for comp. 2 operation by closing C2 switch. S6 comp. monitor must be closed. (K18 cool 2 readout relay energized)	If compressor 2 light is ON, & comp. 2 does not start, check: 1. Low ambient thermostat S7 (2753 units only, if used). 2. Compressor Delay 2 - DL6. 3. High pressure switch S2. 4. Low pressure swtich S10. 5. Compressor 2 contactor K9. 6. Compressor 2.
Auxiliary Heat Light	Senses 24VAC readout from TBD-2 to common TBD-9. (through JP6-6 & JP6-4)	Auxiliary Heat Light ON when logic panel calls for Stage 1 heat by closing switch H1. S4 & S5 heating limits must be closed. (K20 heat readout relay energized) On C.G.A. units certified for operation to − 60°F ambients S18 low amb. heating t'stat must be closed	If Auxiliary heat Light is ON, & heat section does not operate, check: 1. Gas supply valves external & internal to unit. 2. K5 burner relay. 3. DL2 purge delay relay. 4. S15 combustion air switch. 5. B8 combustion air blower. 6. Primary control. 7. Pilot and main solenoid gas valves.
Emergency Heat Switch	Does not apply to GCS11 units	----	----
Defrost Override Switches 1 & 2	Do not apply to GCS11 units	----	----

C - Initial Start-up Check For Fenwal 05-143 Proof of Flame System On New Units & Replacement Boards

Test Fenwal boards using the procedure below. Removal of the flame sensor wire from the board is not an accepted testing method for loss of flame tests.

1 - Set thermostat for a heating demand.
2 - Turn on gas to unit.
3 - Turn on power to unit. After unit purge delay, sparking should begin and the pilot gas valve should open. With both sparking and gas present, pilot flame should be established. Pilot flame is proved through flame rectification. The 05-143 board then opens the main gas valves to light main burner.
4 - Turn off gas supply at the manual shut-off valve. The control board should detect loss of flame and start a re-ignition sequence. The main gas valve should close immediately as the system attempts to relight the pilot. After the trial-for-ignition period, the control board should lockout.
5 - Open the main gas shut-off valve.
6 - Turn off power. Wait ten seconds and then turn power back on and depress the manual reset button. The control should initiate pilot and relight main burner.

D - Troubleshooting Fenwal 05-143 Primary Control

Refer to Table 13, Fenwal Troubleshooting Chart. First, select symptom, then determine cause and make necessary corrections. Some corrections given in the chart are self explanatory, others are referenced to remaining paragraphs in this section for further explanation.

Before faulting the control board make sure the system is properly grounded, power is available at input terminals following unit purge delay and the manual reset button has been depressed.

1 - Valve Malfunction

If sparking occurs but the pilot gas valve does not open, check for 120VAC across valve connections. Recycle the control by depressing the manual reset button. If voltage is present but valve does not open, check for defective valve, broken wire or bad connection to valve. If voltage is absent at gas valve connections, replace control board.

2 - Input Polarity

If sparking is present and pilot valve opens for trial-for-ignition period and then control board locks out, check voltage (120VAC) at input terminals for proper polarity. The hot leg L1 should read

TABLE 13

FENWAL 05-143 TROUBLESHOOTING CHART

Problem	Causes	Correction
No power to control board input terminals on heating demand.	Unit power turned off.	Turn on unit power.
	Unit fuses blown.	Determine reason for blown fuse and replace.
	Relay contacts open.	Determine if relay is faulty or find the problem in heating control circuit.
	Limit control(s) open.	Determine why limit opened. Replace limit if defective.
	Combustion air proving switch open.	If combustion air blower motor is not operating, troubleshoot the combustion air proving switch.
Power to control board input terminals on heating demand, but gas valve remains de-energized and no sparking.	Control board locked out.	Depress reset button.
	Faulty control board.	Replace control board.
On a heating call there is sparking, but no flame.	Faulty gas valve.	See **Valve Malfunction** in troubleshooting checks.
	Manual main valve closed.	Open valve.
	Plugged gas line or orifice.	If the manual main valve is open and the gas valve is energized, check for restrictions.
	Faulty control board.	See **Valve Malfunction** in troubleshooting checks.
Lockout occurs 3-10 seconds after ignition.	Reverse polarity.	See **Improper Grounding** in troubleshooting checks.
	System not properly grounded.	See **Improper Grounding** in troubleshooting checks.
	Gas pressure too high causing flame to lift.	Adjust gas pressure to correct reading listed on unit rating plate.
	Sensor probe is incorrectly positioned in flame.	Reposition sensor proble according to electrode mounting drawing in this manual.
	Insufficient microamp signal.	Refer to **Microamp Reading** section.
Flame not established and arcing to ground.	Spark gap too small or large.	See section a of **Inoperative High Voltage** in troubleshooting checks.
No sparking.	Corroded connector.	Check ignition cable connections for corrosion. Clean if necessary.
Arcing other than across gap.	Cracked or dirty insulator.	See section b of **Inoperative High Voltage** in troubleshooting checks.
	Broken high voltage lead.	Check ignition cable for cracks or breaks. If there are cracks, breaks or chaffing, replace cable.
Weak spark.	Ignition cable too close to metal surface.	See section c of **Inoperative High Voltage** in troubleshooting checks.
Nuisance lockouts.	Electrode assembly improperly placed.	Reposition electrode assembly according to mounting drawing in this manual.
	Insufficient microamp signal.	Refer to **Microamp Reading** section.
	Low gas pressure.	Check to insure that manifold pressure meets reading listed on unit rating plate.

voltage to ground following unit purge delay. The neutral leg L2 should read zero voltage to ground. If readings are reversed, switch the input leads to insure correct polarity. Do not apply power to input terminals unless electrode assembly is properly grounded and connected. The control board may be damaged if electrode assembly is not correctly connected.

3 - Improper Grounding

If pilot flame is present during the trial-for-ignition period but the control board locks out, check for proper grounding of the burner. If it is not grounded, the flame monitoring signal does not function and the control locks out. Check for loose or corroded terminals and replace if necessary.

The burner is grounded through the unit chassis. The control transformer T5 has a grounding wire that connects to the chassis. If the transformer is replaced, the new transformer must also be grounded to the chassis.

The electrode assembly must also be grounded. Damage to the control board may occur if the electrode assembly is not grounded.

4 - Inoperative High Voltage

If spark is absent or intermittent, disconnect power to unit and make following checks.

a - Check Spark Gap

The gap should be 1/8 inch. Never replace the control board without first checking the electrode gap. If the gap is too wide, the control board can be damaged. Electrode assemblies are precision components and should not be adjusted or disassembled. Electrodes are not field adjustable. If spacing is incorrect, replace electrode assembly.

b - Check Electrode Assembly

Inspect for cracked, chipped, or broken insulators. Also inspect insulator for grounding. This will appear as dark brown spots or lines on the outside of the insulator. These spots or lines can easily be seen with a good light and/or magnifying glass. Excessive temperatures can damage ceramic insulators. Discolored or chalky ceramic, fine cracks or crazed lines indicate high temperatures. An overfired unit, malformed burner, or improperly assembled burner (drilled ports in burner head mislocated in relation to electrode assembly) all cause high temperatures. Clock the meter to determine if input is correct and inspect burner carefully.

c - Check Reasons For Weak Spark

Check for ignition cable too close to metal surfaces. Arcing should not occur at any point other than the high voltage electrode. Make sure the ignition cable is not connected to a metal frame, does not touch sharp metal edges and is not bundled with other wires. Always leave one inch spacing between the ignition cable and any other metal or wire. Check to insure that the ignition cable terminal is clear of dust, moisture or any other foreign material which could create a high voltage leak to ground.

5 - Microamp Readings

The flame detector circuit on the Fenwal proof of flame system uses the ionized gas flame to conduct the flame signal. This signal is a small DC current that can be measured with a 0 to 50 microamp meter.

To Measure:

a - Shut off power and discharge capacitor by shorting terminal E1 to ground.

b - Remove sensing probe wire from terminal S1.

c - Connect a microammeter in series between primary control and sensor wire; positive (+) lead of meter to terminal S1 and negative (−) lead of meter to sensor wire.

d - Turn on power and cycle thermostat to initiate a heating demand. After flame is established check microamp reading. Typically, the flame current is 5 to 20 microamps. The minimum flame current necessary to prevent lockout is 2.5 microamps, the lowest recommended reading is 5 microamps. The sensing probe may have to be repositioned in the flame to increase the signal.

E - Fireye TFM3 Primary Control Checkout

Figure 49 illustrates the heating control circuit for IRI/FM units using the Fireye TFM3 primary control. A circuit must be completed through S4, S5, H1, S12, S16 and S15 to energize the primary control.

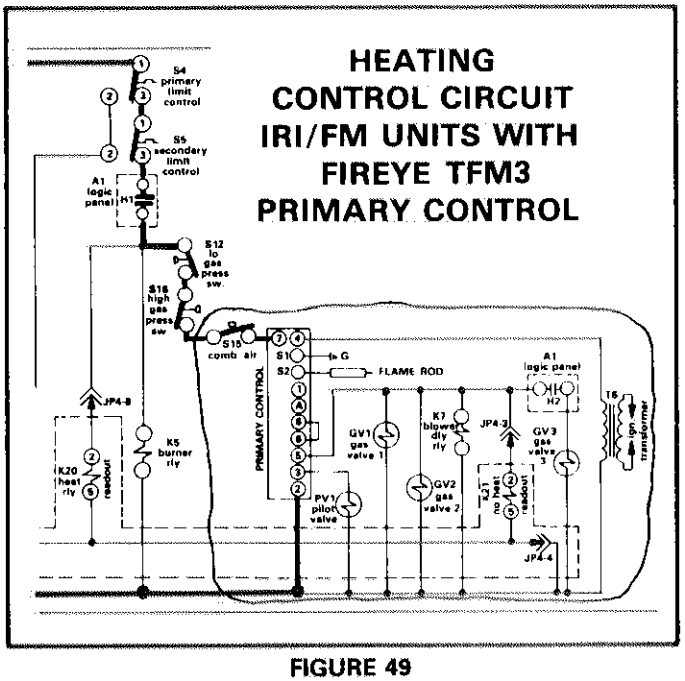


FIGURE 49

Refer to Figure 50 to perform the following checks.

1 - AC Voltage Checks

With the cover of the control removed, test points on the chassis can be used. The test points identified correspond to the wiring terminals on the subbase and the unit schematic wiring diagram.

a - Read 120VAC between test point no. 2 (neutral) and no. 3 when pilot valve is energized following the 90 second purge and during the 12 second trial-for-ignition.

b - Read 120VAC between test point no. 2 (neutral) and no. 4 when ignition transformer is energized following the 90 second purge and during the 12 second trial-for-ignition.

c - Read 120VAC between test point no. 2 (neutral) and no. 5 when main gas valve is energized following the 90 second purge and 12 second trial-for-ignition.

2 - Flame Signal Checks

The flame signal can be verified by either of two methods; reading a DC test voltage or by reading the actual DC microamp flame signal.

Flame Signal DC Test Voltage Check

This check can be performed without removing any wiring.

a - Shut off the manual valve on manifold feeding main burners; on IRI/FM units this valve is downstream of the motorized main gas valve. Leave pilot and supply manual gas valves open.

b - Remove cover of TFM3 control and connect a DC voltmeter to the (+) and (−) test jacks on the chassis.

c - Cycle thermostat to initiate a heating demand.

d - Following the 90 second purge and ignition of pilot flame, the meter should read 14 to 17VDC when flame is detected (zero VDC when no flame is present).

Flame Signal DC Microamp Check

This check requires connection of microammeter in series with the flame sensor wire.

a - Shut off power and remove TFM3 chassis from subbase. Remove the flame sensor wire from terminal S2 and pull it outside the subbase for connection to meter.

b - Replace the TFM3 chassis on the subbase. Connect the (−) negative lead of a DC microammeter to the flame sensor wire and the (+) positive lead to the S2 test point on the chassis.

c - Shut off the manual valve on manifold feeding main burners; on IRI/FM units this valve is downstream of the motorized main gas valve. Leave pilot and supply manual gas valves open.

d - Turn on power and cycle thermostat to initiate a heating demand.

e - Following the 90 second purge and ignition of pilot flame, the meter should read 4 to 10 microamps when flame is detected.

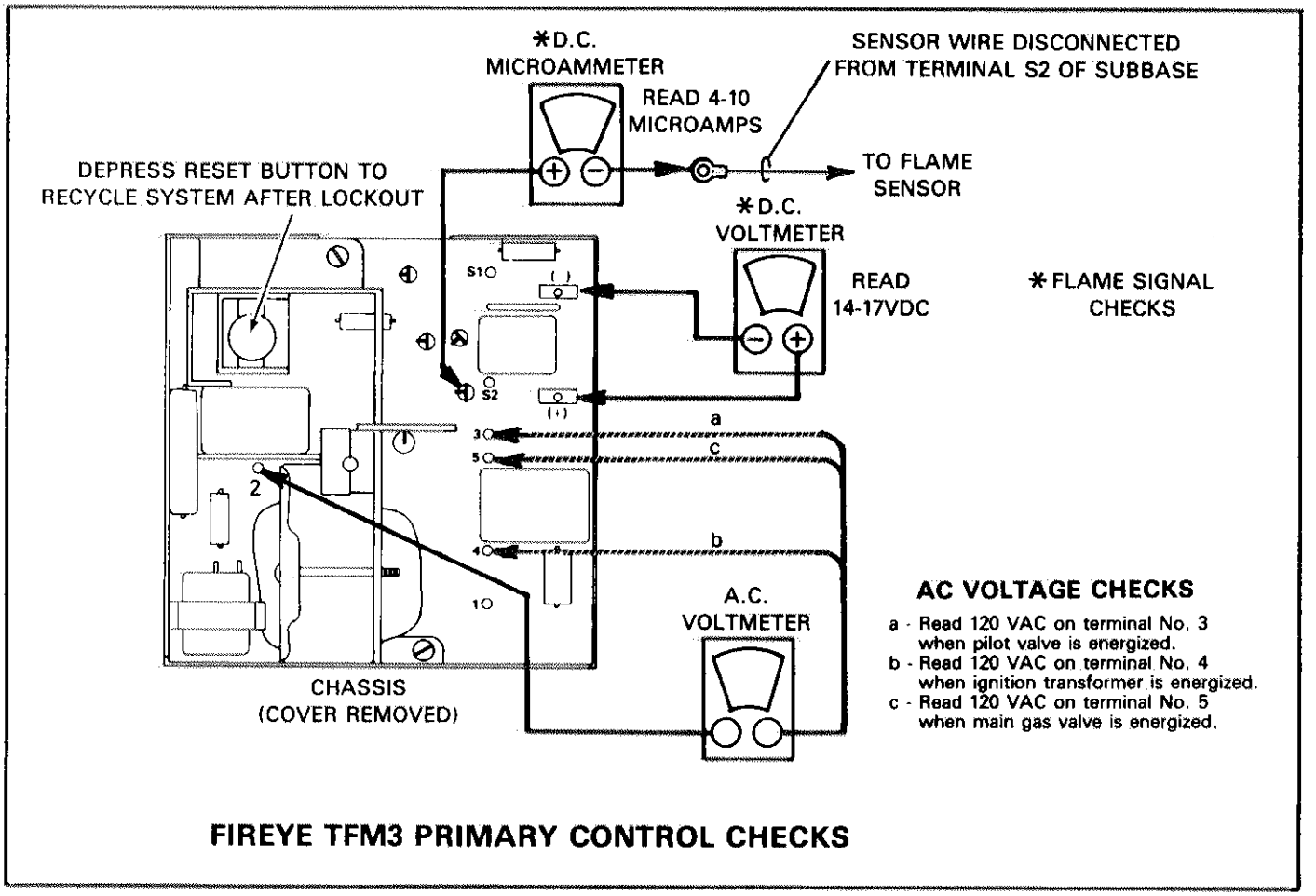


FIGURE 50

F - Compressor Protection Module Checkout DL6 on 1853 units; DL5 & DL6 on 2753 units

The compressor protection module used with the 10 ton Tecumseh compressors may be checked in or out of the unit circuitry. The module cannot be repaired or adjusted and must be replaced if defective. Checkout of the internal compressor sensors is also a part of the procedure. If sensors are determined defective, the compressor must be replaced.

1 - Module Description

Temperature Protection

The solid state motor protection module is a single channel device that connects to four PTC thermistor sensors in series internal to the compressor. Three of the sensors are in the motor windings and the fourth sensor is on the discharge line.

The module de-energizes its output (connected in series with compressor contactor control circuit) if one or more sensors reach their trip temperature (high resistance). The module automatically resets after the minimum off delay has timed out and the sensor temperature has decreased to below its reset point (low resistance). The module also protects against shorted sensor input by de-energizing its output if the sensor resistance approaches zero ohms.

Minimum Off Time Delay

The module incorporates a minimum off time delay of 4 ± 1 minute. This delay is actuated only by either 240 volt supply power interruption to the unit or a temperature trip. The delay is not actuated during normal cycling of the compressor contactor circuit on cooling demand or if the low or high pressure switches open and reset.

2 - Field Checkout Procedure - In Unit

Power Supply Check

Check for 230VAC control power across terminals T1 and T2. If 230VAC is absent check out unit wiring, F1 fuse and T1 transformer if used.

Sensor Resistance Check

If the compressor has been operating and may have stopped on a temperature trip through the module, allow the compressor to cool at least one hour and/or make the following check to determine sensor condition. Disconnect sensor leads from terminals 'S' and 'S1' and check resistance with ohmmeter; if resistance is less than 10K ohms but greater than 500 ohms, sensors are within limits.

If following sufficient time for compressor to cool completely, the sensor resistance approaches infinity, an open or break in sensor circuit is indicated. The module senses this as an over-temperature condition and prevents compressor operation. Also, if the sensor resistance approaches zero ohms, a short is indicated and the module prevents compressor operation. Shorted or open sensors require replacement of compressor.

Check For Shorted Module

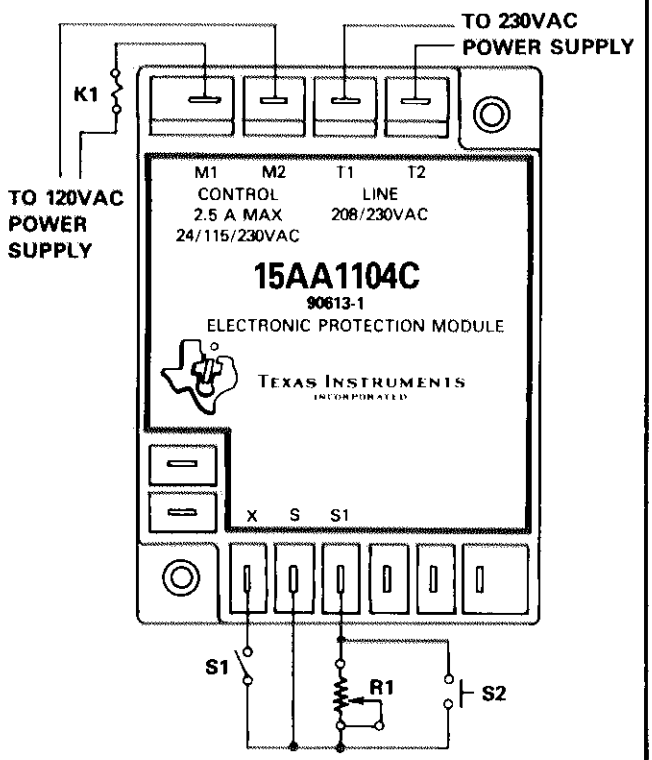
A shorted module wil not de-energize the compressor control circuit if over-temperatures are sensed. To verify ability of module to de-energize the compressor circuit, initiate a cooling demand to run compressor. When the compressor is running disconnect one sensor lead from either terminal 'S' or 'S1', if the compressor is de-energized the module is okay. If the compressor is not de-energized, replace module.

Check For Open Module

If the compressor does not operate, first check unit controls; verify a cooling demand and closed logic panel cooling contacts providing 120VAC to terminal 'M1' of protection module. Also verify that low and high pressure switches in the contactor circuit are closed. To disable the minimum off delay, temporarily jumper test terminal 'X' to sensor terminal 'S'. If the compressor contactor does not energize, jumper across terminals 'M1' and 'M2' — CAUTION: 120VAC. If the contactor energizes replace the module. If the contactor does not energize, the problem is not within the module; recheck other controls in circuit and contactor coil.

3 - Out of Unit Checkout Procedure

Figure 51 gives the test circuit hookup and checkout procedure for bench testing of the compressor protection module. If the module is removed from equipment for testing be sure to check compressor sensor resistance after compressor has cooled as in Section 2 - Field Checkout Procedure.



COMPONENTS:

K1 - 120VAC RELAY OR CONTACTOR.
R1 - 35K OHM POTENTIOMETER LINEAR TAPER
S1 - TOGGLE SWITCH SPST-PILOT DUTY
S2 - PUSH BUTTON SPNO-PILOT DUTY

CHECKOUT:

1 - Close S1, apply power & vary resistance R1. Module must trip & reset within the following values:

TRIP RANGE	RESET RANGE
26K-34K OHMS	11K-13K OHMS

2 - With module reset, close S2. K1 must de-energize (shorted sensor protection check).
3 - Reset module & open S1. Increase R1 until the module trips. Then decrease approximately 1K OHM. K1 must stay de-energized for 240 ± 60 seconds.

COMPRESSOR PROTECTION MODULE TEST CIRCUIT

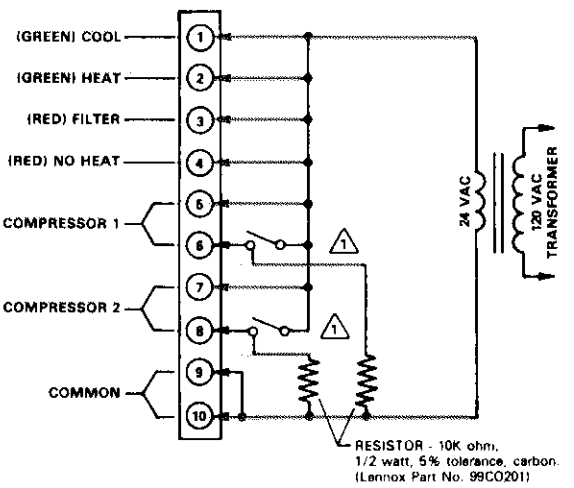
FIGURE 51

G - Status Panel Checkout

The SP11 and SSP11 status panels are non repairable items. They may be bench tested to check for operation of LED's (light emitting diodes.).

1 - The items needed for testing are 2 small pilot duty toggle switches, 24VAC transformer, 2 carbon resistors (10K ohm, 1/2 watt, 5% tolerance; available as Lennox Part No. 99C0201) and hookup wire no larger than 16 gauge (Panel terminals accept maximum of one 16 gauge wire per terminal.).

2 - Refer to Figure 52 and wire the circuit shown to the 1 to 10 terminal strip on back of status panel. No other wiring should be connected to the panel when making this test. Be sure the back of panel does not touch anything that could short components or terminals when bench testing.



SP11 & SSP11 STATUS PANEL LED OPERATION CHECKOUT

FIGURE 52

3 - The resistors are required to provide operation of the compressor 1 and 2 LED's in the red mode when the test switches are open. For example, to light compressor 1 LED green requires 24VAC to both terminals 5 and 6; red operation requires 24VAC to terminal 5 and a separate circuit from terminal 6 through the resistor to common. Compressor 2 LED follows same example using terminals 7 and 8.

4 - To test the panel close the switches and plug in transformer to apply power. All LED's should be ON-green except for the Filter and No Heat, they should be ON-red. Open the test switches one at a time, the respective LED should change from green to red.

5 - If any LED does not operate correctly, be sure the test switches are good and will pass the low current used by the panel; jumper across the test switch to check, if LED remains inoperative the panel must be replaced.