

SERVICE UNIT INFORMATION GCS3

Litho U.S.A

GCS3 SERIES UNITS

I - INTRODUCTION

GCS3 units are designed primarily for rooftop installation with the RMF3 roof mounting frame, but it can be installed for slab mounting with end discharge.

A.G.A. units produced after January 1, 1980 have an additional redundant valve in the manifold. These A.G.A. units also have regulators for both natural and L.P. gases.

Figure 1 shows a cutaway of the unit.

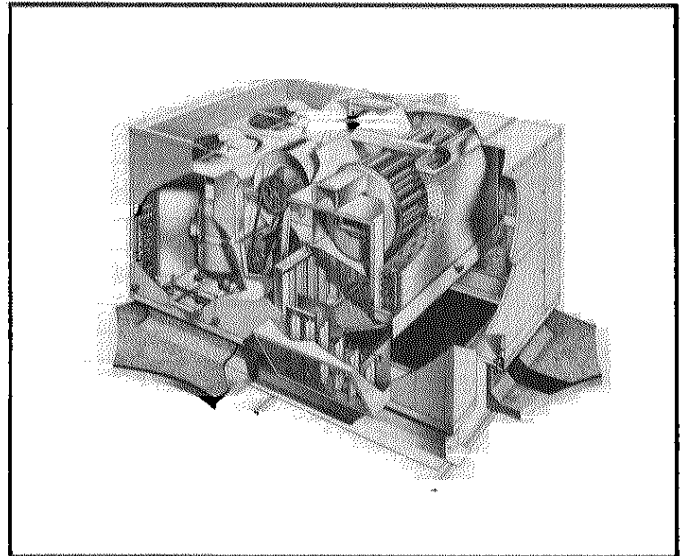


FIGURE 1

II - UNIT INFORMATION

A - Accessories

Accessory Description	Accessory Order No. & Net Weight (lbs.)			
	GCS3-953	GCS3-1353	GCS3-1853	GCS3-2753
**POWER SAVER and No. & size of filters (in.)	RD3-95 (275 lbs.) (2) 20 x 25 x 1	RD3-135 (360 lbs.) (4) 16 x 25 x 1	RD3-185 (510 lbs.) (3) 20 x 36 x 1	RD3-275 (606 lbs.) (4) 20 x 36 x 1
Minimum fresh air damper and No. & size of filters (in.)	OAD3-95 (38 lbs.) (1) 16 x 20 x 1	OAD3-135 (60 lbs.) (1) 20 x 20 x 1	OAD3-185 (101 lbs.) (1) 25 x 27 x 1	OAD3-275 (107 lbs.) (1) 26 x 31 x 1
Automatic Kit for OAD3 Damper	BM-5563 (9 lbs.)	BM-5563 (9 lbs.)	BM-5563 (9 lbs.)	BM-5563 (9 lbs.)
RP2-1 Remote Readout Panel	BM2-5358 (5 lbs.)	BM2-5358 (5 lbs.)	BM2-5358 (5 lbs.)	BM2-5358 (5 lbs.)
RP2-00-1 Rough-in Box	BM1-5358 (3 lbs.)	BM1-5358 (3 lbs.)	BM1-5358 (3 lbs.)	BM1-5358 (3 lbs.)
Remote Readout Panel Kit	BM-5817 (5 lbs.)	BM-5817 (5 lbs.)	BM-5817 (5 lbs.)	BM-5817 (5 lbs.)
Low Ambient Control Kit	LB-80249BB (8 lbs.)	LB-80249BB (8 lbs.)	LB-80249BA (8 lbs.)	LB-80249BA (8 lbs.)
Hot Gas Bypass Kit	BM-4310 (10 lbs.)	BM-4311 (10 lbs.)	----	----
Roof Mounting Frame	RMF3-95 (100 lbs.)	RMF3-135 (140 lbs.)	RMF3-185/275 (200 lbs.)	RMF3-185/275 (200 lbs.)
Combination Ceiling Supply and Return Kit	BM-3564 (20 lbs.)	BM-3565 (29 lbs.)	BM-3566 (40 lbs.)	BM-3567 (43 lbs.)
Combination Ceiling Supply And Return Step Down Diffuser	RTD-95 (60 lbs.)	RTD-135 (118 lbs.)	RTD-185/275 (172 lbs.)	RTD-185/275 (172 lbs.)
Combination Ceiling Supply And Return Flush Diffuser	FD-95 (50 lbs.) *FD-95-D (50 lbs.)	FD-135 (60 lbs.) *FD-135-D (60 lbs.)	FD-185 (64 lbs.) *FD-185-D (64 lbs.)	FD-275 (69 lbs.) *FD-275-D (69 lbs.)
End Supply & Return Air Discharge Kit	----	----	LB-44878CA (20 lbs.)	LB-44877CA (25 lbs.)

***Night Setback Accessories

Accessory Description		Order No. All GCS3 Usage
Night Setback Kits	Manual Night Setback Switch	BM-4762
	12 Hour Night Setback Timer	BM-4761
Night Setback Options	24 Hour Skip Day Clock (with carryover)	P-8-3744
	24 Hour Skip Day Clock (less carryover)	P-8-4168
	7 Day Time Clock (with carryover)	P-8-10213
	7 Day Time Clock (less carryover)	P-8-6858
	Night Thermostat	P-8-8899
	Night Thermostat Subbase	P-8-8889

*Flush diffuser with adjustable baffle blades
 **See section 16.2 for additional information.
 ***See section 16.4 for additional information.

B - Specifications

Model No.		GCS3-953-125	GCS3-953-250	GCS3-1353-175	GCS3-1353-350	GCS3-1853-275	GCS3-1853-500	GCS3-2753-275	GCS3-2753-500
Single Stage Heating Capacity Natural Gas	Btuh Input	125,000	----	175,000	----	275,000	----	275,000	----
	Btuh Output	93,750	----	131,250	----	206,000	----	206,000	----
Two Stage Heating Capacity Natural Gas	Btuh Input (low)	----	125,000	----	200,000	----	275,000	----	275,000
	Btuh Input (high)	----	250,000	----	350,000	----	500,000	----	500,000
	Btuh Output (high)	----	187,500	----	262,500	----	375,000	----	375,000
*Cooling Capacity @ARI Standard Conditions	Total capacity (Btuh)	196,000		1130,000		200,000		273,000	
	Total unit watts	12,700		17,100		25,000		35,500	
	Dehumidifying capacity	26%		28%		29%		26%	
Refrigerant charge (R-22)		16 lbs.		17 lbs.		40 lbs.		48 lbs.	
Blower wheel nominal diameter x width (in.)		{2}-12 x 6		{2}-15 x 9		{2}-15 x 11		{2}-15 x 15	
Blower Motor Hp. See Drive Table	Minimum	2		3		3		5	
	Maximum	3		5		5		7-1/2	
Condenser Coil	Net face area (sq ft)	10.2		13.8		{2}-10.75		{2}-12.15	
	Tube diam. (in.) & No. of rows	3/8 — 4		3/8 — 4		1/2 — 4		1/2 — 6	
	Fins per inch	18		18		13		13	
Condenser Fan	Diam. (in.) & No. of blades	{2} 22 — 5		{2} 22 — 5		{2} 25-1/2 — 6		{2} 25-1/2 — 6	
	Air volume (cfm)	6000		7550		13,500		13,250	
	Motor hp	{2} 1/2		{2} 3/4		{2} 1		{2} 1	
	Watts input (total)	1100		1650		2820		2500	
Evaporator Coil	Net face area (sq ft)	7.4		9.4		{2} 7.67		{2} 8.75	
	Tube diam. (in.) & No. of rows	3/8 — 4		3/8 — 4		1/2 — 4		1/2 — 4	
	Fins per inch	13		13		10		13	
No. & size of filters (in.)		(1) 20 x 25 x 1 (2) 16 x 25 x 1		(6) 16 x 20 x 1		(4) 16 x 20 x 1 (4) 20 x 20 x 1		(8) 20 x 20 x 1	
Gas supply connection MPT (in.)		Natural		3/4		1		1-1/4	
Recommended gas supply pressure wc (in.)		Natural		6		6		6	
Condensate drain size MPT (in.)		3/4		1		1-1/4		1-1/4	
Net weight of basic unit (lbs.)		1605		2100		3185		3730	

*Rated in accordance with ARI Standard 210; 450 cfm (maximum) evaporator air volume per ton of cooling capacity, 95F outdoor air temperature and 80 db/67 wb entering evaporator air.

†ARI Standard 210 ratings.

C - Burner Ratings

60 HZ UNITS							
UNIT	GAS TYPE	STAGES	BURNER	INPUT		OUTPUT	**MANIFOLD OR REGULATOR PRESSURE (In. w.c.)
				Btuh Minimum	Btuh Maximum	Maximum	
*GCS3-953-125	NATURAL	SINGLE	BX-20-125-1N	----	125,000	93,750	3.5
†GCS3-953-250	NATURAL	TWO	BX-20-252-2N	★ 125,000	250,000	187,500	3.5
†GCS3-953-250	L.P.	SINGLE	BX-20-252-3P	----	250,000	187,500	10.5 or 11
*GCS3-1353-175	NATURAL	SINGLE	BX-28-350-2N	----	175,000	131,250	3.5
GCS3-1353-350	NATURAL	TWO	BX-28-350-2N	200,000	350,000	262,500	3.5
GCS3-1353-350	L.P.	SINGLE	BX-28-352-2P	----	350,000	262,500	9.0
GCS3-1853/2753-275	NATURAL	SINGLE	BX2-30-275-2N	----	275,000	206,250	3.5
GCS3-1853/2753-500	NATURAL	TWO	BX2-30-500-1N	275,000	500,000	375,000	3.5
GCS3-1853/2753-500	L.P.	SINGLE	BX2-30-502-1P	----	500,000	375,000	9.0
50 HZ UNITS							
UNIT	GAS TYPE	STAGES	BURNER	INPUT		OUTPUT	**MANIFOLD OR REGULATOR PRESSURE (In. w.c.)
				Btuh Minimum	Btuh Maximum	Maximum	
GCS3-953-250	NATURAL	TWO	BX-20-252-2N	120,000 Btuh 30 240 Kcal/hr	225,000 Btuh 56 700 Kcal/hr	168,750 Btuh 42 530 Kcal/hr	3.6
GCS3-1353-350	NATURAL	TWO	BX-28-350-2N	174,000 Btuh 43 850 Kcal/hr	315,000 Btuh 79 380 Kcal/hr	236,250 Btuh 59 540 Kcal/hr	3.1
GCS3-1853/2753-500	NATURAL	TWO	BX2-30-500-1N	250,000 Btuh 63 000 Kcal/hr	450,000 Btuh 113 400 Kcal/hr	337,500 Btuh 85 050 Kcal/hr	3.2

*Not C.G.A. Approved.

**IMPORTANT - Always check pressure settings listed on burner. If different from this table, adjust according to pressure listed on burner.

†Installation must be adjusted for an air temperature rise of 45° to 75°F on model GCS3-953. C.G.A. L.P. units and A.G.A. L.P. units produced before 1/80 use manifold pressure of 11" w.c. A.G.A. L.P. units produced after 1/80, use regulator pressure of 10.5" w.c.

★ Minimum rate is 140,000 for C.G.A. units.

D - Electrical Data

Model No.		GCS3-953			GCS3-1353			GCS3-1853			GCS3-2753						
Line voltage data (60hz — 3 phase)		208/230			460			208/230			460						
Compressor(s)	Rated load amps	28.3			14.6			46.7			22.8						
	Locked rotor amps	185.0			93.0			240.0			128.0						
	Power factor	.85			.85			.85			.85						
(2) Condenser Fan Motors	Full load amps (total)	6.0			*3.0			8.0			*4.0						
	Locked rotor amps (total)	13.8			*6.9			18.0			*9.0						
Evaporator Blower Motor	horsepower	2	3	2	3	3	5	3	5	3	5	3	5	5	7½	5	7½
	Full load amps	7.5	10.6	3.4	4.8	10.6	16.7	4.8	7.6	10.6	16.7	4.8	7.6	16.7	24.2	7.6	11.0
	Locked rotor amps	44.0	64.0	22.0	32.0	64.0	92.0	32.0	46.0	64.0	92.0	32.0	46.0	92.0	140.0	46.0	70.0
Recommended maximum fuse size (amps)		70	80	35	40	110	125	60	60	110	125	50	60	150	150	70	80
†Minimum Circuit Ampacity		48.9	52.0	24.7	26.1	77.0	83.1	37.3	40.1	91.9	98.1	44.3	47.1	121.6	129.1	58.3	61.7

†Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements.

NOTE - Extremes of operating range are plus and minus 10% of line voltage.

*Motors are rated at 230V, amps shown is for stepdown transformer.

E - Blower Data

GCS3-953 BLOWER PERFORMANCE CHART

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT (Inches Water Gauge)																						
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90		1.0		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM
2600	700	.70	750	.80	795	.90	840	1.00	880	1.07	920	1.15	960	1.25	995	1.35	1030	1.45	1065	1.55	1100	1.70	
2800	750	.90	800	1.00	845	1.10	885	1.20	925	1.30	960	1.40	1000	1.50	1035	1.60	1070	1.70	1100	1.80	1130	1.90	
3000	810	1.10	850	1.20	890	1.30	930	1.40	970	1.50	1005	1.60	1040	1.75	1075	1.85	1110	1.95	1140	2.05	1170	2.15	
3200	860	1.30	900	1.40	940	1.55	980	1.65	1015	1.75	1050	1.90	1080	2.00	1115	2.15	1145	2.25	1175	2.35	1210	2.50	
3400	915	1.55	950	1.70	990	1.80	1025	1.95	1060	2.05	1090	2.15	1125	2.30	1150	2.40	1185	2.50	1215	2.65	1245	2.80	
3600	970	1.85	1005	2.00	1045	2.15	1075	2.25	1105	2.40	1135	2.50	1165	2.65	1195	2.80	1225	2.90	1255	3.00	1285	3.15	
3800	1020	2.20	1050	2.35	1085	2.45	1120	2.60	1150	2.75	1180	2.90	1210	3.05	1240	3.15	1270	3.30	1300	3.45	---	---	

GCS3-1353 BLOWER PERFORMANCE CHART

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT (Inches Water Gauge)																						
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90		1.0		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM
3800	555	1.00	600	1.15	640	1.30	680	1.45	725	1.60	765	1.85	800	2.05	835	2.25	---	---	---	---	---	---	
4000	585	1.20	625	1.35	665	1.50	705	1.65	745	1.85	780	2.00	815	2.20	850	2.45	890	2.65	---	---	---	---	
4200	615	1.40	650	1.50	690	1.65	730	1.85	770	2.05	800	2.25	835	2.50	870	2.70	905	2.90	935	3.15	---	---	
4400	645	1.60	680	1.75	720	1.90	755	2.10	790	2.30	825	2.55	855	2.70	890	2.90	925	3.20	955	3.45	985	3.65	
4600	675	1.80	710	2.00	745	2.15	780	2.35	815	2.60	845	2.80	880	3.00	910	3.20	945	3.50	975	3.70	1005	3.95	
4800	700	2.05	740	2.25	770	2.40	805	2.65	835	2.80	865	3.00	900	3.25	930	3.50	965	3.75	995	4.00	1020	4.25	
5000	735	2.35	765	2.55	800	2.75	830	2.95	860	3.10	890	3.30	920	3.55	950	3.75	985	4.10	1015	4.30	1040	4.55	
5200	765	2.65	795	2.85	825	3.05	855	3.25	885	3.45	915	3.60	945	3.85	975	4.15	1005	4.35	1035	4.60	1060	4.90	
5400	795	2.95	820	3.15	850	3.35	880	3.55	910	3.75	940	4.00	965	4.25	995	4.45	1025	4.75	1050	5.00	1080	5.30	
5600	825	3.30	850	3.45	880	3.70	905	3.90	930	4.10	960	4.30	990	4.50	1015	4.75	1045	5.05	1070	5.35	1095	5.60	

GCS3-1853 BLOWER PERFORMANCE CHART

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT (Inches Water Gauge)																						
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90		1.0		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM
5000	490	.95	530	1.15	570	1.30	605	1.40	635	1.55	670	1.70	700	1.85	730	2.00	760	2.15	785	2.30	815	2.50	
5500	540	1.30	575	1.45	615	1.65	645	1.80	675	1.95	705	2.10	735	2.25	765	2.40	790	2.60	820	2.80	840	2.95	
6000	590	1.70	620	1.85	650	2.00	685	2.20	715	2.40	740	2.60	775	2.80	800	3.00	825	3.15	850	3.30	875	3.50	
6500	640	2.15	670	2.35	700	2.55	725	2.70	750	2.85	780	3.05	810	3.30	835	3.50	860	3.65	885	3.85	910	4.10	
7000	685	2.65	715	2.90	740	3.10	770	3.30	800	3.50	825	3.70	850	3.90	875	4.15	900	4.35	920	4.55	940	4.75	
7500	735	3.25	765	3.45	790	3.70	815	3.95	840	4.15	865	4.35	890	4.60	910	4.80	930	5.00	955	5.25	980	5.55	

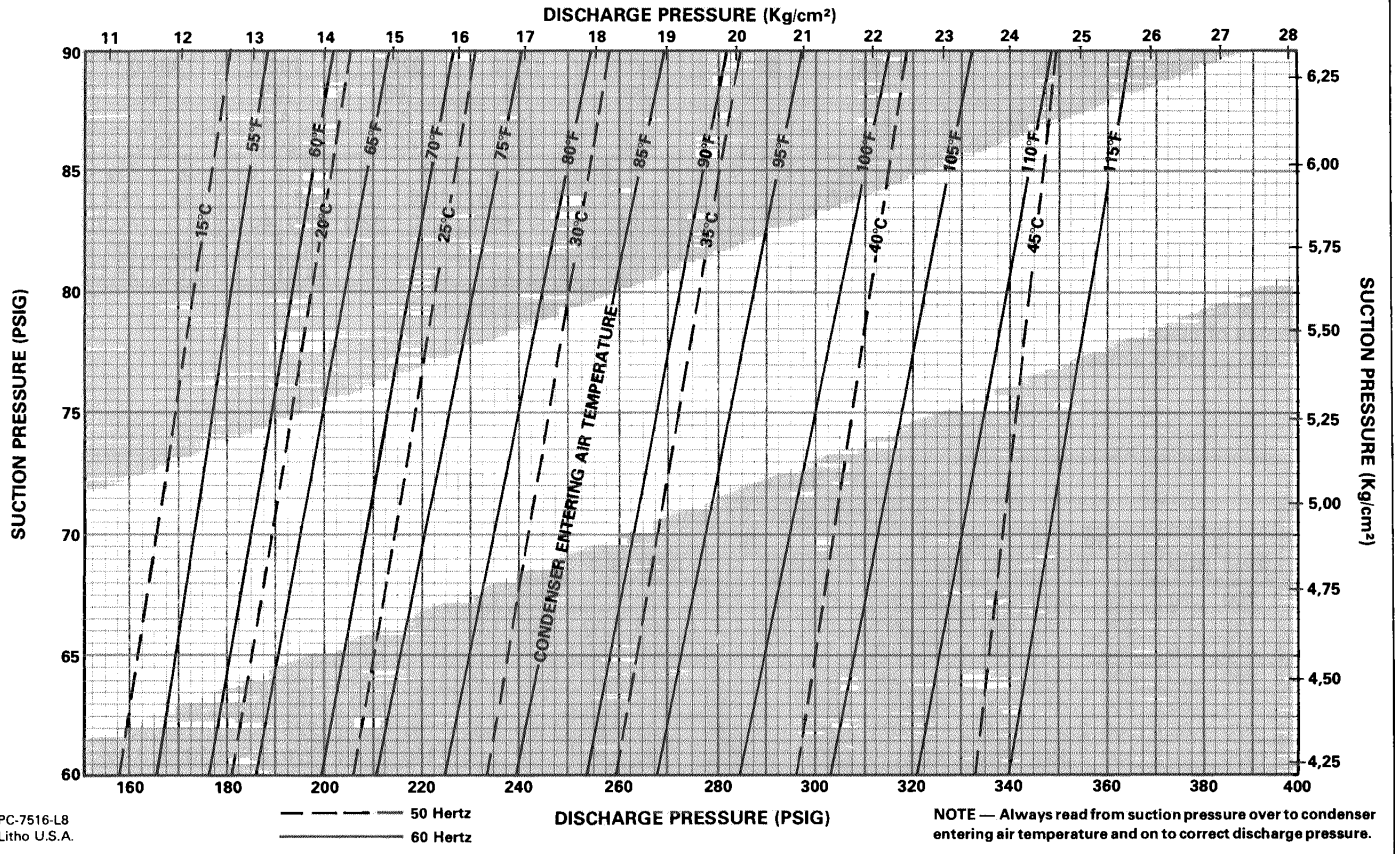
GCS3-2753 BLOWER PERFORMANCE CHART

Air Volume (Cfm)	STATIC PRESSURE EXTERNAL TO UNIT (Inches Water Gauge)																						
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90		1.0		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM
6500	530	1.40	570	1.60	605	1.80	640	1.95	675	2.15	705	2.35	730	2.55	760	2.75	785	2.95	810	3.10	835	3.30	
7000	570	1.80	605	1.95	640	2.15	675	2.35	705	2.55	735	2.75	760	2.95	790	3.15	815	3.35	840	3.55	865	3.85	
7500	615	2.20	645	2.40	675	2.60	705	2.80	735	3.00	765	3.20	795	3.45	820	3.65	845	3.90	870	4.10	895	4.35	
8000	650	2.65	680	2.85	715	3.10	745	3.30	770	3.50	800	3.75	825	3.95	850	4.20	875	4.45	900	4.70	920	4.90	
8500	690	3.15	720	3.40	750	3.65	780	3.85	805	4.10	830	4.30	855	4.55	880	4.80	905	5.10	930	5.35	950	5.55	
9000	730	3.80	760	4.05	790	4.30	815	4.50	840	4.75	865	5.05	890	5.25	915	5.50	940	5.80	960	6.05	980	6.25	
9500	775	4.55	800	4.75	825	5.00	850	5.20	875	5.45	900	5.75	925	6.05	950	6.30	970	6.55	990	6.80	1015	7.15	
10,000	815	5.25	840	5.50	860	5.70	885	6.00	915	6.30	935	6.55	960	6.85	980	7.15	1000	7.40	1020	7.65	1040	7.95	

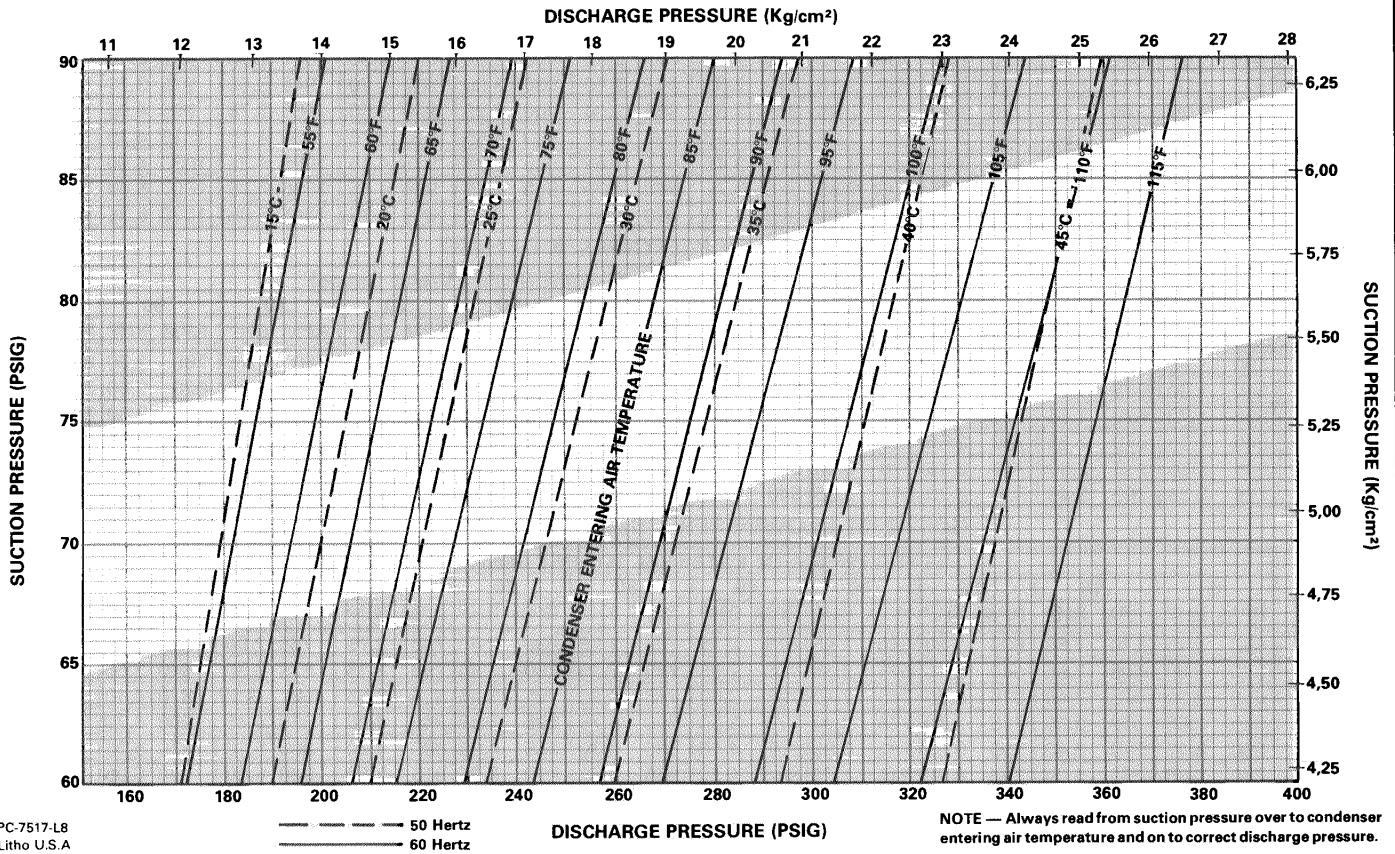
NOTE — All cfm data is measured external to the unit using standard return air opening and with filters in place.

F - Pressure Curves

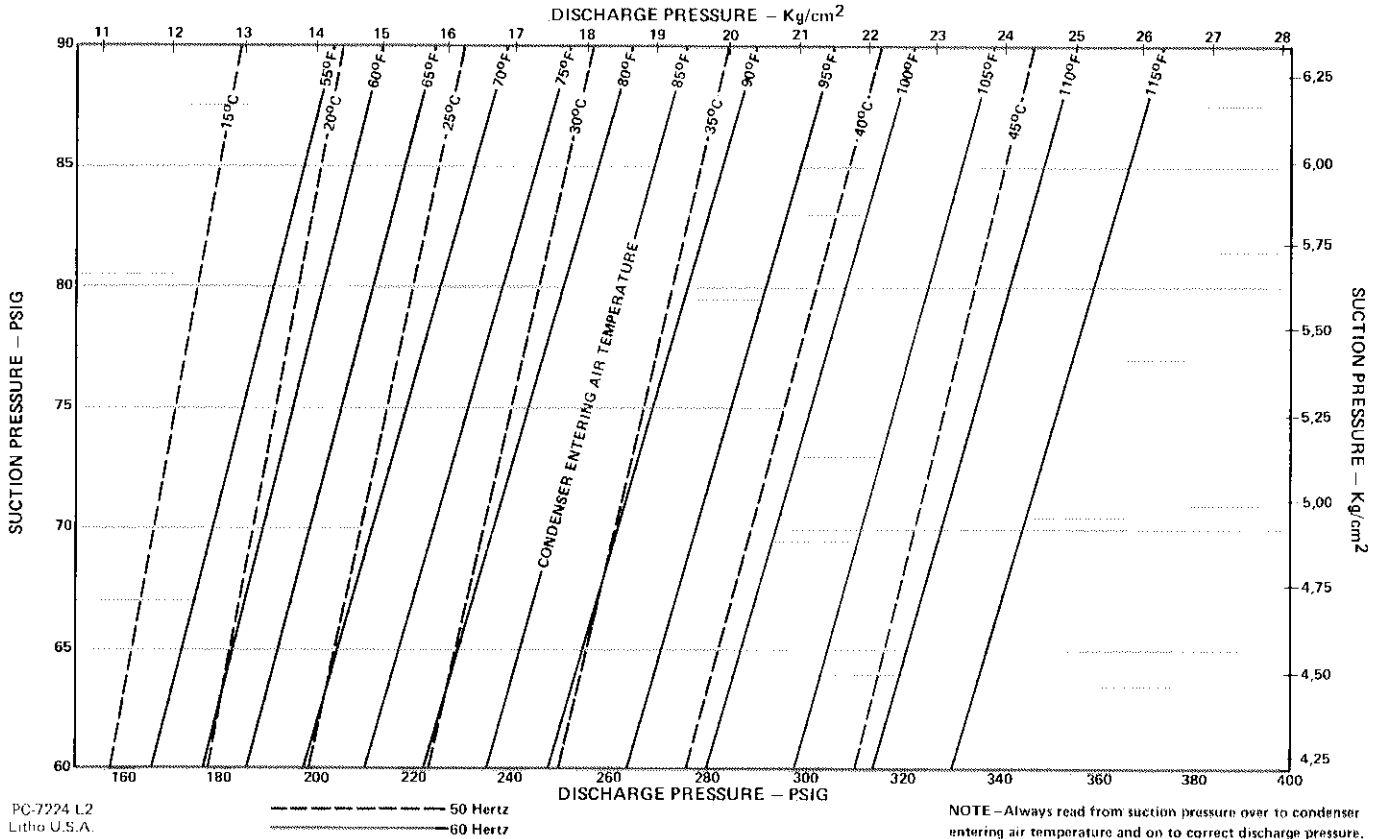
NORMAL OPERATING PRESSURE CURVE FOR GCS3-953 SERIES UNITS



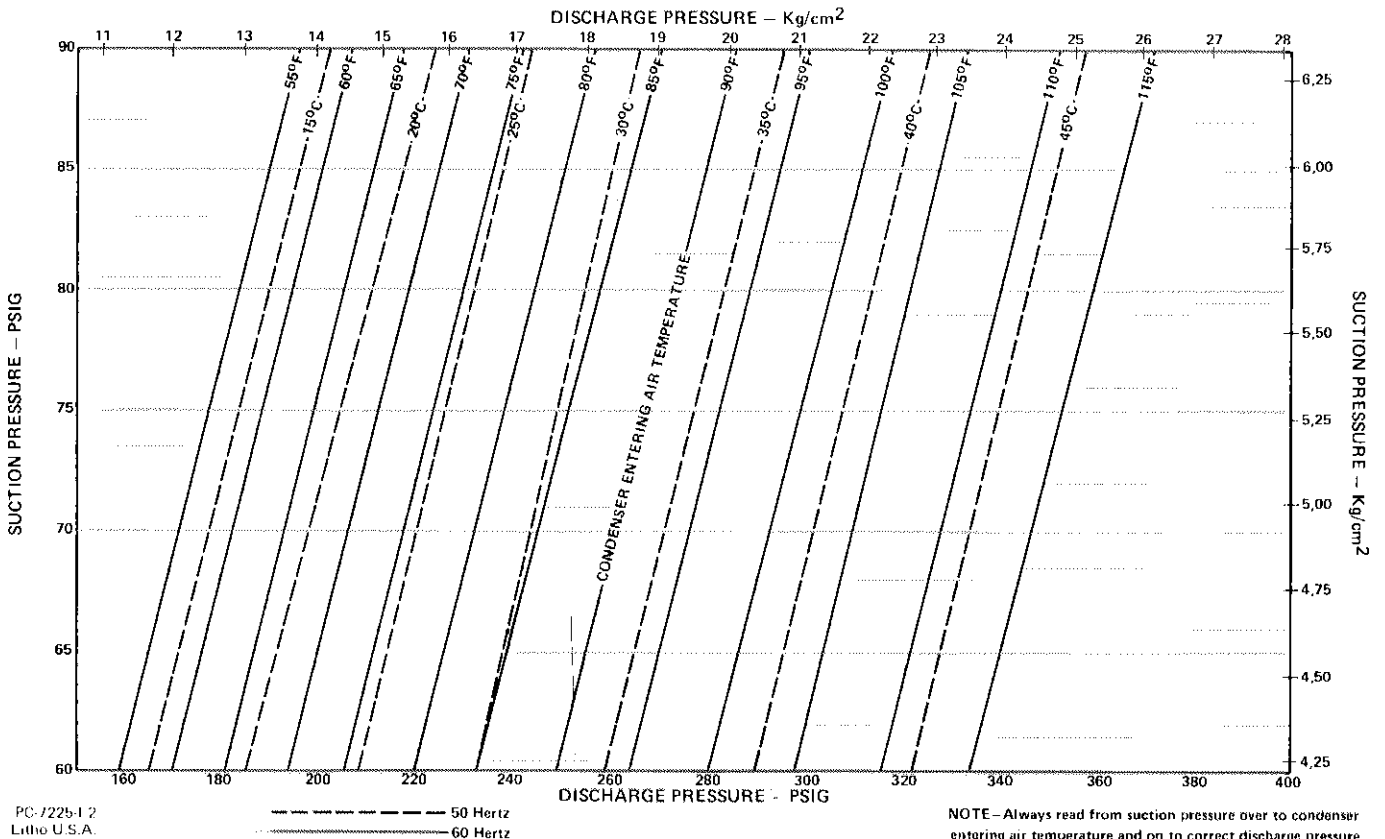
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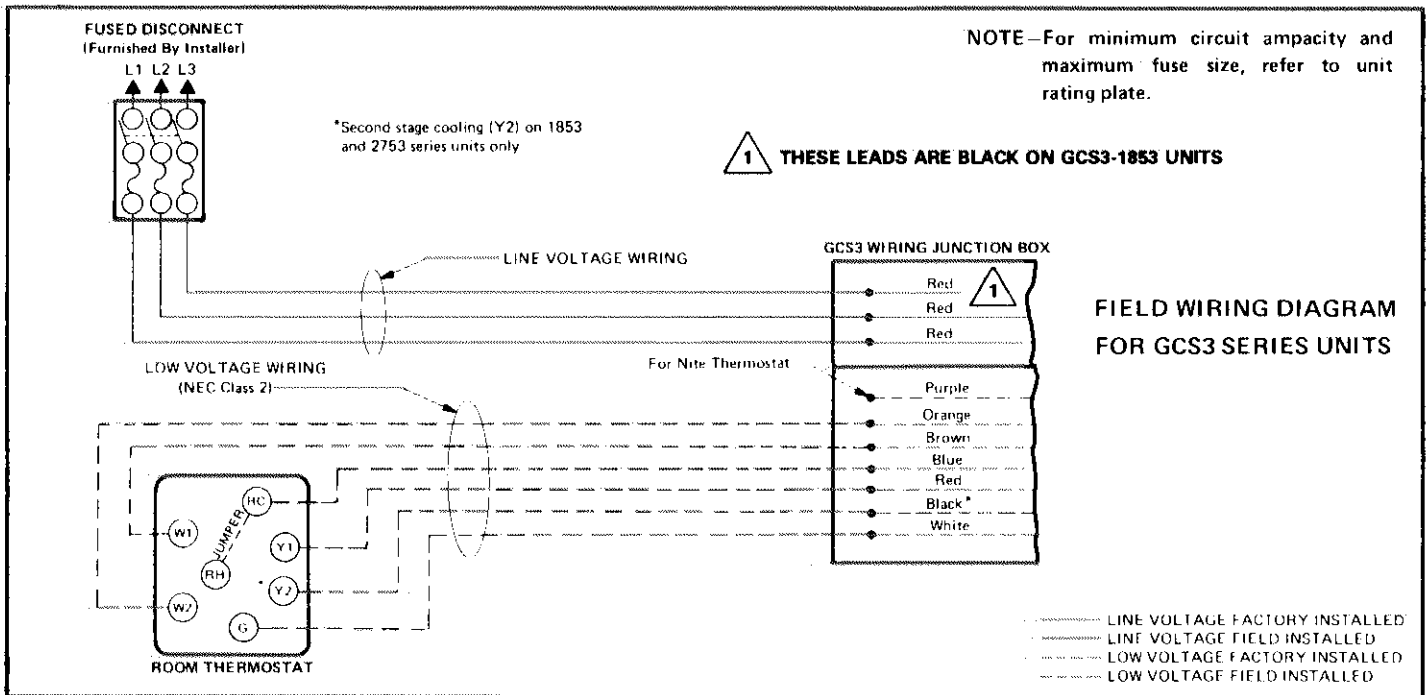
NORMAL OPERATING PRESSURE CURVE FOR GCS3-1853 SERIES UNITS



NORMAL OPERATING PRESSURE CURVE FOR GCS3-2753 SERIES UNITS



G - Field Wiring



III - COMPONENTS

Table 1 lists the electrical components by their wiring diagram key numbers and then gives a brief description and function of the component. Table 1 also lists components for power saver and night setback options.

Tables 2 and 3 show the components energized during the sequence of operation.

TABLE 1

Key No.	Description	Function	Location
BASIC GCS3 UNIT			
B1	Compressor 1	Initiates DX cooling in No. 1 refrigerant circuit.	Compressor Compartment
B2	Indoor Motor	Provides supply air.	Blower Compartment
B3	Outdoor Fan Motors	Draws air across condenser coil to allow refrigerant to condense as it flows through coil.	Compressor Compartment
B4	Combustion Air Blower	Provides combustion air to burner.	Power Burner
B6	Compressor 2	Initiates DX cooling in No. 2 refrigerant circuit.	Compressor Compartment
F1	Fuse	Two - 5AMTH 250V fuses protect control circuit.	Control Box
F2	Fuse	One - 5A MDX 125 V fuse protects heating control circuit.	Control Box
FD	Fuse	On "Y" voltage units, two - 5A MTH 250V fuses protect the power saver circuit (when used).	Control Box
F4	Fuse	The low voltage transformer has the secondary protected by a 2.5A Type C 250V fuse.	Transformer
F6	Fuse	Each compressor has two - 3A AGC 250V fuses in the safety circuit.	

Key No.	Description	Function	Location
BASIC GCS3 UNIT			
F7	Fuse	On GCS3-1853 & 2753 "Y" voltage units, the indoor blower motor is protected by three - 30A Class K5 250V fuses.	Control Box
F8	Fuse	On GCS3-1853 & 2753 "Y" voltage units, the outdoor fan motors are protected by three - 15A Class K5 250V fuses.	Control Box
GV1	Gas Valve	Provides gas flow to burner. On natural gas size 350 and 500 burners, this valve has low and high fire solenoids.	Heating Section
GV2	Pilot Valve	On GCS3-1353/1853 & 2753 units, this valve provides flow for pilot ignition.	Heating Section
GV3	Redundant Gas Valve	On AGA units this valve assure gas shutoff should GV1 stick open.	Heating Section
K1	No. 1 Compressor Contactor	Energizes compressor #1. On GCS3-953 & 1353 "Y" voltage units, the outdoor fan motors are also energized.	Control Box
K2	Indoor Blower Contactor	Energizes indoor blower motor. On "Y" voltage units, it also provides power for power saver transformer (when used).	Control Box
K3	Outdoor Fan Contactor	On all "G" & "J" voltage units and GCS3-1853 & 2753 "Y" voltage units, this contactor energizes outdoor fan motors.	Control Box
K4	Cool 1 Relay	Energizes K1 on a cooling demand to initiate cooling.	Control Box
K5	Time Delay Relay	Energized on a heating demand. N.O. K5-1 contacts close to initiate heating sequence. N.C. K5-2 open to lock out cooling.	Control Box

Key No.	Description	Function	Location
BASIC GCS3 UNIT			
K6	Indoor Blower Relay	Is energized by the "G" leg of thermostat. It closes its N.O. contacts to then energize K2.	Control Box
K7	Indoor Blower Delay Relay	Energizes K2 to bring on blower, providing K5-1 and K12-2 contacts are made. There is a short delay.	Control Box
K8	Heat 1 Relay	When K5-1 and K12-2 contacts close, this relay energizes primary control providing safety switches are closed.	Control Box
K11	Power Saver Relay	On "G" and "J" voltage units, this relay energizes power saver transformer (when used). Is energized on "Y1" cooling demand.	Control Box
K12	Purge Relay No. 1	Is energized on a heating demand. N.O. K12-1 contacts close to power combustion air blower. Purges combustion chamber. N.O. K12-2 closes to energize K8 and K7.	Control Box
K14	Heat 2 Relay	On natural gas 350 and 500 size burners, this relay energized by W2 leg.	Control Box
K15	Purge Relay No. 2	On GCS3-1353, 1853 & 2753 units, K15 keeps the combustion air blower running until K5-1 contacts open. Purges out combustion chamber after heating cycle.	Control Box
K16	No. 2 Compressor Contactor	On GCS3-1853 & 2753 units, K16 energizes compressor no. 2.	Control Box
K18	Cool 1 Relay	Energizes K16 on a Y2 cooling demand.	Control Box
S10 (S11 - On 953 units)	Limit	At excessive unit temperatures S10 de-energizes primary control. In addition it keeps K2 energized until it resets.	Heating Section
S11	Secondary Limit	On GCS3-1353 & 1853 units this added limit de-energizes primary control at excessive temperatures. S11 is optional on GCS3-1353 CGA units.	Heating Section
S13	Combustion Air Switch	S13 must close before primary control can power gas valve. Assures combustion chamber purge and presence of combustion air.	Heating Section
S20	Gas High Pressure Switch	On C.G.A. units S20 opens at unusual high gas pressure to de-energize primary control.	Gas Manifold
S21 (S19 on 953 units)	Gas Low Pressure Switch	On C.G.A. and some GCS3-953 A.G.A. units, switch opens at unusual low gas pressure to de-energize primary control.	Gas Manifold

Key No.	Description	Function	Location
BASIC GCS3 UNIT			
T1	Heat Transformer	Provides 120 volt heating control circuit. On "G" and "J" voltage units, T1 also powers compressor safety circuit. On GCS3-953 & 1353 "Y" voltage units, transformer is located in control box.	Blower Compartment
T3	Low Voltage Transformer	Provides 24V power to thermostat circuit.	Control Box
TOC 1 And TOC 2	Timed Off Controls	Prevents compressor short cycling and allows time for system pressure to equalize. Initially delays compressor operation for 20 seconds. It must run through a 5 minute cycle before it resets. If compressor runs less than 5 minutes, control will run through remaining time plus 20 seconds on next demand.	Control Box
POWER SAVER OPTION			
K9	R3 Power Saver Relay	Switches compressor control through compressor monitor. Switches power saver circuit from minimum position into power saver operation.	Power Saver Control Box
K10	R4 Night Relay	De-energizes power saver circuit during night setback mode (if used).	Power Saver Control Box
S14	Mixed Air Temperature Control	Modulates outside and return air dampers to provide a 58°F mixed air temperature.	Power Saver Control Box
S15	Enthalpy Control	Control returns dampers to minimum position when total heat content of air exceeds set point.	Power Saver
S18	Compressor Monitor	Locks out compressor(s) at outdoor temperatures below setpoint.	Power Saver
T2	Power Saver Transformer	Provides 24V power saver circuit.	Power Control Box
NIGHT SETBACK OPTION			
S12	12 hr. Timer Or Manual Switch	Determines day or night mode.	Remote
S16	Night Thermostat	Controls thermostat set point during night set back mode.	Remote
S17	Clock Timer	Provides automatic by-pass to S16 during night setback mode.	Remote

TABLE 2

COMPONENTS ENERGIZED DURING SEQUENCE OF OPERATION		24 VOLT CIRCUIT										120 VOLT CIRCUIT				POWER SUPPLY CIRCUIT				POWER SAVER			
GCS3-953 SERIES 220/240, 380/420, 440/480 AND 550/600 VOLT UNITS		Indoor Blower Delay Relay	Heat Relay	Time Delay Relay	Purge Relay	Indoor Blower Relay	No. 2 Gas Valve	Cooling Relay	Indoor Blower Contactor	Combustion Air Blower	Primary Control	No. 1 Gas Valve	Power Saver Relay †	Timed Off Control	Compressor Contactor	Compressor	Indoor Blower	Outdoor Fan Contactor †	Outdoor Fan	Oil Rectifier	Minimum Position	Modulating Position	Closed
DEMAND	CONDITION																						
1st Stage Heat	Below 58°F (14,4°C)	●	●	●	●	●		●	●	●	●	●	●						●	●	●		
2nd Stage Heat	Below 58°F (14,4°C)	●	●	●	●	●		●	●	●	●	●	●							●	●	●	
Cooling	Below 58°F (14,4°C)						●	●	●	●	●	●	●						●	●	●	●	
Cooling	Above 58°F (14,4°C)						●	●	●	●	●	●	●						●	●	●	*	*
Unit Indoor Blower "Off"	Any Temperature																		●	●			●

*May be at modulating or at minimum position depending on humidity and heat content of air.
†"G" and "J" voltage units only.

TABLE 3

COMPONENTS ENERGIZED DURING SEQUENCE OF OPERATION		24 VOLT CIRCUIT							120 VOLT CIRCUIT					POWER SUPPLY CIRCUIT					POWER SAVER											
GCS3-1353, GCS3-1853 AND GCS3-2753 SERIES 220/240, 380/420, 440/480 AND 550/600 VOLT UNITS		Purge Relay (Approx. 36 Sec.)	Time Delay Relay	No. 1 Heating Relay	Indoor Blower Delay Relay	No. 2 Heating Relay (nat. only)	Indoor Blower Control Relay	No. 1 Cooling Relay	No. 2 Cooling Relay *	Power Saver Relay †	Ignition Transformer	Pilot Valve	Indoor Blower Contactor	1st Stage Gas Valve	2nd Stage Gas Valve (nat. only)	Combustion Air Blower	Primary Control	No. 1 Timed Off Control	No. 2 Timed Off Control *	No. 1 Compressor Contactor	No. 2 Compressor Contactor *	No. 1 Compressor	No. 2 Compressor *	Outdoor Fan Motors	Indoor Blower Motor	No. 1 Oil Rectifier	No. 2 Oil Rectifier *	Minimum Position	Modulating Position	Closed
DEMAND	CONDITION																													
1st Stage Heat	Below 58°F (14,4°C)	●	●	●	●					●		●	●	●	●	●									●	●	●	●	●	
2nd Stage Heat	Below 58°F (14,4°C)	●	●	●	●	●				●		●	●	●	●	●									●	●	●	●	●	
Cooling	Below 58°F (14,4°C)						●			●		●	●	●	●	●									●	●	●	●	●	
1st Stage Cooling	Above 58°F (14,4°C)						●	●		●		●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
2nd Stage Cooling *	Above 58°F (14,4°C)						●	●	●	●		●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Unit Indoor Blower "Off"	Any Temperature																								●	●				●

*Two stage cooling (1853/2753 units only)
**May be at modulating or at minimum position depending on humidity and heat content of air.
†"G" and "J" voltage units only.

A - Control Box

Figure 2 identifies the components in GCS3 series control boxes.

B - L2 Compressor (Figure 3)

The compressor is protected by a series of controls located in the compressor make-up box which monitor the system. They shut down the compressor during abnormal operating conditions.

1 - Compressor Overloads (3)

These protectors are current sensitive and protect the

compressor motor from single phasing (loose wiring) and locked rotor conditions.

2 - High Pressure Switch

Opens control circuit at 410 psig head pressure. Automatically resets.

3 - Ambient Thermostat

This thermostat opens control circuit at 22°F ambient and automatically resets at 32°F.

4 - Low Pressure Switch

Opens control circuit at 20 psig suction pressure and automatically resets at 50 psig.

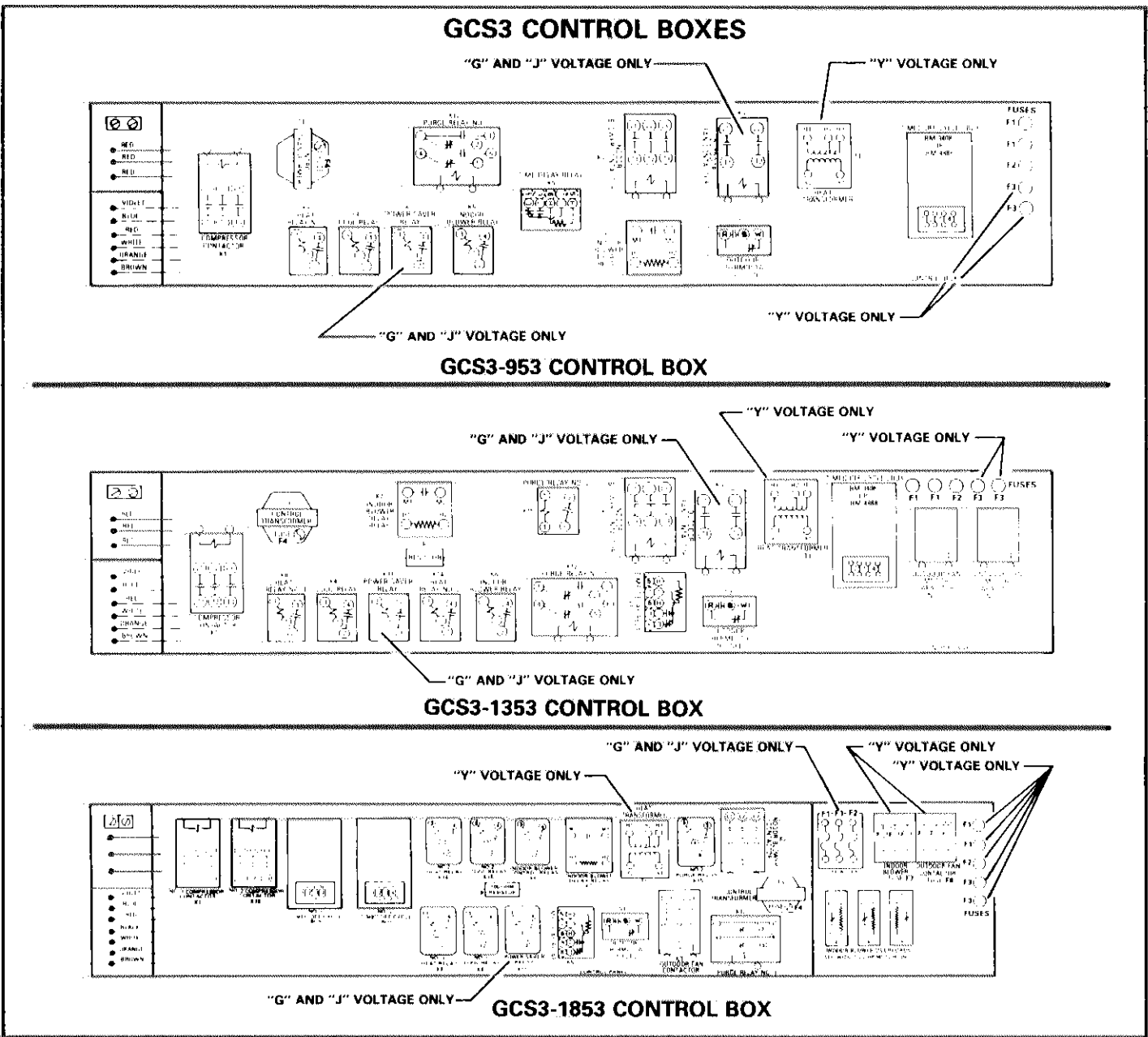


FIGURE 2

5 - Fuses

The 3 amp fuses protect the inwinding thermostat from damage.

6 - Internal Thermostat

This consists of 2 inwinding devices which protect the motor windings from overheating. It may take up to an hour for reset once tripped.

C - Heating Section

GCS3 units employ power burners. Basically the heating components provide fuel supply, combustion air supply, ignition source and proof of flame. Figures 4, 5 and 6 identify the various heat sections.

Burner usage is listed in the burner ratings table. Figures 7 and 8 show exploded views of the burners.

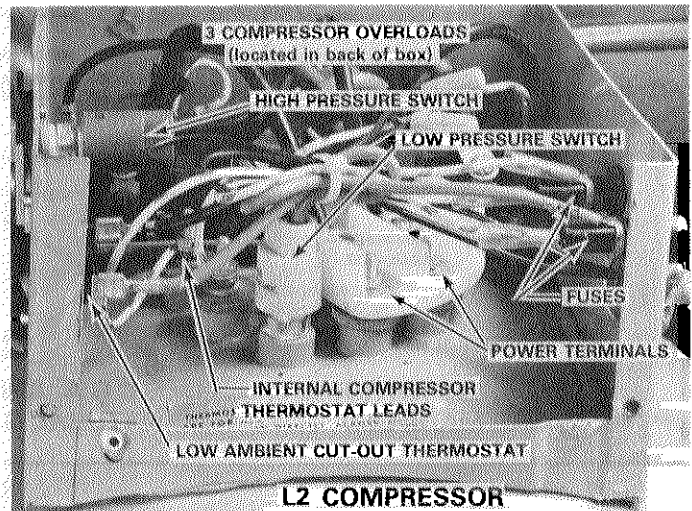
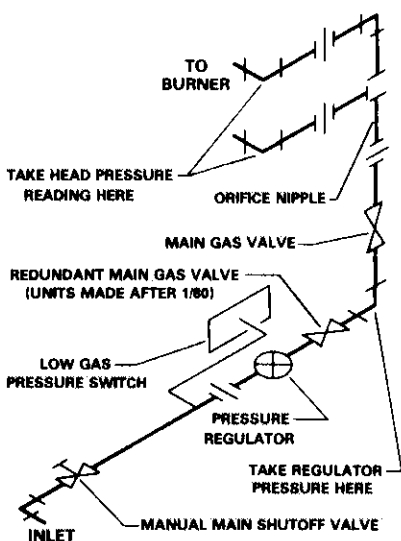
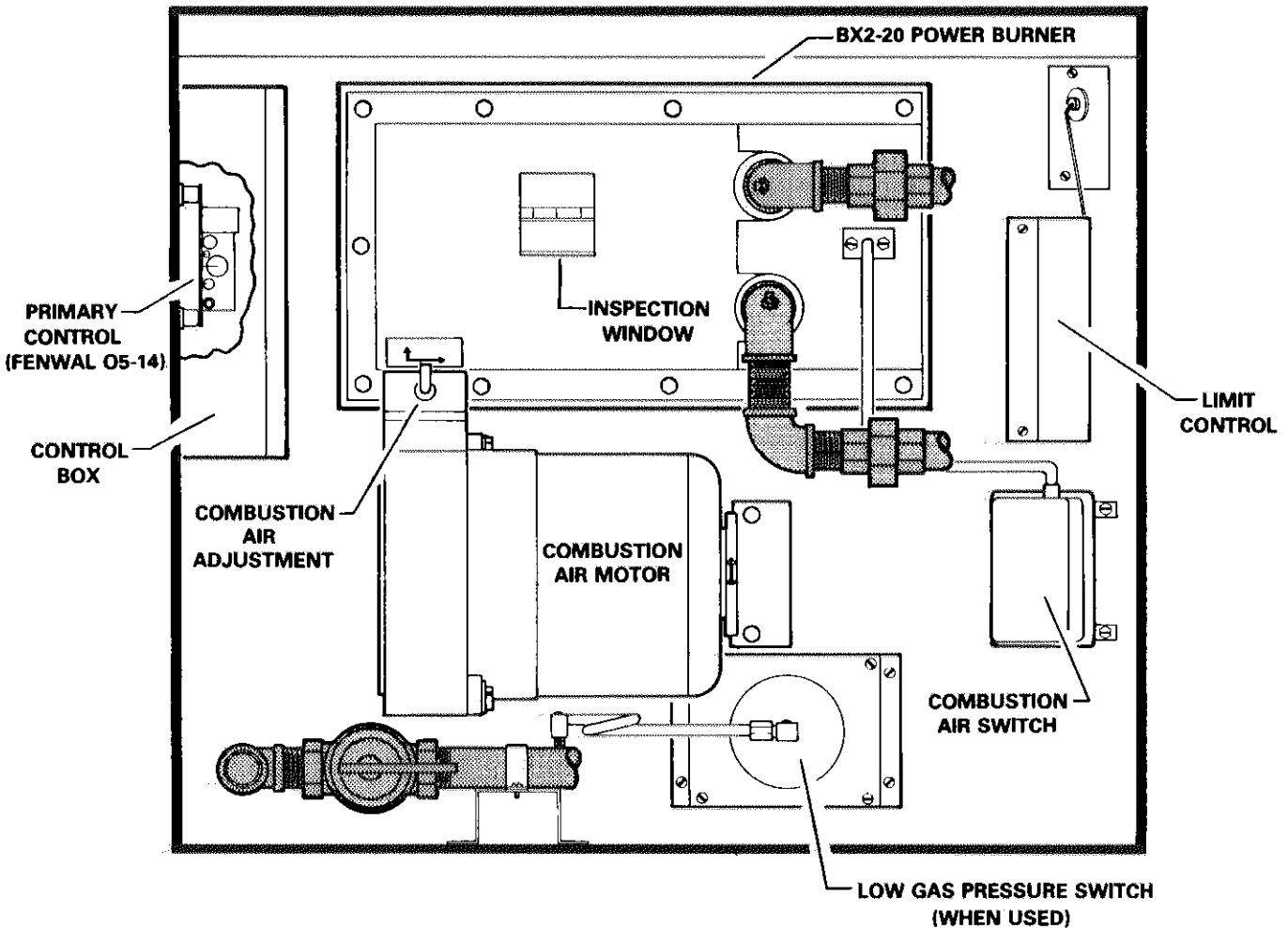
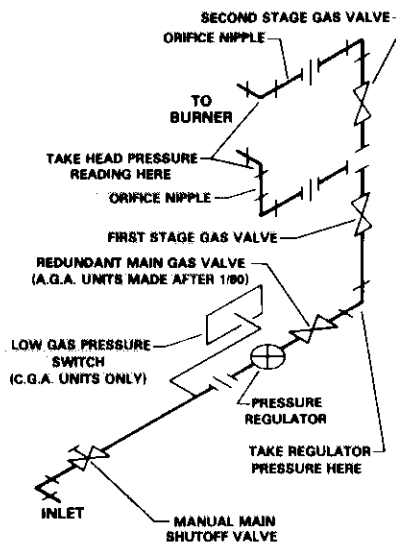


FIGURE 3

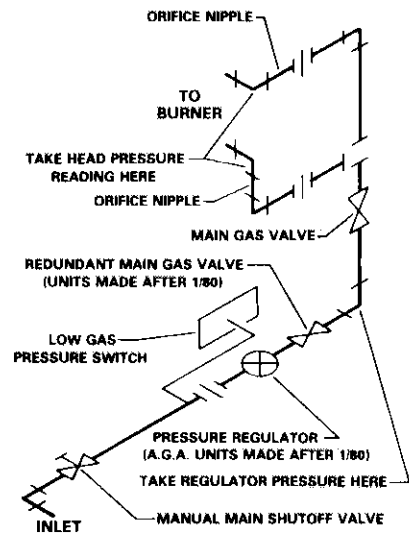
GCS3-953 HEAT SECTION



A.G.A. 125 NATURAL GAS MANIFOLD



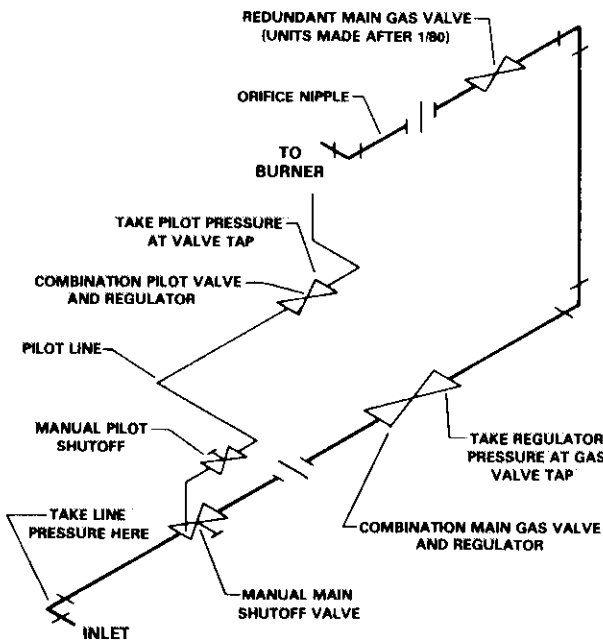
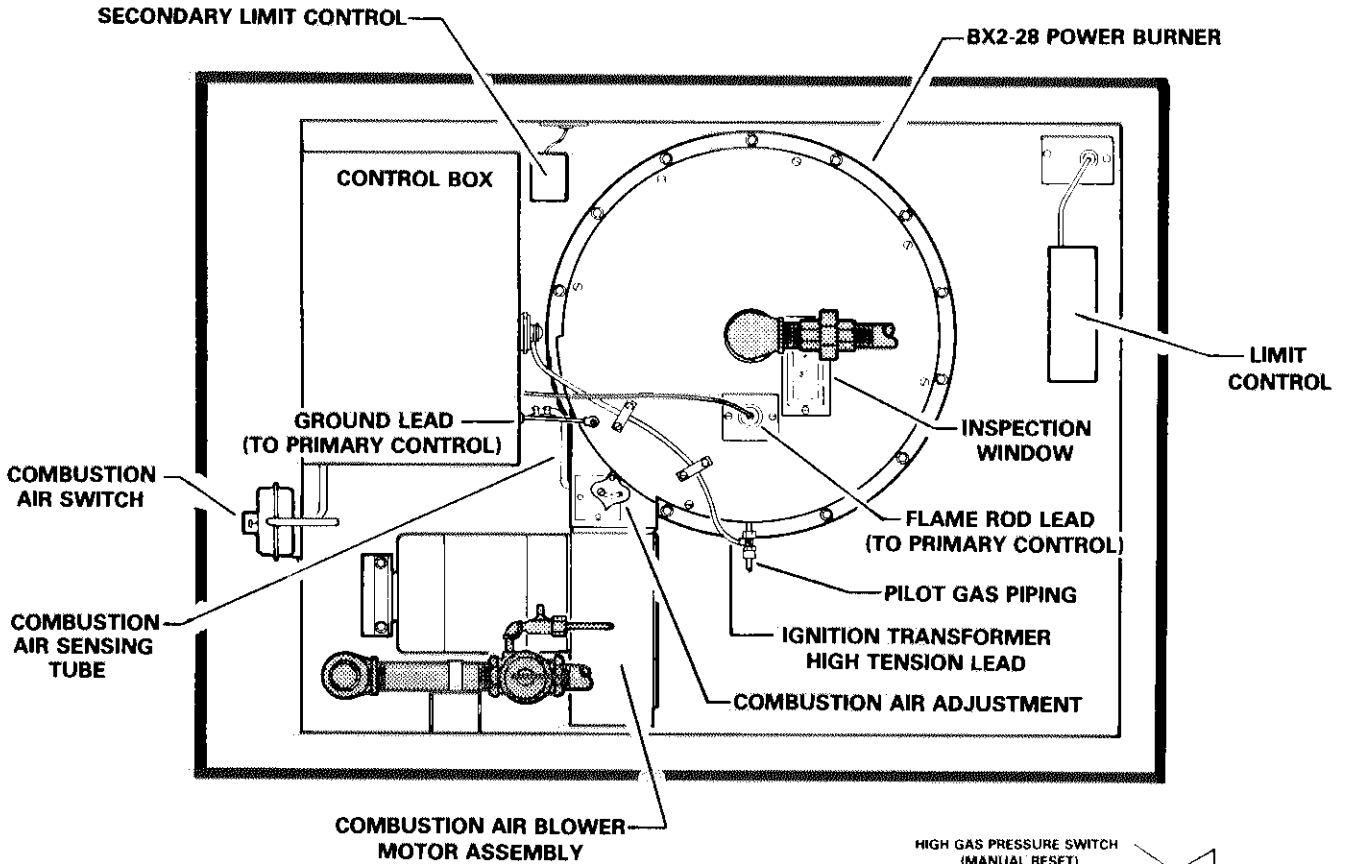
C.G.A. AND A.G.A. 250 NATURAL GAS MANIFOLD



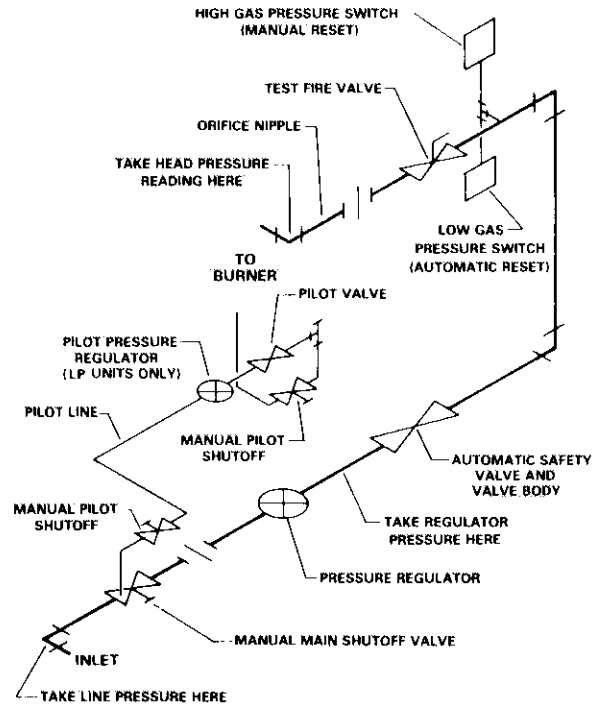
C.G.A. AND A.G.A. 250 L.P. GAS MANIFOLD

FIGURE 4

GCS3-1353 HEAT SECTION



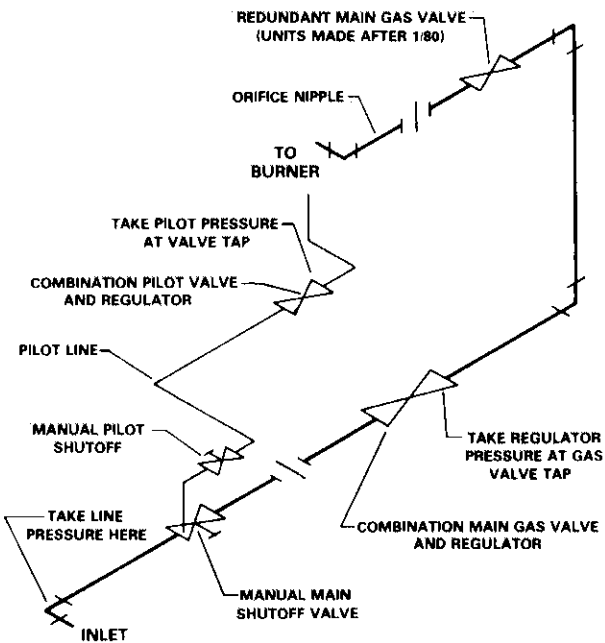
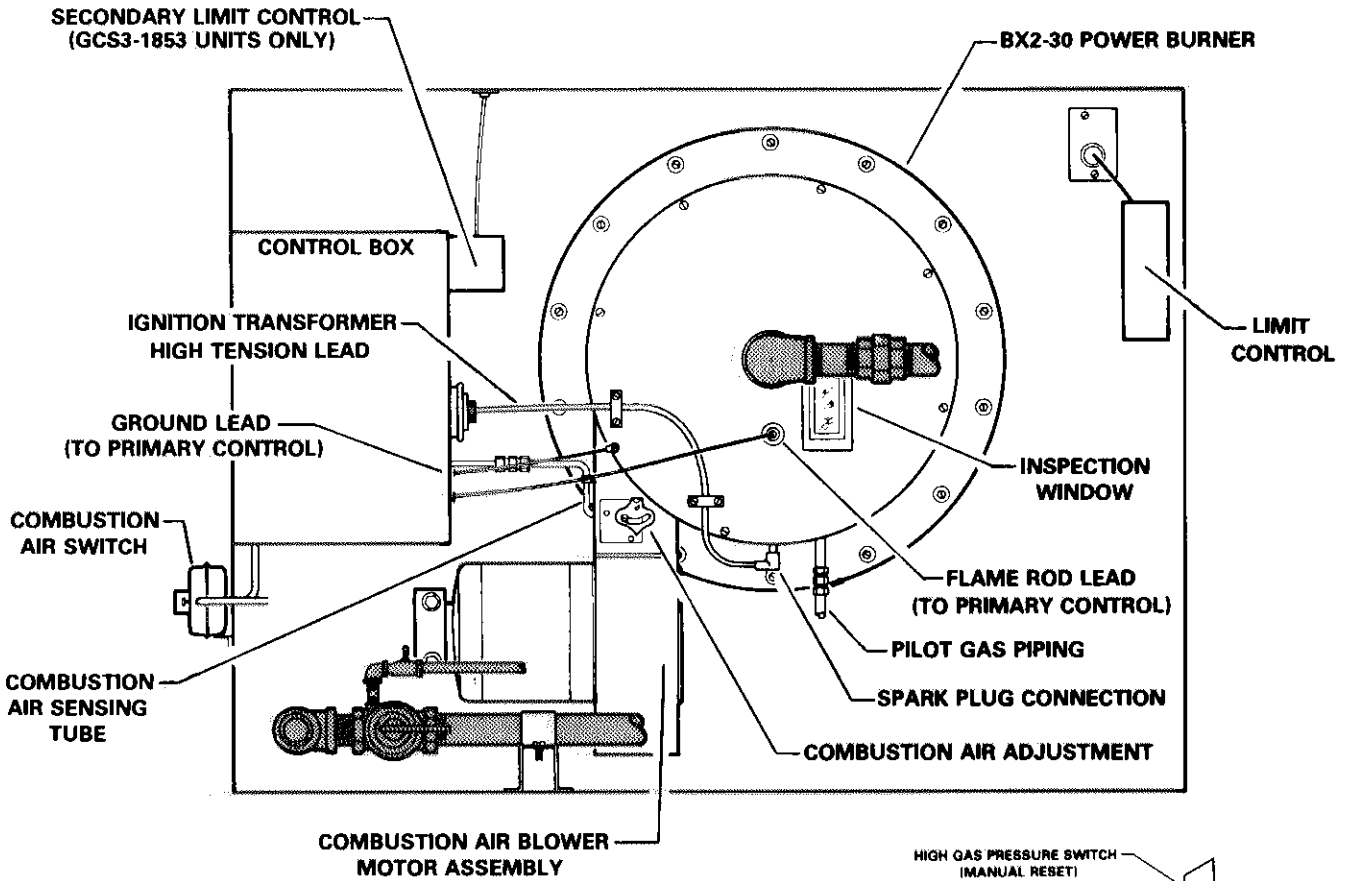
A.G.A. NATURAL AND L.P. GAS MANIFOLD



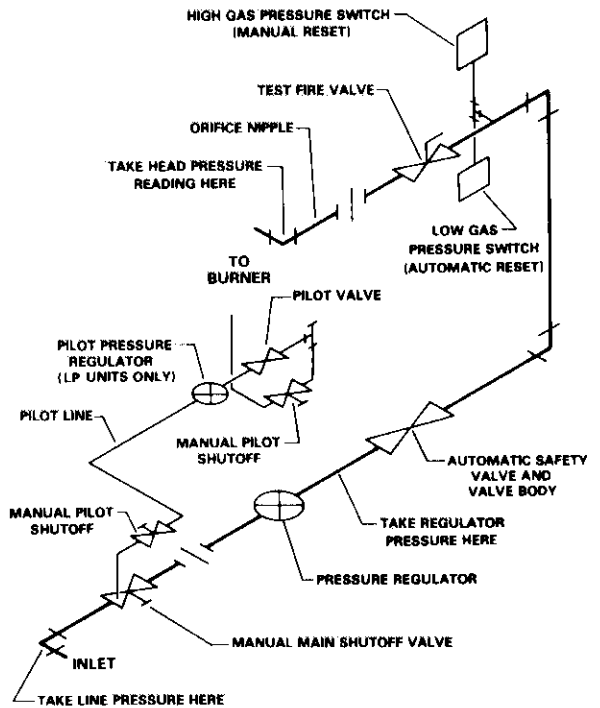
C.G.A. NATURAL AND L.P. GAS MANIFOLD

FIGURE 5

GCS3-1853/2753 HEAT SECTION



A.G.A. NATURAL AND L.P. GAS MANIFOLD



C.G.A. NATURAL AND L.P. GAS MANIFOLD

FIGURE 6

BX2-20 POWER BURNER EXPLODED VIEW

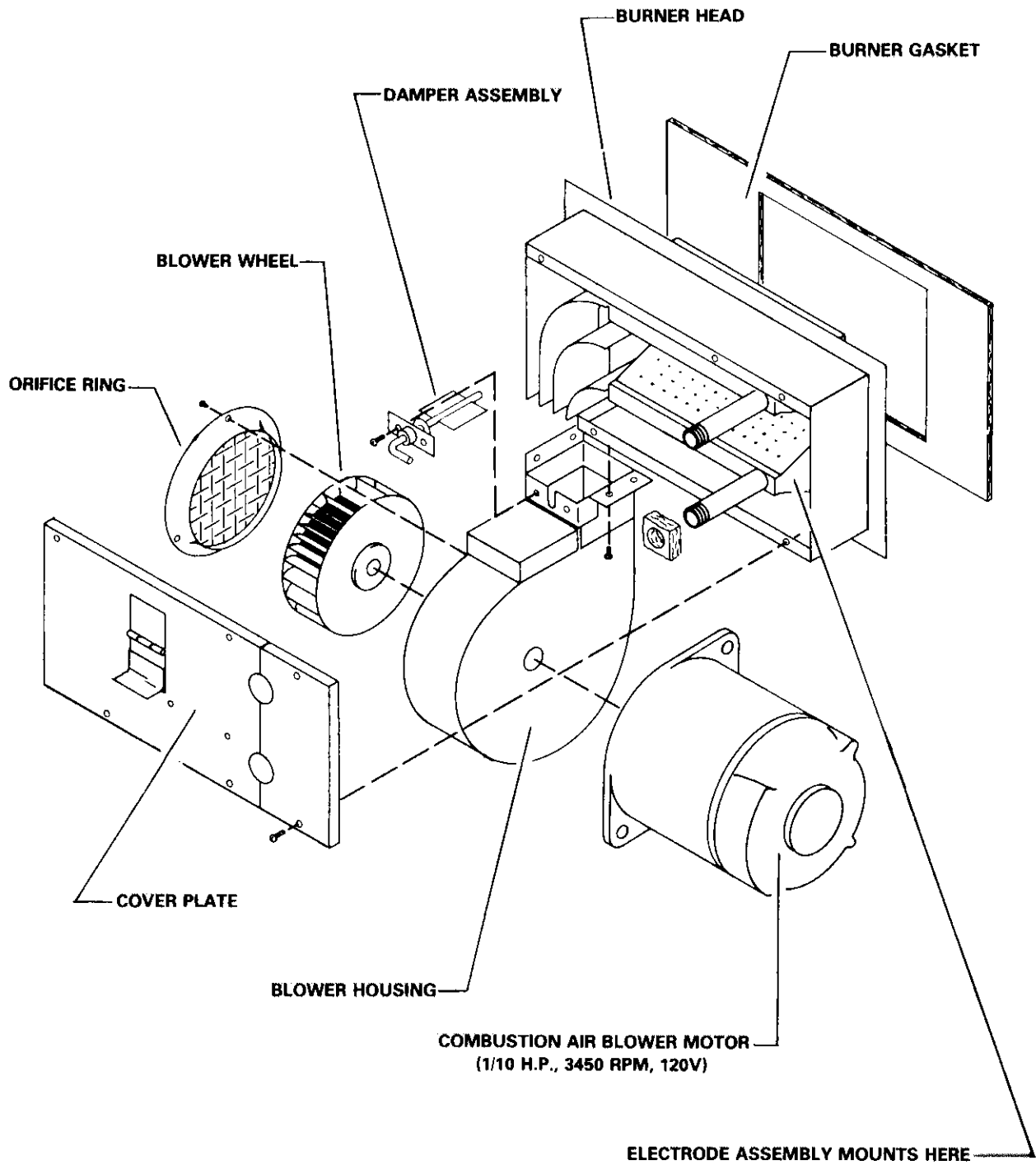


FIGURE 7

**BX2-28 AND BX2-30 POWER BURNERS
EXPLODED VIEW**

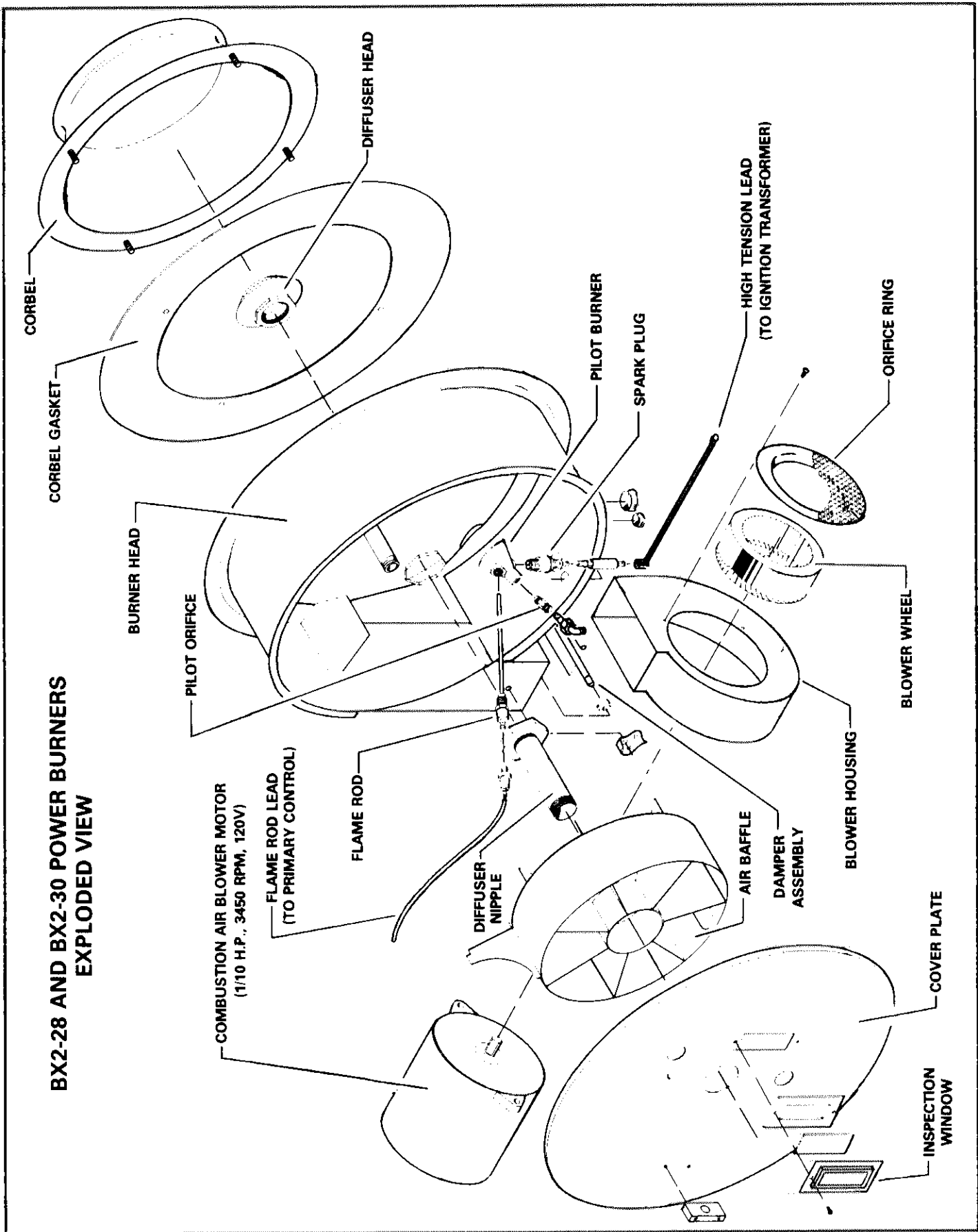


FIGURE 8

C - Condenser Coil

Air draws through the coil and discharges it out the top of unit. For fan service access, remove the bolts securing fan assembly. Figure 9 illustrates the condenser fan and motor assemblies.

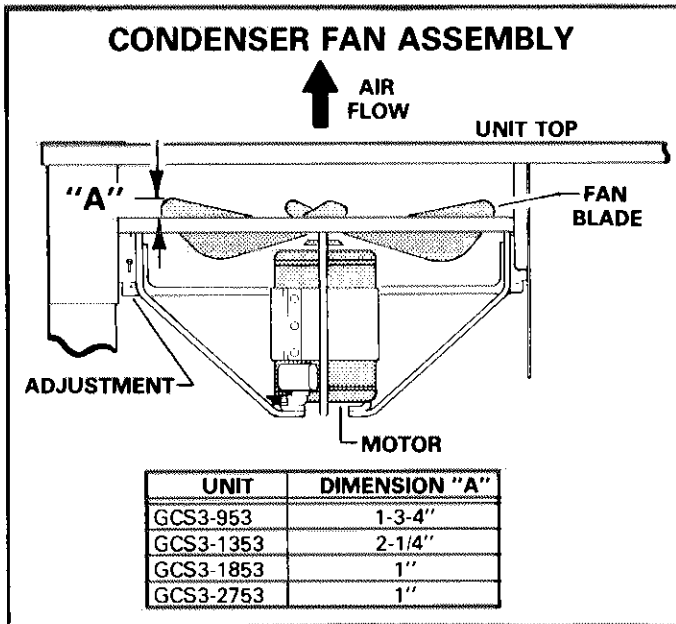


FIGURE 9

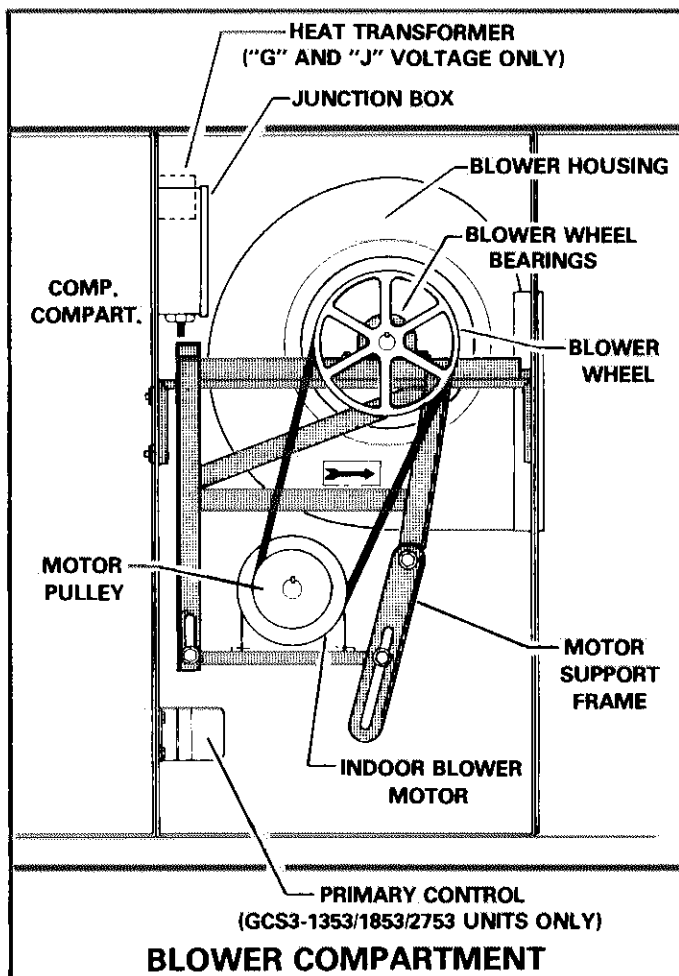


FIGURE 10

D - Blower Compartment

Table 4 lists the drive selection available for GCS3 series units. 7-1/2 H.P. motors are equipped with overloads. Figure 10 identifies the blower compartment.

TABLE 4

Model No.	Nominal Motor Hp	Maximum Usable Hp	Rpm Range Of All Available Drive Setups @ 1720 Rpm Motor Speed
GCS3-953	2	2.30	860-1200
	3	3.45	990-1200
GCS3-1353	3	3.45	765-955
	5	5.75	893-1087
GCS3-1853	3	3.45	720-875
	5	5.75	815-970
GCS3-2753	5	5.75	740-890
	7-1/2	8.63	830-980

E - Power Saver (Optional)

RD3 Power Savers are optional to GCS3 units. Refer to Accessories Section for additional information.

III - REFRIGERANT SYSTEM

GCS3-953 & 1353 units have a single L2 compressor in a single refrigeration system. GCS3-1853/2753 units have twin L2 compressors in separate refrigeration systems. Each system uses an expansion valve to meter the refrigerant. The element is field replaceable.

Each unit is furnished with a normal operating pressure curve. The curve uses suction pressure, discharge pressure and outdoor temperature comparison. To use 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 (953 and 1353 units

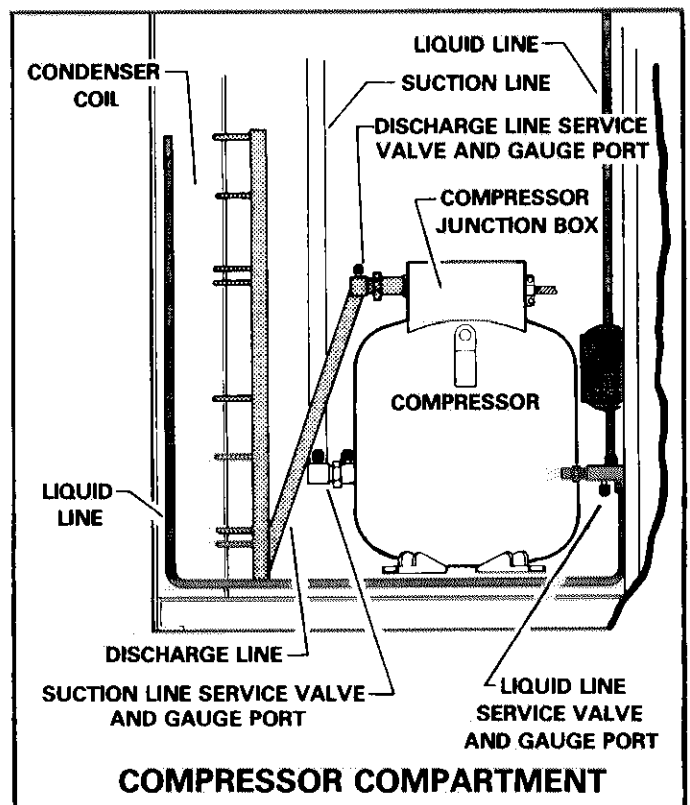


FIGURE 11

only). 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.

The suction and discharge service valves are located at compressor. A liquid line service valve(s) is located inside cabinet. See Figure 11. The gauge ports on service valves can be shut off by backseating the valves. Open valve one turn off backseat to record pressure at gauge manifold.

IV - HEATING SYSTEM

A - A.G.A./C.G.A. Usage

All A.G.A. units produced after January 1, 1980 incorporate a regulating device and a redundant main gas valve in the manifold piping. Should the main gas valve stick open, the redundant valve assures gas shut off. GCS3-1353/1853/2753 units use a combination gas valve and regulator as shown in Figures 5 and 6. GCS3-953 units use a separate regulator as shown in Figure 4. On A.G.A. GCS3-953 L.P. units produced prior to January 1, 1980 a regulator is not used.

C.G.A. units do not use a redundant valve. In addition C.G.A. GCS3-953 L.P. units do not use a regulator.

B - Burners

The BX2-20 burners in GCS3-953 units have dual combustion heads. On 250 size natural gas applications, these heads are two staged and controlled by separate gas valves. The bottom heat is first stage and the top head is second stage.

GCS3-1353/1853 and 2753 units have a single combustion head. Two stage gas valves are available on natural gas applications as indicated in the Burner Rating Table. These units use intermittent pilot ignition. After the pilot is lit on a heating demand, it ignites the main burner. The pilot burns continuously during main burner operation. The spark plug gap is .05 inches.

All GCS3 units incorporate an orifice nipple at the combustion head(s). Table 5 lists the drill size per unit usage.

TABLE 5

UNIT	ORIFICE DRILL SIZE	
	PILOT	NIPPLE
GCS3-953-125 (Nat.)	----	7/32
GCS3-953-250 (Nat.)	----	#1 (2)
GCS3-953-250 (L.P.)	----	1/8
GCS3-1353-175 (Nat.)	#50	1
GCS3-1353-350 (Nat.)	#50	7/16
GCS3-1353-350 (L.P.)	#57	C
GCS3-1853-275 (Nat.)	#50	11/32
GCS3-1853-500 (Nat.)	#50	17/32
GCS3-1853-500 (L.P.)	#57	19/64
GCS3-2753-275 (Nat.)	#50	11/32
GCS3-2753-500 (Nat.)	#50	17/32
GCS3-2753-500 (L.P.)	#57	19/64

NOTE - GCS3-953 units use direct spark ignition and do not require pilot orifices.

C - Primary Controls

1 - GCS3-953 Units (Direct Spark Ignition)

This unit uses a Fenwal 05-14 primary control. The igni-

tion system is solid state, capacitive - discharge and includes an output relay to control gas valve. Upon a call for heat, the control energizes the gas valve and generates a spark between the electrodes for the ignition trial period (10 seconds). If ignition is not achieved, the control will close valve and lockout. To re-establish trial for ignition, move thermostat switch to "off" for a few seconds and then return to "Heat" position. If the control locks out and can not be reset at thermostat, push the manual reset button at control board. See Figure 12.

An electronic flame sensor system monitors flame conditions through flame rectification. In the event of flame

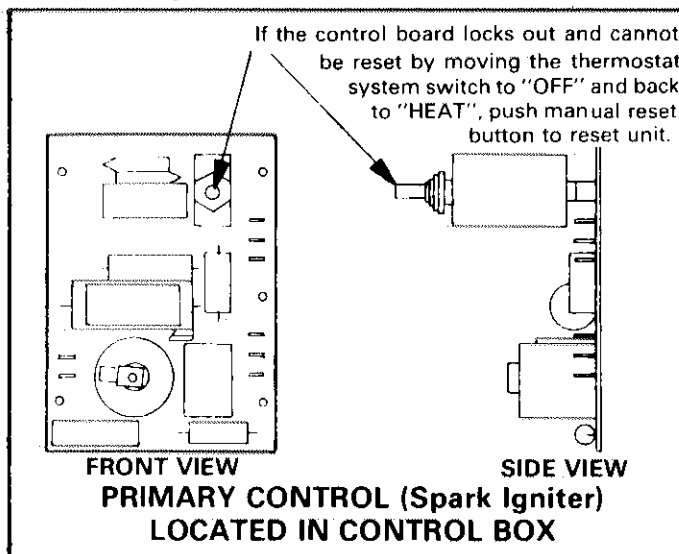


FIGURE 12

outage during a heating cycle, the igniter will provide one retry for ignition before going into lockout.

Table 6 shows flame current range for GCS3-953 units.

TABLE 6

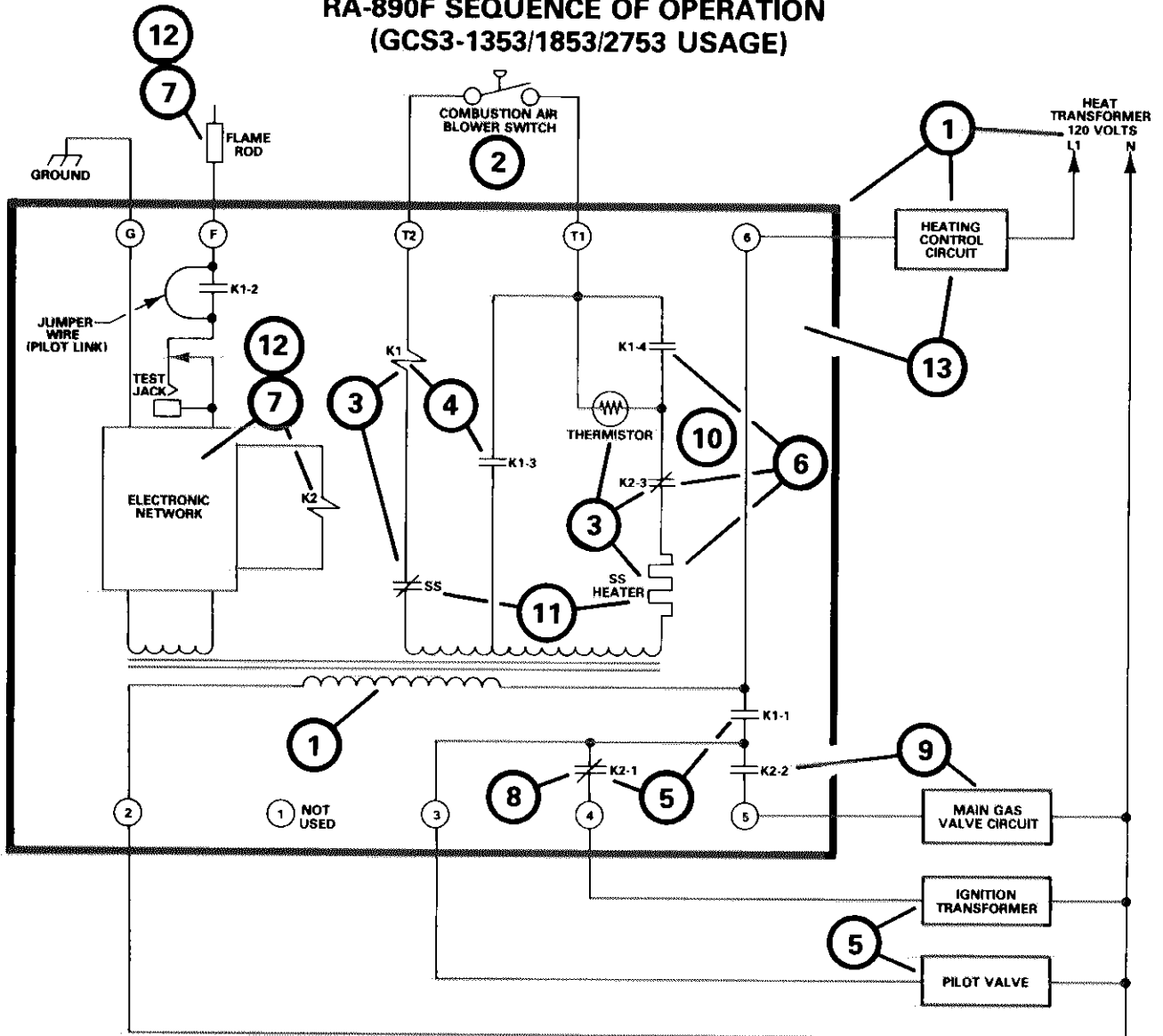
UNIT	MICRO-AMPS	
	PILOT	HIGH FIRE
GCS3-953	----	2 - 20
GCS3-1353	2.2 - 3.5	3.5
GCS3-1853	2.5 - 3.0	3.0 - 4.0
GCS3-2753	2.5 - 3.0	3.0 - 4.0

2 - GCS3-1353/1853 & 2753 Units (Intermittent Pilot)

These units use a Honeywell RA-890F primary control. This control is the heart of the heating system. On a heating demand it initiates sparking through the ignition transformer and energizes the pilot gas valve to establish pilot flame. An internal electronic circuit verifies flame through flame rectification to energize gas valve and terminate sparking. The control locks out if pilot does not light. To re-establish trial for ignition, push the manual reset button at control. In the event of flame outage during a heating cycle, the primary control will provide one retry for ignition before going into lockout. Figure 13 explains the RA-890F sequence of operation.

The primary control has a flame current test jack to determine the micro amps present during flame rectification. Refer to Table 6 for proper pilot currents and high fire currents. Current reading should be steady for stable, adequate pilot.

**RA-890F SEQUENCE OF OPERATION
(GCS3-1353/1853/2753 USAGE)**



- 1 - On a heating demand the primary control is powered by the heating transformer through the control circuit. This energizes transformer internal to primary control.
- 2 - GCS3 circuits initiate combustion air blower operation. The air switch closes verifying combustion air.
- 3 - This completes a circuit to energize K1 (load relay) through N.C. SS contacts, air switch, thermistor, N.C. K2-3 contacts and the SS heater. The thermistor is affected by ambient temperature; time delay may vary from 2 seconds at a high temperature to 30 seconds at low temperature. As thermistor warms it may cause K1 relay to hum slightly before pulling in.
- 4 - With K1 energized, N.O. K1-3 contacts close to "latch in" the relay.
- 5 - N.O. K1-1 contacts close to energize pilot valve circuit. The ignition transformer is also powered through N.C. K2-1 contacts. With gas flow and sparking, pilot should light.
- 6 - N.O. K1-4 contacts also close. This completes a circuit through K1-3, K1-4 and N.C. K2-3 contacts to energize safety switch heater.
- 7 - The electronic flame detection circuit verifies pilot flame by flame rectification. At the correct microamp current, K2 (flame relay) is energized.
- 8 - With K2 activated, N.C. K2-1 contacts open to de-energize the ignition transformer and terminate sparking.
- 9 - N.O. K2-2 contacts also close to energize the main gas valve circuit. Pilot flame will ignite main burner.
- 10 - N.C. K2-3 contacts open to de-energize the safety switch heater and prevent a control lockout.
- 11 - If the pilot is not established, K2-3 contacts remain closed and the safety switch heater activates the SS contacts in approximately 30 seconds. This de-energizes K1 to lock out the system. The manual reset button must be pushed, after a 5 minute delay for heater to cool, for another ignition attempt.
- 12 - On a loss of gas, the electronic flame detection circuit de-energizes K2. The ignition circuit is activated for a retry and the safety heater is energized. If ignition isn't re-established within 30 seconds, the control locks out.
- 13 - When the heating demand is satisfied, the heating control circuit de-energizes the primary control to terminate the heating cycle.

FIGURE 13

D - Start-Up And Shut Down Procedures

1 - Start-Up

Close manual main gas valve and pilot valve (GCS3-1353/1853/2753 units only). Set room thermostat to lowest setting. Wait at least 5 minutes and then open gas valve(s). Set room thermostat in "heating" position and at desired temperature. On a heating demand, the pilot should light on GCS3-1353/1853/2753 units and the burner should operate.

2 - Safety Shutdown

Turn off power to unit. Close manual main gas valve and pilot valve. **DO NOT ATTEMPT TO RELIGHT PILOT OR START BURNER** with a hot combustion chamber. Allow a minimum of 5 minutes to allow heat exchange time to purge unburned gases before trying to restart.

NOTE - GCS3-953 - If thermostat is in "heat" position and power to unit is turned on before gas supply, or in case of safety shutdown, disconnect power to unit at least 5 minutes to allow primary control to reset.

NOTE - GCS3-1353, 1853, 2753 units - In case of a safety shutdown, disconnect power to unit, wait at least 5 minutes, manually reset primary control and restore power to unit.

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 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.

E - Gas Pressure Adjustment

1 - Check gas line pressure with unit firing at maximum rate. A minimum line pressure of 6 inches w.c. for natural gas or 11 inches w.c. for propane should be maintained. On multiple unit installations, each unit should be checked in sequence beginning with the one closest to supply gas main. Line pressure should be 6 inches w.c. for natural gas or 11 inches w.c. for propane with all units firing on high stage.

2 - After line pressure has been checked and adjusted, check manifold or regulator pressure with unit operating on high stage. Refer to factory pressure regulating setting given on the sticker at regulator. This setting may vary slightly from values listed in burner rating table. Always adjust to setting listed on sticker. Figures 4, 5 and 6 show correct locations to take readings.

On A.G.A. GCS3-953 and all C.G.A. units, a factory head pressure setting is given on a sticker affixed to burner.

F - Burner Flame

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 lever is provided on burner. Loosen lock screw and move damper indicator to desired position. The flame ap-

pearance should be basically blue with some white. See Figure 14.

For efficient operation, keep combustion air blower wheel clean. If necessary remove blower wheel by loosening Allen screw and pulling wheel out of housing. When replacing wheel make sure that flat on motor aligns up with Allen screw on wheel. Tighten securely.

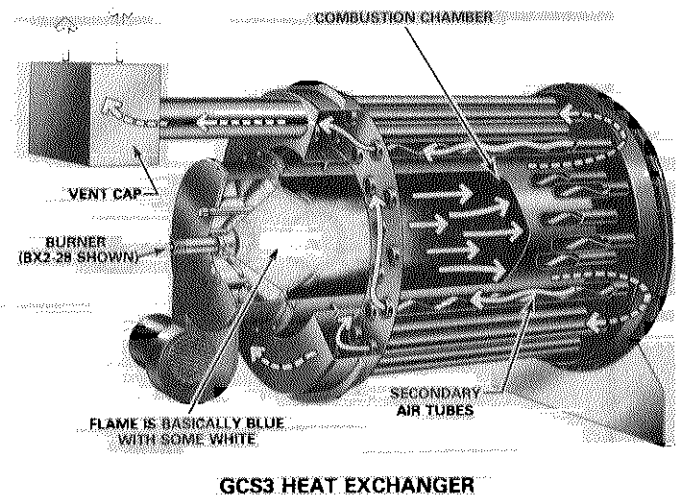


FIGURE 14

G - Periodic Safety Checks

1 - Primary Control

Fire burner at high stage and perform a flame current check. Compare with values listed in Table 6. Close the main gas shut off valve. On GCS3-953 units this simulated flame failure will lockout the Fenwal primary control after one attempt for re-ignition.

On GCS3-1353/1853/2753 units the pilot will remain lit. Perform a flame current check on pilot and compare to Table 6. Close the pilot shut off valve to simulate a loss of pilot. The main gas valve will immediately be de-energized. The indicator on the automatic safety valve used in FIA/FM and C.G.A. units, will read closed. The RA-890 primary control will lockout in 15 to 30 seconds while attempting re-ignition.

2 - Gas Pressure Switches

GCS3-1353/1853/2753 FIA/FM and C.G.A. units use a high gas pressure switch which must be manually reset.

In addition these same units, plus some GCS3-953 A.G.A. units, also include a low gas pressure switch. This switch automatically resets. To test the low pressure switch, slowly close the manual main gas valve with burner firing. The switch will de-energize the primary control and main gas valve. The primary is not locked out since pilot is still lit. Wait 5 minutes and open manual main gas valve. Main burner should ignite.

3 - Limit Control

With burner fired, reduce primary limit control setting by turning adjustment screw clockwise. When the limit control trips, the primary control and the main gas valve will be de-energized. The primary control is not locked out

since pilot is still lit. Wait 5 minutes and return limit setting to the fixed maximum stop. Main burner should ignite.

4 - Leak Testing (IRI/FM and C.G.A. GCS3-1353/1853/2753 units only)

These units are equipped with a test firing valve. See Figure 15. Close the valve. Set thermostat for a heat de-

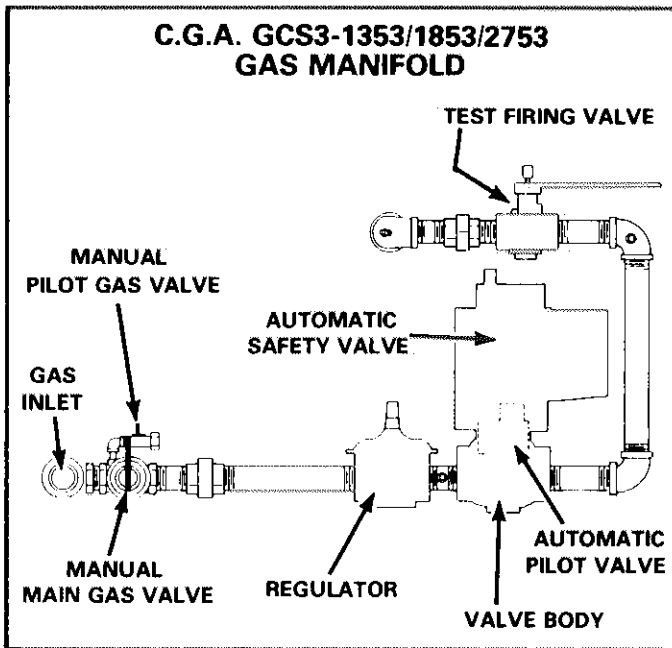


FIGURE 15

mand to pressurize manifold. Pilot will light. Carefully check all piping connections for gas leaks. Use a soap solution or other preferred means. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

When completed turn test valve open. Main burner should ignite.

H - Inspecting Flue Passageways

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

- 1 - Remove heat exchanger access panel.
- 2 - Unscrew cap screws and remove heat exchanger breaching.
- 3 - Slide flue baffles from heat exchanger tubes.
- 4 - Clean flue passages with a wire brush.
- 5 - Replace gasket and re-assemble heat exchanger.

V - BLOWER SPEED ADJUSTMENT

A - Changing Blower Speed

The drive kit options are listed in Table 4. To change speed, refer to Figure 16. Loosen nut on motor base frame, slide motor up and remove belt. Loosen motor pulley with Allen wrench and adjust pulley according to detail in Figure 16. Be sure Allen screw is lined up with flat side of sheave before retightening.

B - Checking Evaporator Coil Air Pressure Drop

- 1 - Air test holes are provided (one each side of coil) for

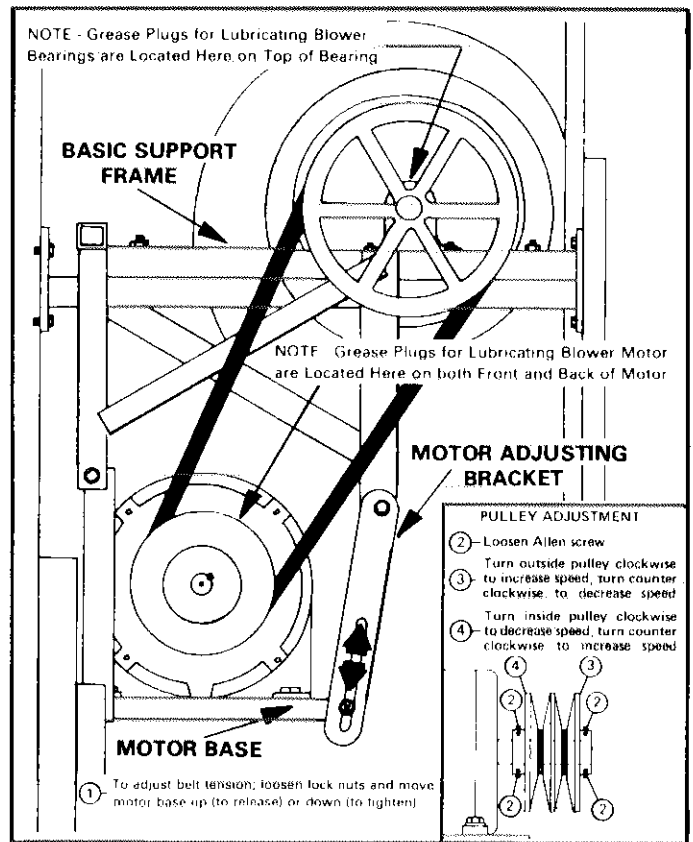


FIGURE 16

checking pressure drop across evaporator coil. This check should be made with an inclined monometer or draft gauge. See Figure 17.

- 2 - Remove snaphole plugs and insert an awl or screwdriver to open insulation behind holes.
- 3 - Insert hoses from draft gauge into air test holes so about 1/4" extends inside cabinet. Zero end of draft gauge scale

TABLE 7

UNIT	DRAFT GAUGE READING (DRY EVAPORATOR)			
	AIR VOLUME		READING	
	CFM	m ³ /hr	In. Water	mm Water
GCS3-953	2625	4460	.06 — .08	1.52 — 2.03
	3000	5100	.08 — .10	2.03 — 2.54
	3375	5735	.10 — .12	2.54 — 3.05
	3750	6370	.12 — .14	3.05 — 3.56
GCS3-1353	3850	6540	.06 — .08	1.52 — 2.03
	4400	7475	.08 — .10	2.03 — 2.54
	4950	8410	.10 — .12	2.54 — 3.05
	5500	9345	.13 — .15	3.30 — 3.81
GCS3-1853	5250	8920	.09 — .10	2.29 — 2.54
	6000	10 195	.11 — .12	2.79 — 3.05
	6750	11 470	.13 — .14	3.30 — 3.56
	7500	12 745	.16 — .17	4.06 — 4.31
GCS3-2753	7700	13 085	.31 — .33	7.87 — 8.38
	8800	14 950	.27 — .28	9.39 — 9.65
	9900	16 820	.39 — .41	9.91 — 10.4

NOTE - These are not total resistance readings, but pressure drop readings across the coil.

IMPORTANT - To eliminate false readings, close blower access panel before reading draft gauge.

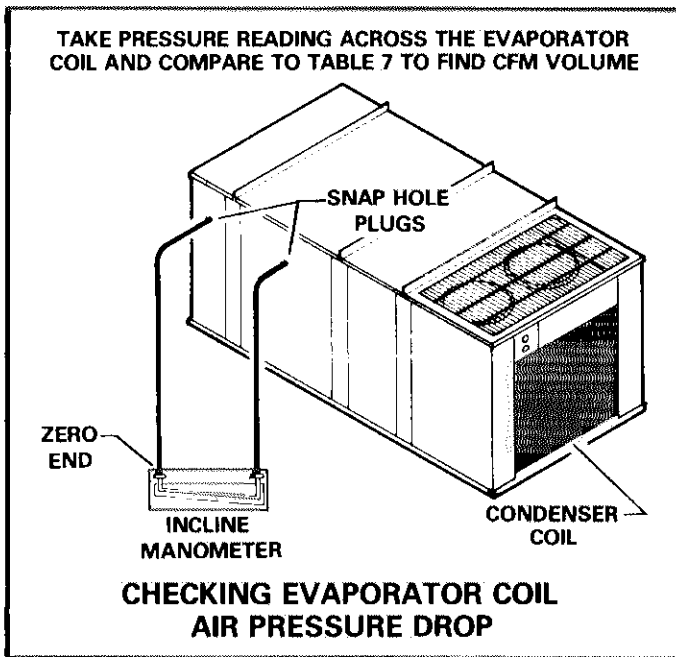


FIGURE 17

connects to entering side of coil. Seal around holes with permagum or sealing compound.

- 4 - To start evaporator blower motor, move thermostat heat selector to lowest setting. Move cooling selector to highest setting. Place system switch in "cool" or "auto" position and fan switch in "cont." position. Turn on power supply. Evaporator blowers only will operate.
- 5 - See Table 7 for air volumes and equivalent draft gauge readings. Observe draft gauge readings with evaporator blowers running. If reading is below air volume required, increase blower speed. If reading is above air volume required, decrease blower speed.
- 6 - After draft gauge reading is obtained, remove draft gauge lines and replace snaphole plugs. Turn off blower motor.

VI - MAINTENANCE

A - Lubrication

NOTE - Always relubricate motors according to manufacturers lubrication instructions on each motor. If no instructions

are provided, use the following as guide:

- 1 - *Evaporator Blower Bearings* - Bearings are prelubricated. For extended bearing life, relubricate at least once every two years with a lithium base grease, such as Alvania 3 (Shell Oil), Chevron BRB2 (Standard Oil) or Regal AFB2 (Texas Oil). Use a **hand grease gun** for relubrication. Add only enough grease to purge through the bearings so that a bead of grease appears at the seal lip contacts. Refer to Figure 16.
- 2 - *Evaporator 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 Oil). To relubricate, replace top plugs with standard grease fittings. Remove lower outlet plugs and add grease with a **hand gun** until new grease appears at bottom outlets. Run motor for a short time before replacing bottom plugs. Refer to Figure 16.
- 3 - *Condenser Fan Motors* - Permanently sealed and lubricated.

B - Filters

Polyurethane filters are cleanable. Use following procedure:

- 1 - Remove filters from unit.
- 2 - To clean vacuum or wash with mild detergent in warm water. For increased efficiency, coat with water soluble oil (No. P-8-5069) available from your Lennox Dealer.

CAUTION - Some detergents have an adverse effect on filter media, causing it to lose its flexibility or become soft. It is recommended that dish washing liquid be used. When cleaning filter, do not leave soaking in cleaner. Leave filter in cleaner only as long as it takes to clean it. Do not use enzyme detergents or pre-soakers. After filter is clean, rinse thoroughly before replacing in unit.

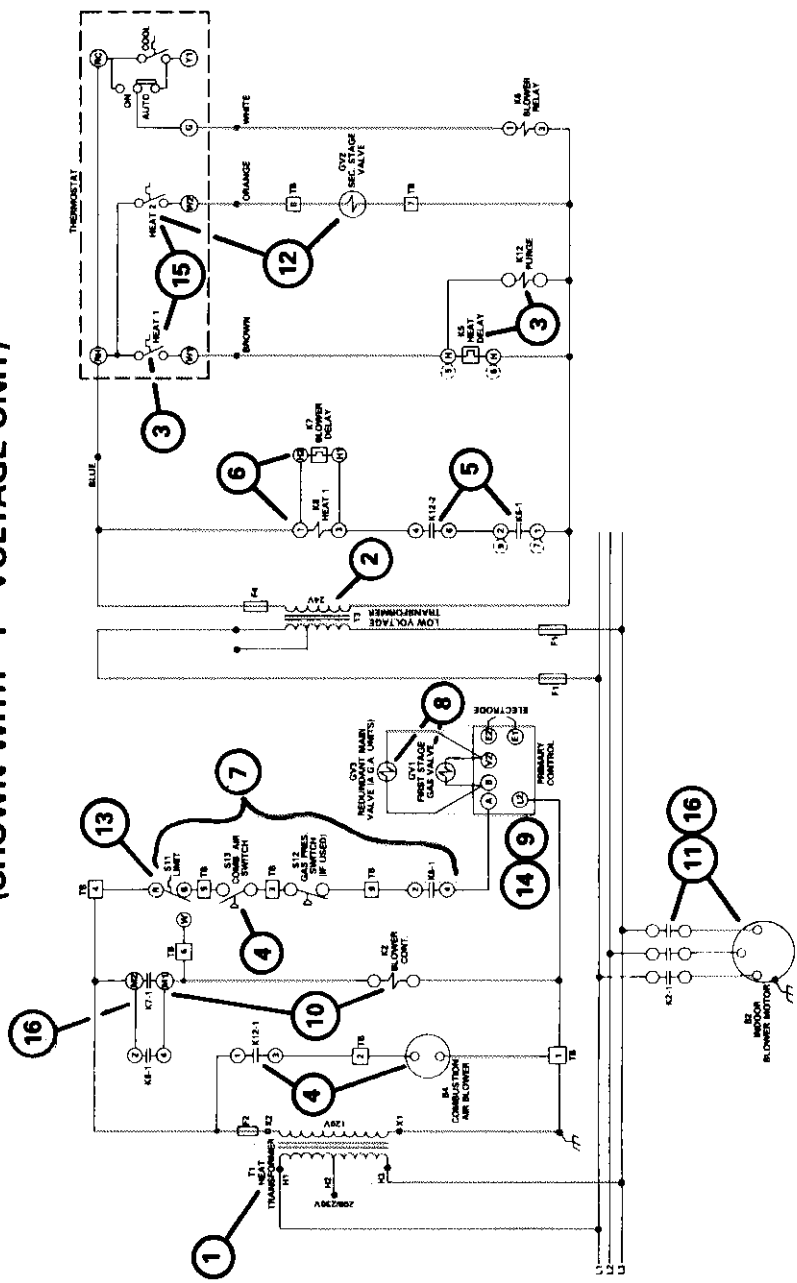
- 3 - Replace filter with wire mesh on downstream side of air flo.

VII - SCHEMATIC WIRING DIAGRAM

Figures 18 and 19 illustrate the GCS3 heating sequence of operation for 953 and 1353/1853/2753 units respectfully.

Figure 20 illustrates the GCS3 cooling sequence.

**GCS3-953 HEATING SEQUENCE OF OPERATION
(SHOWN WITH "Y" VOLTAGE UNIT)**

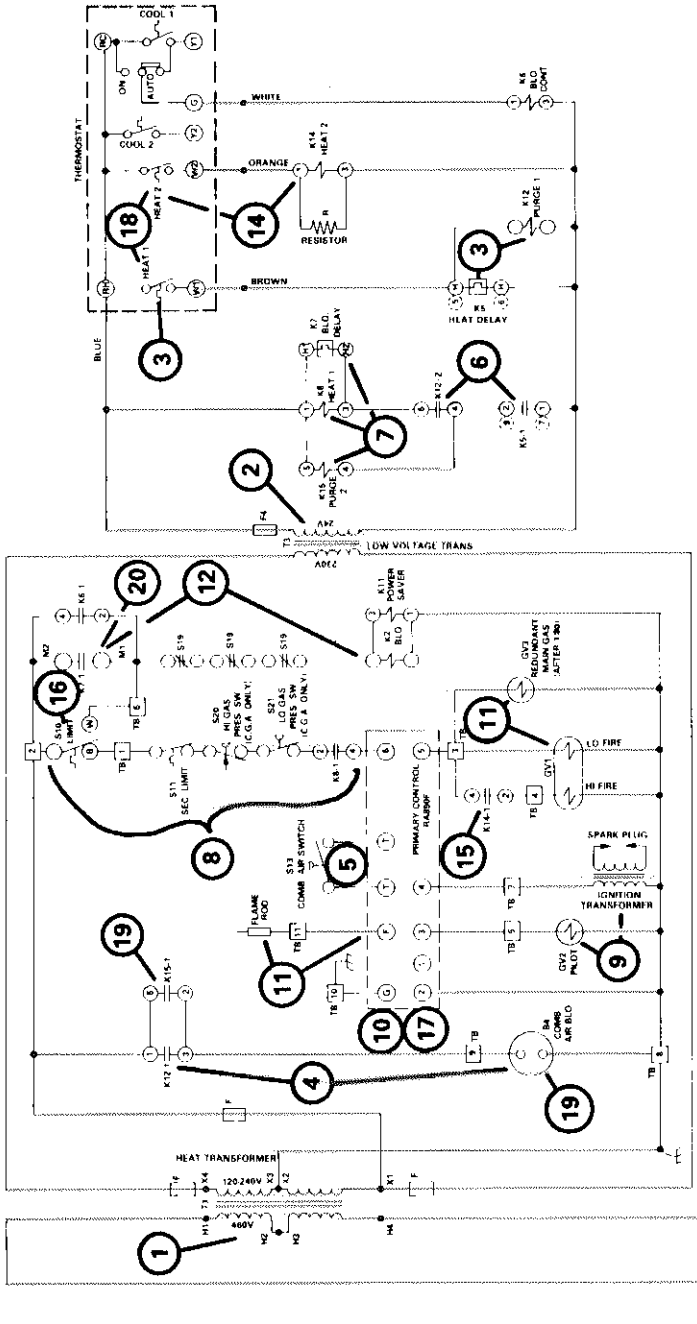


- 1 - Heat transformer (T1) is energized continuously. It provides the 120 volt heating control circuit.
- 2 - Low voltage transformer (T3) is also energized continuously, but is protected by the F1 fuses. T3 provides 24 volt thermostat circuit.
- 3 - On a heating demand, "W1" leg makes at thermostat. This energizes purge relay (K12) and heat delay relay (K5).
- 4 - N.O. K12-1 contacts close to initiate combustion air blower motor (B4) operation. The combustion air switch (S13) contacts make.
- 5 - N.O. K12-2 contacts also close. After a 33-60 second delay to allow sufficient purge time, N.O. K5-1 contacts close.
- 6 - This energizes heat relay (K8) and blower delay relay (K7).
- 7 - N.O. K8-1 contacts close to complete a circuit to primary control through limit (S11), combustion air switch and gas pressure switch (if used).
- 8 - The primary control energizes the first stage gas valve (GV1) and the redundant main gas valve (GV3 — AGA usage). The control also initiates sparking at the electrodes. With sparking and gas flow, ignition is established.
- 9 - If ignition is not established, the primary control detects this by flame rectification and locks itself out in approximately 10 seconds. This de-energizes both GV1 and GV3.
- 10 - From Step 6, K7 blower delay relay heater activates in approximately 5 - 30 seconds. N.O. K7-1 contacts close to energize blower motor (K2).
- 11 - K2 closes its N.O. contacts to power indoor blower motor.
- 12 - On two stage units, the "W2" thermostat leg makes on a further heating demand. This energizes the second stage gas valve (GV2). The additional gas is ignited by the existing flame at burner.
- 13 - Should unit temperatures exceed limit control setpoint, it breaks circuit to primary control and simultaneously makes another circuit to K2. This assures indoor blower motor operation.
- 14 - Should there be a burner flame failure, the primary control detects this condition. It will try once for re-ignition and then will lockout. This de-energizes both GV1 and GV3 to stop gas flow to burner.
- 15 - As the heating demand is satisfied, the "W2" and then the "W1" leg break at thermostat. As "W2" opens it de-energizes GV2. As "W1" opens it de-energizes K12, B4, K8, primary control, GV1, GV2 and K5.
- 16 - The K7 heater takes 65 to 140 seconds before it allows K7-1 contacts to open. The indoor blower motor keeps running during this period.

- 1 - Heat transformer (T1) is energized continuously. It provides the 120 volt heating control circuit.
- 2 - Low voltage transformer (T3) is also energized continuously, but is protected by the F1 fuses. T3 provides 24 volt thermostat circuit.
- 3 - On a heating demand, "W1" leg makes at thermostat. This energizes purge relay (K12) and heat delay relay (K5).
- 4 - N.O. K12-1 contacts close to initiate combustion air blower motor (B4) operation. The combustion air switch (S13) contacts make.
- 5 - N.O. K12-2 contacts also close. After a 33-60 second delay to allow sufficient purge time, N.O. K5-1 contacts close.
- 6 - This energizes heat relay (K8) and blower delay relay (K7).
- 7 - N.O. K8-1 contacts close to complete a circuit to primary control through limit (S11), combustion air switch and gas pressure switch (if used).
- 8 - The primary control energizes the first stage gas valve (GV1) and the redundant main gas valve (GV3 — AGA usage). The control also initiates sparking at the electrodes. With sparking and gas flow, ignition is established.
- 9 - If ignition is not established, the primary control detects this by flame rectification and locks itself out in approximately 10 seconds. This de-energizes both GV1 and GV3.

FIGURE 18

GCS3-1353/1853/2753 HEATING SEQUENCE OF OPERATION (SHOWN WITH "G" VOLTAGE UNIT)



- 1 - Heat transformer (T1) is energized continuously. It provides the 120 volt heating control circuit.
- 2 - Low voltage transformer (T3) is also energized continuously, but is protected by the F1 fuses. T3 provides 24 volt thermostat circuit.
- 3 - On a heating demand, "W1" leg makes at thermostat. This energizes purge relay (K12) and heat delay relay (K5).
- 4 - N.O. K12-1 contacts close to initiate combustion air blower motor (B4) operation.
- 5 - The combustion air switch (S13) makes to permit an ignition attempt at the primary control.
- 6 - N.O. K12-2 contacts also close. After a 33 - 60 second delay to allow sufficient purge time, N.O. K5-1 contacts close.
- 7 - This energizes heat relay 1 (K8), blower delay relay (K7) and purge 2 relay (K15).
- 8 - N.O. K8-1 contacts close to complete a circuit to primary control through limit (S10), secondary limit (S11 - if used), high as pressure switch (S20 - C.G.A. units) and low gas pressure switch (S21 - C.G.A. units).
- 9 - The primary control energizes pilot gas valve (GV2) and initiates sparking at ignition transformer, providing S13 is still made. With gas flow and sparking, pilot should ignite.
- 10 - If pilot flame is not established, the primary control locks out in approximately 15 - 30 seconds.
- 11 - With proper pilot flame, the primary control proves by flame rectification. Sparking stops. Primary control energizes main gas valve (GV1) low fire solenoid and redundant main gas valve (GV3 - AGA usage). Pilot flame will ignite main burner.
- 12 - From Step 7, K7 blower relay heater activates in approximately 5 - 30 seconds. N.O. K7-1 contacts close to energize blower motor (K2).
- 13 - K2 closes its contacts to power indoor blower motor. 7-1/2 H.P. motors are protected by overloads.
- 14 - On two stage units, the "W2" thermostat leg makes on a further heating demand. This energizes heat 2 relay (K14).
- 15 - N.O. K14-1 contacts make to energize the GV1 high fire solenoid. The burner fires at its maximum rate.
- 16 - Should unit temperatures exceed limit control setpoint, it breaks circuit to primary control and simultaneously makes another circuit to K2. This assures indoor blower motor operation.
- 17 - The primary control detects a burner flame failure. It will try once for re-ignition and then will lockout.
- 18 - As the heating demand is satisfied, the "W2" and then the "W1" leg break at thermostat. As "W2" opens it de-energizes K14 and the low fire solenoid. As "W1" opens it de-energizes K12, K8, primary control, low fire solenoid, GV3 and GV2.
- 19 - The K5 heater takes 25 - 50 seconds before it allows K5-1 contacts to open. This keeps K15 energized. N.O. K15-1 contacts remain closed to power B4 for a purge period.
- 20 - The K7 heater takes 65 - 140 seconds before it allows K7-1 contacts to open. The indoor blower motor keeps running during this period.

FIGURE 19

**GCS3 COOLING SEQUENCE OF OPERATION
(SHOWN WITH "G" VOLTAGE UNIT)**

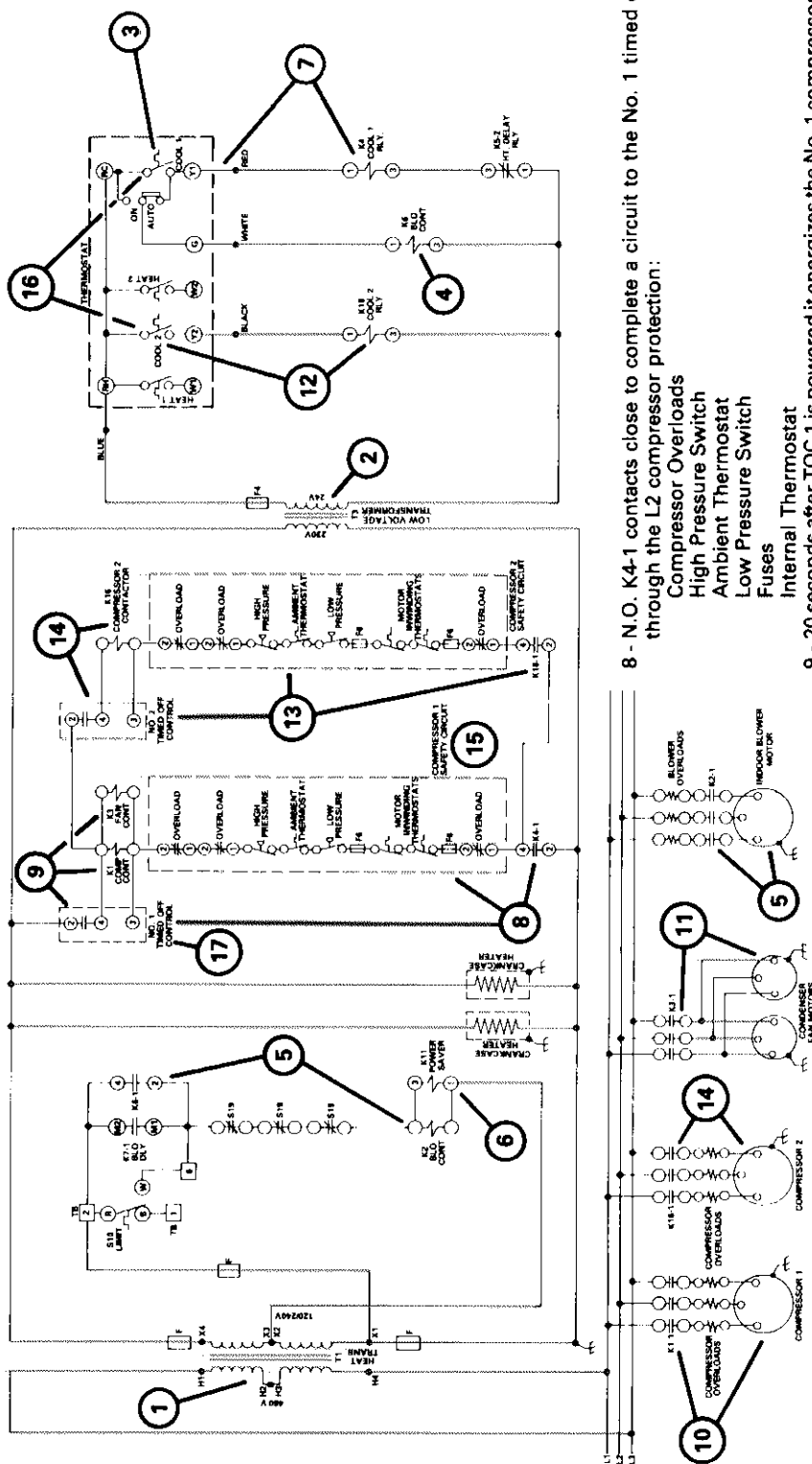


FIGURE 20

- 1 - On "G" and "J" voltage units, the heat transformer (T1) provides the 120 volts for blower control circuit and the 240 volts for compressor control circuit. On "Y" voltage units, the compressor control circuit uses line voltage. T1 is energized continuously.
- 2 - The low voltage transformer (T3) is also energized continuously. It provides the 24 volt thermostat circuit.
- 3 - On a cooling demand, the first stage cooling bulb makes.
- 4 - If the thermostat is set on "Auto", the indoor blower relay (K6) is energized.
- 5 - N.O. K6-1 contacts close to energize blower contactor K2. K2 contacts close to power the indoor blower motor. 7-1/2 motors are protected by overloads.
- 6 - On GCS3 "Y" voltage units, K2 also energizes the power saver circuit. This circuit is protected by 2 fuses (F3). On GCS3 "G" and "J" voltage units, a power saver relay (K11) is energized simultaneously with K2. K11-1 closes to activate power saver circuit.
- 7 - As "Y1" leg makes, it also energizes cool 1 relay (K4).

- 8 - N.O. K4-1 contacts close to complete a circuit to the No. 1 timed off control through the L2 compressor protection:
 - Compressor Overloads
 - High Pressure Switch
 - Ambient Thermostat
 - Low Pressure Switch
 - Fuses
 - Internal Thermostat
- 9 - 20 seconds after TOC 1 is powered it energizes the No. 1 compressor contactor (K1) and outdoor fan contactor (K3 - "G" and "J" voltage only).
- 10 - K1 closes its N.O. contacts to power the No. 1 compressor. On "Y" voltage units K1-1 contacts also power the condenser fans (B3).
- 11 - K3 closes its N.O. contacts to power the condenser fans (B3) on "G" and "J" voltage units.

CHAS-1853 & 2753 Units Only

- 12 - On a further cooling demand, the "Y2" thermostat leg makes to energize cool 2 relay (K18).
- 13 - N.O. K18-1 contacts close to complete a circuit to the No. 2 timed off control through K4-1, L2 compressor protection and TOC 1.
- 14 - 20 seconds after TOC 2 is powered, it energizes the No. 2 compressor contactor (K16). K16 powers the No. 2 compressor.
- 15 - If a safety control opens in no. 1 compressor, it will de-energize TOC 1 causing both compressors and condenser fan motors to stop.
- 16 - As the cooling demand is satisfied, the thermostat cycles off compressor 2 and then compressor 1. Blower circuit is also de-energized.
- 17 - If the original cycle was less than 5 minutes, the timed off control will wait the remaining time plus 20 seconds on the next demand.