

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.

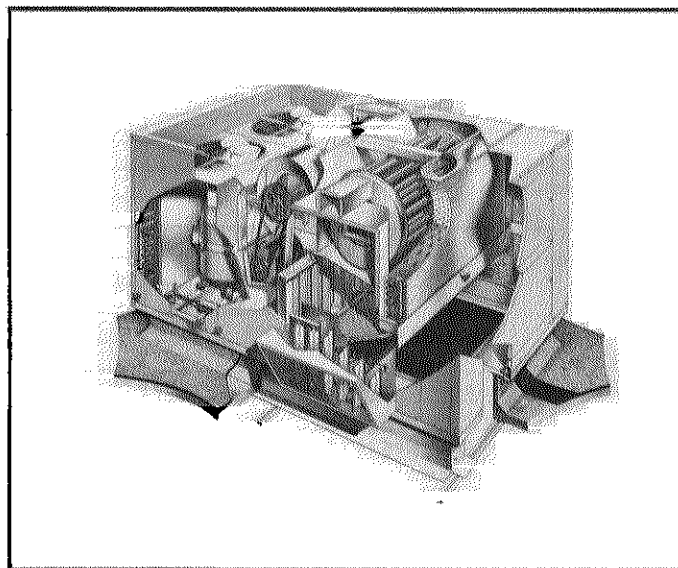


FIGURE 1

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 | | (6) 16 x 20 x 1 | | (4) 16 x 20 x 1 | | (8) 20 x 20 x 1 | |
| | | (2) 16 x 25 x 1 | | | | (4) 20 x 20 x 1 | | | |
| Gas supply connection MPT (in.) | Natural | 3/4 | | 1 | | 1-1/4 | | 1-1/4 | |
| Recommended gas supply pressure wc (in.) | Natural | 6 | | 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 | | | 208/230 | | | 208/230 | | | 208/230 | | |
| Compressor(s) | Rated load amps | 28.3 | | | 46.7 | | | 64.6 | | | 85.6 | | |
| | Locked rotor amps | 185.0 | | | 240.0 | | | 370.0 | | | 480.0 | | |
| | Power factor | .85 | | | .85 | | | .85 | | | .85 | | |
| (2) Condenser Fan Motors | Full load amps (total) | 6.0 | | | 8.0 | | | 8.6 | | | 8.6 | | |
| | Locked rotor amps (total) | 13.8 | | | 18.0 | | | 40.0 | | | 40.0 | | |
| Evaporator Blower Motor | horsepower | 2 | 3 | 2 | 3 | 3 | 5 | 3 | 5 | 3 | 5 | 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 |
| | 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 |
| Recommended maximum fuse size (amps) | | 70 | 80 | 35 | 40 | 110 | 125 | 60 | 60 | 110 | 125 | 50 | 60 |
| †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 |

†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.

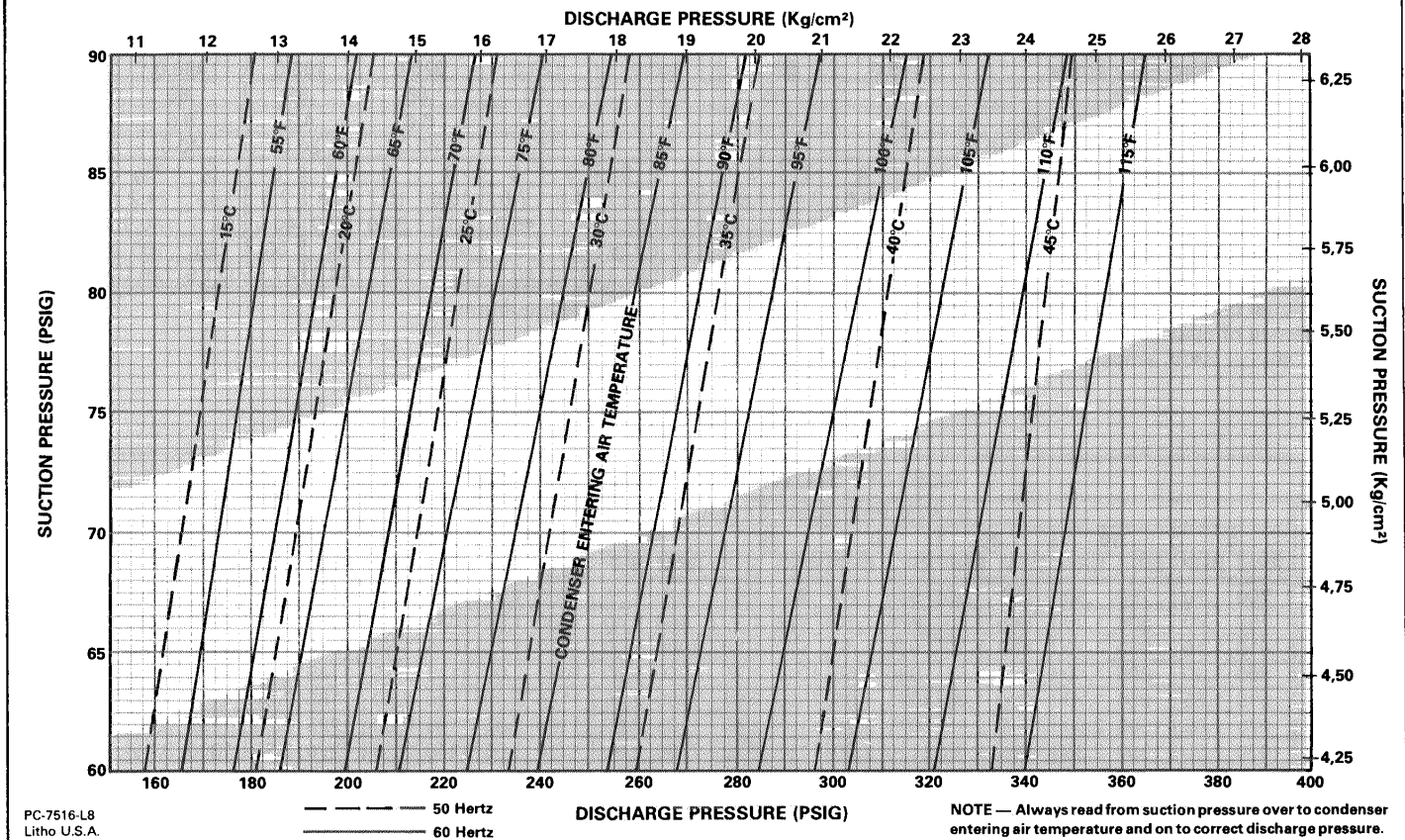
E - Blower Data

| 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 BHP |
| 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 BHP |
| 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 BHP |
| 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 BHP |
| 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 | |

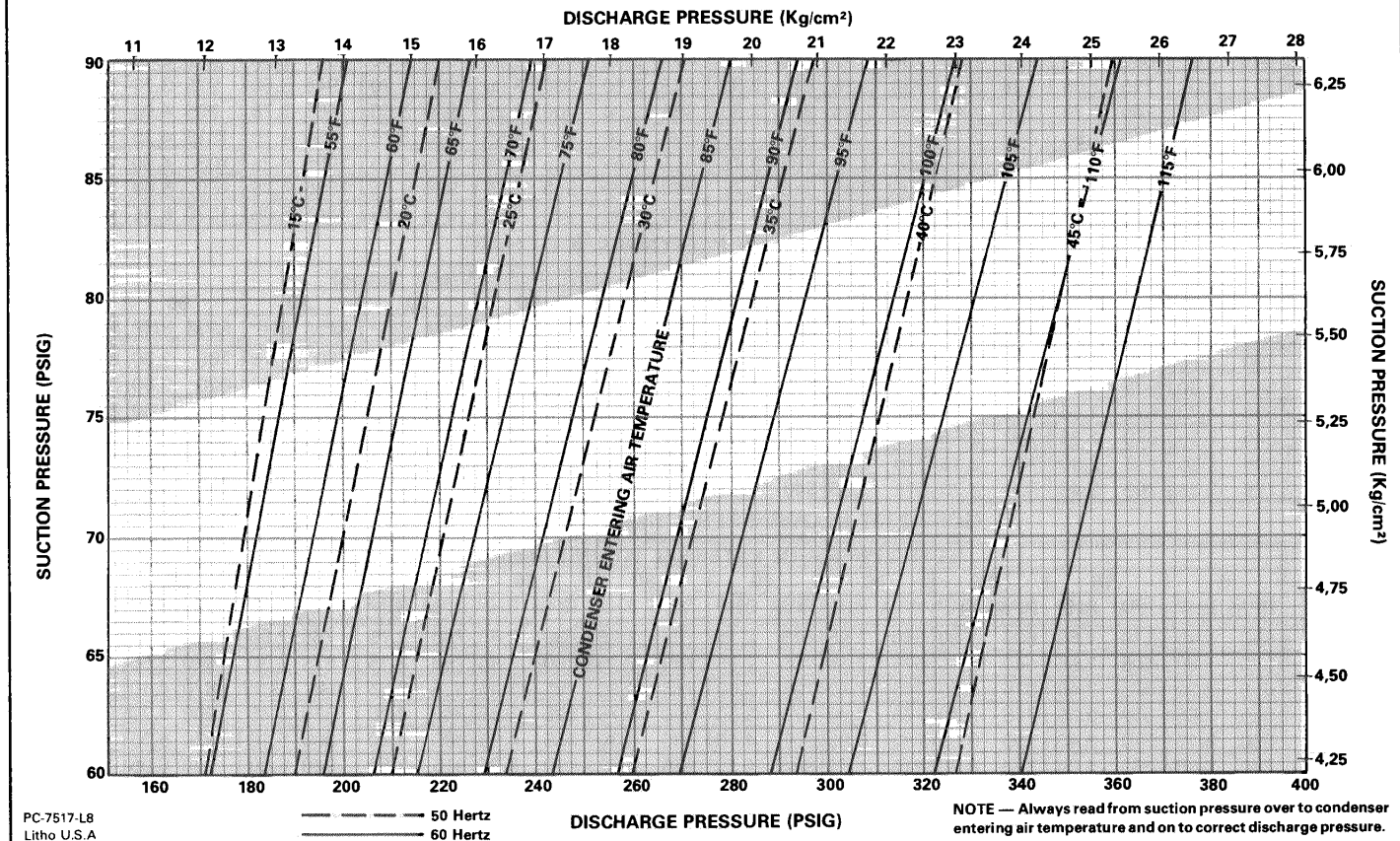
NOTE — All cfm data is measured external to the unit using standard return air opening and with filters in place.

F - Pressure Curves

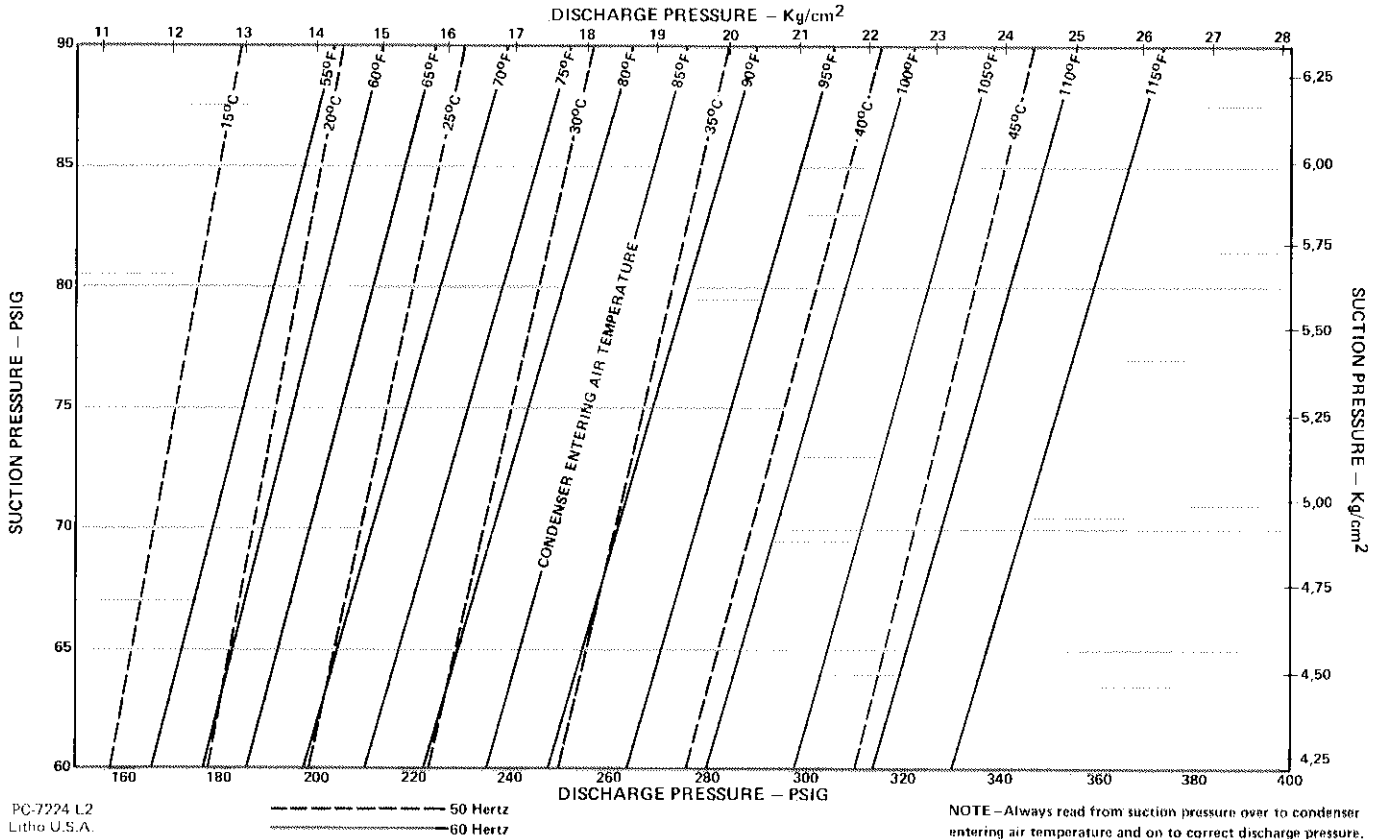
NORMAL OPERATING PRESSURE CURVE FOR GCS3-953 SERIES UNITS



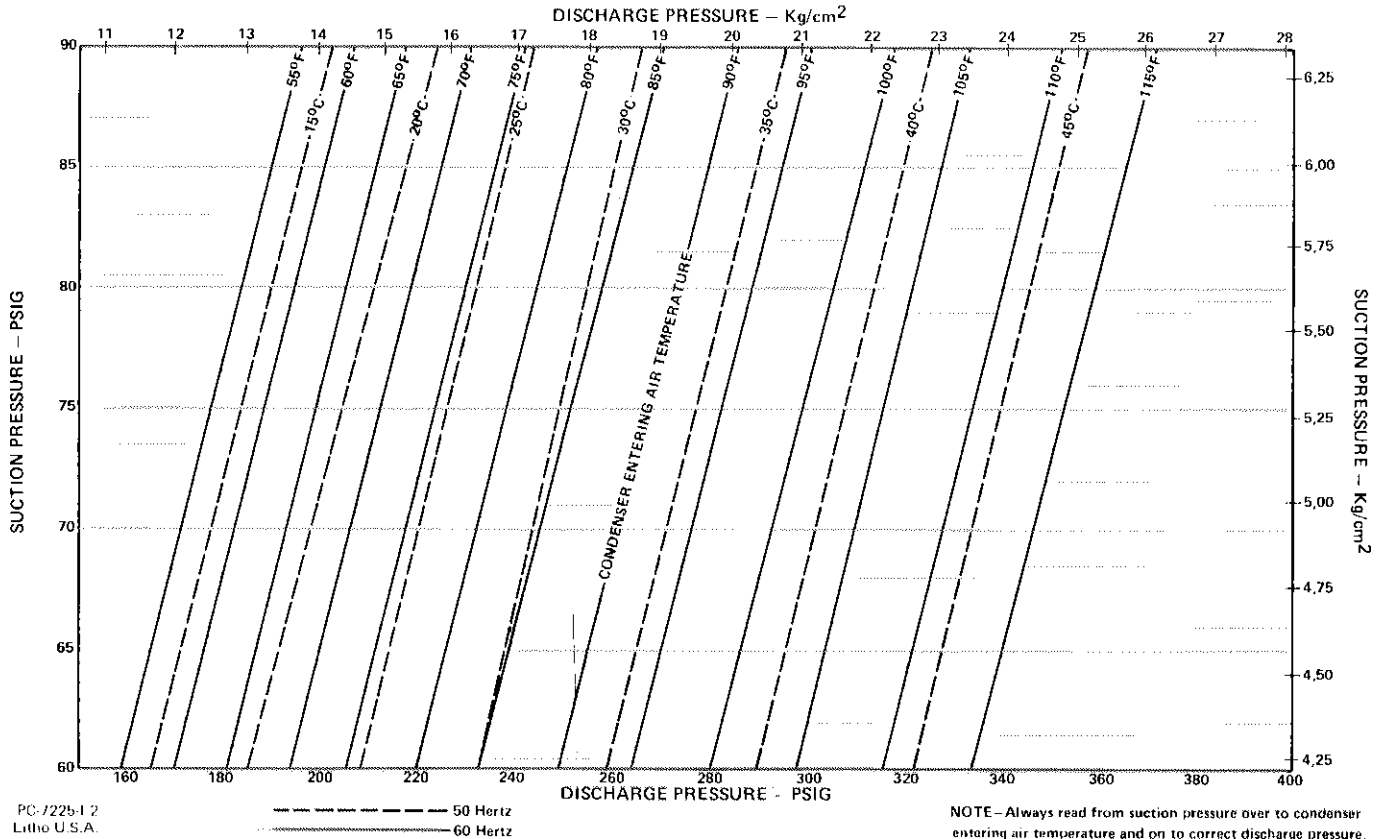
NORMAL OPERATING PRESSURE CURVE FOR GCS3-1353 SERIES UNITS



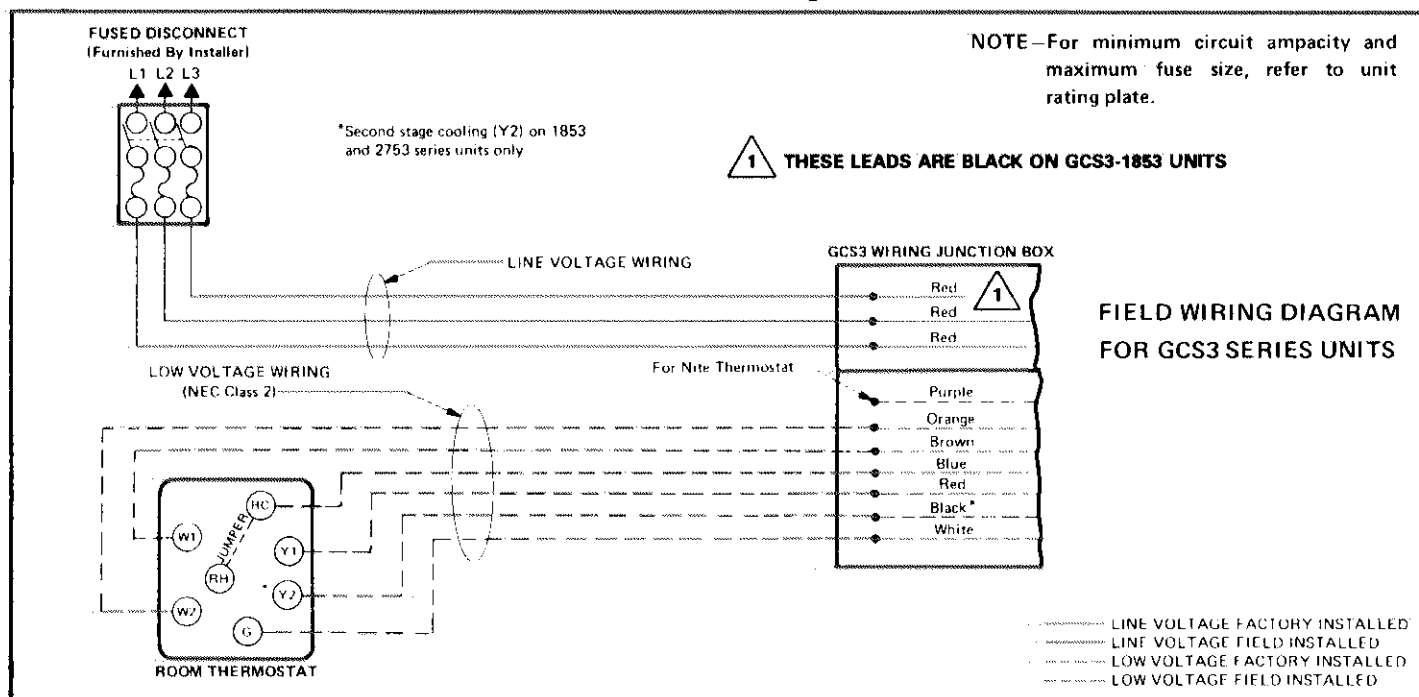
NORMAL OPERATING PRESSURE CURVE FOR GCS3-1853 SERIES UNITS



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 | | | | | | | | | | | | | | | | | | | | | | | |
|--|---------------------|---------------------------|------------|------------------|-------------|---------------------|-----------------|------------------|-------------------------|-----------------------|-----------------|----------------------|---------------------|-------------------|----------------------|-------------|---------------|-------------------------|-------------|---------------|------------------|---------------------|--------|
| GCS3-953 SERIES 220/240, 380/420, 440/480 AND 550/600 VOLT UNITS | | 24 VOLT CIRCUIT | | | | | | 120 VOLT CIRCUIT | | | | POWER SUPPLY CIRCUIT | | | | POWER SAVER | | | | | | | |
| | | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---------------------|-------------------------------|------------------|---------------------|---------------------------|---------------------------------|-----------------------------|---------------------|-----------------------|---------------------|----------------------|-------------------------|-------------------------|---------------------|---------------------------------|-----------------------|-----------------|-------------------------|---------------------------|------------------------------|------------------------------|------------------|--------------------|--------------------|---------------------|---------------------|-----------------------|------------------|---------------------|--------|
| GCS3-1353, GCS3-1853 AND GCS3-2753 SERIES 220/240, 380/420, 440/480 AND 550/600 VOLT UNITS | | 24 VOLT CIRCUIT | | | | | 120 VOLT CIRCUIT | | | | | POWER SUPPLY CIRCUIT | | | | | | POWER SAVER | | | | | | | | | | | | |
| | | 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.

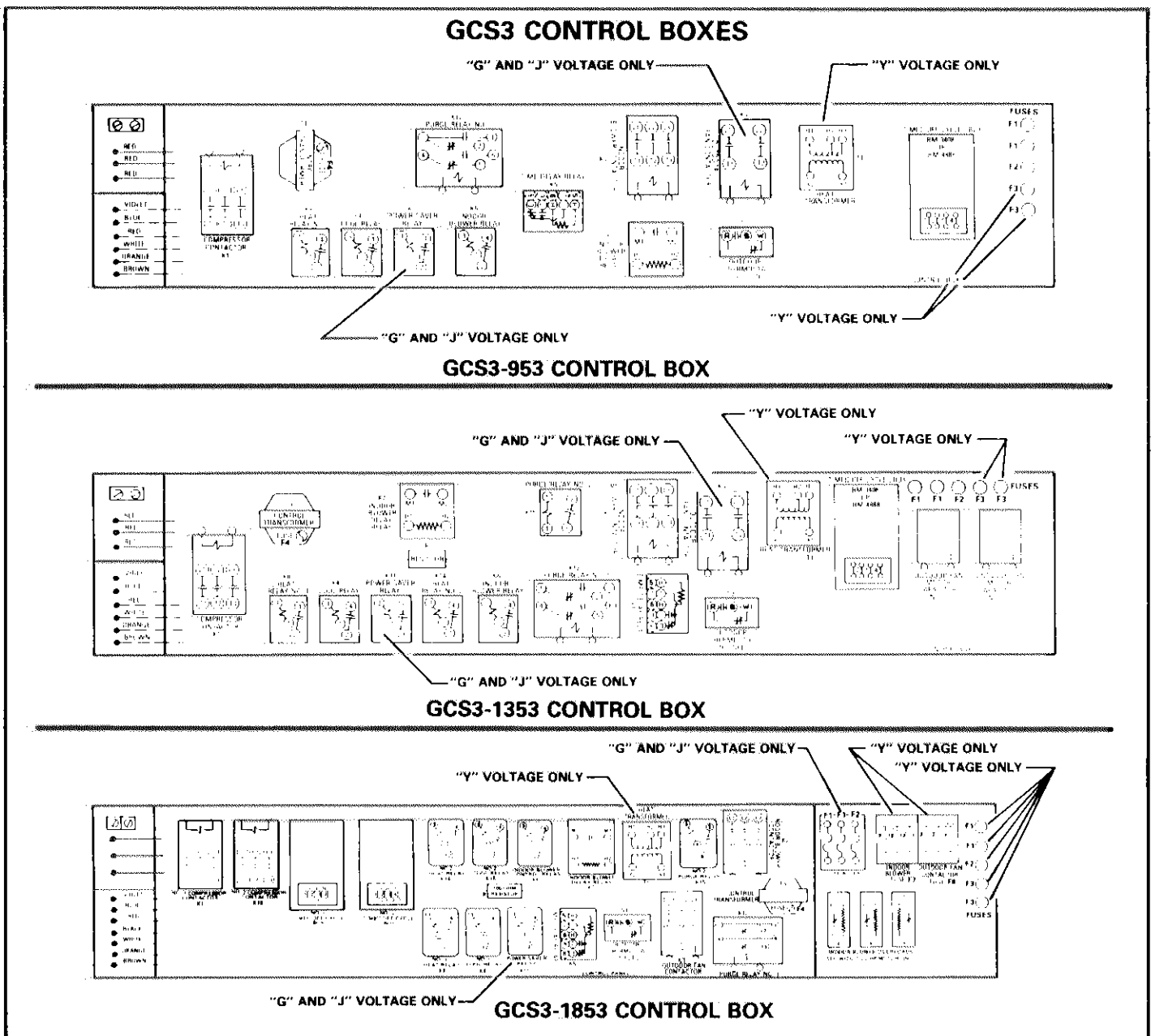


FIGURE 2

5 - Fuses

The 3 amp fuses protect the inwinding thermostat from damage.

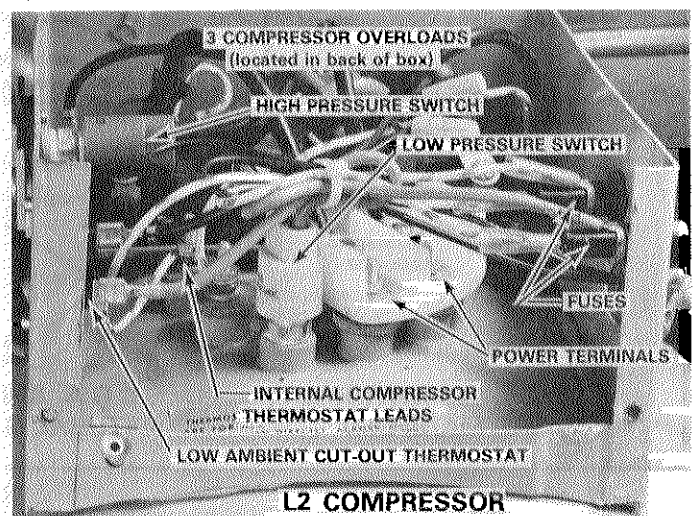
6 - Internal Thermostat

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.

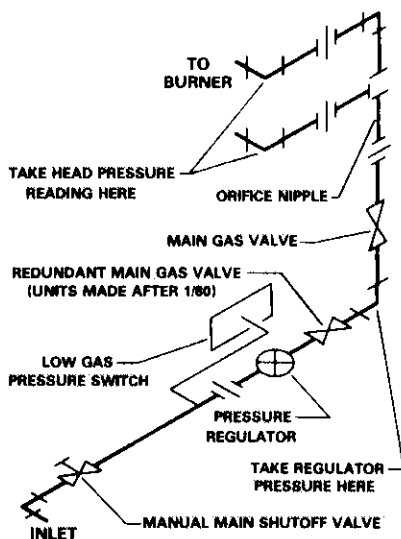
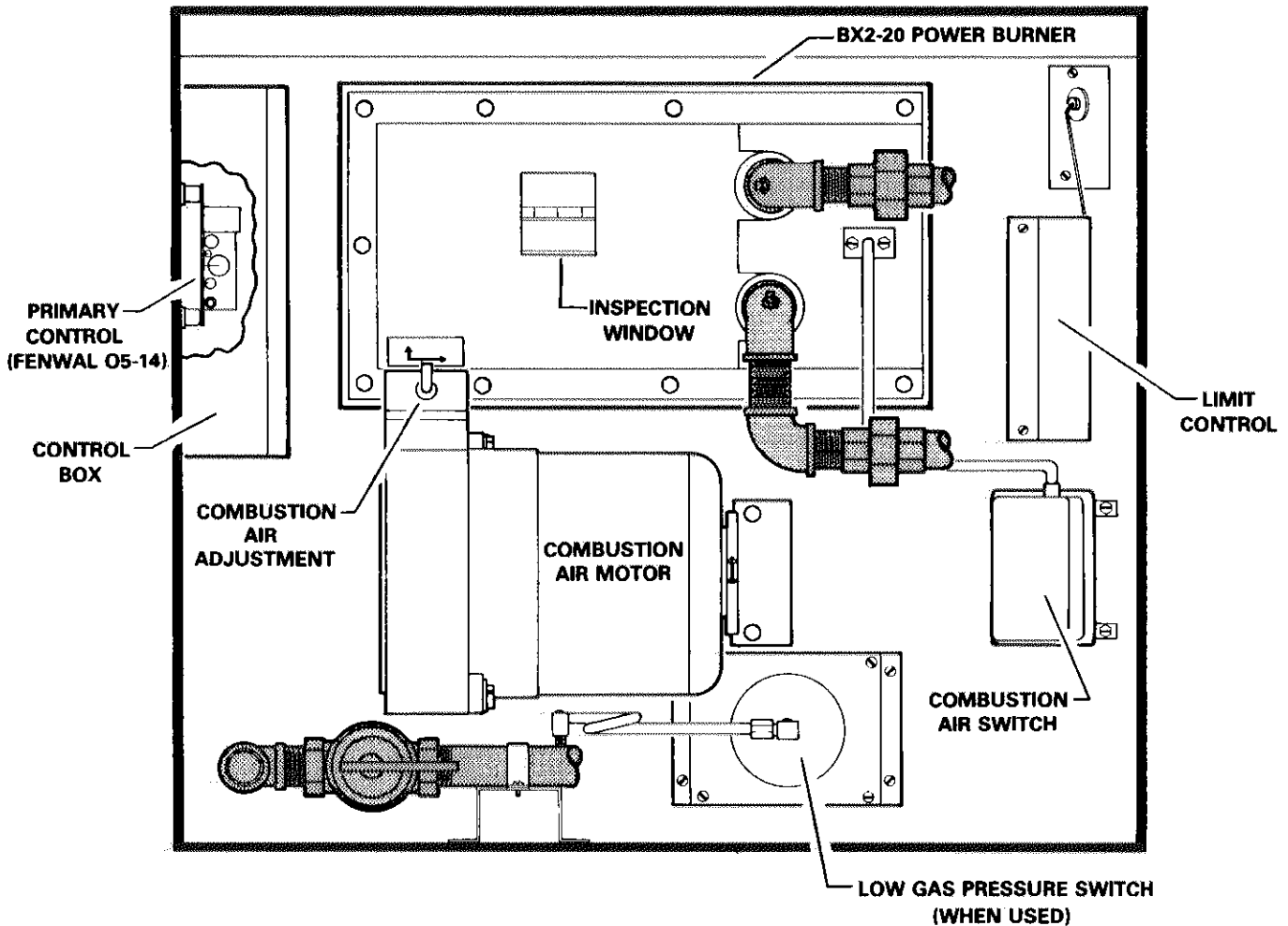
Burner usage is listed in the burner ratings table. Figures 7 and 8 show exploded views of the burners.



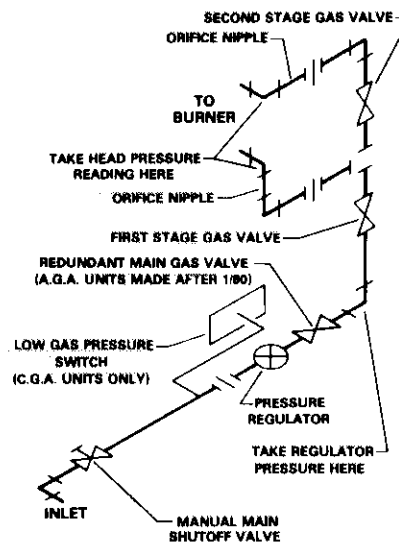
L2 COMPRESSOR

FIGURE 3

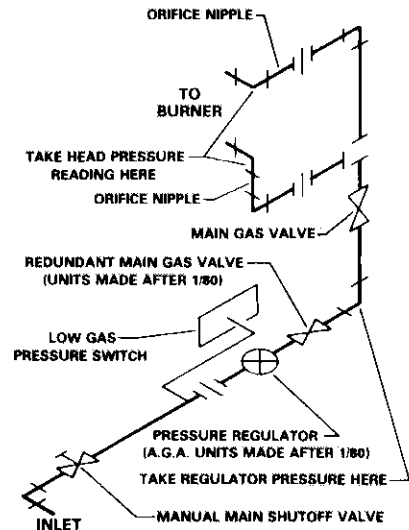
GCS3-953 HEAT SECTION



**A.G.A. 125 NATURAL
GAS MANIFOLD**



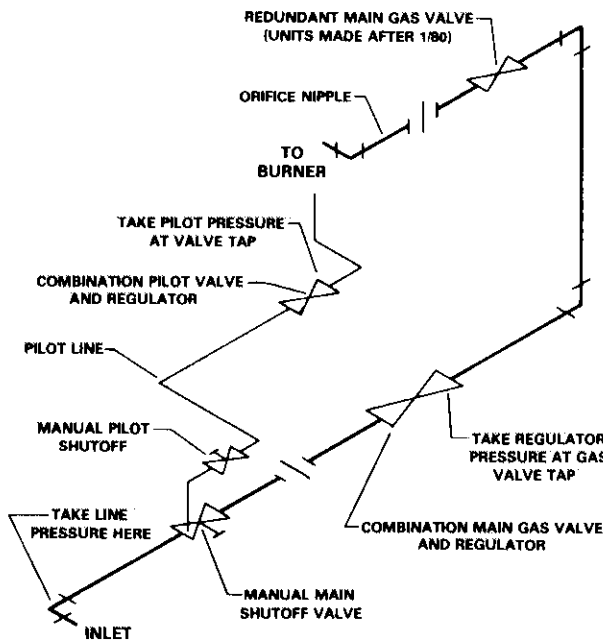
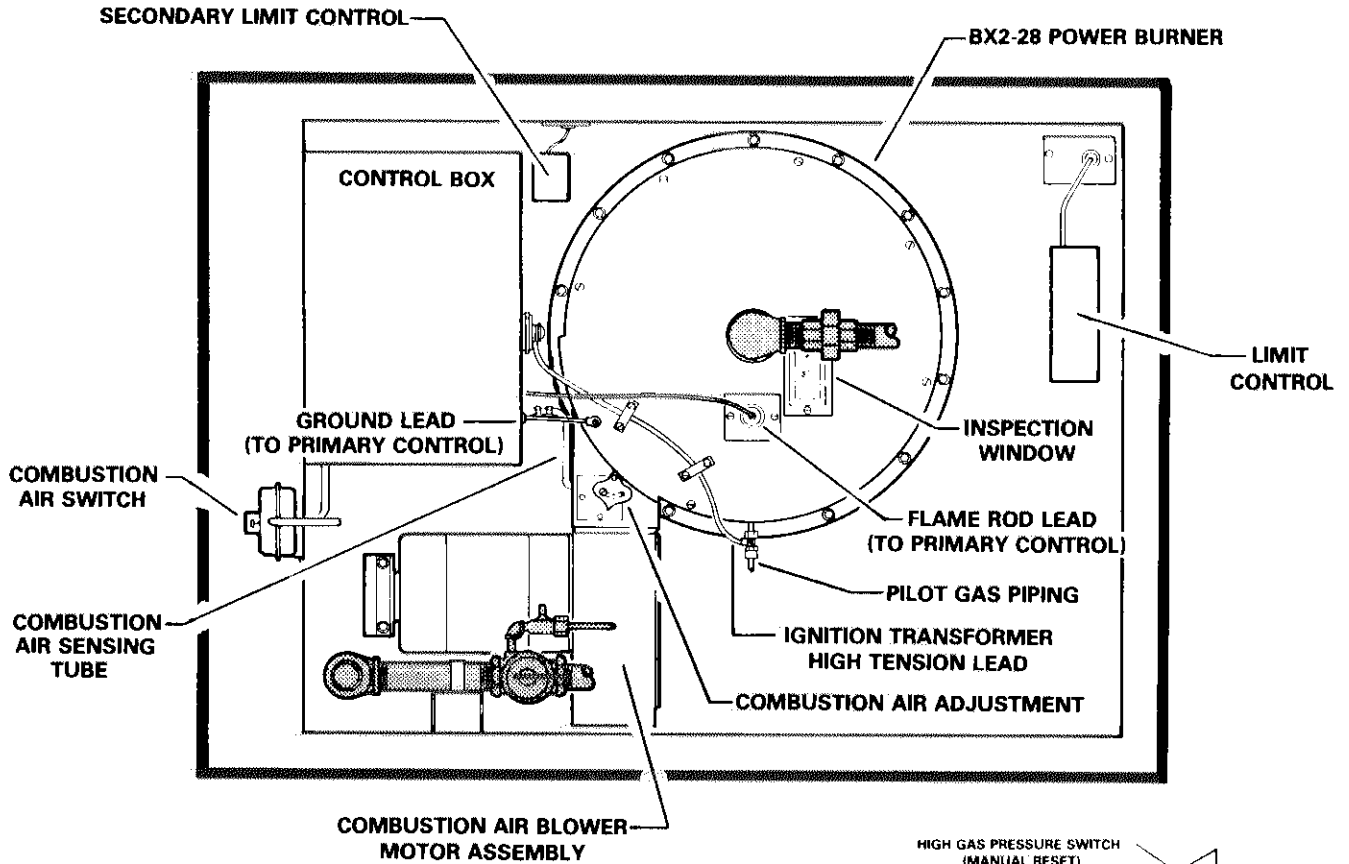
**C.G.A. AND A.G.A. 250
NATURAL GAS MANIFOLD**



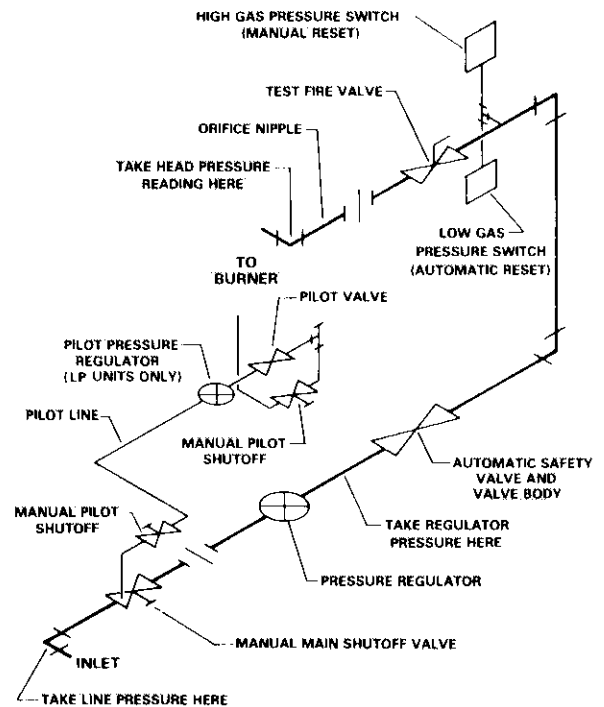
**C.G.A. AND A.G.A. 250
L.P. GAS MANIFOLD**

FIGURE 4

GCS3-1353 HEAT SECTION



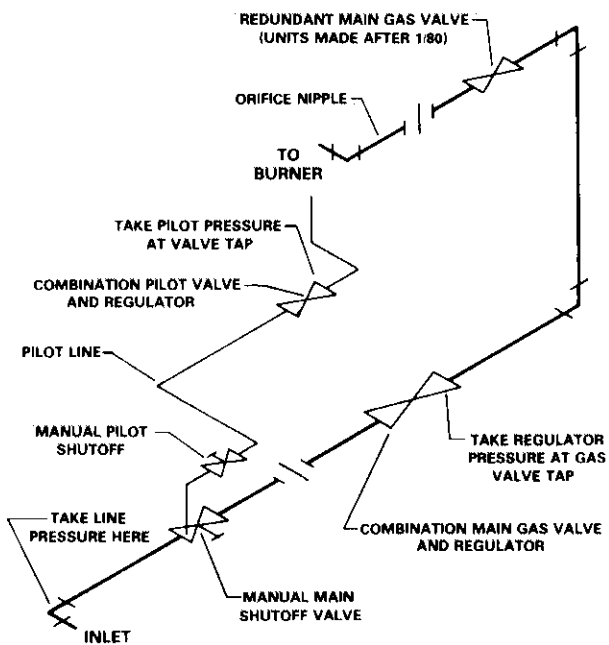
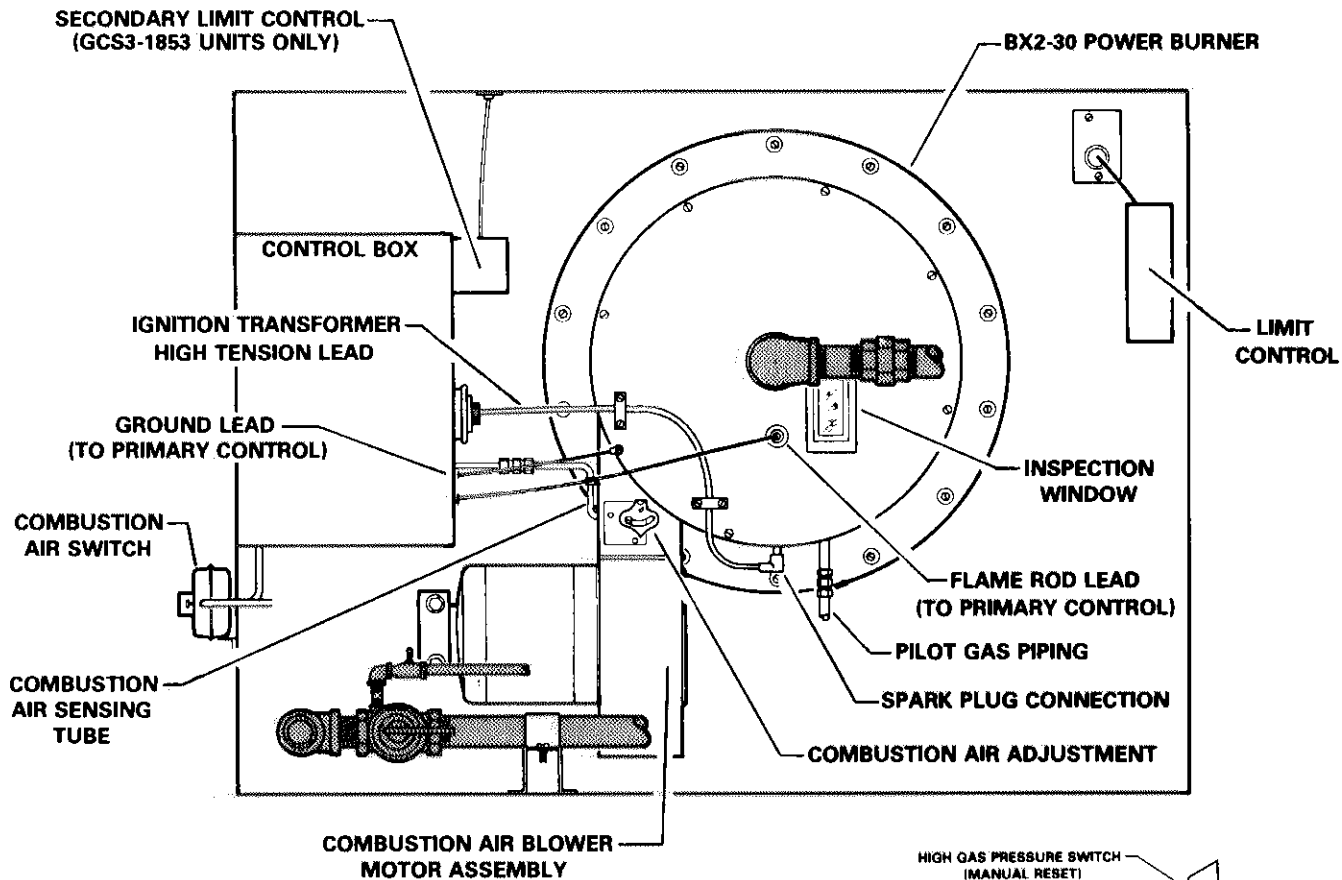
**A.G.A. NATURAL AND
L.P. GAS MANIFOLD**



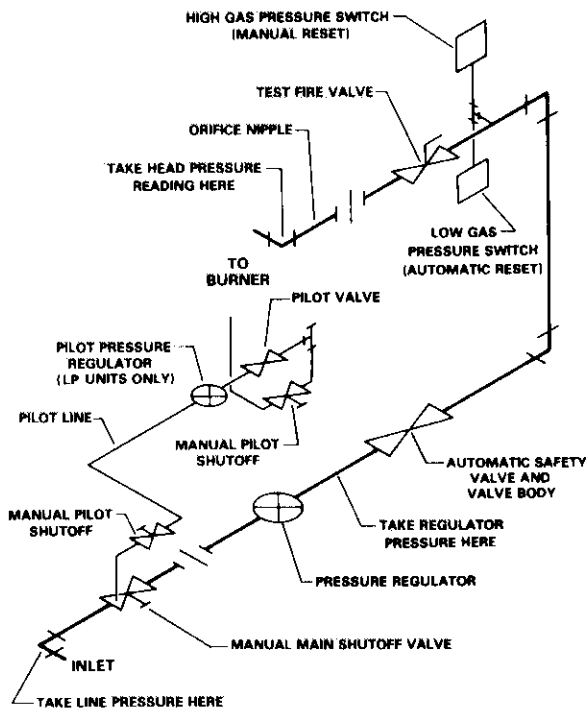
**C.G.A. NATURAL AND
L.P. GAS MANIFOLD**

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

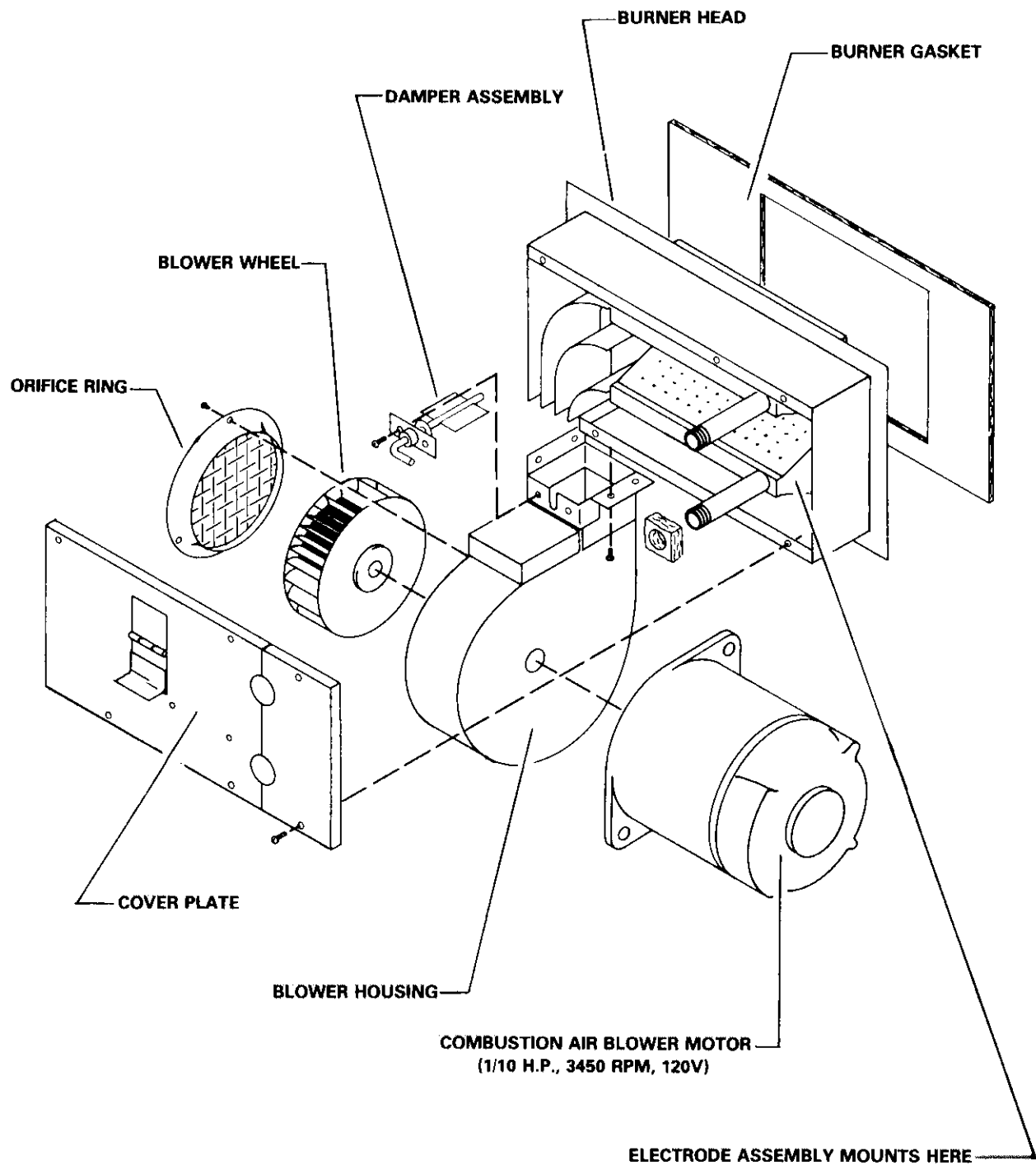


FIGURE 7

BX2-28 AND BX2-30 POWER BURNERS EXPLODED VIEW

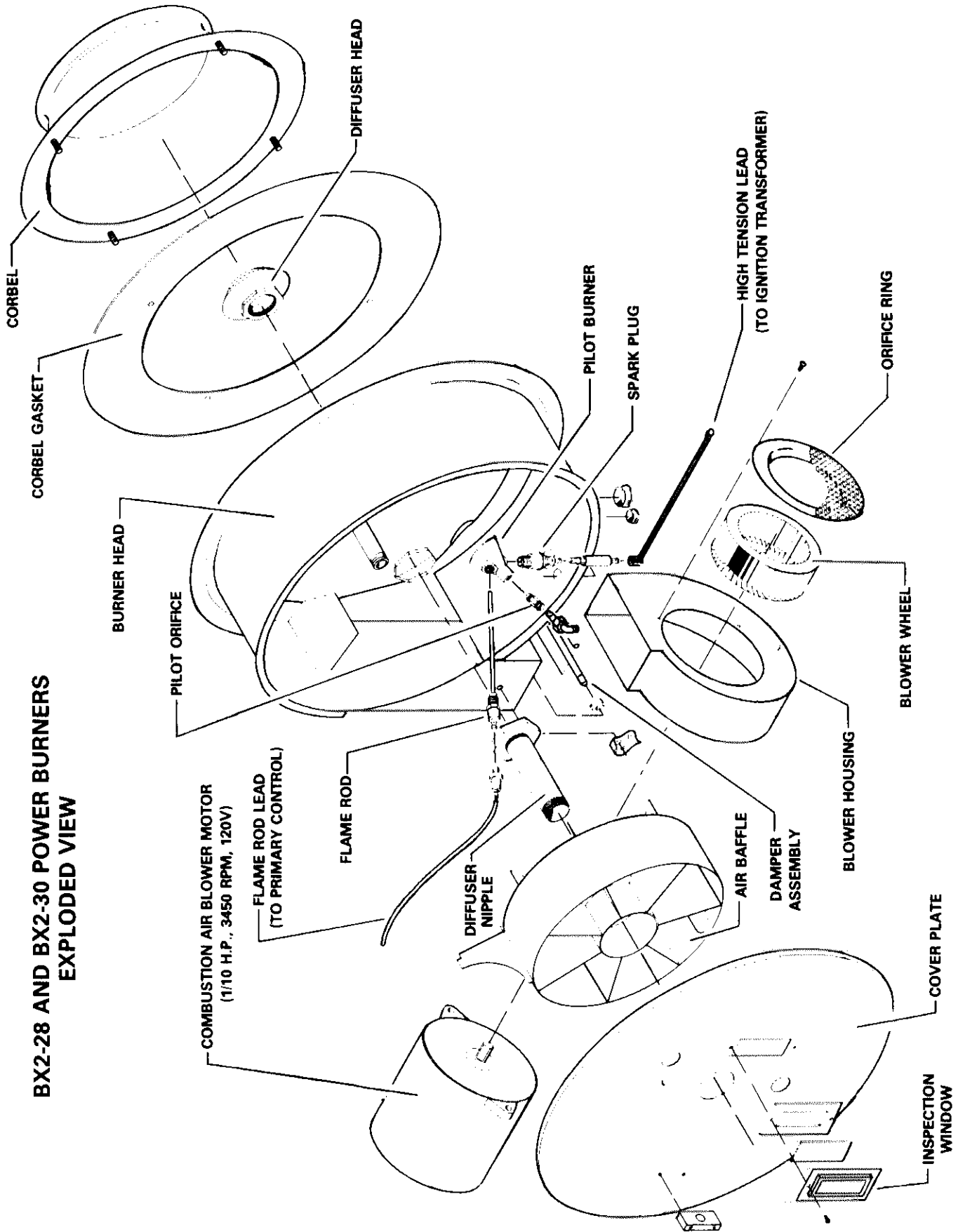


FIGURE 8

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.

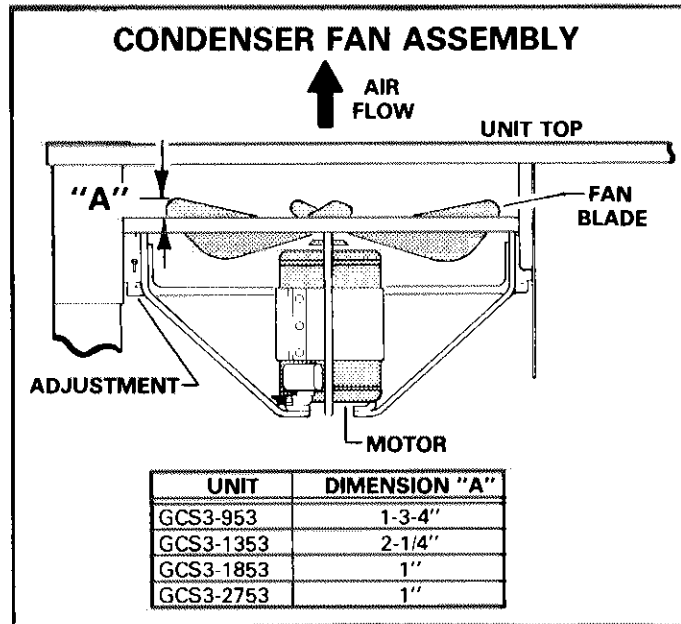


FIGURE 9

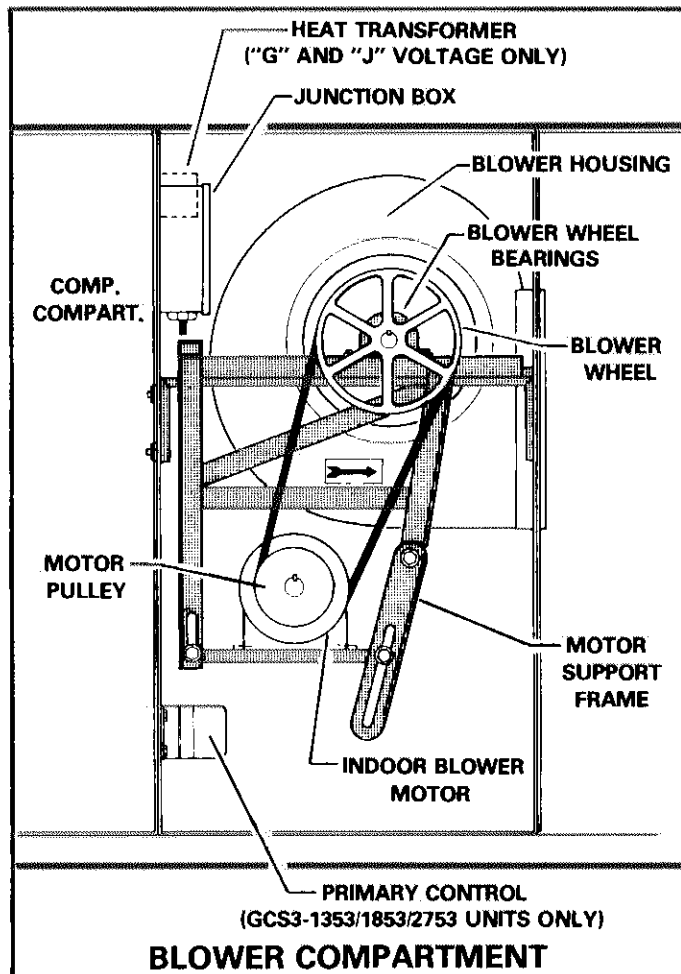


FIGURE 10

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

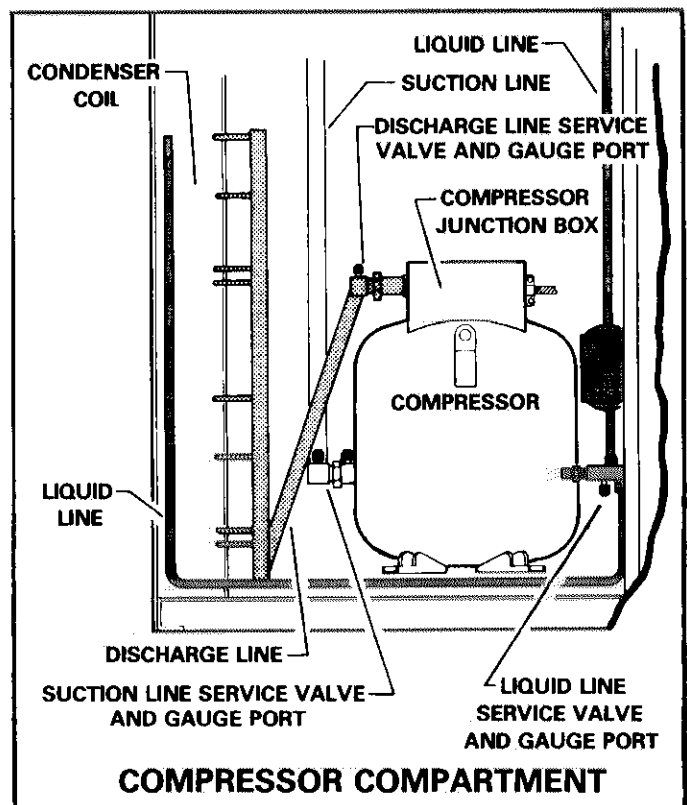


FIGURE 11

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

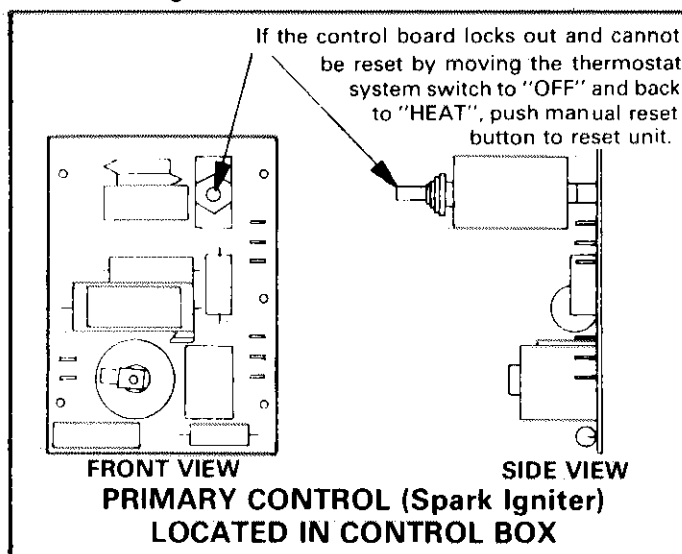


FIGURE 12

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

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

TABLE 6

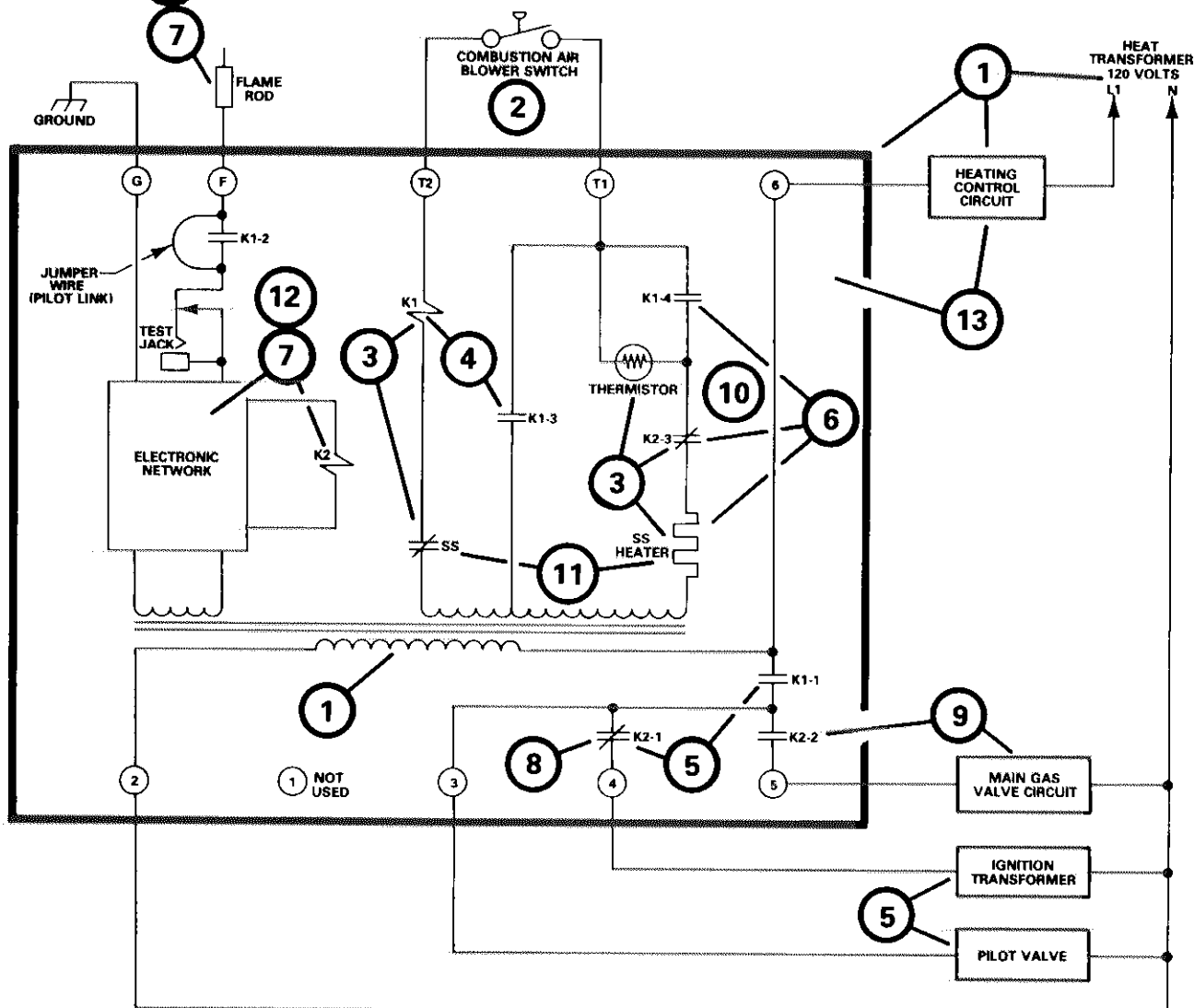
| UNIT | MICRO-AMPS | |
|-----------|------------|-----------|
| | PILOT | HIGH FIRE |
| GCS3-953 | ---- | 2 - 20 |
| GCS3-1353 | 2.2 - 3.5 | 3.5 |
| GCS3-1853 | 2.5 - 3.0 | 3.0 - 4.0 |
| GCS3-2753 | 2.5 - 3.0 | 3.0 - 4.0 |

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.

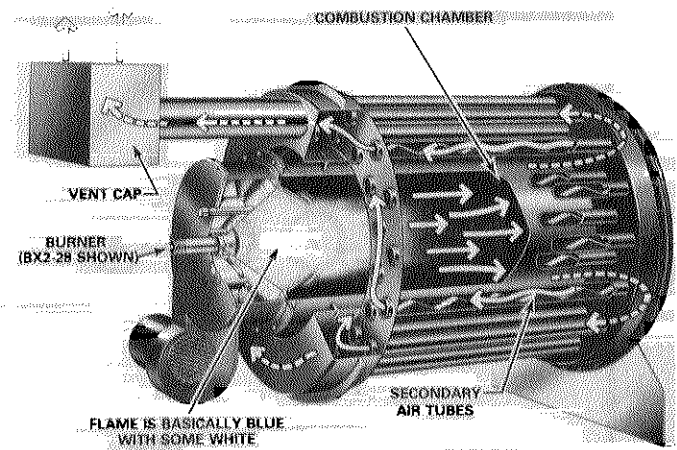
On A.G.A. GCS3-953 and all C.G.A. units, a factory head pressure setting is given on a sticker affixed to burner.

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.



GCS3 HEAT EXCHANGER

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-

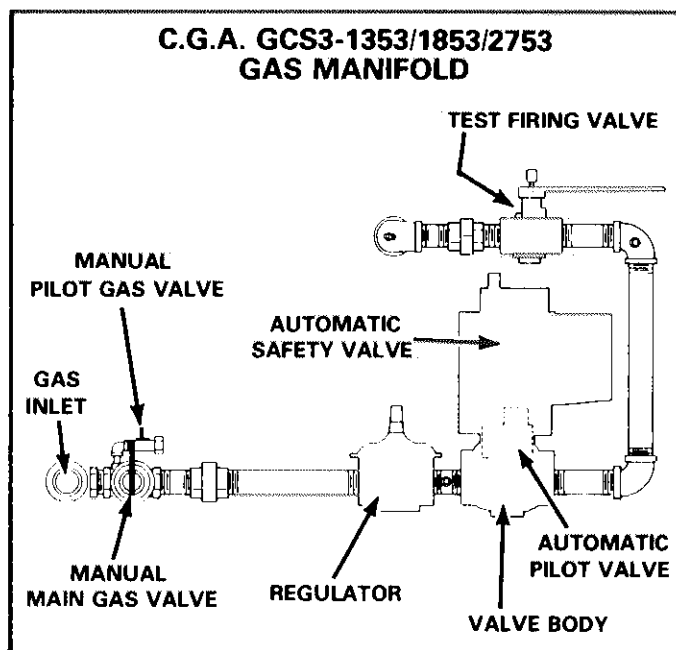


FIGURE 15

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 breeching.
- 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

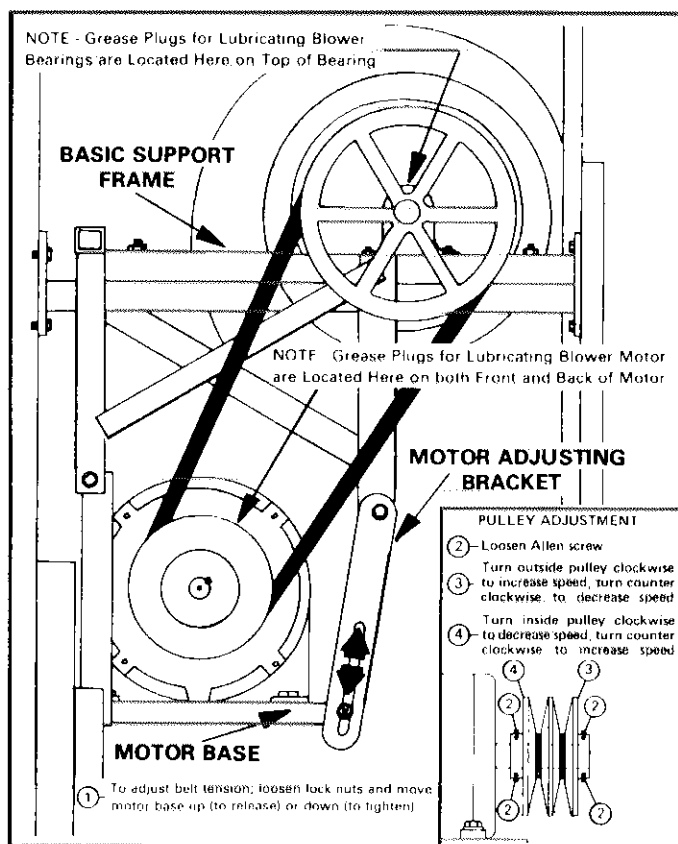


FIGURE 16

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.

TAKE PRESSURE READING ACROSS THE EVAPORATOR COIL AND COMPARE TO TABLE 7 TO FIND CFM VOLUME

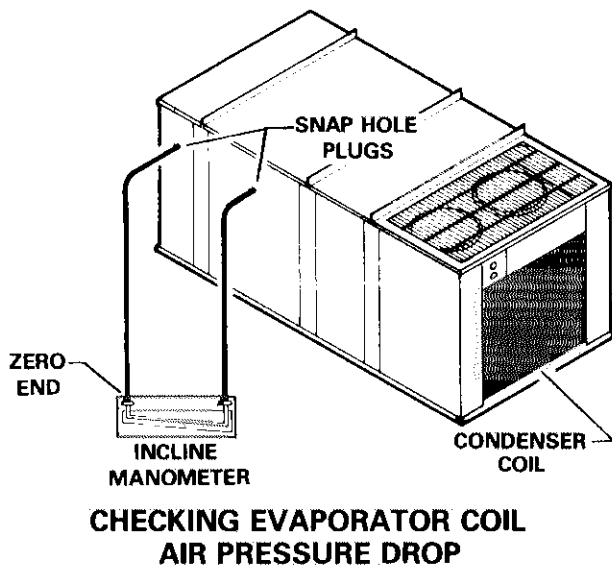


FIGURE 17

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.

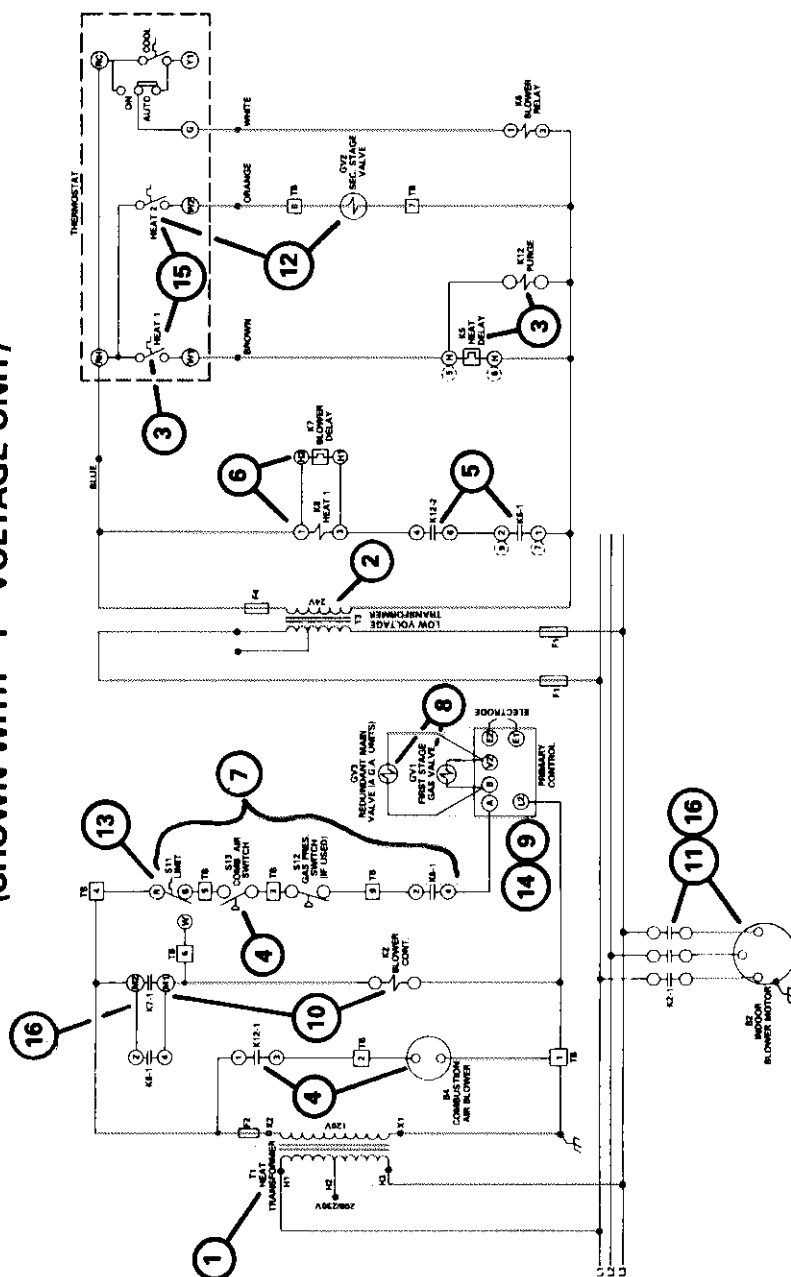
CAUTION - Some detergents have an adverse effect on filter media, causing it to lose its flexibility or become soft. It is recommended that dish washing liquid be used. When cleaning filter, do not leave soaking in cleaner. Leave filter in cleaner only as long as it takes to clean it. Do not use enzyme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



- 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.

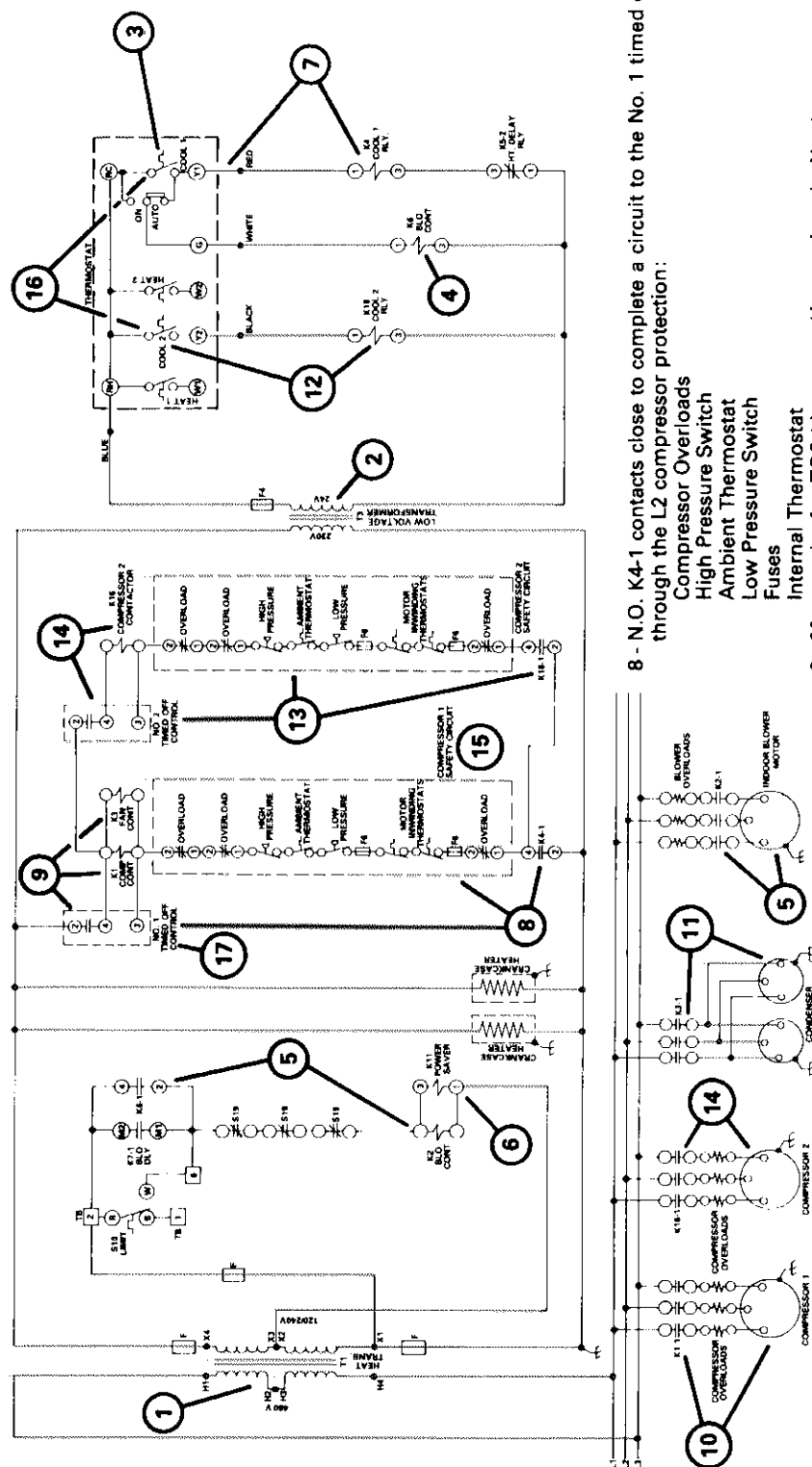
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[illegible]

- 10 - pilot should ignite.
- 11 - If pilot flame is not established, the primary control locks out in approximately 15 - 30 seconds.
- 12 - 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.
- 13 - From Step 7, K7 blower relay heater activates in approximately 5 - 30 seconds. N.O. K7-1 contacts close to energize blower contactor (K2).
- 14 - K2 closes its contacts to power indoor blower motor. 7-1/2 H.P. motors are protected by overloads.
- 15 - On two stage units, the "W2" thermostat leg makes on a further heating demand. This energizes heat 2 relay (K14).
- 16 - N.O. K14-1 contacts make to energize the GV1 high fire solenoid. The burner fires at its maximum rate.
- 17 - 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.
- 18 - The primary control detects a burner flame failure. It will try once for re-ignition and then will lockout.
- 19 - 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.
- 20 - 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.
- 21 - The K7 heater takes 65 - 140 seconds before it allows K7-1 contacts to open. The indoor blower motor keeps running during this period.

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



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.

FIGURE 20