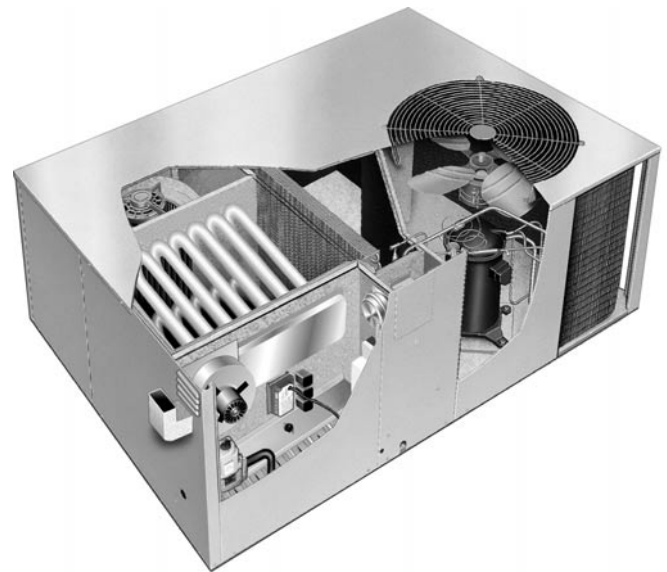


GCS20R(X) RESIDENTIAL SERIES UNITS

GCS20R series units in the 2 to 5 ton (7.0 to 17.0 kW) cooling size are packaged combination gas heat / dx cool units designed for residential applications. GCS20R cooling capacities range from 24,600 to 59,000 Btuh (7.2 to 17.3 kW). Gas heat sections are available with Lennox' new tubular heat exchanger in 50,000, 75,000, 90,000 and 120,000 (14.7, 22.0, 26.4, 35.2 kW) Btuh input sizes.

All GCS20R model units utilize a scroll compressor. The scroll compressor offers high volumetric efficiency, quiet operation and the ability to start under system load. Continuous flank contact, maintained by centrifugal force, minimizes gas leakage and maximizes efficiency. The motor is internally protected from excessive current and temperature.

Information in this manual is for use by a qualified service technician only. All specifications in this manual are subject to change. Procedures outlined in this manual are represented as a recommendation only and do not supersede or replace state or local codes.



⚠ WARNING
Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.
Failure to follow this warning may result in personal injury or death.


⚠ WARNING
 Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

Table of Contents

Specifications 2
Blower Data 4
Electrical Data 6
High Altitude 6
I Application 7
II Unit Components 7
III Placement and Installation 16
IV Electrical Connections 16
V Start Up 16
VI Refrigeration System Service Checks 18
VII Heating System Service Checks 18
VIII Evaporator Blower Operation 20
IX Maintenance 21
X Accessories 23
XI Wiring and Sequence of Operation 25

**ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures**

⚠ CAUTION
Electrostatic discharge can affect electronic components. Take precautions during furnace installation and service to protect the furnace's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the furnace, the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface, such as the gas valve or blower deck, before performing any service procedure.

SPECIFICATIONS GCS20R

SPECIFICATIONS						
Heating Performance	Model No.	GCS20R-024-50	GCS20R-030-75	GCS20R-036-75	GCS20R-042-75	GCS20R-042-120
	Low NO_x Model No.	GCS20RX-024-50	GCS20RX-030-75	GCS20RX-036-75	GCS20RX-042-75	GCS20RX-042-120
	Input - Btuh (kW)	50,000 (14.7)	75,000 (22.0)	75,000 (22.0)	75,000 (22.0)	120,000 (35.2)
	Output - Btuh (kW)	40,000 (11.7)	60,000 (17.6)	60,000 (17.6)	60,000 (17.6)	96,000 (28.1)
	☆A.F.U.E.	80.0%	80.0%	80.0%	80.0%	80.0%
	California Seasonal Efficiency	76.0%	76.0%	76.0%	75.0%	75.0%
	Gas Supply Connections npt - in.	1/2	1/2	1/2	1/2	1/2
	Rec. Gas Supply Pressure - w.c. in. (kPa) Natural	7 (1.7)	7 (1.7)	7 (1.7)	7 (1.7)	7 (1.7)
	LPG/Propane	11 (2.7)	11 (2.7)	11 (2.7)	11 (2.7)	11 (2.7)
Cooling Performance	Nominal Tonnage (kW)	2 (7.0)	2.5 (8.8)	3 (10.6)	3.5 (12.3)	3.5 (12.3)
	★Cooling capacity - Btuh (kW)	24,600 (7.2)	30,400 (8.9)	35,200 (10.3)	42,000 (12.3)	42,000 (12.2)
	Total Unit Watts	2420	3140	3330	3950	3950
	★SEER (Btuh/Watts)	11.00	11.00	12.40	12.60	12.60
	EER (Btuh/Watts)	10.20	9.70	10.60	10.70	10.70
	*Sound Rating Number (dB)	80	80	82	82	82
	Refrigerant Charge (HCFC-22)	4 lbs. 5 oz. (1.96 kg)	4 lbs. 10 oz. (2.10 kg)	5 lbs. 2 oz. (2.32 kg)	7 lbs. 6 oz. (3.35 kg)	7 lbs. 6 oz. (3.35 kg)
Condenser Coil	Net face area - sq. ft. (m ²) Outer Coil	8.7 (0.81)	8.7 (0.81)	14.3 (1.33)	14.3 (1.33)	14.3 (1.33)
	Inner Coil	8.4 (0.78)	8.4 (0.78)	5.9 (0.55)	13.7 (1.27)	13.7 (1.27)
	Tube diameter - in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Number of rows	2	2	1.4	2	2
	Fins per inch (m)	20 (787)	20 (787)	20 (787)	20 (787)	20 (787)
Condenser Fan	Motor output - hp (W)	1/6 (124)	1/6 (124)	1/4 (187)	1/4 (187)	1/4 (187)
	Motor watts	240	240	340	340	340
	Diameter - in. (mm)	20 (508)	20 (508)	24 (610)	24 (610)	24 (610)
	Number of blades	4	4	4	4	4
	Air volume - cfm (L/s)	2200 (1040)	2200 (1040)	3880 (1830)	3770 (1780)	3770 (1780)
Evaporator Coil	Net face area - sq. ft. (m ²)	3.2 (0.30)	4.1 (0.38)	5.3 (0.49)	6.2 (0.58)	6.2 (0.58)
	Tube diameter - in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Number of rows	2	2	2	2	2
	Fins per inch (m)	15 (590)	15 (590)	15 (590)	15 (590)	15 (590)
	Condensate drain coupling size npt - in.	3/4	3/4	3/4	3/4	3/4
Evaporator Blower	Motor output - hp (W)	1/3 (249)	1/3 (249)	1/2 (373)	3/4 (560)	3/4 (560)
	Wheel nominal diameter x width - in. (mm)	9 x 8 (229 X 203)	10 x 8 (254 X 203)	10 x 8 (254 X 203)	11-1/2 x 9 (292 x 228)	11-1/2 x 9 (292 x 228)
Shipping Data	Net weight of basic unit - lbs. (kg)	406 (184)	406 (184)	496 (225)	541 (245)	541 (245)
	Shipping weight of basic unit - lbs. (kg) 1 pkg.	650 (295)	472 (214)	605 (274)	650 (295)	650 (295)
Electrical characteristics (60 hz)		208/230V-1 ph	208/230V-1 ph	208/230V-1 ph	208/230V-1 ph	208/230V-1 ph
OPTIONAL ACCESSORIES - MUST BE ORDERED EXTRA						
Ceiling Diffusers	Step-Down - Net Weight - lbs. (kg)	RTD9-65 - 67 (30)		RTD9-65 - 67 (30)		
	Flush - Net Weight - lbs. (kg)	FD9-65 - 37 (17)		FD9-65 - 37 (17)		
	Transitions (Supply and Return) - lbs. (kg)	SRT16-65 - 20 (9)		SRT16-65 - 20 (9)		
Combustion Air Intake Extensions		96L71	96L71	96L71	96L71	96L71
Hail Guards		90N90	90N90	90N91	90N91	90N91
Low Ambient Control Kit		24H77	24H77	24H77	24H77	24H77
LPG/Propane Kits		50L89	50L89	50L89	50L89	50L88
Outdoor Air Damper Section	US Only	Down-Flow - Net Weight	OAD16-41 - 12 lbs. (5 kg)		OAD16-65 - 12 lbs. (5 kg)	
		Number & Size of Filter - in. (mm)	(1) 5 x 17 x 1 (127 x 432 x 25)		(1) 8 x 17 x 1 (203 x 432 x 25)	
Outdoor Air Damper Section	Canada Only	Down-Flow - Net Weight	OAD16-41S - 10 lbs. (5 kg)		OAD16-65S - 16 lbs. (7 kg)	
		Number & Size of Filter - in. (mm)	(1) 14 x 6 x 1 (356 x 152 x 25)		(1) 18 x 6 x 1 (457 x 152 x 25)	
Roof Curb Power Entry Kit - 1/2 in. (13 mm) Conduit		18H70	18H70	18H70	18H70	18H70
Roof Mounting Frame	Frame	RMF16-41	RMF16-41	RMF16-41 or RMF16-65		
	Sound Reduction Plate (US Only) For RMF16-41	73H80	73H80	73H80	73H80	73H80
	For RMF16-65	---	---	73H82	73H82	73H82
Timed-Off Control		47J27	47J27	47J27	47J27	47J27
Unit Stand-Off Mounting Kit		38H18	38H18	38H18	38H18	38H18
Vertical Vent Extension Kit		28M50	28M50	28M50	28M50	28M50

☆Annual Fuel Utilization Efficiency based on DOE test procedures and FTC labeling regulations.

*Sound Rating Number in accordance with test conditions included in ARI Standard 270.

★Certified in accordance with the USE certification program, which is based on ARI Standard 210/240: 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19.5°C) wb entering evaporator air.

SPECIFICATIONS GCS20R

SPECIFICATIONS					
Heating Performance	Model No.	GCS20R-048-75	GCS20R-048-120	GCS20R-060-75	GCS20R-060-120
	Model No.	GCS20RX-048-75	GCS20RX-048-120	GCS20RX-060-75	GCS20RX-060-120
	Input - Btuh (kW)	75,000 (22.0)	120,000 (35.2)	75,000 (22.0)	120,000 (35.2)
	Output - Btuh (kW)	60,000 (17.6)	96,000 (28.1)	60,000 (17.6)	96,000 (28.1)
	☆A.F.U.E.	80.0%	80.0%	80.0%	80.0%
	California Seasonal Efficiency	75.0%	75.0%	75.0%	75.0%
	Gas Supply Connections npt - in.	1/2	1/2	1/2	1/2
	Rec. Gas Supply Pressure - w.c. in. (kPa)	7 (1.7)	7 (1.7)	7 (1.7)	7 (1.7)
	Natural				
	LPG/Propane	11 (2.7)	11 (2.7)	11 (2.7)	11 (2.7)
Cooling Performance	Nominal Tonnage (kW)	4 (14.1)	4 (14.1)	5 (17.6)	5 (17.6)
	★Cooling Capacity Btuh (kW)	50,000 (14.6)	50,000 (14.6)	59,000 (17.3)	59,000 (17.3)
	Total Unit Watts	4545	4545	5780	5780
	★SEER (Btuh/Watts)	12.70	12.70	12.00	12.00
	EER (Btuh/Watts)	11.00	11.00	10.20	10.20
	*Sound Rating Number (dB)	82	82	82	82
	Refrigerant Charge (HCFC-22)	7 lbs. 14 oz. (3.57 kg)	7 lbs. 14 oz. (3.57 kg)	8 lbs. 8 oz. (3.86 kg)	8 lbs. 8 oz. (3.86 kg)
Condenser Coil	Net face area - sq. ft. (m ²) Outer Coil	14.3 (1.33)	14.3 (1.33)	14.3 (1.33)	14.3 (1.33)
	Inner Coil	13.7 (1.27)	13.7 (1.27)	13.7 (1.27)	13.7 (1.27)
	Tube diameter - in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Number of rows	2	2	2	2
	Fins per inch (m)	20 (787)	20 (787)	20 (787)	20 (787)
Condenser Fan	Motor output - hp (W)	1/4 (187)	1/4 (187)	1/4 (187)	1/4 (187)
	Motor watts	360	360	360	360
	Diameter - in. (mm)	24 (610)	24 (610)	24 (610)	24 (610)
	Number of blades	4	4	4	4
	Air volume - cfm (L/s)	3770 (1780)	3770 (1780)	3770 (1780)	3770 (1780)
Evaporator Coil	Net face area - sq. ft. (m ²)	6.2 (0.58)	6.2 (0.58)	6.2 (0.58)	6.2 (0.58)
	Tube diameter - in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
	Number of rows	3	3	3	3
	Fins per inch (m)	14 (551)	14 (551)	14 (551)	14 (551)
	Condensate drain coupling size npt - in.	3/4	3/4	3/4	3/4
Evaporator Blower	Motor output - hp (W)	3/4 (560)	3/4 (560)	3/4 (560)	3/4 (560)
	Wheel nominal diameter x width - in. (mm)	11-1/2 x 9 (292 x 228)	11-1/2 x 9 (292 x 228)	11-1/2 x 9 (292 x 228)	11-1/2 x 9 (292 x 228)
Shipping Data	Net weight of basic unit - lbs. (kg)	541 (245)	541 (245)	541 (245)	541 (245)
	Shipping weight of basic unit - lbs. (kg) 1 pkg.	541 (245)	650 (295)	650 (295)	650 (295)
Electrical characteristics (60 hz)		208/230V - 1 ph	208/230V - 1 ph	208/230V - 1 ph	208/230V - 1 ph
OPTIONAL ACCESSORIES - MUST BE ORDERED EXTRA					
Ceiling Diffusers	Step-Down - Net Weight - lbs. (kg)	RTD9-65 - 67 (30)	RTD9-65 - 67 (30)	RTD9-65 - 67 (30)	RTD9-65 - 67 (30)
	Flush - Net Weight - lbs. (kg)	FD9-65 - 37 (17)	FD9-65 - 37 (17)	FD9-65 - 37 (17)	FD9-65 - 37 (17)
	Transitions (Supply and Return) - lbs. (kg)	SRT16-65 - 20 (9)	SRT16-65 - 20 (9)	SRT16-65 - 20 (9)	SRT16-65 - 20 (9)
Combustion Air Intake Extensions		96L71	96L71	96L71	96L71
Hail Guards		90N91	90N91	90N91	90N91
Low Ambient Control Kit		24H77	24H77	24H77	24H77
LPG/Propane Kits		50L89	50L88	50L89	50L88
Outdoor Air Damper Section	US Only	Down-Flow - Net Weight - lbs. (kg)	OAD16-65 - 12 (5)	OAD16-65 - 12 (5)	OAD16-65 - 12 (5)
		Number & Size of Filter - in. (mm)	(1) 8 x 17 x 1 (203 x 432 x 25)	(1) 8 x 17 x 1 (203 x 432 x 25)	(1) 8 x 17 x 1 (203 x 432 x 25)
	Canada Only	Down-Flow - Net Weight - lbs. (kg)	OAD16-65S - 16 (7)	OAD16-65S - 16 (7)	OAD16-65S - 16 (7)
		Number & Size of Filter - in. (mm)	(1) 18 x 6 x 1 (457 x 152 x 25)	(1) 18 x 6 x 1 (457 x 152 x 25)	(1) 18 x 6 x 1 (457 x 152 x 25)
Roof Curb Power Entry Kit - 1/2 in. (13 mm) Conduit		18H70	18H70	18H70	18H70
Roof Mounting Frame	Frame	RMF16-41 or RMF16-65	RMF16-41 or RMF16-65	RMF16-41 or RMF16-65	RMF16-41 or RMF16-65
	Sound Reduction Plate (US Only) For RMF16-41	73H80	73H80	73H80	73H80
	For RMF16-65	73H82	73H82	73H82	73H82
Timed-Off Control		47J27	47J27	47J27	47J27
Unit Stand-Off Mounting Kit		38H18	38H18	38H18	38H18
Vertical Vent Extension Kit		28M50	28M50	28M50	28M50

☆Annual Fuel Utilization Efficiency based on DOE test procedures and FTC labeling regulations.
 *Sound Rating Number in accordance with test conditions included in ARI Standard 270.
 ★Certified in accordance with the USE certification program, which is based on ARI Standard 210/240: 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19.5°C) wb entering evaporator air.

BLOWER DATA GCS20R

GCS20R-024-50 BLOWER PERFORMANCE @ 230V (For 208V unit operation, derate air volume by 7%)

External Static Pressure		Down-Flow Air Openings								Horizontal Air Openings							
		Air Volume at Various Blower Speeds								Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1335	630	1000	470	905	425	665	315	1315	620	915	430	840	395	615	290
.05	12	1330	630	1010	475	915	430	680	320	1300	615	930	440	855	405	640	300
.10	25	1315	620	1015	480	920	435	685	325	1285	605	945	445	870	410	655	310
.15	37	1300	615	1015	480	925	435	690	325	1265	595	950	450	875	415	670	315
.20	50	1280	605	1010	475	920	435	695	330	1240	585	950	450	880	415	680	320
.25	62	1255	590	1005	475	915	430	695	330	1220	575	950	450	880	415	685	325
.30	75	1225	580	990	465	900	425	690	325	1195	565	945	445	875	415	685	325
.40	100	1160	550	945	445	865	410	665	315	1140	540	915	430	850	400	675	320
.50	125	1075	505	885	420	815	385	630	295	1080	510	870	410	815	385	650	305
.60	150	975	460	805	380	745	350	585	275	1010	475	805	380	760	360	610	290
.70	175	860	405	705	335	655	310	520	245	935	440	725	340	690	325	550	260
.80	200	730	345	590	280	545	255	---	---	845	400	625	295	600	285	---	---
.90	225	570	270	---	---	---	---	---	---	735	345	515	245	---	---	---	---

GCS20R-030-75 BLOWER PERFORMANCE @ 230V (For 208V unit operation, derate air volume by 7%)

External Static Pressure		Down-Flow Air Openings								Horizontal Air Openings							
		Air Volume at Various Blower Speeds								Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1525	720	1350	635	1090	515	870	410	1435	675	1280	605	1010	475	860	405
.05	12	1515	715	1345	635	1090	515	880	415	1425	675	1265	595	1005	475	860	405
.10	25	1495	705	1335	630	1085	510	885	420	1410	665	1250	590	1005	475	865	410
.15	37	1480	700	1325	625	1075	505	890	420	1380	650	1235	585	1000	470	860	405
.20	50	1465	690	1310	620	1065	505	885	420	1365	645	1220	575	990	465	855	405
.25	62	1450	685	1285	605	1055	500	875	415	1345	635	1205	570	975	460	845	400
.30	75	1420	670	1270	600	1045	495	870	410	1315	620	1190	560	970	460	835	395
.40	100	1375	650	1230	580	1020	480	855	405	1270	600	1160	550	945	445	810	380
.50	125	1325	625	1190	560	990	465	835	395	1220	575	1115	525	920	435	790	375
.60	150	1280	605	1150	545	965	455	810	380	1155	545	1070	505	900	425	765	360
.70	175	1220	575	1110	525	930	440	790	375	1095	515	1010	475	865	410	740	350
.80	200	1130	535	1030	485	885	420	765	360	1030	485	955	450	820	385	700	330
.90	225	1070	505	955	450	820	385	---	---	950	450	865	410	745	350	---	---
1.00	250	965	455	860	405	---	---	---	---	850	400	760	360	---	---	---	---

BLOWER DATA GCS20R

GCS20R-036-75 BLOWER PERFORMANCE @ 230V (For 208V unit operation, derate air volume by 7%)

External Static Pressure		Down-Flow Air Openings								Horizontal Air Openings							
		Air Volume at Various Blower Speeds								Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low		High		Medium-High		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	1885	890	1530	720	1335	630	990	465	1935	915	1580	745	1320	625	1140	540
.05	12	1860	880	1530	720	1335	630	995	470	1910	900	1580	745	1325	625	1150	545
.10	25	1840	870	1525	720	1340	630	995	470	1890	890	1570	740	1330	630	1160	545
.15	37	1815	855	1520	715	1340	630	1000	470	1870	880	1565	740	1330	630	1165	550
.20	50	1790	845	1510	715	1335	630	1000	470	1845	870	1555	735	1330	630	1170	550
.25	62	1765	835	1500	710	1330	630	995	470	1820	860	1540	725	1330	630	1170	550
.30	75	1735	820	1485	700	1320	625	995	470	1795	845	1525	720	1325	625	1170	550
.40	100	1675	790	1450	685	1295	610	985	465	1740	820	1490	705	1305	615	1160	545
.50	125	1605	755	1405	665	1255	590	975	460	1680	795	1450	685	1280	605	1135	535
.60	150	1530	720	1350	635	1210	570	955	450	1620	765	1395	660	1240	585	1105	520
.70	175	1450	685	1285	605	1155	545	930	440	1550	730	1335	630	1195	565	1060	500
.80	200	1365	645	1205	570	1085	510	900	425	1480	700	1270	600	1140	540	1010	475
.90	225	1270	600	1120	530	1005	475	870	410	1405	665	1190	560	1070	505	945	445
1.00	250	1165	550	1020	480	915	430	830	390	1325	625	1105	520	995	470	870	410

GCS20R-042-75 and GCS20R-042-120 BLOWER PERFORMANCE @ 230V (For 208V unit operation, derate air volume by 7%)

External Static Pressure		Down-Flow Air Openings								Horizontal Air Openings											
		Air Volume at Various Blower Speeds								Air Volume at Various Blower Speeds											
		High		Medium-High		Medium		Medium-Low		Low		High		Medium-High		Medium		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2740	1295	2520	1190	2270	1070	2025	955	1710	805	2760	1305	2545	1200	2295	1085	2015	950	1680	795
.05	12	2715	1280	2495	1180	2250	1060	2005	945	1690	800	2745	1295	2530	1195	2280	1075	2005	945	1675	790
.10	25	2685	1265	2470	1165	2230	1055	1980	935	1670	790	2730	1290	2510	1185	2265	1070	1995	940	1670	790
.15	37	2655	1255	2445	1155	2210	1045	1960	925	1650	780	2710	1280	2495	1180	2250	1060	1985	935	1665	785
.20	50	2630	1240	2420	1140	2190	1035	1935	915	1635	770	2695	1270	2480	1170	2235	1055	1970	930	1665	785
.25	62	2600	1225	2395	1130	2170	1025	1910	900	1615	760	2675	1265	2460	1160	2220	1050	1955	925	1645	775
.30	75	2570	1215	2370	1120	2150	1015	1885	890	1595	755	2650	1250	2440	1150	2200	1040	1930	910	1635	770
.40	100	2510	1185	2320	1095	2100	990	1835	865	1550	730	2600	1225	2395	1130	2160	1020	1875	885	1605	760
.50	125	2450	1155	2255	1065	2080	980	1780	840	1500	710	2540	1200	2340	1105	2110	995	1805	850	1555	735
.60	150	2375	1120	2185	1030	1995	940	1755	830	1440	680	2480	1170	2265	1070	2025	955	1725	815	1475	695
.70	175	2305	1090	2120	1000	1935	915	1695	800	1390	655	2395	1130	2200	1040	1985	935	1630	770	1450	685
.80	200	2230	1055	2040	965	1860	880	1645	775	1315	620	2285	1080	2100	990	1900	895	1540	725	1370	645
.90	225	2140	1010	1945	920	1775	840	1585	750	---	---	2155	1015	1985	935	1795	845	1410	665	---	---
1.00	250	2030	960	1835	865	1670	790	---	---	---	---	2000	945	1845	870	1665	785	---	---	---	---

GCS20R-048-75, GCS20R-048-120, GCS20R-060-75, and GCS20R-060-120 BLOWER PERFORMANCE @ 230V (For 208V unit operation, derate air volume by 7%)

External Static Pressure		Down-Flow Air Openings								Horizontal Air Openings											
		Air Volume at Various Blower Speeds								Air Volume at Various Blower Speeds											
		High		Medium-High		Medium		Medium-Low		Low		High		Medium-High		Medium		Medium-Low		Low	
in. w.g.	Pa	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
0	0	2480	1170	2315	1090	2060	970	1800	850	1555	735	2470	1165	2340	1105	2160	1020	1880	885	1620	765
.05	12	2460	1160	2295	1085	2055	970	1795	845	1555	735	2445	1155	2315	1090	2145	1010	1865	880	1615	760
.10	25	2435	1150	2275	1075	2050	965	1785	840	1550	730	2420	1140	2295	1085	2130	1005	1855	875	1610	760
.15	37	2410	1135	2255	1065	2040	965	1775	840	1545	730	2395	1130	2270	1070	2110	995	1840	870	1605	755
.20	50	2380	1125	2235	1055	2030	960	1765	835	1540	725	2365	1115	2245	1060	2090	985	1825	860	1595	755
.25	62	2355	1110	2210	1045	2015	950	1755	830	1535	725	2340	1105	2220	1050	2070	975	1810	855	1585	750
.30	75	2325	1095	2185	1030	2005	945	1745	825	1525	720	2310	1090	2195	1035	2050	965	1795	845	1575	745
.40	100	2265	1070	2135	1010	1970	930	1715	810	1505	710	2250	1060	2135	1010	2000	945	1760	830	1545	730
.50	125	2205	1040	2080	980	1930	910	1685	795	1475	695	2185	1030	2075	980	1950	920	1715	810	1510	715
.60	150	2135	1010	2015	950	1880	885	1650	780	1445	680	2115	1000	2010	950	1890	890	1670	790	1470	695
.70	175	2065	975	1950	920	1825	860	1610	760	1405	665	2045	965	1945	920	1825	860	1620	765	1420	670
.80	200	1990	940	1880	885	1765	835	1570	740	1365	645	1965	925	1870	880	1760	830	1565	740	1370	645
.90	225	1910	900	1800	850	1700	800	1520	715	1315	620	1885	890	1795	845	1685	795	1505	710	1310	620
1.00	250	1825	860	1720	810	1625	765	1470	695	1260	595	1800	850	1715	810	1605	755	1440	680	1245	590

BLOWER DATA GCS20R

AIR RESISTANCE									
Air Volume		Total Air Resistance							
		RTD9-65 Diffuser				FD9-65 Diffuser			
		2 Ends Open		1 Side 2 Ends Open		All Ends & Sides Open		FD9-65 Diffuser	
cfm	L/s	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa
800	380	.15	37	.13	32	.11	27	.11	27
1000	470	.19	47	.16	40	.14	35	.14	35
1200	565	.25	62	.20	50	.17	42	.17	42
1400	660	.33	82	.26	65	.20	50	.20	50
1600	755	.43	107	.32	80	.20	50	.24	60
1800	850	.56	139	.40	90	.30	75	.30	75
2000	945	.73	182	.50	124	.36	90	.36	90
2200	1040	.95	236	.63	157	.44	109	.44	109

CEILING DIFFUSER AIR THROW DATA					
Model No.		RTD9-65		FD9-65	
Air Volume		□ Effective Throw		□ Effective Throw	
cfm	L/s	ft.	m	ft.	m
1000	470	10-17	3-5	15-20	5-6
1200	565	11-18	3-5	16-22	5-7
1400	660	12-19	4-6	17-24	5-7
1600	755	12-20	4-6	18-25	5-8
1800	850	13-21	4-6	20-28	6-9
2000	945	14-23	4-7	21-29	6-9
2200	1040	16-25	5-8	22-30	7-9

□ Effective throw based on terminal velocities of 75 ft. (22.9 m) per minute.

WET INDOOR COIL AIR RESISTANCE				
Model Number	Air Volume		Air Resistance	
	cfm	L/s	in. w.g.	Pa
GCS20R-024	800	380	0.06	15
	1000	470	0.07	17
	1200	565	0.08	20
GCS20R-030	800	380	0.09	22
	1000	470	0.10	25
	1200	565	0.11	27
GCS20R-036	800	380	0.09	22
	1000	470	0.08	20
	1200	565	0.09	22
GCS20R-042	1600	755	0.08	20
	1800	850	0.09	22
	2000	945	0.10	25
GCS20R-048	2000	945	0.10	25
	2200	1040	0.11	27

ELECTRICAL DATA GCS20R

ELECTRICAL DATA							
General Data	Model No.	GCS20R-02 4	GCS20R-03 0	GCS20R-03 6	GCS20R-04 2	GCS20R-04 8	GCS20R-06 0
Line voltage data - 60 hz - 1 phase		208/230v	208/230v	208/230v	208/230v	208/230v	208/230v
Rec. maximum fuse size (amps)		30	30	40	45	50	70
†Minimum Circuit Ampacity		19	21	27	30	32	44
Compressor	Rated load amps	12.2	13.5	16.1	17.9	19.2	28.8
	Locked rotor amps	61	73	88	104	137	148
Condenser Coil	Full load amps	1.1	1.1	2.0	2.0	2.0	2.0
Fan Motor	Locked rotor amps	2.3	2.3	4.2	4.2	4.2	4.2
Evaporator	Motor output - hp (W)	1/3 (249)	1/3 (249)	1/2 (373)	3/4 (560)	3/4 (560)	3/4 (560)
Blower Motor	Full load amps	2.2	3.0	3.9	5.0	5.0	5.0
	Locked rotor amps	4.6	6.2	8.3	10.1	10.1	10.1
Combustion Air Inducer Motor full load amps		0.7	0.7	0.7	0.7	0.7	0.7

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

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

HIGH ALTITUDE INFORMATION

No gas pressure adjustment is needed when operating from 0 to 7500 ft. (0 to 2285 m). See below for correct manifold pressures for natural gas and LPG/propane.

FUEL	Manifold Absolute Pressure (outlet) 0 to 7500 ft. (0 to 2248 m) above sea level
Natural Gas	3.5 in. w.g. (0.87 kPa)
LPG/Propane	9.5 in. w.g. (2.36 kPa)

GCS20R PARTS ARRANGEMENT

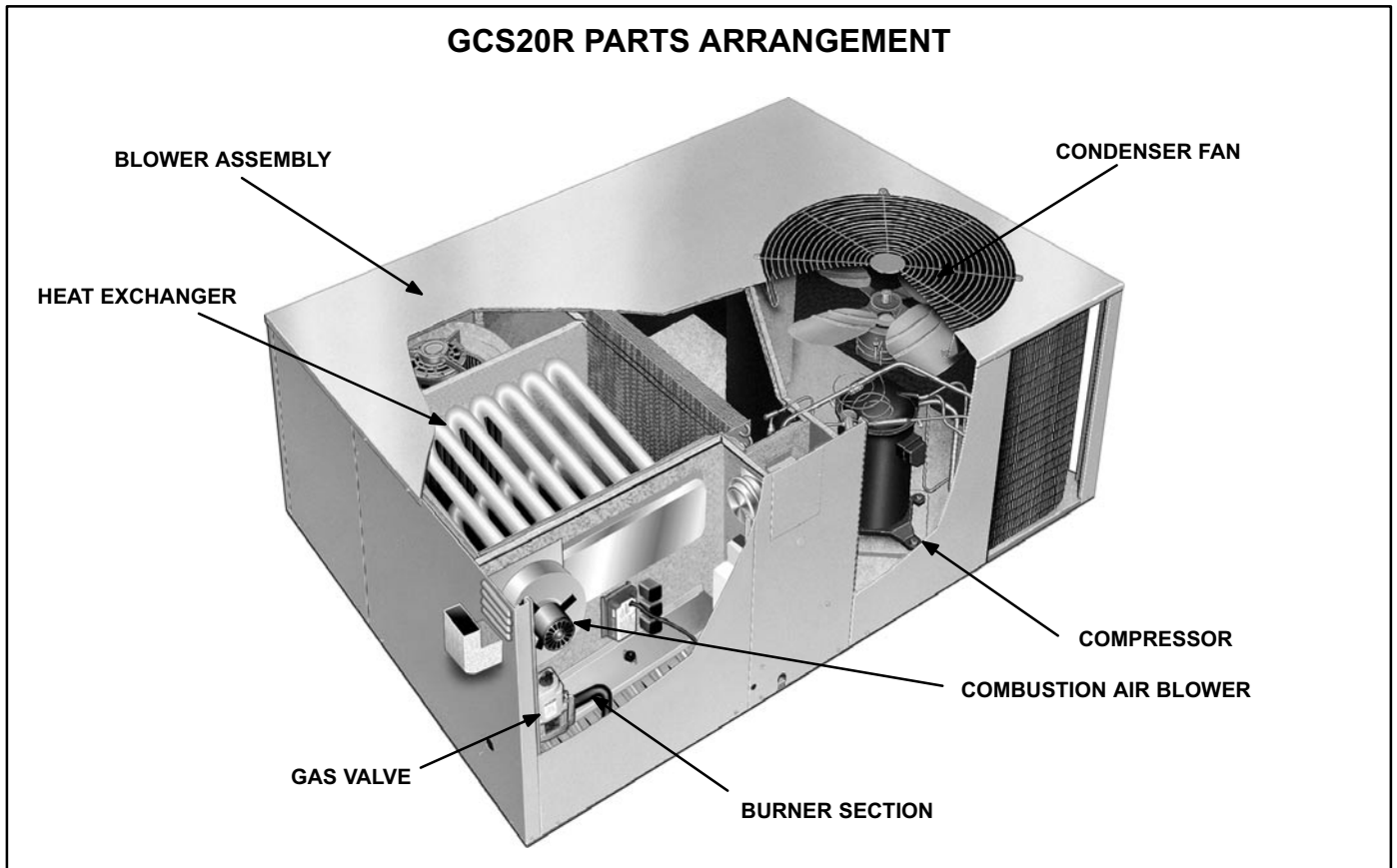


FIGURE 1

I-APPLICATION

GCS20R 2-5 ton units are available in two cabinet sizes (refer to the Engineering Handbook for more specific application data). GCS20R 2 through 5 ton models are applicable for single phase residential installations.

II-UNIT COMPONENTS

GCS20R unit components are shown in figure 1.

A-Control Box Components

GCS20R control box is shown in figure 3. The control box is located in the heating compartment behind the heating compartment access panel. Note that the T1 transformer on the -024 and -030 model units is located on the mullion adjacent to the compressor compartment access panel. The condenser fan can be accessed by removing the fan grill located on top of the unit.

The indoor blower access panel (all units) is located on the opposite side of the unit from the heating compartment access.

⚠ WARNING

Sharp edges.

Be careful when servicing unit to avoid sharp edges which may result in personal injury.

⚠ DANGER



All single phase units use single pole contactors. One leg of compressor, capacitor and condenser fan are connected to line voltage at all times.

Remove all power to disconnect before servicing.

Electrical shock resulting in death or injury may result if power is not disconnected.

1-Transformer T1

All GCS20R series units use a single line voltage to 24VAC transformer mounted in the control box. The transformer supplies power to control circuits in the unit. Transformers are rated at 70VA and use two primary voltage taps as shown in figure 2.

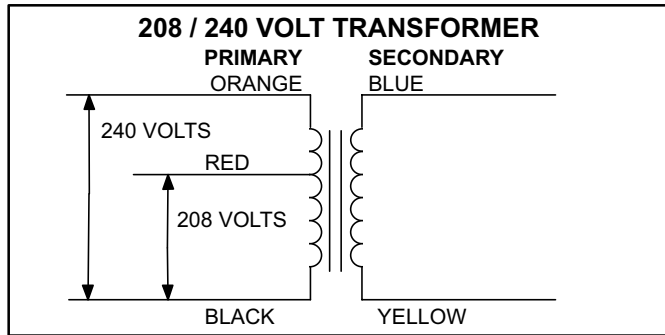


FIGURE 2

2-Cooling Contactor K1

K1 is a line voltage contactor with a 24V coil used to energize the compressor and condenser fan in response to thermostat demand. GCS20R units use single-pole double break contactors.

3-Indoor Blower Relay K3 (Cooling Speed)

All units use a DPDT relay to energize the indoor blower motor. The relay coil is energized by blower demand from indoor thermostat terminal "G" (cooling demand or fan switch in "ON" position). When the coil is energized, a set of N.O. contacts closes to energize the blower motor on high speed. When de-energized, a set of N.C. contacts allows the fan/limit control relay to energize the blower on heating speed (refer to unit wiring diagram).

4-Combustion Air Inducer Relay K13

Relay K13 is a DPDT relay located inside the control box. K13 is energized by heating demand from the thermostat and is energized throughout the heating demand. When energized, K13 normally open contacts close to energize the combustion air inducer and begin a heating sequence. A differential pressure "prove" switch connected to the combustion air inducer in turn energizes the ignition control and gas valve.

5- Indoor Blower Delay Relay K25

Relay K25 is a printed circuit board located in the control box wired in series with the gas valve. K25 is designed to provide an indoor blower delay of 45 seconds on time and 150 seconds off time during a heat demand. When there is a demand for heat, the gas valve will open and the on time delay will begin. When heat demand is satisfied the gas valve will close and the off time will begin. If K25 fails replace the entire control.

6- Indoor Blower Relay K20

Relay K20 is a DPDT relay also located in the control box. Relay K20 is energized after the 45 second on time delay by relay K25. K20 is de-energized after the 150 second off time delay by relay K25 after heat demand is satisfied or when limit S10 resets. When relay K20 is de-energized, contacts K20-1 open to de-energize the blower. A separate set of contacts (K20-2) close energizing the optional economizer.

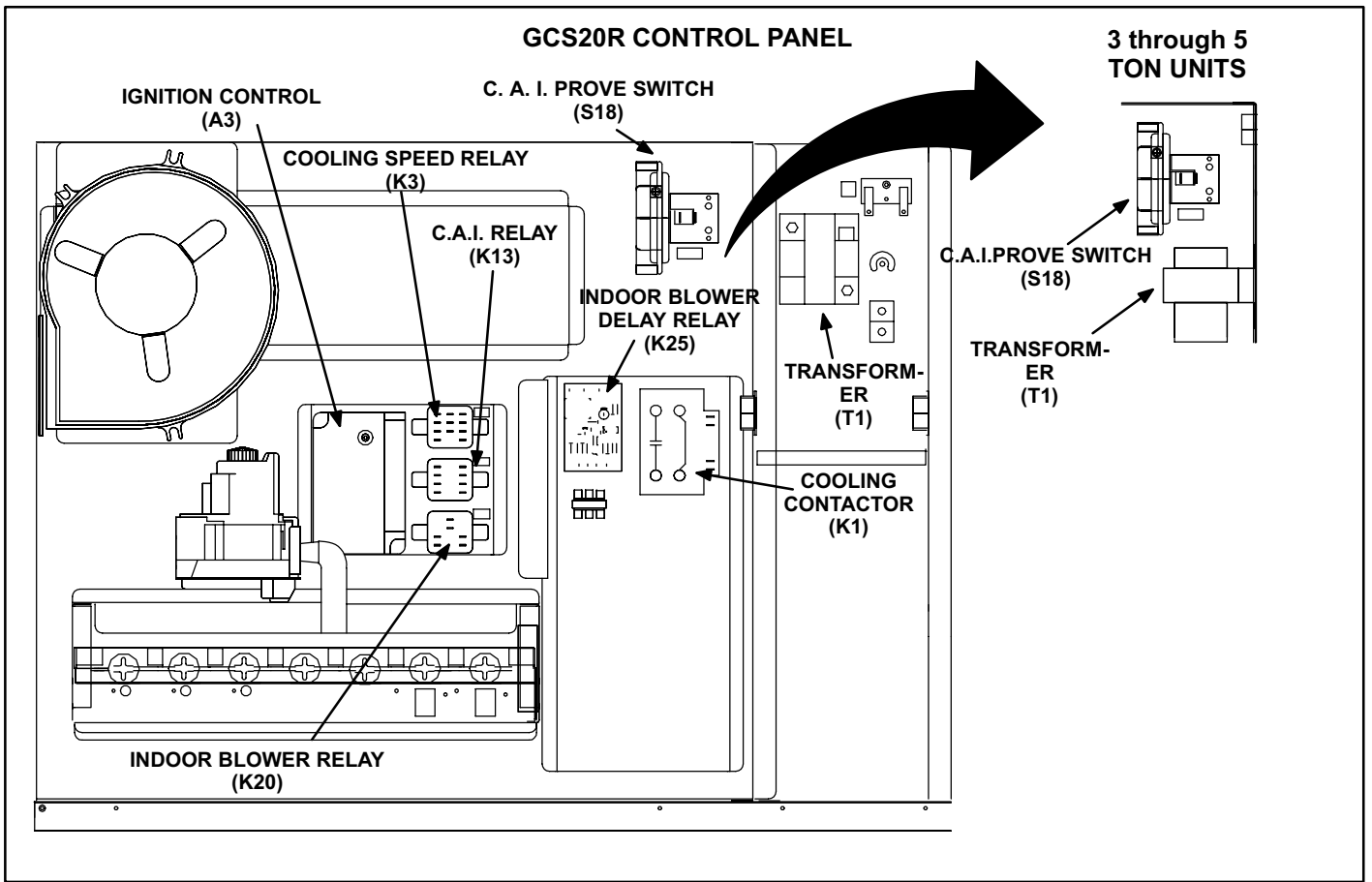


FIGURE 3

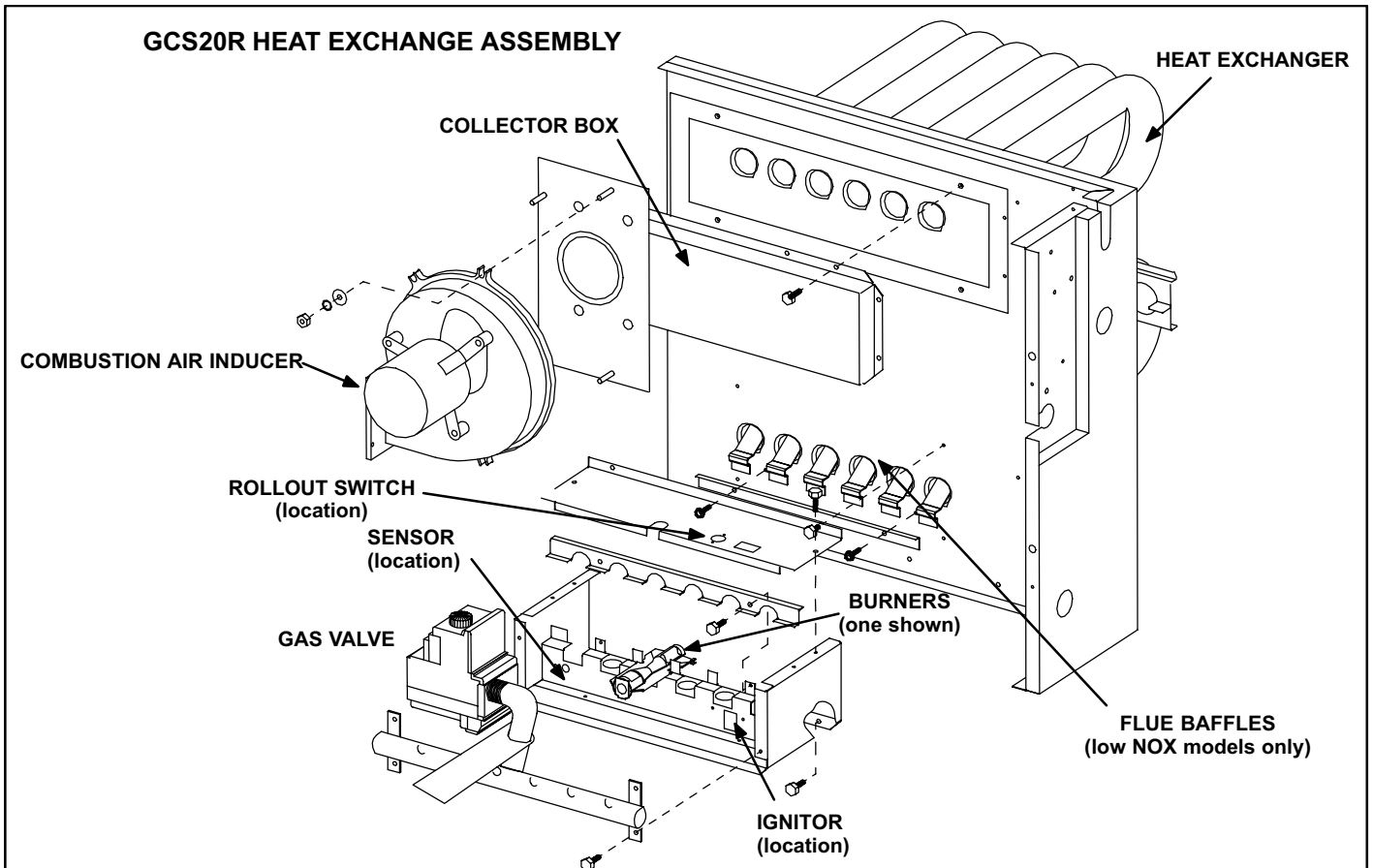


FIGURE 4

B-Heating Components

Heating components are illustrated in figure 4.

1-Heat Exchanger (Figure 4)

All units use an aluminized steel tubular heat exchanger. Each tube has a matching inshot burner. Combustion takes place at each tube entrance and is drawn upwards through each tube by the combustion air blower. Heat is transferred from all surfaces of the heat exchanger tubes. The supply air blower which is controlled by the ignition control, forces air across all surfaces of the tubes to extract the heat of the combustion. The shape of the tubes ensure maximum heat exchange.

2-Burner Assembly (Figure 4)

The burners are controlled by the spark electrode, flame sensing electrode, gas valve GV1 and combustion air blower B6. The spark electrode, flame sensing electrode and gas valve GV1 are directly controlled by ignition control A3. Ignition control A3 is controlled by combustion air blower B6. Combustion air blower B6 is controlled by heating demand from the thermostat or control system.

a-Burners

All units use inshot burners. Burners are factory set and do not require adjustment. Burner shutters are designed to be fully open only. All units have a peep hole with cover in the access panel for flame viewing. Always operate unit with access panel in place. Burners can be individually removed for service. Burner maintenance and service is detailed in the MAINTENANCE section of this manual.

b-Orifice

Each burner uses an orifice which is matched to the burner input. The orifice is threaded into the manifold. The burner is supported by the orifice and will easily slide off for service.

Each orifice and burner are sized specifically to the unit. Refer to unit nameplate or Lennox Repair Parts for correct sizing.

3-Primary High Temperature Limit S10

S10 is the primary limit for gas heat. S10 is located in the blower deck (figure 5) on all GCS20R model units. Primary limit S10 is wired to the ignition control A3. It's N.C. contacts open to de-energize the ignition control when excessive heat is reached in the blower compartment. At the same time, the N.O. contacts close maintaining power to blower relay K20 and power to indoor blower B3. Set point is factory set and cannot be adjusted. See table 1.

TABLE 1

Unit	S10 Set Point °
GCS20R-024	180
GCS20R-030	190
GCS20R-036, -042, -048, -060	145

4-Flame Rollout Switch S47

Flame rollout switch S47 is a high temperature limit located just above the burner on all units. See figure 4. The limit is a N.C. SPST manual reset thermostat connected in series with ignition control A3. When S47 senses flame rollout, ignition control immediately stops ignition and closes the gas valve. The switch is factory set to open at $180^{\circ}\text{F} \pm 8$ ($82^{\circ}\text{C} \pm 1.3^{\circ}$) and cannot be adjusted. S47 on GCS20R(X) units will open at $200^{\circ}\text{F} \pm 12^{\circ}$ ($93.3^{\circ}\text{C} \pm 11^{\circ}$).

5-Secondary Limit S21

GCS20R-024 and 030 units are equipped with a secondary limit located on the blower scroll. See figure 5. The limit is an auto-reset thermostat which opens on a temperature rise. It is electronically connected in series with the ignition control. The limit is used to de-energize the ignition control and shut down the burners when temperature in the blower scroll becomes too high. The limit is factory preset to open at $180^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($82^{\circ}\text{C} \pm 15^{\circ}$) on a temperature rise and close at $140^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($60^{\circ}\text{C} \pm 12^{\circ}$) on a temperature fall. It is not adjustable. This is a safety shut-down function of the unit.

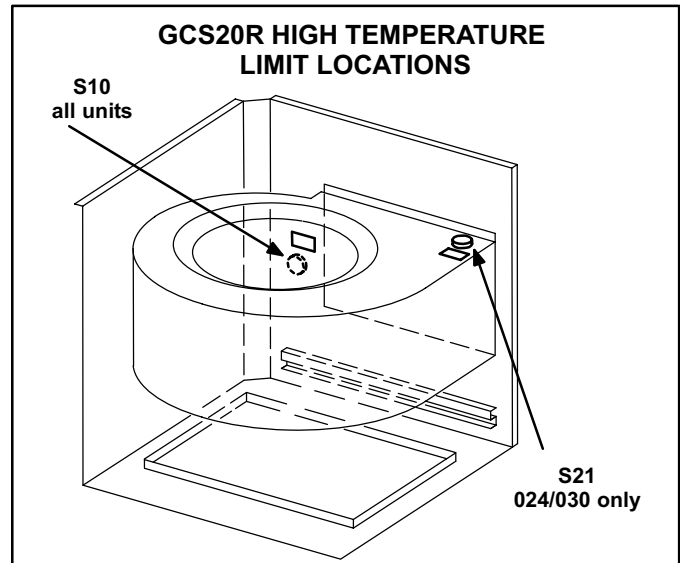


FIGURE 5

6-Combustion Air Prove Switch S18

The combustion air prove switch (S18) is a SPST N.O. differential pressure switch used to monitor combustion air inducer operation. A flexible hose connects one side of the switch to the blower housing. The other side of the switch is open to the atmosphere. The switch is wired in series with ignition control A3. Prove switch S18 closes when combustion air inducer reaches full speed to allow the ignition control to energize. This proves that the combustion air inducer is operating and allows the heating cycle to continue.

Combustion air prove switch S18 is factory set and non-adjustable. Set point will be on the side of switch.

7-Combustion Air Inducer B6

Combustion air inducer B6 provides fresh air to the burner while clearing the combustion chamber of exhaust gases. The inducer uses a shaded pole, 208/230VAC, single phase, 1/25 hp motor. The blower begins operating immediately upon receiving a thermostat demand and is de-energized immediately when thermostat demand is satisfied. All combustion air blower motors are sealed and cannot be oiled.

The tube connecting the switch to the blower flue box must be sloped in a manner that will prevent condensate from collecting in the tube. It is normal for a small amount of condensate to form in the tube during unit operation. The tube and switch must be allowed to drain accumulated condensate between thermostat demands. If the tube is positioned so that accumulated condensate is trapped in the tube, the unit may run improperly or may lock out.

8-Flue Vent and Rain Shield (Figure 6)

⚠ IMPORTANT

Vent cap assembly must be installed without modification. Any modification to the vent cap assembly or failure to install assembly can result in improper operation and will void the AGA/CGA certification of the unit.

⚠ CAUTION

Do not start or operate unit unless vent cap is in place.

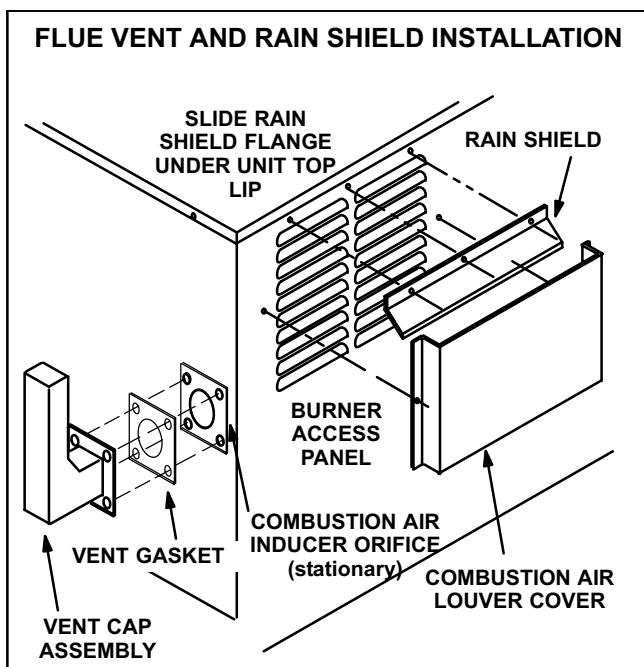


FIGURE 6

9-Gas Valve GV1

Gas valve GV1 (figure 7) is a single-stage redundant valve manufactured by Honeywell or White Rodgers. On a call for heat, the valve is energized by the ignition control simultaneously with the spark electrode. The valve opens 1/2 to 2 seconds. When the valve is de-energized, it closes in 1/2 to 3 seconds. A manual shut-off knob is provided on the valve for shut-off.

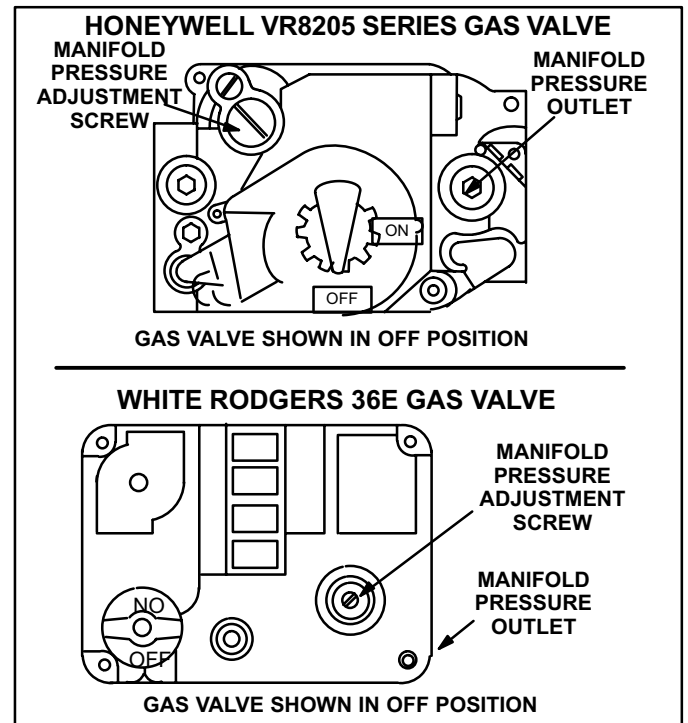


FIGURE 7

10-Ignitor

Ignitor tips are located in the path of the right most burner. See figure 4. The spark electrode is connected to the ignition control by a 8mm silicone insulated stranded high voltage wire. The wire uses 1/4" female quick connect on the electrode end and female spark plug-type terminal on the ignition control end. See figure 8 for gap dimension.

11-Sensor

The sensor tip is located in the left most burner path. See figure 4. Flame is sensed by rectification through the flame sensing electrode.

⚠ IMPORTANT

In order to maximize spark energy to the electrode, the high voltage wire should not rest on the bottom of unit vestibule panel and should touch unit cabinet as little as possible.

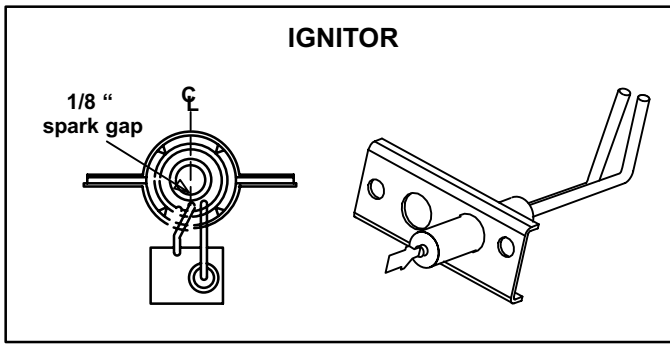


FIGURE 8

12-Ignition Control A3

⚠ DANGER

Shock Hazard.

Spark related components contain high voltage. Disconnect power before servicing unit. The ignition control is not field repairable.

Can cause unsafe operation, injury or death.

Electronic direct spark ignition with flame rectification sensing is used in GCS20R units. **Flame strength ranges from 0.5 to 1.0 micro-amps.** In GCS20R units, ignition control A3 is located in the heating compartment.

Johnson Control Figure 9

On a heating demand, the ignition control is energized after proving combustion air inducer operation. The control allows 30 to 40 seconds for the combustion air inducer to vent exhaust gases from the burner. The ignition control then activates gas valve GV1, the spark electrode, the flame sensing electrode and blower relay K25. The ignition control is not adjustable.

The Johnson control is illustrated in figure 9. The unit wires plug directly into the side of the control. The spark electrode wire connects to the spark plug-type connector on top of the control.

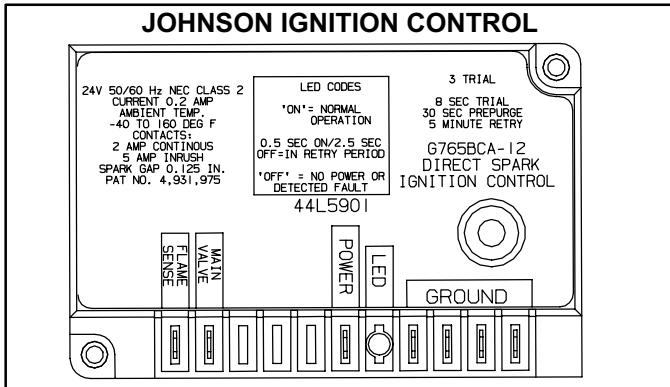


FIGURE 9

- a- The ignition control provides three main functions: gas valve control, ignition and flame sensing. It is powered only after the combustion air prove switch has closed and as long as other safety switch circuits are closed. The ignition attempt sequence provides three trials for ignition before locking out for 5 minutes. The blower control (K25) is energized simultaneously with the gas valve, so the blower will energize 45 seconds after flame has successfully been established. The unit will usually ignite on the first attempt. See figure 11 for a normal ignition sequence with nominal timings for simplicity.
- b- Proper gas/air mixture is required for ignition on the first attempt. If there is any deviation, within tolerance of the unit, a second or third trial may be necessary for ignition. The control will lock out the heating system if ignition is not obtained within three trials and the (indoor) blower will not start. Reset after lockout requires only breaking and re-making thermostat demand. See figure 11 for the ignition attempt sequence with retries (nominal timings given for simplicity). Loss of flame during a heating cycle is indicated by an absence of flame signal. If this happens, the control will immediately restart the ignition sequence and then lock out if ignition is not gained within three trials.
- c- The specific timings for the Johnson ignition control are shown in figure 11.

United Technologies Control Figure 10

The ignition control provides four main functions: gas valve control, blower control, ignition, and flame sensing. The control has a green LED to show control status (table 2). The control is designed to ignite on the first attempt; however, the ignition attempt sequence provides three trials for ignition before locking out. The lockout time for is 1 hour . A After lockout, the ignition control automatically resets and provides three more attempts at ignition. Manual reset after lockout requires breaking and remaking power to the ignition control. 24 volt thermostat connections (P2) and heating component connections (P1) are made through separate jackplugs. See table 3 for thermostat terminations and table 4 for heating component terminations.

TABLE 2

LED	STATUS
Slow Flash	Normal operation. No call for heat.
Fast Flash	Normal operation. Call for heat.
2 Flashes	Lockout. Failed to detect or sustain flame.
3 Flashes	Prove switch or Rollout Switch open or closed.
4 Flashes	Limit switch open.
5 Flashes	Flame sensed but gas valve not open.
Steady	Internal failure in the control.

TABLE 4

P1 TERMINAL DESIGNATIONS	
Pin #	Function
1	Limit Switch Out
2	Rollout Switch / Prove Switch Out
3	Ground
4	Gas Valve Out
5	Rollout Switch / Prove Switch In
6	Limit Switch In

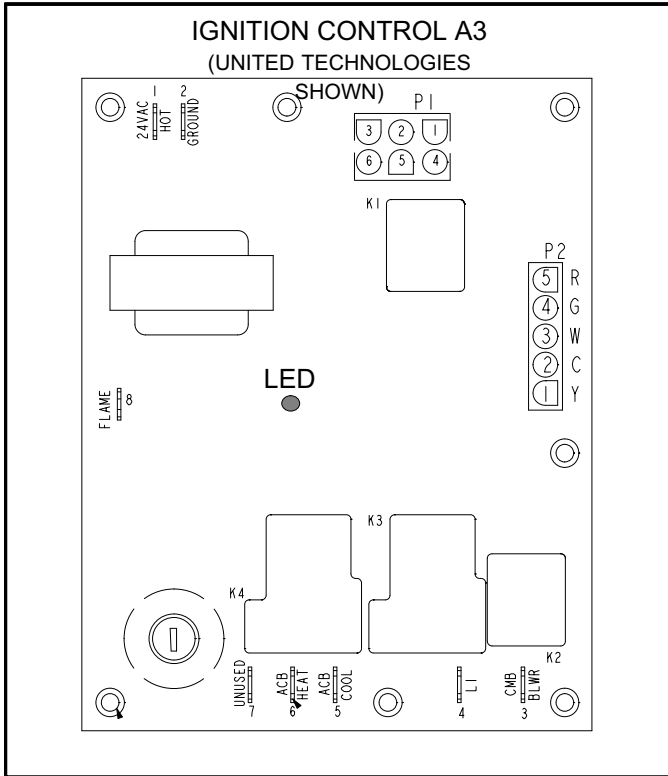


FIGURE 10

TABLE 3

P2 TERMINAL DESIGNATIONS	
Pin #	Function
1	Y Cool Demand
2	C Common
3	W1 Heat Demand
4	G Indoor Blower
5	R 24 Volts to thermostat

Flame rectification sensing is used on all GCS20 units. Loss of flame during a heating cycle is indicated by an absence of flame signal (< 0.5 microamps). If this happens, the control will immediately restart the ignition sequence and then lock out if ignition is not gained after the third trial. See System Service Checks section for flame current measurement.

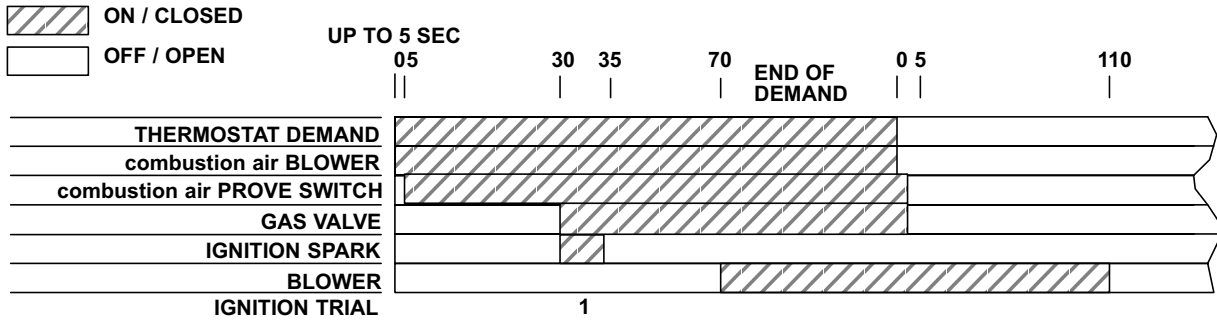
The control shuts off immediately in the event of a power failure. Upon restoration of power, the control will restart the ignition sequence and continue until flame is established or system locks out.

Operation

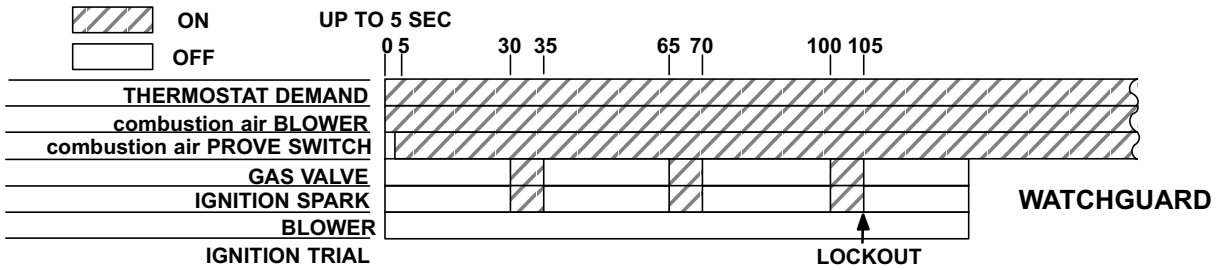
On a heating demand, the ignition control checks for a closed limit switch and open prove switch. Once this check is complete and conditions are correct, the ignition control then allows 30 seconds for the combustion air inducer (CAI) to vent exhaust gases from the burners. When the CAI is purging the exhaust gases, the CAI prove switch is closing proving that the CAI is operating before allowing the ignition control to energize. If the prove switch does not close within the 300 seconds, the control de-energizes the CAI for another 300 seconds and then re-energizes the CAI again. This cycle will continue as long as there is a call for heat and the CAI prove switch is open. Once the CAI switch is proven closed, the control begins a 30 second pre-purge period. After the pre-purge period the ignition control activates gas valve, the spark electrode and the flame sensing electrode. Once the gas valve is energized the non-adjustable 45 second indoor blower delay period begins. Sparking stops immediately after flame is sensed.

The control then proceeds to “steady state” mode where all inputs are monitored to ensure the limit switch, rollout switch and prove switch are closed as well as flame is present. When the heat call is satisfied the gas valve is de-energized and a 150 second blower off delay begins.

JOHNSON NORMAL IGNITION SEQUENCE - TIMINGS NOMINAL



RETRIALS - IGNITION ATTEMPT SEQUENCE - TIMINGS NOMINAL



IGNITION CONTROL TIMING

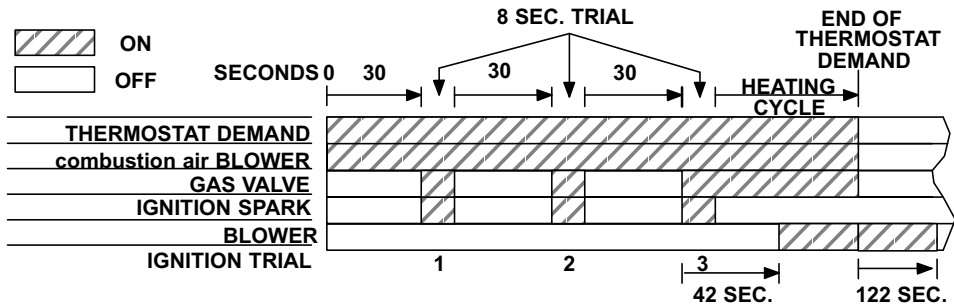


FIGURE 11

COOLING COMPONENTS GCS20R

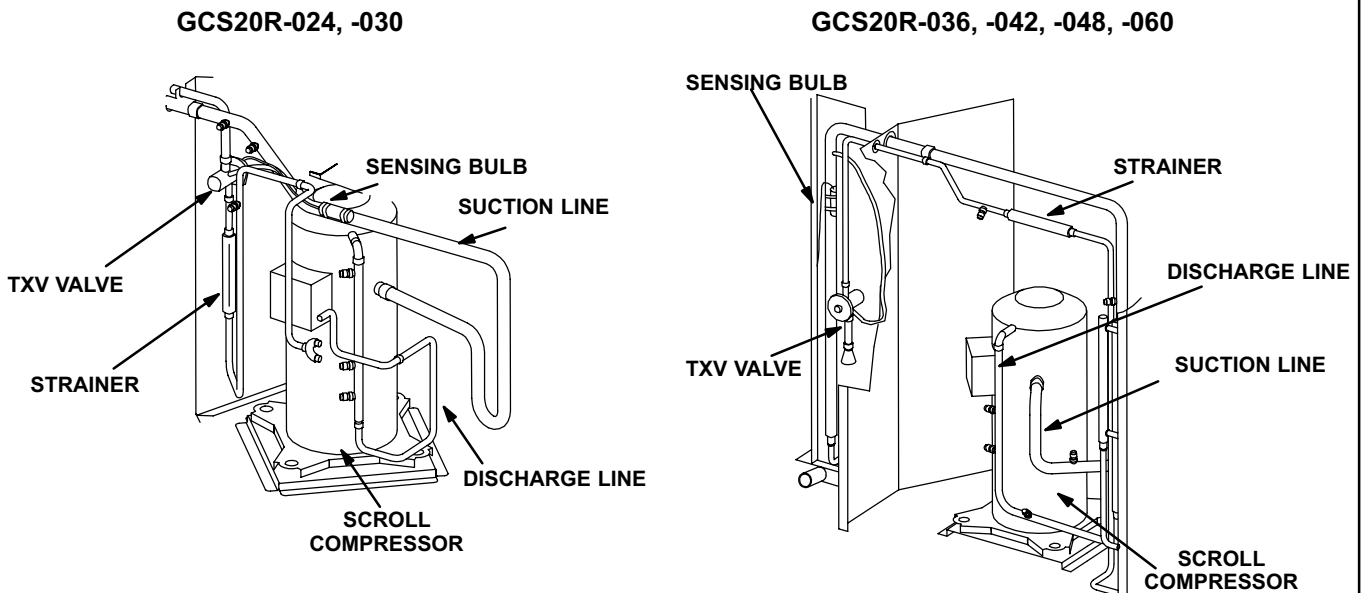


FIGURE 12

C-Cooling Components Figure 12

⚠ WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.

Failure to follow this warning may result in personal injury or death.

All units use DX cooling. All units use a single slab-type enhanced fin evaporator with rifled tubing and a thermal expansion valve “TXV” as the primary expansion device. All models use draw-through type condenser fans.

1-Scroll Compressor

All GCS20R model units utilize a scroll compressor. The scroll compressor design is simple, efficient and requires few moving parts. A cutaway diagram of the scroll compressor is shown in figure 13. The scrolls are located in the top of the compressor can and the motor is located in the bottom of the compressor can. The oil level is immediately below the motor and oil is pressure fed to the moving parts of the compressor. The lower portion of the compressor shell is exposed to low side pressure while only the very top of the shell is exposed to high side pressure.

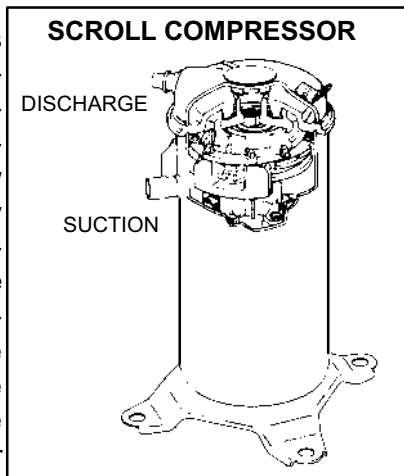


FIGURE 13

The scroll is a simple compression concept centered around the unique spiral shape of the scroll and its inherent properties. Figure 14 shows the basic scroll form. Two identical scrolls are mated together forming concentric spiral shapes (figure 15).

One scroll remains stationary, while the other is allowed to orbit (figure 16-1). Note that the orbiting scroll does not rotate or turn but merely orbits the stationary scroll.

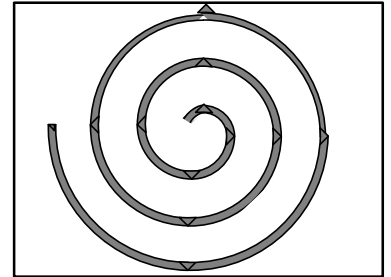


FIGURE 14

The counterclockwise orbiting scroll draws gas into the outer crescent shaped gas pocket created by the two scrolls (figure 16-2). The centrifugal action of the orbiting scroll seals off the flanks of the scrolls (figure 16-3). As the orbiting motion continues, the gas is forced toward the center of the scroll and the gas pocket becomes compressed (figure 16-4).

When compressed gas reaches the center, it is discharged vertically into a chamber and discharge port in the top of the compressor (figure 13). The discharge pressure forcing down on the top scroll helps seal off the upper and lower edges (tips) of the scrolls (figure 15). During a single orbit, several pockets of gas are compressed simultaneously providing smooth continuous compression.

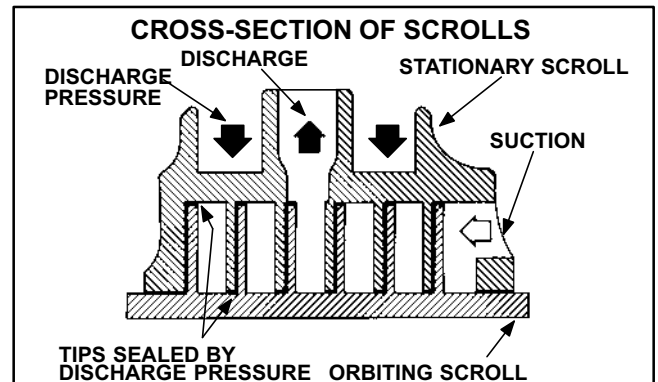


FIGURE 15

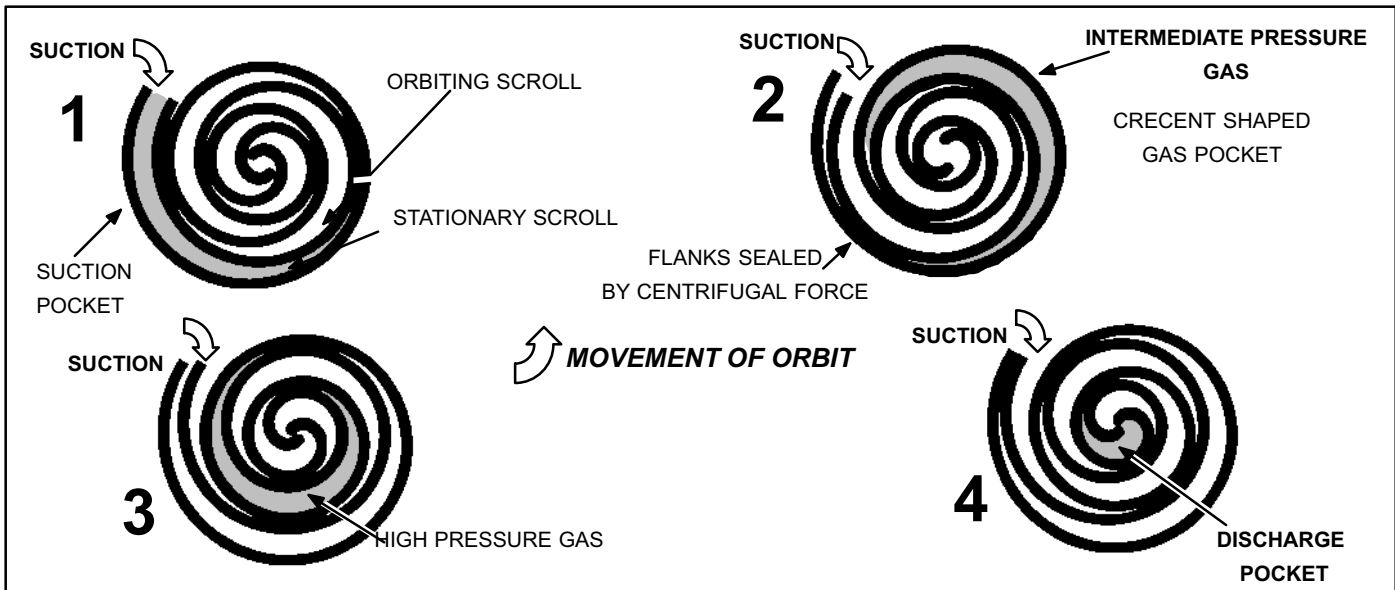


FIGURE 16

The scroll compressor is tolerant to the effects of liquid return. If liquid enters the scrolls, the orbiting scroll is allowed to separate from the stationary scroll. The liquid is worked toward the center of the scroll and is discharged. If the compressor is replaced, conventional Lennox cleanup practices must be used.

Due to its efficiency, the scroll compressor is capable of drawing a much deeper vacuum than reciprocating compressors. Deep vacuum operation can cause internal fuse arcing resulting in damaged internal parts and compressor failure. It is permissible to “pump-down” the system using the compressor but never use a scroll compressor for drawing a vacuum on the system. This type of damage can be detected and will result in denial of warranty claims.

<p>⚠ CAUTION</p> <p>The head of a scroll compressor may be hot since it is in constant contact with discharge gas. Contact could result in serious burns.</p>

For compressor specifications see compressor nameplate or ELECTRICAL DATA section in this manual. All compressors are protected by internal overload protection circuitry.

2-Dual Capacitor C12

GCS20R units use a single “dual” capacitor for both the fan motor and the compressor. The fan side of the capacitor and the compressor side of the capacitor have different mfd ratings. The capacitor is located inside the compressor compartment. Ratings will be printed on capacitor side.

<p>⚠ DANGER</p>	
	<p>Shock hazard.</p> <p>Compressor must be grounded. Do not operate without protective cover over terminals. Capacitors contain high voltage. Disconnect power before removing cover. Discharge capacitors before servicing unit. Disconnect power before servicing unit.</p> <p>Can cause unsafe operation, injury or death.</p>

3-Condenser Fan and Motor B4

The specifications section in this manual shows the specifications of condenser fans used in GCS20Rs. The condenser fan in all units is controlled by cooling contactor K1.

4-Condenser Fan Motor Capacitor C1

All GCS20R units use single-phase PSC condenser fan motors. See condenser fan motor nameplate for capacitor ratings.

5-Blower Motor B3 and Run Capacitor C4

All GCS20R series units use single-phase PSC blower motors. A single run capacitor is mounted on the blower housing. Ratings for capacitor will be on motor nameplate. All motors use multiple speed taps. Typically, the high speed tap is energized during compressor operation and a lower speed tap is energized during heating operation. See motor nameplate or ELECTRICAL DATA section for motor specifications.

6-Evaporator Coil

All GCS20Rs have a single slab evaporator coil. The GCSR20-024, -030, -036 and -042 coil has two rows of rifled copper tubes fitted with ripple-edged aluminum fins while the -048 and -060 units have three. A Thermal Expansion Valve (TXV) feeds multiple parallel circuits through the coil. See figure 17.

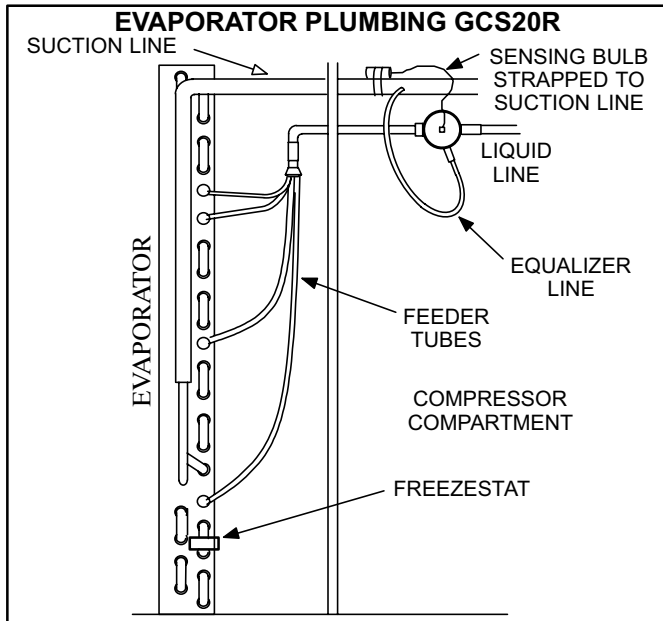


FIGURE 17

7-Freezestat Switch S49

All GCS20R units are equipped with a low temperature freezestat switch S49 located on the evaporator coil. S49 is wired in series with compressor contactor K1. S49 is a SPST N.C. auto-reset switch which opens at $29^{\circ}\text{F} \pm 3^{\circ}\text{F}$ ($-1.7^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$) on temperature drop and closes at $58^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($14.4^{\circ}\text{C} \pm 2.2^{\circ}\text{C}$) on a temperature rise. To prevent coil icing, S49 opens during compressor operation to temporarily disable the compressor until the coil warms sufficiently to melt any accumulate frost.

If S49 trips frequently due to coil icing, check the unit charge, air flow and filters before allowing unit back in operation. Make sure to eliminate conditions which might promote ice build up.

8-Condenser Coil

All GCS20Rs have a single condenser coil. All models have two rows of copper filled tubes with ripple-edged aluminum fins.

III-PLACEMENT AND INSTALLATION

Make sure that the unit is installed in accordance with the installation instructions and all applicable codes. See accessories section for conditions requiring use of the optional roof mounting frame (RMF16).

IV-ELECTRICAL CONNECTIONS


A-Field Wiring

Unit and optional thermostat field wiring is shown in the unit diagram section of this manual.

B-Power Supply

Refer to start-up directions and refer closely to the unit wiring diagram when servicing. Refer to unit nameplate for minimum circuit ampacity and maximum fuse size. 230 volt units are factory wired with orange wire connected to control transformer primary. 208 volt units are field wired with red wire connected to control transformer primary.

⚠ DANGER



All SINGLE PHASE units use single pole contactors. One leg of compressor, capacitor and condenser fan are connected to line voltage at all times.

Remove all power to disconnect before servicing.

Electrical shock resulting in death or injury may result if power is not disconnected.

V-START-UP - OPERATION

A-Preliminary Checks

- 1 - Make sure unit is installed in accordance with the installation instructions and applicable codes. Make sure filter is in place,
- 2 - Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.
- 3 - Check to ensure that refrigerant lines are in good condition and do not rub against the cabinet or other refrigerant lines.
- 4 - Check voltage at the disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have the voltage condition corrected before starting the unit.
- 5 - Recheck voltage with unit running. If power is not within range listed on unit nameplate, stop unit and consult power company. Check amperage of unit. Refer to nameplate for correct running amps.

B-Cooling Start-Up

⚠ IMPORTANT

The following is a generalized procedure and does not apply to all thermostat systems. Electronic thermostats may operate differently. Refer to the operation sequence section of this manual for more information.

- 1 - Set fan switch to AUTO or ON and move the system selection switch to COOL. Adjust the thermostat to a setting far enough below room temperature to bring on the compressor.
- 2 - Close unit disconnect switch. Compressor will start and cycle with demand.
- 3 - The cooling circuit is charged with R-22 refrigerant. See rating plate for correct amount of charge.
- 4 - Refer to the Refrigeration System Service Checks section for the proper method of checking charge.

C-Heating Start-Up:

⚠ WARNING

Shock and burn hazard.

This unit is equipped with a direct spark ignition system. Do not attempt to light manually.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

Gas Valve Operation (Figure 18)

This unit is equipped with an automatic spark ignition system. There is no pilot. In case of a safety shutdown, move thermostat switch to "OFF," then return the thermostat switch to "HEAT" position.

- 1- If using electro-mechanical thermostat, set to the lowest setting.
- 2- Turn off all electrical power to appliance.
- 3- This appliance is equipped with an ignition device which automatically lights burner. Do **not** try to light burner by hand.
- 4- Remove heat access panel.

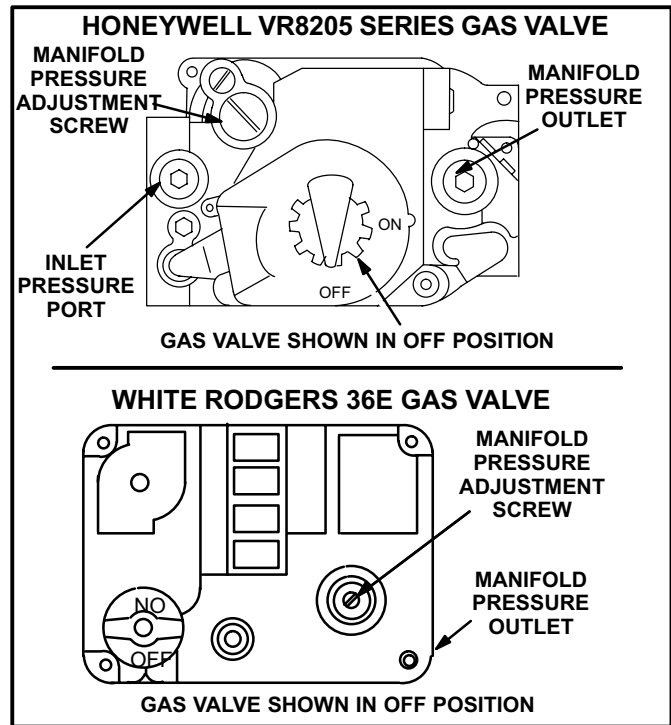







FIGURE 18

- 5- *Honeywell VR8205* - Turn knob on gas valve clockwise  until it stops. Depress knob and turn clockwise  to **OFF**.
White Rodgers 36E - Turn knob on gas valve 180° either way to **OFF**.
- 6- Wait five minutes to clear out any gas. If you then smell gas, STOP! Immediately call your gas supplier from your neighbor's phone. Follow the gas supplier's instructions. If you don't smell gas go to next step.
- 7- *Honeywell VR8205* - Turn knob on gas valve counterclockwise  until it stops. Allow knob to pop up and continue counterclockwise to **ON** position.
White Rodgers 36E - Turn knob on valve 180° either way to **ON**.
- 8- Replace heat section access panel.
- 9- Turn on electrical power to unit. If using electro-mechanical thermostat, set to desired setting.
- 10-The combustion air inducer will start. The burners will light within 40 seconds.
- 11-If unit does not light first time (gas line not fully purged) it will attempt up to two more ignitions before locking out.
- 12-If lockout occurs, repeat steps 1 through 10.
- 13-If the appliance will not operate, follow the instructions "To Turn Off Gas To Unit" and call your service technician or gas supplier.

B-To Turn Off Gas To Unit

- 1- Set thermostat to lowest setting.
- 2- Turn off all electric power to unit if service is to be performed.
- 3- Remove control access panel.
- 4- Turn knob on Honeywell gas valve clockwise  until it stops. Depress knob and turn clockwise  to **OFF**. Turn knob on White Rodgers 180_ either way to off. Do not force.
- 5- Replace burner access panel.

D-Safety or Emergency Shutdown:

Turn off power to the unit. Close the manual and/or main gas valves.

E-Extended Period Shutdown:

Turn off the thermostat or set to “UNOCCUPIED” mode. Close all gas valves both internal and external to the unit to prevent gas leakage into the combustion chamber. Turn off power to the unit. All access panels, covers and vent caps must be in place and secured.

VI-REFRIGERATION SYSTEM SERVICE CHECKS

A-Cooling Start-Up

- 1 - Set thermostat system switch in “Cool” position, fan switch in “On” or “Auto” position and adjust room thermostat to a setting below room temperature.
- 2 - Close unit disconnect switch.
- 3 - Compressor will start and cycle on thermostat demand.

B-Charging

It is not recommended that the system be charged below 60°F (15°C). If charging below 60°F (15°C) is required or if system is completely void of refrigerant, the recommended and most accurate method of charging is to weigh the refrigerant into the unit according to the amount shown on the unit rating plate.

Approach Method

If ambient temperature is above 60° F (15° C), read liquid line temperature. Approach temperature is the difference between liquid line temperature and ambient temperature.

IMPORTANT-Use the same thermometer for both temperature readings.

Approach temperature should be as shown in table 5. Refrigerant must be added to lower approach temperature. Remove refrigerant from system to increase approach temperature.

TABLE 5
GCS20 APPROACH TEMPERATURES

UNIT	Liquid Line Temperature Minus Ambient Temperature
GCS20-024	6°F ± 1 (3.3°C ± 0.5)
GCS20-030	10°F ± 1 (5.5°C ± 0.5)
GCS20-036	8°F ± 1 (4.4°C ± 0.5)
GCS20-042	6°F ± 1 (3.3°C ± 0.5)
GCS20-048	7°F ± 1 (3.9°C ± 0.5)
GCS20-060	8°F ± 1 (4.4°C ± 0.5)

VII-HEATING SYSTEM SERVICE CHECKS

A-C.S.A.

Applications and Requirements

All GCS20Rs are C.S.A. design certified without modification.

Refer to the GCS20R Operation and Installation Instruction Manual for more information.

B-Gas Piping

Gas supply piping must not allow more than 0.5”w.c. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

Compounds used on threaded joints of gas piping should be resistant to the action of L.P. gas.

C-Testing Gas Piping Pressure

IMPORTANT

In case emergency shutdown is required, turn off the main shut-off valve and disconnect the main power to unit. These controls should be properly labeled by the installer.

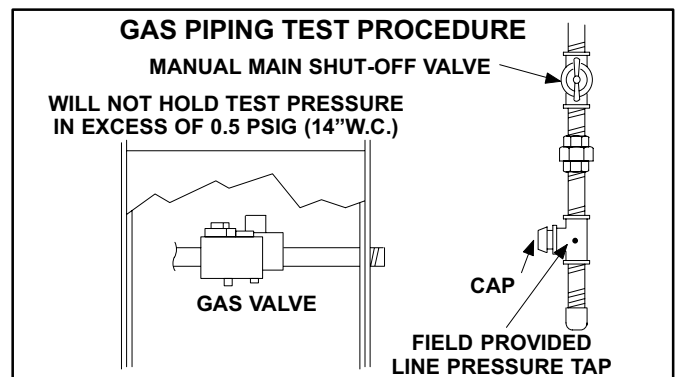


FIGURE 19

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (14”w.c.). See Figure 19.

If test pressure is equal to or less than 0.5 psig (14”w.c.), use the main manual shut-off valve before testing to isolate unit from gas supply system.

When checking piping connection for gas leaks, use a soap solution or other preferred means. Do not use matches, candles, flame, or other source of ignition to check for gas leaks.

D-Testing Gas Supply Pressure

When testing gas supply pressure, connect test gauge to the inlet pressure tap (field provided). Test supply gas pressure with unit firing at maximum rate. Make sure the reading falls within the range of the following values. Low pressure may result in erratic operation or “underfire.” High pressure can result in permanent damage to the gas valve or “overfire.” For natural gas units, operating pressure at the unit gas connection must be between 4.5”w.c. and 10.5”w.c. For L.P. gas units, operating pressure at the unit gas connection must be between 11.0”w.c. and 13.0”w.c.

On multiple unit installations, each unit should be checked separately, with and without the other units operating. Supply pressure must fall within the range listed in the previous paragraph.

E-Check and Adjust Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Refer to figure 18 for location of manifold pressure adjustment screw and pressure tap outlet.

The gas valve is factory set and should not require adjustment. Manifold pressure for natural gas units is 3.5”w.c. ± 0.3 (.87kPa ± .074) and for propane units, 9.5”w.c. ± 0.5 (2.36kPa ± .12). The gas valve should completely and immediately cycle off in the event of gas or power failure. The manual shut-off knob can be used to immediately shut off gas supply.

⚠ IMPORTANT

For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

- 1 - Connect a test gauge to the outlet pressure tap on the gas valve. Start the unit and allow five minutes for the unit to reach steady state.
- 2 - While waiting for the unit to stabilize, notice the flame. The flame should be stable without flashback and should not lift from the burner head. Natural gas should burn blue. L.P. gas should burn mostly blue with some orange streaks.
- 3 - After allowing the unit to stabilize for five minutes, record the manifold pressure.

- 4 - Disconnect heating demand as soon as an accurate reading has been obtained.

F-Proper Gas Flow (Approximate)

Unit should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in table 6. Seconds in table 6 are based on a 1 cu.ft. dial and gas value of 1000 btu’s for natural and 2500 btu’s for LP. Adjust manifold pressure on gas valve to match time needed.

TABLE 6

Unit in Btu’s	Seconds for Natural	Seconds for Propane
50,000	72	180
75,000	48	120
90,000	40	100
120,000	30	75

G-High Altitude Derate

Unit does not need gas pressure adjustment when operating from 0 to 7500 ft. (0 to 2248m.)

H-Flame Sensing

Flame current is an electrical current which passes from the ignition control through the sensor electrode during unit operation. The current passes from the sensor through the flame to ground electrode to complete a safety circuit. The minimum flame current necessary to keep the ignitor from lockout is 0.1 microamps. The electrodes should be located so the tips are at least 1/2” inside the flame envelope. Do not bend electrodes. To measure flame current, follow the procedure below:

- 1 - Disconnect power to unit.
- 2 - Remove lead from sensing electrode and install a microamp meter in series between the sensing electrode and the sensing lead.
- 3 - Reconnect power and adjust thermostat for heating demand.
- 4 - When flame is established, meter reading should be .5 to 1.0 microamps. Do not bend electrodes.
- 5 - If the meter scale reads 0, the leads are reversed. Disconnect power and reconnect leads for proper polarity.
- 6 - When finished, disconnect power to unit before disconnecting meter. Make sure sensor wire is securely reconnected before reconnecting power to unit.

VIII-INDOOR BLOWER OPERATION / ADJUSTMENT

A-Blower Operation

The following is a generalized procedure and does not apply to all thermostat control systems.

- 1 - Blower operation is dependent on the thermostat option that has been installed in the GCS20R.
- 2 - Generally, blower operation is set at the thermostat subbase fan switch. With the fan switch in the "ON" position, the blower operates continuously. With the fan switch in the "AUTO" position, the blower cycles with demand (or, with some control systems, runs continuously while the heating or cooling circuits cycle).
- 3 - In most cases, the blower and entire unit will be off when the system switch is in the "OFF" position. The only exception is immediately after a heating demand until blower control switches off.

B-Determining Unit CFM

- 1 - The following measurements must be made with a dry indoor coil. Run the blower without the cooling demand. Air filters must be in place when measurements are taken.
- 2 - Measure static pressure external to the unit (from supply to return).

To Measure Discharge Static Pressure:

- a - Measure tap locations as shown in figure 20.
- b - Punch a 1/4" diameter hole. Insert manometer hose flush with the inside edge of hole or insulation. Seal around hole with permagum. Connect zero end of manometer to the discharge (supply) side of system. Connect other end of manometer to return duct as above.

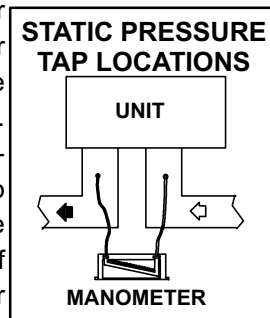


FIGURE 20

- c - With only the blower motor running, observe the manometer reading.
- d - Seal around the hole when check is complete.

- 3 - The CFM can be adjusted by changing the motor speed taps. Follow the blower speed change instructions below.

C-Blower Speed Adjustment

Blower speed selection is accomplished by changing the taps in the harness connector at the blower motor (see figure 21). See wiring diagram for blower speeds.

Each motor port in a leadless motor (figure 21) is analogous to speed taps (pigtailed) used in previous Lennox units. Each motor is capable of four or five different speeds depending on unit (refer to unit wiring diagram). Each unit is factory wired to provide a single cooling speed and a single heating speed. Speeds can be changed by moving the cooling wire or the heating wire to a different port at the harness connector.

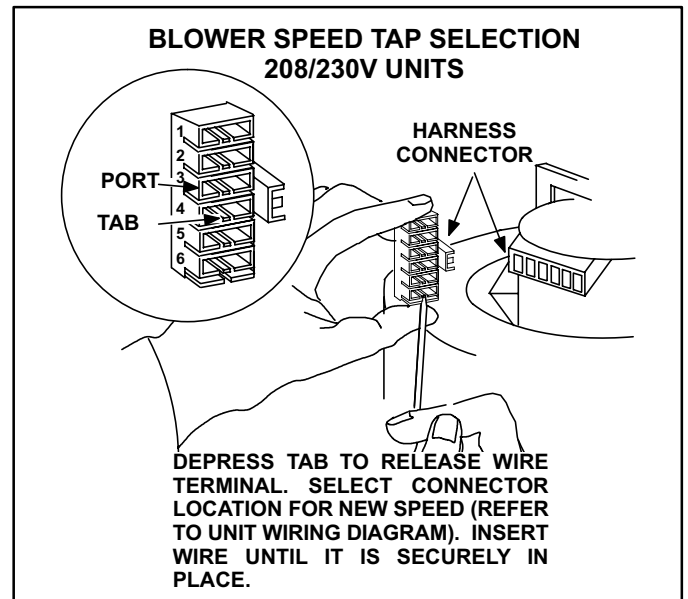


FIGURE 21

Heating Speed:

Factory blower speeds are listed in a table on the unit wiring diagram. Adjust the blower heating speed for proper air temperature rise (listed on unit rating plate). To measure temperature rise, place thermometers in the supply and return air plenums. Turn up thermostat to start the unit. After plenum thermometers have reached their highest and most steady readings, subtract thermometer readings. The difference should be in the range listed on unit rating plate. If this temperature is high, wire the blower to a higher speed; if resulting temperature is too low, wire the blower to a slower speed. Repeat this procedure until desired temperature rise is obtained.

Cooling Speed:

Factory blower speeds are listed in a table on the unit wiring diagram. Blower performance tables are listed in the first section of this manual. Section "VIII-B-Determining Unit CFM" shows how to measure discharge static pressure. Once discharge static pressure has been determined, compare the value to the blower performance tables listed in the first section of this manual. If CFM is low, wire the blower to a higher speed; if CFM is high, wire the blower to a lower speed. Repeat this procedure until desired CFM is reached.

IX-MAINTENANCE

At the beginning of each heating season, the system should be checked as follows:

CAUTION

Potential for personal injury.

Disconnect power to unit before performing any maintenance or service operation. Avoid contact with sharp metallic edges.

Can cause personal injury or death.

CAUTION

Potential for personal injury.

Remember to follow lighting instructions attached to the unit before putting unit back into operation.

Can cause property damage, unit damage and personal injury or death.

A-Lubrication

All motor bearings are prelubricated and sealed. No further lubrication is needed.

B-Filters

Filters are field provided with the GCS20R units and are installed external to the unit. See Installation Instructions. Filters should be checked monthly (or more frequently in severe use) and cleaned or replaced regularly. Take note of the "AIR FLOW DIRECTION" marking on the filter frame when re-installing.

IMPORTANT

Filters must be U.L.C certified or equivalent for use in Canada.

C-Burners

Clean burner as follows:

- 1 - Turn off both electrical power and gas supply to unit.
- 2 - Open access panel to burner compartment.
- 3 - Remove burner retaining bracket and gas manifold. Lift burners from orifices.
- 4 - Clean as necessary and replace burners. Refit retaining brackets and gas manifold. Make sure that burner heads line up correctly. Spark gap on ignition electrode must be properly set. Refer to Heating Adjustment section. Close access panel.
- 5 - Restore electrical power and gas supply. Follow lighting instructions attached to unit to restart unit.

D-Combustion Air Inducer

All GCS20Rs use combustion air inducers with pre-lubricated sealed stainless-steel ball bearings.

A differential pressure switch (combustion air prove switch) is used to prove combustion air inducer operation. If the inducer is obstructed, the switch will not close and the ignition control will be locked out.

Under normal operating conditions, the combustion air inducer wheel should be inspected prior to the heating season to determine if cleaning is necessary. With the power supply disconnected, the condition of the blower wheel can be determined by looking through the vent opening.

Maintenance consists of:

- 1 - Checking prove switch. Prove switch should close at the factory setting shown on side of switch.
- 2 - Check the combustion air pressure switch hose for blockage or deterioration. Replace if necessary.
- 3 - Position hose so accumulated condensate can drain from the switch into blower housing.
- 4 - Clean combustion air blower assembly.

To clean combustion air blower:

- 1 - Shut off power supply and gas to the unit.
- 2 - Remove screws retaining the vent cap and combustion air inducer to the end panel. Clean vent cap as necessary. Check gaskets for deterioration. Replace if necessary.

! IMPORTANT

Pay close attention to the order in which flue orifice and gaskets are installed.

- 3 - Remove screws holding blower housing to the flue box cover plate and wires attached to motor.
- 4 - Remove combustion air inducer assembly.
- 5 - Clean with a wire brush as required.
- 6 - Remove burner assembly from unit as described in burner section the previous page.
- 7 - Clean heat exchanger tubes with a wire brush as required.
- 8 - Replace flue box cover and burner assembly. Replace combustion air inducer assembly including gaskets.

! CAUTION

Use care when cleaning combustion air blower wheel. Wheel is made of aluminum and may distort if too much pressure is applied.

- 9 - Reconnect tubing connecting blower to flue box. Arrange tubing so that it can drain accumulated condensate.
- 10 - Clean vestibule panel louvers using a small brush.

E-Flue

Make sure the flue is clean and free of debris.

F-Evaporator Coil

- 1 - Clean coil, if necessary.
- 2 - Check connecting lines and coil for oil leaks.
- 3 - Check condensate drain pan and line, if necessary.

G-Condenser Coil

- 1 - Clean and inspect condenser coil. (May be flushed with a water hose.)
- 2 - Visually inspect connecting lines and coils for evidence of oil leaks.

! IMPORTANT

If owner complains of insufficient cooling, unit should be gauged and refrigerant charge checked. Refer to gauge manifold attachment, checking charge and charging sections in this instructions.

H-Electrical

- 1 - Check all wiring for loose connections.
- 2 - Check for correct voltage at unit (unit operating).
- 3 - Check amp-draw on both condenser fan motor and blower motor.
Fan Motor Rating Plate ____ Actual _____
Indoor Blower Motor Rating Plate ____ Actual _____

X-ACCESSORIES

A-RMF16 Mounting Frame

When installing a GCS20R unit on a combustible surface for downflow discharge applications, RMF16 roof mounting (figure 22) frame is required. Otherwise, the RMF16 is recommended but not required. The GCS20R, if not mounted on a flat (roof) surface, **MUST** be supported under all edges and under the middle of the unit to prevent sagging. The GCS20R **MUST** be mounted level within 1/16" per linear foot in any direction.

The assembled RMF16 mounting frame is shown in figure 22. Refer to the RMF16 installation instructions for details of proper assembly and mounting. Roof mounting frame **MUST** be squared to roof before mounting. Plenum system **MUST** be installed before unit is set on mounting frame. Refer to RMF16 installation instructions for proper plenum construction.

Many types of roof framing or supports can be used to mount the GCS20R unit, depending upon different roof structures. A typical field fabricated roof mounting frame is shown in figure 23.

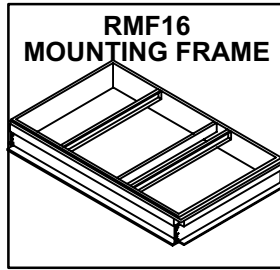


FIGURE 22

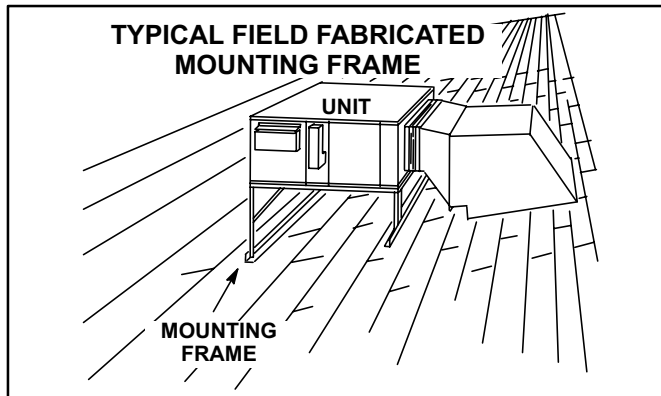


FIGURE 23

B-OAD16 Outdoor Air Damper

OAD16 damper section may be installed any place outside of the building in the return air duct. Refer to OAD16 installation instruction manual for specific details regarding installation. The washable filter supplied with the OAD16 can be cleaned with water and mild detergent. It should be sprayed with Filter Handicoater when dry prior to reinstallation. Filter Handicoater is R.P. Products coating no. 418 and is available as Lennox Part No. P-8-5069.

C-LPG Kit

All C.S.A rated GCS20Rs are factory set for use with natural gas. An optional L.P.G. conversion kit allows change-over from natural to L.P.G. supply. The kit includes a gas valve changeover kit and new gas orifices. See "OPTIONAL ACCESSORIES" section for kit number.

Refer to the L.P.G. conversion kit installation instruction for specific installation procedures.

D-Low Ambient Kit

The optional low ambient kit (figure 24) allows for mechanical cooling operation at low outdoor temperature.

Low ambient kit field wiring is shown in figure 25. The low ambient pressure switch is wired in series with the condenser fan L1 lead. Refer to the low ambient kit installation instruction manual for detailed installation instructions.

The low ambient pressure switch cycles the condenser fan while allowing normal compressor operation. This intermittent fan operation results in a high evaporating temperature which allows the system to operate without evaporator coil icing and losing capacity.

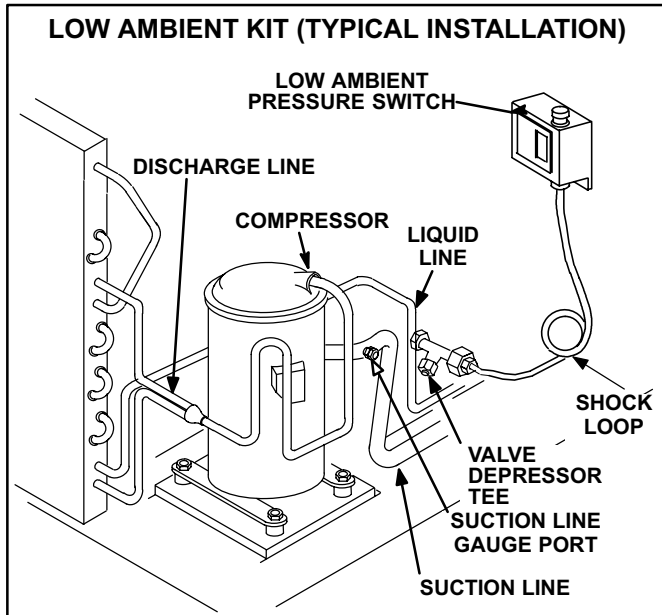


FIGURE 24

Adjustment:

The low ambient pressure switch is adjustable but the adjustment knob *does not* adjust CUT-IN or CUT-OUT points. CUT-IN point is fixed and cannot be adjusted. The scale on the switch measures the difference in pressure between preset CUT-IN and adjustable CUT-OUT points. Adjustment knob changes CUT-OUT point by adjusting the DIFFERENCE between CUT-IN and CUT-OUT.

The low ambient pressure switch is factory set to CUT-IN at 280psig with a difference of 140 psig (CUT-OUT at 140psig). Adjustment should not be needed. If adjustment is needed, adjust the switch as follows:

- 1 - Loosen knob securing screw to allow knob stop to pass over fixed stop on control (see figure 26).

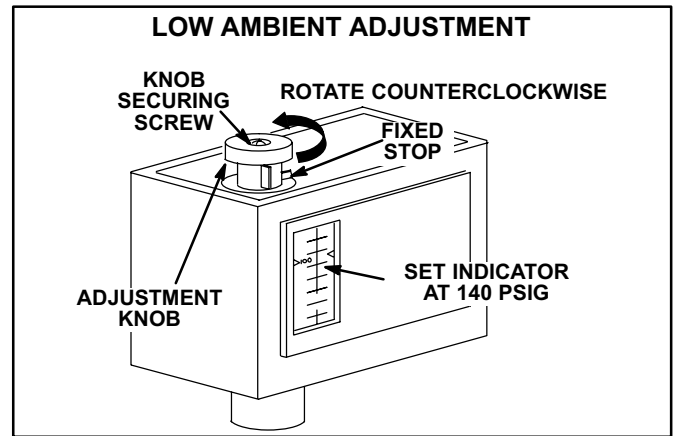


FIGURE 26

$DIFFERENCE$ (set by knob) = $CUT-IN POINT$ (fixed) minus $CUT-OUT POINT$

To find CUT-OUT point, this equation can be re-arranged:

$CUT-OUT = CUT-IN$ minus the $DIFFERENCE$.

- 2 - Rotate the knob as needed to set the difference indicator at 140psig (1000kPa).

- 3 - Tighten the securing screw after adjusting.

E-SRT-65 Transitions

Optional supply/return transitions are available for use with downflow GCS20Rs utilizing the optional RMF16 roof mounting frame. The transition must be installed in the RMF16 mounting frame before mounting the GCS unit to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

F-RTD9-65 and FD9-65 Diffusers

Optional flush mount diffuser/return FD9-65 and extended mount diffuser/return RTD9-65 are available for use with the GCS16 unit. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

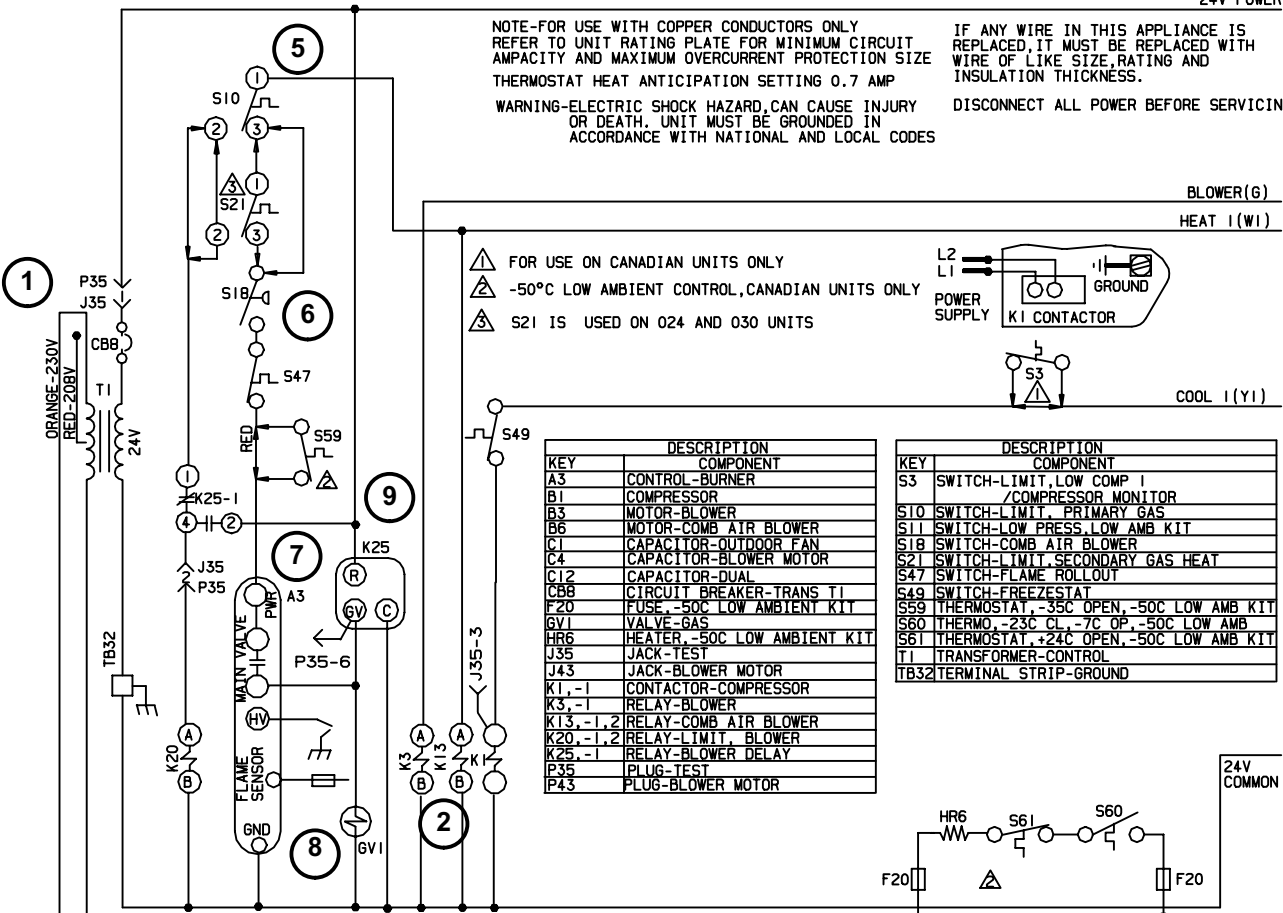
XI-Wiring Diagrams and Sequence of Operation

GCS20R WIRING DIAGRAM

24V POWER

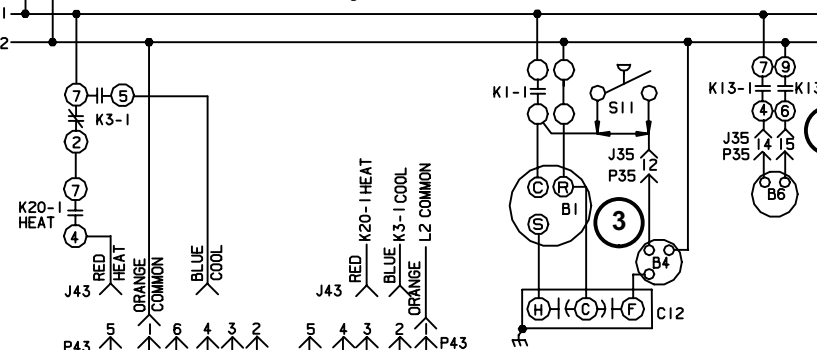
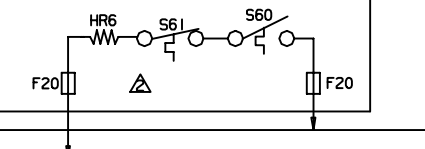
NOTE-FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE THERMOSTAT HEAT ANTICIPATION SETTING 0.7 AMP
 WARNING-ELECTRIC SHOCK HAZARD,CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

IF ANY WIRE IN THIS APPLIANCE IS REPLACED,IT MUST BE REPLACED WITH WIRE OF LIKE SIZE,RATING AND INSULATION THICKNESS.
 DISCONNECT ALL POWER BEFORE SERVICING



KEY	DESCRIPTION	COMPONENT
A3	CONTROL-BURNER	
B1	COMPRESSOR	
B3	MOTOR-BLOWER	
B6	MOTOR-COMB AIR BLOWER	
C1	CAPACITOR-OUTDOOR FAN	
C4	CAPACITOR-BLOWER MOTOR	
C12	CAPACITOR-DUAL	
CB8	CIRCUIT BREAKER-TRANS T1	
F20	FUSE,-50C LOW AMBIENT KIT	
GV1	V VALVE-GAS	
HR6	HEATER,-50C LOW AMBIENT KIT	
J35	JACK-TEST	
J43	JACK-BLOWER MOTOR	
K1,-1	CONTACTOR-COMPRESSOR	
K3,-1	RELAY-BLOWER	
K13,-1,2	RELAY-COMB AIR BLOWER	
K20,-1,2	RELAY-LIMIT, BLOWER	
K25,-1	RELAY-BLOWER DELAY	
P35	PLUG-TEST	
P43	PLUG-BLOWER MOTOR	

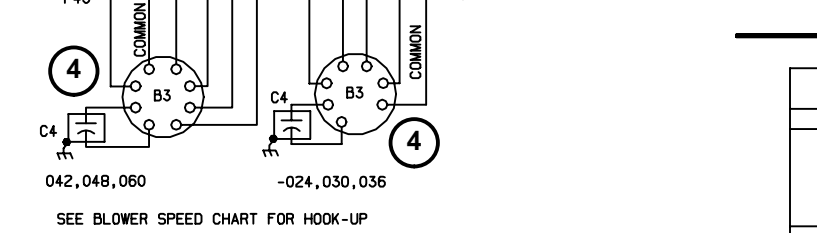
KEY	DESCRIPTION	COMPONENT
S3	SWITCH-LIMIT,LOW COMP I	
S10	SWITCH-LIMIT, PRIMARY GAS	
S11	SWITCH-LOW PRESS,LOW AMB KIT	
S18	SWITCH-COMB AIR BLOWER	
S21	SWITCH-LIMIT,SECONDARY GAS HEAT	
S47	SWITCH-FLAME ROLLOUT	
S49	SWITCH-FREEZE/STAT	
S59	THERMOSTAT,-35C OPEN,-50C LOW AMB KIT	
S60	THERMO,-23C CL,-7C OP,-50C LOW AMB	
S61	THERMOSTAT,+24C OPEN,-50C LOW AMB KIT	
T1	TRANSFORMER-CONTROL	
TB32	TERMINAL STRIP-GROUND	



UNITS	FACTORY CONNECTED SPEED TAPS		MOTOR SPEEDS AVAILABLE
	COOL	HEAT	
-024,-030	3	4	4
-036	3	4	5
-042,-048,-060	3	4	5

BLOWER SPEED SELECTION
 HI ← 3 4 5 → LO

SPEED TAPS	2	3	4	5	6
COOL	2	3	4	5	6
HEAT	2	3	4	5	6



042,048,060 -024,030,036
 SEE BLOWER SPEED CHART FOR HOOK-UP

LINE VOLTAGE FIELD INSTALLED NEC/CEC CLASS I
 NOTE-ALL REMAINING WIRES FACTORY INSTALLED

WIRING DIAGRAM 2/02
 COMBINATION UNITS-ROOFTOP
 GCS20R-024, 030, 036, 042, 048, 060-3 THRU 6-P
 HEAT, COOL SECTION B42
 Supersedes Form No. 533, B24W
 New Form No. 534, 037W
 © 2002 Litho U.S.A.

GCS20R Sequence of Operation

Operation Sequence

Cooling:

- 1-Line voltage energizes transformer T1. Transformer T1 provides 24VAC power to all unit controls and thermostat.
- 2-Cooling demand energizes Y1 and G in the thermostat. K1 compressor contactor and K3 blower relay energizes.
- 3-K1-1 closes to energize compressor terminal C and condenser fan. Compressor B1 and condenser fan B4 immediately begin operating.
- 4-K3-1 contacts close to energize the indoor blower on cooling speed.

Heating:

- 5-Heating demand initiates at W1 in the thermostat and energizes relay K13. Heating demand also passes through high temperature limit S10 to combustion air prove switch S18.

- 6-Relay K13 closes to energize combustion air blower B6. When the combustion air blower nears full speed, prove switch S18 closes. Heating demand continues through S18 and through flame rollout switch S47 to energize ignition control A3.
- 7-Ignition control A3 then waits 30 to 40 seconds to allow combustion air blower B6 time to draw exhaust gas from combustion chamber and to introduce fresh air. Combustion air blower B6 operates throughout the heating cycle.
- 8-After the ignition control delay, A3 activates gas valve GV1 and the spark electrode. When flame is sensed by the flame sensor, the spark electrode stops. If flame is not sensed after the first trial for ignition, controller A3 repeats steps 7 and 8 up to two more times (depending on controller make) before locking out. If the control locks out, it can be reset by breaking and remaking thermostat demand.
- 9- Blower delay relay K25 de-energizes blower B3 after 150 second delay.