UNIT INFORMATION

100114
04/2026

SGH SERIES
10 & 20 Ton

Service Literature

SGH120 & 240 With R-454B

The SGH120 & 240 units are configure to order units (CTO) with a wide selection of factory installed options.

The SGH is available in 84,000 to 480,000 Btuh. See SPECIFICATIONS-GAS HEAT for more detail per model.

Gas heat sections are designed with aluminized steel tube heat exchangers with stainless steel as an option.

Cooling capacities range from 120,00 to 228,000 Btuh. SGH120 utilizes two compressors and two condenser fans. SGH240 utilizes four compressors and six condenser fans.

Both models are equipped with Multi-Stage Air Volume MSAV® blower. The VFD-driven blower will operate at lower speeds when demand is low and increase to higher speeds when demand is high.

False ceilings or drop ceiling may be used as a return air plenum only if the unit being installed has a Refrigerant Detection System installed.

⚠ WARNING

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater).

Do not pierce or burn.

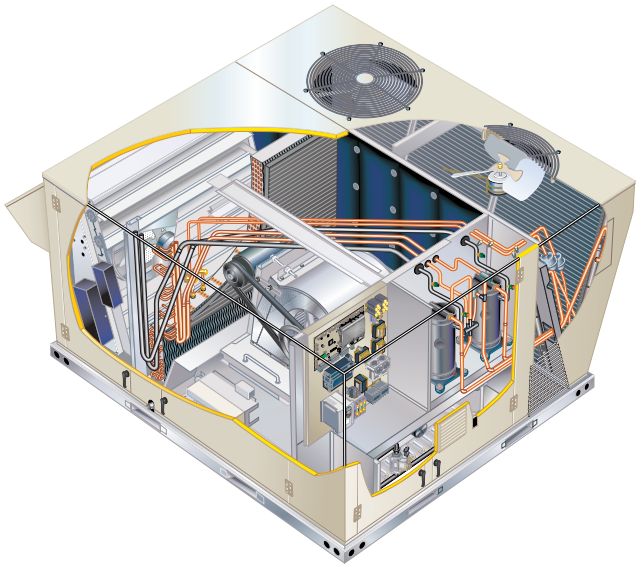
Be aware that refrigerants may not contain an odor.

⚠ WARNING

If this appliance is conditioning a space with an area smaller than TA min or stored in a space with an area smaller than A min as defined by this instruction, then that space must be without continuously operating open flames (e.g. an operating gas appliance) or other potential ignition sources (e.g. an operating electric heater or similar hot surface). A flame-producing device may be installed in the same space if the device is provided with an effective flame arrest system.

⚠ WARNING

Auxiliary devices which may be potential ignition sources shall not be installed in the duct work. Examples of potential ignition sources are hot surfaces with a temperature exceeding 700°C and electric switching components.



All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out with work in confined spaces being avoided.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

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⚠ WARNING

To prevent serious injury or death:

1- Lock-out/tag-out before performing maintenance.

2- If system power is required (e.g., smoke detector maintenance), disable power to blower, remove fan belt where applicable, and ensure all controllers and thermostats are set to the "OFF" position before performing maintenance.

3- Always keep hands, hair, clothing, jewelry, tools, etc., away from moving parts.

⚠ WARNING

Only Manufacturer approved auxiliary devices are permitted to be installed in this unit.

⚠ CAUTION

Any service personnel installing, decommissioning, or performing maintenance on the unit must be properly trained with A2L refrigerants.

⚠ 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.

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent, service agency, or the gas supplier.

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

⚠ IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

⚠ WARNING

• This appliance must be installed in accordance with local and national wiring regulations.

• If the appliance is not fitted with an option for full disconnection from power, a means of disconnection must be incorporated in the fixed wiring in accordance with national and local wiring regulations.

⚠ CAUTION

Servicing shall be performed only as recommended by the manufacturer.

⚠ CAUTION

Leak Detection System installed. Unit must be powered except for service.

⚠ WARNING

Ducts connected to an appliance shall not contain a potential ignition source.

IMPORTANT

Pipe work, including piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

⚠ IMPORTANT

Refrigerant sensors for refrigerant detection systems shall only be replaced with sensors specified by the appliance manufacture.

⚠ CAUTION

This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

OPTIONS / ACCESSORIES

Item Description			Order Number	120	240
COOLING SYSTEM					
Corrosion Protection	Coated indoor/outdoor coil assemblies, painted cabinet interior		Factory	O	O
	Coated outdoor coil assembly		Factory	O	O
Drain Pan Overflow Switch			**21Z07**	OX	OX
HEATING SYSTEM					
Combustion Air Intake Extension			**20X99**		
			33W62	X	
			89L97		[1] X
Gas Heat Input		Standard 2 Stage - 53/70 kBtuh input (Low NOx)	Factory		
		Medium 2 Stage - 81/108 kBtuh input (Low NOx)	Factory		
		High 2 Stage - 113/150 kBtuh input (Low NOx)	Factory		
		Standard 2 Stage - 84.5/130 kBtuh input	Factory	O	
		Medium 2 Stage - 117/180 kBtuh input	Factory	O	
		High 2 Stage - 156/240 kBtuh input	Factory	O	
		Standard 2 Stage - 169/260 kBtuh input	Factory		O
		Medium 2 Stage - 234/360 kBtuh input	Factory		O
		High 2 Stage - 312/480 kBtuh input	Factory		O
LPG/Propane Kits		2 Stage Standard Heat	**21Z24**		
		2 Stage Medium and High Heat	**21Z23**		
		Standard Heat	**14N28**	X	[1] X
		Medium Heat	**14N29**	X	[1] X
		High Heat	**14N30**	X	[1] X
Low Temperature Vestibule Heater		460V - 3 phase	**31A62**		
		575V - 3 phase	**31A63**		
		460V - 3 phase	**31A65**	X	
		575V - 3 phase	**31A66**	X	
		460V - 3 phase	**58W29**		X
		575V - 3 phase	**58W30**		X
Stainless Steel Heat Exchanger			Factory	O	O
Vertical Vent Extension			**31W62**		
			73M72	X	
			42W16		[1] X
BLOWER - SUPPLY AIR					
ECM DirectPlus™, Direct Drive, MSAV® (Multi-Stage Air Volume)		1.5 hp	Factory		
Belt Drive, MSAV® (Multi-Stage Air Volume)		3 hp	Factory	O	
		5 hp	Factory		O
		7.5 hp	Factory		O
CABINET					
Combination Coil/Hail Guards			**19H54**		
			19H55	X	
			13T16		X

[1] Order two.

NOTE - Order numbers shown are for ordering field installed accessories.
OX - Configure To Order (Factory Installed) or Field Installed
O = Configure To Order (Factory Installed)
X = Field Installed

OPTIONS / ACCESSORIES

Item Description		Order Number	120	240
CONTROLS				
Commercial Control	LonTalk® Module	Factory	O	O
Dirty Filter Switch		Factory	O	O
[1] Smoke Detectors	Supply or Return (Power board and one sensor)	**10B40**		
		10B42	OX	OX
	Supply and Return (Power board and two sensors)	**10B41**		
		10B43	OX	OX
ELECTRICAL				
Voltage 60 hz	460V - 3 phase	Factory	O	O
	575V - 3 phase	Factory	O	O
GFI Service Outlets (**REQUIRED**)	20 amp non-powered, field-wired (all voltages)	Factory	O	O
Weatherproof Cover for GFI		**10C89**	X	X
INDOOR AIR QUALITY				
Air Filters				
Standard Air Filters	MERV 8 (16 x 20 x 2 - Order 4 per unit)	**54W20**		
	MERV 8 (20 x 25 x 2 - Order 4 per unit)	**50W61**	OX	
	MERV 8 (20 x 20 x 2 - Order 12 per unit)	**54W21**		OX
Healthy Climate® High Efficiency Air Filters	MERV 13 (16 x 20 x 2 - Order 4 per unit)	**52W37**		
	MERV 13 (20 x 25 x 2 - Order 4 per unit)	**52W41**	OX	
	MERV 13 (20 x 20 x 2 - Order 12 per unit)	**52W39**		OX
Replacement Media Filter With Metal Mesh Frame 20 x 20 x 2 Order 12 per unit (includes non-pleated filter media)		**44N60**		X
Indoor Air Quality (CO_2) Sensors				
Sensor - Wall-mount, off-white plastic cover with LCD display		**77N39**	X	X
Sensor - Wall-mount, off-white plastic cover, no display		**23V86**	X	X
Sensor - Black plastic case, LCD display, rated for plenum mounting		**87N52**	X	X
Sensor - Black plastic case, no display, rated for plenum mounting		**23V87**	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications		**23Y47**	X	X
Aspiration Box - for duct mounting non-plenum rated CO_2 sensors (**77N39**)		**90N43**	X	X
HUMIDITROL® CONDENSER REHEAT OPTION				
Humiditrol® Dehumidification Option		Factory	O	O

[1] Factory installed smoke detectors must be ordered for use with either 115V or 24V external power supply only.

NOTE - Order numbers shown are for ordering field installed accessories.
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OPTIONS / ACCESSORIES

Item Description		Order Number	120	240
ECONOMIZER				
High Performance Economizer (Approved for California Title 24 Building Standards / AMCA Class 1A Certified)				
ULL Economizer - Includes Outdoor Air Hood		Factory	O	
(Global Sensor, field provided, order Barometric Relief Dampers separately		**18X87**		OX
Economizer Controls				
Differential Enthalpy (Not for Title 24)	Order 2	**21Z09**	OX	OX
Global Control	Sensor Field Provided	Factory	O	O
Barometric Relief Dampers				
Barometric Relief Dampers (No Exhaust Hood)		Factory		
Barometric Relief Dampers With Power Exhaust Fans (Exhaust Hood Furnished)		Factory	O	
Barometric Relief Dampers Without Power Exhaust Fans (No Exhaust Hood)		Factory	O	
Barometric Relief Dampers Without Power Exhaust Fans (Exhaust Hood Furnished)		Factory		O
POWER EXHAUST				
Standard Static		Factory	O	O
OUTDOOR AIR				
Motorized Outdoor Air Dampers with Outdoor Air Hood and Bird Screen		**18X89**		X
Manual Outdoor Air Damper with Outdoor Air Hood and Bird Screen		**18X88**		X
ROOF CURBS				
Hybrid Roof Curbs, Downflow,		**11F70**		
14 in. height		**11F72**	X	
	Full Perimeter	**11F74**		X
Hybrid Roof Curbs, Downflow		**11F71**		
24 in. height		**11F73**	X	
	Full Perimeter	**11F75**		X
Curb Alignment (See note in the Roof Curb section)		Factory		O

NOTE - Order numbers shown are for ordering field installed accessories.
OX - Configure To Order (Factory Installed) or Field Installed
O = Configure To Order (Factory Installed)
X = Field Installed

SPECIFICATIONS — BELT DRIVE | 10 - 20 TON

Model			SGH120H5M	SGH240H5M	
Nominal Tonnage			10	20	
Efficiency Type			High	High	
Blower Type			MSAV® (Multi-Stage Air Volume) (Belt Drive)	MSAV® (Multi-Stage Air Volume) (Belt Drive)	
Cooling Performance	Gross Cooling Capacity - Btuh		123,500	234,000	
	[1] Net Cooling Capacity - Btuh		120,000	228,000	
	AHRI Rated Air Flow - cfm		3800/2800/2000	7100	
	Total Unit Power		10	18.8	
	[1] IEER (Btuh/Watt)		15.2	16.8	
	[1] EER (Btuh/Watt)		12.0	12.0	
Refrigerant Charge	Refrigerant Type		R-454B	R-454B	
	Without Reheat Option	Circuit 1	7 lbs. 0 oz.	6 lbs. 11 oz.	
		Circuit 2	4 lbs. 13 oz.	6 lbs. 1 oz.	
		Circuit 3	- - -	5 lbs. 1 oz.	
		Circuit 4	- - -	5 lbs. 3 oz.	
	With Reheat Option	Circuit 1	7 lbs. 0 oz.	7 lbs. 12 oz.	
		Circuit 2	5 lbs. 2 oz.	7 lbs. 3 oz.	
		Circuit 3	- - -	5 lbs. 5 oz.	
		Circuit 4	- - -	5 lbs. 6 oz.	
[2] Sound Rating Number		dBA	89	92	
Gas Heating Options Available - See page 23			Standard (2 Stage) Medium (2 Stage) High (2 Stage)	Standard (2 Stage) Medium (2 Stage) High (2 Stage)	
Compressor Type (Number)			Two-Stage Scroll (1) Single-Stage Scroll (1)	Single-Stage Scroll (4)	
Condenser Coil	Net face area - ft.^{2}		45.7	68.3	
	Rows		1	1	
	Fins - in.		23	23	
Condenser Fan(s)	Motor (number) HP (type)		(2) 1/2 (PSC)	(6) 1/3 (PSC)	
	Rpm		1075	1075	
	Watts		1160	1900	
	Diameter (Number) - in.		(2) 24	(6) 24	
	Blades		4	3	
	Total air volume - Cfm		10,000	22,500	
Evaporator Coil	Net face area - ft.^{2}		13.54	32.2	
	Tube diameter - in.		3/8	3/8	
	Rows		4	3	
	Fins - in.		14	14	
	Condensate drain size (NPT) - in.		(1) 1	(1) 1	
	Expansion device type		Balance Port TXV, removable head		
[3] Indoor Blower	Nominal motor HP		3	5	7.5
	RPM Range (Standard Static)		Drive #3 - 660-900 rpm	Drive #4 - 520-685 rpm	Drive #7 - 770-965 rpm
	RPM Range (High Static)		Drive #4 - 865-1080 rpm	Drive #5 - 685-865 rpm	- - -
	Wheel nominal diameter x width - in.		(1) 15 x 15	(2) 18 x 15	(2) 18 x 15
Filters	Type of filter		MERV 8 or 13		
	Number and size - in.		(4) 20 x 25 x 2	(12) 20 x 20 x 2	
Line voltage data (Volts-Phase-Hz)			460-3-60, 575-3-60		

NOTE - Net capacity includes evaporator blower motor heat deduction. Gross capacity does not include evaporator blower motor heat deduction.

[1] AHRI Certified to AHRI Standard 340/360: 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure..

[2] Sound Rating Number rated in accordance with test conditions included in AHRI Standard 270-95.

[3] Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors furnished are shown. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

NOTE – Units equipped with MSAV® (Multi-Stage Air Volume) are limited to a motor service factor of 1.0.

SPECIFICATIONS - GAS HEAT

10 TON | 20 TON

Model		120			240		
Heat Input Type		**Standard (2 Stage)**	**Medium (2 Stage)**	**High (2 Stage)**	**Standard (2 Stage)**	**Medium (2 Stage)**	**High (2 Stage)**
Input Btuh	1st Stage	85,000	117,000	156,000	169,000	234,000	312,000
	2nd Stage	130,000	180,000	240,000	260,000	360,000	480,000
Output Btuh	2nd Stage	105,000	146,000	194,000	211,000	292,000	389,000
Temperature Rise Range - °F		15-45	30-60	40-70	15-45	30-60	40-70
[1] Thermal Efficiency		81%	81%	81%	81%	81%	81%
Gas Supply Connections		3/4 in. NPT	3/4 in. NPT	3/4 in. NPT	1 in. NPT	1 in. NPT	1 in. NPT
Rec. Gas Supply Pressure - Nat. / LPG		7 in. w.g. / 11 in. w.g.					
Gas Supply Pressure Range	Min./Max. (Natural)	4.7 - 10.5 in. w.g.					
	Min./Max. (LPG)	10.8 - 13.5 in. w.g.					

[1] Thermal Efficiency at full input.

HIGH ALTITUDE DERATE

NOTE - Units may be installed at altitudes up to 2000 ft. above sea level without any modifications.
At altitudes above 2000 ft. units must be derated to match information in the table shown.
120-240 Models - At altitudes above 4500 ft. unit must be derated 4% for each 1000 ft. above sea level.
NOTE - This is the only permissible derate for these units.

Model	**Heat Input Type**	**Altitude Feet**	**Gas Manifold Pressure - in. w.g. (min./max.)**		**Input Rate Natural Gas Btuh (min./max.)**	**Input Rate LPG/Propane Btuh (min./max.)**
			Natural Gas	**LPG/Propane**		
		2001 - 4500	1.7/3.0	5.1/9.0	104,000 / 139,000	104,000 / 139,000
120	Standard (2 Stage)	0 - 2000	1.6/3.7	5.5/10.5	85,000 / 130,000	94,000 / 130,000
		2001 - 4500	1.6/3.1	5.5/8.9	85,000 / 120,000	85,000 / 120,000
	Medium (2 Stage)	0 - 2000	1.6/3.7	5.5/10.5	117,000 / 180,000	130,000 / 180,000
		2001 - 4500	1.6/3.1	5.5/8.9	117,000 / 166,000	117,000 / 166,000
	High (2 Stage)	0 - 2000	1.6/3.7	5.5/10.5	156,000 / 240,000	173,000 / 240,000
		2001 - 4500	1.6/3.1	5.5/8.9	156,000 / 221,000	156,000 / 221,000
240	Standard (2 Stage)	0 - 2000	1.6/3.7	5.5/10.5	169,000 / 260,000	187,000 / 260,000
		2001 - 4500	1.6/3.1	5.5/8.9	169,000 / 239,000	169,000 / 239,000
	Medium (2 Stage)	0 - 2000	1.6/3.7	5.5/10.5	234,000 / 360,000	259,000 / 360,000
		2001 - 4500	1.6/3.1	5.5/8.9	234,000 / 331,000	234,000 / 331,000
	High (2 Stage)	0 - 2000	1.6/3.7	5.5/10.5	312,000 / 480,000	346,000 / 480,000
		2001 - 4500	1.6/3.1	5.5/8.9	312,000 / 442,000	312,000 / 442,000

SGH120H5M BLOWER PERFORMANCE
NOTE - Blower Table Includes Resistance For Base Unit With Gas Heat, Wet Indoor Coil And Air Filters In Place.
See Blower Motor / Drive Kit Table on page 10 for Motor HP and Drive Kit RPM Ranges Available.

Air Volume cfm	EXTERNAL STATIC PRESSURE - In. w.g.																							
	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9		1.0		1.1		1.2		1.3	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2000	439	0.31	480	0.40	522	0.48	565	0.56	607	0.63	647	0.70	685	0.76	719	0.82	753	0.90	785	0.99	816	1.09	846	1.18	874	1.27
2200	454	0.38	496	0.47	538	0.56	581	0.63	622	0.71	661	0.78	698	0.84	732	0.92	765	1.01	798	1.11	830	1.21	859	1.31	887	1.41
2400	470	0.45	512	0.55	555	0.64	598	0.72	638	0.79	676	0.87	711	0.94	745	1.02	779	1.13	813	1.24	845	1.35	875	1.46	902	1.55
2600	487	0.53	530	0.63	573	0.72	615	0.81	655	0.89	691	0.97	726	1.05	760	1.14	795	1.26	829	1.39	861	1.51	892	1.62	920	1.71
2800	506	0.62	549	0.73	592	0.82	634	0.91	672	0.99	707	1.08	741	1.17	776	1.28	811	1.42	846	1.55	879	1.67	909	1.79	938	1.89
3000	525	0.72	569	0.83	613	0.93	653	1.02	689	1.11	724	1.20	758	1.31	793	1.44	829	1.58	864	1.72	897	1.85	928	1.97	956	2.08
3200	547	0.84	591	0.95	634	1.05	672	1.14	707	1.23	741	1.34	776	1.47	812	1.61	848	1.76	883	1.91	916	2.04	946	2.16	975	2.28
3400	570	0.96	614	1.07	655	1.18	692	1.28	726	1.38	759	1.51	794	1.65	831	1.81	867	1.96	901	2.11	934	2.25	965	2.37	993	2.48
3600	594	1.09	638	1.21	676	1.32	711	1.43	744	1.55	778	1.69	814	1.85	850	2.01	886	2.18	920	2.33	953	2.47	983	2.59	1011	2.70
3800	620	1.24	661	1.36	698	1.48	731	1.60	763	1.73	797	1.89	833	2.06	869	2.24	904	2.40	939	2.55	971	2.69	1001	2.81	1029	2.92
4000	647	1.40	685	1.53	719	1.66	751	1.79	782	1.94	816	2.11	852	2.29	887	2.47	923	2.63	957	2.78	988	2.91	1018	3.03	1047	3.14
4200	672	1.58	707	1.72	740	1.85	771	2.00	801	2.16	834	2.34	870	2.53	905	2.71	940	2.87	974	3.02	1005	3.14	1035	3.26	1064	3.36
4400	696	1.78	729	1.93	760	2.07	790	2.22	820	2.39	852	2.59	887	2.78	922	2.95	957	3.11	990	3.25	1021	3.37	1051	3.48	1080	3.58
4600	719	2.00	751	2.14	781	2.29	810	2.45	839	2.63	869	2.83	903	3.03	938	3.20	972	3.36	1005	3.49	1037	3.60	1067	3.71	1097	3.81
4800	742	2.23	772	2.37	801	2.52	829	2.69	857	2.87	886	3.08	919	3.28	953	3.45	987	3.60	1020	3.72	1052	3.83	1083	3.93	1113	4.03

NOTE - MSAV® (Multi-Stage Air Volume) drive is capable of 350 - 1050 rpm.

SGH240H5M BLOWER PERFORMANCE

NOTE - Blower Table Includes Resistance For Base Unit With Gas Heat, Wet Indoor Coil And Air Filters In Place.

See Blower Motor / Drive Kit Table on page 10 for Motor HP and Drive Kit RPM Ranges Available.

Air Volume cfm	EXTERNAL STATIC PRESSURE - In. w.g.																									
	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9		1.0		1.1		1.2		1.3	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2000	255	0.33	310	0.48	366	0.63	416	0.74	458	0.81	498	0.89	537	0.99	573	1.10	607	1.22	642	1.35	677	1.49	712	1.65	749	1.80
2200	258	0.37	313	0.52	369	0.67	418	0.78	460	0.85	500	0.92	538	1.03	574	1.15	609	1.27	643	1.40	678	1.55	714	1.70	751	1.86
2400	261	0.40	316	0.56	372	0.70	421	0.81	462	0.88	502	0.96	540	1.07	576	1.19	610	1.32	645	1.45	680	1.60	716	1.76	753	1.92
2600	265	0.44	319	0.60	375	0.74	423	0.85	464	0.92	505	1.00	542	1.11	578	1.24	612	1.37	646	1.51	682	1.66	718	1.82	755	1.98
2800	268	0.48	322	0.63	378	0.77	426	0.89	467	0.95	507	1.04	545	1.16	580	1.29	614	1.42	648	1.56	684	1.72	720	1.88	757	2.04
3000	272	0.51	326	0.67	382	0.81	429	0.92	470	0.99	510	1.09	547	1.21	582	1.34	616	1.48	650	1.63	686	1.78	723	1.94	759	2.10
3200	276	0.55	330	0.71	386	0.85	433	0.96	473	1.03	513	1.13	550	1.26	584	1.40	618	1.54	652	1.69	688	1.85	725	2.01	762	2.16
3400	280	0.59	335	0.74	391	0.88	437	1.00	477	1.08	516	1.18	552	1.32	587	1.46	620	1.61	655	1.76	691	1.91	727	2.07	764	2.23
3600	285	0.62	340	0.78	395	0.92	441	1.04	480	1.12	520	1.24	555	1.38	589	1.53	623	1.67	657	1.83	693	1.98	730	2.14	767	2.30
3800	290	0.66	345	0.81	400	0.96	445	1.08	484	1.17	523	1.29	559	1.44	592	1.59	626	1.74	660	1.90	696	2.06	733	2.22	770	2.38
4000	296	0.69	351	0.85	406	0.99	449	1.12	488	1.22	527	1.35	562	1.51	595	1.66	629	1.82	663	1.97	699	2.14	736	2.30	773	2.46
4200	301	0.73	358	0.88	411	1.03	453	1.17	493	1.27	531	1.41	565	1.57	599	1.73	632	1.89	666	2.05	702	2.22	739	2.39	776	2.56
4400	308	0.76	364	0.92	416	1.07	458	1.22	497	1.33	534	1.48	569	1.64	602	1.81	635	1.97	670	2.14	706	2.31	743	2.48	779	2.66
4600	315	0.80	371	0.95	422	1.12	463	1.26	502	1.39	539	1.54	573	1.71	606	1.88	639	2.05	673	2.22	710	2.40	746	2.58	783	2.76
4800	322	0.83	378	0.99	427	1.16	468	1.32	507	1.45	543	1.62	577	1.79	609	1.96	642	2.14	677	2.32	714	2.50	751	2.69	788	2.87
5000	330	0.86	386	1.03	433	1.21	473	1.38	512	1.52	547	1.69	581	1.87	613	2.05	647	2.22	682	2.41	718	2.60	755	2.79	792	2.98
5200	338	0.89	393	1.07	438	1.27	478	1.44	517	1.59	551	1.77	585	1.95	617	2.13	651	2.32	686	2.50	722	2.70	759	2.89	796	3.08
5400	346	0.92	400	1.12	444	1.33	484	1.51	522	1.67	556	1.86	589	2.04	622	2.23	655	2.41	690	2.60	727	2.79	764	2.98	801	3.17
5600	355	0.96	407	1.17	450	1.40	490	1.58	528	1.76	561	1.96	594	2.14	626	2.33	660	2.51	695	2.70	732	2.89	769	3.08	806	3.27
5800	364	1.00	414	1.23	457	1.47	496	1.65	533	1.85	566	2.06	599	2.24	631	2.43	665	2.61	701	2.81	737	3.00	774	3.19	811	3.38
6000	372	1.04	422	1.29	463	1.54	502	1.73	539	1.95	571	2.17	604	2.35	636	2.53	670	2.72	706	2.91	743	3.11	779	3.30	816	3.50
6200	381	1.08	429	1.36	470	1.62	508	1.82	544	2.05	576	2.28	609	2.46	641	2.64	676	2.82	712	3.02	749	3.22	785	3.42	822	3.62
6400	390	1.14	437	1.44	477	1.71	515	1.92	550	2.16	582	2.39	614	2.57	647	2.74	682	2.93	718	3.14	755	3.34	792	3.54	828	3.75
6600	399	1.20	444	1.53	484	1.80	521	2.02	556	2.28	587	2.51	620	2.68	653	2.85	688	3.04	725	3.25	762	3.46	798	3.67	835	3.87
6800	408	1.27	452	1.62	491	1.89	528	2.13	562	2.40	593	2.63	625	2.80	659	2.96	694	3.15	731	3.37	768	3.58	805	3.80	842	4.01
7000	417	1.35	460	1.71	498	1.99	535	2.24	568	2.52	599	2.74	631	2.91	665	3.08	700	3.27	737	3.48	775	3.70	812	3.92	848	4.14
7200	426	1.45	467	1.82	505	2.10	541	2.36	574	2.65	606	2.86	638	3.02	671	3.19	707	3.39	744	3.60	781	3.83	818	4.05	855	4.27
7400	435	1.55	475	1.93	513	2.22	548	2.49	580	2.77	612	2.98	644	3.14	677	3.31	713	3.50	750	3.72	788	3.94	825	4.17	861	4.39
7600	444	1.67	483	2.05	520	2.34	555	2.62	587	2.90	618	3.10	650	3.26	684	3.43	719	3.62	756	3.84	794	4.06	831	4.29	868	4.51
7800	452	1.80	491	2.18	528	2.47	562	2.75	594	3.02	625	3.22	657	3.38	690	3.55	726	3.74	763	3.96	800	4.18	837	4.40	874	4.62
8000	461	1.93	500	2.31	536	2.61	570	2.89	601	3.15	632	3.35	664	3.51	697	3.67	732	3.87	769	4.08	806	4.30	843	4.52	880	4.74
8200	470	2.08	508	2.45	544	2.75	577	3.03	608	3.29	639	3.47	671	3.63	704	3.80	739	3.99	775	4.20	812	4.42	849	4.64	886	4.86
8400	479	2.23	516	2.60	552	2.90	585	3.18	615	3.42	646	3.60	678	3.76	711	3.93	746	4.11	782	4.32	819	4.54	855	4.76	892	4.98
8600	488	2.39	525	2.76	560	3.05	592	3.33	623	3.56	653	3.74	685	3.89	718	4.06	752	4.24	788	4.44	825	4.66	862	4.88	898	5.10
8800	498	2.56	533	2.91	568	3.21	600	3.48	630	3.70	661	3.87	692	4.02	725	4.19	759	4.37	795	4.57	831	4.78	868	5.00	904	5.21
9000	507	2.73	542	3.08	576	3.37	608	3.63	638	3.85	668	4.01	699	4.16	732	4.32	766	4.50	802	4.69	838	4.90	874	5.12	911	5.33
9200	516	2.91	551	3.25	584	3.53	616	3.78	645	3.99	676	4.15	707	4.29	739	4.45	773	4.63	808	4.82	844	5.03	881	5.24	917	5.46
9400	526	3.09	560	3.42	593	3.69	623	3.94	653	4.13	683	4.28	714	4.43	746	4.58	780	4.76	815	4.95	851	5.15	887	5.36	923	5.58
9600	535	3.27	569	3.59	601	3.86	631	4.10	661	4.28	691	4.42	721	4.56	753	4.72	787	4.89	822	5.08	858	5.28	894	5.49	930	5.70

BLOWER DATA

MSAV® (MULTI-STAGE AIR VOLUME) BELT DRIVE KIT SPECIFICATIONS

Size	Nominal / Maximum - HP	Drive Kit Number	RPM Range
120	3	#3 #4	660 - 900 865 - 1080
240	5	#4 #5	520 - 685 685 - 865
	7.5	#7	770 - 965

FACTORY INSTALLED OPTIONS/FIELD INSTALLED ACCESSORY AIR RESISTANCE - in. w.g.

Air Volume cfm	Humiditrol Dehumidification Coil	Economizer	Filters MERV 13
120 Size			
2000	0.03	0.06	0.03
2500	0.04	0.11	0.05
3000	0.05	0.13	0.06
3500	0.06	0.15	0.07
4000	0.08	0.19	0.08
4500	0.10	0.22	0.09
5000	0.12	0.29	0.10
5500	0.14	0.34	0.12
6000	0.15	0.52	0.13
240 Size			
3000	0.02	0.00	0.00
3500	0.04	0.00	0.00
4000	0.04	0.00	0.00
4500	0.04	0.00	0.00
5000	0.04	0.00	0.00
5500	0.06	0.01	0.01
6000	0.06	0.01	0.02
6500	0.08	0.01	0.02
7000	0.08	0.02	0.03
7500	0.10	0.02	0.04
8000	0.10	0.02	0.04
8500	0.10	0.03	0.04
9000	0.12	0.04	0.04
9500	0.14	0.04	0.06

POWER EXHAUST FANS STANDARD STATIC PERFORMANCE

120 Size		240 Size	
Return Air System Static Pressure	Air Volume Exhausted	Return Air System Static Pressure	Air Volume Exhausted
in. w.g.	cfm	in. w.g.	cfm
0.05	4085	0	10,200
0.10	3685	0.05	9700
0.15	3280	0.10	9200
0.20	2880	0.15	8600
0.25	2475	0.20	8100
- - -	- - -	0.25	7600
- - -	- - -	0.30	6900
- - -	- - -	0.35	6000
- - -	- - -	0.40	5000
- - -	- - -	0.45	4150

ELECTRICAL DATA — BELT DRIVE |10 TON

Model		SGH120H5M	
[1] Voltage - 60Hz		460V-3ph	575V-3ph
Compressor 1 (Non-Inverter)	Rated Load Amps	6.5	4.9
	Locked Rotor Amps	60	41
Compressor 2 (Non-Inverter)	Rated Load Amps	6.6	4.8
	Locked Rotor Amps	60	41
Outdoor Fan Motors	Full Load Amps (2 Non-ECM)	1.5	1.2
	Total	3	2.4
Power Exhaust (1) 0.5 HP	Full Load Amps	1.5	1.2
Service Outlet 115V GFI (Amps)		20	20
Indoor Blower Motor	HP	3	3
	Type	Belt	Belt
	Full Load Amps	4.8	3.9
[2] Maximum Overcurrent Protection (MOCP)	Unit Only	25	20
	With (1) 0.5 HP Power Exhaust	30	20
[3] Minimum Circuit Ampacity (MCA)	Unit Only	23	18
	With (1) 0.5 HP Power Exhaust	25	19

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 35kA.
[1] NOTE - Extremes of operating range are plus and minus 10% of line voltage.
[2] HACR type breaker or fuse.
[3] Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRICAL DATA — BELT DRIVE | 20 TON

Model		SGH240H5M			
[1] Voltage - 60Hz		460V-3ph		575V-3ph	
Compressor 1 (Non-Inverter)	Rated Load Amps	6.6		4.8	
	Locked Rotor Amps	60		41	
Compressor 2 (Non-Inverter)	Rated Load Amps	6.6		4.8	
	Locked Rotor Amps	60		41	
Compressor 3 (Non-Inverter)	Rated Load Amps	6.6		4.8	
	Locked Rotor Amps	60		41	
Compressor 4 (Non-Inverter)	Rated Load Amps	6.6		4.8	
	Locked Rotor Amps	60		41	
Outdoor Fan Motors	Full Load Amps (6 Non-ECM)	1.3		1	
	Total	7.8		6	
Power Exhaust (3) 0.33 HP	Full Load Amps	1.3		1	
	Total	3.9		3	
Service Outlet 115V GFI (Amps)		20		20	
Indoor Blower Motor	HP	5	7.5	5	7.5
	Type	Belt	Belt	Belt	Belt
	Full Load Amps	7.6	11	6.1	9
[2] Maximum Overcurrent Protection (MOCP)	Unit Only	50	50	35	45
	With (3) 0.33 HP Power Exhaust	50	60	40	45
[3] Minimum Circuit Ampacity (MCA)	Unit Only	44	48	33	37
	With (3) 0.33 HP Power Exhaust	48	52	36	40

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 35kA.
[1] NOTE - Extremes of operating range are plus and minus 10% of line voltage.
[2] HACR type breaker or fuse.
[3] Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

MINIMUM R454B SPACE AND CFM REQUIREMENTS

Minimum Airflow[1]		
Unit	Q_{min}(CFM)	Q_{min}(m^3h)
SGH/SCH120 circ 1	185	314
SGH/SCH120 circ 2	127	216
SGH/SCH120 circ 1W/ Humidtrol	185	314
SGH/SCH120 circ2 W/ Humidtrol	135	230
SGH/SCH240 circ 1	177	300
SGH/SCH240 circ 2	160	272
SGH/SCH240 circ 3	134	227
SGH/SCH240 circ 4	137	233
SGH/SCH240 circ 1 W/ Humiditrol	205	348
SGH/SCH240 circ 2 W/ Humiditrol	190	323
SGH/SCH240 circ 3 W/ Humiditrol	140	239
SGH/SCH240 circ 4 W/ Humiditrol	142	241

[1] The minimum airflow is the lowest CFM allowed during venting operation (leak mitigation).

Minimum Room Area of Conditioned Space[2]		
Unit	TA_{min}(ft^2)	TA_{min}(m^2)
SGH/SCH120 circ 1	102.54	9.53
SGH/SCH120 circ 2	70.46	6.55
SGH/SCH120 circ 1W/ Humidtrol	102.54	9.53
SGH/SCH120 circ2 W/ Humidtrol	75.07	6.97
SGH/SCH240 circ 1	97.97	9.10
SGH/SCH240 circ 2	88.81	8.25
SGH/SCH240 circ 3	74.16	6.89
SGH/SCH240 circ 4	76.00	7.06
SGH/SCH240 circ 1 W/ Humiditrol	113.53	10.55
SGH/SCH240 circ 2 W/ Humiditrol	105.29	9.78
SGH/SCH240 circ 3 W/ Humiditrol	77.82	7.23
SGH/SCH240 circ 4 W/ Humiditrol	78.74	7.31

[2] The minimum room area of conditioned space is the smallest area the unit can service.

Refrigerant Charge R-454B		
Unit	M_c(lbs)	M_c(kg)
SGH/SCH120 circ 1	7.00	3.18
SGH/SCH120 circ 2	4.81	2.18
SGH/SCH120 circ 1W/ Humidtrol	7.00	3.18
SGH/SCH120 circ2 W/ Humidtrol	5.13	2.32
SGH/SCH240 circ 1	6.69	3.03
SGH/SCH240 circ 2	6.06	2.75
SGH/SCH240 circ 3	5.06	2.30
SGH/SCH240 circ 4	5.19	2.35
SGH/SCH240 circ 1 W/ Humiditrol	7.75	3.52
SGH/SCH240 circ 2 W/ Humiditrol	7.19	3.26
SGH/SCH240 circ 3 W/ Humiditrol	5.31	2.41
SGH/SCH240 circ 4 W/ Humiditrol	5.38	2.44

Altitude Adjustment Factor[3]									
Halt	0	200	400	600	800	1000	1200	1400	1600
AF	1	1	1	1	1.02	1.05	1.04	1.1	1.12
Halt	1600	1800	2000	2200	2400	2600	2800	3000	3200
AF	1.12	1.15	1.18	1.21	1.25	1.28	1.32	1.36	1.4

[3] Use the Altitude Ajustment Factor to adjust the values in the table above to different altitudes. Find the relevant altitude above sea level in two “Halt” rows and then multiply the value from the table above by the factor number. Example for a SGH120 at 1000 ft. above sea level, multiply 185 by 1.05 to get 194.255Q_{min}

SGH120 Parts Arrangement

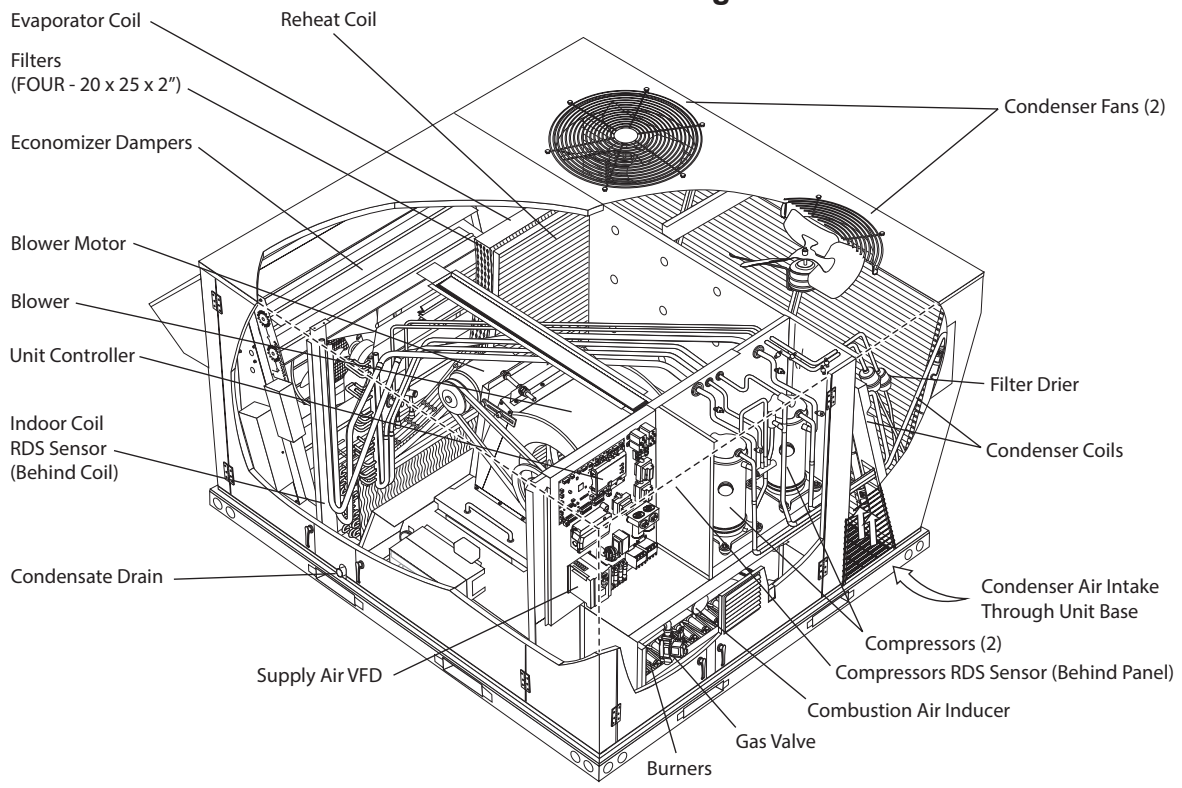


FIGURE 1

SGH240 Parts Arrangement

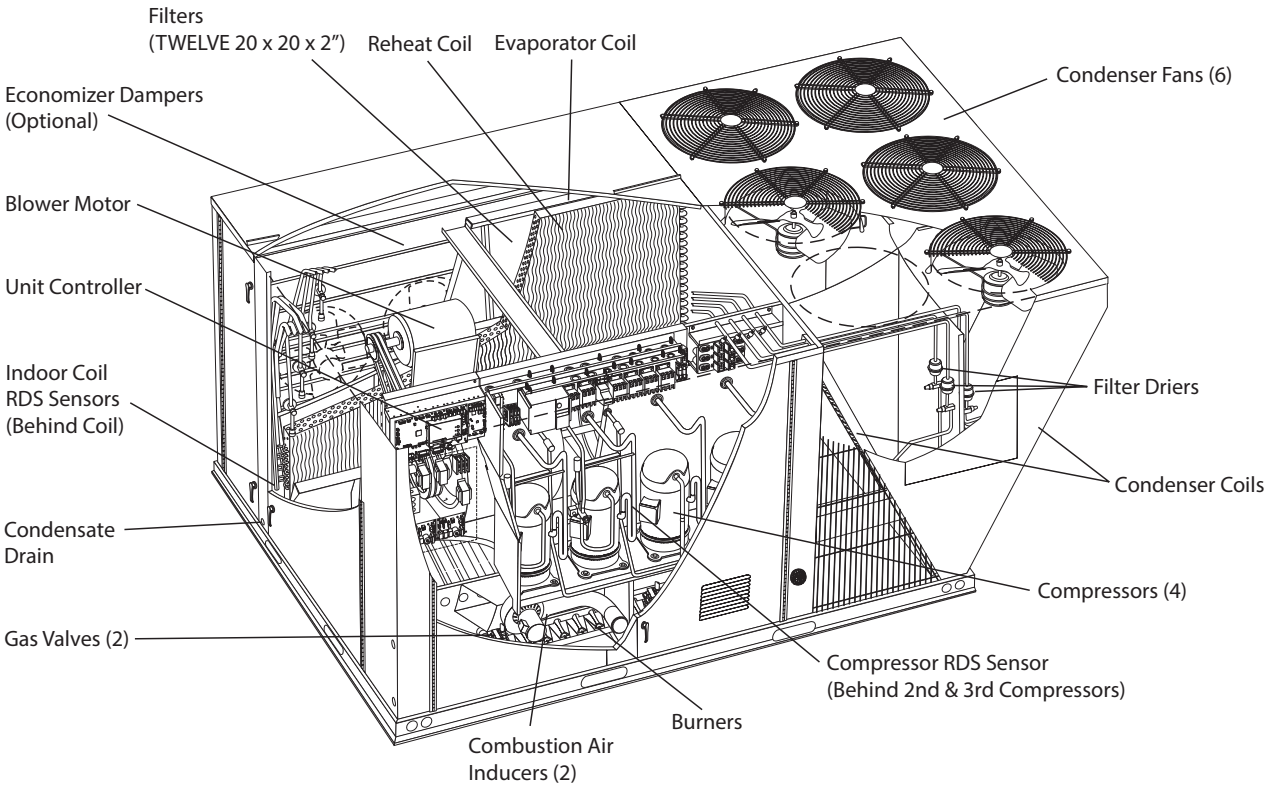


FIGURE 2

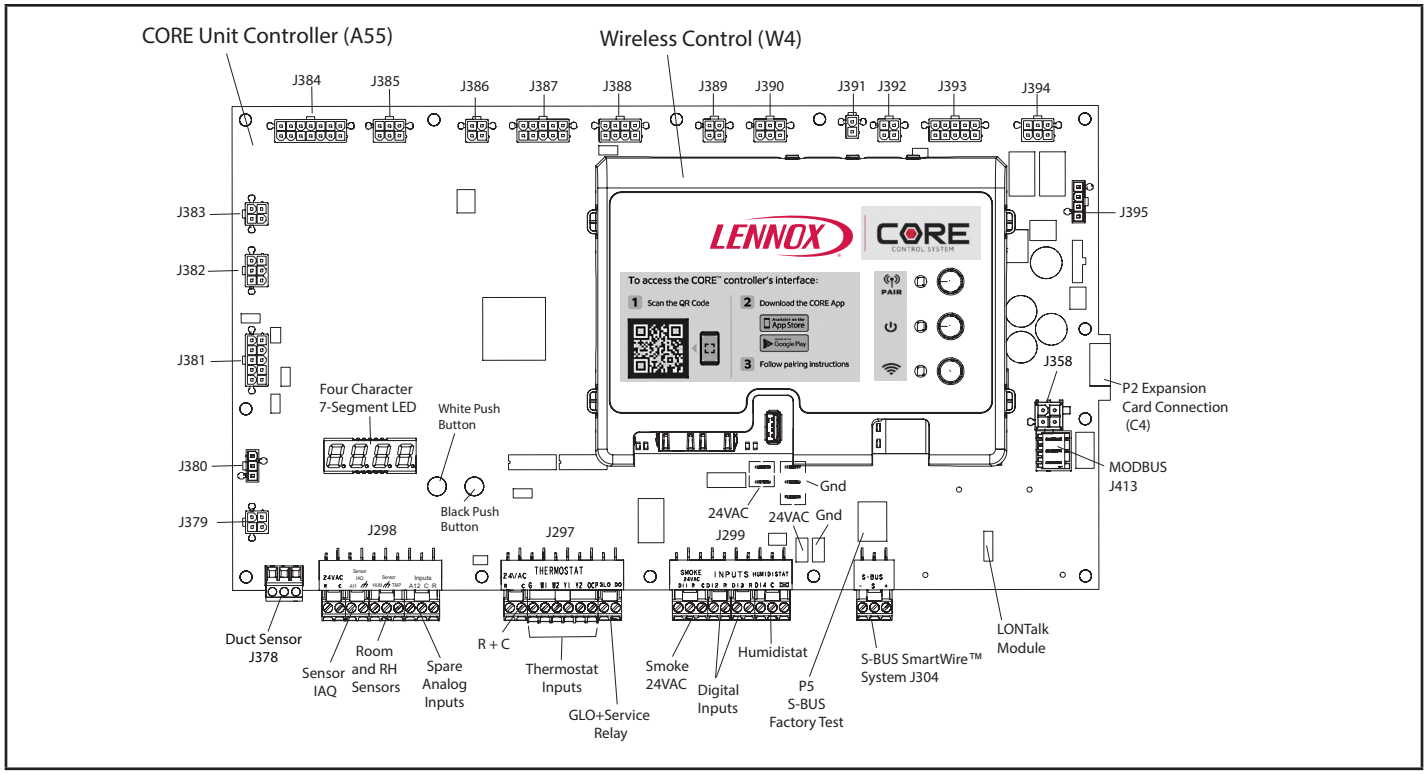


FIGURE 3

I-UNIT COMPONENTS

All units are configure to order units (CTO). Unit components are shown in FIGURE 1 and FIGURE 2. All units come standard with hinged unit panels. The unit panels may be held open with the door rod located inside the unit. All L1, L2 and L3 wiring is color coded; L1 is red, L2 is yellow and L3 is blue.

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

A-Control Box Components

Control box components are shown in FIGURE 3. The control box is located in the upper portion of the compressor compartment

1-Circuit Breaker CB10

All units are equipped with circuit breaker CB10. Circuit breaker CB10 is a toggle switch which can be used by the service technician to disconnect power to the unit.

2-Control Transformer T1

All use a single line voltage to 24VAC transformer mounted in the control box. Transformer supplies power to control circuits in the unit. The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker (CB8). The 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

3-Contactor Transformer T18 (240 only)

T18 is a single line voltage to 24VAC transformer used in the 20 ton units. Transformer T18 is protected by a 3.5 amp circuit breaker (CB18). T18 is identical to transformer T1. The transformer supplies 24VAC power to he contactors.

4-Terminal Block TB13 (240 only)

TB13 terminal block distributes line voltage power to the line voltage items in the unit.

5-Terminal Block TB13 (240 only)

TB13 terminal block distributes line voltage power to the line voltage items in the unit.

6-Transformer T43 (all units)

All reheat units and units with phase detection components are equipped with transformer T43 located in the control box. The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker (CB31). The 460(G) and 575(J) voltage transformers use a single primary tap.

7-Outdoor Fan Relay K10,K68 (120 only) and K10,K68, K149, K150, K152, K153 (240 units

Outdoor fan relays are DPDT relays with a 24VAC coil used to power the outdoor fans. Relays are energized by the CORE board (A55) depending on the unit operation.

8-Compressor Contactor K1, K2, K14, K146

K1, K2: All units

K14, K146: 240 units

All compressor contactors are three-pole-double-break contactors with 24VAC coils. In all units K1 (energized by A55) energizes compressors B1 in response to first stage cool demand, and K2 (energized by A55) energizes B2 in response to second stage cool demand. In the 240 units K14 and K146 (energized by A178) energize compressors B13 and B20 in response to second stage cool demand.

9-Burner Controls A3 & A12

A3: All units

A12: 240 units

A3 controls gas heat section one and A12 controls gas heat section two. The first gas heat section and the second gas heat section burner controls are identical. Both burner controls are factory set and are not adjustable. The control makes three attempts at ignition and then locks out the system if ignition is not obtained after the third trial. Reset after lockout requires only breaking and remaking thermostat demand. The control shuts off gas flow immediately in the event of a gas or power failure.

Upon restoration of gas and power, the control will restart the ignition sequence and continue until flame is established or system locks out. For a more detailed description see the Gas Heat Components section.

10-Power Exhaust Relay K65 all units & K231 240 uits (PED units)

K65: All units

K231: 240 units

Power exhaust relays K65 and K231 are N.O. DPDT relays with a 24VAC coil. The relay are used in units equipped with the optional power exhaust dampers. K65 and K231 are energized by the A55 Unit Controller, after the economizer dampers reach 50% open (adjustable in ECTO). When K65 closes, exhaust fan B10 is energized and when K231 closes B11 is energized.

11-Variable Frequency Drive A96 (optional)

Staged-Blower units are equipped with a VFD which alters the supply power frequency and voltage to the blower motor. Blower speed is staged depending on the compressor stages, heating demand, ventilation demand, or smoke alarm. The amount of airflow for each stage is preset from the factory. Airflow can be adjusted by changing ECTO parameters in the A55 Unit Controller. The VFD is located below the Unit Controller.

12-Unit Controller A55

The Unit Controller provides all unit control functions, unit status information, unit diagnostics, programmable parameters and USB verification and profile sharing. Refer to the Unit Controller guide provided with the unit.

Thermostat wires are connected to J297 on the Unit Controller.

13-Compressor 3 & 4 Controller (240 Only)

The compressor 3 & 4 control module A178 controls two additional compressor stages. A178 includes all inputs and outputs required for compressor and fan control, compressor stage diagnostics and low ambient control.

14-Enthalpy Sensor - Optional

The optional enthalpy sensors (A7 and A63) used with the economizer have an output of 4-20mA. The sensor is powered with 18VAC provided by M4 unit control.

15-Economizer Differential Pressure Sensor - Option

Rooftop units installed with Smart Airflow™ will have a Pressure Transducer (PT5) present in the economizer. PT5 requires 5VDC power supply (P266-5 and {P266-6) and gives 0.25 VDC to 4 VDC output (P266-4) corresponding to 0” water column and 2” water column respectively. For all practical purposes the output should be less than 1.2” water column if not an error code is stored and service alarm output is turned on.

16-Temperature Sensors

The return air (RT16) and discharge air (RT6) duct probes and the outdoor air (RT17) are all two wire thermistors. See FIGURE 4 for locations.

17-Wireless Antenna

Wireless antenna is located above the return air compartment of the unit. Please follow the CORE Controller setup guide. See FIGURE 5.

18-Outdoor Fan Transformers T5

All 460 (G) and 575 (J) voltage units use transformer T5. The auto voltage to 230VAC transformer is mounted in the control box. The transformer has an output rating of 0.5A. T5 transformer supplies 230 VAC power to outdoor fans B21 (156), B5 & B22 (180/210), B21 & B24 (240/300).

19 - Short Circuit Rating Fuse F10 & F6

F10 fuses provide SCCR over-current protection up to35kA to all components on the load side. Two line voltagefuses F6 provide over-current protection to the optionalpower exhaust fans on 240 units.

20-Condenser Fan Capacitors

C1, C2: All Units

C18, C19, C20, C21: 240 Units

The outdoor motors require run capacitors. Capacitor C1 is connected to OD Motor B4. C2 to B5, C18 to B21, C19 to B22, C20 to B23, & C21 to B24.

RT16 & RT17 SENSOR LOCATION

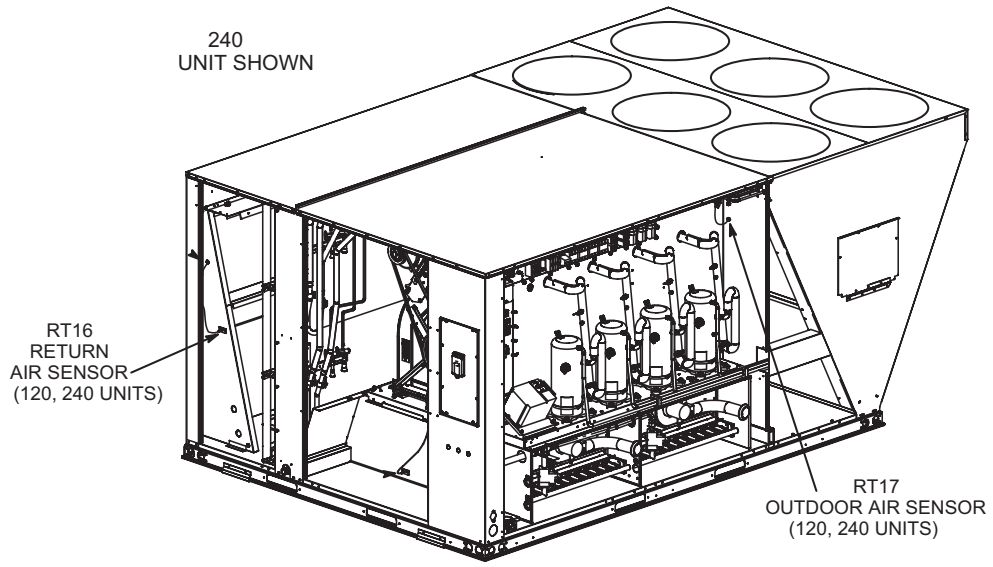


FIGURE 4

Antenna Location

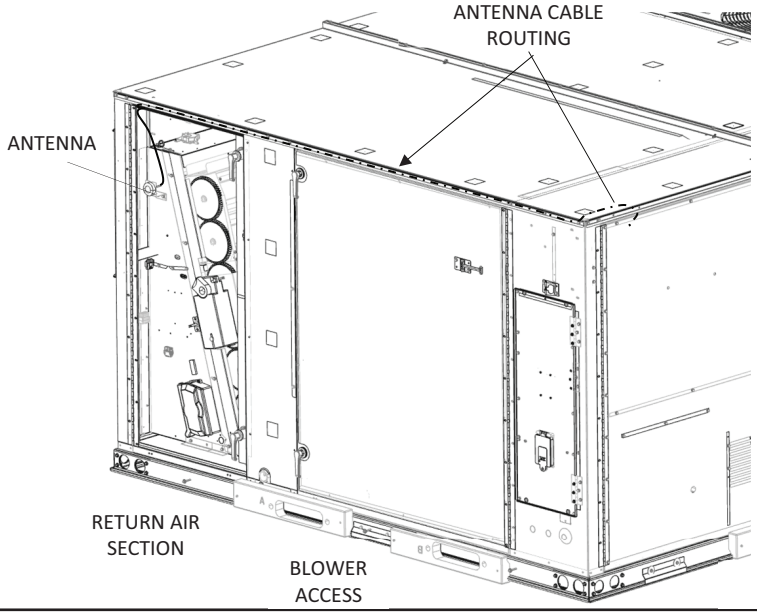


FIGURE 5

B-Cooling Components

Units use independent cooling circuits consisting of one compressor, one condenser coil, and one evaporator coil per circuit.

Two draw-through type condenser fans are used in SGH120 and six draw-through type condenser fans are used in SGH240 units.

Cooling may be supplemented by a factory-or field-installed economizer. Each evaporator uses a thermostatic expansion valve as the primary expansion device. Each evaporator is also equipped with enhanced fins and rifled tubing. In all units each compressor is protected by a crankcase heater, high pressure switch and low pressure switch.

1-Compressors B1, B2, B13, B20

All units use scroll compressors. SGH120 use 2 compressors and SGH240 use use four compressors. Compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications.

⚠ WARNING

Electrical shock hazard. Compressor must be grounded. Do not operate without protective coverover terminals. Disconnect power before removing protective cover. Discharge capacitors before servicing unit. Failure to follow these precautions could cause electrical shock resulting in injury or death.

Each compressor is energized by a corresponding compressor contactor.

NOTE-*Refer to the wiring diagram section for specific unit operation.*

If a compressor replacement is necessary, call 1-800-453-6669.

⚠ IMPORTANT

Some scroll compressors have an internal vacuum protector that will unload scrolls when suction pressure goes below 20 psig. A hissing sound will be heard when the compressor is running unloaded. Protector will reset when low pressure in system rises above 40 psig. DO NOT REPLACE COMPRESSOR.

2-Crankcase Heaters HR1, HR2, HR5 & HR11

All SGH units use insertion type heaters. Heater HR1 is installed around compressor B1, heater HR2 compressor B2, HR5 compressor B13 and HR11 compressor B20.

3-High Pressure Switches S4, S7, S28, S96

S4, S7 (120, 240 units)

S28, 296 (240 units)

The high pressure switches is an auto-reset SPST N.C. switch which opens on a pressure rise. All units are equipped with this switch. The switch is located in the compressor discharge line and is wired in series with the compressor contactor coil through A55 unit controller or A178 compressor 3 and 4 controller. See FIGURE 6 and FIGURE 7.

S4 and S7 are is wired in series with B1 and B2 compressor contactors and S28 and S96 are wired in series with B13 and B20 compressor contactors.

When discharge pressure rises to 640 ± 10 psig (indicating a problem in the system) the switch opens and the respective compressor(s) is de-energized (the economizer can continue to operate). When discharge pressure drops to 475 ± 20 psig the pressure switch will close re-energizing the compressor(s).

Main control A55 has a three-strike counter before locking out. This means the control allows three high pressure trips per one thermostat demand. The control can be reset by breaking and remaking the thermostat demand or manually resetting the control.

4-Filter Drier (all units)

Units have a filter drier located in the liquid line of each refrigerant circuit at the exit of each condenser coil. The drier removes contaminants and moisture from the system.

5-Condenser Fans

B4, B5 (210, 240 units)

B21, B22, B23 and B24 (240 units)

See SPECIFICATIONS tables at the front of this manual for specifications of condenser fans used in all units. All condenser fans used have single-phase motors. The fan assembly may be removed for servicing and cleaning.

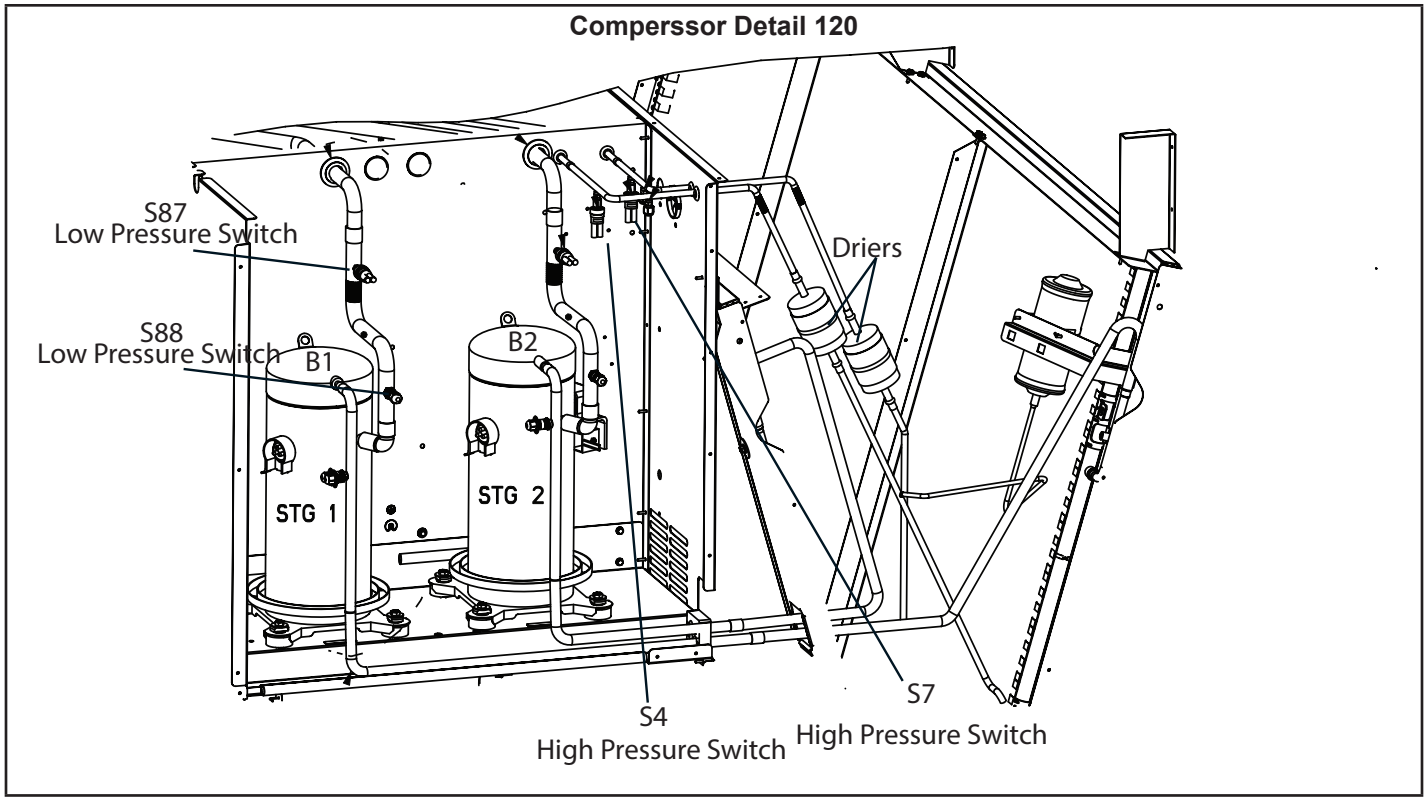


FIGURE 6

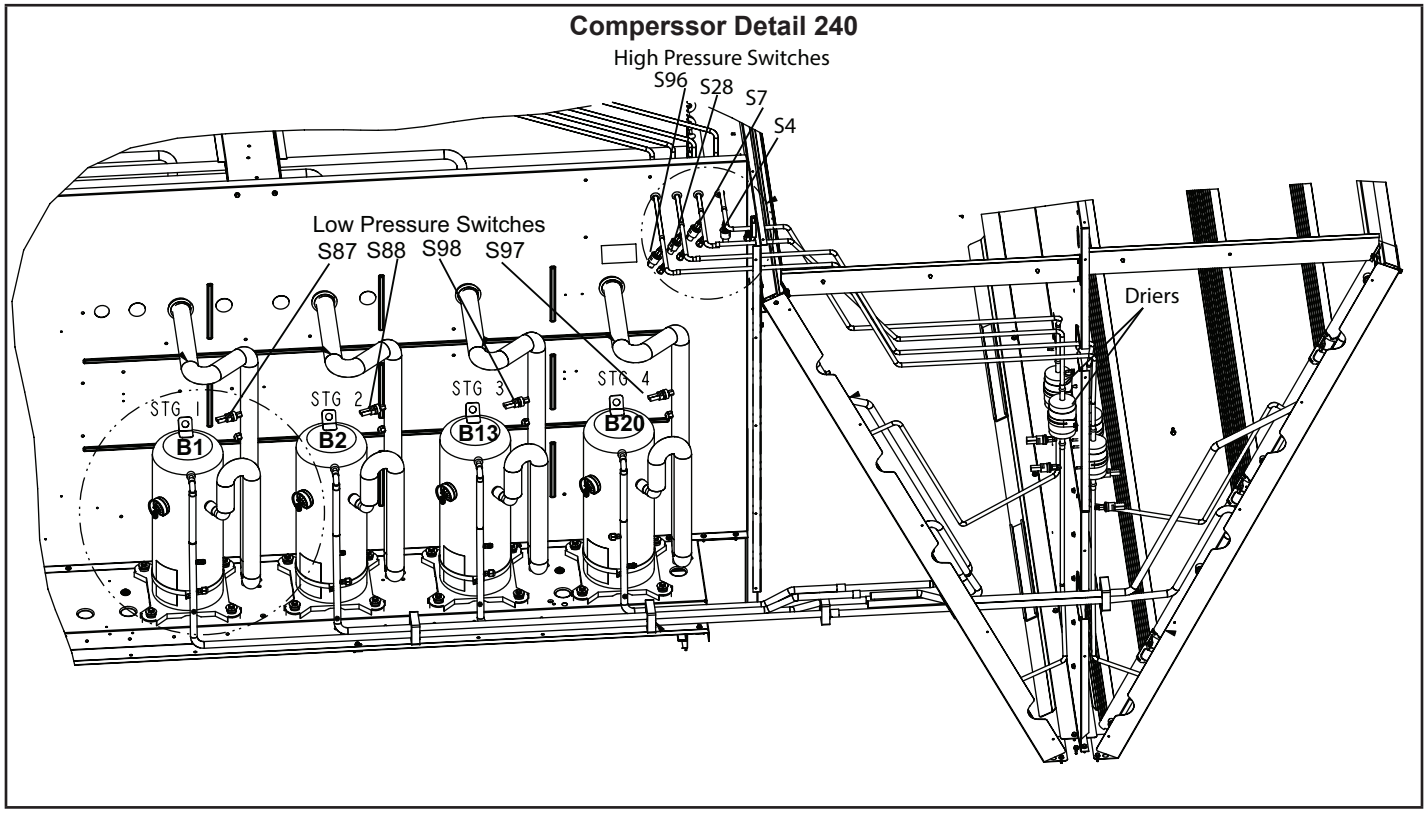


FIGURE 7

SG/SC 120 MSAV™ UNIT REFRIGERANT CIRCUITS

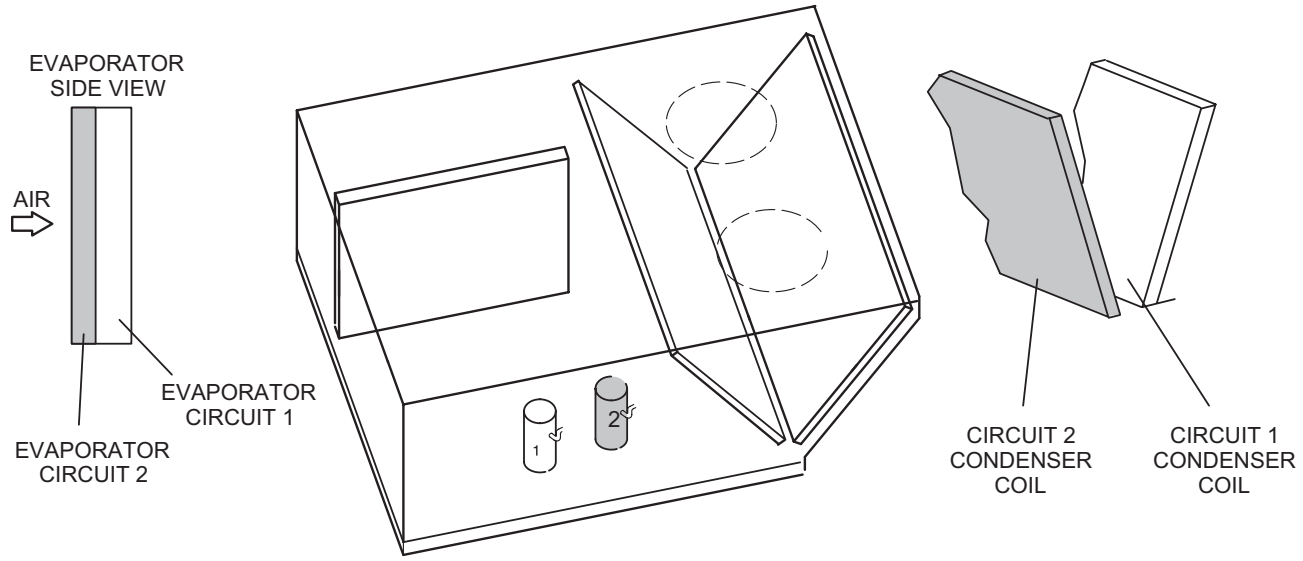


FIGURE 8

SG/SC 240 MSAV™ UNIT REFRIGERANT CIRCUITS
(IN THERMOSTAT MODE)

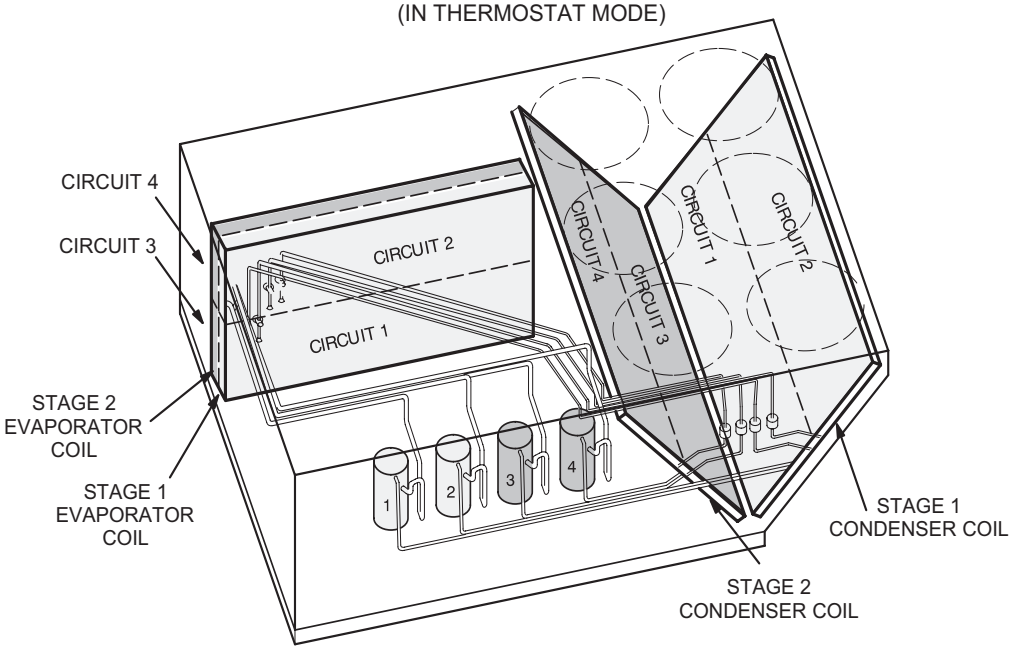


FIGURE 9

6-Temperature Thermistor

RT46/47/50/51 and RT48/49/52/53

Units are equipped with multiple factory-installed thermistors and are located on different points on the refrigerant circuit.

The thermistors provide the Unit Controller with constant temperature readings of two specific locations on the refrigeration circuit. These temperatures are used as feedback in certain modes of unit operation. In addition, the Unit Controller uses these temperatures to initiate alarms such as loss of condenser or evaporator airflow and loss of charge.

Each thermistor must be specifically placed for proper unit operation and to initiate valid alarms. See TABLE 1 for proper locations

TABLE 1

THERMISTOR LOCATION		
Unit	**Sensor**	**Figure**
120 Indoor Coil	RT46, 47	FIGURE 10
120 Outdoor Coil	RT48, 49	FIGURE 11
240 Indoor Coil	RT46, 47, 50, 51	FIGURE 12
240 Outdoor Coil	RT48, 49, 52, 53	FIGURE 13

7-Low Pressure Switches S87, S88, S97, S98

S87 all units

S88 all units

S97 180, 210, 240, 300 units

S98 210, 240, 300 units

The low pressure switch is an auto-reset SPST N.O. switch (held N.C. by refrigerant pressure) which opens on a pressure drop. All units are equipped with this switch. The switch is located in the compressor suction line. See FIGURE 6 and FIGURE 7.

S87 and S88 (compressor one and two) and S98 (compressor three) ans S98 (compressor 4) are wired in series with the contactor coils through the A55 Unit Controller

The Unit Controller A55 governs the low pressure switches by shunting the switches during start up until pressure is stabilized. After the shunt period, the control has a three-strike counter, during a single thermostat demand, before the compressor(s) is locked out. The control is resetby breaking and remaking the thermostat demand or manually resetting the control.

When suction pressure drops to 40 $\pm$ 5 psig (indicating low pressure), the switch opens and the compressor(s) is de-energized. The switch automatically resets when pressure in the suction line rises to 90 $\pm$ 5 psig.

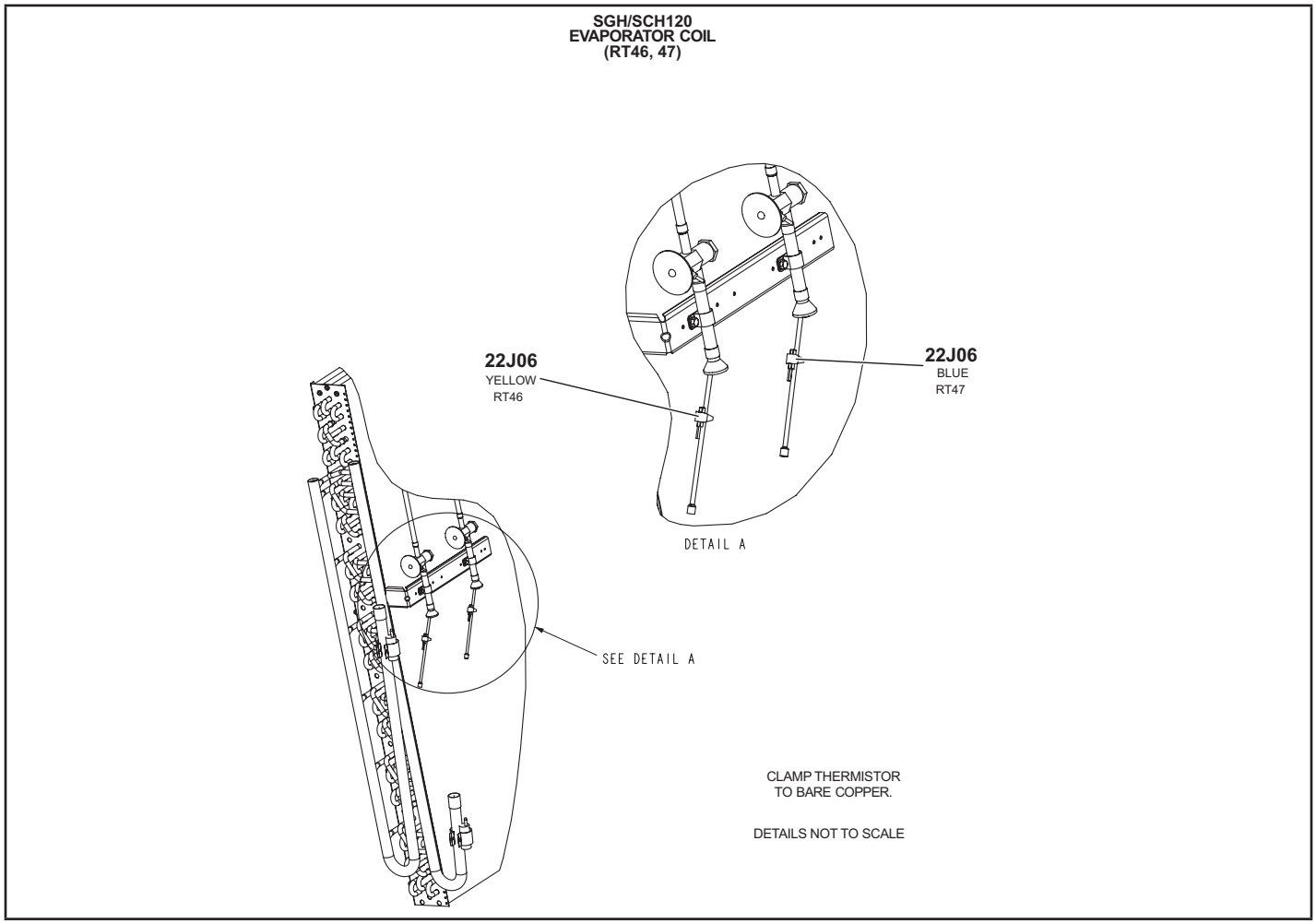


FIGURE 10

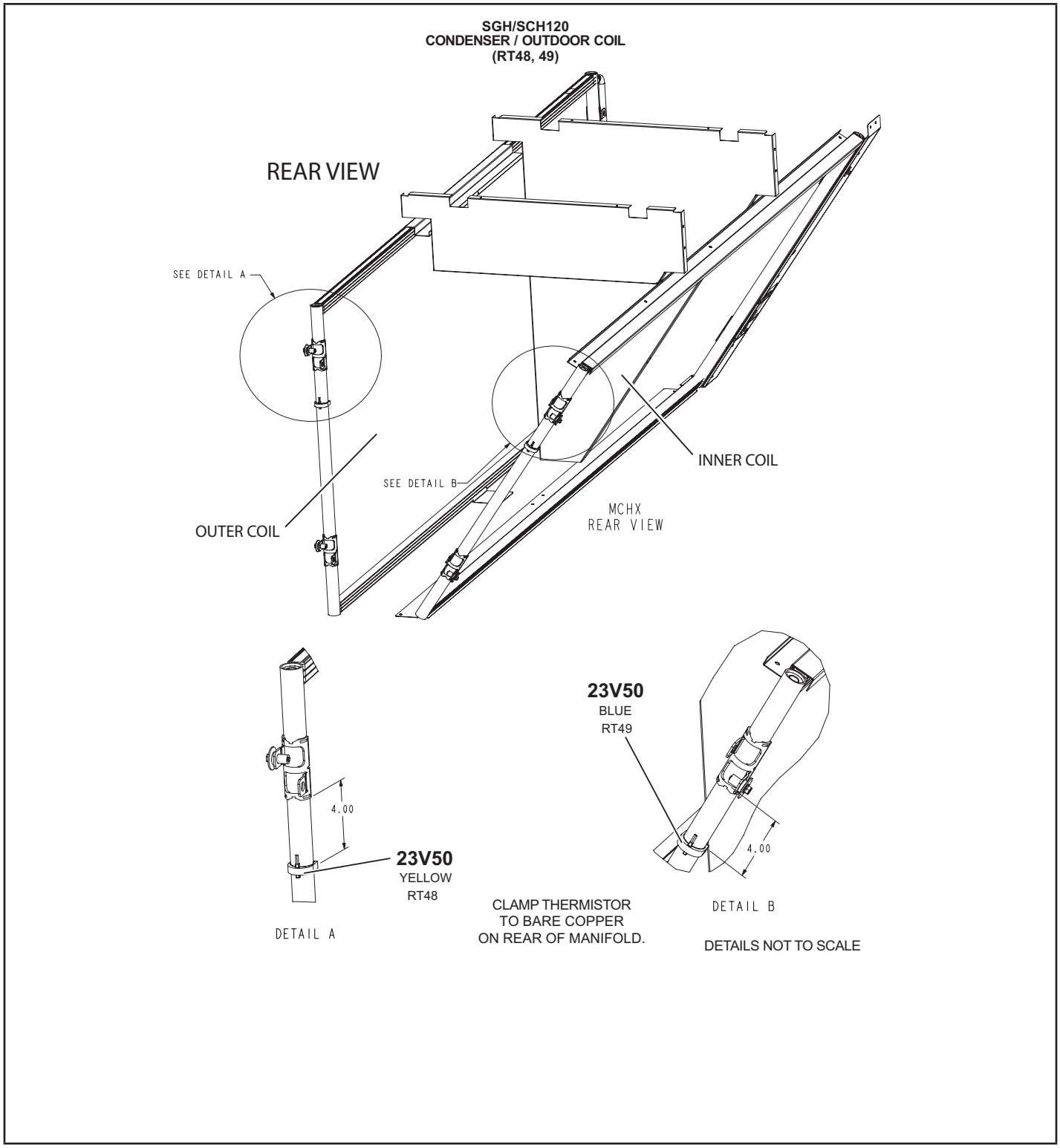

SGH/SCH120
CONDENSER / OUTDOOR COIL
(RT48, 49)
REAR VIEW
SEE DETAIL A
SEE DETAIL B
INNER COIL
OUTER COIL
MCHX
REAR VIEW
4.00
23V50
YELLOW
RT48
DETAIL A
23V50
BLUE
RT49
4.00
DETAIL B
CLAMP THERMISTOR
TO BARE COPPER
ON REAR OF MANIFOLD.
DETAILS NOT TO SCALE

FIGURE 11

SGH/SCH240
EVAPORATOR COIL
(RT46, 47, 50, 51)

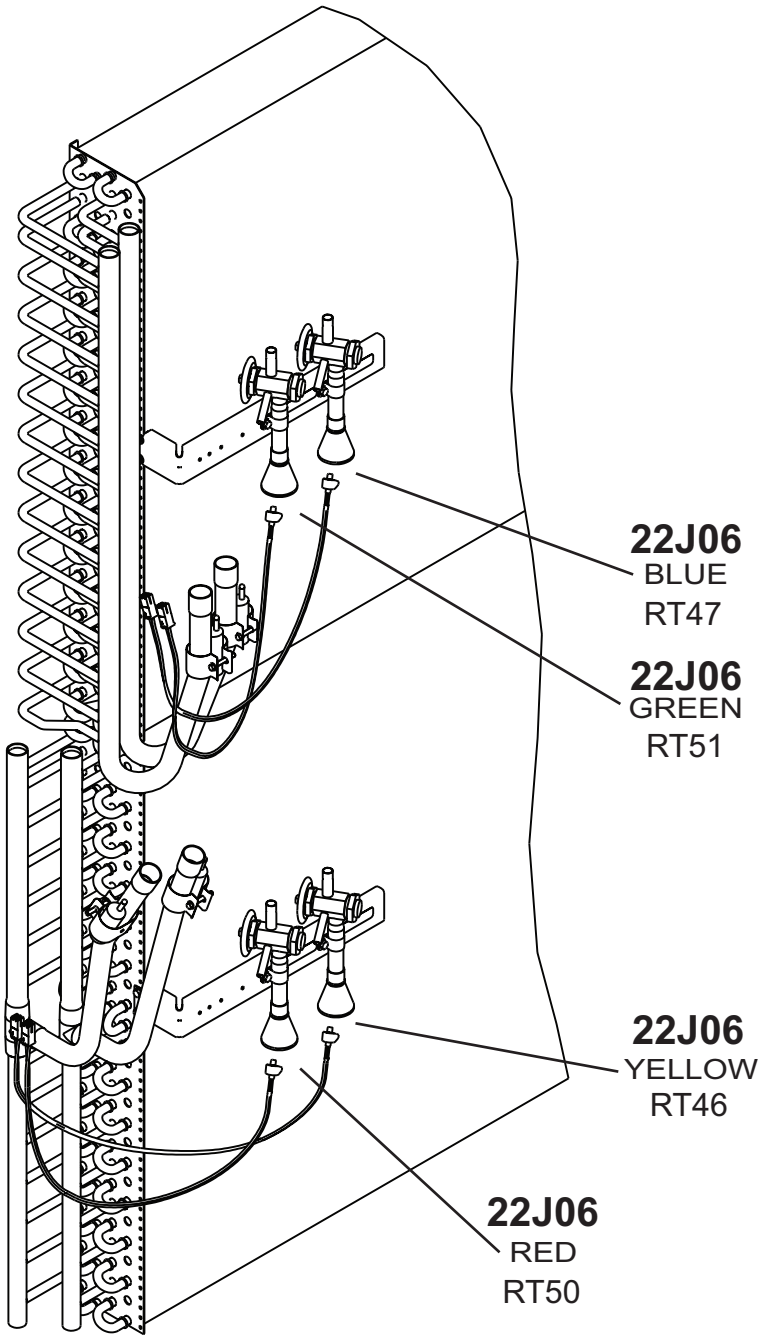
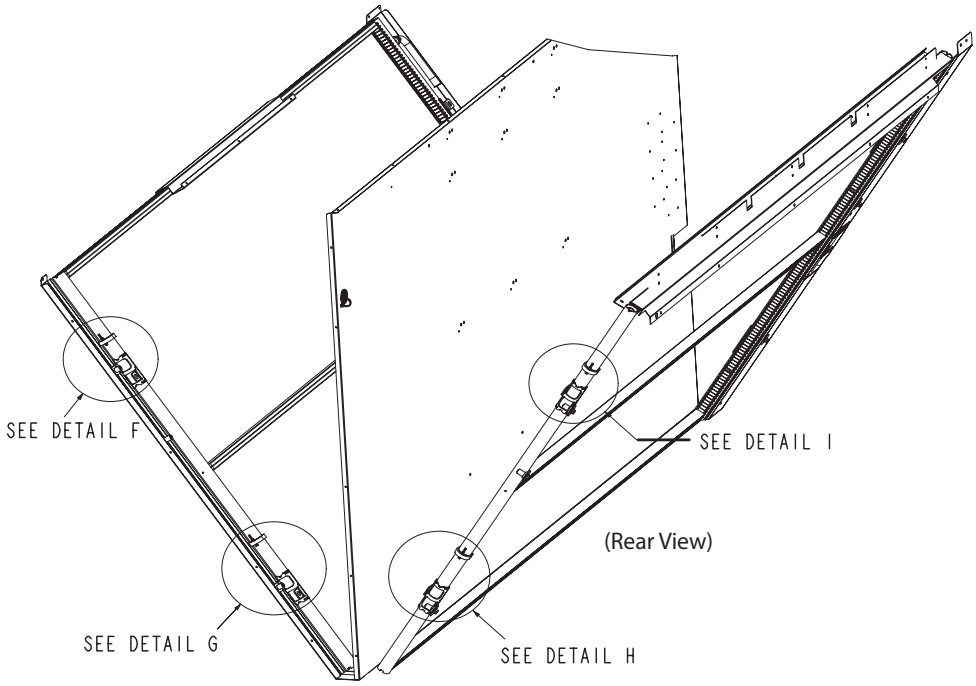
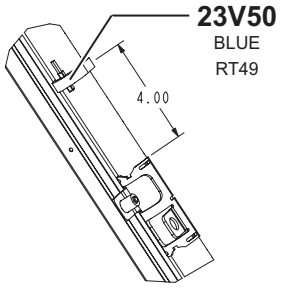


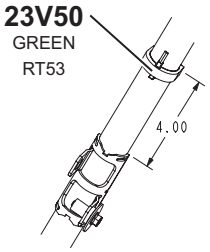
FIGURE 12

SGH/SCH240
CONDENSER COIL
RT48, 49, 52, 53

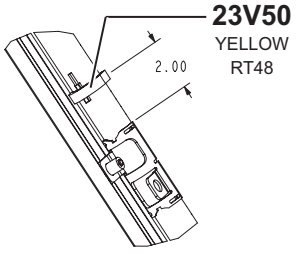




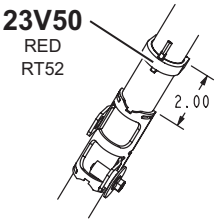
SEE DETAIL F



SEE DETAIL I



SEE DETAIL G



SEE DETAIL H

DETAILS NOT TO SCALE

FIGURE 13

8-RDS Sensors RT58, RT59

Units are equipped with factory-installed RDS Sensors located on different points on the unit. The RDS sensors provide the Unit Controller with continuous readings for leaked refrigerant concentration levels and sensor health status (Good or Fault). These readings are used to modify unit operation to disperse the leaked refrigerant and to remove possible ignition sources. In addition, the Unit Controller uses these readings to initiate alarms to alert the operator of a refrigerant leak or faulty sensor(s).

Each sensor must be specifically placed for proper unit operation and to initiate valid alarms. To identify sensor locations see TABLE 2.

TABLE 2

RDS Sensor Figures

Model	Qty.	Type	Figure
SGH120	2 sensors	INDOOR SENSOR	FIGURE 14
		COMPRESSOR SENSOR	FIGURE 15
SGH/ SCH240	2 sensors	INDOOR SENSOR	FIGURE 16
		COMPRESSOR SENSOR	FIGURE 17

The RDS Sensors and Controller shall only be replaced with parts specified by the appliance manufacturer.

SCH/SGH INDOOR COIL 120 RDS SENSOR LOCATION

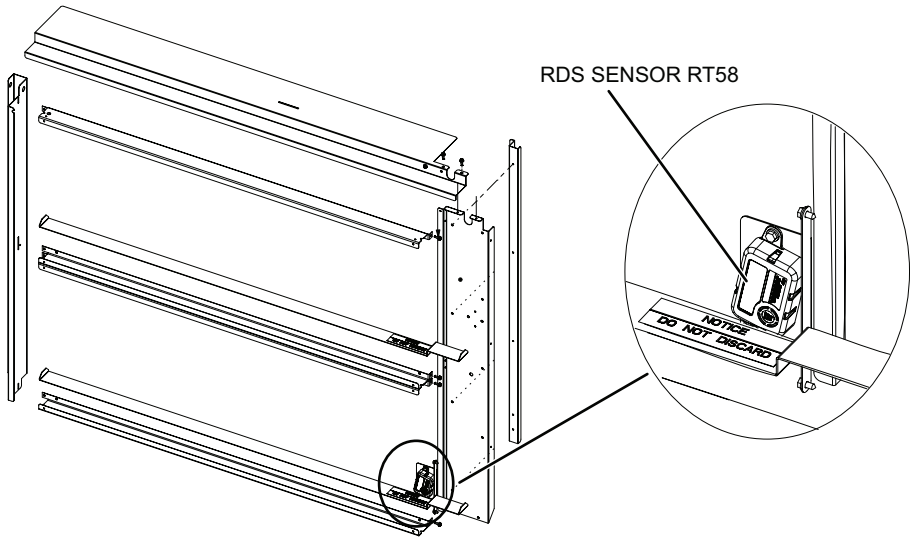


FIGURE 14

120 COMPRESSOR RDS SENSOR LOCATION

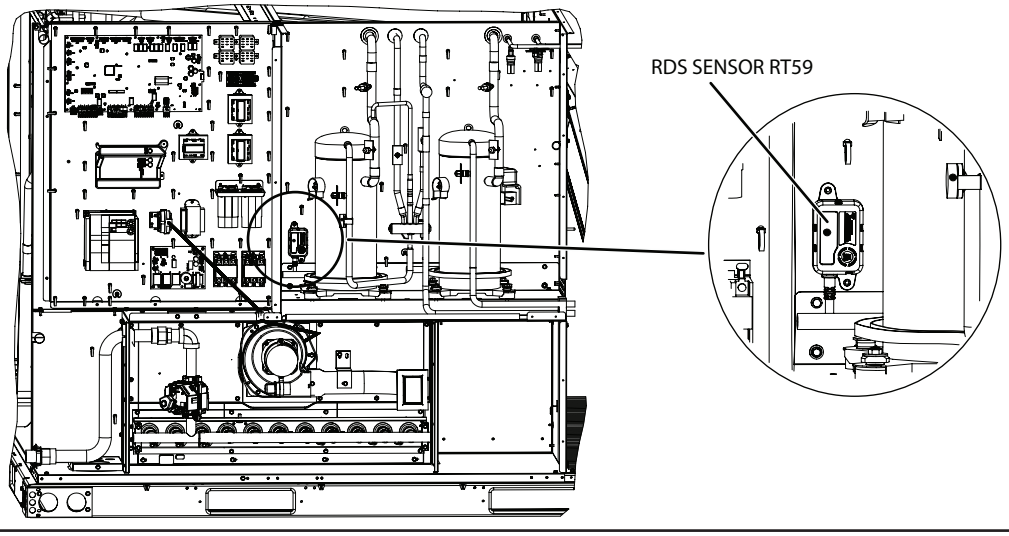


FIGURE 15

240 INDOOR COIL RDS SENSOR LOCATION

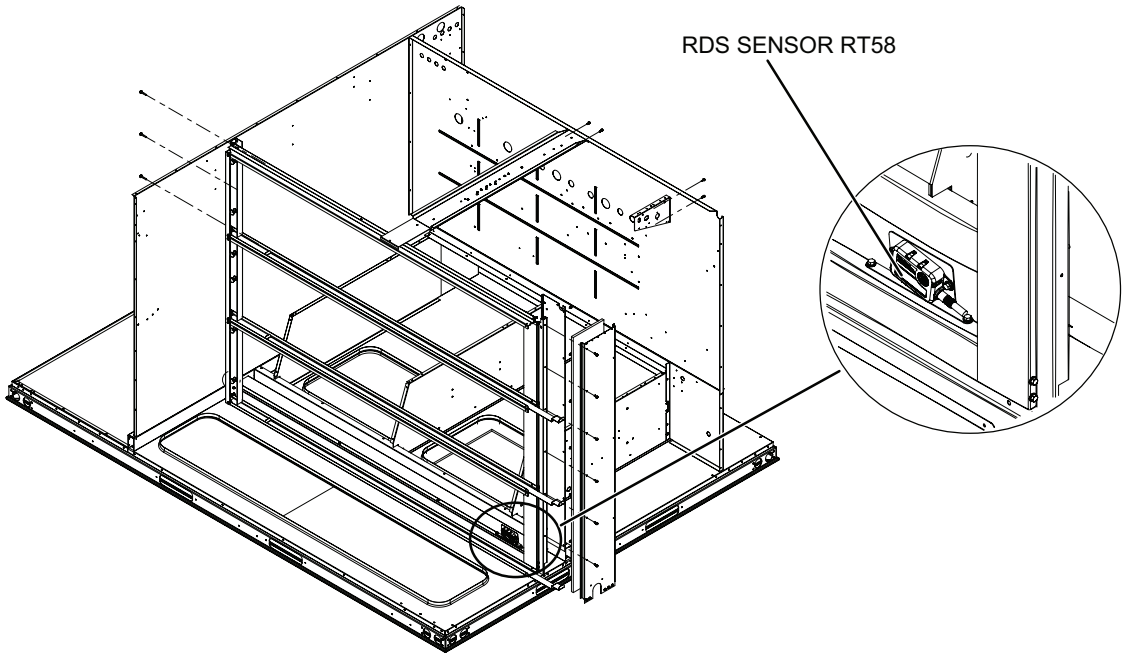


FIGURE 16

240 COMPRESSOR RDS SENSOR LOCATION

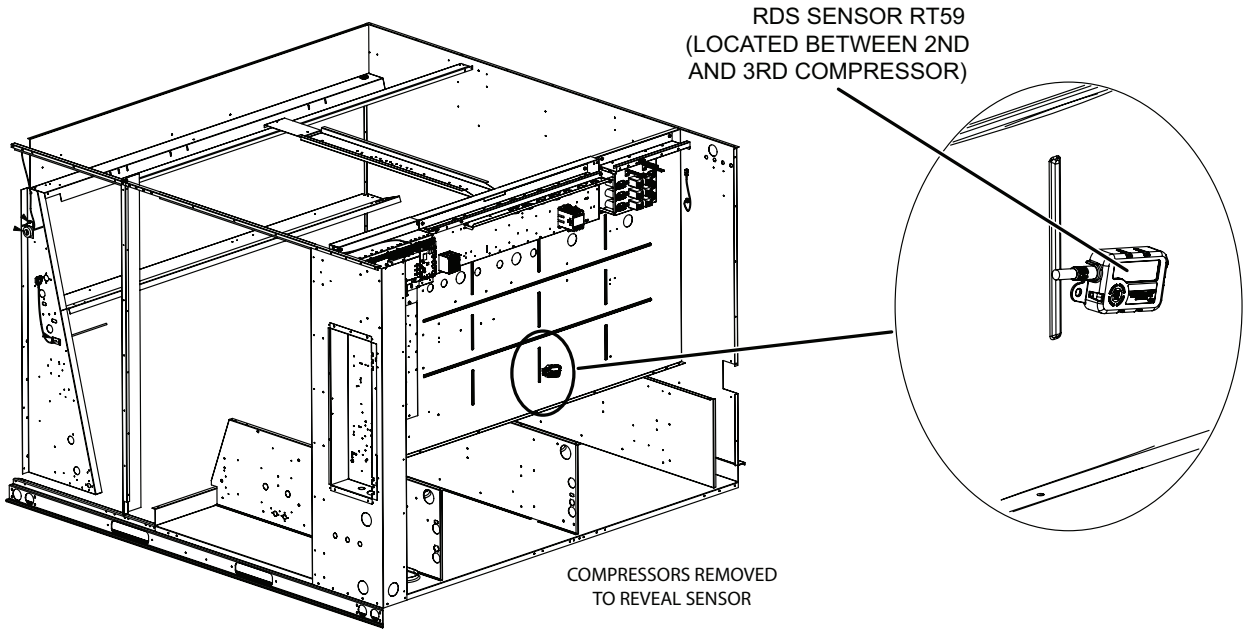


FIGURE 17

C-Blower Compartment

The blower compartment is located between the evaporator coil and the compressor / control section on the opposite side of the condenser coil. The blower assembly is accessed by disconnecting the blower motor wiring (and all other plugs) and removing the screws on either side of the sliding base. The base pulls out as shown in FIGURE 19 and FIGURE 20.

1-Blower Wheels

SGH120 units have one 15 in. x 15 in. blower wheels and SGH240 units have two 18 in x 15 in blower wheels. Blower wheels are driven by one motor.

2-Indoor Blower Motor B3

All units use three-phase single-speed blower motors. CFM adjustments are made by adjusting the motor pulley (sheave). Motors are equipped with sealed ball bearings. All motor specifications are listed in the SPECIFICATIONS (table of contents) in the front of this manual. Units may be equipped with motors manufactured by various manufacturers, therefore electrical FLA and LRA specifications will vary. See unit rating plate for information specific to your unit.

OPERATION / ADJUSTMENT

Belt Drive With Supply Air Inverter The blower rotation will always be correct on units equipped with an inverter or a direct drive blower. Checking blower rotation is not a valid method of determining voltage phasing for incoming power.

Belt Drive Blowers Controlled by an Inverter The Unit Controller checks the incoming power during start-up. If the voltage or phase is incorrect, the Unit Controller will display an alarm and the unit will not start.

A-Blower Operation

NOTE - *On units with staged blowers, use the Unit Controller to start the blower. Refer to the appropriate start-up section.*

Initiate blower demand at thermostat according to instructions provided with thermostat. Unit will cycle on thermostat demand. The following steps apply to applications using a typical electro-mechanical thermostat. MSAV™ units refer to the Optional Supply Air VFD section.

1 - Blower operation is manually set at the thermostat subbase fan switch. With fan switch in ON position, blowers will operate continuously.

2 - With fan switch in AUTO position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in OFF position.

⚠ IMPORTANT

Three Phase Scroll Compressor Voltage Phasing

Three phase scroll compressors must be phased sequentially to ensure correct compressor and blower* rotation and operation. Compressor and blower are wired in phase at the factory. Power wires are color-coded as

follows: line 1-red, line 2-yellow, line 3-blue.

1-Observe suction and discharge pressures and blower* rotation on unit start-up.

2-Suction pressure must drop, discharge pressure must rise and blower* rotation must match rotation marking. If pressure differential is not observed or blower* rotation is not correct:

3-Disconnect all remote electrical power supplies.

4-Reverse any two field-installed wires connected to the line side of S48 disconnect or TB13 terminal strip. Do not reverse wires at blower contactor.

5-Make sure the connections are tight. Discharge and suction pressures should operate at their normal start-up ranges.

***Supply air inverter blower motors should rotate in the correct direction; verify scroll compressor rotation separately. Contact technical support if the blower is rotating incorrectly.**

⚠ WARNING

1-Make sure that unit is installed in accordance with the installation instructions and applicable codes.

2-Inspect all electrical wiring, both field- and factoryinstalled, for loose connections. Tighten as required.

3-Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.

4-Check voltage at disconnect switch. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.

5-Make sure filters are new and in place before start-up.

B-Determining Unit CFM (with wet coil)

Belt Drive Blowers Controlled by an Inverter

IMPORTANT - *MSAV™ units are factory-set to run the blower at full speed when there is a blower (G) demand without a heating or cooling demand. Refer to the field-provided, design specified CFM for all modes of operation. Use the following procedure to adjust motor pulley to deliver the highest CFM called for in the design spec. See MSAV™ Start-Up section to set blower CFM for all modes once the motor pulley is set.*

1 - Measure the indoor blower motor RPM. Air filters must be in place when measurements are taken.

2 - With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in FIGURE 18. ***NOTE -*** *Static pressure readings can vary if not taken where shown.*

3 - Referring to BLOWER DATA (table of contents), use static pressure and RPM readings to determine unit CFM.

4 - The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See FIGURE 19 or FIGURE 20. Do not exceed minimum and maximum number of pulley turns as shown in TABLE 3.

TABLE 3

Belt	Minimum Turns Open	Maximum Turns Open
A Section	0	5
B Section	1*	6

*No minimum number of turns open when B belt is used on pulleys 6-inch O.D. or larger.

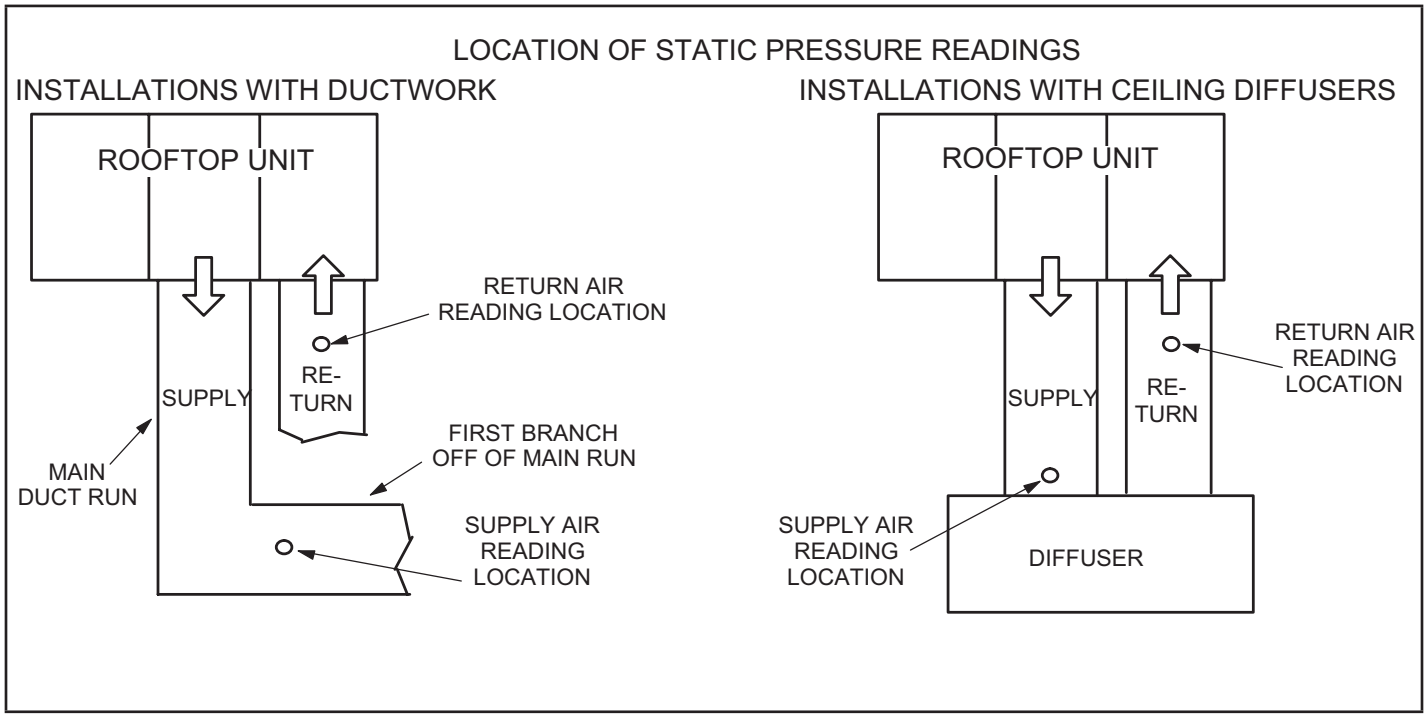


FIGURE 18

BLOWER ASSEMBLY (SG / SC 120)

TO INCREASE BELT TENSION

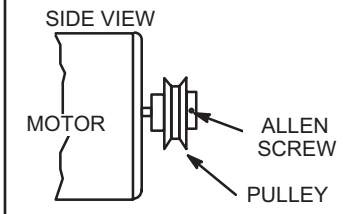
1-Loosen front and back screws securing pivoting motor base to slotted arm.

2-Turn adjusting bolt to the right, or clockwise, to move the motor outward and tighten the belt.

3-Tighten pivoting base screw on motor pulley (front) side.

IMPORTANT - Align top edges of pivoting motor base and mounting frame base parallel before tightening the screw on the back side of base. Motor shaft and blower shaft must be parallel.

4-Tighten pivoting base screw on back side of base.



TO INCREASE CFM
LOOSEN ALLEN SCREW & TURN PULLEY CLOCKWISE

TO DECREASE CFM
TURN PULLEY COUNTERCLOCKWISE

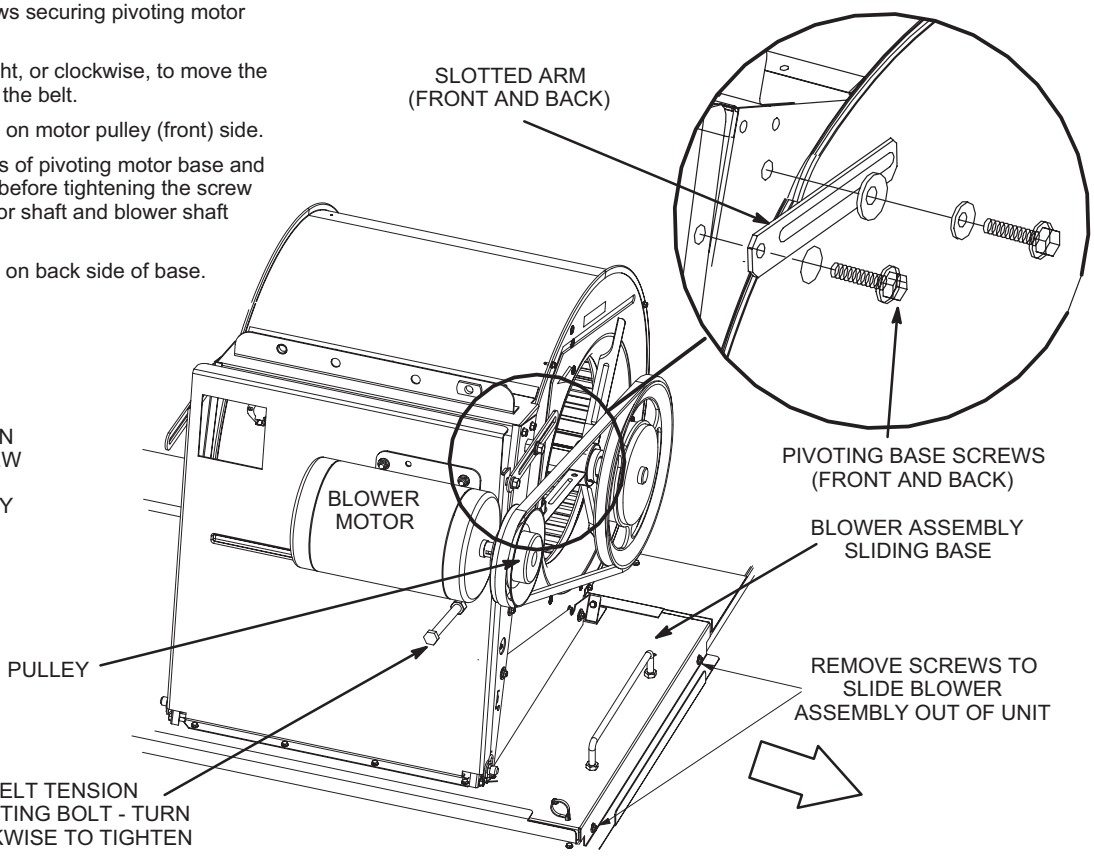


FIGURE 19

BLOWER ASSEMBLY - NO TENSIONER

TO INCREASE CFM
LOOSEN ALLEN SCREW & TURN PULLEY CLOCKWISE

TO DECREASE CFM
TURN PULLEY COUNTERCLOCKWISE

TO INCREASE BELT TENSION

1-Loosen four screws securing blower motor to sliding base.

2-Turn adjusting screw to the left, or counter-clockwise, to move the motor downward and tighten the belt.

3-Tighten four screws.

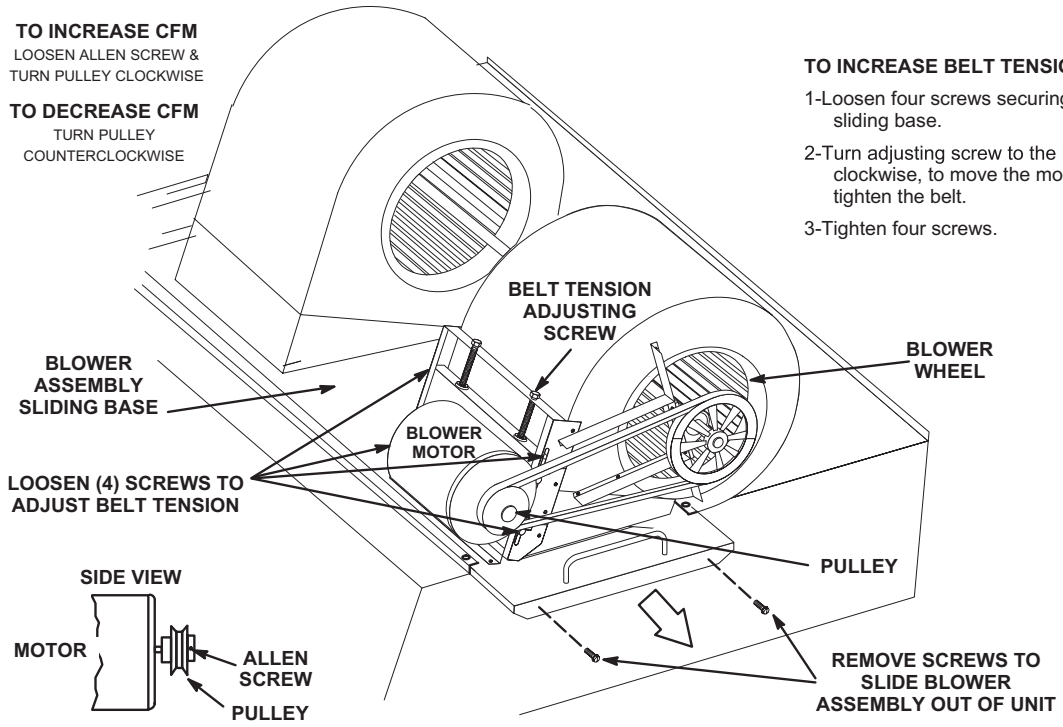


FIGURE 20

D-Adjust Belt Tension

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belt after a 24-48 hour period of operation. This will allow belt to stretch and seat to grooves. Make sure blower and motor pulley are aligned as shown in FIGURE 21. See FIGURE 19 or FIGURE 20 to adjust belt tension.

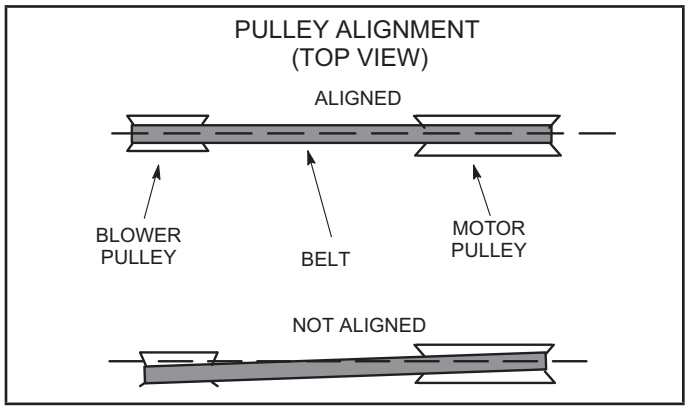


FIGURE 21

E-Check Belt Tension

Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

1 - Measure span length (X). See FIGURE 22.

2 - Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 0.4mm per 25.4mm of span length.

Example: Deflection distance of a 40" span would be 40/64" or 5/8".

Example: Deflection distance of a 1016mm span would be 16mm.

3 - Measure belt deflection force. The deflection force should be 7.0 lbs.

A force below these values indicates an undertensioned belt. A force above these values indicates an overtensioned belt.

F-Blower Drives

See BLOWER DATA section (page 10) for blower drives.

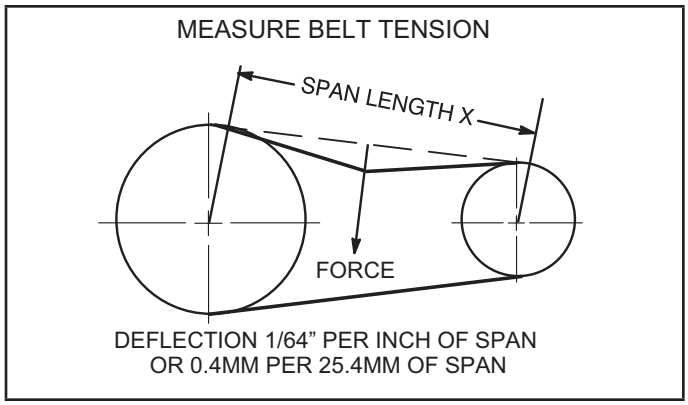


FIGURE 22

D-GAS HEAT COMPONENTS

See SPECIFICATIONS tables or unit nameplate for Btuh capacities. SGH120 units are equipped with one gas heat section and 240 units are equipped with two identical gas heat sections (gas heat section one and gas heat section two) see FIGURE 23 (SGH240 shown) . Stainless steel flex pipe will feed supply gas to the right side and black pipe will feed the left side. If for service the flexible connection must broken, hand tighten then turn additional 1/4" with a wrench for metal to metal seal (do not overtighten).

NOTE - *Do not use thread sealing compound on flex pipe flare connections.*

1-Control Box Components A3, A12, A55

⚠ WARNING

Shock hazard. Spark related components contain high voltage which can cause personal injury or death. Disconnect power before servicing. Control is not field repairable. Unsafe operation will result. If control is inoperable, simply replace the entire control.

Burner Ignition Control A3, A12

The ignition controls are located in the heat section areas (FIGURE 23) below the compressors. The controls are manufactured UTEC. See TABLE 4 for LED codes. The ignition control provides three main functions: gas valve control, ignition and flame sensing. There are three trials for ignition. Each trial is 10 second long with 30 seconds in between trial. After the third attempt for ignition.

the unit will lockout for 60 minutes. 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. See FIGURE 24 for a normal ignition sequence and FIGURE 25 for the ignition attempt sequence with retrials (nominal timings given for simplicity). Specific timings for the ignition controls are shown in FIGURE 26.

TABLE 4

LED Flashes	Indicates
Slow Flash	Control ok, no call for heat
Fast Flash	Control ok, call for heat present.
Steady Off	Control ok, call for heat present.
Steady On Failure	Control internal failure
1 Flash	Rollout switch open
2 Flashes	Limit open or lockout from to many tries during a single heat demand
3 Flashes	Pressure switch open with inducer on/ open during 5 minute inducer off time.
4 Flashes	Ignition lockout from no flame detected or from too many flame losses.
5 Flashes	Flame sensed out of sequence
6 Flashes	Pressure switch closed with induc-er off
7 Flashes	Gas valve relay failure
8 Flashes	Lockout due to too many pressure switch openings during one heat demand

Gas Components (240 shown)

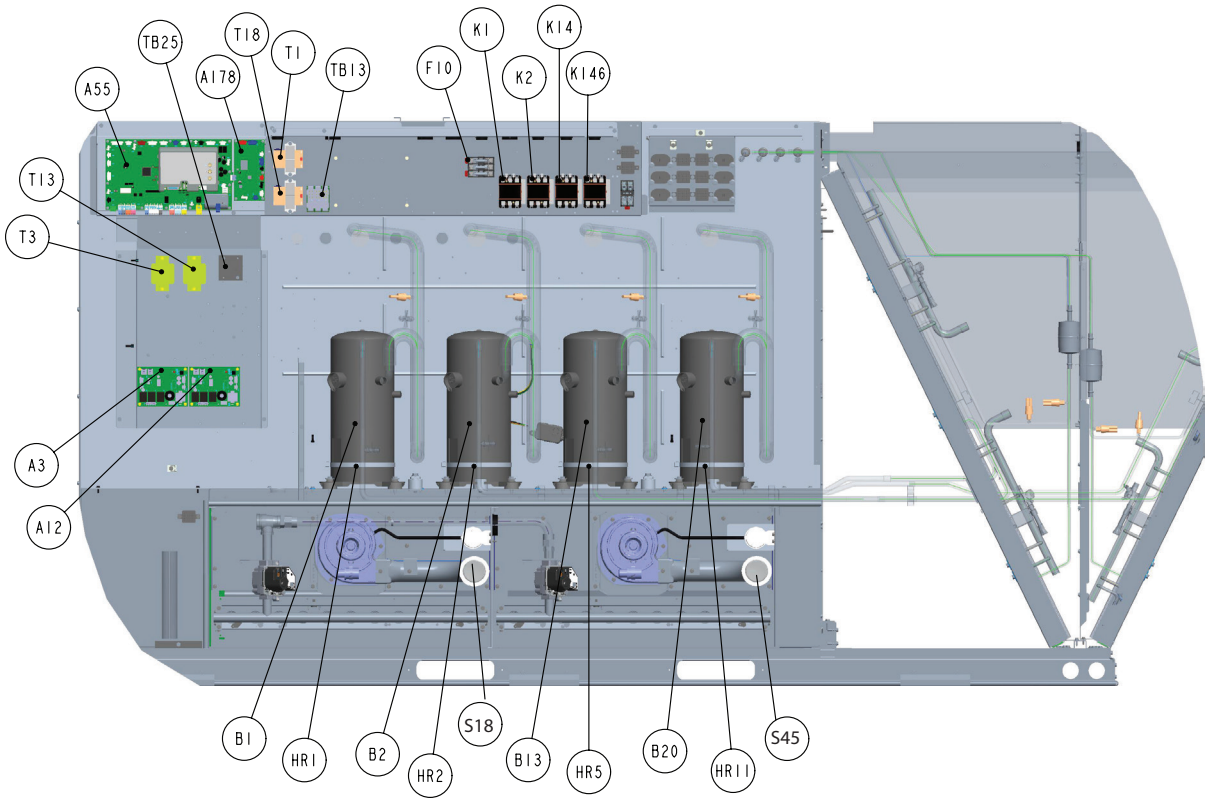


FIGURE 23

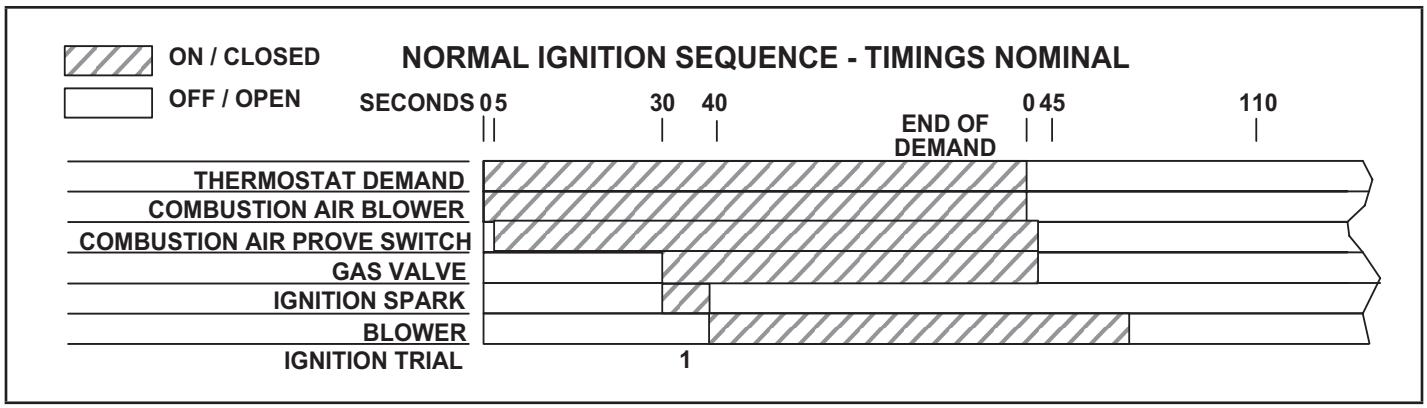


FIGURE 24

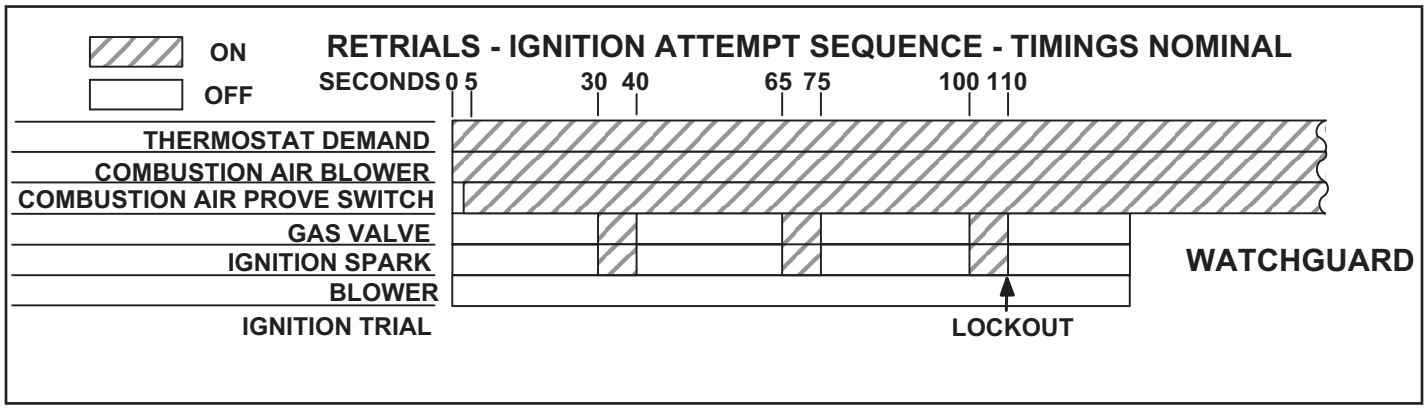


FIGURE 25

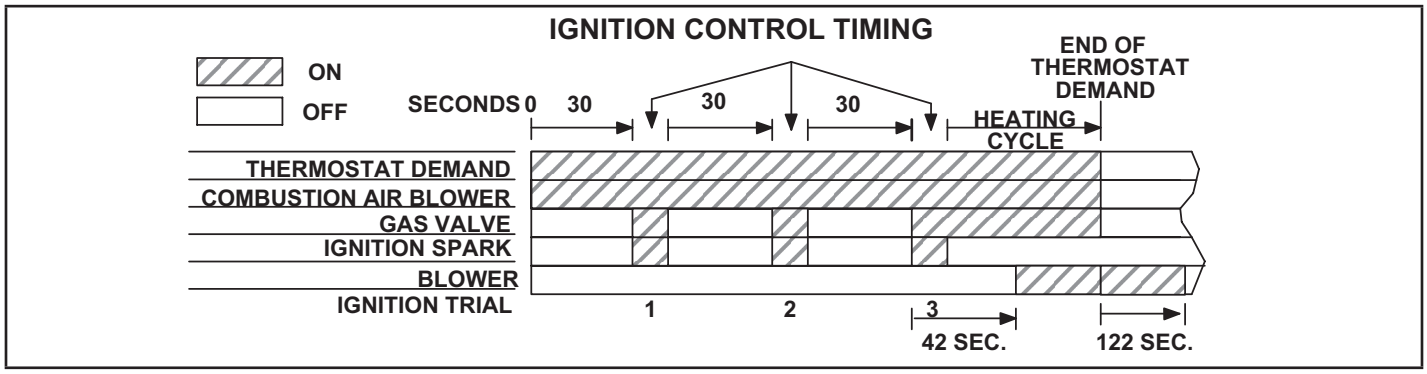


FIGURE 26

Flame rectification sensing is used on all units. Loss of flame during a heating cycle is indicated by an absence of flame signal (0 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 gas flow immediately in the event of a power failure. Upon restoration of gas and power, the control will restart the ignition sequence and continue until flame is established or system locks out.

On a heating demand, the ignition control is energized by the A55 Unit Controller. The ignition control then allows 30 to 40 seconds for the combustion air blower to vent exhaust gases from the burners.

When the combustion air blower is purging the exhaust gases, the combustion air prove switch is closing proving that the combustion air blower is operating before allowing the ignition control to energize.

When the combustion air prove switch is closed and the delay is over, the ignition control activates gas valve, the spark electrode and the flame sensing electrode. Sparking stops immediately after flame is sensed. The combustion air blower continues to operate throughout the heating demand. If the flame fails or if the burners do not ignite, the ignition control will attempt to ignite the burners up to two more times. If ignition cannot be obtained after the third attempt, the control will lock out. The ignition control is not adjustable.

2-Heat Exchanger (FIGURE 27)

Units use aluminized steel cluster inshot burners with matching tubular aluminized (stainless steel is an option) steel heat exchangers and two-stage redundant gas valves. Units use eleven-tube/burners for high heat, six-tube/burners for standard or low heat and nine-tube/burners for medium heat. Burners in all units use a burner venturi to mix gas and air for proper combustion. Combustion takes place at each tube entrance.

As hot combustion gases are drawn upward through each tube by the combustion air blower, exhaust gases are drawn out the top and fresh air/gas mixture is drawn in at the bottom. Heat is transferred to the air stream from all surfaces of the heat exchanger tubes. The supply air blowers, controlled by the Unit Controller A55, force air across all surfaces of the tubes to extract the heat of combustion. The shape of the tubes ensures maximum heat exchange. The gas valves accomplish staging by allowing more or less gas to the burners as called for by heating demand.

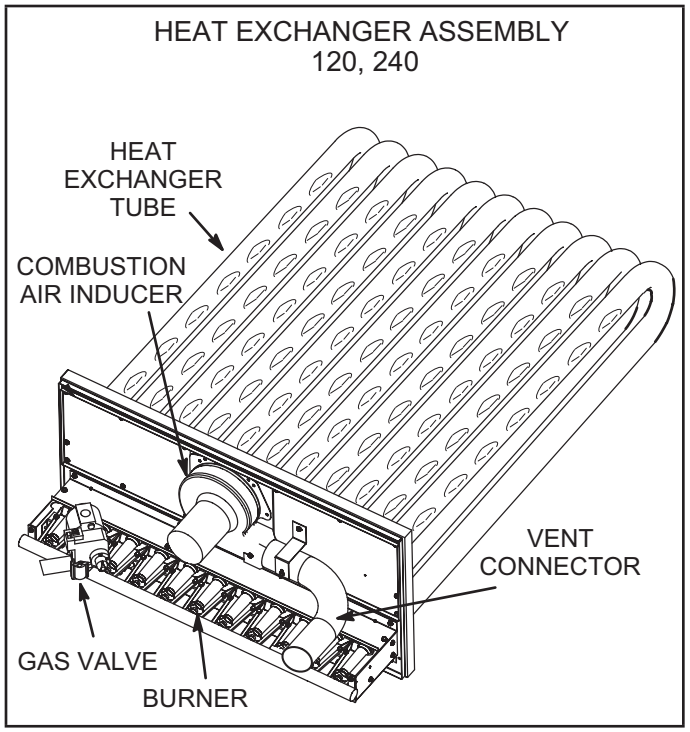


FIGURE 27

3-Burner Assembly (FIGURE 28)

The burners are controlled by the spark electrode, flame sensing electrode, gas valve and combustion air blower. The spark electrode, flame sensing electrode and gas valve are directly controlled by ignition control. Ignition control and combustion air blower is controlled by Unit Controller A55.

Burners

All units use cluster inshot burners. Burners are factory set and do not require adjustment. A peep hole with cover is furnished in the heating access panel for flame viewing. Always operate the unit with the access panel in place. Burners can be removed for service. Burner maintenance and service is detailed in the SERVICE CHECKS section of this manual.

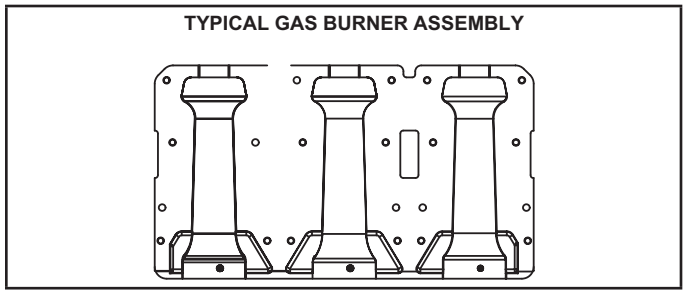


FIGURE 28

Orifice

Each burner uses an orifice (FIGURE 29) which is precisely matched to the burner input. Install only the orifices with the same threads. The orifice is threaded into the burner manifold. The burner is supported by the orifice and will easily slide off for service.

NOTE-*Do not use thread sealing compound on the orifices. Using thread sealing compound may plug the orifices. Natural gas orifice size is on nameplate. The LP gas orifice size is on the label provided in the LP kit.*

NOTE- *In primary and secondary high temperature limits S10 and S99 the ignition circuits in both gas heat sections one and two are immediately de-energized when terminals 1-3 open and the indoor blower motor is immediately energized when terminals 1-2 close. This is the primary and secondary safety shut-down function of the unit.*

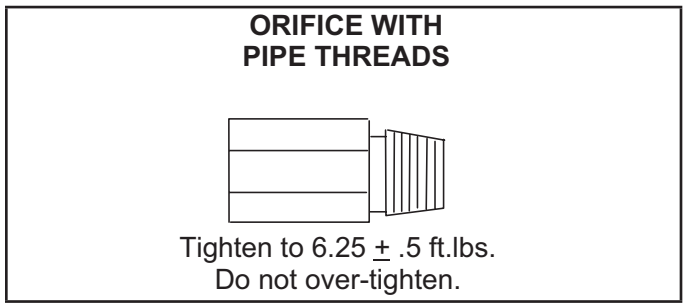


FIGURE 29

4-Primary High Temperature Limits S10 all units & S99 240 only

S10 is the primary high temperature limit for gas heat section one and S99 is the primary high temperature limit for gas heat section two.

FIGURE 30 (120) and FIGURE 31 (240) show locations of S10 and S99.

Primary limit S10 is wired to the Unit Controller A55 which energizes burner 1 control (A3), while primary limit S99 is wired to the A55 Unit Controller which energizes burner 2 control (A12). Its N.C. contacts open to de-energize the ignition control when excessive temperature is reached in the blower compartment. If either limit trips the blower will be energized. Limits settings are factory set and cannot be adjusted. If limit must be replaced same type and set point must be used. See Repair Parts Handbook.

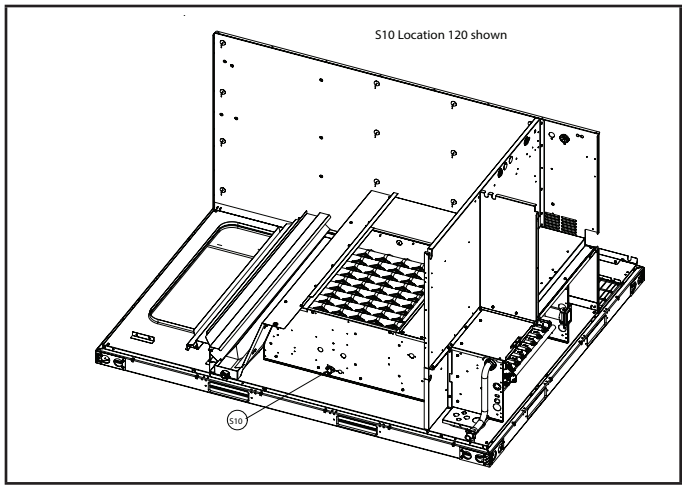


FIGURE 30

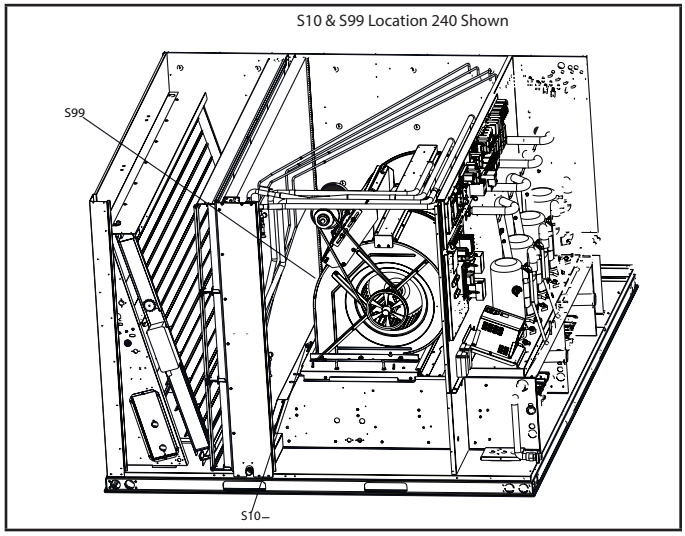


FIGURE 31

5-Flame Rollout Limits S47, S69

Flame rollout limits S47 on first heat section and S69 on second heat section are SPST N.C. high temperature limits located just above the burner air intake opening in the burner enclosures. Both switches are wired to the A55 Unit Controller. When S47 or S69 senses flame rollout (indicating a blockage in the combustion air passages), the corresponding flame rollout limit trips and the ignition control immediately closes the gas valve. Limit S47 and S69 in standard heat units are factory preset to open at 290F $\pm$ 12F on a temperature rise, while on high heat units both limits open at 270F $\pm$ 12F on a temperature rise. All flame rollout limits are manual reset.

6-Combustion Air Prove Switches S18, S45

Prove switches S18 (first heat section 120, 240) and S45 (second heat section 240) are located in the compressor compartment. Each has its own control box. Both are identical SPST N.O. switches and monitor combustion air inducer operation. Switch S18 and S45 are wired to the A55 Unit Controller.

The switch closes on a negative pressure fall. This negative pressure fall and switch actuation allows the ignition sequence to continue (proves, by closing, that the combustion air inducer is operating before allowing the gas valve to open.) The combustion air prove switch is factory set and not adjustable. The switch will automatically open on a pressure rise (less negative pressure). TABLE 5 shows prove switch settings.

TABLE 5

S18 & S45 Prove Switch Settings

Close“ w.c.	Open “ w.c.
0.25 $\pm$ 5	0.10$\pm$5

7-Combustion Air Inducers B6 & B15

Combustion air blowers B6 on the first heat section and B15 on the second heat section, are identical blowers which provide fresh air to the corresponding burners while clearing the combustion chamber of exhaust gases. The blowers begin operating immediately upon receiving a thermostat demand and are de-energized immediately when thermostat demand is satisfied.

Both combustion air blowers use a 208/230 or 460V single-phase PSC motor and a 4.81in. x 1.25in blower wheel. All motors operate at 3200 or 3450 RPM and are equipped with auto-reset overload protection. Blowers are supplied by various manufacturers. Ratings may vary by manufacturer. Specific blower electrical ratings can be found on the unit rating plate.

All combustion air blower motors are sealed and cannot be oiled. The blower cannot be adjusted but can be disassembled for cleaning.

8-Combustion Air Motor Capacitors C3 & C11

The combustion air blower motors in all LGT units require run capacitors. Capacitor C3 is connected to combustion air blower B6 and C11 is connected to combustion air blower B15. Capacitors are rated at 208/230V. CAB has 4uF 450V capacitors and 460V CAB has 2uF 450V capacitors.

9-Gas Valves GV1 & GV3

Gas valves GV1 (120, 240) and GV3 (240) are identical. The gas valves are two-stage redundant valves. Units are equipped with valves manufactured by WhiteRodgers.. On a call for first stage heat (low fire), the valve is energized by the ignition control simultaneously with the spark electrode. On a call for second stage heat (high fire), the second stage operator is energized directly from A55 (GV1, GV3). The valve is adjustable for both low fire and high fire. A manual shut-off knob is provided on the valve for shut-off. Manual shut-off knob immediately closes both stages without delay. FIGURE 32 shows gas valve components. TABLE 6 shows factory gas valve regulation for SGH series units

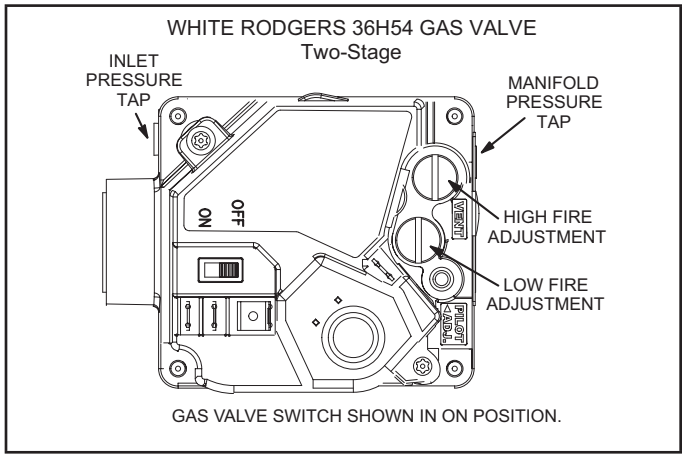


FIGURE 32

TABLE 6

GAS VALVE REGULATION FOR LGT UNITS

Max Inlet Pressure "W.C.	Operating Pressure "W.C. (outlet) Factory Setting			
	Natural		L.P. Propane	
	Low	High	Low	High
13.0	1.6±0.2.	3.7±0.3	5.5±0.3	0.5±0.5

10-Spark Electrodes

An electrode assembly is used for ignition spark. Two identical electrodes are used (one for each gas heat section). The electrode is mounted through holes on the left-most end of the burner support. The electrode tip protrudes into the flame envelope of the adjacent burner.

The electrode assembly is fastened to burner supports and can be removed for service without removing any part of the burners.During ignition, spark travels through the spark electrode (FIGURE 33) and ignitwes the left burner. Flame travels from burner to burner until all are lit.The spark electrode is connected to the ignition control by a 8 mm 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.

NOTE- *IN ORDER TO MAXIMIZE SPARK ENERGY TO ELECTRODE, HIGH VOLTAGE WIRE SHOULD TOUCH UNIT CABINET AS LITTLE AS POSSIBLE.*

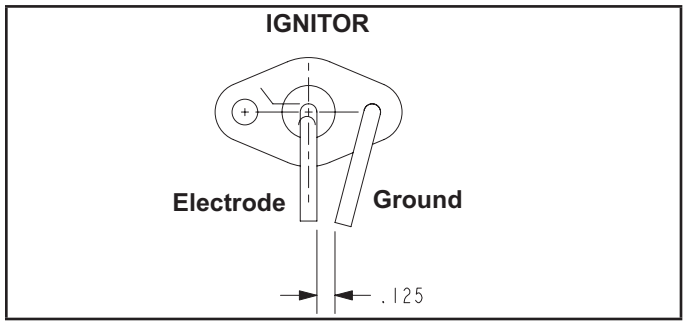


FIGURE 33

11-Flame Sensors

A flame sensor is located on the right side of each burner support. The sensor is mounted through a hole in the burner support and the tip protrudes into the flame envelope of the right most burner. The sensor assembly is fastened to burner supports and can be removed for service without removing any part of the burners.

When flame is sensed by the flame sensor (indicated by microamp signal through the flame) sparking stops immediately. During operation, flame is sensed by current passed along the ground electrode (located on the spark electrode), through the flame and into the sensing electrode. The ignition control allows the gas valve to stay open as long as a flame signal (current passed through he flame) is sensed.

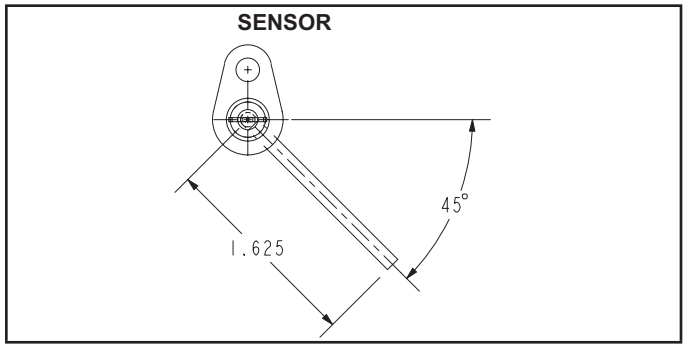


FIGURE 34

II-CHARGING

A-Refrigerant Charge and Check - All-Aluminum Coil

IMPORTANT - Charge unit in standard cooling mode.

WARNING*-Do not exceed nameplate charge under any condition.*

This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, reclaim the charge, evacuate the system, and add required nameplate charge.

Refrigerant Charge R-454B		
Unit	M_c(lbs)	M_c(kg)
SGH120 circ 1	7.00	3.18
SGH120 circ 2	4.81	2.18
SGH120 circ 1W/ Humidtrol	7.00	3.18
SGH120 circ2 W/ Humidtrol	5.13	2.32
SGH240 circ 1	6.69	3.03
SGH240 circ 2	6.06	2.75
SGH240 circ 3	5.06	2.30
SGH240 circ 4	5.19	2.35
SGH240 circ 1 W/ Humiditrol	7.75	3.52
SGH240 circ 2 W/ Humiditrol	7.19	3.26
SGH240 circ 3 W/ Humiditrol	5.31	2.41
SGH240 circ 4 W/ Humiditrol	5.38	2.44

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed and, since flammability is a consideration, the following procedure shall be adhered to:

- Safely remove refrigerant following local and national regulations,
- Evacuate the circuit,
- Purge the circuit with inert gas,
- Evacuate,
- Purge with inert gas,
- Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. Refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating unit is earthed prior to charging the system with refrigerant.
    - Label the system when charging is complete (if not already).
    - Extreme care shall be taken not to overfill the refrigerating unit.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

- When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i. e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure- relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants includ-ing, when applicable, flammable refrigerants. In ad-dition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manu-facturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site

NOTE - *System charging is not recommended below 60F (15C). In temperatures below 60F (15C), the charge must be weighed into the system.*

If weighing facilities are not available, or to check the charge, use the following procedure:

1 - Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.

2 - Compare the normal operating pressures to the pressures obtained from the gauges. Check unit components if there are significant differences.

3 - Measure the outdoor ambient temperature and the suction pressure. Refer to the charging curve to determine a target liquid temperature.

Note - *Pressures are listed for sea level applications.*

4 - Use the same thermometer to accurately measure the liquid temperature (in the outdoor section).

- If measured liquid temperature is higher than the target liquid temperature, add refrigerant to the system.
- If measured liquid temperature is lower than the target liquid temperature, recover some refrigerant from the system.
- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i. e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

5 - Add or remove charge in increments. Allow the system to stabilize each time refrigerant is added or removed.

6 - Continue the process until measured liquid temperature agrees with the target liquid temperature. Do not go below the target liquid temperature when adjusting charge. Note that suction pressure can change as charge is adjusted.

7 - Example: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 97°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquidtemperature agrees with the target liquid temperature.

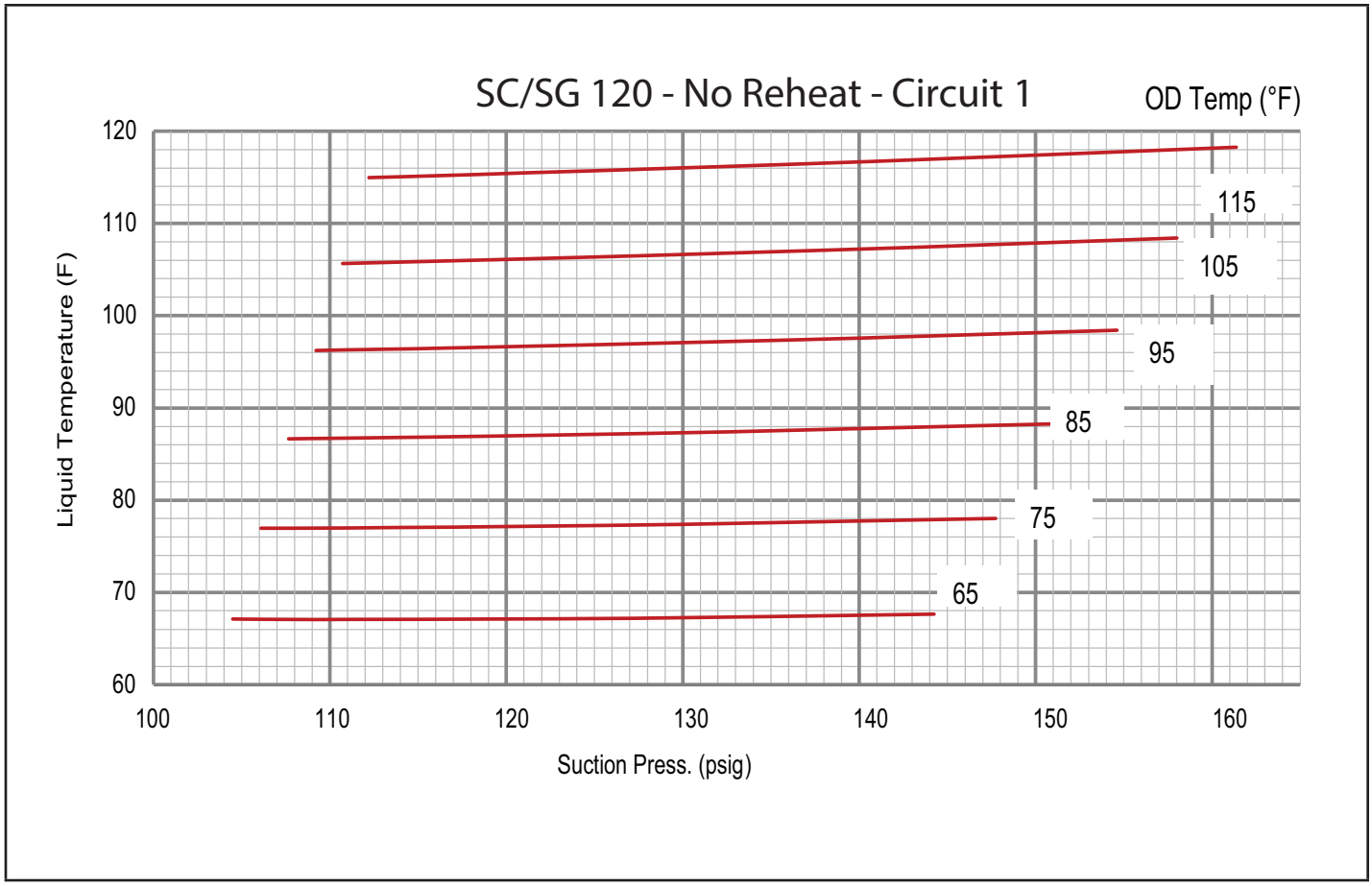
TABLE 7

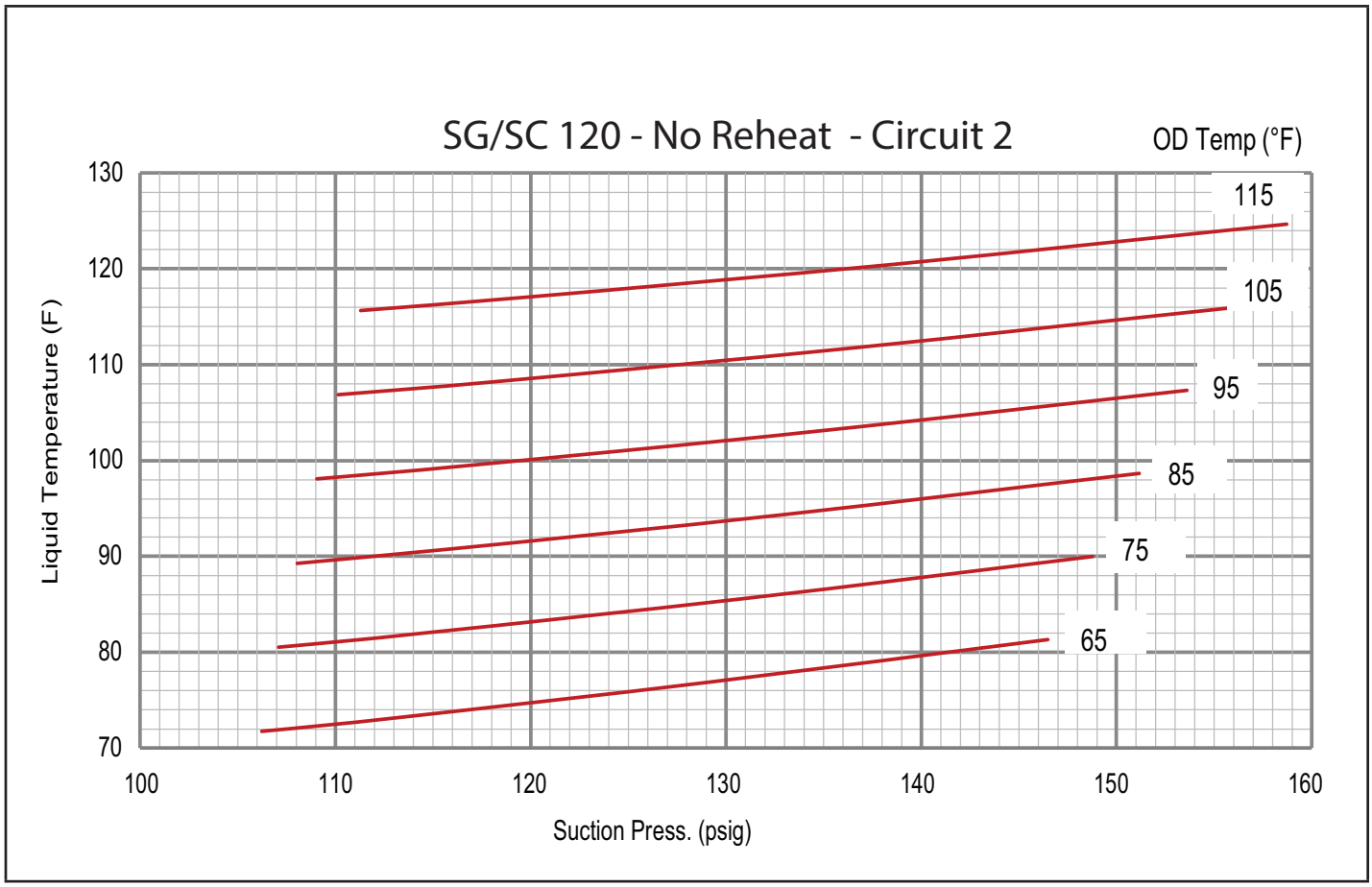
SG/SC 120 Normal Operating Pressures - No Reheat 581197-01

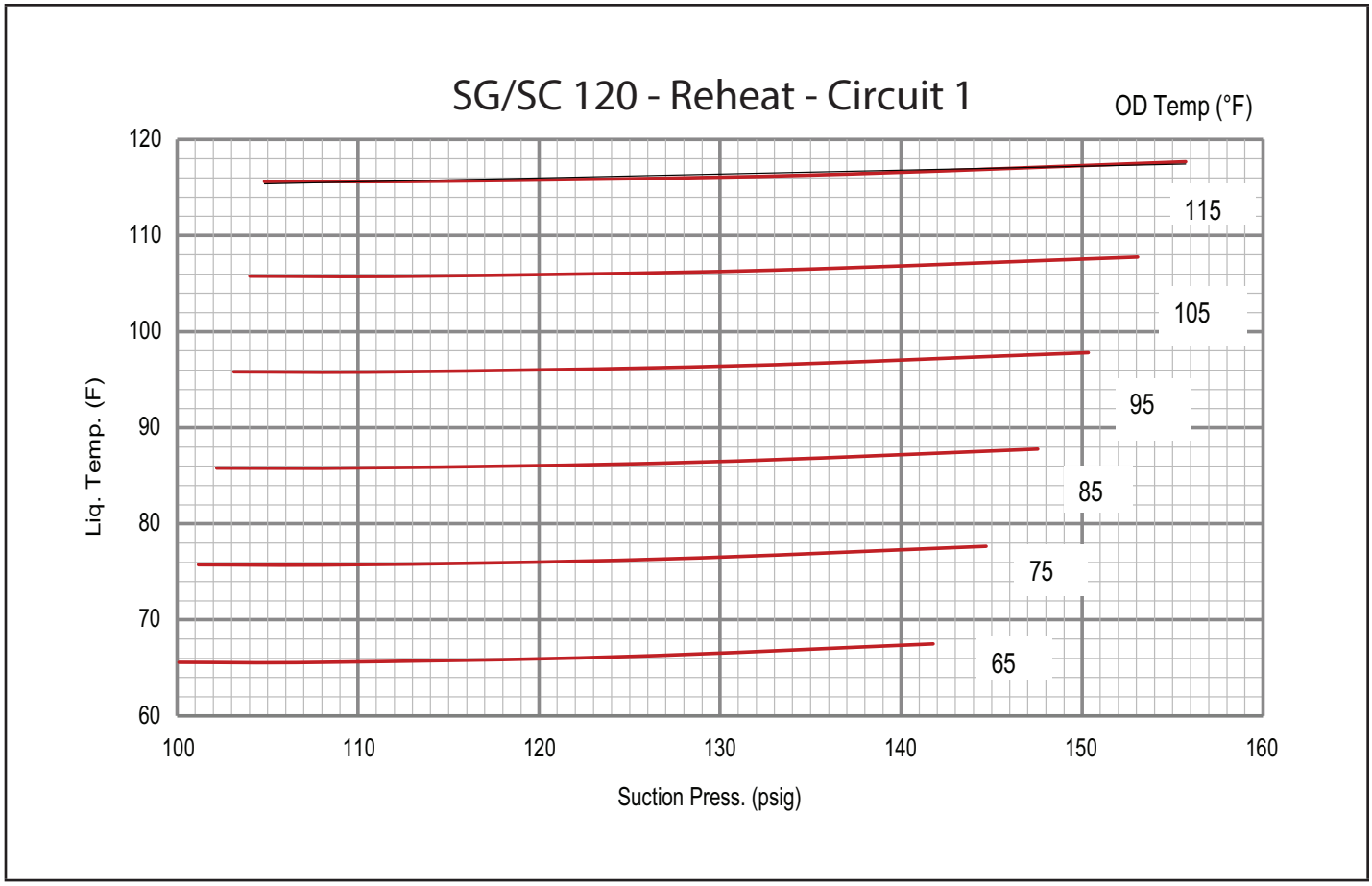
	Outdoor Coil Entering Air Temperature											
	65°F		75°F		85°F		95°F		105°F		115°F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	104	220	106	259	108	304	109	356	111	415	112	480
	112	222	114	259	116	303	118	353	119	410	121	474
	127	229	130	263	133	304	135	351	138	405	141	465
	144	242	148	273	151	310	155	355	158	405	161	462
Circuit 2	106	242	107	279	108	321	109	366	110	415	111	469
	114	245	115	282	116	324	117	369	119	419	120	472
	129	252	131	290	133	332	135	377	137	427	139	480
	146	261	149	299	151	341	154	386	156	436	159	489

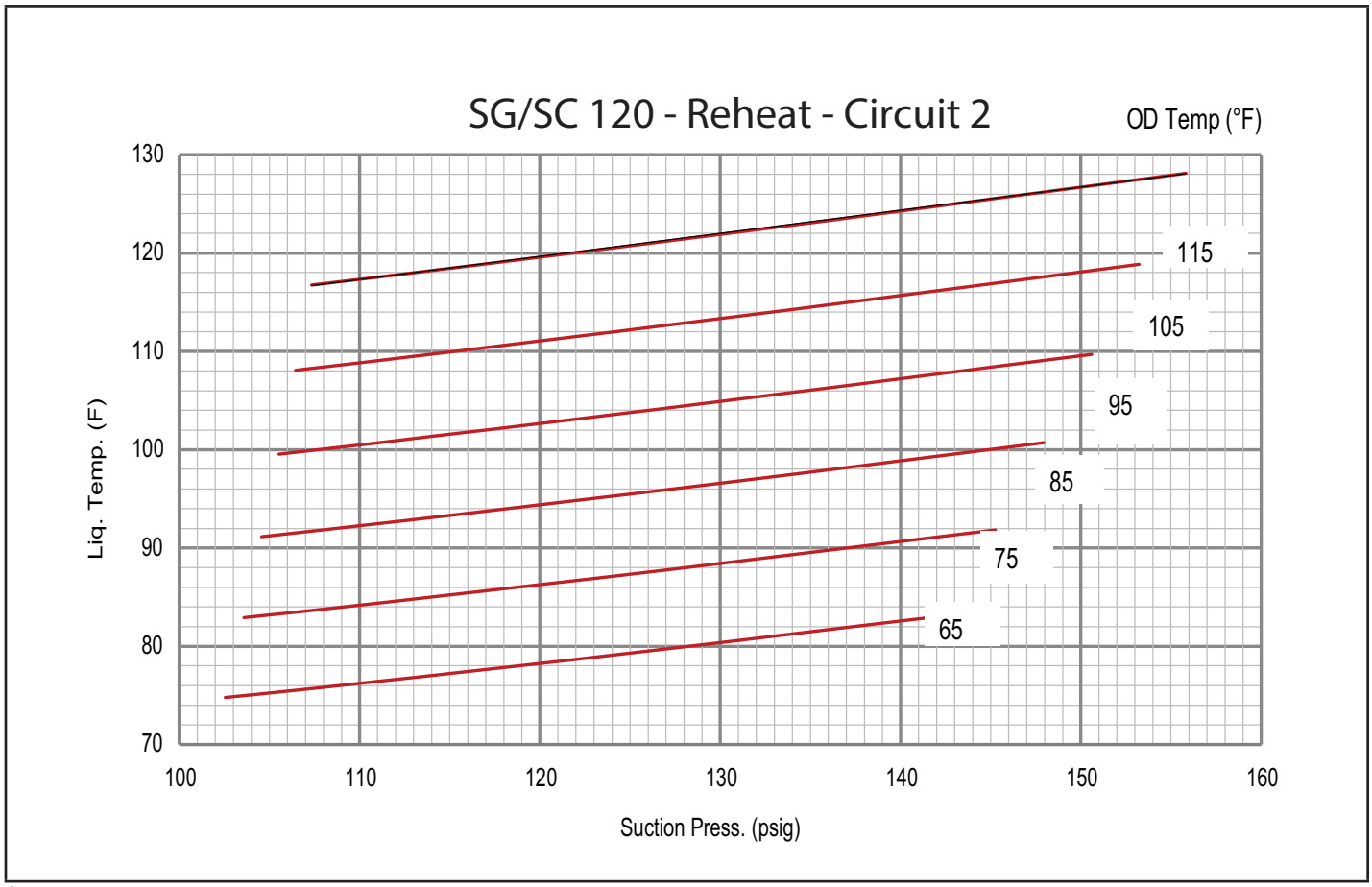
TABLE 8

	SG/SC 120 Normal Operating Pressures - Reheat - 581283-01											
	Outdoor Coil Entering Air Temperature											
	65°F		**75°F**		**85°F**		**95°F**		**105°F**		**115°F**	
	Suct (psig)	**Disc (psig)**	**Suct (psig)**	**Disc (psig)**	**Suct (psig)**	**Disc (psig)**	**Suct (psig)**	**Disc (psig)**	**Suct (psig)**	**Disc (psig)**	**Suct (psig)**	**Disc (psig)**
Circuit 1	100	230	101	269	102	314	103	367	104	426	105	493
	108	232	109	268	111	312	112	363	113	420	115	485
	124	239	127	272	129	312	131	359	133	413	135	474
	142	254	145	283	148	320	150	363	153	413	156	471
Circuit 2	103	236	104	272	105	312	106	358	106	408	107	462
	110	239	111	275	113	315	114	361	115	411	117	465
	126	246	128	282	130	323	132	368	134	418	136	473
	143	256	145	292	148	333	151	378	153	428	156	483


SC/SG 120 - No Reheat - Circuit 1
OD Temp (°F)
Liquid Temperature (F)
120
110
100
90
80
70
60
115
105
95
85
75
65
100
110
120
130
140
150
160
Suction Press. (psig)


SG/SC 120 - No Reheat - Circuit 2
OD Temp (°F)
Liquid Temperature (F)
130
120
110
100
90
80
70
115
105
95
85
75
65
100
110
120
130
140
150
160
Suction Press. (psig)


SG/SC 120 - Reheat - Circuit 1
OD Temp (°F)
115
105
95
85
75
65
Liq. Temp. (F)
120
110
100
90
80
70
60
100
110
120
130
140
150
160
Suction Press. (psig)


SG/SC 120 - Reheat - Circuit 2
OD Temp (°F)
115
105
95
85
75
65
Liq. Temp. (F)
130
120
110
100
90
80
70
100
110
120
130
140
150
160
Suction Press. (psig)

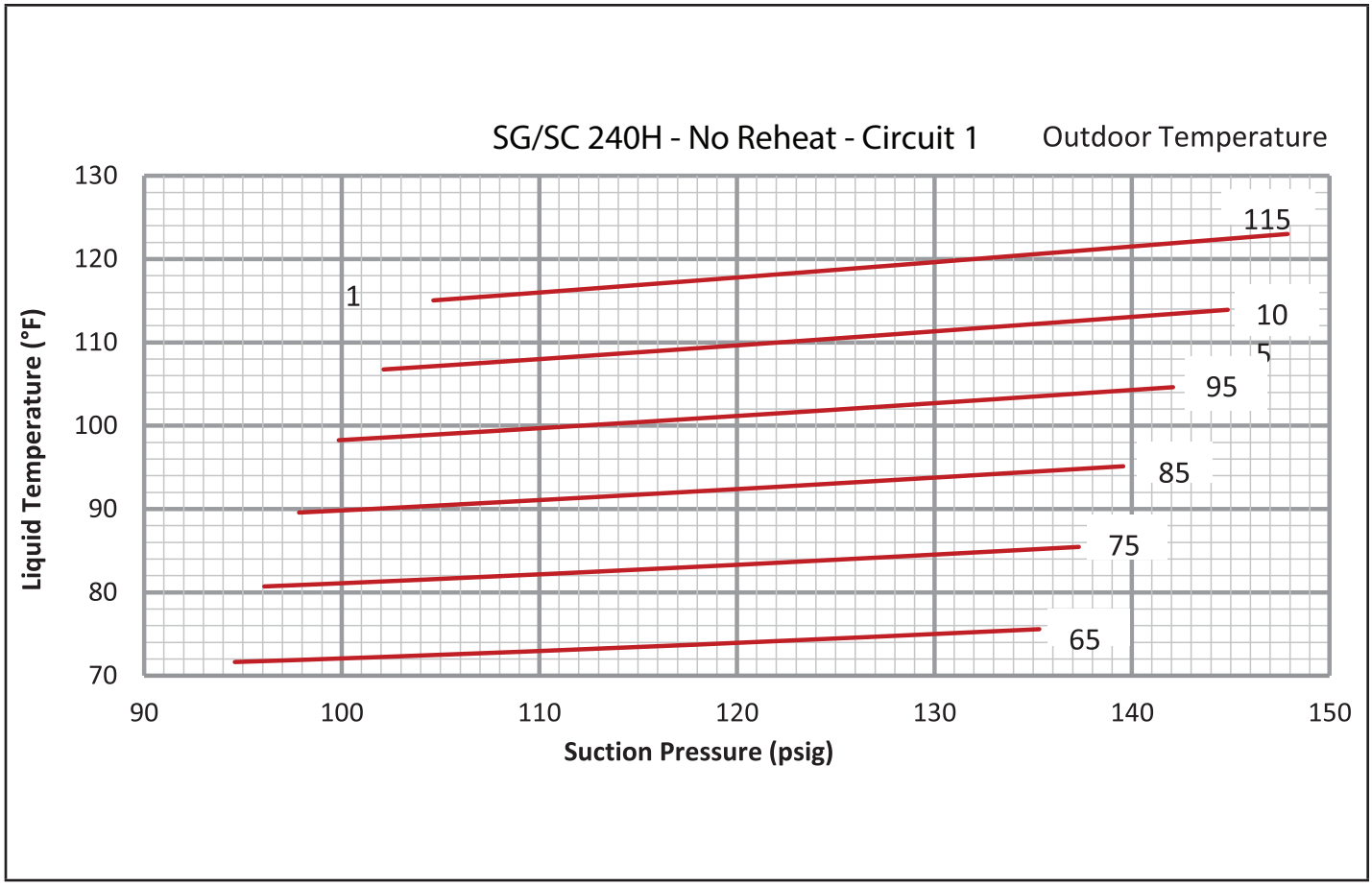
+

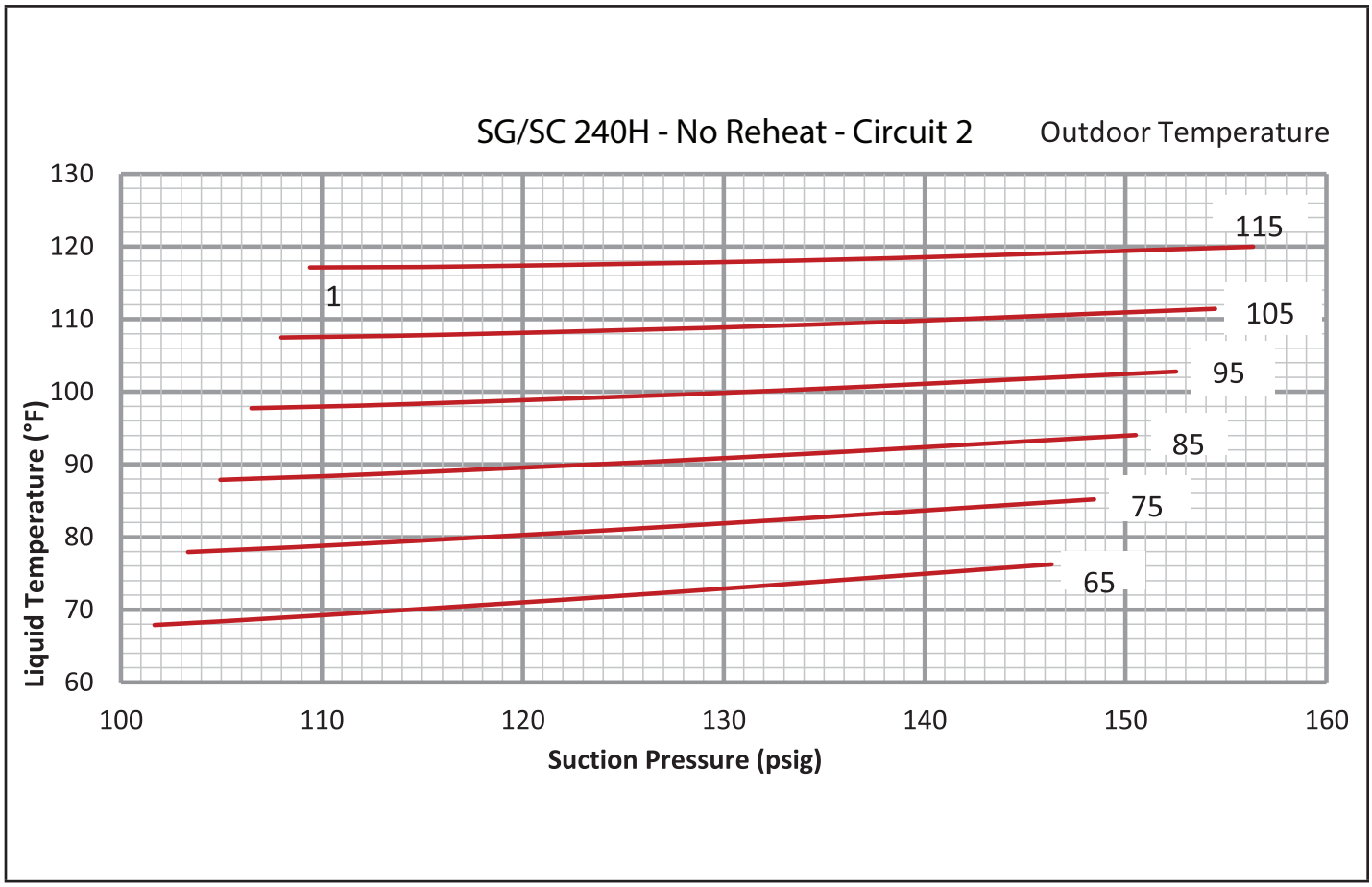
TABLE 9

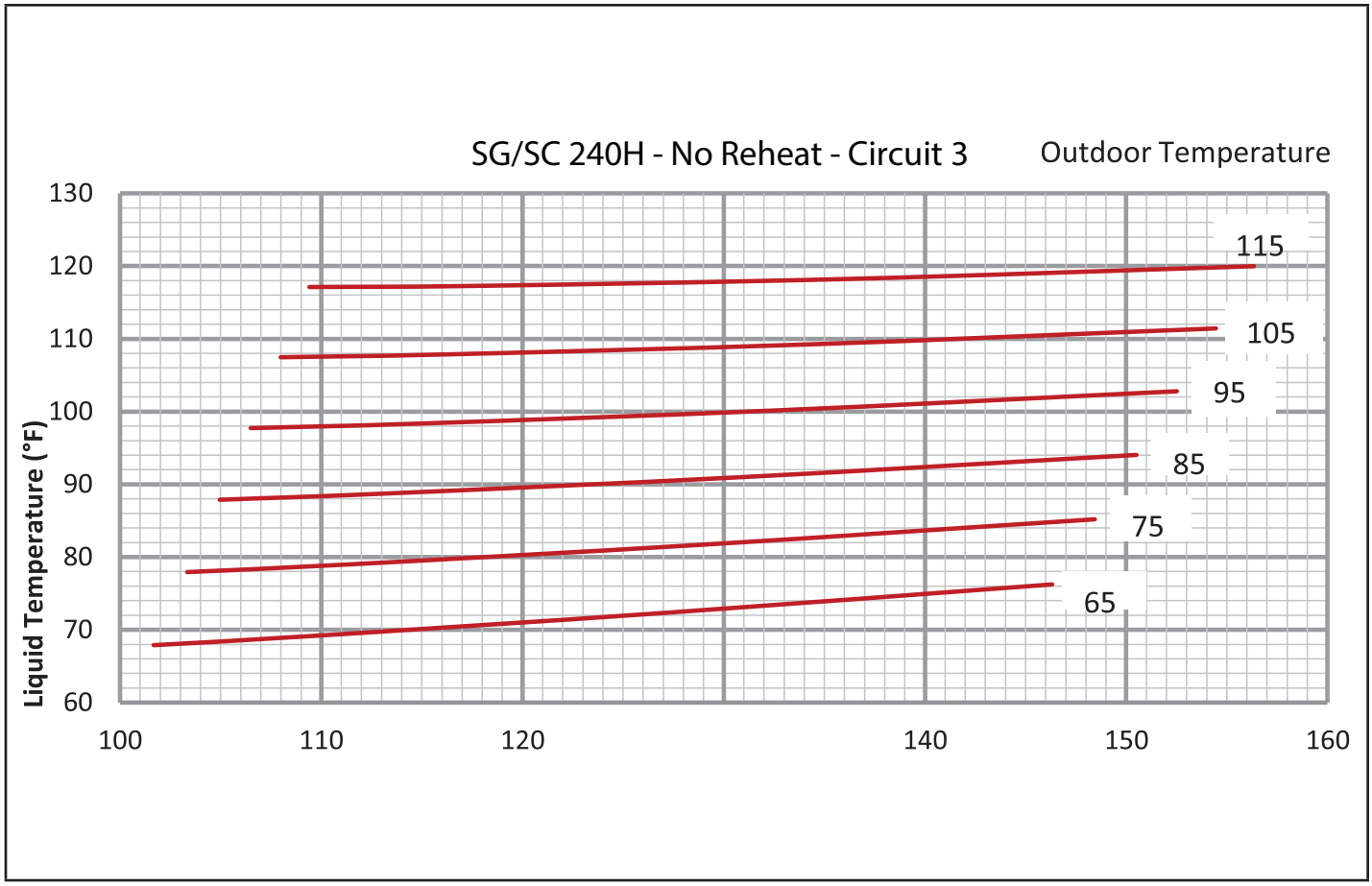
	SG/SC240 Normal Operating Pressures - No Reheat - 581198-01											
	Outdoor Coil Entering Air Temperature											
	65°F		75°F		85°F		95°F		105°F		115°F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	95	216	96	251	98	290	100	335	102	384	105	438
	102	218	104	253	106	293	108	337	110	387	113	441
	118	224	120	259	122	299	124	344	127	393	130	447
	135	232	137	267	140	306	142	351	145	401	148	455
Circuit 2	102	214	103	249	105	289	106	334	108	385	109	441
	110	216	111	251	113	291	115	336	116	387	118	443
	127	220	129	255	131	295	133	340	134	391	136	446
	146	225	148	260	151	300	153	345	154	395	156	451
Circuit 3	104	223	105	260	107	300	108	344	110	392	112	444
	111	226	113	263	114	303	116	348	118	396	120	448
	127	233	129	270	131	310	133	355	135	403	137	455
	145	241	147	278	149	318	151	363	154	412	156	464
Circuit 4	101	217	102	252	104	292	106	336	107	385	109	438
	108	219	110	255	112	295	114	339	116	387	118	440
	125	225	127	260	129	300	131	344	134	393	136	445
	145	231	147	267	149	307	151	351	154	399	156	452

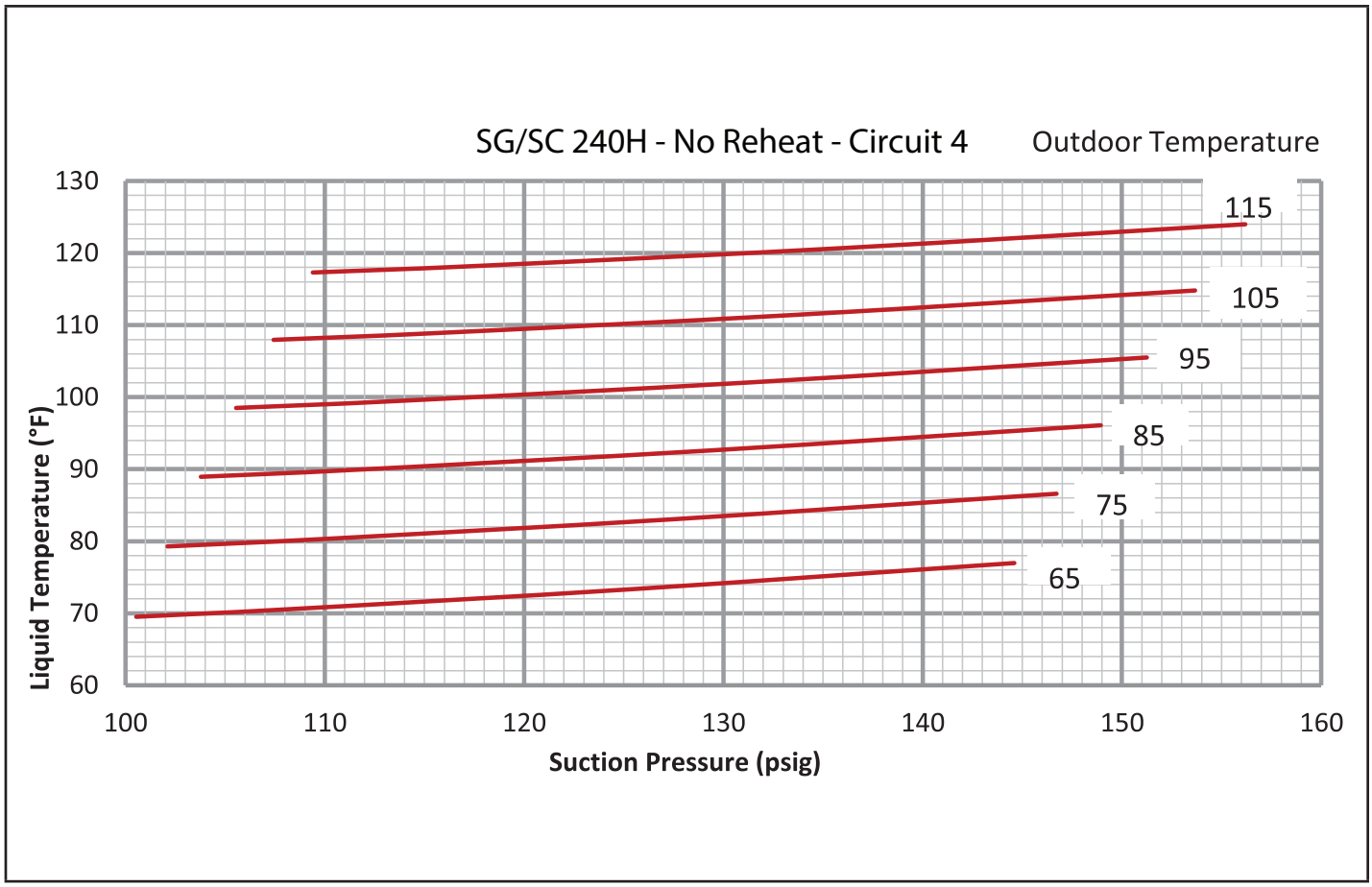
TABLE 10

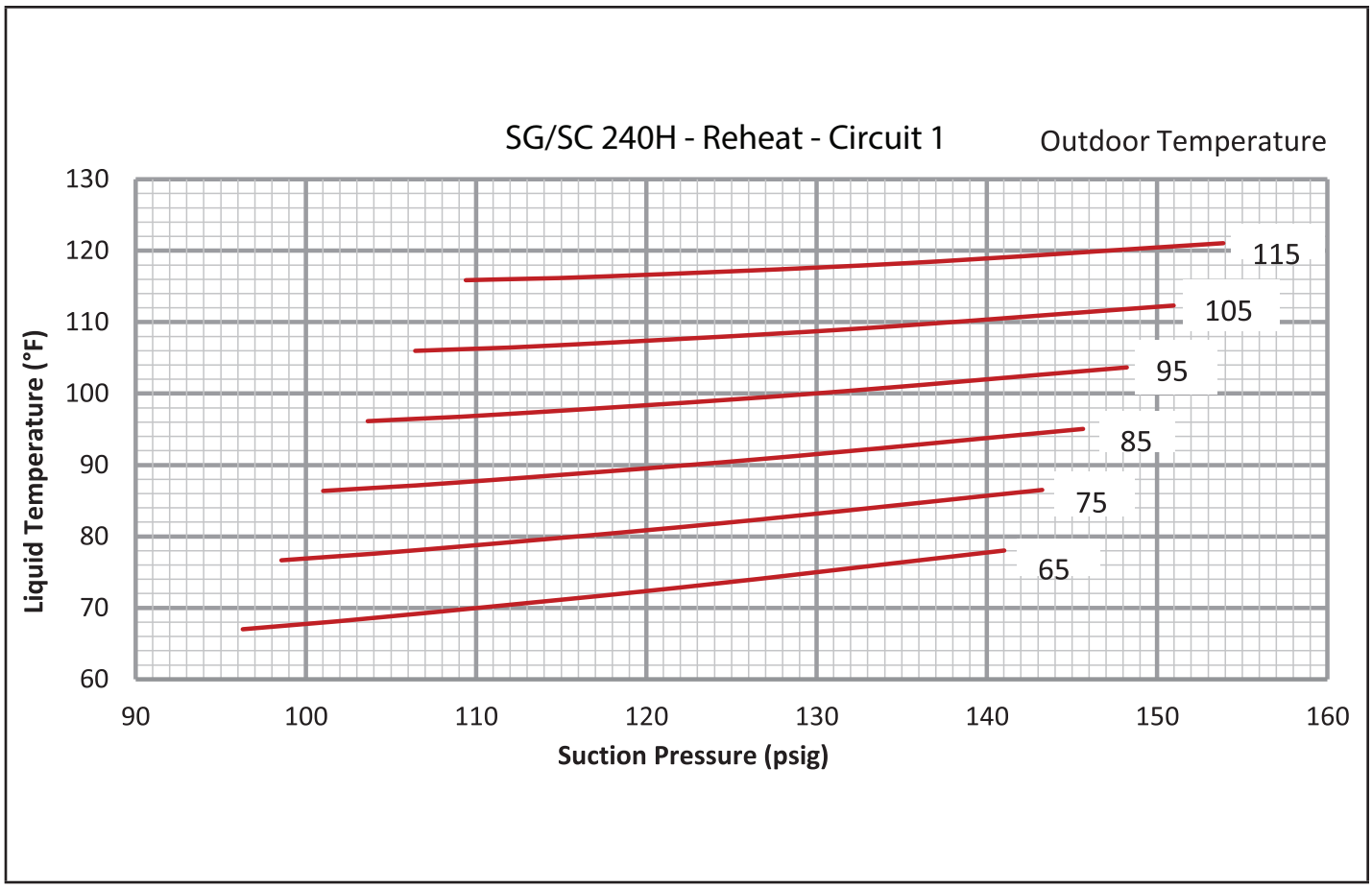
	SG/SC 240 Normal Operating Pressures - Reheat - 581200-01											
	Outdoor Coil Entering Air Temperature											
	65°F		75°F		85°F		95°F		105°F		115°F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	96	231	99	268	101	310	104	358	106	410	109	468
	105	233	107	270	109	311	112	358	115	410	118	468
	122	240	124	276	127	316	129	362	132	413	135	469
	141	251	143	286	146	325	148	370	151	420	154	475
Circuit 2	98	224	101	260	103	300	106	346	109	397	112	453
	106	227	109	262	111	303	114	348	117	399	120	455
	125	234	127	269	129	309	131	354	133	404	136	459
	146	241	147	275	149	315	151	360	153	410	155	464
Circuit 3	100	227	102	264	104	306	107	351	110	401	112	456
	107	231	109	268	111	309	114	355	116	405	119	459
	124	238	126	275	128	316	130	362	132	412	135	466
	144	245	145	282	147	324	149	369	151	419	153	473
Circuit 4	102	225	103	261	105	301	107	346	110	396	113	450
	110	227	111	263	113	303	115	348	118	398	120	452
	128	232	129	268	130	309	132	354	134	404	137	458
	148	240	149	276	150	317	152	362	154	412	156	466

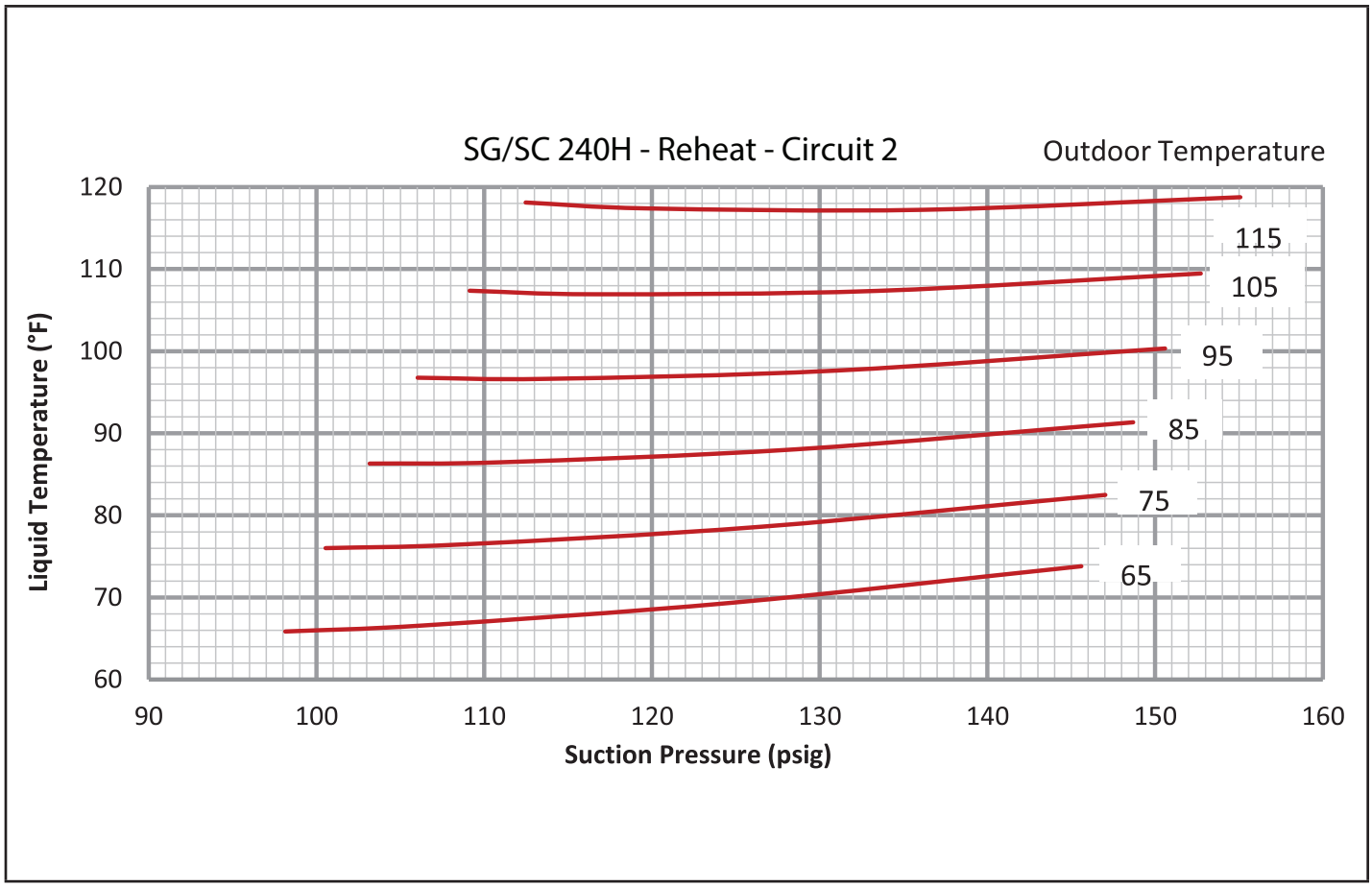

SG/SC 240H - No Reheat - Circuit 1
Outdoor Temperature
Liquid Temperature (°F)
Suction Pressure (psig)
130
120
110
100
90
80
70
90
100
110
120
130
140
150
115
1
10
5
95
85
75
65

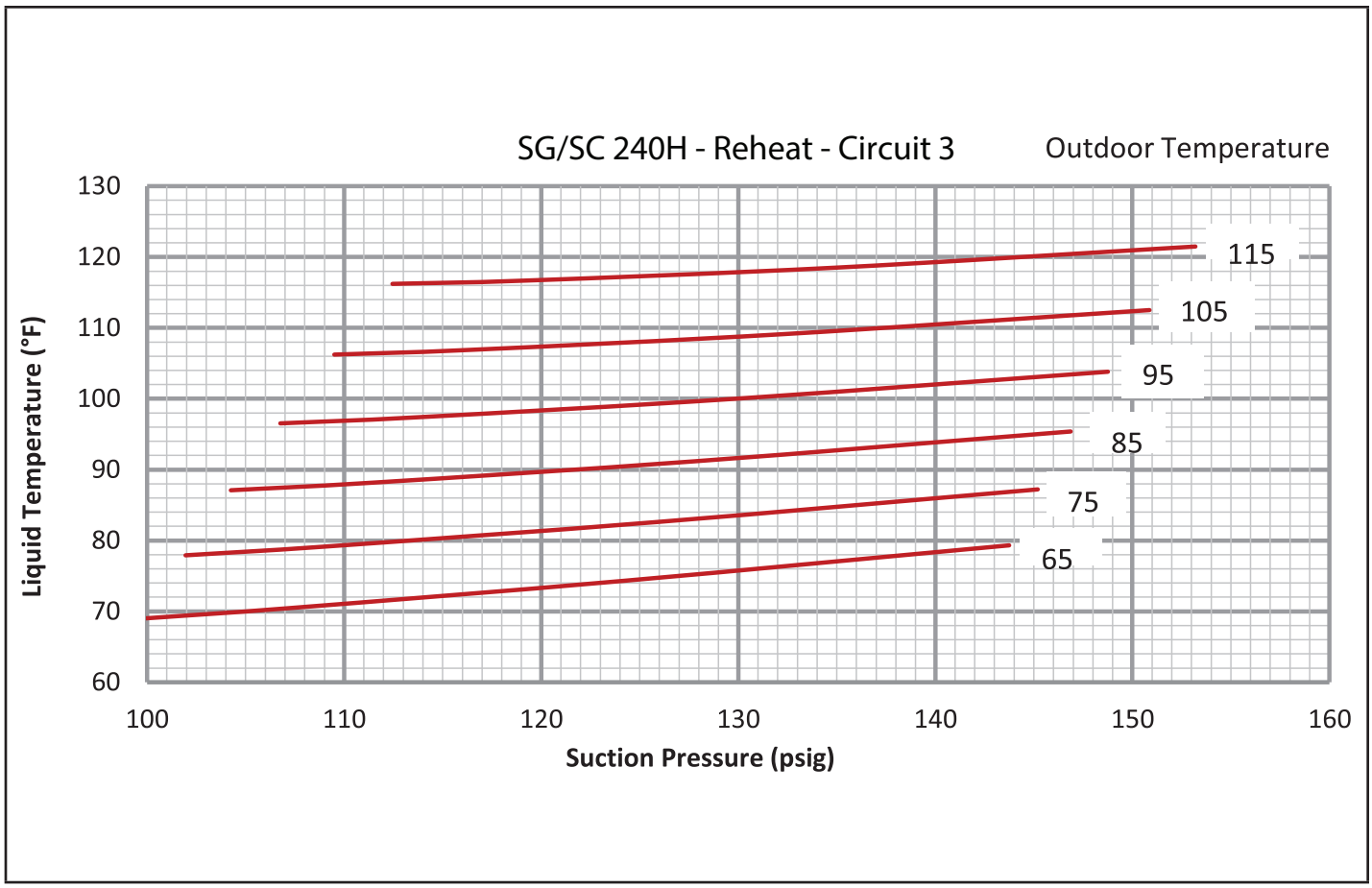

SG/SC 240H - No Reheat - Circuit 2
Outdoor Temperature
Liquid Temperature (°F)
Suction Pressure (psig)
130
120
110
100
90
80
70
60
100
110
120
130
140
150
160
115
1
105
95
85
75
65

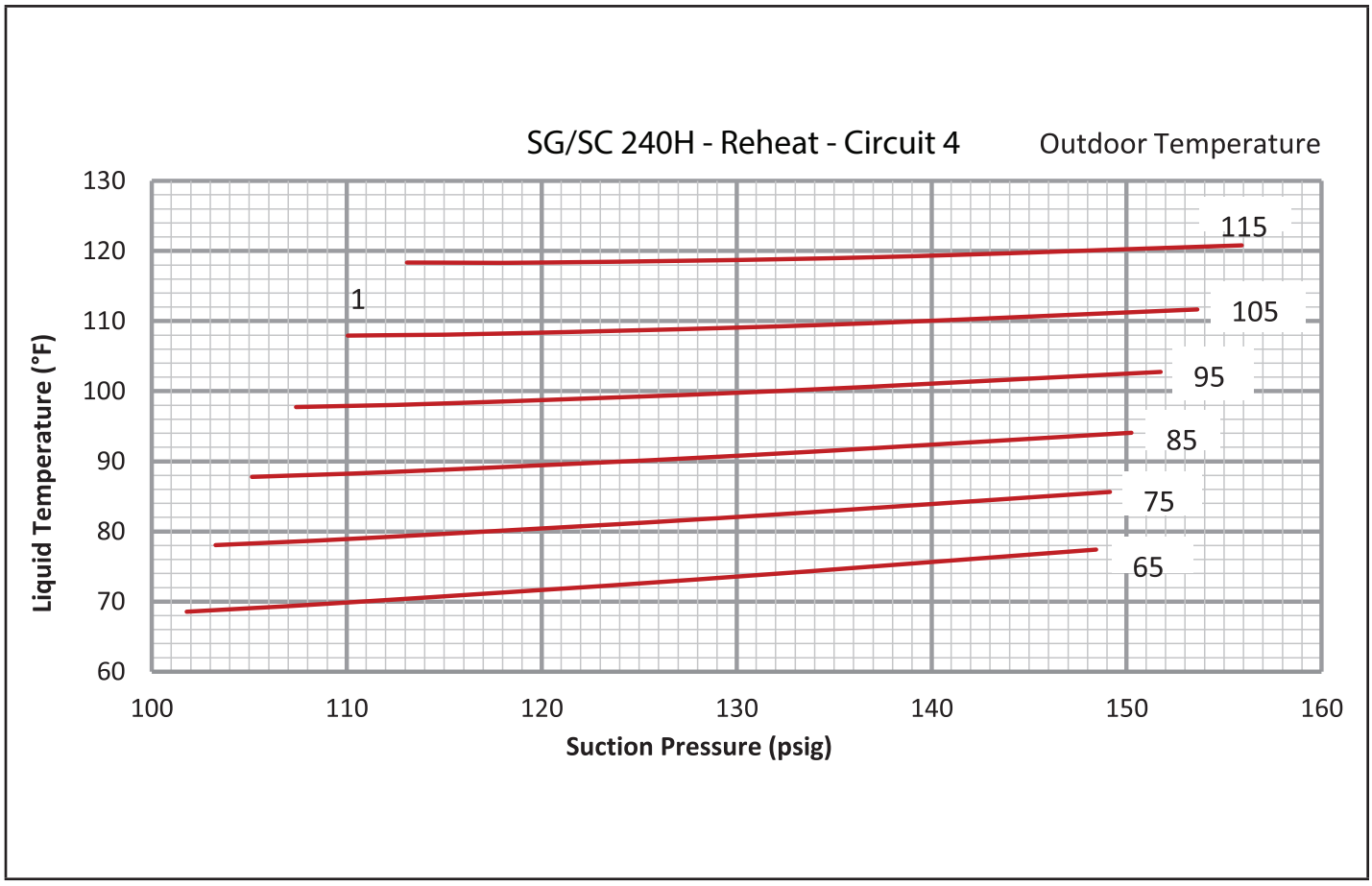

SG/SC 240H - No Reheat - Circuit 3
Outdoor Temperature
Liquid Temperature (°F)
130
120
110
100
90
80
70
60
100
110
120
140
150
160
115
105
95
85
75
65


SG/SC 240H - No Reheat - Circuit 4
Outdoor Temperature
Liquid Temperature (°F)
130
120
110
100
90
80
70
60
100
110
120
130
140
150
160
Suction Pressure (psig)
115
105
95
85
75
65


SG/SC 240H - Reheat - Circuit 1
Outdoor Temperature
Liquid Temperature (°F)
130
120
110
100
90
80
70
60
115
105
95
85
75
65
90
100
110
120
130
140
150
160
Suction Pressure (psig)


SG/SC 240H - Reheat - Circuit 2
Outdoor Temperature
Liquid Temperature (°F)
120
110
100
90
80
70
60
115
105
95
85
75
65
90
100
110
120
130
140
150
160
Suction Pressure (psig)


SG/SC 240H - Reheat - Circuit 3
Outdoor Temperature
Liquid Temperature (°F)
130
120
110
100
90
80
70
60
100
110
120
130
140
150
160
Suction Pressure (psig)
115
105
95
85
75
65


SG/SC 240H - Reheat - Circuit 4
Outdoor Temperature
Liquid Temperature (°F)
130
120
110
100
90
80
70
60
100
110
120
130
140
150
160
Suction Pressure (psig)
115
105
95
85
75
65
1

III- START-UP OPERATION

A-Preliminary and Seasonal Checks

1 - Make sure the unit is installed in accordance with the installation instructions and applicable codes.

2 - Inspect all electrical wiring, both field and factory installed for loose connections. Tighten as required. Refer to unit diagram located on inside of unit control box cover.

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. Voltage must be within the range listed on the nameplate. If not, consult power company and have the voltage corrected before starting the unit.

5 - Recheck voltage and amp draw with unit running. If voltage is not within range listed on unit nameplate, stop unit and consult power company. Refer to unit nameplate for maximum rated load amps.

6 - Inspect and adjust blower belt (see section on Blower Compartment - Blower Belt Adjustment)

B-Cooling Start-up

NOTE-*Crankcase heaters must be energized 24 hours before attempting to start compressor. Set thermostat so that there is no demand to prevent compressor from cycling. Apply power to unit.*

MSAV™ Units and Units Equipped With Voltage or Phase Detection - The Unit Controller checks the incoming power during start-up. If the voltage or phase is incorrect, the Unit Controller will display an alarm and the unit will not start.

1 - Initiate first and second stage cooling demands according to instructions provided with thermostat. Refer to the Optional Supply Air VFD section on MSAV™ units

2 - *SG/SC 120 Units* - First-stage thermostat demand will energize compressor 1. Second-stage thermostat demand will energize compressor 2. On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressor 1.

SG/SC 240 Units - First-stage thermostat demand will energize compressors 1 and 2. Second-stage thermostat demand will energize compressors 3 and 4. On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressors 1 and 2.

3 - SG/SC 120 units contain two refrigerant circuits and two stages of cooling. See FIGURE 8.

4 - SG/SC 240 units contain four refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuits 1 and 2 make up stage 1 cooling in thermostat mode. Evaporator and condenser refrigerant circuits 3 and 4 make up stage 2 cooling in thermostat mode. See FIGURE 9.

⚠ IMPORTANT

Three Phase Scroll Compressor Voltage Phasing

Three phase scroll compressors must be phased sequentially to ensure correct compressor and blower* rotation and operation. Compressor and blower are wired in phase at the factory. Power wires are color-coded as follows: line 1-red, line 2-yellow, line 3-blue.

1- Observe suction and discharge pressures and blower* rotation on unit start-up.

2- Suction pressure must drop, discharge pressure must rise and blower* rotation must match rotation marking.

If pressure differential is not observed or blower* rotation is not correct:

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of S48 disconnect or TB13 terminal strip. Do not reverse wires at blower contactor.

5- Make sure the connections are tight.

Discharge and suction pressures should operate at their normal start-up ranges.

***Supply air VFD motors should rotate in the correct direction; verify scroll compressor rotation separately. Contact technical support if the VFD blower is rotating incorrectly. The blower rotation will always be correct on MSAVTM units (120/240 units will always have VFD motors). Checking blower rotation is not a valid method of determining voltage phasing for incoming power.**

C-Heating Startup

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠ WARNING

Danger of explosion. Can cause injury or product or property damage. If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

⚠ WARNING

Electric shock hazard. Can cause injury or death. Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control which has been under water.

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

⚠ IMPORTANT

This unit is equipped with an automatic spark ignition system. Do not attempt to light manually.

In case of a safety shutdown, move thermostat switch to **OFF** and return the thermostat switch to **HEAT** to reset ignition control.

Placing Furnace In Operation

Gas Valve Operation (FIGURE 35)

1 - Set thermostat to lowest setting.
2 - Turn off all electrical power to appliance.
3 - This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
4 - Open or remove the heat section access panel.
5 - Turn the knob on the gas valve to **"OFF"**. Do not force.
6 - Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas, go to the next step.
7 - Turn the knob on the gas valve to "ON". Do not force.
8 - Close or replace the heat section access panel.
9 - Turn on all electrical power to appliance.
10 - Set thermostat to desired setting.
11 - The combustion air inducer will start. The burners will light within 40 seconds.
12 - If the appliance does not light the first time (gas line not fully purged), it will attempt up to two more ignitions before locking out
13 - If lockout occurs, repeat steps 1 through 10.
14 - If the appliance will not operate, follow the instructions "Turning Off Gas to Appliance" and call your service technician or gas supplier.

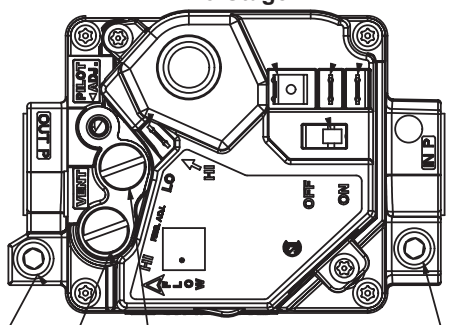
Turning Off Gas to Appliance

1 - If using an electromechanical thermostat, set to the lowest setting.
2 - Before performing any service, turn off all electrical power to the appliance.
3 - Open or remove the heat section access panel.
4 - Turn the knob on the gas valve to "OFF". Do not force.

D-Safety or Emergency Shutdown

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

WHITE RODGERS 36H54 GAS VALVE
Two-Stage



GAS VALVE SWITCH SHOWN IN **ON** POSITION.

FIGURE 35

IV- SYSTEMS SERVICE CHECKS

A-Heating System Service Checks

All SGH units are ETL/CSA design certified without modification.

Before checking piping, check with gas company or authorities having jurisdiction for local code requirements. Refer to the SGH Installation, Operation and Maintenance instruction for more information.

1-Gas Piping

Gas supply piping must not allow more than 0.5”W.C. drop in pressure between the gas meter and the unit. Supply gas pipe must not be smaller than the unit gas connection. Refer to installation instructions for details.

2-Testing Gas Piping

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

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. See FIGURE 36.

When checking piping connection for gas leaks, use the preferred means. Common kitchen detergents can cause harmful corrosion on various metals used in gas piping.

The use of specialty Gas Leak Detector is strongly recommended. It is available through under part number 31B2001. See CORP 8411-L10, for further details. Do not use matches, candles, flame or any other source of ignition to check for gas leaks.

3-Testing Gas Supply Pressure

When testing gas supply pressure, connect test gauge to the inlet pressure tap located on unit gas valve GV1 and or GV3. Test supply gas pressure with unit firing at maximum rate (both stages energized).

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.”. See table 11 for supply pressures.

On multiple unit installations, each unit should be checked separately while operating at maximum rate, beginning with the one closest to the supply gas main and progressing to the one furthest from the main. Multiple units should also be tested with and without the other units operating. Supply pressure must fall within the range listed in the previous paragraph.

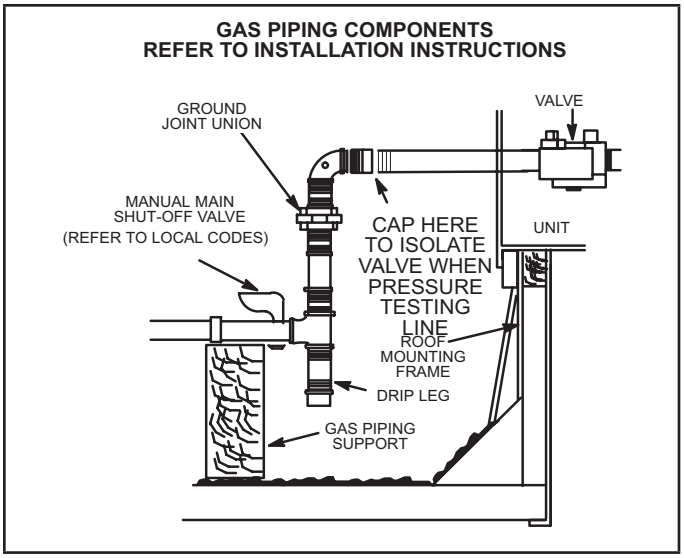


FIGURE 36

4-Combustion Air Inducer

The combustion air inducer is factory set and is not field adjustable. However, operation should be monitored to ensure proper operation. The combustion air inducer is used to draw fresh air into the combustion chamber while simultaneously expelling exhaust gases. The inducer operates throughout the heating cycle.

On a heating demand, the ignition control is energized by the A55 Unit Controller. The ignition control then allows 30 to 40 seconds for the combustion air inducer to vent exhaust gases from the burners. When the combustion air inducer is purging the exhaust gases, the combustion air prove switch is closing proving that the combustion air inducer is operating before allowing the ignition control to energize.

When the combustion air prove switch is closed and the delay is over, the ignition control activates the first stage operator of the gas valve (low fire), the spark and the flame sensing electrode. Sparking stops immediately after flame is sensed.

5-Check and Adjust Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move test gauge to the outlet pressure tap located on unit gas valve GV1 and or GV3. See FIGURE 35 for location of pressure tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See FIGURE 35 for location of gas valve (manifold pressure) adjustment screw.

All gas valves are factory regulated. 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.

⚠ CAUTION

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

Manifold Adjustment Procedure

1 - Connect test gauge to the outlet pressure tap on the gas valve. Start the unit (call for second stage heat) 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 heads. Natural gas should burn basically blue with some clear streaks. L.P. gas should burn mostly blue with some clear yellow streaks.

3 - After allowing the unit to stabilize for five minutes, record the manifold pressure and compare to the values given in TABLE 11.

⚠ IMPORTANT

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

TABLE 11

Manifold Pressure "W.C.				Supply Pressure "W.C.	
Natural		LP.Propane		Nat	LP
Low	High	Low	High	4.7-10.5	10.8-13.5
1.6± 0.2	3.7±0.3	5.5± 0.3	10.5± 0.5		

Combustion gases

Flue products must be analyzed and compared to the unit specifications. Problems detected during the inspection may make it necessary to temporarily shut down the furnace until the items can be repaired or replaced.

6-Proper Gas Flow

To check for proper gas flow to burners, determine Btuh input from unit rating plate or the gas heating capacity in the SPECIFICATIONS tables. Divide this input rating by the Btuh per cubic foot of available gas. Result is the number of cubic feet per hour required. Determine the flow of gas through gas meter for two minutes and multiply by 30 to get hourly flow of gas to the burners.

NOTE - *To obtain accurate reading, shut off all other gas appliances connected to meter.*

7-Inshot Burner

Burners are factory set for maximum air and cannot be adjusted. Always operate unit with access panel in place. A peep hole is furnished in the heating access panel for flame viewing. Natural gas should burn basically blue with some clear streaks. L.P. gas should burn mostly blue with some clear yellow streaks.

Follow steps below to remove burner assembly.

1 - Turn off power to unit and shut off gas supply.

2 - Remove screws holding the burner support cap.

3 - Burner assembly is a cluster assembly (FIGURE 37) and can be removed as one.

4 - Clean and reassemble (reverse steps 1-3).

5 - Be sure to secure all wires and check plumbing.

6 - Turn on power to unit. Follow lighting instructions attached to unit and operate unit in heating mode. Check burner flames. They should be blue with yellow streaks.

TYPICAL GAS BURNER ASSEMBLY

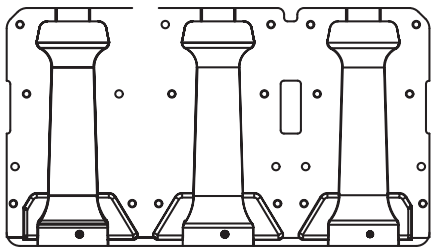


FIGURE 37

8-Spark Electrode Gap

The spark electrode assembly can be removed for inspection by removing two screws securing the electrode assembly and sliding it out of unit.

For proper unit operation, electrodes must be positioned and gapped correctly.

Spark gap may be checked with appropriately sized twist drills or feeler gauges. Disconnect power to the unit and remove electrode assembly. The gap should be between 0.125" ± 0.015". See FIGURE 33.

9-Heat Exchanger

To Access or Remove Heat Exchanger From Unit:

1 - Turn off gas and electric power.

2 - Remove access panel(s) and unit center mullion.

3 - Remove gas valve, manifold assembly and burners.

4 - Remove combustion air inducer and flue box. Pay careful attention to the order in which gaskets and orifice are removed.

5 - Support heat exchanger (to prevent it from falling when final screws are removed.)

6 - Remove screws supporting heat exchanger.

7 - To install heat exchanger, reverse procedure. Be sure to secure all wires and check plumbing and burner plate for airtight seal. Screws must be torqued to 35 in.-lbs. to ensure proper operation.

10-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 the ground electrode (located on the flame electrode) to complete a safety circuit. The electrodes should be located so the tips are at least 1/2" (12.7 mm) inside the flame envelope. Do not bend electrodes. To measure flame current, follow the procedure on the following page:

NOTE-*Electrodes are not field adjustable. Any alterations to the electrode may create a hazardous condition that can cause property or personal injury.*

1 - Disconnect power to unit.

2 - Remove lead from sensing electrode and install a 0-50DC 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, compare reading to TABLE 12. Do not bend electrodes.

5 - Disconnect power to unit before disconnecting meter. Make sure sensor wire is securely reconnected before reconnecting power to unit.

TABLE 12

Manufacturer	Nominal Signal Microamps	Drop Out
UTEC	0.5 - 1.0	.09

NOTE-*If the meter scale reads 0, the leads are reversed. Disconnect power and reconnect leads for proper polarity.*

B-Cooling System Service Checks

SGH units are factory charged and require no further adjustment; however, charge should be checked periodically. See section III- CHARGING

V-MAINTENANCE

⚠ 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.

⚠ WARNING

Any service personnel installing, decommissioning, or performing maintenance on the unit must be properly trained with A2L refrigerants

Prior to beginning work on systems containing refrigerant to ensure the risk of ignition is minimized:

- All work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i. e. non-sparking, adequately sealed or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, the appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work.

A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

- Where electrical components are being changed, service technicians shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations using flameable refrigerants as applicable:

1 - The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed.

2 - The ventilation machinery and outlets are operating adequately and are not obstructed.

3 - If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.

4 - Markings on the equipment should be visible and legible. Markings and signs that are illegible shall be corrected.

5 - Refrigerating pipes or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

- For systems containing refigerant all repair and maintenance to electrical components shall include initial safety checks and component inspection procedures such as that capacitors are discharged in a safe manner to avoid possibility of sparking, that no live electrical components and wiring are exposed while charging, recovering, or purging the system, and that there is continuity of earth bonding. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used that is reported to the owner of the equipment, so all parties are advised.

  NOTE - *Sealed electrical components shall be replaced, not repaired.*

  NOTE - *Intrinsically safe components must be replaced, not repaired.*

- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

- When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

  a. Safely remove refrigerant following local and national regulations,

  b. Evacuate the circuit,

  c. Purge the circuit with inert gas,

  d. Evacuate,

  e. Purge with inert gas,

  f. Open the circuit.

- The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. Refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

A-Filters

Units are equipped with filters as shown in TABLE 13. Units will accept 4" filters. Filters should be checked monthly and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters.

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

TABLE 13

SG/SC Unit	Qty	Filter Size - inches (mm)
120	4	20 X 25 X 2 (508 X 635 X 51)
240	12	20 X 20 X 2 (508 X 508 X 51)

B-Lubrication

All motors and blower wheels used in SGH units are lubricated; no further lubrication is required.

C-Supply Air Blower Wheel

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.

D-Evaporator Coil

Inspect and clean coil at beginning of each season. Clean using mild detergent or commercial coil cleanser. Check condensate drain pan and line, if necessary. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet. Check connecting lines and coil for evidence of oil and refrigerant leaks.

E-Condenser Coil

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season. Check connecting lines and coil for evidence of oil and refrigerant leaks.

Clean the all-aluminum coil by spraying the coil steadily and uniformly from top to bottom. Do not exceed 900 psi or a 45 angle; nozzle must be at least 12 inches from the coil face. Take care not to fracture the braze between the fins and refrigerant tubes. Reduce pressure and work cautiously to prevent damage.

NOTE-*If owner complains of insufficient cooling, the unit should be gauged and refrigerant charge checked. Refer to Gauge Manifold Attachment and Charging sections in this manual.*

F-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____

4 - Check crankcase heater temperatures to ensure they are operating.

VI-ACCESSORIES

The accessories section describes the application of most of the optional accessories which can be factory or field installed to the SGH units.

A-Roof Curbs

When installing the SGH units on a combustible surface for downflow discharge applications, the hybrid S1CURB71 (11F70, 11F72, or 11F74) 14-in height and S1CURB73 (11F71, 11F73, or 11F75) 24-in roof mounting frame is used. The assembled hybrid mounting frame is shown in FIGURE 38, FIGURE 39, and FIGURE 40. Refer to the roof mounting frame installation instructions for details of proper assembly and mounting. The roof mounting frame MUST be squared to the roof and level before mounting. Plenum system MUST be installed before the unit is set on the mounting frame. Typical roof curbing and flashing is shown in FIGURE 41. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

NOTE - *When installing a D-Box unit on an existing C-box curb, a Factory installed curb alignment kit is required. Refer to the unit installation instructions for more details.*

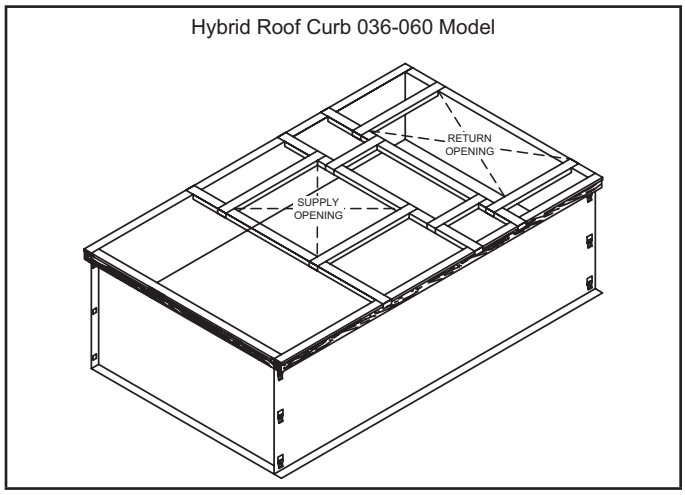


FIGURE 38

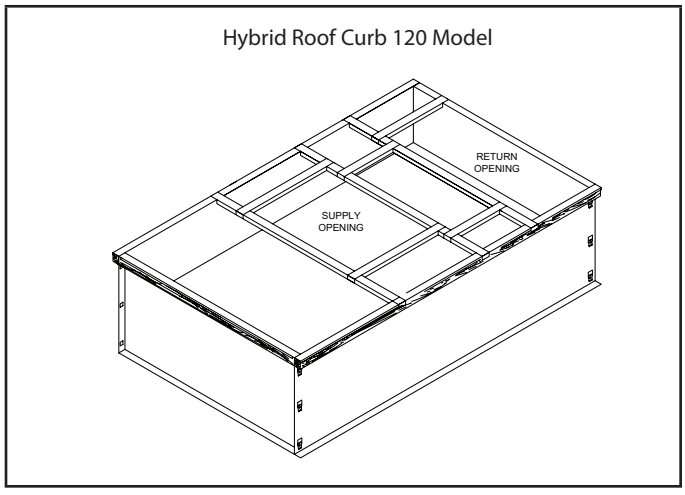


FIGURE 39

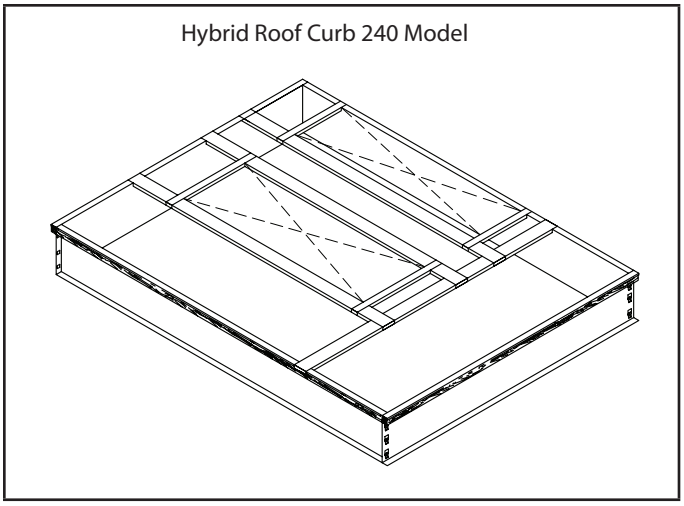


FIGURE 40

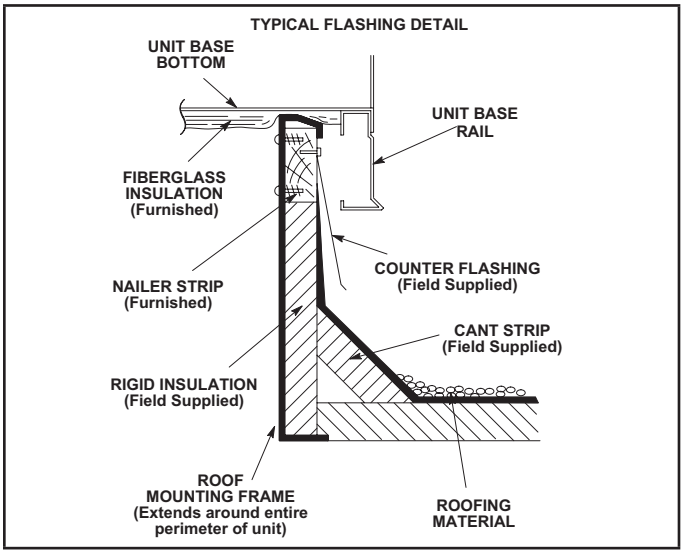


FIGURE 41

B-Outdoor Air Dampers (FIGURE 42)

Dampers are manually or motor operated to allow up to 25 percent outside air into the system at all times. Either air damper can be installed in 240 units. Washable filter supplied with the outdoor air dampers can be cleaned with water and a 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 Part No. P-8-5069.

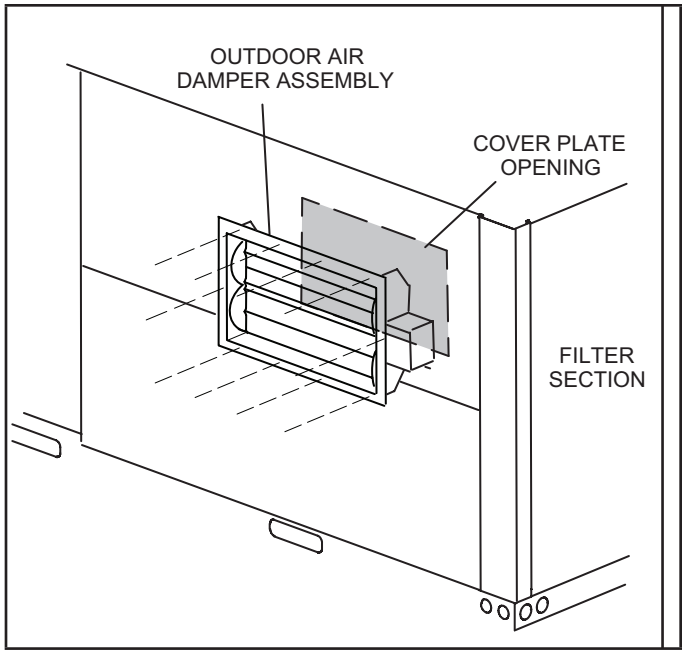


FIGURE 42

C-Economizer (Field or Factory Installed)

General

The economizer allows outdoor air to be used for free cooling or ventilation requirements.

Configure Economizer

Use the following menu and go through the installation wizard.

SETUP > INSTALL

When prompted, set Configuration ID 1, position 2 to the applicable economizer option. Economizer options are shown in TABLE 114. Once the option is set, the installation wizard prompts will vary depending on the option selected

NOTE - *Some setup information is factory-set, such as the unit model number. Verify that each setting is correct before advancing to the next prompt.*

Sensors are used to determine outdoor air suitability for free cooling. Some economizer options require field-installed sensors. See TABLE 114. See FIGURE 43 for sensor locations.

Use the following menu to make adjustments to the economizer option once configured. Refer to the Menu Interface tables in the Unit Controller Setup Guide provided with this unit.

TEST & BALANCE > DAMPER CONFIGURATION.

Economizer Operation

NOTE- *Use indicating lights on Unit Controller to determine thermostat demand.*

See TABLE 15 for economizer operation with a standard two-stage thermostat

Damper Minimum Position Setting

Use the following menu path to modify the minimum damper positions for both high and low operations.

TEST&BALANCE>DAMPER CALIBRATION>BLOWER SPEED HIGH>MINIMUM DAMPER POSITION X.X%

TEST&BALANCE>DAMPER CALIBRATION>BLOWER SPEED LOW>MINIMUM DAMPER POSITION X.X%

TABLE 16 shows economizer operation with an energy management system which uses a global sensor.

Both tables show the occupied and unoccupied time period. The occupied time period is determined by the thermostat or energy management system.

TABLE 17 shows economizer operation in zone sensor mode.

IAQ Damper Operation

The Unit Controller has a 0-10VDC IAQ input for a standard 0-2000ppm CO2 sensor. The economizer starts opening at a CO2 level of 700 ppm (default) and reaches full open at a CO2 level of 1200ppm. Adjustments may be made to the indoor air quality parameters to alter operation or meet required specifications (parameters 117 through 119). Go to:

TEST & BALANCE > DAMPER CONFIGURATION

If the economizer is operating in the free cooling mode and the IAQ sensor demands more fresh air, the IAQ demand will override the free cooling demand to open the dampers further or to keep them open.

The IAQ function is not energized during the unoccupied or night time period.

TABLE 14
ECONOMIZER CONFIGURATION OPTIONS

Option	Description	Required Sensors	Dampers will modulate to 55°F* (default) discharge air when outdoor air is suitable:	Parameter**
M	MOTORIZED OUTDOOR AIR DAMPERS	None	Dampers do not modulate; dampers will open to minimum position during the occupied time period and close during the unoccupied time period.	NA
T	ECONOMIZER FREE COOLING TEMPERATURE OFFSET	Factory-installed	Outdoor air temperature (RT17) is less than return air temperature (RT16) by at least the OFFSET value (10°F default).	161
	ECONOMIZER FREE COOLING TEMPERATURE SETPOINT	Factory-installed	Outdoor air temperature (RT17) is less than the free cooling setpoint (60°F default).	160
G	GLOBAL	NA	Dampers will modulate to maintain 55°F* (default) discharge air when a 24VAC signal is provided to the GLO input (P297-9). Global input also brings on the blower. Refer to Energy Management System manufacturer's instructions for required sensors.	NA
S	ECONOMIZER FREE COOLING ENTHALPY SETPOINT	C7400	Outdoor air enthalpy (A7) is less than free cooling setpoint (73°F default).	162
D	ECONOMIZER FREE COOLING ENTHALPY OFFSET	(Two) C7400	Outdoor air enthalpy (A7) is less than return air enthalpy (A62) by at least the OFFSET value.	163

*RT6 discharge air sensor is factory-installed. See parameter 159 in the Unit Controller Setup Guide.

**Refer to the Menu Interface tables in the Unit Controller Setup Guide provided with this unit.

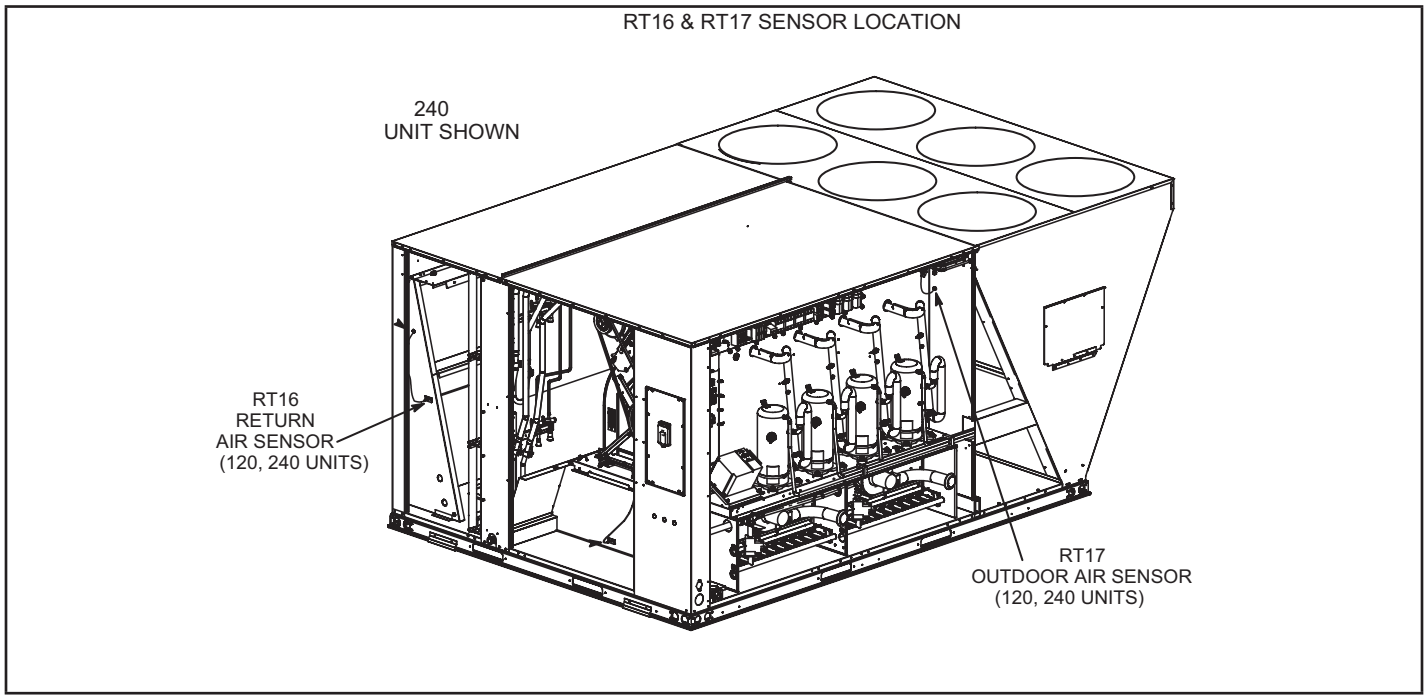


FIGURE 43

TABLE 15

ECONOMIZER OPERATION - Standard Two-Stage Thermostat (Default Option)

THERMOSTAT DEMAND	DAMPER POSITION UNOCC.	DAMPER POSITION OCCUPIED	MECHANICAL COOLING
OUTDOOR AIR IS **NOT SUITABLE** FOR FREE COOLING			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	CLOSED	MINIMUM	STAGE 1
Y2	CLOSED	MINIMUM	STAGES 1 AND 2
OUTDOOR AIR IS **SUITABLE** FOR FREE COOLING			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	MODULATING	MODULATING	NO
Y2	MODULATING	MODULATING (1)	STAGE 1

NOTE - *Modulating dampers adjust to control supply air (RT6) to 55°F (13°C). (1) The Unit Controller goes into a "cool down" or "warm-up" mode when the occupied time period starts. (2) Units with two-stage compressor operation will operate only stage 1 with a Y2 demand.*

TABLE 16

ECONOMIZER OPERATION WITH GLOBAL SENSING - Energy Management System (Default Option)

THERMOSTAT DEMAND	DAMPER POSITION UNOCC.	DAMPER POSITION OCCUPIED	MECHANICAL COOLING
GLOBAL INPUT **OFF**			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	CLOSED	MINIMUM	STAGE 1
Y2	CLOSED	MINIMUM	STAGES 1 AND 2
GLOBAL INPUT **ON**			
OFF	MODULATING	MODULATING	NO
G	MODULATING	MODULATING	NO
Y1	MODULATING	MODULATING	STAGE 1
Y2	MODULATING	MODULATING (1)	STAGES 1 AND 2 (2)

NOTE - *Modulating dampers adjust to control supply air (RT6) to 55°F (13°C). (1) The Unit Controller goes into a "cool down" or "warm-up" mode when the occupied time period starts. (2) Units with two-stage compressor operation will operate only stage 1 with a Y2 demand (default).*

TABLE 17

ECONOMIZER OPERATION - Zone Sensor Mode

DEMAND	DAMPER POSITION UNOCC.	DAMPER POSITION OCCUPIED	MECHANICAL COOLING
OUTDOOR AIR IS NOT SUITABLE FOR FREE COOLING			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Cooling Stage 1	CLOSED	MINIMUM	COMPRESSOR 1
Cooling Stage 2	CLOSED	MINIMUM	COMPRESSOR 1 & 2
Cooling Stage 3	CLOSED	MINIMUM	COMPRESSOR 1, 2, & 3
Cooling Stage 4	CLOSED	MINIMUM	COMPRESSOR 1, 2, 3, & 4
OUTDOOR AIR IS SUITABLE FOR FREE COOLING			
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Cooling Stage 1	MODULATING	MODULATING	NO
Cooling Stage 2	FULL OPEN*	FULL OPEN*	COMPRESSOR 1
Cooling Stage 3	FULL OPEN*	FULL OPEN*	COMPRESSORS 1 & 2
Cooling Stage 4	FULL OPEN*	FULL OPEN*	COMPRESSORS 1, 2, 3, & 4

Damper will modulate to maintain 55°F supply air when parameter 164 is changed to setting "0". Note - Modulating dampers adjust to control supply air (RT6) to 55°F (13°C).

D-Gravity Exhaust Dampers

Dampers FIGURE 44 (120 units) and FIGURE 45 (240 units) are used in downflow applications. Gravity exhaust dampers are installed in the return air plenum. The dampers must be used any time an economizer or power exhaust fans are applied to SGH series units. An exhaust hood is furnished with the gravity exhaust damper.

Gravity exhaust dampers allow exhaust air to be discharged from the system when an economizer and/or power exhaust is operating. Gravity exhaust dampers also prevent outdoor air infiltration during unit off cycle. See installation instructions for more detail.

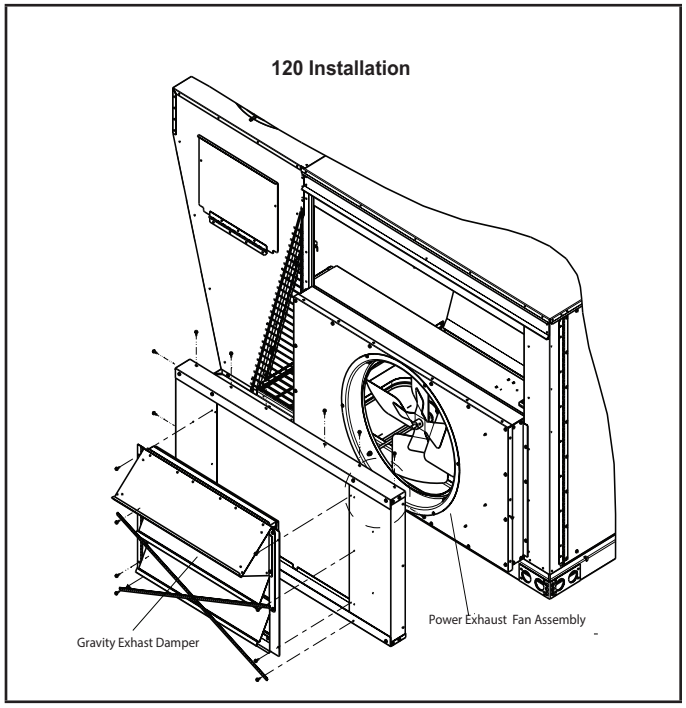


FIGURE 44

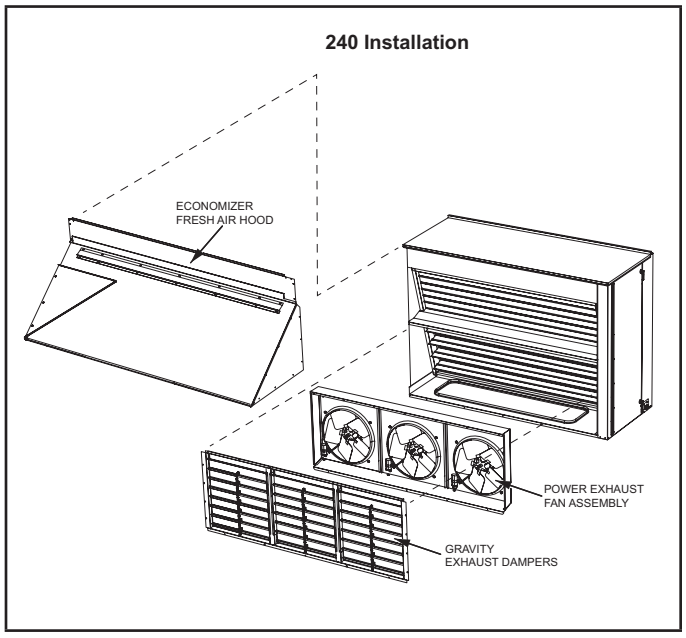


FIGURE 45

E-Power Exhaust Fans

Power exhaust fans are used in downflow applications only. Fans require optional downflow gravity exhaust dampers and economizers. Power exhaust fans provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. FIGURE 44 and FIGURE 45 show the location of the power exhaust fans. See installation instructions for more detail

F-Optional Cold Weather Kit (Canada only)

Electric heater is available to automatically control the minimum temperature in the gas burner compartment. Heater is C.G.A. certified to allow cold weather operation of unit down to -60° F.

The kit includes the following parts:

1 - The strip heater (HR6) is located as close as possible to the gas valve. The strip heater is rated at 500 Watts (line voltage).

2 - A thermostat mounting box is installed on the vestibule of the heating compartment. Included in the box are the following thermostat switches:

   a. Thermostat switch (S59) is an auto-reset SPST N.C. switch which opens on a temperature drop. The switch is wired in series with 24v power and the combustion air blower switch. When the temperature drops below -30° F the switch opens and the gas heat section is de-energized. The switch automatically resets when the heating compartment temperature reaches -10° F.

   b. Thermostat switch (S60) is an auto-reset SPST N.C. switch which opens on a temperature rise. The switch is wired in series with K125 coil. When the temperature rises above 20° F the switch opens and the electric heater is de-energized through K125. The switch automatically resets when the heating compartment temperature reaches -10° F.

   c. Thermostat switch (S61) is an auto-reset SPST N.O. switch which closes on a temperature drop. The switch is wired in series with K125 coil. When temperature drops below 20° F the switch closes and electric heater is energized through K125. The switch automatically opens when heating compartment temperature reaches 76° F.

G-Control Systems

The A55 Unit Controller provides all control function for the rooftop unit. Default operation requires a standard room thermostat or direct digital controller (DDC). The A55 can also control the unit from a zone temperature sensor. The A55 Unit Controller is a network controller when daisy-chained to the L Connection® Network Control System. For ease of configuration, the A55 can be connected to a PC with Unit Controller PC software installed.

H-Smoke Detectors A171, A172, A173

Photoelectric smoke detectors are a factory- and field-installed option. The smoke detectors can be installed in the supply air section (A172), return air section (A171), or in both the supply and return air section. Smoke detection control module (A173) is located below the control panel.

I-Blower Proving Switch S52

The blower proving switch monitors blower operation and locks out the unit in case of blower failure. The switch is N.O. and closes at .15" W.C. The switch is mounted on the middle left corner of the blower support panel. l.

J-Dirty Filter Switch S27

The dirty filter switch senses static pressure increase indicating a dirty filter condition. The switch is N.O. and closes at 1" W.C. The switch is mounted on the top corner of the economizer.

K-LP / Propane Kit

Units require two (one for each gas heat section) natural to LP/propane kit. The kit includes one gas valve, eleven burner orifices and three stickers. For more detail refer to the natural to LP gas changeover kit installation instructions.

L-Indoor Air Quality (CO2) Sensor A63

The indoor air quality sensor monitors CO2 levels and reports the levels to the A55 Unit Controller. The board adjusts the economizer dampers according to the CO2 levels. The sensor is mounted next to the indoor thermostat or in the return air duct. Refer to the indoor air quality sensor installation instructions for proper adjustment.

M-Drain Pan Overflow Switch S149 (optional)

The overflow switch is used to interrupt cooling operation when excessive condensate collects in the drain pan. The N.C. overflow switch is connected to the M2 Unit Controller (A55) through DI-3. When the switch opens, the Unit Controller will shut off the unit. After a five-minute time out, the Unit Controller will verify the overflow switch position and restart the unit (if the switch has closed). The Unit Controller has a three-strike counter before the unit locks out. This means the Unit Controller will allow the overflow switch to open three times per thermostat demand. If the unit locks out, a reset of the Unit Controller is required after the switch has closed to restore unit operation.

N- Hot Gas ReHeat

Hot gas reheat units provide a dehumidifying mode of operation. These units contain a reheat coil adjacent to and downstream of the evaporator coil. Reheat coil solenoid valve, L14 (and L30 on 240 units), routes hot discharge gas from the compressor to the reheat coil. Return air pulled across the evaporator coil is cooled and dehumidified; the reheat coil adds heat to supply air.

See FIGURE 46 and FIGURE 47 for reheat refrigerant routing.

L14/L30 Reheat Coil Solenoid Valve

When Unit Controller input (Unit Controller J298-5 or J299-8) indicates room conditions require dehumidification, L14/L30 reheat valve is energized (Unit Controller P269-3 or P269-4) and refrigerant is routed to the reheat coil.

Reheat Setpoint

Reheat is factory-set to energize when indoor relative humidity rises above 60% (default). The reheat setpoint can be adjusted by changing Unit Controller Settings - Control menu. A setting of 100% will operate reheat from an energy management system digital output

Reheat will terminate when the indoor relative humidity falls 3% (57% default) or the digital output de-energizes. The reheat deadband can be adjusted at Settings - Control menu.

A91 Humidity Sensor (120 & 240 Units)

Relative humidity should correspond to the sensor (A91) output voltage listed in TABLE 18. For example: if indoor air relative humidity is 80% $\pm$ 3%, the humidity sensor output should read 8.00VDC.

Check the sensor output annually for accuracy. Keep the air intake openings on the sensor clean and free of obstructions and debris.

TABLE 18

Relative Humidity (%RH $\pm$ 3%)	Sensor Output (VDC)
20	2.00
30	3.00
40	4.00
50	5.00
60	6.00
70	7.00
80	8.00
90	9.00

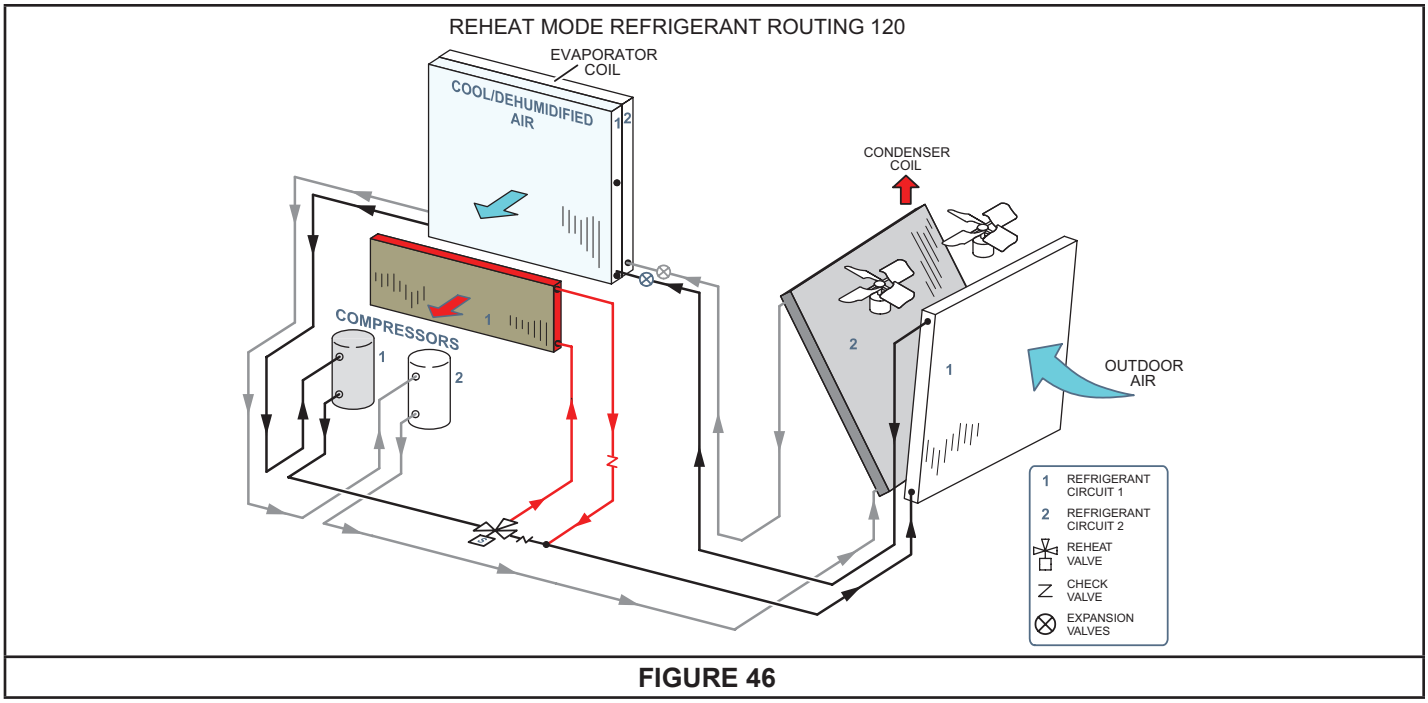


FIGURE 46

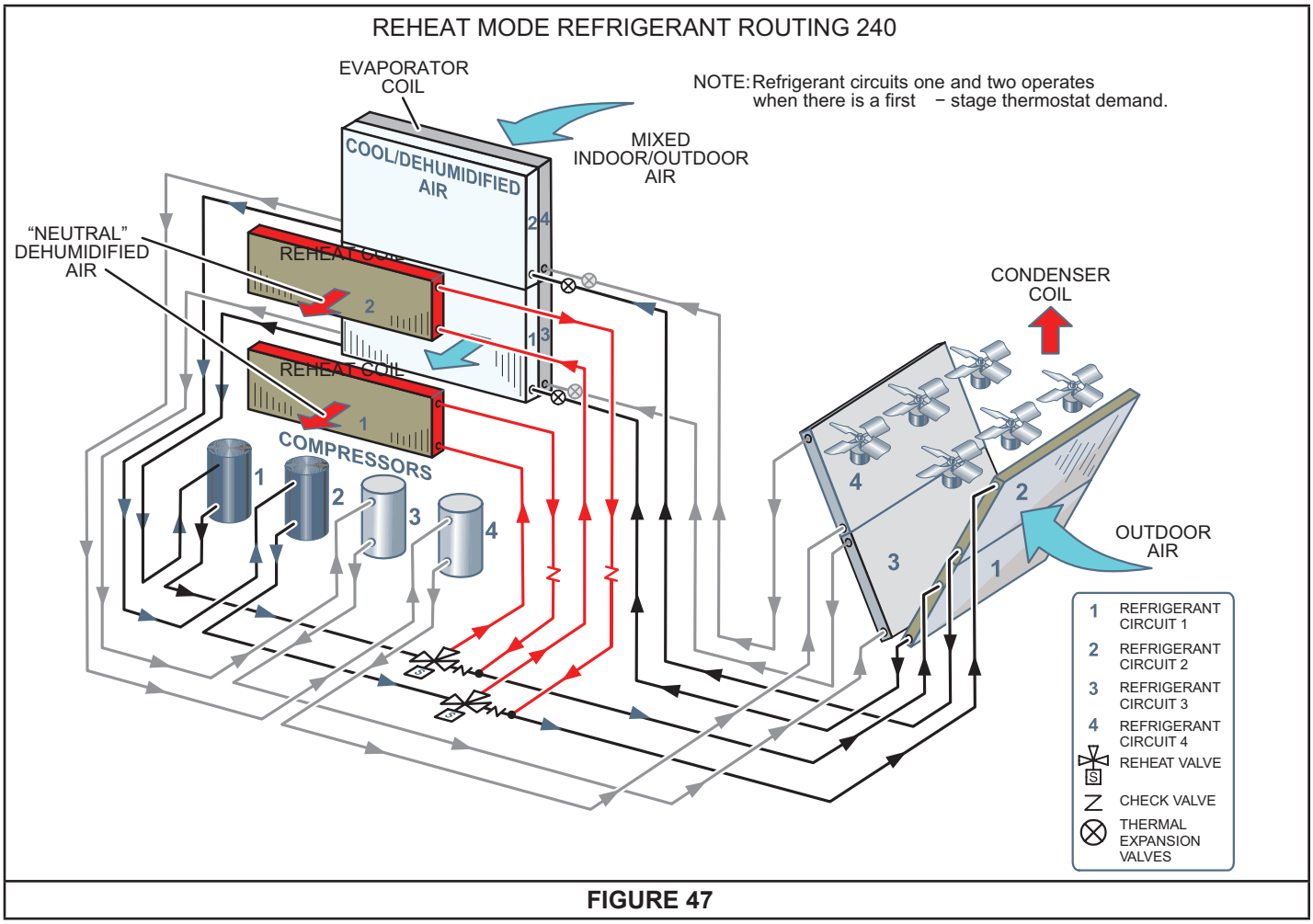


FIGURE 47

Check-Out

Test reheat operation using the following procedure.

1 - Make sure reheat is wired as shown in wiring section.

2 - Make sure unit is in local thermostat mode.

3 - Use Unit Controller application to elect :

SERVICE > TEST > DEHUMIDIFIER

120 -

The blower and compressor (reheat) should be operating. **DEHUMIDIFIER 1 ON** will be appear on the Unit Controller display.

240 -

The blower, compressor 1, and compressor 2 (reheat) should be operating. L14 and L30 LEDs on the Unit Controller should also be **ON**, indicating the reheat valves are energized. **REHEAT MODE** will be appear on the Unit Controller display.

4 - Press **BACK** on the Unit Controller display to stop the testing mode.

Default Reheat Operation - 120

TABLE 19

Reheat Operation - Two Cooling Stages - Default

T'stat and Humidity Demands	Operation
Reheat Only	Compressor 1 Reheat & Blower Low Speed
Reheat & Y1	Compressor 1 Reheat & Compressor 2 Cooling* & Blower High Speed
Reheat & Y1 & Y2	Compressor 1 Cooling & Compressor 2 Cooling** & Blower High Speed

*If there is no reheat demand and outdoor air is suitable, free cooling will operate.

**If there is no reheat demand and outdoor air is suitable free cooling and compressor 1 will operate.

Default Reheat Operation - 240

Reheat will operate as shown in TABLE 20 once three conditions are met:

1 - Blower must be operating.

2 - System must be in occupied mode.

3 - System must NOT be operating in heating mode.

IMPORTANT - Free cooling does not operate during reheat.

For other reheat control options, refer to the Unit Controller manual.

Additional Cooling Stages

Units are shipped from the factory to provide two stages of cooling.

Three stages of cooling is available in zone sensor mode. Three stages of cooling is also available by installing a transfer relay and a three-stage thermostat. Refer to the Main Control Operation section in the Unit Controller manual when using the transfer relay.

Additional Cooling Stages - 240

Four stages of cooling is available in zone sensor mode on units with four compressors.

Compressors are not de-energized when unit operation changes from cooling to reheat or from reheat to cooling. Instead, L14 and L30 reheat valves are energized (reheat) or de-energized (cooling).

NOTE - *Another thermostat staging option is available which allows both compressors to be energized during free cooling. See Unit Controller manual for details.*

TABLE 20
REHEAT OPERATION

Two-Stage Thermostat - Default	
T'stat and Humidity Demands	**Operation**
	240 (4-Compressors)
Reheat Only	Compressor 1 & 2 Reheat
Reheat & Y1	Compressor 1 & 2 Reheat Compressor 3 & 4 Cooling[1]
Reheat & Y1 & Y2	Compressor 1, 2, 3, & 4 Cooling[3]
Three-Stage Thermostat (Transfer relay required)	
T'stat and Humidity Demands	**Operation**
	240 (4-Compressors)
Reheat Only	Compressor 1 & 2 Reheat
Reheat & Y1	Compressor 1 & 2 Reheat Compressor 3 & 4 Cooling[2]
Reheat & Y1 & Y2	Compressor 1 & 2 Reheat Compressor 3 & 4 Cooling[3]
Reheat Y1 & Y2 & Y3	Compressor 1, 2, 3, & 4 Cooling[4]
Four-Stage Zone Sensor Mode	
Cooling* and Humidity Demands**	**Operation**
	240 (4-Compressors)
Reheat Only	Compressor 1 & 2 Reheat
Reheat & Y1	Compressor 1 & 2 Reheat Compressor 3 Cooling1
Reheat & Y1 & Y2	Compressor 1 & 2 Reheat Compressor 3 & 4 Cooling[2]
Reheat Y1 & Y2 & Y3	Compressor 1 Reheat, Compressor 2, 3, & 4 Cooling[3]
Reheat Y1 & Y2 & Y3 & Y4	Compressor 1, 2, 3, & 4 Cooling[5]

*Cooling stage is initiated when zone temperature is higher than the cooling setpoint plus the appropriate stage differential.

**Reheat demand is initiated when relative humidity is higher than relative humidity setpoint.

[1]If there is no reheat demand and outdoor air is suitable, free cooling will operate.

[2]If there is no reheat demand and outdoor air is suitable, free cooling and compressor 1 will operate.

[3]If there is no reheat demand and outdoor air is suitable, free cooling and compressor 1 and 2 will operate.

[4]If there is no reheat demand and outdoor air is suitable, free cooling, compressor 1, 2 and 3 will operate.

[5]If there is no reheat demand and outdoor air is suitable, free cooling, compressor 1, 2, 3 and 4 will operate.

The following conditions must be met before reheat will be energized:
(factory-default; see Unit Controller manual for other options)

1 - Blower must be operating.

2 - System must be in occupied mode.

3 - System must NOT be operating in heating mode.

VII - MSAV™ Unit Start-Up & Operation

Units may contain a supply air blower equipped with a variable frequency drive A96 (VFD) which stages supply air CFM.

The supply air VFD (A96) is located near the compressors. See FIGURE 48.

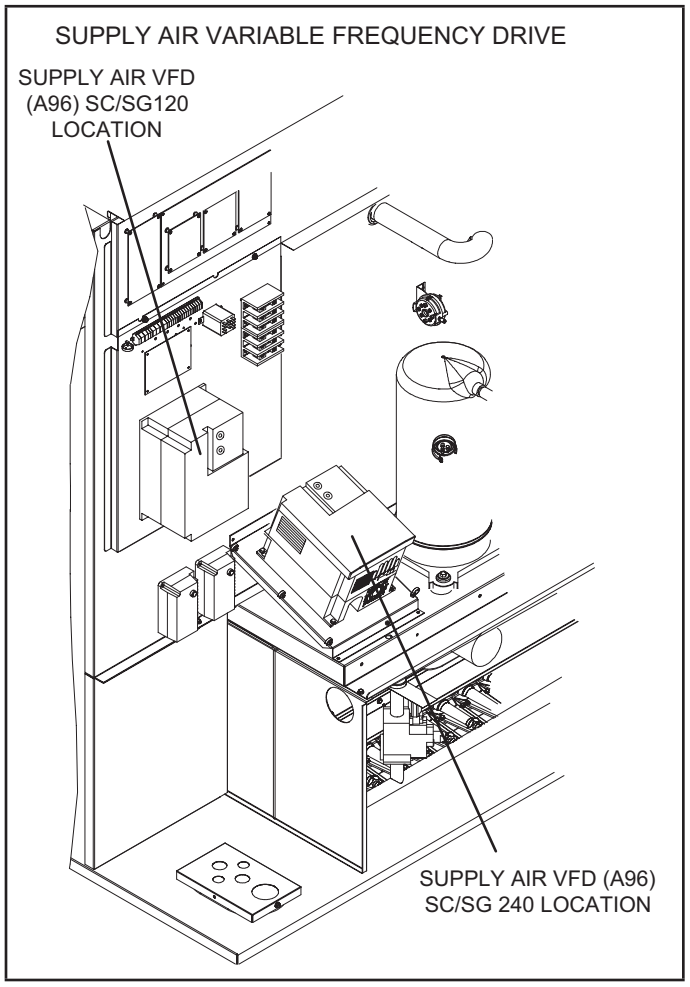


FIGURE 48

A-Design Specifications

Use TABLE 21 to fill in field-provided, design specified blower CFM for appropriate unit.

If only high and low cooling design specifications are provided, set the medium cooling CFM at the high or low cooling design spec or any CFM between.

B-Set Maximum CFM

Use TABLE 22 to determine highest blower CFM for appropriate unit. Adjust the blower pulley to deliver that amount of CFM with only the blower operating. See *Determining Unit CFM* in the Blower Operation and Adjustment section.

C-Enter Design Specifications Into Controller

1 - Use the following menu to enter the blower design specified CFM into the Unit Controller. Make sure blower CFM is within limitations shown in TABLE 21. Refer to the Unit Controller manual provided with unit.

TEST & BALANCE > BLOWER (enter information as prompted by the Unit Controller if not already done).

2 - Enter the following design specifications as shown.

Blower / Heat CFM
Cooling High CFM[1]
Cooling Low CFM[1]
Vent CFM

[1]The Unit Controller will prompt when more cooling stages are available depending on the number of compressors and the control mode.

3 - Adjust the blower RPM to deliver the target CFM based on the measured static pressure using the blower table.

4 - Measure the static pressure again and apply the static pressure and RPM to the tables to determine adjusted CFM.

5 - Repeat adjustments until design CFM is reached.

D-Set Damper Minimum Position

To maintain required minimum ventilation air volumes when the unit is in the occupied mode, two minimum damper positions must be set. The Unit Controller will open the dampers to “Min OCP Blwr Low” when blower CFM is BELOW a “midpoint” CFM. The Unit Controller will open the damper to “Min OCP Blwr High” when blower CFM is at or ABOVE the “midpoint” CFM.

The Unit Controller will calculate the “midpoint” CFM.

Set Minimum Position 1

Use the following menu in the Unit Controller to set “Min OCP Blwr Low” for the blower CFM below the “midpoint” CFM. When navigating into this menu, the Unit Controller will bring on the corresponding blower speed and allow damper position adjustment.

RTU OPTION > DAMPER > MIN DAMPER POSITION BLOWER ON HIGH = X.X%

TABLE 21
Blower CFM Design Specifications

Unit	T’Stat or Zone Control Stages	Blower Speed	Design Specified CFM
120, 240	2	Htg.	
		Clg. High	
		Clg. Low	
		Ventilation	
240	4	Htg.	
		Clg. High	
		Clg. Med. High	
		Clg. Med. Low	
		Clg. Low	
		Ventilation	

**Available blower speeds vary by unit and thermostat stages*

Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the Unit Controller to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

NOTE - *Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.*

TABLE 22

MINIMUM AND MAXIMUM CFM

Gas Heat Minimum CFM		
Unit	**Gas Heat Size**	**Airflow CFM**
SG 120	Std. , Med.	2225
SG 120	High	2550
SG 240	Std. , Med.	4450
SG 240	High	5075
Electric Heat Minimum CFM		
Unit	**Heat Size (kW)**	**Airflow CFM**
SC 120	0, 15, 20, 30, 40, 45, 60	3800
SC 240	0, 20, 30, 40, 60, 80, 90	8000
Cooling Minimum CFM - 220 CFM/ton		
Unit	**Blower Speed**	**Airflow CFM**
SG/SC 120	Low, Med. Low, Med. High	2200
SG/SC 240	Low, Med. Low, Med. High	4400
Cooling Minimum CFM - 280 CFM/ton		
Unit	**Blower Speed**	**Airflow CFM**
SG/SC 120	High	2800
SG/SC 240	High	5600
Smoke and Ventilation Minimum CFM - 150 CFM/ton		
Unit	**Not Applicable**	**Airflow CFM**
SG/SC 120	NA	1500
SG/SC 240	NA	3000
Heating and Cooling Maximum CF< - 480 CFM/ton		
Unit	**Blower Speed**	**Airflow CFM**
SG/SC 120	High	4800
SG/SC 240	High	9600

Set Minimum Position 2

Use the same menu in the Unit Controller to set “Min OCP Blwr High” for the blower CFM above the “midpoint” CFM. When navigating into this menu, the Unit Controller will bring on the corresponding blower speed and allow damper position adjustment.

Settings / Control / MSAV / Damper / High Speed

Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the Unit Controller to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

NOTE - *Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.*

This is a summary of cooling operation. Refer to the sequence of operation provided in the Engineering Handbook or Service Manual for more detail.

A-Two-Stage T’Stat; 2 and 4-Compressor Units

1 - Economizer With Outdoor Air Suitable

Y1 Demand -

Compressors Off
Blower Cooling Low
Dampers modulate

Y2 Demand -

Compressors Off
Blower Cooling High
Dampers Modulate

NOTE - *If dampers are at maximum open for three minutes, compressor 1 and 2 are energized and blower stays on cooling high.*

2 - No Economizer or Outdoor Air Not Suitable

Y1 Demand -

First-stage Compressors On (compressor 1 on 120 units, compressor 1 & 2 on 240 units)
Blower Cooling Low
Dampers Minimum Position

Y2 Demand -

All Compressors On
Blower Cooling High
Dampers Minimum Position

B-Zone Sensor (4 Clg. Stages), 4-Compressor Units (240 Units)

1 - Economizer with Outdoor Air Suitable

Y1 Demand -

Compressors Off
Blower Cooling Medium High
Dampers modulate

Y2 Demand -

Compressors Off
Blower Cooling High
Dampers Modulate

NOTE - *If dampers are at maximum open for three minutes, compressor 1 is energized and blower stays on cooling high.*

Y3 Demand -

Compressors 1 and 2 On
Blower Cooling High
Dampers Maximum Open

Y4 Demand -

All Compressors On
Blower Cooling High
Dampers Maximum Open

2 - No Economizer or Outdoor Air Not Suitable

Y1 Demand -

Compressor 1 On
Blower Cooling Low

Y2 Demand -

Compressor 1 and 2 On
Blower Cooling Medium Low

Y3 Demand -

Compressors 1, 2, and 3 On
Blower Cooling Medium High

Y4 Demand -

All Compressors On
Blower Cooling High

E-Unit Operation

Use the mobile app to check unit mechanical operation. See the Service - Test section of the Unit Controller manual.

F-Manual Supply Air VFD Bypass

IMPORTANT - All dampers must be open to prevent damage to duct work and dampers.

Note - *This section does not apply to units equipped with optional automatic VFD bypass. That option will automatically change from multi-stage air volume to constant air volume operation in the event of VFD failure.*

Manually change blower operation to constant air volume as follows:

1 - Disconnect all power to unit and **WAIT AT LEAST 10 MINUTES** before opening the VFD cover.

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

STOP! Before you continue, make sure that power to the VFD has been off for at least 10 minutes. The capacitor in the VFD holds high voltage power for up to 10 minutes after power has been disconnected.

2 - Locate P246 and P247 connectors near the VFD. See FIGURE 49.

3 - Disconnect P246 from P246 (power in to VFD) and P247 from P247 (power out to blower). See FIGURE 50.

4 - Connect P246 to P247. See FIGURE 51.

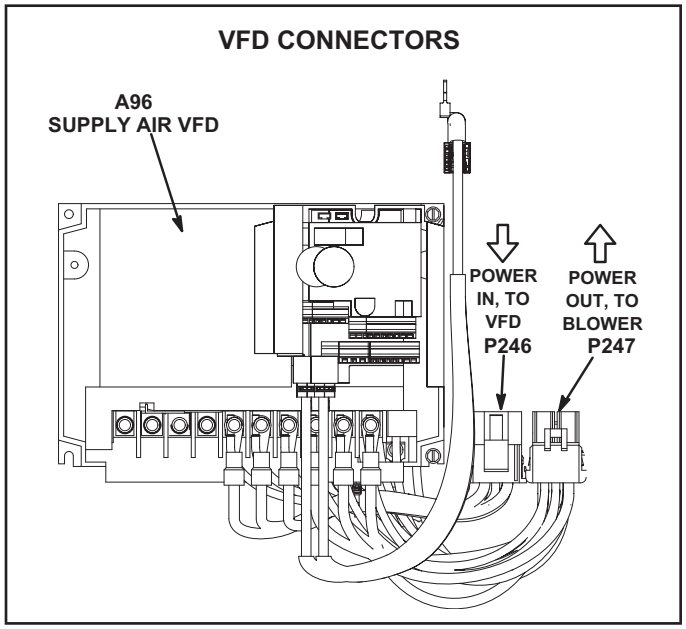


FIGURE 49

5 - Restore power to unit. Blower will operate in constant air volume (CAV) mode.

Note - *The indoor blower motor will start as soon as the main unit power is restored. In manual bypass, the blower will run regardless of thermostat signals until main unit power is turned off. Manual bypass is meant for emergency operation only and not long-term usage.*

6 - Check the indoor blower motor nameplate for full load amperage (FLA) value. Measure the amp readings from the indoor blower motor operating in bypass mode. If measured amps are higher than nameplate FLA value, decrease the CFM by opening (turning counterclockwise) the motor pulley. See FIGURE 19 or FIGURE 20. Do not exceed minimum and maximum number of pulley turns as shown in table 3.

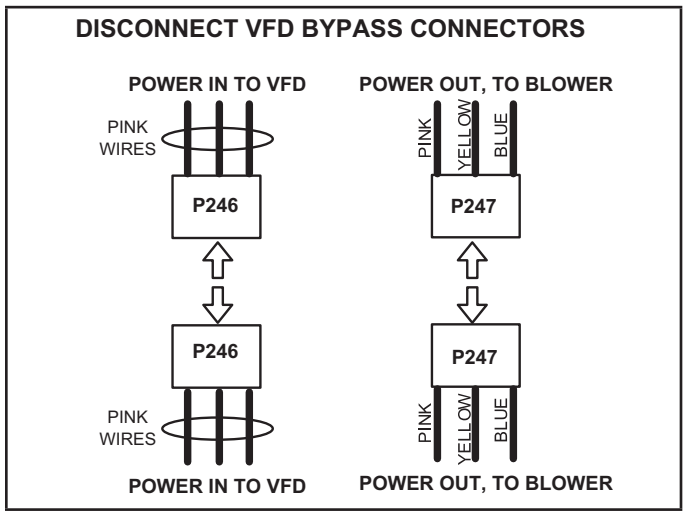


FIGURE 50

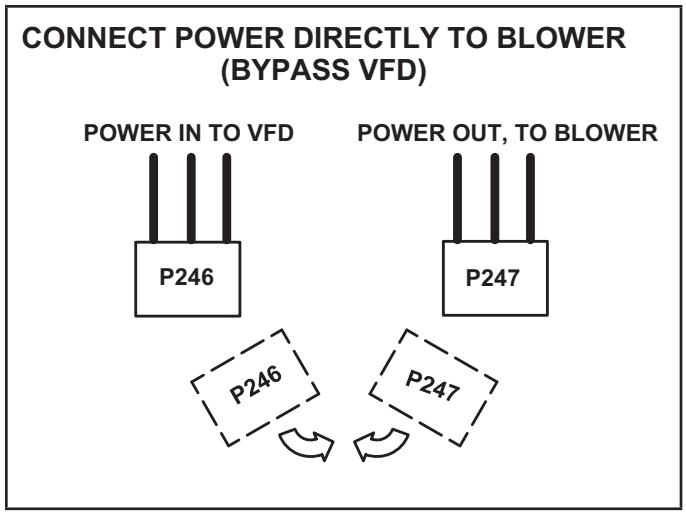


FIGURE 51

VIII-Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available befor the task is commenced.

Steps to ensure this are:

- Become familiar with the equipment and its operation,
- Isolate the system electrically,
- Ensure that before attempting the procedure that mechanical handling equipment is available, if required, for handling refrigerant cylinders, and that all personal protective equipment is available and being used correctly while the recovery process is supervised at all times by a competent person and that the recovery equipment and cylinders conform to the appropriate standards.

Additionally, pump down refrigerant system, if possible, and if a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system. Make sure that cylinders are situated on the scales before recovery takes place. Start the recovery machine and operate in accordance with instructions. Do not overfill cylinders (no more than 80 % volume liquid charge). Do not exceed the maximum working pressure of the cylinder, even temporarily. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area)

Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

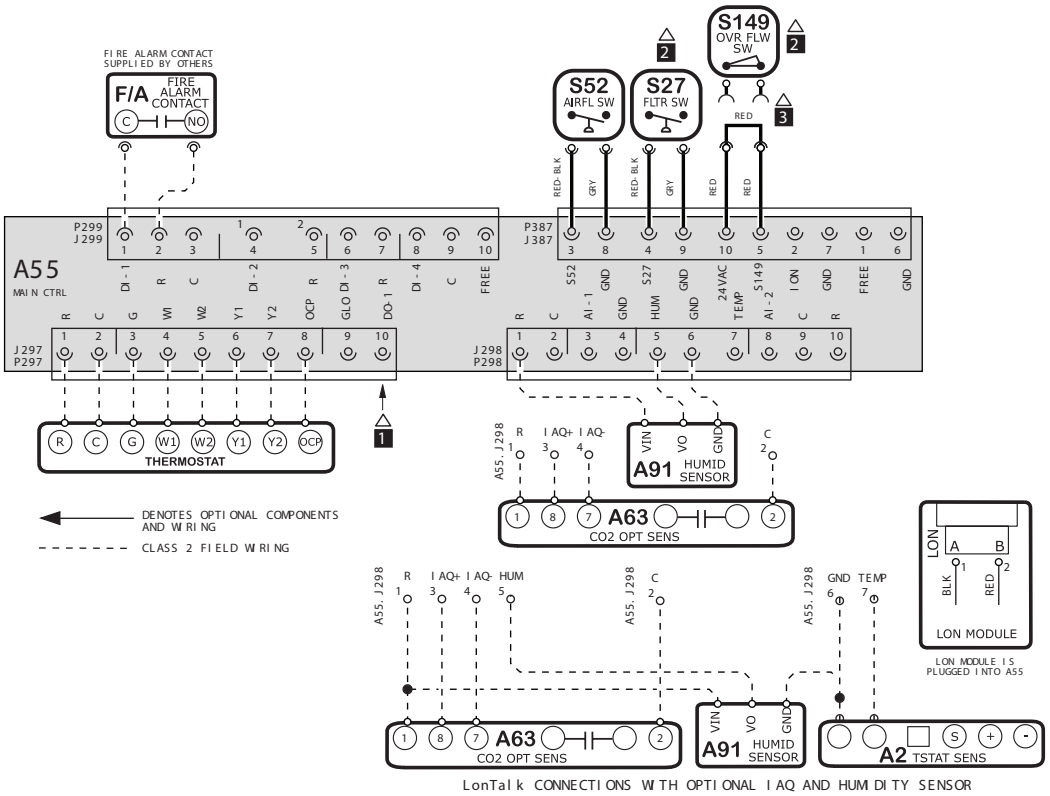
When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- Safely remove refrigerant following local and national regulations,
- Evacuate the circuit,
- Purge the circuit with inert gas,
- Evacuate,
- Purge with inert gas,
- Open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. Refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

IX-Wiring Diagrams and Sequence of Operation

Thermostat



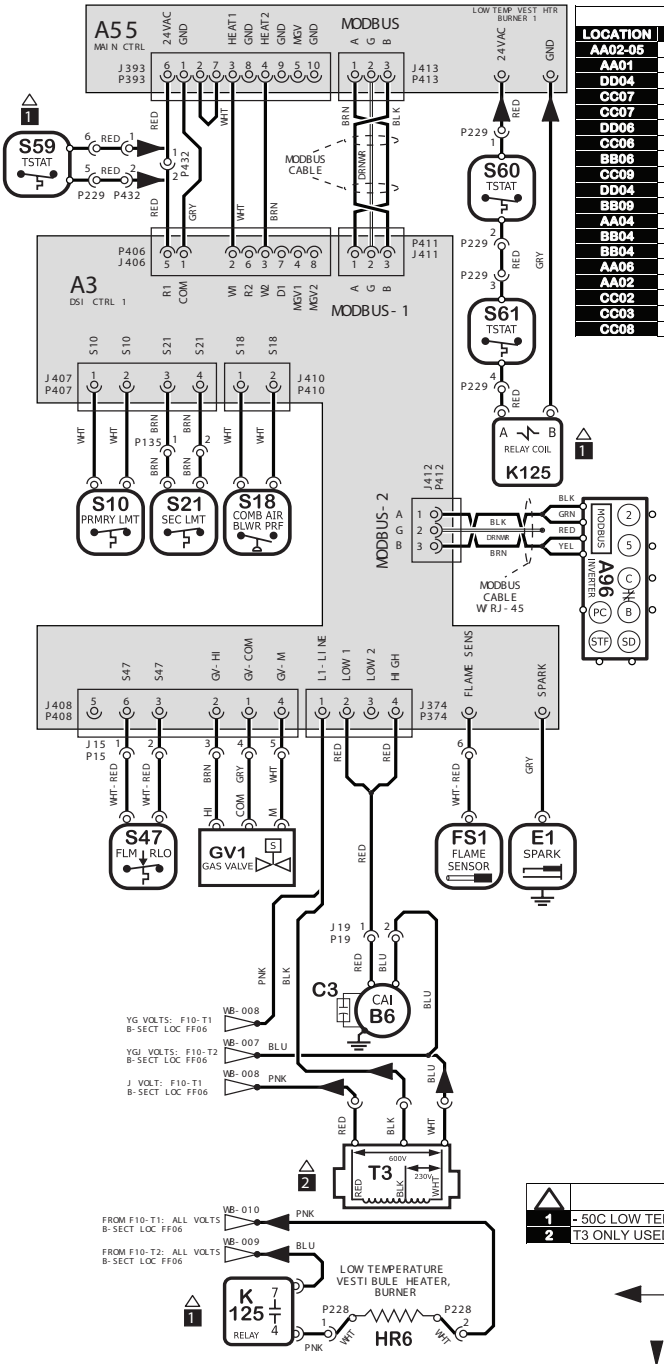
LonTalk CONNECTIONS WITH OPTIONAL IAQ AND HUMIDITY SENSOR

KEY LIST		
LOCATION	**COMPONENT DESCRIPTION**	
FF05	A2	SENSOR, ELECTRONIC THERMOSTAT
AA03	A55	CONTROL BOARD, MAIN
DD04/05	A63	SENSOR, CO2 (IAQ)
DD04/05	A91	SENSOR, HUMIDITY
AA01	F/A	FIRE ALARM CONTACT
DD01	S27	SWITCH, FILTER
DD01	S52	SWITCH, AIRFLOW
EE01	S149	SWITCH, OVERFLOW ONE

△	NOTES
1	P297-10 (SR) IS SERVICE RELAY OUTPUT (24VAC) IF USED CONNECT TO AN INDICATOR LIGHT
2	CORE CONTROLLER SETTINGS MUST BE MODIFIED WHEN S27, S149 ARE INSTALLED
3	REMOVE JUMPER TO INSTALL S149

Model: SC, SG Series RTU
Thermostat and LonTalk
Voltage: All Voltages
Supersedes: N/A Form No: 538391-01 Rev: 0

SGH120 Gas Heat



KEY LIST		
LOCATION	**COMPONENT DESCRIPTION**	
AA02-05	A3	CONTROL BOARD, DSI BURNER
AA01	A55	CONTROL BOARD, MAIN
DD04	A96	CONTROL INVERTER, BLOWER
CC07	B6	MOTOR, CAI MOTOR
CC07	C3	CAPACITOR, CAI MOTOR
DD06	E1	IGNITER, SPARK, BURNER
CC06	FS1	SENSOR, FLAME, BURNER
BB06	GV1	VALVE, GAS, BURNER
CC09	HR6	HEATER, -50C LOW TEMP VEST, BURNER
DD04	K125	RELAY, LOW TEMP VEST HEATER, BURNER
BB09	K125	
AA04	S10	LIMIT, PRIMARY, BURNER
BB04	S18	SWITCH, COMB AIR BLWR PROOF, BURNER
BB04	S21	LIMIT, SECONDARY, BURNER
AA06	S47	SWITCH, FLAME ROLLOUT, BURNER
AA02	S59	TSTAT, OPEN -20F, CLOSE 10F, BURNER
CC02	S60	TSTAT, OPEN 20F, CLOSE -10F, BURNER
CC03	S61	TSTAT, OPEN 50F, CLOSE 20F, BURNER
CC08	T3	TRANSFORMER, CAB

NOTES	
1	- 50C LOW TEMPERATURE VESTIBULE HEATER - OPTIONAL
2	T3 ONLY USED IN J VOLT UNITS

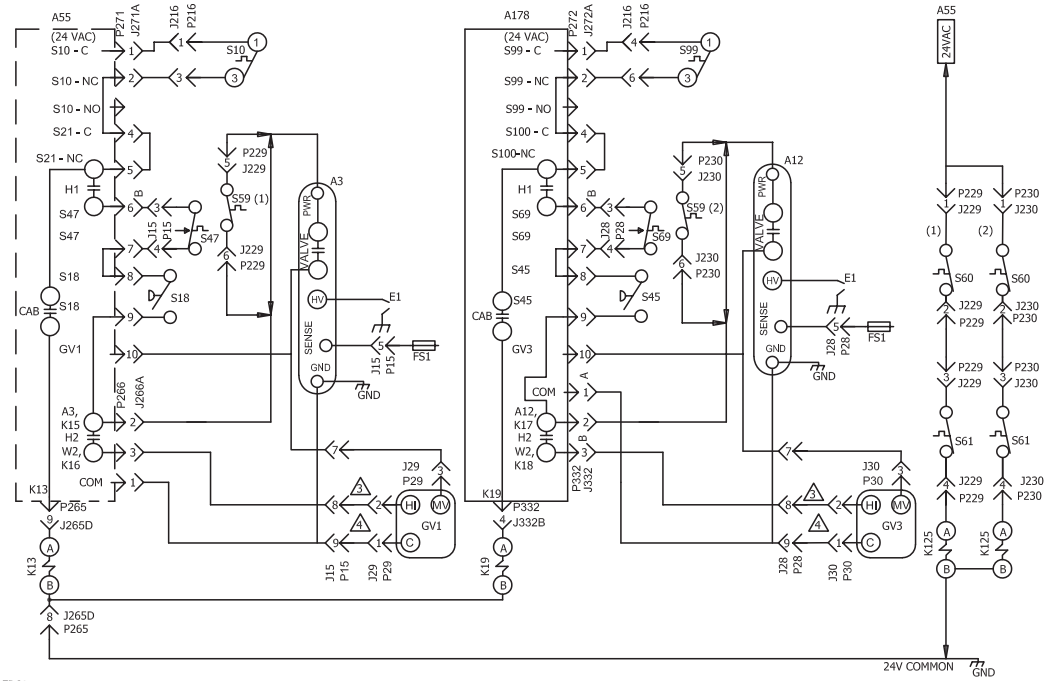
DENOTES OPTIONAL COMPONENTS AND WIRING

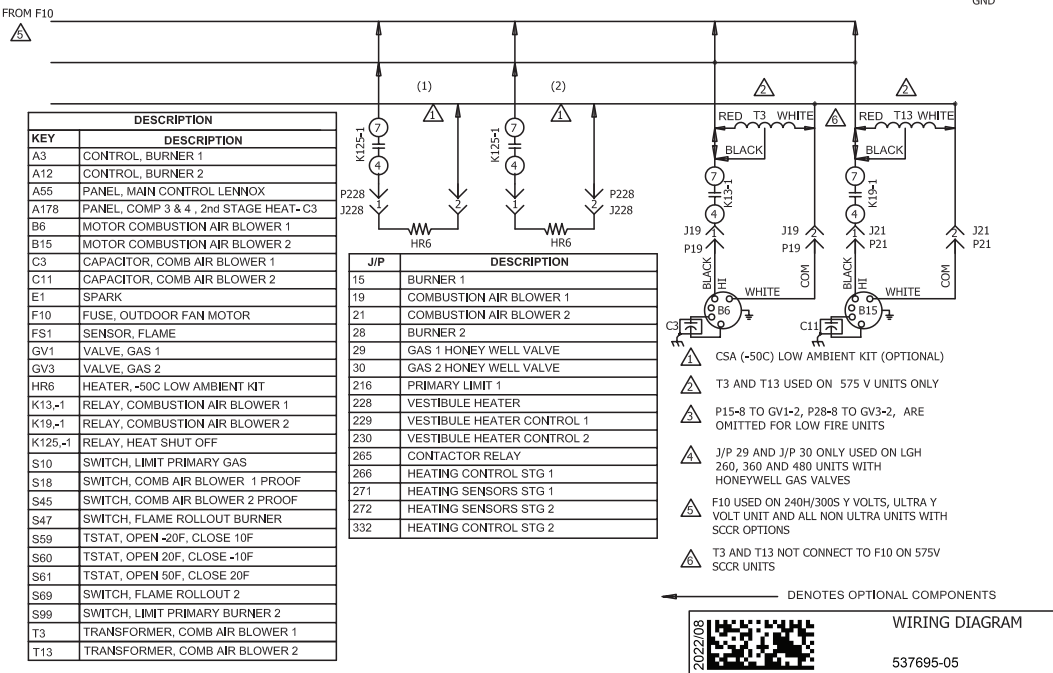
HEATING	COOLING	COOLING	ACCS	ACCS
SECTION A	SECTION B	SECTION B3/5	SECTION C	SECTION D

WIRING DIAGRAM FLOW

Model: SG – 120H
Input Heat Capacity 130k - 240k Btuh
Voltage: All Voltages
Supersedes: XXXXXX-XX Form No: 538405-01 Rev: 000

SGH240 Gas Heat





DESCRIPTION	
KEY	**DESCRIPTION**
A3	CONTROL, BURNER 1
A12	CONTROL, BURNER 2
A55	PANEL, MAIN CONTROL LENNOX
A178	PANEL, COMP 3 & 4 , 2nd STAGE HEAT- C3
B6	MOTOR COMBUSTION AIR BLOWER 1
B15	MOTOR COMBUSTION AIR BLOWER 2
C3	CAPACITOR, COMB AIR BLOWER 1
C11	CAPACITOR, COMB AIR BLOWER 2
E1	SPARK
F10	FUSE, OUTDOOR FAN MOTOR
FS1	SENSOR, FLAME
GV1	VALVE, GAS 1
GV3	VALVE, GAS 2
HR6	HEATER, -50C LOW AMBIENT KIT
K13,-1	RELAY, COMBUSTION AIR BLOWER 1
K19,-1	RELAY, COMBUSTION AIR BLOWER 2
K125,-1	RELAY, HEAT SHUT OFF
S10	SWITCH, LIMIT PRIMARY GAS
S18	SWITCH, COMB AIR BLOWER 1 PROOF
S45	SWITCH, COMB AIR BLOWER 2 PROOF
S47	SWITCH, FLAME ROLLOUT BURNER
S59	TSTAT, OPEN -20F, CLOSE 10F
S60	TSTAT, OPEN 20F, CLOSE -10F
S61	TSTAT, OPEN 50F, CLOSE 20F
S69	SWITCH, FLAME ROLLOUT 2
S99	SWITCH, LIMIT PRIMARY BURNER 2
T3	TRANSFORMER, COMB AIR BLOWER 1
T13	TRANSFORMER, COMB AIR BLOWER 2

J/P	DESCRIPTION
15	BURNER 1
19	COMBUSTION AIR BLOWER 1
21	COMBUSTION AIR BLOWER 2
28	BURNER 2
29	GAS 1 HONEY WELL VALVE
30	GAS 2 HONEY WELL VALVE
216	PRIMARY LIMIT 1
228	VESTIBULE HEATER
229	VESTIBULE HEATER CONTROL 1
230	VESTIBULE HEATER CONTROL 2
265	CONTACTOR RELAY
266	HEATING CONTROL STG 1
271	HEATING SENSORS STG 1
272	HEATING SENSORS STG 2
332	HEATING CONTROL STG 2

1. CSA (-50C) LOW AMBIENT KIT (OPTIONAL)
2. T3 AND T13 USED ON 575 V UNITS ONLY
3. P15-8 TO GV1-2, P28-8 TO GV3-2, ARE OMITTED FOR LOW FIRE UNITS
4. J/P 29 AND J/P 30 ONLY USED ON LGH 260, 360 AND 480 UNITS WITH HONEYWELL GAS VALVES
5. F10 USED ON 240H/300S Y VOLTS, ULTRA Y VOLT UNIT AND ALL NON ULTRA UNITS WITH SCCR OPTIONS
6. T3 AND T13 NOT CONNECT TO F10 ON 575V SCCR UNITS

DENOTES OPTIONAL COMPONENTS

2022/08	WIRING DIAGRAM	08/22
	537695-05	
COOLING -MSAV NO BYPASS		
GAS HEAT FOR LGH/SG 169,260,360 AND 480		
SECTION B		REV. 0.0
Supersedes 537695-04	New Form No. 537695-05	

Sequence of Operation Gas Heat SGH120

First Stage Heat:

1 - Heating demand initiates at W1 in the thermostat.

2 - 24VAC is routed through the A55 unit controller to A3 Ignition Control. The Ignition control then routes the 24VAC to the N.C. primary limit S10. The A3 Ignition control energizes the combustion air blower B6.

3 - After the combustion air blower B6 has reached full speed, the combustion air proving switch S18 contacts close. The A3 routes 24VAC through N.C. burner flame roll-out switch S47 and the closed contacts of combustion air proving switch S18 to energize the ignition module A3.

4 - After a 30 second delay A3 energizes the ignitor and LO terminal (low fire) of gas valve GV1.

Second Stage Heat:

5 - With first stage heat operating, an additional heating demand initiates W2 in the thermostat.

6 - A second stage heating demand is received by A55 Unit Controller.

7 - A55 provides the 24VAC to the A3 Ignition control. This is routed to the HI Terminal (high fire) of gas valve GV1.

End of Second Stage Heat:

8 - Heating demand is satisfied. Terminal W2 (high fire) is de-energized.

9 - Terminal HI of GV1 is de-energized by A3 control module.

End of First Stage Heat:

10 - Heating demand is satisfied. Terminal W1 (low fire) is de-energized.

11 - Ignition A3 is de-energized by control module A55 in turn de-energizing terminal LO of GV1. Combustion air blower relay K13 located in the A3 ignition control is also de-energized.

Optional Low Ambient Kit:

(C.S.A. -50° C Low Ambient Kit)

12 - Line voltage (or transformer T20 in 460V and 575V only) is routed through the low ambient kit fuses F20 and N.C. low ambient kit thermostats S60 and S61,to energize low ambient kit heater HR6.

Sequence of Operation Gas Heat SGH240

FIRST STAGE HEAT:

1 - Heating demand initiates at W1 in thermostat.

2 - 24VAC is routed to the A55 Unit Controller. After A55 proves N.C. primary limit S10, the combustion air blower B6 is energized.

3 - After the combustion air blower B6 has reached full speed, the combustion air proving switch (S18) contacts close. The A55 routes 24VAC through N.C. burner 1 flame rollout switch S47 and the closed contacts of the combustion air proving switch (S18) to energize the ignition module A3. After a 30 second delay A3 energizes the gas valve GV1 on low fire.

4 - As steps 2, 3 and 4 occur, A55 proves N.C. primary gas heat limit S99 and the combustion air blower B15 is energized.

5 - After the combustion air blower B15 has reached full speed, the combustion air proving switch (S45) contacts close. The A55 routes 24VAC through N.C. burner 2 flame rollout switch S69 and the closed contacts of the combustion air proving switch (S45) to energize the ignition module A12. After a 30 second delay A12 energizes gas valve GV3 on low fire.

SECOND STAGE HEAT:

6 - With first stage heat operating, an additional heating demand initiates W2 in the thermostat.

7 - A second stage heating demand is received by A55.

8 - A55 will energize the corresponding gas valves GV1 and GV3 on high fire.

OPTIONAL LOW AMBIENT KIT

(C.G.A. -50° C LOW AMBIENT KIT):

9 - When heat section temperature drops below -20°F, S59 opens and de-energized A3 and A12 ignition controls. At the same temperature, S60 closes and energizes K125. K125-1 contacts close energizing HR6 Cold Weather Kit electric heat.

10 - When heat section temperature rises to 10°F, S59 closes allowing power to A3 and A12 ignition controls. At the same temperature, S60 opens and de-energizes K125. K125-1 contacts open de-energizing HR6 Cold Weather Kit electric heat.

11 - If heat section temperature rises above 50°F, S61 will open and de-energize K125. K125-1 contacts will open and de-energize HR6 Cold Weather Kit electric heat. If heat section temperature drops to 20°F, S61 will close and allow power to K125.

END OF SECOND STAGE HEAT:

12 - Heating demand is satisfied. Terminal W2 is de-energized.

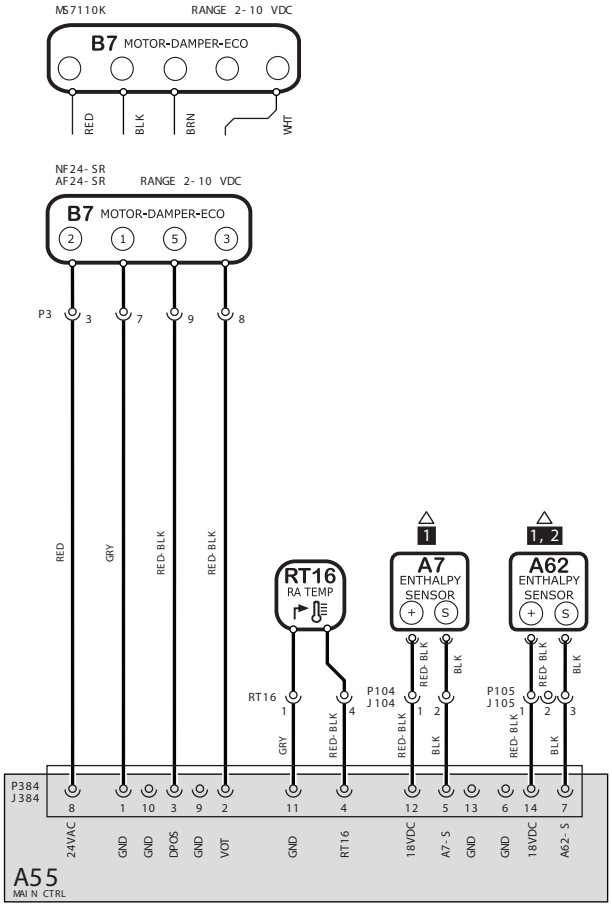
13 - High fire on GV1 and GV3 are de-energized by the A55.

END OF FIRST STAGE HEAT:

14 - Heating demand is satisfied. Terminal W1 is de-energized.

15 - Ignition module A3 is de-energized by A55 in turn de-energizing GV1. Combustion blower air blower B6 is also de-energized. At the same instant, ignition module A12 is de-energized by A55 in turn de-energizing GV3. B6 combustion air blower is also de-energized.

Economizer



△	NOTES
1	A7 AND A62 NOT USED FOR SENSIBLE TEMPERATURE CONTROL
2	FOR UNIT DIFFERENTIAL ENTHALPY CONTROL, ADD A62 RETURN AIR ENTHALPY SENSOR

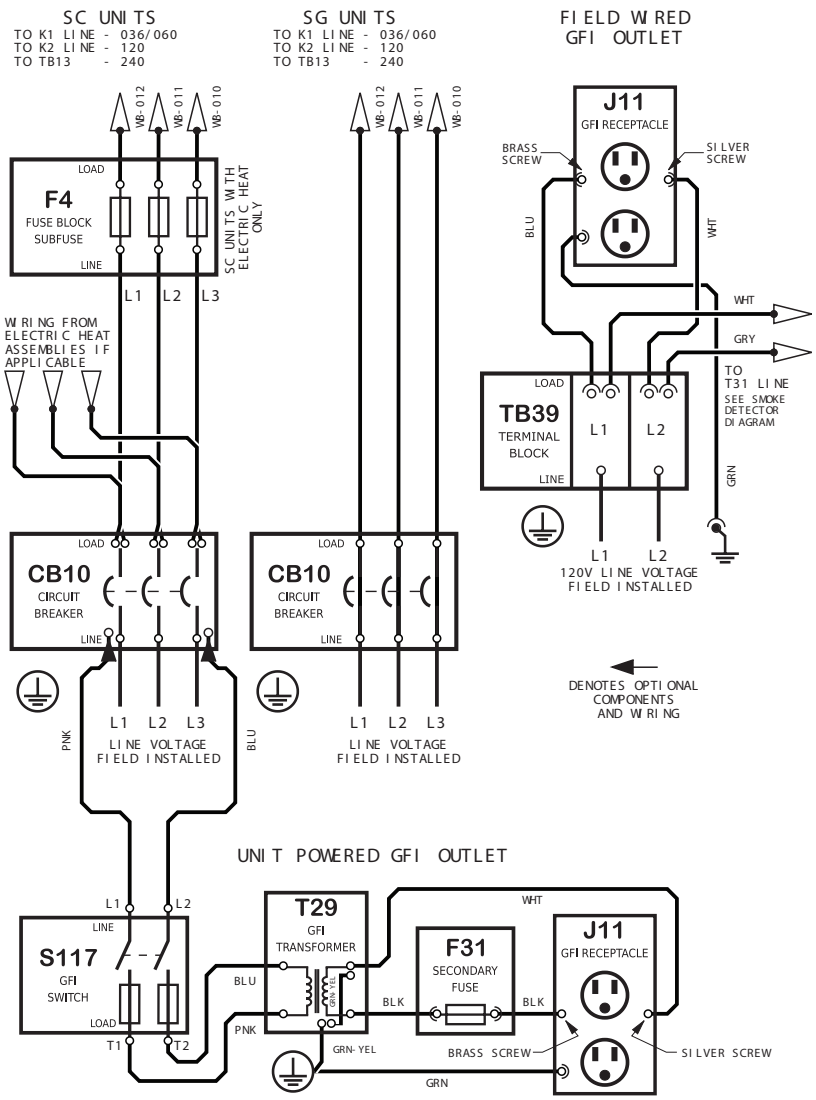
KEY LIST		
LOCATION	**COMPONENT DESCRIPTION**	
CC05	**A7**	SENSOR, SOLID STATE ENTHALPY
AA06	**A55**	CONTROL BOARD, MAIN
DD05	**A62**	SENSOR, ENTHALPY INDOOR
BB02	**B7**	MOTOR, DAMPER ECONOMIZER
CC05	**RT16**	SENSOR, RETURN AIR TEMP

HTG SEC A	CLG SEC B	CLG SEC B3	ACCS SEC C	ACCS SEC D

WIRING DIAGRAM FLOW

Model: LC,LG,LH,LD,SC,SG Series
Economizer & Motorized OAD
Voltage: All Voltages
Supersedes: N/A Form No: 538072-01 Rev: 2

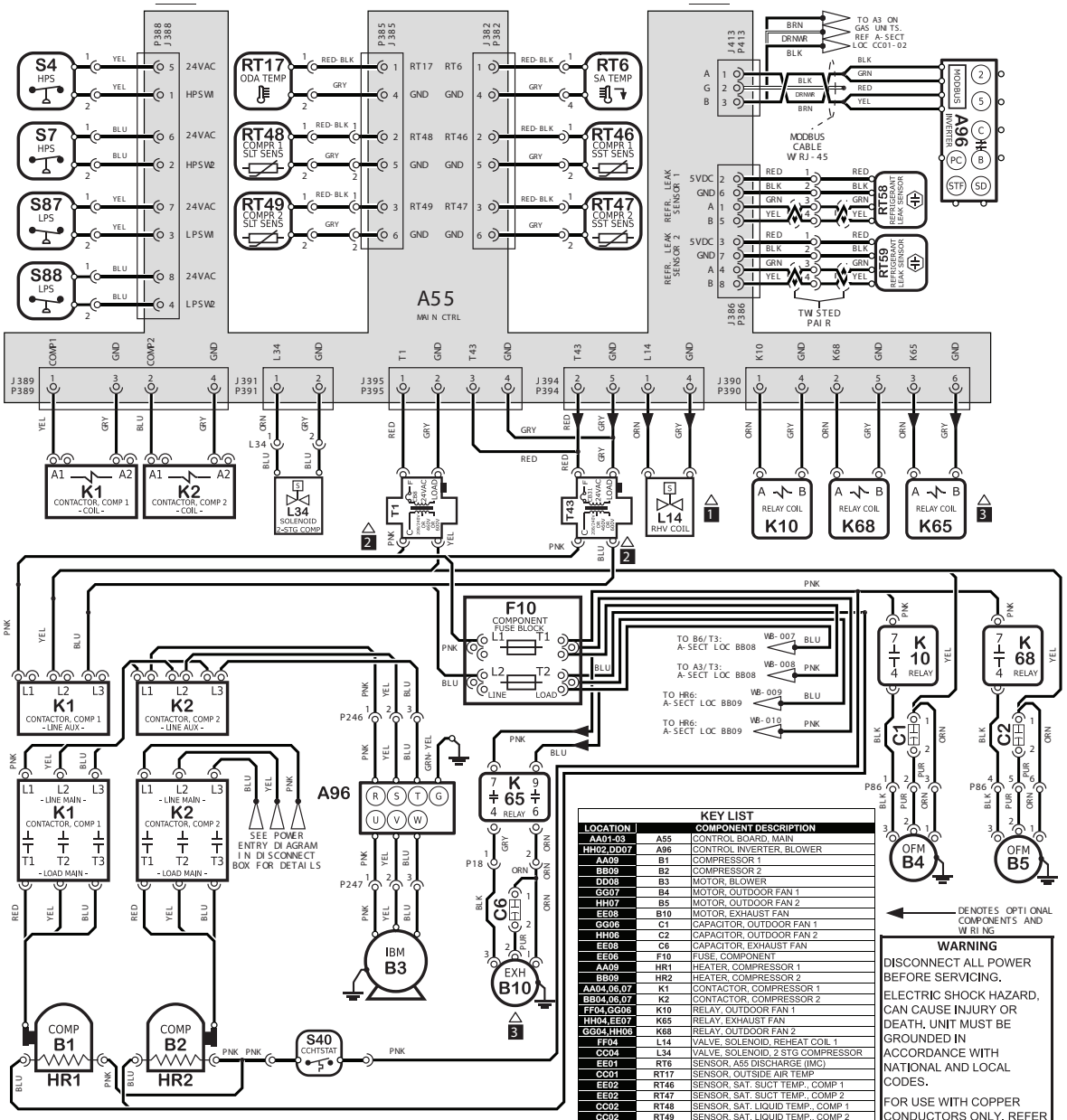
Power Entry



Model:	SC, SG Series R1U Power Entry Options
Voltage:	All Voltages
Supersedes:	538103-01

Form No. 538469-01 Rev: 0

SGH120 Schematic



NOTES	
1	ONLY ON UNITS WITH HUMIDITROL OPTION
2	MOVE WIRES FROM 240 TO 208 TAP ON TRANSFORMERS FOR 208 VOLT APPLICATIONS
3	ONLY ON UNITS WITH POWER EXHAUST OPTION

KEY LIST		
LOCATION		COMPONENT DESCRIPTION
AA01-03	A55	CONTROL BOARD, MAIN
HH02,DD07	A96	CONTROL INVERTER, BLOWER
AA09	B1	COMPRESSOR 1
BB09	B2	COMPRESSOR 2
DD08	B3	MOTOR, BLOWER
GG07	B4	MOTOR, OUTDOOR FAN 1
HH07	B5	MOTOR, OUTDOOR FAN 2
EE03	B10	MOTOR, EXHAUST FAN
GG06	C1	CAPACITOR, OUTDOOR FAN 1
HH06	C2	CAPACITOR, OUTDOOR FAN 2
EE08	C6	CAPACITOR, EXHAUST FAN
EE06	F10	FUSE, COMPONENT
AA09	HR1	HEATER, COMPRESSOR 1
BB09	HR2	HEATER, COMPRESSOR 2
AA04,06,07	K1	CONTACTOR, COMPRESSOR 1
BB04,06,07	K2	CONTACTOR, COMPRESSOR 2
FF04,GG06	K10	RELAY, OUTDOOR FAN 1
HH04,EE07	K65	RELAY, EXHAUST FAN
GG04,HH06	K68	RELAY, OUTDOOR FAN 2
FF04	L14	VALVE, SOLENOID, REHEAT COIL 1
CC04	L34	VALVE, SOLENOID, 2 STG COMPRESSOR
EE01	RT6	SENSOR, A55 DISCHARGE (IMC)
CC01	RT17	SENSOR, OUTSIDE AIR TEMP
EE02	RT46	SENSOR, SAT. SUCT TEMP., COMP 1
EE02	RT47	SENSOR, SAT. SUCT TEMP., COMP 2
CC02	RT48	SENSOR, SAT. LIQUID TEMP., COMP 1
CC02	RT49	SENSOR, SAT. LIQUID TEMP., COMP 2
GG02	RT58	SENSOR 1, REFR. LEAK DETECTION
GG02	RT59	SENSOR 2, REFR. LEAK DETECTION
AA01	S4	LIMIT, HI PRESS. SWITCH, COMP 1
AA02	S7	LIMIT, HI PRESS. SWITCH, COMP 2

DENOTES OPTIONAL COMPONENTS AND WIRING

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

ELECTRIC SHOCK HAZARD. CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

FOR USE WITH COPPER CONDUCTORS ONLY. REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.

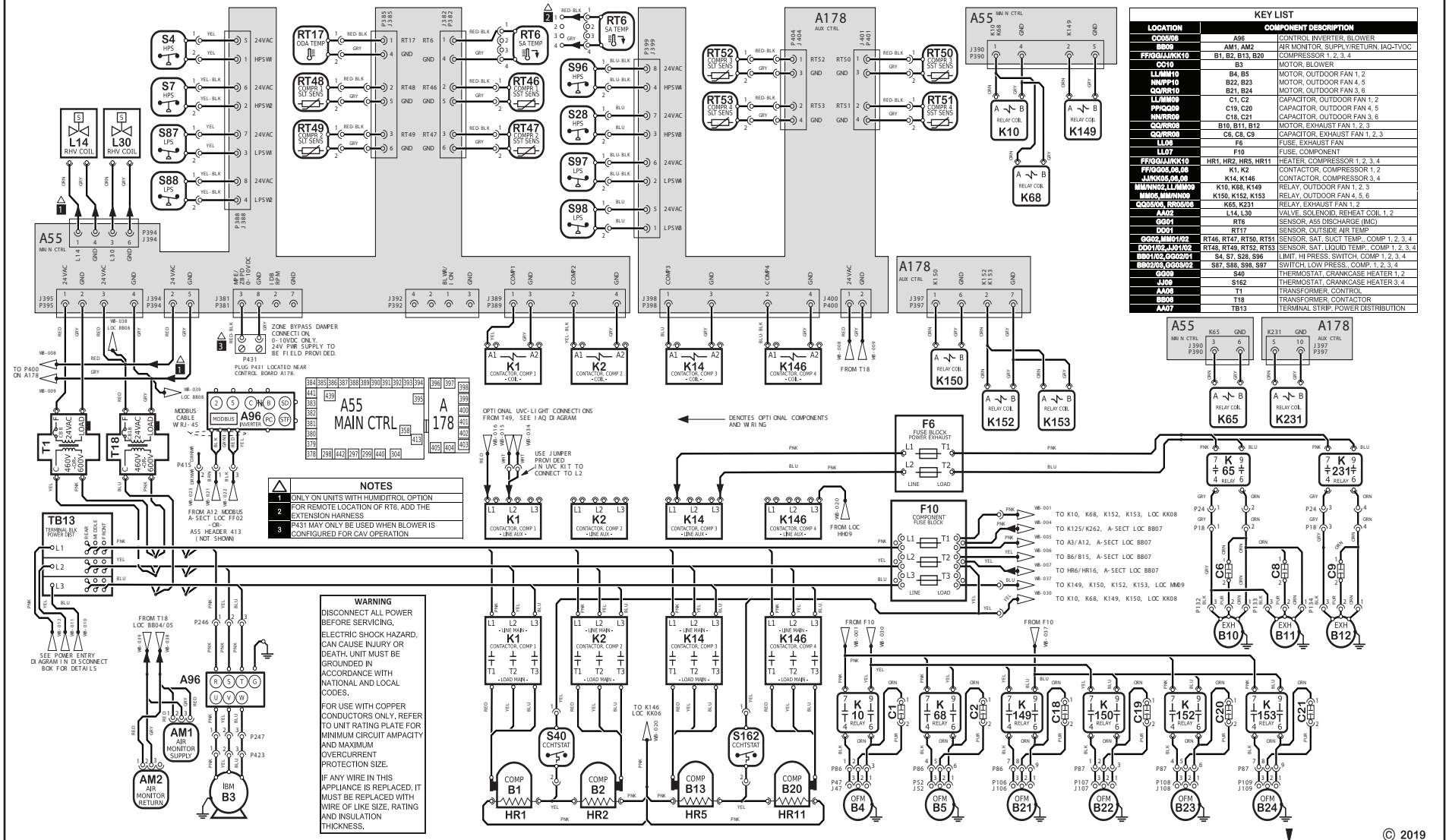
IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING AND INSULATION THICKNESS.

HEATING	COOLING	COOLING	ACCS	ACCS
SECTION A	SECTION B	SECTION B5	SECTION C	SECTION D

WIRING DIAGRAM FLOW

Model: SC, SG – 120H
COOLING
Voltage: All Voltages
Supersedes: XXXXXX-XX Form No: 538406-01 Rev: 000

SGH240 Schematic



KEY LIST	
LOCATION	COMPONENT DESCRIPTION
CC05/06	A96 — CONTROL INVERTER, BLOWER
BB03	AM1, AM2 — AIR MONITOR, SUPPLY/RETURN, IAQ-TVOC
FF/GG/JJ/KK10	B1, B2, B13, B20 — COMPRESSOR 1, 2, 3, 4
CC10	B3 — MOTOR, BLOWER
LL/MM10	B4, B5 — MOTOR, OUTDOOR FAN 1, 2
NN/PP10	B22, B23 — MOTOR, OUTDOOR FAN 4, 5
QQ/RR10	B21, B24 — MOTOR, OUTDOOR FAN 3, 6
LL/MM09	C1, C2 — CAPACITOR, OUTDOOR FAN 1, 2
PP/QQ09	C19, C20 — CAPACITOR, OUTDOOR FAN 4, 5
NN/RR09	C18, C21 — CAPACITOR, OUTDOOR FAN 3, 6
QQ/RR09	B10, B11, B12 — MOTOR, EXHAUST FAN 1, 2, 3
QQ/RR08	C6, C8, C9 — CAPACITOR, EXHAUST FAN 1, 2, 3
LL06	F6 — FUSE, EXHAUST FAN
LL07	F10 — FUSE, COMPONENT
FF/GG/JJ/KK10	HR1, HR2, HR5, HR11 — HEATER, COMPRESSOR 1, 2, 3, 4
FF/GG05,06,08	K1, K2 — CONTACTOR, COMPRESSOR 1, 2
JJ/KK05,06,08	K14, K146 — CONTACTOR, COMPRESSOR 3, 4
MM/NN02,LL/MM09	K10, K68, K149 — RELAY, OUTDOOR FAN 1, 2, 3
MM06,MM/NN09	K150, K152, K153 — RELAY, OUTDOOR FAN 4, 5, 6
QQ05/06, RR05/06	K65, K231 — RELAY, EXHAUST FAN 1, 2
AA02	L14, L30 — VALVE, SOLENOID, REHEAT COIL 1, 2
GG01	RT6 — SENSOR, A55 DISCHARGE (IMC)
DD01	RT17 — SENSOR, OUTSIDE AIR TEMP
GG02,MM01/02	RT46, RT47, RT50, RT51 — SENSOR, SAT, SUCT TEMP., COMP 1, 2, 3, 4
DD01/02,JJ/KK02	RT48, RT49, RT52, RT53 — SENSOR, SAT, LIQUID TEMP., COMP 1, 2, 3, 4
BB01/02,GG02/01	S4, S7, S28, S96 — LIMIT, HI PRESS, SWITCH, COMP 1, 2, 3, 4
BB02/05,GG03/02	S87, S88, S98, S97 — SWITCH, LOW PRESS., COMP, 1, 2, 3, 4
GG09	S40 — THERMOSTAT, CRANKCASE HEATER 1, 2
JJ09	S162 — THERMOSTAT, CRANKCASE HEATER 3, 4
AA06	T1 — TRANSFORMER, CONTROL
AA08	T18 — TRANSFORMER, CONTACTOR
AA07	TB13 — TERMINAL STRIP, POWER DISTRIBUTION

Model: SGH, SCH 240 - G, J-VOLT
COOLING - MSAV

Voltage: 460V/3~/60Hz (G), 575V/3~/60Hz (J)
Supersedes: N/A Form No: 538448-01 Rev: 0

WIRING DIAGRAM FLOW

HEATING	COOLING	COOLING	ACCS	ACCS
SECTION A	SECTION B	SECTION B3/5	SECTION C	SECTION D

Sequence of Operation SGH120

Power:

1 - Line voltage through the S48 unit disconnect, TB2 terminal block, or CB10 circuit breaker energizes the T1 transformer. T1 provides 24VAC power to A55 Unit Controller which provides 24VAC to the unit cooling, heating and blower controls.

2 - Line voltage is also routed to compressor crankcase heaters, compressor contactors, the blower motor, condenser fan relays and exhaust fan relays.

Blower Operation:

3 - The A55 Unit Controller module receives a demand from thermostat terminal G.

4 - B3 recieves the pre-set blower setting through MODUS.

Economizer Operation:

5 - A55 receives a demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).

6 - N.O. K65-1 and N.O. K65-2 both close, energizing exhaust fan motor B10.

1st Stage Cooling (compressor B1)

7 - A55 receives a Y1 thermostat demand.

8 - After A55 proves N.C. low pressure switch S87, RT46 reading above freeze point and N.C. high pressure switch S4, compressor contactor K1 is energized.

9 - N.O. contacts K1-1 close energizing compressor B1. Crankcase heater HR1 is de-energized.

10 - At the same time, A55 energizes condenser fan relays K10 and K68.

11 - N.O. contacts K10-1 close energizing condenser fan B4 and N.O. contacts K68-1 close energizing condenser fan B5.

2nd Stage Cooling (compressor B2 is energized)

12 - A55 receives a Y2 thermostat demand.

13 - After A55 proves N.C. low pressure switch S88, RT47 reading above freeze point, and N.C. high pressure switch S7, compressor contactor K2 is energized.

14 - N.O. contacts K2-1 close energizing compressor B2. Crankcase heater HR2 is de-energized.

3nd Stage Cooling (compressor B1 in full load and compressor 2 is energized)

15 - A55 receives a Y3 thermostat demand (Y1 + Y2 thermostat inputs).

16 - A55 sends 24VAC to B1 compressor solenoid (L14), B1 compressor runs at full load.

Sequence of Operation SGH240

1 - 1- Line voltage from TB13 energizes transformer T1 and T18. Transformer T1 and T18 provides 24VAC power to the main controller A55. The transformers also provide 24VAC power to the unit cooling, heating and blower controls and thermostat.

ECONOMIZER OPERATION

2 - The A55 Unit Controller receives a demand and energizes exhaust fan relay K65 and K231 with 24VAC at 50% (travel) outside air damper open (adjustable).

3 - N.O. K65-1, K65-2, K231-01 and K231-02 close, energizing exhaust fan motors B10 and B11.

1ST STAGE COOLING

4 - First stage cooling demand energizes Y1 and G in the thermostat.

5 - 24VAC is routed to the A55 Unit Controller. After A55 proves N.C. low pressure switches S87, S88 and N.C. high pressure switches S4 and S7, compressor contactors K1 and K2 are energized.

6 - A55 energizes fan B21 directly and fans B4 & B5 through K10.

7 - N.O. K1 closes energizing compressor B1, and N.C. K1-52 opens de-energizing HR1, N.O. K2 closes energizing compressor B2, and N.C. K2-52 opens de-energizing HR2.

2ND STAGE COOLING

8 - Second stage cooling demand energizes Y2.

9 - N.O. contacts K14-1 close energizing compressor B13, de-energizing HR5.

10 - A178 energizes fan B24 directly and fans B22 & B23 through K150.

11 - N.O. K14 closes energizing compressor B13, and N.C. K14-52 opens de-energizing HR5.

12 - \N.O. K146 closes energizing compressor B20, and N.C. K146-52 opens de-energizing HR11.

BLOWER OPERATION

With By Pass Installed - Active

1 - Main control A55 de-energizes relays K202 and K203

2 - K202 contacts open to interrupt power to B3 blower motor from A96 blower inverter.

3 - Main control A55 energizes relay K203-7.

4 - K203-1 N.C. contacts close allowing power to K3.

5 - K3 contacts close to allow power to B3 blower motor.

With By Pass Installed - Inactive

1 - Main control A55 energizes relays K202 and K203.

2 - K203-1 N.C. contacts open to de-energize K3 relay coil. K3 contacts open to interrupt power to B3 blower motor through K3 N.O. contacts.

3 - K202 contacts close to allow power to B3 blower motor from A96 blower inverter.

By-Pass Not Installed

1 - Control inverter A96 energizes B3.