Service Literature

UNIT INFORMATION

Corp. 1605-L11
11-2016

LGH SERIES

3 to 6 ton
7 to 21 kW

Ultra High Efficiency LGH036 through 074U

LGH036U, 048U, 060U, and 074U are ultra high efficiency gas packaged units equipped with variable speed direct drive blowers, an inverter-driven variable speed compressor, and a variable speed outdoor fan.

LGH036 units are available in 65,000 to 108,000 Btuh (19 to 31 kW) heating inputs. LGH048, 060 and 074 units are available in 65,000 to 150,000 Btuh (19 to 43.9 kW) heating inputs. Gas heat sections are designed with aluminized (stainless optional) steel tube heat exchangers. Cooling capacities range from 3 to 6 tons (7 to 21kW).

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

If the unit must be lifted for service, rig unit by attaching four cables to the holes located in the unit base rail (two holes at each corner). Refer to the installation instructions for the proper rigging technique.

⚠WARNING

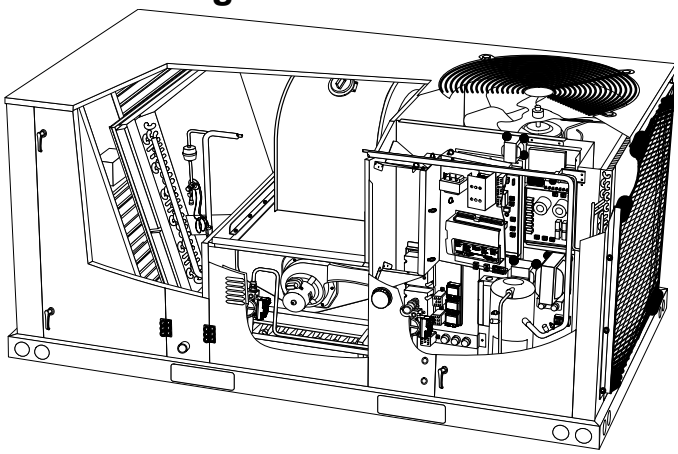
Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional installer (or equivalent), service agency or the gas supplier.

⚠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

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.



ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠CAUTION

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

⚠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.

Table of Contents

OPTIONS / ACCESSORIES

Item	Model Number	Catalog Number	Unit Model No 036	048	060	074
COOLING SYSTEM						
Condensate Drain Trap	PVC - C1TRAP20AD2	**76W26**	OX	OX	OX	OX
	Copper - C1TRAP10AD2	**76W27**	OX	OX	OX	OX
Drain Pan Overflow Switch	E1SNSR71AD1	**68W88**	OX	OX	OX	OX
Service valves		Factory	O	O	O	O
HEATING SYSTEM						
Bottom Gas Piping Kit	T1GPKT01AN1	**19W50**	OX	OX	OX	OX
Combustion Air Intake Extensions	T1EXTN10AN1	**19W51**	X	X	X	X
Gas Heat Input	Standard One-Stage - 65 kBtuh input	Factory	O	O	O	O
	Standard Two-Stage - 53/70 kBtuh input	Factory	[1] O	[1] O	[1] O	[1] O
	Medium One-Stage - 108 kBtuh input	Factory	O	O	O	O
	Medium Two-Stage - 81/108 kBtuh input	Factory	O	O	O	O
	High One-Stage - 150 kBtuh input	Factory		O	O	O
	High Two-Stage - 113/150 kBtuh input	Factory		O	O	O
	High Four-Stage - 28/81/113/150 kBtuh input	Factory		[1] O	[1] O	[1] O
Low Temperature Vestibule Heater	208/230V-1 or 3ph - E1LTVH10A-1Y	**54W23**	OX	OX	OX	OX
	460V-3ph - E1LTVH10A-1G	**54W24**	OX	OX	OX	OX
LPG/Propane Conversion Kits	For One-Stage models - C1PROP10AP2	**11U62**	X	X	X	X
	For Two-Stage Standard models - C1PROP28A11	**21A01**	X	X	X	X
	For Two-Stage Medium and High models - C1PROP20AP2	**11U63**	X	X	X	X
	For Four-Stage High models - C1PROP30A11	**21A02**		X	X	X
Stainless Steel Heat Exchanger (Furnished as Standard when Four-Stage Heat is Ordered)		Factory	O	O	O	O
Vertical Vent Extension	C1EXTN20FF1	**31W62**	X	X	X	X
BLOWER - SUPPLY AIR						
Motors	Direct Drive - 0.50 hp	Factory	O			
	Direct Drive - 0.75 hp	Factory		O		
	Direct Drive - 1 hp	Factory			O	O
CABINET						
Combination Coil/Hail Guards	C1GARD51AT1	**13T03**	X	X	X	X
Corrosion Protection (indoor coil / outdoor coil)		Factory	O	O	O	O
CONTROLS						
Commercial Controls	CPC Einstein Integration	Factory	O	O	O	O
	Prodigy® Control System - BACnet® Module - C0CTRL60AE1L	**59W51**	OX	OX	OX	OX
	Prodigy® Control System - LonTalk® Module - C0CTRL65FF1	**54W27**	OX	OX	OX	OX
	Novar® 2051 - C0CTRL40AA1	**14U39**	OX	OX	OX	OX
	Novar® LSE	Factory	O	O	O	O
	L Connection® Building Automation System	- - -	X	X	X	X
Dirty Filter Switch	E1SNSR55AP1	**53W66**	OX	OX	OX	OX
General Purpose Control Kit	E1GPBK30C1	**13J78**	X	X	X	X
Fresh Air Tempering	C1SNSR75AD1	**58W63**	OX	OX	OX	OX
Smoke Detector - Supply or Return (Power board and one sensor)	C1SNSR44AP1	**53W78**	OX	OX	OX	OX
Smoke Detector - Supply and Return (Power board and two sensors)	C1SNSR43AP1	**53W79**	OX	OX	OX	OX

[1] Standard Two-Stage Heat and High Four-Stage Heat is only available with Low NOx Models.

NOTE - Catalog and model 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	Model Number	Catalog Number	Unit Model No 036	048	060	074
ELECTRICAL						
Voltage 60 hz	208/230V - 3 phase	Factory	O	O	O	O
	460V - 3 phase	Factory	O	O	O	O
HACR Circuit Breakers		Factory	O	O	O	O
Disconnect Switch	80 amp - T2DISC080NH1	**20W24**	OX	OX	OX	OX
GFI Service Outlets	15 amp non-powered, field-wired - LTAGFIK10/15	**74M70**	OX	OX	OX	OX
Weatherproof Cover for GFI	C1GFCI99FF1	**10C89**	X	X	X	X
ECONOMIZER						
Standard Economizer With Outdoor Air Hood (Sensible Control) (Not for Title 24)						
Standard Economizer - Includes Barometric Relief Dampers and Exhaust Hood	E1ECON30A-2-	**90W59**	OX	OX	OX	OX
Standard Economizer - Includes Barometric Relief Dampers and Exhaust Hood and Power Exhaust		Factory	O	O	O	O
Standard Economizer - No Exhaust Option		Factory	O	O	O	O
High Performance Economizer With Outdoor Air Hood (Sensible Control) (Approved for California Title 24 Building Standards)						
High Performance Economizer - Includes Barometric Relief Dampers with Exhaust Hood and Power Exhaust	E1ECON17A-1	**10U54**	OX	OX	OX	OX
High Performance Economizer - No Exhaust Option		Factory	O	O	O	O
Economizer Accessories						
Horizontal Economizer Conversion Kit	T1HECK00AN1	**17W45**	X	X	X	X
Economizer Controls (Not for Title 24)						
Differential Enthalpy	Order 2 - C1SNSR64FF1	**53W64**	OX	OX	OX	OX
Sensible Control	Sensor is Furnished	Factory	O	O	O	O
Single Enthalpy	C1SNSR64FF1	**53W64**	OX	OX	OX	OX
Global Control	Sensor Field Provided	Factory	O	O	O	O
Building Pressure Control	E1GPBK10C1	**13J77**	X	X	X	X
Outdoor Air CFM Control	E1GPBK20C1	**13J76**	X	X	X	X
OUTDOOR AIR						
Outdoor Air Dampers With Outdoor Air Hood						
Motorized	C1DAMP21A-1	**15D17**	OX	OX	OX	OX
Manual	C1DAMP11A-2	**15D18**	OX	OX	OX	OX
POWER EXHAUST FAN						
Standard Static	208/230V-3ph - C1PWRE10A-1P	**79W87**	OX	OX	OX	OX
Note: Factory installed Power Exhaust Fan includes Exhaust Hood. Barometric Relief Dampers without Exhaust Hood are required (order separately).	460V-3ph - C1PWRE10A-1G	**79W88**	OX	OX	OX	OX
Note: Field installed Power Exhaust Fans do not include Exhaust Hood. Barometric Relief Dampers with Exhaust Hood are required (order separately).						
BAROMETRIC RELIEF						
[1] Barometric Relief Dampers with Exhaust Hood	C1DAMP50A-1-	**74W38**	X	X	X	X
[2] Barometric Relief Dampers without Exhaust Hood	C1DAMP50A-2-	**72W89**	X	X	X	X

[1] Required when Economizer is factory installed (no exhaust option) with field installed Power Exhaust Fan option.

[2] Required when Economizer is factory installed with factory installed Power Exhaust Fan option.

NOTE - Catalog and model numbers shown are for ordering field installed accessories.
OX - Configure To Order (Factory Installed) or Field Installed
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OPTIONS / ACCESSORIES

Item	Model Number	Catalog Number	Unit Model No 036	048	060	074
INDOOR AIR QUALITY						
Air Filters						
Healthy Climate® High Efficiency Air Filters	MERV 8 (20 x 20 x 2 in.) - C1FLTR15D-1-	**54W21**	OX	OX	OX	OX
Order 4 per unit	MERV 13 (20 x 20 x 2 in.) - C1FLTR40D-1-	**52W39**	OX	OX	OX	OX
Replaceable Media Filter With Metal Mesh Frame (includes non-pleated filter media)	20 x 20 x 2 in. (Order 4) - K1FLTR30A-2	**44N60**	X	X	X	X
Indoor Air Quality (CO_2) Sensors						
Sensor - Wall-mount, off-white plastic cover with LCD display	C0SNSR50AE1L	**77N39**	X	X	X	X
Sensor - Wall-mount, off-white plastic cover, no display	C0SNSR52AE1L	**87N53**	X	X	X	X
Sensor - Black plastic case with LCD display, rated for plenum mounting	C0SNSR51AE1L	**87N52**	X	X	X	X
Sensor - Wall-mount, black plastic case, no display, rated for plenum mounting	C0MISC19AE1	**87N54**	X	X	X	X
CO_2 Sensor Duct Mounting Kit - for downflow applications	C0MISC19AE1-	**85L43**	X	X	X	X
Aspiration Box - for duct mounting non-plenum rated CO_2 sensors (**87N53** or **77N39**)	C0MISC16AE1-	**90N43**	X	X	X	X
UVC Germicidal Lamps						
[1] Healthy Climate® UVC Light Kit (208/230V-3ph)	C1UVCL10AN1-	**50W90**	OX	OX	OX	OX
ROOF CURBS						
Hybrid Roof Curbs, Downflow						
8 in. height	C1CURB70A-1	**11F50**	X	X	X	X
14 in. height	C1CURB71A-1	**11F51**	X	X	X	X
18 in. height	C1CURB72A-1	**11F52**	X	X	X	X
24 in. height	C1CURB73A-1	**11F53**	X	X	X	X
Adjustable Pitched Curb						
14 in. height	C1CURB55AT1	**43W27**	X	X	X	X
Transition Curb						
Matches Energence® 036-074 Units to existing L Series® Curbs	E1CURB60A-1	**20W06**	X	X	X	X
CEILING DIFFUSERS						
Step-Down - Order one	RTD11-95S	**13K61**	X	X	X	X
Flush - Order one	FD11-95S	**13K56**	X	X	X	X
Transitions (Supply and Return) - Order one	T1TRAN20N-1	**17W54**	X	X	X	X
Sunsource® Commercial Energy System						
Solar Module CE Kit	One 285W Solar Module (silver frame), One PanelClaw Polar Bear III Mounting System and One Enphase M250 Microinverter	**10U67**	X	X	X	X
Solar Power Entry with Disconnect		Factory	O	O	O	O
Enphase Envoy Communications Gateway with Communications Booster (internal)		**13L89**	X	X	X	X
Line Communication Filter (external)	C1C400D11A	**10F93**	X	X	X	X
Transformer (5 kW)	E1TRFM15AD3Y (208Y to 208 VAC Delta)	**11H71**	X	X	X	X
	E1TRFM15AD2Y (230 VAC Delta)	**11H28**	X	X	X	X
	E1TRFM15AD3G (460 VAC Delta or Wye)	**11H29**	X	X	X	X

[1] Lamps operate on 110-230V single-phase power supply. Step-down transformer may be ordered separately for 460V. Alternately, 110V power supply may be used to directly power the UVC ballast(s).

NOTE - Catalog and model 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

General Data		3 Ton	4 Ton	5 Ton	6 Ton
	Model Number	**LGH036U4E**	**LGH048U4E**	**LGH060U4E**	**LGH074U4E**
	Efficiency Type	**Ultra**	**Ultra**	**Ultra**	**Ultra**
	Blower Type	MSAV (Multi-Stage Air Volume) Direct Drive	MSAV (Multi-Stage Air Volume) Direct Drive	MSAV (Multi-Stage Air Volume) Direct Drive	MSAV (Multi-Stage Air Volume) Direct Drive
Cooling Performance	Gross Cooling Capacity - Btuh	35,300	48,500	59,500	72,000
	[1] Net Cooling Capacity - Btuh	34,500	47,000	58,000	70,000
	AHRI Rated Air Flow - cfm	1200	1550	1800	2050
	Total Unit Power - kW	2.3	3.4	4.5	5.8
	SEER (Btuh/Watt) - 208/230V-3ph	[1] 23.5	[1] 21.0	[1] 20.0	- - -
	SEER (Btuh/Watt) - 460V-3ph	[1] 22.5	[1] 20.2	[1] 19.5	- - -
	EER (Btuh/Watt) - 208/230V-3ph	[1] 15.0	[1] 14.0	[1] 13.0	[2] 12.0
	EER (Btuh/Watt) - 460V-3ph	[1] 14.5	[1] 13.7	[1] 12.5	[2] 12.0
	IEER (Btuh/Watt) - 208/230V-3ph-3ph	- - -	- - -	- - -	[2] 22.0
	IEER (Btuh/Watt) - 460V-3ph	- - -	- - -	- - -	[2] 22.0
	Refrigerant Type	R-410A	R-410A	R-410A	R-410A
Refrigerant Charge		17 lbs. 0 oz.	17 lbs. 0 oz.	16 lbs. 11 oz.	16 lbs. 11 oz.
Gas Heating Options Available - See page 6		Standard (1 or 2 stage), Medium (1 or 2 stage)	Standard (1 or 2 stage), Medium (1 or 2 stage), High (1, 2 or 4 Stage)		
Compressor Type (number)		Variable Capacity Scroll (1)	Variable Capacity Scroll (1)	Variable Capacity Scroll (1)	Variable Capacity Scroll (1)
Outdoor Coil	Net face area (total) - sq. ft.	19.3	19.3	19.3	19.3
	Tube diameter - in.	3/8	3/8	3/8	3/8
	Number of rows	2	2	2	2
	Fins per inch	20	20	20	20
Outdoor Coil Fan	Motor - (No.) horsepower	(1) 1/3 (ECM)	(1) 1/3 (ECM)	(1) 1/3 (ECM)	(1) 1/3 (ECM)
	Motor rpm	550 - 850	600 - 900	700 - 950	700 - 1050
	Total Motor Input - watts	50 - 200	80 - 236	120 - 272	120 - 360
	Diameter - (No.) in.	(1) 24	(1) 24	(1) 24	(1) 24
	Number of blades	3	3	3	3
	Total air volume - cfm	2500 - 3850	2750 - 4100	3200 - 4300	3200 - 4700
Indoor Coil	Net face area (total) - sq. ft.	9.72	9.72	9.72	9.72
	Tube diameter - in.	3/8	3/8	3/8	3/8
	Number of rows	3	3	4	4
	Fins per inch	14	14	14	14
	Drain connection (Number) and size - in.	1 in. NPT coupling			
	Expansion device type	Balance port TXV, removable head			
[2] **Indoor Blower**	Nominal motor HP	0.50 (ECM)	0.75 (ECM)	1 (ECM)	1 (ECM)
	Blower wheel nominal diameter x width - in.	(1) 10 x 10	(1) 10 x 10	(1) 11 x 10	(1) 11 x 10
Filters	Type of filter	Disposable			
	Number and size - in.	(4) 20 x 20 x 2	(4) 20 x 20 x 2	(4) 20 x 20 x 2	(4) 20 x 20 x 2
Electrical characteristics		208/230V or 460V - 3 phase			

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

[1, 2] AHRI Certified to AHRI Standard [1] 210/240 or [2] 340/360: 95°F outdoor air temperature and 80°F db/67°F wb entering evaporator air; minimum external duct static pressure.

[2] 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.

SPECIFICATIONS - GAS HEAT

Model No.		036 048 060 074	036 048 060 074	036 048 060 074	036 048 060 074	048 060 074	048 060 074	048 060 074
Heat Input Type		**Standard (1 Stage)**	**[1] Standard (2 Stage) Low NOx Only**	**Medium (1 Stage)**	**Medium (2 Stage)**	**High (1 Stage)**	**High (2 Stage)**	**[1, 2] High (4 Stage) Low NOx Only**
Input Btuh	1st Stage	65,000	53,000	108,000	81,000	150,000	113,000	28,000
	2nd Stage	- - -	70,000	- - -	108,000	- - -	150,000	81,000
	3rd Stage	- - -	- - -	- - -	- - -	- - -	- - -	113,000
	4th Stage	- - -	- - -	- - -	- - -	- - -	- - -	150,000
Output Btuh Standard Models	1st Stage	52,000	- - -	86,000	65,000	120,000	90,000	- - -
	2nd Stage	- - -	- - -	- - -	86,000	- - -	120,000	- - -
	3rd Stage	- - -	- - -	- - -	- - -	- - -	- - -	- - -
	4th Stage	- - -	- - -	- - -	- - -	- - -	- - -	- - -
Output Btuh Low NOx Models	1st Stage	- - -	43,000	87,000	66,000	121,000	92,000	22,000
	2nd Stage	- - -	57,000	- - -	87,000	- - -	121,000	66,000
	3rd Stage	- - -	- - -	- - -	- - -	- - -	- - -	92,000
	4th Stage	- - -	- - -	- - -	- - -	- - -	- - -	121,000
Temp. Rise Range- °F	1st stage	15-45	5-35	30-70	25-55	45-75	30-60	5-35
	2nd Stage	- - -	15-45	- - -	30-70	- - -	45-75	35-65
	3rd Stage	- - -	- - -	- - -	- - -	- - -	- - -	35-65
	4th Stage	- - -	- - -	- - -	- - -	- - -	- - -	45-75
[3] Thermal Efficiency - Standard		80%	- - -	80%	80%	80%	80%	- - -
[3] Thermal Efficiency -Low NOx Gas Heat		81%	81%	81%	81%	81%	81%	81%
Gas Supply Connections		1/2 in. NPT						
Rec. Gas Supply Pressure - Nat./ LPG		7 in.w.g. / 11 in.w.g.						

[1] Two-Stage Standard Heat and Four-Stage High Heat is only available with Low NOx Models.

[2] Stainless Steel Heat Exchanger is furnished as Standard when Four-Stage Heat is Ordered.

[3] 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. At altitudes above 4500 ft. unit must be derated 2% for each 1000 ft. above sea level.
NOTE - This is the only permissible derate for these units.

Heat Input Type	Altitude Feet	Gas Manifold Pressure in. w.g.		Input Rate (Btuh)
		Natural Gas	LPG/ Propane	
Standard (1 stage)	2001 - 4500	3.0	9.0	60,000
Standard (2 stage)	2001 - 4500	3.0/1.7	9.0/5.1	65,000 / 49,000
Medium (1 stage)	2001 - 4500	3.0	9.0	100,000
Medium (2 stage)	2001 - 4500	3.0/1.7	9.0/5.1	100,000 / 75,000
High (1 stage)	2001 - 4500	3.0	9.0	139,000
High (2 stage)	2001 - 4500	3.0/1.7	9.0/5.1	139,000 / 104,000
High (4 stage)	2001 - 4500	3.0/1.7	9.0/5.1	139,000 / 104,000 / 75,000 / 26,000

BLOWER DATA - DIRECT DRIVE - 3 TON

036 DIRECT DRIVE BLOWER - BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (heat section, economizer, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 10 or blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

External Static Press. in. w.g.	Percentage of Total Motor Torque																													
	10%			20%			30%			40%			50%			60%			70%			80%			90%			100%		
	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM
0.1	459	29	380	698	47	414	903	76	475	1069	110	539	1224	153	598	1374	195	632	1500	248	677	1617	312	723	1729	375	763	1821	447	803
0.2	357	32	464	596	55	520	828	86	563	1023	120	597	1180	165	634	1331	210	685	1461	264	727	1590	325	757	1704	387	796	1796	460	835
0.3	255	36	554	521	61	596	772	94	607	977	130	654	1137	177	706	1302	220	720	1435	274	776	1550	344	808	1666	406	843	1772	473	866
0.4	166	39	637	445	67	669	716	102	694	916	143	728	1108	185	740	1258	235	772	1397	289	808	1523	356	841	1641	417	874	1735	492	911
0.5	---	---	---	369	72	739	661	111	759	869	153	782	1050	200	807	1214	249	822	1358	304	855	1483	372	889	1603	434	919	1710	504	940
0.6	---	---	---	---	---	---	---	---	---	823	162	834	1006	212	856	1171	262	872	1319	318	900	1456	383	920	1565	450	962	1674	521	983
0.7	---	---	---	---	---	---	---	---	---	762	175	901	963	223	903	1127	275	920	1280	331	944	1416	398	966	1540	460	991	1637	536	1024
0.8	---	---	---	---	---	---	---	---	---	716	184	950	905	237	964	1083	287	968	1241	344	986	1376	412	1011	1502	474	1032	1612	546	1050
0.9	---	---	---	---	---	---	---	---	---	670	193	997	862	247	1007	1040	299	1014	1202	356	1027	1336	425	1054	1464	488	1072	1576	560	1088
1.0	---	---	---	---	---	---	---	---	---	623	202	1043	818	257	1049	981	314	1074	1151	371	1079	1296	437	1095	1426	501	1110	1539	573	1125
1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	938	325	1118	1112	382	1117	1256	447	1135	1388	513	1147	1490	589	1171
1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1215	457	1174	1344	526	1188	1453	600	1204

HORIZONTAL

External Static Press. in. w.g.	Percentage of Total Motor Torque																													
	10%			20%			30%			40%			50%			60%			70%			80%			90%			100%		
	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM
0.1	432	29	395	674	49	443	882	79	511	1053	115	567	1211	156	617	1334	205	676	1463	260	725	1583	322	769	1692	391	813	1791	466	852
0.2	334	32	479	581	56	537	822	87	582	1021	122	609	1178	165	659	1308	215	712	1439	270	758	1560	333	801	1670	402	843	1771	477	877
0.3	217	36	578	517	61	603	763	96	651	953	137	696	1128	179	720	1265	230	768	1400	286	809	1522	350	850	1634	420	888	1737	494	920
0.4	149	39	636	436	68	684	703	105	719	918	145	738	1079	193	781	1237	239	805	1374	297	842	1498	361	881	1611	431	917	1714	505	947
0.5	---	---	---	372	73	749	644	114	786	867	155	799	1046	201	820	1194	254	858	1335	312	891	1460	377	927	1576	447	960	1680	521	987
0.6	---	---	---	---	---	---	---	---	---	816	166	858	997	214	879	1152	267	909	1296	326	938	1435	387	957	1552	457	987	1645	536	1026
0.7	---	---	---	---	---	---	---	---	---	765	176	915	948	227	936	1109	280	959	1257	339	983	1398	401	1000	1517	471	1026	1611	550	1063
0.8	---	---	---	---	---	---	---	---	---	714	185	970	915	235	974	1081	288	991	1231	348	1013	1360	415	1041	1482	484	1064	1588	558	1087
0.9	---	---	---	---	---	---	---	---	---	663	194	1022	866	247	1030	1024	304	1052	1179	364	1070	1322	427	1081	1434	500	1112	1542	575	1133
1.0	---	---	---	---	---	---	---	---	---	611	203	1073	816	259	1085	981	315	1096	1140	376	1112	1285	438	1118	1399	511	1146	1508	586	1165
1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	939	325	1138	1101	387	1152	1235	452	1166	1364	521	1178	1474	596	1197
1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1198	461	1200	1323	532	1214	1439	606	1227

BLOWER DATA - DIRECT DRIVE - 4 TON

048 DIRECT DRIVE BLOWER - BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (heat section, economizer, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 10 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

External Static Press. in. w.g.	Percentage of Total Motor Torque																													
	10%			20%			30%			40%			50%			60%			70%			80%			90%			100%		
	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM
0.1	682	46	420	894	79	499	1148	131	579	1366	192	651	1551	268	726	1725	348	781	1885	445	840	2031	550	893	2165	669	950	2290	790	993
0.2	583	52	510	836	87	562	1105	142	635	1329	204	697	1530	279	756	1695	368	827	1856	466	883	2006	567	925	2149	683	972	2271	813	1023
0.3	484	59	601	778	96	629	1062	152	688	1292	217	744	1500	294	800	1675	380	856	1837	479	910	1981	585	958	2125	704	1005	2252	834	1051
0.4	410	64	666	720	105	697	1019	162	739	1255	231	792	1469	309	841	1645	397	898	1808	498	950	1956	603	992	2100	723	1036	2233	851	1076
0.5	---	---	---	662	114	764	961	176	805	1218	244	840	1428	327	895	1615	414	937	1780	515	987	1931	622	1025	2076	741	1066	2205	874	1111
0.6	---	---	---	---	---	---	---	---	---	1182	257	887	1398	341	934	1585	429	974	1751	532	1022	1906	641	1058	2052	758	1095	2186	886	1131
0.7	---	---	---	---	---	---	---	---	---	1145	270	933	1367	354	972	1555	443	1009	1722	548	1056	1874	663	1098	2028	774	1122	2148	903	1167
0.8	---	---	---	---	---	---	---	---	---	1096	287	992	1326	372	1021	1515	462	1056	1693	564	1090	1850	679	1129	1996	792	1157	2111	913	1196
0.9	---	---	---	---	---	---	---	---	---	1047	302	1047	1296	385	1058	1485	476	1090	1664	579	1123	1824	693	1157	1963	807	1188	2073	916	1219
1.0	---	---	---	---	---	---	---	---	---	1010	312	1085	1255	403	1107	1455	491	1125	1635	594	1155	1787	710	1195	1931	818	1216	2036	912	1236
1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1425	505	1160	1606	609	1188	1762	717	1216	1883	828	1250	1960	890	1260
1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1687	715	1254	1834	827	1275	1848	834	1274

HORIZONTAL

External Static Press. in. w.g.	Percentage of Total Motor Torque																													
	10%			20%			30%			40%			50%			60%			70%			80%			90%			100%		
	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM
0.1	641	46	443	875	82	522	1127	137	614	1334	202	691	1524	280	762	1694	367	827	1866	470	881	1997	581	955	2119	699	1010	2241	830	1058
0.2	568	50	505	831	90	582	1097	144	650	1310	211	723	1504	290	793	1671	379	859	1829	484	921	1977	600	986	2106	715	1032	2227	846	1080
0.3	483	56	584	778	98	647	1050	155	706	1269	225	777	1470	308	844	1642	396	900	1799	498	957	1953	621	1022	2079	743	1072	2199	873	1118
0.4	398	62	661	724	106	707	1004	167	764	1228	240	831	1436	325	891	1612	413	941	1777	511	985	1930	640	1055	2062	758	1096	2181	888	1140
0.5	---	---	---	671	113	763	957	179	822	1201	250	867	1413	335	921	1588	427	973	1748	530	1025	1906	657	1087	2036	777	1129	2153	904	1170
0.6	---	---	---	---	---	---	---	---	---	1161	265	919	1378	350	964	1552	447	1019	1718	549	1064	1874	676	1124	2000	796	1166	2115	917	1202
0.7	---	---	---	---	---	---	---	---	---	1120	279	970	1344	365	1006	1529	459	1049	1696	564	1093	1850	688	1150	1974	805	1189	2078	922	1228
0.8	---	---	---	---	---	---	---	---	---	1093	288	1003	1310	379	1047	1493	477	1091	1667	583	1131	1818	700	1180	1930	812	1220	2040	919	1246
0.9	---	---	---	---	---	---	---	---	---	1052	302	1051	1275	393	1087	1469	488	1118	1644	595	1158	1779	711	1213	1896	812	1239	1984	903	1265
1.0	---	---	---	---	---	---	---	---	---	1012	314	1096	1241	407	1128	1434	502	1155	1615	610	1191	1747	715	1235	1843	802	1259	1910	865	1276
1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1386	516	1201	1571	625	1232	1684	713	1266	1738	760	1277	1760	775	1282
1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1620	697	1282	1633	707	1283	1667	736	1296

BLOWER DATA - DIRECT DRIVE - 5 AND 6 TON

060/074 DIRECT DRIVE BLOWER - BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:
1 - Any factory installed options air resistance (heat section, economizer, etc.).
2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 10 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW

External Static Press. in. w.g.	Percentage of Total Motor Torque																													
	10%			20%			30%			40%			50%			60%			70%			80%			90%			100%		
	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM
0.1	743	58	428	992	100	492	1284	161	556	1526	231	607	1726	327	678	1890	427	737	2072	557	800	2220	686	848	2362	842	901	2478	996	938
0.2	661	65	497	928	110	556	1231	175	610	1479	251	662	1685	348	726	1872	440	761	2052	574	827	2198	705	876	2344	860	925	2468	1016	969
0.3	579	71	563	881	118	602	1179	188	663	1431	270	716	1658	362	757	1835	466	807	2024	597	863	2176	724	903	2322	881	952	2448	1035	993
0.4	518	76	611	818	128	662	1126	202	716	1400	283	751	1618	383	802	1811	483	837	1995	619	898	2153	743	930	2301	900	978	2428	1053	1016
0.5	---	---	---	754	138	719	1074	216	768	1352	301	801	1578	403	847	1775	507	881	1972	636	925	2120	769	968	2280	919	1002	2403	1074	1043
0.6	---	---	---	---	---	---	---	---	---	1305	319	850	1551	416	875	1738	529	922	1938	659	963	2098	785	992	2248	945	1037	2383	1090	1064
0.7	---	---	---	---	---	---	---	---	---	1273	330	882	1511	434	917	1714	544	948	1903	681	1000	2064	808	1026	2227	961	1059	2353	1113	1094
0.8	---	---	---	---	---	---	---	---	---	1226	347	928	1470	453	957	1678	564	986	1869	701	1033	2031	830	1058	2195	983	1090	2323	1133	1121
0.9	---	---	---	---	---	---	---	---	---	1178	363	972	1430	470	997	1641	583	1022	1835	720	1065	1998	849	1088	2163	1004	1119	2293	1151	1147
1.0	---	---	---	---	---	---	---	---	---	1147	374	1000	1390	487	1034	1605	601	1057	1800	737	1094	1953	873	1125	2131	1022	1146	2263	1167	1170
1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1556	623	1099	1755	756	1129	1920	888	1151	2089	1043	1177	2203	1193	1211
1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1875	906	1181	2036	1063	1211	2169	1213	1227

HORIZONTAL

External Static Press. in. w.g.	Percentage of Total Motor Torque																													
	10%			20%			30%			40%			50%			60%			70%			80%			90%			100%		
	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM	Cfm	Watts	RPM
0.1	695	49	431	1051	88	470	1280	157	562	1430	314	665	1615	420	753	1798	526	807	1957	656	873	2100	793	925	2228	947	979	2351	1107	1022
0.2	610	55	495	973	96	543	1233	166	607	1382	332	715	1589	433	782	1762	547	847	1927	677	905	2079	808	947	2207	965	1002	2332	1126	1043
0.3	525	61	560	914	104	612	1186	177	657	1347	345	752	1563	446	811	1738	561	873	1907	690	927	2047	830	979	2186	982	1024	2308	1148	1069
0.4	461	66	611	856	115	695	1138	190	714	1312	358	788	1525	464	853	1702	581	911	1877	709	958	2026	844	999	2165	998	1046	2289	1164	1088
0.5	---	---	---	822	122	749	1095	202	772	1277	370	823	1486	482	893	1678	593	936	1847	726	987	1995	864	1030	2144	1013	1067	2264	1182	1111
0.6	---	---	---	---	---	---	---	---	---	1242	382	857	1460	494	919	1642	612	972	1827	738	1007	1974	877	1050	2112	1035	1096	2239	1197	1133
0.7	---	---	---	---	---	---	---	---	---	1194	398	901	1421	510	957	1618	624	995	1787	760	1044	1943	896	1079	2091	1048	1115	2208	1213	1158
0.8	---	---	---	---	---	---	---	---	---	1148	413	943	1382	527	993	1582	641	1029	1757	775	1071	1912	914	1107	2059	1065	1142	2184	1223	1176
0.9	---	---	---	---	---	---	---	---	---	1112	424	974	1343	542	1028	1546	657	1061	1727	789	1096	1880	932	1135	2028	1081	1167	2147	1233	1200
1.0	---	---	---	---	---	---	---	---	---	1069	438	1011	1305	557	1062	1510	673	1092	1687	807	1129	1849	948	1162	1996	1095	1191	2110	1238	1221
1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1474	688	1122	1652	822	1156	1818	964	1188	1964	1107	1212	2060	1235	1243
1.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1781	982	1217	1912	1123	1245	2010	1221	1258

BLOWER DATA

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

Air Volume cfm	Wet Indoor Coil		Gas Heating		Economizer	Filters	
	036, 048	060, 074	Medium Heat	High Heat		MERV 8	MERV 13
800	0.01	- - -	0.02	0.02	0.04	0.04	0.05
1000	0.02	0.02	0.02	0.02	0.04	0.04	0.07
1200	0.03	0.04	0.02	0.02	0.04	0.04	0.07
1400	0.04	0.05	0.02	0.03	0.04	0.04	0.07
1600	0.05	0.07	0.03	0.04	0.04	0.04	0.07
1800	0.06	0.08	0.04	0.05	0.05	0.04	0.07
2000	0.08	0.10	0.04	0.06	0.05	0.05	0.08
2200	- - -	0.11	0.04	0.07	0.05	0.05	0.08
2400	- - -	0.13	0.05	0.08	0.05	0.05	0.08

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure in. w.g.	Air Volume Exhausted cfm
0.00	2000
0.05	1990
0.10	1924
0.15	1810
0.20	1664
0.25	1507
0.30	1350
0.35	1210

CEILING DIFFUSERS AIR RESISTANCE (in. w.g.)

Air Volume - cfm	RTD11-95S Step-Down Diffuser			FD11-95S Flush Diffuser
	2 Ends Open	1 Side & 2 Ends Open	All Ends & Sides Open	
1800	0.13	0.11	0.09	0.09
2000	0.15	0.13	0.11	0.10
2200	0.18	0.15	0.12	0.12
2400	0.21	0.18	0.15	0.14
2600	0.24	0.21	0.18	0.17
2800	0.27	0.24	0.21	0.20
3000	0.32	0.29	0.25	0.25

CEILING DIFFUSER AIR THROW DATA

Air Volume - cfm	[1] Effective Throw - ft.	
	RTD11-95S	FD11-95S
2600	24 - 29	19 - 24
2800	25 - 30	20 - 28
3000	27 - 33	21 - 29

[1] Effective throw based on terminal velocities of 75 ft. per minute.

ELECTRICAL DATA — 3 TON

3 TON ULTRA EFFICIENCY (R-410A) — **LGH036U4E**

[1] Voltage - 60hz		208/230V - 3 Ph	460V - 3 Ph
Compressor	Rated Load Amps	9.1	5.1
Outdoor Fan Motor	Full Load Amps	4.1	2.1
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4	1.3
Service Outlet 115V GFI (amps)		15	15
Indoor Blower Motor	Horsepower	0.5	0.5
	Full Load Amps	4.3	2.2
[2] Maximum Overcurrent Protection	Unit Only	25	15
	With (1) 0.33 HP Power Exhaust	30	15
[3] Minimum Circuit Ampacity	Unit Only	20	11
	With (1) 0.33 HP Power Exhaust	23	12

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[1] 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 — 4 TON

4 TON ULTRA EFFICIENCY (R-410A) — **LGH048U4E**

[1] Voltage - 60hz		208/230V - 3 Ph	460V - 3 Ph
Compressor	Rated Load Amps	13.8	6.5
Outdoor Fan Motor	Full Load Amps	4.1	2.1
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4	1.3
Service Outlet 115V GFI (amps)		15	15
Indoor Blower Motor	Horsepower	0.75	0.75
	Full Load Amps	6.1	3.1
[2] Maximum Overcurrent Protection	Unit Only	40	15
	With (1) 0.33 HP Power Exhaust	40	20
[3] Minimum Circuit Ampacity	Unit Only	28	14
	With (1) 0.33 HP Power Exhaust	30	15

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[1] 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 — 5 TON

5 TON ULTRA EFFICIENCY (R-410A) — **LGH060U4E**

[1] Voltage - 60hz		208/230V - 3 Ph	460V - 3 Ph
Compressor	Rated Load Amps	14.6	7
Outdoor Fan Motor	Full Load Amps	4.1	2.1
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4	1.3
Service Outlet 115V GFI (amps)		15	15
Indoor Blower Motor	Horsepower	1	1
	Full Load Amps	7.4	3.7
[2] Maximum Overcurrent Protection	Unit Only	40	20
	With (1) 0.33 HP Power Exhaust	45	20
[3] Minimum Circuit Ampacity	Unit Only	30	15
	With (1) 0.33 HP Power Exhaust	33	16

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[1] 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 — 6 TON

6 TON ULTRA EFFICIENCY (R-410A) — **LGH074U4E**

[1] Voltage - 60hz		208/230V - 3 Ph	460V - 3 Ph
Compressor	Rated Load Amps	16.9	8.3
Outdoor Fan Motor	Full Load Amps	4.1	2.1
Power Exhaust (1) 0.33 HP	Full Load Amps	2.4	1.3
Service Outlet 115V GFI (amps)		15	16
Indoor Blower Motor	Horsepower	1	1
	Full Load Amps	7.4	3.7
[2] Maximum Overcurrent Protection	Unit Only	45	20
	With (1) 0.33 HP Power Exhaust	50	25
[3] Minimum Circuit Ampacity	Unit Only	33	17
	With (1) 0.33 HP Power Exhaust	36	18

NOTE - All units have a minimum Short Circuit Current Rating (SCCR) of 5000 amps.

[1] 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.

LGH PARTS ARRANGEMENT

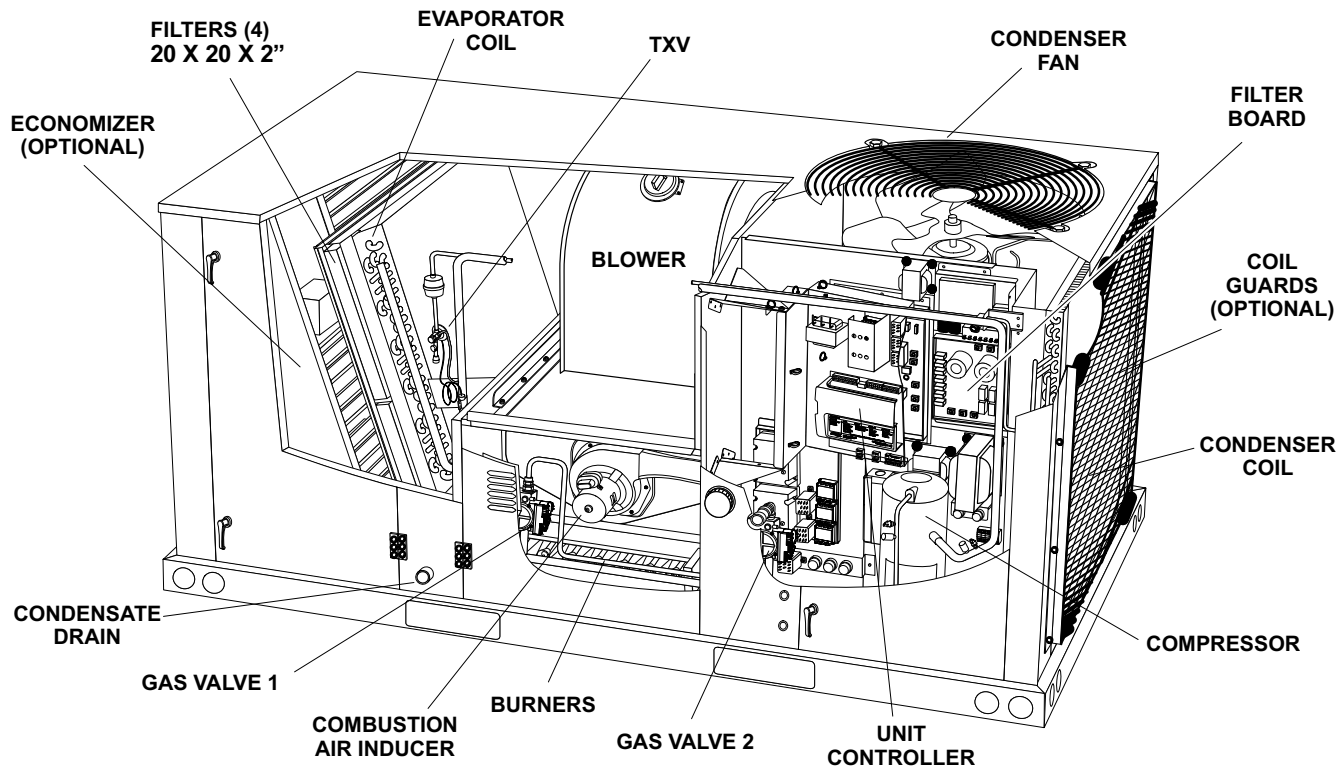
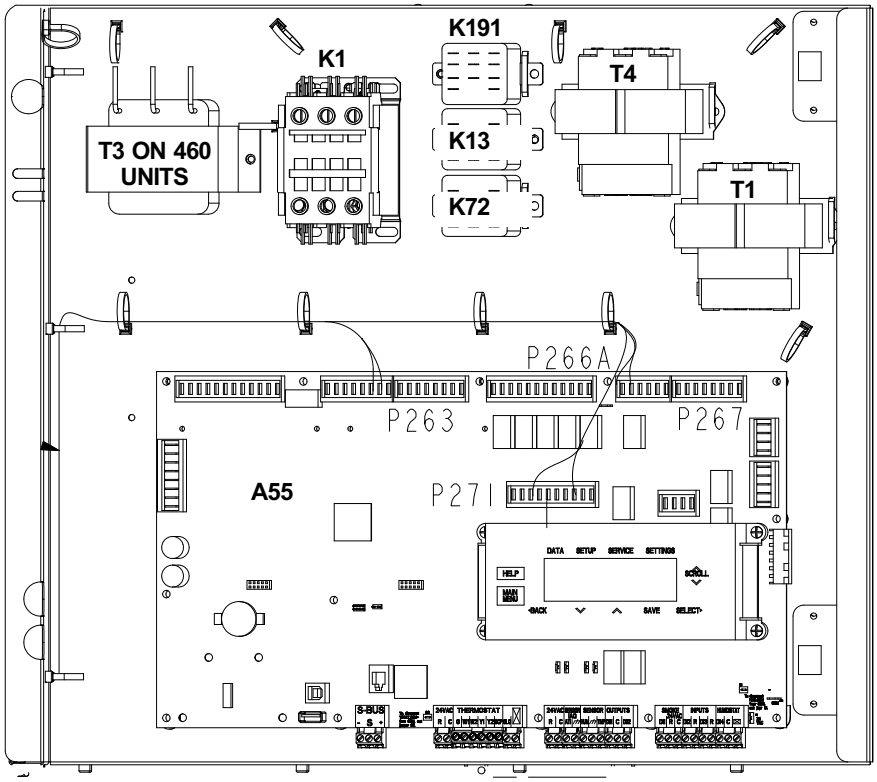


FIGURE 1

LGH HINGED CONTROL PANEL



INVERTER CONTROLS ARE LOCATED BEHIND THE HINGED PANEL. SEE FIGURE 8

FIGURE 2

I-UNIT COMPONENTS

All 3 through 6 ton (7 through 21 kW) units are configure to order units (CTO). The LGH unit components are shown in figure 1. All units come standard with hinged unit panels. All L1, L2, and L3 wiring is color coded; L1 is red, L2 is yellow, and L3 is blue.

A-Control Box Components

LGH control box components are shown in figure 2. The control box is located in the upper right portion of the compressor compartment.

1-Control Transformer T1

All use a single line voltage to 24VAC transformer mounted on the hinged control panel. 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 208/230 (Y) voltage transformers use two primary voltage taps as shown in figure 3, while the 460 (G) voltage transformer use a single primary voltage tap.

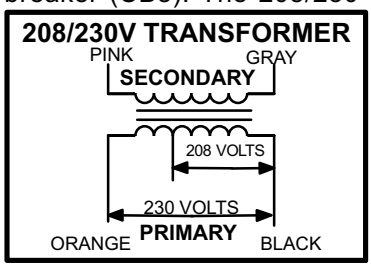


FIGURE 3

2-C.A.I. Transformers T3 (G voltage)

All (G) 460 voltage units use transformer T3 mounted on the hinged control panel. The transformers have an output rating of 0.75A. T3 transformer supplies 230 VAC power to the combustion air inducer motor (B6).

3-Transformer T4 (G voltage)

All units use transformer T4 mounted in the back panel in the compressor section. T4 is a line voltage to 230V transformer to power the indoor blower and outdoor fan motor. It is connected to line voltage and is powered at all times.

4-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.

The Unit Controller uses input from a zone/room sensor cooling, a thermostat, or a third-party controller to operate the unit. When a zone/room sensor (most efficient) is used, the compressor, blower, and condenser fan motor speed is variable. The motor speed depends on how far room/zone temperature is from setpoint. When a thermostat or third-party controller are used, the compressor, blower, and condenser fan motor speed is 2-stage. Zone/room sensor, thermostat, and third-party controller wires are connected to J297 on the Unit Controller.

Many default Unit Controller settings are adjustable. Refer to the unit installation instruction or the Unit Controller manual provided with the unit.

The Unit Controller is configured to identify optional kits and accessories for proper function. Each character in the configuration ID represents a different option. Refer to the unit installation instruction or the Unit Controller manual provided with the unit.

5-Compressor Contactor K1

The Unit Controller closes n.o. K1 contacts to provide power to the inverter control board (A192). The contactor does not energize the compressor in the same manner as a traditional cooling system. Three phase units use three pole double break contactors with a 24 volt coil.

6-Crankcase Heater Relay K191

All units use relay K191 to control crnkcase heater HR1.

7-Combustion Air Inducer Relay K13

Relay K13 is normally open and controls combution air inducer B6. K13 supplies power to B6.

B-Cooling Components

All units use a single cooling circuit consisting of a variable speed compressor, fin/tube condenser coil and evaporator coil. See figure 4. All units use one draw-through type condenser fan and a single direct drive blower. The blower draws air across the evaporator during unit operation.

Cooling may be supplemented by a factory- or field-installed economizer. The evaporator coil is slab type and uses a thermostatic expansion valve as the primary refrigerant metering device. The evaporator is also equipped with enhanced fins and rifled tubing. The compressor is protected by a freezestat (S49) on the evaporator coil, a high pressure switch (S4) on the discharge line, a high temperature limit switch (S5) on the compressor, and a low pressure switch (S87) on the suction line. See figure 4. A low ambient switch (S11) and a supply air temperature sensor (RT6) are standard.

1-Freezestat S49

Each unit is equipped with a low temperature switch (freezestat) located on a return bend of each evaporator coil.

The freezestat is wired to the A55 Unit Controller. The freezestat is a SPST N.C. auto-reset switch which opens at 29°F ± 3°F (-1.7°C ± 1.7°C) on a temperature drop and closes at 58°F ± 4°F (14.4°C ± 2.2°C) on a temperature rise. To prevent coil icing, freezestats open during compressor operation to temporarily disable the compressor until the coil temperature rises.

If the freezestat is tripping frequently due to coil icing, check the airflow / filters , economizer position and unit charge before allowing unit back in operation. Make sure to eliminate conditions which might promote evaporator ice buildup.

2-High Pressure Switch S4

The high pressure switch is an auto-reset SPST N.C. switch which opens on a pressure rise.

S4 is located in the compressor discharge line and wired to the A55 Unit Controller.

When discharge pressure rises to 640 ± 10 psig (4412 ± 69 kPa) (indicating a problem in the system) the switch opens and the compressor inverter is de-energized (the economizer can continue to operate). The switch automatically resets at 475 ± 10 psig.

3-Low Pressure Switch S87

The compressor circuit is protected by a loss of charge switch located on the suction line. Switch opens at 40 psig ± 5 psig (276 ± 34 kPa) and automatically resets at 90 psig ± 5 psig (621 kPa ± kPa).

4-High Temperature Limit Switch S5

Each variable speed compressor is equipped with a compressor-mounted normally closed temperature switch that prevents compressor damage due to overheating caused by internal friction. The switch is located on top of the compressor casing. This switch senses the compressor casing temperature and opens at 239-257°F to shut-off compressor operation. The auto-reset switch closes when the compressor casing temperature falls to 151-187°F, and the compressor is re-energized. This switch is a single-pole, single-throw (SPST) bi-metallic switch and is wired to the A55 Unit Controller.

5-Low Ambient Switch S11

The low ambient switch is an auto-reset SPST N.O. pressure switch and is located in the liquid line prior to the indoor coil section. The switch is wired to the A55 Unit Controller which uses the S11 input to control the outdoor fan when outdoor temperatures drop below 62°F. S11 opens when the liquid pressure drops below 240 ± 10 psig (1655 ± 69 kPa). S11 closes when the liquid pressure rises to 450 ± 10 psig (3102 ± 69 kPa) psig.

The low ambient switch is used to cycle outdoor fan operation between low speed and off during low ambient temperatures. The reduced heat transfer across the outdoor coil results in higher refrigerant temperatures and prevents indoor coil icing.

The following is a summary of low ambient operation assuming there is a cooling demand:

Outdoor Temperature Initiated Low Ambient Operation* –

When outdoor air temperature drops below 62°F, the Unit Controller will operate the outdoor fan at low speed.

*Assuming S11 low ambient pressure switch it closed.

Low Ambient Operation Cycles Between Outdoor Fan Off & Low Speed* -

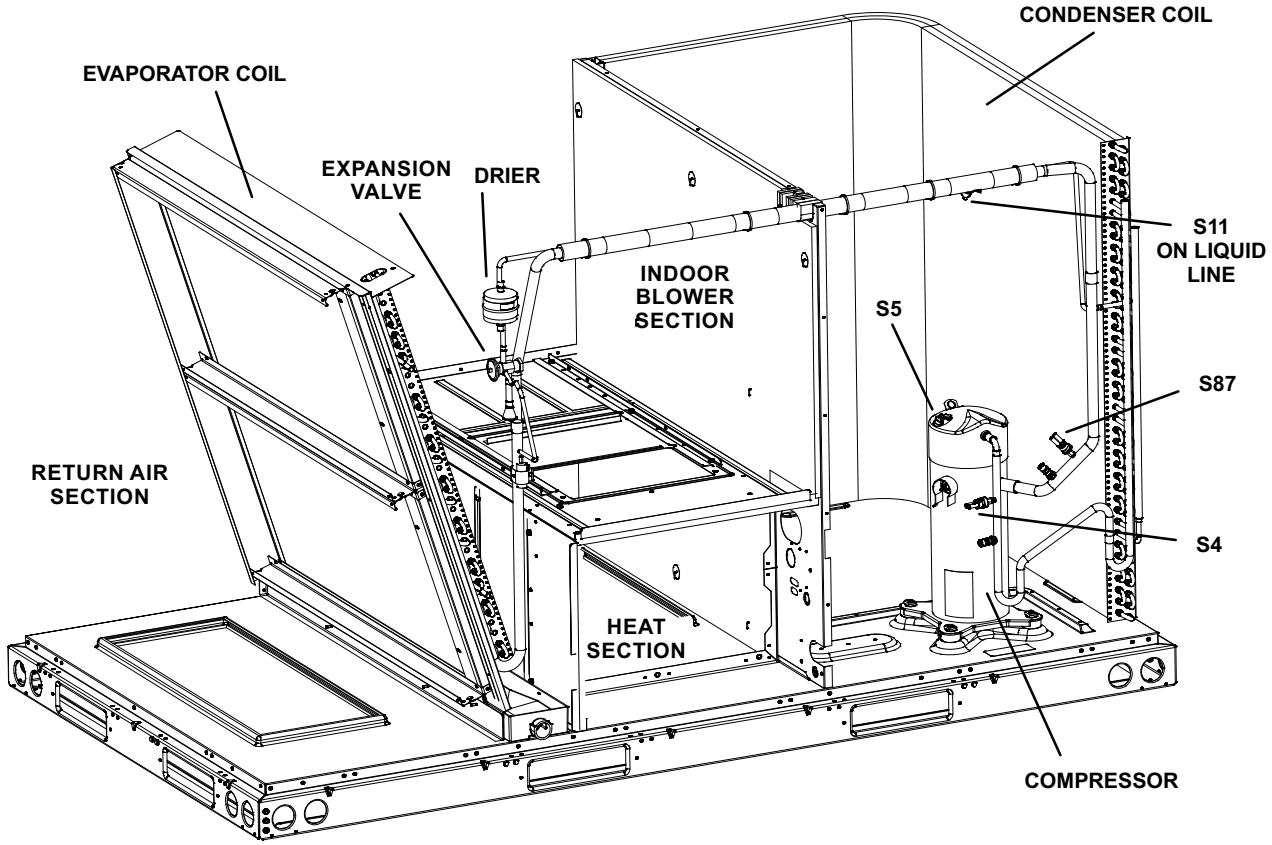
If S11 low ambient switch opens, indicating liquid pressure has dropped below 240psig, the Unit Controller will de-energize the outdoor fan but continue mechanical cooling. If S11 closes, indicating liquid pressure has risen to 450psig, the Unit Controller will operate the outdoor fan at low speed.

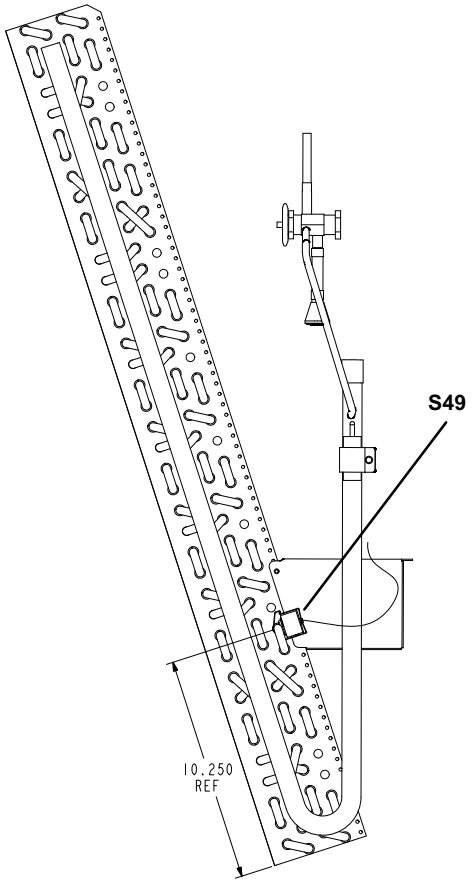
*Assuming outdoor temperature remains below 65°F.

Low Ambient Operation Termination -

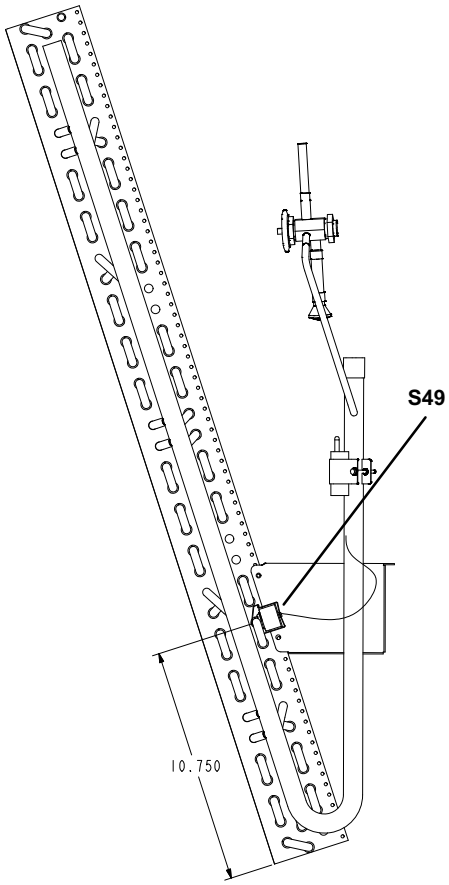
If outdoor air temperature rises above 65°F (62°F + 3°F deadband), the Unit Controller will operate the outdoor fan at the customary variable speed until the outdoor temperature drops below 62°F.

PLUMBING AND COMPRESSOR PROTECTION COMPONENTS





060, 074U



036, 048U

FIGURE 4

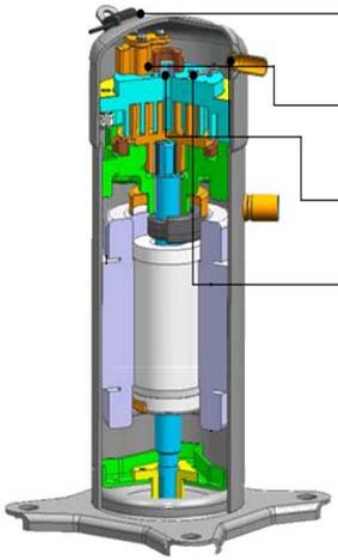
⚠WARNING

Electrical shock hazard. Compressor must be grounded. Do not operate without protective cover over 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.

6-Variable Speed Compressor B1

All units use one variable speed scroll compressor. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications. Refer to figure 5 for compressor safety devices and figure 6 for compressor diagnostics.

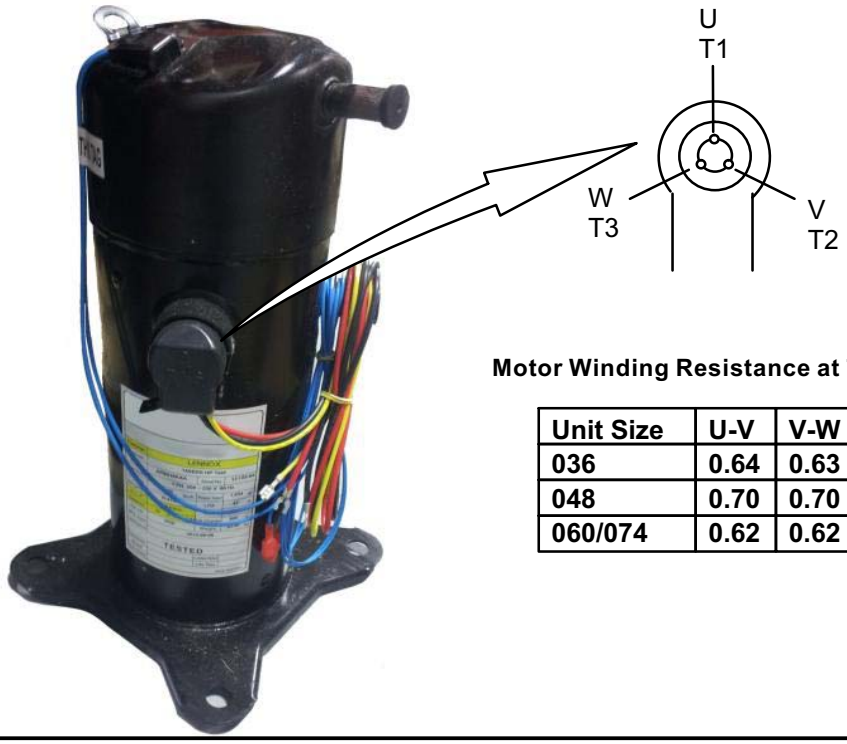
COMPRESSOR SAFETY DEVICES



Thermal Protector	Temperature protection: Opens 248±9°F; Closes 168.8 ±18°F
Vacuum Protector	Low suction pressure protection: Opens below 20 psig
Check Valve	Prevents reverse rotation after stop and increased Cd value
By-pass Valve	By-passes liquids during compression.

FIGURE 5

COMPRESSOR DIAGNOSTICS



Motor Winding Resistance at 77°F (+/-7%)

Unit Size	U-V	V-W	W-U
036	0.64	0.63	0.63
048	0.70	0.70	0.70
060/074	0.62	0.62	0.62

FIGURE 6

7-Compressor Inverter A192

⚠WARNING

Electrical Hazard

High Voltage

Wait 7 Minutes

Electrical components may hold charge. Do not remove this panel or service this area for 7 minutes after the power has been removed.

See figure 8 for compressor inverter controls located behind the hinged control panel.

The inverter varies the compressor speed (capacity) by converting an AC input signal to a pulse width modulation (PWM) output. To initiate cooling operation, the Unit Controller (A55) supplies a control signal to the inverter (A192) via a MODBUS protocol. Inverter status and diagnostics are continuously monitored and reported to the Unit Controller such as:

-Improper Unit Controller input voltage compared to unit model number

-High input voltage

-Low input voltage

-Imbalanced input voltage

-A communication issue - check MODBUS communication wire for good connections between the Unit Controller and the inverter board.

An example of the Unit Controller displaying alarm 187 is shown in figure 7. See table 1 for inverter-related alarms.

Inverter component wire routing is shown in figure 9.

⚠WARNING

Electrical shock hazard. Variable speed compressor components must be grounded. Failure to follow these precautions could cause electrical shock resulting in injury or death.

UNIT CONTROLLER ALARM DISPLAY

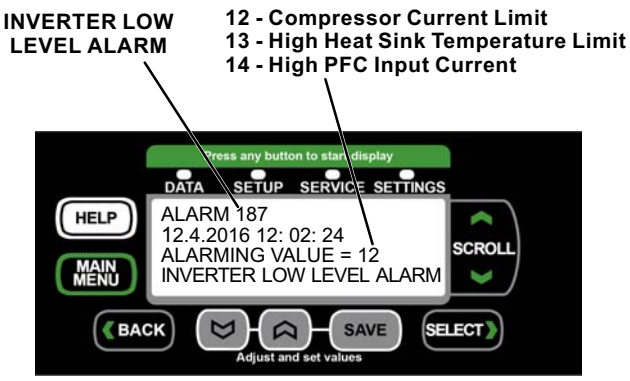


FIGURE 7

INVERTER CONTROLS BEHIND THE HINGED CONTROL PANEL

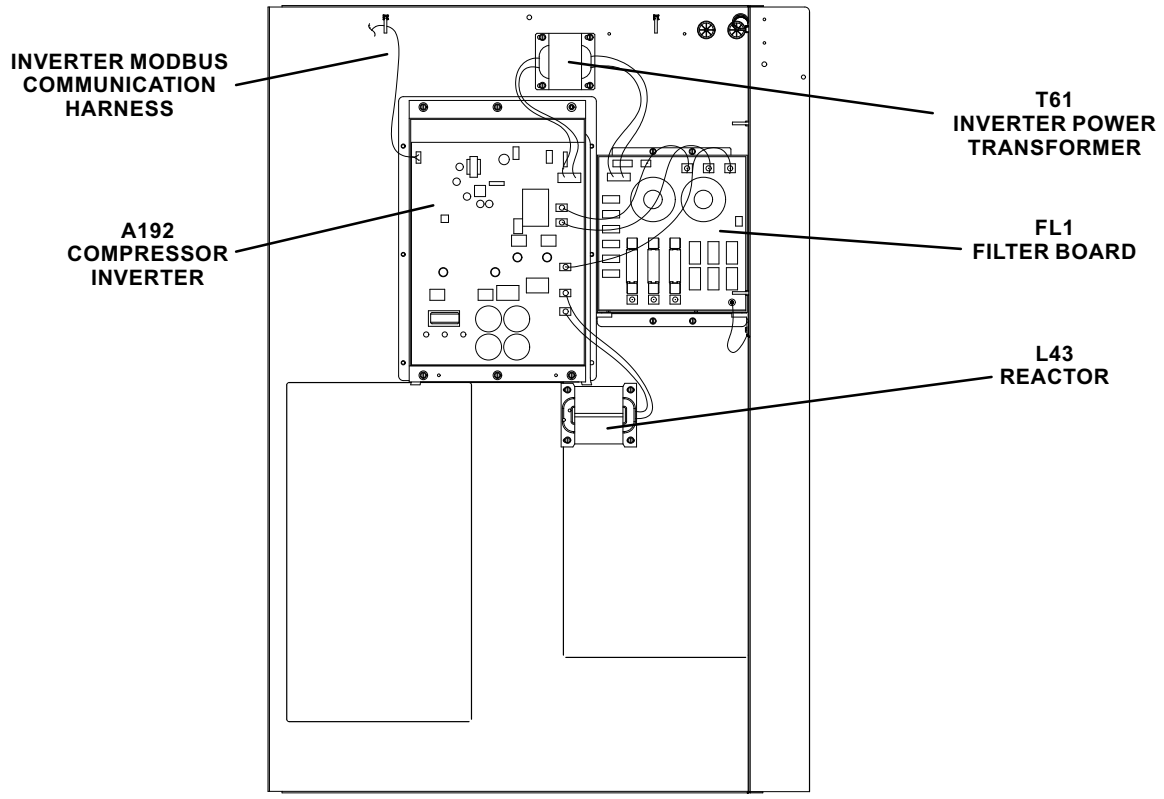


FIGURE 8

TABLE 1

INVERTER-RELATED ALARMS		
ALARM CODE	**DISPLAY MESSAGE**	**EVENT ACTION**
187	INVERTER LOW LEVEL ALARM	Possible alarming values for Prodigy Alarm 187 are: 12 - High compressor input current 13 - High heat sink temperature 14 - High PFC input current Alarm might be caused by outdoor fan abnormal operation, high ambient conditions, dirty outdoor coil, refrigerant overcharge, or a blocked heat sink. The compressor speed will slow down until the temperature or current lowers, then the compressor will speed up again. If the alarm continues after outdoor conditions have moderated, check the fan, charge and coil. Alarm 187 will automatically clear when minimum off time expires. **REFER TO TROUBLE SHOOTING GUIDE IN SERVICE MANUAL FOR MORE INFORMATION.**
188	INVERTER HIGH LEVEL ALARM	Possible alarming values for Prodigy Alarm 188 are: 21 - Peak DC current - Intelligent Power Module (IPM) fault condition (follow 12) 22 - Maximum current reached lockout 23 - DC link low voltage 26 - Locked rotor 28 - DC link high voltage 29 - Compressor over-current 61 - Low outdoor ambient inverter lockout 62 - High heat sink temperature lockout 75 - Low input voltage No action required. Compressor stops for the duration of the minimum run time (anti-short-cycle delay of 180 seconds). Unit shuts down after ten occurrences in one hour and Alarm 189 is initiated. Alarm 188 will automatically clear when inverter error clears. **REFER TO TROUBLE SHOOTING GUIDE IN SERVICE MANUAL FOR MORE INFORMATION.**
189	INVERTER FATAL ALARM	Possible alarming values for Prodigy Alarm 189 are the same as alarm 188. Alarm 189 will clear upon manual reset. **REFER TO TROUBLE SHOOTING GUIDE IN SERVICE MANUAL FOR MORE INFORMATION.**
190	INVERTER COMMUNICATION ERROR	Unable to communicate with inverter. Unit Controller will disable compressor operation. Replace communication cable between inverter and M3 unit controller. If alarm continues, replace M3 unit controller or inverter.
191	INVERTER VOLTAGE MISMATCH	Unit Controller will disable compressor operation. Replace with correct inverter part.

8-Filter Board FL1

The filter, also called a line or noise filter, is used to prevent static interference from outside sources. In addition, the filter prevents electrical interference from transferring to other appliances. The input voltage should read the same value as the output voltage. The same filter is used on all unit sizes and voltages.

9-Inverter Transformer T61

This transformer is used to supply power to the inverter's low voltage logic circuit. It also provides electrical isolation to protect sensitive components from electrical surges.

10-Reactor L43

The reactor (inductor or choke) is used to improve the power factor. This passive, two-terminal electrical component has a magnetic field that stores energy. Reactors are one of the basic components used in electronics where current and voltage change with time (due to the ability of inductors to delay and reshape alternating currents). This component is connected to the compressor inverter A192. A 2mH reactor is used on 208/230V units and a 13mH reactor is used on 460V units.

11-Inverter Heat Sink

An inverter heat sink is located on the back side of the wall between the compressor and outdoor fan sections. The outdoor fan draws air across the heat sink to cool inverter control board components. See figure 10.

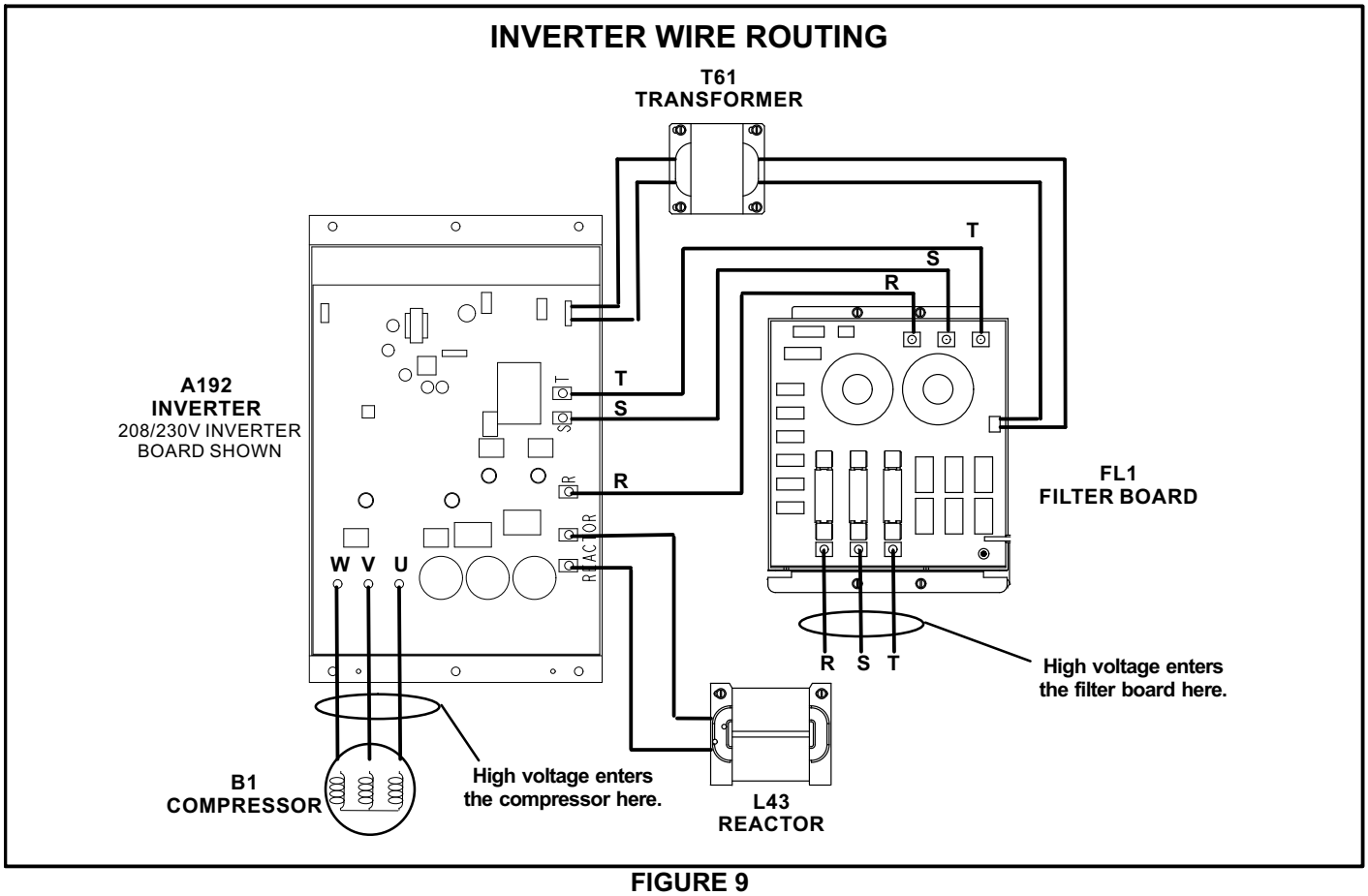


FIGURE 9

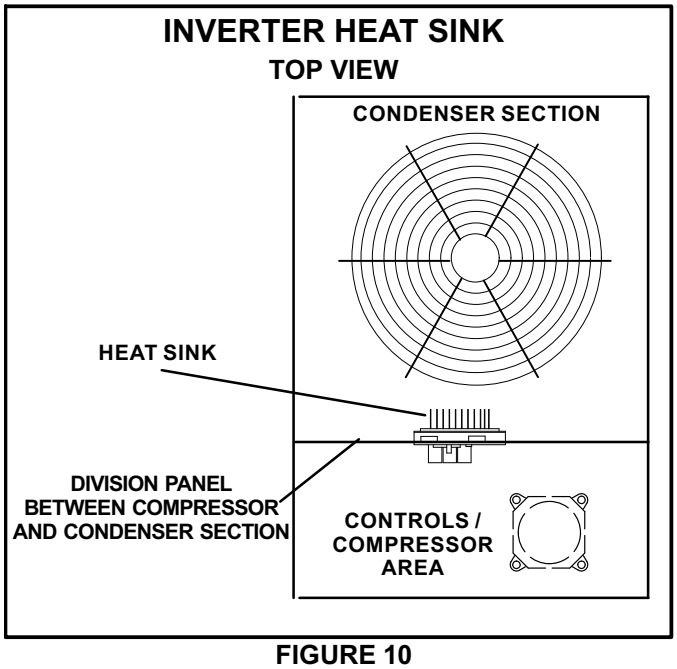


FIGURE 10

C-GAS HEAT COMPONENTS

LGH048U, 060U, and 074U are available with four-stages of gas heat. All units are available with one- or two-stage gas heat.

1-Ignition Control A3 & A12

See figure 11 for ignition control location. Also refer to figure 12.

The ignition control provides three main functions: gas valve control, ignition, and flame sensing. The control has a red LED to show control status (table 2).

TABLE 2

LED Flashes	Indicates
Steady Off	No power or control hardware fault.
Steady On	Power applied. Control OK.
3 Flashes	Ignition lockout from too many trials.
4 Flashes	Ignition lockout from too many flame losses within single call for heat.
5 Flashes	Control hardware fault detected.

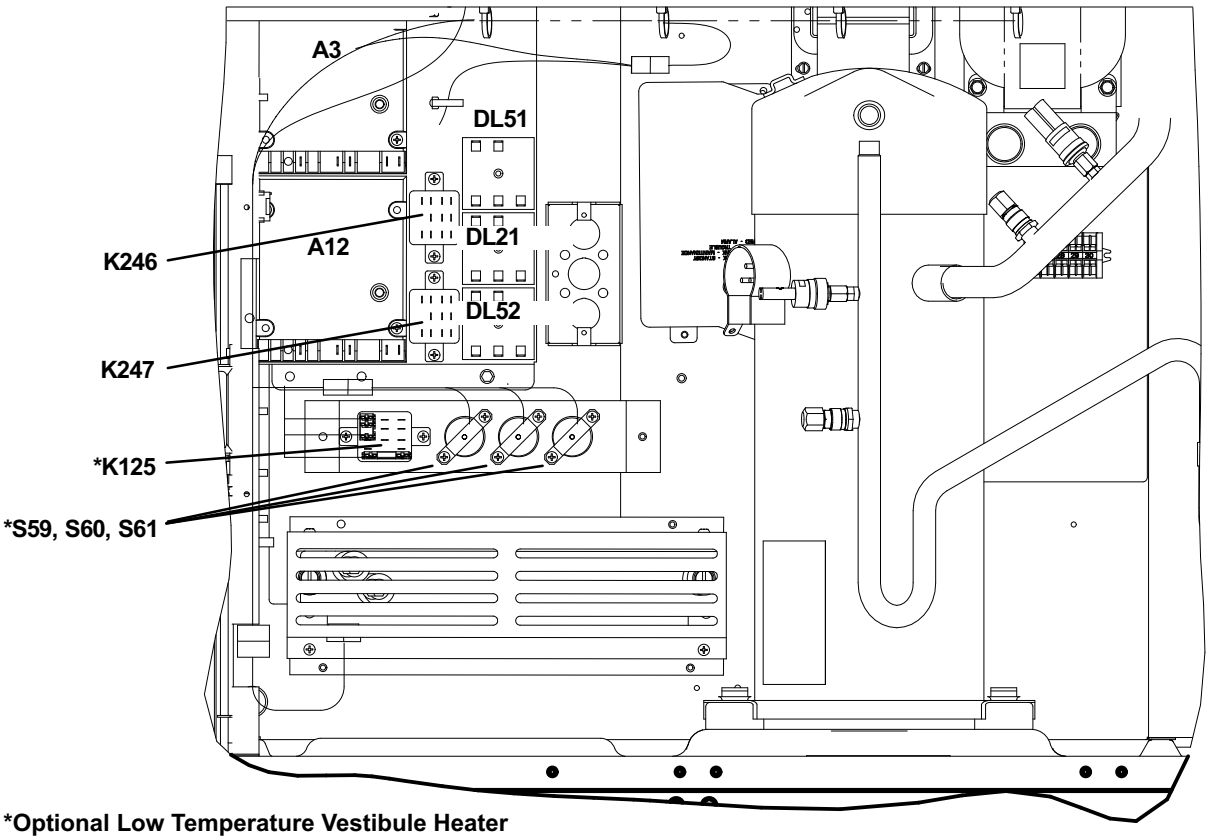
Flame rectification sensing is used on all LGH units. Loss of flame during a heating cycle is indicated by an absence of flame signal (0 microamps). If this happens, the control will immediately restart the ignition sequence and then lock out if ignition is not gained after the third trial. See System 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.

⚠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.

FOUR-STAGE HEATING COMPONENTS ON THE COMPRESSOR BACK WALL



***Optional Low Temperature Vestibule Heater**

FIGURE 11

Operation

On a heating demand, the ignition control checks for a closed limit switch. Once this check is complete and conditions are correct, the ignition control then allows 30 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 closes 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 gas valve(s), the spark electrode and the flame sensing electrode. At the start of the ignition sequence, the adjustable 40 second (default) indoor blower delay period begins. Sparking stops immediately after flame is sensed or at the end of the 8 second trial for ignition. If flame is not sensed, A3 or A12 will wait 5 minutes before attempting ignition again. If the third trial fails, A3 or A12 will lock-out for one hour. The A55 counts this as a **first** strike. After the first lock-out hour elapses, A3 or A12 will attempt ignition three more times. If flame is still not sensed, A3 or A12 will lock-out for the second hour. A55 counts this as the **second** strike. After the second lockout hour, A3 or A12 will attempt ignition three more times. If ignition fails, A55 considers this the **third** strike and will lock-out unit operation. Service relay contacts close and alarm 59 or 69 is displayed. The unit will remain in lock-out until:

1-A55 is reset
or
2-The alarm condition is cleared **AND** the alarm status is read through the SBUS command.

Once the flame is sensed, the ignition control then proceeds to “steady state” mode where all inputs are monitored to ensure the limit switch, roll-out switch and prove switch are closed as well as flame is present. When the heat call is satisfied the gas valve and combustion air inducer are de-energized. An adjustable 120-second (default) blower off delay begins.

2-Primary High Temperature Limits S10, S99

S10 and S99 are SPST N.C. high temperature primary limits for gas heat. S99 is used on 4-stage units only. Limits are located on the vestibule panel. See figure 13 or 14.

Limits are wired to the A55 Unit Controller. N.C. contacts open to de-energize the ignition control when excessive temperature is reached in the blower compartment.

UTEC IGNITION CONTROL A3/A12

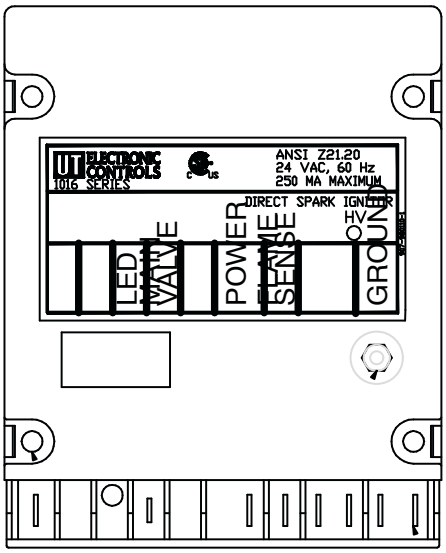


FIGURE 12

3-Heat Exchanger Figure 13 or 14

The LGH units use aluminized steel inshot burners with tubular aluminized (stainless is optional) steel heat exchangers and redundant gas valve. 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 inducer, 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 blower forces air across the tubes to extract the heat of combustion. The shape of the tubes ensures maximum heat exchange.

The gas valves on two stage units accomplish staging by allowing more or less gas to the burners as called for by heating demand.

The gas valves on four-stage units operate as follows:
Stage 1 - GV1 Two Left Burners - Low Heat
Stage 2 - GV3 Five Right Burners - Low Heat
Stage 3 - GV1 & GV3 - All Burners - Low Heat
Stage 4 - GV1 & GV3 - All Burners - High Heat

Note - See table 7 or the sequence of operation in the back of this manual for complete heating operation.

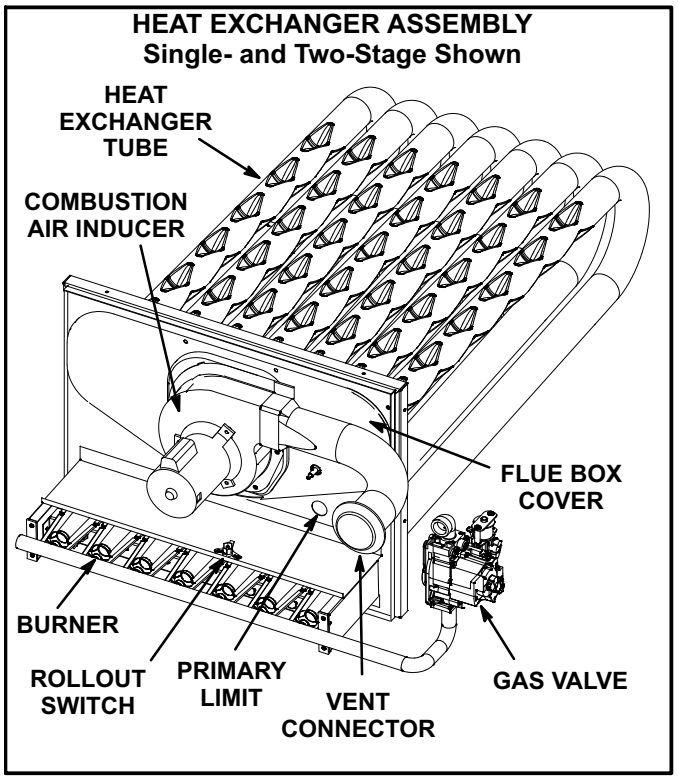


FIGURE 13

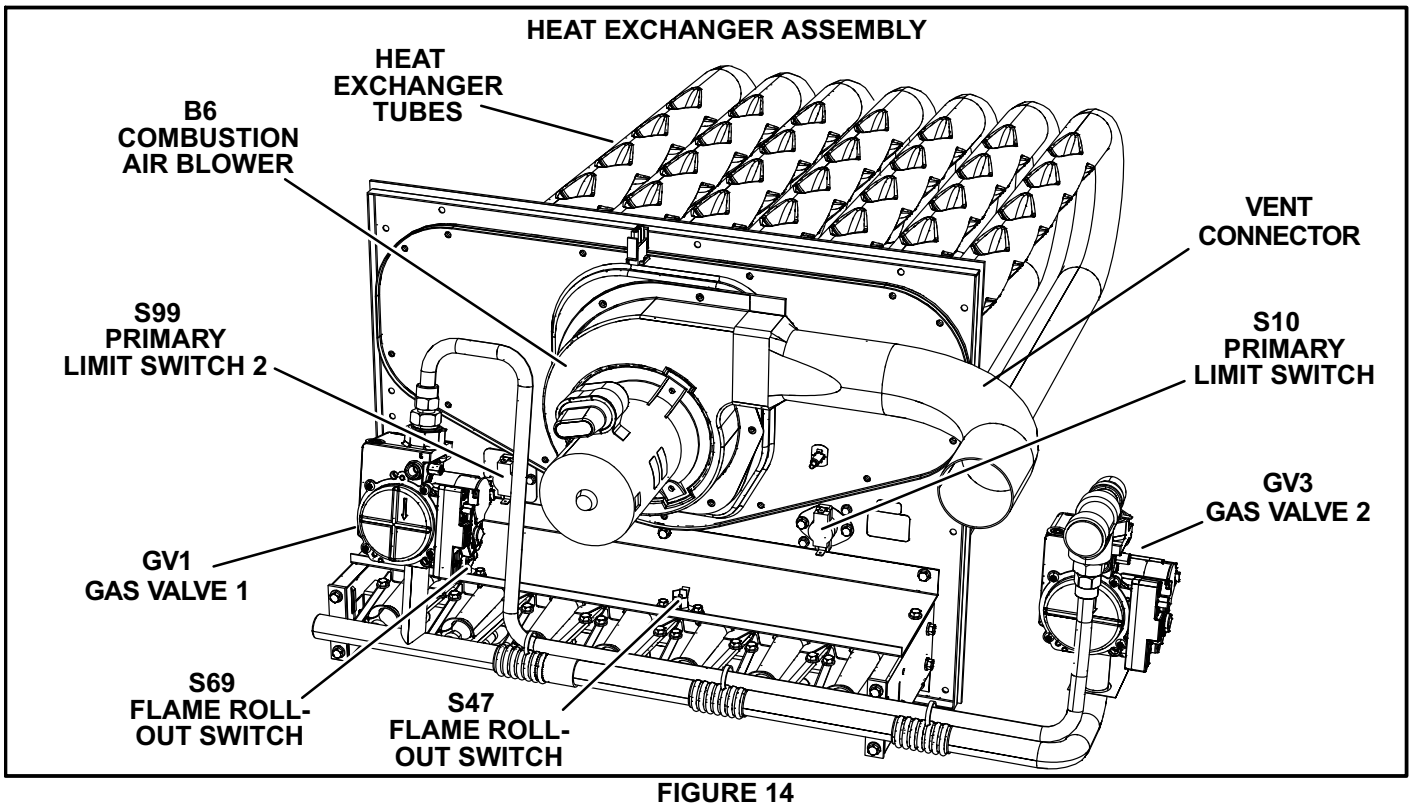


FIGURE 14

4-Burner Box Assembly Figure 15 and 16

The burner assembly consists of a spark electrode, flame sensing electrode and gas valve. Ignition board A3 and A12 control all functions of the assembly.

Burners

All units use 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 individually for service on older units. On newer units, burners are connected and the entire assembly can be removed. Burner maintenance and service is detailed in the SERVICE CHECKS section of this manual. See figure 17 or 18 for number of burners.

Orifice

Each burner uses an orifice which is matched to the burner input. The orifice is threaded into the burner manifold. The burner is supported by the orifice and will easily slide off for service once the mounting screws are removed from the burners.

NOTE - Do not use thread sealing compound on the orifices. Using thread sealing compound may plug the orifices.

NOTE - On four-stage units, the five right orifices (GV3) are larger than the two left orifices (GV1). Orifices are not interchangeable.

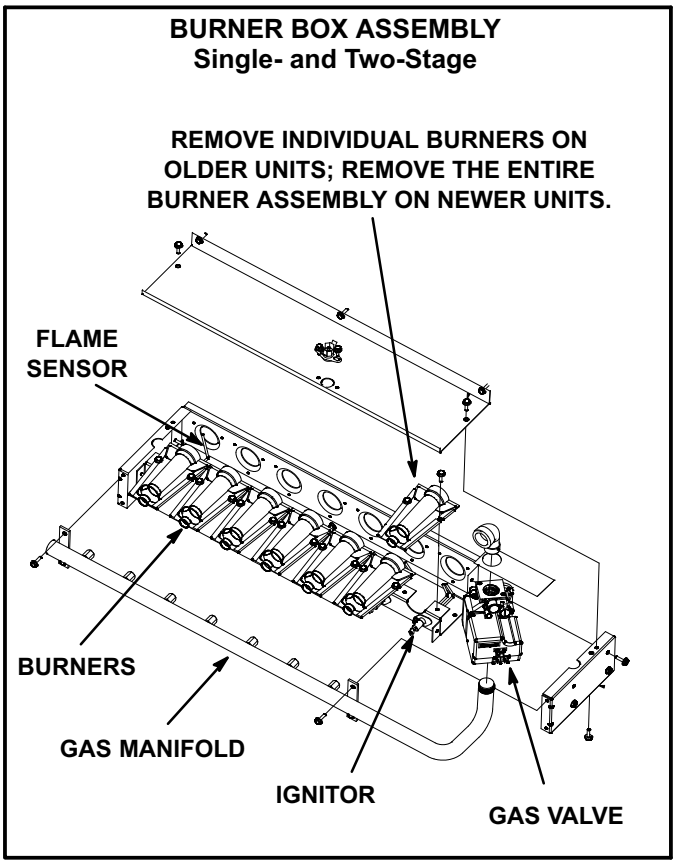


FIGURE 15

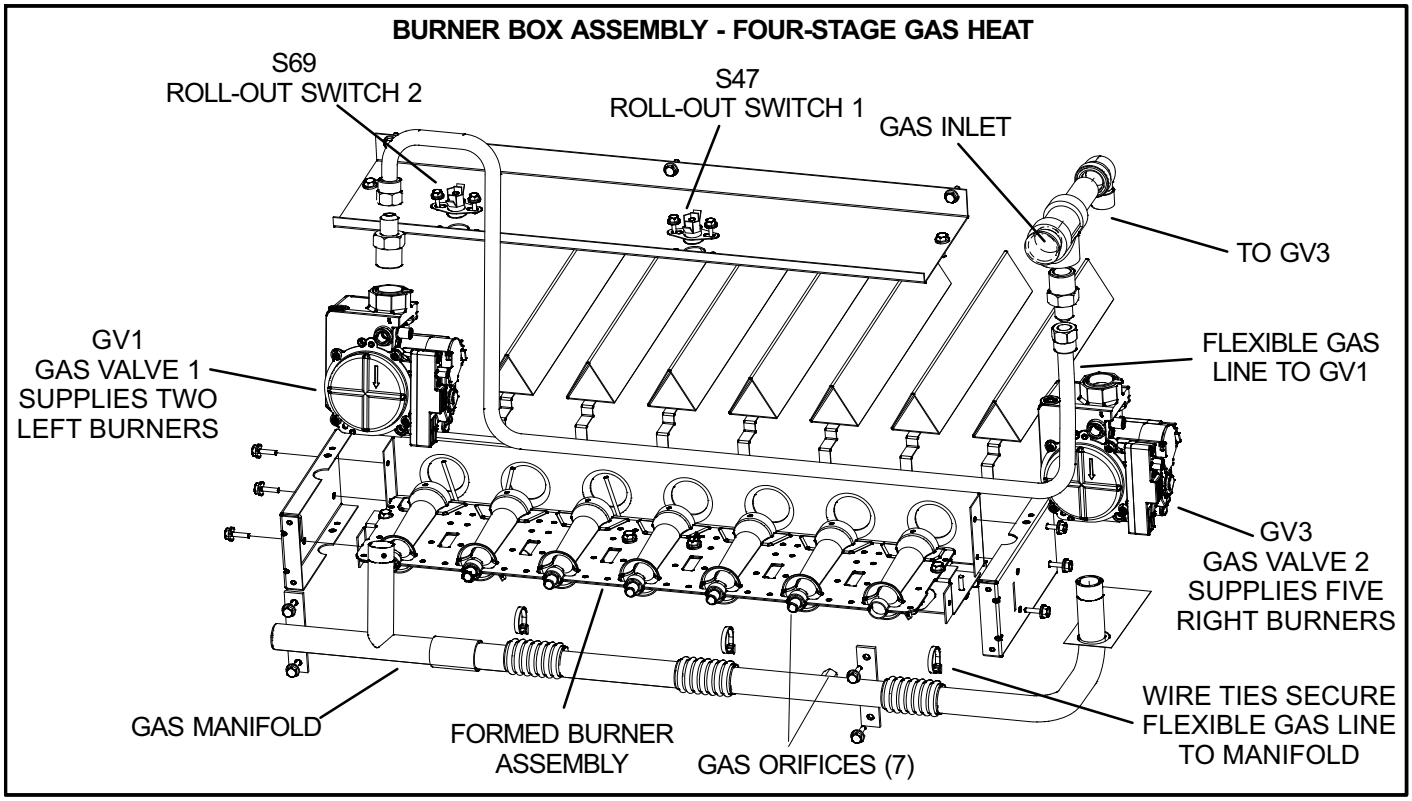


FIGURE 16

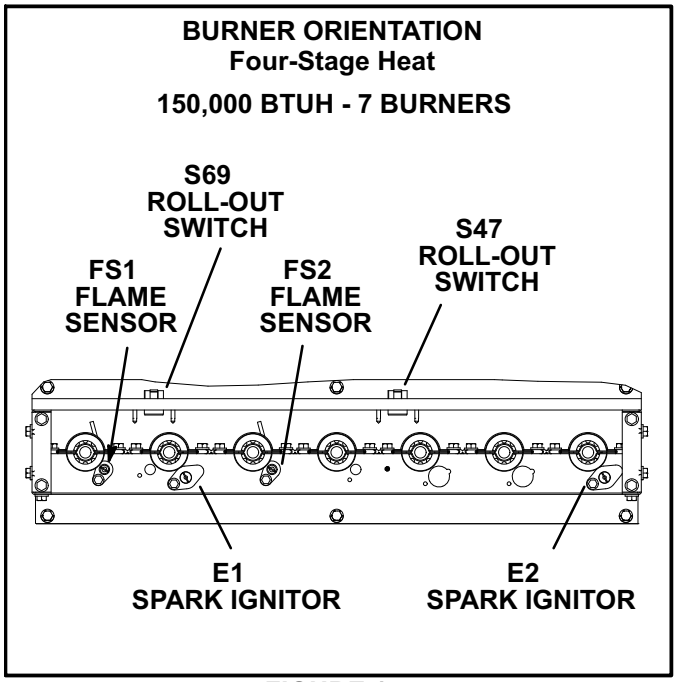


FIGURE 17

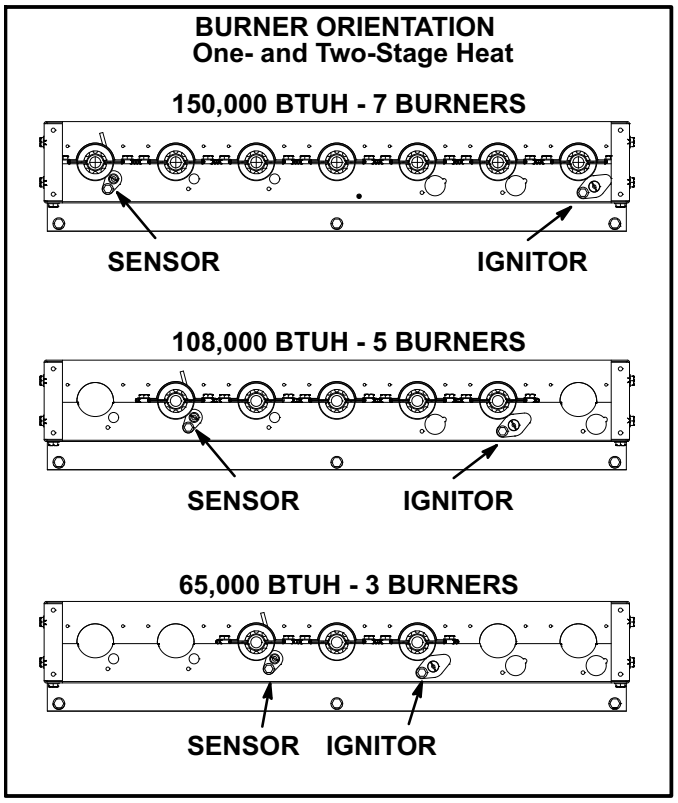


FIGURE 18

5-Flame Roll-out Limit Switch S47, S69

S69 is used on four-stage gas heat units only. Flame roll-out limit switches are SPST N.C. high temperature limits located just above the burner air intake opening in the burner enclosures (see figure 15 or 16). switches are wired to the A55 Unit Controller. When the limit switch(s) senses flame roll-out (indicating a blockage in the combustion air passages), the flame roll-out limit trips, and the Unit Controller immediately closes the gas valve.

Limit is factory preset to open at 340°F ± 16°F on a temperature rise on all units. All flame roll-out limits are manual reset.

6-Combustion Air Prove Switch S18

Prove switch S18 is a SPST N.O. switch located to the right of the induced draft assembly. See figure 19. S18 monitors combustion air inducer operation. Switch S18 is wired to A55 Unit Controller via J271-8 and -9. A55 reads the status of S18 and provides power to A3/A12 if B6 is functioning normally. The switch closes at *negative* 0.10"W.C. ± 0.05" (24.8 Pa ± 12.4 Pa) on 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.

7-Combustion Air Motor Capacitor C3

The combustion air inducer motors in all LGH units require run capacitors. Capacitor C3 is connected to combustion air inducer B6. Ratings will be on side of capacitor or combustion air motor nameplate.

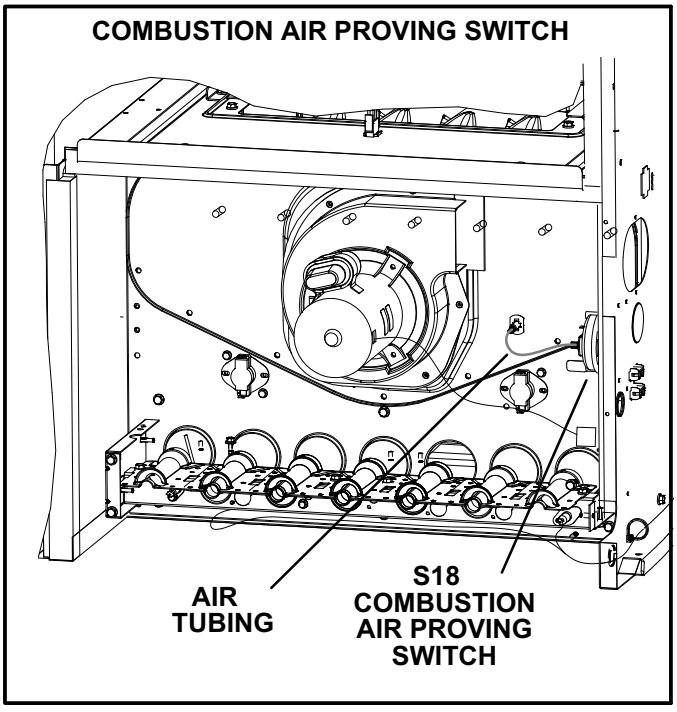


FIGURE 19

8-Combustion Air Inducer B6

Combustion air inducers provide air to the corresponding burners while clearing the combustion chamber of exhaust gases. The inducer begins operating immediately upon receiving a thermostat demand and is de-energized when thermostat demand is satisfied.

The inducer uses a 208/230V single-phase PSC motor and a 5.24 in. x .96in. blower wheel. All motors operate at 3300RPM and are equipped with auto-reset overload protection. Two-speed units have reduced RPM for low speed. Inducers are supplied by various manufacturers. Ratings may vary by manufacturer. Specific inducer electrical ratings can be found on the unit rating plate.

The A55 Unit Controller energizes K13 relay to route power to the combustion air blower motor. A3 then allows 30 to 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 closes, proving that the combustion air inducer is operating before allowing the ignition sequence to continue. When the combustion air prove switch is closed and the delay is over, the A55 Unit Controller through the ignition control activates the appropriate stage operator of the gas valve, the spark and the flame sensing electrode. Sparking stops immediately after flame is sensed or at the end of the eight second trial for ignition.

On two-stage natural gas units, the inducer will operate on low speed for first stage heat (W1) and ramp up to high speed for second stage heat (W2).

On four-stage natural gas units, the inducer will operate on low speed for first-, second-, and third-stage heat. The inducer will ramp up to high speed for fourth-stage heat.

All combustion air inducer motors are sealed and cannot be oiled. The inducer cannot be adjusted but can be removed from the heat section for cleaning.

9-Gas Valves GV1, GV3

One- and two-stage gas units are equipped with either a 1- or 2-stage gas valve, respectively. Four-stage gas units are equipped with two, 2-stage gas valves. When a heating demand is present, the valve(s) are energized in low fire by the ignition control at the same time as the spark electrode.

On two- and four-stage units, if the heating demand increases, the high fire signal is provided directly to the gas valve(s) by A55 without the use of the ignition control. Both the low fire and high fire signals are required for the gas valve(s) to operate in high fire.

A shut-off knob/switch is provided on the valve for manual shut-off. The shut-off knob/switch will immediately close both stages without delay.

Both low fire and high fire (if applicable) valve outputs are adjustable. Figures 23 and 24 show gas valve components. Table 3 shows factory gas valve operating manifold pressures.

TABLE 3

Operating Manifold Pressure			
Natural		L.P.	
Low	High	Low	High
2.0 ± 0.3" W.C.	3.5 ± 0.3" W.C.	5.9" ± 0.3" W.C	10.5" ± 0.5" W.C.

The gas manifold pressure should be adjusted when the unit is installed at altitudes higher than 2000 feet. See table 4 for the proper setting.

TABLE 4
HIGH ALTITUDE DERATE

Altitude Ft.*	Gas Manifold Pressure
2000-4500	See Unit Nameplate
4500 And Above	Derate 2% / 1000 Ft. Above Sea Level

NOTE - This is the only permissible derate for these units.

10-Spark Electrode (Ignitor) Figure 20

An electrode assembly is used for ignition spark. The electrode is inserted through holes in 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 20) and ignites the appropriate burner depending on the heating stage. 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" (6.35 mm)female quick connect on both ends of the wire.

NOTE - If electrode wire must be replaced, wire and suppression must be same type cable.

The spark electrode assembly can be removed for inspection by removing the screw 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" (3.2 mm ± .4 mm). See figure 20.

⚠IMPORTANT

In order to maximize spark energy to electrode, high voltage wire should touch unit cabinet as little as possible.

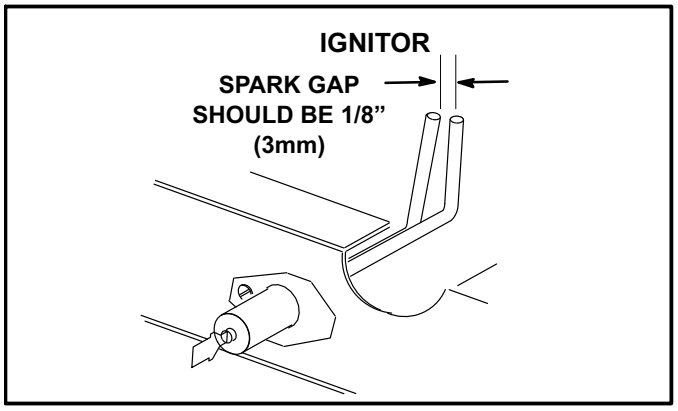


FIGURE 20

11-Flame Sensor Figure 21

The flame sensor is mounted through a hole in the burner support and the tip protrudes into the flame envelope of the appropriate burner. See figure 17 or 18 for location. 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 or after the eight second trial for ignition. 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 the flame) is sensed.

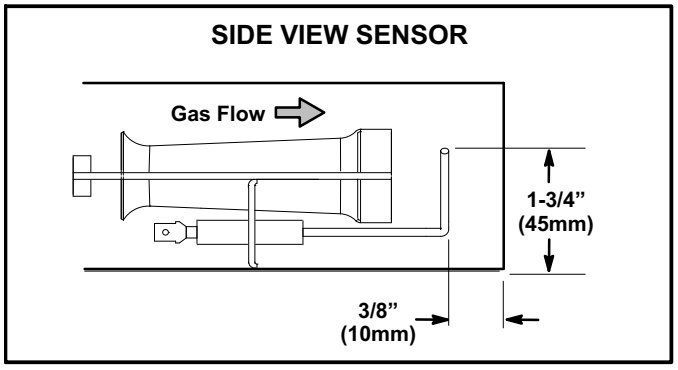


FIGURE 21

12-First-Stage Gas Heat Off Delay DL51 (4-stage units)

On a W1 demand, this delay routes 24VAC to A3 ignition control for 10 minutes. After 30 seconds, A3 will energize GV1 for the remaining 9-1/2 minutes (1st-stage heating, two left heat exchanger tubes).

13-Gas Relay K246 (four-stage units)

On a W2 call, this relay bypasses the DL21 and DL51 timers and allows A55 to power A3 and A12 directly. (3rd-stage heating, all seven heat exchanger tubes on low fire).

14-Second-Stage Gas Heat On Delay DL21 (4-stage units)

On a W1 demand, this delay routes 24VAC to A12 ignition control after 9-1/2 minutes elapses. After 30 more seconds, A12 will energize GV3 unless the heating demand changes (2nd stage heating, five right heat exchanger tubes).

15-Fourth-Stage Gas Heat On Delay DL52 (4-stage units)

On a W2 demand, this delay routes 24VAC to high heat on both gas valves after 10 minutes elapses. (4th-stage heating, all seven heat exchanger tubes on high fire).

16-Gas Relay K247 (four-stage units)

K247 maintains a feedback loop to the Unit Controller.

D-GAS HEAT TROUBLESHOOTING

Refer to the following scenarios when troubleshooting gas heat operation.

No operation with W1 demand:

- Verify 24VAC at K13 relay and 208/230VAC at P/J19 terminal 1 & 3
- Verify pressure switch S18 closes and trial for ignition begins
- Verify 24VAC at A55 terminal J266A-2, DL51 terminals 1 and 2, and A3 PWR (red LED on ignition controller will illuminate). If voltage is present at A3, after 30 seconds, verify voltage at GV1 "MV" during ignition trial
- Verify spark present at left side ignitor during trial for ignition
- Verify flame sensor connections are not reversed
- Verify inlet gas pressure is be between 4.5" and 10.5 " w.c.
- Verify manifold pressure is 2.0 $\pm$.3" w.c.

No Stage 3 operation with W2:

- Verify 24VAC at A55 terminal J266A-3 and relay K246 terminal A
- Verify voltage at ignition module A3 PWR and A12 PWR (both red LEDs will illuminate)

Heating does not move from stage 3 to stage 4 operation after 10 minutes:

- Verify voltage at DL52 terminals 1 and 2 and relay K72 terminal A
- Verify voltage at GV1 & GV3 'HI' terminal
- Verify inlet gas pressure is be between 4.5" and 10.5 " w.c.
- Verify manifold pressure is 3.5 $\pm$.3" w.c.

E-BLOWER COMPARTMENT

Ultra high efficiency units are equipped with a variable speed, direct drive blower. The installer is able to enter the design-specified supply air CFM into the Unit Controller for optimal efficiency. The Unit Controller calibrates the supply air volume which eliminates the need to manually take duct static measurements.

1-Blower Wheels

See table 5 for blower wheel type and size.

TABLE 5

BLOWER WHEELS		
LGH Unit	Type	Size - in. (mm)
036U, 048U	Direct	10 X 10 (254 X 254)
060U, 074U	Direct	11 X 10 (279 X 254)

2-Indoor Blower Motor B3

All direct drive blower motors are electronically commutated, brushless, DC motors. Low speed is approximately 2/3 of high speed. CFM adjustments are made by changing Unit Controller parameters. 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.

⚠IMPORTANT

Three phase scroll compressors must be phased sequentially for correct compressor and blower rotation. Follow "COOLING START-UP" section of installation instructions to ensure proper compressor and blower operation.

A-Blower Operation

Refer to the Unit Controller Installation and Setup Guide to energize blower. Use the menu navigation arrows and select button; see *Service - Test*.

B-Determining Unit CFM

1- The following measurements must be made with air filters in place.

IMPORTANT - A low speed adjustment less than 2/3 of high speed will improve humidity removal; refer to product data for more information.

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 22.

Note - Static pressure readings can vary if not taken where shown.

3- Measure the indoor blower wheel RPM. RPM can be read from the A55 Unit Controller display on direct drive blowers. See Unit Controller manual.

4- Referring to the blower tables in the front of this manual, use static pressure and RPM readings to determine unit CFM. Apply the optional accessory air resistance.

C-Adjusting Unit CFM

The supply CFM can be adjusted by changing Unit Controller settings. Refer to table 6 for menu paths and default settings. Record any CFM changes on the parameter settings label located on the inside of the compressor access panel.

⚠CAUTION

The BLOWER CALIBRATION process starts the indoor blower at operational speeds and closes the economizer damper blades. Before starting this process, replace any access panels and close all unit doors except compressor compartment door.

Blower calibration is required only on units that are newly installed or if there is a change in the duct work or air filters after installation. After the new CFM values are entered, use the down and up arrow buttons to select START CALIBRATION. Push SAVE to start calibration. The blower calibration status is displayed as a % complete. Upon successful completion, the Unit Controller will display CALIBRATION SUCCESS and go back to the blower calibration screen. Press the MAIN MENU button to go to the main menu and press the BACK button to go to the status screen.

If only the CFM values are updated, use the down and up arrow buttons to select "CALIBRATION DONE". Push SAVE to enter the updated values. This selection will not initiate calibration, resulting in less setup time. Press the MAIN MENU button to go to the main menu and press the BACK button to go to the status screen.

IMPORTANT - The default value for Cooling Low CFM is lower than a traditional singe- or two-speed unit. If operating the unit with a 2- or 3-stage controller (2- or 3-stage thermostat, DDC controller, etc.), it is recommended to increase the Cooling Low CFM default value to a suitable level for part load cooling (typically 60% of full load CFM).

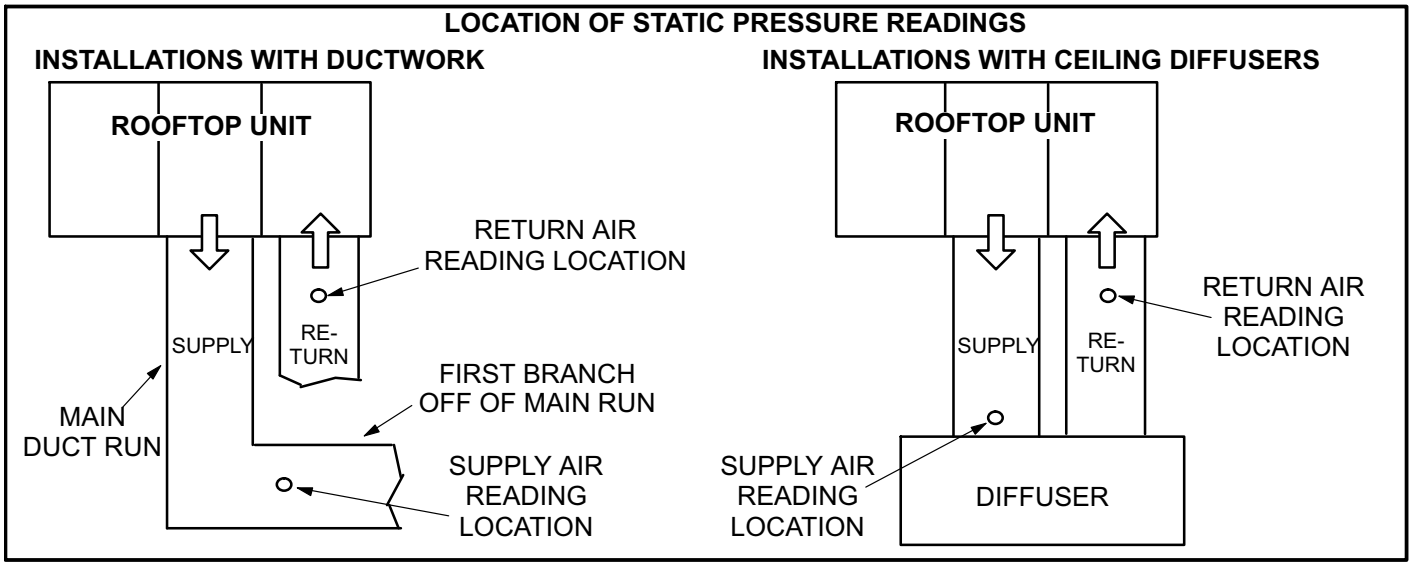


FIGURE 22

TABLE 6
036, 048, 060, 074U DIRECT DRIVE PARAMETER SETTINGS

LGH/LCH036-074U4E Default Parameter Settings						
Parameter	Factory Setting				Field Setting	Description
	036	048	060	074		
Note: Any changes to Smoke CFM setting must be adjusted before the other CFM settings. Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS = 12						
BLOWER SMOKE CFM	1200	1600	2000	2400	CFM	Smoke blower speed
SETUP > TEST & BALANCE > BLOWER						
BLOWER HEATING HIGH CFM	1200	1600	2000	2000	CFM	High heat blower speed
BLOWER HEATING LOW CFM	N/A	1250	1250	1250	CFM	Low heat blower speed (applies to 150kBtuh 4-stg. gas heat only)
BLOWER COOLING HIGH CFM	1100	1450	1825	2200	CFM	High cooling blower speed
BLOWER COOLING LOW CFM	575	750	950	950	CFM	Low cooling blower speed
BLOWER VENTILATION CFM	575	750	950	1150	CFM	Ventilation blower speed
SETUP > TEST & BALANCE > DAMPER						
BLOWER HIGH CFM DAMPER POS %	0%	0%	0%	0%	%	Minimum damper position for high speed blower operation.
BLOWER LOW CFM DAMPER POS %	0%	0%	0%	0%	%	Minimum damper position for low speed blower operation.
POWER EXHAUST DAMPER POS %	50%	50%	50%	50%	%	Minimum damper position for power exhaust operation.
SETTINGS > RTU OPTIONS > EDIT PARAMETERS = 216						
POWER EXHAUST DEAD-BAND %	10%	10%	10%	10%	%	Deadband % for power exhaust operation.
SETTINGS > RTU OPTIONS > EDIT PARAMETER = 10 (Applies to Thermostat Mode ONLY)						
FREE COOLING STAGE-UP DELAY	300 sec.	300 sec.	300 sec.	300 sec.	sec	Number of seconds to hold indoor blower at low speed before switching to indoor blower at high speed.

Installer: Circle applicable unit model number and record any parameter changes under “Field Setting” column. Settings need to be recorded by installer for use when Unit Controller is replaced or reprogrammed.

II-PLACEMENT AND INSTALLATION

Make sure the unit is installed in accordance with the installation instructions and all applicable codes. See accessories section for conditions requiring use of the optional roof mounting frame (T1CURB-AN or C1CURB-AN).

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 compressor access panel.

3- Check to ensure that refrigerant lines are in good condition and do not rub against the cabinet or other refrigerant lines.

4- Check voltage at the disconnect switch. Voltage must be within the range listed on the nameplate. If not, consult the 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.

B-Heating Start up

FOR YOUR SAFETY READ BEFORE LIGHTING

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.

⚠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.

⚠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. 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

SMOKE POTENTIAL

The heat exchanger in this unit could be a source of smoke on initial firing. Take precautions with respect to building occupants and property. Vent initial supply air outside when possible.

The gas valve may be equipped with either a gas control lever or gas control knob. Use only your hand to push the lever or turn the gas control knob. Never use tools. If the the lever will not move or 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.

⚠WARNING

Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

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

Placing Unit In Operation

⚠WARNING

Danger of explosion and fire. Can cause injury or product or property damage. You must follow these instructions exactly.

Gas Valve Operation (figure 23 or 24)

1- Set thermostat to lowest setting.

2- Turn off all electrical power to appliance.

3- This appliance is equipped with an ignition device(s) which automatically lights the burner. Do **not** try to light the burner by hand.

4- Open or remove the heat section access panel.

5- Move gas valve switch(es) to **OFF**. See figure 23 or 24.

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- Move gas valve switch(es) to **ON**. See figure 23 or 24.

8- Close or replace the control access panel.

9- Turn on all electrical power to appliance.

10- Set thermostat to desired setting.

NOTE - When unit is initially started, steps 1 through 9 may need to be repeated to purge air from gas line.

11- The ignition sequence will start.

12- If the furnace 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 Unit

1- If using an electromechanical thermostat, set to the lowest setting.

2- Before performing any service, turn off all electrical power to the appliance.

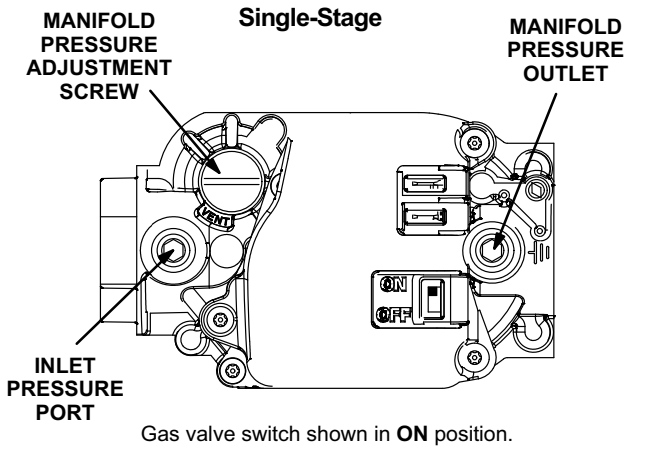
3- Open or remove the control access panel.

4- Move gas valve switch(es) to **OFF**.

5- Close or replace the control access panel.

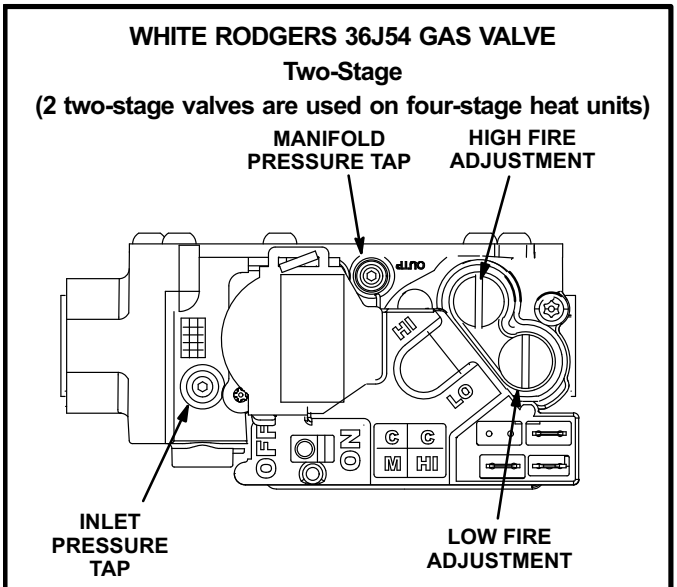
⚠WARNING

Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.



Gas valve switch shown in **ON** position.

FIGURE 23



Gas valve switch is shown in **OFF** position.

FIGURE 24

Four-Stage Heating Operation

Table 7 is a summary of four-stage heating operation. See the Heating Sequence of Operation in the back of this manual for details.

TABLE 7
FOUR-STAGE HEATING OPERATION

Heating Stage	Thermostat Demand	Gas Valve		Burners	CAB Speed	Indoor Blower Motor Speed
1	W1	GV1 Low Fire	GV3 Off	Two Left Burners On	Low	Low
2	W1[1]	GV1 Off	GV3 Low Fire	Five Right Burners On	Low	Low
3	W2[2]	GV1 Low Fire	GV3 Low Fire	All Seven Burners On	Low	High
4	W2[3]	GV1 High Fire	GV3 High Fire	All Seven Burners On	High	High

[1] After 10 minutes with W1 demand in Stage 1.
[2] W2 is initiated via thermostat input or upstage timer expiration via Unit Controller.
[3] After 10 minutes with W2 demand in Stage 3.

C-Cooling Start up
LGH036-074U Sequence of Operation Summary - Default Unit Controller Parameters Only

Blower

Unit Controller A55 energizes the blower motor B3 by sending a PWM signal from P259.

Zone Sensor:

Blower motor B3 modulates CFM between High Cool CFM and Low Cool CFM (based on the difference between the zone/room temperature and set point).

Exception: If the cooling demand is very low (small difference between room setpoint and temperature), the Unit Controller will modulate the blower between off and Low Cool CFM.

Exception: If a dehumidification switch A91 is installed, there is no cooling demand, AND the room temperature is 2° F less than the room temperature setpoint (Over-cool limit default), the Unit Controller will energize the blower at Low Cool CFM.

2-Stage Thermostat:

No Economizer / Outdoor Air Not Suitable

T'Stat Demand	Blower Speed*
Y1	Low
Y2	High

Economizer / Outdoor Air Suitable

T'Stat Demand	Blower Speed*
Y1	Low
Y2	Low

3-Stage Thermostat:

No Economizer / Outdoor Air Not Suitable

T'Stat Demand	Blower Speed*
Y1	Low
Y2	High
Y3	High

Economizer / Outdoor Air Suitable

T'Stat Demand	Blower Speed*
Y1	Low
Y2	Low
Y3	High

*70% when there is a dehumidification demand.

Compressor

Unit Controller A55 communicates compressor speed to inverter A192 via P358 (MODBUS communication).

Zone Sensor:

Compressor B1 speed varies (based on the difference between discharge air temperature and setpoint).

2-Stage Thermostat:

No Economizer / Outdoor Air Not Suitable

T'Stat Demand	Compressor Speed
Y1	60% of full speed
Y2	Full speed

Economizer / Outdoor Air Suitable

T'Stat Demand	Compressor Speed
Y1	Off
Y2	60% of full speed

3-Stage Thermostat:

No Economizer / Outdoor Air Not Suitable

T'Stat Demand	Compressor Speed
Y1	60% of full speed
Y2	Full speed
Y3	Full speed

Economizer / Outdoor Air Suitable

T'Stat Demand	Compressor Speed
Y1	Off
Y2	60% of full speed
Y3	Full speed

Outdoor Fan

Unit Controller A55 energizes outdoor fan B4 by sending a PWM signal from P259.

Zone Sensor:

Outdoor fan speed varies (with the compressor speed).

2-Stage Thermostat:

No Economizer / Outdoor Air Not Suitable

T'Stat Demand	Fan Speed
Y1	Low speed
Y2	High speed

Economizer / Outdoor Air Suitable

T'Stat Demand	Fan Speed
Y1	Off
Y2	Low speed

3-Stage Thermostat:

No Economizer / Outdoor Air Not Suitable

T'Stat Demand	Fan Speed
Y1	Low speed
Y2	High speed
Y3	High speed

Economizer / Outdoor Air Suitable

T'Stat Demand	Fan Speed
Y1	Off
Y2	Low speed
Y3	High speed

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.

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 K1 contactor. 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.

D-Safety or Emergency Shutdown

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

IV-CHARGING

D-Refrigerant Charge and Check - Fin/Tube Coil

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.*

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

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

1- Operate unit in cooling mode on **HIGH SPEED**. Use Unit Controller menu path SERVICE > TEST > COOL > COOL 3 for 036, 048 and 060U units. Use COOL 4 for 074U units.

2- Attach gauge manifolds wait until system stabilizes (approximately five minutes). Make sure economizer is disabled and outdoor air dampers are closed.

3- Use a thermometer to accurately measure the outdoor ambient temperature.

4- Apply the outdoor temperature to tables 8 through 11 to determine normal operating pressures. Pressures are listed for sea level applications at 80°F dry bulb and 67°F wet bulb return air.

5- Compare the normal operating pressures to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. **Correct any system problems before proceeding.**

6- If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.

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

7- Use one of the following charge verification methods along with the normal operating pressures to confirm readings.

TABLE 8
LG/LC 036U NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Discharge ±10 psig	Suction ± 5 psig
65° F	238	146
75° F	277	149
85° F	317	150
95° F	363	151
105° F	416	151
115° F	474	154

TABLE 9
LG/LC 048U NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Discharge ±10 psig	Suction ± 5 psig
65° F	252	142
75° F	289	145
85° F	332	147
95° F	379	149
105° F	428	151
115° F	484	153

TABLE 10
LG/LC 060U NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Discharge ±10 psig	Suction ± 5 psig
65° F	261	135
75° F	299	138
85° F	341	140
95° F	388	142
105° F	441	144
115° F	499	146

TABLE 11
LG/LC 074U NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	Discharge ±10 psig	Suction ± 5 psig
65° F	268	128
75° F	307	134
85° F	351	137
95° F	399	140
105° F	450	142
115° F	505	144

Subcooling Method

1- Attach gauge manifold to the liquid line. With the economizer disabled, operate the unit in **cooling mode at high speed** using the following Unit Controller menu path:

SERVICE > TEST > COOL > COOL 3
(COOL 4 on 074U units)

2- Use the liquid line pressure and a PT chart to determine the saturated liquid temperature.

3- Measure the liquid line temperature at the condenser outlet.

Subcooling Temperature = Liquid Saturated Temperature Minus Liquid Temperature.

4- The subcooling temperature should be as shown in table 12. A subcooling temperature greater than this value indicates an overcharge. A subcooling temperature less than this value indicates an undercharge.

TABLE12
SUBCOOLING TEMPERATURE

LGH/LCH Unit	Liquid Saturated Temp. Minus Liquid Temperature
036U; 060U	15°F ± 1 (8.3°C ± 0.5)
048U	15.5°F ± 1 (8.6°C ± 0.5)
074U	16°F ± 1 (8.8°C ± 0.5)

V- SYSTEMS SERVICE CHECKS

A-Heating System Service Checks

All LGH units are C.S.A. design certified without modification.

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

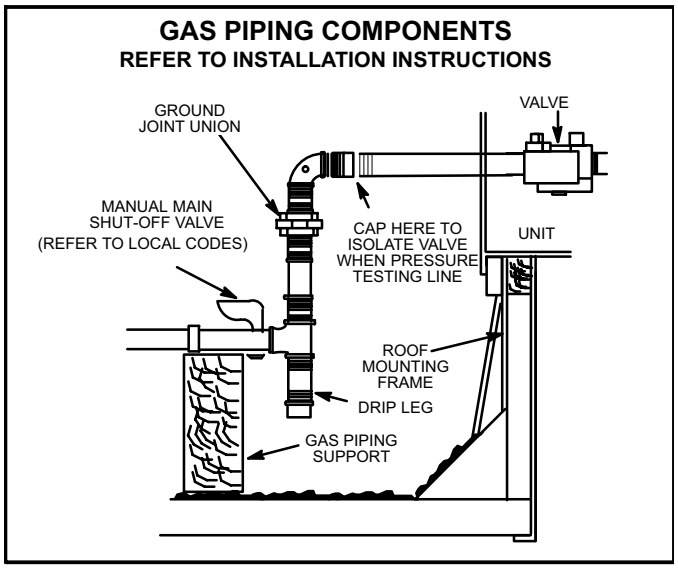


FIGURE 25

1-Gas Piping

Gas supply piping must not allow more than 0.5"W.C. (124.3 Pa) 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 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 [14"W.C. (3481 Pa)]**. See figure 26.

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.

Do not use matches, candles, flame or any other source of ignition to check for gas leaks.

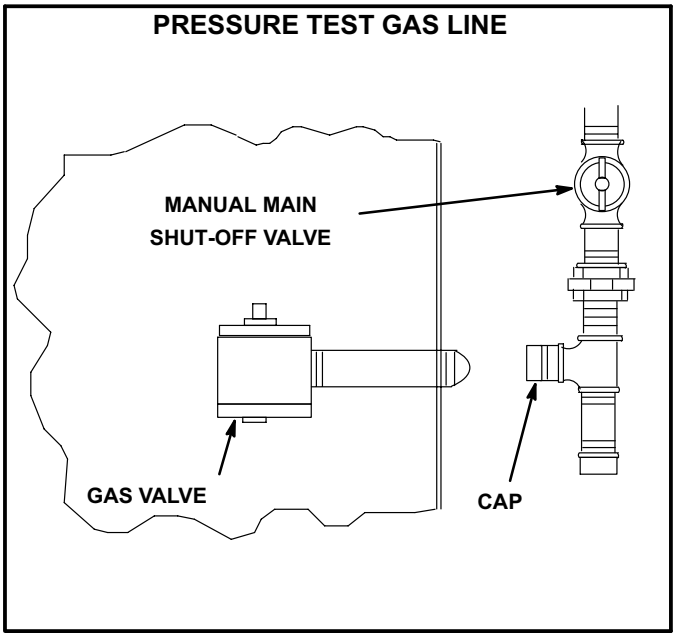


FIGURE 26

3-Testing Gas Supply Pressure

When testing gas supply pressure, connect test gauge to the inlet pressure tap located on unit gas valve GV1. 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 "under fire." High pressure can result in permanent damage to the gas valve or "over fire." For natural gas units, operating pressure at the unit gas connection must be between 4.5"W.C. and 10.5"W.C. For L.P. gas units, operating pressure at the unit gas connection must be between 10.5"W.C. and 13.0"W.C.

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.

4-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. See figure 23 or 24 for location of pressure tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. See table 3. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See figure 23 or 24 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/switch 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 3. On two-stage units, check low fire, make adjustments, and recheck high fire before recording values.

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.

5-Proper Gas Flow

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in table 13. Seconds in table 13 are based on a 1 ft.^{3}. dial and gas value of 1000 Btu/ft^3 for natural and 2500 Btu/ft$^{3'}$ for LP. Adjust manifold pressure on gas valve to match time needed.

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

TABLE 13

Unit Input Rate	Seconds for Natural	Seconds for Propane
65,000	55	138
105,000	34	86
150,000	24	60

⚠ IMPORTANT

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

6-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. 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.

7-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, microamp reading should be 0.5 to 1.0. Do not bend electrodes.
Drop out signal is .09 or less.

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

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

B-Cooling System Service Checks

LGH units are factory charged and require no further adjustment; however, charge should be checked periodically using the approach method. The approach method compares actual liquid temperature with the outdoor ambient temperature. See section IV- CHARGING.

NOTE-When unit is properly charged discharge line pressures should approximate those in tables 8 through 11.

VI-MAINTENANCE

The unit should be inspected once a year by a qualified service technician.

⚠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.

⚠CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

⚠WARNING

This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm.

A-Filters

Units are equipped with temporary filters which must be replaced prior to building occupation. See figure 27. All units have 20 X 20 X 2 in. (508 X 508 X 51mm) filters. Refer to local codes or appropriate jurisdiction for approved filters.

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

B-Lubrication

All motors are lubricated at the factory. No further lubrication is required.

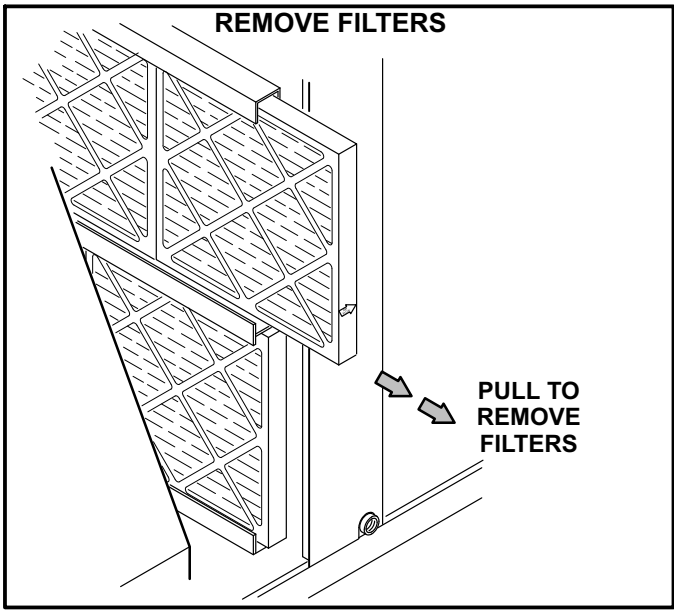


FIGURE 27

C-Burners

Periodically examine burner flames for proper appearance during the heating season. Before each heating season examine the burners for any deposits or blockage which may have occurred.

Clean burners as follows:

1- Turn off both electrical power and gas supply to unit.
2- Remove burner compartment access panel.
3- Remove top burner box panel.
4- Remove two screws securing burners to burner support and lift the burners from the orifices. See figure 15 and 16. Clean as necessary.

⚠WARNING

Danger of explosion. Can cause injury or death. Do not overtighten main burner mounting screws. Snug tighten only.

D-Combustion Air Inducer

A combustion air proving switch checks combustion air inducer operation before allowing power to the gas controller. Gas controller will not operate if inducer is obstructed.

Under normal operating conditions, the combustion air inducer wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule.

Clean combustion air inducer as follows:

1- Shut off power supply and gas to unit.

2- Remove the mullion on the right side of the heat section.

3- Disconnect pressure switch air tubing from combustion air inducer port.

4- Remove and retain screws securing combustion air inducer to flue box. Remove vent connector. See figure 13 or 14.

5- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Take care not to damage exposed fan blades. Clean accumulated dust from front of flue box cover.

6- Return combustion air inducer motor and vent connector to original location and secure with retained screws. It is recommended that gaskets be replaced during reassembly.

7- Replace mullion.

8- Clean combustion air inlet louvers on heat access panel using a small brush.

E-Flue Passageway and Flue Box

Remove flue box cover only when necessary for equipment repair. Clean inside of flue box cover and heat exchanger tubes with a wire brush when flue box cover has to be removed. Install a new flue box cover gasket and replace cover. Make sure edges around flue box cover are tightly sealed.

F-Evaporator Coil

Inspect and clean coil at beginning of each cooling season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

G-Condenser Coil

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season.

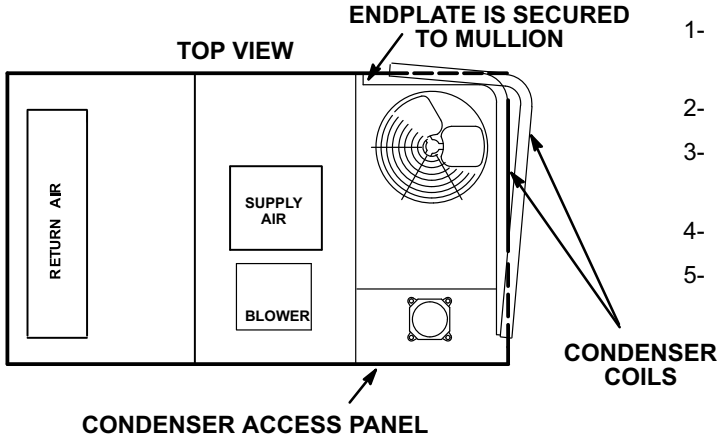
Condenser coils are made of single and two formed slabs. On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 28. Flush coils with water following cleaning.

Note - Remove all screws and gaskets prior to cleaning procedure and replace upon completion.

H-Supply 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.

CLEAN CONDENSER COIL



1- Remove unit top panel and condenser section access panel.

2- Remove screws securing coil end plate to mullion.

3- Remove wire ties connecting coils slabs and separate slabs 3-4” (76-102mm).

4- Clean coils with detergent or commercial coil cleaner.

5- Rinse thoroughly with water and reassemble. Use field-provided wire ties to connect coil slabs.

FIGURE 28

VII-ACCESSORIES

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

A-C1/T1CURB

When installing the LGH units on a combustible surface for downflow discharge applications, the C1/T1CURB 8 inch, 14-inch, 18 inch or 24-inch height roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the LGH units are not mounted on a flat (roof) surface, they MUST be supported under all edges and under the middle of the unit to prevent sagging. The units MUST be mounted level within 1/16" per linear foot or 5mm per meter in any direction.

The assembled mounting frame is shown in figure 29. 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 30. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

B-Transitions

Optional supply/return transitions T1TRAN10AN1 is available for use with the LGH 3, 4 and 5 ton units and the T1TRAN20N-1 is available for the 6 ton units utilizing optional T1CURB roof mounting frames. Transition must be installed in the C1/T1CURB mounting frame before mounting the unit to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

C-Outdoor Air Dampers

E1DAMP11A-1 manually operated outdoor air damper and E1DAMP21A-1 motorized outdoor air damper is available for LGH 3 and 4 ton units (see figure 31 or 32). E1DAMP11AT-1 manually operated outdoor air damper and E1DAMP21AT-1 motorized outdoor air damper is available for LGH 5 and 6 ton units. Both sets include the outdoor air hood. The manual damper is set at a fixed point to bring outside air into the building anytime the blower is operating. The motorized damper opens when the blower is operating and the thermostat is sending an occupied signal to the Unit Controller. If the thermostat signal is unoccupied, the motorized damper will not open. 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 re-installation. Filter Handicoater is R.P. Products coating no. 418 and is available as Part No. P-8-5069.

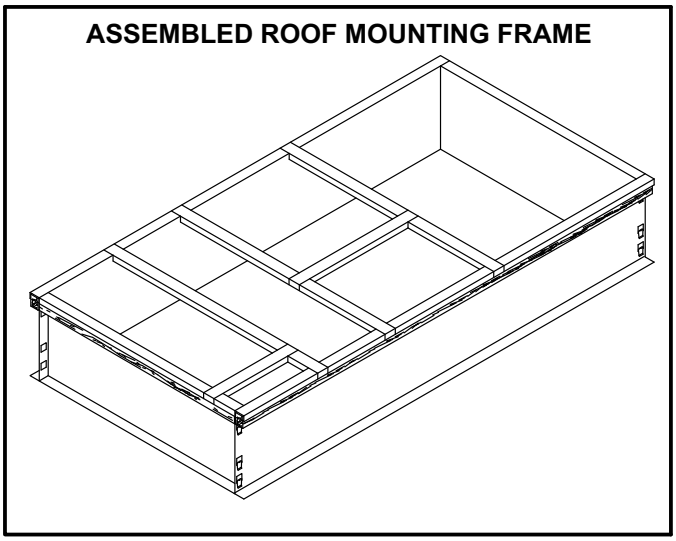


FIGURE 29

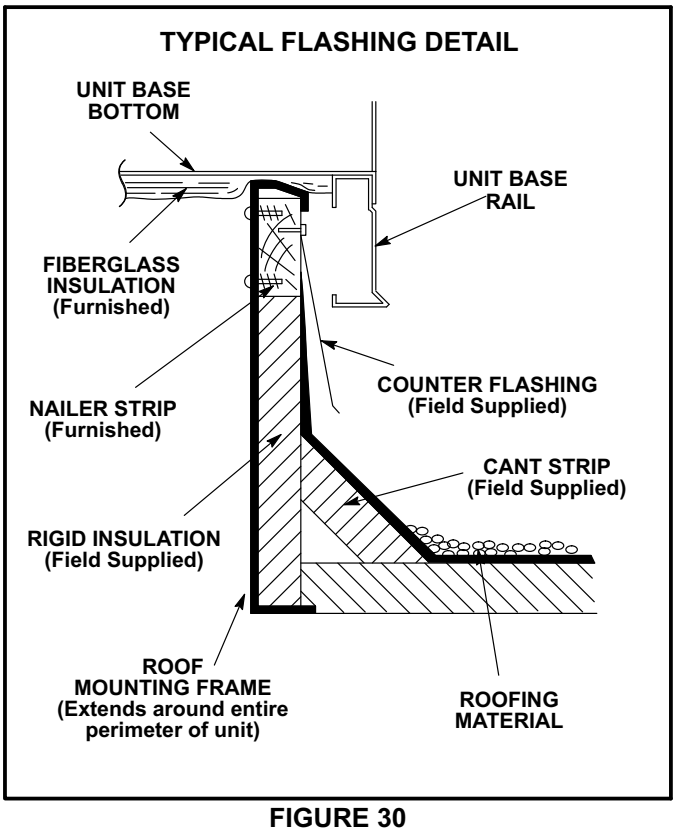


FIGURE 30

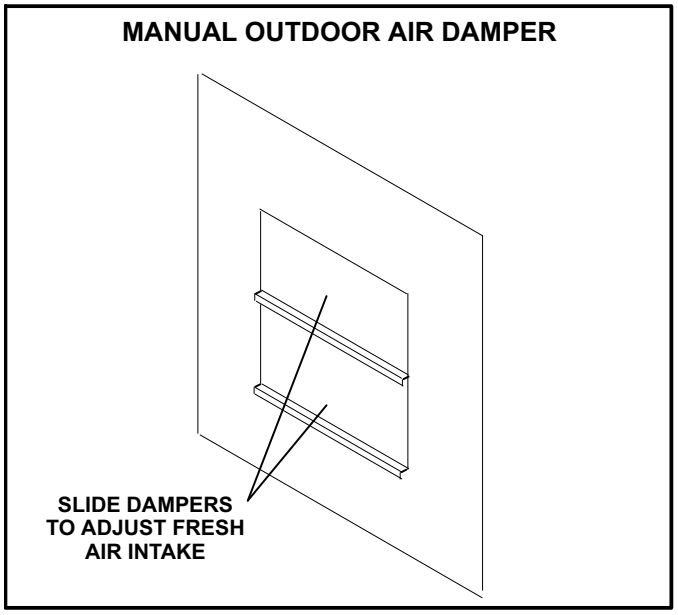


FIGURE 31

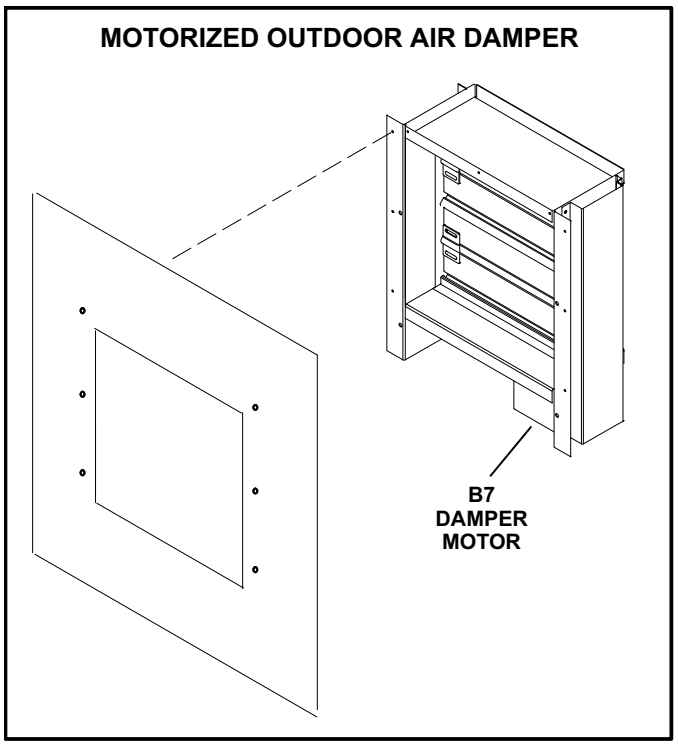


FIGURE 32

D-Supply and Return Diffusers

Optional flush mount diffuser/return FD9-65 and FD11-95 and extended mount diffuser/return RTD9-65 and RTD11-95 are available for use with all LGH units. Refer to manufacturer's instructions included with transition for detailed installation procedures.

E-Economizer

(Optional Field- or Factory-Installed)

The economizer uses outdoor air for free cooling when temperature is suitable. See figure 33.

When outdoor air is suitable, the Unit Controller will modulate the economizer dampers to maintain 55°F discharge air (RT6). Use the following menu to adjust the discharge air temperature setpoint between 45-67°F.

RTU OPTION > DAMPER > FREE COOLING SUPPLY AIR SETPOINT = 55°F

Sensors

Units are equipped with the following factory-installed, CEC Title 24 approved sensors:

RT17 - Outside Air Temperature
RT16 - Return Air Temperature
RT6 - Discharge Air Temperature

See figure 34 for sensor location.

Optional field-provided sensors may be used instead of unit sensors to determine whether outdoor air is suitable for free cooling. Refer to table 14. TEMP OFFSET is the default mode.

Note - Network OAS signal and California Title 24 Compliance options use either TEMPERATURE OFFSET or TEMPERATURE SETPT mode.

Minimum Position

The Unit Controller will move the dampers to minimum position during the following:

Ventilation mode (G demand only)
Outdoor air is NOT suitable for free cooling

Two blower speeds are available during damper minimum position:

1-Minimum Position -
When blower CFM is closer to the High Cool/Heat CFM
OR
When Ventilation CFM is closer to the High Cool/Heat CFM

2-Minimum Position Low Blower -
When blower CFM is closer to the Low Cool/Heat CFM
OR
When Ventilation CFM is closer to the Low Cool/Heat CFM

GED (Gravity Exhaust / Barometric Relief Dampers) Field-Installed Option

The GED is located in the economizer except in downflow applications or when a PEF (power exhaust fan) is NOT installed. In horizontal airflow applications or when a PEF is installed, the GED is located in the exhaust air hood.

Horizontal Air Discharge Economizers

The economizer is located in the unit the same as downflow applications but note the position of the return air duct. The duct attaches to a duct transition and duct inlet on the end of the unit. An optional GED is located in the duct transition. See figure 35.

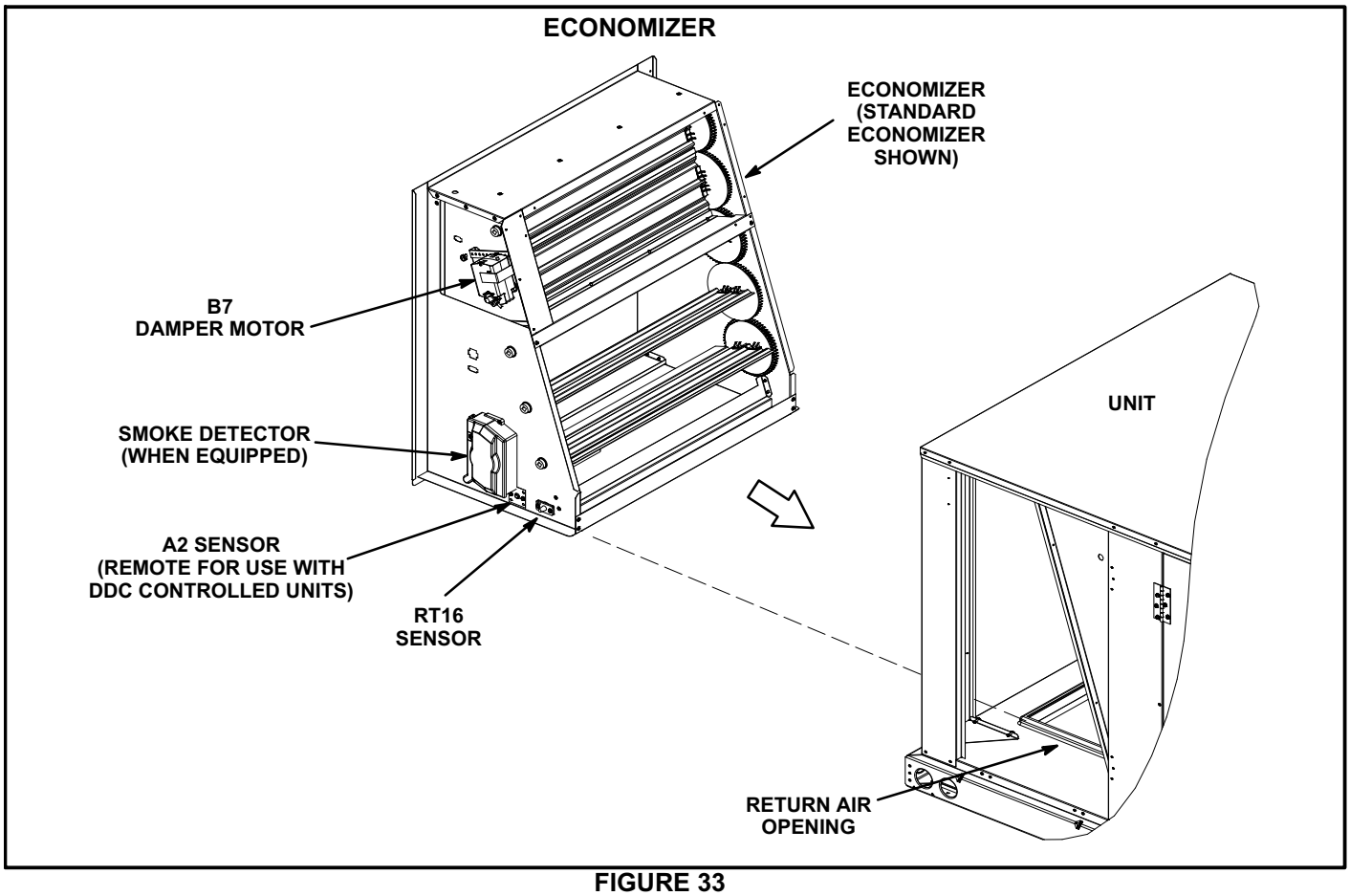


FIGURE 33

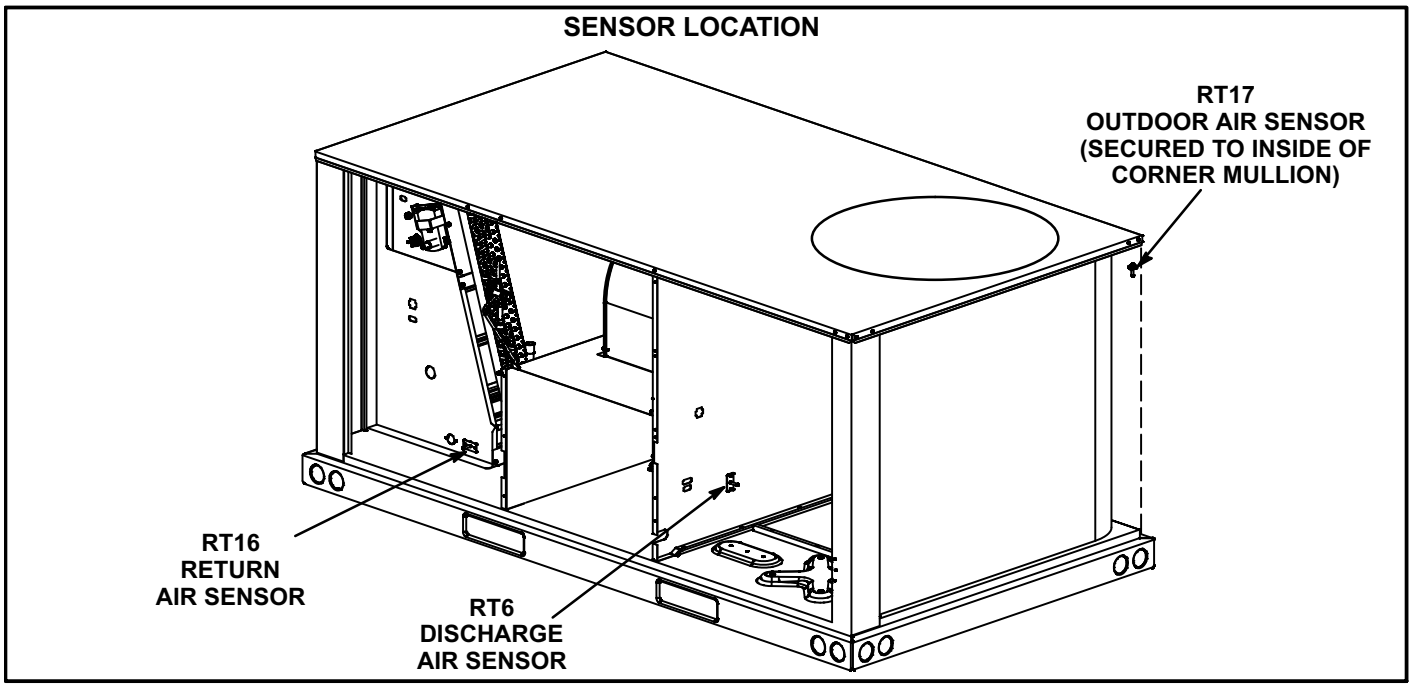


FIGURE 34

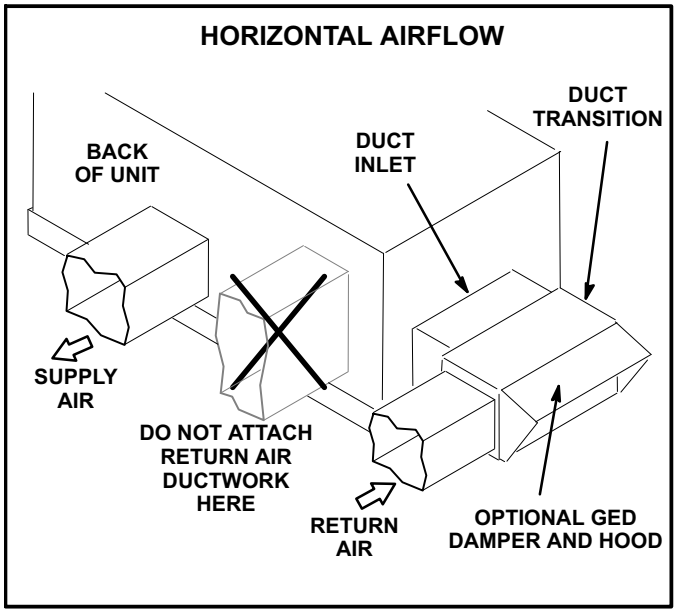


FIGURE 35

TABLE 14
ECONOMIZER MODES AND SETPOINT

Free Cooling Mode	Free Cooling Setpoint	Field-Provided Sensors	Dampers will modulate to 55°F discharge air (RT6) when outdoor air is suitable:	Permitted Inputs
TEMP	OFFSET	None Needed	Outdoor air temperature (RT17) is less than return air temperature (RT16) by at least the OFFSET value.	0-40°F
TEMP	OAT STPT	None Needed	Outdoor air temperature (RT17) is less than the OAT STPT value.	41-75°F
Remote	Remote	Energy Management System**	Either of the TEMP modes can be used when a network OAS signal is provided by an energy management or building control system, via BACnet, LonTalk, or L Connection. The network can command OAS, NOT OAS, or AUTO. AUTO returns to local control of OAS, which is the selected TEMP mode.	NA
ENTH	DIFF OFFSET	(Two) C7400	Outdoor air enthalpy* (A7) is less than return air enthalpy (A62) by at least the OFFSET value.	0mA-4mA
ENTH	ODE STPT	C7400	Outdoor air enthalpy (A7) is less than free cooling setpoint.	12-19mA
GLOBAL	GLOBAL	24VAC Input Signal	Global input is energized by (P297-9). This setting is also used for outdoor air damper applications. Global input also brings on the blower. (This mode is NOT used when OAS signal is provided via network connection. GLO is only used when a 24VAC signal is used to energize the P297-9 GLO input.)	NA

*Enthalpy includes effects of both temperature and humidity.

**Energy management systems may require additional field-provided sensors; refer to manufacturer's instructions.

DIRECT DRIVE DRIVE SYSTEM OPERATION:

Note: Direct drive units feature ECM condenser fans that are staged to match the compressor's capacity. When the compressor is operating at first stage, the condenser fan is operating at low speed. The condenser fan switches to high speed when the compressor switches to second stage to match operation.

Modulating Outdoor Air Damper:

Damper minimum positions #1 and 2 are adjusted during unit setup to provide minimum fresh air requirements at the indicated supply fan speeds per ASHRAE 62.1.

-Supply fan is off and the outdoor air damper is closed

-Supply fan is on low speed and the outdoor air damper is at minimum position 1

-Supply fan is on high speed and the outdoor air damper is at minimum position 2

[1]Outdoor Air is Suitable

Note: When outdoor air is not suitable during the occupied time period, damper modulates to minimum position. When outdoor air is not suitable during the unoccupied time period, damper modulates closed.

Cooling - Thermostat or Zone Sensor Mode (Up to 3 stages Y1, Y2, Y3)

Y1 demand:

1st-Compressor is off, supply fan is on low speed, economizer modulates (minimum to maximum open position) to maintain 55°F supply air temperature (default unit controller setting)

2nd-After 5 minutes (default unit controller setting), supply fan switches to high speed. Economizer continues modulating with supply fan on high speed to maintain 55°F supply air temperature

Y2 demand:

1st-Compressor is off, supply fan is on high speed, and economizer modulates to maintain 55°F supply air temperature

2nd-Economizer opens to maximum. If economizer stays at maximum open for 3 minutes (default unit controller setting) compressor is energized and operates at first stage while supply fan stays on high speed.

[1]Outdoor air suitability is determined by the energy state of outdoor ambient (enthalpy or sensible) and its ability to achieve the desired free cooling effects. Outdoor air suitability can also be determined by a third party controller and provided to the RTU via a network connection.

Y3 demand:

1st-Economizer is at maximum open and compressor operates at first stage. If economizer stays at maximum open for 3 minutes (default unit controller setting) compressor switches to second stage operation while supply fan stays on high speed

F-Power Exhaust Relay K65 (power exhaust units)

Power exhaust relay K65 is a DPDT relay with a 24VAC coil. K65 is used in all LGH units equipped with the optional power exhaust dampers. K65 is energized by the Unit Controller after the economizer dampers reach 50% open (adjustable). When K65 closes, exhaust fan B10 is energized.

G-Power Exhaust Fans

E1PWRE10A available for LGH 3 and 4 ton units and ET1PWRE10N available for 5 and 6 ton units, provide exhaust air pressure relief. See figure 36 and installation instructions for more detail.

H-Optional UVC Lights

The germicidal light emits ultraviolet (UVC) energy that has been proven effective in reducing microbial life forms (viruses, bacteria, yeasts, and molds) in the air.

UVC germicidal lamps greatly reduce the growth and proliferation of mold and other bio-aerosols (bacteria and viruses) on illuminated surfaces.

Germicidal lamps are NOT intended to be used for removal of active mold growth. Existing mold growth must be appropriately removed PRIOR to installation of the germicidal lamp.

Refer closely to UVC light installation instruction warnings when servicing units.

I-Optional Cold Weather Kit

An electric heater is available to automatically control the minimum temperature in the gas burner compartment. Heater is C.S.A. certified to allow cold weather operation of unit down to -60° F (-50° C).

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

2- A thermostat mounting box is installed on the wall of the compressor 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 (-35° C) the switch opens and the gas heat section is de-energized. The switch automatically resets when the heating compartment temperature reaches -10° F (-12° C).

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 HR6. When the temperature rises above 20° F (-7° C) the switch opens and the electric heater is de-energized. The switch automatically resets when the heating compartment temperature reaches -10° F (23.3° C).

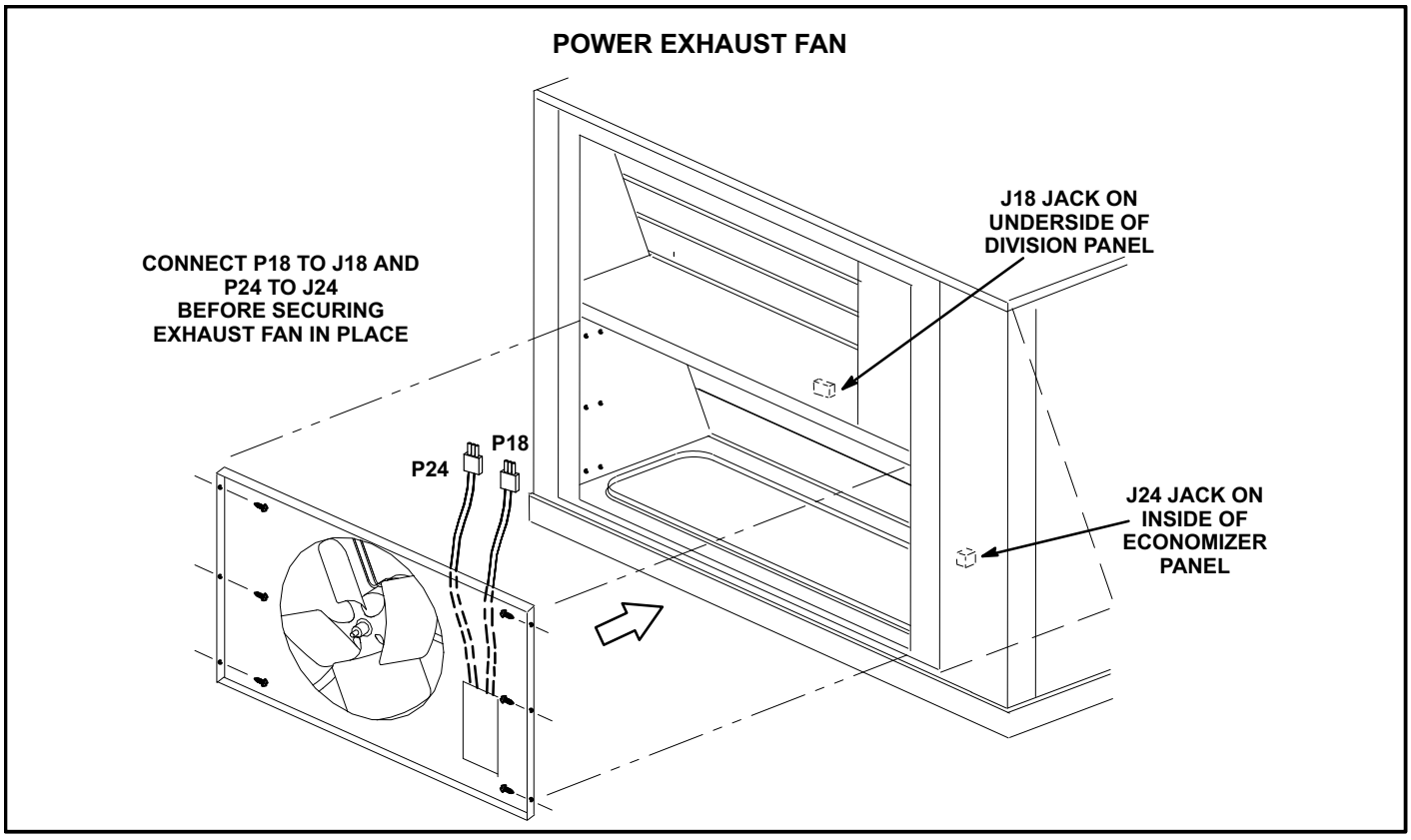


FIGURE 36

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 HR6. When temperature drops below 20° F (-7° C) the switch closes and electric heater is energized. The switch automatically opens when heating compartment temperature reaches 70° F (21° C).

J-Smoke Detectors A171 and A172

Photoelectric smoke detectors are a factory- or field-installed option. The smoke detectors can be installed in the supply air duct (A172), return air section (A171), or in both the supply duct and return air section.

K-Indoor Air Quality (CO_2) Sensor A63

The indoor air quality sensor monitors CO_2 levels and reports the levels to the Unit Controller. The Unit Controller adjusts the economizer dampers according to the CO_2 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.

L-LP / Propane Kit

All units operated on LP/Propane require a natural to LP /propane kit. The kit for single-stage units include one LP spring, seven burner orifices, and three stickers. Two-stage kits include the same but has a prove switch used to lock out first stage on the combustion air inducer. Four-stage units require (2) two-stage kits. For more detail refer to the natural to LP gas changeover kit installation instructions.

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.O. overflow switch is controlled by K220 and DL46 relays, located in the unit control panel. When the overflow switch closes, 24VAC power is interrupted and after a five-second delay unit compressors are de-energized. Once the condensate level drops below the set level, the switch will open. After a five-minute delay the compressor will be energized.

N-Dirty Filter Switch S27

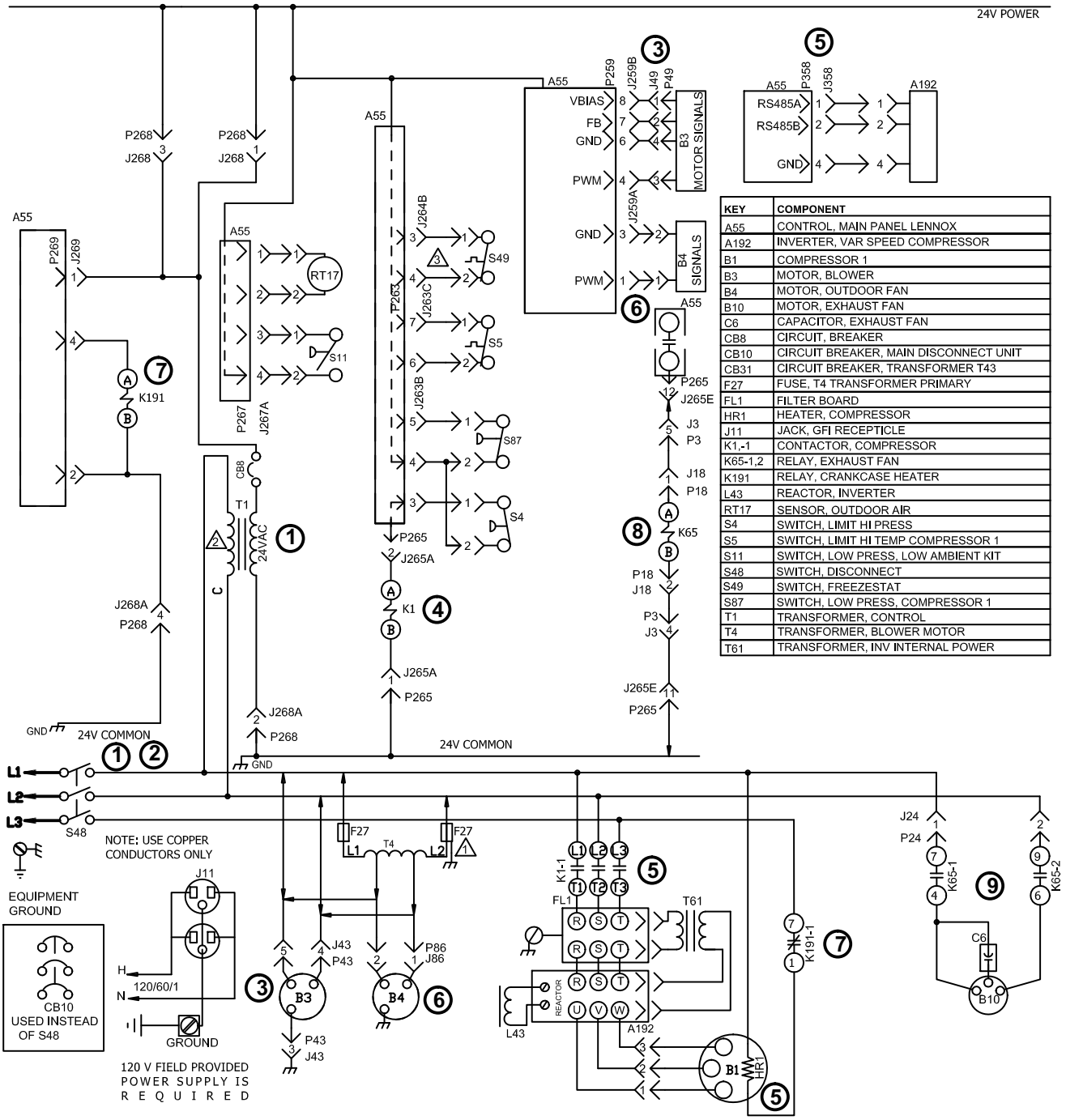
The dirty filter switch senses static pressure increase indicating a dirty filter condition. The switch is N.O. and closes at 1" W.C. (248.6 Pa) The switch is mounted in the supply air section on the evaporator coil seal.

O-Solar-Ready Units

Optional, factory-installed S48 circuit breaker and F54 solar fuse block make units solar-ready. These specially-equipped units can be matched with solar modules and other optional equipment.

Solar energy is first used to meet cooling/heating demands. When the unit is not operating, the system powers lighting, appliances and other electronic devices in the building. Any surplus power is sent back to the utility company for a possible credit (check your local utility company for policies).

Wiring runs from the roof-mounted solar modules to the unit. From there, power travels to the electrical service panel using the existing HVAC unit power wiring.



KEY	COMPONENT
A55	CONTROL, MAIN PANEL LENNOX
A192	INVERTER, VAR SPEED COMPRESSOR
B1	COMPRESSOR 1
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN
B10	MOTOR, EXHAUST FAN
C6	CAPACITOR, EXHAUST FAN
CB8	CIRCUIT, BREAKER
CB10	CIRCUIT BREAKER, MAIN DISCONNECT UNIT
CB31	CIRCUIT BREAKER, TRANSFORMER T43
F27	FUSE, T4 TRANSFORMER PRIMARY
FL1	FILTER BOARD
HR1	HEATER, COMPRESSOR
J11	JACK, GFI RECEPTICLE
K1,-1	CONTACTOR, COMPRESSOR
K65-1,2	RELAY, EXHAUST FAN
K191	RELAY, CRANKCASE HEATER
L43	REACTOR, INVERTER
RT17	SENSOR, OUTDOOR AIR
S4	SWITCH, LIMIT HI PRESS
S5	SWITCH, LIMIT HI TEMP COMPRESSOR 1
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S48	SWITCH, DISCONNECT
S49	SWITCH, FREEZESTAT
S87	SWITCH, LOW PRESS, COMPRESSOR 1
T1	TRANSFORMER, CONTROL
T4	TRANSFORMER, BLOWER MOTOR
T61	TRANSFORMER, INV INTERNAL POWER

1. T4 AND F27 USED ONLY ON G VOLTAGE UNITS
2. MOVE WIRE FROM 240 TO 208 TAP ON T1 TRANSFORMER FOR 208 LINE VOLTAGE APPLICTIONS
3. S49 IS PART OF A 5VDC CIRCUIT

J/P #	JACK/PLUG DESCRIPTION
3	ECONOMIZER BYPASS
18	EXHAUST FAN
24	EXHAUST FAN
43	BLOWER MORTOR
49	MOTOR VARIABLE SPEED
259	ECM MOTORS
263	HIGH AND LOW PRESSURE SWITCHES
264	BLOWER DECK
265	CONTACTORS AND RELAYS
267	OUTDOOR FAN AREA
268	TRANSFORMER 1 POWER
269	REHEAT
358	MODBUS

DENOTES OPTIONAL COMPONENTS
LINE VOLTAGE FIELD INSTALLED

NOTE - IF ANY WIRE IN THIS APPLIANCE IS REPLACED IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, TERMINATION AND INSULATION THICKNESS
WARNING - ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH . UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

DISCONNECT ALL POWER BEFORE SERVICING.

12/15	WIRING DIAGRAM 537842-01	12/15
COOLING		
ULTRA HIGH EFFICIENCY LCH/LGH - 036U,048U,060U,074U - Y,G		
SECTION B		REV 0
Supersedes	Form No. 537842-01	

Cooling Sequence of Operation

Using input from a room/zone sensor only. See Cooling Start-Up section operation summary for thermostat and third-party control operation.

Power:

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

2- Line voltage from unit disconnect, terminal block, or circuit breaker provides voltage to compressor crankcase heater relay K191-1 N.C. contacts, compressor contactor K1, blower motor B3, and outdoor fan motor B4 (on G volt units line voltage is supplied to two fuses F27, transformer T4, blower motor B3, and outdoor fan motor B4).

Blower Operation:

3- A55 Unit Controller P297 receives a cooling demand from the room/zone sensor. Unit Controller A55 energizes the blower motor B3 by sending a PWM signal from P259. The blower motor modulates between High Cool CFM and Low Cool CFM (based on the difference between the zone/room temperature A2 and setpoint).

Cooling

4- A55 proves N.C. freezestat S49, N.C. high temperature switch S5, N.C. low pressure switch S87, N.C. high pressure switch S4, and compressor contactor K1 is energized. A55 makes sure unit voltage and variable speed compressor inverter A192 voltage are equal. A55 also communicates the unit refrigeration tonnage to A192.

5- N.O. contacts K1-1 close providing voltage to A192 through FL1 filter board, T61 transformer, and L43 reactor. A192 varies B1 compressor speed based on a compressor demand from A55 P358 via MODBUS. The A55 compressor demand varies based on the difference between discharge air temperature (RT6) and discharge air temperature setting (default 55°F).

Note - The A55 will start to reduce the three- through five-ton compressor speed at a heat sink temperature of 125°F. Typical competitor equipment reduces compressor speed at 115°F.

6- A55 modulates outdoor fan B4 speed by sending a PWM signal from P259 (based on the compressor speed).

7- During cooling operation, A55 energizes crankcase heater relay K191. K191-1 N.C. Contacts open to de-energize HR1 crankcase heater.

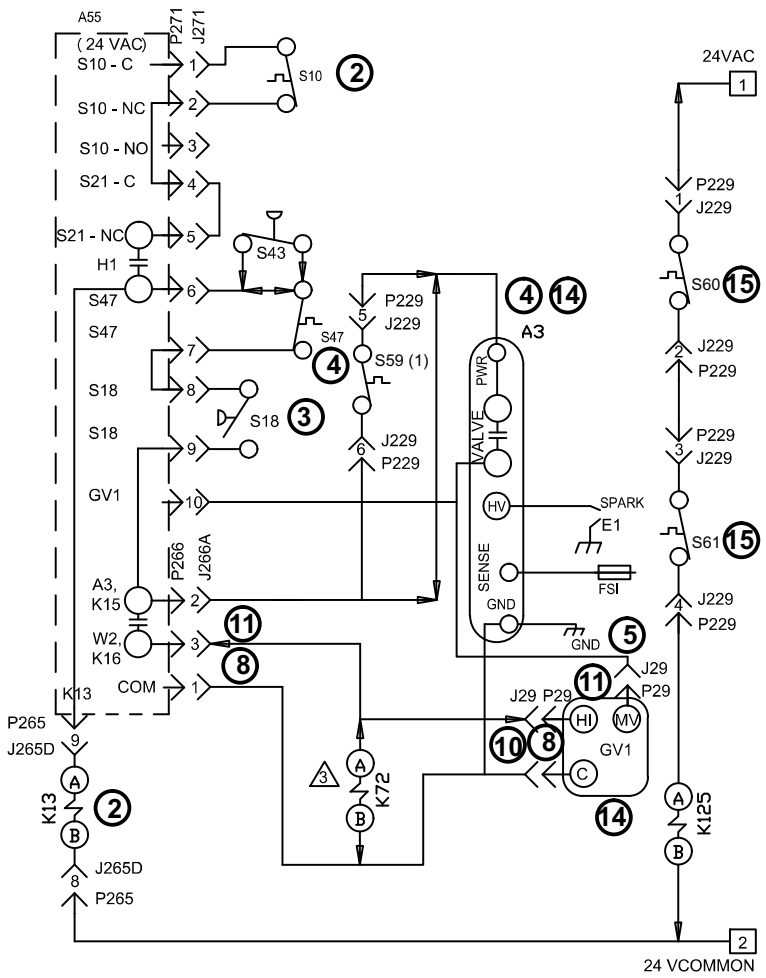
Power Exhaust Fan Operation

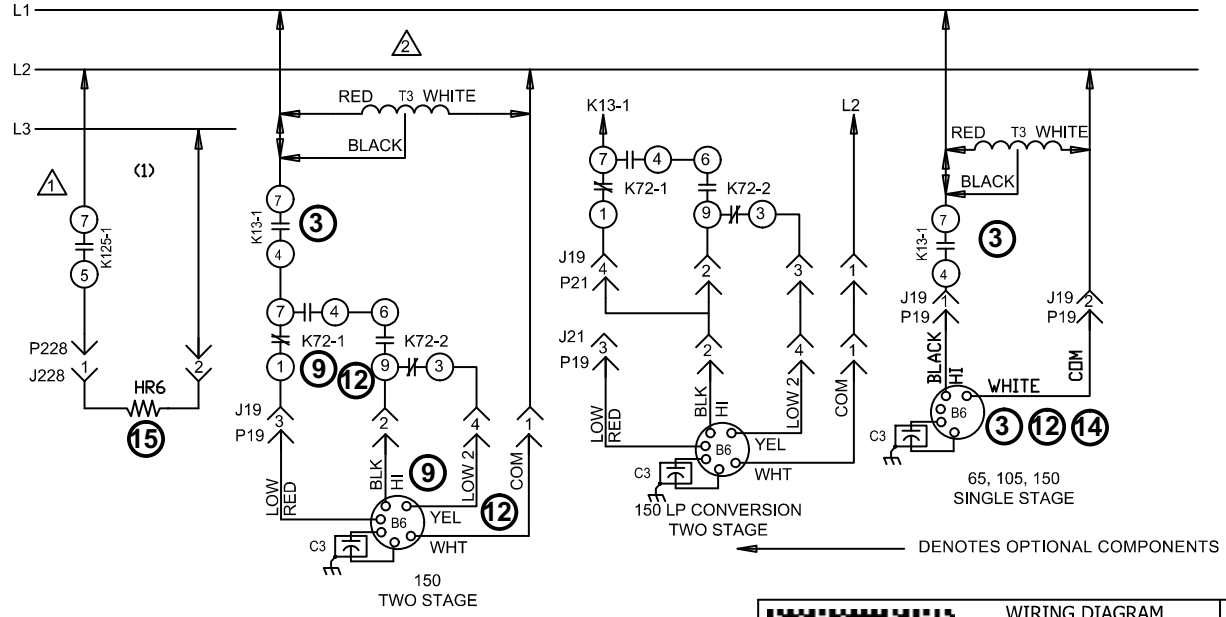
8- A55 receives a position feedback signal from the economizer damper motor and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).

9- N.O. contact K65-1 & 2 close, energizing exhaust fan motor B10.

2-STAGE GAS HEAT FOR UNITS

DESCRIPTION	
KEY	**DESCRIPTION**
A3	CONTROL, BURNER 1
A55	CONTROL, MAIN BOARD LENNOX
B6	MOTOR, COMBUSTION AIR BLOWER
C3	CAPACITOR, COMB AIR BLOWER 1
E1	SPARK
FS1	SENSOR, FLAME
GV1	VALVE, GAS 1
HR6	HEATER, -50C LOW AMBIENT KIT
J19	JACK, COMBUSTION AIR BLOWER 1
J21	JACK, COMBUSTION AIR BLOWER 2
J29	JACK, VALVE HONEYWELL
J228	JACK, VESTIBULE HEATER
J229	JACK, VESTIBULE HEATER CONTROL 1
J265C	JACK, CONTACTOR RELAY
J266A	JACK, HEATING CONTROL STG 1
J271A,B	JACK, HEATING SENSORS STG 1
K13,-1	RELAY, COMBUSTION AIR BLOWER
K72,-1,2	RELAY, GAS 3
K125,-1	RELAY, HEAT SHUT OFF
P19	PLUG, COMBUSTION AIR BLOWER 1
P21	PLUG, COMBUSTION AIR BLOWER 2
P29	PLUG, VALVE HONEYWELL
P228	PLUG, VESTIBULE HEATER
P229	PLUG, VESTIBULE HEATER CONTROL 1
P265	PLUG, CONTACTOR RELAY
P266	PLUG, HEATING CONTROL
P271	PLUG, HEATING SENSORS STG 1
S10	SWITCH, LIMIT PRIMARY GAS
S18	SWITCH, COMBUSTION AIR PROVE 1
S43	SWITCH, LOW GAS PRESSURE
S47	SWITCH FLAME ROLLOUT BURNER
S59	TSTAT, OPEN -20F, CLOSE 10F
S60	TSTAT, OPEN 20F, CLOSE -10F
S61	TSTAT, OPEN 50F, CLOSE 20F
T3	TRANSFORMER COMB AIR BWR 1





1. CSA (-50C) LOW AMBIENT KIT (OPTIONAL)
2. T3 USED ON 460V AND 575 V UNITS ONLY
3. K72 AND GV1 2STG ARE USED ON TWO STAGE UNITS.

	WIRING DIAGRAM	11/09
HEATING		
GAS HEAT LGH 65 -150		
SECTION A		REV. 2.0
Supersedes	New Form No. 537179-01	

TWO-STAGE GAS HEAT SEQUENCE OF OPERATION

First Stage Heat:

1- The thermostat initiates W1 heating demand.

2- 24VAC is routed to A55 Unit Controller. After A55 proves N.C. primary limit S10, the combustion air blower relay K13 is energized.

3- N.O. K13-1 contacts close allowing voltage to energize combustion air inducer B6. After B6 has reached full speed, the combustion air blower proving switch S18 contacts close.

4- A55 routes 24VAC through n.c. burner flame rollout switch S47 and the closed contacts of combustion air proving switch S18 to energize the ignition module A3.

5- After a 30 second delay A3 energizes the ignitor and gas valve GV1 on first stage.

Second Stage Heat:

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

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

8- A55 energizes HI terminal (high fire) of gas valve.

9- Relay K72-1 terminals 1 and 7 open, 7 and 4 close. K72-2 terminals 6 and 9 close and 9 and 3 open, energizing combustion air inducer B6 on high speed.

End of Second Stage Heat:

10- Heating demand is satisfied. Terminal HI (second stage) is de-energized.

11- Second stage heat is de-energized on GV1 A55.

12- K72 terminals 4 and 7 open and 1 and 7 close. K72 terminals 6 and 9 open, 9 and 3 close. Combustion air inducer B6 is now on low speed.

End of First Stage Heat:

13- Heating demand is satisfied. Terminal W1 (first stage) is de-energized.

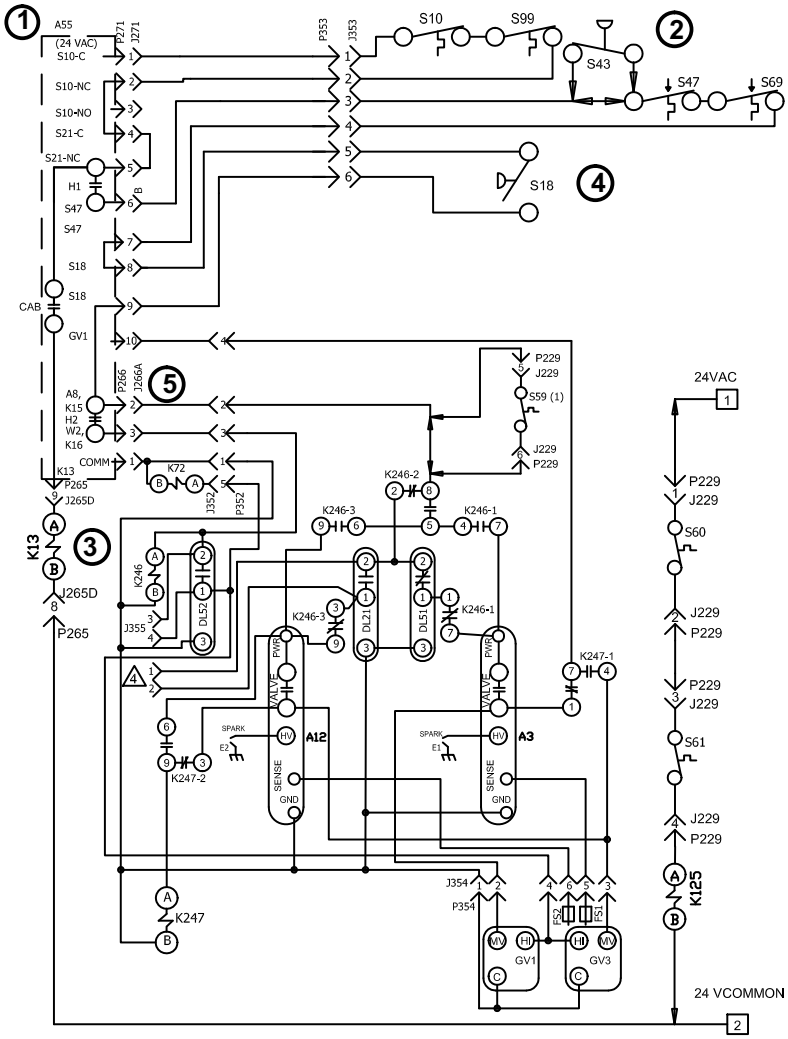
14- Ignition A3 is de-energized in turn de-energizing gas valve GV1 and combustion air inducer B6.

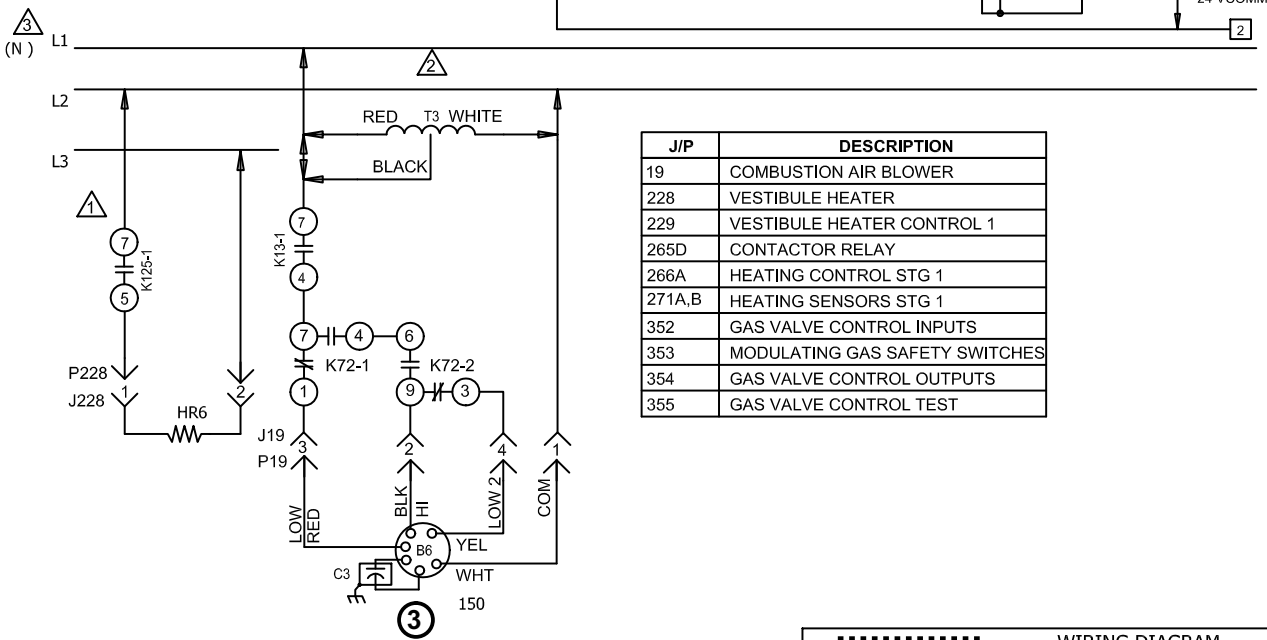
Optional Low Ambient Kit:
(C.S.A. -50° C Low Ambient Kit)

15- Line voltage is routed through the N.C. low ambient kit thermostats S60 and S61, to energize low ambient kit heater HR6.

4-STAGE GAS HEAT

KEY	DESCRIPTION
A3	CONTROL, BURNER 1
A12	CONTROL, BURNER 2
A55	CONTROL, MAIN BOARD LENNOX
B6	MOTOR, COMBUSTION AIR BLOWER
C3	CAPACITOR, COMB AIR BLOWER 1
DL21	DELAY, GAS, STAGE 2
DL51	DELAY, 1ST STAGE GAS HEAT
DL52	DELAY, 4TH STAGE GAS HEAT
E1	SPARK
E2	SPARK
FS1	SENSOR, FLAME
FS2	SENSOR, FLAME
GV1	VALVE, GAS 1
GV3	VALVE, GAS 2
HR6	HEATER, -50C LOW AMBIENT KIT
K13,-1	RELAY, COMBUSTION AIR BLOWER
K72,-1,2	RELAY, GAS 3
K77-1,2,3	RELAY, HEAT 1
K98,-1	RELAY, HEAT 2
K125,-1	RELAY, HEAT SHUT OFF
K246-1,2,3	RELAY - 1 ST, 2 ND STAGE
K247-1,2	RELAY - 4 TH STAGE
S10	SWITCH, LIMIT PRIMARY GAS
S18	SWITCH, COMBUSTION AIR PROVE 1
S43	SWITCH, LOW GAS PRESSURE
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 BURNER 2
S99	SWITCH, LIMIT PRIMARY GAS 2
T3	TRANSFORMER COMB AIR BWR 1





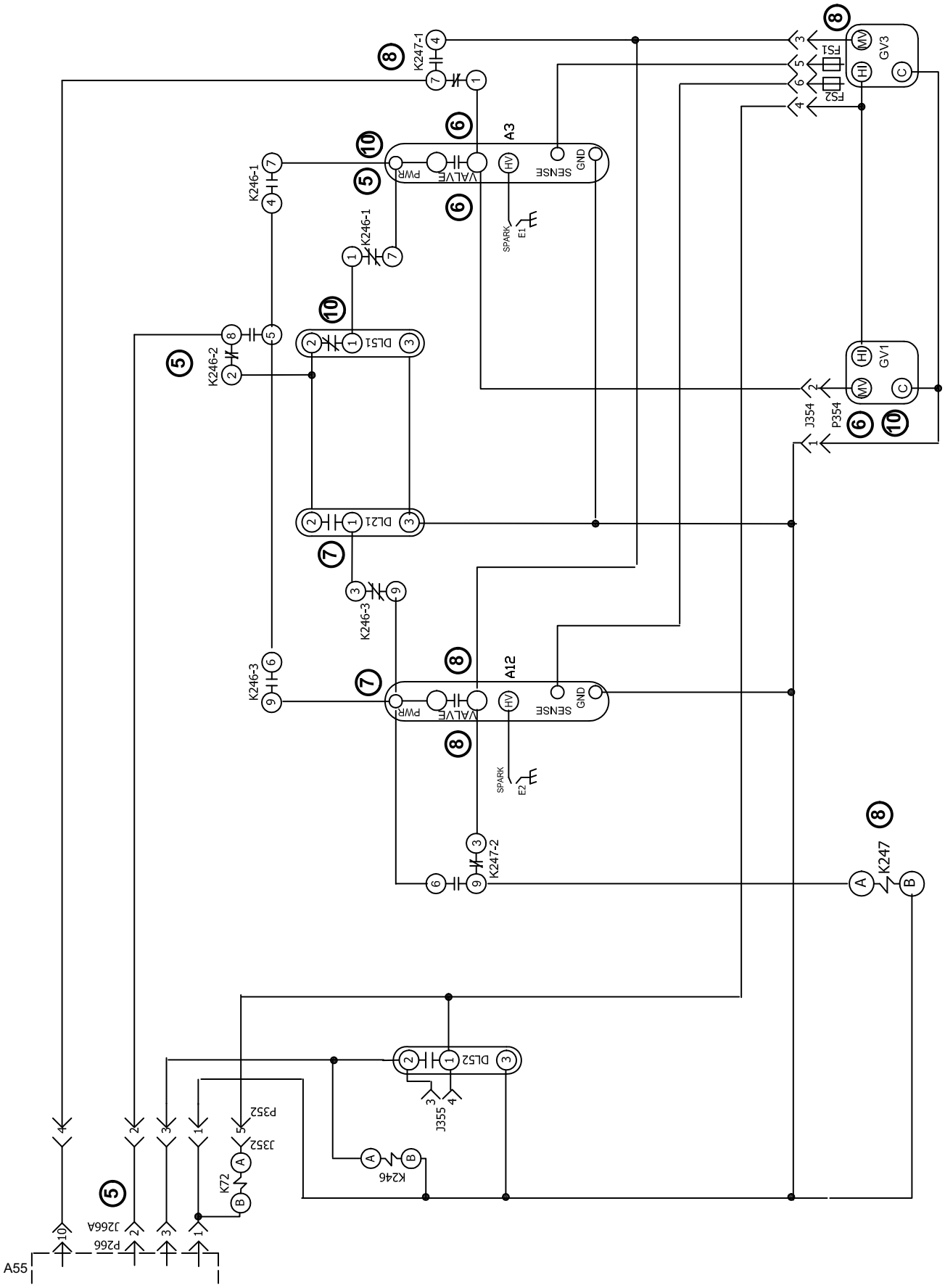
J/P	DESCRIPTION
19	COMBUSTION AIR BLOWER
228	VESTIBULE HEATER
229	VESTIBULE HEATER CONTROL 1
265D	CONTACTOR RELAY
266A	HEATING CONTROL STG 1
271A,B	HEATING SENSORS STG 1
352	GAS VALVE CONTROL INPUTS
353	MODULATING GAS SAFETY SWITCHES
354	GAS VALVE CONTROL OUTPUTS
355	GAS VALVE CONTROL TEST

1. CSA (-50C) LOW AMBIENT KIT (OPTIONAL)
2. T3 USED ON 460V AND 575 V UNITS ONLY
3. CONNECT TO (N) ON 380/420V UNITS ONLY
4. FOR USE DURING RUN-TEST ONLY

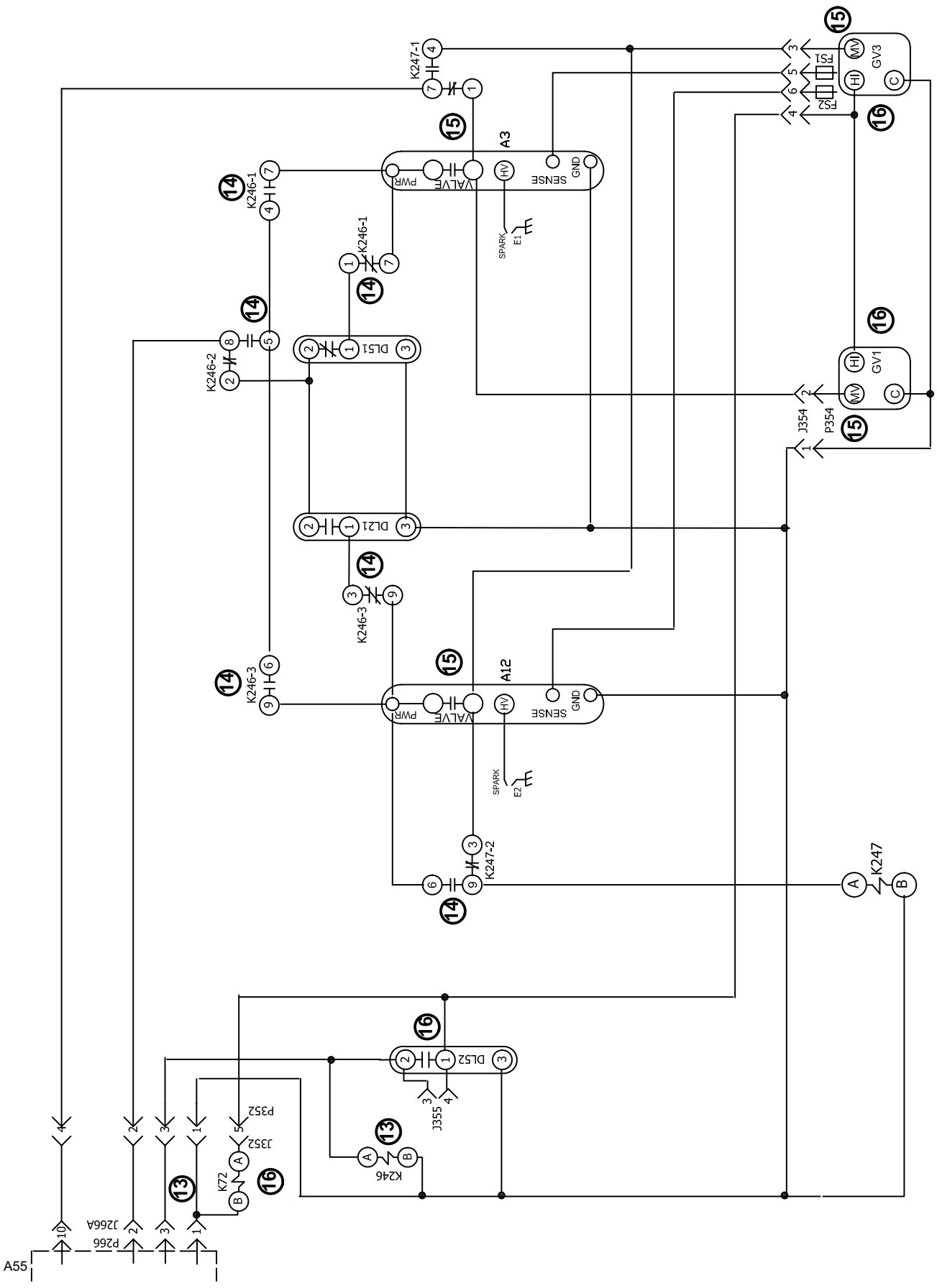
DENOTES OPTIONAL COMPONENTS

03/16	WIRING DIAGRAM 537837-01	03/16
HEATING		
4-STAGE GAS HEAT, LGH 150		
SECTION A		REV. 2
Supersedes	New Form No. 537837-01	

4-STAGE SIMPLIFIED DIAGRAM SECTION - STAGES 1 AND 2



4-STAGE SIMPLIFIED DIAGRAM SECTION - STAGES 3 AND 4



4-STAGE GAS HEAT SEQUENCE OF OPERATION

NOTE – The 4-stage modulating 150kBtuh, seven- tube high heat exchanger is split into two sections. One 2-stage gas valve (GV1) supplies fuel to the two left tubes and a second 2-stage gas valve (GV3) supplies fuel to the right five tubes. A W1 results in 1st and 2nd stage and W2 results in 3rd and 4th stage.

First Stage Heat:

1- W1 demand is initiated.

2- 24VAC is routed to A55 Unit Controller. After A55 proves N.C. primary limits S10 and S99, it checks the status of the N.C. roll-out switches S47 and S69 and also the status of the N.O. combustion air proving switch S18. If the switches are closed and the CAB proving switch is open, the normal starting sequence is continued. Otherwise, an A55 alarm will be set.

3- The combustion air blower relay K13 is energized and the B6 CAB is activated on low speed.

4- If the CAB prove switch closes within 30 seconds of CAB activation, normal operation continues. Otherwise, an A55 alarm is set.

5- A55 routes 24VAC from J266A-2 through N.C. relay K246-2 terminals 8 and 2 to time delay DL51 and DL21 terminal 2. DL51 (10-minute delay-**OFF** timer) N.C. contacts transfer 24VAC through K246-1 N.C. contacts terminal 1 and 7 to energize ignition module A3. DL21 (9.5-minute delay-**ON** timer) will provide no output at this time.

6- After a 30-second delay, A3 energizes the gas valve GV1 on low-fire. DL51 will maintain low-fire (via A3 and GV1) for 9 minutes and 30 seconds unless the heating demand is satisfied. A3 also routes power through K247-1 N. C. contacts 1 and 7 to provide a feedback loop to A55 P266A-10. The A55 Unit Controller operates the supply air blower B3 at Heating Low CFM. **TWO LEFT BURNERS ON LOW FIRE**

Second Stage Heat:

7- Approximately 9 minutes after the W1 demand, time delay-**ON** relay DL21 terminals 1 and 2 close, routing 24VAC through K246-3 N.C. terminals 3 and 9 to A12.

8- After a 30-second delay, A12 energizes gas valve GV3 on low-fire. A12 also routes power through K247-2 N.C. terminals 3 and 9 and energizes K247 relay coil. This closes K247-1 N.O. terminals 4 and 7 to maintain a signal to A55 P266A-10 to prevent Unit Controller alarm 58. **FIVE RIGHT BURNERS ON LOW FIRE**

9- At this point DL51 will maintain 1st stage heating for approximately 30 more seconds. Depending on component tolerances, for less than 30 seconds, both A3 and A12 output signals will overlap, energizing K247-1 contacts (this maintains the feedback loop to A55 P266A-10 and prevents Unit Controller alarm 58). Both GV1 and GV3 will operate on low speed briefly.

10- Ten minutes after the W1 demand, time delay-**OFF** DL51 opens terminals 1 and 2, de-energizing A3 and turning off GV1.

11- Unit will operate in second-stage until the W1 demand is satisfied or a W2 is initiated (either by A55 or thermostat input). The A55 continues to operate the supply air blower at Heating Low CFM.

12- A55 will automatically upstage a W1 demand to a W2 demand if the setpoint has not been achieved within a default 20 minutes (adjustable).

Third Stage Heat:

13- A W2 heating demand is initiated from J226A-3. (GV3 already operating in 2nd stage low speed.)

14- 24VAC is routed to K246-A relay coil. The N.C. K246 relay terminals 1 and 7, 2 and 8, and 3 and 9 terminals open. N.O. K246 relay terminals terminals 4 and 7, 5 and 8, and 6 and 9 close. 24VAC is routed to both ignition modules A3 and A12. Power to DL51 and DL21 is discontinued.

15- After a 30-second delay, A3 will energize gas valve GV1 on low fire. Both ignition modules and gas valves will operate for 10 minutes unless the heating demand is satisfied. The CAB will remain on low speed. The A55 changes the supply air blower speed to Heating High CFM. **ALL SEVEN BURNERS ON LOW FIRE**

Fourth Stage Heat:

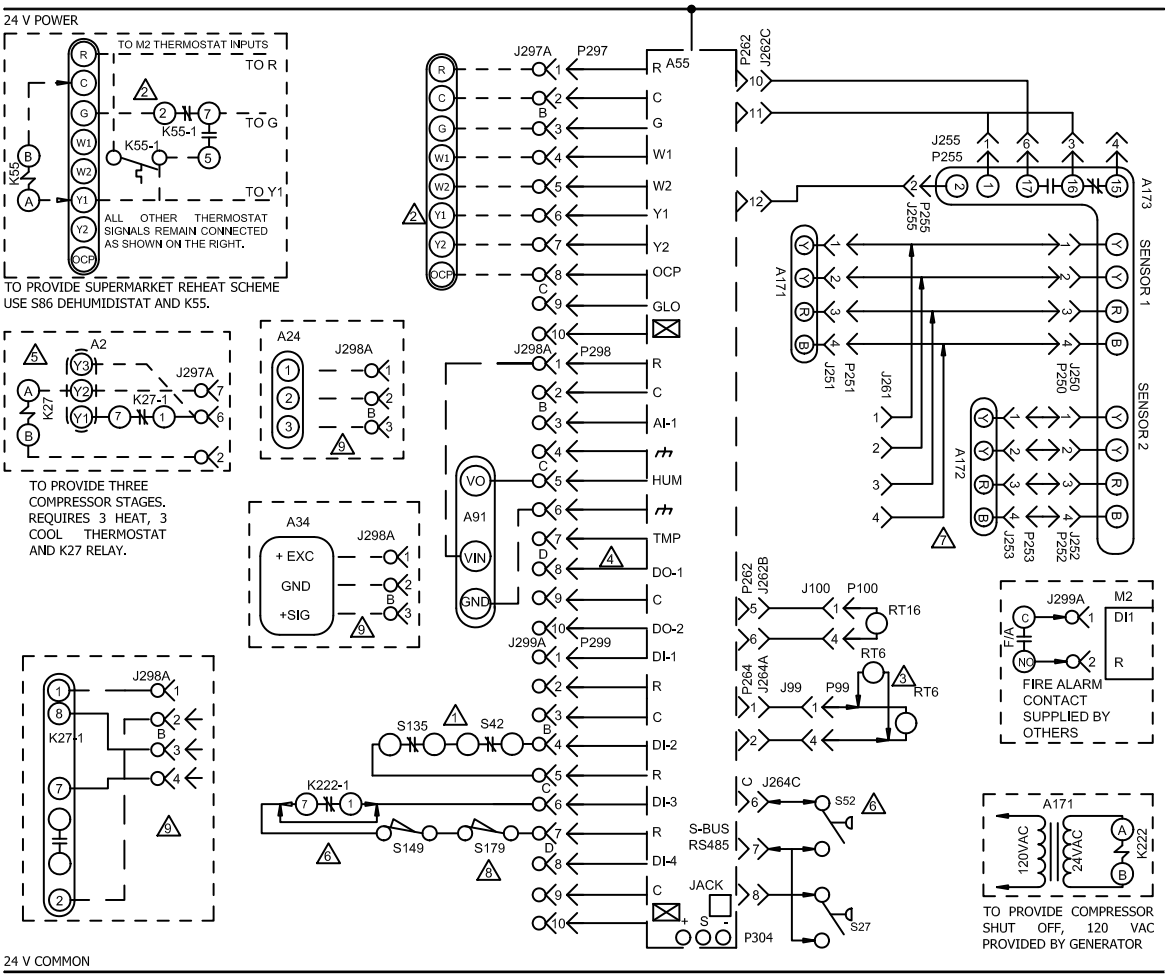
16- After 10 minutes, time delay-**ON** DL52 terminals 1 and 2 close. Gas relay K72 is energized. N.C. K72-1 terminals 1 and 7 open, and N.O. terminals 4 and 7 close. K72-2 terminals N.C. 3 and 9 open, and N.O. 6 and 9 close. Combustion air blower B6 is energized on high speed. At the same time, gas valve GV1 and GV3 terminal HI is energized. The Unit Controller continues to operate the supply air blower at Heating High CFM. **ALL SEVEN BURNERS ON HIGH FIRE**

17- The system will remain in fourth stage as long as a W2 demand is present.

End of Third and Fourth Stage Heat:

18- W2 demand is satisfied, W1 demand is still present. DL51 and DL21 relays are reset by W1 (via K246-2 N.C. Terminals 2 and 8); DL51 will maintain A3/GV1 operation and DL21 will delay-**ON** A12/GV3 operation in the same manner as stage 2. Combustion air blower B6 is on low-speed. The Unit Controller will operate the indoor blower in Heat Low CFM after a 90 second delay from Heat High CFM.

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT



DESCRIPTION	
KEY	COMPONENT
A2	SENSOR, ELECTRONIC THERMOSTAT
A24	CONTROL, OUTDOOR AIR CFM FLOW
A34	DUCT STATIC PRESS
A55	PANEL, MAIN
A63	SENSOR, CO2 (IAQ) OPTIONAL
A91	SENSOR, HUMIDITY
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
J99	JACK, RT16 RETURN AIR SENSOR
J100	JACK, RT6 SUPPLY AIR SENSOR
J250	JACK, SMOKE DETECTOR ONE
J251	JACK, SMOKE DETECTOR ONE
J252	JACK, SMOKE DETECTOR TWO
J253	JACK, SMOKE DETECTOR TWO
J255	JACK, MODULE, CONTROL SMOKE DETECTION
J261	JACK, SUPPLY SMOKE DETECTOR JUMPER
J262	JACK, ECONOMIZER
J264	JACK, BLOWER DECK
J297	JACK, THERMOSTAT - DDC INTERFACE
J298	JACK, IAQ INTERFACE
J299	JACK, SAFETY INTERFACE
K27, -1	RELAY, TRANSFER
K55,-1	RELAY, BLOWER
K222, -1	RELAY, COMPRESSOR LOCKOUT
P99	PLUG, RT16 RETURN AIR SENSOR
P100	PLUG, RT6 SUPPLY AIR SENSOR
P250	PLUG, SMOKE DETECTOR ONE
P251	PLUG, SMOKE DETECTOR ONE
P252	PLUG, SMOKE DETECTOR TWO
P253	PLUG, SMOKE DETECTOR TWO
P255	PLUG, MODULE, CONTROL SMOKE DETECTION
P262	PLUG, ECONOMIZER
P264	PLUG, BLOWER DECK
P297	PLUG, THERMOSTAT - DDC INTERFACE
P298	PLUG, IAQ INTERFACE
P299	PLUG, SAFETY INTERFACE
P304	PLUG, SYS BUS
RT6	SENSOR, SUPPLY AIR TEMP
RT16	SENSOR, RETURN AIR TEMP
S27	SWITCH, FILTER
S52	SWITCH, AIRFLOW
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S86	SWITCH, DEHUMIDISTAT
S135	OVERLOAD,BLOWER MOTOR SUPPLY
S149	SWITCH, OVERFLOW ONE
S179	SWITCH, OVERFLOW TWO
T8	TRANSFORMER, 120 V GENERATOR POWERED

1. FOR MOTORS WITH S42 and S135 EXTERNAL OVERLOAD LESS INVERTER, SEE INVERTER WITH BY PASS FOR S42 HOOK UP
2. USE S86 DEHUMIDISTAT AND K55 FOR OPTIONAL SUPERMARKET REHEAT SCHEME, PRODIGY PARAMETERS NEED TO BE MODIFIED UNDER THE SETTINGS MENU OR VIA UC SOFTWARE FOR SIMULTANEOUS HEATING AND COOLING.
3. REMOTE LOCATION OF RT6
4. P298-8 (DO-1) IS SERVICE RELAY OUTPUT (24VAC) IF USED CONNECT TO AN INDICATOR LIGHT
5. THERMOSTAT HOOKUP FOR PROGRAMMABLE CONFIGURATION OF THE BOARD (A55).
6. PRODIGY SETTINGS MUST BE MODIFIED WHEN K222, S42, S52, S135, S149 OR S179 ARE INSTALLED
7. CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY
8. S179, OVERFLOW SWITCH USED ON LGH/LCH 420-600 UNITS ONLY
9. A63, A34 & A24 ARE MUTUALLY EXCLUSIVE

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

05/16	WIRING DIAGRAM 537108-03	05/16
ACCESSORIES		
ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT FOR ENERGENCE		
SECTION C		REV. 2
Supersedes	New Form No. 537108-03	

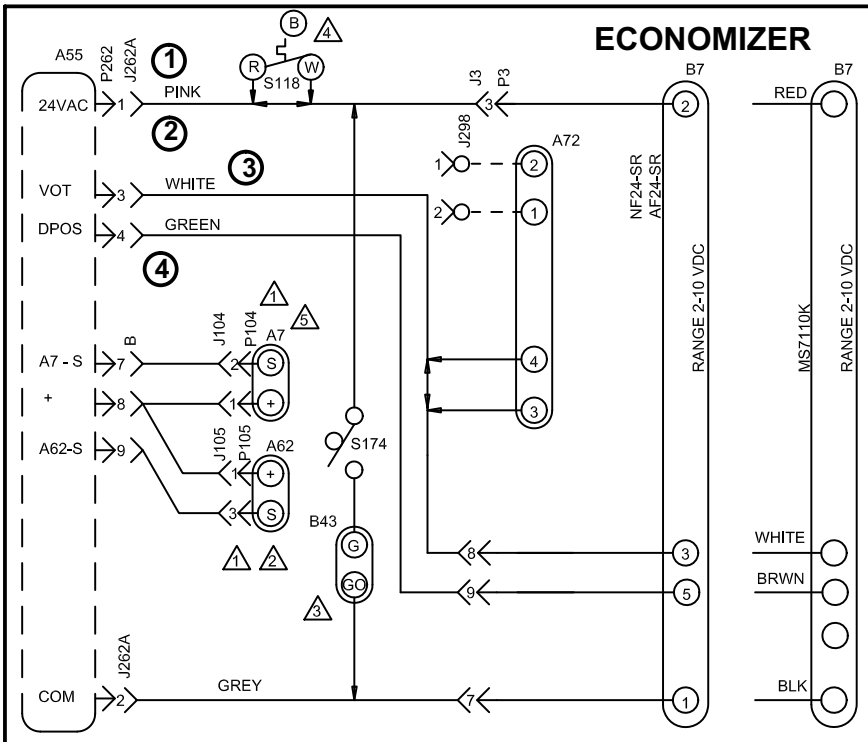
POWER:

1- A55 Unit Controller, located in the main control box, supplies thermostat components with 24VAC.

OPERATION:

2- A55 receives data from the room/zone sensor A2 and energizes the appropriate components for heat or cool demand.

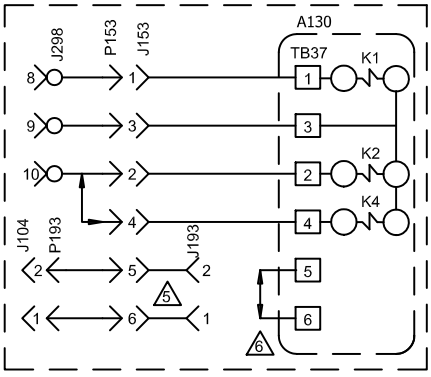
ECONOMIZER



1. DELETE A7 AND A62 (IF USED) FOR EITHER GLOBAL ENTHALPY OR SENSIBLE TEMPERATURE CONTROL
2. FOR UNIT DIFFERENTIAL ENTHALPY CONTROL, ADD A62 RETURN AIR ENTHALPY SENSOR
3. OPTIONAL EXHAUST DAMPER ACTUATOR TO HOLD EXHAUST DAMPER CLOSED WHEN OUTSIDE AIR DAMPER IS CLOSED
4. S118 USED ON 35 TO 50 TON ENERGENCE UNITS WITH ENERGY RECOVERY WHEEL (ERW)
5. REPOSITION A7 ENTHALPY SENSOR FROM ROOFTOP UNIT ECONOMIZER INTO INTAKE HOOD OF THE ERW ROOFTOP UNIT
6. REMOVE JUMPER WHEN INSTALLING OPTIONAL LOW AMBIENT SWITCH

NOTE - THIS DIAGRAM USED ONLY WHEN ECONOMIZER OR MOTORIZED OUTDOOR AIR DAMPERS ARE INSTALLED.

DESCRIPTION	
KEY	COMPONENT
A7	SENSOR, SOLID STATE ENTHALPY
A130	CONTROL, ERS
A55	CONTROL, MAIN PANEL LENNOX
A62	SENSOR, ENTHALPY INDOOR
A72	CONTROL, REMOTE MIN POS (OPT)
B7	MOTOR, DAMPER ECONOMIZER
B43	MOTOR, EXHAUST DAMPER
J3	JACK, UNIT ECONOMIZER
J104	JACK, SENSOR OUTDOOR ENTHALPY
J105	JACK, SENSOR RETURN AIR ENTHALPY
J153	JACK, ENTHALPY / DAMPER MOTOR
J193	JACK, ENTHALPY SENSOR
J298A	JACK, IAQ INTERFACE
J262A	JACK, DAMPER MOTOR
J262B	JACK, ENTHALPY SENSORS
P3	PLUG, ECONOMIZER BYPASS
P153	PLUG, ENTHALPY / DAMPER MOTOR
P193	PLUG, ENTHALPY SENSOR
P262	PLUG, ECONOMIZER OUTPUT
S118	THERMOSTAT, DESICANT DEFROST
S174	SWITCH, EXHAUST DAMPER



ENERGY RECOVERY WHEEL HOOK UP

WIRING DIAGRAM	04/14
ACCESSORIES	
ENERGENCE SERIES ECONOMIZER AND MOTORIZED OAD PIVOTING WHEEL ENERGY RECOVERY SYSTEM OPTION	
SECTION D	REV 2
Supersedes	New Form No. 537189-01

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

04/14

537189-01

SEQUENCE OF OPERATION

POWER:

1- A55 Unit Controller energizes the economizer components with 24VAC.

OPERATION:

2- Sensor(s), a global input, or a communication signal communicates to A55 when to power the damper motor B7.

3- A55 supplies B7 with 0 - 10 VDC to control the positioning of economizer.

4- The damper actuator provides 2 to 10 VDC position feedback.