The TGA 7.5, 8.5 and 10 ton packaged gas units are available in standard cooling efficiency (090S, 102S, 120S) and high cooling efficiency (090H, 102H, 120H). The TGA 12.5 ton unit is available in standard cooling efficiency only (150S).

TGA090, 102, 120 and 150 units are available in 130,000, 180,000 or 240,000Btuh (38.1, 52.7 or 70.3 kW) heating inputs. Gas heat sections are designed with aluminized steel tube heat exchangers . Cooling capacities range from 7.5 to 12 tons (26.3 to 44 kW).

All TGA units are designed to accept any of several different energy management thermostat control systems with minimum field wiring. Factory or field provided control options connect to the unit with jack plugs. When "plugged in" the controls become an integral part of the unit wiring.

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 qualified installer or service agency.

⚠ 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.

⚠ 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.

Phone: (803) 738-4000

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SPECIFICATIONS
090, 102 Standard Efficiency

General Data	Nominal Tonnage		**7.5 Ton**		**8.5 Ton**	
	Model No.		**TGA090S2B**		**TGA102S2B**	
	Efficiency Type		**Standard**		**Standard**	
Cooling Performance	Gross Cooling Capacity - Btuh (kW)		93,000 (27.2)		104,000 (30.5)	
	[1]Net Cooling Capacity - Btuh (kW)		90,000 (26.4)		100,000 (29.3)	
	ARI Rated Airflow - cfm (L/s)		3000 (1415)		3400 (1605)	
	Total Unit Power (kW)		8.9		9.9	
	[1] EER (Btuh/Watt)		10.1		10.1	
	[2] Integrated Part Load Value (Btuh/Watt)		10.5		10.5	
	Refrigerant Charge Furnished (HCFC-22)	Circuit 1	7 lbs. 0 oz. (3.18 kg)		7 lbs. 8 oz. (3.40 kg)	
		Circuit 2	6 lbs. 8 oz. (2.95 kg)		7 lbs. 0 oz. (3.18 kg)	
[3] Sound Rating Number (dB)			88		88	
Gas Heating Performance	Heat Input Type		**Standard (S)**	**Medium (M)**	**Standard (S)**	**Medium (M)**
	Input - Btuh (kW)	First Stage	84,500 (24.8)	117,000 (34.3)	84,500 (24.8)	117,000 (34.3)
		Second Stage	130,000 (38.1)	180,000 (52.7)	130,000 (38.1)	180,000 (52.7)
	Output - Btuh (kW)	Second Stage	104,000 (30.5)	144,000 (42.2)	104,000 (30.5)	144,000 (42.2)
	CSA Thermal Efficiency		80.0%		80.0%	
	Gas Supply Connections		3/4 in. npt		3/4 in. npt	
	Gas Supply Pressure	Natural	7 in. w.c. (1.7 kPa)		7 in. w.c. (1.7 kPa)	
		LPG/Propane	11 in. w.c. (2.7 kPa)		11 in. w.c. (2.7 kPa)	
Compressor - Number & Type			(2) Scroll		(2) Scroll	
Condenser Coil	Net face area - sq. ft. (m^2)		29.3 (2.72) total		29.3 (2.72) total	
	Tube diameter - in. (mm)		3/8 (9.5)		3/8 (9.5)	
	Number of rows		1		1	
	Fins per inch (m)		20 (787)		20 (787)	
Condenser Fans	Motor horsepower (W)		(2) 1/3 (249)		(2) 1/3 (249)	
	Motor rpm		1075		1075	
	Total Motor watts		700		700	
	Diameter - in. (mm) - no. of blades		(2) 24 (610) - 3		(2) 24 (610) - 3	
	Total air volume - cfm (L/s)		8,000 (3775)		8,000 (3775)	
Evaporator Coil	Net face area - sq. ft. (m^2)		10.5 (0.98) total		10.5 (0.98) total	
	Tube diameter - in. (mm)		3/8 (9.5)		3/8 (9.5)	
	Number of rows		3		3	
	Fins per inch (m)		14 (551)		14 (551)	
	Drain Connection - no. & size		(1) 1 in. NPT coupling		(1) 1 in. NPT coupling	
	Expansion device type		Balanced Port Thermostatic Expansion Valve, removeable power head			
Standard Indoor Blower and Drive	[4] Belt Drive - Nominal motor output		2 hp (1.5 kW)		2 hp (1.5 kW)	
	Maximum usable output (US Only)		2.3 hp (1.7 kW)		2.3 hp (1.7 kW)	
	Drive kit		kit #1 - 680 - 925 rpm		kit #1 - 680 - 925 rpm	
	Wheel nominal diameter x width - in. (mm)		(1) 15 x 15 (381 x 381)		(1) 15 x 15 (381 x 381)	
Filters	Type of filter		Disposable, pleated MERV 7 (standard) or MERV 11 (optional)			
	Number and size - in. (mm)		(4) 18 x 24 x 2 (457 x 610 x 51)		(4) 18 x 24 x 2 (457 x 610 x 51)	
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase			

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

[1] Certified in accordance with the ULE certification program, which is based on ARI Standard 340/360, 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering evaporator air; minimum external duct static pressure.

[2] Integrated Part Load Value rated at 80°F (27°C) outdoor air temperature, 80°F (27°C) db/67°F (19°C) wb indoor air temperature.

[3] Sound Rating Number rated in accordance with test conditions included in ARI Standard 270.

[4] Maximum usable output of motors 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
120, 150 Standard Efficiency

General Data	Nominal Tonnage		**10 Ton**		**12.5 Ton**	
	Model No.		**TGA120S2B**		**TGA150S2B**	
	Efficiency Type		**Standard**		**Standard**	
Cooling Performance	Gross Cooling Capacity - Btuh (kW)		126,000 (36.6)		145,000 (42.5)	
	[1]Net Cooling Capacity - Btuh (kW)		120,000 (35.2)		138,000 (40.4)	
	ARI Rated Airflow - cfm (L/s)		3800 (1795)		4250 (2005)	
	Total Unit Power (kW)		11.8		14.5	
	[1]EER (Btuh/Watt)		10.1		9.5	
	[2] Integrated Part Load Value (Btuh/Watt)		10.5		9.2	
	Refrigerant Charge Furnished (HCFC-22)	Circuit 1	10 lbs. 0 oz. (4.53 kg)		13 lbs. 0 oz. (5.90 kg)	
		Circuit 2	10 lbs. 0 oz. (4.53 kg)		12 lbs. 0 oz. (5.44 kg)	
[3] Sound Rating Number (dB)			88		88	
Gas Heating Performance		Heat Input Type	**Medium (M)**	**High (H)**	**Medium (M)**	**High (H)**
	Input - Btuh (kW)	First Stage	117,000 (34.3)	156,000 (45.7)	117,000 (34.3)	156,000 (45.7)
		Second Stage	180,000 (52.7)	240,000 (70.3)	180,000 (52.7)	240,000 (70.3)
	Output - Btuh (kW)	Second Stage	144,000 (42.2)	192,000 (56.3)	144,000 (42.2)	192,000 (56.3)
	CSA Thermal Efficiency		80.0%		80.0%	
	Gas Supply Connections		3/4 in. NPT		3/4 in. NPT	
	Gas Supply Pressure	Natural	7 in. w.c. (1.7 kPa)		7 in. w.c. (1.7 kPa)	
		LPG/Propane	11 in. w.c. (2.7 kPa)		11 in. w.c. (2.7 kPa)	
Compressor - Number and Type			(2) Scroll		(2) Scroll	
Condenser Coil	Net face area - sq. ft. (m^2)		29.3 (2.72) total		26.6 (2.47) total	
	Tube diameter - in. (mm)		3/8 (9.5)		3/8 (9.5)	
	Number of rows		2		3	
	Fins per inch (m)		20 (787)		20 (787)	
Condenser Fans	Motor horsepower (W)		(2) 1/3 (249)		(2) 1/2 (372)	
	Motor rpm		1075		1075	
	Total Motor watts		700		1150	
	Diameter - in. (mm) - no. of blades		(2) 24 (610) - 3		(2) 24 (610) - 3	
	Total air volume - cfm (L/s)		8,000 (3775)		9,000 (4245)	
Evaporator Coil	Net face area - sq. ft. (m^2)		10.5 (0.98) total		10.5 (0.98) total	
	Tube diameter - in. (mm)		3/8 (9.5)		3/8 (9.5)	
	Number of rows		4		4	
	Fins per inch (m)		14 (551)		14 (551)	
	Drain Connection - no. & size		(1) 1 in. NPT coupling		(1) 1 in. NPT coupling	
	Expansion device type		Balanced Port Thermostatic Expansion Valve, removeable power head			
Standard Indoor Blower and Drive	[4] Belt Drive - Nominal motor output		3 hp (2.2 kW)		5 hp (3.7 kW)	
	Maximum usable output (US Only)		3.45 hp (2.6 kW)		5.75 hp (4.3 kW)	
	Motor - Drive kit		kit #3 - 895 - 1120 rpm		kit #6 - 1100 - 1395 rpm	
	Wheel nominal diameter x width - in. (mm)		(1) 15 x 15 (381 x 381)		(1) 15 x 15 (381 x 381)	
Filters	Type of filter		Disposable, pleated MERV 7 (standard) or MERV 11 (optional)			
	Number and size - in. (mm)		(4) 18 x 24 x 2 (457 x 610 x 51)		(4) 18 x 24 x 2 (457 x 610 x 51)	
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase			

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

[1] Certified in accordance with the ULE certification program, which is based on ARI Standard 340/360, 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering evaporator air; minimum external duct static pressure.

[2] Integrated Part Load Value rated at 80°F (27°C) outdoor air temperature, 80°F (27°C) db/67°F (19°C) wb indoor air temperature.

[3] Sound Rating Number rated in accordance with test conditions included in ARI Standard 270.

[4] Maximum usable output of motors 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
090, 102, 120 High Efficiency

General Data			7.5 Ton TGA090H2B		8.5 Ton TGA102H2B		10 Ton TGA120H2B	
	Nominal Tonnage							
	Model No.							
Cooling Performance	Gross Cooling Capacity - Btuh (kW)		93,000 (27.2)		106,000 (31.0)		126,000 (36.9)	
	[1]Net Cooling Capacity - Btuh (kW)		90,000 (26.4)		103,000 (30.2)		120,000 (35.2)	
	ARI Rated Airflow - cfm (L/s)		3000 (1415)		3400 (1605)		3800 (1795)	
	Total Unit Power (kW)		8.0		9.2		10.9	
	[1] EER (Btuh/Watt)		11.0		11.0		11.0	
	[2] Integrated Part Load Value (Btuh/Watt)		11.4		11.4		11.4	
	Refrigerant Charge Furnished (HCFC-22)	Circuit 1	8 lbs. 8 oz. (3.86 kg)		8 lbs. 8 oz. (3.86 kg)		10 lbs. 0 oz. (4.54 kg)	
		Circuit 2	8 lbs. 8 oz. (3.86 kg)		8 lbs. 8 oz. (3.86 kg)		10 lbs. 0 oz. (4.54 kg)	
[3] Sound Rating Number (dB)			88		88		88	
Gas Heating Performance	Heat Input Type		**Standard (S)**	**Medium (M)**	**Standard (S)**	**Medium (M)**	**Medium (M)**	**High (H)**
	Input - Btuh (kW)	First Stage	84,500 (24.8)	117,000 (34.3)	84,500 (24.8)	117,000 (34.3)	117,000 (34.3)	156,000 (45.7)
		Second Stage	130,000 (38.1)	180,000 (52.7)	130,000 (38.1)	180,000 (52.7)	180,000 (52.7)	240,000 (70.3)
	Output - Btuh (kW)	Second Stage	104,000 (30.5)	144,000 (42.2)	104,000 (30.5)	144,000 (42.2)	144,000 (42.2)	192,000 (56.3)
	CSA Thermal Efficiency		80.0%		80.0%		80.0%	
	Gas Supply Connections		3/4 in. npt		3/4 in. npt		3/4 in. NPT	
	Gas Supply Pressure	Natural	7 in. w.c. (1.7 kPa)		7 in. w.c. (1.7 kPa)		7 in. w.c. (1.7 kPa)	
		LPG/Propane	11 in. w.c. (2.7 kPa)		11 in. w.c. (2.7 kPa)		11 in. w.c. (2.7 kPa)	
Compressor - Number and Type			(2) Scroll		(2) Scroll		(2) Scroll	
Condenser Coil	Net face area - sq. ft. (m^2)		29.3 (2.72) total		29.3 (2.72) total		29.3 (2.72) total	
	Tube diameter - in. (mm)		3/8 (9.5)		3/8 (9.5)		3/8 (9.5)	
	Number of rows		2		2		2	
	Fins per inch (m)		20 (787)		20 (787)		20 (787)	
Condenser Fans	Motor horsepower (W)		(2) 1/3 (249)		(2) 1/3 (249)		(2) 1/3 (249)	
	Motor rpm		1075		1075		1075	
	Total Motor watts		700		700		750	
	Diameter - in. (mm) - no. of blades		(2) 24 (610) - 3		(2) 24 (610) - 3		(2) 24 (610) - 3	
	Total air volume - cfm (L/s)		8,000 (3775)		8,000 (3775)		8,000 (3775)	
Evaporator Coil	Net face area - sq. ft. (m^2)		10.5 (0.98) total		10.5 (0.98) total		10.5 (0.98) total	
	Tube diameter - in. (mm)		3/8 (9.5)		3/8 (9.5)		3/8 (9.5)	
	Number of rows		3		3		4	
	Fins per inch (m)		14 (551)		14 (551)		14 (551)	
	Drain Connection - no. & size		(1) 1 in. NPT coupling		(1) 1 in. NPT coupling		(1) 1 in. NPT coupling	
	Expansion device type		Balanced Port Thermostatic Expansion Valve, removeable power head					
Standard Indoor Blower and Drive	[4] Belt Drive - Nominal motor output		2 hp (1.5 kW)		2 hp (1.5 kW)		3 hp (2.2 kW)	
	Maximum usable output (US Only)		2.3 hp (1.7 kW)		2.3 hp (1.7 kW)		3.45 hp (2.6 kW)	
	Motor - Drive kit		kit #1 - 680 - 925 rpm		kit #1 - 680 - 925 rpm		kit #3 - 895 - 1120 rpm	
	Wheel nominal diameter x width - in. (mm)		(1) 15 x 15 (381 x 381)		(1) 15 x 15 (381 x 381)		(1) 15 x 15 (381 x 381)	
Filters	Type of filter		Disposable, pleated MERV 7 (standard) or MERV 11 (optional)					
	Number and size - in. (mm)		(4) 18 x 24 x 2 (457 x 610 x 51)		(4) 18 x 24 x 2 (457 x 610 x 51)		(4) 18 x 24 x 2 (457 x 610 x 51)	
Electrical characteristics			208/230V, 460V or 575V - 60 hertz - 3 phase					

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

[1] Certified in accordance with the ULE certification program, which is based on ARI Standard 340/360, 95°F (35°C) outdoor air temperature and 80°F (27°C) db/67°F (19°C) wb entering evaporator air; minimum external duct static pressure.

[2] Integrated Part Load Value rated at 80°F (27°C) outdoor air temperature, 80°F (27°C) db/67°F (19°C) wb indoor air temperature.

[3] Sound Rating Number rated in accordance with test conditions included in ARI Standard 270.

[4] Maximum usable output of motors 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.

OPTIONAL ACCESSORIES

Item		7.5 ton 090	8.5 ton 102	10 ton 120	12.5 ton 150
Cabinet Accessories	Coil Guards	TACGKGC10/15			
	Hail Guards	TAHGKGC10/15			
	Horizontal Discharge Conversion Kit	LTHSDKGC10/15			
Ceiling Diffusers	Step-Down - Net Weight	RTD11-95 88 lbs. (40 kg)	RTD11-135 205 lbs. (93 kg)		RTD11-185 392 lbs. (178 kg)
	Flush - Net Weight	FD11-95 75 lbs. (34 kg)	FD11-135 174 lbs. (79 kg)		FD11-185 289 lbs. (131 kg)
	Transitions (Supply and Return) - Net Weight	LASRT08/10 30 lbs (14 kg)	LASRT10/12 32 lbs (15 kg)		LASRT15 36 lbs. (16 kg)
Controls	Blower Proving Switch	LTABPSK			
	Dirty Filter Switch	LTADFSK			
	L Connection® Network	See Engineering Handbook			
	Smoke Detector - Supply	LTASASDK10/36			
	Smoke Detector - Return	LTRASDK-10/30			
Cooling Accessories	PVC Condensate Drain Trap	LTACDKP03/36			
	Copper Condensate Drain Trap	LTACDKC03/36			
	High Pressure Switch	TAHPK10/15			
	Compressor Crankcase Heater	TACCHK10/15			
	Low Ambient Kit	TALAK10/15			
Economizer	Economizer - Net Weight	TAREMD10/15 - 47 lbs. (21 kg)			
	Economizer Outdoor Air Hood - Net Weight Number and Size of Filters	LAOAH10/15 - 11 lbs. (5 kg) (2) 16 x 25 x 1 in. (406 x 635 x 25 mm)			
	Economizer Enthalpy Control - Differential	LTADEK03/36			
	Economizer Enthalpy Control - Outdoor	LTASEK03/36			
Barometric Relief	Down-Flow Barometric Relief Dampers - Net Weight	LAGED10/15 - 8 lbs. (4 kg)			
	Hood for Down-Flow LAGED	LAGEH09/15			
	Horizontal Barometric Relief Dampers - Net Weight	LAGEDH03/15 - 8 lbs. (4 kg)			
Outdoor Air Dampers	Damper Section (down-flow) - Automatic - Net Weight	TAOADM10/15 - 31 lbs. (14 kg)			
	Damper Section (down-flow) - Manual - Net Weight	LAOAD10/15 - 26 lbs. (12 kg)			
	Outdoor Air Hood (down-flow) Net Weight Number and Size of Filters	LAOAH10/15 - 11 lbs. (5 kg) (2) 16 x 25 x 1 in. (406 x 635 x 25 mm)			
Power Exhaust	Power Exhaust Fan - Net Weight	LAPEF10/15 - 28 lbs. (13 kg)			
Electrical Accessories	HACR Circuit Breaker	TAHBK10/15-* (indicate size)			
	Disconnect Switch	TADK10/15-80 (80A) TADK10/15-150 (150A)			
	GFI Service Outlets	LTAGFIK10/15			
Filters	MERV 11 High Efficiency	AFK-11 (18 x 24 x 2 specify four per unit)			
Gas Heating Accessories	Combustion Air Intake Extensions	LTACAIK10/15			
	Cold Weather Kit	LTACWK10/15-Y - 208/230V, LTACWK10/15-J - 575V			
	Gas Piping Kit	LTAGPSK10/15 (Through Curb), LTAGPB10/15 (Through Unit Base)			
	LPG/Propane Kits	LTALPGK-130 - Standard Heat, LTALPGK-180 - Medium Heat LTALPGK-240 - High Heat			
	Vertical Vent Extension Kit	LTAWEK10/15			
Indoor Air Quality (CO_2) Sensors	CO_2 Sensor Duct Mounting Kit	LTIAQSDMK03/36			
	Sensor - white case CO_2 display	LTAIAQSWDK03/36			
	Sensor - white case no display	LTAIAQSWN03/36			
	Sensor - black case CO_2 display	LTAIAQSND03/36			
	Sensor - duct mount, black, no display	LTAIAQSDMBN03/36			
	Aspiration Box for duct mounting	LTIAQABD03/36			
	Handheld CO_2 Monitor	LTAIAQSHM03/36			
Standard Roof Curbs	14 in. (356 mm) height - Net Weight	LARMF10/15-14 - 126 lbs. (57 kg)			
	24 in. (610 mm) height - Net Weight	LARMF10/15-24 - 174 lbs. (79 kg)			
Cliplock 1000 Roof Curbs	14 in. (356 mm) height - Net Weight	LARMF10/15S-14 - 126 lbs. (57 kg)			
	18 in. (457 mm) height - Net Weight	LARMF10/15S-18 - 156 lbs. (71 kg)			
	24 in. (610 mm) height - Net Weight	LARMF10/15S-24 - 174 lbs. (79 kg)			

ELECTRICAL DATA

7.5 TON STANDARD / HIGH EFFICIENCY

Model No.		TGA090S						TGA090H					
Line voltage data - 60 Hz - 3 phase		208/230V		460V		575V		208/230V		460V		575V	
Compressors (2)	Rated load amps - each (total)	12.8 (25.6)		6.4 (12.8)		5.1 (10.2)		12.4 (24.9)		6.4 (12.8)		4.8 (9.6)	
	Locked rotor amps - each (total)	91 (182)		46 (92)		37 (74)		88 (176)		44 (88)		34 (68)	
Condenser Fan Motor	Number of motors	2		2		2		2		2		2	
	Full load amps - each (total)	2.4 (4.8)		1.3 (2.6)		1.0 (2.0)		2.4 (4.8)		1.3 (2.6)		1.0 (2.0)	
	Locked rotor amps - each (total)	4.7 (9.4)		2.4 (4.8)		1.9 (3.8)		4.7 (9.4)		2.4 (4.8)		1.9 (3.8)	
Evaporator Blower Motor	Motor Output - hp	2	3	2	3	2	3	2	3	2	3	2	3
	kW	1.5	2.2	1.5	2.2	1.5	2.2	1.5	2.2	1.5	2.2	1.5	2.2
	Full load amps	7.5	10.6	3.4	4.8	2.7	3.9	7.5	10.6	3.4	4.8	2.7	3.9
	Locked rotor amps	46.9	66	20.4	26.8	16.2	23.4	46.9	66	20.4	26.8	16.2	23.4
[1] Maximum Overcurrent Protection (amps)	With Exhaust Fan	50	50	25	25	20	20	50	50	25	25	20	20
	Less Exhaust Fan	50	50	25	25	20	20	50	50	25	25	20	20
[2] Minimum Circuit Ampacity	With Exhaust Fan	44	47	22	24	18	19	43	46	22	24	17	18
	Less Exhaust Fan	42	45	21	22	17	18	41	44	21	22	16	17
Optional Power Exhaust Fan	(Number) Horsepower (W)	(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)	
	Full load amps	2.4		1.3		1.0		2.4		1.3		1.0	
	Locked rotor amps	4.7		2.4		1.9		4.7		2.4		1.9	
Service Outlet (2) 115 volt GFCI (amp rating)		15		15		15		15		15		15	

NOTE - Extremes of operating range are plus and minus 10 % of line voltage.
1 HACR type breaker or fuse.
2 Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

8.5 TON STANDARD / HIGH EFFICIENCY

Model No.		TGA102S						TGA102H					
Line voltage data - 60 Hz - 3 phase		208/230V		460V		575V		208/230V		460V		575V	
Compressors (2)	Rated load amps - each (total)	14.7 (29.4)		7.1 (14.2)		5.8 (11.6)		14.7 (29.4)		7.1 (14.2)		5.1 (10.2)	
	Locked rotor amps - each (total)	91 (182)		50 (100)		37 (74)		91 (182)		46 (92)		37 (74)	
Condenser Fan Motors (2)	Full load amps - each (total)	2.4 (4.8)		1.3 (2.6)		1.0 (2.0)		2.4 (4.8)		1.3 (2.6)		1.0 (2.0)	
	Locked rotor amps - each (total)	4.7 (9.4)		2.4 (4.8)		1.9 (3.8)		4.7 (9.4)		2.4 (4.8)		1.9 (3.8)	
Evaporator Blower Motor	Motor Output - hp	2	3	2	3	2	3	2	3	2	3	2	3
	kW	1.5	2.2	1.5	2.2	1.5	2.2	1.5	2.2	1.5	2.2	1.5	2.2
	Full load amps	7.5	10.6	3.4	4.8	2.7	3.9	7.5	10.6	3.4	4.8	2.7	3.9
	Locked rotor amps	46.9	66	20.4	26.8	16.2	23.4	46.9	66	20.4	26.8	16.2	23.4
[1] Maximum Overcurrent Protection (amps)	With Exhaust Fan	60	60	30	30	20	25	60	60	30	30	20	20
	Less Exhaust Fan	60	60	25	30	20	20	60	60	25	30	20	20
[2] Minimum Circuit Ampacity	With Exhaust Fan	48	51	24	25	19	20	48	51	24	25	18	19
	Less Exhaust Fan	46	49	22	27	18	19	46	49	22	24	17	18
Optional Power Exhaust Fan	(Number) Horsepower (W)	(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)	
	Full load amps	2.4		1.3		1.0		2.4		1.3		1.0	
	Locked rotor amps	4.7		2.4		1.9		4.7		2.4		1.9	
Service Outlet (2) 115 volt GFCI (amp rating)		15		15		15		15		15		15	

NOTE - Extremes of operating range are plus and minus 10 % of line voltage.
1 HACR type breaker or fuse.
2 Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

ELECTRICAL DATA

10 TON STANDARD / HIGH EFFICIENCY

Model No.		TGA120S									TGA120H								
Line voltage data - 60 Hz - 3 phase		208/230V			460V			575V			208/230V			460V			575V		
Compressors (2)	Rated load amps - each (total)	15.4 (30.8)			7.4 (14.8)			5.9 (11.8)			17.3 (34.6)			9.0 (18.0)			7.1 (14.2)		
	Locked rotor amps - each (total)	124 (248)			59.6 (119.2)			49.4 (98.8)			123 (246)			62 (124)			50 (100)		
Condenser Fan Motors (2)	Full load amps - each (total)	2.4 (4.8)			1.3 (2.6)			1.0 (2.0)			2.4 (4.8)			1.3 (2.6)			1.0 (2.0)		
	Locked rotor amps - each (total)	4.7 (9.4)			2.4 (4.8)			1.9 (3.8)			4.7 (9.4)			2.4 (4.8)			1.9 (3.8)		
Evaporator Blower Motor	Motor Output - hp	2	3	5	2	3	5	2	3	5	2	3	5	2	3	5	2	3	5
	kW	1.5	2.2	3.7	1.5	2.2	3.7	1.5	2.2	3.7	1.5	2.2	3.7	1.5	2.2	3.7	1.5	2.2	3.7
	Full load amps	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1	7.5	10.6	16.7	3.4	4.8	7.6	2.7	3.9	6.1
	Locked rotor amps	46.9	66	105	20.4	26.8	45.6	16.2	23.4	36.6	46.9	66	105	20.4	26.8	45.6	16.2	23.4	36.6
[1] Maximum Overcurrent Protection (amps)	With Exhaust Fan	60	60	70	30	30	35	20	25	25	70	70	80	35	35	40	25	30	30
	Less Exhaust Fan	60	60	70	30	30	30	20	25	25	60	70	70	35	35	35	25	25	30
[2] Minimum Circuit Ampacity	With Exhaust Fan	50	53	59	24	26	29	19	21	23	54	57	63	28	29	32	22	23	26
	Less Exhaust Fan	47	51	57	23	25	27	18	20	22	52	55	61	27	28	31	21	22	25
Optional Power Exhaust Fan	(Number) Horsepower (W)	(1) 1/3 (249)			(1) 1/3 (249)			(1) 1/3 (249)			(1) 1/3 (249)			(1) 1/3 (249)			(1) 1/3 (249)		
	Full load amps	2.4			1.3			1.0			2.4			1.3			1.0		
	Locked rotor amps	4.7			2.4			1.9			4.7			2.4			1.9		
Service Outlet (2) 115 volt GFCI (amp rating)		15			15			15			15			15			15		

NOTE - Extremes of operating range are plus and minus 10 % of line voltage.
1 HACR type breaker or fuse.
2 Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

12.5 TON STANDARD EFFICIENCY

Model No.		TGA150S					
Line voltage data - 60 Hz - 3 phase		208/230V		460V		575V	
Compressors (2)	Rated load amps - each (total)	18.6 (37.2)		9 (18)		7.4 (14.8)	
	Locked rotor amps - each (total)	156 (312)		75 (150)		54 (108)	
Condenser Fan Motors (2)	Full load amps - each (total)	3.0 (6.0)		1.5 (3.0)		1.2 (2.4)	
	Locked rotor amps - each (total)	6.0 (12.0)		3.0 (6.0)		2.9 (5.8)	
Evaporator Blower Motor	Motor Output - hp	3	5	3	5	3	5
	kW	2.2	3.7	2.2	3.7	2.2	3.7
	Full load amps	10.6	16.7	4.8	7.6	3.9	6.1
	Locked rotor amps	66	105	26.8	45.6	23.4	36.6
[1] Maximum Overcurrent Protection (amps)	With Exhaust Fan	70	80	35	40	30	30
	Less Exhaust Fan	70	80	35	35	30	30
[2] Minimum Circuit Ampacity	With Exhaust Fan	61	67	30	33	24	27
	Less Exhaust Fan	59	65	29	31	23	26
Optional Power Exhaust Fan	(Number) Horsepower (W)	(1) 1/3 (249)		(1) 1/3 (249)		(1) 1/3 (249)	
	Full load amps	2.4		1.3		1.0	
	Locked rotor amps	4.7		2.4		1.9	
Service Outlet (2) 115 volt GFCI (amp rating)		15		15		15	

NOTE - Extremes of operating range are plus and minus 10 % of line voltage.
1 HACR type breaker or fuse.
2 Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

BELT 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 - Wet indoor coil air resistance of selected unit.
2 - Any factory installed options air resistance (heat section, economizer, etc.)
3 - Any field installed accessories air resistance (duct resistance, diffuser, etc.)

Then determine from blower table blower motor output and drive required.

BOLD INDICATES FIELD FURNISHED DRIVE.

Air Volume cfm (L/s)	Total Static Pressure - in. w.g. (Pa)											
	.20 (50)	.40 (100)	.60 (150)	.80 (200)	1.00 (250)	1.20 (300)	1.40 (350)	1.60 (400)	1.80 (450)	2.00 (495)	2.20 (545)	2.40 (595)	2.60 (645)
	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)	RPM BHP (kW)
2250 (1060)	**455 0.30 (0.22)**	**555 0.45 (0.34)**	**640 0.60 (0.45)**	720 0.80 (0.60)	790 1.00 (0.75)	855 1.20 (0.90)	915 1.40 (1.04)	975 1.60 (1.19)	1030 1.85 (1.38)	1080 2.05 (1.53)	1130 2.30 (1.72)	1175 2.55 (1.90)	1220 2.80 (2.09)
2500 (1180)	**475 0.40 (0.30)**	**575 0.55 (0.41)**	**660 0.70 (0.52)**	735 0.90 (0.67)	805 1.10 (0.82)	870 1.30 (0.97)	930 1.55 (1.16)	985 1.75 (1.31)	1040 2.00 (1.49)	1090 2.25 (1.68)	1140 2.50 (1.87)	1185 2.75 (2.05)	1230 3.00 (2.24)
2750 (1300)	**495 0.45 (0.34)**	**595 0.65 (0.48)**	**675 0.85 (0.63)**	750 1.05 (0.78)	820 1.25 (0.93)	885 1.45 (1.08)	940 1.70 (1.27)	995 1.90 (1.42)	1050 2.20 (1.64)	1100 2.45 (1.83)	1145 2.65 (1.98)	1195 2.95 (2.20)	1240 3.25 (2.42)
3000 (1415)	**525 0.55 (0.41)**	**615 0.75 (0.56)**	695 0.95 (0.71)	770 1.20 (0.90)	835 1.40 (1.04)	895 1.60 (1.19)	955 1.85 (1.38)	1010 2.10 (1.57)	1060 2.35 (1.75)	1110 2.65 (1.98)	1160 2.90 (2.16)	1205 3.20 (2.39)	1250 3.45 (2.57)
3250 (1535)	**550 0.65 (0.48)**	**640 0.90 (0.67)**	715 1.10 (0.82)	790 1.35 (1.01)	855 1.60 (1.19)	915 1.80 (1.34)	970 2.05 (1.53)	1025 2.35 (1.75)	1075 2.60 (1.94)	1125 2.85 (2.13)	1170 3.15 (2.35)	1215 3.40 (2.54)	1260 3.70 (2.76)
3500 (1650)	**580 0.80 (0.60)**	**665 1.05 (0.78)**	740 1.25 (0.93)	810 1.50 (1.12)	870 1.75 (1.31)	930 2.00 (1.49)	985 2.25 (1.68)	1040 2.55 (1.90)	1090 2.85 (2.13)	1135 3.10 (2.31)	1185 3.40 (2.54)	1230 3.70 (2.76)	1270 4.00 (2.98)
3750 (1770)	**605 0.95 (0.71)**	690 1.20 (0.90)	760 1.45 (1.08)	830 1.70 (1.27)	890 1.95 (1.45)	950 2.25 (1.68)	1005 2.50 (1.87)	1055 2.80 (2.09)	1105 3.10 (2.31)	1150 3.35 (2.50)	1195 3.65 (2.72)	1240 3.95 (2.95)	1285 4.30 (3.21)
4000 (1890)	**635 1.10 (0.82)**	715 1.40 (1.04)	785 1.65 (1.23)	850 1.90 (1.42)	910 2.20 (1.64)	965 2.45 (1.83)	1020 2.75 (2.05)	1070 3.05 (2.28)	1120 3.35 (2.50)	1165 3.65 (2.72)	1210 3.95 (2.95)	1255 4.30 (3.21)	1295 4.60 (3.43)
4250 (2005)	**665 1.30 (0.97)**	740 1.60 (1.19)	810 1.85 (1.38)	870 2.15 (1.60)	930 2.45 (1.83)	985 2.75 (2.05)	1040 3.05 (2.28)	1090 3.35 (2.50)	1135 3.65 (2.72)	1185 4.00 (2.98)	1225 4.30 (3.21)	1270 4.65 (3.47)	1310 4.95 (3.69)
4500 (2125)	695 1.50 (1.12)	770 1.80 (1.34)	835 2.10 (1.57)	895 2.40 (1.79)	955 2.70 (2.01)	1005 3.00 (2.24)	1060 3.35 (2.50)	1105 3.65 (2.72)	1155 4.00 (2.98)	1200 4.30 (3.21)	1245 4.65 (3.47)	1285 5.00 (3.73)	1325 5.30 (3.95)
4750 (2240)	725 1.75 (1.31)	795 2.05 (1.53)	860 2.40 (1.79)	920 2.70 (2.01)	975 3.00 (2.24)	1030 3.35 (2.50)	1080 3.65 (2.72)	1125 3.95 (2.95)	1175 4.35 (3.25)	1215 4.65 (3.47)	1260 5.00 (3.73)	1300 5.35 (3.99)	1340 5.70 (4.25)
5000 (2360)	760 2.05 (1.53)	825 2.35 (1.75)	885 2.65 (1.98)	945 3.00 (2.24)	1000 3.35 (2.50)	1050 3.65 (2.72)	1100 4.00 (2.98)	1145 4.35 (3.25)	1190 4.70 (3.51)	1235 5.05 (3.77)	1280 5.45 (4.07)	---	---
5250 (2475)	790 2.30 (1.72)	855 2.65 (1.98)	910 2.95 (2.20)	970 3.35 (2.50)	1020 3.65 (2.72)	1070 4.00 (2.98)	1120 4.35 (3.25)	1165 4.70 (3.51)	1210 5.10 (3.80)	1255 5.45 (4.07)	---	---	---
5500 (2595)	820 2.60 (1.94)	880 2.95 (2.20)	940 3.30 (2.46)	995 3.70 (2.76)	1045 4.05 (3.02)	1095 4.40 (3.28)	1145 4.80 (3.58)	1190 5.15 (3.84)	1230 5.50 (4.10)	---	---	---	---
5750 (2715)	850 2.95 (2.20)	910 3.30 (2.46)	965 3.70 (2.76)	1020 4.05 (3.02)	1070 4.45 (3.32)	1120 4.80 (3.58)	1165 5.20 (3.88)	1210 5.60 (4.18)	---	---	---	---	---
6000 (2830)	885 3.35 (2.50)	940 3.70 (2.76)	995 4.10 (3.06)	1045 4.45 (3.32)	1095 4.85 (3.62)	1145 5.25 (3.92)	1190 5.65 (4.21)	---	---	---	---	---	---

BLOWER DATA

ACCESSORY AIR RESISTANCE

Air Volume		Wet Indoor Coil				Gas Heat Exchanger						Economizer		MERV 11 Filter	
		090, 102		120S, 120H,150S		Standard Heat		Medium Heat		High Heat					
cfm	L/s	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa
2250	1060	.06	15	.10	25	.05	12	.07	17	.09	22	.035	9	.01	2
2500	1180	.08	20	.12	30	.05	12	.09	22	.11	27	.04	10	.01	2
2750	1325	.09	22	.14	35	.06	15	.10	25	.13	32	.045	11	.02	5
3000	1420	.10	25	.16	40	.07	17	.12	30	.16	40	.05	12	.02	5
3250	1535	.11	27	.19	47	.08	20	.15	37	.19	47	.06	15	.02	5
3500	1650	.13	32	.21	52	.09	22	.17	42	.22	55	.07	17	.03	7
3750	1770	.14	35	.23	57	.10	25	.20	50	.26	65	.075	19	.03	7
4000	1890	.16	40	.26	65	.11	27	.22	55	.30	75	.08	20	.04	10
4250	2005	.17	42	.28	70	.12	30	.25	62	.34	85	.09	22	.04	10
4500	2125	.18	45	.31	77	.13	32	.28	70	.38	94	.10	25	.04	10
4750	2240	.20	50	.33	82	.14	35	.31	77	.42	104	.11	27	.05	12
5000	2360	.22	55	.36	90	.16	40	.35	87	.47	117	.12	30	.06	15
5250	2475	.24	60	.39	97	.18	45	.38	94	.52	129	.13	32	.06	15
5500	2595	.26	65	.42	104	.20	50	.42	104	.57	142	.14	35	.07	17
5750	2715	.28	70	.45	112	.22	55	.46	114	.62	154	.15	37	.07	17
6000	2830	.30	75	.48	119	.24	60	.50	124	.68	169	.16	40	.08	20

AIR RESISTANCE - CEILING DIFFUSERS

Unit Size	Air Volume		RTD11 Step-Down Diffuser						FD11 Flush Diffuser	
			2 Ends Open		1 Side, 2 Ends Open		All Ends & Sides Open			
	cfm	L/s	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa	in. w.g.	Pa
090 Models	2400	1135	0.21	52	0.18	45	0.15	37	0.14	35
	2600	1225	0.24	60	0.21	52	0.18	45	0.17	42
	2800	1320	0.27	67	0.24	60	0.21	52	0.20	50
	3000	1415	0.32	80	0.29	72	0.25	62	0.25	62
	3200	1510	0.41	102	0.37	92	0.32	80	0.31	77
	3400	1605	0.50	124	0.45	112	0.39	97	0.37	92
	3600	1700	0.61	152	0.54	134	0.48	119	0.44	109
	3800	1795	0.73	182	0.63	157	0.57	142	0.51	127
102 & 120 Models	3600	1700	0.36	90	0.28	70	0.23	57	0.15	37
	3800	1795	0.40	99	0.32	80	0.26	65	0.18	45
	4000	1890	0.44	109	0.36	90	0.29	72	0.21	52
	4200	1980	0.49	122	0.40	99	0.33	82	0.24	60
	4400	2075	0.54	134	0.44	109	0.37	92	0.27	67
	4600	2170	0.60	149	0.49	122	0.42	104	0.31	77
	4800	2265	0.65	162	0.53	132	0.46	114	0.35	87
	5000	2360	0.69	172	0.58	144	0.50	124	0.39	97
	5200	2455	0.75	186	0.62	154	0.54	134	0.43	107
150 Models	4200	1980	0.22	55	0.19	47	0.16	40	0.10	25
	4400	2075	0.28	70	0.24	60	0.20	50	0.12	30
	4600	2170	0.34	85	0.29	72	0.24	60	0.15	37
	4800	2265	0.40	99	0.34	85	0.29	72	0.19	47
	5000	2360	0.46	114	0.39	97	0.34	85	0.23	57
	5200	2455	0.52	129	0.44	109	0.39	97	0.27	67
	5400	2550	0.58	144	0.49	122	0.43	107	0.31	77
	5600	2645	0.64	159	0.54	134	0.47	117	0.35	87
	5800	2735	0.70	174	0.59	147	0.51	127	0.39	97

DRIVE KIT SPECIFICATIONS

Motor Outputs				RPM Range				
Nominal hp	Maximum hp	Nominal kW	Maximum kW	Drive 1	Drive 3	Drive 4	Drive 5	Drive 6
2	2.3	1.5	1.7	680 - 925	895 - 1120	- - -	- - -	- - -
3	3.45	2.2	2.6	680 - 925	895 - 1120	- - -	1110 - 1395	- - -
5	5.75	3.7	4.3	- - -	- - -	895 - 1120	- - -	1110 - 1395

NOTE - Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors 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.

CEILING DIFFUSER AIR THROW DATA

Model No.	Air Volume		[1]Effective Throw Range RTD11 Step-Down		FD11 Flush	
	cfm	L/s	ft.	m	ft.	m
090	2600	1225	24 - 29	7 - 9	19 - 24	6 - 7
	2800	1320	25 - 30	8 - 9	20 - 28	6 - 9
	3000	1415	27 - 33	8 - 10	21 - 29	6 - 9
	3200	1510	28 - 35	9 - 11	22 - 29	7 - 9
	3400	1605	30 - 37	9 - 11	22 - 30	7 - 9
102 120	3600	1700	25 - 33	8 - 10	22 - 29	7 - 9
	3800	1795	27 - 35	8 - 11	22 - 30	7 - 9
	4000	1885	29- 37	9 - 11	24 - 33	7 - 10
	4200	1980	32 - 40	10 - 12	26 - 35	8 - 11
	4400	2075	34 - 42	10 - 13	28 - 37	9 - 11
150	5600	2645	39 - 49	12 - 15	28 - 37	9 - 11
	5800	2740	42 - 51	13 - 16	29 - 38	9 - 12
	6000	2830	44 - 54	13 - 17	40 - 50	12 - 15
	6200	2925	45 - 55	14 - 17	42 - 51	13 - 16
	6400	3020	46 - 55	14 - 17	43 - 52	13 - 16
	6600	3115	47 - 56	14 - 17	45 - 56	14 - 17

[1] Throw is the horizontal or vertical distance an air stream travels on leaving the outlet or diffuser before the maximum velocity is reduced to 50 ft. (15 m) per miute. Four sides open.

POWER EXHAUST FANS PERFORMANCE

Return Air System Static Pressure		Air Volume Exhausted	
in. w.g.	Pa	cfm	L/s
0	0	4200	1980
0.05	12	3970	1875
0.10	25	3750	1770
0.15	37	3520	1660
0.20	50	3300	1560
0.25	62	3080	1455
0.30	75	2860	1350
0.35	87	2640	1245

TGA PARTS ARRANGEMENT

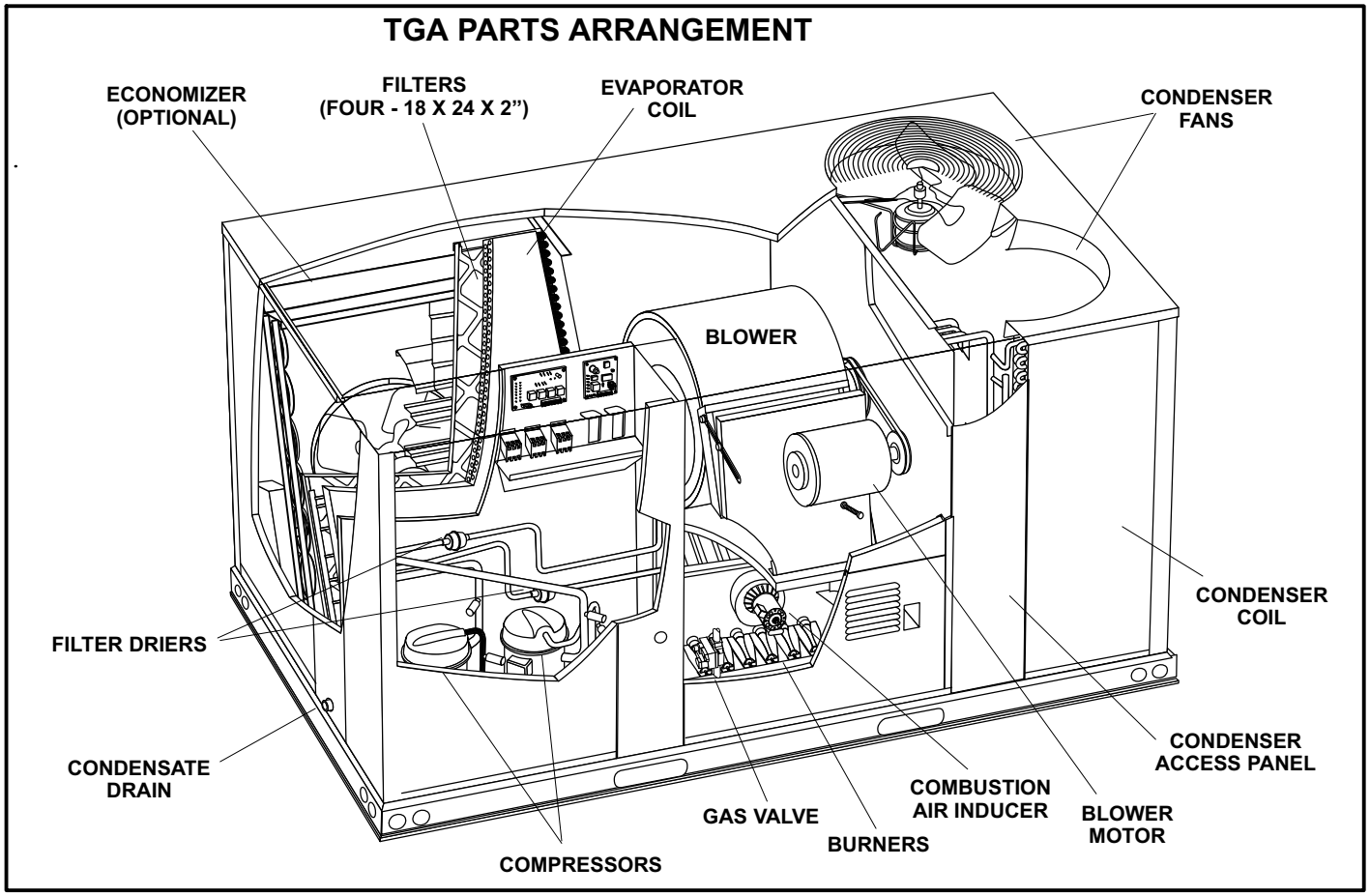


FIGURE 1

TGA CONTROL BOX

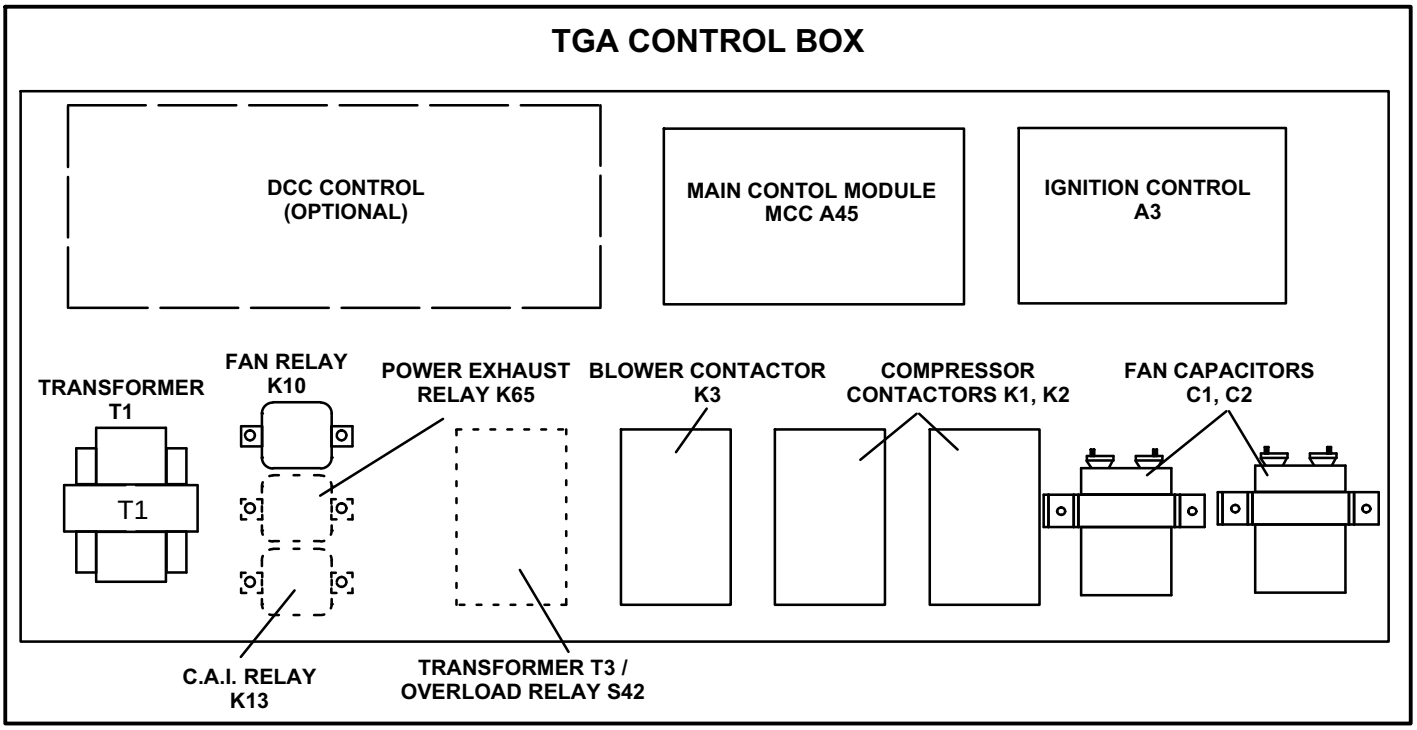


FIGURE 2

I-UNIT COMPONENTS

All 7.5 through 12.5 ton (26.3 through 44 kW) units are configure to order units (CTO). The TGA unit components are shown in figure 1. All units come standard with removable 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

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

1-Disconnect Switch S48 (Field Installed for all units)

All units may be equipped with an optional disconnect switch S48 or circuit breaker CB10. S48 and CB10 are toggle switches, which can be used by the service technician to disconnect power to the unit.

2-Control Transformer T1 all units

All use a single line voltage to 24VAC transformer mounted in the control box. Transformer supplies power to control circuits in the unit. The transformer is rated at 70VA and is protected by a 3.5 amp circuit breaker (CB8). The 208/230 (Y) voltage transformers use two primary voltage taps as shown in figure 3, while 460 (G) and 575 (J) voltage transformers use a single primary voltage tap.

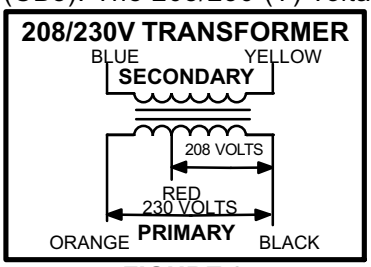


FIGURE 3

3-C. A. I. Transformers T3 575V units

All TGA 575 (J) voltage units use transformer T3 mounted in the control box. The transformers have an output rating of 0.5A. T3 transformer supplies 230 VAC power to the combustion air inducer motor (B6).

4-Terminal Strip TB1

All indoor thermostat connections will be to TB1 located on MCC board A45. For thermostats without “occupied “ and “unoccupied” modes, a factory installed jumper across terminals A1 and A2 should be in place.

5-Terminal Strip TB14

Terminal strip TB14 located on the MCC board A45 distributes 24V power from the thermostat to the control box components. Units not equipped with smoke detectors A17 or A64, will have a factory installed jumper across terminals 24VAC and R.

6-Condenser Fan Capacitors C1 & C2

Fan capacitors C1 and C2 are used to assist in the start up of condenser fans B4 and B5. Ratings will be on side of capacitor or outdoor fan motor nameplate.

7-Compressor Contactor K1 & K2

All compressor contactors are three-pole-double-break contactors with 24VAC coils. In all TGA units, K1 and K2 (energized by MCC board A45) energize compressors B1 and B2 in response to thermostat demand. K2 also serves as the line voltage terminal block for L1, L2 and L3.

8-Blower Contactor K3

Blower contactor K3, used in all units, is a three-pole-double-break contactor with a 24VAC coil used to energize the indoor blower motor B3 in response to blower demand. K3 is energized by relay KD on the MCC board.

9-Condenser Fan Relay K10

Outdoor fan relay K10 is a DPDT relay with a 24VAC coil. K10 energizes condenser fans B4 and B5.

10-C. A. I. Relay K13 575V Units

Combustion air inducer relay K13, used in 575 volt TGA units, is a DPDT relay with a 24VAC coil. K13 is energized by ignition control A3 after a first stage heating demand from the thermostat. K13 remains energized throughout the heating demand. When energized, K13 N.O. contacts close to energize combustion air blower and begin a heating sequence. Prove switch S18, located in the burner compartment, closes as combustion air static pressure falls to “prove” combustion air inducer operation. When S18 closes, the ignition control initiates the heating sequence.

11-Power Exhaust Relay K65 (PED units)

Power exhaust relay K65 is a DPDT relay with a 24VAC coil. K65 is used in all TGA units equipped with the optional power exhaust dampers. K65 is energized by the economizer enthalpy control A6, after the economizer dampers reach 50% open (adjustable) When K65 closes, exhaust fan B10 is energized.

INTEGRATED CONTROL BOARDS A3 & A45

12-Burner Control A3

⚠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.

The main control box (see figure 2) houses the burner control A3 and control module A45.

The ignition control provides four main functions: gas valve control, blower control, ignition, and flame sensing. The control has a green LED to show control status (table 1). The unit will usually ignite on the first trial and A3 allows three trials for ignition before locking out. The lockout time is 1 hour . After lockout, the ignition control automatically resets and provides three more attempts at ignition. Manual reset after lockout requires removing power from the control for more than 1 second or removing the thermostat call for heat for more than 1 second but no more than 20 seconds. 24 volt thermostat connections (P2) and heating component connections (J1) are made through separate jackplugs. See table 2 for thermostat terminations and table 3 for heating component terminations.

TABLE 1

LED	STATUS
Slow Flash	Normal operation. No call for heat.
Fast Flash	Normal operation. Call for heat.
Steady Off	Internal Control Fault, No Power To Board or Gas Valve Relay Fault
Steady On	Control Internal Failure.
2 Flashes	Lockout. Failed to detect or sustain flame.
3 Flashes	Rollout switch open / Prove switch open or closed.
4 Flashes	Primary High Limit switch open.
5 Flashes	Flame sensed but gas valve not open.
6 Flashes	On Board Microprocessors Disagree

IGNITION CONTROL A3

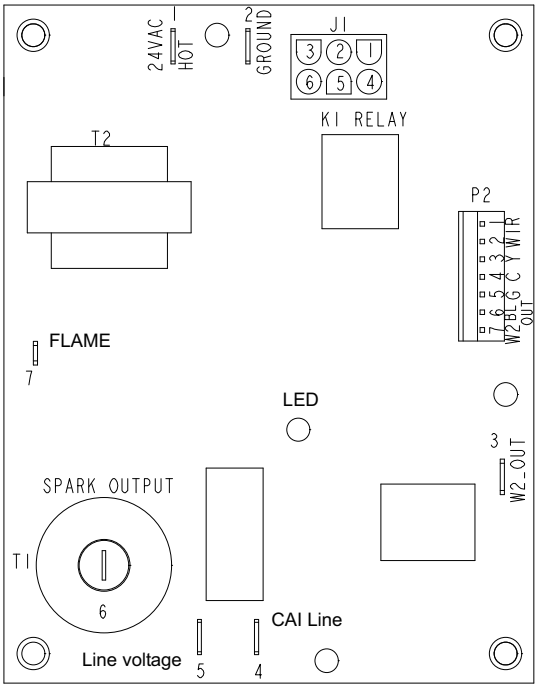


FIGURE 4

TABLE 2

P2 TERMINAL DESIGNATIONS	
Pin #	**Function**
1	**R** 24 Volts to thermostat
2	**W1** Heat Demand
3	**Y** Cool Demand
4	**C** Common
5	**G** Indoor Blower
6	**BL OUT** Indoor Blower Relay
7	**W2** Second Stage Heat

TABLE 3

J1 TERMINAL DESIGNATIONS	
Pin #	Function
1	Limit Switch Out
2	Rollout Switch / Prove Switch Out
3	Gas Valve Common
4	Gas Valve Out
5	Rollout Switch / Prove Switch In
6	Limit Switch In

Flame rectification sensing is used on all TGA 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.

Operation

On a heating demand, the ignition control checks for a closed limit switch and open combustion air prove 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, the spark electrode and the flame sensing electrode. Once the gas valve is energized the non-adjustable 40 second indoor blower delay period begins. Sparking stops immediately after flame is sensed or at the end of the 8 second trial for ignition.

The control then proceeds to “steady state” mode where all inputs are monitored to ensure the limit switch, rollout switch and prove switch are closed as well as flame is present. When the heat call is satisfied and the gas valve is de-energized, a combustion air inducer post purge period of 5 seconds begins along with a 120 second blower off delay.

13-MCC Control A45

The main control module A45 (figure 5) controls all cooling operation and serves as a staging point for all internal inputs to the appropriate components of the TGA unit. The MCC control receives and sends out 24 volts to the components located in the TGA control box, economizer and supply/return compartments. The control corresponds to compressor contactors K1, K2 and K14/K146 (if applicable) and indoor blower contactor K3. Thermostat hook ups (TB1) and accessory low voltage hook ups (TB14) are located on the board. See tables 5 and 6 for terminal designations. Tables 7, 8 and 9 show pin terminal designations.

Features

The MCC is equipped with a green LED for board status. See table 4 for LED flash codes. While in the cooling mode the board will incorporate AUTO-STAGING. If the board receives a Y3 demand (if applicable) the board will energize Y1, Y2 and Y3 in successive order. In the same manner a Y2, will be interpreted as a Y1/Y2. The MCC control also incorporates a minimum run time of 4 minutes for up to 2 independent cooling stages. This 4 minute run time can be interrupted by pushing SW1 located on the board. If pressed for 3 seconds or more, the control does a soft reset. The MCC control board is used for all T series units. A dip switch, factory set, is provided to configure to unit type (TGA gas, TCA cooling/electric heat, THA heat pump)See figure 6.

MCC CONTROL BOARD (A45)

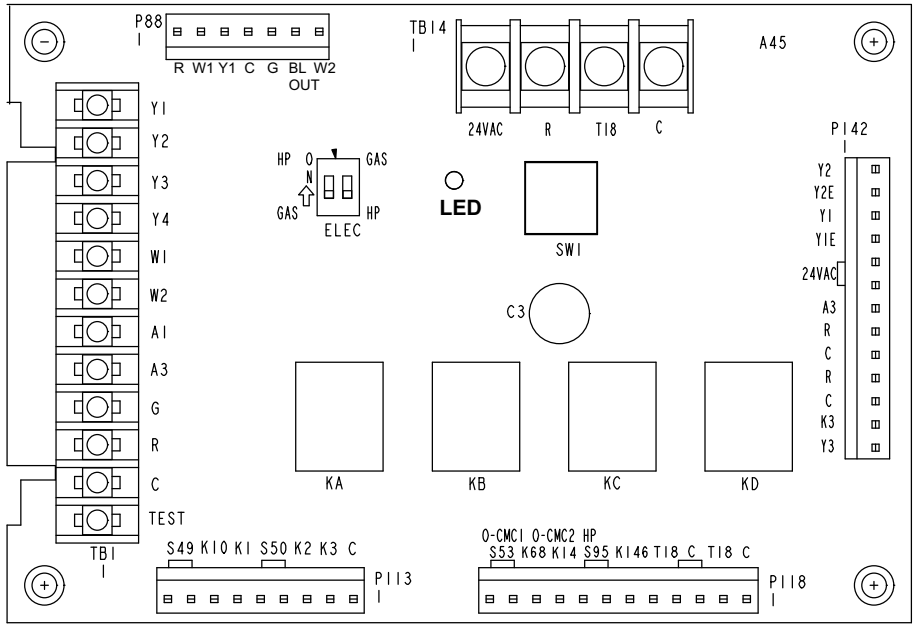


FIGURE 5

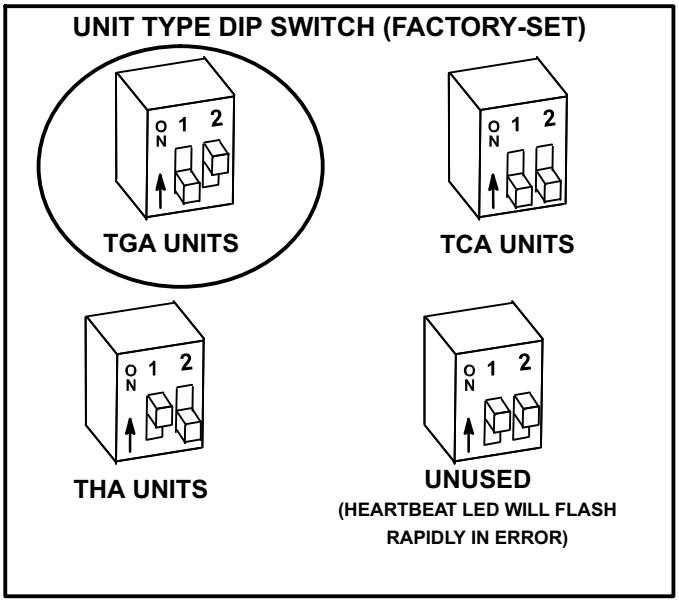


FIGURE 6

TABLE 4

LED Status	Indicates	Action
Off	No power to board.	Check field wiring.
On	Processor error.	Press MCC pushbutton and hold for three seconds to reset processor.*
Flashes Slowly	Normal.	None.
Flashes Rapidly	Invalid unit DIP switch selected.	Make sure switches are set correctly. Refer to figure 6.
Flashes Rapidly	Simultaneous heat and cool demands.	Check thermostat and wiring.

*Press pushbutton and immediately release to override the 4-minute compressor-minimum run time.

TABLE 5

TB1 TERMINAL DESIGNATIONS	
Y1	Cool Stage 1
Y2	Cool Stage 2
Y3	Cool Stage 3
Y4	Cool Stage 4
W1	Heat Stage 1
W2	Heat Stage 2
A1	Occupied Loop
A2	Occupied Loop
G	Indoor Blower
R	24V To Thermostat
C	Ground
TEST	Test Terminal (Disable Min Run Time)

TABLE 6

TB14 24VAC TERMINAL DESIGNATIONS	
24VAC	Uninterrupted 24 Volt Power
R	24 Volt Accessories (from T1 transformer)
T18	24 Volts (from T18 transformer)
C	Ground

TABLE 7

P142 TERMINAL DESIGNATIONS	
Terminal	**Function**
Y2	To Economizer (cool 2)
Y2E	To Processor (micro chip)
Y1	To Economizer (cool 1)
Y1E	To Processor (micro chip)
24V	To Smoke Detector
24V	From T1 Transformer
A1	Occupied Loop from Thermostat
24V	To Economizer
GND	Ground to Economizer
24V	From Transformer T1
GND	Ground
24V	From Transformer T18
Y3	To Processor (micro chip)

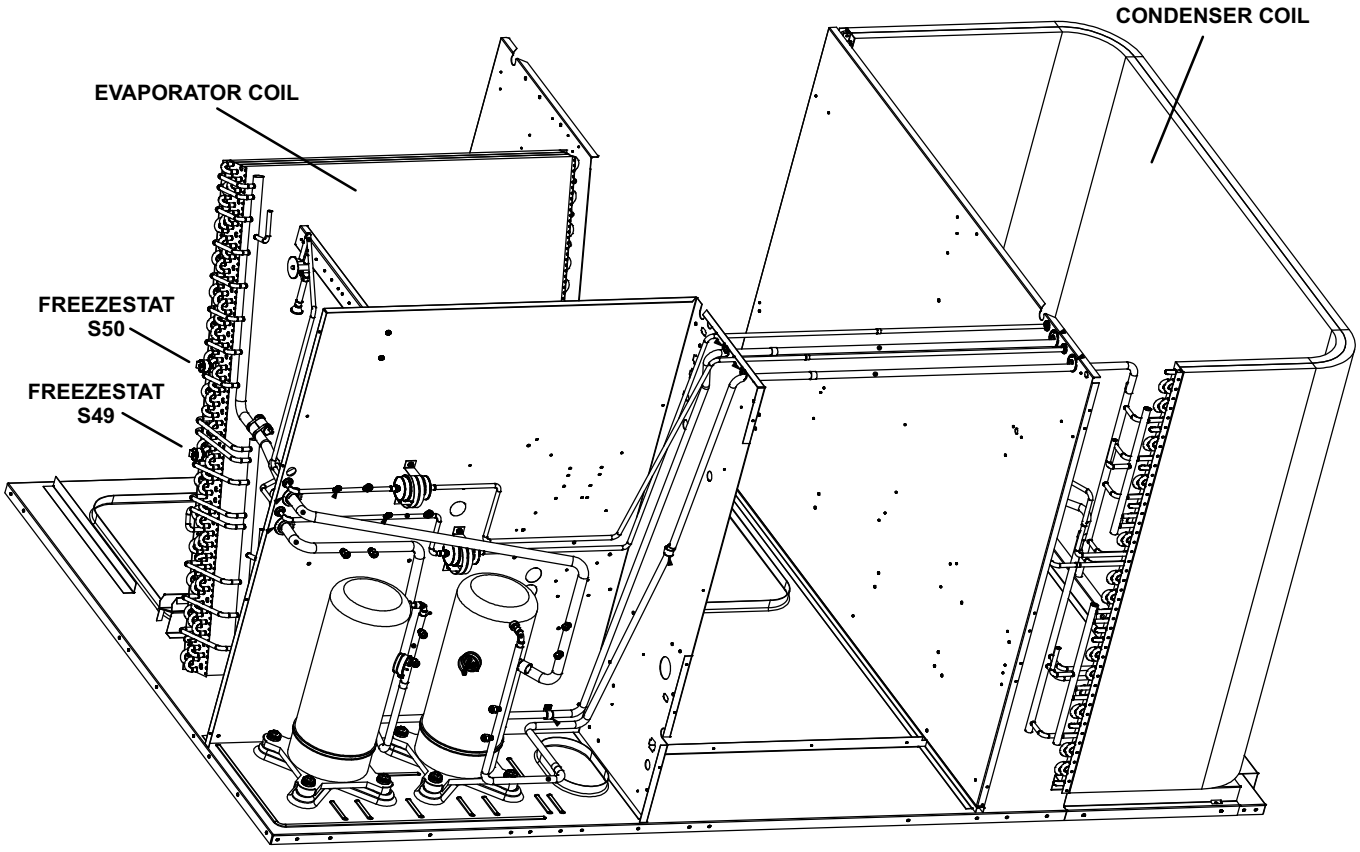
TABLE 8

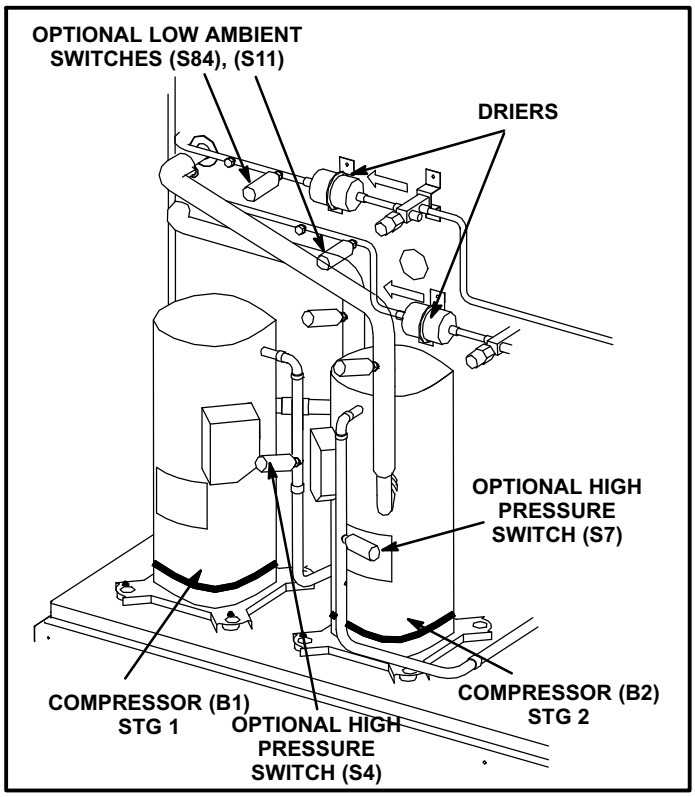
P113 TERMINAL DESIGNATIONS	
Terminal	**Function**
S49	Relay KC To Freezestat
S49	From Freezestat
K10	Relay KA To Outdoor Fan Contactor
K1	Freeze Stat to Compressor Contactor
S50	Relay KB To Freeze Stat
S50	From Freeze Stat
K2	Freeze Stat To Compressor Contactor
K3	KD To Fan Relay
C	Ground To Cooling Components

TABLE 9

P88 TERMINAL DESIGNATIONS	
Terminal	Function
R	24V To A3
W1	Heat Stage 1 to A3
Y1	Cooling Stage to A3
C	Ground to A3
G	Blower Demand to A3
BL Out	Blower Out from A3
W2	Heat Stage 2 to A3

TGA090,102, 120, 150 PLUMBING, COMPRESSOR AND REFRIGERANT CIRCUITS DETAIL





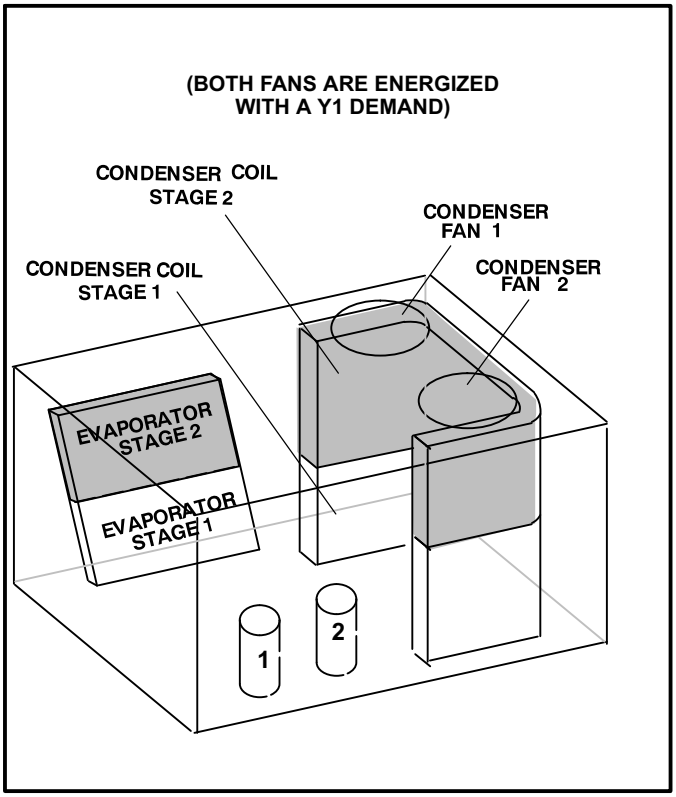


FIGURE 7

B-Cooling Components

All units use independent cooling circuits consisting of separate compressors, condenser coils and evaporator coils. See figure 7. Two draw-through type condenser fans are used in TGA090/150 units. All units are equipped with belt-drive blowers which draw air across the evaporator during unit operation.

Cooling may be supplemented by a factory- or field-installed economizer. The evaporators are slab type and are stacked. Each evaporator uses a thermostatic expansion valve as the primary refrigerant metering device. Each evaporator is also equipped with enhanced fins and rifled tubing. In all units each compressor is protected by a freezestats (on each evaporator). Low ambient switches (S11, S84) and high pressure switches (S4, S7) are available as an option for additional compressor protection.

1-Compressors B1 and B2

All TGA090/150 units use two scroll compressors. Compressor capacity may vary from stage to stage. In all cases, the capacity of each compressor is added to reach the total capacity of the unit. See “SPECIFICATIONS” and “ELECTRICAL DATA” (table of contents) or compressor nameplate for compressor specifications.

⚠ WARNING

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

Each compressor is energized by a corresponding compressor contactor.

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

2-Freezestats S49 and S50

Each unit is equipped with a low temperature switch (freezestat) located on a return bend of each evaporator coil. S49 (first circuit) and S50 (second circuit) are located on the corresponding evaporator coils.

Each freezestat is wired to the main control module (MCC) A45. Each 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 respective compressor until the coil temperature rises.

If the freezestats are 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.

3-High Pressure Switches S4 and S7 (optional)

The high pressure switch is a manual reset SPST N.C. switch which opens on a pressure rise.

S4 (first circuit) and S7 (second circuit) are located in the compressor discharge line and wired in series with the respective compressor contactor coils.

When discharge pressure rises to 450 ± 10 psig (3103 ± 69 kPa) (indicating a problem in the system) the switch opens and the respective compressor is de-energized (the economizer can continue to operate).

4-Low Ambient Switches S11 & S84 (optional)

The low ambient switch is an auto-reset SPST N.O. pressure switch which allows for mechanical cooling operation at low outdoor temperatures. In all models a switch is located in each liquid line prior to the indoor coil section.

In the TGA090/150, S11 and S84 are wired in parallel with outdoor fan relay K10 (compressor one).

When liquid pressure rises to 275 ± 10 psig (1896 ± 69 kPa), the switch closes and the condenser fans are energized. When discharge pressure in both refrigerant circuits drops to 150 ± 10 psig (1034 ± 69 kPa), the switches open and the condenser fans are de-energized. This intermittent fan operation results in higher evaporating temperature allowing the system to operate without icing the evaporator coil and losing capacity.

C-Blower Compartment

The blower compartment in all TGA090/150S units is located between the evaporator coil and the condenser coil section. The blower assembly is accessed by disconnecting the blower motor . See *Blower Access* in the Operation / Adjustment section. The blower pulls out as shown in figure 8.

1-Blower Wheels

All TGA090/150 units have one 15 in. x 15 in. (381 mm x 381 mm) blower wheel.

2-Indoor Blower Motor B3

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

OPERATION / ADJUSTMENT

Blower Operation

Initiate blower demand at thermostat according to instructions provided with thermostat. Unit will cycle on thermostat demand. The following steps apply to applications using a typical electro-mechanical thermostat.

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

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

Blower Access

The blower assembly is secured to a sliding base which allows the entire assembly to be pulled out of the unit. See figure 8.

1- Turn off power to unit. Remove the clamp which secures the blower wiring to the blower motor base.

2- Remove and retain screws on either side of sliding base. Pull base toward outside of unit.

3- Slide base back into original position when finished servicing. Replace the clamp and blower wiring in the previous location on the blower motor base. Re-install screws after servicing blower.

Determining Unit CFM

1- The following measurements must be made with a dry indoor coil. Run blower without a cooling demand. Measure the indoor blower shaft RPM. Air filters must be in place when measurements are taken.

2- With all access panels in place, measure static pressure external to unit (from supply to return). *Measure static below roof curb if roof curb is used.*

3- Refer to blower tables in BLOWER DATA (table of contents) in the front of this manual. Use static pressure and RPM readings to determine unit air volume.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 8. Do not exceed minimum and maximum number of pulley turns as shown in table 10.

TABLE 10
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum Turns Open
A Section	No minimum	5
B Section	1*	6

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

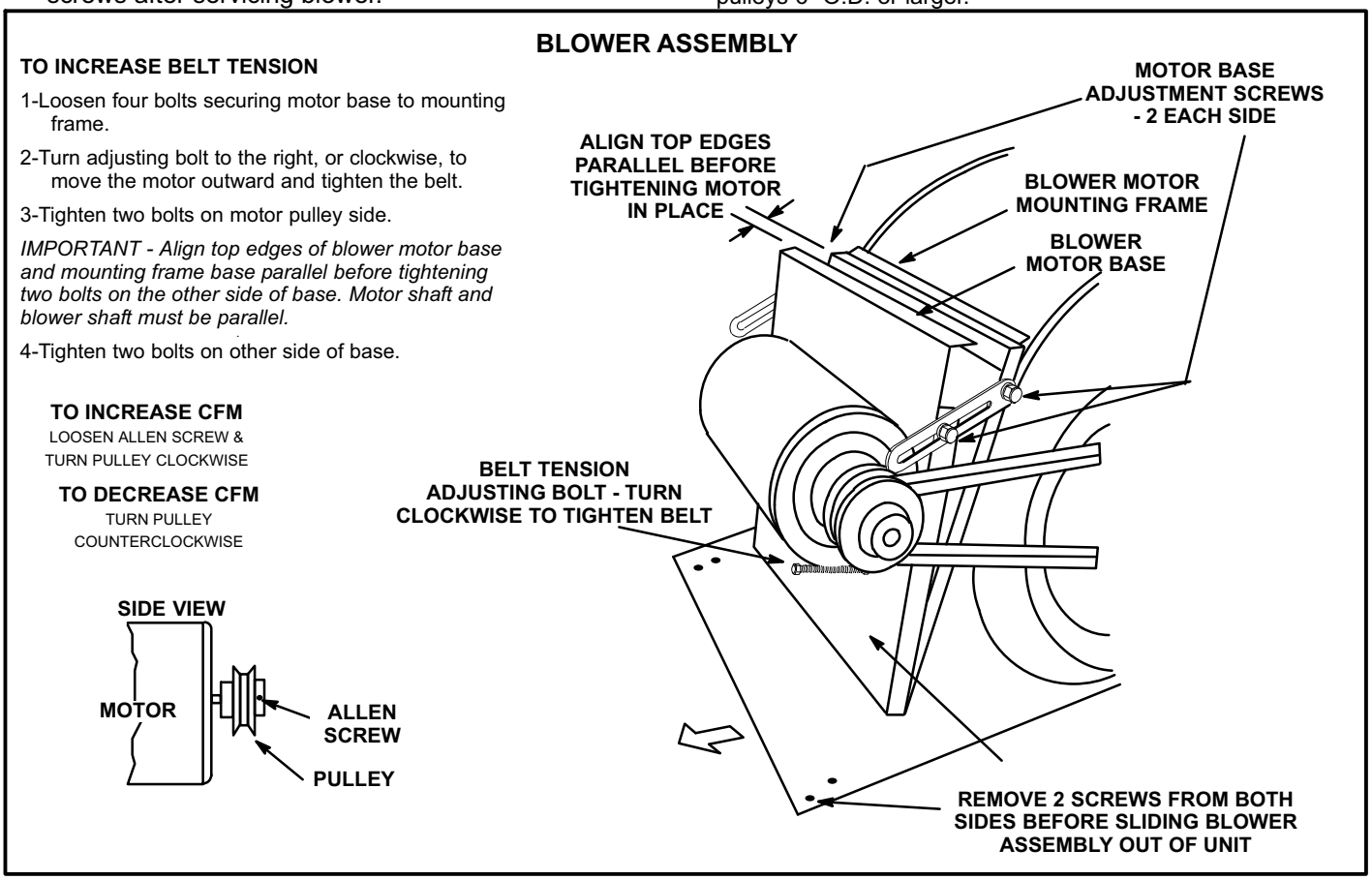


FIGURE 8

Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat grooves. Make sure blower and motor pulley are aligned as shown in figure 9.

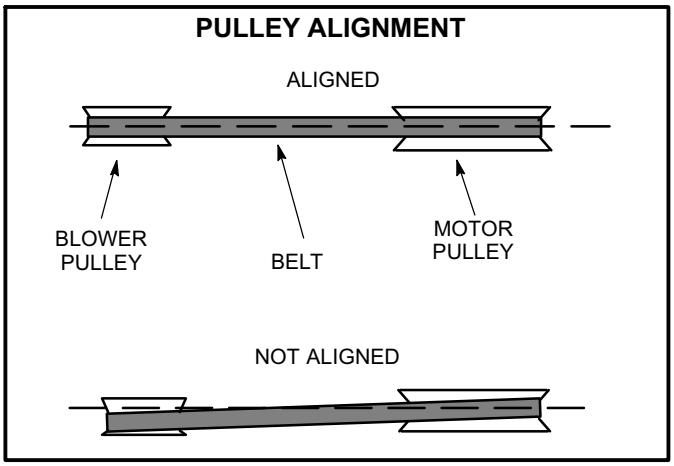


FIGURE 9

1- Loosen four bolts securing motor base to mounting frame. See figure 8.

2- *To increase belt tension -*
Turn adjusting bolt to the right, or clockwise, to move the motor outward and tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -
Turn the adjusting bolt to the left, or counterclockwise to loosen belt tension.

3- Tighten two bolts on motor pulley side. Tighten four bolts securing motor base to mounting frame.

IMPORTANT - Align top edges of blower motor base and mounting frame base parallel before tightening two bolts on the other side of base. Motor shaft and blower shaft must be parallel.

4- Tighten two bolts on other side of base.

Check Belt Tension

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

1- Measure span length X. See figure 10.

2- Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length.

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

Example: Deflection distance of a 400mm span would be 6mm.

3- Measure belt deflection force. For a used belt, the deflection force should be 5 lbs. (35kPa). A new belt deflection force should be 7 lbs. (48kPa).

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

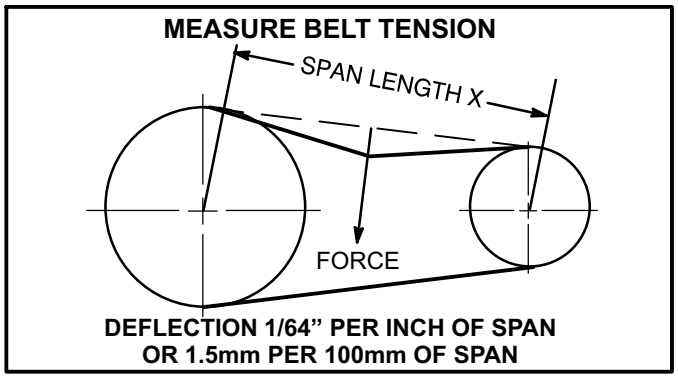


FIGURE 10

D-GAS HEAT COMPONENTS

TGA090/150 units are available in 130,000 BTUH (38.1 kW), 180,000 BTUH (52.7 Kw) or 240,000 BTUH (70.3 kW) heat sizes.

1-Heat Exchanger Figure 11

The TGA units use aluminized steel inshot burners with tubular aluminized steel heat exchangers and two-stage redundant gas valves. TGA090/150 units use one eleven tube/burner for high heat, one eight tube/burner for medium heat and one six tube/burner for standard heat. Burners in all units use a burner venturi to mix gas and air for proper combustion. Combustion takes place at each tube entrance. As hot combustion gases are drawn upward through each tube by the combustion air 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 accomplish staging by allowing more or less gas to the burners as called for by heating demand.

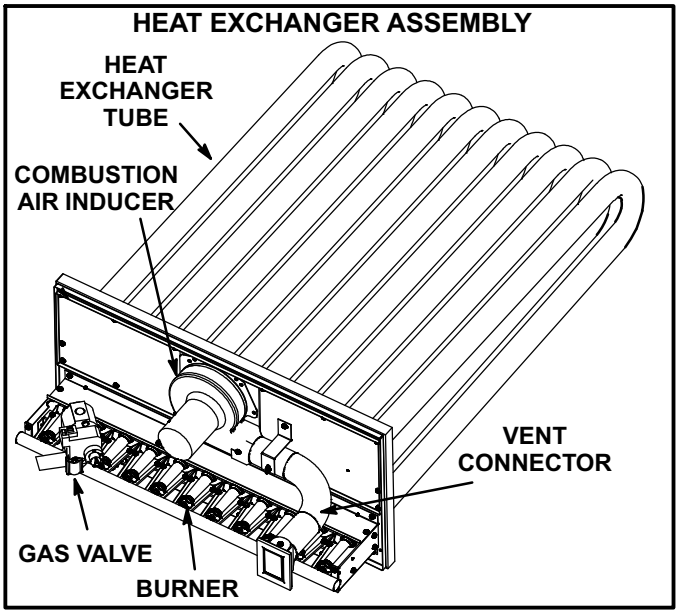


FIGURE 11

2-Burner Box Assembly (Figure 12)

The burner assembly consists of a spark electrode, flame sensing electrode and gas valve. Ignition board A3 controls 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. Burner maintenance and service is detailed in the SERVICE CHECKS section of this manual.

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.

Each orifice and burner are sized specifically to the unit.

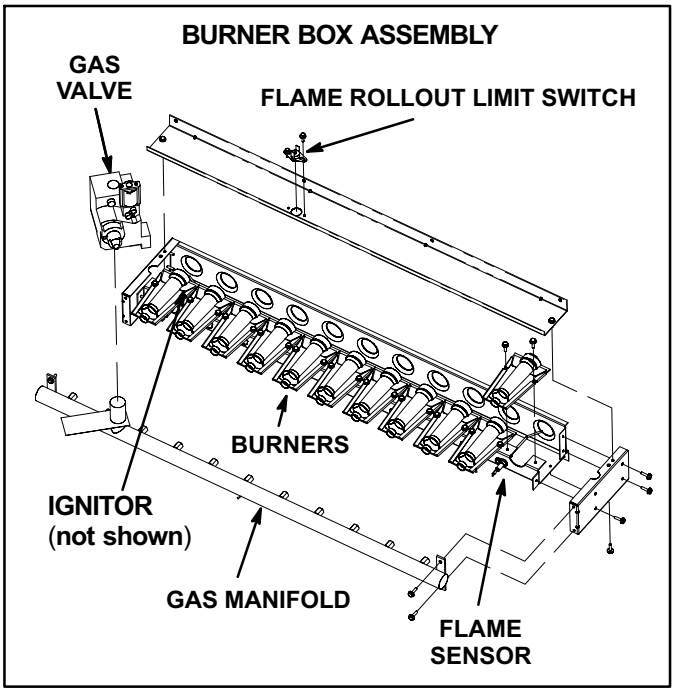


FIGURE 12

3-Primary High Temperature Limit S10

S10 is a SPST N.C.high temperature primary limit for gas heat in TGA090/150 units. On TGA090/150 S10 is located on the blower deck behind the blower. See figure 13.

Primary limit S10 is wired to the ignition control A3. Its N.C. contacts open to de-energize the ignition control when excessive temperature is reached in the blower compartment. If the limit trips the blower relay coil K3 will be energized by ignition control A3. Three limits with different actuating temperatures are used for limits S10.

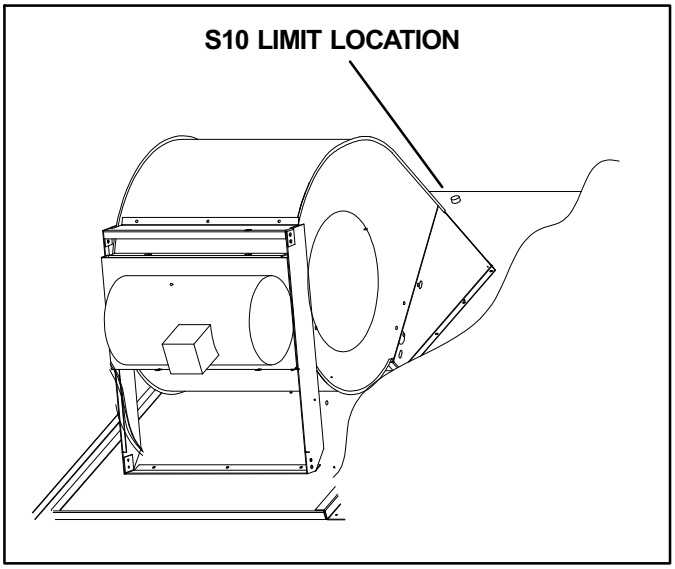


FIGURE 13

4-Flame Rollout Limit Switch S47

Flame rollout limit switch S47 is a SPST N.C. high temperature limit located just above the burner air intake opening in the burner enclosures (see figure 12). S47 is wired to the ignition control A3. When S47 senses flame rollout (indicating a blockage in the combustion air passages), the flame rollout limit trips, and the ignition control immediately closes the gas valve.

Limit S47 is factory preset to open at 290°F ± 12°F (143°C ± 6.7°C) on a temperature rise on all units. All flame rollout limits are manual reset.

5-Combustion Air Prove Switch S18

Prove switch S18 is a SPST N.O. switch located to the right of the induced draft assembly. S18 monitors combustion air inducer operation. Switch S18 is wired to the ignition control A3. The switch closes at *negative* 0.46"W.C. ± 0.05" (114 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. The switch will automatically open on a pressure rise (less negative pressure) at 0.31" W.C. ± 0.05" W.C. (77.2 Pa ± 12.4 Pa).

6-Combustion Air Inducer B6

Combustion air inducers on TGA090/150 units 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 4.81in. x 1.25in. (122mm x 32mm) blower wheel. All motors operate at 3200RPM and are equipped with auto-reset overload protection. Inducers are supplied by various manufacturers. Ratings may vary by manufacturer. Specific inducer electrical ratings can be found on the unit rating plate.

On a heating demand (W1), the ignition control A3 initiates the heating cycle. 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 ignition control activates the first stage operator of the gas valve (low fire), the spark and the flame sensing electrode. Sparking stops immediately after flame is sensed or at the end of the eight second trial for ignition.

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

7-Combustion Air Motor Capacitor C3

The combustion air inducer motors in all TGA 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.

8-Gas Valves GV1

Gas valve GV1 is a two-stage redundant valve. Units are equipped with valves manufactured by White-Rodgers or Honeywell. On a call for first stage heat (low fire), the valve is energized by the ignition control simultaneously with the spark electrode. On a call for second stage heat (high fire), the second stage operator is energized directly from A3. A manual shut-off knob is provided on the valve for shut-off. Manual shut-off knob immediately closes both stages without delay. On both valves first stage (low fire) is quick opening (on and off in less than 3 seconds).

On the White-Rodgers valve second stage is slow opening (on to high fire pressure in 40 seconds and off to low fire pressure in 30 seconds). The White-Rodgers valve is adjustable for high fire only. Low fire is not adjustable. On the Honeywell valve second stage is quick opening. The Honeywell valve is adjustable for both low fire and high fire. Figures 16 and 17 show gas valve components. Table 11 shows factory gas valve regulation for TGA series units.

TABLE 11

GAS VALVE REGULATION				
Max. Inlet Pressure	Operating Manifold Pressure			
13.0" W.C.	Natural		L.P.	
	Low	High	Low	High
	1.6 ± 0.2" W.C.	3.7 ± 0.3" W.C.	6.5" ± 0.3" W.C	10.5" ± 0.5" W.C.

9-Spark Electrode Figure 14

An electrode assembly is used for ignition spark.The electrode is mounted through holes under the left most burner location. 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 14) and ignites the left burner. Flame travels from burner to burner until all are lit.

The spark electrode is connected to the ignition control by a 8 mm silicone-insulated stranded high voltage wire. The wire uses 1/4" (6.35 mm)female quick connect on both ends of the wire.

NOTE - If electrode wire is replace, 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 14.

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

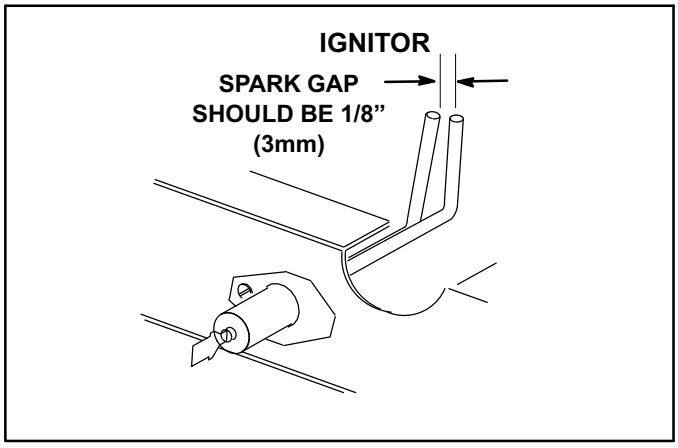


FIGURE 14

10-Flame Sensor Figure 15

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

When flame is sensed by the flame sensor (indicated by microamp signal through the flame) sparking stops immediately 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.

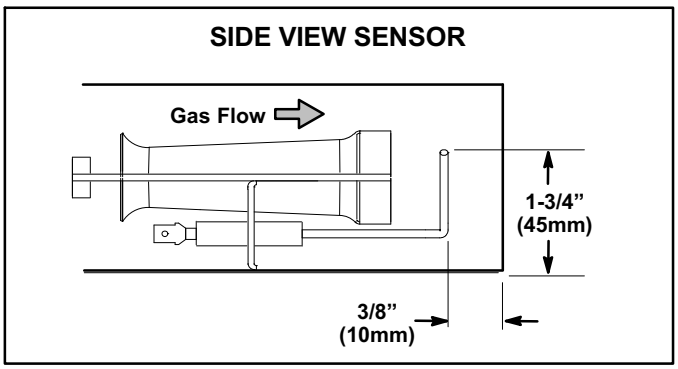


FIGURE 15

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 (LARMF18/36 or LARMFH18/24).

III-STARTUP - 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.

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

B-Heating Startup

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠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.

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

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

⚠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 for White Rodgers 36C (figure 16) and Honeywell VR8205Q/VR8305Q (figure 17)

1- Set thermostat to lowest setting.

2- Turn off all electrical power to appliance.

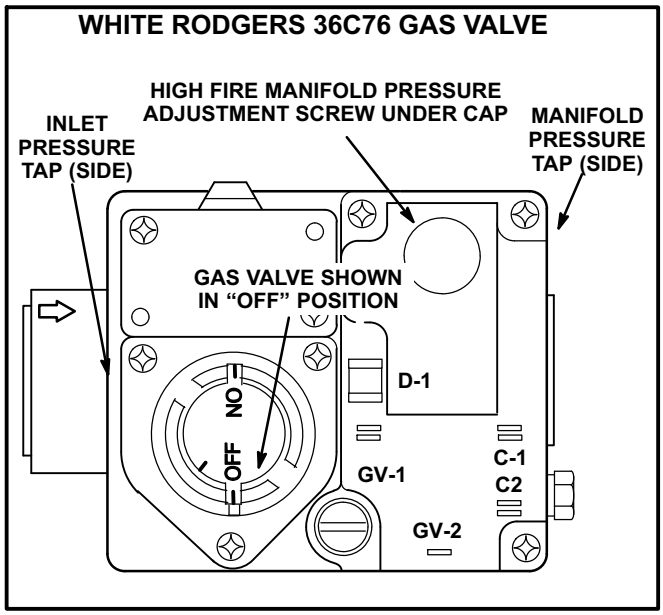


FIGURE 16

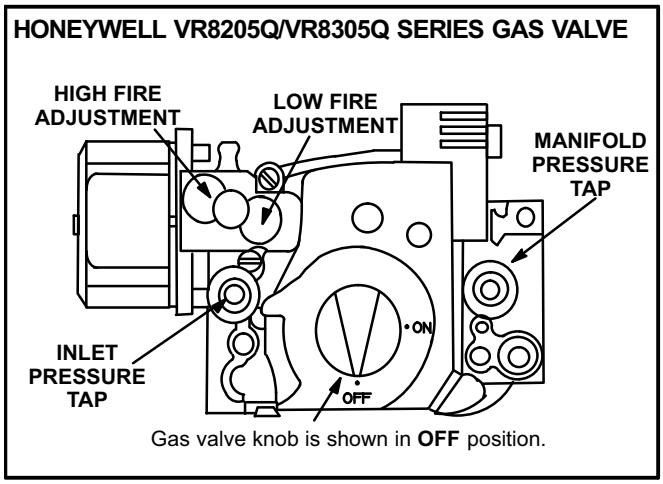


FIGURE 17

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

4- Open or remove the heat section access panel.

5- Turn the knob on the gas valve clockwise ↷ to **"OFF"**. Depress 36C knob slightly. Do not force.

6- Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas, go to the next step.

7- Turn the knob on the gas valve counterclockwise ↶ to **"ON"**. Do not force.

8- Close or replace the heat section access panel.

9- Turn on all electrical power to appliance.

10- Set thermostat to desired setting.

11- The combustion air inducer will start. The burners will light within 40 seconds.

12- If the appliance does not light the first time (gas line not fully purged), it will attempt up to two more ignitions before locking out.

13- If lockout occurs, repeat steps 1 through 10.

14- If the appliance will not operate, follow the instructions "Turning Off Gas to Appliance" and call your service technician or gas supplier.

Turning Off Gas to 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 heat section access panel.

4- Turn the knob on the gas valve clockwise ↷ to **"OFF"**. Depress 36C knob slightly. Do not force.

5- Close or replace the heat section access panel.

C-Cooling Startup

1- Initiate first and second stage cooling demands according to instructions provided with thermostat.

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

3- Units contain two refrigerant circuits or stages. See figure 18.

4- Each refrigerant circuit is separately charged with refrigerant. See unit rating plate for correct amount of charge.

NOTE - Refer to IV-CHARGING for proper method to check refrigerant charge.

Three Phase Scroll Compressor Voltage Phasing

Three phase power supplied to the unit disconnect switch must be phased sequentially to ensure the scroll compressor and indoor blower rotate in the correct direction. Compressor and blower are wired in phase at the factory. Power wires are color-coded as follows: line 1-red, line 2-yellow, line 3-blue.

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

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

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

3- Disconnect all remote electrical power supplies.

4- Reverse any two field-installed wires connected to the line side of K2 contactor or disconnect switch if installed. 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.

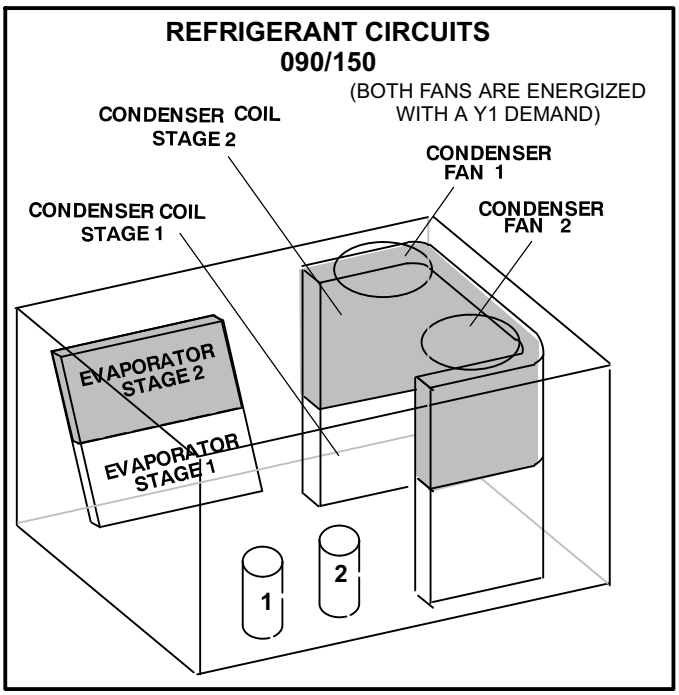


FIGURE 18

D-Safety or Emergency Shutdown

Turn off power to unit.

IV-CHARGING

⚠ WARNING

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

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

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires charge, *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- Attach gauge manifolds and operate unit in cooling mode until system stabilizes (approximately five minutes). Make sure outdoor air dampers are closed.

2- Check each system separately with all stages operating.

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

4- Apply the outdoor temperature to tables 12 through 18 to determine normal operating pressures.

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 the following approach method along with the normal operating pressures to confirm readings.

TABLE 12
TGA090S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	175	74	180	73
75°F	200	76	206	73
85°F	228	77	236	74
95°F	260	79	269	75
105°F	292	80	303	77
115°F	329	82	343	80

TABLE 13
TGA090H NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	152	74	156	76
75°F	175	77	181	78
85°F	202	79	209	80
95°F	231	81	239	81
105°F	262	81	274	83
115°F	295	82	310	85

TABLE 14
TGA102S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	170	74	178	73
75°F	196	75	204	73
85°F	227	77	237	74
95°F	260	79	272	76
105°F	298	81	313	77
115°F	341	83	360	79

TABLE 15
TGA102H NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dls. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	156	72	160	75
75°F	181	75	186	77
85°F	207	76	213	79
95°F	234	77	243	81
105°F	266	78	277	82
115°F	300	80	313	84

TABLE 16
TGA120S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dls. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	169	74	176	77
75°F	195	77	203	79
85°F	222	79	233	81
95°F	252	81	264	82
105°F	283	82	300	83
115°F	319	84	340	84

TABLE 17
TGA120H NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dls. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	163	72	168	76
75°F	188	76	193	78
85°F	214	78	221	80
95°F	244	80	252	81
105°F	275	81	286	83
115°F	309	83	322	84

TABLE 18
TGA150S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dls. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	179	67	176	70
75°F	205	70	200	72
85°F	231	72	227	73
95°F	260	74	257	74
105°F	293	75	291	76
115°F	324	77	325	77

Charge Verification - Approach Method

1- Using the same thermometer, compare liquid temperature to outdoor ambient temperature.

Approach Temperature = Liquid temperature minus ambient temperature.

2- Approach temperature should be 7°F ± 1 (3.8°C ± 0.5). An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.

3- Do not use the approach method if system pressures do not match pressures in tables 12 through 18. The approach method is not valid for grossly over or undercharged systems.

V- SYSTEMS SERVICE CHECKS

A-Heating System Service Checks

All TGA units are C.G.A. design certified without modification.

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

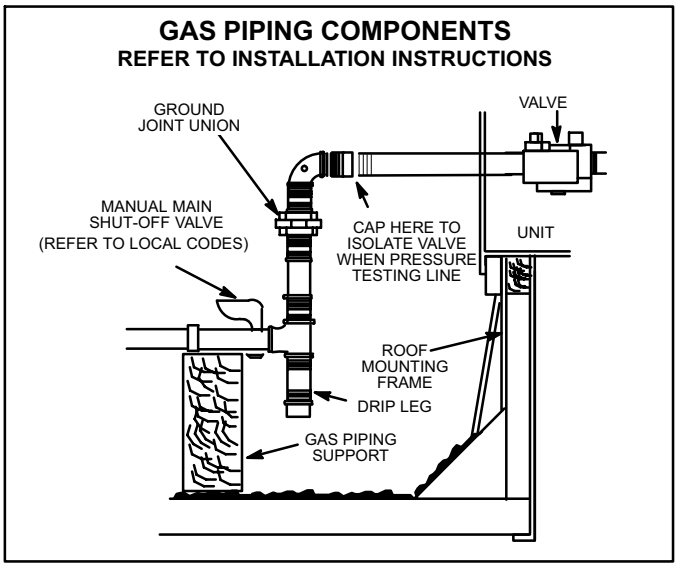


FIGURE 19

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

When pressure testing gas lines, the gas valve must be disconnected and isolated. **Gas valves can be damaged if subjected to more than 0.5 psig [14"W.C. (3481 Pa)]**. See figure 19.

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.

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 "underfire." High pressure can result in permanent damage to the gas valve or "overfire." For natural gas units, operating pressure at the unit gas connection must be between 4.7"W.C. and 10.5"W.C. (1168 Pa and 2610 Pa). For L.P. gas units, operating pressure at the unit gas connection must be between 10.8"W.C. and 13.5"W.C. (2685.3 Pa and 3356.7 Pa).

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 16 for location of pressure tap on the gas valve.

The manifold pressure is factory set and should not require adjustment. See table 19. If manifold pressure is incorrect and no other source of improper manifold pressure can be found, the valve must be replaced. See figure 16 or 17 for location of gas valve (manifold pressure) adjustment screw.

All gas valves are factory regulated. The gas valve should completely and immediately cycle off in the event of gas or power failure. The manual shut-off knob can be used to immediately shut off gas supply.

⚠ CAUTION

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

Manifold Adjustment Procedure

1- Connect test gauge to the outlet pressure tap on the gas valve. Start the unit (call for second stage heat) and allow five minutes for the unit to reach steady state.

2- While waiting for the unit to stabilize, notice the flame. The flame should be stable without flashback and should not lift from the burner heads. Natural gas should burn basically blue with some clear streaks. L.P. gas should burn mostly blue with some clear yellow streaks.

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

5-High Altitude

Units may be installed at altitudes up to 2000 feet (610 m) above sea level without any modification. At altitudes above 2000 feet (610 m), units must be derated to match the gas manifold pressures shown in table 19.

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

TABLE 19

Altitude - ft. (m)	Gas Manifold Pressure in. w.g. (kPa)	
	Natural	LP (Propane)
0 - 2000 (610)	3.7 (0.92)	10.5 (2.61)
2001 - 3000 (610 - 915)	3.6 (0.90)	10.2 (2.54)
3001 - 4000 (915 - 1220)	3.5 (0.87)	9.9 (2.46)
4001 - 5000 (1220 - 1525)	3.4 (0.85)	9.6 (2.39)
5001 - 6000 (1525 - 1830)	3.3 (0.82)	9.4 (2.34)
6001 - 7000 (1830 - 2135)	3.2 (0.80)	9.1 (2.26)
7001 - 8000 (2135 - 2440)	3.1 (0.77)	8.8 (2.19)

*Contact Technical Support for altitudes higher than 8000 ft. (2400m).

⚠ IMPORTANT

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

6-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 20. Seconds in table 20 are based on a 1 cu.ft. dial and gas value of 1000 btu's for natural and 2500 btu's for LP. Adjust manifold pressure on gas valve to match time needed.

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

TABLE 20

Unit in Btu's	Seconds for Natural	Seconds for Propane
130,000	28	69
180,000	20	50
240,000	15	37

7-Heat Exchanger

To Access or Remove Heat Exchanger From Unit:

1- Turn off gas and electric power.
2- Remove access panel(s) and unit center mullion.
3- Remove gas valve, manifold assembly and burners.
4- Remove combustion air inducer and flue box cover. 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.

8-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

TGA 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 12 through 18.

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

Product contains fiberglass wool.
Disturbing the insulation in this product during installation, maintenance, or repair will expose you to fiberglass wool. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)
Fiberglass wool may also cause respiratory, skin, and eye irritation.
To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown on unit nameplate or contact your supervisor.

A-Filters

Units are equipped with four 18 X 24 X 2" filters. Filters should be checked and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 20. *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.

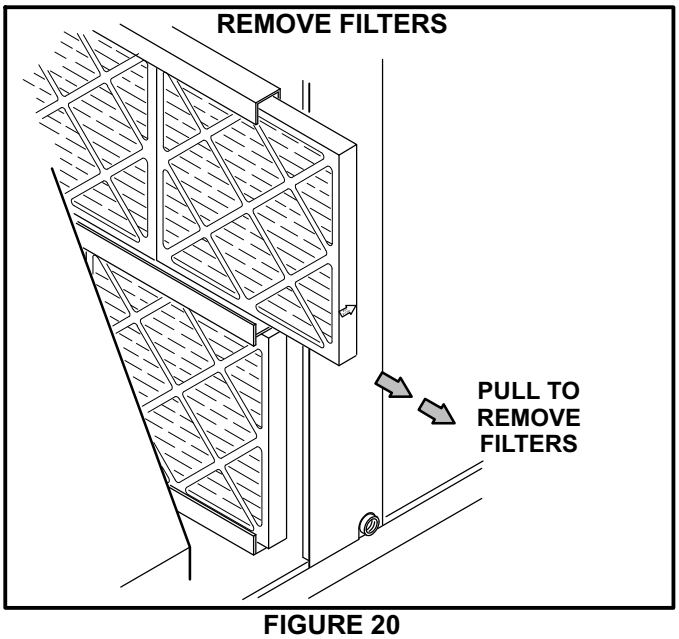


FIGURE 20

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 two screws securing burners to burner support and lift the burners from the orifices. See figure 12. Clean as necessary.

4- Locate the ignitor under the left burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 14.

5- Replace burners and screws securing gas manifold.

⚠WARNING

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

7- Replace access panel.

8- Restore electrical power and gas supply. Follow lighting instructions attached to unit and use inspection port in access panel to check flame.

D-Combustion Air Inducer

A combustion air proving switch checks combustion air inducer operation before allowing heating sequence to continue. The sequence will not be allowed to continue if inducer is obstructed.

The combustion air inducer wheel should be checked and cleaned prior to the heating season. It should be examined periodically during the heating season to establish an ideal cleaning schedule. With power supply disconnected, the condition of the inducer wheel can be determined by removing the vent pipe and inspecting the wheel through the outlet opening.

Clean combustion air inducer as follows:

1- Shut off power supply and gas to unit.

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

3- Remove and retain screws securing combustion air inducer to flue box. Remove and retain two screws from bracket supporting vent connector. See figure 11.

4- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Clean accumulated dust from front of flue box cover.

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

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

E-Flue Passageway and Flue Box

1- Remove combustion air inducer assembly as described in section D.

2- Remove flue box cover. Clean with a wire brush as required.

3- Clean tubes with a wire brush.

4- Reassemble the unit. The flue box cover gasket and combustion air inducer gasket should also be replaced during reassembly.

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.

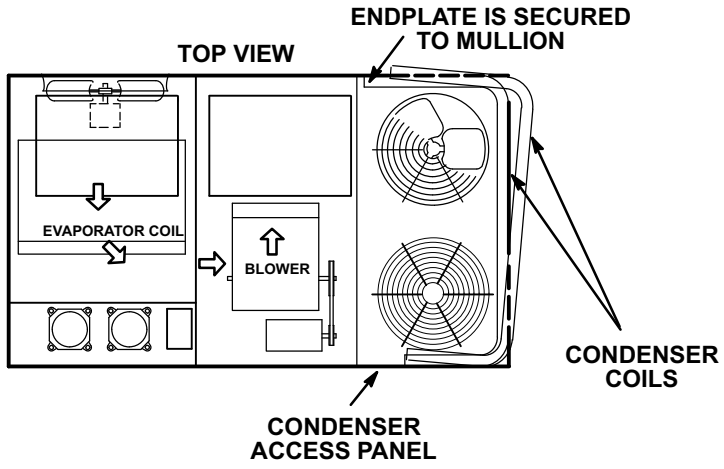
Condenser coils are made of one, two, and three formed slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 21. Flush coils with water following cleaning.

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 clips 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.

FIGURE 21

VII-ACCESSORIES

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

A-LARMF and LARMFH Mounting Frames

TGA090/150

When installing either the TGA units on a combustible surface for downflow discharge applications, the LARMF10/15 14-inch or 24-inch (356 mm or 610mm) height roof mounting frame is used. The roof mounting frames are recommended in all other applications but not required. If the TGA 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 LARMF mounting frame is shown in figure 22. 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 23. Refer to the roof mounting frame installation instructions for proper plenum construction and attachment.

ASSEMBLED ROOF MOUNTING FRAME TGA090/150

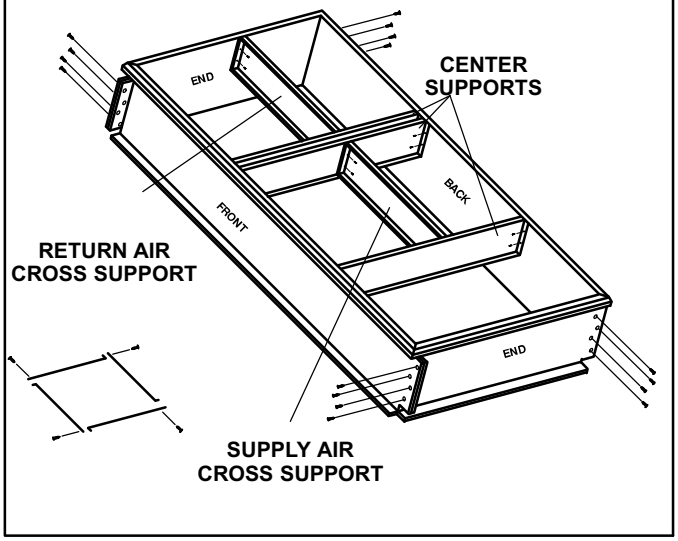


FIGURE 22

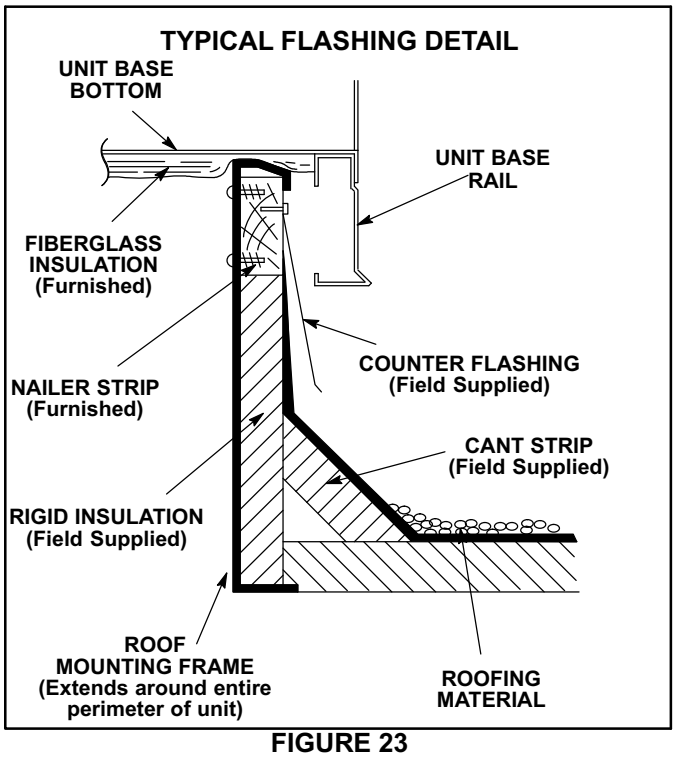


FIGURE 23

B-Transitions

Optional supply/return transitions LASRT08/10 is available for use with the TGA 7.5 ton units and LASRT10/12 is available for the 7.5 and 10 ton units, utilizing optional LARMF10/15 roof mounting frames. TGA 12.5 ton units will use LASRT15 with LARMF10/15 roof mounting frame. Transition must be installed in the LARMF mounting frame before mounting the unit to the frame. Refer to the manufacturer's instructions included with the transition for detailed installation procedures.

C-LAOAD(M) Outdoor Air Dampers

LAOAD(M)10/15 used on TGA090S/150 units consists of a set of dampers which may be manually or motor (M) operated to allow up to 25 percent outside air into the system at all times (see figure 24). Either air damper can be installed in TGA units. Washable filter supplied with the outdoor air dampers can be cleaned with water and a mild detergent. It should be sprayed with Filter Handicoater when dry prior to reinstallation. Filter Handicoater is R.P. Products coating no. 418.

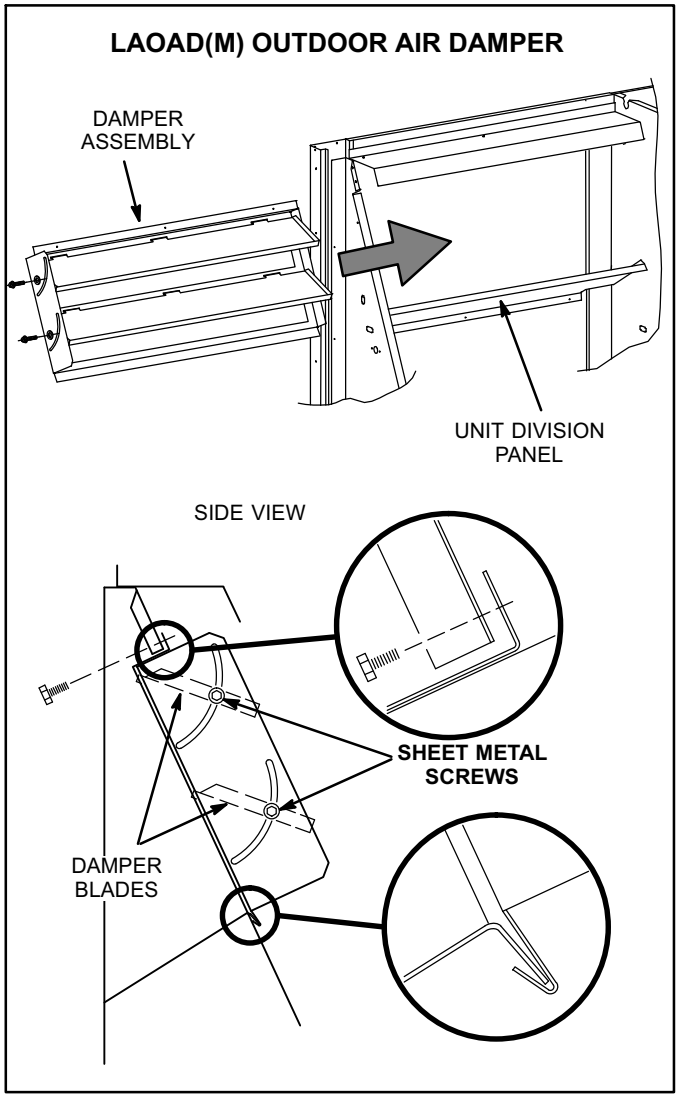


FIGURE 24

D-Supply and Return Diffusers (all units)

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

E-TAREMD Economizer

(Field or Factory Installed)

Unit may contain an optional factory-installed three-position economizer equipped with an A6 enthalpy control and an A7 outdoor enthalpy sensor. The three-position economizer opens fully to use outdoor air for free cooling when temperature is suitable and opens to minimum position during the occupied time period.

The A6 enthalpy control is located in the economizer access area. See figure 25. The A7 enthalpy sensor is located on the division panel between horizontal supply and return air sections.

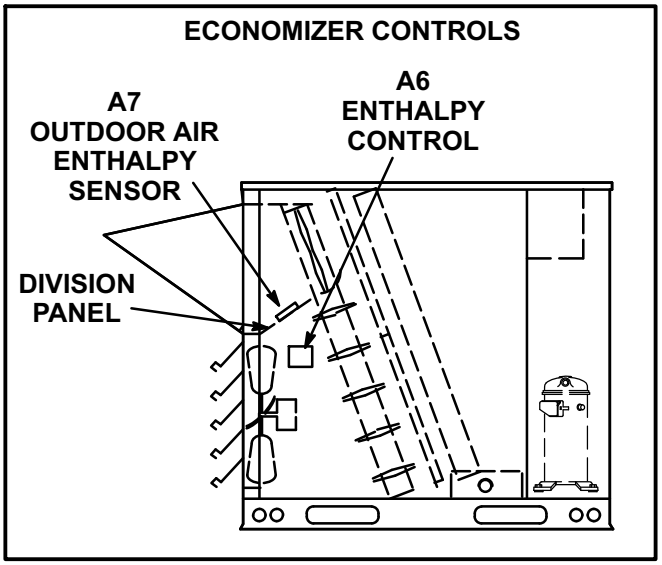


FIGURE 25

Optional Sensors

An optional differential sensor (A62) may be used with the A7 outdoor sensor to compare outdoor air temperature to return air temperature. When the outdoor air temperature is below the return air temperature, outdoor air is used for free cooling.

An optional mixed air sensor (R1) may be used to modulate dampers to 55°F (13°C) discharge air.

An optional IAQ sensor (A63) may be used to lower operating costs by controlling outdoor air based on CO_2 level or room occupancy (also called demand control ventilation or DCV). Damper minimum position can be set lower than traditional minimum air requirements; dampers open to traditional ventilation requirements when CO_2 level reaches DCV (IAQ) setpoint.

Refer to instructions provided with sensors for installation.

A6 Enthalpy Control LED's

A steady green Free Cool LED indicates that outdoor air is suitable for free cooling.

When an optional IAQ sensor is installed, a steady green DCV LED indicates that the IAQ reading is higher than setpoint requiring more fresh air. See figure 26.

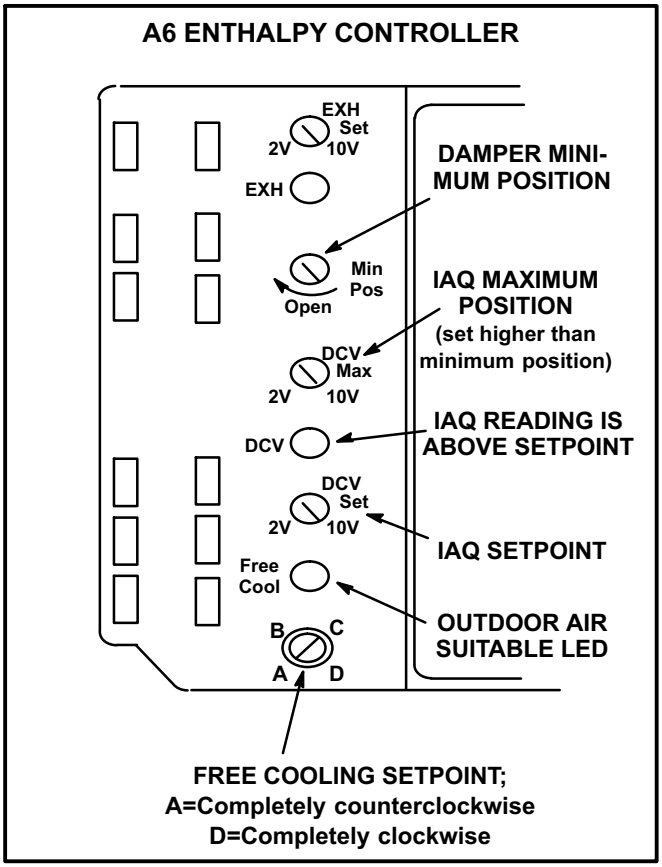


FIGURE 26

Free Cooling Setpoint

Outdoor air is considered suitable when temperature and humidity are less than the free cooling setpoints shown in table 21. Setting A is recommended. See figure 26. At setting A, free cooling will be energized when outdoor air is approximately 73°F (23°C) and 50% relative humidity. If indoor air is too warm or humid, lower the setpoint to B. At setting B, free cooling will be energized at 70°F (21°C) and 50% relative humidity.

When an optional A62 differential sensor is installed, turn A6 enthalpy control free cooling setpoint potentiometer completely clockwise to position "D".

TABLE 21
ENTHALPY CONTROL SETPOINTS

Control Setting	Free Cooling Setpoint At 50% RH
A	73° F (23° C)
B	70° F (21° C)
C	67° F (19° C)
D	63° F (17° C)

Damper Minimum Position

NOTE - A jumper is factory-installed between TB1 A1 and A2 terminals to maintain occupied status (allowing minimum fresh air). When using an electronic thermostat or energy management system with an occupied/unoccupied feature, remove jumper.

1- Set thermostat to occupied mode if the feature is available. Make sure jumper is in place between A45 control board TB1 terminals A1 and A2 if using a thermostat which does not have the feature.

2- Rotate MIN POS SET potentiometer to approximate desired fresh air percentage.

Note - Damper minimum position can be set lower than traditional minimum air requirements when an IAQ sensor is specified. Dampers will open to DCV MAX setting (if CO2 is above setpoint) to meet traditional ventilation requirements.

3- Measure outdoor air temperature. Mark the point on the bottom line of chart 1 and label the point “A” (40°F, 4°C shown).

4- Measure return air temperature. Mark that point on the top line of chart 1 and label the point “B” (74°F, 23°C shown).

5- Measure mixed air (outdoor and return air) temperature. Mark that point on the top line of chart 1 and label point “C” (70°F, 21°C shown).

6- Draw a straight line between points A and B.

7- Draw a vertical line through point C.

8- Draw a horizontal line where the two lines meet. Read the percent of fresh air intake on the side.

9- If fresh air percentage is less than desired, adjust MIN POS SET potentiometer higher. If fresh air percentage is more than desired, adjust MIN POS SET potentiometer lower. Repeat steps 3 through 8 until calculation reads desired fresh air percentage.

DCV Set and Max Settings

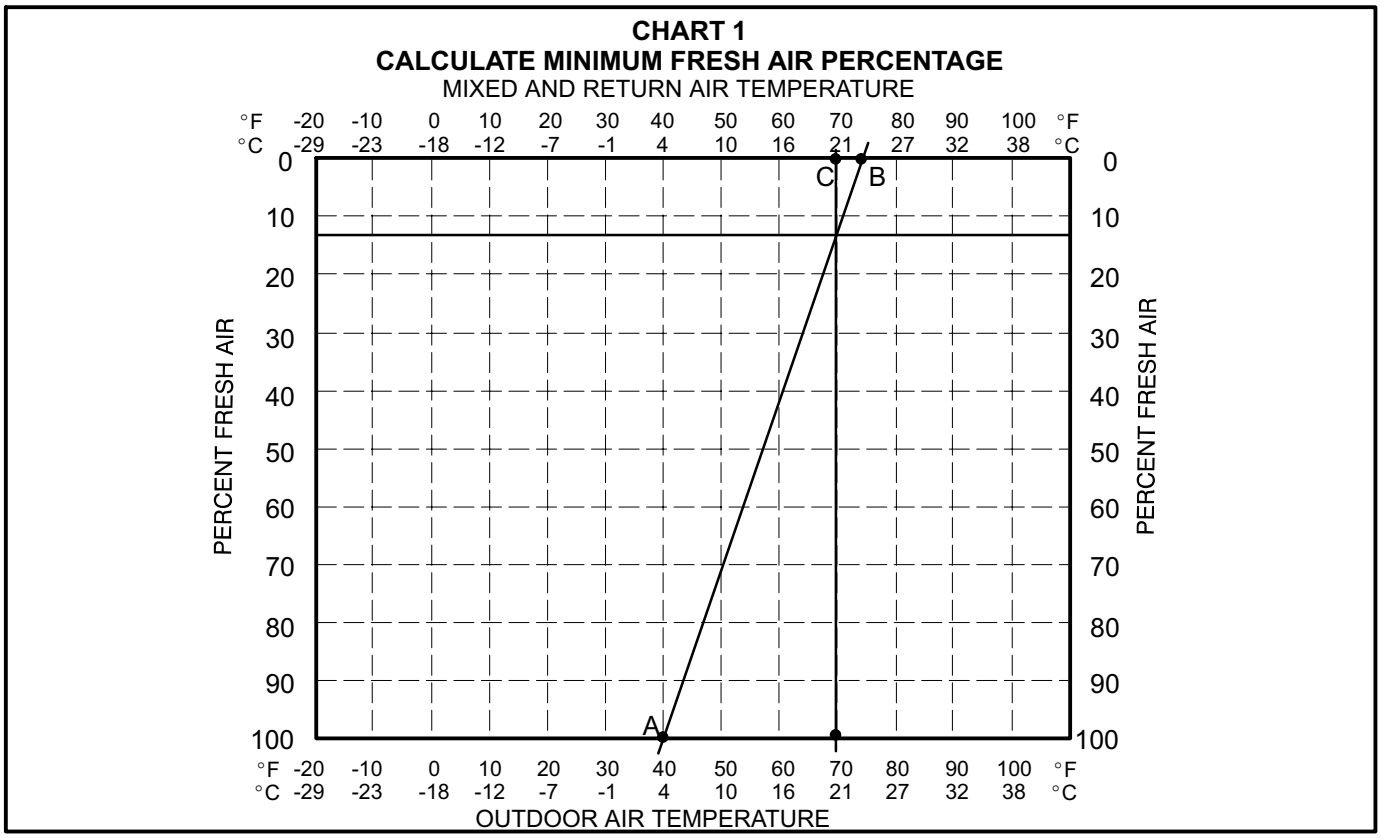
Adjust settings when an optional IAQ sensor is installed.

The DCV SET potentiometer is factory-set at approximately 50% of the potentiometer range. Using a standard 1-2000ppm CO_2 sensor, dampers will start to open when the IAQ sensor reads approximately 1000ppm. Adjust the DCV SET potentiometer to the approximate setting specified by the controls contractor. Refer to figure 26.

The DCV MAX potentiometer is factory-set at approximately 50% of the potentiometer range or 6VDC. Dampers will open approximately half way when CO_2 rises above setpoint. Adjust the DCV MAX potentiometer to the approximate setting specified by the controls contractor. Refer to figure 26.

Note - DCV Max must be set higher than economizer minimum position setting for proper demand control ventilation.

CHART 1
CALCULATE MINIMUM FRESH AIR PERCENTAGE



Economizer Operation

The occupied time period is determined by the thermostat or energy management system.

Outdoor Air Not Suitable:

During the unoccupied time period dampers are closed.

During the occupied time period a cooling demand will open dampers to minimum position and mechanical cooling functions normally.

During the occupied time period dampers will open to DCV MAX when IAQ reading is above setpoint (regardless of thermostat demand or outdoor air suitability).

Outdoor Air Suitable:

See table 22 for economizer operation with a standard two-stage thermostat.

During the occupied period, dampers will open to DCV MAX when IAQ reading is above setpoint (regardless of thermostat demand or outdoor air suitability). DCV MAX will NOT override damper full-open position. When an R1 mixed air sensor for modulating dampers is installed, DCV MAX may override damper free cooling position when occupancy is high and outdoor air temperatures are low. If R1 senses discharge air temperature below 45°F (7°C), dampers will move to minimum position until discharge air temperature rises to 48°F (9°C).

B-Outdoor Air Dampers

Optional manual and motorized outdoor air dampers provide fresh outdoor air. The motorized damper assembly opens to minimum position during the occupied time period and remains closed during the unoccupied period. Manual damper assembly is set at installation and remains in that position. See figure 27.

Set damper minimum position in the same manner as economizer minimum position. Adjust motorized damper position using the thumbwheel on the damper motor. See figure 28. Manual damper fresh air intake percentage can be determined in the same manner.

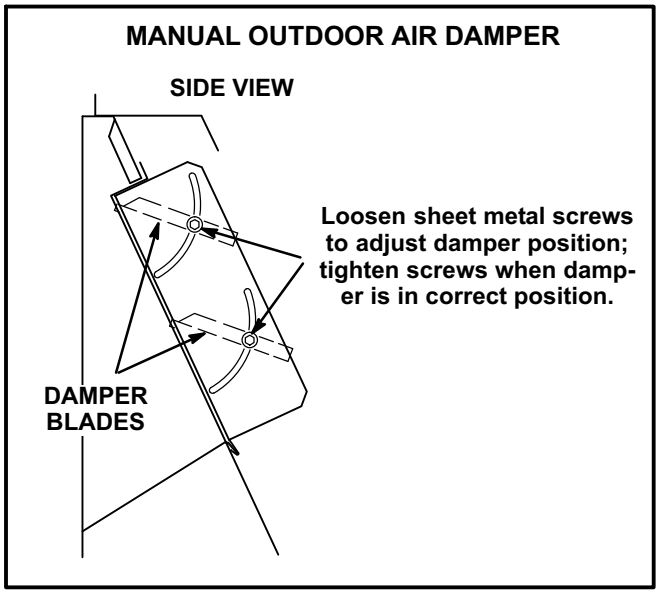


FIGURE 27

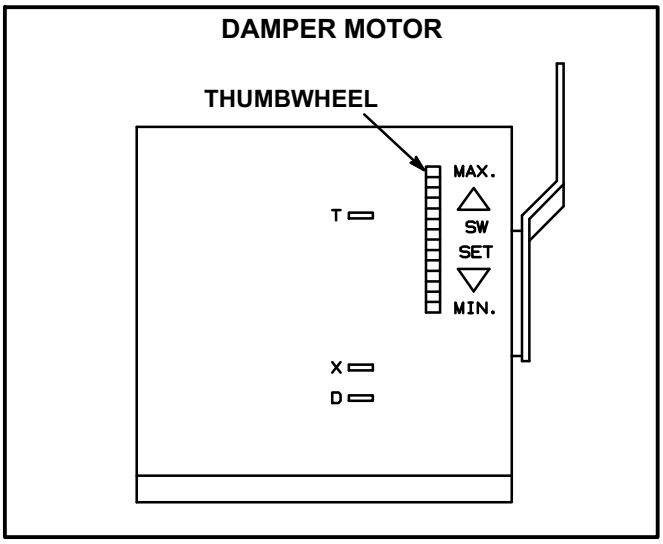


FIGURE 28

TABLE 22
ECONOMIZER OPERATION
OUTDOOR AIR IS SUITABLE FOR FREE COOLING – FREE COOL LED "ON"

THERMOSTAT DEMAND	DAMPER POSITION		MECHANICAL COOLING
	UNOCCUPIED	**OCCUPIED**	
OFF	CLOSED	CLOSED	NO
G	CLOSED	MINIMUM	NO
Y1	OPEN*	OPEN*	NO
Y2	OPEN*	OPEN*	STAGE 1

*Dampers will modulate to maintain 55°F (13°C) supply air when an R1 mixed air sensor is installed.

F-LAGED(H) Gravity Exhaust Dampers

LAGED(H)10/15 dampers (figure 29) available for TGA090/150 units are used in downflow and LAGEDH are used in horizontal air discharge applications. LAGED(H) gravity exhaust dampers are installed in the return air plenum . The dampers must be used any time an economizer or power exhaust fans are applied to TGA series units.

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

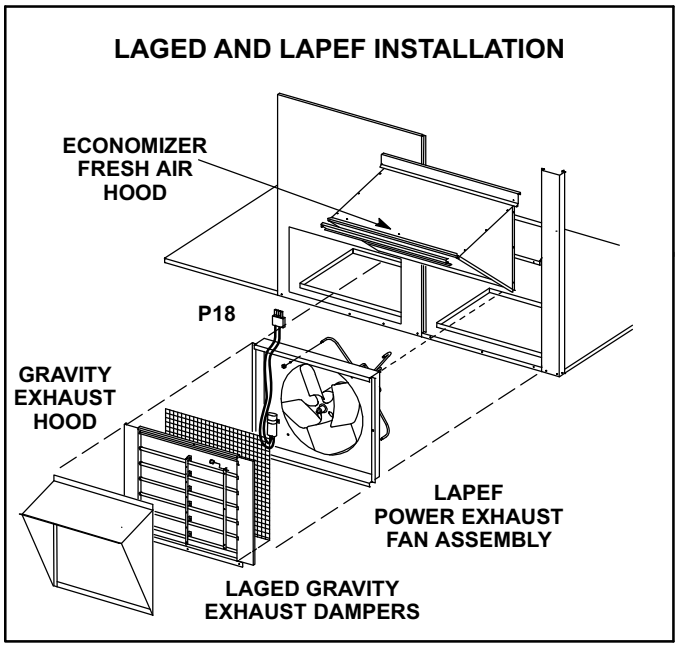


FIGURE 29

G-LAPEF Power Exhaust Fans (all units)

LAPEF10/15 available for TGA090/150 units are power exhaust fans used in downflow applications only. LAPEF fans requires optional down-flow gravity exhaust dampers and TA-REMD economizers. Power exhaust fans provide exhaust air pressure relief and also run when return air dampers are closed and supply air blowers are operating. Figure 29 shows location of the LAPEF. See installation instructions for more detail.

H-Optional Cold Weather Kit (Canada only)

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

The kit includes the following parts:

1- Transformer (T20) is a 600V to 120/240V stepdown transformer mounted in the blower compartment.

2- T20 has two in line fuses (F20), one on each leg of the transformer. Both are rated at 15 amps.

3- The strip heater (HR6) is located as close as possible to the gas valve. It is wired in series with T20. The strip heater is rated at 500 Watts

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

a - Thermostat switch (S59) is an auto-reset SPST N.C. switch which opens on a temperature drop. The switch is wired in series with 24v power and the combustion air blower switch. When the temperature drops below -30°F (-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 and T20. 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).

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 and T20. 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 76°F (24°C).

I-Control Systems

Three different types of control systems may be used with the TGA series units. All thermostat wiring is connected to TB1 located on the MCC board A45. Each thermostat has additional control options available. See thermostat installation instructions for more detail.

1- Electro-mechanical thermostat (13F06)

   The electro-mechanical thermostat is a two stage heat / two stage cool thermostat with dual temperature levers. A non-switching or manual system switch subbase may be used.

2- Electronic thermostat (see price book)

   Any two stage heat / two stage cool electronic thermostat may be used.

3- Honeywell T7300 thermostat (60L59)

   The Honeywell T7300 thermostat is a programmable, internal or optional remote temperature sensing thermostat. The T7300 provides occupied and unoccupied changeover control.

J-Smoke Detectors A17 and A64

Photoelectric smoke detectors are a field installed option. The smoke detectors can be installed in the supply air section (A64), return air section (A17), or in both the supply and return air section.

K-Blower Proving Switch S52

The blower proving switch monitors blower operation and locks out the unit in case of blower failure. The switch is N.O. and closes at .14" W.C. (34.9 Pa) The switch is mounted on the upper left hand corner of the blower deck.

L-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 on the top filter channel corner.

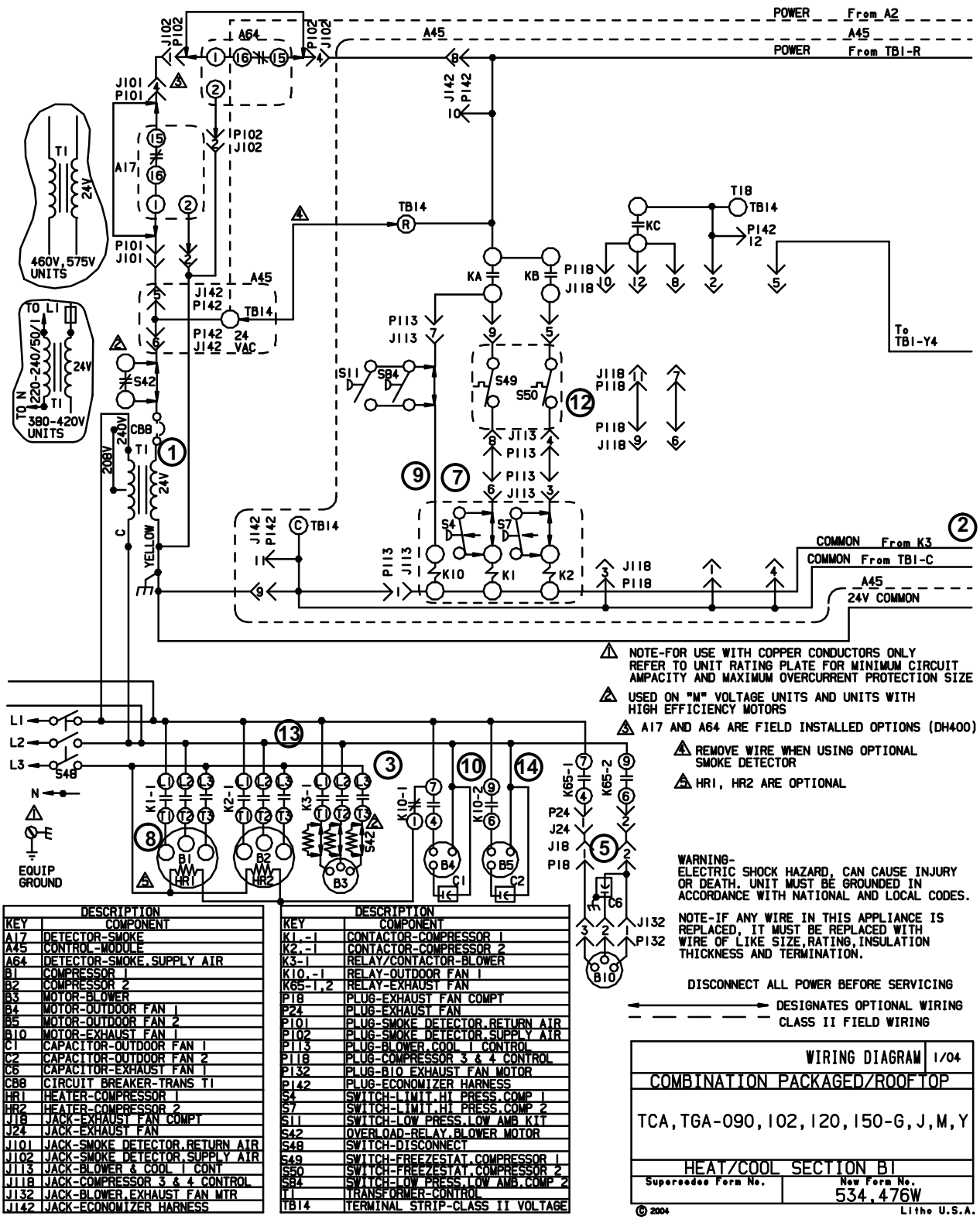
M-Indoor Air Quality (CO_2) Sensor A63

The indoor air quality sensor monitors CO_2 levels and reports the levels to the economizer enthalpy control A6. Controller A6 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.

N-LP / Propane Kit

TGA090/150 units require a natural to LP /propane kit. The kit includes one LP spring conversion kit, up to eleven burner orifices, and three stickers. For more detail refer to the natural to LP gas changeover kit installation instructions.

TGA090/150 UNIT DIAGRAM



DESCRIPTION	
KEY	COMPONENT
A17	DETECTOR-SMOKE
A45	CONTROL-MODULE
A64	DETECTOR-SMOKE,SUPPLY AIR
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN 1
B5	MOTOR-OUTDOOR FAN 2
B10	MOTOR-EXHAUST FAN 1
C1	CAPACITOR-OUTDOOR FAN 1
C2	CAPACITOR-OUTDOOR FAN 2
C6	CAPACITOR-EXHAUST FAN 1
CB8	CIRCUIT BREAKER-TRANS T1
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J18	JACK-EXHAUST FAN COMPT
J24	JACK-EXHAUST FAN
J101	JACK-SMOKE DETECTOR,RETURN AIR
J102	JACK-SMOKE DETECTOR,SUPPLY AIR
J113	JACK-BLOWER & COOL 1 CONT
J118	JACK-COMPRESSOR 3 & 4 CONTROL
J132	JACK-BLOWER,EXHAUST FAN MTR
J142	JACK-ECONOMIZER HARNESS

DESCRIPTION	
KEY	COMPONENT
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3-1	RELAY/CONTACTOR-BLOWER
K10,-1	RELAY-OUTDOOR FAN 1
K65-1,2	RELAY-EXHAUST FAN
P18	PLUG-EXHAUST FAN COMPT
P24	PLUG-EXHAUST FAN
P101	PLUG-SMOKE DETECTOR,RETURN AIR
P102	PLUG-SMOKE DETECTOR,SUPPLY AIR
P113	PLUG-BLOWER,COOL 1 CONTROL
P118	PLUG-COMPRESSOR 3 & 4 CONTROL
P132	PLUG-BIO EXHAUST FAN MOTOR
P142	PLUG-ECONOMIZER HARNESS
S4	SWITCH-LIMIT,HI PRESS,COMP 1
S7	SWITCH-LIMIT,HI PRESS,COMP 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S42	OVERLOAD-RELAY,BLOWER MOTOR
S48	SWITCH-DISCONNECT
S49	SWITCH-FREEZESTAT,COMPRESSOR 1
S50	SWITCH-FREEZESTAT,COMPRESSOR 2
S84	SWITCH-LOW PRESS,LOW AMB,COMP 2
T1	TRANSFORMER-CONTROL
TB14	TERMINAL STRIP-CLASS II VOLTAGE

WIRING DIAGRAM	1/04
COMBINATION PACKAGED/ROOFTOP	
TCA,TGA-090,102,120,150-G,J,M,Y	
HEAT/COOL SECTION B1	
Superseded Form No.	New Form No. 534.476W

TGA090/150 NUMBERED SEQUENCE OF OPERATION

Power:

1. Line voltage from unit disconnect energizes transformer T1. T1 provides 24VAC power to terminal strip TB1. TB1 provides 24VAC to the unit cooling, heating and blower controls.

Blower Operation:

2. The main control module receives a demand from thermostat terminal G. A45 energizes blower contactor K3 with 24VAC.
3. N.O. K3 closes, energizing blower B3.

Economizer Operation:

4. The economizer control module receives a demand and energizes exhaust fan relay K65 with 24VAC at 50% outside air damper open (adjustable).
5. N.O. K65-1 and N.O. K65-2 both close, energizing exhaust fan motor B10.

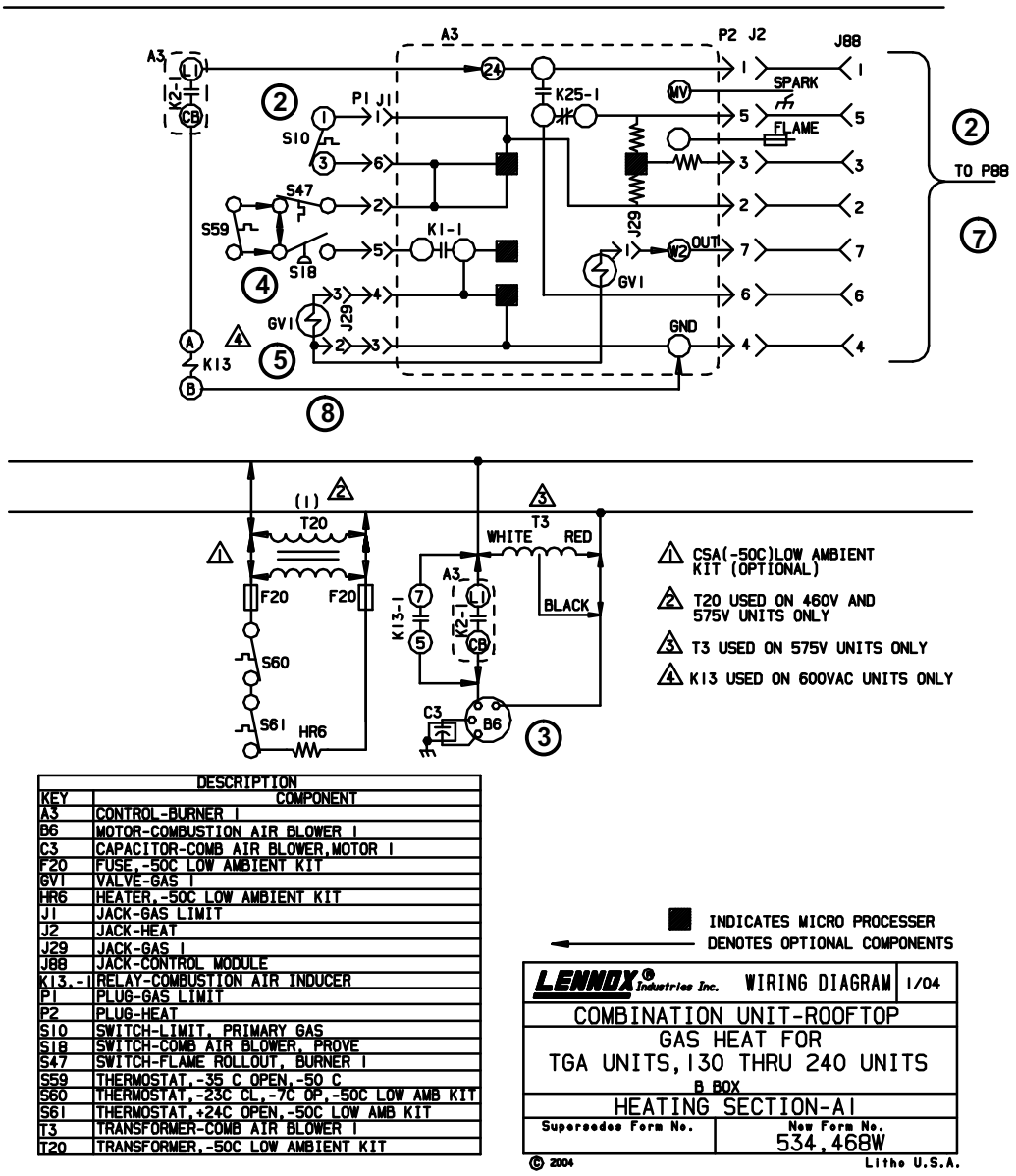
1st Stage Cooling (compressor B1)

6. First stage cooling demand Y1 and G is energized by the thermostat. G energizes blower.
7. 24VAC is routed through TB1 on main control module A45. A45 proves N.C. freezestat S49, and optional N.C. high pressure switch S4. Compressor contactor K1 is energized.
8. N.O. contacts K1 close energizing compressor B1.
9. Optional N.O. low ambient switch S11 closes to energize condenser fan relay K10.
10. N.O. contacts K10-1 close energizing condenser fan B4 .

2nd Stage Cooling (compressor B2 is energized)

11. Second stage cooling demand energizes Y2.
12. 24VAC is routed through TB1on module A45. A45 proves N.C. freezestat S50 and optional N.C. high pressure switch S7. Compressor contactor K2 is energized.
13. N.O. K2 closes energizing compressor B2.
14. Optional N.O. low ambient switch S84 closes energizing contacts K10-2. K10-2 close energizing condenser fan B5.

GAS HEAT FOR TGA090/150 UNITS



KEY	DESCRIPTION COMPONENT
A3	CONTROL-BURNER I
B6	MOTOR-COMBUSTION AIR BLOWER I
C3	CAPACITOR-COMB AIR BLOWER,MOTOR I
F20	FUSE,-50C LOW AMBIENT KIT
GV1	VALVE-GAS I
HR6	HEATER,-50C LOW AMBIENT KIT
J1	JACK-GAS LIMIT
J2	JACK-HEAT
J29	JACK-GAS I
J88	JACK-CONTROL MODULE
K13,-1	RELAY-COMBUSTION AIR INDUCER
P1	PLUG-GAS LIMIT
P2	PLUG-HEAT
S10	SWITCH-LIMIT, PRIMARY GAS
S18	SWITCH-COMB AIR BLOWER, PROVE
S47	SWITCH-FLAME ROLLOUT, BURNER I
S59	THERMOSTAT,-35 C OPEN,-50 C
S60	THERMOSTAT,-23C CL,-7C OP,-50C LOW AMB KIT
S61	THERMOSTAT,+24C OPEN,-50C LOW AMB KIT
T3	TRANSFORMER-COMB AIR BLOWER I
T20	TRANSFORMER,-50C LOW AMBIENT KIT

■ INDICATES MICRO PROCESSER
DENOTES OPTIONAL COMPONENTS

LENNOX Industries Inc.	WIRING DIAGRAM	1/04
COMBINATION UNIT-ROOFTOP		
GAS HEAT FOR TGA UNITS,130 THRU 240 UNITS B BOX		
HEATING SECTION-A1		
Supersedes Form No.	New Form No. 534,468W	

 Litho U.S.A.

First Stage Heat:

1. The thermostat initiates W1 heating demand.
2. 24VAC is routed from TB1 on control module A45 to ignition control A3 through P88. A3 proves N.C. primary limit S10 and N.C. rollout switch S47.
3. Combustion air inducer blower B6 is energized.
4. After the combustion air inducer B6 has reached full speed, the combustion air proving switch S18 contacts close.
5. After a 30 second delay A3 energizes the ignitor and LO terminal (low fire) of gas valve GV1.

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 A45 control module. The second stage heat signal passes from A45 to A3.
8. A3 energizes HI terminal (high fire) of gas valve GV1.

End of Second Stage Heat:

9. Heating demand is satisfied. Terminal W2 (high fire) is de-energized.
10. Terminal HI of GV1 is de-energized by A3 control module.

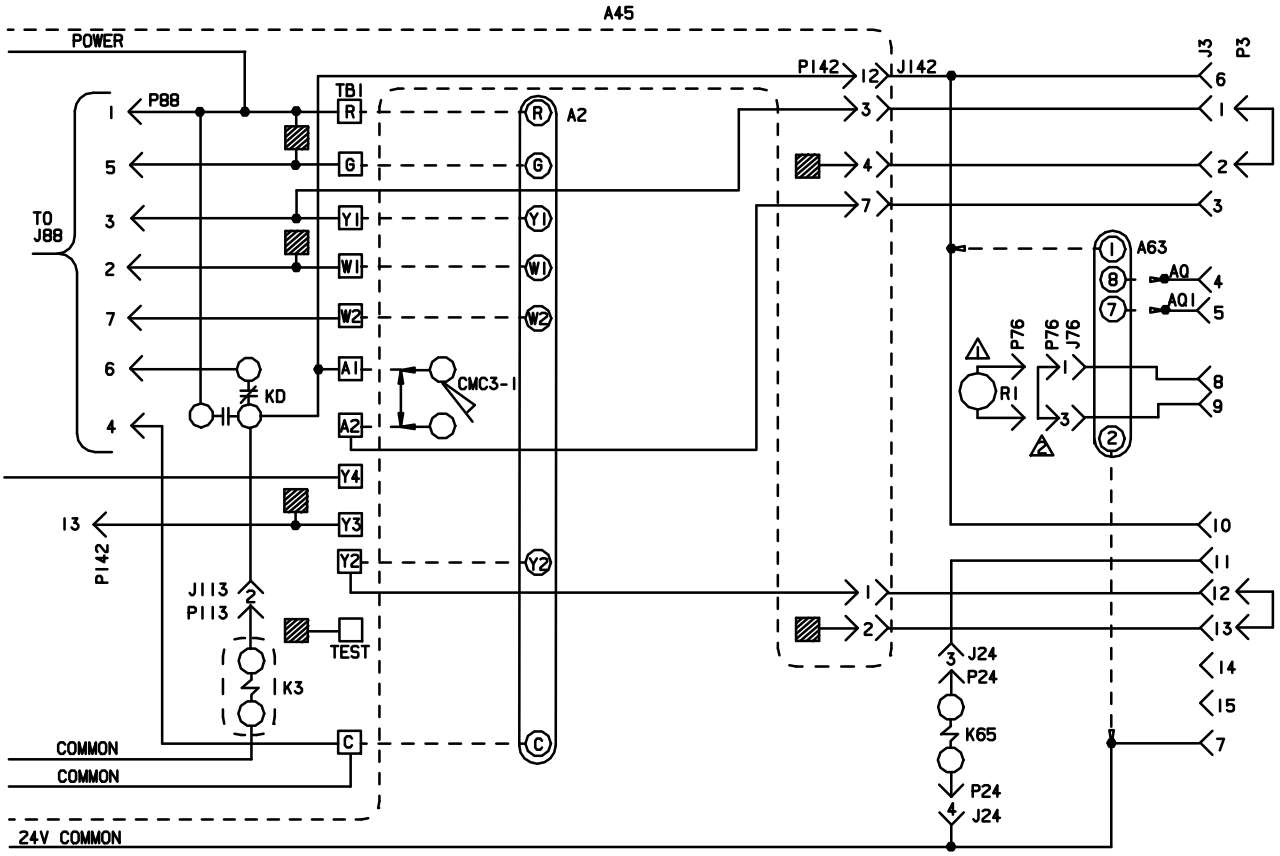
End of First Stage Heat:

11. Heating demand is satisfied. Terminal W1 (low fire) is de-energized.
12. Ignition A3 is de-energized by control module A45 in turn de-energizing terminal LO of GV1.

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

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

ELECTRONIC OR ELECTROMECHANICAL THERMOSTAT



⚠1 RI IS USED WITH OPTIONAL MODULATING ECONOMIZER FIELD KIT

⚠2 REMOVE JUMPER WHEN RI IS USED

DESCRIPTION	
KEY	COMPONENT
A2	SENSOR-ELECTRONIC
A45	CONTROL-MODULE
A63	SENSOR-CO2
CMC3-1	CLOCK-TIME
J3	JACK-UNIT, ECONOMIZER
J24	JACK-EXHAUST FAN
J76	JACK-SENSOR, ECONOMIZER
J113	JACK-BLOWER & COOL 1 CONTROL
J142	JACK-ECONOMIZER HARNESS
K3	RELAY/CONTACTOR-BLOWER
K65	RELAY-EXHAUST FAN
P3	PLUG-LESS ECONOMIZER
P24	PLUG-EXHAUST FAN
P76	PLUG-SENSOR, ECONOMIZER
P88	PLUG-HEAT CONTROL
P113	PLUG-BLOWER & COOL 1 CONTROL
P142	PLUG-ECONOMIZER HARNESS
RI	SENSOR-MIXED OR SUPPLY AIR
TB1	TERMINAL STRIP-24V CLASS II

THERMOSTAT HEAT ANTICIPATION SETTING 0.1 AMP

INDICATES MICRO PROCESSER

DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

WIRING DIAGRAM	12/03
ACCESSORIES	
ELECTROMECHANICAL OR ELECTRONIC THERMOSTAT FOR TCA/TGA UNITS	
TEMPERATURE CONTROL SECTION CI	
Supersedes Form No.	New Form No. 534,484W

 Litho U.S.A.

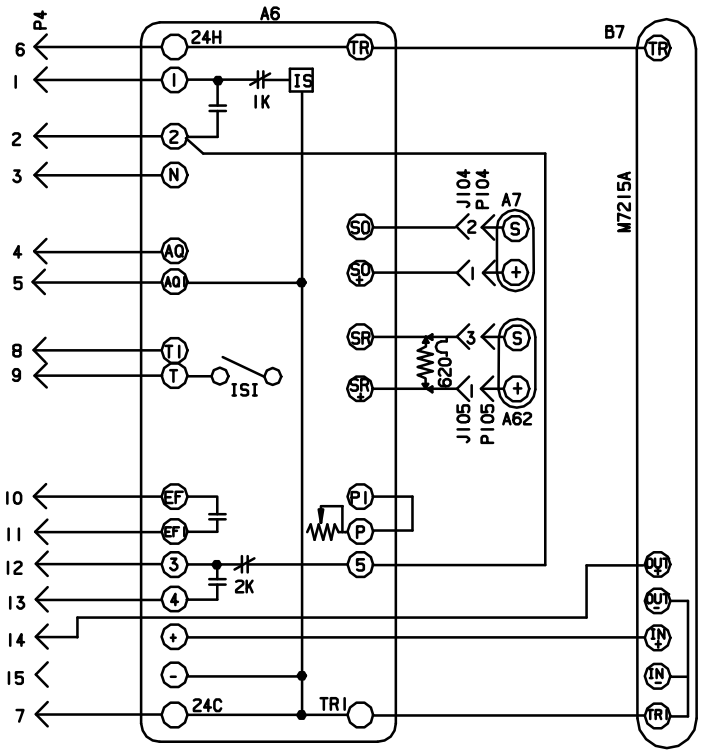
POWER:

1. Terminal strip TB1 found on the main control module A45energize thermostat components with 24VAC.

OPERATION:

2. The main control module A45 receives data from the electronic thermostat A2 (Y1, Y2, W1, W2, G, OCP) A45 energizes the appropriate components for heat or cool demand.

"T" SERIES ECONOMIZER



DESCRIPTION	
KEY	COMPONENT
A6	CONTROL-SOLID STATE ENTHALPY
A7	SENSOR-SOLID STATE ENTHALPY
A62	SENSOR-ENTHALPY, INDOOR
B7	MOTOR-DAMPER, ECONOMIZER
J104	JACK-SENSOR,OUTDOOR ENTHALPY
J105	JACK-SENSOR,RETURN AIR ENTHALPY
P4	PLUG-ECONOMIZER
P104	PLUG-SENSOR,OUTDOOR ENTHALPY
P105	PLUG-SENSOR,RETURN AIR ENTHALPY

DESIGNATES OPTIONAL WIRING
CLASS II FIELD WIRING

WIRING DIAGRAM	11/03
ACCESSORIES	
ECONOMIZER FOR TCA/TGA UNITS	
ECONOMIZER SECTION DI	
Supersedes Form No.	New Form No. 534,485W

 Litho U.S.A.

SEQUENCE OF OPERATION

POWER:

1. Terminal strip TB1 found on main control module A45 energizes the economizer components with 24VAC.

OPERATION:

2. Enthalpy sensor A7 and A62 (if differential enthalpy is used) communicates to the economizer control module A6 when to power the damper motor B7.
3. Economizer control module A6 supplies B7 with 0 - 10 VDC to control the positioning of economizer.
4. The damper actuator provides 2 to 10 VDC position feedback.