MT2136 SERIES
CONVEYOR OVEN
SERVICE AND REPAIR MANUAL

BLODGETT OVEN COMPANY

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PN M9884 A (6/01)

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CHAPTER 1

INTRODUCTION

OVEN SPECIFICATIONS

VENTILATION REQUIREMENTS

The hood should completely cover the unit with an overhang of at least 6" (15 cm) on all sides not adjacent to a wall. The distance from the floor to the lower edge of the hood should not exceed 7' (2.1 m). The ventilation system should replace 80% of the exhaust volume with fresh make up air. TABLE 1 should be used as a guideline.

	Single	Double	Triple
CFM	500-600	1000-1200	1500-1800
M^3/min	14 - 17	28-34	42-51

TABLE 1

ELECTRICAL SPECIFICATIONS

NOTE: Three Phase hookup is not permitted on gas models.

WARNING: DO NOT INSTALL A "HIGH LEG" TO ANY CONVEYOR OVEN!

Installations within the U.S.

MT2136G ovens require a 15 amp, 60HZ, 1Φ, 120/208-240 VAC, 4 wire service consisting of L1, L2 neutral and ground. See FIGURE 1. Use 90°C wire and size to National Electric or local codes.

MT2136E ovens are available in either 1Φ or 3Φ options. Single phase models require a 15 amp, 60 HZ, 208-240 VAC 3 wire service consisting of L1, L2 and ground. Three phase units require a 15 amp, 60 HZ, 208-240 VAC 4 wire service consisting of L1, L2, L3, and ground. See FIGURE 1. Use 90°C wire and size to National Electric or local codes.

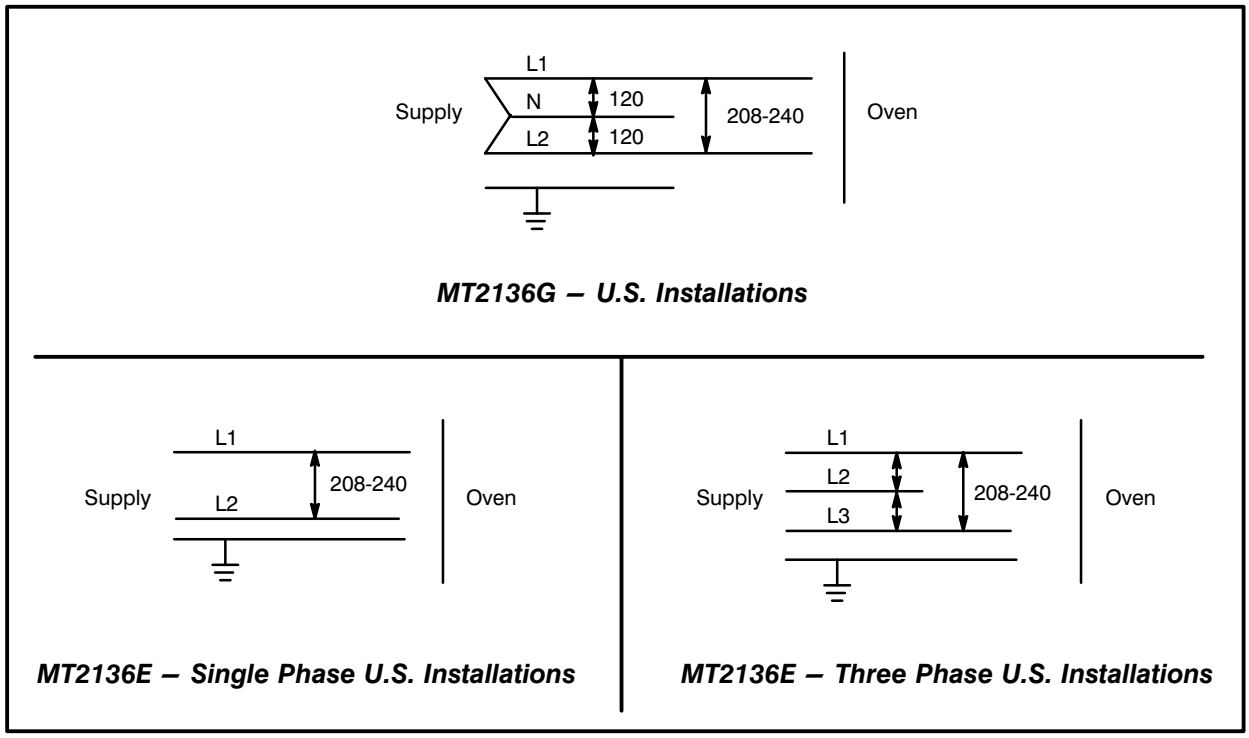


FIGURE 1

Installations outside the U.S.

MT2136G ovens require a 15 amp, 50HZ, 1Φ, 220-240VAC, 3 wire service consisting of L1, neutral and ground. See FIGURE 2. Use 90°C wire and size to National Electric or local codes.

MT2136E ovens are available in either 1Φ or 3Φ options. Single phase units require a 15 amp, 50 HZ, 240VAC 3 wire service consisting of L1, L2 and ground. Three phase units require a 15 amp, 50 HZ, 220-240 VAC 4 wire service consisting of L1, L2, L3 and ground. See FIGURE 1. Use 90°C wire and size to National Electric or local codes.

CE approved installations

The MT2136G requires a 15 amp 50Hz, 1Φ, 230 VAC, 3 wire service consisting of L1, neutral and ground. Connect exhaust fan connector 1 and 2. See FIGURE 2. Use 90°C wire and size according to local codes.

NOTE: If the phase and neutral are switched the control locks out.

The MT2136E requires a 15 amp, 50Hz, 3Φ, 230 VAC, 5 wire service consisting of L1, L2, L3, neutral and ground. See FIGURE 2. Use 90°C wire and size according to local codes.

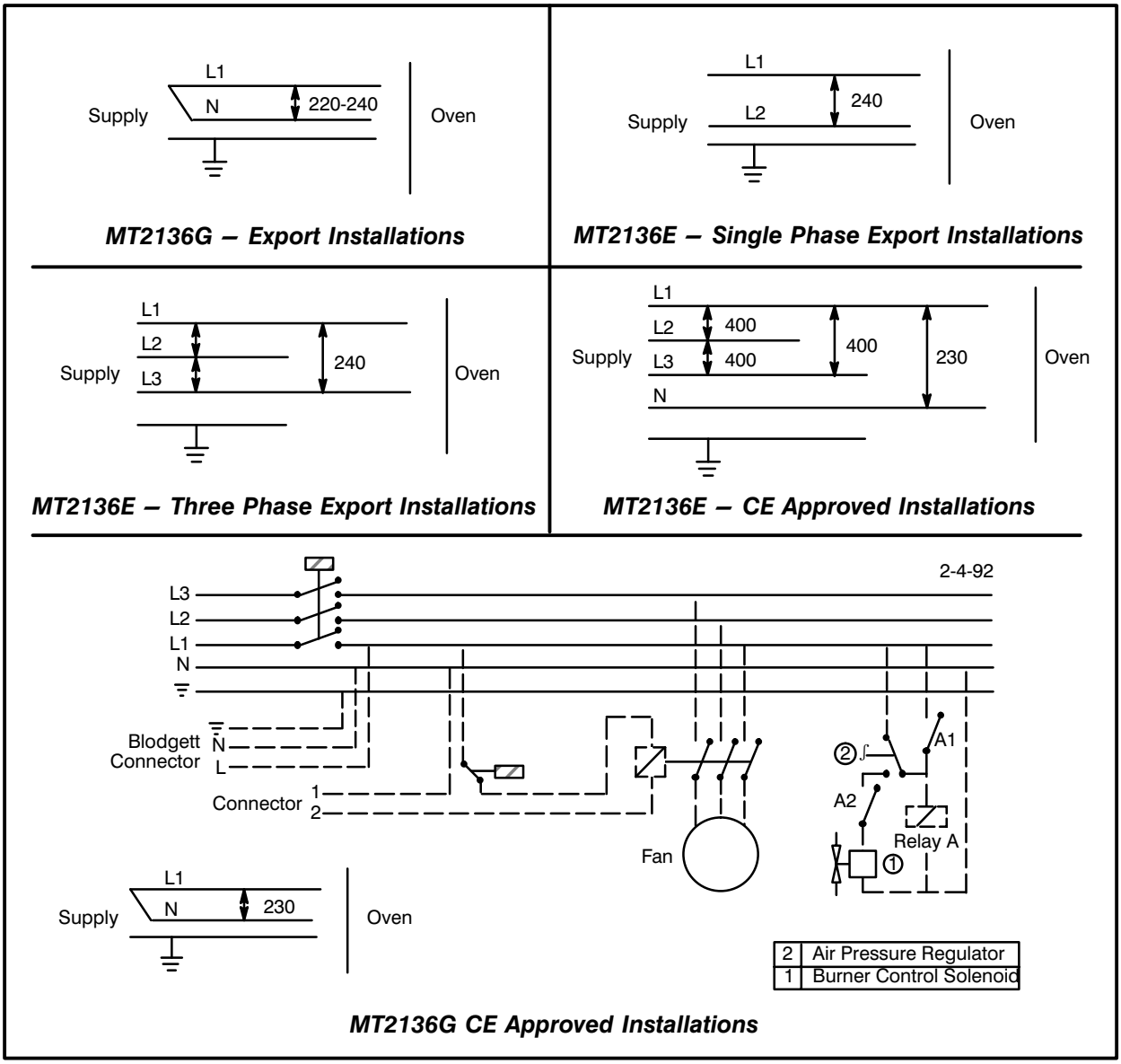


FIGURE 2

GAS SPECIFICATIONS

GAS CONNECTIONS

Domestic and General Export installations

The gas line should be large enough to accommodate the peak demand of all the gas appliances. TABLE 2 reflects a straight line, 50 foot run with no coupling restrictions and no other appliances drawing service. Gas line installations MUST conform to National Fuel Gas Code NFPA 54/ANSI Z223.1 Sec. 1.4 (Latest Edition). TABLE 2 should be used as a guideline only.

NOTE: For any pipe runs over 50 feet (15 m), consult the factory.

CE approved installations

1. Connect the oven to the gas line with the proper type of gas according to Local and National Installation Standards. See TABLE 2.

GAS REQUIREMENTS

The firing rate for the MT2136G is 55,000 BTU/Hr. (16 kW/Hr.)

NOTE: For natural gas meter sizing, consult your local gas company to ensure that your meter will provide the proper supply.

Installations within the U.S.

1. Add the total BTU's/hr of all the gas appliances.
2. Convert BTU's to cubic ft/hr using the formula Cu Ft/Hr = 1000 BTU/Hr for natural gas.
3. Size the meter accordingly.

Installations outside the U.S.

1. Add the total M^3/min of all the appliances.
2. Size the meter accordingly.

DOMESTIC AND GENERAL EXPORT

	Natural Gas			Propane Gas		
Gas Line Sizing						
Single	3/4" line			3/4" line		
Double	3/4" line			3/4" line		
Triple	1" line			3/4" line		
Orifice Size	#1			#29		
Incoming Gas Pressure	W.C.	kPa	mbar	W.C.	kPa	mbar
Static	7"	1.74	17.4	12.5"	3.11	31.1
Operational	5.5"	1.36	13.7	11"	2.73	27.4

CE APPROVED UNITS

Type of Gas	Inlet Pressure mbars	Burner Pressure mbars	Injector Diameter mm	Air Opening mm	Pilot Injector mm	Standard Delivery Value kW (H_S)
G25	25	12	3,30	2 x 16	2 x 0,63	16,3 Nat. Gas
G20	20	8	3,30	2 x 16	2 x 0,63	16,3 Nat. Gas
G20/G25	20/25	Totally Inscrewed Pressure Regulator	2,90	2 x 16	2 x 0,63	16,3 Nat. Gas
G31	30/37/50	24	2,10	2 x 16	2 x 0,30	16,3 Propane

TABLE 2

ILLUSTRATED PARTS LISTS

CONVEYOR COMPONENTS

NOTE: ✓ = ASAP Distributor Required Stocking Parts

Ref. No.	Part No.	Description
	M2740	Belt, Wire S/S 21" SB (Per Foot) (Total 11 FT)
39	M6336	Belt, Wire S/S 10" TB (Per Foot) (Total 21 FT)
	✓M2388	Tensioner Assy., Belt
22	✓M2379	Speed Control Board, Bodine
	M3301	Capacitor, Speed Control Board, 200WVDC
	✓M3145	Potentiometer, Bodine, 10K
23	✓M2316	Fuse, Armature, Bodine Board, 200 MA, 250V
7	✓M2254	Fuse, Line, Bodine Board, 5 AMP, 125V
	M5770	Conversion Kit, Digital Time (Open Loop) to Micro-Drive (Closed Loop)
	M7202	Conversion Kit, Open Loop to Closed Loop (Computerized)
	✓M3146	Time Display, Digital
	✓M3147	Pick-Up, PV-10 (For M3146)
	✓M0200	Lock, Speed Control Potentiometer
	✓M0201	Dial, Speed Control Potentiometer
	21169	Knob, Speed Control Potentiometer
	✓M2378	Motor, Conveyor Drive, Bodine 130V
	✓M2500	Brush Set, Bodine
	✓M2738	Chain, Drive
	M2011	Conveyor Assy., Drive Side SB
	M2012	Conveyor Assy., Idle Side SB
	M2207	Conveyor Assy., Drive Side TB
	M2208	Conveyor Assy., Idle Side TB
	✓M0109	Sprocket, Motor Drive, 12 Tooth SB/TB
	✓M0108	Sprocket, Conveyor Belt, 11 Tooth SB/TB (Bore Diameter 3/4") (Qty 1)
	✓M0110	Sprocket, Conveyor Drive, 15 Tooth SB/TB (Bore Diameter 3/4")
	M1865	Sprocket, Conveyor Drive, 15 Tooth TB (Bore Diameter 1/2")
	✓M0112	Masterlink, Drive Chain
	✓M0122	Bearing, Conveyor Drive

TEMPERATURE CONTROLS

Computer solid state controls for ovens manufactured after mid sept., 1993

NOTE: ✓ = ASAP Distributor Required Stocking Parts

Ref. No.	Part No.	Description
	✓M3149	Controller, Digital Temperature
	✓M3439	Relay, Digital Temp. Controller, 10 AMP, 250V
	✓M3150	Control Board, Temperature Hi-Lo Limit
	✓M3151	Thermocouple, Dual Lead
	✓M3152	Thermocouple, Single Lead
	✓M6474	Computer Control Kit, Closed Loop SB
	✓FW525	Computer Control Kit, Closed Loop SB (Reconditioned)
	M5635	Computer Control Kit, Open Loop TB
	✓M7427	Probe, Temperature RTD, 500 OHMS
	✓M3347	Cable, Computer Control, 25 Pin, 10 Foot
	✓M3348	Cable, Computer Control, 9 Pin, 10 Foot
	M3490	Cable, Computer Control, 25 Pin, 50 Foot
	M3491	Cable, Computer Control, 9 Pin, 50 Foot
	M3314	Bracket, Computer Wall
	M5661	Bracket Assy., Cable Clamp
19	✓22672	Relay, Control (Ice Cube) (Qty 4)
18	✓M3295	Thermostat, High Limit (Manual Reset)
	✓M0152	Contact, Emergency Stop Switch
	M3296	Activator, Emergency Stop Switch (Mushroom Shape)
	M3297	Nameplate, Emergency Stop
20	✓M3136	Breaker, 7 AMP Circuit (Qty 2) (Before AB Ver.)
21	✓M2772	Breaker, 4 AMP Circuit (Qty 2) (Before AB Ver.)
26	✓M3352	Transformer, 120V to 24V (Qty 1)
	✓M3349	Harness, Inter-Connecting DC Drive, 3 Wire (For 9 Pin)
	M3353	Harness, Relay Board (Open Loop) (Qty 1) (For 25 Pin)
	M7237	Harness, Relay Board (Closed Loop) (Qty 1) (For 25 Pin)

GAS BURNER COMPONENTS

NOTE: ✓ = ASAP Distributor Required Stocking Parts

Ref. No.	Part No.	Description
	✓20287	Valve, Single Solenoid 110/120V
	✓M0282	Valve, Manual Gas
3	✓M0767	Blower Motor, Combustion w/ Control Box
4	✓M2383	Blower Motor, Combustion
1	✓M2381	Transformer, 120V to 24V
2	✓M2385	Relay, Time Delay
5	✓M6397	Pilot Burner & Igniter Assy., Natural
5	✓M6398	Pilot Burner & Igniter Assy., LP
6	M0248	Tube, Pilot Aluminum 1/4”
7	22258	Burner Assy., Complete
8	✓M0415	Flame Sensor
9	✓M0697	Orifice, Pilot Natural
9	✓M2690	Orifice, Pilot LP
10	✓M3203	Orifice, Main Burner, Natural (MTD 29)
10	✓M1491	Orifice, Main Burner, LP (MTD 45)
	M2140	Flame Tube Assy.
16	✓M1054	Spark Box, 24V
11	✓M5495	Dual Solenoid/Pressure Regulator, Nat. 24V
11	✓22190	Dual Solenoid/Pressure Regulator, LP 24V
	M3434	Conversion Kit, Natural to LP (MTD 45)
	M3435	Conversion Kit, LP to Natural (MTD 29)
	✓18612	Spring, Solenoid Valve, Natural to LP
	✓23007	Spring, Solenoid Valve, LP to Natural
12	M0279	Union, 1/2 Inch Black
13	1949	Nipple, Pipe 1/2 x 1-3/16 Close
	M0590	Nipple, Pipe 1/2 x 2-1/2
14	M0317	Elbow, 1/2 Inch Street 90 Deg.
15	597	Ell, Black 90 Degree
	17874	Ell, Black 1/2 x 3/4

ELECTRICAL COMPONENTS

NOTE: ✓ = ASAP Distributor Required Stocking Parts

Ref. No.	Part No.	Description
	M2571	Element Assy., 208V, 3 PH, 15 KW (Qty 1)
	M2697	Element Assy., 208V, 1 PH, 15 KW (Qty 1)
	M2572	Element Assy., 240V, 3 PH, 15 KW (Qty 1)
	M2698	Element Assy., 240V, 1 PH, 15 KW (Qty 1)
	M6891	Element, Individual, 208V (Qty 6)
	M6892	Element, Individual, 220V (Qty 6)
	M6893	Element, Individual, 240V (Qty 6)
	✓20162	Fuse, 10 AMP, 300V, SC-10 (Qty 2) (After...)
	✓M1821	Fuse, 4 AMP, 300V, SC-4 (Qty 2) (Before...)
	✓M0156	Fuse, 10 AMP, 250V, FMN-10
	✓M3389	Fuse, 4 AMP, Ceramic, MDA-4
	✓M0158	Fuse Holder for SC-10 & SC-4 Fuses (Qty 2)
	M0702	Fuse Block for FMN-10 Fuse
	✓M3390	Fuse Holder, 20 AMP for MDA-4 Fuse
	✓M2453	Snap Disc, L140-20F, 3 Pole SPDT
	✓M1362	Snap Disc, L140-20F, 2 Pole SPST
	✓M0635	Snap Disc, F110-20F, 2 Pole SPST
	✓M2734	Snap Disc, L165-30F, 2 Pole
	M0593	Terminal Block, 2 Pole (Neutrals) w/ Push On Terminals
	M3714	Terminal Block, 3 Pole (Power) MT2136E w/ Allen Head Screws
25	✓M0708	Contactor, Mechanical, 16 AMP, 3 Pole,120V Coil (Motor)
	M2483	Contactor, Mercury, 60 AMP, 3 Pole, 120V Coil (Heat)
	M2720	Contactor, Mercury, 100 AMP, 2 Pole, 120V Coil (Heat)
	M7170	Transformer, 240V to 115V
	✓M2469	Fan, Axial 110 CFM 4-1/2" (Qty 3) or (AB Qty 4)
	M0571	Guard & Hardware, Fan (Qty 3) or (AB Qty 4)
	✓M0572	Cord Set, Axial Fan (Qty 3) or (AB Qty 4)
	✓M0152	Selector Switch, Heat & Conveyor
	✓M0153	Selector Switch, Blower
	✓M0151	Knob, Selector Switch (Heat/ Conveyor/Blower)
	M1694	Cord Set & Plug Assy., 10 Foot
	M0772	Receptacle, Twist Lock
	4168	Lug, Grounding

CONVECTION COMPONENTS

Ref. No.	Part No.	Description
	✓M2871	Motor & Blower Assy., 60 HZ, CW (Qty 1)
	✓M2870	Motor & Blower Assy., 60 HZ, CCW (Qty 1)
36	M2100	Nozzle Assy. (Aluminum) (Qty 5)
36	M3456	Nozzle Assy. (S/S) (Qty 5)
	M2741	Plate Assy., Air (Aluminum) (LH & RH)
37	M7490	Air Plate, LH (Aluminum)
38	M7493	Air Plate, RH (Aluminum)
	M7492	Plate Assy., Block Off
	M3125	Upgrade Kit, Cooling Fan (Domestic)

EXTERIOR COMPONENTS

NOTE: ✓ = ASAP Distributor Required Stocking Parts
◆ = Doors Are Not Returnable

Ref. No.	Part No.	Description
	M2085	Decal, Control Panel, SB, Red
	M2087	Decal, Control Panel, TB, Red
	M2524	Decal, Racing Strip, Red
	M2722	Decal, Control Panel, SB, Black
	M2723	Decal, Black
	M2769	Decal, Control Panel, TB, Black
28	M4306	Crumb Pan, Idle (Remote & Intergal)
27	M4372	Crumb Pan, Drive w/ Remote
27	M4305	Crumb Pan, Drive w/ Intergal
	M4309	Stop, Product
29	M3121	Extension Assy., Product 6”
29	M3122	Extension Assy., Product 12”
26	M2059	Drip Pan (Aluminum)
26	M5008	Drip Pan (S/S)
30	M2450	Access Panel, Combustion Compartment (Manual) Element Assy., 240V, 3 PH, 15 KW (Qty 1)
30	M3376	Access Panel, Combustion Compartment (Computer Controls)
30	M3553	Access Panel, Control Box (Integral)
31	M4580	Access Panel, Front w/ Door
	M2072	Access Panel, Front w/o Door
	M2514	Bolt, Front Access Panel (Allen Head Decoration)
	M3420	Gasket Assy., Front Access Panel
	M3574	Retainer, Gasket Top/Bottom w/ Door
	M3575	Retainer, Gasket LH/RH w/ Door
	M2731	Retainer, Gasket Top/Bottom w/o Door
	M2732	Retainer, Gasket LH/RH w/o Door
	M2801	Hinge Pin & Plate Assy.
	16470	Nameplate, Blodgett 10”
32	◆ M4587	Door Assy., Sandwich
	M2188	Handle Assy., Sandwich Door
	✓ M6035	Latch, Sandwich Door
33	M4581	Plate, Pivot RH Slotted
34	M4582	Plate, Pivot LH Slotted
	M6970	Retrofit Kit, Sandwich Door (To Add Sandwich Door)
	M2515	Allen Key
	21826	Installation Hose, 36”
	21242	Installation Hose, 48”
	M7273	Body Top w/ Hardware
	M2678	Body Back
	M2361	Pin, Stacking
	M2486	Stacking Rails
	M2439	Stacking, 24” Stand & Caster Assy.
	M3123	Stacking, Single to Double
	M3124	Stacking, Double to Triple
	M2532	Triple Base w/ Casters
	M3998	Heat Shield Kit
35	M2075	Tunnel Extension

EXCLUSIVE TO VERSION AB

Serial number model identification code of BK=MT2136G or FB=MT2136E.

NOTE: ✓ = ASAP Distributor Required Stocking Parts

Ref. No.	Part No.	Description
1	M5070	Conveyor Assy., Drive Side SB
	M5066	Conveyor Assy., Idle Side SB
	M5069	Conveyor Assy., Drive Side TB
	M5067	Conveyor Assy., Idle Side TB
	✓M6044	Snap Disc, L110-20F, 3 Pole
	M5302	Nozzle Assy. (Aluminum) (Qty 5)
	M5288	Nozzle Assy. (S/S) (Qty 5)
	M2741	Plate Assy., Air (Aluminum) (LH & RH)
	M7490	Air Plate, LH (Aluminum)
	M7493	Air Plate, RH (Aluminum)
	M4674	Air Plate, LH (S/S)
	M4675	Air Plate, RH (S/S)
	M4163	Plate Assy., Block Off (Aluminum)
	M4673	Plate Assy., Block Off (S/S)
	M5071	Crumb Pan, Idle (Remote & integral) (Bottom Section)
	M5335	Crumb Pan, Drive w/ Remote (Bottom Section)
	M5068	Crumb Pan, Drive w/ Integral (Bottom Section)
	M6996	Crumb Pan, Idle (Remote & Integral) (Top & Middle Section - Vented)
	M6995	Crumb Pan, Drive w/ Remote (Top & Middle Section - Vented)
	M5068	Crumb Pan, Drive w/ Intergal (Top & Middle Section)
	M7002	Extension Assy., Product 6”
	M6997	Extension Assy., Product 12”
	M7000	False Front w/o Door
	M7001	False Front w/ Door
	M6213	Access Panel, Combustion Compartment
	✓M6035	Latch, Combustion Compartment Access Panel
	M4580	Access Panel, Front w/ Door
	M6389	Access Panel, Front w/o Door
	M2733	Bolt, Front Access Panel
	M2599	Gasket, Front Access Panel
	M3574	Retainer, Gasket Top/Bottom w/ Door
	M3575	Retainer, Gasket LH/RH w/ Door
	M6383	Retainer, Gasket w/o Door
	M2801	Hinge Pin & Plate Assy.
	16470	Nameplate, Blodgett 10”
	M4587	Door Assy., Sandwich
	M2188	Handle Assy., Sandwich Door
	✓M6035	Latch, Sandwich Door
	M4581	Plate, Pivot RH Slotted
	M4582	Plate, Pivot LH Slotted
	M7274	Body Top w/ Hardware
	M6220	Body Back
	21390	Legs, 17-1/4” w/ Casters (Double Oven)
	21391	Legs, 23-1/4” w/ Casters (Single Oven)
	M3828	Pin, Stacking
	M5537	Triple Base w/ Casters

NOTE: MT2136 AB version is only available with legs (Part #’s 21390 & 21391). There is no stand available for this oven.

EXCLUSIVE TO EXPORT 50 HZ (ZA VERSION)

NOTE: ✓ = ASAP Distributor Required Stocking Parts

Ref. No.	Part No.	Description
	M2246	Burner Assy., Complete
	M2386	Blower Motor, Combustion
	M2384	Transformer (Burner Assy.)
	M2245	Valve, Single Solenoid, 240VAC
	M2573	Element Assy., 220/380V, 3 PH, 15 KW
	M2699	Element Assy., 220/380V, 1 PH, 15 KW
	M2574	Element Assy., 240/415V, 3 PH, 15 KW
	M2698	Element Assy., 240/415V, 1 PH, 15 KW
	M6892	Element, Individual, 220/380V
	M6893	Element, Individual, 240/415V
	M2630	Fuse, Bodine Speed Control, 5 AMP, 250V
✓	23034	Axial Fan, 230V (Qty 3)
	M2247	Contactor, Mechanical, 16 AMP, 3 Pole, 250V (Motor) 50 HZ
✓	R1530	Contactor, Mercury, 60 AMP, 3 Pole (Heat)
	M2591	Contactor, Mercury, 100 AMP, 1 Pole (Heat)
	M7170	Transformer, 208/460-120V, 300VA (Step Down)
	M2873	Motor & Blower Assy., 50 HZ, CW
	M2872	Motor & Blower Assy., 50 HZ, CCW
	M3154	Time Display, Digital 50 HZ
	M3126	Upgrade Kit, Cooling Fan (Export)
	M3153	Speed Control Board, Digital 180VDC
	M3128	Motor, Conveyor Drive, 180VDC
	M3155	Controller, Temperature C§/50 HZ
	M2819	Switch, Air Pressure Differential (in W.C) (Qty 1) (Australia)
	M7880	Computer Control Kit, Closed Loop SB (CE)
	M3237	Burner Assy. (CE)
16	M7334	Pilot Burner & Igniter Assy., Natural (CE)
16	M7333	Pilot Burner & Igniter Assy., LP (CE)
	M2497	Switch, Push Button (CE)
	M2498	Switch, Contact (CE)
✓	M0595	Switch, Air Pressure SPDT (CE)
40	M3172	Timer, Fixed, 2 Second (CE)
41	M3173	Timer, Fixed, 10 Second (CE)
	M3166	Fuse, 4 Amp., 250V (CE)
	M3167	Fuse Holder (CE)
	M2549	Strip, Terminal (CE)
43	M3168	Spark Box, 240V (Landis & Gyr) (CE)
	R1586	Terminal Block, Power (CE)
	R0166	Terminal Block, Ground (CE)
	R1580	Stop, End (CE)
✓	16037	Indicator Light, 250V, Red, Round (CE & Australia)
	90250	Relay, 240V 3PDT (CE)
42	16775	Relay, 240V SPST, 30 AMP (CE)
17	M6000	Dual Solenoid/Pressure Regulator, Nat. (CE)
17	M6001	Dual Solenoid/Pressure Regulator, LP (CE)
	M3330	Switch, Air Pressure Differential (mbr) (CE)
	M6649	Noise Filter (G&E)
	M6648	Noise Filter (E Only)
	M7282	Relay Board (All CE Computerized Ovens)
	M6025	Fuse, 250V 80 MA (For M7282)

EXTERIOR COMPONENTS

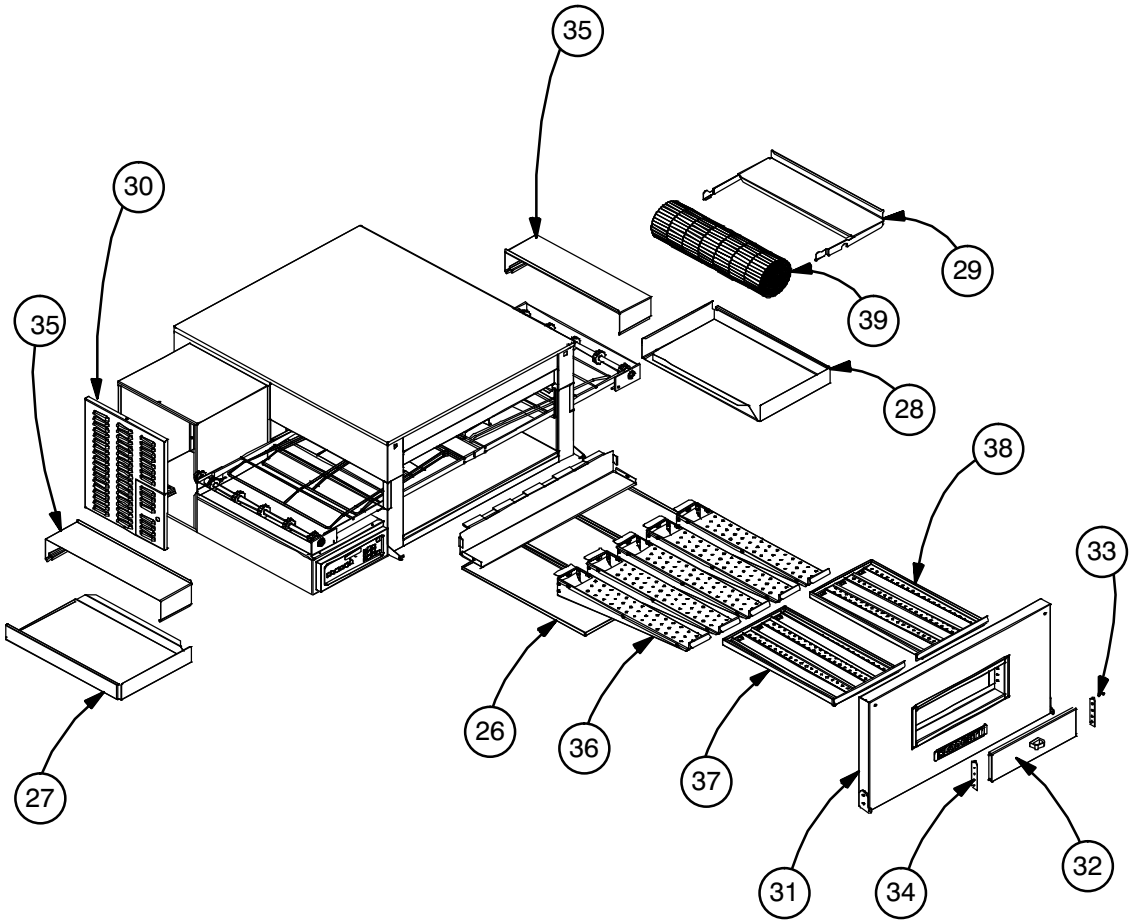


FIGURE 3

DOMESTIC GAS BURNER COMPONENTS

(Control Box not Shown)

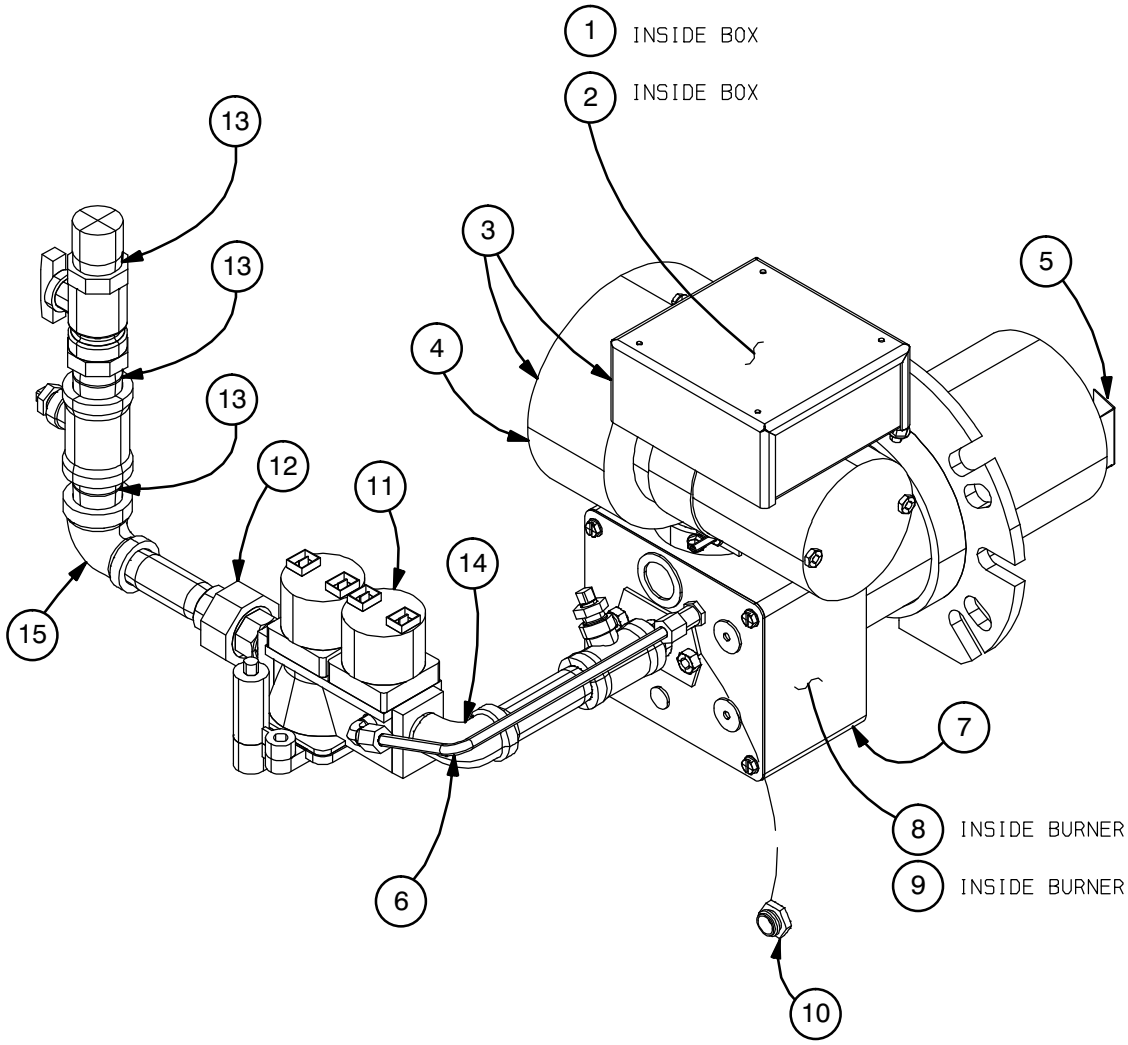


FIGURE 4

CE GAS BURNER COMPONENTS

(Control Box not Shown)

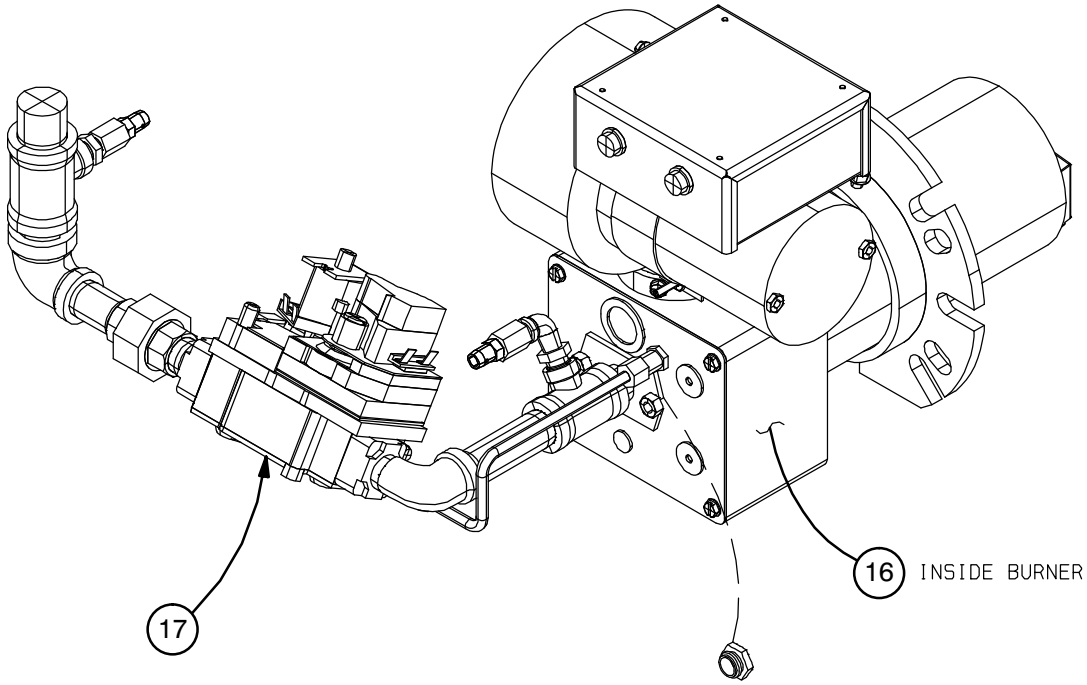
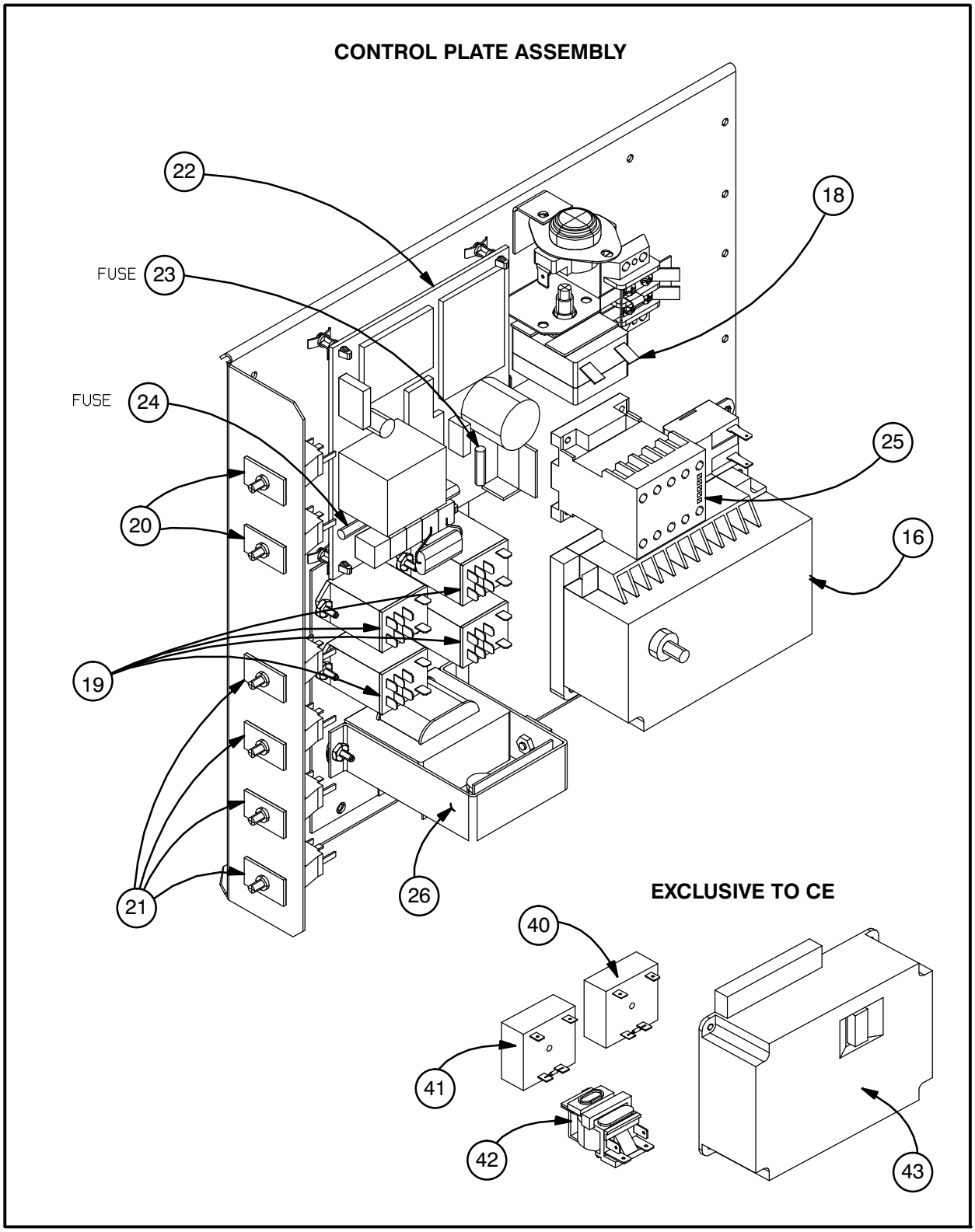


FIGURE 5


CONTROL PLATE ASSEMBLY
22
18
FUSE
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FUSE
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EXCLUSIVE TO CE
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43

FIGURE 6

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CHAPTER 2

ASSEMBLY

OVEN ASSEMBLY PROCEDURES

NOZZLES

1. Install the nozzles from the center of the oven working toward the ends. Make sure the top tongue of each nozzle fits into the upper rectangular cut-out in the nozzle support plate at the top rear of the oven.
2. Pull the nozzle slightly forward to engage the hole in the alignment flange with the conveyor rail pin. To make sure that the nozzle is seated properly, try to move it from side to side. The nozzle should not move any appreciable distance.

CONVEYOR SUPPORTS

1. Slide the left conveyor belt support (with the sprocket on the end of the shaft) into the support tracks. The sprocket must be located next to the control panel after being pushed into the oven.
2. Slide the right conveyor belt support into the support tracks.
3. Install the 1/4—20 (6m x 1) hex head screw through the conveyor rack and into the control box.

DRIVE CHAIN

1. Install the drive chain around the drive motor, through the opening in the control panel door, and then around the sprocket on the conveyor belt support.
2. Push the conveyor motor to tighten the drive chain and lock it into position by tightening the hex socket head screws.

NOTE: Twin belt models have a double sprocket, chain and motor.

WIRE CONVEYOR BELT

NOTE: The conveyor belt has loops on both sides. The belt must be installed so the loops travel as shown in FIGURE 1.

1. Thread the wire belt from the right side of the oven, lower level first.
2. After pushing the belt through on the lower level, leave about 12” (30.5 cm) hanging out on the left side.
3. Take the remainder of the belt, loop it around the right shaft, and push it through on the upper level. The two ends of the belt should be approximately 6-9” (15-22 cm) past the left shaft (right shaft if right to left travel is required) on the upper level of the belt support.

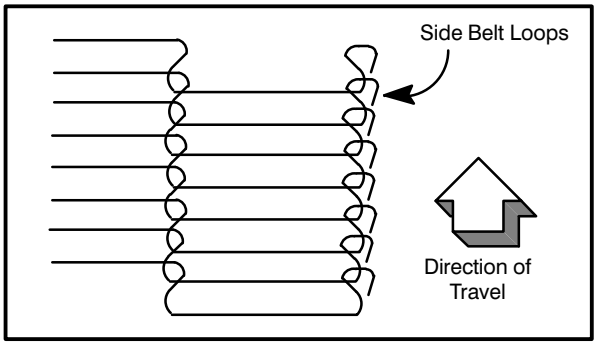

FIGURE 1

4. Install the inner and outer master links as shown in FIGURE 2.

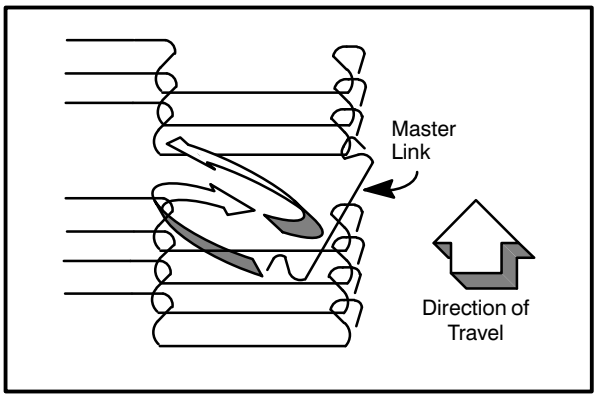

FIGURE 2

Unless otherwise specified, the conveyor travel is factory set for left-to-right operation when facing the front of the oven. If a direction change is required, the polarity of the drive motor must be reversed. To change the polarity of the drive motor, disconnect the oven from the power source and interchange the black and white motor leads at the D.C. Controller Board located within the control box. **If the polarity of the motor is changed to right-to-left belt travel, the conveyor belt must be installed from the left side of the oven instead of the right side.**

NOTE: Reconfigure the air plates whenever the conveyor belt direction of travel is changed.

AIR PLATES

1. Inspect the orientation of the air plates. Refer to FIGURE 3.

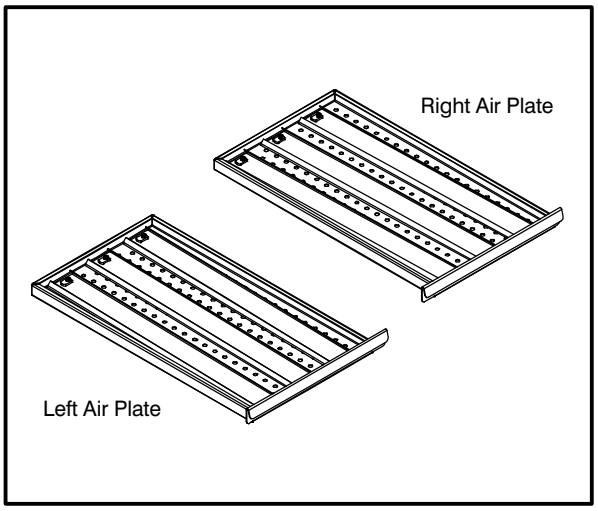

FIGURE 3

CONVEYOR TUNNEL EXTENSIONS

1. Install the conveyor tunnel extensions over the conveyor on each end of the oven.

CONVEYOR BELT TENSIONERS

Each tensioner installs between the idle end of the conveyor (the side opposite the drive) and the oven's body side.

1. The belt tensioner contain a spring to adjust the length. Compress the spring to shorten the length of the belt tensioner.
2. Insert the pin on the end of the tensioner into the hole in the oven's body side.
3. Expand the tensioner to engage the pin located on the conveyor support.

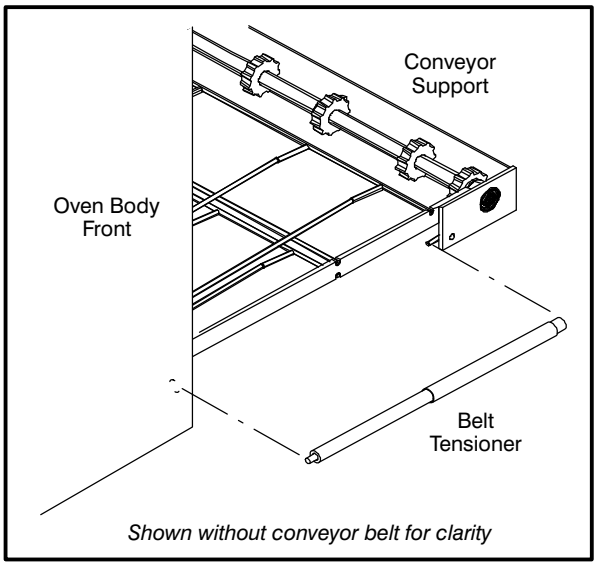

FIGURE 4

CRUMB PANS

1. Install the crumb pans under each end of the conveyor.

   NOTE: On stacked ovens, either use perforated crumb pans or install the pans on the lower oven only.

MOUNT REMOTE CONTROL

1. Mount the remote control unit on a wall within reach of the computer cables.
2. Connect the computer cables from the controller's rear connector to the connector located at the rear of the oven.

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CHAPTER 3

OPERATION

STANDARD CONTROL OPTIONS

U.E. TEMPERATURE CONTROLLER WITH OPEN LOOP DC DRIVE SYSTEM

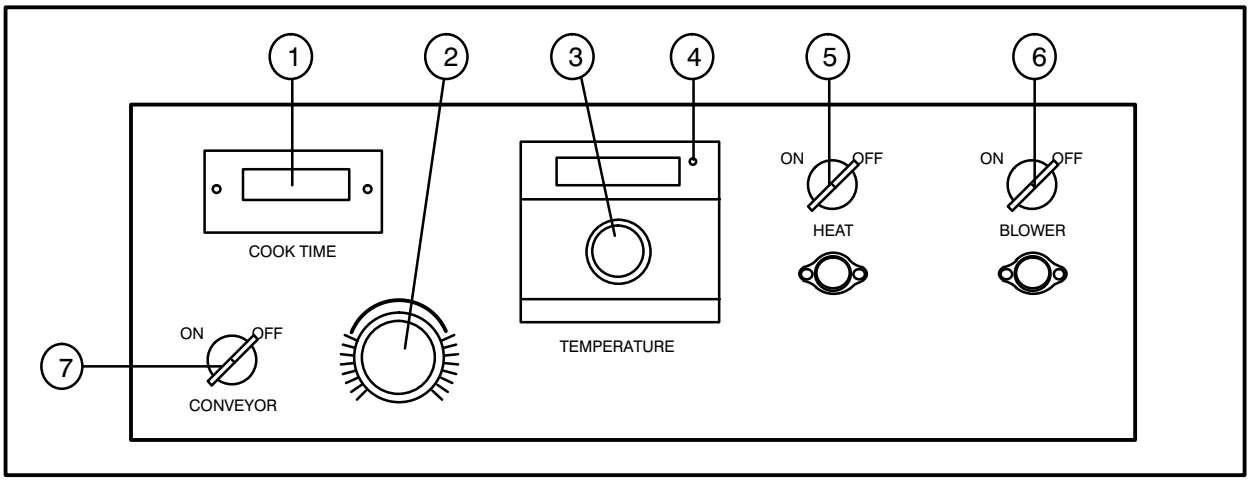


FIGURE 1

CONTROL DESCRIPTION

1. COOK TIME DISPLAY — Gives the belt speed.
2. CONVEYOR ADJUSTMENT KNOB — Turn to adjust the conveyor speed.
3. TEMPERATURE CONTROL KNOB — Turn to set cook temperature.
4. HEAT LIGHT — Indicates the control is calling for heat.
5. HEAT SWITCH — Controls power to the burner.
6. BLOWER SWITCH — Controls power to the blowers.
7. CONVEYOR SWITCH — Controls power to the conveyor motor.

CONTROL OPERATION

1. Turn the manual gas valve to the *OPEN* position. This is only necessary on initial start-up.
2. Turn the BLOWER SWITCH (6) to *ON*.
3. Push and turn the TEMPERATURE CONTROL KNOB (3) clockwise to the desired setting.
4. Turn the HEAT SWITCH (5) to *ON*. The burner purge timer will be energized. After approximately thirty (30) seconds, a spark ignites the burner. Initial start may require longer due to air in the gas line.

   *NOTE: If the oven fails to ignite after the thirty (30) second purge, turn the HEAT SWITCH (*5*) to OFF and wait 5 minutes before turning back to ON.*
5. Turn the CONVEYOR SWITCH (7) to *ON*. The conveyor belt starts to travel through the oven. This circuit is independent and can be turned on or off without affecting any other operations. Adjust the conveyor speed as follows:

   Turn the ADJUSTMENT KNOB (2) clockwise to increase speed, counter-clockwise to decrease speed. Turn the knob-lock behind the control knob to hold the desired belt speed
6. Turn the BLOWER (6), CONVEYOR (7) and HEAT (8) SWITCHES to *OFF*. The Cool Down circuit is energized. The blower motor(s) continue to run until the oven temperature is between 135—170°F (57—77°C). The digital temperature display remains lit until the cool down circuit de-energizes.

The oven will hold these parameters daily and will require no further adjustments unless a different product is placed in the oven.

NOTE: Each oven contains different components and must be adjusted individually.

ATHENA TEMPERATURE CONTROLLER WITH OPEN LOOP DC DRIVE SYSTEM

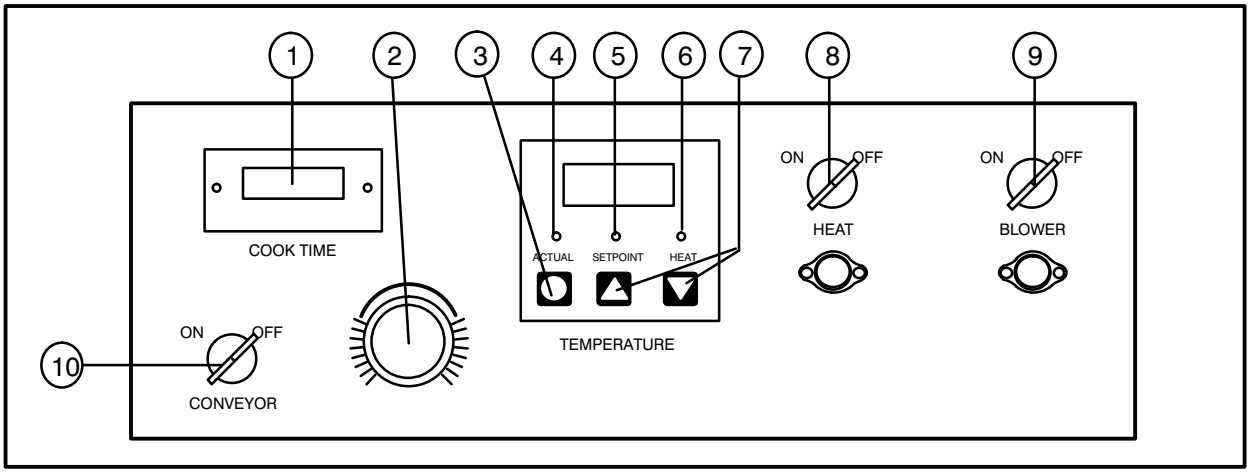


FIGURE 2

CONTROL DESCRIPTION

1. COOK TIME DISPLAY — Gives the belt speed.
2. CONVEYOR ADJUSTMENT KNOB — Turn to adjust the conveyor speed.
3. ACTUAL TEMPERATURE KEY — Press to display the actual oven temperature.
4. ACTUAL TEMPERATURE LIGHT — When lit indicates the control is displaying the actual oven temperature.
5. SETPOINT LIGHT — When lit indicates control is displaying desired cook temperature.
6. HEAT LIGHT — When lit indicates that the control is calling for heat.
7. UP and DOWN ARROW KEYS — Used to increase/decrease desired cook temperature.
8. HEAT SWITCH — Controls power to the burner.
9. BLOWER SWITCH — Controls power to the blowers.
10. CONVEYOR SWITCH — Controls power to the conveyor motor.

CONTROL OPERATION

1. Turn the manual gas valve to the *OPEN* position. This is only necessary on initial start-up.
2. Turn the BLOWER SWITCH (9) to *ON*.
3. Press the UP or DOWN ARROW keys (7) to enter the desired cook temperature.
4. Turn the HEAT SWITCH (8) to *ON*.

   NOTE: If the oven fails to ignite after the thirty (30) second purge, turn the blower switch OFF and wait 5 minutes before turning back ON.
5. Press the ACTUAL TEMPERATURE KEY (3). If the actual temperature matches the setpoint the oven is ready to cook.

   NOTE: The display will flash until the actual temperature is within the preset deviation alarm band. The default setting is ± 20°F of the setpoint.
6. Turn the CONVEYOR SWITCH (10) to *ON*. The conveyor belt starts to move. Turn the CONVEYOR ADJUSTMENT KNOB (2) clockwise to increase speed, counter-clockwise to decrease speed. Turn the knob-lock behind the control knob to hold the desired belt speed
7. Turn the BLOWER (6), CONVEYOR (7) and HEAT (8) SWITCHES to *OFF*. The Cool Down circuit is energized. The blower motor(s) continue to run until the oven temperature is between 135—170°F (57—77°C). The digital temperature display remains lit until the cool down circuit de-energizes.

The oven will hold these parameters daily and will require no further adjustments unless a different product is placed in the oven.

NOTE: Each oven contains different components and must be adjusted individually.

COMPUTER CONTROLLER

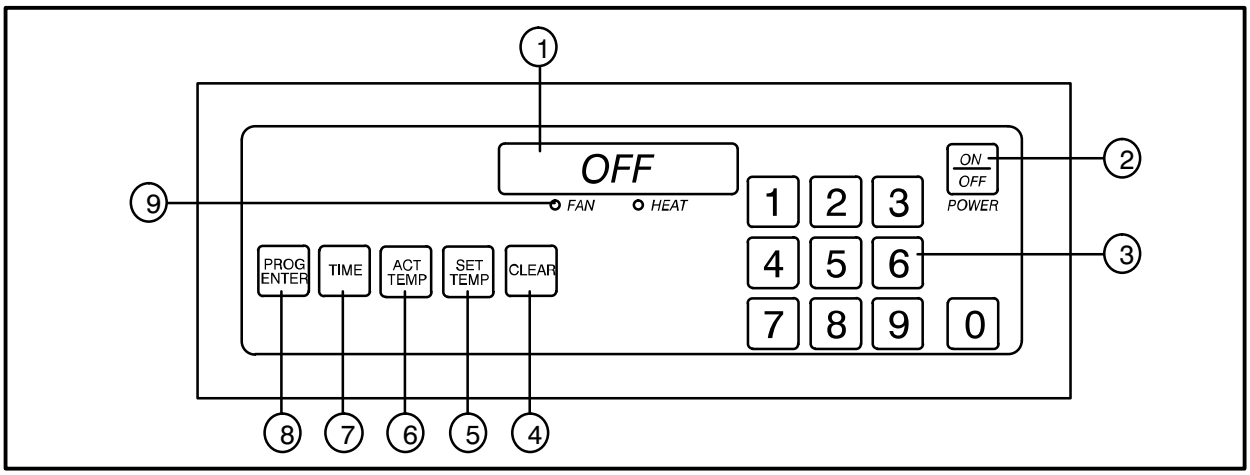


FIGURE 3

CONTROL DESCRIPTION

1. DIGITAL DISPLAY — Displays the time, temperature and controller related information.
2. OVEN ON/OFF — Controls power to the oven.
3. NUMERIC KEYS — Used to enter numerical data in the programming mode.
4. CLEAR KEY — Used to clear the display if an error is made in the programming mode.
5. SET TEMP KEY — Used to view or program the temperature setpoint.
6. ACT TEMP KEY — Used to view the current oven temperature.
7. TIME KEY — Used to view or program the cook time.
8. PROG/ENTER KEY — Used to enter and exit the programming mode. Also used to lock in programmed settings.
9. STATUS LAMPS — When lit indicate that the fan or burners are operating.

This oven, supplied with remote control, is equipped with an emergency shut down switch. Should you need to stop the belt, fans, or heat press the emergency switch.

Do not use the emergency switch as a GENERAL on/off switch!

CONTROL OPERATION

To turn the oven on:

1. Press and hold the ON/OFF key (2). The display reads *OFF* when the oven is idle.
2. The display flashes *WAIT • LOW • SET • TIME.*
3. The FAN and HEAT status lamps (9) light. The fans begin to run. The heat rises to the programmed temperature. The conveyor belt travels at the programmed speed.

To view the cook time setting:

1. Press the TIME key (7). The LED on the key lights and the display flashes *SET • TIME.*

To display the actual oven temperature:

1. Press the ACT TEMP key (6). The LED on the key lights and the display reads *ACTUAL • °F.*

To view the temperature set point:

1. Press the SET TEMP key (5). The LED on the key lights and the display flashes *SET • TEMP • °F.*

To turn the oven off:

1. Press the ON/OFF key (2). The blower motor(s) continue to run regardless of the controller status until the temperature drops below 180°F (82°C).

PROGRAMMING PROCEDURES

Programming the Cook Time:

1. Press the PROGRAM/ENTER key (8).
2. Press the TIME key (7). The display reads *PROG-? • SET • TIME-? • _ _ _ _.*
3. Use the NUMERIC keys (3) to enter the desired cook time. The display will read the numbers as they are entered. If an error is made, press the CLEAR key (4) and re-enter the number.
4. Press the PROGRAM/ENTER key (8) a second time to lock-in the new time. The new cook time will be stored in the computer's memory.

Programming the Temperature:

1. Press the PROGRAM/ENTER key (8).
2. Press the SET TEMP key (5). The display reads *PROG-? • SET • TEMP-? • _ _ _ _ °F.*
3. Use the NUMERIC keys (3) to enter the desired temperature set point. The control displays the numbers as they are entered. If an error is made, press the CLEAR key (4) and re-enter the number.
4. Press the PROGRAM/ENTER key (8) a second time to lock-in the new temperature. The new temperature setpoint will be stored in the computer's memory.

Operation at the Programmed Settings:

1. Press and hold the ON/OFF key (2).
2. The FAN and HEAT status lamps (9) light. The fans begin to run. The heat rises to the temperature setting stored in the computer's memory. The conveyor belt begins to travel at the timed speed stored in memory.
3. The display will flash *WAIT • LOW • SET • TIME* until the programmed bake temperature is reached. The HEAT lamp (9) will remain lit until the oven reaches the temperature set point.
4. The display reads *READY* and the HEAT lamp (9) goes out.
5. The oven is now ready to accept product.
6. Press and hold the ON/OFF key (2) to turn the oven off. The fans continue to run while the oven cools to a safe temperature.

DISPLAY INFORMATION

- WAIT • *LOW* — indicates that the present oven temperature is lower than the set point temperature. When the oven reaches the set point temperature the display changes to *READY.*
- *READY* — indicates that the oven is ready to accept product.
- *SET • TEMP • mmss* — indicates the current cook time setting.
- *HIGH • TIME* — indicates that the temperature is well above the set point. This usually occurs when moving from a higher to a lower temperature. Wait until the display reads ready before loading product.
- *HIGH • TEMP • LIMIT* — indicates that the oven temperature exceeds the high limit from the 2nd level program. The Over Temperature Alarm buzzer will sound. Shut the oven off and wait for the unit to cool down.
- *HIGH • TEMP • PANEL* — indicates that the control area reaches an excessive temperature. Shut the oven off and wait for the unit to cool down. Error code generally means loose ground wire.
- *PROBE • OPEN • PROBE • SHORT* — indicates that the temperature sensor has failed. The Alarm buzzer sounds. Shut the oven off and contact a service representative.

SEQUENCE OF OPERATION

NOTE: The following instructions represent the most common configurations. For questions regarding other options call the Blodgett Service Department at (800)331-5842.

MT2136E DOMESTIC WITH ATHENA CONTROLS — M2190 REV H

COMPONENT REFERENCE

NOTE: Refer to FIGURE 4 page 3—25 for component locations.

1. BLOWER SWITCH (M0153)
2. HI/LO BOARD (M3150)
3. TEMPERATURE CONTROLLER (M3149)
4. MOTOR CONTACTOR (M0708)
5. CONVECTION FANS (Clockwise — M2871, Counter-clockwise — M2870)
6. THERMOCOUPLES (Dual lead — M3151, Single — M3152)
7. HEAT SWITCH (M0152)
8. SPST THERMAL SWITCH (M1362, L140-20F or M2734, L165—30F)
9. SPST THERMAL SWITCH (M1362, L140-20F or M2734, L165—30F)
10. ELEMENT CONTACTOR (M2720)
11. HEATING ELEMENTS (208VAC, 3Φ — M2571 208VAC, 1Φ — M2697, 240VAC, 3Φ — M2572, 240VAC, 1Φ — M2698)
12. SPST THERMAL SWITCH (M0635, F110-20F)
13. COOLING FANS (M2469)
14. SPST THERMAL SWITCH (M0635, F110-20F)
15. CONVEYOR SWITCH (M0152)
16. TIME DISPLAY (M3146)
17. 10kΩ POTENTIOMETER (M3145)
18. D.C. SPEED CONTROL BOARD (M2379)
19. 130 VDC MOTOR (M2378)
20. #10 HALL EFFECT PICKUP (M3147)
21. STEP DOWN TRANSFORMER (M7170)

OPERATION

1. Turn the blower switch (1) to ON. The N.O. contacts close, the N.C. contacts open. 115 VAC runs to terminal #7 of the hi/lo board (2), L1 of the temperature controller (3) and the coil of the motor contactor (4). Terminal #7 is an output. It remains powered after the oven is shut down to keep the convection fans (5) operating until the unit reaches 135-170°F (57-77°C) as sensed by the thermocouples (6).

   NOTE: Two thermocouples are located between the convection fans in the rear of the oven. One thermocouple provides DC millivolts to the Hi/Lo limit board. The other provides DC milivolts to the temperature controller. Check thermocouples with a millivolt meter.

2. Turn the heat switch (7) to ON. 115 VAC is supplied to terminal #5 of the hi/lo board (2). If the temperature is below 600°F (316°C) a switch is made between terminals #5 and #6 allowing power to go to the common terminal of the temperature controller (3). If the temperature controller (3) is calling for heat, a switch is made between common and N.O. Power is sent to one side of a N.C. SPST thermal switch (8). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed, sending power to one side of another N.C. SPST thermal switch (9). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between two convection blowers in the rear convection fan compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed, sending power to the element contactor (10). When the element contactor closes it sends power to the heating elements (11).

3. When power is applied to the coils of the motor contactor (4) the contacts close sending power to the two convection fans (5) located in the back of the oven.

4. There are two cooling fans (13) located in the rear convection fan compartment. These fans are activated when the N.O. SPST thermal switch (12) closes due to high ambient heat. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between the two blowers in the rear convection fan compartment. It protects the convection fans from hi ambient heat.

   A third cooling fan (13) is located in the control box compartment. This fan is activated when another N.O. SPST thermal switch (14) closes. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the controls from hi ambient heat.

5. The conveyor is driven by an open loop D.C. control system consisting of a conveyor switch (15), time display (16), 10kΩ potentiometer (17), D.C. speed control board (18), 130 VDC motor (19) and #10 Hall effect pickup (20). After the conveyor switch is turned on, the time display illuminates. The D.C. control board powers up. The output voltage measured on terminals A1 and A2 of the board to the motor varies from 20 to 130 VDC based on the position of the potentiometer. The speed of the motor should also vary. The time display varies depending on the speed of the Hall effect pickup. The pickup sends an R.P.M. value to the display. The display converts this value to minutes:seconds.

   NOTE: This type of system does not sense the weight of the product and will slow down slightly if the belt is fully loaded.

NOTE: The oven has a 240/120 step down transformer (21) located in the control compartment. This transformer is used for the controls only.

MT2136E GENERAL EXPORT WITH ATHENA CONTROLS — M2341 REV F

COMPONENT REFERENCE

NOTE: Refer to FIGURE 5 page 3—26 for component locations.

1. BLOWER SWITCH (M0153)
2. HI/LO BOARD (M3150)
3. TEMPERATURE CONTROLLER (M3149)
4. MOTOR CONTACTOR (M2247)
5. CONVECTION FANS (Clockwise — M2873, Counter-clockwise — M2872)
6. THERMOCOUPLES (Dual lead — M3151, Single — M3152)
7. HEAT SWITCH (M0152)
8. SPST THERMAL SWITCH (M1362, L140-20F or M2734, L165—30F)
9. SPST THERMAL SWITCH (M1362, L140-20F or M2734, L165—30F)
10. ELEMENT CONTACTOR (R1530)
11. HEATING ELEMENTS (220/380VAC, 3Φ — M2573 or 240/315 VAC 3Φ — M2574)
12. SPST THERMAL SWITCH (M0635, F110-20F)
13. COOLING FANS (23034)
14. SPST THERMAL SWITCH (M0635, F110-20F)
15. CONVEYOR SWITCH (M0152)
16. TIME DISPLAY (M3154)
17. 10kΩ POTENTIOMETER (M3145)
18. D.C. SPEED CONTROL BOARD (M3153)
19. 180 VDC MOTOR (M3128)
20. #10 HALL EFFECT PICKUP (M3147)

OPERATION

1. Turn the blower switch (1) to ON. The N.O. contacts close, the N.C. contacts open. 115 VAC runs to terminal #7 of the hi/lo board (2), L1 of the temperature controller (3) and the coil of the motor contactor (4). Terminal #7 is an output. It remains powered after the oven is shut down to keep the convection fans (5) operating until the unit reaches 135-170°F (57-77°C) as sensed by the thermocouples (6).

   NOTE: Two thermocouples are located between the convection fans in the rear of the oven. One thermocouple provides DC millivolts to the Hi/Lo limit board. The other provides DC milivolts to the temperature controller. Check thermocouples with a millivolt meter.

2. Turn the heat switch (7) to ON. 115 VAC is supplied to terminal #5 of the hi/lo board (2). If the temperature is below 600°F (316°C) a switch is made between terminals #5 and #6 allowing power to go to the common terminal of the temperature controller (3). If the temperature controller (3) is calling for heat, a switch is made between common and N.O. Power is sent to one side of a N.C. SPST thermal switch (8). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed, sending power to one side of another N.C. SPST thermal switch (9). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between two convection blowers in the rear convection fan compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed, sending power to the element contactor (10). When the element contactor closes it sends power to the heating elements (11).

3. When power is applied to the coils of the motor contactor (4) the contacts close sending pow-

er to the two convection fans (5) located in the back of the oven.

4. There are two cooling fans (13) located in the rear convection fan compartment. These fans are activated when the N.O. SPST thermal switch (12) closes due to high ambient heat. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between the two blowers in the rear convection fan compartment. It protects the convection fans from hi ambient heat.

   A third cooling fan (13) is located in the control box compartment. This fan is activated when another N.O. SPST thermal switch (14) closes. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the controls from hi ambient heat.

5. The conveyor is driven by an open loop D.C. control system consisting of a conveyor switch (15), time display (16), 10kΩ potentiometer (17), D.C. speed control board (18), 180 VDC motor (19) and #10 Hall effect pickup (20). After the conveyor switch is turned on, the time display illuminates. The D.C. control board powers up. The output voltage measured on terminals A1 and A2 of the board to the motor varies from 20 to180 VDC based on the position of the potentiometer. The speed of the motor should also vary. The time display varies depending on the speed of the Hall effect pickup. The pickup sends an R.P.M. value to the display. The display converts this value to minutes:seconds.

   NOTE: This type of system does not sense the weight of the product and will slow down slightly if the belt is fully loaded.

MT2136G AUSTRALIAN UNIT WITH ATHENA CONTROL — M2847 REV C

COMPONENT REFERENCE

NOTE: Refer to FIGURE 6 page 3—27 for component locations.

1. BLOWER SWITCH (M0153)
2. HI/LO LIMIT BOARD (M3150)
3. TEMPERATURE CONTROLLER (M3149)
4. MOTOR CONTACTOR (M2247)
5. CONVECTION FANS (Clockwise — M2873, Counter-clockwise — M2872)
6. THERMOCOUPLES (Dual lead — M3151, Single — M3152)
7. HEAT SWITCH (M0152)
8. CONVECTION FAN PRESSURE SWITCH (M0595)
9. STEP DOWN TRANSFORMER (M2384)
10. COMBUSTION MOTOR (M2386)
11. IGNITION MODULE (M1054)
12. PILOT VALVE (LP — 22190, Natural — M5495)
13. MAIN BURNER VALVE (LP — 22190, Natural — M5495)
14. SPST THERMAL SWITCH (M1362, L140-20F or M2734, L165-30F)
15. SPST THERMAL SWITCH (M1362, L140-20F or M2734, L165-30F)
16. DIFFERENTIAL PRESSURE SWITCH (M2819)
17. SINGLE SOLENOID GAS VALVE (M2245)
18. COOLING FANS (23034)
19. SPST THERMAL SWITCH (M0635, F110-20F)
20. SPST THERMAL SWITCH (M0635, F110-20F)
21. CONVEYOR SWITCH (M0152)
22. TIME DISPLAY (M3154)
23. 10kΩ POTENTIOMETER (M3145)
24. DC SPEED CONTROL BOARD (M3153)
25. 180 VDC MOTOR (M3128)
26. #10 HALL EFFECT PICKUP (M3147)

OPERATION

1. Turn the blower switch (1) to ON. The N.O. contacts close, the N.C. contacts open. 115 VAC runs to terminal #7 of the hi/lo board (2), L1 of the temperature controller (3) and the coil of the motor contactor (4). Terminal #7 is an output. It remains powered after the oven is shut down to keep the convection fans (5) operating until the unit reaches 135-170°F (57-77°C) as sensed by the thermocouples (6).

   NOTE: Two thermocouples are located between the convection fans in the rear of the oven. One thermocouple provides DC millivolts to the Hi/Lo limit board. The other provides DC milivolts to the temperature controller. Check thermocouples with a millivolt meter.

2. Turn the heat switch (7) to ON. 240 VAC is supplied to terminal #5 of the hi/lo board (2). If the temperature is below 316°C (600°F) a switch is made between terminals #5 and #6 allowing power to go to one side of a N.O. convection fan pressure switch (8).

   NOTE: This switch reacts to a vacuum created by the convection fans (5).

   When the switch closes, 240 VAC is delivered to the primary side of a 240/24 VAC step down transformer (9) and the combustion motor (10) of the flame blower. When the transformer powers up, 24 VAC are sent to the ignition module (11). After the module's self diagnostics are complete, the pilot valve (12) opens. When a proof of flame is established, the main burner valve (13) opens.

3. Terminal #5 of the hi/lo board (2) sends power to the common terminal of the temperature controller (3). If the temperature controller (3) is calling for heat, a switch is made between common and N.O. Power is sent to one side of a N.C. SPST thermal switch (14). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed, sending power to one side of another N.C. SPST thermal switch (15). The switch toggles if the

temperature passing its face exceeds the rating on the back of the switch.

NOTE: The switch is located between two convection blowers in the rear convection fan compartment. It protects the other components from hi ambient heat.

If this switch is cold it should be closed sending power to the common terminal of a differential pressure switch (16). The pressure switch is made between common and N.C. when the combustion motor (10) is idle. When the combustion motor reaches full speed the differential pressure switch toggles from common and N.C. to common and N.O. sending power to the single solenoid gas valve (17).

NOTE: The differential pressure switch toggles due to a change in air pressure created by the combustion motor.

4. There are two cooling fans (18) located in the rear convection fan compartment. These fans are activated when the N.O. SPST thermal switch (19) closes due to high ambient heat. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between the two blowers in the rear convection fan compartment. It protects the convection fans from hi ambient heat.

   A third cooling fan (18) is located in the control box compartment. This fan is activated when another N.O. SPST thermal switch (20) closes. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the controls from hi ambient heat.

5. The conveyor is driven by an open loop D.C. control system consisting of a conveyor switch (21), time display (22), 10kΩ potentiometer (23), D.C. speed control board (24), 180 VDC motor (25) and #10 Hall effect pickup (26). After the conveyor switch is turned on, the time display illuminates. The D.C. control board powers up. The output voltage measured on terminals A1 and A2 of the board to the motor varies from 20 to180 VDC based on the position of the potentiometer. The speed of the motor should also vary. The time display varies depending on the speed of the Hall effect pickup. The pickup sends an R.P.M. value to the display. The display converts this value to minutes:seconds.

   NOTE: This type of system does not sense the weight of the product and will slow down slightly if the belt is fully loaded.

MT2136G CE WITH ATHENA CONTROL — M3163 REV C

COMPONENT REFERENCE

NOTE: Refer to FIGURE 7 page 3—28 for component locations.

1. BLOWER SWITCH (M0153)
2. TEMPERATURE CONTROLLER (M3155)
3. MOTOR CONTACTOR (M2247)
4. HI/LO LIMIT BOARD (M3150)
5. CONVECTION FANS (Clockwise — M2873, Counter-clockwise — M2872)
6. THERMOCOUPLES (Dual lead — M3151, Single — M3152)
7. HEAT SWITCH (M0152)
8. CONVECTION PRESSURE SWITCH (M0595)
9. COMBUSTION MOTOR (M2386)
10. BURNER PRESSURE SWITCH (M3330)
11. TPDT RELAY/LATCHING RELAY (M6519)
12. 10 SECOND PURGE TIMER (M3173)
13. SPST RELAY (16775)
14. SPST N.C. THERMAL SWITCH (M1362, L140-20F or M2734, L165-30F)
15. SPST N.C. THERMAL SWITCH (M1362, L140-20F or M2734, L165-30F)
16. IGNITION CONTROL MODULE/ LANDIS & GYR (M3168)
17. 2 SECOND PURGE TIMER (M3172)
18. PILOT VALVE (LP — M6001, Natural — M6000)
19. MAIN VALVE (LP — M6001, Natural — M6000)
20. IGNITION ALARM LIGHT (16037)
21. COOLING FANS (23034)
22. SPST N.O. THERMAL SWITCH (M0635, F110-20F)
23. SPST N.O. THERMAL SWITCH (M0635, F110-20F)
24. CONVEYOR SWITCH (M0152)
25. TIME DISPLAY (M3154)
26. 10kΩ POTENTIOMETER (M3145)
27. DC SPEED CONTROL BOARD (M3147)
28. 180 VDC MOTOR (M3128) (M3147)
29. #10 HALL EFFECT PICKUP (M3147)

OPERATION

1. Turn the blower switch (1) to ON. The N.O. contacts close, the N.C. contacts open. 220 or 240 VAC runs to terminal L1 of the temperature controller (2), the coil of the motor contactor (3) and terminals #2 and #7 of the hi/lo limit board (4). Terminal #7 is an output. It remains powered after the oven is shut down to keep the convection fans (5) operating until the unit reaches 57—77°C (135—170°F) as sensed by the thermocouples (6).

   NOTE: Two thermocouples are located between the middle convection fans in the rear of the oven. One thermocouple provides DC millivolts to the Hi/Lo limit board. The other provides DC milivolts to the temperature controller. Check thermocouples with a millivolt meter.

2. Turn the heat switch (7) to ON. Power goes to the common terminal of the temperature controller (2) and terminal #5 of the Hi/Lo limit board (4). A switch is made between terminals #5 and #6 of the Hi/Lo board. This switch opens if the oven cavity temperature exceeds 316°C (600°F). Terminal #6 of the Hi/Lo board is an output and sends power to a convection pressure switch (8). The switch reacts from a vacuum created by the convection fans. If the switch is closed, power runs to the combustion motor (9), the common terminal of the burner pressure switch (10), and terminal #7 of a TPDT relay (11).

   NOTE: This relay acts as a latching relay and remains powered up even after the burner pressure switch changes state.

   The burner pressure switch should be made between common and N.C., sending power to terminal #4 and the coil of the latching relay.

3. When the combustion motor (9) reaches full speed, the burner pressure switch (10) toggles between common and N.C. to common and N.O. Power goes to terminal #9 of the latching relay (11). This relay is latched due to voltage passing from terminal #7 through a set of closed contacts to terminal #4 to its coil. A set of contacts are also closed between terminals #9 and #6 of the same relay, sending power to a 10 second purge timer (12). When the tim-

er times out, power goes to the coil of a SPST relay (13), allowing its contacts to close.

4. On a call for heat from the temperature controller (2), as sensed by the thermocouples, a set of contacts closes sending power out of the N.O. terminal of the temperature controller to one side of a N.C. SPST thermal switch (14). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed, sending power to one side of another N.C. SPST thermal switch (15). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between two convection blowers in the rear convection fan compartment. It protects the other components from hi ambient heat.

   If this switch is cold it should be closed sending power to one side of the SPST relay (13). This relay was closed shortly after the 10 second purge timer (12) timed out. Power is sent to terminal #1 of the Landis and Gyr ignition control system (16). Terminal #8 of the ignition control module is an output. It sends power to a 2 second purge timer (17) and the pilot valve (18). The main valve (19) opens when the 2 second purge timer times out. If the ignition control senses a flame the system remains energized. If not, the control locks out within 1 to 3 seconds. The ignition alarm light (20) illuminates.

   NOTE: This system is polarity specific. If the unit locks out repeatedly and the D.C. microamps are within the acceptable range, check for proper polarity.

5. When power is applied to the coil of the motor contactor (3) the contacts close sending power to the two convection fans (5) located in the rear of the oven.

   NOTE: Terminals #13 and #14 of the motor contactor act as a hood interlock. They are sometimes used as a means of starting the hood.

6. There are two cooling fans (21) located in the rear convection fan compartment. These fans are activated when the N.O. SPST thermal switch (22) closes due to high ambient heat. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between the two blowers in the rear convection fan compartment. It protects the convection fans from hi ambient heat.

   A third cooling fan (21) is located in the control box compartment. This fan is activated when another N.O. SPST thermal switch (23) closes. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located in the slide out control compartment. It protects the controls from hi ambient heat.

7. The conveyor is driven by an open loop D.C. control system consisting of a conveyor switch (24), time display (25), 10kΩ potentiometer (26), D.C. speed control board (27), 180 VDC motor (28) and #10 Hall effect pickup (29). After the conveyor switch is turned on, the time display illuminates. The D.C. control board powers up. The output voltage measured on terminals A1 and A2 of the board to the motor varies from 20 to180 VDC based on the position of the potentiometer. The speed of the motor should also vary. The time display varies depending on the speed of the Hall effect pickup. The pickup sends an R.P.M. value to the display. The display converts this value to minutes:seconds.

   NOTE: This type of system does not sense the weight of the product and will slow down slightly if the belt is fully loaded.

MT2136G DOMESTIC WITH REMOTE COMPUTER CONTROL — M3476 REV B

COMPONENT REFERENCE

NOTE: Refer to FIGURE 8 page 3—29 for component locations.

1. COMPUTER (FW525)
2. BELT STOP RELAY (22672)
3. BLOWER RELAY (22672)
4. HEAT RELAY (22672)
5. DC SPEED CONTROL BOARD (M2379)
6. MANUAL RESETABLE HI LIMIT SWITCH (M3295)
7. 115/24 VAC STEP DOWN TRANSFORMER (M2381)
8. COMBUSTION MOTOR (22132)
9. CENTRIFUGAL SWITCH
10. IGNITION MODULE (M1054)
11. PILOT VALVE (LP — 22190, Natural — M5495)
12. BURNER VALVE (LP — 22190, Natural — M5495)
13. MOTOR CONTACTOR (M0708)
14. CONVECTION FANS (Clockwise — M2871, Counter-clockwise — M2870)
15. SPDT THERMAL SWITCH (M2453 L140—20F)
16. COOLING FANS (M2469)
17. RTD PROBE (M7427)
18. SPST THERMAL SWITCH (M1362 L140—20F, M2734 L165—30F)
19. BURNER CONTROL VALVE (20287)
20. FLAME BLOWER (22258)
21. 130 VDC MOTOR (M2378)

OPERATION

1. Apply power to the oven. Program the time and temperature into the computer (1). The belt stop relay (2), blower relay (3) and the heat relay (4) energize powering up the oven.

2. When the belt stop relay closes, 120 VAC goes to the DC speed control board (5) and the manual resetable hi limit switch (6). The high limit switch is a bulb and capillary style switch. It reacts when the oven cavity temperature exceeds the high limit programmed into the cooking computer.

   If the high limit switch is closed power flows to the primary side of a 115/24 volt step down transformer (7) and the combustion motor (8) of the flame blower. The combustion motor powers up. When the combustion motor reaches full speed, a centrifugal switch (9) closes sending 24 VAC to the ignition module (10). After the module's self diagnostics are complete, the pilot valve (11) opens. When a proof of flame is established the main burner valve (12) powers up.

3. The blower relay (3) sends 115 volts to the coil of the motor contactor (13) starting the two convection fans (14) in the rear of the oven. This contactor also supplies power to the N.C. terminal of a SPDT thermal switch (15). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch and may start the fans even if the oven is off. If this switch is cold, it should be made between common and N.C. terminals sending power to the cooling fans (16).

   NOTE: The SPDT thermal switch is located in the junction box in the rear of the oven in the blower compartment.

4. On a call for heat from the cooking computer (1), as sensed by an RTD probe (17), the heat relay (4) closes sending 115 VAC to one terminal of a N.C. SPST thermal switch (18). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch. If the switch is closed, 115 VAC is delivered to the burner control valve (19). This valve opens sending gas to the flame blower (20) for ignition.

   NOTE: The RTD probe is located in front of the combustion motor. It should be checked

with an ohm meter. The SPST thermal switch is located in the rear of the convection fan compartment.

5. The conveyor is driven by an open loop DC control system consisting of a DC speed control board (5), a 130 VDC motor (21) and the DAC located in the cooking computer (1). If a time is programmed into the cooking computer, a voltage ranging between .47 and 4.7 is applied to the DC speed control board. The output voltage measured at A1 and A2 of the board to the motor varies from 20 to130 VDC based on the DAC voltage applied to the board or the time programmed into the computer.

   NOTE: The DAC receives 20 VDC from the speed control boards. The DAC returns a portion of the voltage (between .47 and 4.7 VDC). The amount of voltage is dependent on the time programmed into the computer.

   NOTE: This type of system does not sense the weight of the product and will slow down slightly if the belt is fully loaded.

   NOTE: This oven, supplied with remote control, is equipped with an emergency shut down switch. Should you need to stop the belt, fans, or heat press the emergency switch. ***Do not use the emergency switch as a GENERAL on/off switch!***

MT2136G DOMESTIC WITH OPEN LOOP COMPUTER CONTROL — M3717 REV B

COMPONENT REFERENCE

NOTE: Refer to FIGURE 9 page 3—30 for component locations.

1. COMPUTER (FW525)
2. BELT STOP RELAY (22672)
3. BLOWER RELAY (22672)
4. HEAT RELAY (22672)
5. DC SPEED CONTROL BOARD (M2379)
6. MANUAL RESETABLE HI LIMIT SWITCH (M3295)
7. 115/24 VAC STEP DOWN TRANSFORMER (M2381)
8. COMBUSTION MOTOR (22132)
9. CENTRIFUGAL SWITCH
10. IGNITION MODULE (M1054)
11. PILOT VALVE (LP — 22190, Natural — M5495)
12. BURNER VALVE (LP — 22190, Natural — M5495)
13. MOTOR CONTACTOR (M0708)
14. CONVECTION FANS (Clockwise — M2871, Counter-clockwise — M2870)
15. SPDT THERMAL SWITCH (M2453 L140—20F)
16. COOLING FANS (M2469)
17. SPST THERMAL SWITCH (M0635 F10—20)
18. RTD PROBE (M7427)
19. SPST THERMAL SWITCH (M1362 L140—20F, M2734 L165—30F)
20. BURNER CONTROL VALVE (20287)
21. FLAME BLOWER (22258)
22. 130 VDC MOTOR (M2378)

OPERATION

1. Apply power to the oven. Program the time and temperature into the computer (1). The belt stop relay (2), blower relay (3) and the heat relay (4) energize powering up the oven.

2. When the belt stop relay closes, 120 VAC goes to the DC speed control board (5) and the manual resetable hi limit switch (6). The high limit switch is a bulb and capillary style switch. It reacts when the oven cavity temperature exceeds the high limit programmed into the cooking computer.

   If the high limit switch is closed power flows to the primary side of a 115/24 volt step down transformer (7) and the combustion motor (8) of the flame blower. The combustion motor powers up. When the combustion motor reaches full speed, a centrifugal switch (9) closes sending 24 VAC to the ignition module (10). After the module's self diagnostics are complete, the pilot valve (11) opens. When a proof of flame is established the main burner valve (12) powers up.

3. The blower relay (3) sends 115 volts to the coil of the motor contactor (13) starting the two convection fans (14) in the rear of the oven. This contactor also supplies power to the N.C. terminal of a SPDT thermal switch (15). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch and may start the fans even if the oven is off.

   NOTE: The SPDT thermal switch is located in a junction box in the convection fan compartment.

   If this switch is cold, it should be made between common and N.C. terminals sending power to the two cooling fans (16) located in the rear of the oven. These cooling fans protect the convection fans from high ambient heat. Two additional cooling fans (16) are located in the cooking computer control area and are activated when a SPST N.O. thermal switch (17) closes. The switch toggles if the temperature passing its face exceeds the rating on the back of the switch and may start the fans even if the oven is off.

   NOTE: The SPST N.O. thermal switch is located in the cooking computer compartment.

4. On a call for heat from the cooking computer (1), as sensed by an RTD probe (18), the heat relay (4) closes sending 115 VAC to one terminal of a N.C. SPST thermal switch (19). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch. If the switch is closed, 115 VAC is delivered to the burner control valve (20). This valve opens sending gas to the flame blower (21) for ignition.

   NOTE: The RTD probe is located in front of the combustion motor. It should be checked with an ohm meter. The SPST thermal switch is located in the rear of the convection fan compartment.

5. The conveyor is driven by an open loop DC control system consisting of a DC speed control board (5), a 130 VDC motor (22) and the DAC located in the cooking computer (1). If a time is programmed into the cooking computer, a voltage ranging between .47 and 4.7 is applied to the DC speed control board. The output voltage measured at A1 and A2 of the board to the motor varies from 20 to130 VDC based on the DAC voltage applied to the board or the time programmed into the computer.

   NOTE: The DAC receives 20 VDC from the speed control boards. The DAC returns a portion of the voltage (between .47 and 4.7 VDC). The amount of voltage is dependent on the time programmed into the computer.

   NOTE: This type of system does not sense the weight of the product and will slow down slightly if the belt is fully loaded.

MT2136G DOMESTIC WITH CLOSED LOOP COMPUTER CONTROL — M7287 REV A

COMPONENT REFERENCE

NOTE: Refer to FIGURE 10 page 3—31 for component locations.

1. COMPUTER (FW525)
2. BELT STOP RELAY (22672)
3. BLOWER RELAY (22672)
4. HEAT RELAY (22672)
5. DC SPEED CONTROL BOARD (M2379)
6. SPST THERMAL SWITCH (M1362)
7. HIGH LIMIT SWITCH (M3295)
8. 120/24 VAC STEP DOWN TRANSFORMER (M2352)
9. COMBUSTION MOTOR (M0767)
10. CENTRIFUGAL SWITCH
11. IGNITION MODULE (M1054)
12. PILOT VALVE (LP — 22190, Natural — M5495)
13. BURNER VALVE (LP — 22190, Natural — M5495)
14. MOTOR CONTACTOR (M0708)
15. CONVECTION FANS (Clockwise — M2871, Counter-clockwise — M2870)
16. SPDT THERMAL SWITCH (M2453 L140—20F)
17. COOLING FAN (M2469)
18. RTD PROBE (M7427)
19. VDC MOTOR (M2378)
20. HALL EFFECT PICKUP (M0984)
21. COOLING FANS (M2469)
22. SPDT THERMAL SWITCH (M2453 L140—20F)

OPERATION

1. Apply power to the oven. Program the time and temperature into the computer (1). The belt stop relay (2), blower relay (3) and the heat relay (4) energize powering up the oven.

2. When the belt stop relay closes, 120 VAC goes to the DC speed control board (5) and one terminal of a N.C. SPST thermal switch (6). If the thermal switch is closed, 120VAC is sent to the common terminal of a manual resettable hi limit switch (7). The high limit switch is a bulb and capillary style switch. It reacts when the oven cavity temperature exceeds the high limit programmed into the cooking computer.

   NOTE: The single pole single throw N.C. thermal switch is a high limit device located between the two blowers in the rear convection fan compartment. This switch opens when the temperature passing its face exceeds the rating on the back of the switch and closes when there is a 10-20° drop in temperature across the face of the switch.

   If the high limit switch is closed power flows to the primary side of a 115/24 volt step down transformer (8) and the combustion motor (9) of the flame blower. The combustion motor powers up. When the combustion motor reaches full speed, a centrifugal switch (10) closes sending 24 VAC to the ignition module (11). After the module's self diagnostics are complete, the pilot valve) opens. When a proof of flame is established the main burner valve (13) powers up.

3. The blower relay (3) sends 115 volts to the coil of the motor contactor (14) starting the two convection fans (15) in the rear of the oven. Power is also applied to the N.C. terminal of a SPDT thermal switch (16). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch and may start the fans even if the oven is off. If this switch is cold, it should be made between common and N.C. terminals sending power to the cooling fan (17).

   NOTE: The SPDT thermal switch is located in the cooking computer control compartment.This switch toggles when the temperature passing its face exceeds the rating on the back of the switch and

closes when there is a 10-20° drop in temperature across the face of the switch.

4. On a call for heat from the cooking computer (1), as sensed by an RTD probe (18), the heat relay (4) closes sending 24 VAC to the burner control valve (13). This valve opens sending gas to the flame blower for ignition.

   NOTE: The RTD probe is located in front of the combustion motor. It should be checked with an ohm meter.

5. The conveyor belt is driven by a closed loop D.C. drive system consisting of a 130 VDC motor (19), a #2 Hall effect pickup (20), a DC speed control board (5) and the DAC located in the cooking computer. The motor speed varies based on the time programmed into the cooking computer. If time is programmed, a voltage from .3 to 3.8 is applied to the DC speed control board. The output voltage measured at terminals A1 and A2 varies from 20 to 130 VDC based on the DAC voltage applied to the board or the time programmed into the computer.

   NOTE: The DAC receives 20 VDC from the speed control board. The DAC returns a portion of the voltage (between .3 and 3.8 VDC). The amount of voltage is dependent on the time programmed into the computer.

   NOTE: This type of system does sense the weight of the product and will not slow down if the belt is fully loaded.

   NOTE: The control voltage is supplied by a 240/120 step down transformer (8). The transformer is located in the control compartment.

6. There are two cooling fans (21) located in the rear convection fan compartment and one located in the control compartment. These fans are activated when the belt stop relay (2) is energized. The fans are also activated when a SPDT thermal switch (22) toggles from common/NC to common NO. The switch toggles due to high ambient heat. It will toggle if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between the two blowers in the rear convection fan compartment. It protects the convection fans from hi ambient heat.

MT2136E CE WITH CLOSED LOOP COMPUTER CONTROL — M6476 REV B

COMPONENT REFERENCE

NOTE: Refer to FIGURE 11 page 3—32 for component locations.

1. COMPUTER (FW525)
2. BELT STOP RELAY (22672)
3. BLOWER RELAY (22672)
4. HEAT RELAY (22672)
5. MOTOR CONTACTOR (M0708)
6. SPDT THERMAL SWITCH (M2453 L140—20F)
7. SPDT THERMAL SWITCH (M2453 L140—20F)
8. COOLING FANS (M2469)
9. CONVECTION FANS (Clockwise — M2873, Counter-clockwise — M2872)
10. RTD PROBE (M7427)
11. SPST THERMAL SWITCH (M1362 L140—20F, M2734 L165—30F)
12. MANUAL RESETABLE HIGH LIMIT SWITCH (M3295)
13. HEATING ELEMENT CONTACTOR (R1530)
14. HEATING ELEMENTS (M2573)
15. 130 VDC MOTOR (M2378)
16. #2 HALL EFFECT PICKUP (M0984)
17. DC SPEED CONTROL BOARD (M2379)
18. STEP DOWN TRANSFORMER (M7170)

OPERATION

1. Apply power to the oven. Program the time and temperature into the computer (1). The belt stop relay (2), blower relay (3) and the heat relay (4) energize powering up the oven.

2. The blower relay (3) closes sending power to the motor contactor (5) and the N.C. terminals of two SPDT thermal switches (6 and 7). The switches toggle if the temperature passing their faces exceeds the rating on the back of the switches and may start the fans even if the oven is off.

   NOTE: One of the thermal switches is located in the junction box in the convection fan compartment. The other thermal switch is located in the cooking computer compartment.

   Two cooling fans (8) are located in the rear of the oven. These cooling fans protect the convection fans from high ambient heat. Two additional cooling fans (8) are located in the computer control compartment. These cooling fans protect the controls from high ambient heat.

   The motor contactor (5) closes energizing the two convection fans (9) in the rear of the oven.

3. On a call for heat from the cooking computer (1), as sensed by an RTD probe (10), the heat relay (4) closes sending 115 VAC to one terminal of a N.C. SPST thermal switch (11). The switch toggles if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The RTD probe is located in the control compartment. It should be checked with an ohm meter. The SPST thermal switch is located in the rear of the convection fan compartment.

   If the switch is closed, 115 VAC is delivered to one terminal of the manual resetable high limit switch (12). The high limit switch is a bulb and capillary style switch. It reacts when the oven cavity temperature exceeds the high limit programmed into the cooking computer.

   If the manual resetable high limit switch (12) (12) is closed power is sent to the contact coil of the heatlng element contactor (13) energizing the heating elements (14).

4. The conveyor belt is driven by a closed loop D.C. drive system consisting of a 130 VDC motor (15), a #2 Hall effect pickup (16), a DC speed control board (17) and the DAC located in the cooking computer. The motor speed varies based on the time programmed into the cooking computer. If time is programmed, a voltage from .3 to 3.8 is applied to the DC speed control board. The output voltage measured at terminals A1 and A2 varies from 20 to 130 VDC based on the DAC voltage applied to the board or the time programmed into the computer.

   NOTE: The DAC receives 20 VDC from the speed control board. The DAC returns a portion of the voltage (between .3 and 3.8 VDC). The amount of voltage is dependent on the time programmed into the computer.

   NOTE: This type of system does sense the weight of the product and will not slow down if the belt is fully loaded.

NOTE: The control voltage is supplied by a 240/120 step down transformer (18). The transformer is located in the control compartment.

MT2136G CE WITH COMPUTER CONTROL — M7290 REV E

COMPONENT REFERENCE

NOTE: Refer to FIGURE 12 page 3—33 for component locations.

1. BLOWER RELAY (22672)
2. MOTOR CONTACTOR (M2247)
3. CONVECTION FANS (CCW) (M2872)
4. CONVECTION FANS (CW) (M2873)
5. CONVECTION PRESSURE SWITCH (M0595)
6. BELT STOP RELAY (22672)
7. DC SPEED CONTROL BOARD (M3153)
8. MANUAL RESET HI LIMIT SWITCH (M3295)
9. HEAT RELAY (22672)
10. SINGLE POLE SINGLE THROW THERMAL SWITCH (M1362)
11. SINGLE POLE SINGLE THROW RELAY (16775)
12. TRIPLE POLE DOUBLE THROW RELAY (90250)
13. TEN SECOND PURGE TIMER (M3173)
14. DIFFERENTIAL BURNER PRESSURE SWITCH (M2819)
15. COMBUSTION BLOWER MOTOR (M2386)
16. LANDIS & GYR IGNITION CONTROL SYSTEM (M3168)
17. 2 SECOND TIMER (M3172)
18. DUAL SOLENOID GAS VALVE (Natural — M6000, LP — M6001)
19. COOKING COMPUTER (M7880)
20. RTD PROBE (M7427)
21. SINGLE POLE DOUBLE THROW THERMAL SWITCH (M2453)
22. COOLING FAN (23034)
23. SINGLE POLE DOUBLE THROW THERMAL SWITCH (M2453)
24. DC Motor (M3128)
25. COOLING FANS (23034)

OPERATION

1. Apply power to the oven. Program the time and temperature into the computer (19). The blower relay (1), belt stop relay (6) and heat relay (9) pull in and power up three separate circuits. The voltage to the relay coils is 12 VDC.
2. The blower relay (1) closes sending 230 volts to the coil of the motor contactor (2). Points 1, 2, 5 and 6 close powering the convection fans (3 & 4).
3. The convection fan pressure switch (5) closes due to the vacuum that is established in the burner tube chamber by the operation of the convection fans.
4. The belt stop relay (6) sends 230 volts to the DC drive board (7) and the manual reset hi limit switch (8). The DC motor (24) starts provided there is a time entered in the cooking computer (19).

   NOTE: The motor used in this oven is 180 volts DC at its highest speed.

   NOTE: This relay will only be powered if there is a time programmed into the computer. THE OVEN WILL NOT HEAT IF TIME IS NOT PROGRAMMED INTO THE COMPUTER.
5. The heat relay (9) sends 230 volts to a single pole single throw thermal switch (10). If closed the relay continues to send power to one side of a single pole single throw relay (11). This relay will not see power at it's coil until a triple pole double throw relay (12) closes and the ten second timer (13) counts down.
6. Once the convection fan pressure switch (5) closes, 230 volts go to a differential pressure switch (14), the combustion blower motor (15), terminal #7 and the coil of the triple pole double throw relay (12).
7. When a differential is sensed at the differential pressure switch (14) the switch changes position allowing power to go to terminal #9 of the triple pole double throw relay (12). This relay is a latching relay and is held closed by power that was applied at terminal #7.

8. Power flows from terminal #8 of the triple pole double throw relay (12) to a ten second purge timer (13). This timer allows the combustion blower (15) to operate for ten seconds allowing the combustion chamber to clear of any combustible gasses.

9. After the timer times out the voltage is applied to the other side of the coil of the single pole single throw relay (11). When that set of contacts closes, voltage goes to terminal #1 of the Landis & Gyr ignition control system (16). Terminal #8 will send power to one side of a two second timer (17) and the pilot coil of the dual solenoid gas valve (18). After two seconds elapse, the voltage is applied to the main coil of the dual solenoid gas valve (18). This voltage will remain provided there is a call for heat from the computer (19). If proof of flame is strong the ignition system stays powered up. Should the flame signal be lost, the ignition control system will lock out.

   NOTE: Cooking computer receives information from an RTD probe (20) located in front of the combustion blower motor. The information is in the form of resistance. The resistance ascends as temperature increases.

10. Two sets of contacts are used as a hood interlock in the motor contactor (2), terminals #13 and #14. At this point there is no power to these terminals, they act only as a switch to turn on the hood when the oven is turned on.

    NOTE: This is an option that the customer may use, it is not a requirement.

11. When power is applied to the motor contactor coil voltage is also applied to the NC terminal of a single pole double throw thermal switch (21). This switch in a cold state should be made between NC and common powering up the cooling fan (22) located in the cooking computer compartment.

    NOTE: The single pole double throw switch powers up the cooling fan even if the oven is turned off.

12. When the motor contactor (2) closes, power goes to the NC terminal of a single pole double throw thermal switch (23). This switch in a cold state should be made between NC and common powering up cooling fans (25) located in the rear of the oven.

    NOTE: The single pole double throw switch powers up the cooling fan even if the oven is turned off. This switch is located in the rear of the oven.

MT2136G GENERAL EXPORT — M7295 REV B

COMPONENT REFERENCE

NOTE: Refer to FIGURE 13 page 3—34 for component locations.

1. COOKING COMPUTER (M7880)
2. BLOWER RELAY (22672)
3. BELT STOP RELAY (22672)
4. HEAT RELAY (22672)
5. MOTOR CONTACTOR (M2247)
6. CONVECTION FANS (CCW) (M2872)
7. CONVECTION FANS (CW) (M2873)
8. DC DRIVE BOARD (M3153)
9. SINGLE POLE SINGLE THROW THERMAL SWITCH (M1362)
10. DC MOTOR (M3128)
11. MANUAL RESET HI LIMIT SWITCH (M3295)
12. TRANSFORMER (M2381)
13. FLAME BLOWER (M2386)
14. CENTRIFUGAL SWITCH
15. IGNITION CONTROL MODULE (M1054)
16. PILOT VALVE
    (Natural — M5495, LP — 22190)
17. MAIN BURNER VALVE
    (Natural — M5495, LP — 22190)
18. RTD PROBE (M7427)
19. STEP DOWN TRANSFORMER (M7170)
20. HALL EFFECT PICKUP (M0984)
21. COOLING FANS (23034)
22. SINGLE POLE DOUBLE THROW THERMAL SWITCH (M2453)

OPERATION

1. Apply power to the oven. Program the time and temperature into the computer (1). The blower relay (2), belt stop relay (3) and heat relay (4) pull in and power up three separate circuits. The voltage to the relay coils is 12 VDC.
2. The blower relay (2) closes sending 115VAC to the coil of the motor contactor (5). Points 1, 2, 3 and 4 close powering the convection fans (6 & 7).

   NOTE: 115 volts is applied to one side of the relays from a 240-120 volt step down transformer (19).
3. The belt stop relay (3) sends 115VAC to the DC drive board (8) and one side of a single pole single thermal switch (9). The DC motor (10) starts provided there is a time entered in the cooking computer (1).

   NOTE: The thermal switch is located in the rear of the blower compartment. This switch opens when the face of the switch sees 140°F and closes when there is a 10-20° drop in temperature across the face of the switch. The switch interrupts the heat circuit.

   NOTE: 115 volts is applied to one side of the relays from a 240-120 volt step down transformer (19).

   NOTE: The motor used in this oven is 180 volts DC at its highest speed.

   NOTE: This relay will only be powered if there is a time programmed into the computer. THE OVEN WILL NOT HEAT IF TIME IS NOT PROGRAMMED INTO THE COMPUTER.
4. If the thermal switch is closed, power goes to one terminal of the manual reset hi limit switch (11). If the hi limit switch is closed, power is supplied to the primary side of the transformer (12) and the flame blower (13).
5. When the combustion motor reaches full speed, a centrifugal switch (14) closes sending 24 VAC to the ignition module (15). After the module's self diagnostics are complete, the pilot valve (16) opens. When a proof of flame is established the main burner valve (17) is allowed to open.

6. On a call for heat from the cooking computer (1), as sensed by an RTD probe (18), the heat relay (4) closes sending 24 VAC to the main burner valve (17). This valve opens sending gas to the flame blower (13) for ignition.

   NOTE: The RTD probe is located in front of the combustion motor. It should be checked with an ohm meter.

7. The conveyor belt is driven by a closed loop D.C. drive system consisting of a 130 VDC motor (10), a #2 Hall effect pickup (20), a DC speed control board (8) and the DAC located in the cooking computer. The motor speed varies based on the time programmed into the cooking computer. If time is programmed, a voltage from .3 to 3.8 is applied to the DC speed control board. The output voltage measured at terminals A1 and A2 varies from 20 to 130 VDC based on the DAC voltage applied to the board or the time programmed into the computer.

   NOTE: The DAC receives 20 VDC from the speed control board. The DAC returns a portion of the voltage (between .3 and 3.8 VDC). The amount of voltage is dependent on the time programmed into the computer.

   NOTE: This type of system does sense the weight of the product and will not slow down if the belt is fully loaded.

8. There are two cooling fans (21) located in the rear convection fan compartment and one located in the computer control compartment. These fans are activated when the belt stop relay (3) is energized. The fans are also activated when a single pole double throw thermal switch (22) toggles from common/NC to common NO. The switch toggles due to high ambient heat. It will toggle if the temperature passing its face exceeds the rating on the back of the switch.

   NOTE: The switch is located between the two blowers in the rear convection fan compartment. It protects the convection fans from high ambient heat.

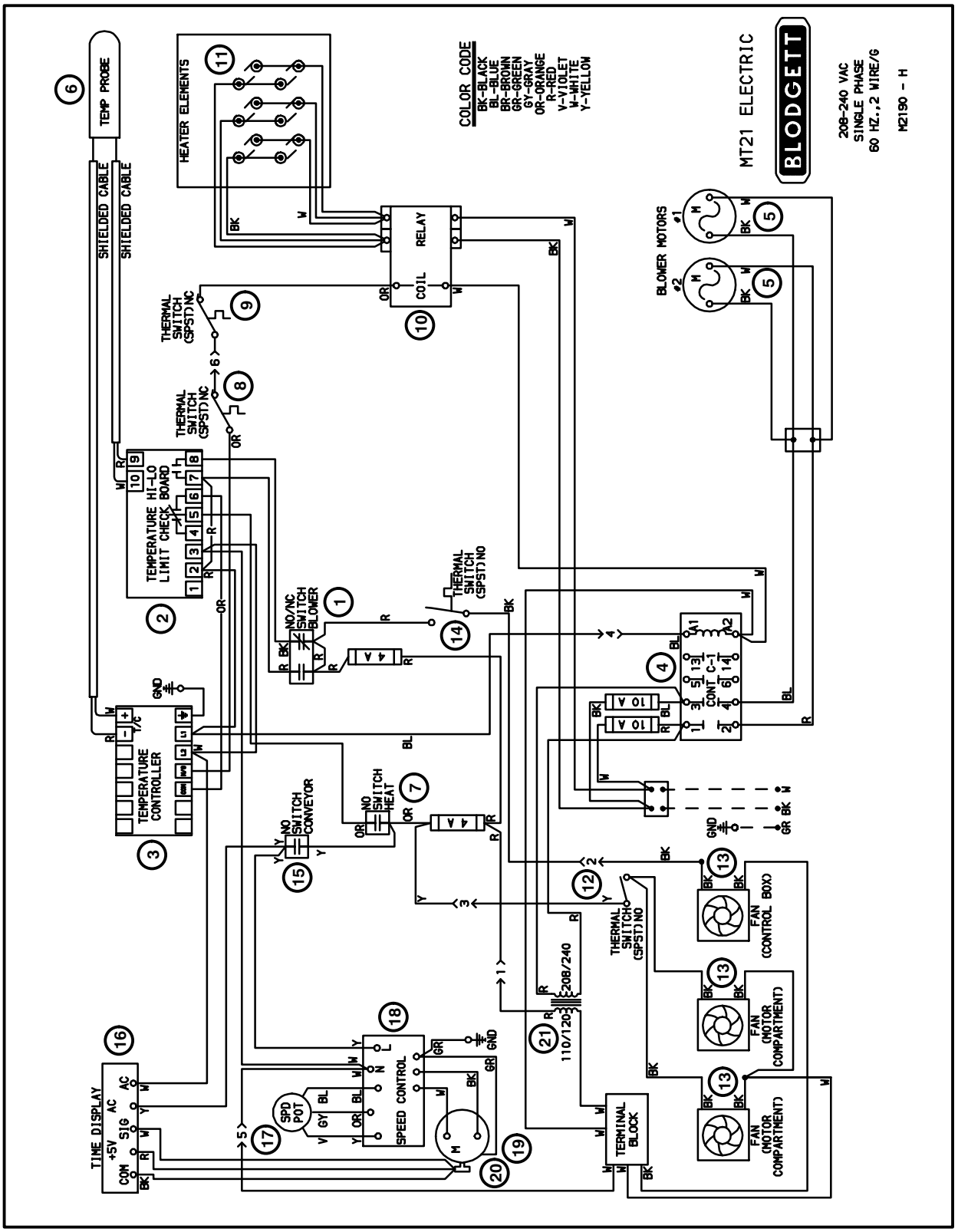

BLODGETT
MT21 ELECTRIC
208-240 VAC
SINGLE PHASE
60 HZ.,2 WIRE/G
M2190 - H
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
TEMP PROBE
SHIELDED CABLE
HEATER ELEMENTS
RELAY
COIL
BLOWER MOTORS #1
BLOWER MOTORS #2
THERMAL SWITCH (SPST)NC
THERMAL SWITCH (SPST)NO
TEMPERATURE HI-LO LIMIT CHECK BOARD
NO/NC SWITCH BLOWER
NO SWITCH HEAT
NO SWITCH CONVEYOR
TEMPERATURE CONTROLLER
CONT C-T
FAN (CONTROL BOX)
FAN (MOTOR COMPARTMENT)
TERMINAL BLOCK
208/240
110/120
SPEED CONTROL
SPD POT
TIME DISPLAY
GND

FIGURE 4

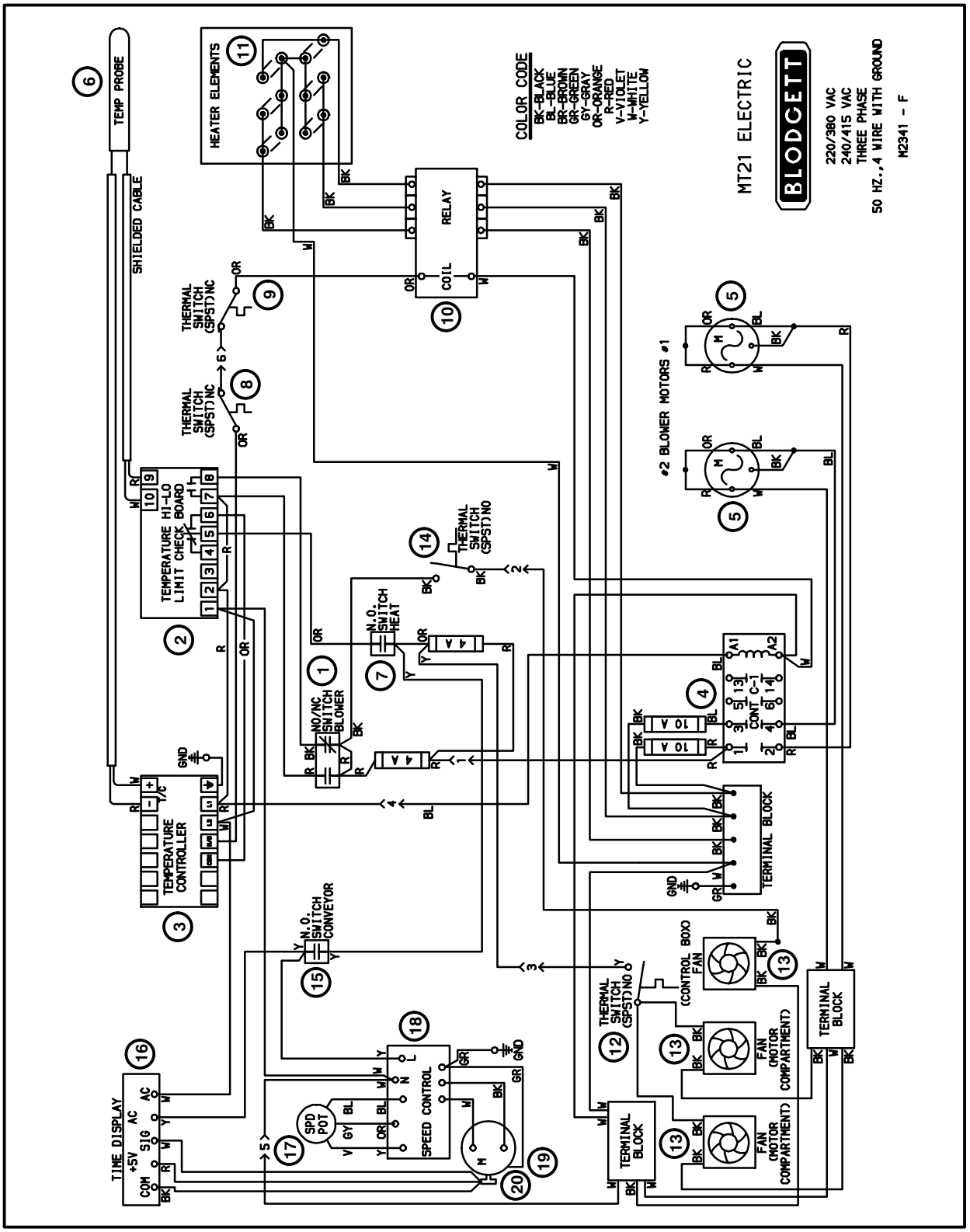

MT21 ELECTRIC
BLODGETT
220/380 VAC
240/415 VAC
THREE PHASE
50 HZ.,4 WIRE WITH GROUND
M2341 - F
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
TEMP PROBE
SHIELDED CABLE
HEATER ELEMENTS
RELAY
COIL
THERMAL SWITCH (SPST) NC
THERMAL SWITCH (SPST) NO
#2 BLOWER MOTORS #1
TEMPERATURE HI-LO LIMIT CHECK BOARD
N.O. SWITCH HEAT
NO/NC SWITCH BLOWER
N.O. SWITCH CONVEYOR
TEMPERATURE CONTROLLER
CONT C-1
TERMINAL BLOCK
FAN (CONTROL BOX)
FAN (MOTOR COMPARTMENT)
SPEED CONTROL
SPD POT
TIME DISPLAY
GND

FIGURE 5

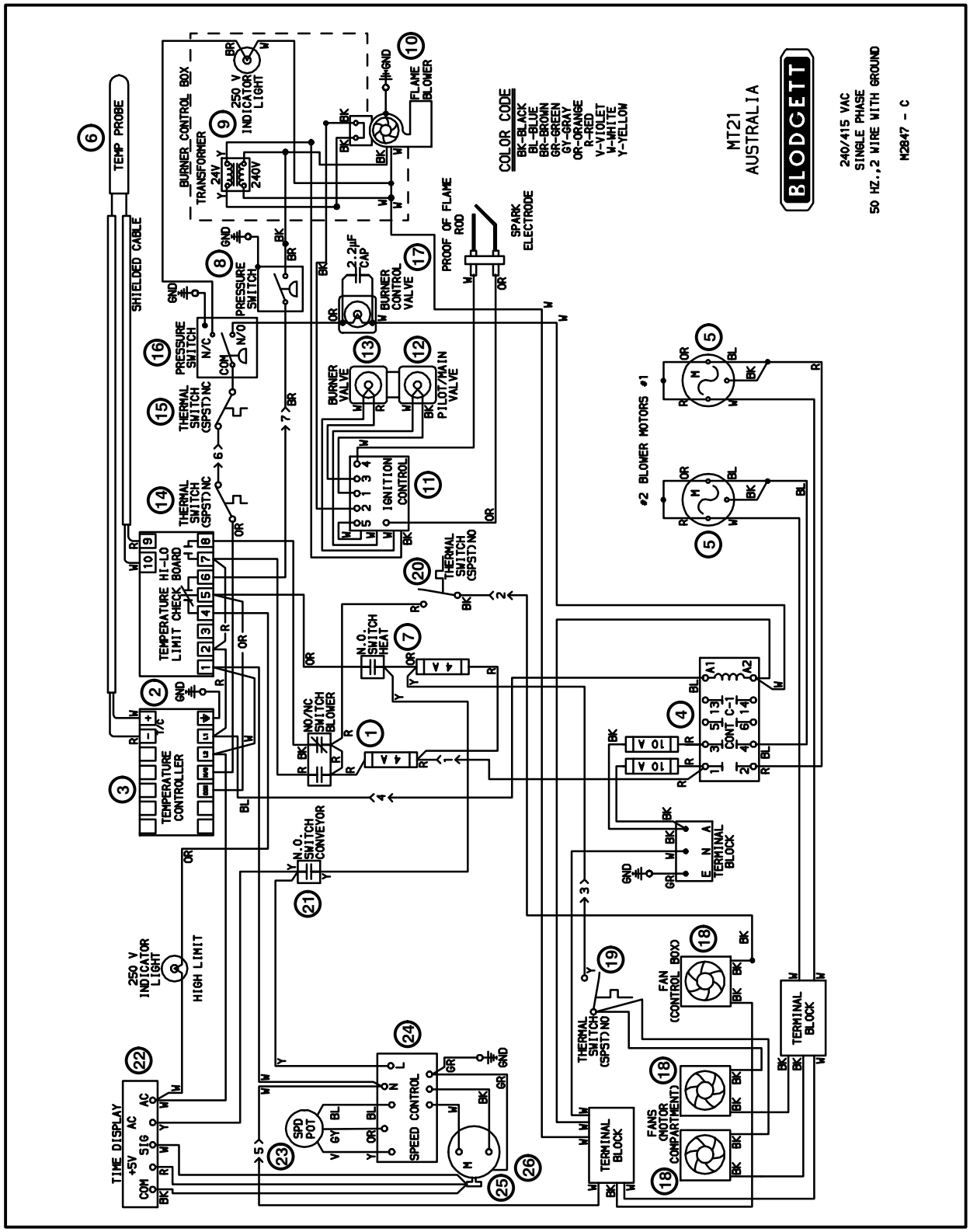

BLODGETT
MT21
AUSTRALIA
240/415 VAC
SINGLE PHASE
50 HZ.,2 WIRE WITH GROUND
M2847 - C
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
TEMP PROBE
SHIELDED CABLE
BURNER CONTROL BOX
TRANSFORMER
250 V INDICATOR LIGHT
FLAME BLOWER
PRESSURE SWITCH
2.2µF CAP
BURNER CONTROL VALVE
PROOF OF FLAME ROD
SPARK ELECTRODE
BURNER VALVE
PILOT/MAIN VALVE
IGNITION CONTROL
THERMAL SWITCH (SPST) NC
THERMAL SWITCH (SPST) NO
TEMPERATURE HI-LO LIMIT CHECK BOARD
TEMPERATURE CONTROLLER
N.O. SWITCH HEAT
NO/NC SWITCH BLOWER
N.O. SWITCH CONVEYOR
#2 BLOWER MOTORS #1
CONT C-T
TERMINAL BLOCK
HIGH LIMIT
TIME DISPLAY
SPEED CONTROL
SPD POT
FAN (CONTROL BOX)
FANS (MOTOR COMPARTMENT)
TERMINAL BLOCK

FIGURE 6

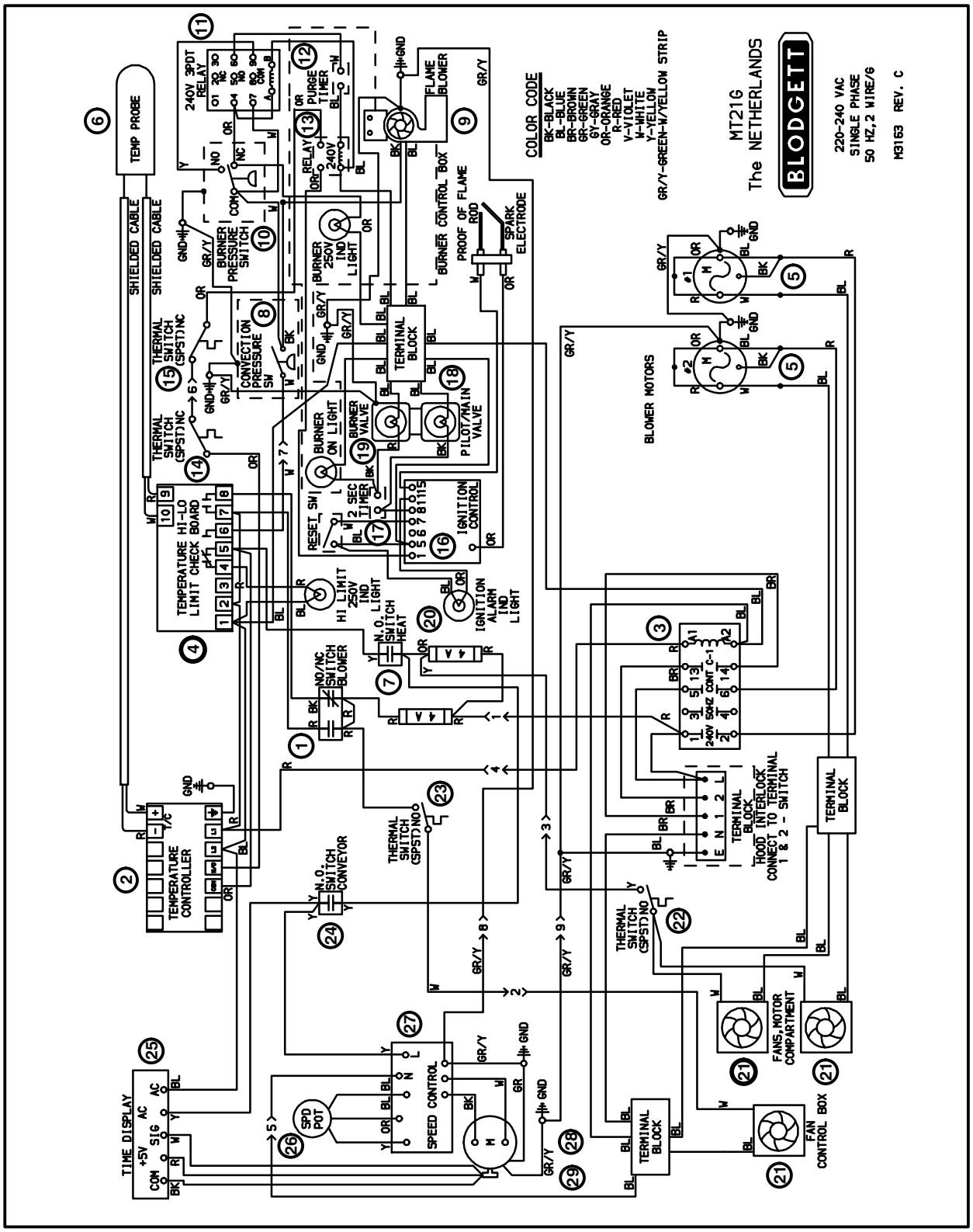

MT21G
The NETHERLANDS
BLODGETT
220-240 VAC
SINGLE PHASE
50 HZ,2 WIRE/6
M3163 REV. C
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
GR/Y-GREEN-W/YELLOW STRIP
TEMP PROBE
SHIELDED CABLE
SHIELDED CABLE
240V 3PDT RELAY
PURGE TIMER
RELAY
FLAME BLOWER
BURNER PRESSURE SWITCH
BURNER 250V IND LIGHT
BURNER CONTROL BOX
PROOF OF FLAME ROD
SPARK ELECTRODE
THERMAL SWITCH (SPST)NC
CONVECTION PRESSURE SW
TERMINAL BLOCK
BLOWER MOTORS
THERMAL SWITCH (SPST)NC
BURNER ON LIGHT
BURNER VALVE
PILOT/MAIN VALVE
RESET SW
2 SEC TIMER
IGNITION CONTROL
TEMPERATURE HI-LO LIMIT CHECK BOARD
HI LIMIT 250V IND LIGHT
N.O. SWITCH HEAT
IGNITION ALARM IND LIGHT
ND/NC SWITCH BLOWER
240V 50HZ CONT C-1
TERMINAL BLOCK
HOOD INTERLOCK CONNECT TO TERMINAL 1 & 2 - SWITCH
TERMINAL BLOCK
THERMAL SWITCH (SPST)NO
N.O. SWITCH CONVEYOR
THERMAL SWITCH (SPST)NO
TEMPERATURE CONTROLLER
TIME DISPLAY
SPD POT
SPEED CONTROL
FANS,MOTOR COMPARTMENT
TERMINAL BLOCK
FAN CONTROL BOX

FIGURE 7

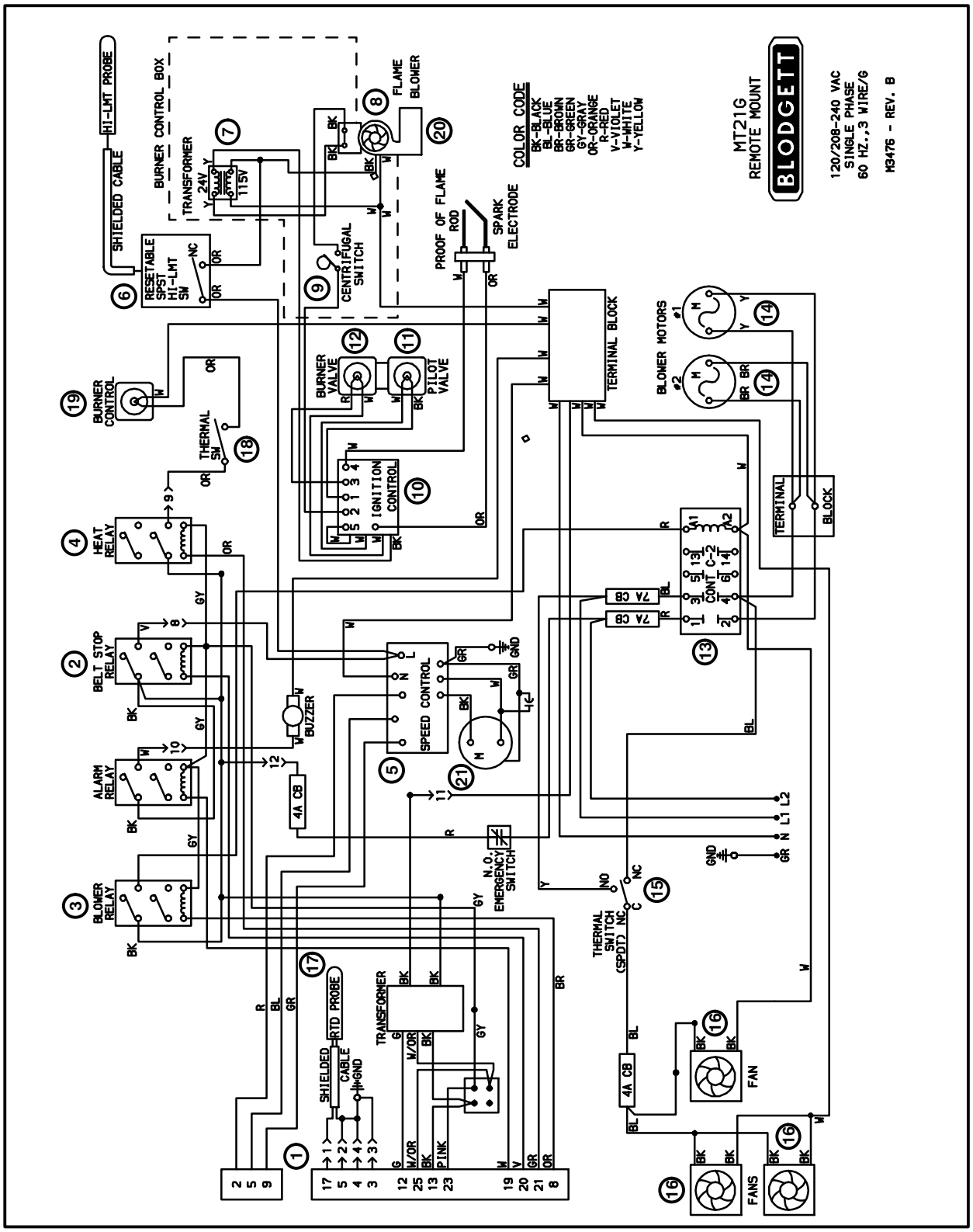

HI-LMT PROBE
SHIELDED CABLE
BURNER CONTROL BOX
TRANSFORMER
24V
115V
RESETABLE SPST HI-LMT SW
NC
NO
CENTRIFUGAL SWITCH
FLAME BLOWER
PROOF OF FLAME ROD
SPARK ELECTRODE
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
MT21G
REMOTE MOUNT
BLODGETT
120/208-240 VAC
SINGLE PHASE
60 HZ.,3 WIRE/G
M3476 - REV. B
BURNER CONTROL
THERMAL SW
HEAT RELAY
BELT STOP RELAY
ALARM RELAY
BLOWER RELAY
BUZZER
4A CB
BURNER VALVE
PILOT VALVE
IGNITION CONTROL
TERMINAL BLOCK
BLOWER MOTORS #1
BLOWER MOTORS #2
SPEED CONTROL
CONT C-2
7A CB
TERMINAL BLOCK
N.O. EMERGENCY SWITCH
THERMAL SWITCH (SPDT) NC
GND
L1 L2
RTD PROBE
SHIELDED CABLE
TRANSFORMER
FAN
FANS

FIGURE 8

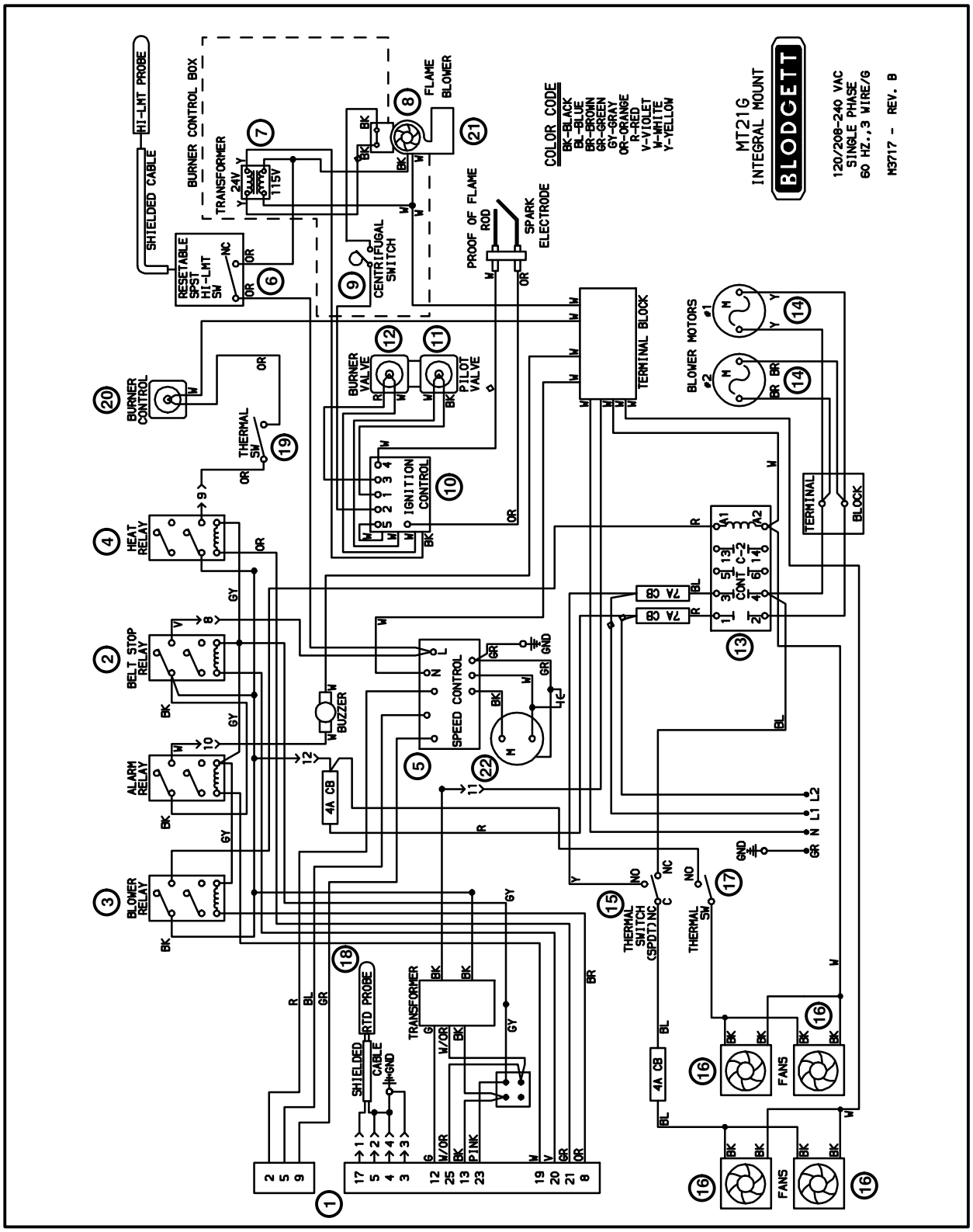

MT21G
INTEGRAL MOUNT
BLODGETT
120/208-240 VAC
SINGLE PHASE
60 HZ.,3 WIRE/G
M3717 - REV. B
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
HI-LMT PROBE
SHIELDED CABLE
BURNER CONTROL BOX
TRANSFORMER
24V
115V
RESETABLE SPST HI-LMT SW
CENTRIFUGAL SWITCH
FLAME BLOWER
PROOF OF FLAME ROD
SPARK ELECTRODE
TERMINAL BLOCK
BLOWER MOTORS #1
BLOWER MOTORS #2
BURNER VALVE
PILOT VALVE
IGNITION CONTROL
BURNER CONTROL
THERMAL SW
HEAT RELAY
BELT STOP RELAY
ALARM RELAY
BLOWER RELAY
BUZZER
4A CB
SPEED CONTROL
CONT C-2
TERMINAL BLOCK
THERMAL SWITCH (SPDT) NC
THERMAL SW
FANS
RTD PROBE
SHIELDED CABLE
TRANSFORMER
GND
L1 L2
N

FIGURE 9

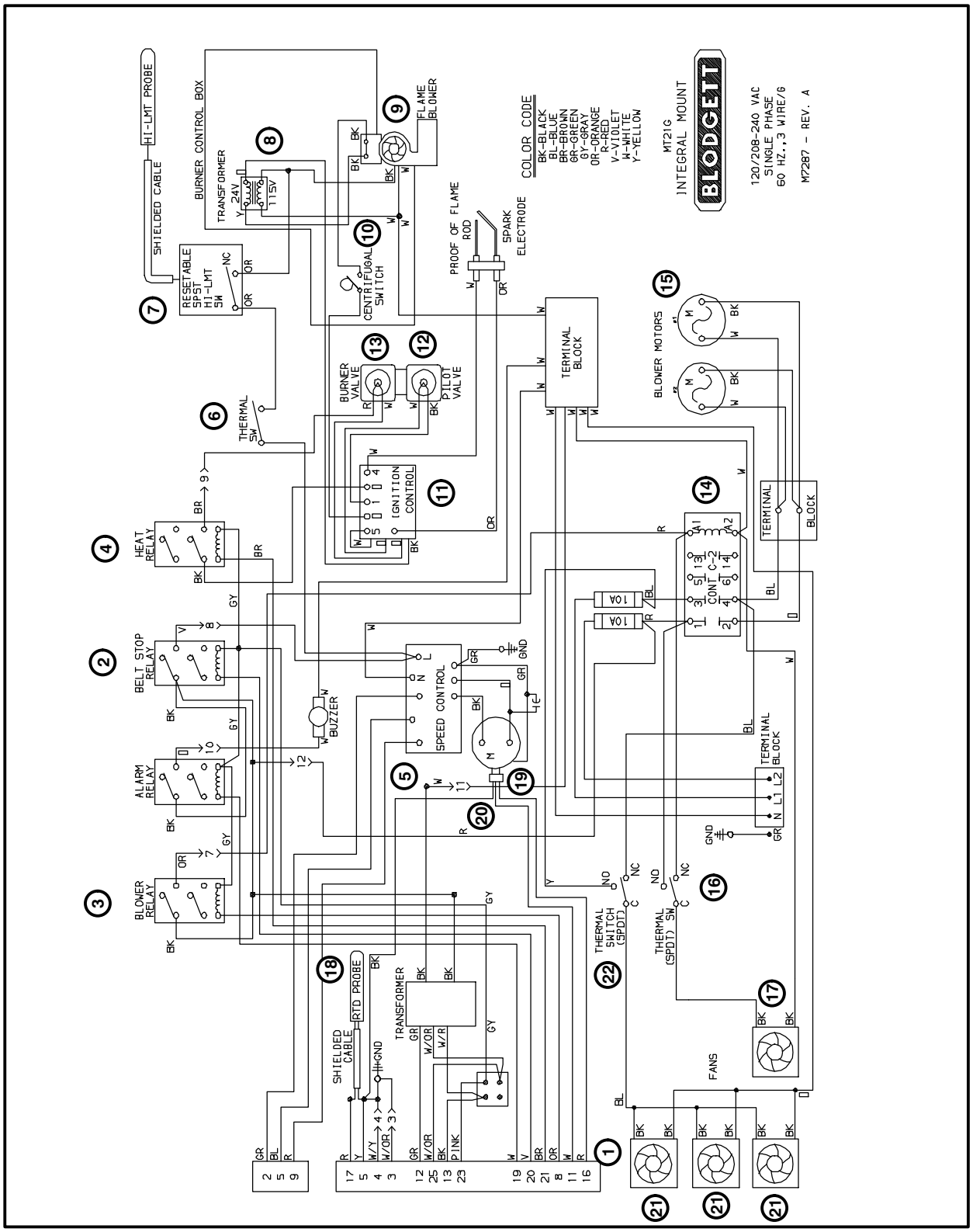

HI-LMT PROBE
SHIELDED CABLE
BURNER CONTROL BOX
TRANSFORMER
24V
115V
FLAME BLOWER
RESETABLE SPST HI-LMT SW
CENTRIFUGAL SWITCH
PROOF OF FLAME ROD
SPARK ELECTRODE
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
MT21G
INTEGRAL MOUNT
BLODGETT
120/208-240 VAC
SINGLE PHASE
60 HZ.,3 WIRE/6
M7287 - REV. A
THERMAL SW
BURNER VALVE
PILOT VALVE
TERMINAL BLOCK
BLOWER MOTORS
IGNITION CONTROL
HEAT RELAY
BELT STOP RELAY
ALARM RELAY
BLOWER RELAY
SPEED CONTROL
BUZZER
CONT C-2
TERMINAL BLOCK
THERMAL SWITCH (SPDT)
THERMAL (SPDT) SW
SHIELDED CABLE
RTD PROBE
TRANSFORMER
FANS
GND

FIGURE 10

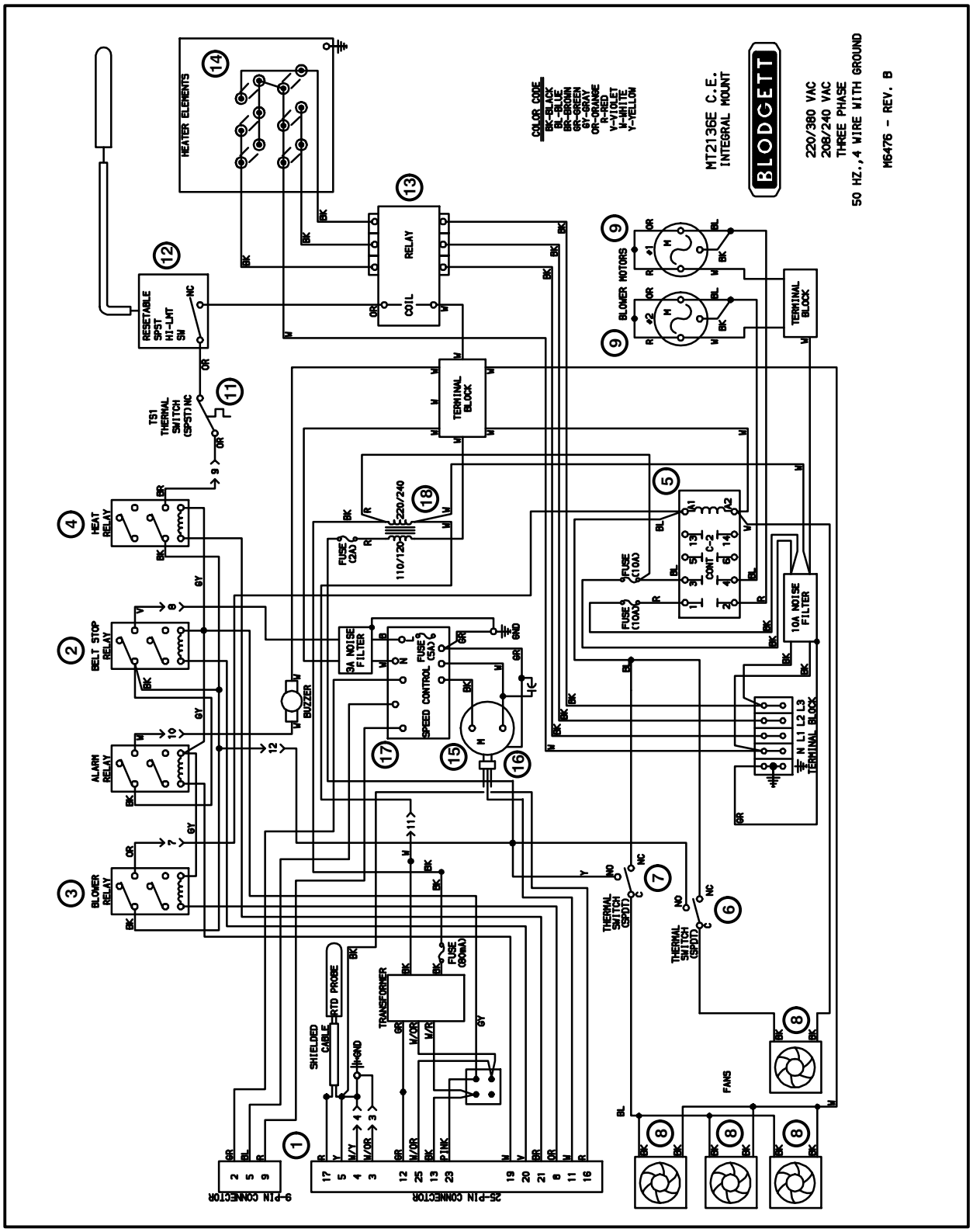

HEATER ELEMENTS
RELAY
COIL
RESETABLE SPST HI-LMT SW
TS1 THERMAL SWITCH (SPST) NC
TERMINAL BLOCK
HEAT RELAY
BELT STOP RELAY
ALARM RELAY
BLOWER RELAY
BUZZER
220/240
110/120
FUSE (2A)
FUSE (10A)
CONT C-2
3A NOISE FILTER
SPEED CONTROL
FUSE (5A)
10A NOISE FILTER
BLOWER MOTORS
#1
#2
THERMAL SWITCH (SPDT)
FANS
RTD PROBE
SHIELDED CABLE
TRANSFORMER
FUSE (500mA)
9-PIN CONNECTOR
25-PIN CONNECTOR
N L1 L2 L3 TERMINAL BLOCK
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
MT2136E C.E.
INTEGRAL MOUNT
BLODGETT
220/380 VAC
208/240 VAC
THREE PHASE
50 HZ.,4 WIRE WITH GROUND
M6476 - REV. B

FIGURE 11

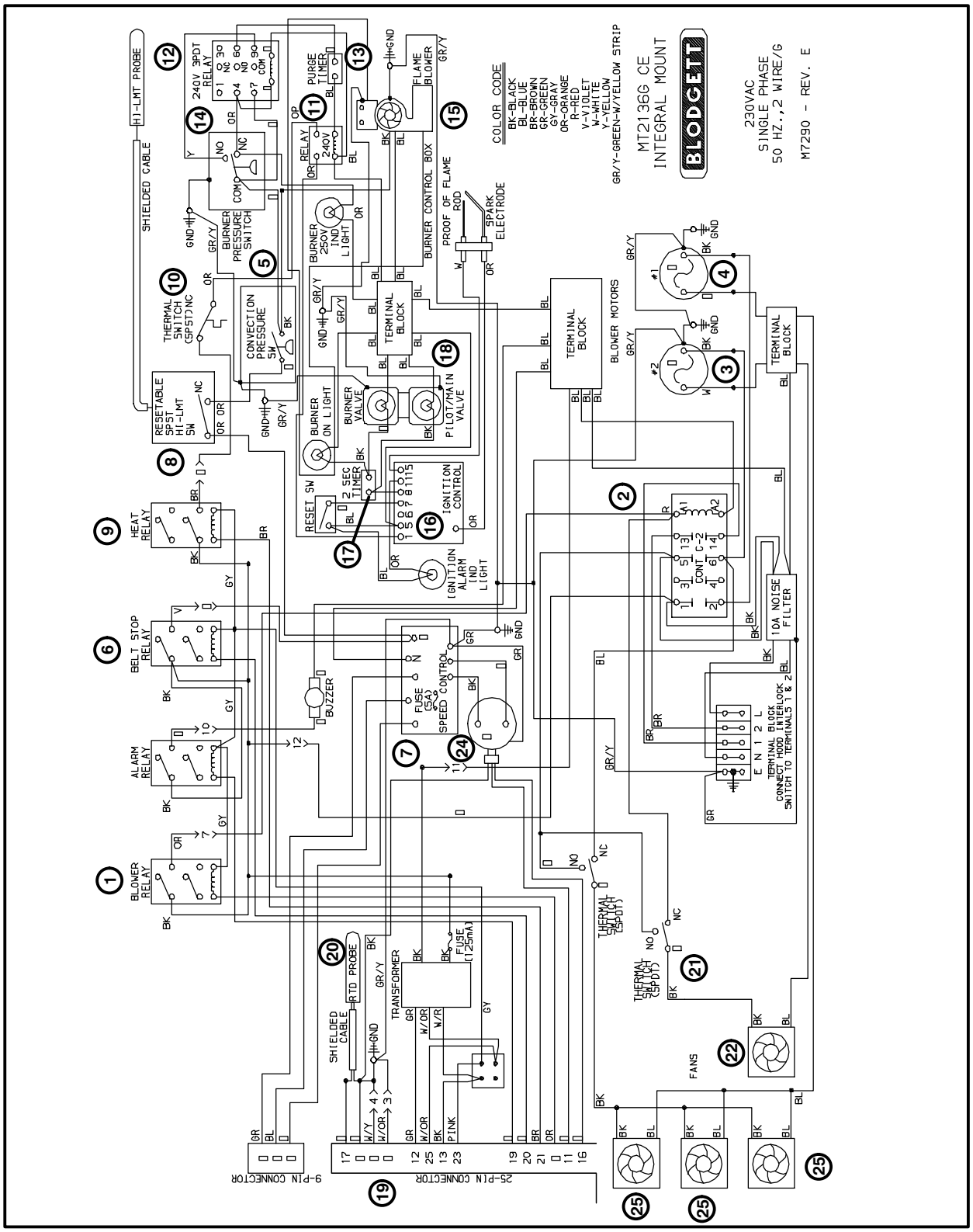

MT2136G CE
INTEGRAL MOUNT
BLODGETT
230VAC
SINGLE PHASE
50 HZ.,2 WIRE/G
M7290 - REV. E
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
GR/Y-GREEN-W/YELLOW STRIP
HI-LMT PROBE
SHIELDED CABLE
240V 3PDT RELAY
PURGE TIMER
FLAME BLOWER
BURNER CONTROL BOX
PROOF OF FLAME ROD
SPARK ELECTRODE
BURNER PRESSURE SWITCH
BURNER 250V IND LIGHT
OP RELAY 240V
THERMAL SWITCH (SPST)NC
CONVECTION PRESSURE SW
TERMINAL BLOCK
RESETABLE SPST HI-LMT SW
BURNER ON LIGHT
BURNER VALVE
PILOT/MAIN VALVE
BLOWER MOTORS
#1
#2
RESET SW
2 SEC TIMER
IGNITION CONTROL
IGNITION ALARM IND LIGHT
HEAT RELAY
BELT STOP RELAY
ALARM RELAY
BLOWER RELAY
BUZZER
FUSE (5A)
SPEED CONTROL
CONT C-2
10A NOISE FILTER
TERMINAL BLOCK CONNECT HOOD INTERLOCK SWITCH TO TERMINALS 1 & 2
THERMAL SWITCH (SPDT)
RTD PROBE
SHIELDED CABLE
TRANSFORMER
FUSE (125mA)
FANS
9-PIN CONNECTOR
25-PIN CONNECTOR

FIGURE 12

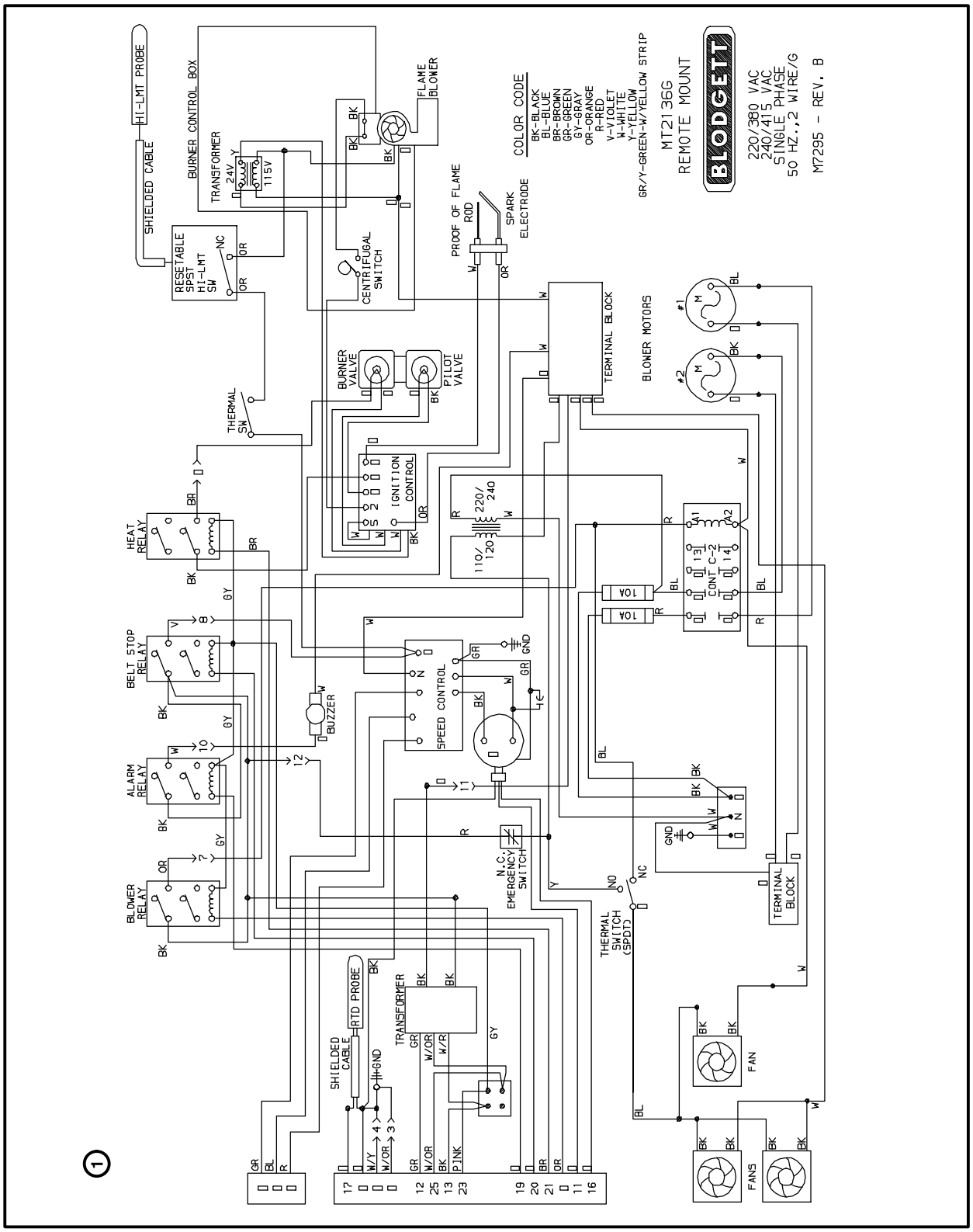

HI-LMT PROBE
SHIELDED CABLE
BURNER CONTROL BOX
TRANSFORMER
24V
115V
RESETABLE SPST HI-LMT SW
NC
OR
CENTRIFUGAL SWITCH
FLAME BLOWER
PROOF OF FLAME ROD
SPARK ELECTRODE
COLOR CODE
BK-BLACK
BL-BLUE
BR-BROWN
GR-GREEN
GY-GRAY
OR-ORANGE
R-RED
V-VIOLET
W-WHITE
Y-YELLOW
GR/Y-GREEN-W/YELLOW STRIP
MT2136G
REMOTE MOUNT
BLODGETT
220/380 VAC
240/415 VAC
SINGLE PHASE
50 HZ.,2 WIRE/G
M7295 - REV. B
BURNER VALVE
PILOT VALVE
THERMAL SW
TERMINAL BLOCK
BLOWER MOTORS
#1
#2
IGNITION CONTROL
220/240
110/120
HEAT RELAY
BELT STOP RELAY
ALARM RELAY
BLOWER RELAY
SPEED CONTROL
BUZZER
GND
10A
CONT
A1
A2
13
14
N.C. EMERGENCY SWITCH
THERMAL SWITCH (SPDT)
NO
NC
SHIELDED CABLE
RTD PROBE
TRANSFORMER
FAN
FANS

FIGURE 13

OVEN ADJUSTMENTS FOR COOKING

The combination of belt time, oven temperature, and air flow are important for achieving quality results from your Blodgett conveyor oven. Use the following guidelines to adjust the belt time and oven temperature of your unit. For questions regarding further oven adjustments, please contact your local Blodgett Sales Representative for assistance.

CONVEYOR SPEED AND OVEN TEMPERATURE

Conveyor belt speed (cook time) and oven temperature are the two variables used when fine tuning your oven for a specific product. To determine the optimum bake time and temperature, make small changes for each trial and keep one variable constant. For example, if the oven temperature is 460°F (238°C) and the belt speed is 7 minutes, but the pizza is not browned enough, increase the temperature to 475°F (246°C) and keep the belt speed the same. However, if the center of the pizza is not completely cooked, keep the oven temperature the same, and increase the bake time to 7 minutes and 30 seconds. In general, raise the bake temperature to increase browning, and lengthen the belt time to increase doneness.

FINISHED PRODUCT TEMPERATURES

Internal temperatures of the cooked products should be measured immediately after the product exits the cooking chamber to ensure a safe food temperature. Internal pizza temperatures should be over 165°F (74°C). Minimum temperature guidelines vary depending on the food items.

Air flow adjustments may be necessary to fine tune the oven for your particular product. The air plates, located at the top of the baking chamber, contain holes that can be covered using Block-off Plates. The plates can easily be adjusted to regulate the air flow for your particular needs. Use the following guidelines to adjust the Block-off Plates.

1. Ensure the oven is Off and completely cooled.
2. Open the front access door.
3. Using the supplied air plate hook, pull the air plates out of the oven.
4. Remove the wing nuts, screws, and washers holding the Block-off Plates.
5. Adjust the plates.
6. Replace the wing nuts, screws, and washers to tightly secure the Block-off plates in their new locations. Make a sketch of the final airplate setup for future reference.

   NOTE: One or two block-off plates may be left off entirely if appropriate to obtain the desired results.
7. Replace the air plates, and close the front access door.

The following examples illustrate air flow regulation.

NOTE: The first half of the oven chamber greatly affects the initial baking of the product, while the last half largely affects the browning.

- A good bake time and temperature have been established, but more top browning is desired. Slide one of the Block-off Plates to uncover a row of holes toward the exit end of the oven.
- The bottom of the pizza is golden brown, but the top is too dark. Close rows at the exit end of the oven to reduce final browning.
- The center of the pizza is still doughy and the toppings are not fully cooked. Open up rows at the chamber entrance and close rows at the chamber exit.

CHAPTER 4

CALIBRATION AND ADJUSTMENT

CONVECTION BLOWER MOTORS

TO CHECK MOTOR ROTATION

1. Remove the back of the oven body and verify proper motor rotation. (See FIGURE 1)

For motor placement, the direction of rotation is viewed left to right from the oven's rear. Typically the motor direction is referenced to the end of the shaft (EOS). However due to the vertical positioning of the motors in Blodgett Conveyor ovens, it is more instructive to reference the end of the motor (EOM) as looking from the rear of the oven. In FIGURE 1 all directions are taken from EOM. The correct rotation amperage draw is approximately 1 amp. If the measured amperage is less than .5, check for proper motor rotation direction.

TO CHECK LOW-LIMIT

1. Turn the oven on and let it heat up to approximately 200°F (93°C).
2. Shut the oven off. The blowers should come back on in several seconds.
3. When the blowers shut off, turn the oven on.

   If computer controlled press the "ACT TEMP" key to verify that the blowers shut off between 135°F (57°C) and 170°F (77°C). If the blowers do not shut off refer to the Troubleshooting section page 5—3.

   For standard controls, turn the blower switch to on to record the temperature. Adjust the hi/lo board if necessary. See page 4—4 for temperature calibration procedure.

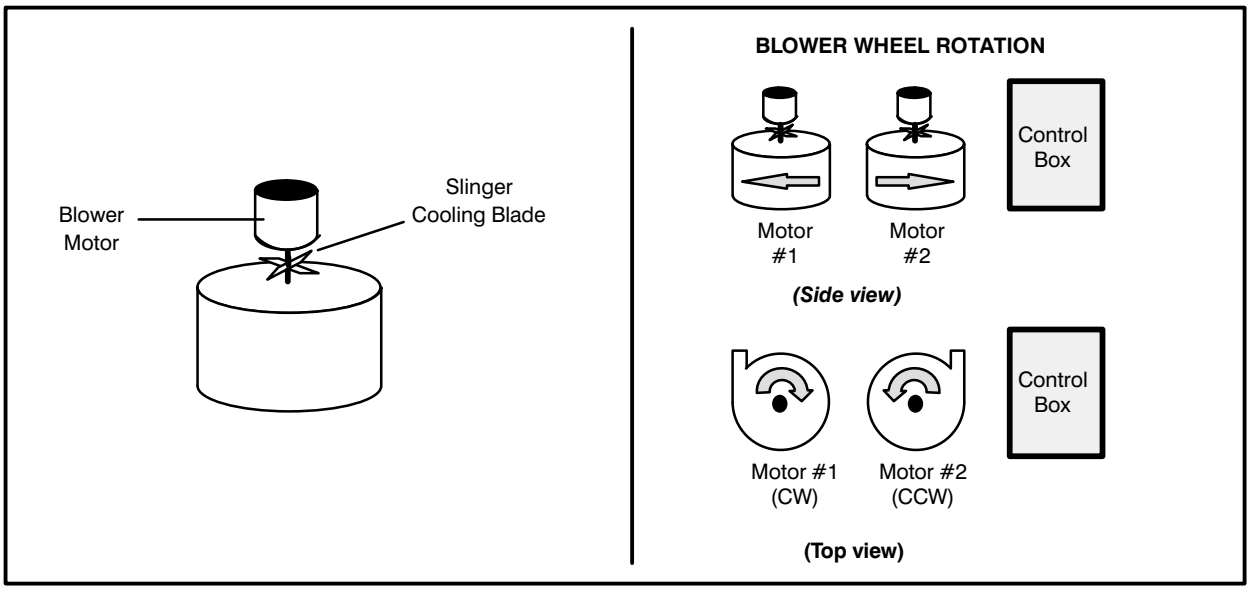


FIGURE 1

REGULATED GAS PRESSURE

1. Let the oven run up to 510°F (266°C). You may now verify the operational and regulated gas pressures.

Incoming static gas pressure to the unit, with all the gas appliances drawing from the supply, should be a minimum of 5.5" W.C. (13.7 mbar) for natural gas and 11" W.C. (28 mbar) for propane gas. The manifold pressure, if measured after the regulator located inside the control box, must be 3.5" W.C. (9 mbar) for natural gas and 10" W.C. (25 mbar) for propane gas. For CE pressures reference TABLE 2 on page 1—3 of the Introduction.

The pressure can be checked at the tap on the dual regulated gas valve or at the tap on the tee valve.

If pressure adjustments are needed, turn the adjusting screw located under a screw cap of the dual regulated valve. Adjust the gas pressure by turning the screw clockwise to raise the gas pressure and counter-clockwise to lower the gas pressure. Be sure to reinstall the screw cap; should the diaphragm rupture this cap acts as a flow limiter.

The air shutter disc on the burner blower motor, located inside the control box at the top of the assembly, is factory adjusted to provide the most efficient blue flame possible at sea level. Visually examine the flame to verify it's quality. Should it need adjustment, increase or decrease the air mixture to attain the best flame quality.

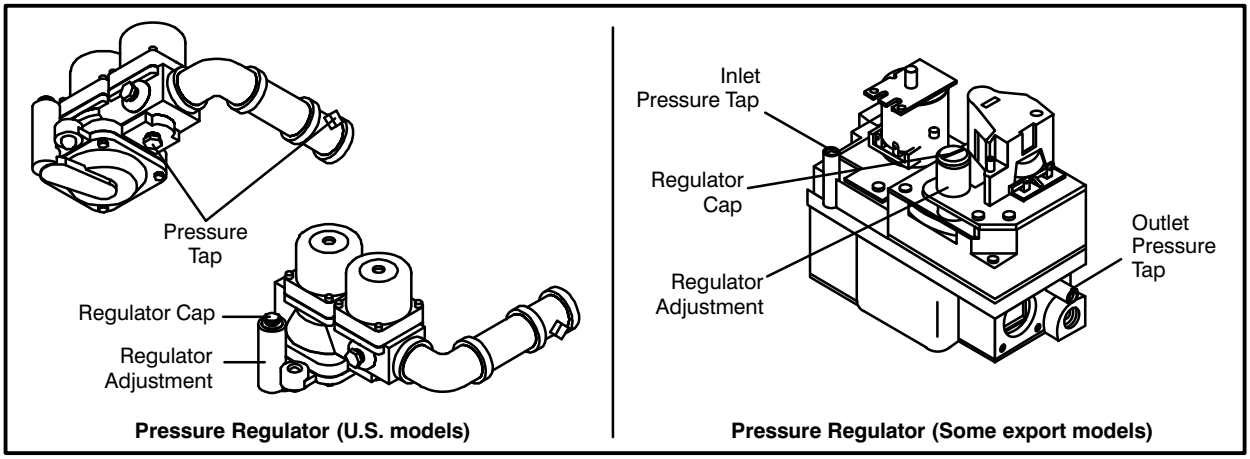


FIGURE 2

Setting Equipment for Other Types of Gas — CE Models

1. Shut off the gas valve and turn off the operating switch.
2. Dismantle the gas block by means of couplings.
3. Dismantle the main burner and replace the injector.
4. Install the burner and gas block.
5. Check for leakage and possible loose electrical connections.
6. Adjust gas pressure if necessary. See FIGURE 3.

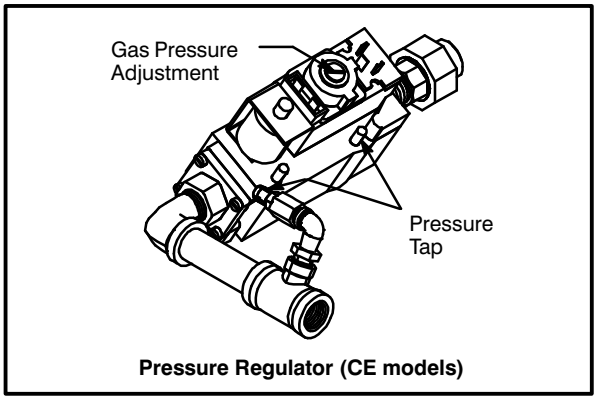


FIGURE 3

STANDARD CONTROLLER CONFIGURATION

BELT SPEED CALIBRATION — OPEN LOOP

NOTE: The following procedures must be performed after dc voltage levels have been set and are known to be accurate.

The cooking time digital display should be adjusted when changing any of the system components. Prior to adjusting the display, determine the following two specifications:

1. **The number of pulses per spindle revolution generated by the Hall effect pickup.**

   Move the plastic end-caps on the pickup located on the DC motor. If the pickup is marked with the number 2, it is a single pulse per revolution pickup. If the pickup is marked with the number 10 (Standard After 6-1-91) it is a five pulse per revolution pickup. Replace the end-caps.

2. **The manufacturer and the voltage rating of the DC drive motor.**

   This information is embossed on the nameplate located on the motor's case.

Once the above specifications have been determined, perform the following calibration procedures.

1. Remove the screws securing the cooking time display lens cover. Remove the lens cover. If a 5 pulse pickup is used, verify that the multiplier potentiometer is set to the x10 position (refer to FIGURE 4 for the potentiometer location).

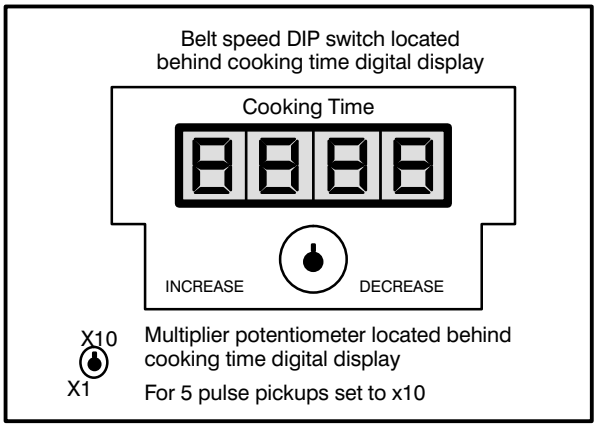


FIGURE 4

Set The Belt Speed DIP Switches.

Belt speed DIP switch settings are specified by the following equations:

- 60Hz motors with a single pulse pickup use: 36 **x Motor RPM x .275**
- 60Hz motors with a five pulse pickup use: 36 **x Motor RPM x .325**
- 50Hz motors with a single pulse pickup use: **36 x Motor RPM x .65**
- 50Hz motors with a five pulse pickup use: **36 x Motor RPM x .325**

NOTE: Refer to TABLE 3 to determine Motor RPM.

Bodine Motors	**RPM**
130VDC (Standard after 9/15/90)	4.2
180VDC (50Hz Only)	4.2

TABLE 3

The DIP switch summed values should match the value obtained in the previous equation. Move the appropriate DIP switches to OFF.

EXAMPLE: For a switch value of 73 (from the motor formula and TABLE 3), set switches 7, 4 and 1 to OFF since the total of these switches is 73 (64+8+1=73).

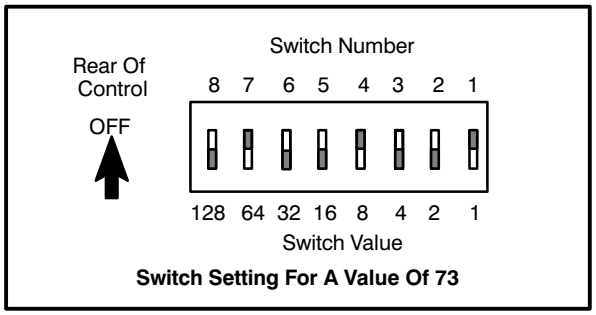


FIGURE 5

TEMPERATURE CALIBRATION — UNITED ELECTRIC CONTROLLER

NOTE: Th U.E. and Zytron boards get input from either single or dual lead thermocouples.

LOW LIMIT ADJUSTMENT

1. Bring the oven to 200°F (93°C).
2. Turn both the blower and the heat switches to OFF. The blower should continue to run.
3. Monitor the digital temperature control display. The blower motors should shut off within the range of 170-135°F(77-57°C).
4. To adjust the temperature, turn the low-limit potentiometer. A clockwise rotation increases the setting, counter-clockwise decreases it. See FIGURE 6.

TEMPERATURE CALIBRATION

1. With the conveyor turned off, place a pyrometer in the center of the oven cavity.
2. Adjust the set point for 500°F (260°C). Monitor the Indicator Lamp. See FIGURE 6. When the lamp goes out, compare the pyrometer with the temperature of the display. If the display differs by +/-5°F (3°C), open the access panel on the temperature controller and continue with STEPS 3 and 4.
3. Adjust the Meter High Set so the display matches the pyrometer. A clockwise rotation lowers the display reading and raises the temperature. A counter-clockwise rotation raises the reading and decreases the temperature. Check the oven set point. Adjustment of the potentiometer may affect this reading. Bring the oven up to 525°F (274°C). Verify the calibration.
4. Set Point Adjustment - Adjust the Coarse Manual so the controller calls for heat at 522°F (272°C) and shut-offs at 525°F (274°C). A clockwise rotation raises the temperature, counter-clockwise lowers it.

HIGH LIMIT ADJUSTMENT

1. Turn both the blower and the heat switches to ON.
2. Set the temperature to 620°F (327°C). When the display reads 600°F (316°C), the burner blower motor should shut off. If the temperature rises above 600°F (316°C), adjust the hi-limit pot (See FIGURE 6) so the burner shuts off at 600°F (316°C). A clockwise rotation of the high-limit pot increases the temperature, counter-clockwise decreases it.

NOTE: Repeat Low Limit Adjustment STEPS 1-3 to verify new settings.

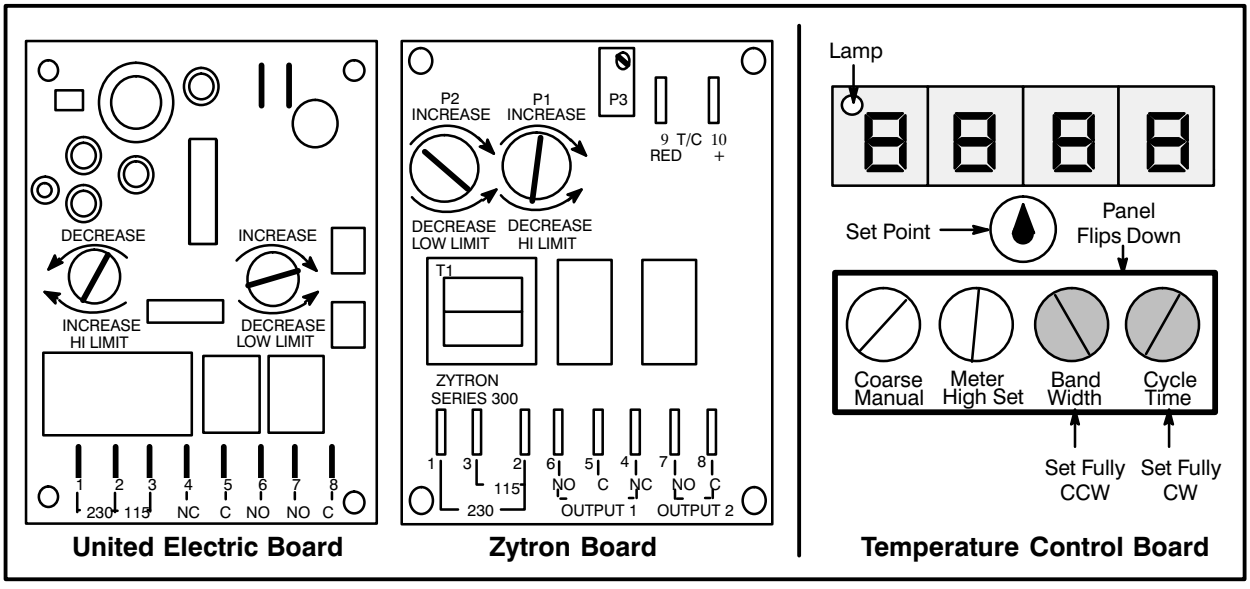


FIGURE 6

TEMPERATURE CALIBRATION — ATHENA CONTROLLER

THE CONFIGURATION MENUS

1. Press and hold the actual temperature key for approximately 10 seconds. When the menu system has been accessed, the display toggles between dEF and either SP or Act.

Setting the Default Display

The default display determines whether the controller displays the actual or the setpoint temperature.

1. Use the arrow keys to select the desired display default.

   NOTE: We recommend using the setpoint display default.

2. Press the actual temperature key to enter the selected display default. The display will toggle between HyS and a numerical value.

Setting the Control Hysteresis

The control hysteresis, or the burner cycle is used to prevent rapid cycling around the setpoint. The hysteresis is adjustable from 2°F to 252°F (0°C to 140°C).

1. Use the arrow keys to select the desired control hysteresis.

   NOTE: We recommend using 5°F initially.

2. Press the actual temperature key to enter the selected hysteresis value. The display will toggle between OFF and a numerical value.

Setting the Display Offset

The display offset is used to provide a limited adjustment of the displayed temperature as a compensation for offsets between the actual temperature and the temperature seen by the thermocouple. The display offset is adjustable from -126°F to +126°F (-70°C to 70°C).

1. Use the arrow keys to select the desired display offset.
2. Press the actual temperature key to enter the selected offset value. The display will toggle between ALr and a numerical value.

Setting the Deviation Band Alarm

The deviation band alarm causes the display to flash when the actual temperature varies (in either direction) from the setpoint. The deviation band alarm is adjustable to off or values from 1°F to 252°F (1°C to 740°C).

1. Use the arrow keys to select the desired deviation band alarm.
2. Press the actual temperature key to enter the selected alarm value.

To exit the Configuration Menus

1. Push and hold the actual temperature key for approximately 3 seconds.

NOTE: The unit exits the configuration menus if the controller is not touched for 1 minute at any time during the programming process.

SETTING THE DISPLAY UNITS

NOTE: On newer models, skip steps 1-3.

1. Disconnect the power from the control. Remove all wires and the back of the control.
2. Locate the black jumper on the microcontroller board next to the thermocouple connection. Install the jumper on both pins.
3. Reconnect the power to the control.
4. Press and hold the actual temperature key for approximately 10 seconds until the display reads unt and flashes F or C. Press the up or down arrow key to toggle between °F and °C.
5. Press and hold the actual temperature key until the control exits the programming mode.

NOTE: DO NOT disconnect power and move the jumper back to single pin until the control has returned to normal operation.

LOW LIMIT ADJUSTMENT

1. Bring the oven to 200°F (93°C).
2. Turn both the blower and the heat switches to OFF. The blower should continue to run.
3. Monitor the digital temperature control display. The blower motors should shut off within the range of 170-135°F(77-57°C).
4. To adjust the temperature, turn the low-limit potentiometer. A clockwise rotation increases the setting, counter-clockwise decreases it. See FIGURE 7.

HIGH LIMIT ADJUSTMENT

NOTE: Refer to the wiring diagram located on the oven or on page 3–25 of the Operation section. For additional assistance call the Blodgett Service department.

1. Remove the wires from the common and N.O. terminals. Touch the wires together to energize the heat circuit. This enables the oven to heat above the highest temperature allowed by the controller.
2. When the display reads 600°F (316°C), the burner blower motor should shut off. If the temperature rises above 600°F (316°C), adjust the hi-limit pot (FIGURE 7) so the burner shuts off at 600°F (316°C). A clockwise rotation of the high-limit pot increases the temperature, counter-clockwise decreases it.

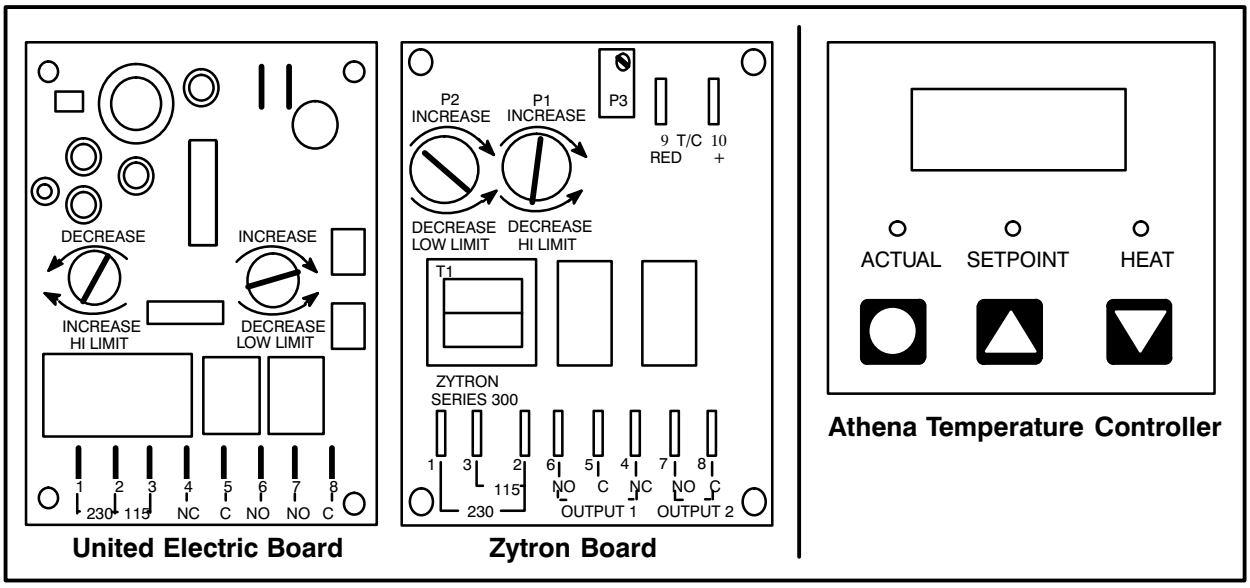


FIGURE 7

COMPUTER CONTROLLER CONFIGURATION

COMPUTER CONTROLS

INITIATING ACCESS MODE

The Cooking Computer provides a special Access Mode for setting and displaying certain computer special functions. To initiate the Access Mode place the control in the OFF state, (OFF is shown in the display when power is first applied to the control). Press the following sequence of keys to set the control to Access Mode: CLEAR 1 2 3 4 5 6 ENTER. The display reads *ACCESS*.

CONFIGURATION

When the controller is in the "ACCESS" mode, press the following buttons: CLEAR 1 1 1 ENTER. With the exception of the positive and negative offsets, to be addressed later, all display data should correspond to the entries in the chart below. If the data does not match the chart, it should be changed accordingly. When the correct data is displayed press the PROG/ENTER key, the display will cycle on to the next screen. If a step is missed, press the CLEAR button to backup.

DISPLAY	ACTION TAKEN	DISPLAY	ACTION TAKEN
F/CMODE?	Press PROG ENTER	T ➧ F°(°C)	Press PROG ENTER again or hit any number and it will change.
POS OFFSET?	Press PROG ENTER	0°(0°)	Press PROG ENTER
NEG OFFSET?	Press PROG ENTER	0°(0°)	Press PROG ENTER
MAX-T ENTRY?	Press PROG ENTER	600°(315°)	Press PROG ENTER or change then press again.
MAX-T LIMIT?	Press PROG ENTER	625°(330°)	Press PROG ENTER
READY BAND?	Press PROG ENTER	10	Press PROG ENTER
MIN-HT ON?	Press PROG ENTER	60	Press PROG ENTER
DISPLAY INTEG?	Press PROG ENTER	30	Press PROG ENTER
T-CTRL INTEG?	Press PROG ENTER	10	Press PROG ENTER

TABLE 4

NOTE: Press the CLEAR key to back up one parameter.

Boost Option — (versions 2.00 or 3.00)

When the controller is in the "ACCESS" mode, press the following buttons: CLEAR 2 1 2 ENTER to enter the boost option.

DISPLAY	ACTION TAKEN	DISPLAY	ACTION TAKEN
BOOST / MODE-? (Flash alternately)	Press PROG ENTER	OPT-1 or OPT-2	Press any numeric key to toggle between OPT-1 and OPT-2
Select OPT-1 to turn off boost mode.			
OPT-1	Press PROG ENTER	DONE SAVE EXIT	Press PROG ENTER

TABLE 5

EXITING THE ACCESS MODE

After pressing PROG/ENTER the last time, the display will show "EXIT" then beep and return to the "ACCESS" mode. Pressing and holding the ON/OFF key will turn the oven on. A new time and temperature must be entered upon exiting the "ACCESS" mode since the oven will automatically default to 0. The oven will not fire until both time and temperature are entered.

Firmware Model Version Display

Password: CLEAR 1 2 3 ENTER

MODEL - Computer Model Number — 6028 (Blodgett Conveyor Oven With Speed Control)

SW-VER - Firmware version number. V-xxyy xx = major version, yy = minor version

DATE-? -Firmware release date

CHKSUM - ROM checksum stored in PROM. xxxx - Value is display in hexadecimal format.

TEMPERATURE CALIBRATION

TO ENTER THE CALIBRATION MODE

1. Press the ON/OFF key until *OFF* is displayed.
2. Press CLEAR 1 2 3 4 5 6 ENTER to enter the access mode**.** The display reads *ACCESS*.
3. Press CLEAR ACT_TEMP ACT_TEMP ACT_TEMP ENTER to access the Temperature Calibration mode**.**
4. Disconnect the white wire from the D.C. motor. Secure so the wire will not ground against any part of the oven. This will disable the conveyor.

NOTE: Disregard the controller display. The only numbers of concern are the pyrometer reading and the temperature set point.

TO CALIBRATE THE OVEN TEMPERATURE

During operation, the temperature control is based on the measured temperature and the temperature offset which is programmed into the control. If the temperature measured in the center of the oven is below the oven setpoint a positive offset is needed. If the temperature measured in the center of the oven is above the oven setpoint a negative offset is needed.

NOTE: In the calibration mode the display gives the current measured temperature only.

To view the current temperature setpoint:

1. Press the SET_TEMP, key.

To change the temperature setpoint :

1. Press PROG/ENTER SET_TEMP.
2. Enter the desired setpoint.
3. Press the PROG/ENTER key.

To program the temperature offset:

To change the temperature calibration an offset, positive or negative, must be programmed.

1. Press PROG/ENTER followed by ACT_TEMP. The display flashes either *POS * OFFSET* or *NEG * OFFSET*

   NOTE: POS OFFSET is displayed if a value has been programmed in for a positive offset. NEG OFFSET is displayed if a value has been programmed for a negative offset. The only time both will be displayed is if a value of 0 has been entered for both.

2. Enter a value for the desired offset. The display flashes *DISPLAY * INTEG?.*
3. Press the PROG/ENTER key. The default value of 30 will be displayed.
4. Press the PROG/ENTER key. The display will flash *T-CTRL * INTEG?.*
5. Press the PROG/ENTER key. The default value of 10 will be displayed.
6. Press the PROG/ENTER key.

The control will now resume using the new parameters.

Verify the temperature calibration once the unit has cycled for 5 minutes with the new settings. Repeat calibration using a new offset value if necessary.

TO EXIT THE CALIBRATION MODE

1. Press the CLEAR key twice.
2. The display flashes *REBOOT* then displays the set time and temperature. You must re-enter a temperature for the oven to start heating again.

   A.) Press PROG/ENTER SET_TEMP

   B.) Enter the desired temperature.

   C.) Press the PROG/ENTER key. The heat light turns on and the burner begins to cycle at set point.

BELT SPEED CALIBRATION

CLOSED LOOP SYSTEM

To enter the calibration mode:

1. Press the ON/OFF key until *OFF* is displayed.
2. Press CLEAR 1 2 3 4 5 6 ENTER to enter the Access mode. The display reads *ACCESS*.
3. Press CLEAR TIME TIME TIME ENTER to access the Belt Speed Calibration mode. The display flashes *INIT*.

Belt speed calibration:

1. OVEN LENGTH — Set the length of the conveyor belt to 36.
2. MOTOR RATIO — Set the motor gear ratio to 600.
3. SHAFT TEETH — Set the shaft teeth number to15
4. MOTOR TEETH — Set the motor teeth number to 12.
5. BELT RADIUS — Set the belt radius to 8,712.

   NOTE: The values given are estimates. If you reenter the calibration mode after setting the belt speed, the belt radius may differ from the table.

6. The display gives a four digit value followed by the letter K. Press ENTER twice to verify the belt time.

Belt speed verification:

1. ENTER TEST TIME — Enter a test time to verify the belt speed. The default setting is 7 minutes.
2. WAIT — 1 second delay before the belt moves.
3. ENTER ACTUAL TIME — Place an object on the belt. Note the time from entrance to exit. Enter the actual measured time.
4. ENTER TEST TIME — If the actual measured time is not within 5 seconds of the test time, repeat the belt verification test to obtain better accuracy. If the actual measured time is acceptable, press the CLEAR key to continue the belt speed calibration.
5. MAX/MIN CALC TIME — The control sets the fastest and slowest cook time the user can program. This requires a 1 minute delay in the calibration process.

   NOTE: If the control cannot read the shaft encoder the display reads ERROR then ABORT before exiting belt calibration. Verify the connection of the encoder Restart the belt speed calibration.

6. The display flashes *MIN SET TIME?* Press the PROG/ENTER key to display the calculated minimum set time. Press the PROG/ENTER key to accept this value or enter a new time with a value higher than the default. Press PROG/ENTER again to accept.
7. The display flashes MAX SET TIME? Press the PROG/ENTER key to display the calculated maximum set time. Press the PROG/ENTER key to accept this value or enter a new time with a value lower than the default. Press PROG/ENTER again to accept.
8. The display reads *DONE*.

To save the new belt speed:

1. Press ENTER to save the belt speed calibration program in the control's memory.

OPEN LOOP SYSTEM — SINGLE BELT

To enter the calibration mode:

1. Press the ON/OFF key until *OFF* is displayed.
2. Press CLEAR 1 2 3 4 5 6 ENTER to enter the Access mode. The display reads *ACCESS*.
3. Press CLEAR TIME TIME TIME ENTER to access the Belt Speed Calibration mode. The display flashes *INIT*.

Belt speed calibration:

1. The display reads *BELT SIZE—?.* Enter 36 for the length of the conveyor belt. Press the PROG/ENTER key.
2. The display reads *STEP—1.* The controller is in Step 1 of the calibration procedure: maximum belt speed. The motor control is automatically set to its maximum output. Place an object on the belt and note the time from entrance to exit.

   NOTE: Be certain to measure either the leading edge in and out or the trailing edge in and out. Do not use the leading edge in and the trailing edge out.

   A.) The display reads *STEP—1TIME—?.* Enter the time measured in STEP—1. Min: 0 Max: 59:59 (min:sec). Press the PROG/ENTER key.

   B.) The display reads *STEP—1DIST—?.* Enter 36 for the belt length. Press the PROG/ENTER key.
3. The display reads *STEP—2.* The controller is in Step 2 of the calibration procedure: minimum belt speed. The motor control is automatically set to its minimum output. The belt will travel very slowly during this part of the calibration procedure. To minimize the time spent on STEP—2, measure off 10” on the conveyor support. Place an object on the belt and note the travel time for the 10” measured distance.

   A.) The display reads *STEP—2 TIME—?.* Enter the measured travel time for STEP—2. Min: 0 Max: 59:59 (min:sec). Press the PROG/ENTER key.

   B.) The display reads *STEP—2 DIST—?.* Enter 10”. Press the PROG/ENTER key.
4. The display reads *MIN—TM ENTRY?* (the fastest belt speed). Limits of this value are determined by the Step—1 and Step—2 calibration values. Use 200 (2 min). Press the PROG/ENTER key.
5. The display reads *MAX—TM ENTRY? (*slowest belt speed). Limits of this value are determined by the Step 1 and Step 2 calibration values. Use 1600 (16 min). Press the PROG/ENTER key.
6. The display flashes *DONE* and *SAVE.* Press the PROG/ENTER key to permanently store the calibration values in non-volatile memory (NOVRAM).

NOTE: During these adjustments, pressing the clear button will abort all entries and require reprogramming of belt time mode. When exiting the Belt Speed Calibration Mode, enter a time. Otherwise the time defaults to zero, the oven will not heat, and the belt will not move.

OPEN LOOP SYSTEM — TWIN BELT

To enter the calibration mode:

1. Press the ON/OFF key until *OFF* is displayed.
2. Press CLEAR 1 2 3 4 5 6 PROG/ENTER. The display flashes *ACCESS*.
3. Press CLEAR, FRONT BELT, FRONT BELT, FRONT BELT, PROG/ENTER to enter the Access mode. The display reads *FRONT*.
4. Press FRONT BELT to toggle between front and rear belt.
5. The display reads *FRONT—INIT—F*.

Belt speed calibration:

1. The display reads *BELT SIZE—?.* Enter 36 for the length of the conveyor belt. Press the PROG/ENTER key.
2. The display reads *STEP—1.* The controller is in Step 1 of the calibration procedure: maximum belt speed. The motor control is automatically set to its maximum output. Place an object on the belt and note the time from entrance to exit.

   NOTE: Be certain to measure either the leading edge in and out or the trailing edge in and out. Do not use the leading edge in and the trailing edge out.

   A.) The display reads *STEP—1TIME—?.* Enter the time measured in STEP—1. Min: 0 Max: 59:59 (min:sec). Press the PROG/ENTER key.

   B.) The display reads *STEP—1DIST—?.* Enter 36 for the belt length. Press the PROG/ENTER key.

3. The display reads *STEP—2.* The controller is in Step 2 of the calibration procedure: minimum belt speed. The motor control is automatically set to its minimum output.

   The belt will travel very slowly during this part of the calibration procedure. To minimize the time spent on STEP—2, measure off 10” on the conveyor support. Place an object on the belt and note the travel time for the 10” measured distance.

   A.) The display reads *STEP—2 TIME—?.* Enter the measured travel time for STEP—2. Min: 0 Max: 59:59 (min:sec). Press the PROG/ENTER key.

   B.) The display reads *STEP—2 DIST—?.* Enter 10”. Press the PROG/ENTER key.

4. The display reads *MIN—TM ENTRY?* (the fastest belt speed). Limits of this value are determined by the Step—1 and Step—2 calibration values. Use 200 (2 min). Press the PROG/ENTER key.
5. The display reads *MAX—TM ENTRY? (*slowest belt speed). Limits of this value are determined by the Step 1 and Step 2 calibration values. Use 1600 (16 min). Press the PROG/ENTER key.
6. The display flashes *DONE* and *SAVE.*

NOTE: During these adjustments, pressing the clear button will abort all entries and require reprogramming of belt time mode. When exiting the Belt Speed Calibration Mode, enter a time. Otherwise the time defaults to zero and the oven will not heat, and the belt will not move.

MOTOR CONTROL BOARD ADJUSTMENT

High/low speed motor control board adjustment for 180 and 130 volt DC motors

NOTE: The motor control board is located on the slide out control panel.

High Speed Motor Adjustment:

For closed loop systems follow Belt Speed Verification through STEP 5 (see page 4—10). For open loop systems follow Belt Speed Calibration through STEP 2 (see page 4—11 or 4—12).

1. With the motor connected (make no open circuit voltage readings) measure the voltage at the motor leads (A1 & A2 in FIGURE 8) on the DC control board. If the voltage is not within 3 VDC of the specified voltage continue with step 2.
2. Turn the MAX trim pot counter-clockwise to lower and clockwise to raise the voltage until it is within 3VDC of the specified voltage.

   NOTE: For computerized closed loop systems this adjustment must be made quickly.

Low Speed Motor Adjustment:

For closed loop systems the computer automatically proceeds to low speed. For open loop systems continue Belt Speed Calibration through STEP 3 (see page 4—11 or 4—12).

1. With the motor connected (make no open circuit voltage readings) measure the voltage at the motor leads on the DC control board (A1 & A2 in FIGURE 8). If the voltage is not 26VDC +/- 1 VDC, continue with step 2.
2. Turn the MIN SPEED pot clockwise to lower the voltage and counter-clockwise to raise the voltage.

NOTE: If any voltage adjustments were made hit the CLEAR key to abort the calibration mode. Reenter the calibration mode to verify that voltage is locked in.

COMPUTERIZED OVENS				
	130 Volt System		**180 Volt System**	
Model	Low	High	Low	High
MT2136	20	130	26	180
NON-COMPUTERIZED OVENS				
MT2136	20	130	26	180

TABLE 6

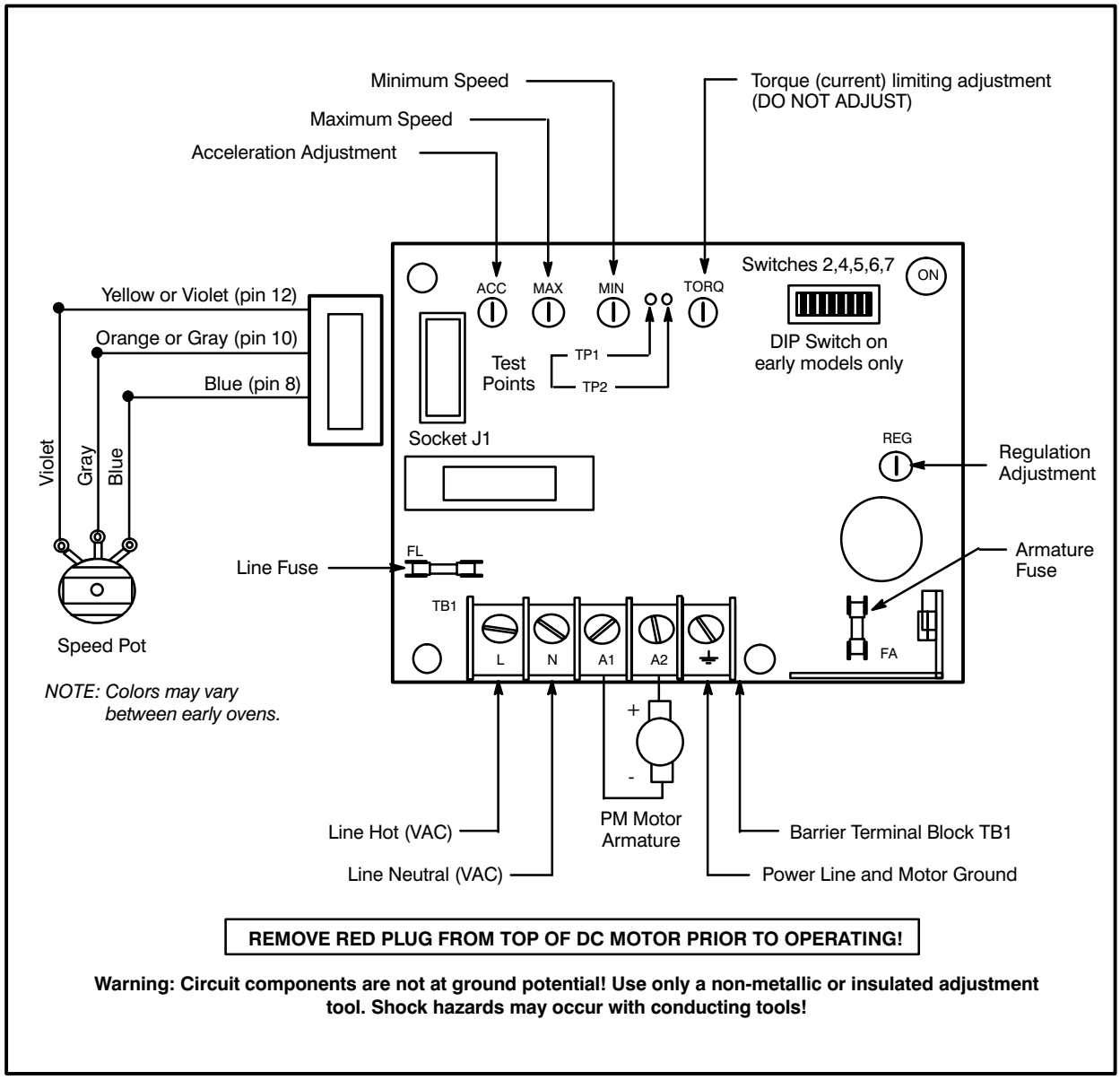

Minimum Speed
Maximum Speed
Acceleration Adjustment
Torque (current) limiting adjustment
(DO NOT ADJUST)
Switches 2,4,5,6,7
ON
ACC
MAX
MIN
TORQ
DIP Switch on
early models only
Test
Points
TP1
TP2
Yellow or Violet (pin 12)
Orange or Gray (pin 10)
Blue (pin 8)
Violet
Gray
Blue
Socket J1
REG
Regulation
Adjustment
Armature
Fuse
Line Fuse
FL
TB1
L
N
A1
A2
FA
Speed Pot
NOTE: Colors may vary
between early ovens.
+
-
PM Motor
Armature
Line Hot (VAC)
Line Neutral (VAC)
Barrier Terminal Block TB1
Power Line and Motor Ground
REMOVE RED PLUG FROM TOP OF DC MOTOR PRIOR TO OPERATING!
Warning: Circuit components are not at ground potential! Use only a non-metallic or insulated adjustment tool. Shock hazards may occur with conducting tools!

FIGURE 8

RERATING THE APPLIANCE

Due to the lack of oxygen at higher elevations, the unit may need to be rerated. (The orifice size may need to be adjusted to accommodate different air pressures at higher elevations.) If not rerated, incomplete combustion may occur releasing Aldehydes and CO or Carbon Monoxide. **Any of these are unacceptable and may be hazardous to the health of the operator.**

To choose the correct orifice for different altitudes several factors must be known:

1. Altitude
2. BTUs per burner
3. Manifold pressure
4. Correct orifice size at sea level
5. BTU value of the gas

   The following are generally accepted heating values:

   A.) Natural Gas — 1000 BTU/Cu Ft

   B.) Propane — 2550 BTU/Cu Ft

   C.) Butane — 3000 BTU/Cu Ft

6. Specific gravity

   The following are generally accepted values (Air = 1.0):

   A.) Natural Gas — 0.63

   B.) Propane — 1.50

   C.) Butane — 2.00

NOTE: For other gases contact your local gas supplier for values.

Use the following formulas to calculate the correct orifice:

1. $\frac{\text{Firing rate}}{\text{\# of burners}} = \text{BTU per burner}$
2. $\frac{\text{BTU per burner}}{\text{Heating value of Gas}} = \text{CuFt/hr}$
3. $\frac{\text{CuFt/Hr}}{\text{Specific Gravity Multiplier}} = \text{Equiv. CuFt/hr}$
4. Use TABLE F-1 from the National Fuel Gas Code Handbook to determine the proper orifice size at sea level.

   NOTE: The sea level orifice size is needed to determine the proper orifice at any elevation.

5. Use TABLE F-4 from the National Fuel Gas Code Handbook to determine the correct orifice for the applicable elevation.
6. Use TABLE F-3 from the National Fuel Gas Code Handbook to determine the specific gravity multiplier.

EXAMPLE

Known factors:

1. Altitude = 5000 ft.
2. BTUs per appliance = 55,000
3. Number of burners = 2
4. BTU value of the gas = 900
5. Specific gravity = .50

Calculations:

1. $\frac{55{,}000}{2} = 27{,}500$ BTU per burner
2. $\frac{27{,}500}{900} = 30.55$ CuFt/hr
3. $\frac{30.55}{1.10} = 27.77$ Equiv. CuFt/hr

Using the tables in the National Fuel Gas Code Handbook we can determine that:

1. Correct orifice size at sea level = #40
2. Correct orifice size at 5000 ft = #42

CHECKING THE FIRING RATE

Method #1

1. Turn off all other appliances on the line. Turn on the appliance to be measured.
2. Using either the 1/2 cu. ft. or the 2 cu. ft. dials located on the gas meter, note the time it takes the indicator to complete one revolution. See FIGURE 9.
3. Use the following formula to determine the firing rate of the meter.

$$\frac{\text{3600 x size of test dial x 1000}}{\text{\# of seconds per revolution}} = \text{BTU/burner}$$

Example:

A.) 3600 x 2 = 7200

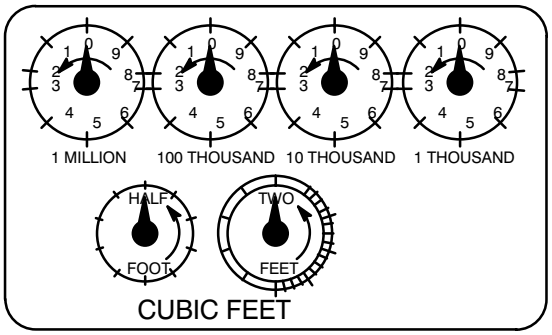
B.) $\frac{7200}{60}$ = 120 Cu. Ft./Hr

C.) To convert to BTU/Hr, multiply by one of the following generally accepted heating values:

Natural Gas — 1000 x 120 = 120,000 BTU
Propane — 2550 x 120 = 306,000 BTU
Butane — 3000 x 120 = 360,000 BTU

NOTE: You may also use TABLE XII from the National Fuel Gas Code Handbook to aid in determining the firing rate of the appliance. This table eliminates the use of the formulas above.

Locate the time observed in STEP 2. Move across the table to either the 1/2 cu. ft. or the 2 cu. ft. column to find the gas input to the burner.



TYPICAL DOMESTIC GAS METER INDEX

FIGURE 9

Method #2

You may also determine the firing rate by sizing the main burner orifice and measuring manifold gas pressure. Either way is accurate, however method #1 is faster.

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CHAPTER 5

TROUBLESHOOTING

DC DRIVE SYSTEM

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #1 — Belt does not move (standard controls)	
• Conveyor switch is turned off.	• Turn switch to on.
• Armature fuse on Bodine board is blown.	• Ohm this fuse out to determine if blown. If necessary, replace with 250 milliamp fuse. Determine the amp draw of the motor.
• Line fuse on Bodine board is blown.	• Replace with 5 amp fuse.
• DC motor is leaking oil.	• Replace motor.
• Motor ohms out higher then 162Ω.	• Replace motor.
• Motor ohms out lower then 100Ω.	• Replace motor.
• Brushes worn.	• Replace brushes.
• Control fuses blown.	• Check wiring going from the front control panel to the burner compartment for damage.
• Potentiometer does not ohm out correctly, 10kΩ.	• Replace potentiometer.
Symptom #2 — Belt does not move (computer controls)	
• Oven in OFF mode.	• Turn to ON position.
• Loose computer controller cord connection.	• Adjust and retighten cables and set screws.
• Time not programmed into computer.	• Program in a cook time. See Operation Section (page 3—4).
• Emergency stop switch on OFF.	• Pull switch out to ON.
• Control circuit breaker tripped.	• Reset breaker.
• Belt hooked on something in oven.	• Turn oven OFF, unhook and repair problem.
• 5 amp line fuse blown.	• Replace fuse. Determine amp draw.
• 200 milliamp armature fuse blown.	• Replace fuse. Determine amp draw.
• Hall Effect Pickup not connected. *(Closed loop systems only)*	• Verify the unit is set for a single pulse pickup. If not, reset for a single pulse pickup. If yes reattach the pickup.
• Motor brushes worn out.	• Replace brushes.
• Defective conveyor drive motor.	• Replace conveyor drive motor.
• Defective conveyor drive motor controller.	• Replace conveyor drive motor controller.
• Wire from pickup open or misplaced.	• Repair or replace wire.
• DAC defective.	• Replace computer.
• 9 or 25 pin cable defective.	• Replace cables.
• Belt speed relay defective.	• Replace relay.

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #3 – Computer error code MOTOR - SPEED - ERROR	
• Belt speed needs calibration.	• See Calibration and Adjustments.
• Voltage from Bodine controller to DAC not present. The DAC (Digital Analog Control) is a non-repairable component of the computer. There should be approximately 20 VDC between the red and green wires on the 3 pin connection of the DC drive board.	• Replace the drive motor controller.
• DAC voltage is present but not regulated between 4.7 and .47 VDC when different times are programmed into the cooking computer. Measure the voltage between the green and blue wires of the 3 pin connection.	• Replace the computer.

CONVECTION SYSTEM

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #1 – Blower motor(s) not running	
• Blower switch off.	• Turn switch to on position.
• No power to the oven.	• Verify power to the oven. If there is no power determine cause.
• Motor fuse blown.	• Replace fuse. Determine the amp draw.
• Faulty start capacitor.	• Replace capacitor.
• Motor burned out.	• Check draw (3 amps or greater).
• Thermal overload tripped.	• Determine if the cooling blower (or fans) are operating. If not, verify voltage to the cooling blower. If voltage is present, replace the cooling blower motor. If voltage is not present, verify voltage through the thermal switch. If no voltage is present, replace the thermal switch.
• No voltage at the motor contactor coil.	• Check for blown fuse or bad blower switch.
• Faulty motor contactor.	• Replace motor contactor.
Symptom #2 – Blower motor(s) do not shut off	
• Faulty motor contactor.	• Replace contactor.
• Faulty thermocouple on Hi/Lo board.	• Refer to the chart on page 6–5 of the Technical Appendix. If the readings do not match replace the thermocouple.
• Faulty Hi/Lo board.	• Determine if 115 VAC is coming out of #7 with the adjustable potentiometer turned completely counter-clockwise. If voltage is still present, replace the board.
• Hi/Lo board is not adjusted properly.	• Check and readjust Hi/Lo board. Refer to page 4–4 of Calibration and Adjustment.
Symptom #3 – Blower motor running backward	
• Motor off by thermal overload (other fans forcing blower to spin).	• Determine if the cooling blower (or fans) are operating. If not, verify voltage to the cooling blower. If voltage is present, replace the cooling blower motor. If voltage is not present, verify voltage through the thermal switch. If no voltage is present, replace the thermal switch.
• Faulty capacitor.	• Replace capacitor.

HEATING SYSTEM

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #1 — Burner will not fire (standard controls)	
• Oven in off mode.	• Turn the oven on.
• No power to the oven.	• Determine if the circuit breaker is tripped.
• Fuse blown on the control panel.	• Replace the fuse.
• Determine if the controller setpoint is above actual.	• If the setpoint is not above the actual, reset accordingly.
• Intermittent Ignition Device (IID) system locked out.	• Reference Technical Appendix (page 6—1 through 6—3).
• Air pressure switch may be open.	• Check convection blower for proper operation.
• Blower motor(s) not running.	• Verify voltage to motor. If voltage is present, replace the motor or start capacitor.
• High limit in front panel open.	• Verify that the temperature in the front panel is lower than 140°F (60°C).
• Hi limit on Hi/Lo limit board has been hit.	• Verify that the oven temperature exceeded 600°F (316°C).
• Verify that the pilot goes out when unit is shut down.	• If pilot does not extinguish, replace the pilot valve.
• Verify that combustion motor is spinning and that the centrifugal switch is closed.	• If the motor is not spinning, check the transformer and time delay relay in the control box on the top of the combustion motor. If one or both are bad, replace. If the motor is spinning and there are not 24 volts to the ignition control box, the centrifugal switch is bad. Replace the combustion motor.
• Temperature not programmed into cooking computer.	• Program cook temperature into the computer.
• Time not programmed into cooking computer.	• Programm cook time into the computer.
• Heat relay defective (computer controlled ovens).	• Replace relay.
• Gas pressure to oven too high.	• Lower to specified gas pressure.
• Gas pressure to oven too low.	• Raise to specified gas pressure.

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #1 – Burner will not fire (computer controls)	
• Oven in OFF mode.	• Turn to ON position.
• Emergency stop switch on OFF.	• Pull switch out to ON.
• Control circuit breaker tripped.	• Reset breaker.
• Combustion motor not running.	• Check transformer for primary and secondary voltage. • Check main control and burner valve relays to see if closed. • Check relay in combustion burner box. If bad replace relay.
• Main Temperature Controller not set above ambient temperature.	• Set to desired temperature.
• Manual gas valve closed.	• Open valve.
• Intermittent Ignition Device (IID) system locked out.	• Reference Technical Appendix (page 6–1 through 6–3).
• Air pressure switch may be open.	• Check convection blower for proper operation.
• Blower motor(s) not running.	• Verify voltage to motor. If voltage is present, replace the motor or start capacitor.
• High Limit control tripped.	• Verify that 625°F (330°C) high limit is programmed into the controller. If so reset the high limit. Set the computer to 500°F (260°C). Use a pyrometer to verify the oven temperature. If the oven climbs significantly above the setpoint, use the chart in the Technical Appendix (page 6–4) to check the probe. If the probe is alright the computer may need replacement.
• Thermal switch in control compartment tripped.	• Check hood system.
• Excessive intake air temperature.	• Check hood system.
• If pilot fails to go out when the unit is shut down, the solenoid valve is bad.	• Replace valve.

COMPUTER CONTROL SYSTEM

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #1 — Computer controller displays: PROBE - OPEN - PROBE - SHORT and alarm buzzer sounds	
• Internal problem with computer controller.	• Verify display integ. in the 2nd level programming. If the controller has been programmed the computer may need to be replaced.
• Loose connections at computer controller.	• Tighten connections.
• Shorted or open RTD probe.	• Use the chart in the Technical Appendix (page 6—4) to determine if probe is bad. Replace if necessary.
Symptom #2 — Computer controller displays: ERROR - HIGH - TEMP - LIMIT	
• Actual temperature exceeds programmed limit value. Default 605°F (319°C).	• Faulty burner valve relay. Replace relay.
• Internal problem with computer controller.	• Verify display integ. in the 2nd level programming. If the controller has been programmed the computer may need to be replaced.
Symptom #3 — Oven will not reach desired temperature	
• Gas pressure to oven is too low.	• Contact local gas representatives.
• Top air plates missing or not adjustable.	• Install/adjust air plates.
• Faulty RTD probe.	• Use the chart in the Technical Appendix (page 6—4) to determine if probe is bad. Replace if necessary.
• Blower motor(s) running backward.	• Verify voltage to motor. If voltage is present, replace the motor or start capacitor.
• Controller out of calibration.	• Recalibrate the controller. See Calibration section (page 4—9).
• Excessive food/debris accumulation blocking the airflow.	• The inside of the oven should be cleaned to remove any materials that could have dropped off the conveyor belt and possibly blocked some of the air flow holes. This would include the removal of the conveyor belt, conveyor belt supports, and the nozzles. The oven interior and all parts removed should then be cleaned with an appropriate oven cleaner safe for aluminum.

Symptom #4 — Burner operates sporadically	
• Air pressure switch may be open.	• Check convection blower (or 4 convection fans) for proper operation.
• Thermal switch tripped.	• Determine the ambient temperature in the control compartment. If above 140°F (60°C) check the cooling fan operation.
• Faulty RTD probe.	• Use the chart in the Technical Appendix (page 6—4) to determine if probe is bad. Replace if necessary.
• Excessive food/debris accumulation blocking the airflow.	• The inside of the oven should be cleaned to remove any materials that could have dropped off the conveyor belt and possibly blocked some of the air flow holes. This would include the removal of the conveyor belt, conveyor belt supports, and the nozzles. The oven interior and all parts removed should then be cleaned with an appropriate oven cleaner safe for aluminum.

CHAPTER 6

TECHNICAL APPENDIX

INTERMITTENT IGNITION SYSTEM

PRINCIPLES OF OPERATION

Pilot flame sensing is a very important aspect of the ignition controls operation. Three zones are needed to give the proper air-gas ratio to produce a blue pilot flame.

Zone 1 – an inner cone that will not burn because excess fuel is present.

Zone 2 – around the inner, fuel rich cone is a blue envelope. This zone contains a mixture of vapor from the fuel rich inner cone and the secondary or surrounding air. This is where combustion occurs, and is the area of highest importance for proper flame sensor location.

Zone 3 – Outside the blue envelope is third zone that contains an excessive quantity of air.

FLAME RECTIFICATION

To identify a current conducted by the flame, we use flame rectification. Place two probes in Zone 2 of the pilot flame. When the surface area of one probe is larger than the other, current tends to flow more in one direction. DC current flows in only one direction, as opposed to AC current, which alternates its direction. The current is rectified from AC to DC by increasing the surface area of one probe and decreasing the surface area of the other.

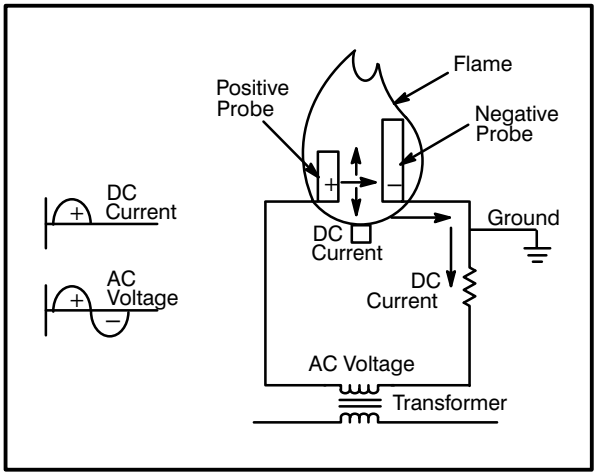

FIGURE 1

In the IID system the probes exposed to the pilot flame are the Flame Sensor and the Pilot Burner Hood. Since the surface area of the pilot hood is larger than the flame sensor, the current rectification process takes place. Current is conducted from terminal 4 at the control through the flame sensor cable to the flame sensor. As the current is conducted through the flame to the pilot hood, it is rectified from AC to DC because of the difference in surface area. The pilot hood is grounded back to the control, thereby completing the circuit.

Flame Sensing Circuit Current

For the ignition control to function properly, a minimum amount of current must flow through the flame sensing circuit.

As the pilot flame is established and current begins to flow in the flame sensing circuit, the current energizes a relay. A minimum amount of current is required to pull-in the relay. When the relay pulls in, one set of contacts opens which shuts off the high energy spark. Another set of contacts closes, putting 24 volts on terminal 3 which opens the main gas valve.

Current vs. Voltage

In normal operation an AC voltage will be present from terminal 4 to ground and a current will be present in the flame sensing circuit.

Even though an AC voltage is present, flame rectification occurs and a DC current flows in the sensing circuit.

For service checkout purposes, measuring these voltages and currents can provide useful information regarding the integrity of the ignition control.

Measuring the current flow rather than voltage is the preferred procedure. Due to the internal circuitry of the ignition control and varying input impedance of voltmeters, the measured voltage will vary depending on type and model of voltmeter being used. However, measuring the current provides a more precise evaluation of the ignition control and flame sensing circuit.

A proper reading not only indicates a functional control, but also verifies all components of the circuit such as flame sensor, cable and ground.

SERVICE PROCEDURES

Service the IID system as follows:

1. Make certain the thermostat contacts are open.
2. Check for proper supply voltage at primary and secondary of system transformer.
3. Close thermostat contacts and observe system.
4. Determine which system condition exists:
   A.) No spark, system does not function
   B.) Spark present but pilot will not light
   C.) Pilot lights but main valve will not open
5. Follow the appropriate service checkout procedure to troubleshoot and repair the system.
6. Observe the system through several complete operating cycles.

VOLTAGE AND CURRENT MEASUREMENTS

When servicing the electronic ignition control there are several times when voltages and currents must be measured or observed.

NOTE: All voltages measured will be AC voltage and all current measured will be DC current.

Terminal	Terminal Use
1	Pilot valve connection between terminal #1 and ground
2	Wire from thermostat
3	Main valve connection between terminal #3 and ground
4	Flame sensor

TABLE 1

To Measure AC Voltages:

1. Set the selector switch on the voltmeter to the AC voltage position.
2. Connect the meter leads in parallel with the voltage to be measured.
3. Read the voltage at the meter.

To Measure DC Flame Sensing Current:

1. Turn off the power supply to the ignition control.
2. Disconnect the flame sensor cable from terminal #4 on Johnson units or terminal #15 on Landis & Gyr units.
3. Set the selector switch on the meter to microamp scale. Connect the positive (red) lead to terminal #4 and the negative (black) lead to the sensor cable.
4. Disconnect the main valve lead from terminal #3. This will prevent the main burner from igniting. A proper measurement of flame sensing current is taken with the pilot light only.
5. Turn the power back on and close the thermostat contacts. Read the current at the meter.

   NOTE: The minimum current required for the Johnson G770 is 0.15DCμA. The minimum current required for the Landis & Gyr is 2.0DCμA. (This unit is polarity specific.)
6. Turn the power off to disconnect the meter and reconnect terminal #3 and #4.

To Measure DC Flame Sensing Current Using the Johnson Y99AU-3 Signal Transducer:

1. Set the function selector switch to the DC voltage position.
2. Turn off the supply voltage to the control.
3. Disconnect the flame sensor cable from terminal #4 on the ignition control.
4. Connect the male 1/4" spade connector (—) to the flame sensor cable. Connect the female 1/4" spade connector (+) to terminal #4.
5. Disconnect the main valve lead from terminal #3 on the ignition control.
6. Turn the supply voltage on and close the thermostat contacts to cycle the system.
7. When the pilot lights, read the current on the meter display.

   NOTE: The conversion factor is 1DC volt — 1 DC microamp.

REPAIRING THE ELECTRONIC IGNITION SYSTEM

Flame Sensing Current Maintenance:

The flame sensor is made of carbon steel and subject to contamination and oxidation buildup. Any buildup on the sensor can add enough resistance to drop the signal below the required minimum. Carbon and oxidation can also build up on the pilot hood. The pilot hood is part of the circuit and must be kept as clean as the flame sensor.

1. Clean the flame sensor with steel wool or an emery cloth.
2. Clean the pilot hood with a small wire brush to remove any carbon or oxidation buildup.

Flame Sensor Replacement:

If the ceramic portion of the flame sensor is broken or if the contamination is extensive, the flame sensor may have to be replaced.

CAUTION!

Shut off all gas to the appliance by closing the shutoff valve in the supply line to that appliance. Disconnect the power supply to prevent electrical shock or possible damage to the equipment.

1. Disconnect the sensing probe cable from the old sensing probe.
2. Remove the old sensing probe from the pilot burner.
3. Check the length of dimension B to be sure the correct replacement probe is being used. See FIGURE 2.
4. Compare the sensing probe rod lengths, dimension A. If required, trim the length of the Y75 rod being installed to the same length as the sensing rod being replaced.

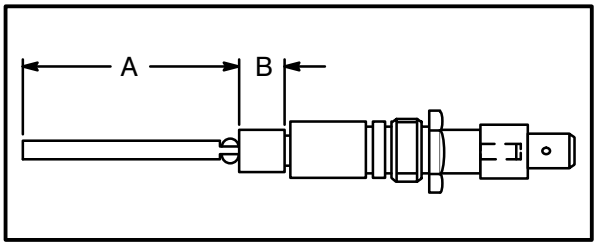

FIGURE 2

5. Install the Y75 sensing probe into the pilot burner. Reconnect the sensing probe cable. The connections to the sensing probe and control terminal must be secure.
6. Restore the power and the gas supply to the appliance.
7. IMPORTANT: Using a microammeter, check the signal passing through the sensing probe.
8. If the microamp signal is marginal, trim the flame sensing probe in increments of 1/8”. Be sure that there is still proper flame impingement on the flame sensing probe.

   Flame must surround sensing probe tip for approximately 1/2”.
9. Observe at least three complete operating cycles to see that all components are functioning correctly.

Ground Connection

Another important requirement for proper operation is the existence of a good electrical ground between the pilot assembly and the ignition control. This ground provides the path for sensing current to return to the control, thereby completing the sensing circuit.

In most systems we assume the pilot burner is grounded back to the control through the pilot tubing and gas valve. The gas valve would be grounded to the ignition control when the control is mounted on the valve. Controls that are not mounted to a gas valve require a separate grounding wire connecting the control to the pilot assembly.

In some instances this ground can become weak and cause a low sensing current signal. To assure that a proper ground exists between the control and pilot, a wire can be installed from one of the ground terminals to the pilot bracket. This will assure a strong ground and maintain a proper sensing current signal.

Using a 1/4” female spade connector, connect one end of the new wire to the ground strip on the ignition control. Attach the other end of the wire to a bolt or screw on the pilot burner bracket. Be sure to use a wire with a high temperature rated insulation.

COOKING COMPUTER — TEMPERATURE VS RESISTANCE

T/F	Res/Ohms	T/F	Res/Ohms	T/F	Res/Ohms	T/F	Res/Ohms
70	541.12	230	711.43	390	877.15	550	1038.293
75	546.51	235	716.68	395	882.26	555	1043.255
80	551.9	240	721.92	400	887.36	560	1048.212
85	557.28	245	727.16	405	892.46	565	1053.165
90	562.66	250	732.4	410	897.55	570	1058.113
95	568.04	255	737.63	415	902.63	575	1063.057
100	573.4	260	742.85	420	907.72	580	1067.997
105	578.77	265	748.05	425	912.8	585	1072.931
110	584.13	270	753.29	430	917.87	590	1077.862
115	589.48	275	758.5	435	922.94	600	1087.709
120	594.84	280	763.71	440	928.002	605	1092.626
125	600.18	285	768.91	445	933.062	610	1097.539
130	605.53	290	774.11	450	938.118	615	1102.447
135	610.86	295	779.31	455	943.17	620	1107.35
140	616.2	300	784.5	460	948.216	625	1112.249
145	621.52	305	789.68	465	953.259	630	1117.1
150	626.85	310	794.87	470	958.296	635	1122
155	632.17	315	800.04	475	963.33	640	1126.9
160	637.48	320	805.21	480	968.359	645	1131.8
165	642.8	325	810.38	485	973.383	650	1136.7
170	648.1	330	815.54	490	978.403	655	1141.6
175	653.4	335	820.7	495	983.419	660	1146.4
180	658.7	340	825.86	500	988.43	665	1151.3
185	663.99	345	831.01	505	993.436	670	1156.1
190	669.28	350	836.15	510	998.438	675	1161
195	674.57	355	841.29	515	1003.436	680	1165.8
200	679.85	360	846.43	520	1008.429	685	1170.7
205	685.12	365	851.56	525	1013.417	690	1175.5
210	690.39	370	856.69	530	1018.402	695	1180.4
215	695.66	375	861.81	535	1023.381	700	1185.2
220	700.92	380	866.93	540	1028.356		
225	706.18	385	872.04	545	1033.327		

TABLE 2

THERMOELECTRIC VOLTAGE IN ABSOLUTER MILLIVOLTS — TYPE J THERMOCOUPLE

°F	Reading	+5°F
10	−0.611	−0.473
20	−0.334	−0.195
30	−0.056	0.084
40	0.224	0.365
50	0.507	0.648
60	0.791	0.933
70	1.076	1.220
80	1.363	1.507
90	1.652	1.797
100	1.942	2.088
110	2.233	2.380
120	2.526	2.673
130	2.820	2.967
140	3.115	3.263
150	3.411	3.560
160	3.708	3.857
170	4.006	4.156
180	4.305	4.455
190	4.605	4.755
200	4.906	5.057
210	5.207	5.358
220	5.509	5.661
230	5.812	5.964
240	6.116	6.268
250	6.420	6.572
260	6.724	6.877
270	7.029	7.182
280	7.335	7.488
290	7.641	7.794
300	7.947	8.100
310	8.253	8.407
320	8.560	8.714
330	8.867	9.021
340	9.175	9.329
350	9.483	9.636

°F	Reading	+5°F
360	9.790	9.944
370	10.098	10.252
380	10.407	10.561
390	10.715	10.869
400	11.023	11.177
410	11.332	11.486
420	11.640	11.794
430	11.949	12.103
440	12.257	12.411
450	12.566	12.720
460	12.874	12.029
470	13.183	13.337
480	13.491	13.645
490	13.800	13.954
500	14.108	14.262
510	14.416	14.570
520	14.724	14.878
530	15.032	15.186
540	15.340	15.494
550	15.648	15.802
560	15.956	16.110
570	16.264	16.417
580	16.571	16.725
590	16.879	17.032
600	17.186	17.339
610	17.493	17.646
620	17.800	17.953
630	18.107	18.260
640	18.414	18.567
650	18.721	18.874
660	19.027	19.180
670	19.334	19.487
680	19.640	19.793
690	19.947	20.100

TABLE 3

CONVERSION FACTORS

COMMON CONVERSION FACTORS		
Multiply	**By**	**To Get**
BTU/hr	.001054804	MJ/hr
	.0002931	kW
	.29285	W
BTU/Ft^3	.0372589	MJ/m^3
	8.905102	$kcal/m^3$
MJ/hr	948.0434279	BTU/hr
Mj/m^3	26,839225	BTU/ft^3
kW	3414.71732	BTU/hr
ft^3	.02832	m^3
ft^2	.09290304	m^2
inches	25.40005	mm
feet	.3048	meters
meters	3.281	feet
pounds	.4536	kg
inches W.C.	.249082	kPa
	2.49082	mbar
kPa	4.01885	inches W.C.
	10	mbar
mbar	0.401474	inches W.C.
kW	3.6	Mj/hr
$kcal/m^3$	.1122952	BTU/ft^3
Kwh/m^3	96.65	BTU/ft^3

TABLE 4

PRESSURE CONVERSIONS FACTORS		
Multiply	**By**	**To Get**
in/H_2O	0.0361	P.S.I.
	25.41	mm/H_2O
	1.868	mm/Hg
	.0025	kg/cm^2
	.0025	bar
	2.489	mbar
	248.9	Pa
	.2489	kPa
P.S.I	27.71	in. H_2O
	2.036	in. Hg
	703.1	mm/H_2O
	51.75	mm/Hg
	.0703	kg/cm^2
	.0689	bar
	68.95	mbar
	6895	Pa
	6.895	kPa

TABLE 5

UNIT CONVERSIONS
1°F = .5556°C
1°C = 1.8°F

TABLE 6

PRESSURE CONVERSION

PRESSURE CONVERSION CHART									
in/H_2O	P.S.I	in/Hg	mm/H_2O	mm/Hg	kg/cm^2	bar	mbar	Pa	kPa
1	.0361	.0735	25.41	1.868	.0025	.0025	2.489	248.9	.2489
2	.0722	.1470	50.81	3.736	.0051	.0050	4.978	497.8	.4978
3	.1083	.2205	76.22	5.604	.0076	.0075	7.467	746.7	.7467
4	.1444	.2940	101.62	7.472	.0102	.0099	9.956	995.6	.9956
5	.1804	.3673	127.0	9.335	.0127	.0124	12.44	1244	1.244
6	.2165	.4408	152.4	11.203	.0152	.0149	14.93	1493	1.493
7	.2526	.5143	177.8	13.072	.0178	.0174	17.42	1742	1.742
8	.2887	.5878	203.2	14.940	.0203	.0199	19.90	1990	1.990
9	.3248	.6613	228.6	16.808	.0228	.0224	22.39	2239	2.239
10	.3609	.7348	254.0	18.676	.0254	.0249	24.88	2488	2.488
11	.3970	.8083	279.4	20.544	.0279	.0274	27.37	2737	2.737
12	.4331	.8818	304.8	22.412	.0304	.0299	29.86	2986	2.986
13	.4692	.9553	330.2	24.280	.0330	.0324	32.35	3235	3.235
14	.5053	1.029	355.6	26.148	.0355	.0348	34.84	3484	3.484
15	.5414	1.102	381.0	28.016	.0381	.0373	37.33	3733	3.733
16	.5774	1.176	406.4	29.879	.0406	.0398	39.81	3981	3.981
17	.6136	1.249	431.8	31.752	.0431	.0423	42.31	4231	4.231
18	.6496	1.322	457.2	33.616	.0457	.0448	44.79	4479	4.479
19	.6857	1.396	482.6	35.484	.0482	.0473	47.28	4728	4.728
20	.7218	1.470	508.0	37.352	.0507	.0498	49.77	4977	4.977
21	.7579	1.543	533.4	39.22	.0533	.0523	52.26	5226	5.226
22	.7940	1.616	558.8	41.09	.0558	.0547	54.74	5474	5.474
23	.8301	1.690	584.2	42.96	.0584	.0572	57.23	5723	5.723
24	.8662	1.764	609.6	44.82	.0609	.0597	59.72	5972	5.972
25	.9023	1.837	635.0	46.69	.0634	.0622	62.21	6221	6.221
26	.9384	1.910	660.4	48.56	.0660	.0647	64.70	6470	6.470
27	.9745	1.984	685.8	50.43	.0685	.0672	67.19	6719	6.719

in/H_2O	P.S.I	in/Hg	mm/H_2O	mm/Hg	kg/cm^2	bar	mbar	Pa	kPa
28	1.010	2.056	710.8	52.26	.0710	.0696	69.64	6964	6.964
29	1.047	2.132	736.8	54.18	.0736	.0722	72.19	7219	7.219
30	1.083	2.205	762.2	56.04	.0761	.0747	74.67	7467	7.467
31	1.119	2.278	787.5	57.91	.0787	.0772	77.15	7715	7.715
32	1.155	2.352	812.8	59.77	.0812	.0796	79.63	7963	7.963
33	1.191	2.425	838.2	61.63	.0837	.0821	82.12	8212	8.212
34	1.227	2.498	863.5	63.49	.0862	.0846	84.60	8460	8.460
35	1.263	2.571	888.9	65.36	.0888	.0871	87.08	8708	8.708
36	1.299	2.645	914.2	67.22	.0913	.0896	89.56	8956	8.956
37	1.335	2.718	939.5	69.08	.0938	.0920	92.04	9204	9.204
38	1.371	2.791	964.9	70.95	.0964	.0945	94.53	9453	9.453
39	1.408	2.867	990.9	72.86	.0990	.0971	97.08	9708	9.708
40	1.444	2.940	1016	74.72	.1015	.0996	99.56	9956	9.956
41	1.480	3.013	1042	76.59	.1040	.1020	102.0	10204	10.20
42	1.516	3.086	1067	78.45	.1066	.1045	104.5	10452	10.45
43	1.552	3.160	1092	80.31	.1091	.1070	107.0	10701	10.70
44	1.588	3.233	1118	82.18	.1116	.1095	109.5	10949	10.95
45	1.624	3.306	1143	84.04	.1142	.1120	112.0	11197	11.20
46	1.660	3.378	1168	85.90	.1167	.1144	114.5	11445	11.44
47	1.696	3.453	1194	87.76	.1192	.1169	116.9	11694	11.69
48	1.732	3.526	1219	89.63	.1218	.1194	119.4	11942	11.94
49	1.768	3.600	1244	91.49	.1243	.1219	121.9	12190	12.19
50	1.804	3.673	1270	93.35	.1268	.1244	124.4	12438	12.44
51	1.841	3.748	1296	95.27	.1294	.1269	126.9	12693	12.69
52	1.877	3.822	1321	97.13	.1320	.1294	129.4	12941	12.94
53	1.913	3.895	1346	98.99	.1345	.1319	131.9	13190	13.19
54	1.949	3.968	1372	100.8	.1370	.1344	134.4	13438	13.44
55	1.985	4.041	1397	102.7	.1395	.1369	136.9	13686	13.69
56	2.021	4.115	1422	104.6	.1421	.1393	139.3	13934	13.93

TABLE 7