



DFG-100 AND DFG-200 SERIES CONVECTION OVEN SERVICE AND REPAIR MANUAL

BLODGETT OVEN COMPANY

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CHAPTER 1

INTRODUCTION

OVEN SPECIFICATIONS

VENTILATION REQUIREMENTS

Canopy Type Exhaust Hood

The preferred method of ventilation is the use of a mechanically driven, canopy type exhaust hood. 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.

Direct Flue

NOTE: U.S. and Canadian installations only.

The minimum recommended clearance of the oven from any combustible, or non-combustible material should be 6" (15 cm). The height of the flue should rise 6-8' (2-2.5 m) above the roof of the building, or any proximate structure. The flue should be capped with a UL listed vent cap to isolate the unit from external environmental conditions.

The direct vent does not have the capability of replacing air consumed and vented by the oven. It is important that provisions be made to supply the room with sufficient make-up air. Total make-up air requirements for each oven section should be about 19 CFM.

ELECTRICAL SPECIFICATIONS

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

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

The DFG-100 and DFG-200 ovens are supplied for connection to 115 VAC grounded circuits with the 6' (1.8 m) power cord supplied. All ovens, when installed must be electrically grounded in accordance with National Electric or local codes.

CE approved installations

Connect the oven to a separate group 230V, 50 hz with rigid connection and operating switch. Use 90°C wire and size according to local codes.

NOTE: The burner control unit is phase sensitive. If the phase and neutral are switched the control locks out.

Connect phase + neutral + ground.

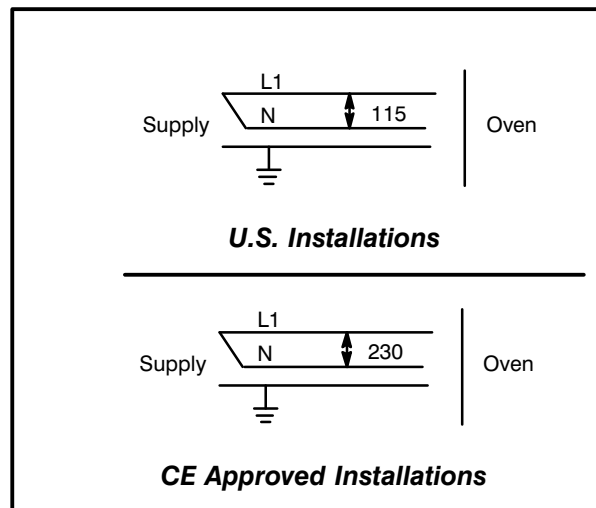


FIGURE 1

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 1 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 1 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 1.

GAS REQUIREMENTS

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 M³/min of all the appliances.
2. Size the meter accordingly.

DOMESTIC AND GENERAL EXPORT						
		Natural Gas		Propane Gas		
		US units	SI units	US units	SI units	
Heating Value		1000 BTU/hr	37.3 MJ/m³	2550 BTU/hr	95.0 MJ/m³	
Specific Gravity (air = 1.0)		0.63	0.63	1.53	1.53	
Gas Manifold Pressure		3.5” W.C.	0.87 kPa	10” W.C.	2.49 kPa	
Oven Input						
DFG-100-3		55,000 BTU/hr	16.2 kW/Hr.	55,000 BTU/hr	16.2 kW/Hr.	
DFG-200-L		60,000 BTU/hr	17.6 kW/Hr.	60,000 BTU/hr	17.6 kW/Hr.	
Main Burner Orifice Size						
DFG-100-3		40 MTD	2.5 mm	53 MTD	1.5 mm	
DFG-200-L		38 MTD	2.6 mm	1/16 dia.	1.55 mm	
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	2,60	18	0,53	16,2 Nat. Gas
G20	20	8	2,60	18	0,53	16,2 Nat. Gas
G20/G25	20/25	Totally Inscrewed Pressure Regulator	2,10	18	0,53	16,2 Nat. Gas
G30	30/50	17	1,60	10	0,28	16,2 Butane
G31	30/37/50	24	1,60	10	0,28	16,2 Propane

TABLE 1

VENTILATION

CANOPY TYPE EXHAUST HOOD

Ovens that are ordered for under-hood venting are supplied with a draft diverter. When supplied with a draft diverter, the oven must be installed under a mechanically driven exhaust hood.

1. To install, place the diverter with the open area toward the rear of the oven.
2. Secure both ends with the sheet metal screws provided.

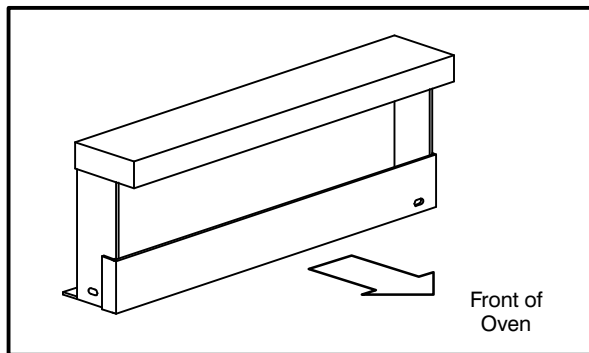


FIGURE 2

DIRECT FLUE ARRANGEMENT

NOTE: Not available for CE approved installations.

Ovens that are ordered for direct venting are supplied with a direct vent.

1. To install, place the direct vent with the angle on the bottom facing toward the front of the oven
2. Secure both ends with the sheet metal screws provided.

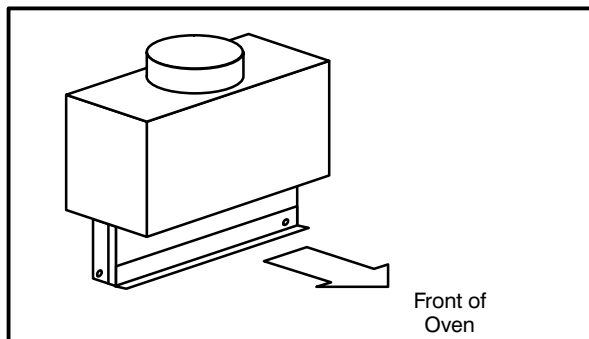


FIGURE 3

TRIM COLLAR

1. Remove the trim collar from its shipping position at the rear of the oven.
2. Remove the protective coating from the stainless steel portion of the collar.
3. Install the collar in the proper position at the top of the oven.

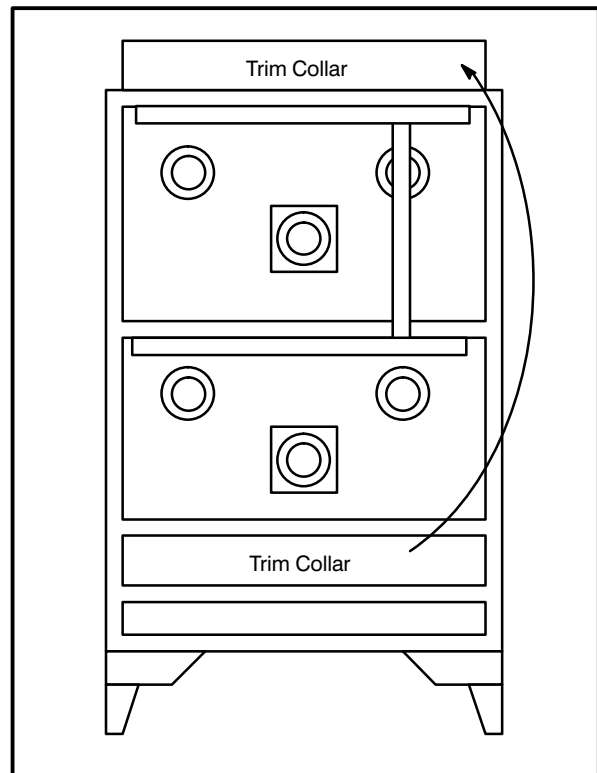


FIGURE 4

CHAPTER 2

OPERATION

MANUAL CONTROLS WITH ELECTRO-MECHANICAL THERMOSTAT

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

SEQUENCE OF OPERATION – DIAGRAM P/N 17794 REV A

Component Reference

NOTE: Refer to FIGURE 5 page 2–2 for component locations.

1. MODE SELECTOR SWITCH
2. COOK THERMOSTAT
3. COOK TIMER
4. GAS SOLENOID
5. DOOR SWITCH
6. CONVECTION MOTOR
7. CENTRIFUGAL SWITCH
8. THERMAL DELAY RELAY
9. HOT SURFACE IGNITER
10. COOK LIGHT
11. BUZZER
12. LIGHT BULBS
13. LIGHT SWITCH

Operation

1. Power is applied to the appliance by a 110VAC power cord attached to the rear of the oven.
2. Power is at terminal L1 and N of the mode selector switch (1).
3. If the mode switch is turned on then a circuit is made between L1 and Terminal 1 allowing current flow to one side of the cook thermostat (2), cook timer (3), pilot valve portion of the gas solenoid valve (4) and one side of a SPST door switch (5).
4. If the door switch is closed, power goes to terminal #4 of the mode selector switch and to the L1 side of the convection motor (6) allowing the motor to start.

NOTE: The door switch is located behind the combustion cover and is operated by the cam that is mounted to the right hand hinge pin.

5. On a call for heat, the cook thermostat closes sending power to one side of a centrifugal switch (7). If the motor is operating at full speed, this switch should be closed sending power to terminals 8 and 6 of a thermal delay relay (8).

NOTE: The centrifugal switch is an integral part of the convection motor and is not field repairable.

NOTE: The thermostat is a fluid filled bulb and capillary style. The bulb is located in the upper right hand corner of the bake chamber.

6. The area connecting terminals 6 and 1 of the thermal delay relay is called a heater strip.

NOTE: The thermal delay relay contains both the heater strip and the set of contacts that operate the gas valve in what looks like an old TV tube. This tube is plugged into a socket, so removal of the tube is simple.

NOTE: This strip warms up as voltage is applied to the HSI.

7. As the hot surface igniter (9) gets hotter so does the heater strip. The heat from the strip causes two strips of metal to come together and touch allowing current to flow from terminal 8 to terminal 3 of the TDR to the main portion of the gas solenoid valve and an indicator light (10). This light goes on and off every time the main gas valve is powered up.
8. Gas flows to the burners and is ignited by the high temperature of the HSI.
9. The timer is a mechanical count down timer. It closes a set of contacts within the timer to power up a buzzer (11) at the expiration of whatever time the operator dials in.
10. The lights (12) are operated by a STDP rocker switch (13).

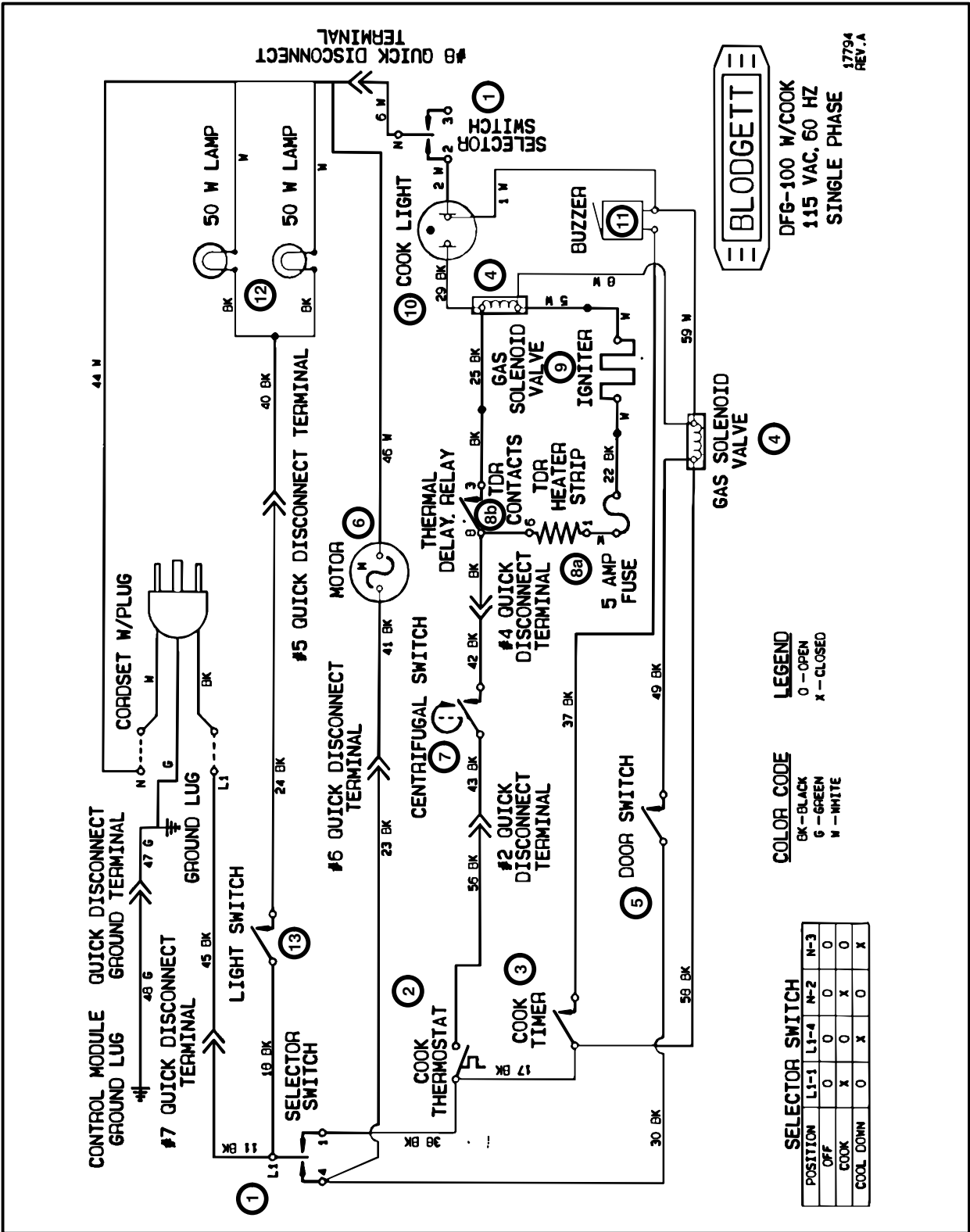


FIGURE 5

SOLID STATE COOK ONLY

SEQUENCE OF OPERATION — DIAGRAM P/N 20027 REV A

Component Reference

NOTE: Refer to FIGURE 6 page 2–4 for component locations.

1. MODE SWITCH
2. DOOR MICROSWITCH
3. TEMPERATURE CONTROL BOARD
4. AXIAL FAN
5. 60 MINUTE TIMER
6. 110/24 VOLT TRANSFORMER
7. TEMPERATURE PROBE
8. IGNITION CONTROL MODULE
9. TWO SPEED MOTOR
10. CENTRIFUGAL SWITCH
11. PILOT VALVE
12. PILOT BURNER
13. MAIN VALVE
14. LIGHT BULBS
15. LIGHT SWITCH
16. BUZZER

Operation

1. Power is applied to the appliance by a 110VAC power cord attached to the rear of the oven.
2. Power is at terminal L1 and N of the mode selector switch (1).
3. If the mode switch (1) is turned on a circuit is made between L1 and 1, N and 2 allowing current to flow to one side of a SPST door switch (2), terminal #8 of the solid state temperature control board (3), axial fan (4), terminal 1 of the cook timer (5) and to the primary side of a 110 volt to 24 volt transformer (6).
4. If the doors are closed, the door switch (2) should be closed sending power to the convection blower (9). When this motor reaches full speed a centrifugal switch (10) closes sending 24VAC to terminal 6 of the tempera-

ture control board (3) and the ignition control module (8).

NOTE: The door switch is located behind the combustion cover and is operated by the cam that is mounted on the right hand hinge pin.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

5. On a call for heat from the thermostat as sensed by an RTD probe (7), a set of contacts on the temperature control board (3) close completing a circuit to terminal 2 of the ignition control module (8).

NOTE: The thermostat consists of three components (RTD probe, solid state temperature control board and 1000 ohm potentiometer)

NOTE: The temperature probe has a descending temperature coefficient.

6. After the ignition control module (8) completes a diagnostics and all functions check out, 24VAC is sent to the pilot valve (11) and a high energy spark jumps a gap at the pilot burner (12). Once the pilot is lit and the pilot flame is proven, the ignition control module (8) sends 24VAC to the main valve (13).

NOTE: A 24VAC indicator light is wired in parallel with the main valve to inform the operator that the main gas valve is being powered up. When the light goes out the thermostat is satisfied.

7. The lights (14) are controlled by a SPST rocker switch (15).
8. The buzzer (16) is controlled by a switch in the cook timer.

NOTE: The timer's only function is to count down and activate a buzzer. This will not shut down the oven.

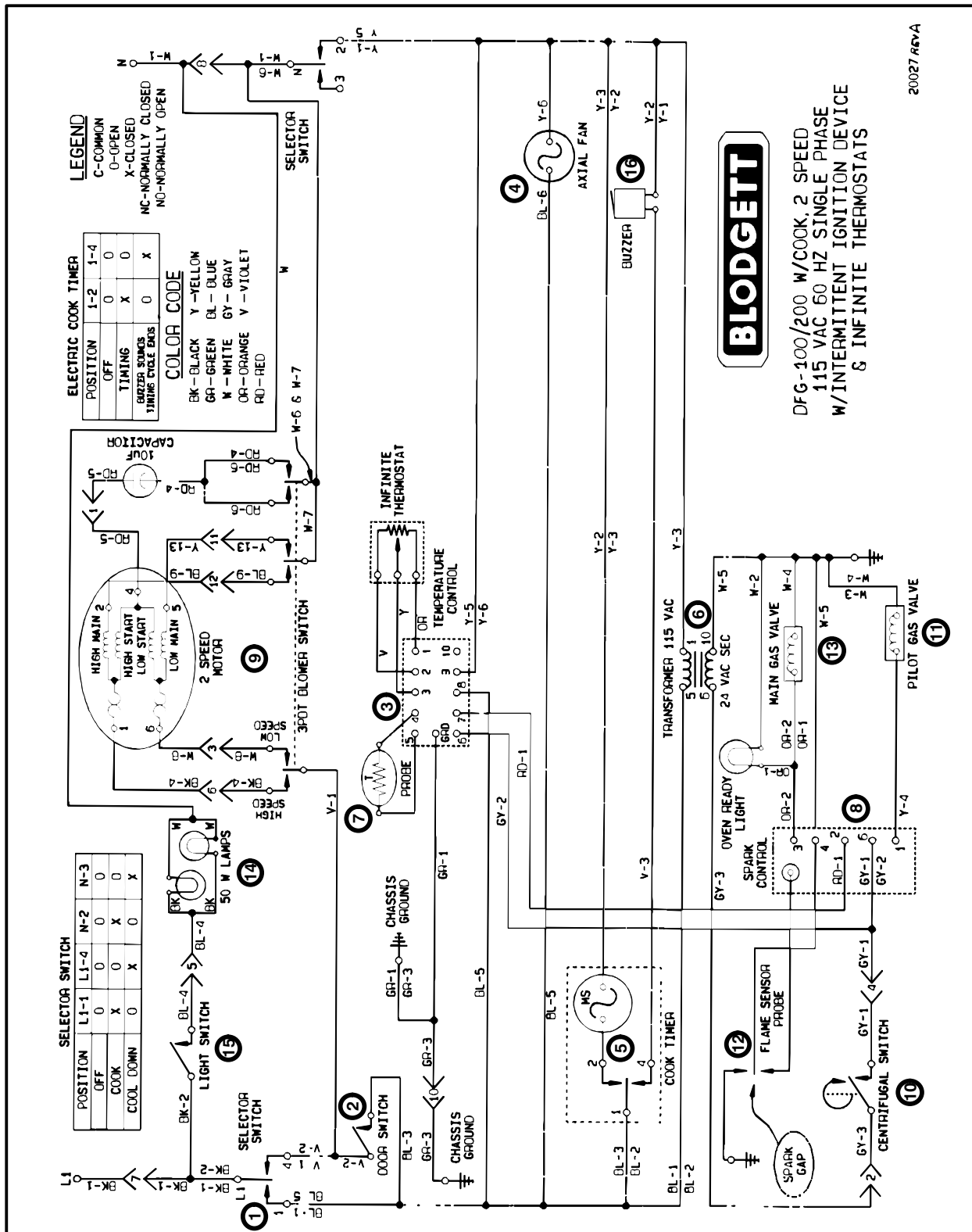


FIGURE 6

SOLID STATE COOK & HOLD

SEQUENCE OF OPERATION — DIAGRAM P/N 19604 REV A

Component Reference

NOTE: Refer to FIGURE 7 page 2–7 for component locations.

1. MODE SELECTOR SWITCH
2. DPDT RELAY
3. LIGHT SWITCH
4. 60 MINUTE TIMER
5. 110/24 VOLT TRANSFORMER
6. TEMPERATURE CONTROL BOARD
7. AXIAL FAN
8. HOLD TEMPERATURE CONTROL BOARD
9. DOOR MICROSWITCH
10. CONVECTION BLOWER MOTOR
11. CENTRIFUGAL SWITCH
12. IGNITION CONTROL MODULE
13. TPDT RELAY
14. COOK TEMPERATURE PROBE
15. A & B DUAL SOLENOID GAS VALVE
16. COOK & HOLD TIMER
17. HOLD INDICATOR LIGHT
18. HOLD TEMPERATURE PROBE

Operation

1. Power is applied to the appliance by a 110VAC power cord attached to the rear of the oven.
2. Power is at terminal L1 and N of the mode selector switch (1), one of the NC terminals of a DPDT relay (2) and one terminal of SPST light switch (3).
3. If the mode selector switch (1) is turned to the cook position a circuit is made between L1 and terminal 4. 110VAC flows to terminal 1 of the 60 minute timer (4), the primary side of a 110 to 24 volt transformer (5), terminals 6 and 8 of the temperature control board (6), axial cooling fan (7) and terminal 8 of the hold temperature board (8).
4. If the doors are closed, the door switch (9) should be closed sending power to the convection blower (10). This switch interrupts the neutral going to the motor. Once this motor reaches full speed a centrifugal switch (11) closes sending 24VAC to terminal 6 of the igni-

tion control module (12) and terminal 7 of a TPDT relay (13).

NOTE: The door switch is located behind the combustion cover and is operated by the cam mounted on the right hand hinge pin.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

5. On a call for heat from the thermostat as sensed by an RTD probe (14), a set of contacts on the temperature control board (6) closes completing a circuit between terminals 6 and 7 allowing 110 volts AC to go to one of the normally closed contacts on the DPDT relay (2). The relay sends 110 volts AC to the coil of the TPDT relay (13) allowing the circuit to be made between terminals 7 and 4 of the same relay. This completes the circuit to the ignition control module (12).

NOTE: The thermostat consists of three components (RTD probe, solid state temperature control board and a 1000 ohm potentiometer.)

NOTE: The temperature probe has a descending temperature coefficient.

6. After the ignition control module (12) has completed a diagnostics and all functions check out, 24VAC is sent to the pilot valve (15a) and a high energy spark jumps a gap at the pilot burner. Once the pilot is lit and the pilot flame is proven, the ignition control (12) sends 24VAC to the main valve (15b).

NOTE: A 24VAC indicator light is wired in parallel with the main valve to inform the operator that the main gas valve is being powered up. When the light goes out the thermostat is satisfied.

7. If the mode selector switch (1) is set to the Cook & Hold position a circuit is made in the switch between L1, 1 and 4. All of the previously mentioned circuitry is active as well as the cook and hold circuit.
8. At the expiration of time on the cook and hold timer (16) a circuit is made between terminals 1 and 4 allowing power to go to a hold indicator light (17), terminal 6 of the hold temperature board and the coil of the DPDT relay (2) allowing the relay (8) to toggle between C—NC to C—NO terminals.
9. When there is a demand for heat from the hold temperature board (8) as sensed by the temperature probe (18) a set of contacts on the temperature control board closes completing a circuit between terminals 6 and 7 allowing 110VAC to go to one of the normally open contacts on the DPDT relay (2) which in turns sends 110VAC to the coil of the TPDT relay (13) allowing the circuit to be made between terminals 7 and 4 of the same relay. This completes

the circuit to the ignition control module (12). This toggling effect also allows 110VAC to go to the convection blower (10). This cycles the blower on and off every time there is a call from heat from the hold board (8).

NOTE: The thermostat consists of three components (RTD probe, solid state temperature control board and a 1000 ohm potentiometer).

NOTE: The temperature probe has a descending temperature coefficient.

NOTE: The two temperature probes and potentiometers used in this oven configuration are identical. The solid state temperature control boards appear identical, however, they are significantly different. The hold board will not allow for temperatures over 200 °F (93 °C).

NOTE: The timer's only function is to count down and activate a buzzer. This will not shut down the oven.

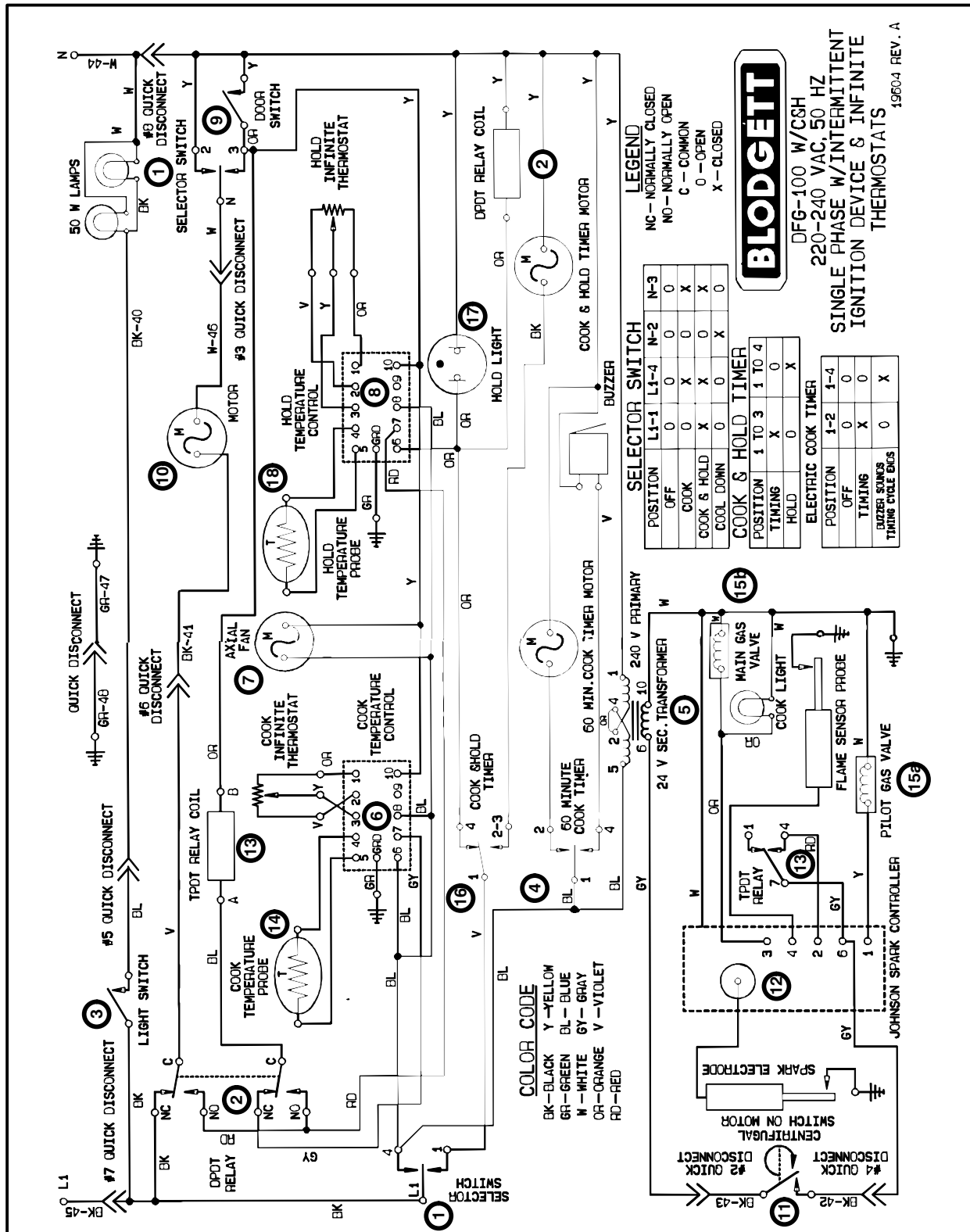


FIGURE 7

SOLID STATE DIGITAL

SEQUENCE OF OPERATION — DIAGRAM P/N 31981 REV F

NOTE: Refer to FIGURE 8 page 2—9 for component locations.

Component Reference

1. MODE SWITCH
2. DOOR SWITCH
3. TIME AND TEMPERATURE CONTROL
4. AXIAL FAN
5. SINGLE SPEED MOTOR
6. CENTRIFUGAL SWITCH
7. PRESSURE SWITCH
8. LANDIS & GYR IGNITION CONTROL
9. 2 SECOND TIMER
10. A & B DUAL SOLENOID GAS VALVE
11. TEMPERATURE PROBE

Operation

1. Power is applied to terminals L1 and N of the mode selector switch (1).
2. If the mode selector switch is set to cook, 230VAC is sent to one side of a SPST door switch (2), terminals J11 and J8 of the time and temperature control (3) and the axial cooling fan (4).
3. If the doors are closed the door switch (2) should be closed sending 230VAC to the convection fan motor (5).

NOTE: The door switch is located behind the combustion cover and is operated by the cam mounted on the right hand hinge pin.

NOTE: The motor only operates continuously if the control is not set for pulse. If there is a time programmed into the control for pulse the control opens and closes a set of contacts on the control to cycle the fan on and off.

4. If there is a temperature programmed into the time and temperature control (3) and the control is calling for heat as sensed by the RTD probe (11), 230VAC is applied to one side of a centrifugal switch (6) in the convection motor (5).

NOTE: The temperature probe has a descending temperature coefficient.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

5. If the motor (5) is up to full speed the centrifugal switch (6) should be closed sending power to the pressure switch (7). If the pressure switch is closed, 230VAC is applied to the Landis & Gyr ignition module (8).
6. This ignition module is used for direct spark application. This appliance utilizes a two second timer (9) wired in parallel with the pilot valve (10a) to keep power from going to the main valve (10b) for two seconds after the pilot is lit.

DFG-100 and DFG-200

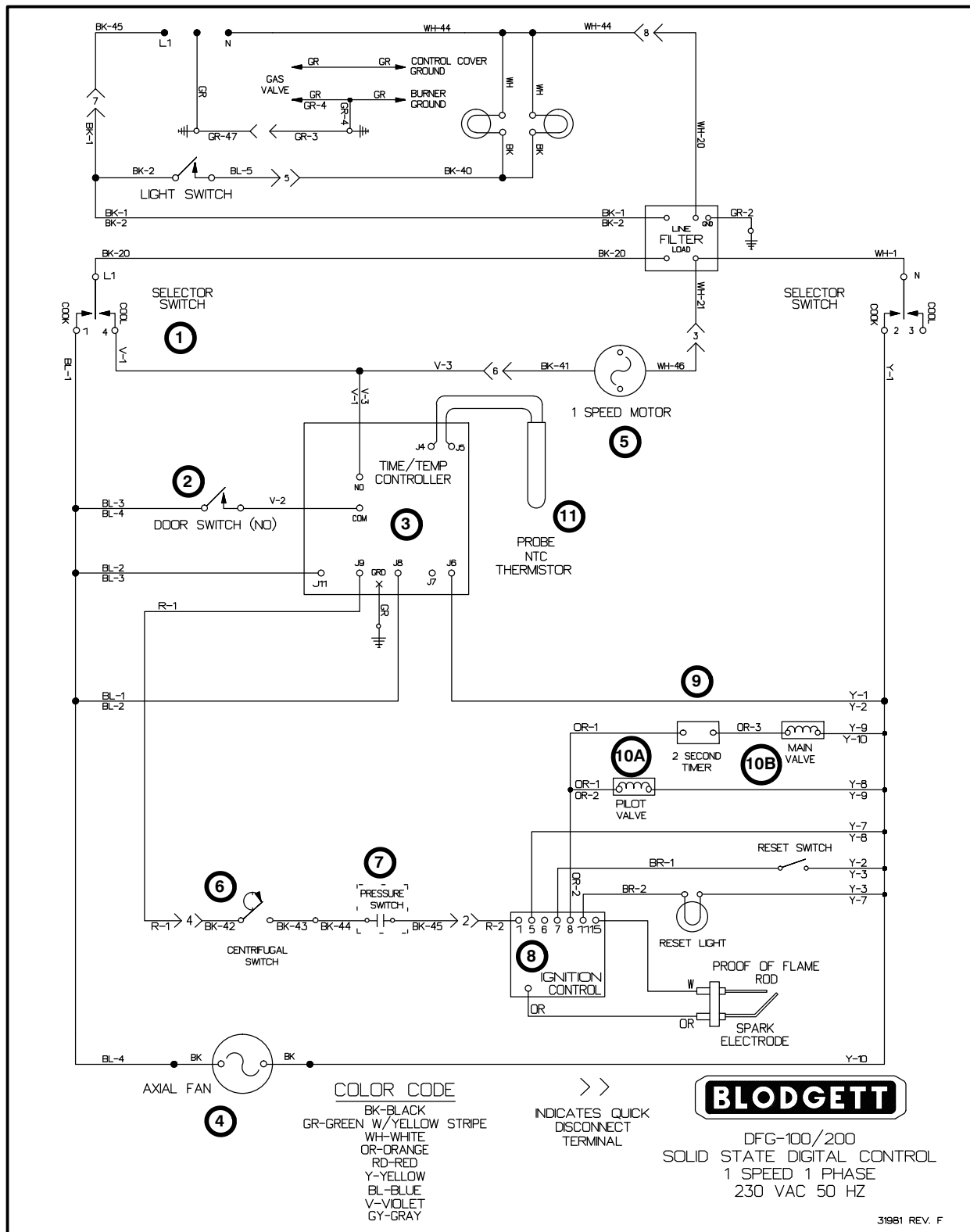


FIGURE 8

SEQUENCE OF OPERATION — DIAGRAM P/N 30073 REV F

NOTE: Refer to FIGURE 9 page 2—11 for component locations.

Component Reference

1. MODE SWITCH
2. LIGHT SWITCH
3. TIME AND TEMPERATURE CONTROL
4. TRANSFORMER
5. AXIAL FAN
6. TWO SPEED MOTOR
7. TEMPERATURE PROBE
8. CENTRIFUGAL SWITCH
9. IGNITION CONTROL MODULE
10. A & B DUAL SOLENOID GAS VALVE
11. PILOT BURNER
12. DOOR SWITCH

Operation

1. Power is applied to the appliance by a 110 volt power cord attached to the rear of the oven.
2. Power is at L1 and N of the mode selector switch (1).
3. Power is also applied to one side of a SPST light switch (2).
4. When the mode selector switch (1) is set to the cook position a circuit is made between N and terminal 3 as well as L1 and terminal 4 or 1 depending on which motor operation is selected.

NOTE: The mode selector switch in this application is a four position selector switch and allows for hi and low speed fan operation.

5. Power is delivered to the common terminal and terminal J8 of the time and temperature controller (3), the primary side of a 110 to 24 volt transformer (4) and to an axial cooling fan (5). When the transformer is powered up 24VAC is delivered to terminals 6 and 2 of the ignition control module (9). After the ignition control module has completed a diagnostic and all functions check out, 24VAC is sent to the pilot valve (10a) and a high energy spark jumps a gap at the pilot burner (11). Once the pilot is lit and the pilot flame is proven the ignition control module (9) sends 24VAC to the centrifugal switch (8) in the convection fan (6).

6. If the doors are closed, the door switch (12) should be closed sending 110VAC to the convection fan motor (6).

NOTE: The door switch is located behind the combustion cover and is operated by the cam that is mounted on the right hand hinge pin.

NOTE: The motor will only operate continuously if the control is not set for pulse. If there is a time programmed into the control for pulse the control opens and closes a set of contacts on the the control to cycle the fan on and off.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

7. If the motor (6) is up to full speed, the centrifugal switch (8) closes sending 24VAC to terminal J11 of the temperature control (3).
8. If there is a temperature programmed into the time and temperature control (3) and the control is calling for heat as sensed by an RTD probe (7), a circuit is completed between J9 and J11 of the time and temperature control (3) allowing 24VAC to go to the main valve (10b).

NOTE: The temperature probe has a descending temperature coefficient.

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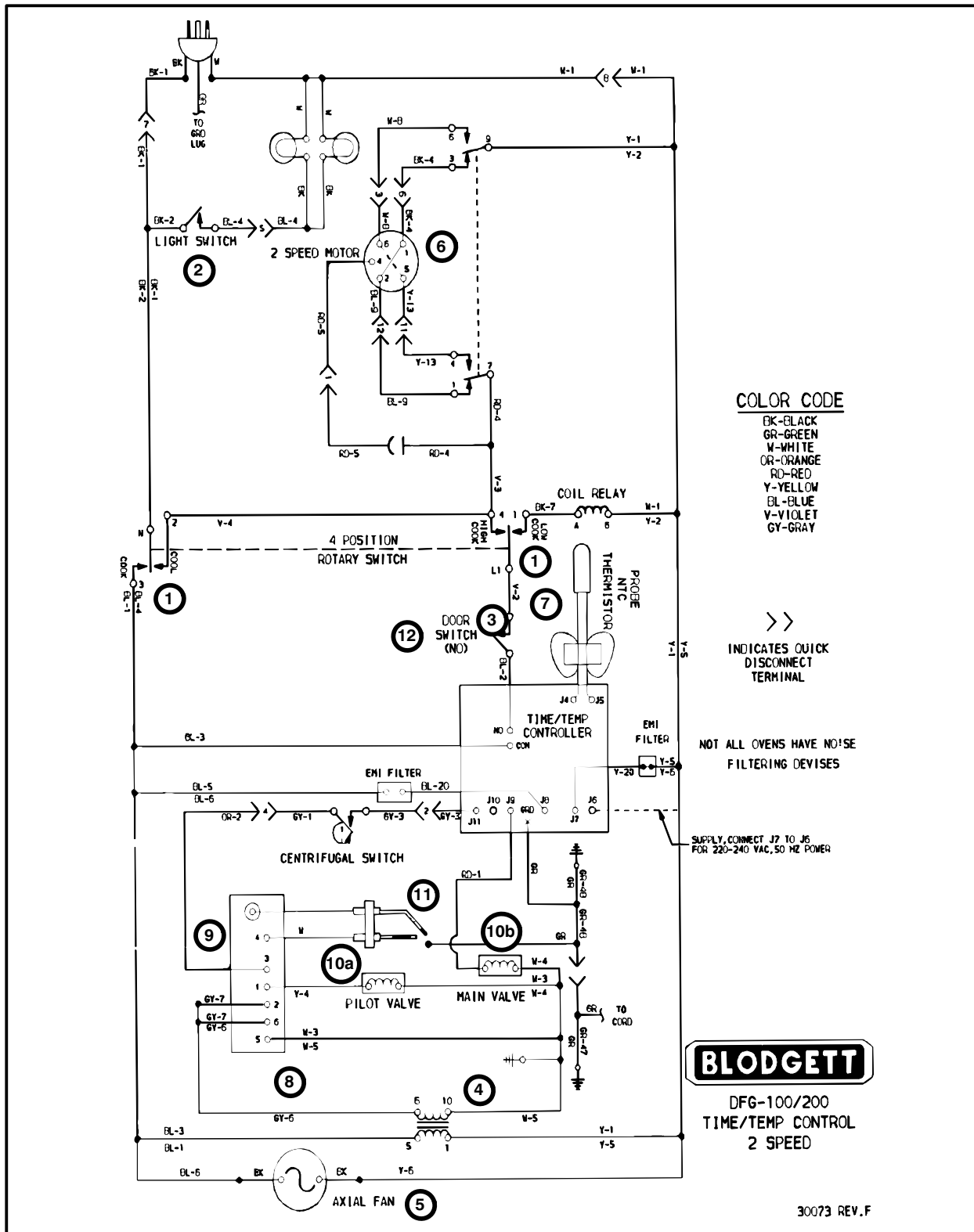


FIGURE 9

FAN DELAY WITH PULSE PLUS

SEQUENCE OF OPERATION — DRAWING P/N 20029 REV A

Component Reference

NOTE: Refer to FIGURE 10 page 2—14 for component locations.

1. MODE SELECTOR
2. TEN MINUTE FAN DELAY TIMER
3. TEMPERATURE CONTROL BOARD
4. AXIAL FAN
5. PULSE TIMER
6. TRANSFORMER
7. DOOR SWITCH
8. TWO SPEED MOTOR
9. CENTRIFUGAL SWITCH
10. IGNITION CONTROL
11. TEMPERATURE PROBE
12. A & B DUAL SOLENOID GAS VALVE
13. COOK TIMER
14. TPDT RELAY
15. TPDT SWITCH
16. LIGHT BULBS
17. LIGHT SWITCH
18. BUZZER

Operation

1. Power is applied to the appliance by a 110 volt power cord attached to the rear of the oven.
2. Power is at L1 and N of the mode selector switch (1).
3. If the mode switch (1) is turned on, a circuit is made between L1—1 and N—2, allowing current to flow to terminal 1 of the fan delay timer (2), terminal #8 of the solid state temperature control board (3) and the axial fan (4).
4. If the fan delay timer (2) is not counting down, a circuit is made between terminals 1 and 4 allowing voltage to go to terminal 3 of the pulse timer (5), one side of a SPST door switch (7), terminal 1 of the cook timer (13) and the primary side of a 110 to 24 volt transformer (6).

5. If the doors are closed the door switch (7) should be closed sending power to the convection blower (8). When this motor reaches full speed, a centrifugal switch (9) closes sending 24VAC to terminal 6 of the temperature control board (3) and the ignition control module (10).

NOTE: The door switch is located behind the combustion cover and is operated by the cam that is mounted on the right hand hinge pin.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

6. On a call for heat from the thermostat as sensed by an RTD probe (11) a set of contacts on the temperature control board (3) close completing a circuit to terminal 2 of the ignition control module (10).

NOTE: The thermostat consists of three components (RTD probe, solid state temperature control board and a 1000 ohm potentiometer).

NOTE: The temperature probe has a descending temperature coefficient.

7. After the ignition control module (10) has completed a diagnostics and all functions check out, 24VAC is sent to the pilot valve (12a) and a high energy spark jumps a gap at the pilot burner. When the pilot is lit and the pilot flame is proven, the ignition control module (10) sends 24VAC to the main valve (12b).

NOTE: A 24VAC indicator light is wired in parallel with the main valve to inform the operator that the main gas valve is being powered up. The light goes out when the thermostat is satisfied.

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8. If time has been set on the fan delay timer (2), a circuit is made between terminals 1 and 2 allowing voltage to go to terminal 2 of the pulse timer. This sends voltage to the coil of a TPDT relay (14).

NOTE: The sole purpose of this relay is to eliminate power to the cook timer motor during pulse operation.

NOTE: The pulse timer is a solid state device which pulses the convection fan on and off for approximately 30 second intervals.

9. The fan delay timer (2) can be set for no more than 10 minutes. The solid state pulse timer (5) will make and break the circuit between terminals 2 and 3 allowing voltage to go to the door switch (7) and the primary side of the step down transformer (6).
10. If the door switch (7) is closed a circuit is completed to a TPDT blower switch (15).

NOTE: This blower switch will operate motor speed based on the switch position.

NOTE: When the convection fan cycles on and off, the ignition control system also cycles on and off.

11. The lights (16) are controlled by a SPST rocker switch (17).
12. The buzzer (18) is controlled by a switch in the cook timer (13).

NOTE: The timer's only function is to count down and activate a buzzer. This will not shut down the oven.

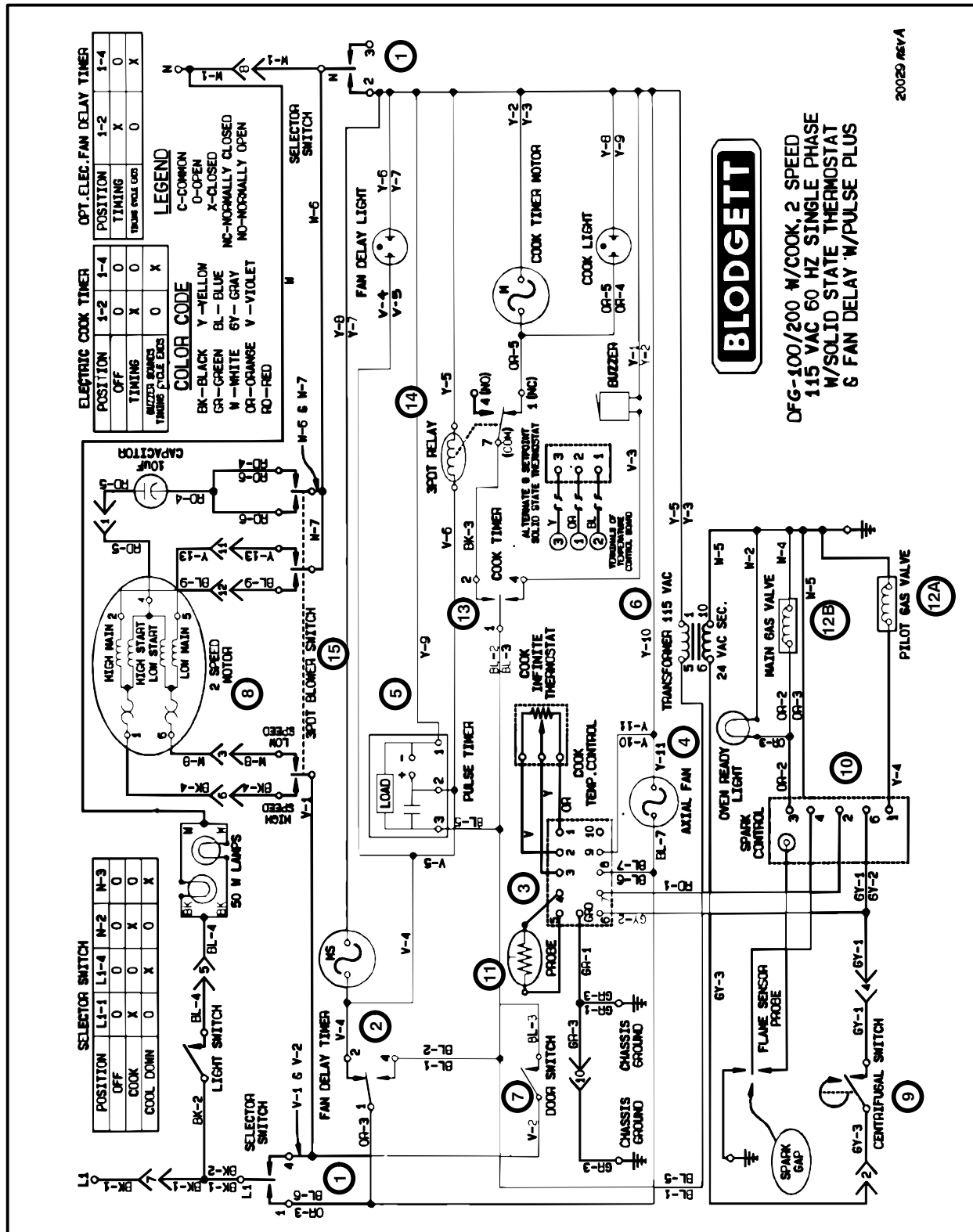


FIGURE 10

HUMIDAIRE

SEQUENCE OF OPERATION – DRAWING P/N 18486 REV H

Component Reference	Operation
<i>NOTE: Refer to FIGURE 11 page 2–17 for component locations.</i>	
1. MODE SWITCH	1. Power is applied to the appliance by a 110 volt power cord attached to the rear of the oven.
2. 60 MINUTE COOK TIMER	2. Power is at L1 and N of the mode selector switch (1).
3. TEMPERATURE CONTROL BOARD	3. If the mode switch (1) is turned on, a circuit is made between L1 and 1, N and 2 allowing current to flow to terminal 1 of the cook timer (2), terminal #8 of the solid state temperature control board (3), the axial fan (5) and the primary side of a 110 to 24 volt step down transformer (4).
4. TRANSFORMER	4. If the doors are closed, the door switch (6) should be closed sending power to the convection blower (7). When the motor reaches full speed a centrifugal switch (8) closes sending 24VAC to terminal 6 of the temperature control board (3) and the ignition control module (9).
5. AXIAL FAN	<i>NOTE: The door switch is located behind the combustion cover and is operated by the cam mounted on the right hand hinge pin.</i>
6. DOOR SWITCH	<i>NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.</i>
7. SINGLE SPEED MOTOR	5. On a call for heat from the thermostat as sensed by an RTD probe (10) a set of contacts on the temperature control board (3) close completing a circuit to terminal 2 of the ignition control module (9).
8. CENTRIFUGAL SWITCH	<i>NOTE: The thermostat consists of three components (RTD probe, solid state temperature control board and a 1000 ohm potentiometer).</i>
9. IGNITION CONTROL	<i>NOTE: The temperature probe has a descending temperature coefficient.</i>
10. TEMPERATURE PROBE	
11. A & B DUAL SOLENOID VALVE	
12. PILOT BURNER	
13. STEAM POTENTIOMETER	
14. SINGLE SHOT TIMER	
15. THERMAL DISC	
16. STEAM SWITCH	
17. WATER SOLENOID	
18. LIGHT BULBS	
19. LIGHT SWITCH	
20. BUZZER	

6. After the ignition control module (9) has completed a diagnostics and all functions check out, 24VAC is sent to the pilot valve (11a) and a high energy spark jumps a gap at the pilot burner (12). When the pilot is lit and the pilot flame is proven, the ignition control module (9) sends 24VAC to the main valve (11b).

NOTE: A 24VAC indicator light is wired in parallel with the main valve to inform the operator that the main gas valve is being powered up. When the light goes out, the thermostat is satisfied.

7. If there is a time set on the steam potentiometer (13), a solid state single shot timer (14) activates, only if the temperature on the oven cavity is above 212°F (100°C) as sensed by a thermal disc (15). When the steam cycle switch (16) is pressed atomized water is injected into the oven cavity through a water solenoid valve (17) onto the blower wheel.

NOTE: The thermal disc is located in the back of the oven attached to the oven liner.

NOTE: The steam start switch is a momentary switch located on the front control panel.

8. The lights (18) are controlled by a SPST rocker switch (19).
9. The buzzer (20) is controlled by a switch in the cook timer (2).

NOTE: The timer's only function is to count down and activate a buzzer. This will not shut down the oven.

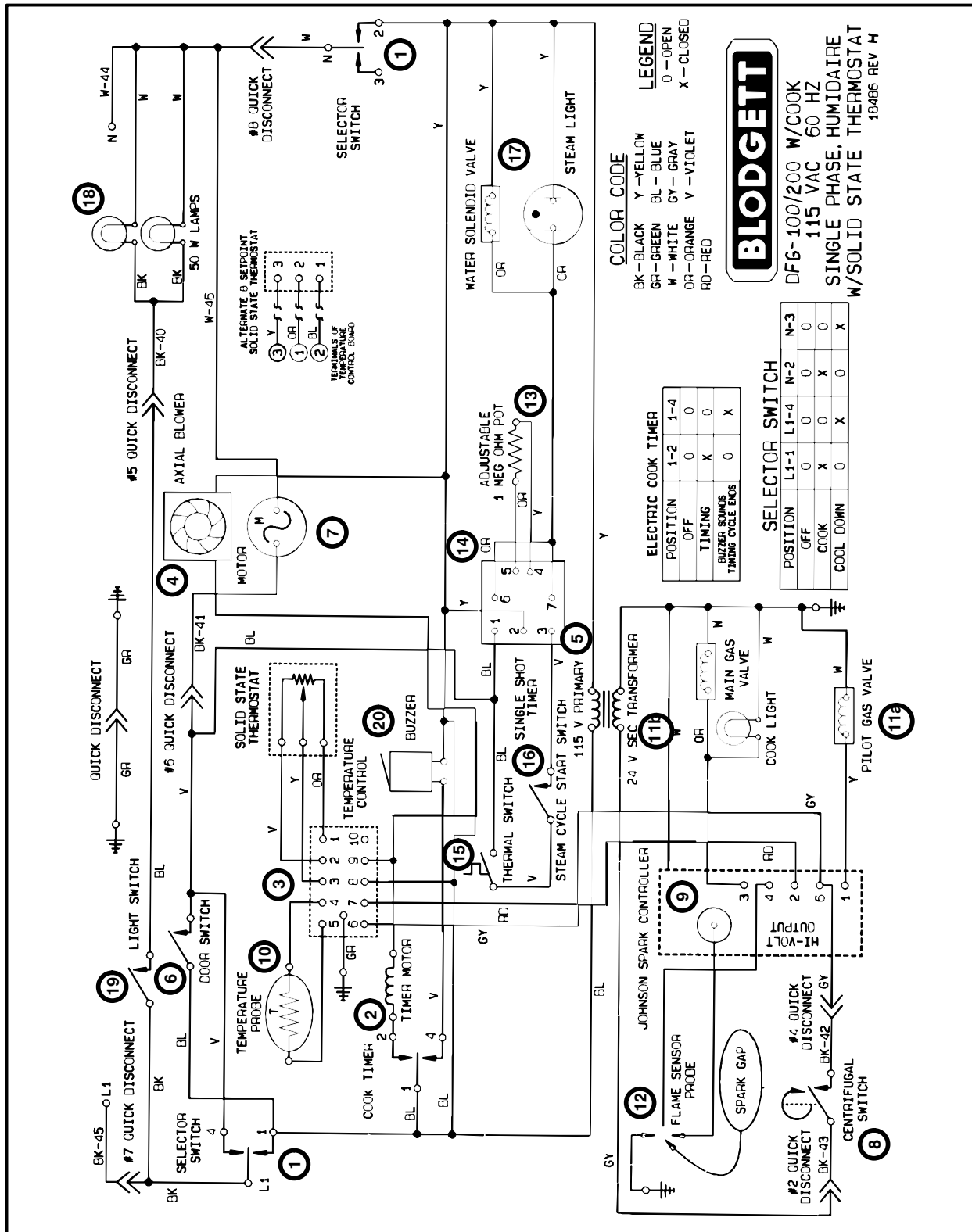


FIGURE 11

INTELLIPLUS WITH CHAIN EVENT CONTROL

SEQUENCE OF OPERATION — DRAWING P/N 21846 REV D

Component Reference

NOTE: Refer to FIGURE 12 page 2— 19 for component locations.

1. MODE SELECTOR SWITCH
2. DOOR SWITCH
3. CONTROLLER
4. AXIAL FAN
5. TRANSFORMER
6. TWO SPEED MOTOR
7. CENTRIFUGAL SWITCH
8. IGNITION CONTROL
9. RTD PROBE
10. A & B GAS VALVES
11. PILOT BURNER
12. A & B DPDT RELAY
13. LIGHT BULBS
14. LIGHT SWITCH

Operation

1. Power is applied to the appliance by a 110 volt power cord attached to the rear of the oven.
2. Power is at L1 and N of the mode selector switch (1).
3. If the mode switch (1) is turned on then a circuit is made between L1 and 1, N and 2, allowing current to flow to a terminal on a SPST door switch (2), to terminal E3 of the Intelliplus control board (3), an axial fan (4) and the primary side of a 110 to 24 volt step down transformer (5).
4. If the doors are closed the door switch (2) should be closed sending 110VAC to K2 and K3 of the Intelliplus controller (3) and the contacts of a DPDT relay (12a). If there is a time, temperature and motor function either dialed or programmed into the controller (3), K2 or K3 should close sending power to the convection blower motor.

NOTE: If K3 is energized, the coil of the DPDT relay powers up allowing its contacts to toggle.

NOTE: The door switch is located behind the combustion cover and is operated by the cam mounted on the right hand hinge pin.

NOTE: The motor only operates continuously if the control is not set for pulse. If a time is programmed for pulse, the control opens and closes a set of contacts to cycle the fan on and off.

NOTE: Every time the convection fan cycles on and off the ignition control system also cycles on and off.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

5. If the motor (6) is up to full speed the centrifugal switch (7) should be closed sending 24VAC to terminal 6 of the ignition control (8) and E6 of K1 on the Intelliplus control (3).
6. If there is a temperature programmed into the Intelliplus control (3) and the control is calling for heat as sensed by the RTD probe (9), a circuit is completed between E6 and E7 of the Intelliplus control (3) allowing 24 volts to go to terminal 2 of the ignition control (8).

NOTE: The temperature probe has an ascending temperature coefficient.

7. After the ignition control module (8) has completed a diagnostic and all functions check out, 24VAC is sent to the pilot valve (10a) and a high energy spark jumps a gap at the pilot burner (11). When the pilot is lit and the pilot flame is proven, the ignition control module sends 24VAC to the main valve (10b).

NOTE: A 24VAC indicator light is wired in parallel with the main valve to inform the operator that the main gas valve is being powered up. When the light goes out the thermostat is satisfied.

NOTE: The time and temperature indicators built into the control flash until the oven has reached set point.

8. The lights (13) are controlled by a SPST rocker switch (14).

DFG-100 and DFG-200

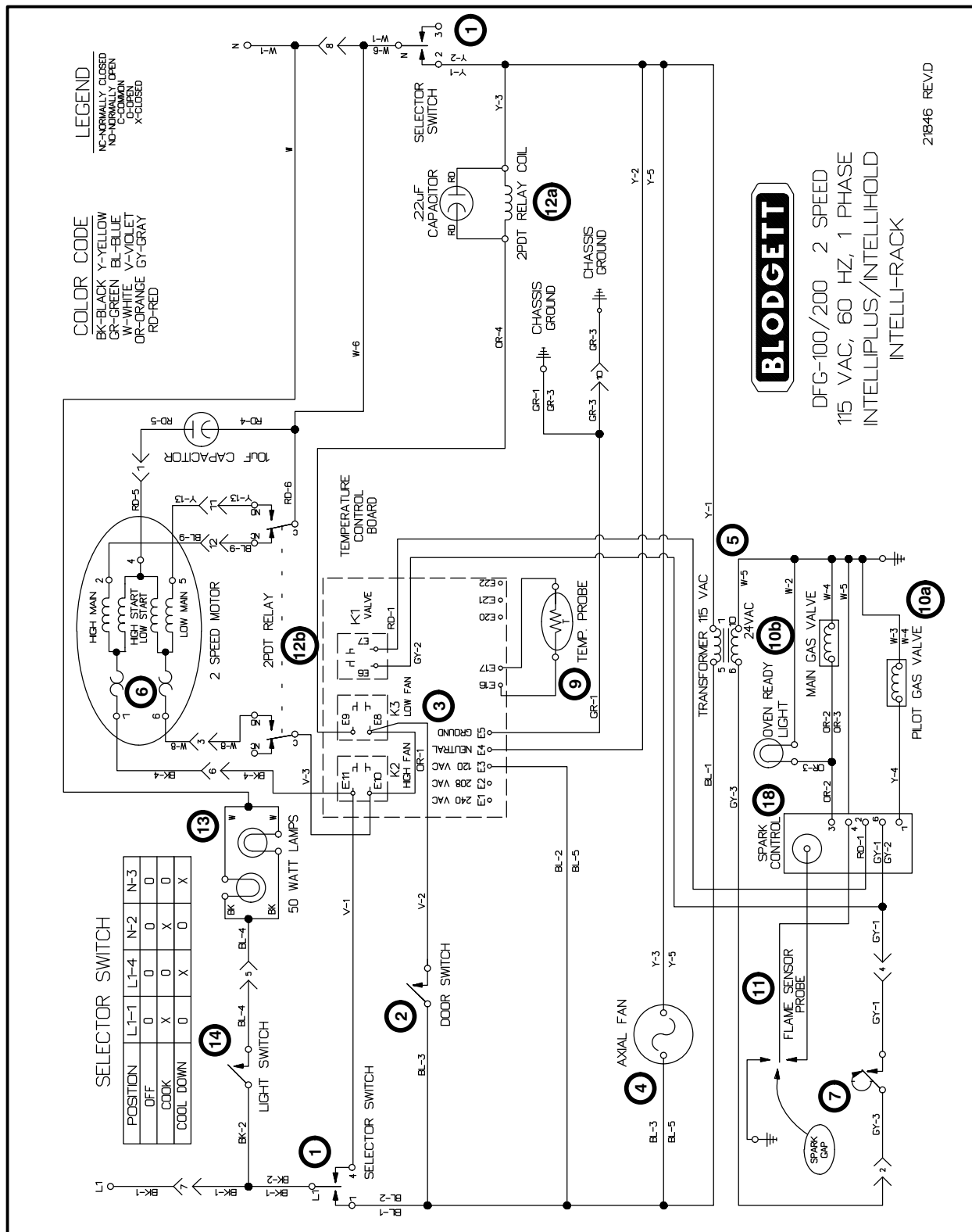


FIGURE 12

INTELLITOUCH

SEQUENCE OF OPERATION — DRAWING P/N 19465 REV B

Component Reference

NOTE: Refer to FIGURE 13 page 2–21 for component locations.

1. MODE SELECTOR SWITCH
2. DOOR SWITCH
3. TRANSFORMER
4. CONVECTION BLOWER
5. CENTRIFUGAL SWITCH
6. IGNITION CONTROL MODULE
7. SPDT RELAY
8. TEMPERATURE CONTROLLER
9. RTD PROBE
10. PILOT VALVE
11. PILOT BURNER
12. MAIN VALVE

Operation

1. Power is applied to the appliance by a 110VAC power cord delivering power to the mode selector switch (1).
2. If the mode selector switch (1) is in the cook position a circuit is made between L1 and terminal 1 and N and terminal 2 allowing voltage to go to one side of a SPST door switch (2) and the primary side of a 110 to 24 volt step down transformer (3).
3. If the doors are closed, the door switch (2) should be closed sending power to the convection blower (4). When this motor reaches full speed a centrifugal switch (5) closes sending 24VAC to terminal 6 of the ignition control module (6) and terminal 7 of a SPDT relay (7).

NOTE: The door switch is located behind the combustion cover and is operated by the cam that is mounted on the right hand hinge pin.

NOTE: The centrifugal switch is an integral part of the convection blower and is not field repairable.

4. On a call for heat from the temperature controller (8) as sensed by an RTD probe (9) a set of contacts in the temperature control (8) closes allowing 24VAC to go to the coil of a SPDT relay (7). When this relay is energized a switch within the relay toggles allowing a circuit to be made between terminals 7 and 5 (7). This completes the circuit to the ignition control module (6) at terminal 2.
5. After the ignition control module (6) has completed a diagnostics and all functions check out, 24VAC is sent to the pilot valve (10) and a high energy spark jumps a gap at the pilot burner (11). When the pilot is lit and the pilot flame is proven, the ignition control module (6) sends 24VAC to the main valve (12)

NOTE: The cooling fan in this oven runs all of the time when the unit is turned on.

NOTE: The lights are activated by a SPST switch and can be turned on even if the oven is off.

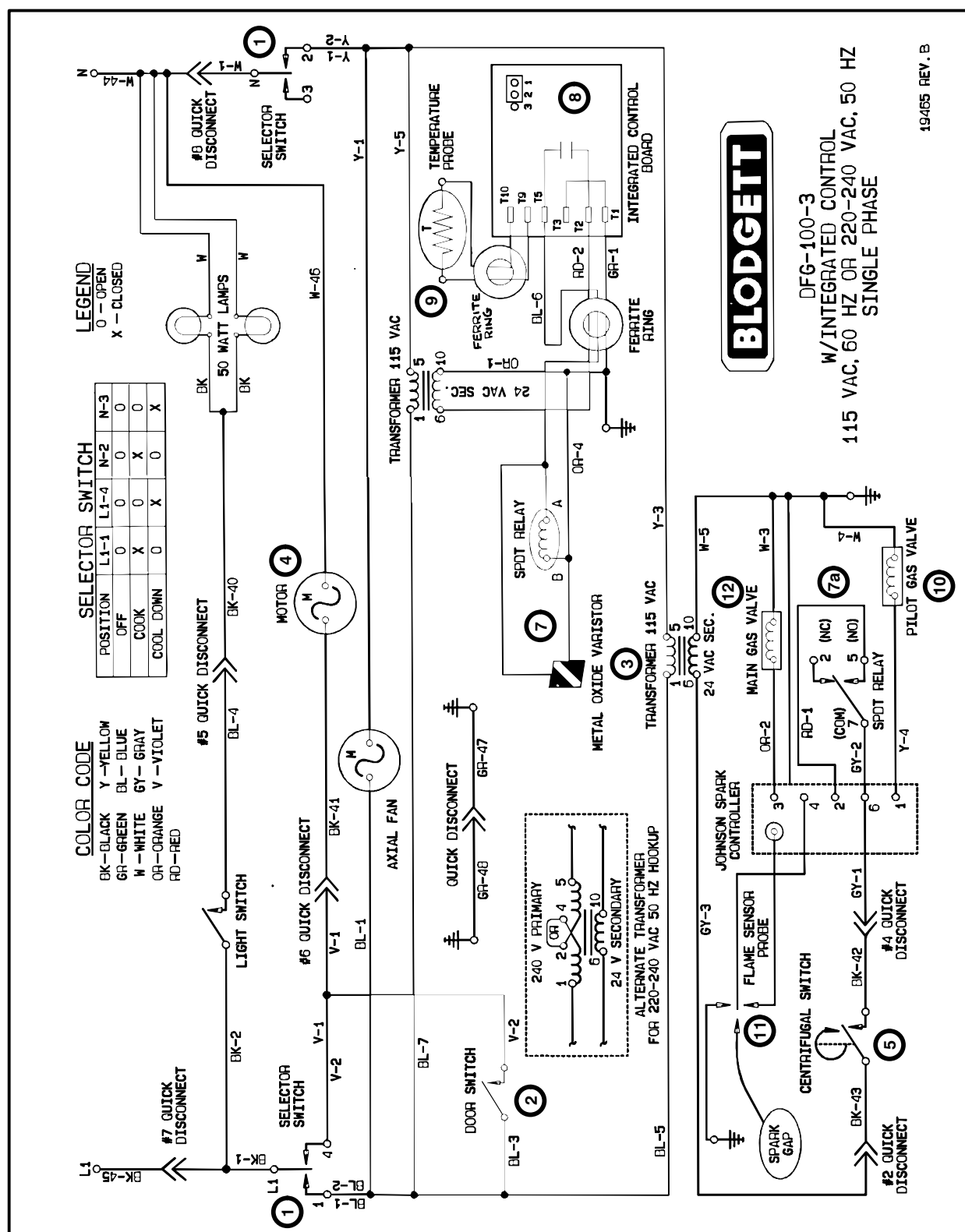


FIGURE 13

INTELLITOUCH II

SEQUENCE OF OPERATION — DRAWING P/N 31173 REV C

Component Reference

NOTE: Refer to FIGURE 14 page 2—23 for component locations.

1. MODE SELECTOR SWITCH
2. TPDT RELAY
3. TPDT RELAY
4. AXIAL FAN
5. DOOR SWITCH
6. CONTROL
7. TRANSFORMER
8. TWO SPEED MOTOR
9. IGNITION CONTROL
10. A & B GAS VALVE
11. TEMPERATURE PROBE

Operation

1. Power is applied to the appliance by a 110VAC power cord. Power is delivered to the mode selector switch (1).
2. If the switch (1) is turned on, power goes to a set of contacts on relay 1 (2), a set of contacts on relay 2 (3), an axial fan (4), one side of a SPST door switch (5), terminals J20, J25 and J47 of the Intellitouch temperature control (6) and the primary side of a 110 to 24 volt step down transformer (7).

NOTE: The temperature control is a chain event control that allows the operator to program various motor, timing and temperature functions for different food product. At the expiration of programmed time another event takes place. If no time is put into the control, the control cannot count down and the chain is broken.

NOTE: The control is backed up with several different support items such as a mechanical thermostat and switch to take the control out of the heat circuit.

NOTE: The temperature probe ascends as temperature increases.

3. If the control (6) is programmed to cook a product and the door switch (5) is closed, the relays within the control close depending on the function chosen. When the operator chooses a particular program, the high or low fan switch closes allowing the coils of either relay 1 (2a) or relay 2 (3a) to power up closing their respective contacts.

NOTE: These relays interrupt both the hot and neutral wires to the convection fan.

4. If the temperature control (6) is calling for heat as sensed by a temperature probe (11) and the convection motor (8) has reached full speed, a centrifugal switch closes sending 24VAC to terminal 2 of the ignition control (9). After the ignition control (9) has completed a diagnostics the pilot valve (10a) powers up. After proof of flame, the main valve (10b) powers up.

NOTE: The centrifugal switch is an integral part of the convection motor and is not considered field repairable.

NOTE: The lights get power from a momentary switch. Lights go out every time the switch is released.

1

1

LEGEND

O-OPEN
X-CLOSED

INDICATES QUICK
DISCONNECT
TERMINAL

COLOR CODE

BK-BLACK
GR-GREEN W/YELLOW
W-WHITE
RD-ORANGE
Y-YELLOW
BL-BLUE
V-VIOLET
GY-GRAY

BLODGETT

DFG100/200
W/INTELLITOUCH II
115 VAC 1PH 60HZ 2 SPEED
31173 REV.C

2-23

CHAPTER 3

CALIBRATION AND ADJUSTMENT

DOORS

The DFG-100 and DFG-200 ovens feature double side mounted doors which operate simultaneously by means of a chain and turnbuckle linkage assembly. Should field adjustment be necessary, the two turnbuckles are located immediately behind the combustion compartment cover. **CAUTION: the turnbuckles are located in a heat zone.**

For units manufactured prior to August 1984.

1. Adjust one turnbuckle, then the other until the doors are properly synchronized.

NOTE: The doors are properly adjusted if the right door is fully closed when the left door (the door with the handle) has between 1/2 and 1 inch of travel remaining.

Both turnbuckles must be adjusted to prevent strain on the door operating mechanism.

2. Tighten the turnbuckle lock nuts.

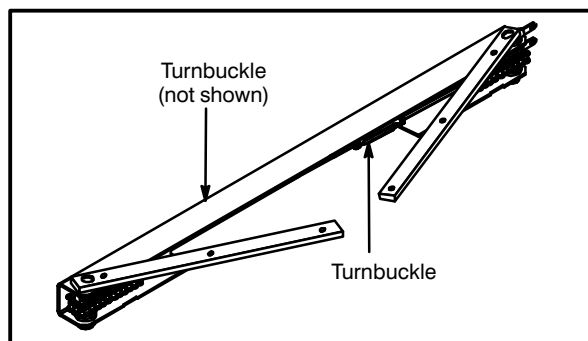


FIGURE 1

To adjust the ball plunger catch:

1. Insert a spanner key in the notches on both sides of the ball plunger. Loosen the lock nut with a wrench.
2. Adjust the ball plunger by turning left or right with the spanner key until the plunger engages in the striker plate on the door.
3. With the spanner key still inserted in the ball plunger notches, tighten the lock nut.

For units manufactured after August 1984

Be sure the doors are in line with each other when viewed from the top and front. If the doors are misaligned adjust as follows:

1. Remove the bottom trim.
2. Loosen the five (5) bolts in the U-shaped lower door hinge and sprocket assembly.
3. Slide the assembly until the doors are aligned.
4. Tighten the bolts.
5. Replace the bottom trim.

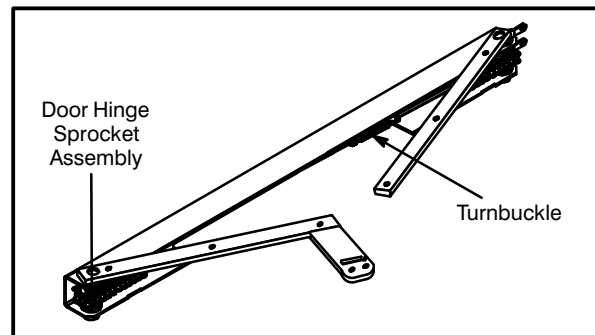


FIGURE 2

To adjust the doors for proper operation, open the doors until the right hand door back flange is even with the front line of the oven as viewed from above. The left hand door should be positioned so the door pressure lock touches the right hand door. If the doors need adjustment proceed as follows:

1. Loosen the chain drive.
2. Adjust for proper location.
3. Tighten the chain drive.

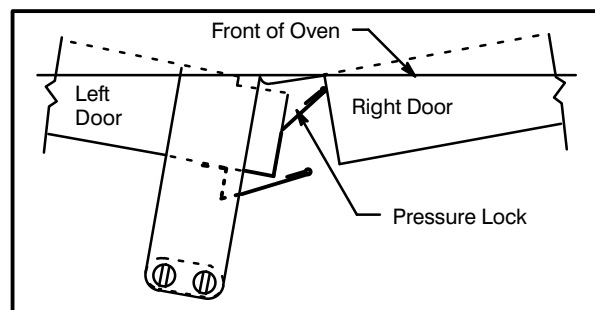


FIGURE 3

DOOR BLOWER SWITCH

The door activated blower switch should be adjusted so the doors are about 1-1/2" (4 cm) from the liner when the switch shuts the blower off. If field adjustment is necessary, the switch can be reached by removing the combustion compartment cover.

1. Open the right hand door until it is approximately 2" (5 cm) from the liner.
2. Place the arm of the cam assembly, located on the door sprocket, against the push button.
3. Tighten the set screw.

When the doors are fully closed, the cam arm depresses the push button enough to allow blower operation. An audible click will determine if the switches are operating correctly.

The switch may be moved forward or backward in the mounting bracket as necessary for alignment.

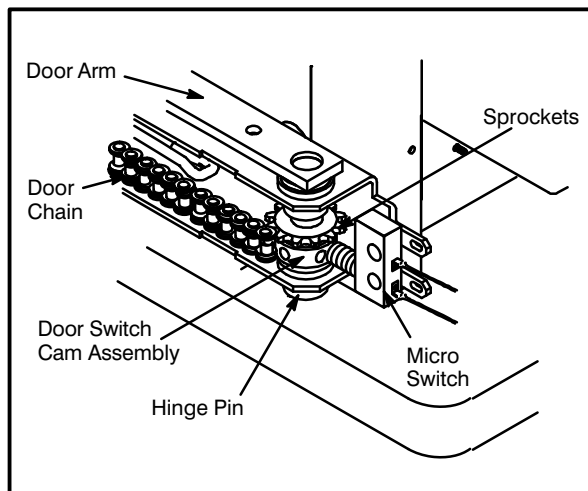


FIGURE 4

THERMOSTAT

DFG BULB AND CAPILLARY THERMOSTAT

For units with rocker style switches

1. Turn the mode selector/power switch to COOK ONLY.
2. Toggle the blower switch to ON.
3. Toggle the cool down switch to MANUAL.
4. Place a pyrometer thermocouple or reliable mercury thermometer on the middle shelf 6" from the front edge and in the center of the shelf.
5. Turn the thermostat dial to 350°F (177°C).
6. When the red indicator light on the control panel goes out, check the thermometer or pyrometer to determine oven temperature.

If this reading is within 10°F (6°C) of the thermostat setting, do not change the thermostat.

If this reading differs more than 10°F (6°C) from the thermostat setting recalibrate the thermostat.

For units with rotary mode selector switch

1. Turn the selector switch to COOK.
2. Place a pyrometer thermocouple or reliable mercury thermometer on the middle shelf 6" from the front edge and in the center of the shelf.
3. Turn the thermostat dial to 350°F (177°C). Let the oven heat for at least 1/2 hour.
4. When the red indicator light on the control panel goes out, check the thermometer or pyrometer to determine oven temperature.

If this reading is within 10°F (6°C) of the thermostat setting, do not change the thermostat.

If this reading differs more than 10°F (6°C) from the thermostat setting recalibrate the thermostat. Refer to page 3-3.

DFG-100 and DFG-200

CALIBRATING THE THERMOSTAT

Bulb and Capillary Style Thermostat

1. Loosen the set screws in the thermostat knob. Pull the knob forward.
2. With a screwdriver, turn the small screw located in the center of the thermostat stem either clockwise to lower the temperature or counter-clockwise to raise the temperature.

NOTE: Do not allow the main stem of the thermostat to turn when adjusting the calibration screw.

Solid State Analog Thermostat

1. Place a pyrometer thermocouple or reliable mercury thermometer on the middle shelf 6" from the front edge and in the center of the shelf.
2. Turn the thermostat dial to 350°F (177°C).
3. When the red indicator light on the control panel goes out, check the thermometer or pyrometer to determine oven temperature.

NOTE: If adjustments are needed locate the adjustment pot on the solid state temperature control board. Turn the pot to raise or lower the temperature.

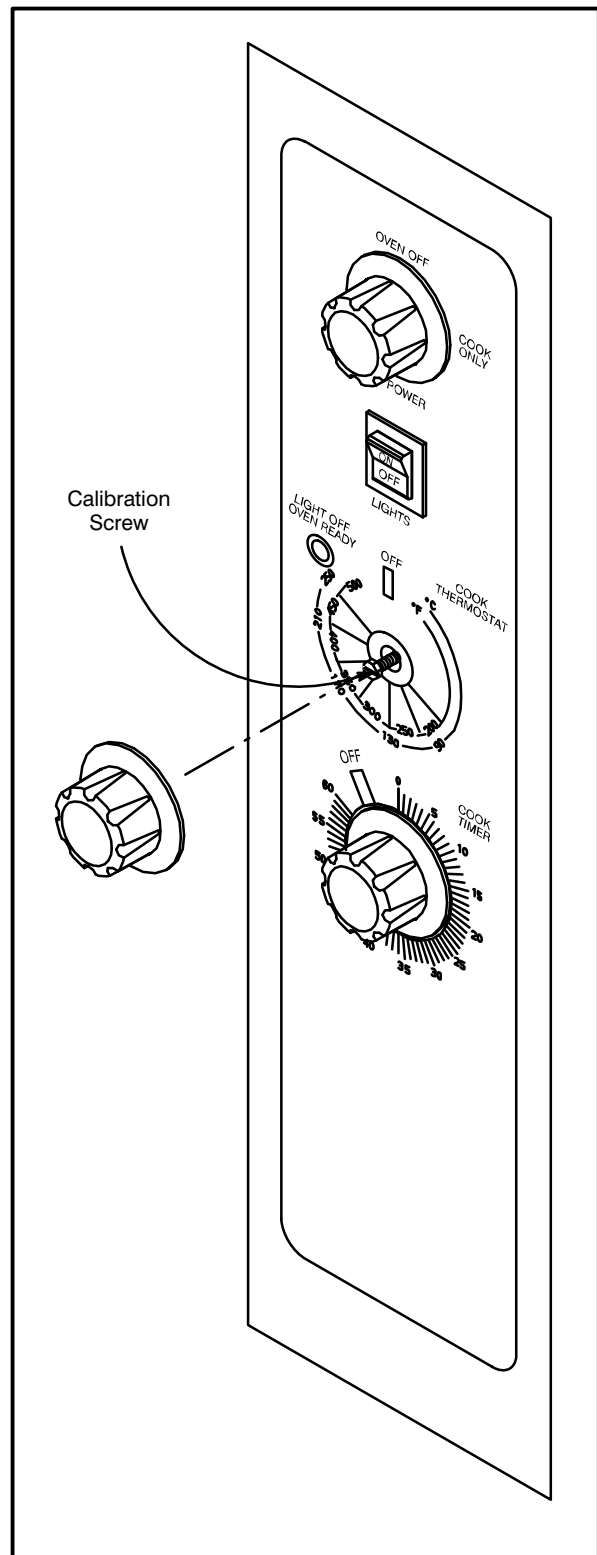


FIGURE 5

BURNERS

Check the rating plate for proper orifice size and correct pressure regulator for the type of gas supplied. If different, the oven must be converted to the correct type of gas before operation. **Do not attempt to operate the oven until corrected for the gas supplied.**

Check the gas pressure at the manifold with a manometer or pressure gauge. Make certain that other equipment on the gas line is ON.

1. Gas pressure at the manifold should be 3.5" W.C. (0.87 kPa) for natural gas, and 10" W.C. (2.50 kPa) for propane with burners operating at full demand.
2. Adjust primary air shutters at the front of the burner to obtain a stable and quiet flame.

Too little primary air will create yellow tipping or all yellow flames. This indicates incomplete combustion and may produce carbon sooting on metal parts near the flame.

When a flame raises off the burner it is important to determine if it is a lifting flame or a floating flame.

Lifting flames:

Lifting flames rise and burn some distance above the ports. In some cases these flames will drop back to the port and lift again intermittently. They are well defined, hard, and may make a blowing noise. They are caused by too much primary air. Decrease the shutter opening to correct the condition.

Floating flames:

Floating flames are long, lazy, poorly defined, quiet flames which roll around the combustion chamber sometimes completely off the ports. Floating flames result from too little secondary or make-up air. Lack of secondary air can be caused by incorrect venting, blocked flue ways, blocked secondary air inlet openings or lack of natural room make-up air to the oven.

Both of these conditions are unacceptable and require prompt corrective action.

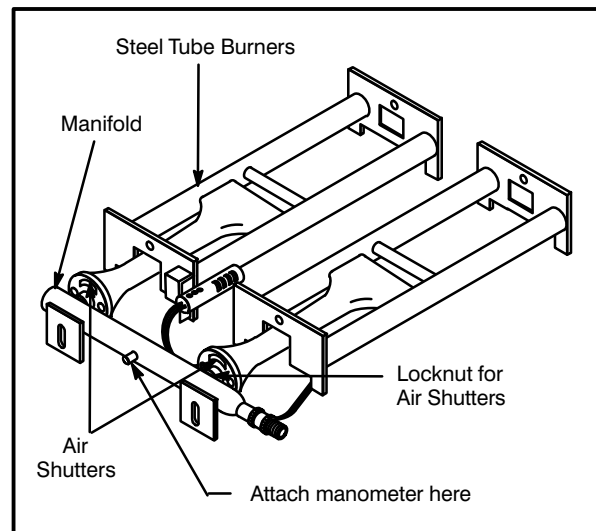


FIGURE 6

SOLID STATE MANUAL

1. Place a pyrometer in the center of the oven.
2. Turn the mode selector switch to cook.
3. Turn the thermostat to 350°F (177°C).
4. When the red indicator light goes out, check the pyrometer to determine oven temperature.
5. If this reading is within 10° (6°C) of the thermostat setting no adjustment is needed.
If the reading is greater than 10° (6°C) adjust as follows:
 - A.) Locate the trim pot on the solid state temperature board.
 - B.) Turn the adjustment screw to raise or lower the setting.

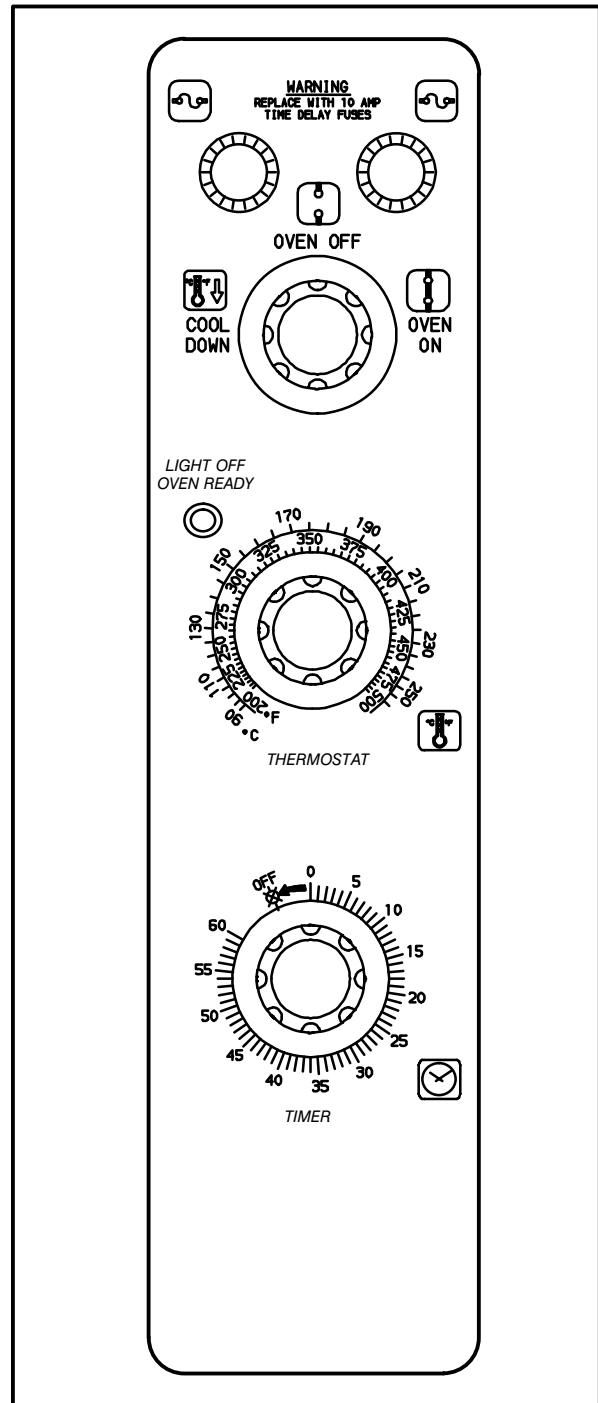


FIGURE 7

CALIBRATION AND ADJUSTMENT

SELECTOR SWITCH CALIBRATION

1. Place a pyrometer in the center of the oven.
2. Turn the mode selector switch to cook.
3. Set 8 position selector switch to one of the eight positions.

NOTE: The 8 individual positions are each set for a temperature of the customer's choosing. For example, if position 1 is set for 350 °F (177 °C) the red indicator light should go out when it gets to within 10 degrees of setpoint.

4. If the light goes out within 10 degrees, no adjustment is required. If the light does not go out within 10 degrees of setpoint calibrate the switch as follows:

A.) Locate the potentiometer on the 8 position selector switch labeled R1.

NOTE: There are 8 trim pots on this device. They are labeled R1, R2, R3, etc.

B.) Turn the brass screw on top of the potentiometer clockwise to increase the temperature. Turn the brass screw on top of the potentiometer counter-clockwise to decrease the temperature.

5. Repeat steps 3–4 for all 8 positions.

NOTE: It is possible for all 8 positions to be out of calibration but highly unlikely.

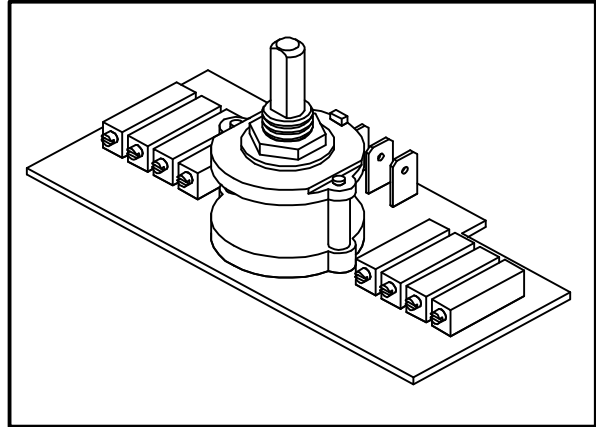


FIGURE 8

INTELLITOUCH CONTROL SECOND LEVEL PROGRAMMING

To access 2nd level programming

1. Turn the oven off.
2. Locate the 3 pin header on the bottom right side of the control. Move the jumper from the middle and bottom pins to the middle and top pins exposing the bottom pin.
3. Turn the oven on. The program LED (1) lights.

Programming the 2nd level parameters

1. The #1 LED illuminates.

NOTE: The LED's (3) are located next to the product and load keys. The LED identification numbers (2) are located to the left of the product and load keys. See FIGURE 9.

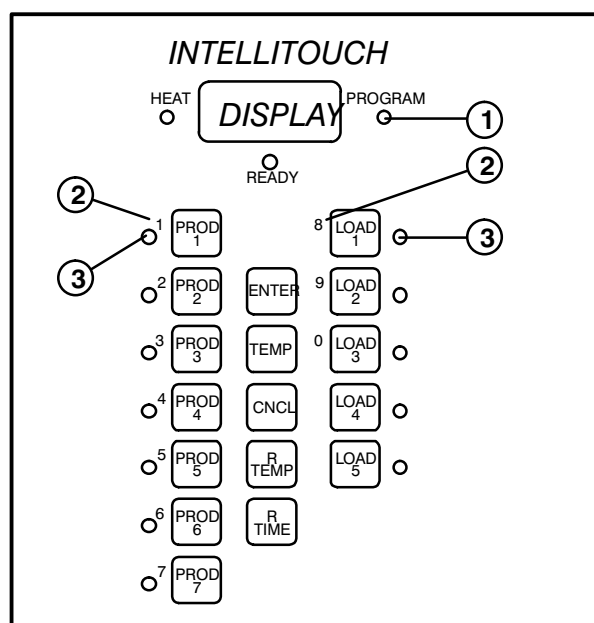


FIGURE 9

2. Use the product and load keys to enter numerical data. See TABLE 2 for correct parameter settings.

NOTE: Use product keys 1-7 for numerals 1-7. Use load keys 1-3 for numerals 8,9 and 0 respectively.

3. Press the enter key to save the parameter setting.
4. The #2 LED illuminates

5. Repeat steps 1-3 for each parameter. When the final parameter setting is entered and saved the #1 LED illuminates.

LED(s)	Parameter	Setting
1	Offset	0
2	Hrs/Min timer	0F
1,2	Fahrenheit (0= °F, <1= °C)	0F
3	Proportional	0F
1,3	Integration	1F
2,3	Dead band	3F
1,2,3	Cycle time	12F
4	Minimum on time	3F
1,4	Hi temp alarm	550F
2,4	Ready temp differential	15F
1,2,4	Minimum setpoint	150F
3,4	Maximum setpoint cook	500F
1,3,4	Minimum setpoint hold	0F
2,3,4	Maximum setpoint hold	0F
1,2,3,4	Fan 2 speed	0F
5	Fan rev.	0F

TABLE 2

To exit the 2nd level programming

1. Turn the oven off.
2. Move the jumper from the middle and top pins to the middle and bottom pins exposing the top pin.
3. Turn the oven on.

Error codes

HELP the temperature setting exceeds the maximum setting of 550°F. This will be shown as an alternating **HELP** and **PROB** display.

PROB

1. Defective temperature probe.
2. Stripped insulation on probe wires.
3. Poor connection of probe terminals.
4. Probe sensing temperatures above or below the probe sensing range.

8888 an Intellitouch computer failure.

SOLID STATE DIGITAL SECOND LEVEL PROGRAMMING

NOTE: Refer to page NO TAG for illustration of control.

To Initiate Programming

1. Set the time to 1 minute. 0:01 01:00
2. Set the temperature to 151°F (66°C).

To Access Second Level Programming

1. Press and hold the TEMPERATURE key and the START/STOP key simultaneously.
2. The control beeps and displays the software version for a few seconds.
3. The control then displays **2nd**. The control has entered the second level program.

To Change the Temperature Offset

1. Press the TEMPERATURE key.
2. The control displays **OFFS** or offset for a few seconds. It then displays the current offset which should be 0°F or 0°F.
3. Rotate the DIAL to enter a $\pm 50^\circ\text{F}$ (28°C) offset. Use this to calibrate the oven if necessary.

To Set the Display Scales

1. Press the TEMPERATURE key.
2. The control displays the current setting from the menu to the right. This menu controls 3 separate parameters:
 - C.) The desired temperature scale (ie Celsius or Fahrenheit)
 - D.) Electric or Gas oven
 - E.) The desired time display (ie hrs/min or min/sec)
3. To adjust the setting turn the DIAL 1 click at a time.

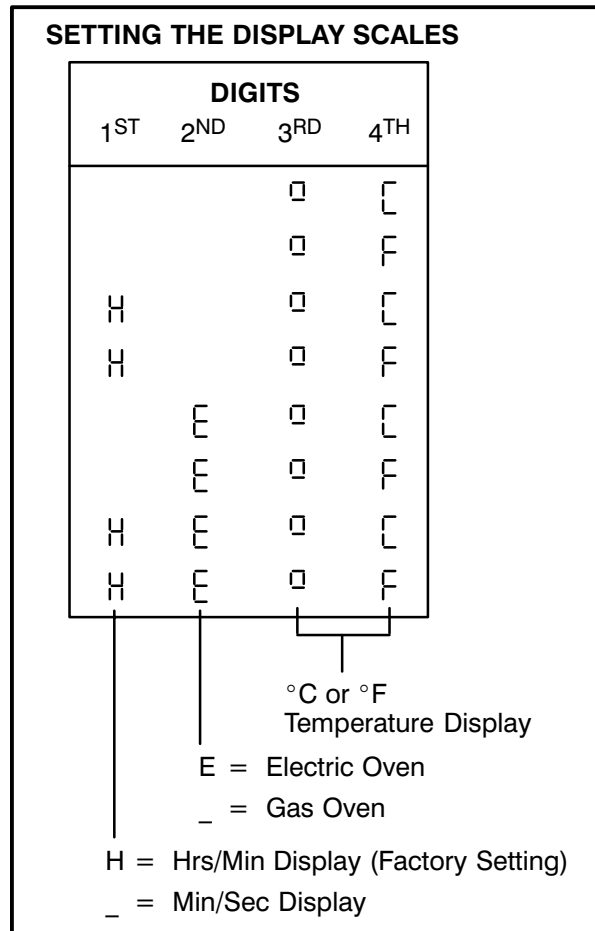


FIGURE 10

To Return to Normal Operating Mode

1. Press the TEMPERATURE key.
2. The control goes through self check then displays the set temperature 151°F (66°C).
3. The oven can now be controlled as normal.

INTELLITOUCH II SECOND LEVEL PROGRAMMING

COMPUTERS WITH ON/OFF KEY IN CONTROL

1. Place the control in *OFF* mode.
2. Press the CLEAR key.
3. Press the B, A, K, and E keys followed by the PROG/ENTER key.
4. The display reads *ACCESS*.
5. Input the relevant code from TABLE 3.
6. Press the PROG/ENTER key.
7. Press CLEAR CLEAR CLEAR to exit.

COMPUTERS WITHOUT ON/OFF KEY

1. Place the control in *SELECT* mode.
2. Press the 1, 2, 3, 4, 5, 6 keys followed by the PROG/ENTER key.
3. The display reads *ACCESS*.
4. Input the relevant code from TABLE 3.
5. Press the PROG/ENTER key.
6. Press CLEAR CLEAR CLEAR to exit.

ALL CONTROLS

Temperature display scale

1. The display flashes °F/°C then MODE—?
2. Press any key to toggle the scale from °F to °C.
3. Press the PROG/ENTER key to lock in new scale.
4. The display flashes T $\blacktriangledown$ °F (or T $\blacktriangledown$ °C).

Ready Band

1. The display flashes *READY*, *BAND* and *POS*.
2. Use the numeric keys to enter a value between 1 and 25. Press the PROG/ENTER key.
3. The display flashes *READY*, *BAND* and *NEG*.
4. Use the numeric keys to enter a value between 1 and 25. Press the PROG/ENTER key.

To exit oven calibration

1. The display flashes *ACCESS*, *DONE* and *EXIT*.
2. Press CLEAR, CLEAR, CLEAR.
3. The display flashes *REBOOT* and *SELECT*.

Access Codes	
123	Display model, version, date and checksum of firmware
000	STD unit test
CLEAR, TEMP, TEMP, TEMP, PROG/ENTER	Temperature offset (+/—) Ready band offset (+/—)

TABLE 3

INTELLIPLUS SECOND LEVEL PROGRAMMING

NOTE: Time must be zeroed out in order to perform the following functions.

SETTING A TEMPERATURE OFFSET

1. Set the temperature dial to 210°.
2. Push and hold the CANCEL and START TIMER keys until the display reads 000.UPO
3. Enter the desired offset.
4. Push the ACTUAL TEMP key.

FAHRENHEIT TO CENTIGRADE CONVERSION

1. Set the temperature dial 220°.
2. Push and hold the START TIMER until the display reads CCC°.
3. Enter the desired temperature.
4. Push the ACTUAL TEMP key.

CHANGING MINUTES TO SECONDS OR HOURS TO MINUTES

1. Set the temperature dial to 230°.
2. Push and hold the START TIMER until the display changes from MIN to HR.
3. Push the ACTUAL TEMP key.

BLODGETT IQ2™ CONTROL FACTORY LEVEL PROGRAMMING

Entering the programming mode

1. Press the program key. The top display reads *CodE*.
2. Use the product keys to enter the factory programming access code: 4 5 2 3. Press the enter key. The top display reads *Fact*.

Programming the oven configuration

1. Press the SCAN KEY. The display reads *Appl*.
2. Press the TOGGLE/CLEAR KEY to toggle between electric oven and gas oven. Set the choice for the oven type. Press the SCAN KEY to enter the choice.
3. Press the TOGGLE/CLEAR KEY to toggle between half sized or full sized oven. Set the choice for the oven type. Press the SCAN KEY to enter the choice.

NOTE: Mark V and DFG-100 are full sized ovens. CTB and DFG-50 are half sized ovens.

Programming the temperature offset

1. The top display reads *oFF*. The bottom display reads *SEt*.
2. Press the SCAN KEY. The top display reads *oFST*. The bottom display reads either *xxF* or *-xxF*.
3. Press the TOGGLE/CLEAR KEY to toggle between positive and negative. Use the product keys to enter the desired temperature offset.
4. Press the SCAN KEY to enter the new temperature offset.

Enabling/Disabling the fan error detection circuit

1. The top display reads *FanC*. The bottom display reads *YES* or *NO*.
2. Press the TOGGLE/CLEAR KEY to toggle between choices.
3. Press scan to move to next operating parameter.

Programming fan speed option

1. The top display reads *FanS*. The bottom display reads *1* or *2*.
2. Press the TOGGLE/CLEAR KEY to toggle between choices: 1 for a single speed motor or 2 for a two speed motor.
3. Press SCAN to move to the next operating parameter.

Programming the maximum temperature setpoint

1. The top display reads *tELt* (temperature limit) and the bottom display reads either 500 or 550.
2. Press the TOGGLE/CLEAR key to toggle between choices 500°F or 550°F maximum temperature setting.
3. Press scan to enter the maximum setpoint temperature.

NOTE: Use 500 °F for the DFG-100, DFG-200, Mark V, CTB and DFG-50. Use 550 °F for the DFG-100 XCEL and Mark V XCEL.

Exiting the factory programming mode

1. The top display reads *Fact*. Press the PROG KEY. The control returns to the operating mode.

CHAPTER 4

PARTS REPLACEMENT

REMOVAL AND REPLACEMENT OF PARTS

ACCESS PANELS AND DOORS

WARNING

Before performing any maintenance or replacing any component on this unit, disconnect the oven from its electrical source and shut off the gas supply.

If it is necessary to replace a defective component, use only genuine Blodgett OEM replacement parts.

COMBUSTION COMPARTMENT COVER

1. Open the doors.
2. Remove the two (2) screws in the top edge of the panel.
3. Lift the panel up and outward.
4. Replace by reversing the above procedure.

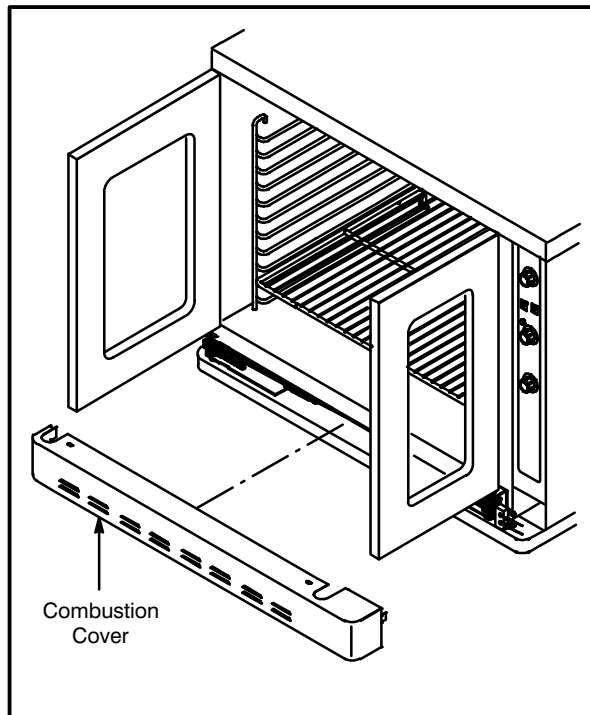


FIGURE 1

CONTROL COVER

1. Remove combustion compartment cover.
2. Remove the screw in the top of the control cover.
3. Pull the bottom of the control cover forward, down and off.
4. Replace by reversing the above procedure.

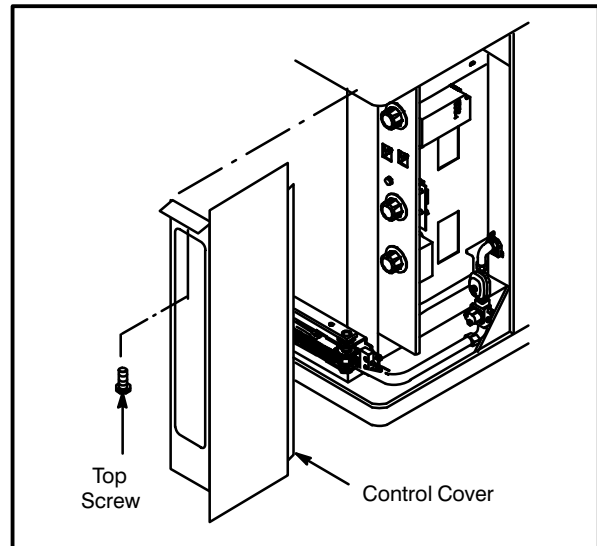


FIGURE 2

PERIMETER DOOR GASKET

1. Remove gasket screws.
2. Remove all door gaskets and top and bottom trim pieces.
NOTE: Side trim pieces remain in place.
3. Position the top gasket over the upper trim piece. Replace the screws.
4. Position side gaskets 1/8" from the end of the top gasket. Replace the screws.
5. Position the bottom gasket over the trim piece.

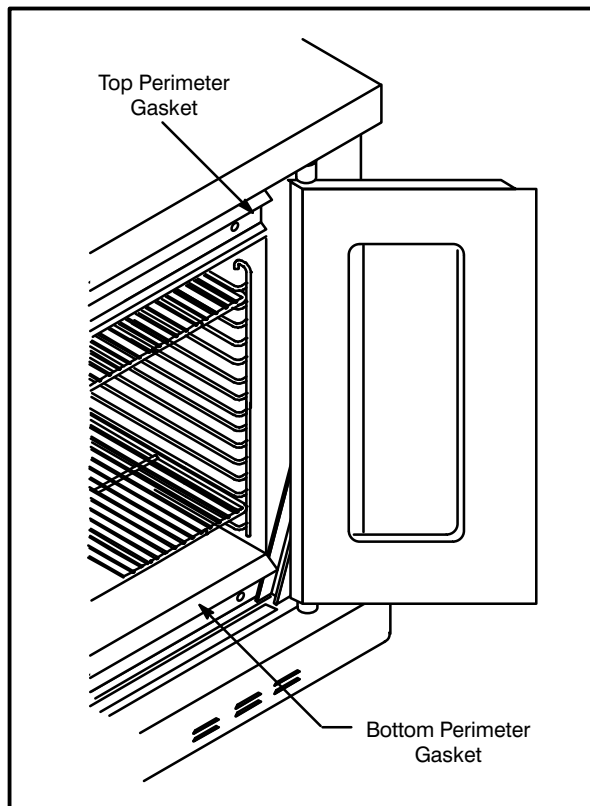


FIGURE 3

CENTER DOOR GASKET

For ovens with 50/50 doors

1. Remove screws securing gaskets to the leading edge right and left doors. Remove the gaskets.
2. Place rigid stainless strip which has been formed at a 90° angle between the front and back halves of the right hand door. Position properly.
3. Align a 1/8" drill bit in the existing holes along the edge of the door. Drill through the stainless strip with formed sections to the outside.
4. Place the two (2) pieces of flexible gasket material side-by-side.

NOTE: The right door gasket has holes punched in the center of the strip. The left door gasket has holes punched slightly to the left of center of the strip.

5. Place the right side gasket flush with the leading edge of the right door. Secure with four (4) screws.
6. Place the left side gasket flush with the leading edge of the left door assembly and secure.
7. Readjust the chain and turnbuckle assembly to ensure that the doors operate properly.

NOTE: Refer to page 3-1 in the Calibration and Adjustment section for door adjustment.

REMOVAL AND REPLACEMENT OF PARTS

OVEN DOOR

1. Open the door. Remove the handle from the left hand door.
2. Remove three (3) machine screws located along the bottom edge of the door.
3. Lift the door slightly. Pull forward until it clears the support.
4. Pull the door down to remove from the oven.
5. Replace by reversing the above procedure.

NOTE: For doors with wooden handle, the handle is attached and is removed with the door.

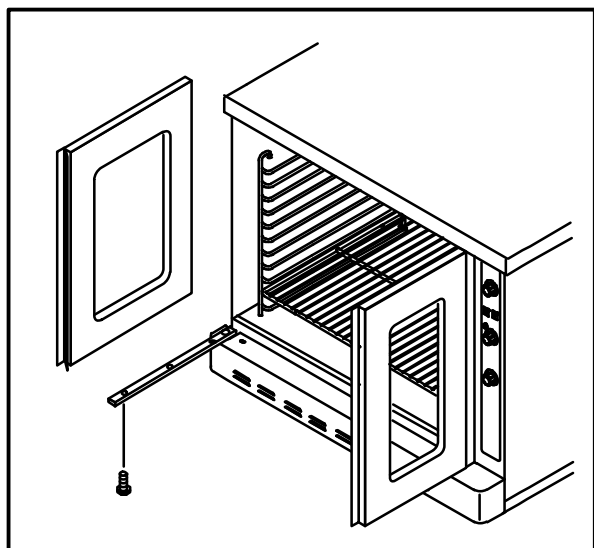


FIGURE 4

WINDOW ASSEMBLY FOR OVENS WITH 50/50 DOORS

1. Remove the door from the oven.
2. Remove the door handle and center door gasket.
3. Place the door on a flat, clean surface. Remove the screws around the edge of the door.
4. Remove the outer (front) door frame.
5. Remove the old glass assembly.
6. Clean the frame thoroughly.
7. Place the glass retainer bracket in each corner of the back frame.

8. Position the glass in the frame with the black border facing upward.
9. Replace the front frame assembly. Press firmly until the screw holes around the edge of the door are aligned.
10. Replace the screws, the center door gasket and the door handle.
11. Reinstall the door on the oven.

WINDOW ASSEMBLY FOR OVENS WITH 60/40 DOORS

1. Remove the door as described. Place the door on a flat surface with the front facing up.
2. Remove the outer door skin. Turn the door onto its back.
3. Use the window insertion tool to pry up the corners of the window assembly in the following order:
 - A.) Bottom right (farthest from the hinge pin)
 - B.) Bottom left
 - C.) Top right
 - D.) Top left (closest to the hinge pin)

NOTE: The window insertion tool is provided with the window assembly.

4. Use the window insertion tool to pry up the corners of the window assembly.
5. Reverse steps 1–4 to replace.

NOTE: To install the door front start at the corner closest to the hinge pin.

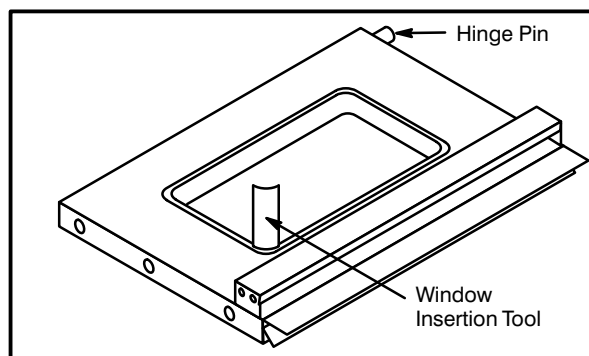


FIGURE 1

LOWER DOOR HINGE AND SPROCKET ASSEMBLY

For models manufactured prior to May 1986:

1. Remove the door from the oven.
2. Remove the roll-pin securing the sprocket to the hinge pin assembly.
3. Loosen the set screw. Lift the hinge pin assembly upward to allow the removal of the sprocket.
4. Replace by reversing the above procedure.

For models manufactured after May 1986:

1. Remove the door from the oven.
2. Remove the roll-pin securing the door arm to the hinge pin assembly.
3. Remove the door switch activating the cam from the right hand door.
4. Loosen the set screw. Lift the hinge pin assembly upward to allow the removal of the sprocket.
5. Replace by reversing the above procedure.

DOOR CHAIN ASSEMBLY

If the replacement of the sprocket as well as the chain is necessary, use the removal instructions for Door Glass Removal. If only the door chain needs to be replaced, remove as follows:

For units manufactured prior to August 1984.

1. Unscrew the turnbuckle. Remove the chain assembly from between the sprocket and frame of the oven.
2. When viewed from the top, the rod from the left sprocket passes over the rod from the right sprocket in a figure eight pattern.

3. After the chain is in position, adjust the chain and turnbuckle as described on page 3—1 of the Calibration and Adjustment section to obtain proper door synchronization.

For units manufactured after August 1984

Be sure the doors are in line with each other when viewed from the top and front. If the doors are misaligned adjust as follows:

1. Remove the bottom trim.
2. Loosen the five (5) bolts in the U-shaped lower door hinge and sprocket assembly.
3. Slide the assembly until the doors are aligned.
4. Tighten the bolts.
5. Replace the bottom trim.

Open the doors until the right hand door back flange is even with the front line of the oven as viewed from above. The pressure lock on the left hand door should touch the right hand door. If not, adjust as follows:

1. Loosen the chain drive.
2. Adjust for proper location.
3. Tighten the chain drive.

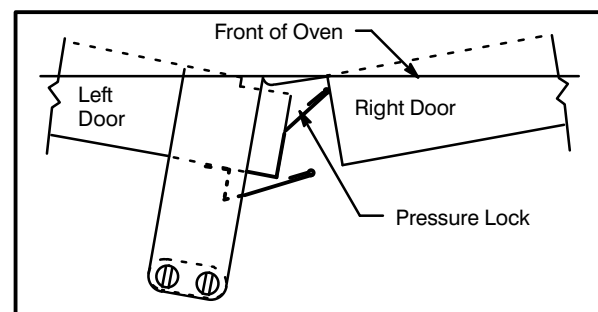


FIGURE 2

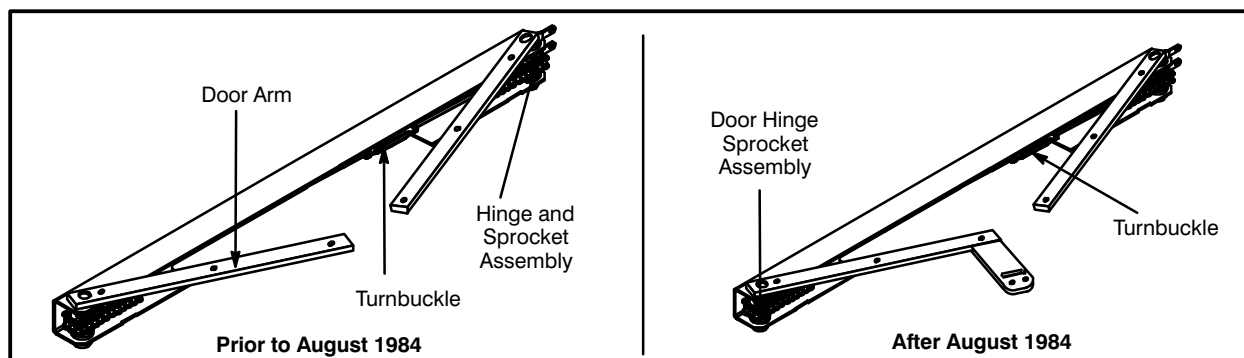


FIGURE 3

REMOVAL AND REPLACEMENT OF PARTS

MOTOR AND BLOWER ASSEMBLY

BLOWER WHEEL

Blower Wheel with Build On Wheel Puller

1. Remove the racks and rack supports.
2. Remove the blower wheel cover by loosening the baffle retaining screws located at each corner. Pull cover forward.
3. Loosen set screws in blower wheel hub.
4. Screw a 3/8"-16 bolt into the threaded hole of the blower wheel. Draw the wheel forward from the shaft.
5. Lubricate the motor shaft with graphite. Maintain a gap between the back of the blower wheel and the back wall of the oven liner.
6. Replace by reversing the procedure above.

NOTE: DO NOT lose the 3/16" square key.

Blower Wheel without Build On Wheel Puller

Use procedure above however, mechanic must provide wheel puller.

MOTOR

1. Remove the blower wheel from the motor shaft.

If access to the rear of the oven is available:

1. Remove the motor attachment bolts.
2. Lift the motor from the mounting bracket.
3. Remove the motor conduit.
4. Replace by reversing the appropriate procedure above.

If access to the rear of the oven is not available:

1. Remove the six (6) screws in the lower heat collector.
2. Pull the lower heat collector forward and down.
3. Remove the two (2) 1/4" nuts from the motor panel.
4. Pull the motor panel forward into the oven. Disconnect the motor wiring conduit.
5. Replace by reversing the appropriate procedure above.

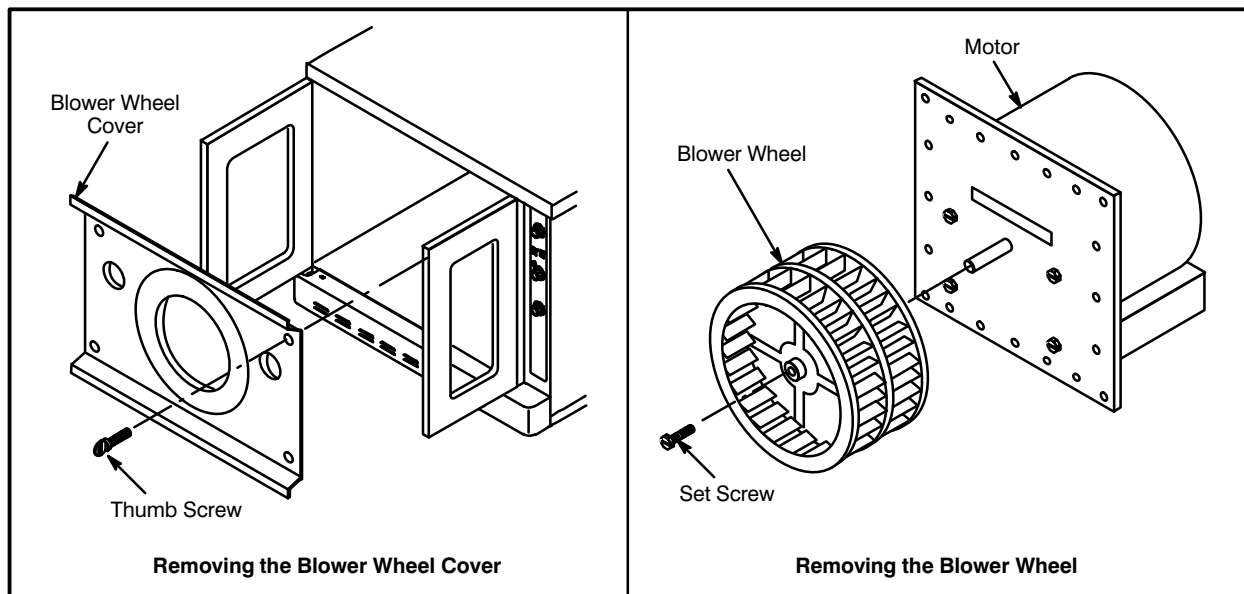


FIGURE 4

BURNER AND DEFLECTOR ASSEMBLIES

MANIFOLD AND BURNER ORIFICES

1. Remove the combustion compartment cover.
2. Remove the brass compression fitting at the right end of the manifold.
3. Remove the two (2) screws securing the manifold to the oven.
4. Move the manifold to the left and forward.
5. Remove the brass orifices.
6. Replace by reversing the above procedure.

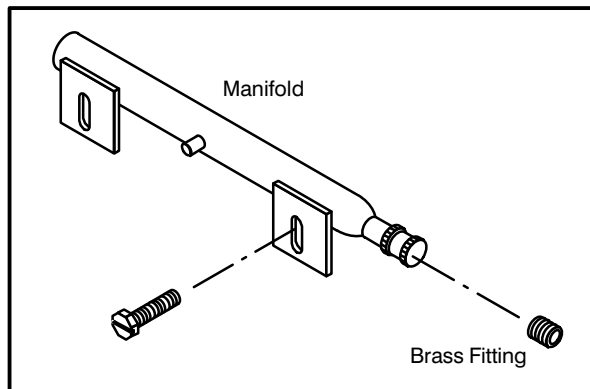


FIGURE 5

BURNERS

1. Remove the combustion compartment cover.
2. Remove the manifold assembly.
3. Remove the electric ignitor.
4. Pull the burners forward.
5. Replace by reversing the above procedure.

COMPARTMENT LINER BOTTOM

1. Remove the racks and rack supports.
2. Remove the blower wheel cover.
3. Remove the bottom perimeter door gasket.
4. Remove the screws securing the front, back and sides of the liner bottom.
5. Pull the compartment liner bottom forward.
6. Replace by reversing the above procedure.

NOTE: All screws must be reinstalled to ensure proper seal in liner.

DEFLECTOR ASSEMBLY

1. Remove the racks and rack supports.
2. Remove the blower wheel cover.
3. Remove the compartment liner bottom.
4. Remove the screws securing the front and back of the deflector.
5. Lift the deflector from the oven.
6. Replace by reversing the above procedure.

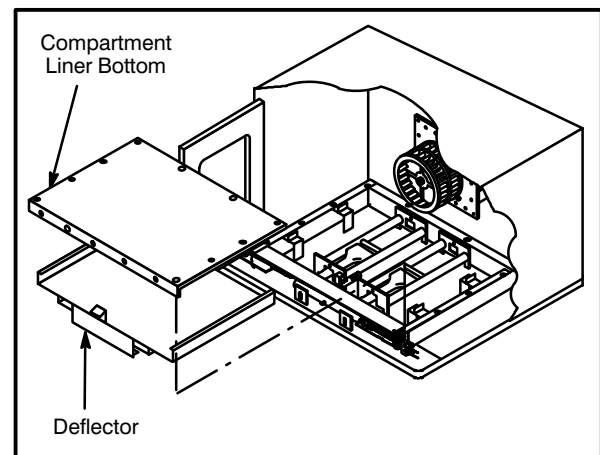


FIGURE 6

REMOVAL AND REPLACEMENT OF PARTS

ELECTRIC IGNITER (GLOW COIL) AND PLUMBING COMPONENTS

ELECTRIC IGNITER

WARNING

The electric igniter is extremely brittle. Care must be taken when handling the igniter to avoid breakage.

For models manufactured prior to August 1984:

1. Remove the combustion compartment cover.
2. Remove the two (2) screws securing the igniter bracket to the left burner.
3. Remove the two (2) ceramic wire nuts connecting the igniter. Remove the igniter from the combustion compartment.
4. Replace by reversing the above procedure.

For models manufactured between August 1984 and January 1989:

1. Remove the combustion compartment cover.
2. Remove the two (2) ceramic wire nuts from the wires connected to the igniter.
3. Remove the hair pin securing the igniter to the bracket.
4. Remove the igniter from the bracket.
5. Replace by reversing the above procedure.

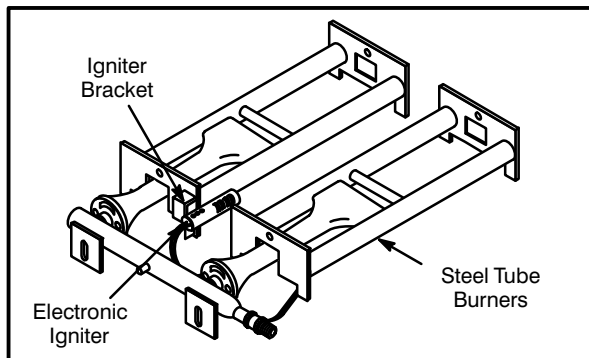


FIGURE 7

THERMAL DELAY RELAY ASSEMBLY

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward.
4. Remove the thermal delay relay assembly.
5. Replace by reversing the above procedure.

GAS PRESSURE REGULATOR

For models manufactured prior to August 1984:

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward for easier access to the regulator.
4. Shut off the gas supply to the oven by closing the manual gas valve.
5. Remove the gas pressure regulator.
6. Replace the gas pressure regulator.
7. Open the manual gas valve. Check for gas leaks using the soap test.
8. Light the oven. Check the gas pressure with the burners in full demand condition.

NOTE: Gas pressure at the manifold should be 3.5" W.C. for natural gas and 10" W.C. for propane.

9. The regulator may be adjusted by turning the adjustment screw clockwise to increase the gas pressure or counterclockwise to decrease the gas pressure.

SOLENOID VALVE

For models manufactured prior to August 1984:

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward for easier access to the solenoid valve.
4. Shut off the gas supply to the oven by closing the manual gas valve.
5. Remove the solenoid valve.
6. Replace by reversing the above procedure.

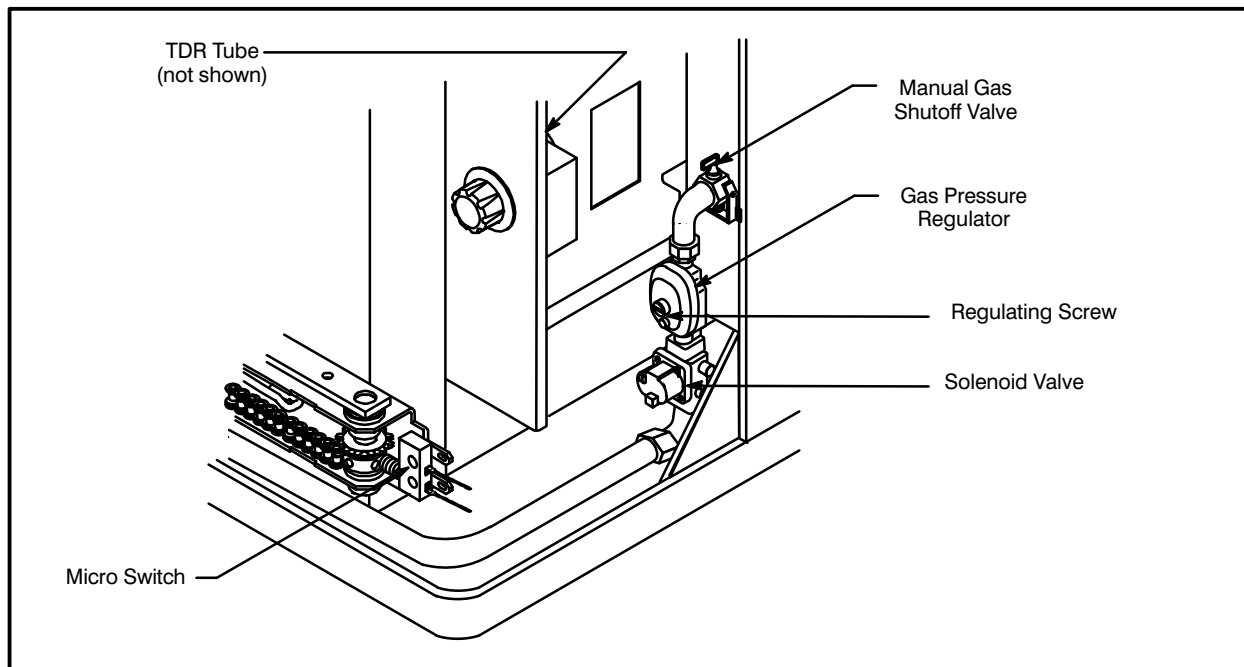


FIGURE 8

REMOVAL AND REPLACEMENT OF PARTS

CONTROL STACK ASSEMBLY

For models manufactured between August 1984 and January 1986:

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward for easier access to the control stack.
4. Close the manual gas valve in the rear of the control area.
5. Disconnect the wire leads to the combination dual gas valve.
6. Disconnect the two (2) control stack unions.
7. Remove the control stack assembly.
8. Replace by reversing the above procedure.
9. Open the manual gas valve. Check for gas leaks.
10. Light the oven. Check the gas pressure with the burners on.

NOTE: Gas pressure at the manifold should be 3.5" W.C. for natural gas and 10" W.C. for propane gas.

COMBINATION DUAL GAS VALVE

For models manufactured after August 1984:

1. Remove the control stack assembly.
2. Remove the combination dual gas valve from the control stack assembly.

NOTE: The pressure regulator is part of the combination dual gas valve.

3. Replace by reversing the above procedure.
4. Open the manual gas valve. Check for gas leaks.

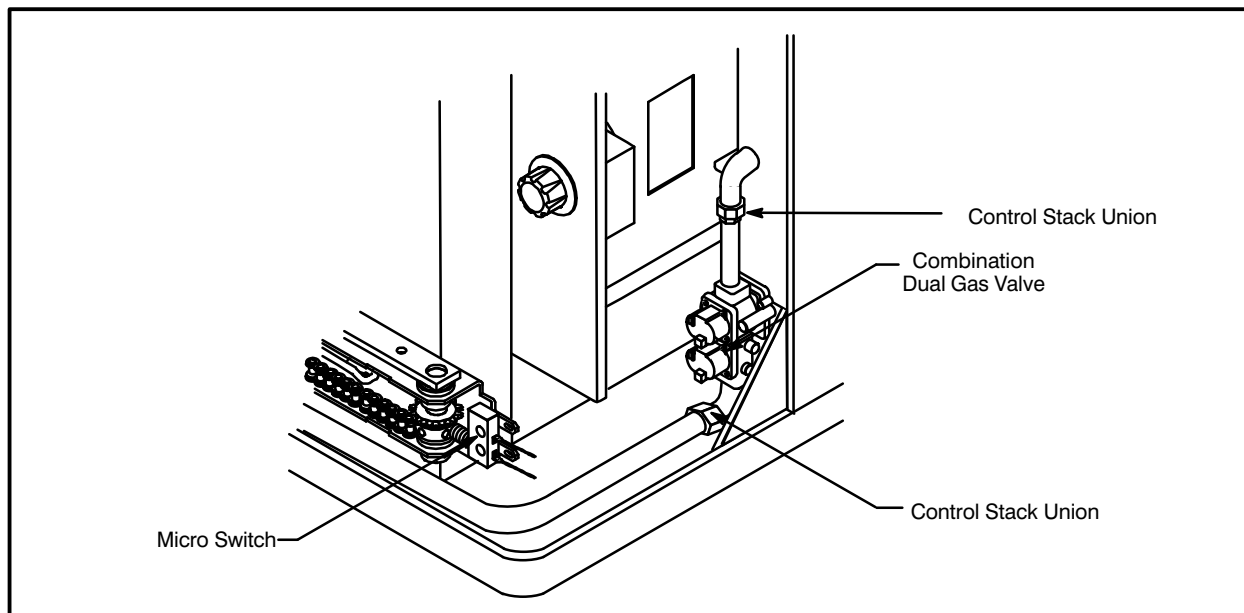


FIGURE 9

INTERMITTENT IGNITION DEVICE (IID) AND PLUMBING COMPONENTS

For units manufactured after January 1986

WARNING

Disconnect electrical power supply before wiring the control into the circuit to avoid possible damage to the equipment.

Shut off all gas to the appliance by closing the shutoff valve to the appliance.

PILOT BURNER AND SPARK IGNITION

1. Remove the combustion compartment cover.
2. Disconnect the nut for the manifold line at the front of the combination dual gas valve.
3. Remove two (2) bolts which hold the manifold to the brackets on the floor of the burner compartment.
4. Disconnect the line from the proof of flame rod.
5. Disconnect the pilot line at the combination dual gas valve.
6. Disconnect the high tension lead to the spark electrode from the bottom of the ignition control box.
7. Remove the two (2) screws securing the pilot burner to the bracket on the right hand main burner.
8. Replace by reversing the above procedure.

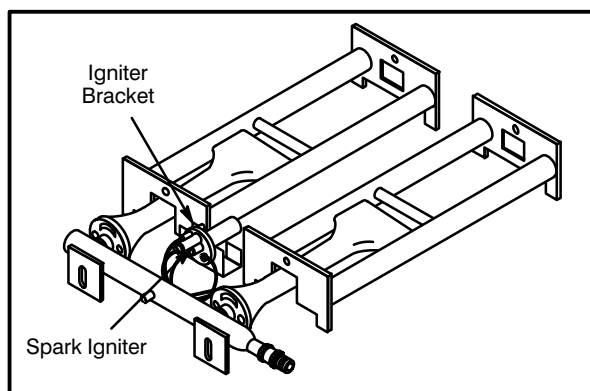


FIGURE 10

IGNITION CONTROL AND TRANSFORMER

NOTE: Ignition control for propane gas is supplied with 100% lockout if no proof of ignition within 25-45 seconds.

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward.
4. Remove the wires to the ignition control box.
5. Remove the ignition control box.
6. Remove the wires to the primary and secondary terminals of the transformer.
7. Remove the transformer.
8. Replace by reversing the above procedure.

NOTE: Be sure to connect the high voltage cable to the ignition transformer before turning on power to the control to avoid possible damage to the equipment.

REMOVAL AND REPLACEMENT OF PARTS

CONTROL STACK ASSEMBLY

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward for easier access to the control stack.
4. Shut off main gas supply to the oven.
5. Disconnect wire leads to the combination dual gas valve.
6. Disconnect the pilot line from the gas valve.
7. Disconnect the nut for the manifold line at the front of the gas valve.
8. Disconnect rear control stack union.
9. Remove the control stack assembly.
10. Replace by reversing the above procedure.
11. Open the manual gas valve. Check for gas leaks.
12. Light the oven. Check the gas pressure with the burners on.

NOTE: Gas pressure at the manifold should be 3.5" W.C. for natural gas and 10" W.C. for propane gas.

COMBINATION DUAL GAS VALVE

1. Shut off main gas supply to the oven.
2. Remove the control stack assembly.
3. Remove the combination dual gas valve from the control stack assembly.
NOTE: The pressure regulator is part of the combination dual gas valve.
4. Replace by reversing the above procedure.
5. If adjustments to regulator are necessary be sure to reinstall the regulator cap. The cap acts as a flow limiter in the event of a ruptured diaphragm.
6. Open the manual gas valve. Check for gas leaks.

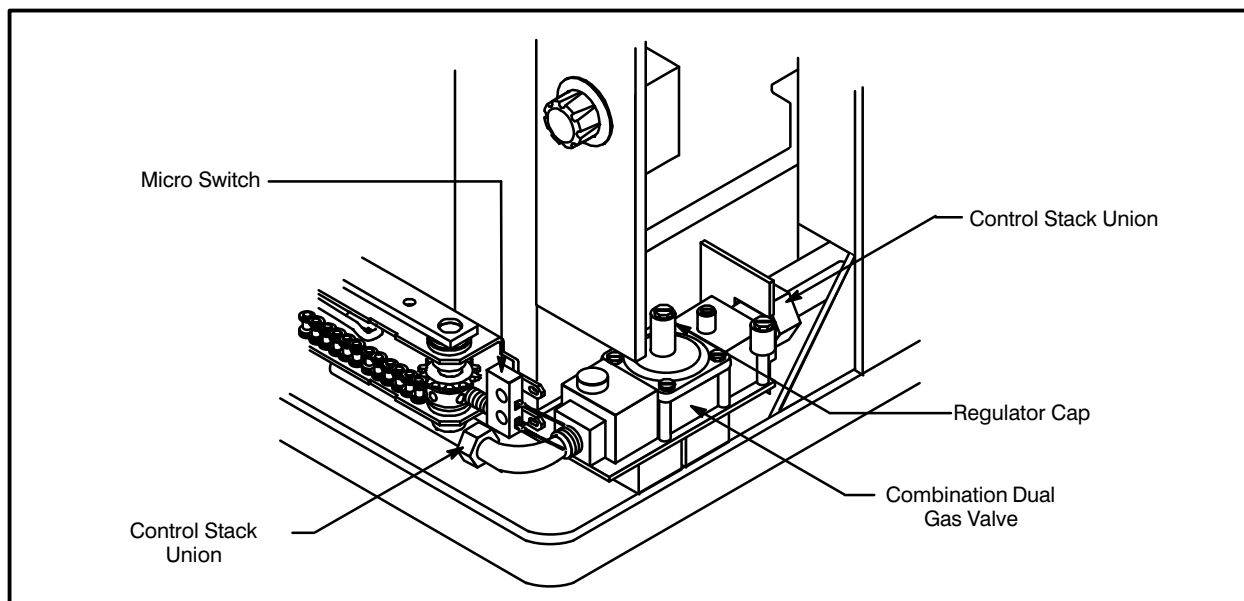


FIGURE 11

ELECTRICAL COMPONENTS

NOTE: A test cord is available to allow removal of the control module from the oven while retaining electrical connections.

BULB AND CAPILLARY THERMOSTAT

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Remove the oven racks.
4. Remove the thermostat capillary bulb clips.
5. Swing the capillary bulb forward until it is at a 90° angle with the liner side.
6. Close the doors. Pull the control module forward.
7. Remove the wires from the thermostat.
8. Loosen the set screw at the bottom of the thermostat knob. Remove the knob.
9. Remove the two (2) screws securing the thermostat to the front panel.
10. Feed the capillaries through the oven wall and the side of the control module.
11. Remove the thermostat.
12. Replace by reversing the above procedure.

NOTE: Be careful not to kink the fine tubing of the thermostat capillary.

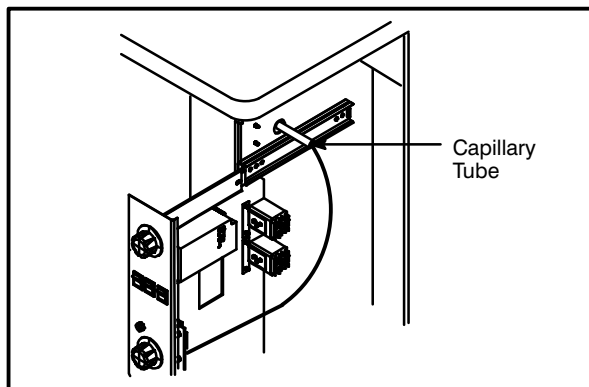


FIGURE 12

ELECTRICAL COMPONENTS LOCATED IN THE CONTROL MODULE

1. Remove the combustion compartment cover.
2. Remove the control compartment cover.
3. Close the doors. Pull the control module forward.
4. Remove the wires from the defective component.
5. Loosen the screws attaching the component to the control module.

Switches may be removed by depressing the spring loaded clips.

The one hour timer is removed by loosening the locknut.

6. Replace by reversing the above procedure.

NOTE: Refer to the wiring diagram at the rear of the oven to ensure correct connection of the wires.

DOOR SWITCH

1. Remove the combustion compartment cover.
2. Remove the wires from the door switch.
3. Remove the screws securing the door switch to the bracket.
4. Replace by reversing the above procedure.

NOTE: Refer to Door Blower Switch adjustments on page 3—2 of the Calibration and Adjustment section to assure proper operation prior to replacement of the combustion compartment cover.

CHAPTER 5

TROUBLESHOOTING

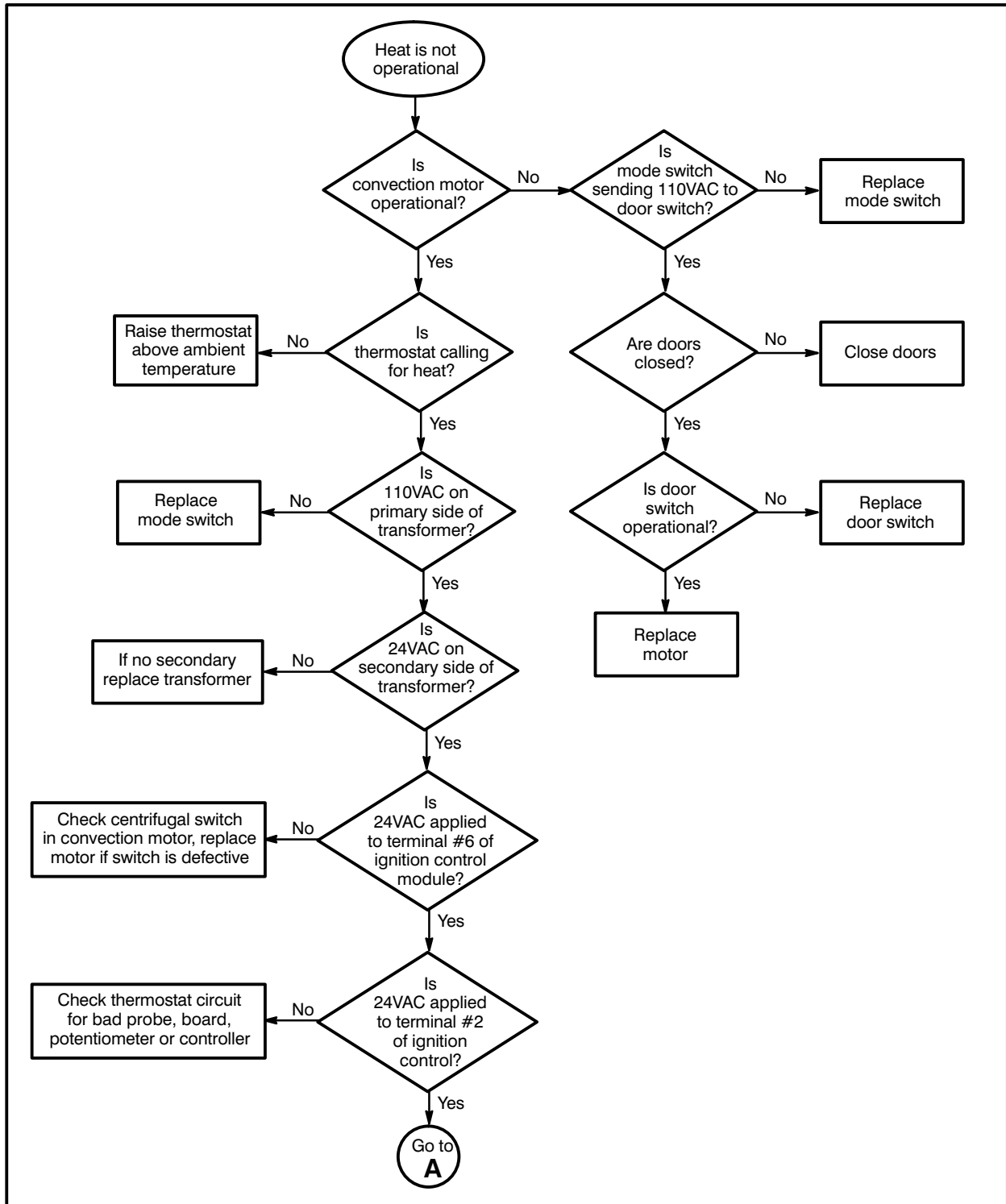
HEAT HSI SYSTEM

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #1 – Heat and motor do not operate	
• Oven not plugged in. • Doors are open. • Door switch is inoperable. • Mode selector switch is not set to cook. • Circuit breaker tripped. • If control configuration has standard fan delay pulse plus feature, this feature may be activated. • If control configuration has solid state digital controls with cycle or pulse feature, this feature may be activated. • Convection motor out due to thermal overload. • Mode selector switch is inoperable.	• Plug in power cord. • Close doors tightly. • Check door switch for continuity. • Turn mode selector switch to cook. • Reset breaker. • Deactivate the fan delay feature. • Deactivate the feature. • Check for external heat against the motor. Such as improper flue connectors on double stack ovens. Check for overramping of the motor. • Replace switch.
Symptom #2 – Convection fan motor does not operate in any mode	
• Oven is not plugged in • Oven not set to cook mode. • Circuit breaker tripped. • Door switch inoperative. • Motor off due to thermal overload. • If control configuration has standard fan delay pulse plus feature, this feature may be activated. • If control configuration has solid state digital controls with pulse or cycle feature, this feature may be activated. • Mode selector switch is inoperable.	• Plug in oven. • Turn oven mode switch to on. • Reset circuit breaker and check the amp draw. Reference electrical specifications on page 1–1 of the Introduction. • Replace door switch. • Check for external heat on the motor. • On double stacked units check that the flue connector is properly installed. • Check the amp draw. If too high, replace the motor. • Deactivate fan delay pulse plus feature. • Deactivate the pulse or cycle feature. • Replace switch.

TROUBLESHOOTING

POSSIBLE CAUSE(S)	SUGGESTED REMEDY
Symptom #3 – Heat system does not recover quickly	
• Gas pressure not correct. • Oven out of calibration. • Incorrect orifice size.	• Refer to rating plate for correct gas pressure. • Reference the calibration procedures for the control configuration on your appliance. • Drill or replace the orifice for correct gas and elevation.
Symptom #4 – Motor operates but there is no heat	
• Temperature control set below actual temperature. • Transformer inoperative. • Centrifugal switch is inoperative. • Convection fan is inoperative. • Ignition control is inoperative. • Gas valve is inoperative. • Temperature probe shorted or open.	• Increase the setpoint temperature. • Determine if there is 115VAC primary and 24VAC secondary. If there is primary voltage but no secondary voltage replace the transformer. • If transformer is good reference wiring diagram provided to locate wires to centrifugal switch. Remove wires from switch. With motor at full speed measure for continuity of switch. If no continuity replace the motor. • Determine if 115VAC is supplied to motor when oven is turned on. If not replace the convection motor. • Refer to Blodgett Technical Supplement document for information. • Check for 24VAC. If present replace gas valve. • Take the resistance reading. Reference pages 5–6 for probe resistance information. Refer to page 2–4 for wiring diagram P/N 20027. For solid state manual controls, remove the wires on terminals #6 and #7 on the solid state board. Touch the wires together to allow the ignition control to power up. If the ignition control powers up, the problem is in the temperature control circuit (consisting of the board, probe and potentiometer). This is only a test. DO NOT leave the oven during this test. If the ignition control fires up place an ohm meter across the probe wire. Note the resistance reading of the probe as the temperature in the oven increases. At no time should the probe go infinite or open before the oven reaches 500°F (260°C). If it does the probe is bad and should be replaced.

FLOW DIAGRAM



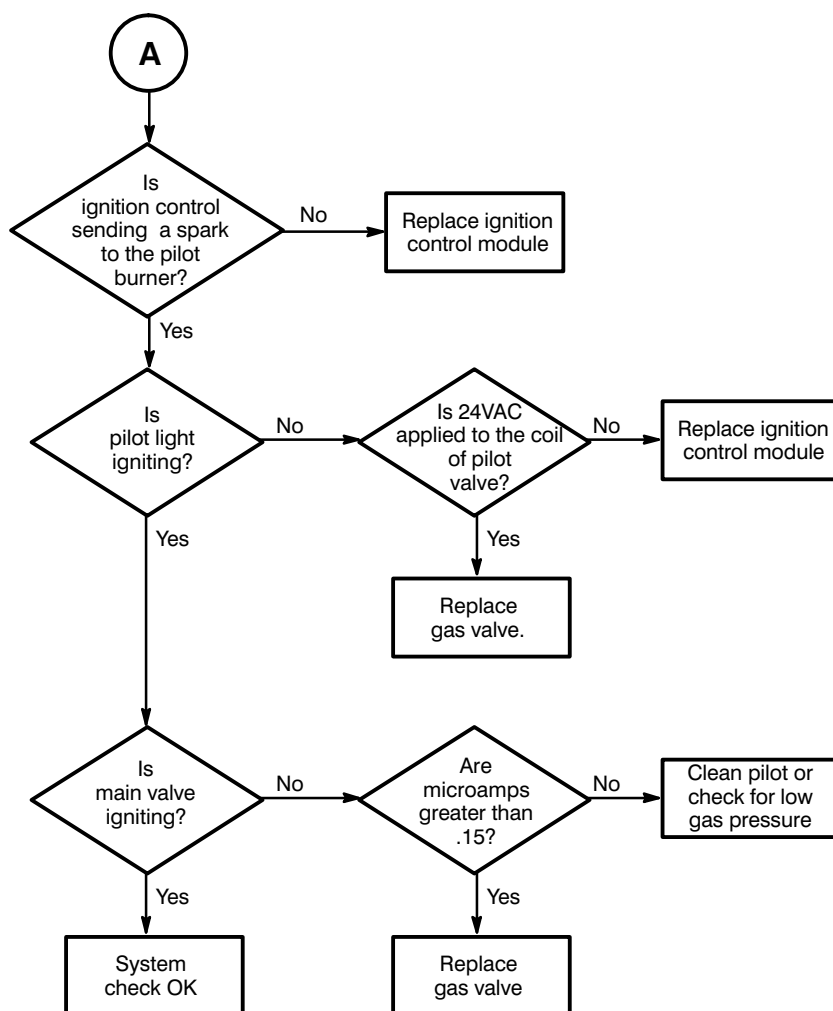


FIGURE 1

DISPLAY ERROR CODES

INTELLITOUCH

HELP the temperature setting exceeds the maximum setting of 550°F. This will be shown as an alternating **HELP** and **PROB** display.

PROB 1. Defective temperature probe.
2. Stripped insulation on probe wires.
3. Poor connection of probe terminals.
4. Probe sensing temperatures above or below the probe sensing range.

8888 an Intellitouch computer failure.

INTELLIHOLD AND INTELLIPLUS

F2 Actual oven temperature is greater than the maximum temperature setpoint

F3 Open temperature sensor

F4 Shorted temperature sensor while the control is in the cook mode.

F6 The 50/60 Hz input does not change states.

F7 Total chain timer over 24 hours

F8 The calculated EEPROM check sum is not the same as the expected check sum retrieved from the EEPROM.

BLODGETT IQ CONTROL

NOTE: The error codes will appear in the top display. All error codes are accompanied by an audible alarm.

Hi Oven temperature is more than 40°F above the highest setpoint.

Prob Probe failure at greater than 693°F.

Probe (with alarm) — shorted temperature probe.

HEAT ERR From a cool start (below 140°F), the oven takes more than 10 minutes to climb from 150-300°F.

FAN ERR Control thinks motor is not operating

FAN C ERR usually occurs when dirt or grease collects on the veins of the blower wheel causing centrifugal switch to remain closed too long.

PROBE RESISTANCE VS TEMPERATURE

Solid State Manual and Digital Controllers (probe P/N 18588)					
°F	°C	Ohms	°F	°C	Ohms
100	38	53029	310	155	1519
125	52	30785	320	160	1340
150	66	18591	330	166	1186
175	80	11633	340	171	1052
200	93	7528	350	177	936
210	99	6391	360	182	835
220	105	5471	370	188	747
230	110	4705	380	193	669
240	116	4030	390	199	601
250	121	3441	400	205	542
260	127	2967	425	219	421
270	132	2583	450	232	333
280	138	2255	475	246	265
290	143	1970	500	260	216
300	149	1728			

TABLE 1

Intellitouch II Controller (probe P/N 32289)					
°F	°C	Ohms	°F	°C	Ohms
32	0	500	212	100	693
68	20	539	250	120	730
75	24	545	300	150	787
86	30	558	356	180	842
125	50	597	392	200	879
140	60	616	450	230	934
175	80	655	500	260	989
200	93	680	554	260	1042

TABLE 2

DFG-100 and DFG-200

Intellitouch (probe P/N 20360) and Blodgett IQ Controllers (probe P/N 33074)						Intellitouch (probe P/N 20360) and Blodgett IQ Controllers (probe P/N 33074)					
°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms	°F	°C	Ohms
60	16	1059	235	113	1422	410	210	1774	460	238	1872
65	18	1067	240	116	1432	415	213	1783	465	241	1882
70	21	1080	245	118	1442	420	216	1793	470	244	1892
75	24	1090	250	121	1453	425	219	1803	475	246	1901
80	27	1099	255	124	1463	430	221	1813	480	249	1911
85	29	1112	260	127	1473	435	224	1823	485	252	1921
90	32	1122	265	130	1483	440	227	1833	490	254	1931
95	35	1133	270	132	1493	445	230	1843	495	255	1940
100	38	1143	275	135	1503	450	232	1852	500	260	1950
105	41	1153	280	138	1514	455	235	1862			
110	43	1164	290	143	1534						
115	46	1174	295	146	1544						
120	49	1185	300	149	1554						
125	52	1195	305	152	1564						
130	55	1206	310	155	1574						
135	57	1216	315	157	1584						
140	60	1226	320	160	1594						
145	63	1237	325	163	1604						
150	66	1247	330	166	1614						
155	68	1258	335	169	1624						
160	71	1268	340	171	1634						
165	74	1278	345	174	1644						
170	77	1289	350	177	1654						
175	80	1299	355	180	1664						
180	82	1309	360	182	1674						
185	85	1320	365	185	1684						
190	88	1330	370	188	1694						
200	93	1350	375	191	1704						
205	96	1361	380	193	1714						
210	99	1371	385	196	1724						
215	102	1381	390	199	1734						
220	105	1391	395	202	1744						
225	107	1402	400	205	1754						
230	110	1412	405	207	1764						

TABLE 3