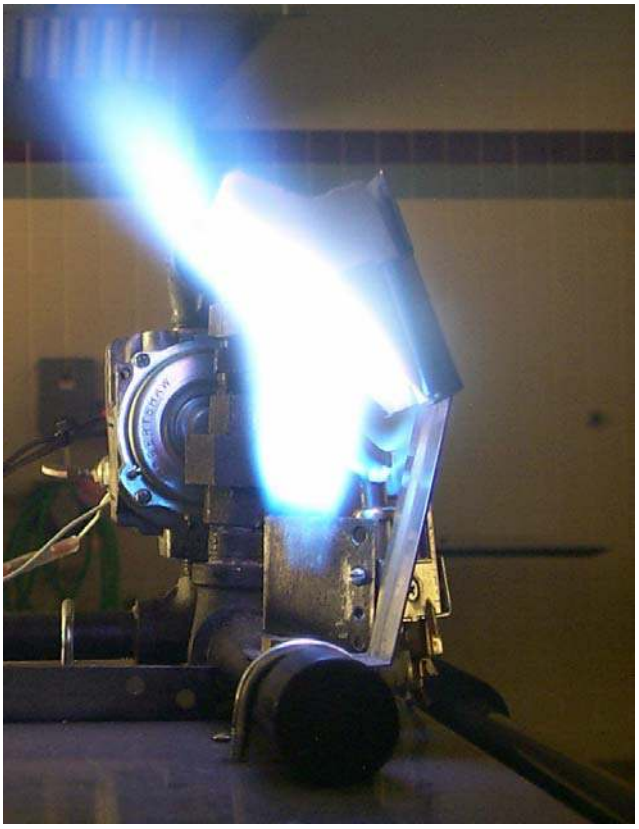
Master Jet:
Atmospheric Gas Fryers

Return to Cover

- **General Information**
- **GF14/40**
- **J1C**
- **MJ35/45**
- **MJ47**



Master Jet

Return to Chapter Cover

The Master Jet is the earliest Frymaster design. The burner heats the frypot directly, unlike the sealed burners on the high efficiency fryers. The Master Jet fryers have a distinctive sound, which prompted the name.

The open burner design includes a wide range of fryers: the economy GF series, a tabletop model, and more advanced units with computer controls, filtration and basket lifts.

Master Jet Operation

In all Master Jet fryers, the flame originates from orifices in a U-shaped manifold, which encircles the frypot. An electromechanical millivolt or 24VAC valve regulates gas flow.

GF14 thermocouple and burner.

Most Master Jet series fryers have pilot ignition systems. Only the MJ47 is available with an electronic ignition. The pilot system consists of the pilot orifice, pilot hood and a thermopile. The pilot heats the thermopile, which produces the millivolts necessary to power the control circuit and light the burner.

The millivolt output passes through a normally closed high-limit switch and energizes the gas valve pilot coil, opening the pilot valve. If the pilot is extinguished, voltage is lost in the circuit and the pilot valve closes.

If the fryer overheats, the high-limit switch opens, stopping the voltage flow to the pilot valve.

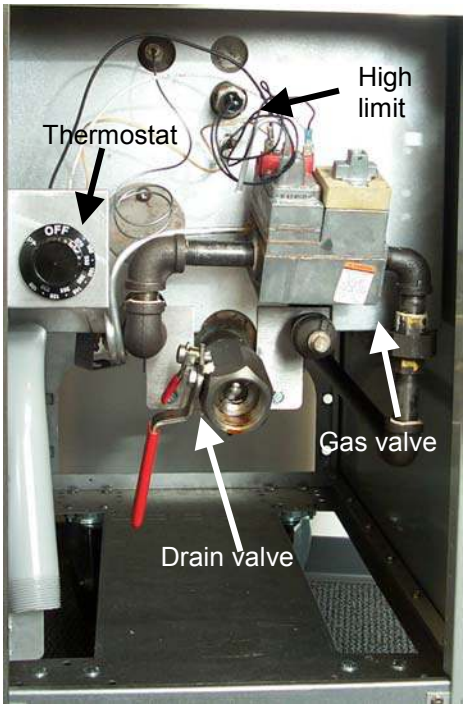
GF14/GF40

The GF14 and GF40 fryers are simple millivolt units, differentiated by the GF40's larger capacity, ceramic burner targets and two orifices for each target. There are no options. All units are thermostat controlled, without basket lifts or filtration.

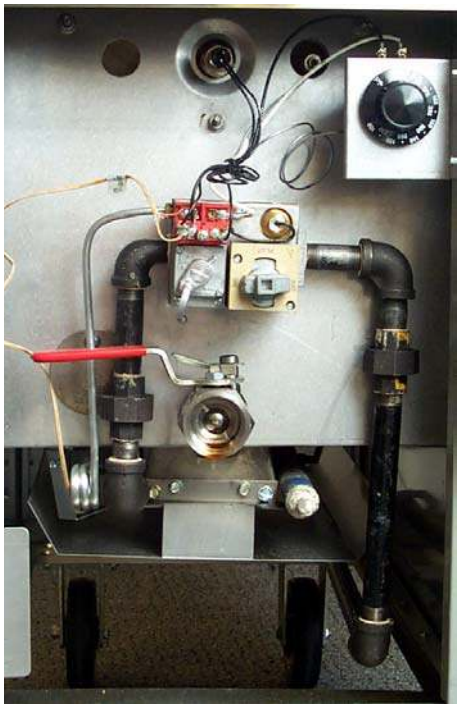
GF14/GF40		
Model	GF14	GF40
BTU	100,000	120,000
Nat Pressure	4" WC	3.5" WC
LP Pressure	10" WC	8.25" WC
Capacity	35-40 lbs	40-50 lbs

GF14.

GF40.

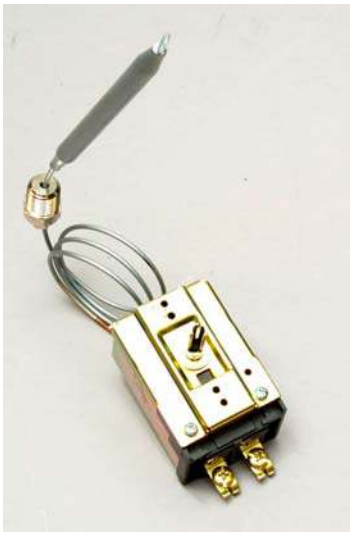


GF14 cabinet interior.



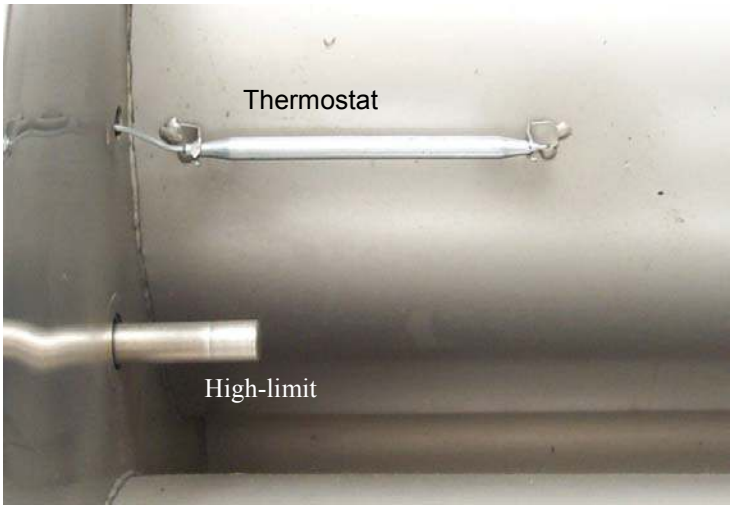
GF40 cabinet interior.

The view behind the doors of the GF14 and the GF40 is nearly identical. These fryers, except for the thermostat, have the same components as the other units in the line.

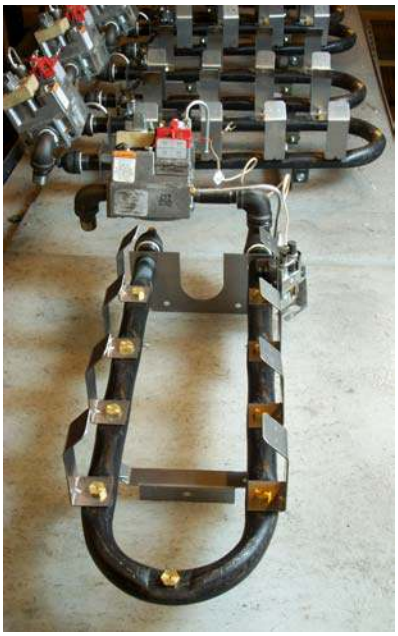


The Sunne thermostat (left and above) is used on both fryers. A setscrew in the shaft of the knob is turned to calibrate the fryer: CW decreases temperature; CCW increases temperature.

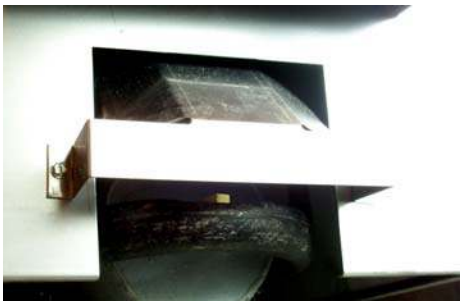
It is only accurate to within +10/-20°F.



GF14/40 frypot components.



GF14 burner with metal targets.



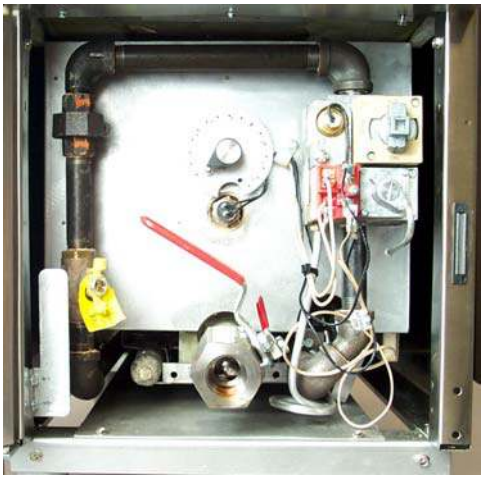
GF14 rear target.

The GF14 burner (shown above) doesn't have ceramic targets. The unit uses metal tabs over single orifices. The fryer also uses a rear target that's attached to the back of the fryer (left). The GF40 uses ceramic target over dual orifices, similar to the MJ35 burner shown on page 3-8.

J1C

The J1C is a countertop fryer similar to the MJ35 except in capacity and options. The small unit cannot be equipped with basket lifts or filtration.

JIC	
BTU	45,000
Nat. Pressure	4” WC
LP Pressure	11” WC
Capacity	15-20 lbs



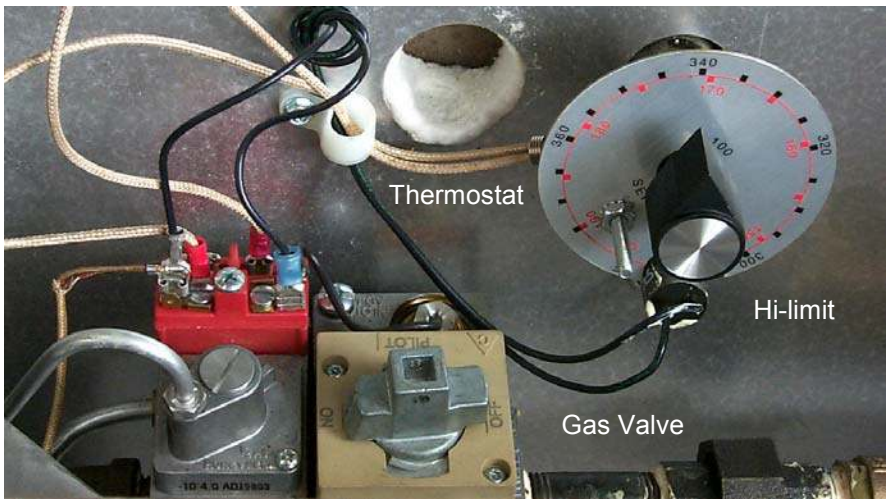
J1C cabinet interior.

J1C tabletop fryer.

MJ35

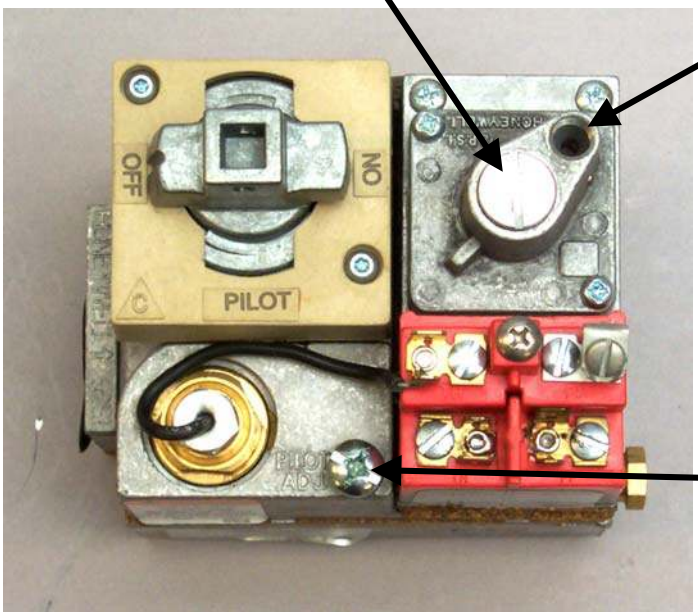
The MJ35 is a millivolt fryer. It is available with basket lifts and Filter Magic filtration. The thermostat on the unit can be mounted behind a hinged front panel or on a fixed front panel. In the latter configuration, a shaft connects the thermostat knob to the Fenwal thermostat mounted in the frypot.

MJ35	
BTU	110,000
Nat Pressure	4” WC
LP Pressure	9” WC
Capacity	35-40 lbs



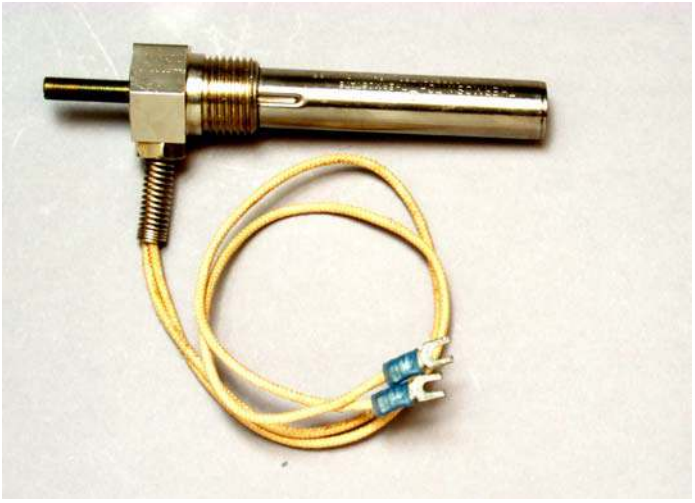
Behind the access panel of a MJ35.

Master Jet



Honeywell millivolt gas valve.

Honeywell valves (left) replaced Robertshaw units in 1992. The Honeywell valve has ½" input and outputs and can regulate pressure up to ½ PSI. The valves operate on approximately 500MV, which is produced by a pilot generator. No electrical input is needed.

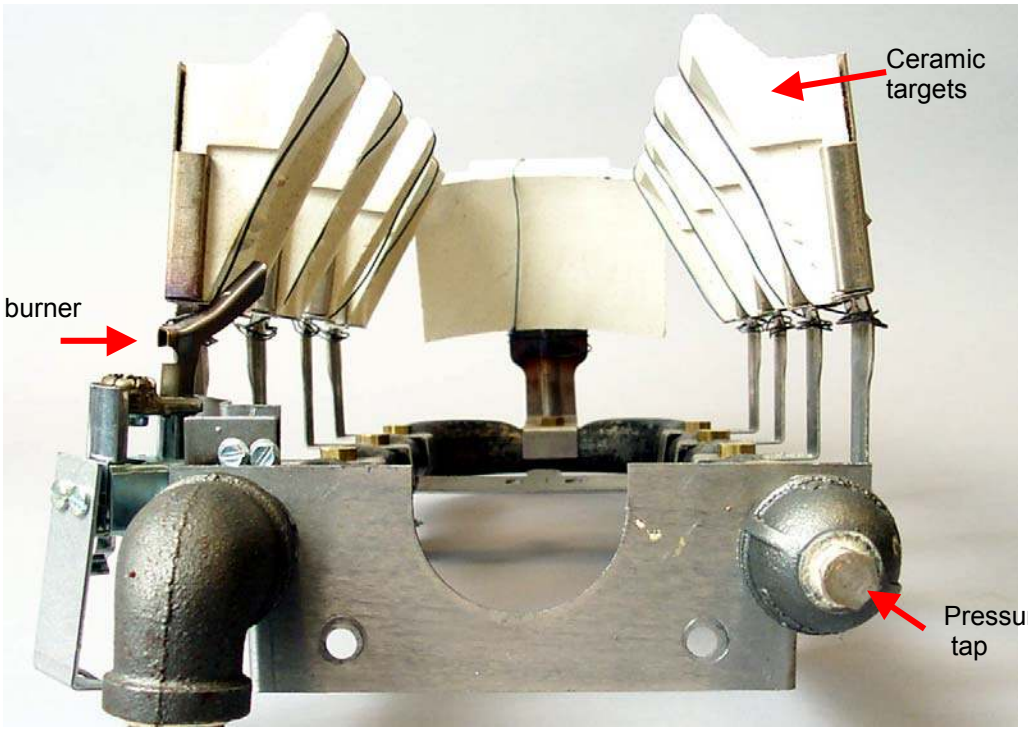


A Fenwal thermostat.

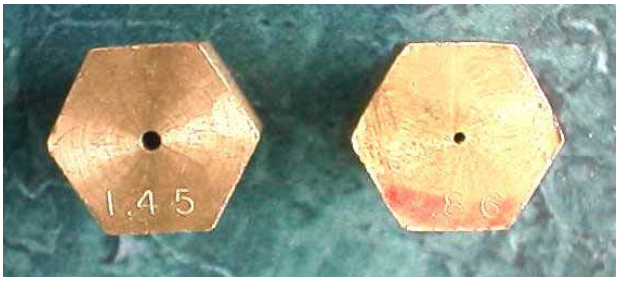
The Fenwal thermostat (left), which extends into the frypot, is sensitive to one-degree changes. It has a range of 75°F - 550°F (24°- 288°C). A full rotation of the shaft covers 140°F (60°C). Excessive rotation will damage the thermostat. Frypot size determines the length of the thermostat. The J1C and MJ35 fryers take a 3-inch thermostat; the MJ45, MJ47, MJCF and MJCFE fryers take a 4-inch thermostat.

Hi-limit for MJ35

Hi-limits (left) are heat-sensitive, normally closed switches, which open at preset temperatures, cutting voltage to the pilot coil of the gas valve. The switch will reset when the oil in the frypot drops below 350°F (176°C).



The components of a MJ35 burner assembly.



Master Jet series burner orifices

Orifices

Master Jet series fryers use flat brass burner orifices. Each is stamped with a drill size or the metric equivalent. The size of the orifice opening depends on gas type, BTU rating and elevation. Check the opening with a drill bit or gauge to ensure the proper orifice is in place.

Pilot Assembly

The pilot assembly is made up of: orifice, hood, thermopile or pilot generator and a mounting bracket. The assembly has two functions: heat the thermopile and light the burner.

The pilot flame should be 1.5” tall, blue and surround the thermopile.

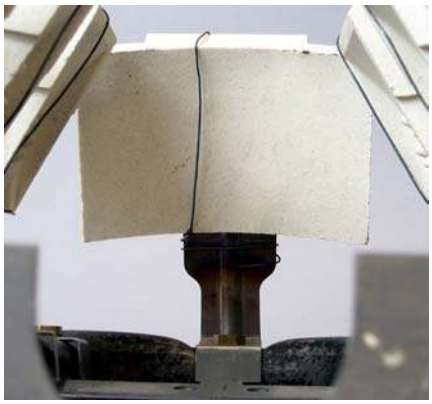
Thermopile

The thermopile (left and below) contains thin strips of dissimilar metal, which, when heated, emit a tiny amount of electricity. This one is rated at 750mV. Because there is so little electricity in the circuit, any additional resistance, such as a wire nut, can cause problems. **Do not use wire nuts in a millivolt circuit.**

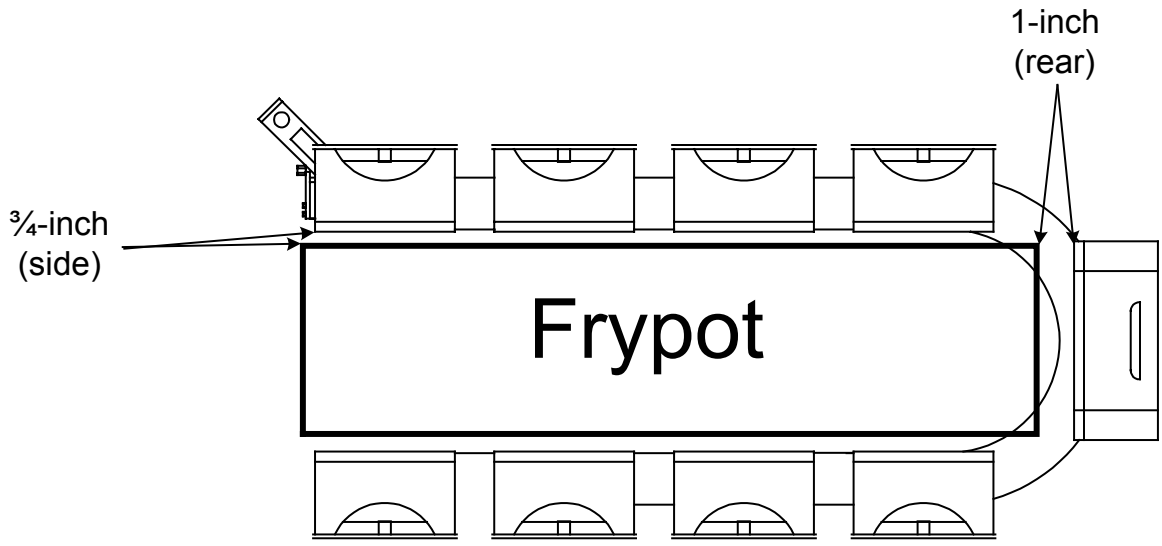
500mV: Open circuit (Not connected to valve)
200mV: Closed circuit (Connected to valve)

Targets/Deflectors

Targets on Master Jet fryers, with the exception of the GF14, consist of a metal bracket and a ceramic target. The burner orifice holds the bracket/target assembly in place. Placement is critical. Rear targets require 1-inch clearance from the frypot, and side targets require ¾-inch clearance.



A rear target on a MJ35 burner assembly.



Alignment is critical to the proper function of the target assemblies. Improperly aligned targets can cause the following:

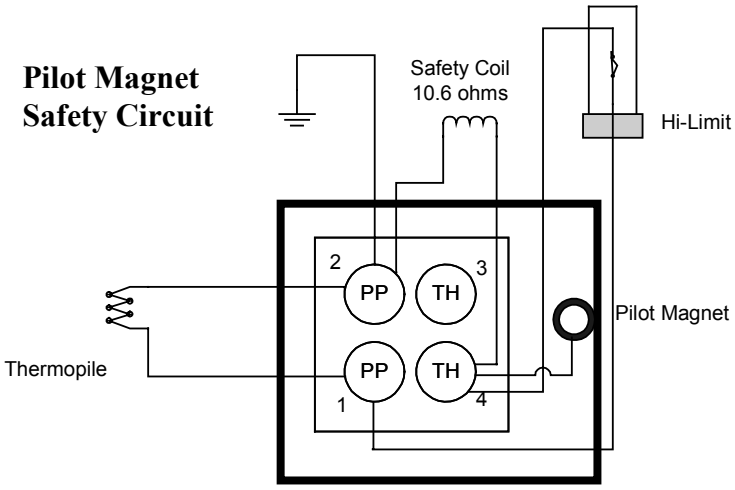
- Delayed ignition
- Improper combustion mixture
- Reduced efficiency

Gas Pressure

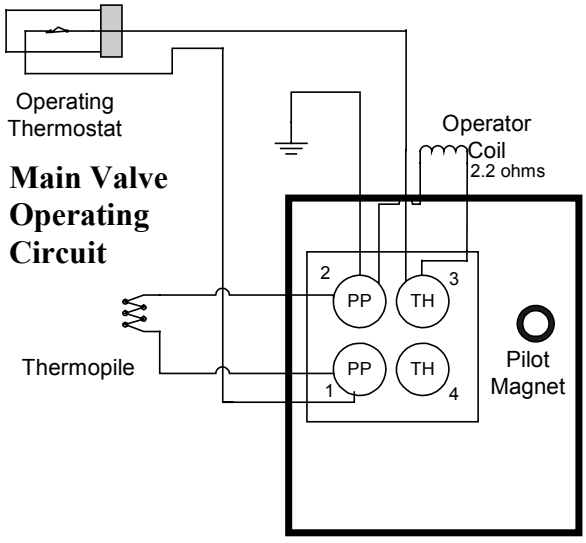
An inspection of the burner can reveal gas pressure problems. The burner flame should ride two inches above the orifice and exhibit a rich blue color. Altitude and gas type affect gas pressure.

Flame rides two inches above the orifice in this picture taken on a demonstration cart.

Millivolt Schematics



Minimum millivolts to energize coil: 164mV.



Minimum millivolts to energize coil: 158mV

Millivolt Fryer Troubleshooting

Millivolt fryers are simple by design, which is one of the advantages. The other obvious advantage is no need for external power.

The most common problem on these fryers is pilot outages. This can be caused by several things and is commonly intermittent, which always makes troubleshooting difficult. When troubleshooting an intermittent problem, it's very important to simulate the conditions in which the fryer failed, i.e. have all the equipment running that shares the troubled fryer's gas source.

Two tests need to be performed: a gas pressure check and a millivolt check.

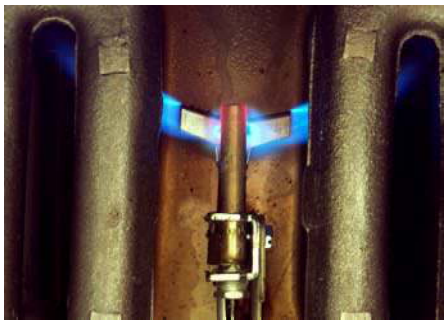
A manometer is shown hooked to a fryer. The gas pressure of a troubled fryer should be checked with all gas equipment that shares its line on and operating.

Gas Pressure

Perform a gas pressure check by hooking a manometer to the fryer. Turn on all the gas equipment that shares the faulty fryer's gas source. Compare the manometer reading, taken at the troubled fryer, to the pressure listed on the data plate. Also, verify that the gas type on the data plate matches the gas the fryer is hooked to. Millivolt fryers are often converted from one gas type to another

Millivolt output

Measure the voltage from the pilot generator or thermopile. Unhook the thermopile from the gas valve and hook those leads to your meter. Turn the gas valve knob to the pilot position and push down and light the pilot. Once the pilot has been lit for at least one minute, check your millivolt reading. Frymaster and Dean fryers require 500mV to operate this circuit. If you do not get 500mV, try adjusting the pilot flame to completely surround the thermopile. If you still do not get 500mv, replace the thermopile.



A thermopile's ability to produce current to power the millivolt circuit is directly related to the quality of the flame striking the thermopile. The head of the thermopile should be engulfed in flame.

If you get 500mv from the thermopile, turn the pilot off and reconnect the thermopile to the gas valve, making sure you have clean, tight connections. After one minute, re-light the pilot. Let the knob go and the pilot should stay lit. If not, disconnect the high-limit and check its resistance. If you read more than 2 ohms or open, install a jumper wire (**FOR TESTING ONLY**) and re-light the pilot. If the pilot stays lit, replace the high-limit. If you read less than 2 ohms, disconnect the high-limit and install jumper wire. Attempt to re-light the pilot. If it fails to stay lit, change gas valve.

With the pilot lit, read voltage across the thermopile, which is connected to the gas valve. You should read 200mv, which is a Frymaster and Dean requirement. If you cannot achieve 200mv, check the resistance of the pilot coil on the gas valve. It should be 10.6Ω ±10 percent. If not, change the gas valve. Once you achieve 200mv, turn the gas valve knob to "ON". If the pilot goes out, disconnect the thermostat and measure resistance. If you read more than 2 ohms, re-light the pilot. Turn the valve knob to "ON". Disconnect thermostat and install a jumper wire. If the burners come on, replace the thermostat. If the resistance is less than 2 ohms, install jumper in place of the thermostat. If the fryer fails to light, replace the gas valve.

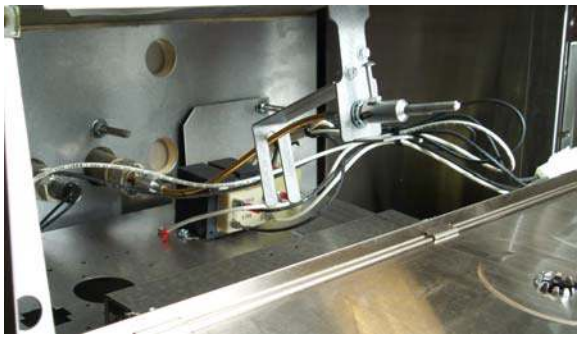
NOTE: Never leave a fryer with a jumper wire installed. Use jumper wires for test purposes only.

A thermopile with good flame exposure can produce over 1000 millivolts. The thermopile circuit in a Dean or Frymaster fryer requires a minimum of 500 mV.

MJCF

MJCF	
BTU	150,000
Nat Pressure	3.5” WC
LP Pressure	10” WC
Capacity	70-80 lbs.

The MJCF is a large capacity fryer used principally for heavily breaded items such as chicken and fish. The MJCFE model uses a 120/24V (220-240/24V export) control system to accommodate accessories such as melt cycle control. The MJCFEC uses the same power system controlled by a CMIII computer. The unit is also available with a Filter Magic system.



The flexible shaft is visible on a thermostat controlled MJCF with the front panel dropped.

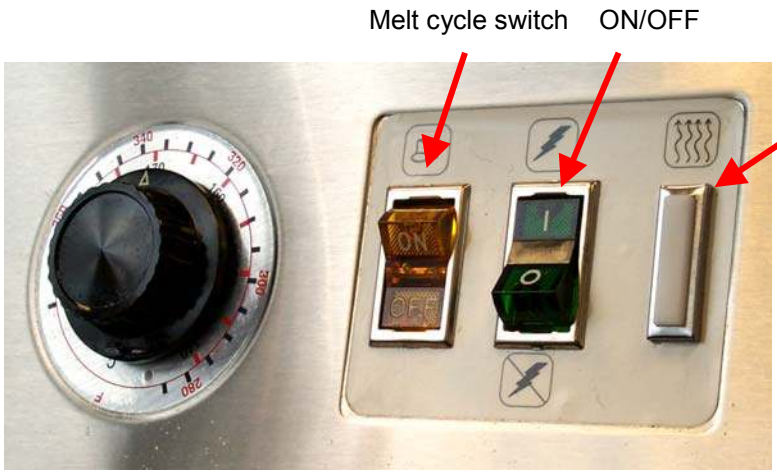
Cabinet interior of MJCFE.

MJ45

FPPH245ECSD.

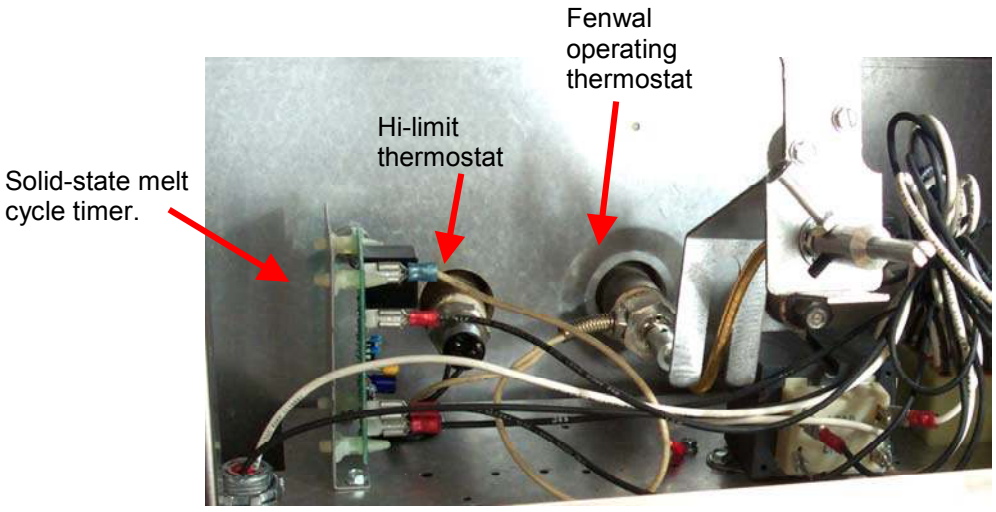
Options for the MJ45 include basket lifts, computer control, melt-cycle timer and Filter Magic.

MJ45	
BTU	122,000
Nat Pressure	3.5” WC
LP Pressure	8.25” WC
Capacity	40-50 lbs.



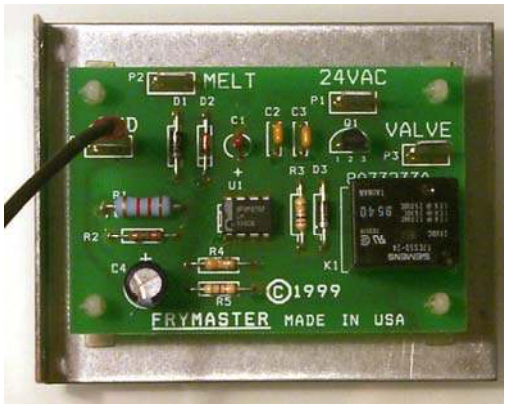
The melt cycle control panel on the MJ45.

ON/OFF switch	Provides 24VAC through the thermostat to the main coil of the gas valve.
Heat indicator light	Illuminates when the thermostat's contacts close and the burner assembly lights.
Melt cycle	In the ON position, the fryer stays in the melt cycle: 3 seconds on/24 seconds off, until the switch is turned off. The oil temperature has no effect on the melt cycle mode.

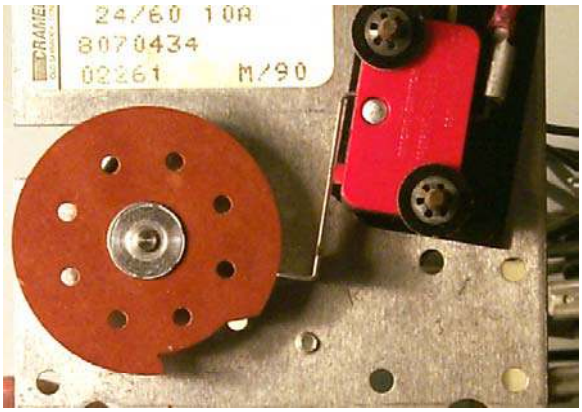


Control box interior of an MJ45 fryer.

Melt Cycle Timers



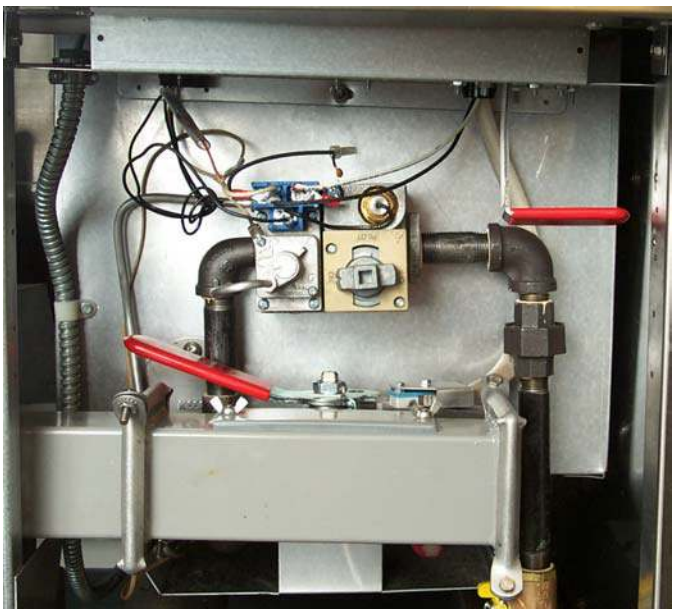
Solid-state board.



Mechanical timer.

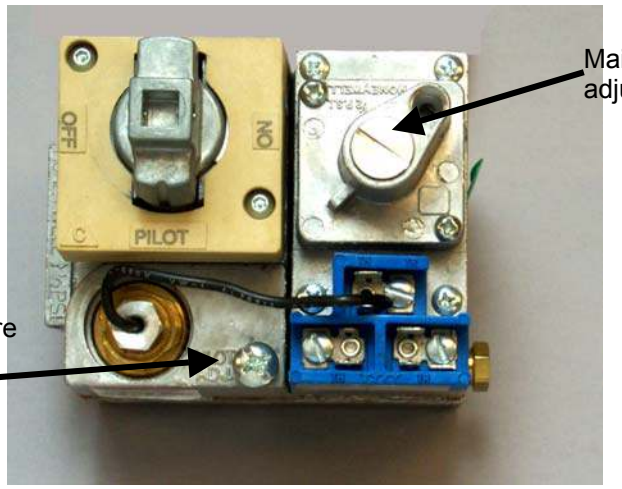
Solid-state melt-cycle boards were introduced in 1998, replacing mechanical timers, which are no longer available. The new timer is a direct replacement and is available in a kit, which includes a mounting plate, relevant wires and instructions.

When the melt cycle switch is thrown, the 24VAC is switched on and off by a relay on the solid-state board. This relay is in series with the thermostat. The board turns the burners on for 3 seconds and off for 24 seconds until the switch is turned off.

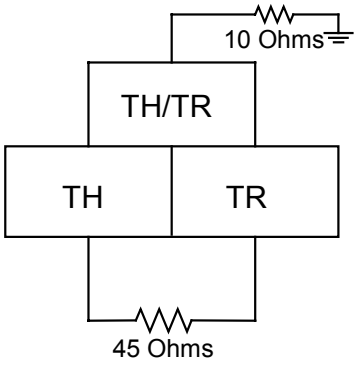


Cabinet interior of Filter Magic equipped 45 series fryer.

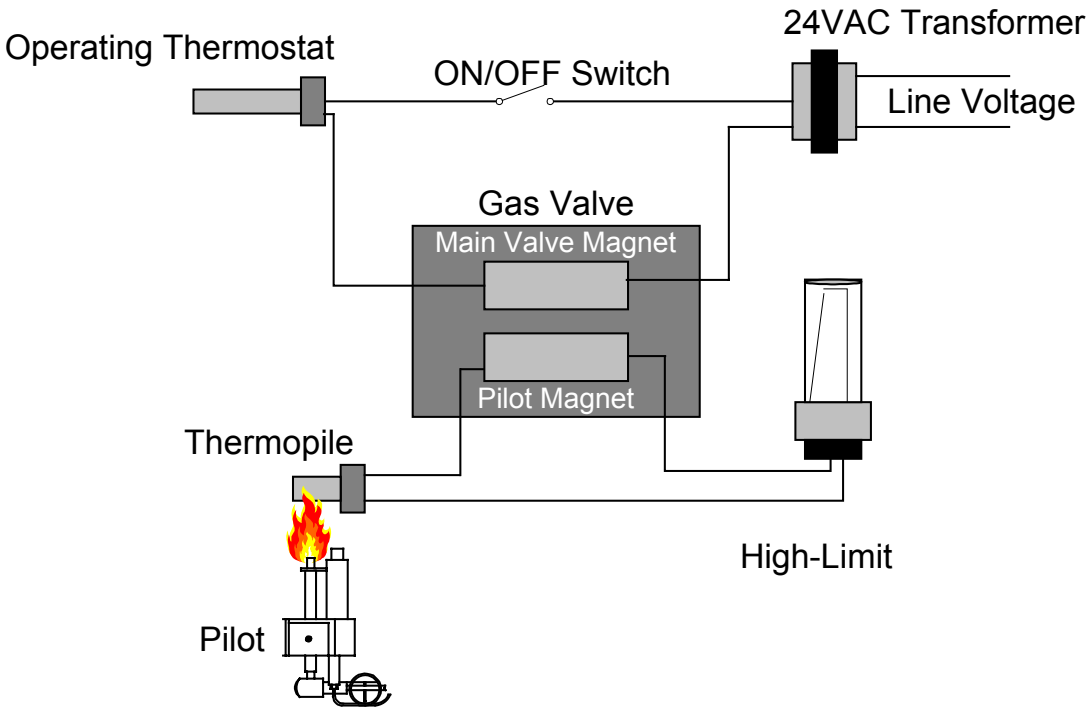
Master Jet



A Honeywell gas valve used on the MJ45.

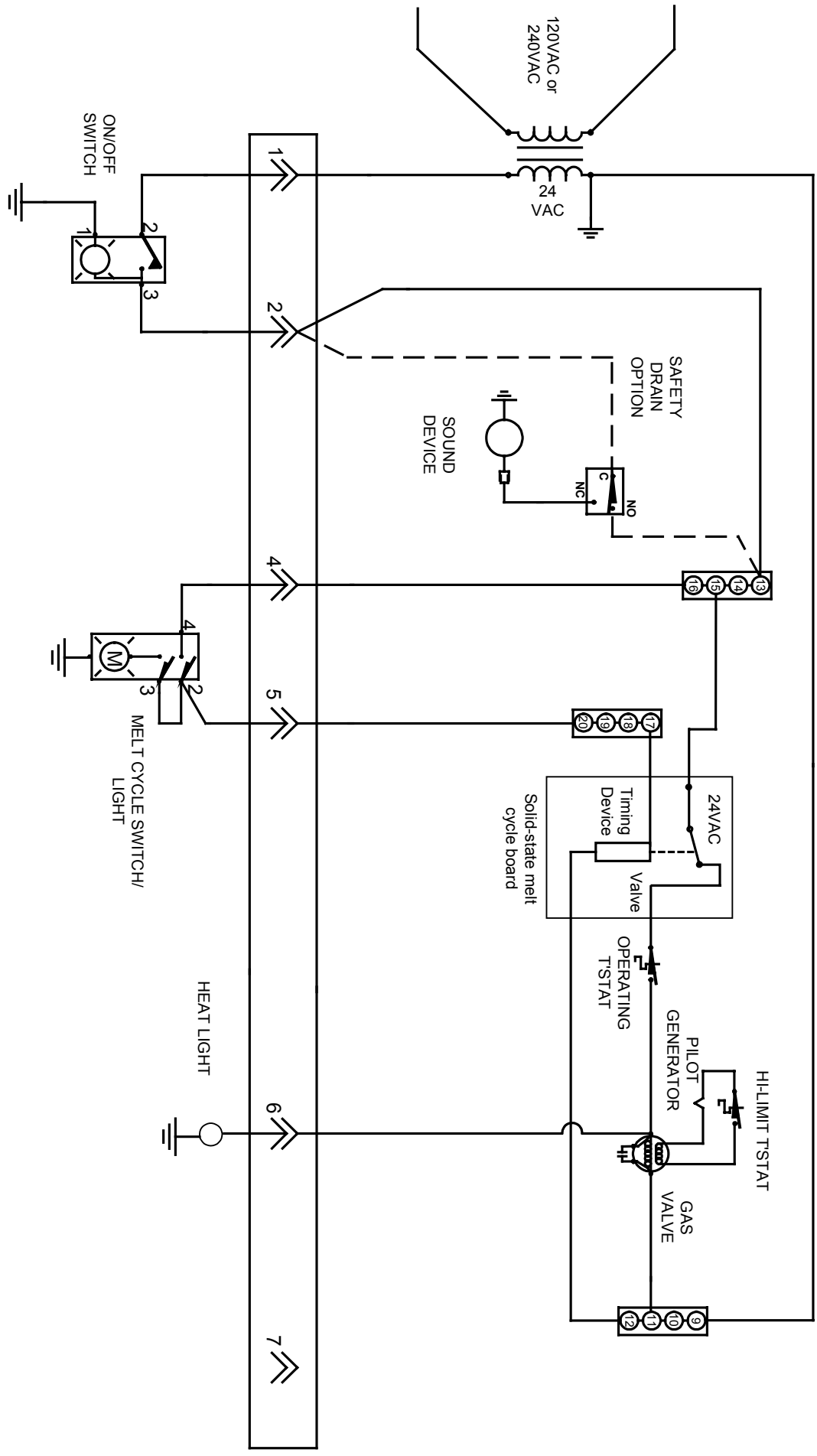


Valve schematic

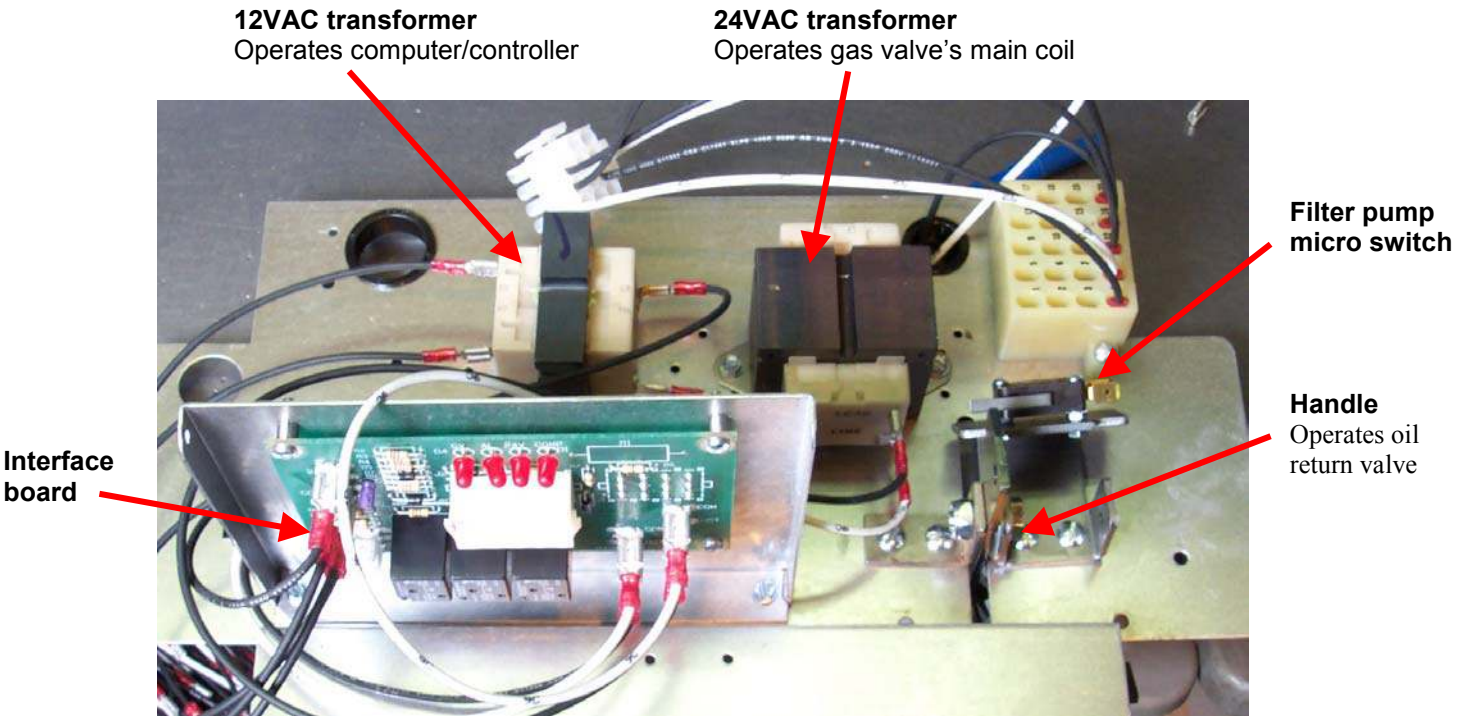


The Honeywell valve used in the MJ45 fryer operates off two voltages. The pilot coil is controlled by millivolts generated by the thermopile. The main coil operates off of 24VAC, which is controlled by the thermostat.

Master Jet



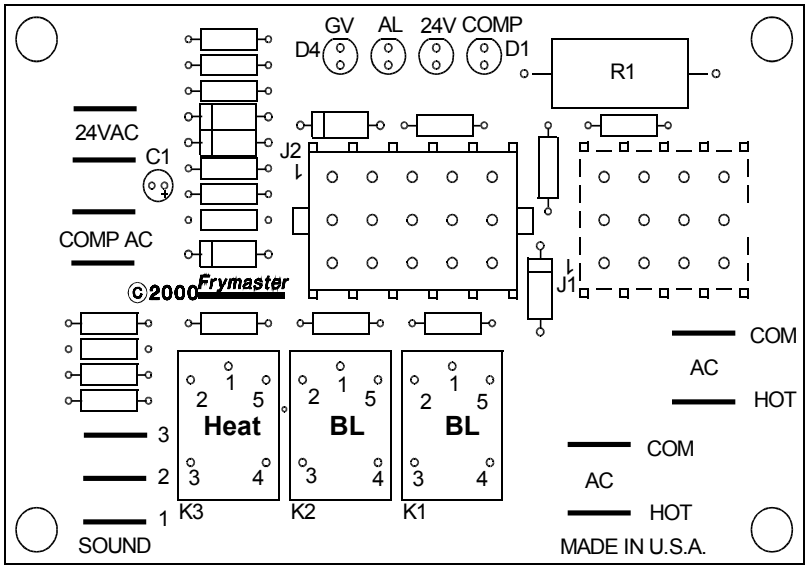
Master Jet Melt Cycle Circuit

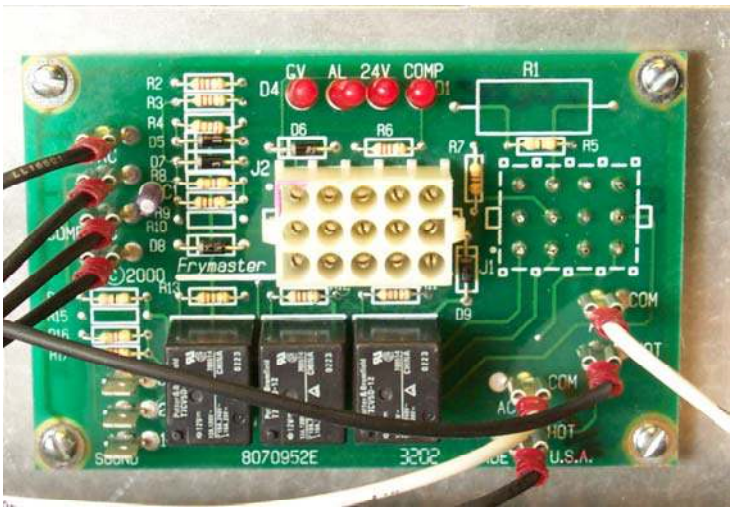


Key components in the controller box on the FM45EC.

MJ45 Interface Board

The interface board provides the link between the controller/computer and the fryer's individual components without requiring excessive wiring, and allows the controller to execute commands from a central point.





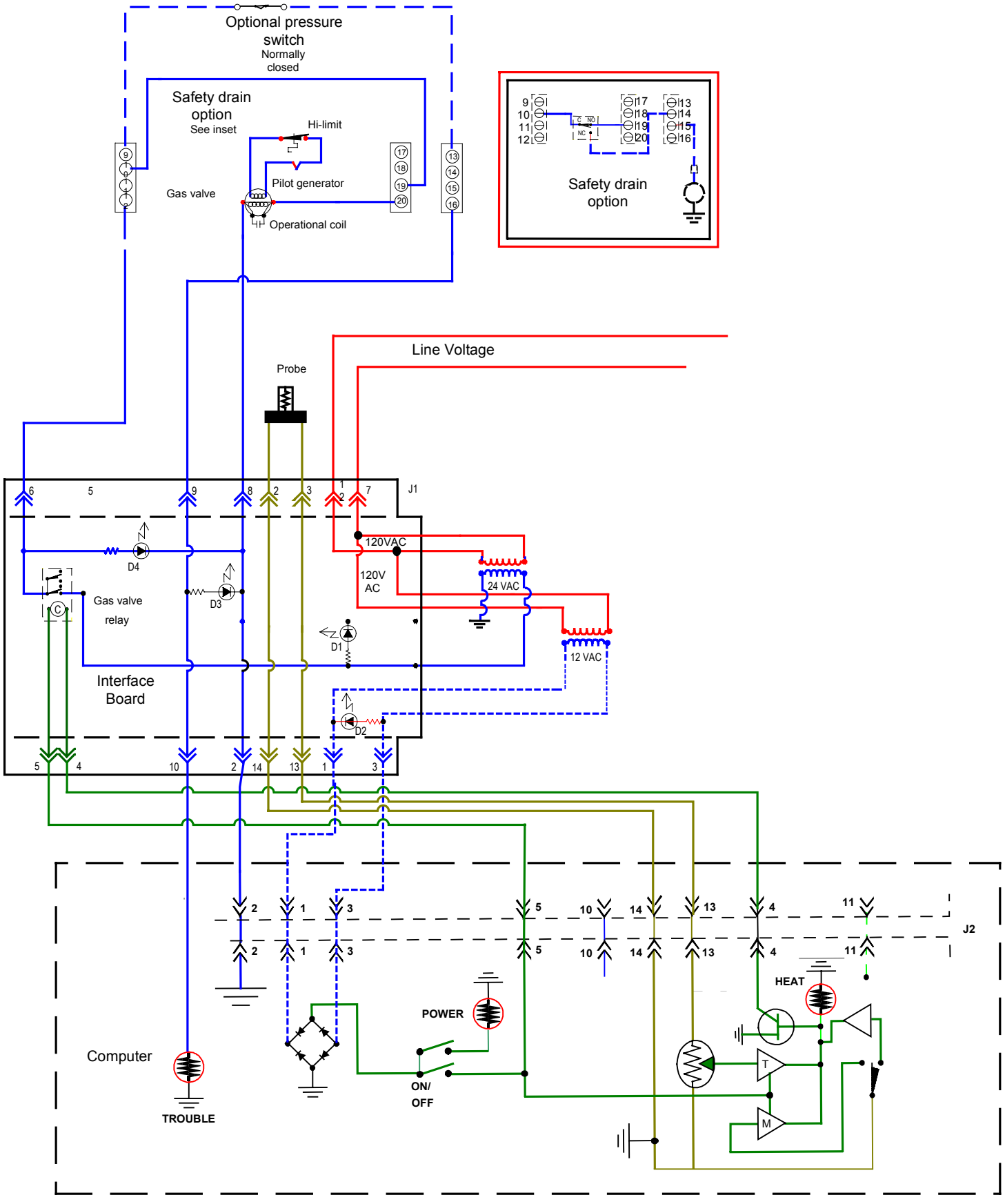
Lights across the top of the board and test points on the right side provide diagnostic tools for troubleshooting the fryer.

Diagnostic Lights on 45 Interface Board	
Light	**Indication**
GV	24 VAC to gas valve
AL	Used if pressure switch is installed
24V	24VAC from transformer
COMP	12VAC to computer

Diagnostic Test Points			
Test	**Meter Setting**	**Pins**	**Results**
12VAC to controller	50VAC	1-3 of J2	12-18
24VAC power	50VAC	24VAC terminals	22-28
24VAC to valve	50VAC	6 and ground on J1	22-28
120VAC power	250VAC	7-12 of J1	110-125
Probe resistance*	RX1000 ohms	2-3 of J1	**

* Disconnect 15-pin harness from controller before testing probe circuit; **see probe resistance chart for readings.

MJ45 with interface board

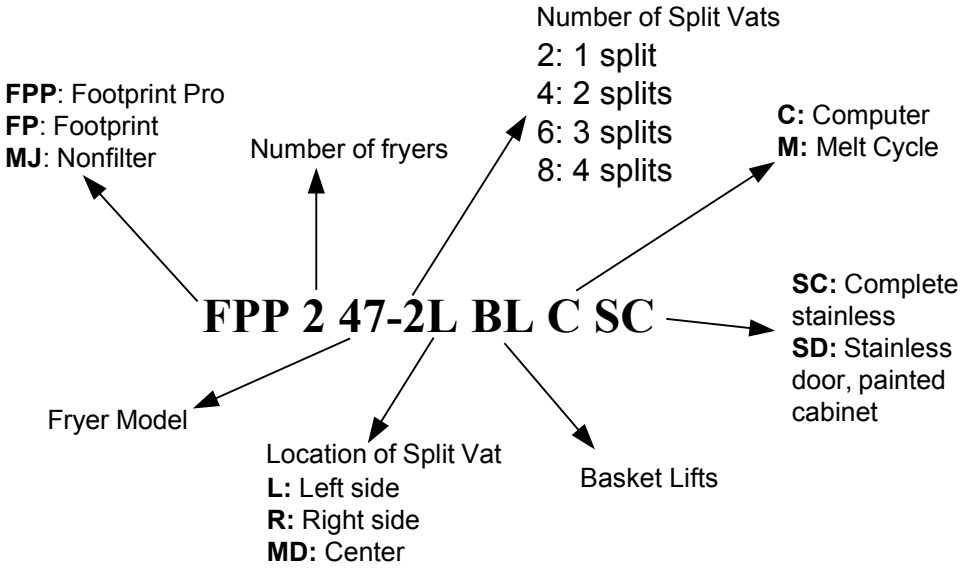


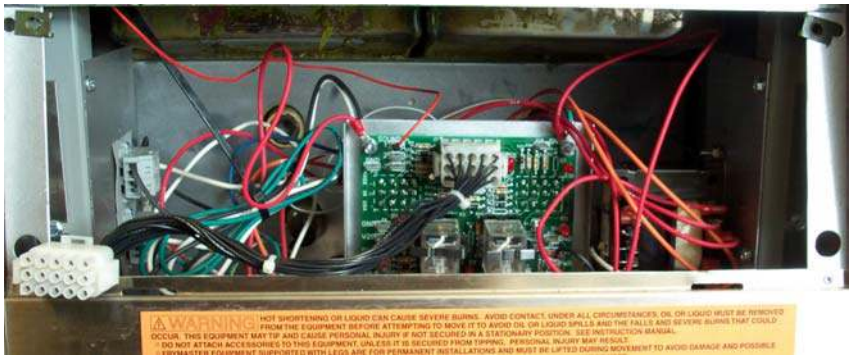
MJ47

FP247-2RECSC.

The MJ47 offers the most options in the open burner fryers. The unit is available in full or split-pot configurations with electronic ignition or a standing pilot. The Footprint is the only filter option.

MJ47		
Cap./Input/Output	**Full**	**Split**
BTU	122,000	63,500
Nat. Pressure	3.5	3.5
LP Pressure	8.25	8.25
Capacity	40-50 lbs	25 lbs



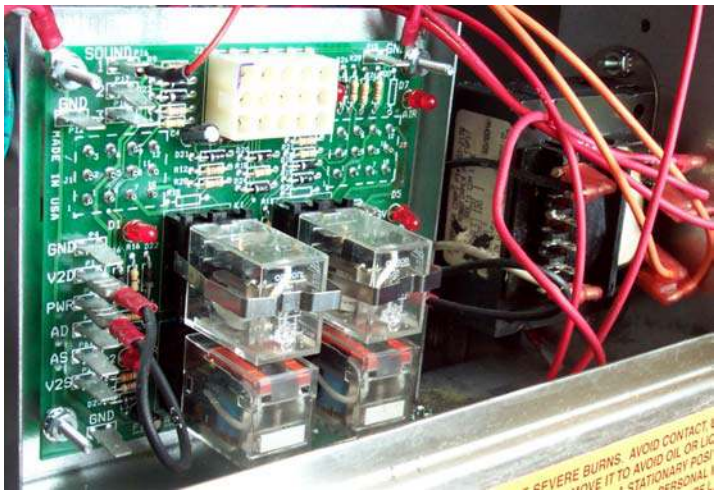


The control box on a computer -controlled 47 with standing pilot ignition system.

Removing two screws from the computer bezel reveals the control box, which contains the interface board and transformers.

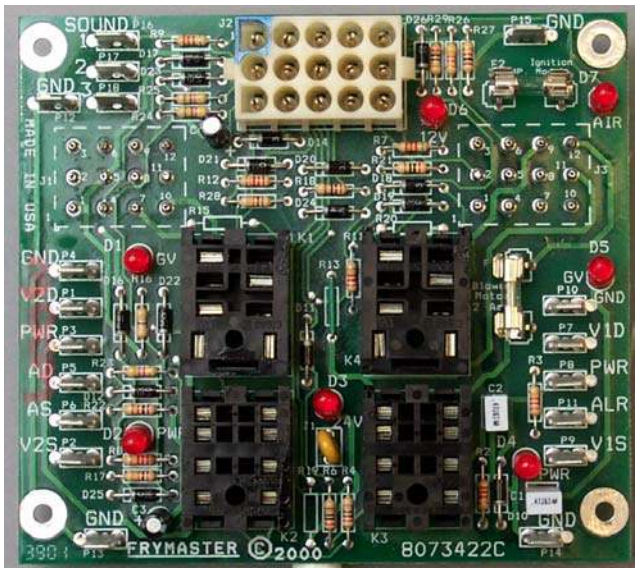
The control box at left is in a fryer with a standing pilot and configured for split pots and basket lifts.

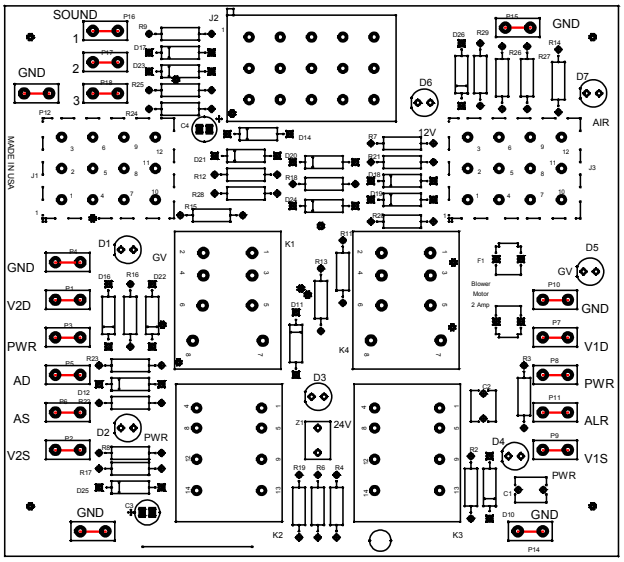
A high efficiency interface board is used on MJ47s with standing pilots.



The interface board on a computer-equipped 47 configured for basket lifts and split pots: MJ47-2EBLC.

Interface Board

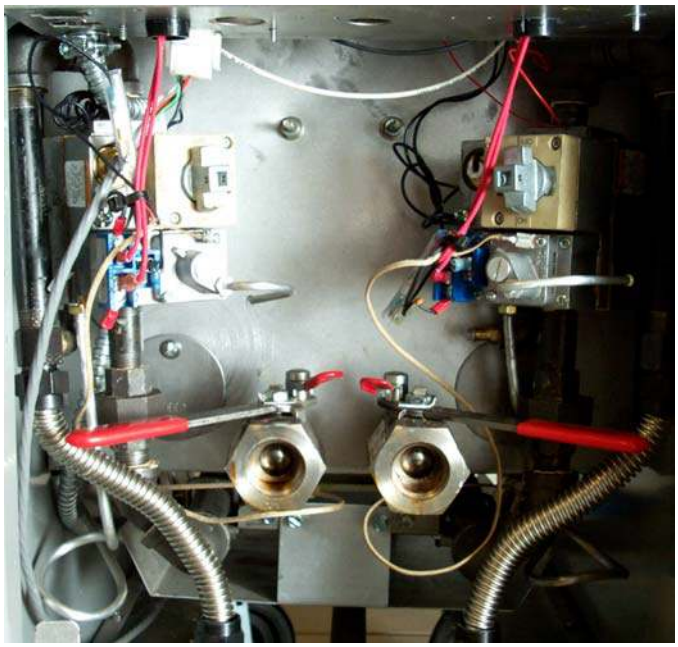




Interface Board LED Diagnostic Lights	
LED	**Indication**
6	12VAC to computer
3	24VAC from transformer
4	24VAC from K3 relay
5	24VAC from drain switch

Frequently Used Test Points for Interface Board			
Test	**Meter Setting**	**Pins**	**Results**
12VAC to controller	50VAC	1-3 of JC	12 18
24VAC to interface board	50VAC	8 or J3 to gnd.	22-28
24VAC to gas valve	50VAC	9 of J3 to gnd.	22-28
Probe resistance	Rx1000 ohms	2-6 of J3*	**

* Disconnect 15-pin harness prior to this test; **use probe resistance chart.

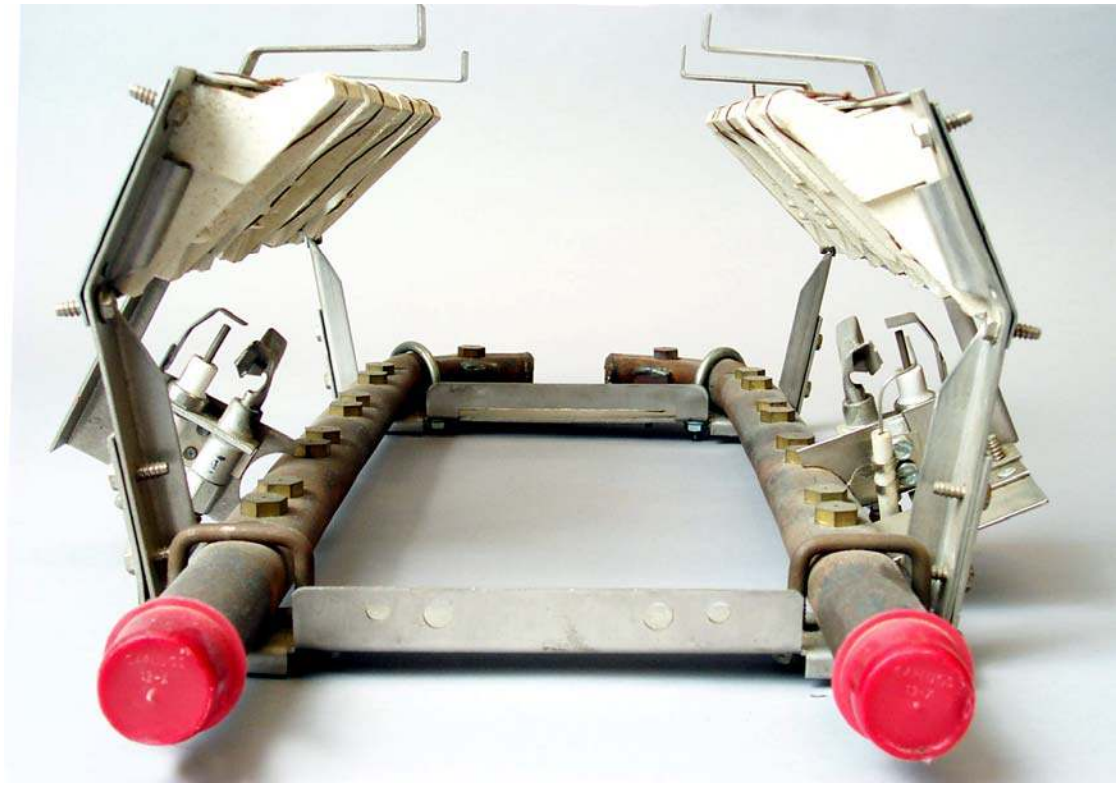


Cabinet interior view of a 47-series fryer.

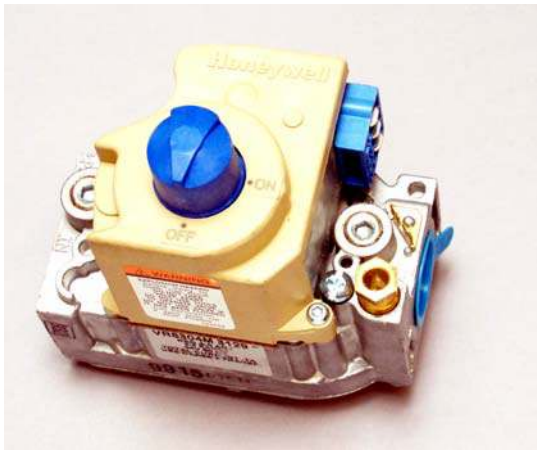
Two 24-volt valves are visible (left) in the cabinet of this 47-series fryer, indicating it is a split pot. Standing-pilot equipped 47s use the same valve as the 45-series fryer. A schematic for this valve is in the MJ45 section on page 3-16.

The 47-series burner (below) incorporates standoffs (seen above targets) to align and position the ceramic targets around the frypot. The rear target (not shown) is mounted on the fryer frame. There is no adjustment on the rear target.

The burner also features J-shaped manifolds, which allow it to work in a split-pot configuration.

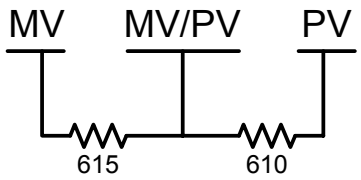


A 47-series burner with electronic ignition installed. Note the standoffs above the ceramic flame targets.



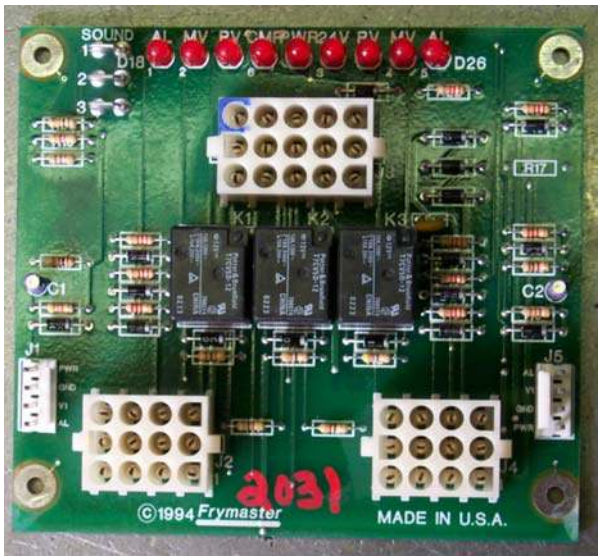
This 24-volt Honeywell valve is used on 47-series fryers with electronic ignition.

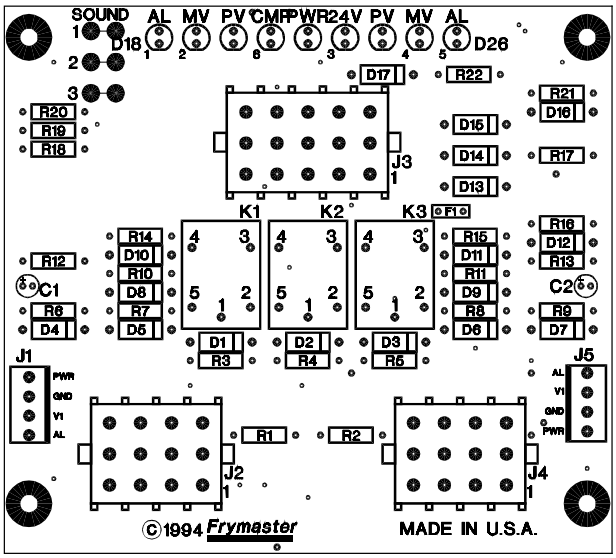
The Honeywell valve used in the electronic ignition-equipped 47-series fryers must sense a pilot before allowing the main valve to open. A schematic of the valve and the resistive values of the coils is shown below. Set meter to diode scale to measure resistance in valve.



Controller box for 47-series fryer with electronic ignition.

The 47-series controller box (shown above) is configured for electronic ignition. The ignition module is connected to an ignition assembly, which replaces the pilot assembly. An electronic spark lights the pilot, and a flame sensor verifies the presence of the pilot flame by measuring a flow of microamps through the flame. If the pilot fails to light or is extinguished, current to the module is cut, preventing the main valve from opening.





The interface board provides a link between the controller/computer and the fryer's components without requiring excessive wiring and allows the controller to execute commands from a central point.

The electronic-ignition interface board contains two types of relays. Heat relays, K1, K3, operate at 12VDC output from the controller. They switch 24VAC to the main gas valve when the unit calls for heat. The K2 relay in the middle of the board switches 24VAC to the pilot circuit of the valve when the unit is powered up, which allows the pilot to remain continuously lit.

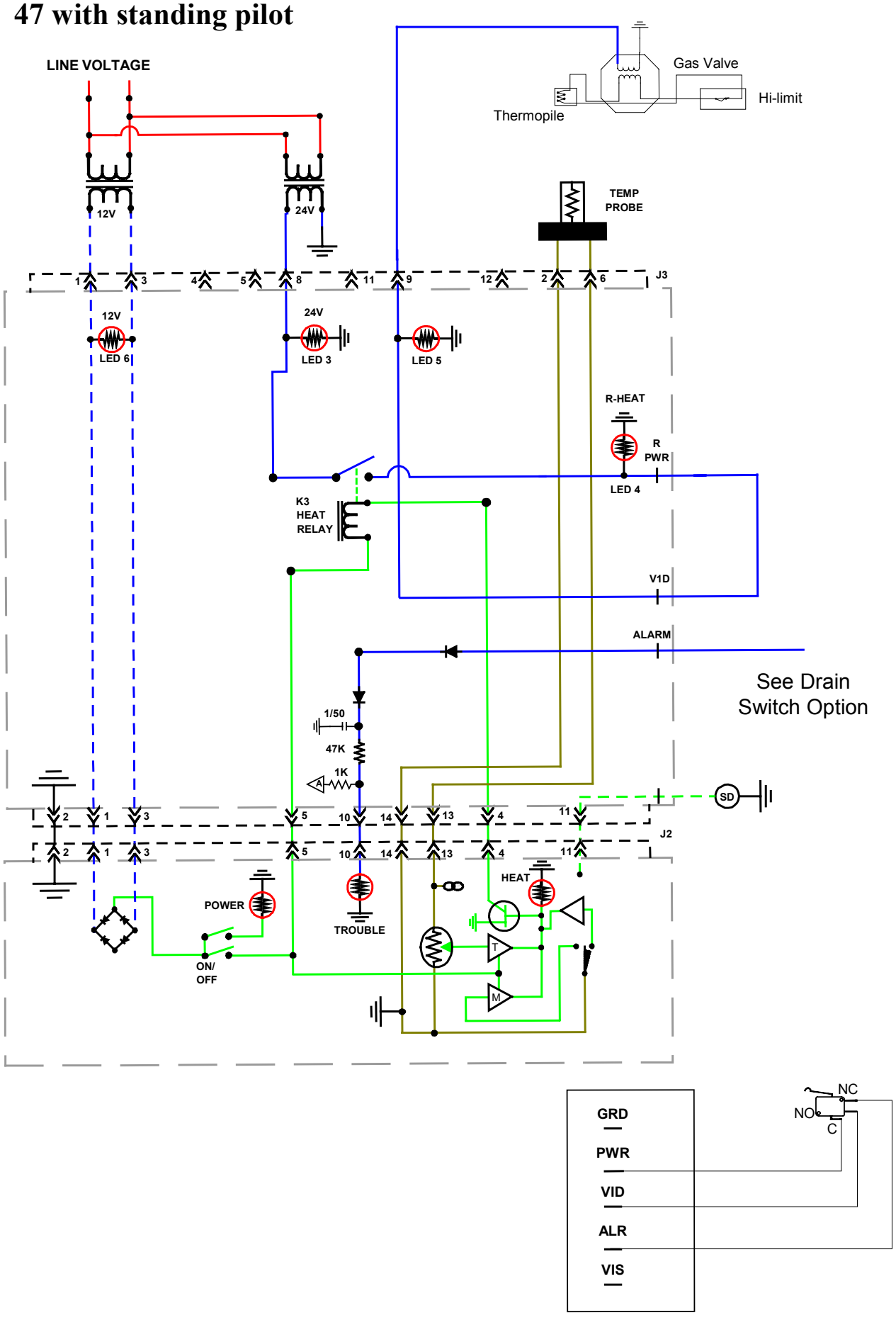
Interface Board LED Diagnostic Lights	
LED	**Indication**
AL	Power module lockout
MV	24VAC to main gas valve
PV	24VAC to pilot valve
CMP	12VAC from transformer
24V	24VAC from transformer
PWR	24VAC to ignition module

Frequently Used Test Points for Interface Board			
Test	**Meter Setting**	**Pins**	**Results**
12VAC to controller	50VAC	1-3 of J4	12-18
24VAC to module	50VAC	4 of J5 and gnd	22-28
24VAC to hi-limit	50VAC	12 of J4 and gnd	22-28
24VAC to main valve	50VAC	8 of J4 and gnd	22-28
Hi-limit continuity	Rx1 ohm	12 of J4 and N.O. micro switch	0
Probe resistance	Rx1000 ohms	10 and 11 of J4*	**

* Disconnect 15-pin harness prior to this test; **use probe resistance chart.

Master Jet

47 with standing pilot



Master Jet

47 with electronic ignition