© FLEX A FLAME CONVERSION PRESSURE JET BURNER ©

SERVICE AND FAULT FINDING

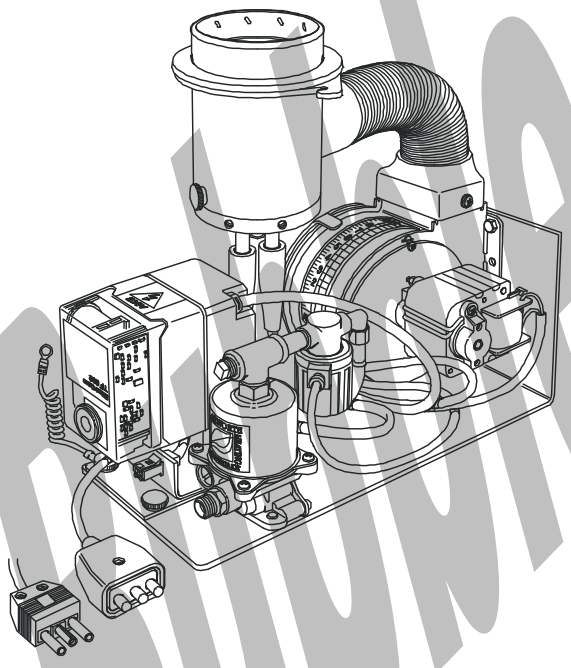
F2 ISSUE 4 @ 01-03-04

1. Introduction

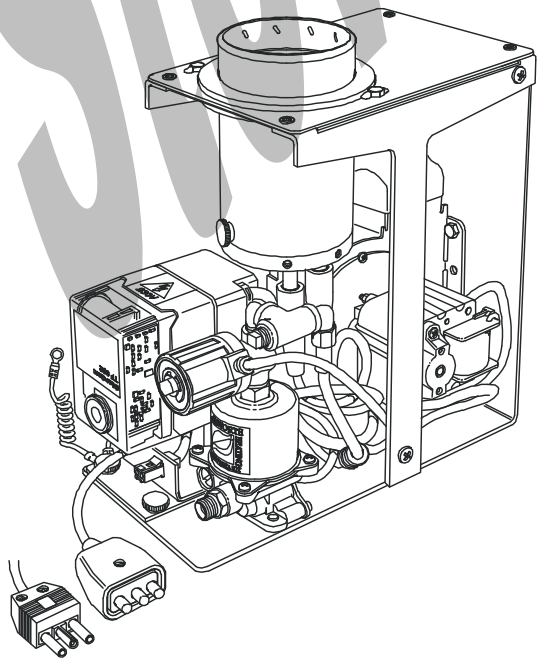
The burner used on our automatic conversions is a lightweight, 230volt a.c. pressure jet powered by a solenoid type fuel pump.
Because all cookers are not installed in the same way, the burner may have to be set up to suit each different installation.
The burners are set up at the factory to suit the appliance to be converted, generally we fit .4 US gal nozzles and adjust burner output via the pump pressure.
When setting the burner up we make the assumption that the appliance to be converted has been correctly installed to the maker's specifications.
If the appliance has not been correctly installed the burner may well need to be adjusted on site to suit the individual situation.
For conversions, it is supplied in two types each using the same modular components housed in different ways.
All the function controls of the burners can be easily accessed and adjusted from the front.

2. Burner Types

MINI BASE BURNER



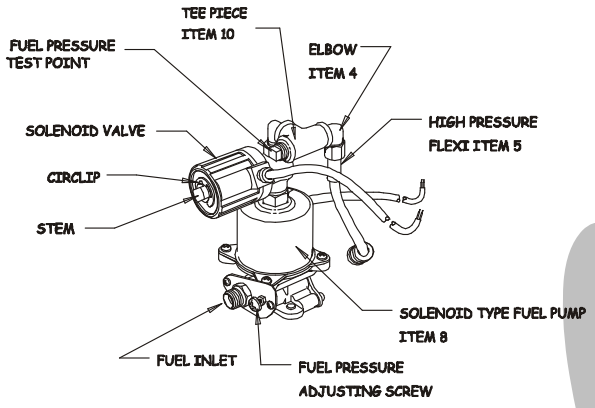
VM BURNER



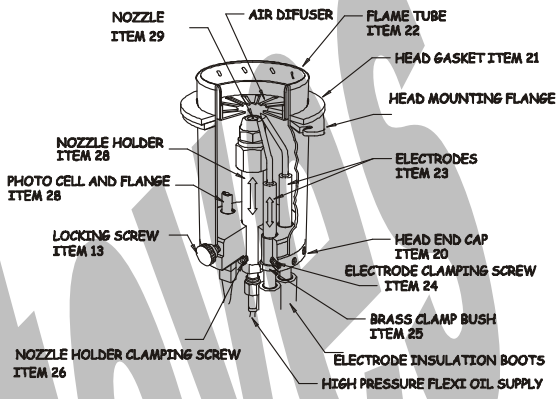
For other applications it can be custom configured to suit hence the name Flex a Flame.
The burner in its basic set up will operate on positive head oil installations only.
For negative head installations a lift pump will be required. (Sales desk have these available)

Both burners use the same basic separate modules –:

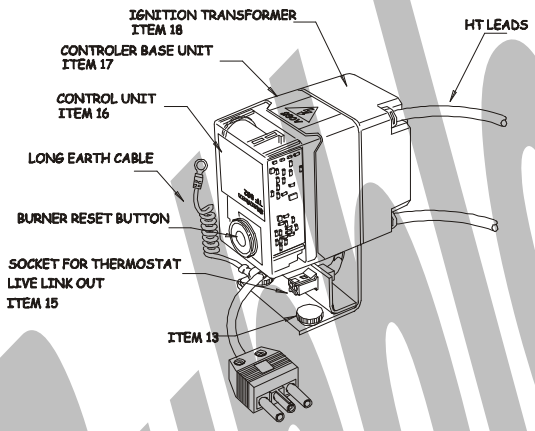
PUMP MODULE FIG 1



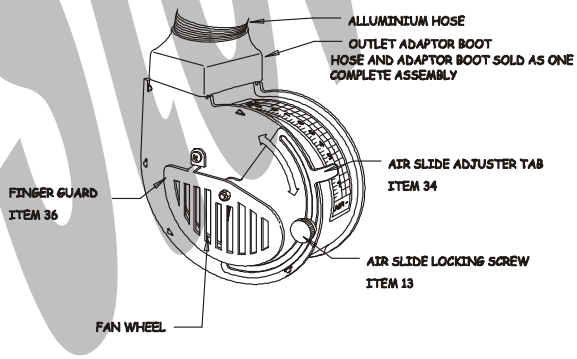
F2 HEAD ASSEMBLY FIG 3



CONTROL MODULE FIG 4



F2 FAN ASSEMBLY FIG 2



2. Principle of Operation.

Air is supplied from the fan to the head via a flexible aluminium hose.
At the fan end, the hose is attached via an adhesive coated heat shrink sheath, at the head end the hose is secured in place via a jubilee clip.
The hose has to be handled with care as it can soon become crushed or dented.
All the modules can be easily and quickly replaced.
Fuel is supplied from the pump to the head via a high-pressure stainless braided flexible hose.

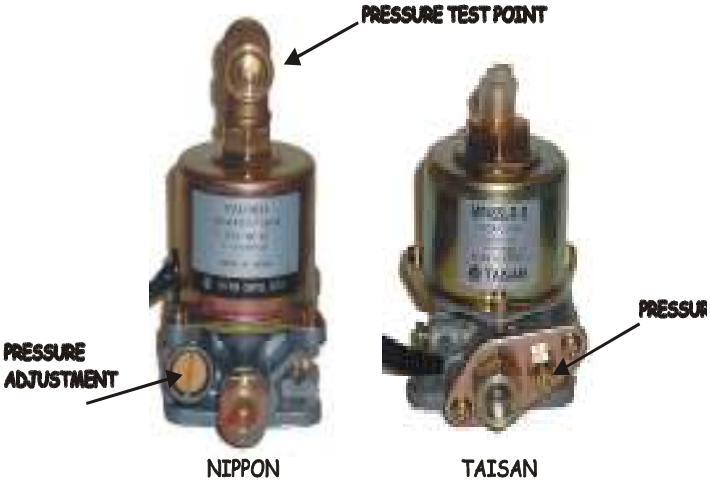
3. Burner Combustion Adjustments.

The burner leaves the factory with the burner pump pressure set at 9 bar and combustion air set to provide a base point for the commissioning engineer.

Nippon

1. Fuel Pump

Two makes of fuel pump are used on Flex a Flame burners and these are-:



The oil pump pressure on the Nippon pump is adjusted via the large slotted screw to the left of

the fuel entry position. The burner is set at the factory at a pressure to suit the appliance being converted.
Fully in and three quarters of a turn out is equal to 10 Bar, each quarter of a turn out is equal to one bar reduction. If you lose your position with the adjustment, get back to the 10 bar start point.
The Nippon fuel pump will self-vent if the oil supply line has been properly purged prior to being connected to the pump.

Taisan.
The Taisan fuel pump is vented via a small butterfly lever on the lower left hand side of the pump.

2. Fuel Pump Pressure Adjustment
Adjusting the oil pressure.
Nippon pumps have a large, slotted brass screw to the left of the oil inlet.
Taisan pumps have a small hexagon headed screw to the right of the oil inlet.
Clockwise to increase the pressure.
Anti-clockwise to decrease the pressure.
The Taisan fuel pump delivery pressure test point is detailed in FIG 1.

3. Air Supply.
The air can be adjusted via the air slide adjuster tab (item 34 FIG 2), which is locked in place via the air slide locking screw, item 15 FIG 2.

4. Commissioning.
See the specific data provided with each individual conversion kit installation literature.
Here is a typical routine for a Rayburn Supreme.
Rayburn Supreme Commissioning.
Commissioning takes the form of three separate activities-:
1. Setting the burner up.
2. Heat balancing the appliance to the users system.
3. Final check of the complete installation.

4-1. Setting the Burner Up.
1a. Nozzle .4 x 80 Deg Hollow
1b. Pump Pressure 9 Bar (130 P.S.I.)
1c. Gross Output 17.6 kW
1d. Net Output 14.08 kW
1e. Flue Gas Flow .0027 m/s.

4-2. Heat Balancing the System.
Setting up the appliance to perform as per our requirements (Heat balancing)

4-3. Lighting.
Make sure the appliance is fully assembled except for the hot plate, do not fit the baffle box as it is necessary to view the flame.
Carry out electrical safety tests in line with IEEE and OFTEC requirements
Polarity.
Short circuiting.
Earthing.
Turn the oil on and check for leaks.

4-3.1. To Bleed The Pump.
Take great care when bleeding the pump, It is a single cylinder reciprocating device and if repeated lockouts occur, due to lack of fuel caused by air locking, it can soon be damaged. If the pump runs without oil it will make a quite loud and rapid rattling noise and permanent damage in the form of a subdued rattling will occur.

Use the 1/8" BSPT plug in the tee fitting connected to the outlet of the pump.

4-3.2. Set The Control Stat.
Turn the stat fully off .

3.3. Set The Time Clock.
Make sure that the time clock is calling.

4-3.4. Check The Burner Air Shutter.
The burner air shutter has been set at the factory and should be satisfactory for test firing.

4-3.5. Prepare A Sampling Point.
Drill a hole suitable for your analysis probe in the inner cover of the vertical rear boiler cover plate. After the tests plug the hole with a Dwyer test point plug.
With the hot plate removed it will be possible to see the burner ignite but before attempting ignition make sure that there isn't any excess light in the combustion chamber, to affect the photocell.

4-3.6. Ignite The Burner.
Turn the stat ON and from a respectable distance you will see the burner go through an ignition

sequence and ignite, it is unlikely that the burner will need bleeding although it may need two attempts at ignition.

Failure to ignite will cause the flame failure button on the controller to illuminate, after a short time push the button in to reset the controller and repeat the process again until ignition occurs.

4-3.7. Fit The Baffle Box.

When you are happy with the flame picture, turn the burner off and isolate the mains electricity before you fit the baffle box and the hot plate. Make sure that the baffle is set up for either summer or winter running.

The baffle is fitted over the flame tube as illustrated.

There are two rectangular cut outs in the vertical sides of the baffle which can be positioned to point to -:

1. The rear and left hand side for intensive water heating or wintertime running

Or

2. The front and right hand side for intensive cooking or summer time running.

Or

3. To the right and rear for intermediate running. It can be set up to bias the flame to the oven or the boiler or an intermediate position.

4-3.8. Fit the Hot Plate.

When refitting the hot plate make sure that the ceramic rope seal which fits over the top of the cooking / heating damper frame is correctly fitted, otherwise the heat balance of the appliance will be seriously affected and the performance will not be satisfactory.

4-3.9. To Set For Good Combustion.

Do not attempt to take any flue gas readings until the burner has been running for at least three quarters of an hour after which time you should check that the flue vacuum conforms to our stated requirements.

Remove the plug you have fitted in the rear boiler access cover plate and insert your analysis probe. Make sure that the chrome cook heat lever is in the heat position as opposed to the cook position. By way of minor adjustments to the fuel air ratio, set the burner to give a CO2 reading of 10.5% at a smoke of between 0 and 1. (You may well get a higher CO2 than 10.5%)

When you are happy with these readings carry out a second test in the flue pipe where you will see because of slight air leaks into the appliance a reduced C02, but still around 8%.

Sampling from the access plate at the rear outlet of the boiler

Note after you have finished with the analysis; fit the rear boiler baffle over the outlet from the rear boiler flue ways.

With a flue vacuum of between .02" &. 05" w.g., the following analysis results should be obtained: -

Smoke between 0 and 1

CO_2 = 10.5%

O_2 =5 - 6%

With the appliance running on a 55,000 BTU system in its heating mode the efficiency should be between79% and 82% and on average, the system should come up to a temperature of around 65 deg C with an oven of around 170 - 190 deg C in about 40 to 55 minutes.

4-3.10. Combustion Air.

Combustion air is adjusted via the air control damper on the fan unit which when set can be locked in place.

If you are having difficulty bringing the burner on to the smoke, try increasing the fuel pressure slightly until you achieve 0 - 1 on the bacharac scale.

4-3.11. To Adjust The Pump Pressure.
There are two type of pump fitted to Flexaflame burners.
Nippon
The oil pump pressure on the Nippon pump is adjusted via the screw to the left of the fuel entry position. The burner is set at the factory at a pressure to suit the appliance being converted. Fully in and three quarters of a turn out is equal to 10 Bar, each quarter of a turn out is equal to one bar reduction. If you lose your position with the adjustment, get back to the 10 bar start point.
Taisan
The oil pump pressure on the Taisan pump is adjusted via the setscrew and locknut to the Right of the fuel entry position.
The burner is set at the factory at a pressure to suit the appliance being converted.

4-4. Final Checks.
Commissioningh checks should be carried out on the following-:
4-4.1. Fuel Tank.
Check for leaks-stability-height-position-vent.
4-4.2. Fuel.
Fuel- check for correct grade
4-4.3. Filter.
Is it fitted?
Check for function and leaks.
4-4.4. Site Glass or Tank Gauge.
Check for function and leaks.
4-4.5. Oil line.
Check for function, positioning, material suitability and leaks.
4-4.6. Fire valves.
Check for function and leaks.
4-4.7. Through Wall Sleeving.
Check that it is fitted and sealed
4-4.8. Isolation valve.
Check for function, convenience of positioning and leaks.
4-4.9. Electrical.
Check for correct fusing, location and specification of any isolation devices.
4-4.10. Ventilation.
Make sure that adequate ventilation is provided.
4-4.11. Chimney System.
Chimney system should be checked to make sure that it complies with the relative standards, regulations and all other instructions given.
4-4.12. Check controls Function.
Check correct hot condition functioning of water heating system and all controls.
4-4.13. Instruct User.
Ensure that the customer is instructed on the basic use of the appliance, timers, controls and oil / electrical isolation devices if fitted.
The importance of regular maintenance.
Commissioning should not be signed off unless the commissioning engineer is satisfied that all the work done complies with the relative standards and regulations detailed within this document.
4-4.14. Vent the Ashpan Door.
This work should not be carried out unless the customer is 100% happy with the conversion.
Once the work has been carried out it is not possible to convert the appliance back to solid fuel, should the need ever arise.
The objective of the activity is to allow a cooling stream of air to pass vertically up behind the ashpit door and stop the build up of hot air in the ashpit.
This will have a beneficial effect on the longevity of the burner as it will be operating in a much cooler environment.
The door should be removed and placed upon a bubble pack support to prevent damage to the enamel surface.
Using a 4inch disc grinder set up with a flap wheel, grind away an area as detailed in Fig 13 and refit the door.

5. Service and Maintenance

Service and fault finding of this equipment, can only be carried out by persons who are suitably qualified.
Generally servicing should take place once per year but under conditions of heavy usage, servicing could be required at shorter frequencies and consists of-:

1. Clean the air diffuser.

2. **Clean the combustion head.**
3. **Clean the Photocell.**
4. **Clean the fan scroll.**
5. **Clean the fan impeller.**
6. **Clean the Flexi air transfer tube (flexi).**
7. **Check for correct nozzle.**
8. **Check for correct chimney vacuum.**
9. **Check for correct setting of pump.**
10. **Check for adequate ventilation.**
11. **Check for fuel leaks.**
12. **Visual Flame Check.**

Take great care to keep well away from the flame whilst carrying out the visual flame check and only run the burner for 5 – 10 seconds maximum.
Run the burner for a short period with damper and hot plate lifted to carry out quick visual flame check.

Flue Gas Analysis.
Flue gas analysis will be difficult to carry out on most converted cookers because of the ingress of air through the castings and oven vents.
If this is found to be the case set the burner with a smoke of zero to one, otherwise the burner should be set up as follows-:

CO_2	**10%.**
Soot	**zero to one.**
Co	**less than 50ppm**
O_2	**6 – 6.5 %**

6. To Remove the Burner.

Before Starting.
Set up a support at the same height as the ash pit base to act as a table to slide the burner on to.
Disconnect the-:
Thermostat link plug
Mains three pin plug
The oil inlet adaptor into the oil pump
Ease each of these connections out of the way to allow for later removal of the burner unit.
In most cases the burner modules are fixed to a base plate which can be removed from the ash pit generally by undoing the two m6 fasteners holding the combustion head to the closure plate.
In some cases it may be necessary to first remove the control module to allow better access into the head fasteners.

Once the head is lowered it should be possible to slide the base unit out, on to the support previously mentioned.
Take care not to dent or damage the flexi aluminium air hose.

7. To Dismantle The Burner.

Combustion Head.
The combustion head is detailed in FIG 3. and all the main components are mounted on the end cap.
To Remove The End CAP.
Undo the locking screw (item 13 FIG 3)
Twist the cap anti-clockwise and pull it out from the flame tube (item 22 FIG 3)
To Adjust the Nozzle Set Back.
The nozzle holder can be adjusted in or out as required, it is locked in place via the clamping screw item 26 FIG 3.

It should be set at a distance of 6mm below the flat face of the air diffuser.
To Adjust the Electrodes.
The electrodes can be adjusted in a similar manner.

Take great care not to over tighten the locking screw, as excess pressure will crack the electrode insulation and cause faulty ignition.
The electrode tips should be set up approx 1.5 mm above the face of the nozzle.
The distance between the pointed electrode tips should be set at 4mm.
After adjustment or repair, check that the spark is forming in the correct position.
The spark should form a good horseshoe shape blowing into the path of the fuel spray.
Do not allow the spark to discharge on to the face of the nozzle or the edge of the diffuser.
Do not allow the fuel spray to touch the electrode tips or the diffuser as this will result in fuel leaking from the combustion head.
The Nozzle.
The nozzle fits into a conventional nozzle holder, which again can be accessed when the end cap is removed from the flame tube.

The nozzle should be set back about 8mm from the face of the air diffuser.

THE PHOTOCELL.
The photocell item 28 fits into a conventional flange mounted on the outer base of the end cap.
THE FLAME TUBE.
The flame tube (item 22 FIG 3) is mounted up to the appliance via two fasteners and the head gasket (item 21 FIG 3) forms the seal.
THE CONTROL MODULE .
The control module FIG 4 comprises of a control unit, a control unit base and an ignition transformer.

REPLACEMENT OF THE FAN MOTOR.
The fan motor needs to be replaced every second year.
Before carrying out this procedure, mark the casing and back plate to ensure an accurate rebuild.
The motor is mounted on a back plate, which is attached to the fan housing by 4 self-tapping screws.
Remove the screws and lift the motor and fan wheel free from the fan scroll.
Undo the Allen grub screw, which hold the wheel on the motor shaft.
Remove the fan wheel to reveal two fasteners, which hold the motor to the back plate.
Remove the fasteners and replace the motor making sure that it is correctly orientated.
Reverse the procedure to rebuild.

REPLACEMENT OF BURNER COMPONENTS.
As part of long-term preventative maintenance we recommend that the following be replaced as follows-:
Replace nozzle every year.
Replace fan motor every second year.
Replace air tube. every second year.
Replace the fuel pump every fifth year.

REPLACEMENT OF BAFFLE KIT COMPONENTS.
As part of long-term preventative maintenance we recommend that the following be replaced as follows-:
Replace the baffle kit every second year.
Replace insulation boards every second year.
Replace sealing ropes every second year.
General Servicing
Service the oil supply, ventilation, and flue/flue ways as per OFTEC guidelines.

8. SERVICE SPARES TO CARRY.
We advise service engineers to ensure that they carry.
FAN MOTOR.
SET OF ELECTRODES.
FUEL PUMP.
FLEXIBLE AIR HOSE
SELECTION OF HEAT SHRINK MATERIAL.

All the other components should be readily available from local heating stockists,

Nozzle .4 or .5 or .6 U.S galls x 60S
Controller is a Satronic 832.3
Photocell is a Satronic MZ 7705
Pump alt 1 is a Taisan MP45SLR-S
Pump alt 2 is a Nippon VSC36H
Solenoid is a Brahma E7L 1/8 x 1/8 1809100

9. SERVICE FREQUENCY.
We strongly recommend that the first servicing of your burner and appliance be carried out after the first three months of operation.
Thereafter every six months.
BEFORE SERVICE WORK STARTS.
Before carrying out any maintenance or service to this unit make sure that the burner unit and appliance to which the burner unit is fitted are thoroughly cooled.

Make sure that the burner unit and appliance are disconnected from the mains electricity and are suitably earthed.
WARNING.
High frequency electrical current is used in the generation of the ignition spark, take great care when carrying out service or repair work.

Make sure that the oil supply is turned off.

ORDERING COMPONENTS.
When ordering components or discussing technical matters, it is essential that you always check the issue and reference no on your literature to make sure that you have the most up to date information.

MARKINGS.
Each burner carries an information label, which generally contains details as follows, serial

number, date etc; it may be necessary to quote this number should spares be required.

WARRANTY.
Where warranty claims are made make sure that you have a copy of the warranty form to refer too otherwise you may find yourself facing delays or unnecessary costs.

10. PRIMARY FAULT FINDING CHECKS.

Before any serious investigations are begun it is most important to check all the primary items first.

1. FUEL.
There is an adequate supply of fuel in the tank.
The fuel is turned on.

2. PROGRAMMER OR POWER IN.
The clock or programmer is switched to the correct position.
3. THERMOSTAT.
The thermostat is set to the correct position.
All the electrical fuses are sound.

11. SECONDARY FAULT FINDING CHECKS.

The basic elements of the conversion around which problems can occur are as follows -:

1. **THE BURNER UNIT.**
2. **WATER SENSING THERMOSTAT.**
3. **THE APPLIANCE CHIMNEY.**
4. **THE OIL SUPPLY AND PIPE LINE.**
5. **THE PLUMBING SYSTEM.**
6. **ASSOCIATED CONTROLS AND VALVES.**

12. FAULT FINDING.

1. BURNER WILL NOT ENERGISE.
If operated via manual switch or time clock
By reference to the wiring diagram it can be seen that the 230v supply into the controller base unit is linked out through the stat / stats and back into the input live terminal of the controller base unit via the two pin plug on the control module.
Disconnect the two pin stat connector on the control module and check for voltage with a test meter.
If voltage
Check for satisfactory operation of stat.
If stat is suspect, temporarily link it out at the plug to verify failed component.
If no voltage.
Check control unit and check that a 230v supply is established.
Check the time clock has switched a 230v supply and neutral and that this supply and neutral is available in the controller base unit.

1A. BURNER WILL NOT RUN PAST IGNITION.
Burner runs, spark occurs at the electrode ignition occurs and after a few seconds, lockout occurs.
This problem can often be caused by dirt lodged in the solenoid valve.
Dirt gets trapped in the solenoid valve and stops it from shutting the oil supply off.
When the burner goes through its ignition cycle the photocell sees light too soon and the controller then shuts the burner down after the electrode discharge has timed out.
To fix this problem
Remove the solenoid actuator.
Undo the solenoid spindle.
Remove the spindle and examine the valve seat.
Clean the seat and reverse the procedure to rebuild.
2. FAILED IGNITION TRANSFORMER
Ignition transformers can fail intermittently,
They work when the burner is cold and then as the burner heats up and shuts down on the stat they fail to re-ignite.

When the burner is energised if operated via manual switch or time clock the fan motor only runs but there is no spark at the electrodes
This could be caused by
Failure of controller to transmit the 230v supply
Interruption of the 230v supply on route to the H.T. unit
Interruption of the H.T. output on route to the electrodes.
Check for
230v supply into H.T. unit
Continuity of H.T. leads
Integrity of electrode ceramic insulation.
The white ceramic insulation can develop hairline cracks if the m5 clamping grub screws are over tightened consequently causing the H.T. to short circuit.
3. DAMAGED ELECTRODES.
It is possible to crack the white ceramic insulation.

If this occurs it can be seen by close observation, as minute cracks in the part of the electrode insulation fitted into the nozzle holder.

12a. Fuel Supply problems.

The fuel supply feed is as follows-:
From the Tank.
Through the fuel filter.
Along the oil line.
Through the fire valve.
Through the isolation valve.
Into the oil pump.
Through the oil pump into the solenoid valve.
Finally to the nozzle.
On first ignition attempt the fuel has to feed into the pump and through the solenoid valve, it is not unusual to need two or three attempt to clear air from the fuel line, to test for fuel availability downstream of the pump loosen the pressure test point in the tee piece on top of the pump.

1. Failed Fuel solenoid Valve
Use a solenoid tester or a multi meter to check for 230volts at the solenoid supply plug.
If the valve does not actuate replace it.
Fault could be solenoid failed open, causing the photocell to see light too early.
Check that the solenoid is not sticking open and causing premature ignition.

2. Failed fuel Pump.
Under conditions of normal use, fuel pumps will run for about Five years.
After this time they will become noisy and lose pressure.

3. Blocked Nozzle .
Particularly common on new installations where new pipe work has not been adequately purged or where excessive amounts of red liquid thread sealant have been used.
Nozzles are a notorious problem.
The smallest amount of dirt lodged in the nozzle can either stop it working or cause it to have an irregular flame pattern where good atomisation does not occur on a full 360-degree arc.
This problem can cause an oil fume smell to come from the flue terminal, excessive oil consumption and poor appliance performance.
Nozzles should be changed every year along with oil line filters.

4. Blocked Fuel LINE.
Disconnect and check for a good clear stream of fuel oil.

5. Intermittent Fuel Supply.
Intermittent supply of fuel at the inlet to the fuel pump caused by air locks in the oil line.
Disconnect and check for a good clear stream of fuel oil.
Check that the fuel supply line is level with no potential for air to trap.

6. Tripped KBB firevalve.
Check the trip button and reset if required.

7. Oil Leaks.
Take great care over oil leaks, they can be caused by oil spray from the nozzle impinging upon the air diffuser causing drips to occur which eventually find their way into the base of the combustion head end cap showing as a drip from the high pressure flexi.
Generally, if oil leaks develop they will occur at
The Outlet From The Pump.
The Flexi Connection.

8.. The Nozzle.
If any dirt gets trapped under the sealing surface of the nozzle it can damage the opposite face of the nozzle holder and cause a small leak, rectification of which could be a new nozzle holder.

12b. Cold Starting Problems.

Burner runs, spark occurs at the electrode ignition occurs and after a few seconds the flame goes out but re-ignites in a continual cycle of ignitions, sometimes lockouts also occur.
This problem is caused by either no chimney vacuum or downdraft
Check for adequate ventilation
Check for adequate chimney vacuum, which must be above .02" w.g.
Simple check-:
If the burner runs with the hotplate off but not with it fitted, this condition is verified.

12c. Hot Starting Problems.

Burner runs, spark occurs at the electrode but ignition fails and lockout occurs.

Normally this problem is caused by an intermittent problem with the H.F. unit.

We have found that failing H.F. units will spark when cold but not when the burner / appliance is up to temperature.

8. Terminal Emissions.
Oil smell and smoke emissions from chimney terminal.
This indicates bad combustion and an obvious fault with the burner or chimney.

Turn the appliance off and carry out investigations.
Make sure that the appliance and chimney are thoroughly de sooted.

9. Loud Rattling Noise From Burner.
Can be caused by-:
Air locks in the oil line or a loose fan wheel.
Air locks in the oil line are a common problem caused by rises and falls in the level of the fuel line.
When the solenoid pump is deprived of oil, is very noisy and sounds like a miniature machine gun.
If the burner is allowed to run on with a shortage of oil, damage will occur to the solenoid oil pump.
This damage will be heard as a rattle when the pump is running normally.

10. Failed Fan Motor.
Fan motors will lose revolutions.
They should be replaced every second year.
When they start to fail the burner will run sooty due to lack of air.

11. Lack of Service.
A combination of lack of cleanliness and general bad adjustment of combustion head and fuel air ratio.

12. Air Proving Switches.
On burners with air prover switches, when the fan motor runs, the fan generates air pressure to over come the air prover switch, if the chimney vacuum is in excess of .06" w.g. the fan will not create enough back pressure to operate the air prover switch and consequently not allow a live to the solenoid valve.

This condition can soon be identified by raising the cooker hot plate to reduce the effects of high flue vacuum and then trying for ignition. If this problem exists phone us for advise.
Make sure that there are no kinks in the air prover tube and that the tube is fitted correctly.
When the air proving switch is made, it allows a current to the solenoid coil, via a plug and socket.

13. Addendum.

1. Burner control Function Detail.
Enclosed copy

2. Fault Finding Flow Chart.
Enclosed copy

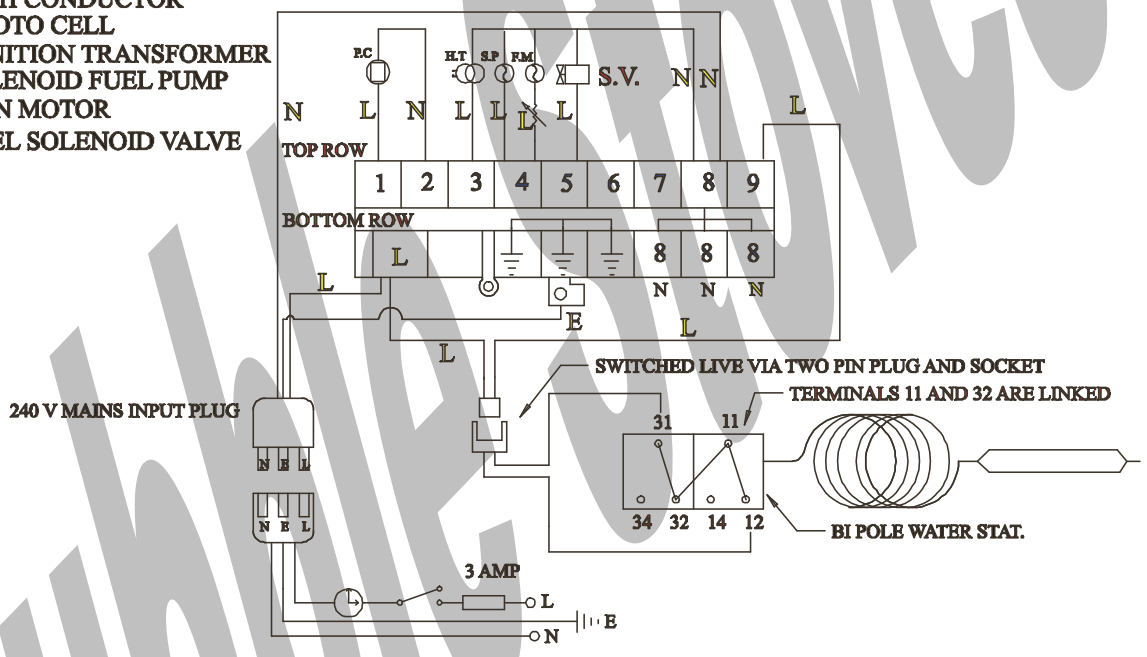
3. Parts List.

14. Wiring details.

F2 CONTROL UNIT

SATRONIC TFI 832.3
10 SECS

L = 240V LIVE CONDUCTOR
N = NEUTRAL CONDUCTOR
E = EARTH CONDUCTOR
P.C. = PHOTO CELL
H.T. = IGNITION TRANSFORMER
S.P. = SOLENOID FUEL PUMP
F.M. = FAN MOTOR
S.V. = FUEL SOLENOID VALVE



Only approved personnel, WHO HAVE BEEN SUITABLY TRAINED, must carry out maintenance on this product.