

## **PROBLEM SOLVING – ELECTRICAL AND FUEL:**

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## **! IMPORTANT !**

**BEFORE ATTEMPTING ANY MAINTENANCE OR REPAIR ON ANY GT PORTABLE GRAIN DRYER, DISCONNECT THE PTO SHAFT FROM THE TRACTOR. IN CASE OF ELECTRIC MOTOR DRIVE, ENSURE THE MAIN SWITCH IS IN THE OFF POSITION AND DISCONNECT THE POWER SUPPLY. IN THE CASE OF MAIN VOLTAGE EQUIPMENT, (ABOVE 12 VDC) CONSULT A QUALIFIED ELECTRICIAN.**

**THE CHART BELOW HAS BEEN FORMULATED TO GUIDE YOU TO THE MOST APPROPRIATE PART OF THIS SECTION ON FAULT FINDING.**

DRYER MODEL

GAS BURNER

DIESEL BURNER

MICROPROCCESOR

PRE MICROPROCCESOR

TRACTOR  
DRIVE

ELECTRIC  
MOTOR  
DRIVE

TRACTOR  
DRIVE

ELECTRIC  
MOTOR  
DRIVE

ALTERNATOR  
NEGATIVE  
EARTH

TRANSFORMER/  
RECTIFIER

NEGATIVE TRANSFORMER  
EARTH  
TRACTOR

ERROR  
MESSAGE  
DISPLAYED

RED AND GREEN  
INDICATOR  
LIGHTS

NO INDICATOR  
LIGHTS

WHICH LIGHTS  
ARE LIT

TIMER  
START

PUSH BUTTON  
START

FUEL PRESSURE  
GAUGE READING

CHECK  
CONTINUITY OF  
CIRCUIT

## **ORDER OF PRIORITY : MICROPROCESSOR DISPLAY:**

<b>PRIORITY</b>	<b>ERROR CONDITION</b>	<b>DISPLAY</b>
<b>1</b>	<b>Voltage low Voltage high</b>	<b>VOLTS LOW VOLTS HIGH</b>
<b>2</b>	<b>PTO speed low PTO speed high</b>	<b>PTO LOW PTO HIGH</b>
<b>3</b>	<b>Extreme plenum temperature</b>	<b>PLENUM</b>
<b>4</b>	<b>Loss of auger motion</b>	<b>AUGER</b>
<b>5</b>	<b>Loss of agitator motion</b>	<b>AGITATOR</b>
<b>6</b>	<b>Loss of air flow</b>	<b>AIR</b>
<b>7</b>	<b>Flame out</b>	<b>FLAME</b>
<b>8</b>	<b>Transient</b>	<b>TRANSIENT</b>
<b>9</b>	<b>Reached grain set point</b>	<b>GRAIN</b>

## SPEED SENSOR ADJUSTMENT

See diagram below.

When either part of the speed sensor has been replaced the gap between the two parts should be set to about 1/8" (3 mm).

The sensors should be positioned so that they are in line.

If the sensors need to be set closer than 1/8" (3 mm) the drive should be turned by hand to ensure that the two parts do not collide.

**WHEN MAKING ANY ADJUSTMENT TO A DRIVE FITTED WITH A SPEED SENSOR ALWAYS CHECK THE ALIGNMENT OF THE SENSORS BEFORE RESTARTING THE DRYER.**

Damaged speed sensors are usually due to misalignment causing one sensor to hit the other.

## **MICROPROCESSOR LOCATIONS**

## **MICROPROCESSOR LOCATIONS : RAB 50000.**

## VOLTAGE READINGS : CONTROL PANEL TERMINALS.

All readings quoted in VOLTS DC.

Voltage readings for the ignition and solenoid coils are to be taken using the earth terminal No. 11.

Voltage readings for the speed and temperature sensors are to be taken using the earth terminal No 22.

FUNCTION	MICRO WIRE COLOR	TERMINAL NUMBER	VOLTAGE POWER ON	
			PTO OFF	PTO ON
EARTH	(B) BLACK	23		
POSITIVE	(R) RED	17	13.5 – 14	12 MIN
LOW HEAT LIQUID SOL.	(GY) GREY	8	0	11.5-12
HIGH HEAT	(BR) BROWN	2	0	11.5-12
IGNITION	(BL) BLUE	16	0	11.5-12
EARTH COILS	(W) WHITE	11		
AIR SWITCH	(G/Y) GREEN/ YELLOW	13	5.10	0
AIGITATOR	(BL/W) BLUE/ WHITE	3	5.10	5.10-0
AUGER	(C) TRANSPARENT	15	5.10	5.10-0
FLAME	(P) PINK	1	5.10	0
PLENUM	(O) ORANGE	4	The readings from the thermostats will vary with temperature.	
GRAIN	(V) VIOLET	5		
PTO	(BE) BEIGE	14	5.10	5.10-0
EARTH SENSORS	(W/BK) BLACK/ WHITE	22		

When starting to test the voltages in the control panel first check the incoming voltage with the Microprocessor switched on.

The temperature sensors will get a signal from the Microprocessor of the 6.8 volts.



## Microprocessor Fault Display: Checking Procedure:

**Disconnect drive power source before attempting maintenance or repair tasks:**

<u>Display:</u>	<u>Cause:</u>	<u>Remedy:</u>
1) No power to Microprocessor Unit	1. Poor battery connection 2. Blown fuse. 3. Damaged battery lead.  <u>Diesel</u> 1. Inadequate diesel level in fuel tank or barrel. 2. Fuel float switch wrong way up. 3. Float switch inoperative. 4. Poor wiring connections at top of float unit.	Clean terminals, reconnect battery and replace fuse. Check battery for correct polarity. Check cable leads are pos-pos and neg- neg. Check adequate fuel supply. Remove fuel tank unit from tank, check operation of float. Refit float or replace switch unit as required. Remove cover and reconnect wires inside top of tank unit. Check and repair battery lead as needed.
2) Volts Low (voltage below 9.5 Vdc)	1. Poor battery connection on tractor. 2. Poor dryer leads connection. 3. Tractor charging circuit at fault. <b>Do not use a tractor fitted with a dynamo.</b> 4. Tractor battery in poor condition. 5. Transformer inadequate. 6. use of a standby battery.  Diesel burners. Intermittent fault as second burner jet cuts in	Clean terminals and reconnect battery. Check lead and repair as needed. Repair tractor. Fit alternator. Fit new battery: Tractor battery needs to be in good condition to keep Microprocessor adequately supplied. Use only GT approved transformers otherwise damage to the Microprocessor may occur. Set transformer output voltage to 13.5 Vdc to 14 Vdc with no load. Note: Warranty on Microprocessor is void if a transformer that is not approved by GT is used. Recharge battery or connect to vehicle. Auxiliary air flap shaft sticking, check for smooth movement.

	Disconnect drive power source before repair tasks	Attempting maintenance or
<u>Display:</u>	<u>Cause:</u>	<u>Remedy:</u>
3) VOLTS HIGH (Voltage + 18 Vdc)	1. Tractor charging circuit at fault. 2. Transformer voltage too high.	Repair charging circuit or change to another tractor. Check and adjust output voltage to 13.5 VD to 14 VDC with no load.
4) PTO LOW (PTO speed below 440 RPM)	1. Start tractor, engage PTO, and adjust engine speed to correct PTO low fault. 2. Incorrectly adjusted or dirty sensor. 3. Faulty or broken sensor. 4. Faulty wiring connection.	Check shaft speed on tractor with Tachometer set to 525 RPM under load. If necessary mark tractor rev counter.  Clean and adjust sensor (see diagram page 3.06)  Replace sensor (see In Field Temporary Repairs). Check and repair wiring as required.
5) PTO HIGH (PTO speed above 540 RPM)	1. Reduce engine speed so PTO speed is below 540 RPM.	See "PTO LOW" above.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

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Cause:

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Remedy:

6) PLENUM  
(Extreme plenum temperature)

1. High heat solenoid diaphragm ruptured.
2. High heat solenoid stuck open due to oil contamination (see servicing chart, oil trap).
3. Leaking LPG connection or ruptured vaporizer ring.
4. Wiring Fault diesel burner.

Check if burner is continuously running on high heat. If so dismantle solenoid, clean and repair as needed. If large quantity of oil residue in solenoid clean oil trap before restarting burner. (See repair section.) Check for leaking gas pipes using a soap/water solution. If burner will not restart, the high temperature fuse in the plenum chamber will need to replace. Wires may have got melted together due to touching burner tube causing both solenoids to operate continuously. Check and repair wiring.

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7) AUGER  
(Loss of auger motion)

1. Drive belt slipping or broken.
2. Untried grain left in dryer overnight.
3. Foreign object in with grain jamming main auger (piece of wood, stone etc.)
4. Speed sensors not aligned after adjusting main drive belt.
5. Filling the dryer too fast with very wet grain through the loading hopper.
6. Damaged or faulty speed sensor.

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Adjust belt tension or replace belt (use only genuine GT belts).

Clean out bottom bin and remove obstruction.

Adjust and clean speed sensors (see diagram – page 3.06)

Clean down Grain flow control on load hopper (see diagram)

Replace speed sensor (see In-Field Temporary Repairs).

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	Disconnect drive power source before repair tasks	Attempting maintenance or
<u>Display:</u>	<u>Cause:</u>	<u>Remedy:</u>
7) AUGER (Loss of auger motion)	7. Damaged or faulty wiring	Check and repair as needed. When checking with multimeter voltage – should alternate between + 5 Vdc and 0 Vdc when checked across to the ground (see Microprocessor technical data).
8) AGITATOR (Loss of agitator motion)	<ol style="list-style-type: none"> <li>1. Drive belt slipping or broken.</li> <li>2. Chain broken or off agitator sprocket due to seized support rollers or excessive side play.</li> <li>3. Filling the dryer too fast with very wet grain through loading hopper. Close down grain flow control (see photo).</li> <li>4. Broken or worn chain connector on gearbox drive.</li> <li>5. Worn or damaged gearbox.</li> </ol>	<p>Adjust belt tension or replace belt as required.</p> <p>Check agitator drive chain repair or replace as required. Check agitator support rollers and tracking. Adjust position of rollers to compensate for wear as required.</p> <p>Adjust all rollers an equal amount so as to make sure the agitator stays central (see page 5.08)</p> <p>Clean any crushed grain out of the adjusting the rollers.</p> <p>Remove chain connector check condition of connector sprockets. Replace chain and sprockets as required.</p> <p>Check condition of gearbox and replace or repair as required.</p>

	Disconnect drive power source before repair tasks	Attempting maintenance or
<u>Display:</u>	<u>Cause:</u>	<u>Remedy:</u>
9) AIR (Loss of air flow)	1. Blocked air switch tube.  2. Faulty air switch.  3. Fan belts slipping or broken.	Remove tube and clean out. Before refitting check entry connector into air switch is not booked. If it is remove it and clean. Refit all parts taking care to position the tube correctly in the fan tube.( See diagram). With fan operating air switch should pass voltage from “C” terminal to “No” terminal on Microprocessor dryers. On Microprocessor dryers voltage will be + 5 Vdc at Pin 7 on plug until fan starts then it will drop to 0 Vdc (see page 3.07). To check switch blow down air switch tube, listen for the switch click as it operates check voltage. Check condition of belts and adjust or replace as required.
10) FLAME (Flame out)	1. Fuel supply exhausted or interrupted.	Check Fuel level refill as required. When gas bottles are used on a manifold and some are still full check: bottle tap is turned on: bottle pipe connector is screwed on fully. If bottle still does not empty contact gas supplier and change bottle.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

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Cause:

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Remedy:

10) FLAME

2. Faulty flame detector.

To check start the dryer in the usual way. Once flame appears on the display fit a bridge wire connection between the two wires on the flame detector circuit; before changing the flame detector check:

- (a) Position of detector bulb in flame. Look through window on side of burner – if detector bulb glows red in flame the position OK, if not reposition bulb.
- (b) Check burner ring for blocked holes (carbon build up) clean out using 1/16” diameter twist drill. (See diagram). Burner holes block first nearest the gas inlet this is where the detector bulb is situated.

See (b) above.

\* When changing flame detector take care not to kink the capillary tube also make sure bulb is positioned carefully in flame.

\* If there is excessive carbon build up check:

(a) oil trap: clean as required (see page 5.11)

(b) fan belt tension adjust if required slipping fan belts will cause incorrect air fuel mixture (See page 5.05)

3. Burner ring holes blocked with carbon.

<u>Display:</u>	<u>Cause:</u>	<u>Remedy:</u>
10) FLAME (continued)	Disconnect drive power source before repair tasks  4. Wiring fault. <b>DIESEL BURNER ONLY.</b> 5. Air in fuel supply. 6. Fuel pump belt slipping. 7. Blocked fuel filter.	Attempting maintenance or  Check wiring connections, repair as required. Check voltage at Pin 10 on plug + 5 Vdc when flame lit (see page 3.07)  Check line connections and repair as needed. Check belt tension – adjust as required. Check indicator dial on filter. Replace if dial reading high.
11) TRANSIENT	This indicates that an error was detected but disappeared before it could identified. The most likely cause is belt slippage so the first course of action is to check and adjust all belt tensions.	
12) GRAIN	1. Grain has reached set temperature.  2. Faulty grain temperature probe or wiring.	Check moisture content adjust set temperature if required. Check all wiring connections repair as required. Fit new grain temperature probe or make temporary repair (see In-Field Temporary Repair).

**! WARNING!**

**When making In Field Temporary Repairs which involve by passing a safety device, the Dryer should not be left unattended whilst the burner is lit as this could result in serious damage to the dryer or even a fire! The safety device that has been bypassed must be replaced and the dryer returned to standard condition as soon as possible. The bypassing of safety devices is done at your own risk. The advice is offered only to enable the completion of the current batch being dried.**

**PROBLEM SOLVING: ALL MICROPROCESSOR DRYERS:**

**Disconnect drive power source before attempting maintenance or repair tasks:**

<u>FAULT:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
1. Microprocessor will not function.	a) No electrical power.  Diesel burner only ....	- Check battery lead and connections. - Check fuel level. - Check fuel float is on correct way up: Remove fuel tank unit from tank and operate float by hand. If power comes on when remove the float and refit the opposite way up. Power should come on with float in the top position. - Check wiring connection in top of fuel tank unit. - Check fuse. Fit correct size only. <b><u>IF AN OVERSIZE FUSE IS FITTED THE MICROPROCESSER WILL BE DAMAGED IN THE EVENT OF A FAULT OCCURING.</u></b> - If transformer is used, check output from transformer. - Check Microprocessor on/off switch.
2. Microprocessor goes through cycle as far as "flame" but burner does not light.	a) Inadequate fuel supply.	i) Check fuel supply/pressure. Gas fired dryers pressure gauge should read 2-5 psi on initial start. Diesel pressure gauge should read 150-160 psi.  ii) If no gas pressure is shown on gauge make sure all gas taps are in the "ON" position. If bulk tank, turn off tap a then turn on again slowly to restart excess demand valve. If cylinders are used on a manifold check all cylinder taps are on and all connectors screwed on fully.



Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

2. Microprocessor goes through cycle as far as “flame” but burner does not light (cont’d)

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Cause:

b) Faulty fuel solenoids.

c) No ignition spark.

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Remedy:

iii) Check that the solenoids are opening correctly. First switch off both liquid and vapor taps then fir a bridge across the wires in the air switch. Next **WITHOUT THE PTO RUNNING** go through the start cycle on the Microprocessor when “flame” appears on the display, an audible click should be heard as the solenoids open. Solenoids can be checked individually by disconnecting them and making a connection to each on in turn. Note: High heat solenoid will not operate normally until burner is lit and “flame” is off the display. After checking, remove the air switch bridge connection and switch on the gas taps.

i) Check that there is a spark at the igniter, if no spark seen remove igniter plug and clean: Reset gap 1/8” refit plug so that gas will pass between the electrodes (see diagram).

ii) Check perforated shield is in place in front of igniter plug.

iii) Check the spark is not going to earth at the base of igniter plug to the holder, if so clean igniter plug and holder.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

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Cause:

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Remedy:

2. Microprocessor goes through cycle as far as "flame" but burner does not light (cont'd)

c) No ignition spark (cont'd)

iv) If no spark can be obtained at the plug lead, make sure the lead is secure in the ignition coil.

d) Blocked or dirty burner ring.

v) check voltage to ignition coil (see microprocessor tech data).

If there is a spark at the igniter plug and gas pressure on the gauge then check condition of holes in the burner ring. The holes can become blocked with carbon deposits so no gas gets to the igniter. To check, go inside dryer with a torch, you will also need a 1/16" diameter twist drill to clean out holes (see diagram) (hole nearest the gas inlet are the ones that block first this is the area of the flame detector and the spark plug). When unblocking burner ring drill out the carbon deposit using the twist drill. If carbon has formed a peaks that hide the hole location take a screwdriver and using the flat edge for the blade scrape off the peaks, this will quite often leave an indent in the exact location of the hole.

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Diesel burner.

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a) No ignition spark.

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i) Check ignition spark: clean and reset gap (1/4" – 5/16") as required.

ii) Check ignition lead for continuity and make sure connections are good.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

2. Microprocessor goes through cycle as far as “flame” but burner does not light (cont’d)

Diesel burner.

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Cause:

b) Inadequate fuel pressure.

c) Faulty solenoids.

d) Faulty fuel nozzles.

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Remedy:

iii) If fuel pressure is low or erratic check fuel indicator gauge: Replace filter if gauge reads 15 or above. Check for air in fuel; if so check all connections and repair as required. Check fuel pump drive belt and coupling, adjust or replace as required.

iv) Check solenoids are opening. To do this STOP PTO DRIVE, fit a bridge across wires in air switch, then go through start cycle on the Microprocessor, when “flame” appears on the display the solenoids should open – this may be difficult to hear because of size of the solenoids but placing your hand on top of the solenoid its possible it possible to feel the vibration. The solenoids can be checked individually but disconnecting them and then making a connection to each one in turn. After checking remove air switch bridge connection and restore system to normal.

i) Check connection of nozzles, if badly sooted clean off soot with a soft brush. If new nozzles have been fitted check they are correct type (via: 80 hollow cone) 80 Should be found stamped on the edge of nozzle. If nozzles are old fit new ones. New nozzles should be fitted at the start of the season.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

2. Microprocessor goes through cycle as far as “flame” but burner does not light (cont’d)

Diesel burner.

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Cause:

d) Faulty fuel nozzles.

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Remedy:

Check that the swirl-plate in the nozzle has not worked loose. If it has the fuel will come out in a single jet instead of a cone shaped spray. To check, remove the small filter at the rear of the nozzle under this will be a screw with either a slot for a screwdriver or a hexagon socket for an Allen key, if this screw is loose then it must be removed and the small cone shaped swirl-plate inside repositioned in the point of the nozzle. Refit the screw and tighten securely. If the problem persists replace the nozzle.

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3. Microprocessor goes through cycle to “START” when button pressed reverts to hours.

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a) Flame detector stuck in “hot” position, therefore Microprocessor thinks burner is lit and will not commence start cycles

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Check voltage at pin 10 on Microprocessor plug should be at + 5 Vdc until flame is lit then it will drop to 0 vdc. (see page 3.07) so if voltage is 0 vdc then flame detector is stuck in the “hot” position. This can be overcome as a temporary measure by taking one of the wires in the flame detector off it’s terminal. Once the display shows “flame” and the burner lights, refit the wire on to it’s terminal in the flame detector: the faulty unit should be replaced as soon as possible.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

---

Cause:

---

Remedy:

3. Microprocessor goes through cycle to "START" when button pressed reverts to hours. (cont'd)

b) Incorrectly wired Microprocessor plug.

This problem may occur when a new Microprocessor lead has been fitted. It is due to pink and violet wires being similar in color and sometimes being incorrectly positioned in Microprocessor plug. To check this take out the pink wire from terminal 1 and violet wire from terminal 5 in the control panel – then fit the wire from terminal 1 (pink) into terminal 5 and the wire terminal 5 (violet) into terminal 1. If this corrects the problem, then return wires to their original positions and make the correction in the plug. If it does not work then return the wires to their original positions to reinstate the system to normal.

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4. Microprocessor fuse blows.

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a) Incorrect battery connection polarity.

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i) Check connections on tractor battery; make sure red clip is on positive terminal and black clip on negative terminal.

ii) Make sure tractor is wired negative earth. If a positive earth tractor is being used change it for a negative earth tractor.

\* NOTES:

1. Only fit the correct 7 amp fuse in the circuit, if a larger fuse is fitted **THE MICROPROCESSOR WILL BE DAMAGED** if the circuit is overloaded.

2. When using transformers the warranty on the microprocessor will be void if a GT approved transformer is not used.

	Disconnect drive power source before repair tasks	Attempting maintenance or
<u>Display:</u>	<u>Cause:</u>	<u>Remedy:</u>
4. Microprocessor fuse blows. (cont'd)	b) Bare wire shorting on frame:  c) Plenum temperature exceeded 300 F.	i) Check condition of all main wires – repair as required.  ii) Fuse may blow if the plenum high limit fuse has blown and there is an additional fault in the Microprocessor which caused the high temperature.
5. Microprocessor reads PRUN LOW with burner lit and “high flame” staying on.	a) Incorrect wiring to the plenum temperature probe.  b) Faulty plenum temperature probe.  NOTE: PRUN LOW will appear on the display when plenum temperature is below 110 F.  If the plenum temperature exceeds 300 F the “high limit” fuse will blow and stop the burner.	i) Check condition of wiring to plenum temperature probe - repair as required.  ii) Replace plenum temperature probe.
6. Burner lights but will not go onto high flame.	a) Faulty wiring to high heat solenoid.	i) Check wiring and connections, repair as required.  ii) Check power supply to solenoid.

Disconnect drive power source before repair tasks

Attempting maintenance or

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Display:

---

Cause:

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Remedy:

6. Burner lights but will not go onto high flame.  
(cont'd)

b) Faulty high heat solenoid

i) Check operation of high heat solenoid operating coil. To do this remove solenoid coil from base. Remove +IVE wire from terminal 2 and - IVE wire from terminal 33 in junction box. Insert a metal object (screw driver blade) into hole in the centre of solenoid coil and then touch the -IVE wire terminal 23 and +IVE wire to terminal 19. If coil becomes magnetized and attracts the metal then is OK. If not the coil should be changed.

ii) If the solenoid's coil is operating correctly then the solenoid may be dirty causing the diaphragm to stick. To check this first turn off the liquid tap and the cylinder or tank tap. Start the burner in the normal way and let it burn until all gas is exhausted from the system. Remove the plug from the base of oil trap and allow residue to drain out. Meanwhile unscrew the four socket head cap screws from the base of the solenoid and carefully lift off the top portion taking care not to drop the centre plunger or the diaphragm – before removing the diaphragm check which way up it is fitted, as there is a right and wrong way.

Disconnect drive power source before repair tasks

Attempting maintenance or

---

Display:

---

Cause:

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Remedy:

6. Burner lights but will not go onto high flame.  
(cont'd)

b) Faulty high heat solenoid

Diaphragm is usually marked "top" but this is frequently difficult to see so do not rely on it. Clean all parts thoroughly and reassemble in reverse order of dismantling.  
**\* IF DIAPHRAGM SHOWS ANY SIGN OF DAMAGE IT MUST BE REPLACED.**

When reassembled refit plug in base of oil trap, turn on gas, recharge system. Once the burner has lit and reached high flame, stop it by turning off the vapor tap then check solenoid for gas leaks using soapy water

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7. Burner lights "FLAME" remains on display. Burner goes out after 90 seconds.

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Faulty flame detector.

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See Microprocessor fault display checking procedure "Flame" sections 2, 3 & 4. It is normal for the burner to go out after 90 seconds if "flame" remains on the display. When "flame" is on the display the Microprocessor thinks the flame is not lit so after preset 90 seconds ignition circuit and reverts back to a "ready" situation so the cycle can begin again.

**THIS IS AN IMPORTANT SAFETY FEATURE WHICH PREVENTS GAS BEING ALLOWED INTO THE DRYER FOR LONG PERIODS AND CREATING A POTENTIALLY EXPLOSIVE MIXTURE**



**IN-FIELD TEMPORARY REPAIRS TO SOLVE PROBLEM OF SENSOR FAILURE:**

**MODEL: GT GRAIN DRYER MODELS:  
380S, 390QF, 580S, 590QF – GAS FIRED:**

**PROBLEM: MICROPROCESSOR DISPLAY SHOWS:  
PTO LOW OR AUGER OR AGITATOR:**

Any of these three displays could indicate that a sensor has failed and needs replacing:

1. Microprocessor Display Shows “PTO LOW”:
  - a) First check that the tractor is running at correct PTO speed.
  - b) DISCONNECTS PTO DRIVE SHAFT OR ELECTRIC MOTOR DRIVE POWER and check that the electrical connections to the sensor are correct.
  - c) Check that the gap between the sensor and the magnet is correct.
  - d) Check that the sensor is not cracked or otherwise damaged.

**IF THE SENSOR IS DAMAGED THEN IT NEEDS TO BE REPLACED, BUT IN ORDER TO MAKE AN IN-FIELD TEMPORARY REPAIR FOLLOW THE PROCEDURE BELOW:**

\* FIRST TURN OFF MICROPROCESSOR BOX AND DISCONNECT PTO SHAFT OR ELECTRIC MOTOR DRIVE POWER.

- i) Remove the PTO sensor.
- ii) Remove the auger sensor and fit into the position of the PTO sensor. (Machine will function without auger sensor but not without PTO sensor).
- iii) Make wire bridge and connect bridge to terminals 15 and 14 which are shown on control box lid decal. (SEE WIRING DIAGRAM GAS, PAGE 2.03)
- iv) Turn on the Microprocessor box. If the repair has been carried out correctly the display should now read HOURS and you can proceed from that point.

**WARNING!**

**The fact that the sensor has been damaged and you have made an in-field temporary repair does make it essential that a new sensor is fitted as soon as possible as one of the safety devices has now been removed from the control system on the dryer:**

2. Microprocessor display shows “AUGER”:

Same procedure as 1 (b), (c) and (d) above.

To make an in-field temporary repair, you need to make a wire bridge and fit to terminals 15 and 14 which are shown on the control box decal (SEE WIRING DIAGRAM GAS, Page 2.03)

Turn on the Microprocessor box. If the repair has been carried out correctly, the display should now read HOURS and you can proceed from that point.

**IN-FIELD TEMPORARY REPAIRS TO SOLVE PROBLEM OF SENSOR FAILURE:**

**MODEL: GT GRAIN DRYER MODELS:  
380S, 390QF, 580S, 590QF – GAS FIRED:**

**WARNING!**

**The fact that the sensor has been damaged and you have made an in-field temporary repair does make it essential that a new sensor is fitted as soon as possible as one of the safety devices has now been removed from the control system of the dryer.**

3. Microprocessor display shows “AGITATOR”:  
Same procedure as 1 (b), (c) and (d).

**If the sensor is damaged then it needs to be replaced.**

\* First turn off the Microprocessor Box.

To make an in-field temporary repair, you need to make a wire bridge and fit to terminals 3 and 14 which are shown on the control box decal, (see wiring diagram gas, page 2.03).

Turn on the Microprocessor box. If the repair has been carried out correctly, the display should now read HOURS and you can proceed from that point.

**WARNING!**

**The fact that the sensor has been damaged and you have made an in-field temporary repair, does make it essential that a new sensor is fitted as soon as possible as one of the safety devices has now been removed from the control of the dryer.**

**IN-FIELD TEMPORARY REPAIRS TO SOLVE PROBLEM OF SENSOR FAILURE:**

**MODEL: GT GRAIN DRYER MODELS:**

**380S, 390QF, 580S, 590QF – DIESEL FIRED:**

**PROBLEM: MICROPROCESSOR DISPLAY SHOWS:**

**“PTO LOW” OR “AUGER” OR “AGITATOR”:**

Turn on the Microprocessor box. If the repairs have been carried out correctly the display should now read HOURS and you can proceed from that point.

**WARNING!**

**The fact that the sensor has been damaged and you have made an in-field temporary repair, does make it essential that a new sensor is fitted as soon as possible as one of the safety devices has now been removed from the control system of the dryer.**

3. Microprocessor Display Shows “AGITATOR”:

Same procedure as 1 (b), (c) and (d).

IF THE SENSOR IS DAMAGED THEN IT NEEDS TO BE REPLACED.

To make an in-field temporary repair, you need to make a wire bridge and fit to terminals 14 and 4 (see wiring diagram diesel, page 2.29).

Turn on the Microprocessor box. If the repair has been carried out correctly the display should now read HOURS and you can proceed from that point.

**WARNING!**

**The fact that the sensor has been damaged and you have made an in-field temporary repair, does make it essential that a new sensor is fitted as soon as possible as one of the safety devices has now been removed from the control system of the dryer.**

## **545XL AND 345XL DRYERS: CIRCUIT DESCRIPTION:**

Power comes from the tractor battery via the twin core cable into the main terminal block in the center of the control panel. The positive wires are connected in the top half of the terminal block, and the negative wires in the bottom half of the terminal block.

From the terminal block the positive feed goes to the fuse and then to the on/off switch. On the input side of the on/off switch a wire goes back to the terminal block and is connected to the plenum high limit fuse, (which will blow and shut down the burner in case of excess plenum temperature). On the outlet side of the switch there are two wires – one goes to the panel light and the other goes to the air switch “C” terminal. A wire goes from the “C” on the air switch to the green “power on” light. With the on/off switch in the on position the green “power on” light should be lit indicating power is as far as the air switch.

With the fan running, the air switch should be operated and power transmitted via on wire to the green “air flow proven” light (which should be lit) and via the other wire to the “C” terminal on the grain temperature thermostat. With cold grain the current is passed through the switch to the “NC” terminal and on to the auto pilot.

When the grain has reached the pre set temperature on the dial, then the switch will operate and cut the current to the “NC” terminal, and connect it to the “NO” terminal, which is connected to the red grain temperature light which will turn then be lit. This indicates to the operator that the burner has stopped because the grain has reached the desired temperature.

Also, from the NC terminal on the “Grain Temperature Thermostat” is a wire which transmits current to the “start button”. This is a double pole spring return switch which has the two input poles connected together. When the switch is depressed current is passed from the output side of the switch to the green “ignition” light which will be lit. From the same pole of the switch current is passed to the +IVE terminal on the spark booster.

From the other pole on the switch current is passed to the top of the terminal block and on the “Low Heat Solenoid” and “Liquid Solenoid” which should the both open and the pressure gauge should indicate pressure in the gas lines. The green “gas on” light should now be lit.

The spark booster on receiving current from the start button will activate the ignition coil which generates a high tension current. This is transmitted to the spark plug and the burner should light.

Once lit the burner will heat the sensor for the auto pilot when the required temperature is reached (about 20-30 seconds). The auto pilot switch will be activated, current is then passed through the “NO” terminal to the “C” terminal on the “Plenum Temperature” thermostat, when the plenum temperature is below the pre set value, current is passed through the “NC” terminal to the “High Heat Solenoid” which will then open and boost the gas pressure – this will then raise the burner temperature.

When the plenum temperature reaches the preset value on the thermostat the current is cut from the “NC” terminal and the high heat solenoid will close. The high heat solenoid is then opened and closed by the plenum thermostat to maintain the required plenum temperature.

Once the grain has reached the pre set temperature on the grain thermostat the current to the “NC” terminal. This is affecting cuts the current to the gas solenoids which then close and shut off the burner. Current is then transmitted to the “NO” terminal which is connected to the red grain temperature light to indicate to the operator that the burner has stopped because the grain has reached the required temperature.

**PANEL INDICATOR LIGHT SEQUENCE:**

CIRCUIT CONDITION:

LIGHTS

	Color	Title
Power switch on.	Green	Power on
Fan operation air switch activated.	Green Green Red	Power on Air flow proven Low flame temp.
Start button depressed	Green Green Green Green Red	Power on Air flow proven Ignition Gas on Low flame temp.
High flame on, auto pilot activated Start button released	Green Green Green Red	Power on Air flow proven Gas on High heat
Plenum temperature achieved	Green Green Green	Power on Air flow proven Gas on
Grain Temperature achieved	Green Green Red	Power on Air flow proven Grain temp.

## **580 & 380 DRYERS (GAS FIRED)**

The gas dryers from 1984 onwards are very similar to the modern 545 & 345 dryers except that they used an electronic timer instead of the push button start. The electronic timer starts the ignition sequence 10 second after the on/off switch is put in the “ON” position and stops the ignition after a period of 90 seconds has elapsed. The ON/OFF switch needs to be put to the OFF position and then back into the ON position to restart the ignition.

### **CIRCUIT DESCRIPTION:**

Power comes from the tractor battery via the main power lead which is connected to the central terminal block. The positive wire is connected to the bottom terminal on the block. From the terminal block the +IVE current goes to the ON/OFF switch (circuit breaker) from the ON/OFF switch it goes to the “C” terminal on the air switch. There are two other wires on the “C” terminal, one goes to the panel light and the other goes to the “Power on” light both of which should be lit when the ON/OFF switch is put in the ON position.

When the fan is engaged the air pressure will operate the switch and make the connection to the “NO” terminal. Power will now be passed to the “Air flow proven” light and to the plenum temperature thermostat “C” terminal. With the thermostat in it’s cold condition power will be passed through the “NC” terminal on to the “C” terminal of the grain temperature thermostat. Also connected in to the “C” terminal of this the thermostat is a wire to pass power to the No. 1 terminal on the relay.

In it’s cold condition, the grain temperature thermostat passes power from the “C” to the “NC” terminal. This connected to the “low flame temperature” light which should be lit.

The relay has a number of wired connected to it. Power-in being a No.1 and coming from the grain temperature thermostat “C” terminal. This relay is split into two halves, so it is necessary to have a small wire from No.1 to No.8 to power the other half of the relay. Also in No.1 is wire which goes to the No.1 terminal on the electronic timer. 10 seconds after the timer receives it’s energizing current it switches on and passes power to terminal No. 2. This is connected to terminal No. 2 on the relay. The relay coil is now energized by power passing between No. 2 and No. 7 and then on to the earth circuit. Also connected to No. 2 is the timer “circuit on” light which should now be lit.

When the relay coil is energized power is passed from No. 1 to No. 3 and from No. 8 to No. 6. The wires in No. 3 are connected to the gas solenoids and to the “Gas on” light which should be lit. The wires in No.8 are connected to the ignition coil, (this is the positive wire and should have a red mark on it) and the ignition light, the ignition coil will buzz and generate a high tension current which is passed to the spark plug situated against the burner to ignite the gas. Once the burner is lit the sensor for the flame detector gets hot and transmits a signal back to the switch in the panel.

When the sensor gets to the correct temperature, the switch will change and pass power from the “C” terminal to the “NO” terminal which is connected to the top of the terminal block to which the gas solenoids are also connected. This provides power to keep the burner going once the 90 seconds ignition cycle has elapsed the low flame temperature light will now be switched off.

As the grain heats up a sensor detects the change and transmits a signal to the grain temperature thermostat. When the pre-set temperature is reached the switch in the thermostat operates and power is cut from the “NC” terminal (this stops the burner) and passed to the “NO” terminal which is connected to the grain temperature light. This tells the operator that the grain has reached the required temperature.

The plenum temperature thermostat does not control the plenum temperature, it is a high limit switch, and acts as a safety switch to shut off the burner in case it overheats. If the switch has activated then the red “Plenum Temp” light will be lit. The ignition circuit cannot be reactivated until the plenum temperature thermostat has been re-set. The re-set button is on top of the thermostat and should be pushed back not pressed down.

Connected to the same terminal as the negative tractor lead is a loop of wire which connects to the bottom securing screw of the terminal block. On the loop of wire there is an earth fuse which must be in good condition for circuit to work correctly. Before starting to trace a fault this fuse should be checked and replaced if necessary.

**IMPORTANT: DRYERS FITTED WITH ELECTRONIC TIMERS SHOULD NOT UNDER ANY CIRCUMSTANCES BE CONNECTED TO POSITIVE EARTH TRACTORS.**

580 and 380 Dryers prior to 1984 will have two electronic timers. These perform the same function as the single electronic timer. The purge timer switched the ignition on after 10 seconds and the ignition timer switches it off after 90 seconds.



**PANEL INDICATOR LIGHT SEQUENCE:**

**Dryers fitted with timers**

CIRCUIT CONDITION:

**LIGHTS**  
Color      Title

Power switch on	Green	Power on
Fan operationing air switch activated.	Green	Power on
	Green	Air flow proven
	Red	Low flame temp.
Timer circuit activated	Green	Power on
	Green	Air flow proven
	Green	Ignition
	Green	Gas on
	Red	Low flame temp.
	Red	Timer circuit on
Burner lit (flame detector activated)	Green	Power on
	Green	Air flow proven
	Green	Gas on
	Green	Ignition
	Red	Timer circuit on
Burner lit (ignition shut down)	Green	Power on
	Green	Air flow proven
	Green	Gas on
Grain temperature achieved, burner off	Green	Power on
	Green	Air flow proven
	Red	Grain temp.

## **PROBLEM SOLVING: ELECTRICAL CIRCUIT 12 VOLTS DC:**

### **THEROMSTAT CONTROL:**

Problem solving is simple as the indicator lights just above the ON/OFF switch give a good indication of what is happening assuming all the lights work. The only tool needed is a simple test light. All the controls are connected on the positive side of the circuit so one side of the test light can be connected to the earth on the terminal block. Usually the earth wires used in the panel are colored white for easy identification.

If a dryer gives a problem, always check the tractor battery connections and the twin core lead to the control panel. Also check the earth fuse, replace it if in doubt.

\* Always check the electrical circuit with both the liquid and vapor gas taps in the OFF position.

When it is certain that there is power to the terminal block, remove the cover from the air switch and fit a bridge across the two terminals. Put the ON/OFF switch in the ON position. Take note of the panel light sequence of operation and compare with the appropriate sequence on Page No. 3.32 or Page No. 3.35 this will give a good indication of where the problem may be.

## PROBLEM SOLVING: THEROMSTAT CONTROL:

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
1. No “power on” light.	Faulty lead to tractor battery.	Check and repair lead and connections as required.
	In-line fuse blown.	70’ range and early 80’ range have an in-line fuse in panel, check and replace as required.
	Blown bulb in light.	Check light and replace as required.
	Earth fuse blown.	Check and replace as required. Check tractor battery polarity.
2. Fan operational. No “air flow proven” light.	Blown bulb in light.	Check and replace as required.
	Air switch pipe blocked.	Remove and clean air switch pipe. Be sure pipe is positioned behind fan correctly. Also check back of switch for dirt and chaff before refitting pipe. Remove and clean switch if required.
	Faulty air switch.	If air switch pipe clean and in correct position, fit a bridge to the air switch terminals – if system operated switch is faulty – fit new air switch.

**!! DO NOT OPERATE THE BURNER WITH THE AIR SWITCH BRIDGED OUT.**

## PROBLEM SOLVING: THEROMSTAT CONTROL:

### PROBLEM:

### CAUSE:

### REMEDY:

3. Timer circuit will not come on.

Low battery on tractor, faulty timer.

Change tractor or battery or recharge battery. If “low flame temp” light is on then power should be as far as the relay. Check there is power as far as terminal No. 1 on timer, if so, fit a bridge from terminal No. 1 to terminal No. 2. The ignition should now start and timer can be assumed to faulty. Before fitting a new timer, Check tractor lead is connected correctly and the tractor is negative earth. Timer will be damaged if connected to positive earth tractors.

4. Timer circuit will not come on – circuits with 2 timers.

Faulty timer (10 seconds purge)

Check power at No.1 terminal on the 10 second purge timer. If power there fit a bridge to No. 3 terminal ignition should start indicating a faulty timer, check polarity at tractor before fitting new timer.

5. Timer circuit will not switch off.

Faulty timer.

Circuit with one timer. Remove wire from No. 2 terminal on timer ignition should stop indicating that timer is permanently on. To check replace wire on to terminal No. 2, switch off the ON/OFF switch then switch on again. If timer circuit on light comes on straight away, then timer is definitely switched on all the time and should be replaced.

## PROBLEM SOLVING: THEROMSTAT CONTROL:

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
6. Timer circuit will not switch off. (Cont'd)	Faulty timer.	Two timer circuit. Check there is power to terminal No. 1 on the ignition (90 sec) timer, if so connect a bridge between terminals 1 and 3, the ignition should now stop – indicating a faulty timer which should be replaced. Check tractor battery polarity before fitting new timer.
7. Burner will not light, “ignition” and “gas on” light lit.	Faulty ignition coil.	Check there is power at position No. 6 on relay next to grain temp. Thermostat. If so check condition of earth, if OK then remove the ignition coil lead from position No. 6 on relay and connect it to positive lead connection on the terminal black. Coil should buzz and a spark should be produced, if not coil is faulty and should be replaced.
	Faulty spark plug.	Switch gas taps off and bridge the air switch. Disconnect PTO shaft and enter the dryer plenum chamber, check the gap at the electrodes, reset to 1/8” – 3/16”. Switch on ignition cycle and check condition of spark at plug. Check to see if spark is shorting to the frame close to the holder indicating faulty insulation. Clean thoroughly or fit new plug.

## PROBLEM SOLVING: THEROMSTAT CONTROL:

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
8. Burner will not light, “ignition” and “gas on” light lit. (Cont’d)	Faulty spark plug lead. Dirty burner ring.	Check lead for damage, replace or repair as required, check holes in burner ring clean with 1/16” twist drill as required.
	Faulty spark booster (345 & 545 XL only)	Check power to and from spark booster. If no output to coil the booster is faulty and should be replaced.
	Gas solenoid not opening.	This is usually indicated by no reading on the pressure gauge. To check the solenoids, remove each positive solenoid wire from the top of the terminal from the tractor. A loud click will be heard as the solenoid operates. As a final check remove the coil from the solenoid body, insert a screw driver or other metal object into the center hole and energize the coil. The article should be gripped by the coil, if not the coil is faulty.
9. Burner lit, but goes out after 90 seconds, “low flame temp” light stays on.	Faulty flame detector.	Check position of sensor in flame sensor – should glow red. Remove wires from “C” and “NO” terminals and connect together, burner should now stay on once the ignition cycle has finished, and the flame detector should be replaced.
	Dirty burner ring.	Clean holes in burner ring using 1/16” twist drill. Once the burner is lit the dryer should not be left unattended if the flame detector is bridged out of the circuit.

## PROBLEM SOLVING: THEROMSTAT CONTROL:

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
10. Ignition cycle will not start.	No power to timer.	Check setting on plenum and grain thermostat, adjust if required, check reset on plenum thermostat, ('80 range dryers) (push back do not press down). Check continuity of current flow through thermostat. (Plenum temp. in at "C" out at "NC" to grain temp. In at "C" out at "NC" to flame detector. Wire from "C" on grain thermostat to relay position 1 and on to timer).
11. Timer circuit on no ignition.	No power through relay.	Check power from timer to position No. 2 on relay. Check earth from position 7 on relay to terminal block. Check earth fuse. Check power into relay at position No. 1 from thermostats also check bridge wire between positions No. 1 & 8. Check output from relay at position No. 3 & 6.
12. Plenum temperature light on burner will not light.	Plenum has overheated.	Reset plenum thermostat by pushing reset lever back. Check thermostat setting is 50 F above operating plenum temperature. Adjust if require. Relight burner and check for overheating.
	Faulty plenum temp. Thermostat.	. When cold current should flow from "C" to "NC". If thermostat also passes to "NO" or only passes to "NO" then it is faulty and should be replaced.

**PROBLEM SOLVING: THEROMSTAT CONTROL:**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
13. <u>NO POWER</u>	Blown high temperature fuse. <u>345 &amp; 545 dryers only.</u>	Check reason for overheating. Disconnect PTO shaft and enter plenum chamber. High temperature fuse is a small round sensor bolted to the side of the plenum chamber with the other sensors. Fit new unit, check panel fuse and replace if necessary.
14. Grain temperature light stays on.	Faulty grain temperature thermostat. <u>545 &amp; 345xl dryers only.</u>	Check setting and adjust if required. Turn to highest setting if light still on check power source for the lights is coming from thermostat, if it is replacing thermostat.
15. Burner remains on high heat.	Faulty plenum temperature thermostat <u>545 &amp; 345xl dryers only.</u>	Check setting on thermostat, turn down temperature dial. If high heat goes off, note temperature on dial and compare with temperature gauge after allowing temperature to stabilize. Note difference, if any for future reference. High heat should switch back on it dial turned up, in this case thermostat OK but there may be a difference between gauge and thermostat readings.

If high heat does not go off when thermostat turned down. Check power output at “NC” terminal on plenum thermostat. If there is power at “NC” terminal, then the thermostat is faulty and should be replacing. If there is no power at “NC” terminal solenoid may be stuck open - see instructions for cleaning solenoid. \* IN CONDITIONS BURNER MAY NEED TO STAY ON HEAT TO MAINTAIN TEMPERATURE, Particularly if plenum temperature is used.

be  
COLD  
HIGH  
high



**PROBLEM SOLVING: THEROMSTAT CONTROL:  
DIESEL BURNER:**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
1. No "power on" light.	Faulty fuel float switch.	Remove tank unit and check fuel float is fitted and is the correct way up. To check operation, move float up and down and watch "power on" light. If "power on" light is lit when the float is in the down position, then it is the wrong way up. Remove spring clip and float, refit float other way up and refit spring clip. If light does not come on check continuity of switch, replace if required.
		The fuel float switch can be bypassed by removing the cover at the top of the tank unit, disconnecting fuel float switch and connecting together the two wires from the control panel. * IF THE FUEL FLOAT SWITCH IS BYPASSED IT IS POSSIBLE FOR THE FUEL PUMP TO RUN DRY OF FUEL, AND AS A RESULT IT WILL BE DAMAGED.
	Faulty tractor lead/connection.	Check tractor lead and connections, repair as required.
	Blown fuse.	Check fuse - replace as required. Check polarity of tractor and that connectors are fitted to correct battery terminal before fitting new fuse.
	Blown bulb.	Check light and replace as required.
	Blown "high temp." fuse.	Check high limit and replace.

**PROBLEM SOLVING: THEROMSTAT CONTROL:  
DIESEL BURNER:**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
2. Fan operational, no “Air flow proven” light.	Blown bulb in light.	Check and replace light as required.
	Air switch pipe blocked.	Remove and clean air switch pipe, take care to get pipe in correct position behind the fan when refitting the pipe. Also check back of switch for dirt and chaff. Remove and clean if required.
	Faulty air switch.	If air switch pipe is clear and in the correct position in relation to the fan, fir a bridge between the two terminals on the switch. If system operated, switch is faulty. Fit new air switch.
<u>*DO NOT OPERATE A BURNER WITH THE AIR SWITCH BRIDGED*</u>		
3. Timer circuit will no switch on.	Low battery on tractor.	Recharge battery or change battery.
	Faulty ignition timer.	The ignition timer is found behind light panel. It is the one with 3 terminals. To check the timer fit a bridge between terminals 1 and 2, if circuit operates timer is faulty. Remove bridge once low flame temperature light has gone off. Replace timer and check tractor polarity before attempting to restart.

**PROBLEM SOLVING: THEROMSTAT CONTROL:  
DIESEL BURNER:**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
4. Timer circuit will not switch off.	Faulty timer.	Remove wire from No. 2 terminal on ignition timer. Circuit should go off indicating faulty timer. Fit new timer.
5. Burner will not light. "Ignition" and "gas on" lights lit.	Faulty igniter.	Check electrode gap, clean and rest to 1/4" – 5/16".
	Faulty ignition coil.	With PTO stopped, remove positive ignition coil wire from position No. 6 on the left hand relay or push button start switch and connect to bottom terminal on central terminal block (positive tractor lead). If coil does not operate it is faulty and should be replaced.
	Faulty spark plug lead.	Check lead from ignition coil to igniter, repair or replace as required.
	Fuel solenoid faulty or dirty.	Check solenoid coil is operating by placing your hand on top of coil and operate system with PTO stopped and air switch bridged. Slight vibration will be felt as solenoid opens. If solenoid appears to operate then it could be blocked in which case dismantle and clean. If solenoid does not operate remove coil and check by inserting screw driver blade or similar metal object into center of coil and energize coil. Replace coil if no magnetic effect is observed. If magnetic effect observed dismantle and clean solenoid body.

**PROBLEM SOLVING: THEROMSTAT CONTROL:  
DIESEL BURNER:**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
6. Burner lights but goes out after 90 seconds. "Low Flame Temp" light stays on.	Dirty flame sensor.	Stop burner. Open burner tube access door, locate sensor on opposite and clean it.
	Incorrectly positioned sensor, faulty flame detector.	Adjust position of sensor in burner tube. Remove cover from flame detector in panel and fit a bridge between the "C" and the "NO" terminals. If system operates correctly flame detector is faulty and should be replaced. * ONCE THE BURNER IS LIT, DRYER SHOULD NOT BE LEFT UNATTENDED IF THE FLAME DETECTOR IS BRIDGED OUT*
7. Auxiliary burner will not switch on.	Faulty or incorrectly set thermostat.	Check thermostat setting, adjust up if required, and check continuity through switch. If power is not passing through the "NC" terminal then thermostat is faulty and should be replaced.
	Faulty solenoid.	Check operation of auxiliary solenoid, clean or replace as required.
	Faulty No. 2 timer, damaged wires to solenoids.	Fit bridge between terminals 1 & 2. If burner operates fit new timer. Check wires to solenoids, repair as required.
8. Auxiliary burner will not switch off.	Faulty or incorrectly set thermostat.	Check auxiliary burner thermostat setting, adjust if required. Turn thermostat to lowest setting, if power is still passing through to "NC" terminal, thermostat is faulty and should be replaced.

**PROBLEM SOLVING: THEROMSTAT CONTROL:  
DIESEL BURNER:**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
8. Auxiliary burner will not switch off. (Cont'd)	Dirt in solenoid.	Dismantle and clean solenoid.
9. "Plenum Temp" Light stays on, burner will not light.	Plenum overheating usually due to auxiliary burner not switching off.	See above.
	Incorrectly set or faulty thermostat.	Check setting on dial. Thermostat should be set 50 F above operating plenum temperature (auxiliary burner thermostat) push reset on top of thermostat, red plenum temp. Light should go out, if not, thermostat is faulty.
10. "Grain Temp" light stays on.	Faulty or incorrectly set thermostat.	Check and adjust setting if required. Check continuity through thermostat, if current continues to pass through the "NO" terminal with the dial turned to its highest setting, thermostat is faulty.
11. Burner will not ignite "Ignition" light lit. "Gas on" not lit.	Faulty No. 3 timer.	Fit a bridge between terminals No. 1 & 3 on the No. 3 timer. If burner ignites, timer is faulty and should be replaced.

DIESEL BURNERS MANUFACTURED IN 1984 AND 1985 HAD ELECTRONIC TIMERS FOR THE IGNITION CIRCUIT. IF THESE TIMERS PROVE TO BE A PROBLEM THEY CAN BE REMOVED AND THE SYSTEM CONVERTED TO PUSH BUTTON START. DETAILS OF THIS MODIFICATION ARE GIVEN IN THE MODIFICATIONS SECTION.

**PROBLEM SOLVING: FUEL SYSTEM: Before making repairs to gas line switch off supply at tank or cylinder and “burn off” any gas in the system.**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
1. Uncontrollable heat.	Faulty modulator valve. (Pre microprocessor gas dryers)	Check operation of modulating valve by turning adjusting screw quickly either up or down ½ turn. Gas pressure reading should alter accordingly either up or down. If not, modulator is faulty. Replace temperature sensor on the back of modulator valve.
	Solenoid stuck open.	Dismantle and clean solenoid.
	Leaking vaporizer.	Check condition of flame to see if there is visible flame outside the normal pattern, if so remove vaporizer, pressure test to establish leak. A temporary repair may be made by welding but the vaporizer should be replaced as it has to withstand full tank pressure.
	Cracked fuel pipe.	Check pipes for leaks, repair as required.
2. Fluctuating fuel pressure, fuel oil burner.	Blocked fuel filter.	Replace fuel filter element.
	Air in fuel system.	Check for air leaks on suction side, repair as required.
	Slipping pump drive belt.	Check and adjust drive belt to fuel pump. Check pump drive coupling. Repair as required.
	Faulty fuel pump.	Adjust pressure, if no different fit new pump.

**PROBLEM SOLVING: FUEL SYSTEM: Before making repairs to gas line switch off supply at tank or cylinder and “burn off” any gas in the system.**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
3. Fluctuating gas pressure, burner sometimes goes out.	Dirty fuel solenoid.	Dismantle and clean fuel vapor solenoids. Check for ruptured or damaged diaphragm, replace as required. See page 4.12
	Dirty pressure regulator.	Dismantle and clean pressure regulator. See page 4.10
	Faulty modulating valve.	Dismantle and clean valve, check for damaged parts, replace as required.
4. No fuel pressure.	Lack of fuel.	Check <u>ALL</u> fuel taps are switched on. Check adequate supply in tank or gas cylinders. Where gas cylinders are used check bottle connections are properly connected. If in doubt change cylinder. Demand valve closed on gas tank – close tap and open again slowly. FUEL OIL BURNER: Check pump drive belt and coupling. Check fuel inlet non-return valve may be closing supply.
	Faulty pressure gauge.	Check gauge and replace as required.
	Faulty fuel pump (fuel oil burner)	Check supply from pump and fit new if required.
5. Burner will not light but has pressure and spark.	Dirty burner ring (propane gas burner)	Clean holes in burner ring using 1/16” twist drill.

**PROBLEM SOLVING: FUEL SYSTEM: Before making repairs to gas line switch off supply at tank or cylinder and “burn off” any gas in the system.**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
5. Burner will not light but has pressure and spark. (Cont'd)	Faulty primary nozzle (fuel oil burner).	Check inside burner tube if wet with diesel primary nozzle may not be atomizing. Fit new nozzle. * IT IS RECOMMENDED NEW NOZZLES ARE FITTED AT THE START OF EACH SEASON.
	Block primary solenoid (fuel oil burner).	Dismantle and clean fuel solenoid, take care to clean inlet to solenoid as this is a small orifice. If solenoid pipe work has been dismantled check that connections have not been screwed in too far blocking the inlet orifice.
6. Fuel oil burner smokes.	Slipping fan belts.	Check fan belt tension, adjust as required.
	Faulty nozzles.	Check flame pattern. Replace nozzles if flame pattern irregular. *DO NOT OVERTIGHTEN NOZZLES OTHERWISE NOZZLE HOLDERS WILL BE DAMAGED*
	Incorrect fuel/air mixture.	Check auxiliary air flap opens when auxiliary (high heat) burner comes on. Check if smoke appears on low or high heat and adjust air flaps on burner tube as required. * TOO HIGH RATIO OF AIR TO FUEL IS INDICATED BY HARSH FUMES WHICH AFFECT THE EYES AND THROAT.
	Fuel leaks from nozzles, holders etc.	Check pipe work and repair as required. Check nozzles holder for cracks.



**PROBLEM SOLVING: FUEL SYSTEM: Before making repairs to gas line switch off supply at tank or cylinder and “burn off” any gas in the system.**

<u>PROBLEM:</u>	<u>CAUSE:</u>	<u>REMEDY:</u>
7. Fuel oil burner nozzles contaminated with soot.	Incorrect fuel/air mixtures.	Check fan belt tension, adjust as required. Clean fan grill panel. Check type of soot. Soft fluffy- too little air. Hard flakey- too much air. Adjust air flaps accordingly.

**IMPORTANT:**

- \* **Always use suitable sealant when repairing pipe leaks (PTFE Tape).**
- \* **Never use a naked flame when tracing propane gas leaks always use soapy water to wet the joints.**
- \* **Never attempt to repair any leak or interfere with any fittings on the propane tank or cylinders. This is the sole responsibility of the gas company that supplies them.**
- \* **Always clean excessive fuel oil from the burner tube and surrounding area before relighting the burner after a repair.**

## **PROPANE GAS:**

### **1. FREEZING OF THE GAS LINE:**

Cause: Restriction in the flow of gas freezing occurs because of an increase in the speed of the gas after the restriction.

**REMEDY:** Trace frosted pipe back from the burner. Where frosting starts is where the restriction is. If the freezing occurs on the line **BACK** to the tank or cylinders, then the restriction is there. In this case check that the tap is fully turned on (turn off the tap and turn it on again slowly). If this does not correct the problem consult the gas supply company.

The most likely cause of freezing gas pipes on the dryer vapor line is the pressure regulator damper sticking.

See 4.10 for instructions on dismantling the pressure regulator.

**Under no circumstances must you interfere with the cylinder or tank fitting.**

Before attempting to dismantle any part of the gas line ensure the pipe work is completely empty of gas. If in doubt release fittings slowly.

Do not smoke or have any naked flame nearby when working on the gas pipes and fittings.

The following contains help with problems that may occur specifically with the FUEL OIL BURNER.

Below is a sectioned drawing of a typical nozzle to assist with identification of various parts

### **SECTION THROUGH A NOZZLE**

## WHAT CAUSES AN OIL NOZZLE TO DRIP?

Drips from an oil nozzle are not always the fault of the nozzle but regardless of the reason, dripping must be stopped. Oil in places where it is not wanted, inside or outside the burner, creates a terrible mess.

### **Drips from the nozzle on start-up.**

If the oil gets through the system with too low a pressure in the start-up period it will merely drip out of the nozzle since atomizing will not occur until pressure becomes sufficiently high.

The cause of low pressure is usually to be found in the solenoid valve or in the hydraulic valve in the oil pump, both of which can collect dirt or become faulty.

### **Drips from the nozzle during operation.**

There can be several reasons:

- The oil nozzle is too far behind the combustion head.
- The ignition electrodes are wrongly placed and protrude into the oil mist.
- The nozzle does not sit tight in its fixture. Note! Do not use too much force when installing a nozzle.
- Dirt in the nozzle or oil coke in or around the nozzle orifice.
- Defects caused by attempts to clean the nozzle orifice.
- Oil pressure too low. Remember to check the pressure gauge itself now and again.

### **Drips from the nozzle on stopping.**

If the nozzle continues to yield oil when combustion stops instead of totally cutting off, the mostly likely reasons are:

- Air in the oil pressure pipe between pump and nozzle.
- Solenoid valve dirty or defective.

## WHAT MAKES THE FLAME LOPSIDED?

A lopsided flame is a guarantee for bad combustion and must be put right immediately. The flame can become lopsided from:

- Wear in the oil nozzle.
- Dirt inside the nozzle – in the cone slots for example.
- Attempts to clean the nozzle with sharp instruments or by brute force.
- Oil cake on the tip of the nozzle.
- Unsymmetrical air supply because of a faulty combustion head.  
A dirty or clogged combustion head will cause an unbalanced air supply.

## WHAT IS THE CAUSE OF NO OIL FROM THE NOZZLE?

To say the least, it is irritating if not one drop of oil emerges from the nozzle. To eliminate the cause, follow the step-by-step approach below.

- Is there oil in the tank?
- Is the valve on the pressure line open or closed?
- Is the check-valve on the suction line the wrong way round?
- Does the pump rotate? Sometimes the pump/motor coupling can break up.
- Does the pump suck? How much suction does the vacuum meter on the filter show?
- Can the presence of air be seen in a transparent test hose on the suction side of the pump? Air can enter because of too high a vacuum, or from a leak in the suction line.
- Is the filter clean and in good order?
- Are the solenoid valves open and working as they should be?
- Is there dirt in the oil pipe to the nozzle?
- Is the nozzle filter clean and in good order?
- Is the nozzle blocked?
- Is the oil very cold and thick? Perhaps some water in the oil has turned to ice?

If all these factors are checked and ordered as necessary there should no longer be a problem.

## WHAT CAUSES OIL COKE ON THE NOZZLE AND IGNITION ELECTRODES?

When liquid oil heated above a certain temperature a process takes place called “cracking” and a stone-hard black carbon (coke) settles out. Under normal conditions the amount of carbon deposited on the nozzle and ignition electrodes will be unnoticeable. But just a slight scratch on the tip of the nozzle can create a path along which small amounts of oil can find their way. This oil will not of course be atomized and will be exposed to radiant heat from the flame. Consequently, it will produce carbon on the tip of the nozzle and cause interference with the atomizing process and poorer combustion.

The same thing can happen if the nozzle drips.

If the ignition electrodes sit incorrectly they can form a projection for the oil spray to hit and any oil appearing on the tips of the electrodes will receive heat from the flame and carbon deposits will start to build up.

Eventually the electrodes will short circuit, the ignition spark will become non-existent and burner restart impossible.

### NOTE!

Coke formation on nozzle and electrodes will always lead to poor performance and must at all costs be avoided.

## WHY “SHOOTING STARS” IN THE FLAME?

It was the Chinese who discovered that powdered carbon added to fireworks produces certain effects and ever since, the sparkle from the little carbon particles when a firework is ignited has delighted everyone.

Not so pleasing are the “fireworks” that occur in the combustion chambers of many oil-heating burners. With bad atomizing, the oil mist will contain such large drops that before the drops have a chance to evaporate they will crack and produce the small carbon particles and the “shooting stars”.

Unfortunately, this process produces much mess in the burner and should be avoided.

The large drops will not all be completely burned and gradually the heating surfaces will get covered with mixture of soot and coke which ruin the heat transfer, so leading to poor operating economy.

Shooting stars in the flame can come from:

- Too low an oil pressure.
- Defective combustion head, or possibly a defective nozzle.
- Oil too thick, (too cold?).
- Too much excess air.

## WHAT PRODUCES A GREASY MALODOROUS DEPOSIT IN THE BURNER AND HOW CAN IT BE REMOVED?

When an oil-fired burner can be detected from a distance by its smell, the most frequent cause is the interior of the boiler being covered with a black shiny greasy substance which is not so easy to remove.

This substance is usually created when the oil burner has too large an excess of air. Some of the ignited oil becomes cooled down so violently that it is extinguished before being completely burned out.

Since the lightest contents in the oil are the first to be burned, what is left if the oil is not completely consumed are the tars. Tarry deposits are avoidable so long as oil combustion does not involve too much excess air.

Tarry deposits most often occur because:

- Oil combustion is accompanied by too much superfluous air.
- Too low an oil pressure, or a defective nozzle, produce oil drops which are too large.

## WHAT MAKES THE FLAME TOO LONG?

If the flame becomes too long it may lick the burner heating surfaces and cause sooty combustion. Under certain circumstances, cracked oil can cake around the combustion chamber walls.

The flame can become too long because:

- The nozzle chosen has too small a spray angle – 60 degrees instead of 80 degrees for example.
- Oil too cold. When oil becomes too cold it gets thicker and produces larger oil drops. These larger drops need to travel through the air for longer time than small drops before being burned up. That is why the flame increases in length.
- Nozzle capacity too large for the size of the combustion chamber or vice versa. This relationship should be checked against that given in the instruction book.
- Nozzle spray and atomizing pattern does not correspond with the atomizing pattern of the burner (consult the instruction book).
- Oil pressure too low. See if it corresponds to the pressure prescribed for the burner.
- Nozzle capacity too high. Possibly because of too high an atomizing pressure.

## WHAT CAUSES OIL AND COKE TO COLLECT AROUND THE NOZZLES AND COMBUSTION HEAD?

A filthy burner tube not only looks unappetizing, but accumulations of oil and coke on the components in the tube (nozzle and fixture combustion head, electrodes, ignition cables, flame monitor etc) can have very adverse effects on combustion and operating economy.

Dirt may accumulate because of:

- Defective nozzle. There may be coke on the tip of the nozzle.
- Incorrect nozzle. Perhaps the spray angle is too large.
- Oil pressure too high or spray pattern incorrect. If the oil pressure is too high, the conical atomizing pattern opens up (the spray angle increases) so that oil can be bounced backwards.
- Nozzle incorrectly placed in relation to the combustion head.
- Defective or wrongly assembled combustion head.
- Hair or other foreign matter in the combustion head.
- Bad oil cut-off on stopping and starting. The solenoid valve and shut-off valve must be examined.
- Electrodes prelude into the oil mist.
- Varying oil pressure because of a defective pressure regulating valve in the pump.
- Leakage between nozzle and fixture. Remember not to use excessive force when tightening the nozzle to avoid damaging the joint surfaces.