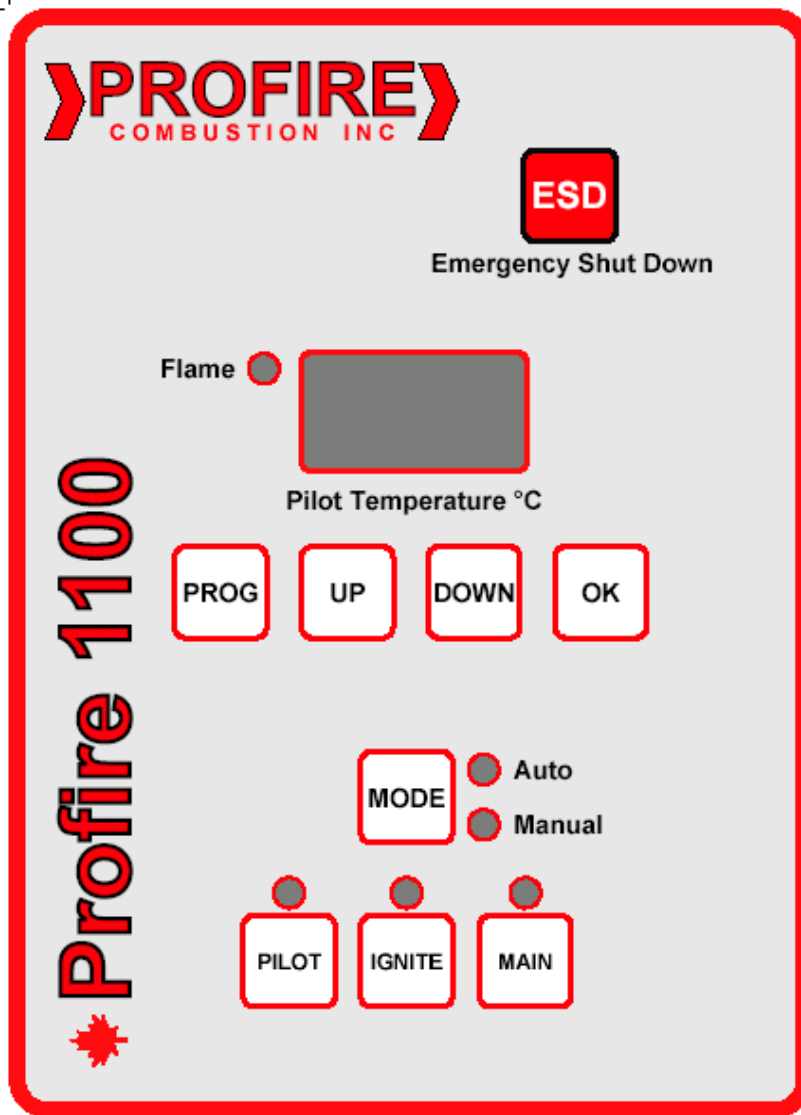


# PROFIRE 1100



## IGNITION FLAME SAFETY CONTROLLER

## CAUTIONS

**EXPLOSION HAZARD: DO NOT SERVICE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS**

**DO NOT OPEN WHEN ENERGIZED**

**SUBSTITUTION OF COMPONENTS MAY IMPAIR THE SUITABILITY FOR ZONE 2 (Class 1 Division 2)**

**REPLACEMENT FUSES MUST BE SAND-FILLED**

## INSTALLATION WARNING

**TERMINALS: MUST CONFORM TO THE DIRECTIONS IN THIS MANUAL**

**THE UNIT MUST BE PROPERLY CONNECTED TO EARTH-GROUND FOR EFFECTIVE IONIZATION OPERATION**

**ELECTRICAL DEVICES CONNECTED TO THE CONTROLLER MUST MEET ELECTRICAL STANDARDS AND BE WITHIN VOLTAGE LIMITS**

## CONTACT NUMBER

For any questions call:

**780-960-5278**

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# 1 Features & Specifications

## 1.1 General Features

The following general features are common to all Profire 1100 models:

- Designed for the fire-tube heater industry
- Meets or exceeds all relevant codes and standards
- Easy installation with clearly marked component I/O
- Large, easily accessible terminal connections
- Rapid 1.8 second shut-down on flame-out
- DC voltage spark generator
- Ultra-low power design to accommodate solar panel or TEG applications
- Auto relight or manual operation
- Equipped with AVD (Advanced Visual Display) for improved operating functions and signals
- Transient protected and fail-safe circuits

## 1.2 Specifications

The following specifications are common to all Profire 1100 models:

### ENCLOSURE

---

Fiberglass  
200 x 150 x 100 mm (8" x 6" x 4") overall dimensions  
2.3 kg (5 lb)  
CSA and UL compliant for Class 1 Zone 2 locations  
Enclosure type 4, 4X, 12, 13

### CIRCUIT BOARDS

---

All solid state  
CSA compliant for Zone 2 (Class 1, Division 2) locations

### IGNITION BASE AND COIL

---

For non-hazardous mounting area only

### POWER REQUIREMENTS

---

+10 to + 28 volts DC (voltage must match solenoid rating)  
2.0 amps surge (limited), 0.015 - 2 amps run

### POWER CONSUMPTION

---

See the Design Code Features table on pg 9 for the power required for each design code.

	12V	24V
Controller only, display ON	1.3 W	1.6 W
Controller only, display OFF	0.6 W	0.9 W
System maximum using design codes	See pg9	See pg9

## **TEMPERATURE RATING**

---

-40°C to 55°C

## **APPROVALS**

---

Zone 2 (Class 1, Division 2) locations approval (CSA 213-92)  
Burner Safety approval (CSA 22.2-199) - can be used on B149.3 compliant system  
Industrial Process Equipment approval (CSA 14-95)

## **INPUTS & OUTPUTS**

---

(4) digital inputs for safety interlock device connections  
(4) digital outputs  
See Section 1.4 for thermocouple inputs

## 1.3 Model Comparison

The following table can be used to determine model functionality:

	<b>1100 s (standard)</b>	<b>1100 b1 (bath 1)</b>	<b>1100 b3 (bath 3)</b>
Ionization flame detection	<b>X</b>	<b>X</b>	<b>X</b>
Thermocouple flame detection	<b>X</b>	<b>X</b>	
Pilot output off when bath temperature > HH2		<b>X</b>	<b>X</b>
Main output off when bath temperature > HH1		<b>X</b>	<b>X</b>
Alarm output when fault detected	<b>X</b>	<b>X</b>	<b>X</b>
Alarm output when bath temperature > HH3		<b>X</b>	<b>X</b>
Bath temperature monitored		<b>X</b>	<b>X</b>
Separate temperature controller required	<b>X</b>	<b>X</b>	
Separate over temperature protection required	<b>X</b>		

\* HH1, HH2 & HH3 are user programmable bath temperature setpoints

## 1.4 Thermocouples

### TE 1 0 1

---

Type “K”

Measures bath liquid temperature

Primary temperature control device

Connected to an external temperature controller (not included) on Models s & b1

Connected to terminals TC+(yellow) & TC-(red) on card on door on Model b3

20 ga or larger Type “K” extension wire must be used

Provides temperature control

Will not alarm if the wires are shorted together or if an open circuit is detected

A large error will result if either lead is shorted to ground.

### TE 1 0 2

---

Type “K”

Measures bath liquid temperature

Connected to terminals TC+(yellow) & TC-(red) on card on door on Model b1

Connected to terminals TC+(yellow) & TC-(red) on main board on Model b3

Connected to an external temperature controller (not included) on Model s

20 ga or larger Type “K” extension wire must be used

Provides over temperature protection

Not the primary temperature control device

Will alarm if an open circuit is detected

A large error will result if either lead is shorted to ground

### TE 3 0 6

---

Type “K”

Measures pilot temperature

Connected to terminals TC+(yellow) & TC-(red) on main board on Models s & b1

14 ga extension wire without a shield is sufficient

Will fault if an open circuit is detected

A large error will result if either lead is shorted to ground

\* TE101 and TE102 may be different elements in the same head of a type “K” thermocouple

\* For all thermocouples avoid locating extension wire near high voltage and shield if necessary

## 2 Installation

### 2.1 Design Code P&IDs and Wiring Diagrams

The design codes are not exhaustive but only a sample of recommended designs that have been used. Any design used should be checked by a qualified person and approved by the gas authority having jurisdiction at the site where the system is to be installed. The design used should be clearly marked and available to maintenance and service personnel.

The following tables show and compare the features of each design code for selection and identification purposes.

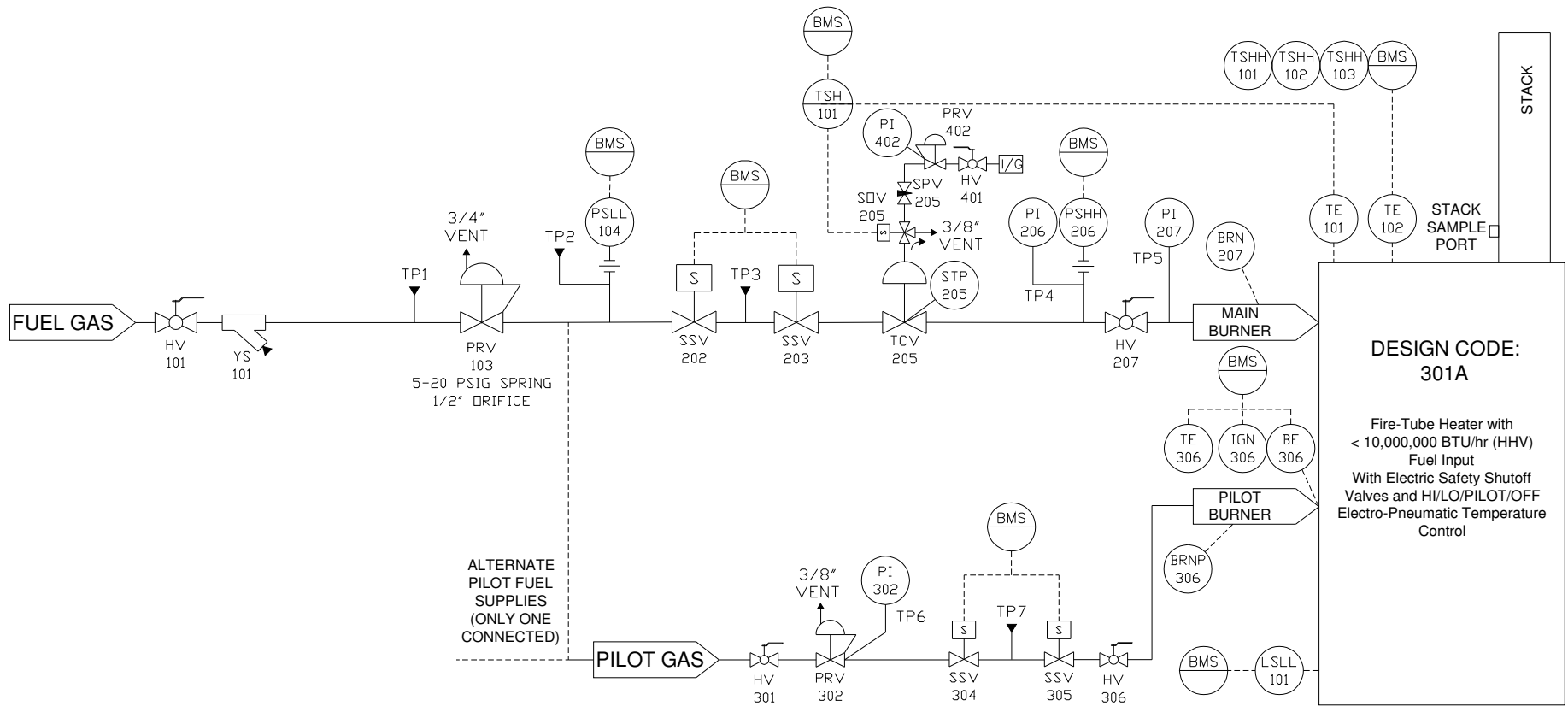


## Design Code Features

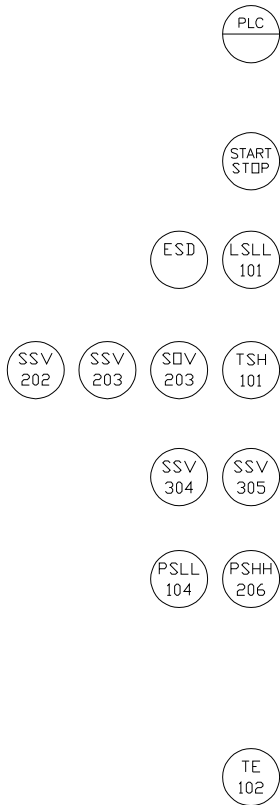
<i>Design Code</i>	<i>Model</i>	<i>Burner Size</i>	<i>SSV Type</i>	<i>Temp Control Type</i>	<i>TCV Type</i>	<i>Pilot Type</i>	<i>Instrument Gas</i>	<i>Power Required</i>
301A	b1	< 10MM Btuh	2 x electric	electric 2- state	pneumatic	separate	separate	30W
301B	b1	< 10MM Btuh	2 x electric	I/P modulating	pneumatic	separate	separate	15W
301C	b1	< 10MM Btuh	2 x electric	pneumatic	pneumatic	separate	separate	15W
302A	b1	< 10MM Btuh	1 x pneumatic c/w ZSC	electric 2- state	pneumatic	separate	separate	10W
302B	b1	< 10MM Btuh	1 x pneumatic c/w ZSC	I/P modulating	pneumatic	separate	separate	10W
302C	b1	< 10MM Btuh	1 x pneumatic c/w ZSC	pneumatic	pneumatic	separate	separate	10W
303A	b1	< 10MM Btuh	2 x electric + LFSSV	electric 2- state	LFSSV	separate	n/a	30W
304A	b3	< 1MM Btuh	2 x electric	electric 2- state b3	none	slipstream	n/a	15W
305A	b3	< 1MM Btuh	1 x pneumatic c/w ZSC	electric 2- state b3	none	slipstream	separate	15W
306C	b1	< 1MM Btuh	2 x electric	pneumatic	pneumatic	slipstream	separate	15W

## Design Code Advantages & Disadvantages

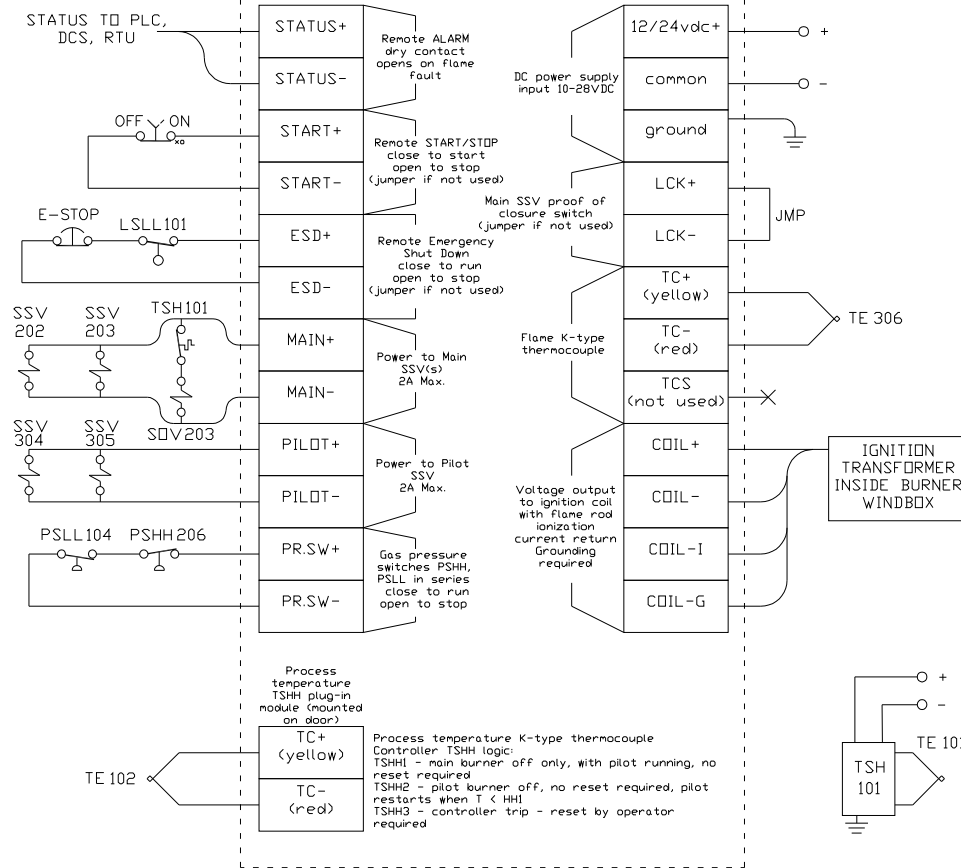
<b>Design Code</b>	<b>Advantages</b>	<b>Disadvantages</b>
301	<ol style="list-style-type: none"> <li>1) Choice of HI/LO/OFF, electronic or pneumatic modulating temperature control</li> <li>2) Uses less instrument gas than 302</li> <li>3) Can be used with remote bath temperature monitoring and setpoint control</li> <li>4) Less wiring than 302</li> <li>5) Incorporates triple setpoint HHHI temperature protection</li> </ol>	<ol style="list-style-type: none"> <li>1) Uses an external temperature controller</li> <li>2) 301A uses more electric power</li> <li>3) Needs clean and dry instrument gas or air at minimum 35 psig</li> <li>4) More difficult to install in 6" fire-tubes</li> </ol>
302	<ol style="list-style-type: none"> <li>1) Choice of HI/LO/OFF, electronic or pneumatic modulating temperature control</li> <li>2) Uses less electric power than 301A</li> <li>3) Can be used with remote bath temperature monitoring and setpoint control</li> <li>4) Incorporates triple setpoint HHHI temperature protection</li> </ol>	<ol style="list-style-type: none"> <li>1) Uses an external temperature controller</li> <li>2) Uses more instrument gas than 301</li> <li>3) More wiring than in 301</li> <li>4) Needs clean and dry instrument gas or air at minimum 70 psig</li> <li>5) More difficult to install in 6" fire-tubes</li> </ol>
303	<ol style="list-style-type: none"> <li>1) No instrument gas needed</li> <li>2) Suitable for all sour sites</li> <li>3) Saves cost and GHG emissions</li> <li>4) Incorporates triple setpoint HHHI temperature protection</li> </ol>	<ol style="list-style-type: none"> <li>1) Limited to HI/LO/OFF temperature control from an external temperature controller</li> <li>2) Uses same higher amount of electric power as 301A</li> <li>3) More difficult to install in 6" fire-tubes</li> </ol>
304	<ol style="list-style-type: none"> <li>1) No instrument gas needed</li> <li>2) Suitable for all sour sites</li> <li>3) +/-1 °C temperature control deadband built into the BMS controller</li> <li>4) Reduces pilot freezing problems</li> <li>5) Allows turning pilot OFF when not needed, then restarting it automatically. (especially for propane pilots)</li> <li>6) Ideally suited for 6" fire-tube</li> <li>7) Save instrument gas cost and GHG emissions</li> <li>8) Incorporates triple setpoint HHHI temperature protection</li> </ol>	<ol style="list-style-type: none"> <li>1) Limited to HI/Pilot/OFF temperature control.</li> <li>2) Suitable only for burners up to and including 3" in size and maximum 1 MM Btuh fuel input.</li> </ol>
305	<ol style="list-style-type: none"> <li>1) +/-1 °C HI/pilot/OFF temperature control deadband built into the BMS controller</li> <li>2) Reduces pilot freezing problems</li> <li>3) Allows turning pilot OFF when not needed, then restarting it automatically. (especially for propane pilots)</li> <li>4) Ideally suited for 6" fire-tube</li> <li>5) Incorporates triple setpoint HHHI temperature protection</li> </ol>	<ol style="list-style-type: none"> <li>1) Suitable only for burners up to and including 3" in size and maximum 1 MM Btu/hr fuel input.</li> <li>2) Needs clean and dry instrument gas or air at minimum 35 psig.</li> </ol>
306	<ol style="list-style-type: none"> <li>1) Uses less instrument gas than 302</li> <li>2) Can be used with remote bath temperature monitoring and setpoint control</li> <li>3) Less wiring than 302</li> <li>4) Incorporates triple setpoint HHHI temperature protection</li> <li>5) Allows turning pilot OFF when not needed, then restarting it automatically. (especially for propane pilots)</li> <li>6) Ideally suited for 6" fire-tube</li> </ol>	<ol style="list-style-type: none"> <li>1) Uses an external temperature controller</li> <li>2) Needs clean and dry instrument gas or air at minimum 35 psig</li> </ol>



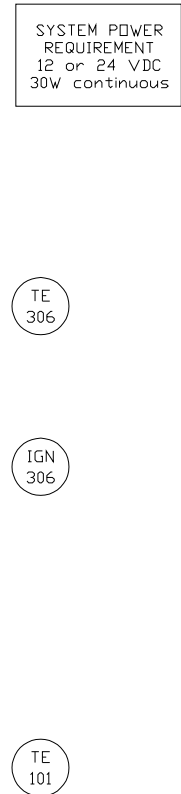
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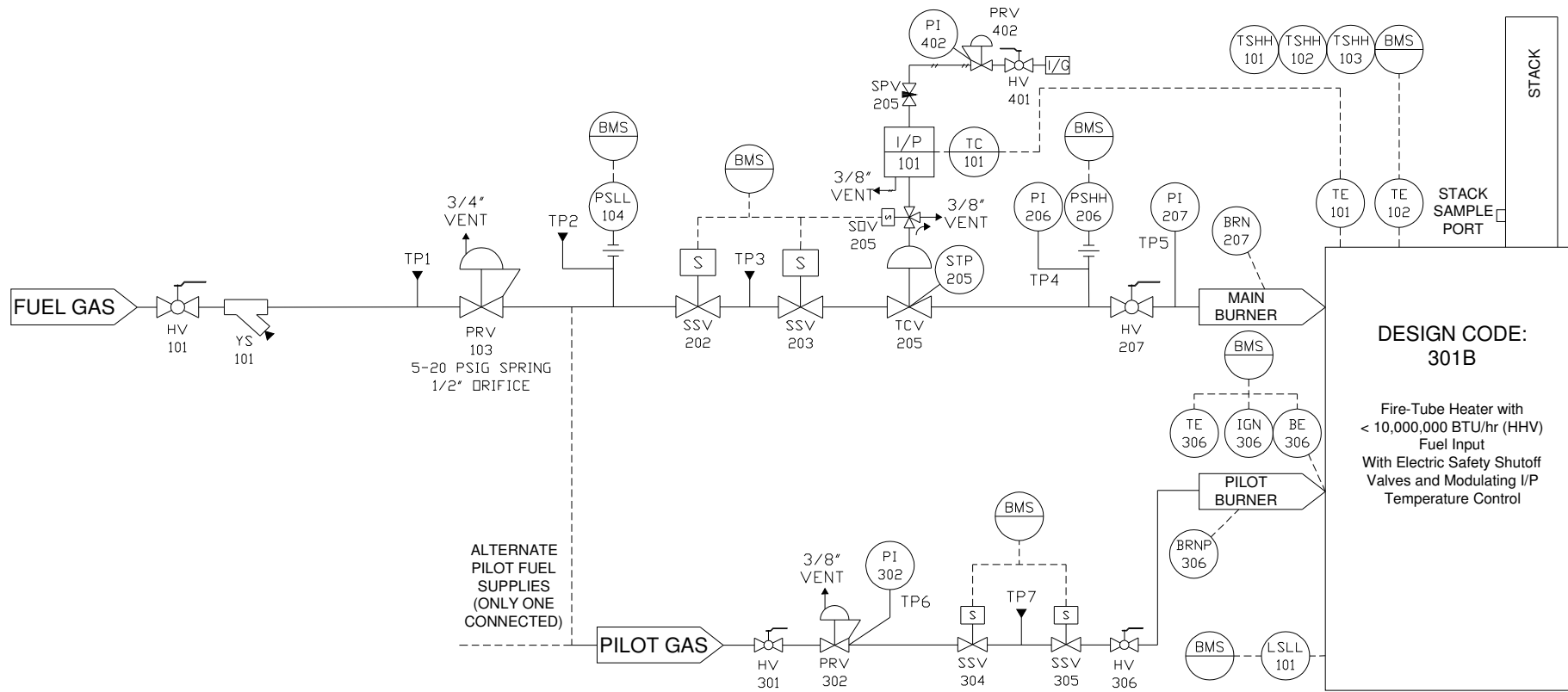
**PROFIRE 1100**  
 Burner Management System Controller  
 (b1 model bath temperature control)



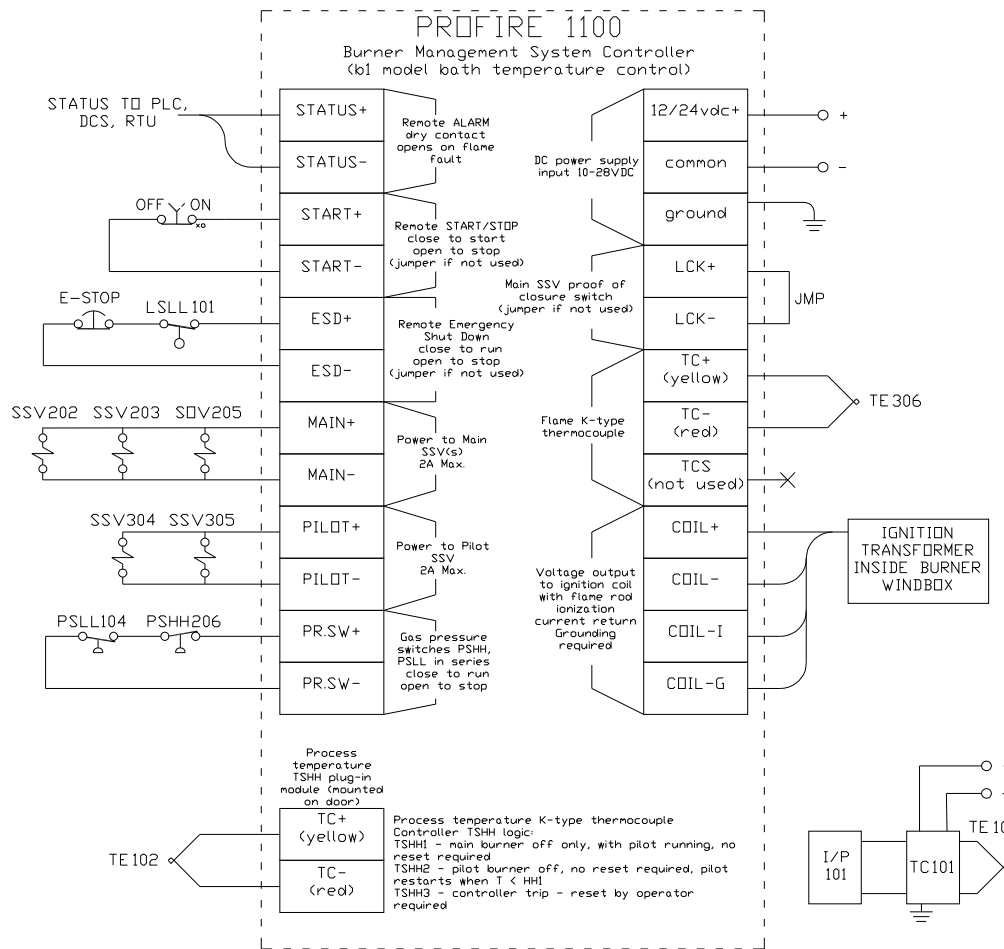
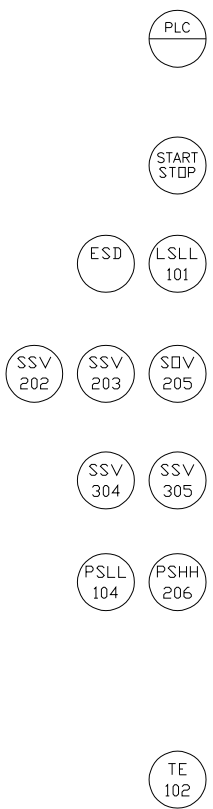
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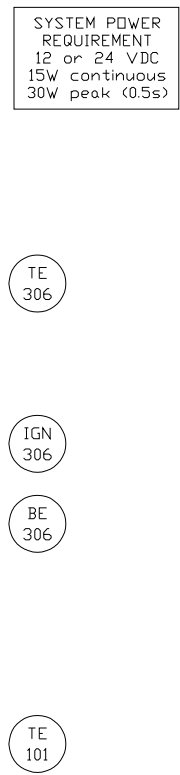
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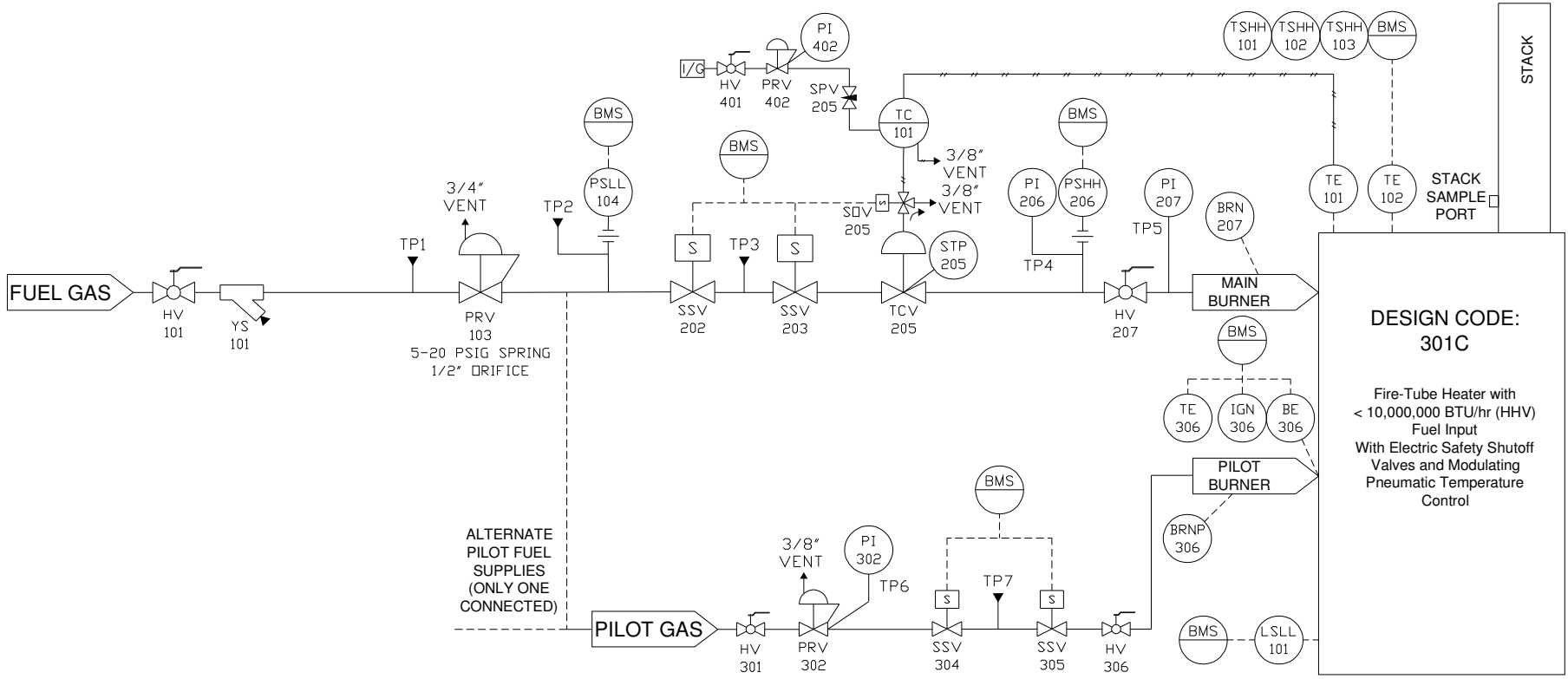
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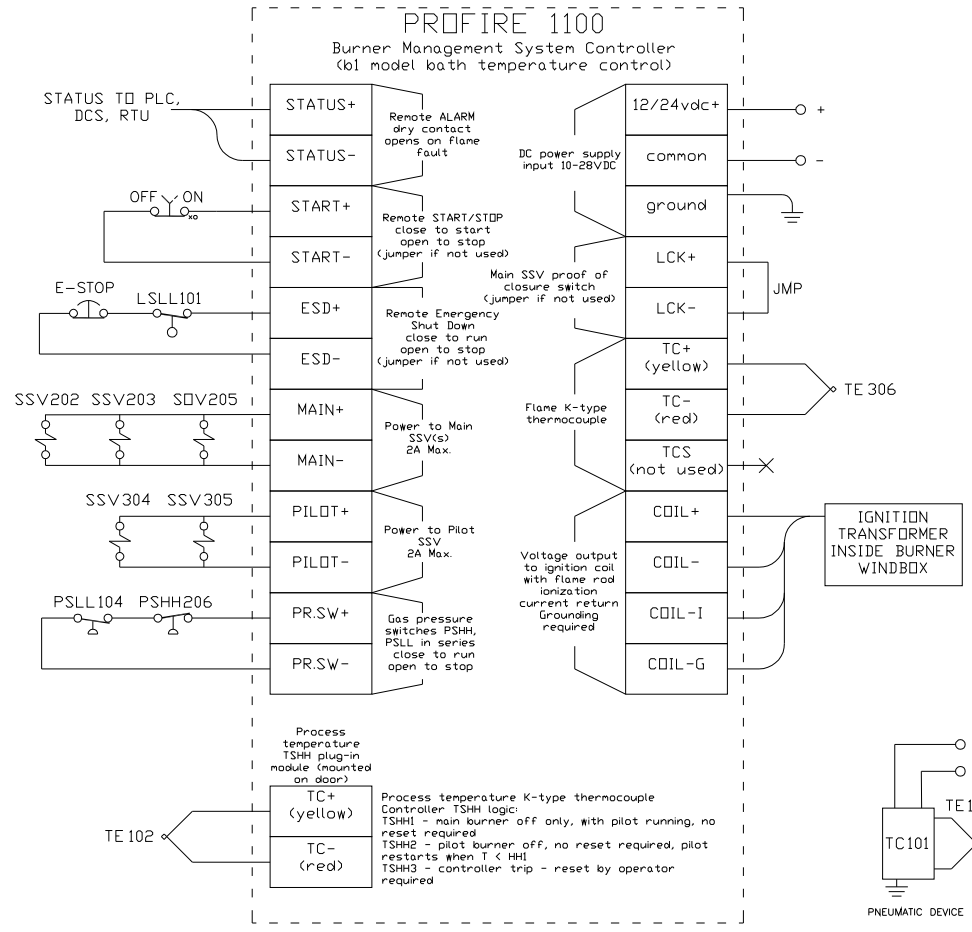
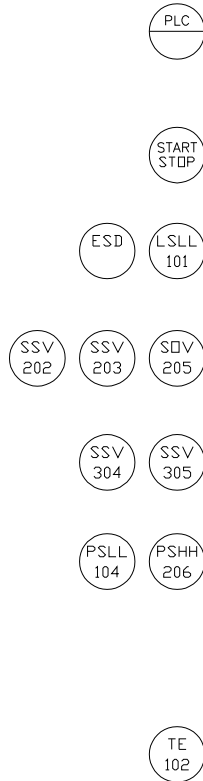
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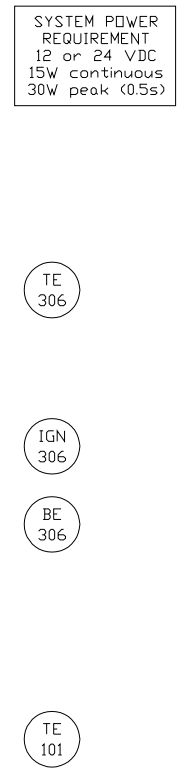
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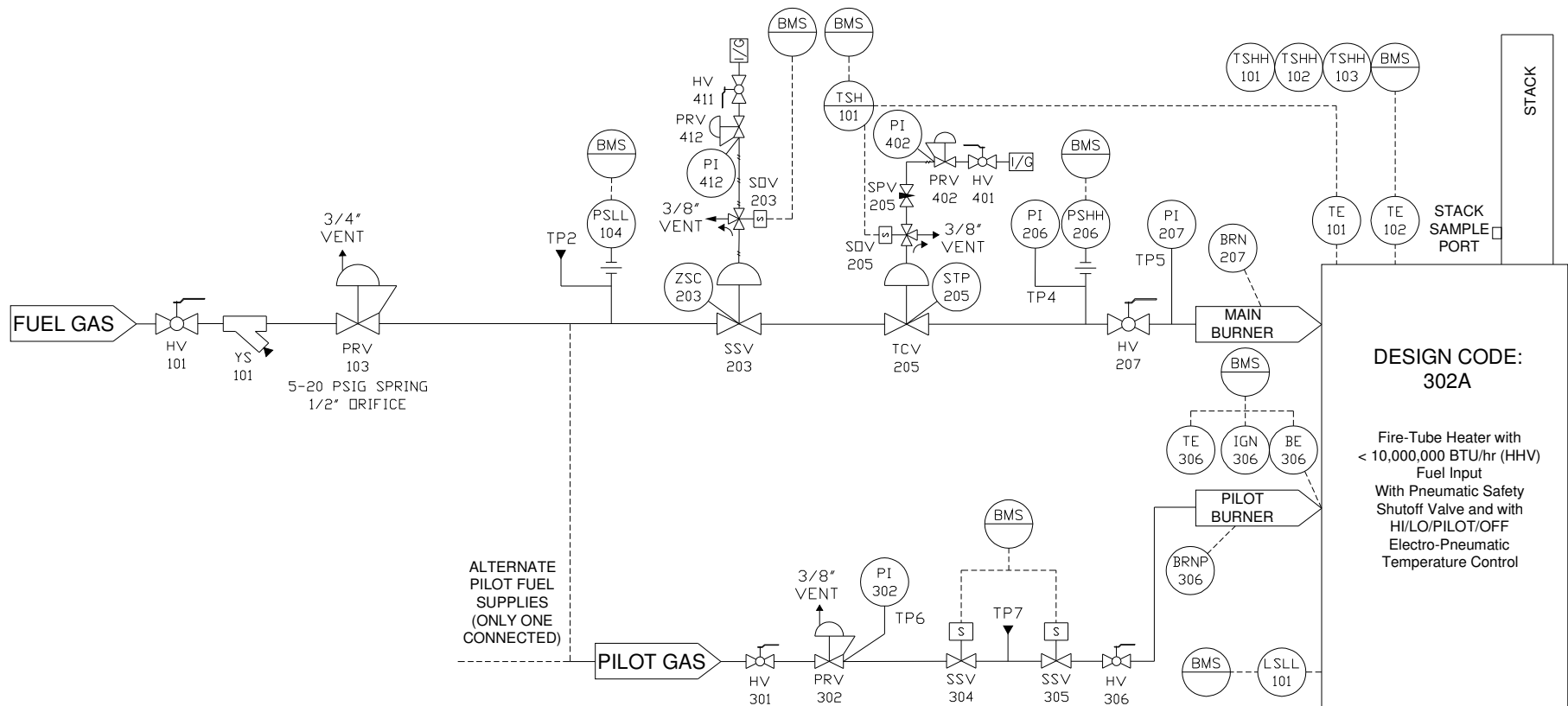


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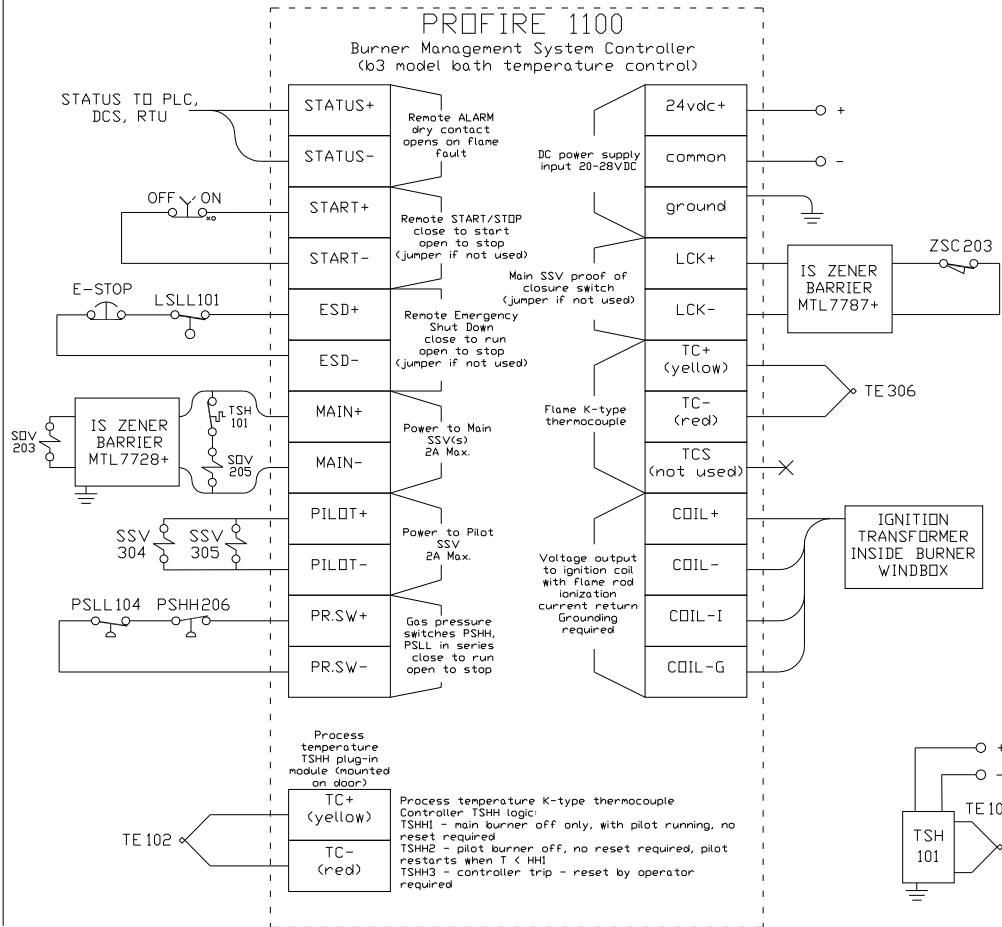
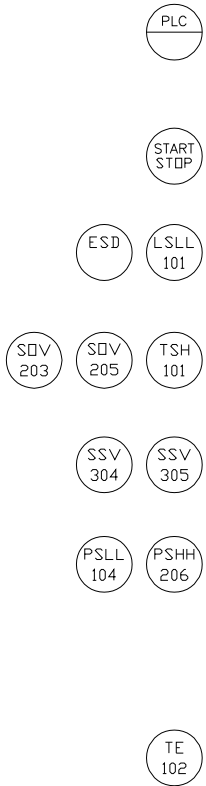


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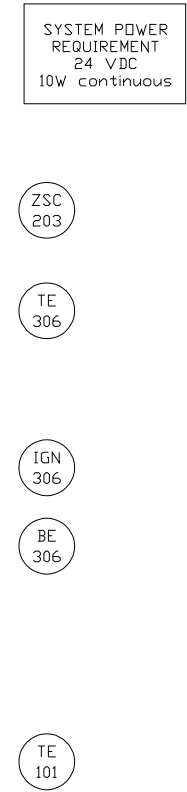




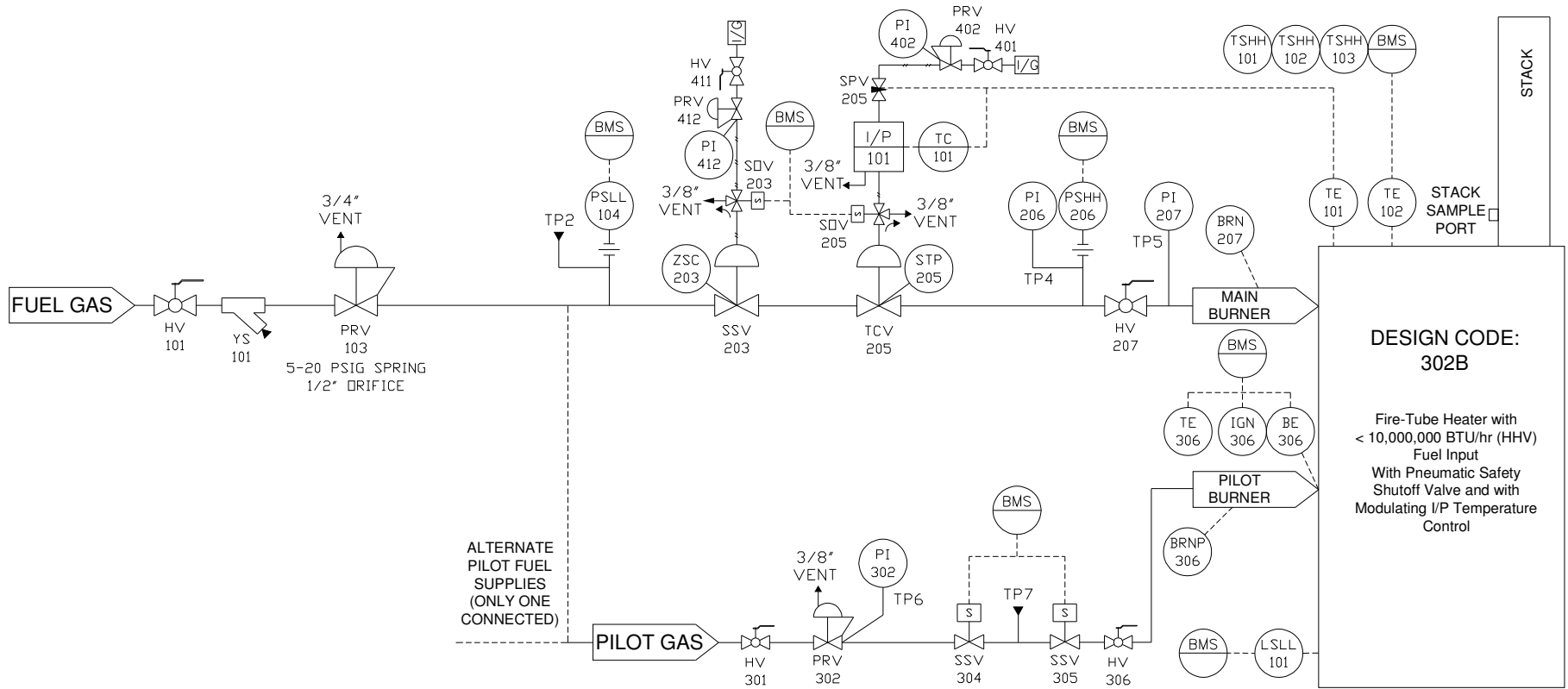
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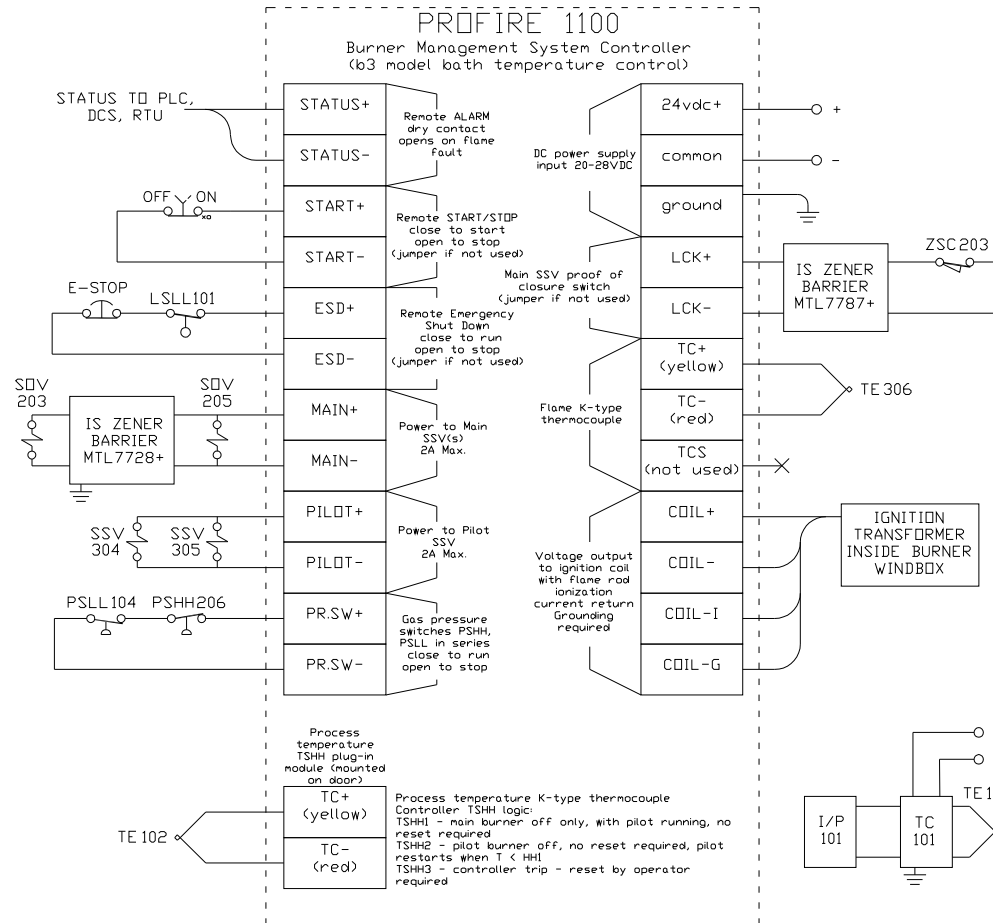
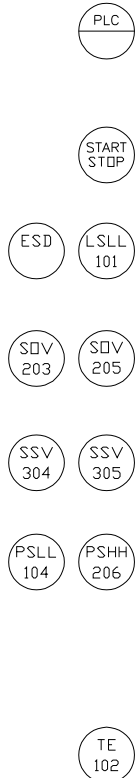
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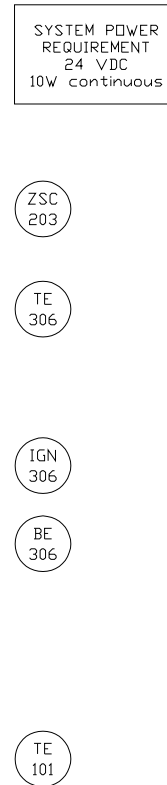
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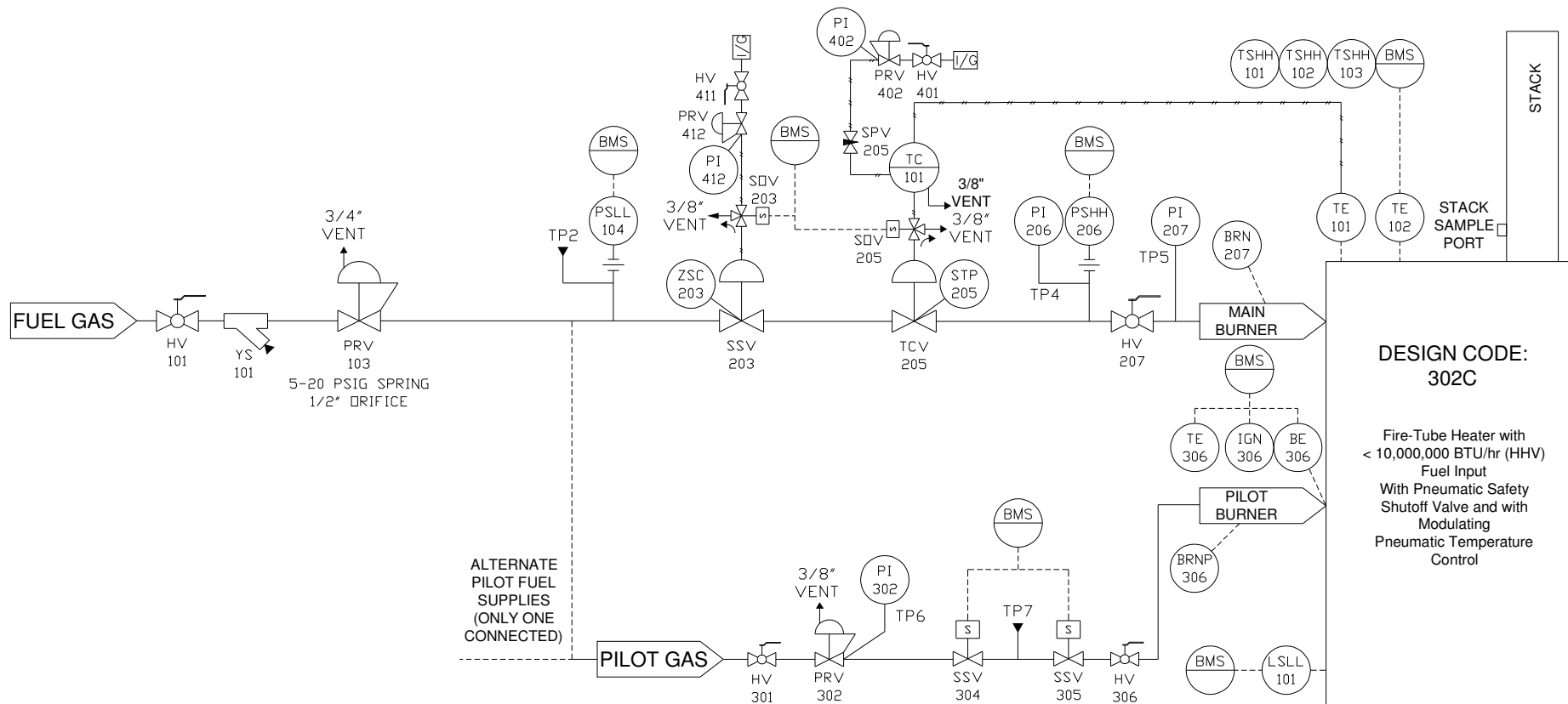
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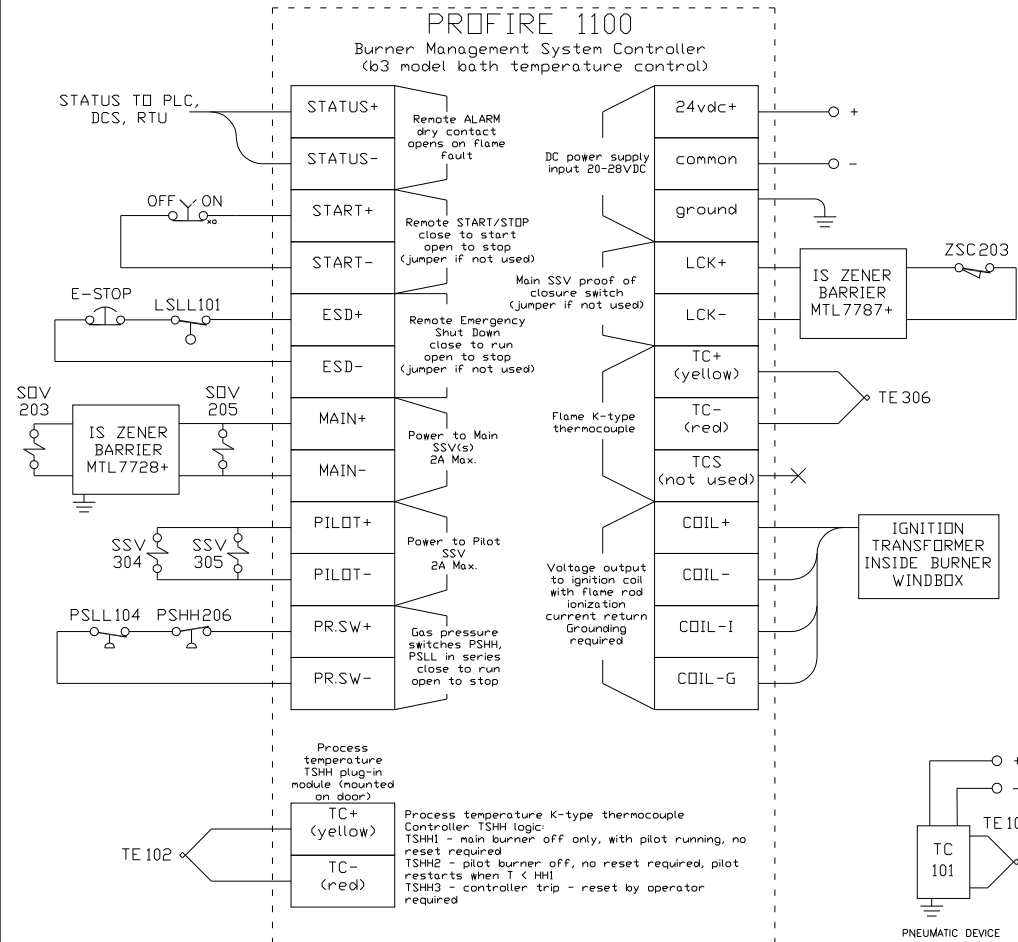
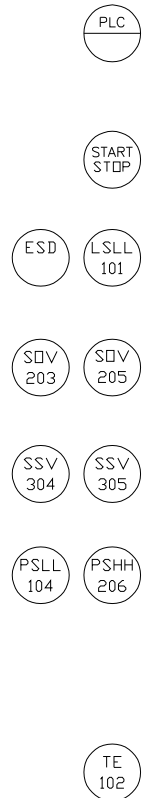
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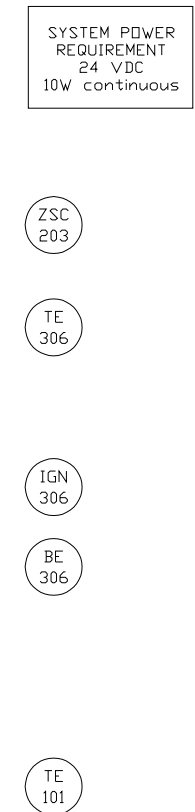
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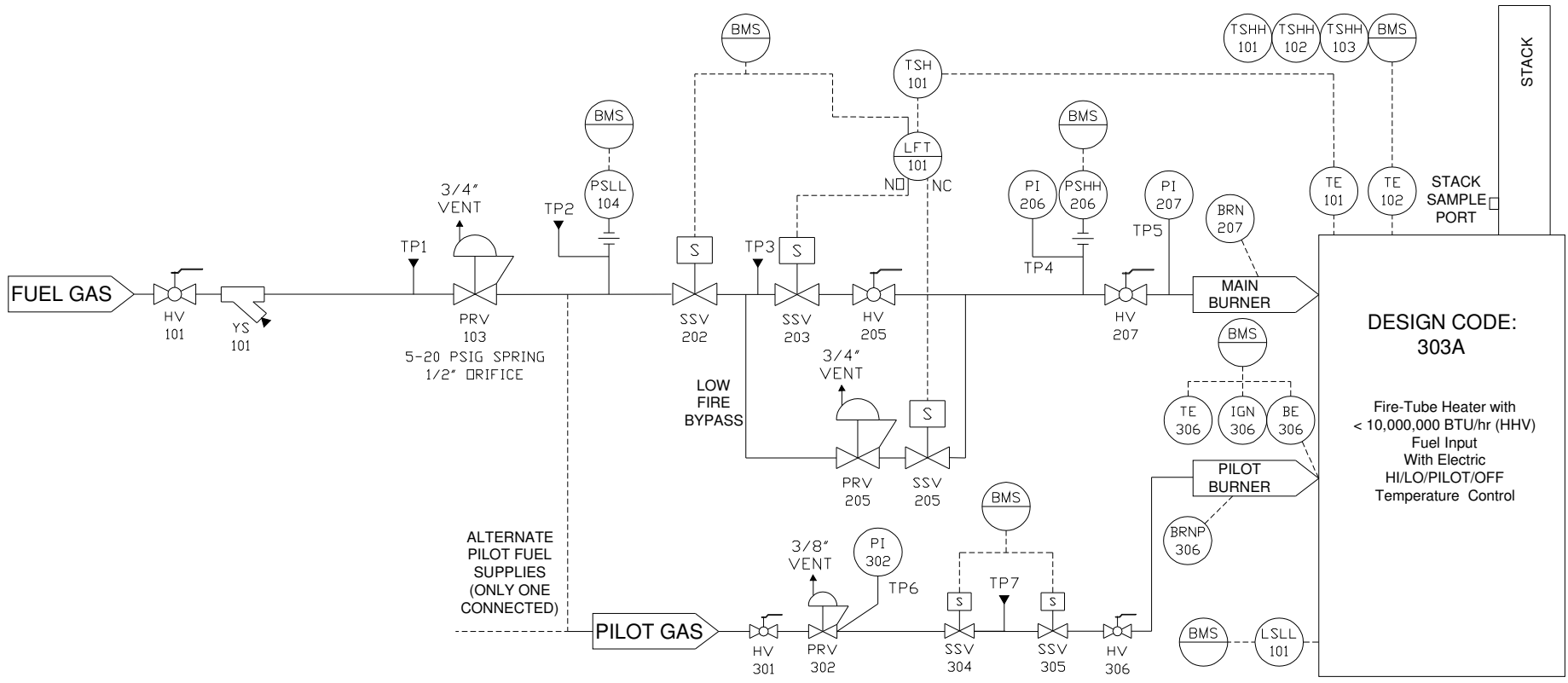
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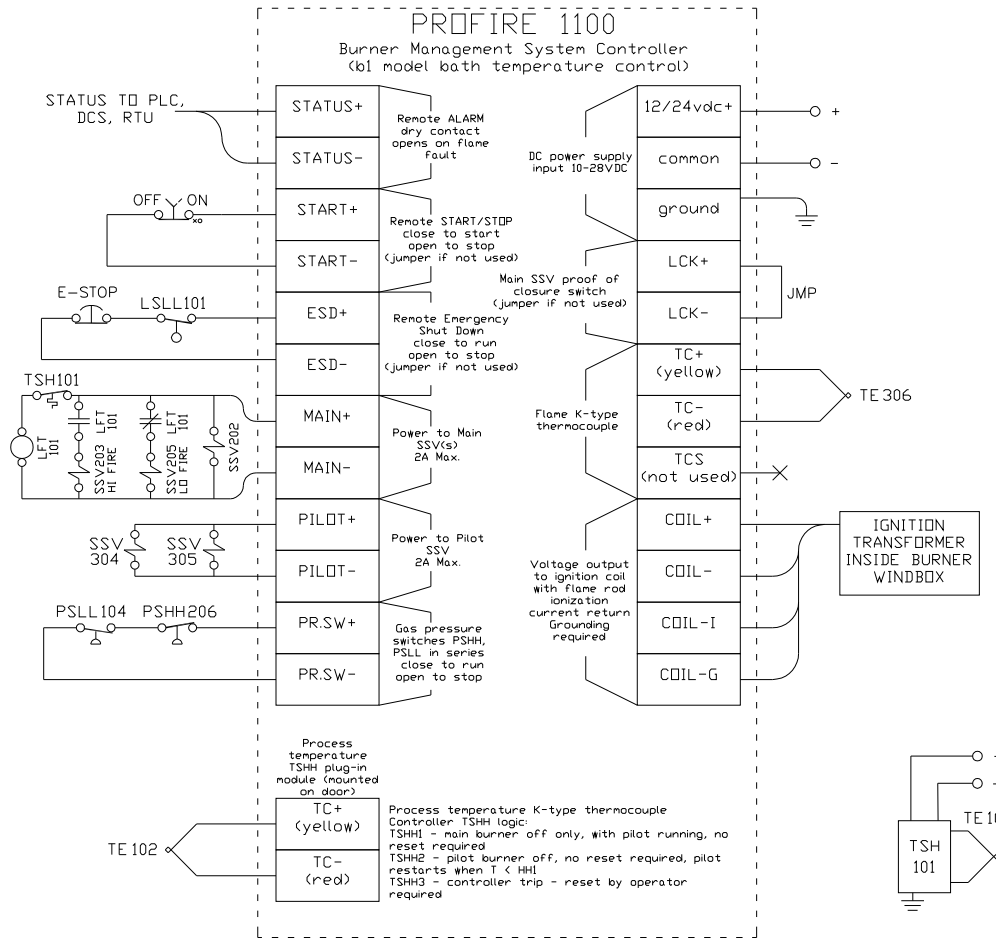
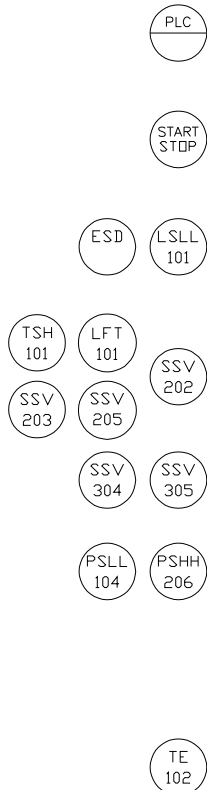
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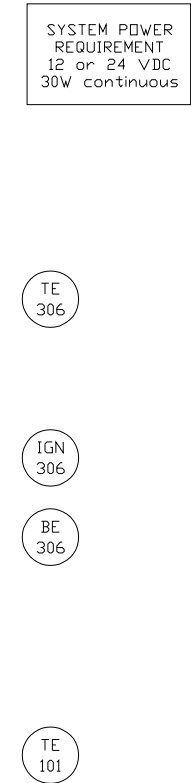
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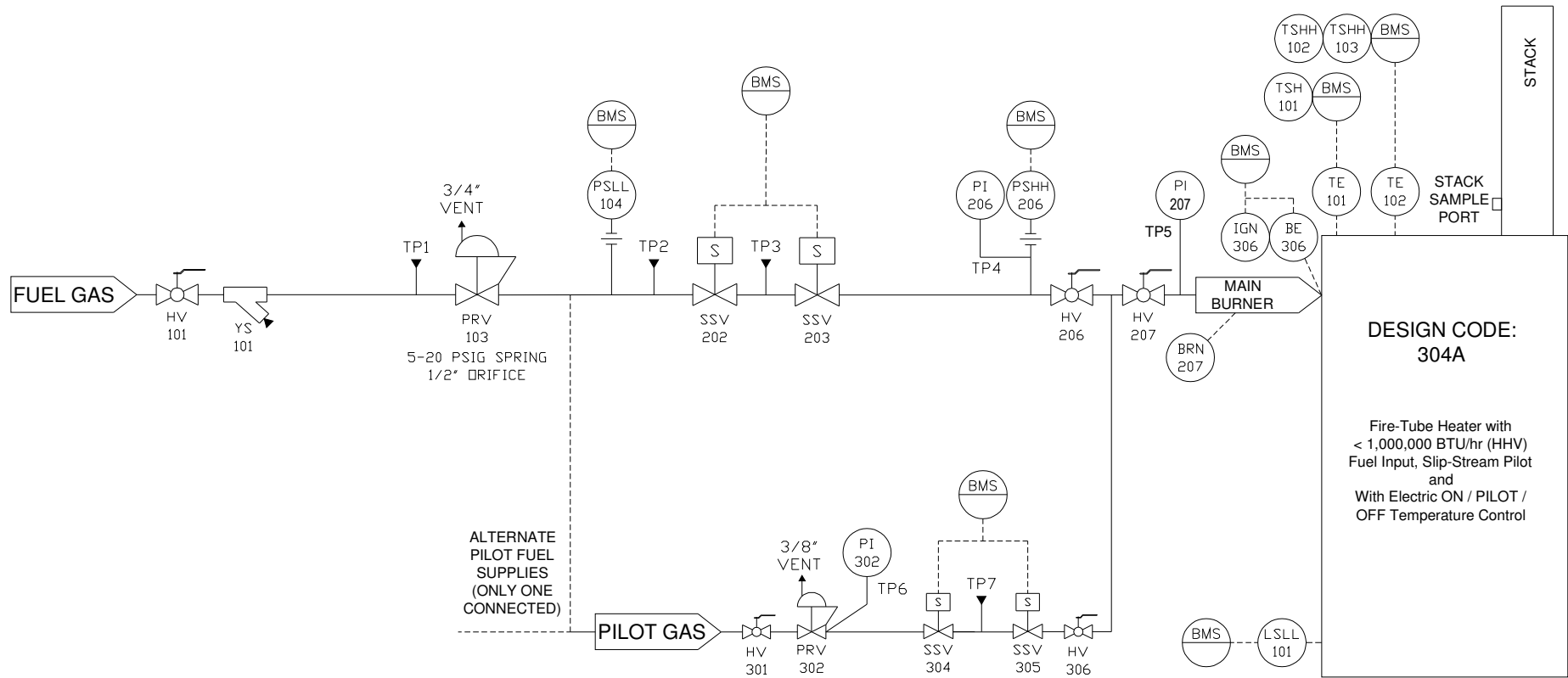


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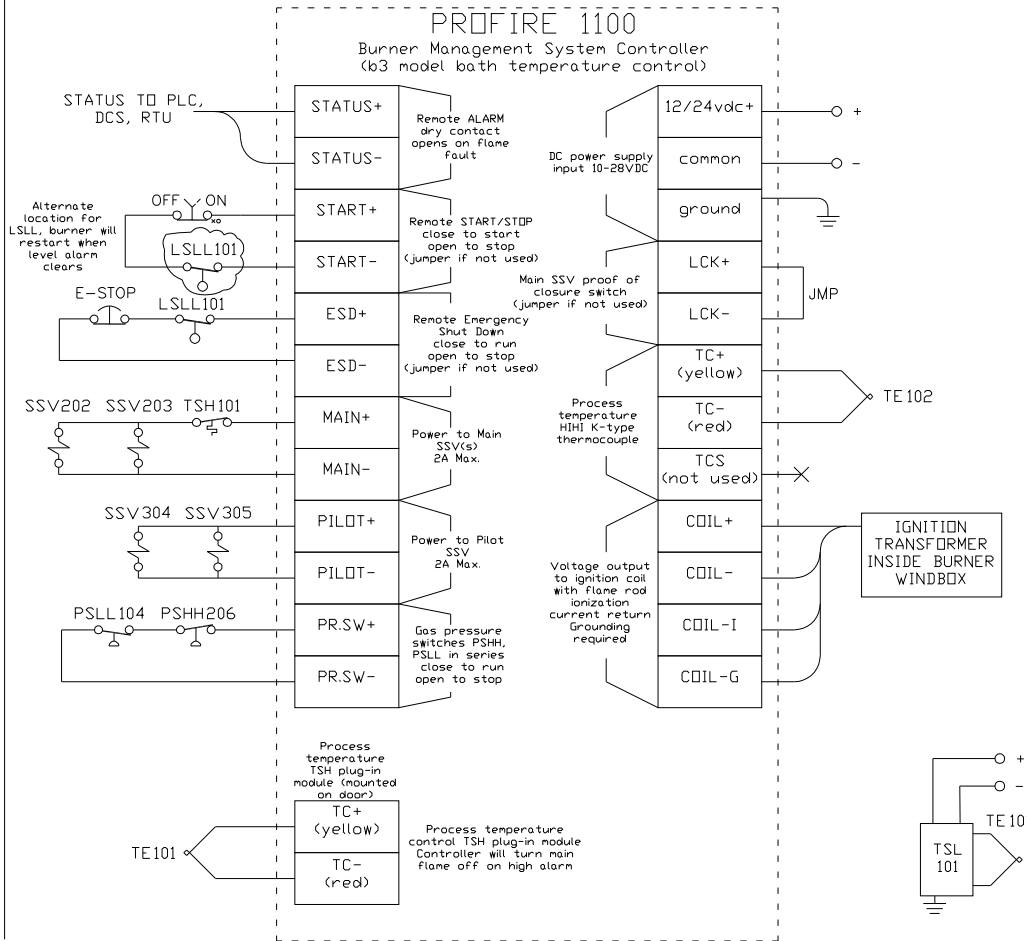
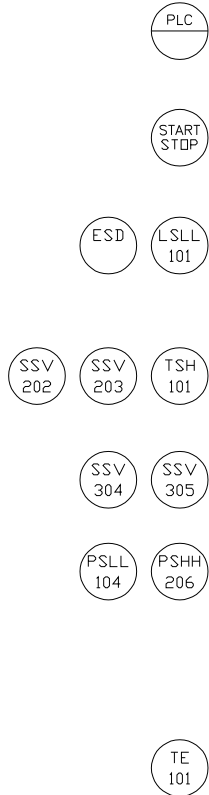


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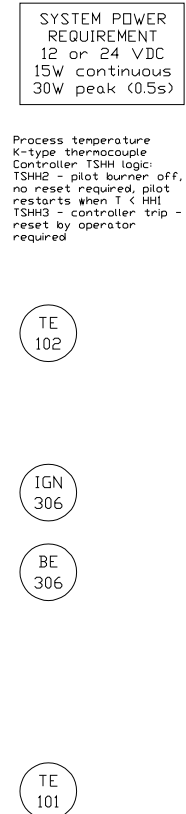




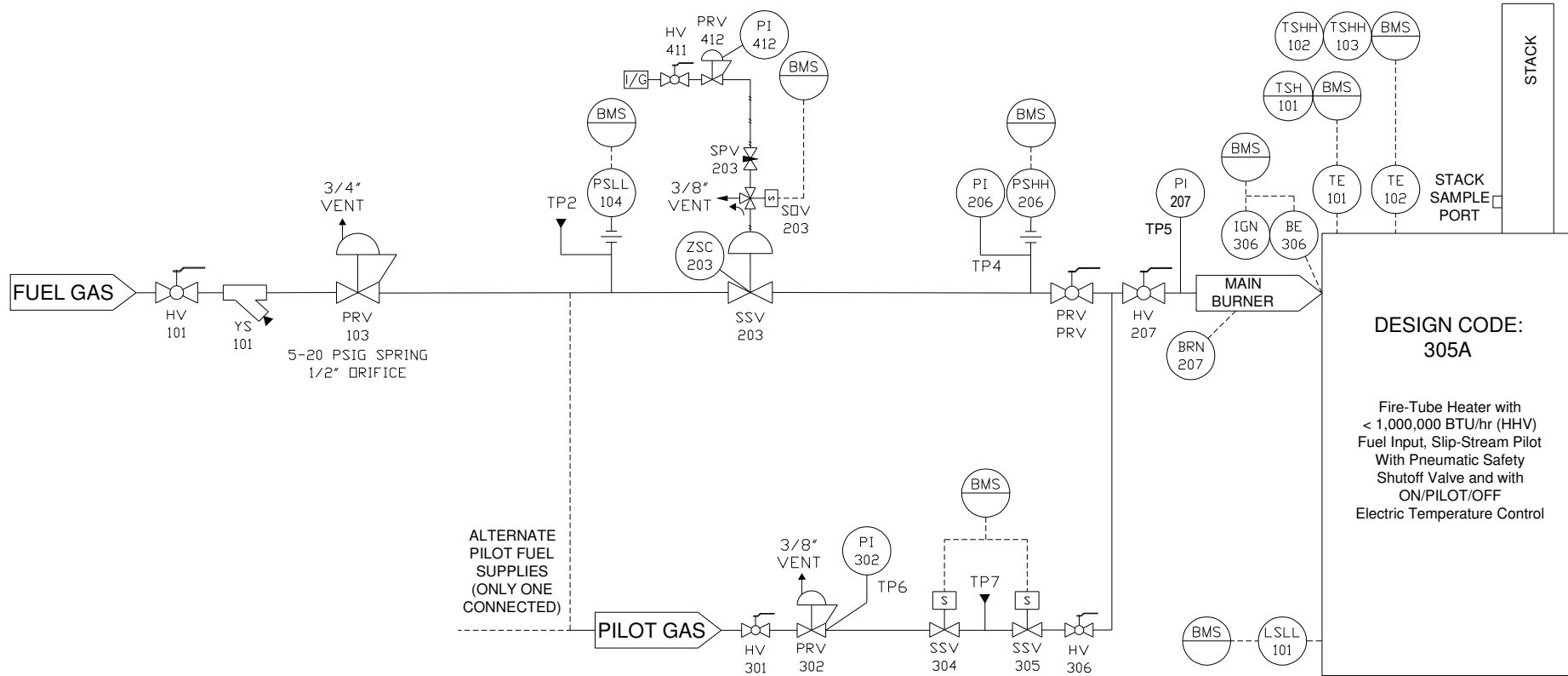
FIELD DEVICES



FIELD DEVICES



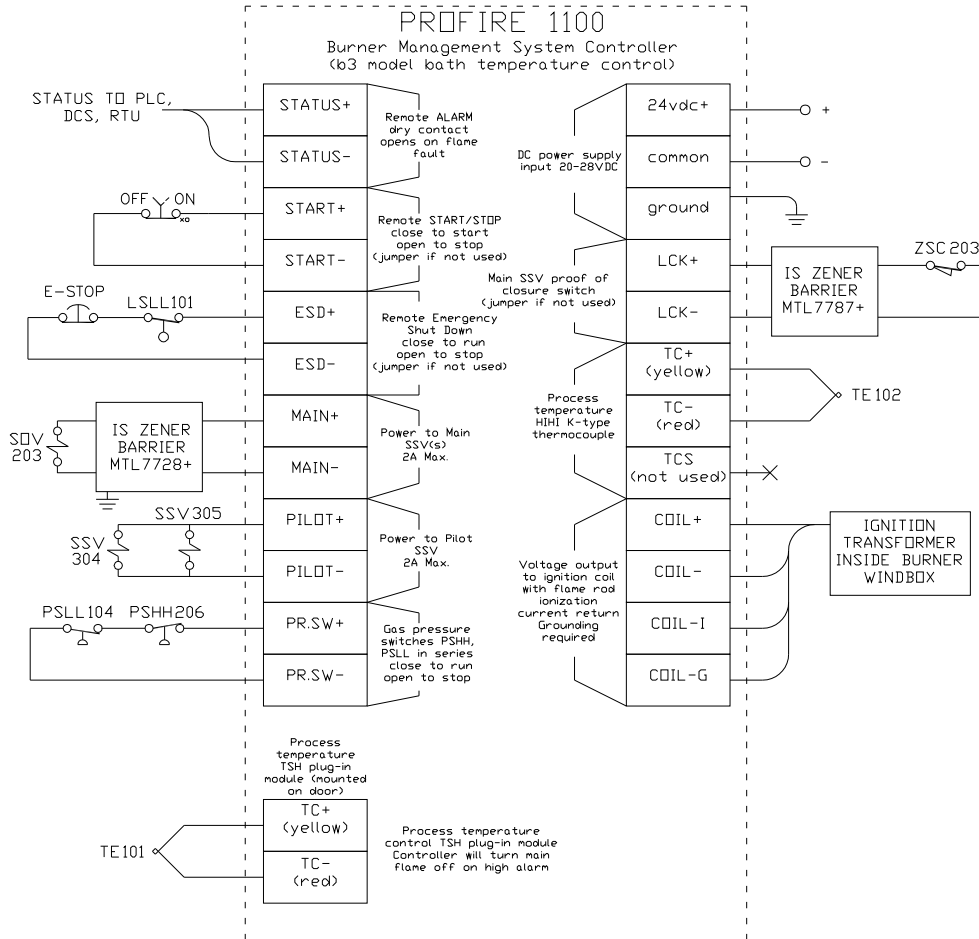
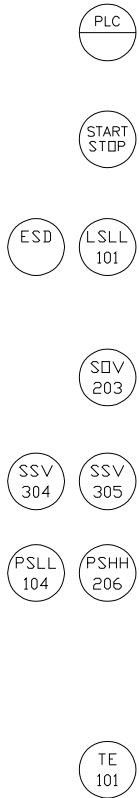
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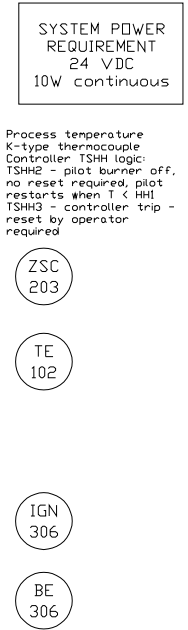
**DESIGN CODE:  
305A**

Fire-Tube Heater with  
< 1,000,000 BTU/hr (HHV)  
Fuel Input, Slip-Stream Pilot  
With Pneumatic Safety  
Shutoff Valve and with  
ON/PILOT/OFF  
Electric Temperature Control

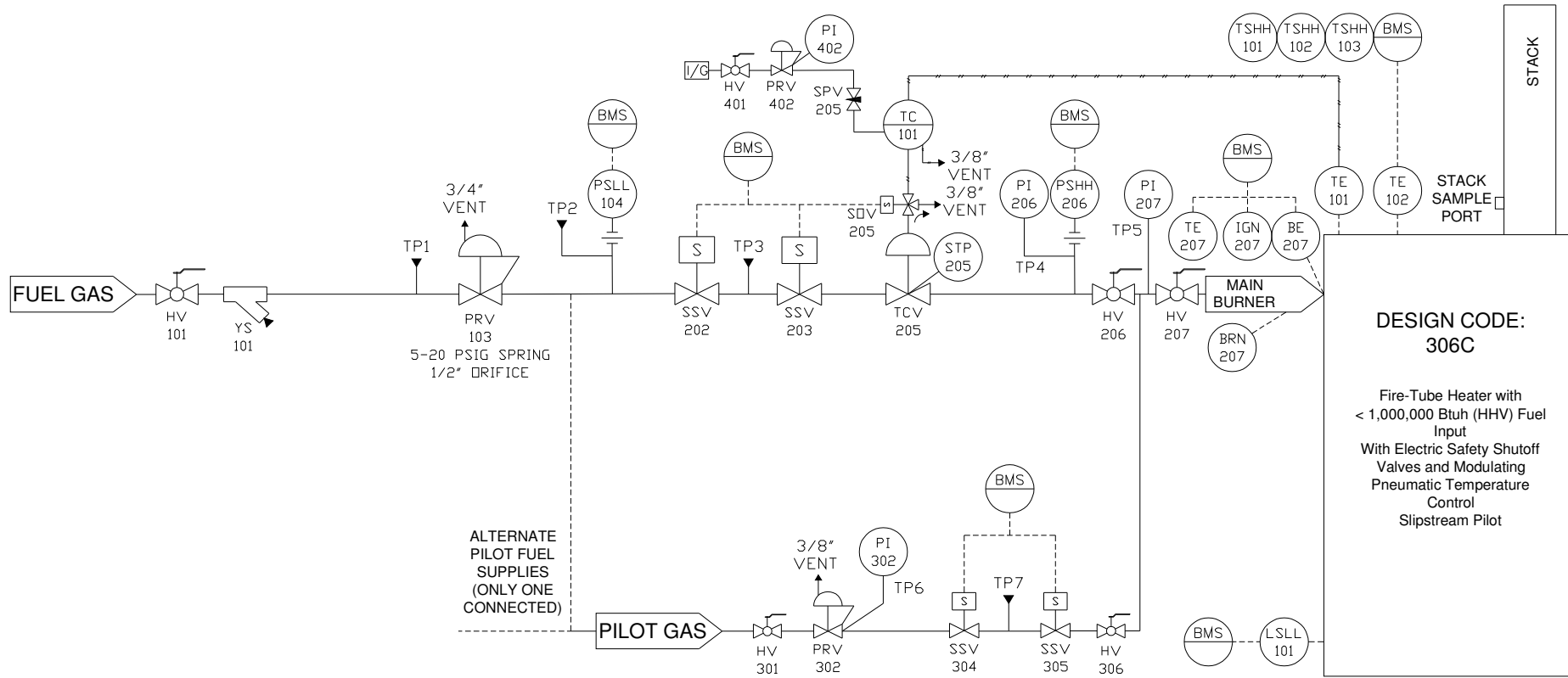
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FIELD DEVICES



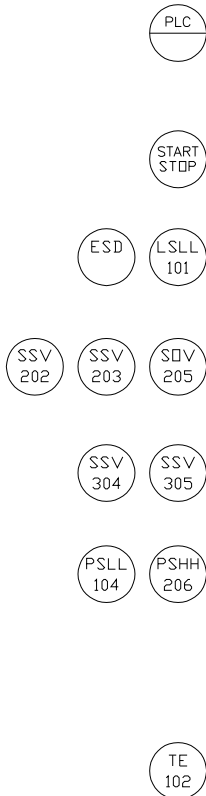
DESIGN CODE: 305A



**DESIGN CODE:  
306C**

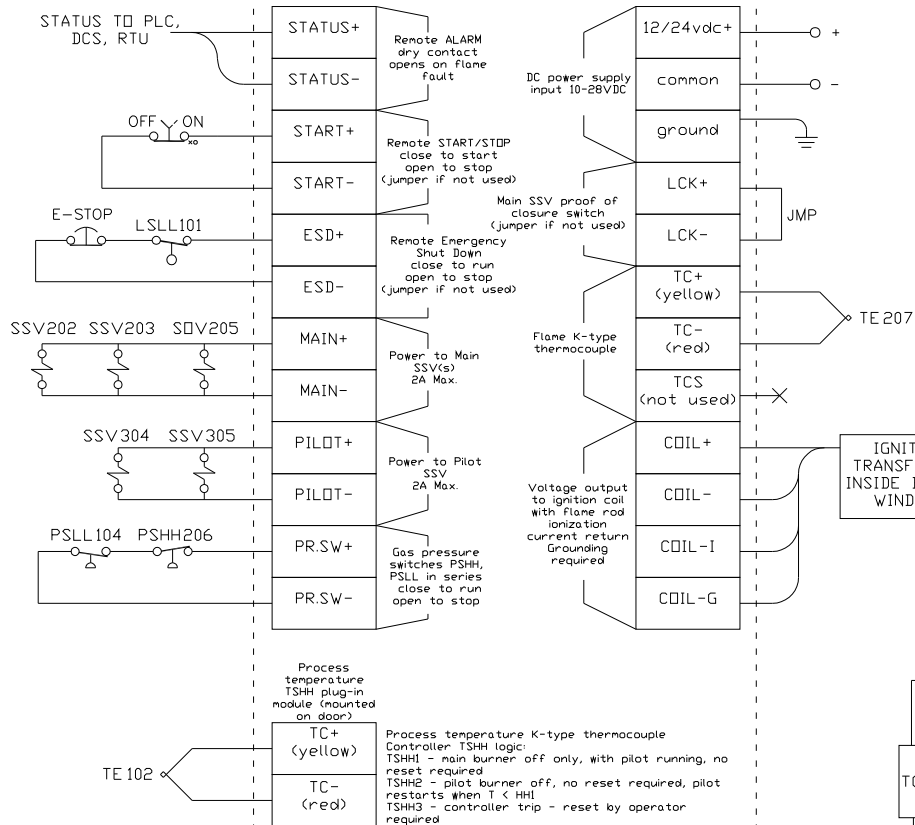
Fire-Tube Heater with  
< 1,000,000 Btuh (HHV) Fuel  
Input  
With Electric Safety Shutoff  
Valves and Modulating  
Pneumatic Temperature  
Control  
Slipstream Pilot

FIELD DEVICES

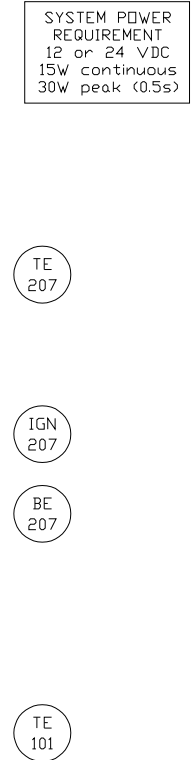


PROFIRE 1100

Burner Management System Controller  
(b1 model bath temperature control)



FIELD DEVICES



DESIGN CODE: 306C

## 2.2 Bill of Materials

The Bill of Materials may vary depending on the size of burner, fuel flow required and availability of parts. All components must be evaluated and field approved for complete system compliance with B149.3, the Code for the Field Approval of Fuel-Related Components on Appliances and Equipment.

Part #	Description	301A	301B	301C	302A	302B	302C	303A	304A	305A	306C
<b>BURNER PARTS</b>											
BRN207	Main Burner	X	X	X	X	X	X	X	X	X	X
BRPL207	Main Burner Secondary Air Plate	X	X	X	X	X	X	X	X	X	X
BRNP306	Pilot Burner	X	X	X	X	X	X	X			
<b>BURNER MANAGEMENT SYSTEM (BMS)</b>											
BMS101	Burner Management System - Profire 1100 b1 model	X	X	X	X	X	X	X			X
BMS101	Burner Management System - Profire 1100 b3 model								X	X	
IGN207 BE207	Main Burner Ignitor / Flame Rod - Profire								X	X	X
IGX207	Main Burner Ignition Transformer - Profire								X	X	X
IGN306 BE306	Pilot Burner Ignitor / Flame Rod - Profire	X	X	X	X	X	X	X			
IGX306	Pilot Burner Ignition Transformer - Profire	X	X	X	X	X	X	X			
TE306	Pilot Burner Flame Thermocouple	X	X	X	X	X	X	X			
TE207	Main Burner Flame Thermocouple										X
TSH101 TSHH102 TSHH103	Bath Temperature Switch HI - Profire b3								X	X	
TSHH101 TSHH102 TSHH103	Bath Temperature Switch HIHI - Profire b1	X	X	X	X	X	X	X			X
<b>MAIN FUEL TRAIN</b>											
HV101	Main Train Manual Inlet Valve	X	X	X	X	X	X	X	X	X	X
YS101	Main Train Y-Strainer	X	X	X	X	X	X	X	X	X	X
PRV103	Main Appliance Pressure Regulator c/w internal pressure relief	X	X	X	X	X	X	X	X	X	X
TP1	Pressure Test Point	X	X	X				X	X		X
TP2	Pressure Test Point	X	X	X	X	X	X	X	X	X	X
PSLL104	Main Burner Gas Pressure Switch LOLO	X	X	X	X	X	X	X	X	X	X
SSV202	Main Burner Upstream Safety Shutoff Valve	X	X	X				X	X		X
TP3	Upstream Main SSV Pressure Test Point	X	X	X				X	X		X
SSV203 SOV203 ZSC203	Main Burner Safety Shutoff Valve - Maxon c/w Solenoid, Closed Position Switch, Zener barrier - output - MTL7728+				X	X	X			X	
SSV203	Main Burner Safety Shutoff Valve	X	X	X				X	X		X
SPV203	Main Burner Safety Shutoff Valve Speed Control									X	
SOV203	Main Burner Safety Shutoff Valve Solenoid									X	
TCV205	Main Burner Input Temperature Control Valve	X	X	X	X	X	X				X
STP205	Main Burner TCV Low Fire Stop	X	X	X	X	X	X				X
SOV205	Main Burner TCV Low Fire Solenoid	X	X	X	X	X	X				X
PRV205	Main Burner Low Fire Pressure Regulator							X			

SSV205	Main Burner Low Fire Solenoid Valve							X			
PI206	Temperature Control Valve Pressure Gauge	X	X	X	X	X	X	X	X	X	X
PSHH206	Main Burner Gas Pressure Switch HIHI	X	X	X	X	X	X	X	X	X	X
TP4	Main TCV Pressure Test Point	X	X	X	X	X	X	X	X	X	X
HV206	Main Burner Manual Shutoff Valve								X	X	X
HV207	Main Burner Test Firing Valve	X	X	X	X	X	X	X	X	X	X
PI207	Main Burner Pressure Gauge	X	X	X	X	X	X	X	X	X	X
TP5	Main Burner Pressure Test Point	X	X	X	X	X	X	X	X	X	X
<b>PILOT FUEL TRAIN</b>											
HV301	Pilot Header Inlet Manual Valve	X	X	X	X	X	X	X	X	X	X
PRV302	Pilot Pressure Regulator	X	X	X	X	X	X	X	X	X	X
PI302	Pilot Regulator Pressure Gauge	X	X	X	X	X	X	X	X	X	X
TP6	Pilot Regulator Pressure Test Point	X	X	X	X	X	X	X	X	X	X
SSV304	Pilot Safety Shutoff Valve	X	X	X	X	X	X	X	X	X	X
SSV305	Pilot Safety Shutoff Valve	X	X	X	X	X	X	X	X	X	X
TP7	Pilot SSV Pressure Test Point	X	X	X	X	X	X	X	X	X	X
HV306	Pilot Test Firing Valve	X	X	X	X	X	X	X	X	X	X
<b>CONTROLS</b>											
TSH101 TE101	Temperature Switch / Element HI	X			X			X			
LFT101	Low Fire Timer Relay							X			
TE101 TE102	Dual Temperature Element HI/HIHI		X			X			X	X	
TC101	Temperature Controller		X			X					
I/P101	Main Burner TCV I/P Transducer		X			X					
TC101 TE101	Temperature Controller with integral TE			X			X				X
SPV205	Main Burner TCV Speed Control	X	X	X	X	X	X				X
HV401	TCV Instrument Gas Shutoff Valve	X	X	X	X	X	X				X
PRV402	TCV Instrument Gas Pressure Regulator	X	X	X	X	X	X				X
PI402	TCV Instrument Gas Regulator Pressure Gauge	X	X	X	X	X	X				X
HV411	Main SSV Instrument Gas Shutoff Valve				X	X	X			X	
PRV412	Main SSV Instrument Gas Pressure Regulator				X	X	X			X	
PI412	Main SSV Instrument Gas Regulator Pressure Gauge				X	X	X			X	
TE102	Temperature Element HIHI	X		X	X		X	X			X
LSLL101	Level Switch LOLO	X	X	X	X	X	X	X	X	X	X
ESD	Emergency Shutdown Button	X	X	X	X	X	X	X	X	X	X
Start/Stop	Run Selector Switch	X	X	X	X	X	X	X	X	X	X



## 2.3 Mounting locations

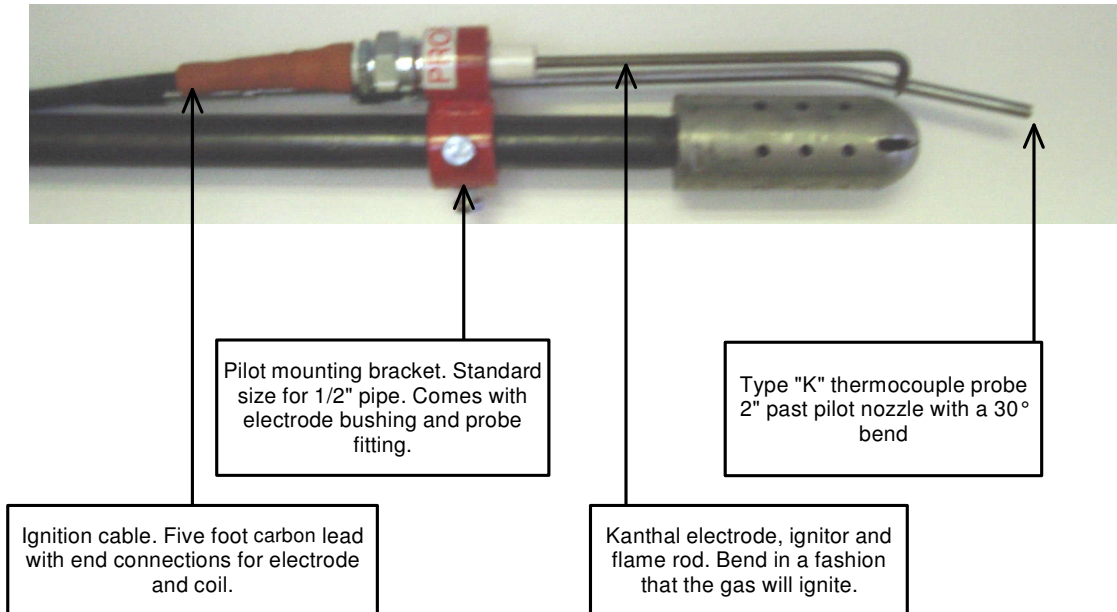
- The system can be mounted on the unit skid or on a building wall providing it does not infringe on a Class 1 Zone 1 area.
- Use enclosure mounting tabs to mount in a location that faces away from the burner housing so the operator is facing both the enclosure and the burner housing while operating. Other considerations are panel access, traffic, wire-runs, and visibility. The enclosure should be mounted about 1.5 to 3m above ground level.
- The spark generator (coil) must be mounted in a non-hazardous area due to spark potential across the output terminals of the coil or along the insulated high-voltage leads. The ideal location is inside the burner housing.

## 2.4 System Installation

1. Connect fuel gas to the fuel train inlet.
2. Wire gas pressure switches.
3. The ESD button is wired so the ESD circuit is normally closed and then opens if the ESD button is pressed. Any other necessary safety limits (bath level switch, stack temperature switch, or other) may be wired in series with the ESD such that they open the circuit if an unsafe condition arises.
4. The “proof-of-closure” limit switch (ZSC203) on the Main Automatic Shut-Off Valve (SSV203) is wired to close the LCK circuit when the valve is closed. The LCK circuit must be jumpered closed if the “proof-of-closure” switch is not available or not used. If a “low-fire start” limit switch (ZSL205) is used it should be wired in series with the “proof-of-closure” limit switch into the LCK circuit.
5. Connect the Pilot and Main solenoid valves to the unit in an approved manner.
6. Mount the ignition coil in a non-hazardous location (i.e. in the wind box) and wire to the unit, pilot and igniter.
7. Connect all type “K” thermocouples to the unit.
8. Connect power to the unit.
9. Apply power (either 24VDC or 12VDC, must be the same as solenoid valves).

## 2.5 Pilot & Coil (Optional)

### Pilot Bracket Assembly

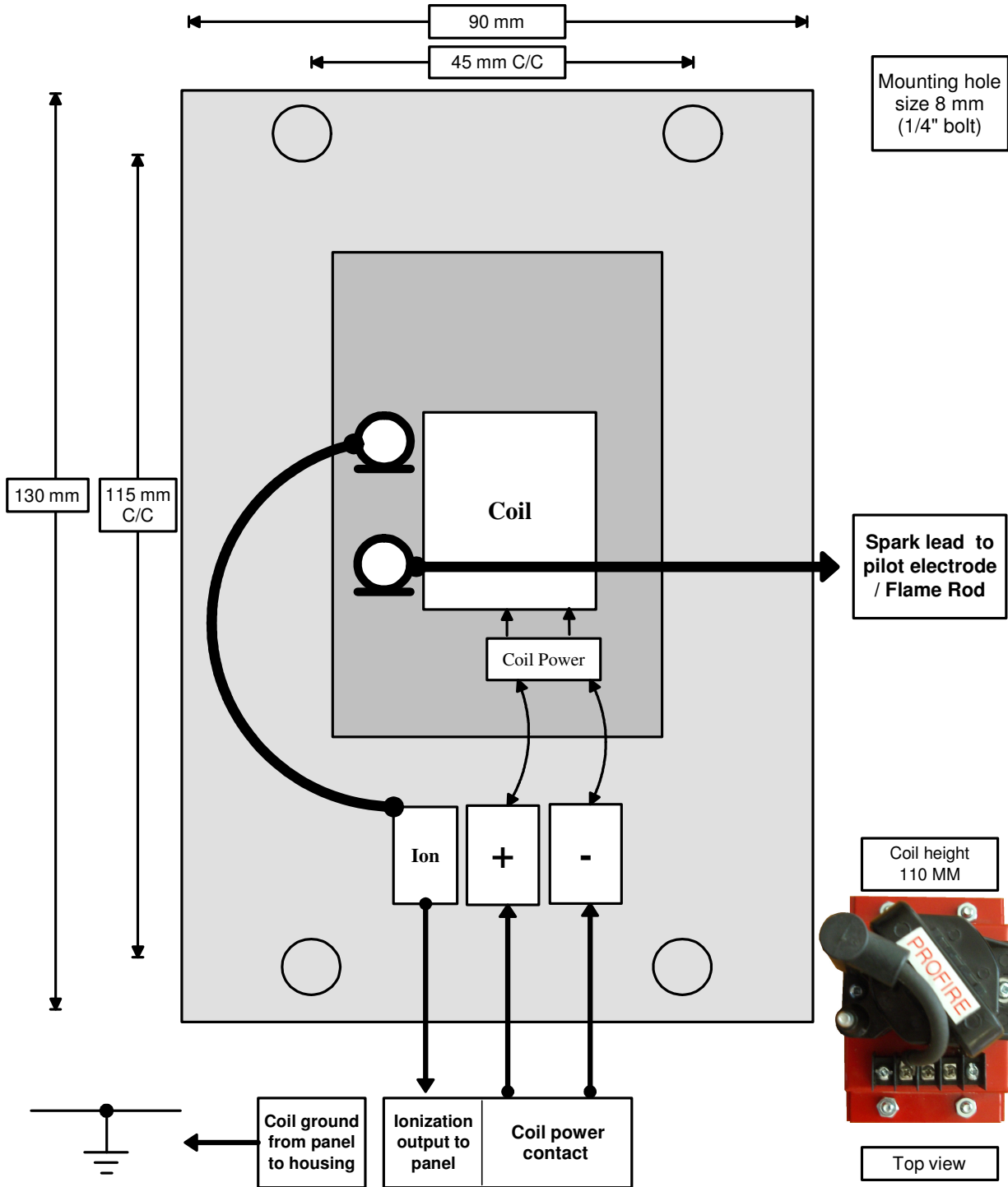


#### NOTES

1. The Pilot Bracket Assembly can be mounted on the existing pilot. Brackets can be ordered to fit pilots 1/2" and up.
2. Slip-stream applications are also acceptable, but may require a custom length probe and ignition electrode.
3. A Pilot Burner is **not included** with the standard system but is available as an option.

# Coil

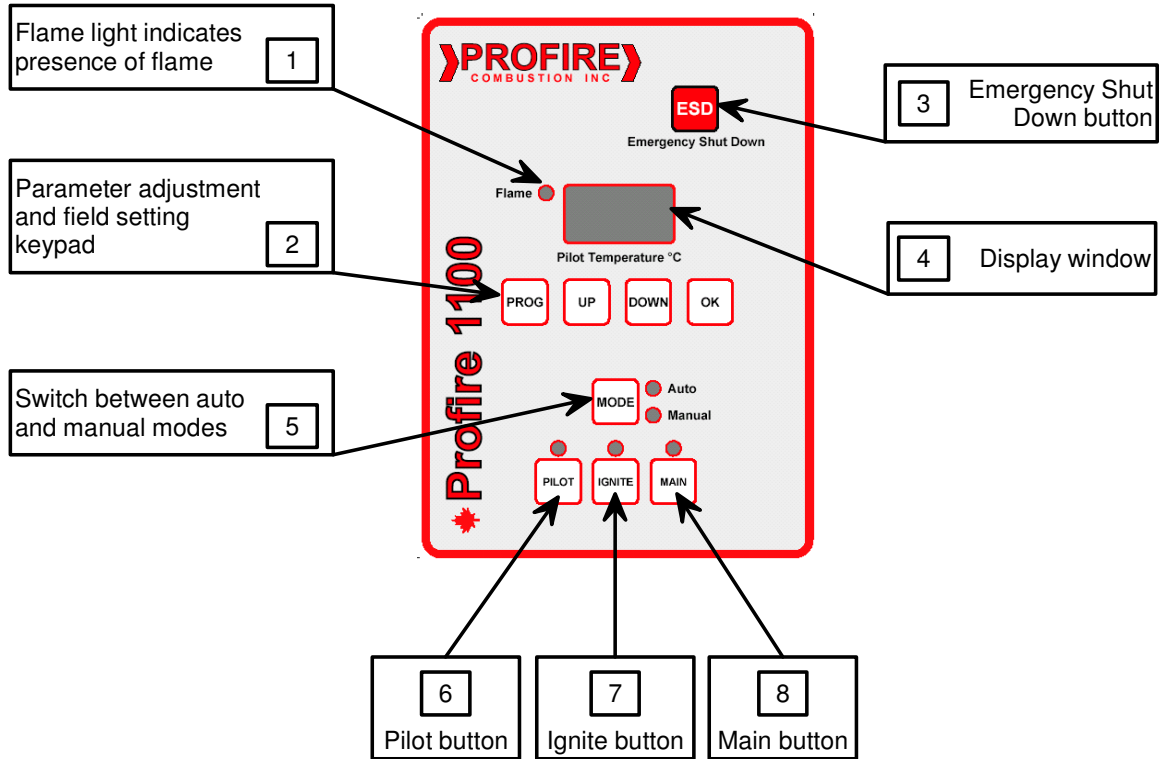
\* must be mounted in a NON-HAZARDOUS location  
\* requires solid ground from Profire 1100 to ensure ionization operates properly



### 3 Keypad & Display

#### 3.1 Keypad Layout

## Keypad Function



<i>Item No.</i>	<i>Item</i>	<i>Description</i>
1	Flame indicating light	Allows operator to see if flame is detected. Only works after ignitor is turned off.
2	Keypad	Allows operator to select adjustable field parameters: The <i>PROG</i> button scrolls through the menu The <i>UP</i> and <i>DOWN</i> buttons adjust the value or select parameters The <i>OK</i> button accepts and stores the change, exits the field parameter menu, and resets a fault
3	Emergency Shut Down (ESD)	Allows operator to manually shut unit down and alarm.
4	Display window	Allows operator to read temperatures, menus, and errors that have occurred.

5	Mode	Allows operator to switch unit into manual mode to check pilot ignitor and pilot solenoid, providing all safety interlocks have been met. LED's indicate the state the unit is in. The unit is put in manual mode when a fault is detected.
6	Pilot Button	Allows operator to open pilot solenoid for a period of time (45 sec) in manual mode. Indicating light above button is on solid if pilot solenoid is energized and has a slow flash if solenoid is off but waiting for bath temperature to drop below HH1.
7	Ignite Button	Allows operator to activate ignition providing all safety parameters are met. Indicating light above button is on solid while ignition transformer is energized.
8	Main Button	Allows operator to open main valve only when pilot has been proven and stable. Indicating light above button is on solid if pilot solenoid is energized and has a slow flash if solenoid is off but waiting for bath temperature to drop below HH1.

## 3.2 Programming Parameters

Must be in manual mode to program.

Press PROG button to select variable & UP or DOWN to change value.

Display alternates between variable "name" and current "value".

B1 & B3 models before 2009 used SP, HH1 & HH2 instead of HH1, HH2 & HH3.

S model before 2009 used HI & Lo instead of PHI & PLo.

<b>Profire 1100 Models</b>	<b>On Screen</b>	<b>Description</b>	<b>Function</b>	<b>Default Setting</b>	<b>Range</b>	<b>User Setting</b>
all	AL	Alarm type	1 : Unit <u>will not</u> alarm if remote stopped 2 : Unit will alarm if remote stop 3 : Alarm contact follows main solenoid	1	1 - 2	
all	Au	Enables unit to automatically start on power-up. If OFF START input required to be cycled after power-up.	ON= Auto mode after power-up OFF = Manual mode after power-up	Off	ON or OFF	
b1,b3	bLO	Bath Temperature Low Set Point	T < Blo - runs normally, but alarm on	45	0 - HH3	
b1,b3	C-r	Bath Temperature Rise Delay	Minutes delay before "Err C-r" if T < HH1 - 10C	3	1-60	
b3	CL1	Bath thermocouple calibration TE101	Can adjust temperature reading by up to 50 degrees C	current reading + offset	+/- 25	
b1,b3	CL2	Bath Thermocouple calibration TE102	Can adjust temperature reading by up to 50 degrees C	current reading + offset	+/- 25	
b1,b3	dEd	Deadband	amount T has to below Setpoint by before reset	0	0-15	
b1,b3	HH1	Bath Temperature Set Point 1	T > HH1 - main SSV off, auto reset when T < (HH1 - dEd)	50	0 - HH3	

b1,b3	HH2	Bath Temperature Set Point 2	T > HH2 - main & pilot SSV off auto reset when T < (HH1 - dEd)	Off	0 - HH3	
b1,b3	HH3	Bath Temperature Set Point 3	T > HH3 - all off & alarm manual or remote reset required when T < (HH1 - dEd)	65	HH1 - 999	
all	LEd	Allows unit to turn display off	ON=display always on OFF=display off after 10 min Press OK to turn back on for 10 min	ON	ON or OFF	
b1,b3	PAS	Password - when ON cannot access rest off setup menu	ON = Program Menu restricted OFF = Program Menu enabled access sequence U D U U D U	OFF	ON or OFF	
all	PdL	Pilot delay	seconds delay between proven pilot and main firing	10	10-300	
s,b1	PHI	Pilot Thermocouple High set point	Signal setting for a fail point?	600	PLO -990	
s,b1	PLo	Pilot Thermocouple Low set point	Signal setting for a prove point?	200	60 - PHI	
all	PUr	Purge time cycle	Time in seconds set for purge	10	10 - 900	
all	rE	Restart attempts	Number of times the unit will retry to light burner before alarming	3	0 - 3	

### 3.3 Messages

Display may alternate between "message" & "value".

S model before 2009 used Pu instead of PUr.

<i>On Screen</i>	<i>Description</i>	<i>Function</i>	<i>Corrective Action</i>
999	if flashing:	Thermocouple error	- check thermocouple wiring
Au	Automatic Mode	Unit is in Automatic mode	
b1C	Bath Temperature	Bath Temperature as measured by Thermocouple TE101	
b2C	Bath Temperature	Bath Temperature as measured by Thermocouple TE102	
bLo	Very Low Bath Temp	- Bath temperature below bLo value - unit alarms	- wait for bath to heat to above bLo
ESd	Emergency Shut Down	- Front panel ESD pressed - ESD input open - Bath Temp got above HH3	- press OK to reset alarm - check contact - allow bath too cool below HH1
FAL	Flame Fail	All outputs are switched off and unit switches to manual mode	- check fuel, air & ignition - return to auto mode and try again
H-1	Main flame off.	Bath temperature has reached HH1 value	- allow bath too cool below HH1
H-2	Burner off	Bath temperature has reached HH2 value	- allow bath too cool below HH1 - check pilot thermocouple wiring
H-3	High Temperature ESD	Bath temperature has reached HH3 value	- allow bath to cool below HH1 & reset
LCo	Lock Out input open	Lck contacts open before main energized	- check lockout wiring
oFF	Off	Start contacts open	- close START contacts
P-C	Pilot Temperature to high to start flame	Displayed when unit is waiting for Pilot Temperature to get below Plo	- wait for Pilot to cool to below Plo



PLC	Pilot Temperature	Bath Temperature as measured by Thermocouple TE306	
PrS	Pressure Switch	Pressure switch input open	- check pressure switch wiring - check fuel pressure
PUr	Purge time cycle	Unit is Purging (15 sec between starts)	- wait (maximum programmed PUr time)
rdY	Ready	Unit in Manual mode but ready	- change to Auto mode
run	Unit running (flame on)	pilot only waiting for pilot temperature to come up to PHI before main energized	- waiting for pilot temperature to come up to PHI

### 3.4 Error Messages

Display may alternate between "Err" & #.

<i>On Screen</i>	<i>Description</i>	<i>Corrective Action</i>
Err	Attempted to set setpoint out of range	- check allowed range
Err 1	Start attempted while flame is still being detected	- check if pilot temp still above Plo - if Flame light ON, then check ionization probe
Err 2	Configuration settings are not being saved in memory	- Try setting configuration item again - replace door card
Err 3	Pilot button held more than 30 seconds	- release pilot button, wait for purge then retry
Err 5	Bad Sensor	- check thermocouple and connections.
Err 6	Solenoid is powered when should be off	- check solenoids and wiring for stray power.
Err 20	Memory error	- try again - replace door card
Err 30	Expansion card not detected	- check expansion card on door plugged in
Err 31	Expansion card thermocouple error	- check thermocouple and connections.
Err 32	Main board Thermocouple error	- check thermocouple and connections.
Err PAD	Keypad has stuck key on power up	- try again - call Profire to get replacement door
Err C-r	Bath Temperature did not rise enough (3C) in programmed time	- check bath is heating up - check thermocouple and connections.

## 4 Operations

### 4.1 Operation Instructions

The operation sequence is as follows:

1. Ensure system is installed correctly and all components are functioning properly.
2. Open manual valves.
3. Turn system run switch to “ON” (not part of unit).
4. The purge cycle begins. The programmed purge time is started when power is applied or the main valve is off and no flame is detected.
5. The ignition cycle begins. The pilot solenoid is opened and ignition is turned on for a 10 second trial period. If the flame is seen the flame indicator turns on and the main valve is opened. If the flame is not seen after this trial period the pilot will turn off.
6. Check main valve indicator light to ensure valve is open.

### 4.2 Resets

- When the unit faults out (normally because an unsafe condition was detected) a reset is required.
- Before the unit can be reset the condition causing the fault needs to be corrected. Some of the conditions that require a reset are:
  - ESD button pressed.
  - Power supplied to the solenoids from an external source
  - Gas pressure out of range
  - Thermocouple wiring loose
  - Flame out
  - Proof-of closure switch not made before main solenoid energized
- A reset can be done locally or remotely.
- A local reset can be done by pressing the OK button on the front of the unit. Then the unit will need to be put back into AUTO mode by locally pressing the MODE button on the front of the unit.
- A remote reset is done by removing power from the unit, waiting 10 seconds and then restoring power. After this type of reset the unit starts in the programmed mode and may result in the flame being lit.

Note: In manual mode the unit may start automatically after a reset. After a power outage, the unit may be in AUTO mode. To ensure the unit does not auto start please make sure the ESD or START contact is open and fuel gas is manually switched off.

### 4.3 Normal Operation Description

On the Profire 1100s model the pilot temperature is monitored.

- When the pilot temperature (TE203) gets above the program PHI (600 default) the STATUS contact will close to indicate everything is okay.
- If the TE203 temperature reaches the programmed PHI (600 default) and then drops below it, the unit will give a P-C message, turn off the pilot and main solenoids (flame off) and allow the pilot thermocouple to cool until its temperature is below the programmed PLo (200 default). The STATUS output changes to open circuit.
- When the pilot thermocouple has cooled below PLo the unit will once again begin the ignition sequence starting with a short purge cycle.

- The main solenoid is not energized until the pilot is proven and the programmed PdL (pilot delay time) has expired. The STATUS contact will close and remain closed unless the TE203 temperature drops below PLo or reaches PHI and then drops below PHI again.

On the Profire 1100b1 model a plug in card on the door will accept the wires from a bath temperature thermocouple (TE102) and will shut down the unit if the bath temperature is too high. This is a secondary temperature safety switch and by code (B149.3 – 13.4.3) must be fed from a different thermocouple than the primary temperature control. This thermocouple will shut down the burner if the bath temperature is too high.

- Like on the 1100s model, the main solenoid is not energized until the pilot is proven and the programmed PdL (pilot delay time) has expired. The pilot thermocouple has the same functions as the standard model..
- When the bath temperature (TE102) is below the programmed bLo value both the pilot and main solenoid valves remain on (provided all other safeties are met), but the STATUS contacts are open circuit indicating there is a problem.
- When the bath temperature rises above the bLo value but is still below the programmed HH1 value the STATUS contacts close and the unit is running normally with both pilot and main solenoids energized.
- If the bath temperature is more than 10°C below HH1 and the temperature does not rise above 3°C or more in the programmed C-r time (in minutes) the unit will fault out.
- If the TE102 temperature gets above the programmed HH1 value the STATUS contacts remain closed (indicating that everything is still okay), but the main solenoid shuts off and the pilot remains on. The main solenoid indicator flashes, showing that the main will come back on if the bath temperature drops below HH1. There may be a delay of up to 30 seconds before the main solenoid comes back on.
- If the bath temperature continues to rise to the point where it is above the programmed HH2 value the STATUS contacts remain closed (indicating that everything is still okay), but the main and the pilot solenoids shut off. The solenoid indicators flash, showing that the flame will be re-ignited if the bath temperature drops below HH1. There may be a delay of up to 30 seconds before the ignition sequence is started.
- If, although the burner is now off, the bath temperature continues to rise until the temperature rises above the programmed HH3 value, the STATUS contacts open (indicating a fault). The display will show an H-3 message and the unit will require a reset and a decrease in bath temperature below HH1 before it will restart.

On the Profire 1100b3 model a plug in card on the door will accept the wires from a bath temperature thermocouple (TE101) and will turn off the main solenoid if the TE101 bath temperature rises above the programmed HH1 value. Also on this unit, a second bath thermocouple (TE102) is wired to the thermocouple terminals on the main board. If TE102 indicates that the bath temperature is above the programmed HH2 value, the unit will turn off the pilot as well (the main should already be off). If TE101 & TE102 indicate a drop in temperature below HH1 the flame will be re-ignited. If the TE102 temperature rises above the programmed HH3 value the unit will fault out (turn off the gas solenoids and require a reset).

- If the bath temperature is below the programmed HH1 value the STATUS contacts are closed and the unit is running normally with both pilot and main solenoids energized.
- If the bath temperature gets above the programmed HH1 value the STATUS contacts remain closed (indicating that everything is still okay), but the main solenoid shuts off and the pilot remains on. The main solenoid indicator will flash to indicate that it will come back on if the bath temperature drops below HH1 (there may be a delay of up to 30 seconds).

- If the bath temperature continues to rise to the point where it is above the programmed HH2 value the STATUS contacts remain closed (indicating that everything is still okay), but the main and pilot solenoids shut off. The solenoid indicators will flash to indicate that the flame will be re-ignited if the bath temperature drops below HH1. There may be a delay of up to 30 seconds before the ignition sequence is started.
- If, although the burner is now off, the bath temperature continues to rise until the temperature is above the programmed HH3 value, the STATUS contacts will open (indicating a fault). The display then shows an H-2 message and the unit will require a reset and the bath temperature must drop below HH1 before the unit will restart.

On all units:

- When the START contacts open (or ESD contacts open, PRSW contacts open or unit faults out) the gas solenoids are immediately turned off, the flame goes out, and the unit begins counting down the programmed purge time.
- If power is lost the gas solenoids turn off and the flame goes out. When the power comes back on the unit begins counting down the programmed purge time and enters programmed mode (AUTO or MANUAL).

## 4.4 Cause & Effect Diagrams

NO.	1	2	3	4	5	Legend
DESCRIPTION (OUTPUT)	ALARM OUTPUT	PILOT SOLENOID	MAIN SOLENOID	IGNITION	REQUIRES RESET	ALARM=alarm contacts open SHUTDOWN=turn off all valves OP=contacts open CL=contacts closed Off=output not energized On=output energized *=output depends on TE102 SP=stop ST=start (Energized during start-up) Y=yes (Reset required) N=no (Reset not required)

### Standard Model

NO.	DESCRIPTION (INPUT)	STATUS	ACTIVITIES	I/O ADDRESS						COMMENTS
1	FLAME FAILURE	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
2	POWER FAILURE	ALARM	SHUTDOWN		OP	Off	Off	Off	N	
3	ESD INPUT (open)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
4	PRESSURE INPUT (open)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
5	LOCKOUT INPUT(open) (only if before start)	ALARM			OP	Off	Off	Off	Y	
6	START INPUT (open)		SHUTDOWN		OP	Off	Off	Off	N	
7	NORMAL OPERATION	NORMAL	All Fire		CL	On	On	Off	N	
8	TSHH < bath temp	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	External switch opens ESD input circuit
9	IGNITE BUTTON (in manual)	MANUAL						ST		
10	PILOT BUTTON (in manual)	MANUAL				On				Solenoid stays ON if flame seen
11	MAIN BUTTON (in manual) IF PILOT RUNNING	MANUAL				On	On			Solenoids stays ON if flame seen
12	ALARM ACKNOWLEDGE (OK button pressed)	MANUAL	Fault Reset							Controller switched to Manual Mode
13	POWER CYCLED (must be off ~ 10 sec)		Fault Reset							Mode after power-up programmable
14	MANUAL BUTTON		Changes State							All fault conditions must be clear to go to AUTO
15	START INPUT (closed transition)		Changes to AUTO							All fault conditions must be clear
16	pilot temp. (TE306) < PLO	ALARM			OP	On	Off	ST	N	Will not start ignition if TE306 > PLO
17	PLO < pilot temp. (TE306) < PHI	ALARM			OP	On	Off	Off	N	Will not energize main until TE306 > PHI
18	PHI < pilot temp. (TE306)	NORMAL			CL	On	On	Off	N	
19	pilot temp. (TE306) < PHI	ALARM			OP	Off	Off	Off	N	Solenoids turn off if temp drops below PHI after being above it

**B1 Model**

NO.	1	2	3	4	5	LEGEND
DESCRIPTION (OUTPUT)	ALARM OUTPUT	PILOT SOLENOID	MAIN SOLENOID	IGNITION	REQUIRES RESET	ALARM=alarm contacts open SHUTDOWN=turn off all valves OP=contacts open CL=contacts closed Off=output not energized On=output energized *=output depends on TE102 SP=stop ST=start (Energized during start-up) Y=yes (Reset required) N=no (Reset not required)

NO.	DESCRIPTION (INPUT)	STATUS	ACTIVITIES	I/O ADDRESS						COMMENTS
1	FLAME FAILURE	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
2	POWER FAILURE	ALARM	SHUTDOWN		OP	Off	Off	Off	N	
3	ESD INPUT (open)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
4	PRESSURE INPUT (open)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
5	LOCKOUT INPUT(open) (only if before start)	ALARM			OP	Off	Off	Off	Y	
6	START INPUT (open)		SHUTDOWN		OP	Off	Off	Off	N	
7	NORMAL OPERATION	NORMAL	Depends on Bath Temp		CL	*	*	ST	N	
8	bath temp. (TE102) < BLO	ALARM	All Fire		OP	On	On	Off	N	
9	BLO < bath temp. (TE102) < HH1	NORMAL	All Fire		CL	On	On	Off	N	
10	HH1 < bath temp. (TE102) < HH2	NORMAL	Pilot Fire		CL	On	Off	Off	N	
11	HH2 < bath temp. (TE102) < HH3	NORMAL	No Fire		CL	Off	Off	Off	N	
12	HH3 < bath temp. (TE102)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
13	IGNITE BUTTON (in manual)	MANUAL						ST		
14	PILOT BUTTON (in manual)	MANUAL				On				Solenoid stays ON if flame seen
15	MAIN BUTTON (in manual) IF PILOT RUNNING	MANUAL				On	On			Solenoids stay ON if flame seen
16	ALARM ACKNOWLEDGE (OK button pressed)	MANUAL	Fault Reset							Controller switched to Manual Mode
17	POWER CYCLED (must be off ~ 10 sec)		Fault Reset							Mode after power-up programmable
18	MANUAL BUTTON		Changes State							All fault conditions must be clear to go to AUTO
19	START INPUT (closed transition)		Changes to AUTO							All fault conditions must be clear
20	pilot temp. (TE306) < PLO	ALARM			OP	On	Off	ST	N	Will not start ignition if TE306 > PLO
21	PLO < pilot temp. (TE306) < PHI	ALARM			OP	On	Off	Off	N	Will not energize main until TE306 > PHI
22	PHI < pilot temp. (TE306)	NORMAL			CL	On	On	Off	N	
23	pilot temp. (TE306) < PHI	ALARM			OP	Off	Off	Off	N	Solenoids turn off if temp drops below PHI after being above it

**B3 Model**

NO.	1	2	3	4	5	LEGEND
OUTPUT	ALARM OUTPUT	PILOT SOLENOID	MAIN SOLENOID	IGNITION	REQUIRES RESET	ALARM=alarm contacts open SHUTDOWN=turn off all valves OP=contacts open CL=contacts closed Off=output not energized On=output energized *=output depends on Bath Temp (TE101 & TE102) SP=stop ST=start (Energized during start-up) Y=yes (Reset required) N=no (Reset not required)

NO.	INPUT	STATUS	ACTIVITIES	I/O ADDRESS						COMMENTS
1	FLAME FAILURE	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
2	POWER FAILURE	ALARM	SHUTDOWN		OP	Off	Off	Off	N	
3	ESD INPUT (open)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
4	PRESSURE INPUT (open)	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
5	LOCKOUT INPUT(open) (only if before start)	ALARM			OP	Off	Off	Off	Y	
6	START INPUT (open)		SHUTDOWN		OP	Off	Off	Off	N	
7	NORMAL OPERATION	NORMAL	Depends on Bath Temp		CL	*	*	ST	N	
9	bath temp < HH1	NORMAL	All Fire		CL	On	On	Off	N	
10	HH1 < bath temp < HH2	NORMAL	Pilot Fire		CL	On	Off	Off	N	
11	HH2 < bath temp < HH3	NORMAL	No Fire		CL	Off	Off	Off	N	
12	HH3 < bath temp	ALARM	SHUTDOWN		OP	Off	Off	Off	Y	
13	IGNITE BUTTON (in manual)	MANUAL						ST		
14	PILOT BUTTON (in manual)	MANUAL				On				Solenoid stays ON if flame seen
15	MAIN BUTTON (in manual) IF PILOT RUNNING	MANUAL				On	On			Solenoids stay ON if flame seen
16	ALARM ACKNOWLEDGE (OK button pressed)	MANUAL	Fault Reset							Controller returns to AUTO Mode if all fault conditions clear
17	POWER CYCLED (must be off ~ 10 sec)		Fault Reset							Mode after power-up programmable
18	MANUAL BUTTON		Changes State							All fault conditions must be clear to go to AUTO
19	START INPUT (closed transition)		Changes to AUTO							All fault conditions must be clear



## 5 Troubleshooting

<b><i>Problem / Display Message</i></b>	<b><i>Response</i></b>
System off and there is a flame	<ul style="list-style-type: none"> <li>• Press OK; if display comes back on unit is in power save mode</li> </ul>
System off and there is no flame	<ul style="list-style-type: none"> <li>• Press OK; if display comes back on unit is in power save mode</li> <li>• Check power to unit</li> </ul>
System on but unit will not start	<ul style="list-style-type: none"> <li>• Check display messages to determine condition</li> <li>• Correct condition</li> </ul>
“rdY”	Unit is in manual mode <ul style="list-style-type: none"> <li>• Press MODE button to return unit to AUTO mode</li> </ul>
“ESd”	Unit has been stopped by ESD button, ESD contacts are open, or bath temperature was above HH3 <ul style="list-style-type: none"> <li>• Press MODE button once to reset the unit and again to return unit to AUTO mode. This will work if ESD button was pressed.</li> <li>• If display goes back to “Esd” immediately after purge, the problem is the ESD contacts or the bath temperature</li> <li>• Correct the problem (reset the remote ESD button, refill bath, let bath cool) before resetting the unit</li> </ul>
“H-1”	Main solenoid has been de-energized because the bath temperature was above the programmed HH1 value <ul style="list-style-type: none"> <li>• Unit will automatically re-energize main solenoid when bath temperature has cooled below HH1 value</li> </ul>
“H-2”	There is no flame because bath temperature was above programmed HH2 value <ul style="list-style-type: none"> <li>• Unit will automatically re-ignite flame when bath temperature is below HH1 value.</li> </ul>
“H-3”	Unit has stopped because bath temperature was above programmed HH3 value <ul style="list-style-type: none"> <li>• Allow bath to cool below HH1 value or change programmed values</li> <li>• Reset and return unit to AUTO mode</li> </ul>
“PrS”	Fuel gas pressure is out of the defined range <ul style="list-style-type: none"> <li>• Check that manual gas valves are open</li> <li>• Check the inlet gas pressure</li> <li>• Check the pressure regulator</li> <li>• Check pressure switches and wiring</li> <li>• Reset and return unit to AUTO mode</li> </ul>
“LCo”	LCK contacts are open before main solenoid is turned on <ul style="list-style-type: none"> <li>• Turn off manual gas valve to ensure no gas flow</li> <li>• If no “proof-of-closure” switch is used check that LCK contacts are jumpered</li> <li>• If “proof-of-closure” switch is used or “low fire” switch is used check wiring of switch(s)</li> </ul>
“bLo”	Bath temperature is below programmed bLo value, but gas valves are on and

	<p>flame is detected.</p> <ul style="list-style-type: none"> <li>• When bath temperature is above bLo value display will return to normal and STATUS contacts will close</li> </ul>
“b1C” or “b2C” alternating with a number	<p>Display is giving the present bath temperature</p> <ul style="list-style-type: none"> <li>• Temperature relative to programmed setpoints “bLo”, ”HH1”, ”HH2” &amp; “HH3” determine expected outputs</li> </ul>
Flashes “Pur” alternating with numbers counting down	<p>Normal purge cycle (counting down the programmed purge time)</p> <ul style="list-style-type: none"> <li>• Ignition will commence when count reaches zero</li> </ul>
“FAL”	<p>The flame has gone out or failed to ignite. Fuel, air and a source of ignition are required to make a flame, and the unit needs to detect the flame.</p> <ul style="list-style-type: none"> <li>• Check fuel: <ul style="list-style-type: none"> <li>○ Gas available at inlet</li> <li>○ Manual gas valves are open</li> <li>○ Pilot solenoid is opening (PILOT button when in manual mode)</li> </ul> </li> <li>• Check air: <ul style="list-style-type: none"> <li>○ Check that air passage (both inlet and outlet) is clear</li> </ul> </li> <li>• Check ignition source: <ul style="list-style-type: none"> <li>○ Check wiring to ignition transformer</li> <li>○ Check wiring from ignition transformer to spark plug/flame rod</li> <li>○ Ensure unit is firing ignition (IGNITE button when in manual mode)</li> </ul> </li> <li>• Check flame detection: <ul style="list-style-type: none"> <li>○ Check wiring to ignition transformer</li> <li>○ Check wiring from ignition transformer to spark plug/flame rod</li> <li>○ Check flame rod</li> </ul> </li> <li>• Reset and return unit to AUTO mode</li> </ul>
Flashes “999”	<p>Thermocouple error</p> <ul style="list-style-type: none"> <li>• Check thermocouple wiring</li> </ul>
Alternates between “Err” and (error code)	<ul style="list-style-type: none"> <li>• Check meaning of error code (Section 3.4)</li> <li>• Correct error</li> <li>• Reset unit and retry</li> </ul>