Heating Basics – Gas Valve Systems

UNI-LINE® PRODUCT KNOWLEDGE

NATE-Recognized Training Provider

invensys Controls

Subjects We Will Cover In This Session

- Fuel and Pressure Characteristics
- Gas Valve Applications
- Gas Valve Actuator Types
- Gas Valve Characteristics
- Gas Valve Manufacturers
- Ignition Control System
- Ignition Manufacturers
- Flame Rectification
- Pilot Basics
- Thermocouple and Thermopile Basics
- Installation and Troubleshooting Tips
- Website Tools
- When You Have Questions
- Q&A

Acronyms

BTU	=	British Thermal Units
LC	=	Low Capacity
LP	=	Liquid Propane
MV	=	Main Valve
NAT	=	Natural Gas
PD	=	Pressure Drop
PV	=	Pilot Valve
SLC	=	Snap-action Low Capacity
mV	=	milliVolts
WC	=	Water Column

Fuel Characteristics

Natural Gas	Characteristics	Liquid Propane (LP)
0.64	Specific Gravity	1.53
1000	BTUs / Cubic Feet	2500
7”WC – 10.5”WC	Service Pressure Range	11”WC – 14”WC
1200º F	Ignition Temperature	950º F
10/1	Combustion Air/Gas Ratio	24/1

- Natural gas is lighter than air and rises
- L.P. gas is heavier and *puddles* in the lowest area it can find

Fuel Characteristics of British Thermal Units

- Definition of BTU: The quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit
- Many gas appliances are rated depending on BTU output
- The more heat needed, the higher the BTU rating
- Residential gas water heaters (regardless of fuel) are rated between 15,000 and 75,000 BTU
- Over 75,000 BTU is considered Commercial Water Heater
- Commercial Water Heaters rated between 75,000 and 750,000 BTU

Pressure Characteristics

Pressure Side	Natural Gas	Liquid Propane
Inlet Pressure	7” – 10” WC	14” – 17” WC
Outlet Pressure	3” – 4” WC @ 1” PD	10” – 11” WC @ 1” PD

- Excessive inlet pressure will not necessarily cause the gas valve to lock up
  - However, the valve will not regulate pressure correctly
- Gas line pressure from utilities vary seasonally with demand
  - During peak usage, inlet pressure can drop below the 7” WC Natural gas shown above
- High rise buildings may experience low pressure on upper floors
  - Especially during cold weather, many times a 2 psig system is used to compensate
- In some instances OEMs will specify higher outlet pressures
  - To obtain BTU rates beyond the capabilities of the gas valve at 1” pressure drop

Central Heating Applications

Factory Model (Uni-Line® Part)	BTU @ 1" PD	Min - Max BTU Capacity	Standing	Intermittent	Direct
7000 STD (Uni-Line 700)	Nat 300,000	10,000 – 720,000	✓	✓	✓
	LP 485,000	10,000 – 900,000	✓	✓	✓
7000 HC (Uni-Line 700)	Nat 600,000	200,000 – 800,000	✓	✓	✓
	LP 972,000	300,000-1,150,000	✓	✓	✓
7200 (Uni-Line 720)	Nat 150,000	15,000 – 200,000	✓	✓	✓
	LP 240,000	15,000 – 320,000	✓	✓	✓

Space Heating And Hearth Applications

Factory Model	BTU @ 1" PD	Min - Max BTU Capacity	Standing	Intermittent	Direct
7000 STD (Uni-Line 700)	Nat 300,000	10,000 – 720,000	✓	✓	✓
	LP 485,000	10,000 – 900,000	✓	✓	✓
7200 (Uni-Line 720)	Nat 150,000	15,000 – 200,000	✓	✓	✓
	LP 240,000	15,000 – 320,000	✓	✓	✓
2000 (Uni-Line 722)	Nat 125,000	25,000 – 170,000	✗	✓	✓
	LP 200,000	25,000 – 272,000	✗	✓	✓
7500 (Uni-Line 722)	Nat 100,000	6,700 – 160,000	✓	✗	✗
	LP 162,000	6,700 – 226,000	✓	✗	✗
7000 LC (Uni-Line 710)	Nat 40,000	5,000 – 70,000	✓	✗	✗
	LP 65,000	5,000 – 100,000	✓	✗	✗
7000 ST (Uni-Line 700)	Nat 100,000	10,000 – 160,000	✓	✗	✗
	LP 162,000	10,000 – 225,000	✓	✗	✗

Commercial Water Heating Applications

Factory Model	BTU @ 1" PD	Min - Max BTU Capacity	Standing	Intermittent	Direct
7000 STD (Uni-Line 700)	Nat 300,000	10,000 – 720,000	✓	✓	✓
	LP 485,000	10,000 – 900,000	✓	✓	✓
7200 (Uni-Line 720)	Nat 150,000	15,000 – 200,000	✓	✓	✓
	LP 240,000	15,000 – 320,000	✓	✓	✓
2000 (Uni-Line 722)	Nat 125,000	25,000 – 170,000	✗	✓	✓
	LP 200,000	25,000 – 272,000	✗	✓	✓
7000 HC (Uni-Line 700)	Nat 600,000	200,000 – 800,000	✓	✓	✓
	LP 972,000	300,000 – 1,150,000	✓	✓	✓

Commercial Cooking Applications

Factory Model	BTU @ 1" PD	Min - Max BTU Capacity	Standing	Intermittent	Direct	Temp Rating
7000 STD (Uni-Line 700)	Nat 300,000	10,000 – 720,000	✓	✓	✓	-40 to 175ºF
	LP 485,000	10,000 – 900,000	✓	✓	✓	
7200 (Uni-Line 720)	Nat 150,000	15,000 – 200,000	✓	✓	✓	-40 to 175ºF
	LP 240,000	15,000 – 320,000	✓	✓	✓	
2000 (Uni-Line 722)	Nat 125,000	25,000 – 170,000	✗	✓	✓	-40 to 175ºF
	LP 200,000	25,000 – 272,000	✗	✓	✓	
7500 (Uni-Line 722)	Nat 100,000	6,700 – 160,000	✓	✗	✗	0 to 185ºF
	LP 162,000	12,000 – 226,000	✓	✗	✗	
7000 LC (Uni-Line 710)	Nat 40,000	5,000 – 70,000	✓	✗	✗	-40 to 225ºF
	LP 65,000	5,000 – 100,000	✓	✗	✗	
TS11 J &K (Uni-Line 700)	Nat 210,000	NA	✓	✗	✗	32 to 300ºF
	LP 340,000	NA	✓	✗	✗	

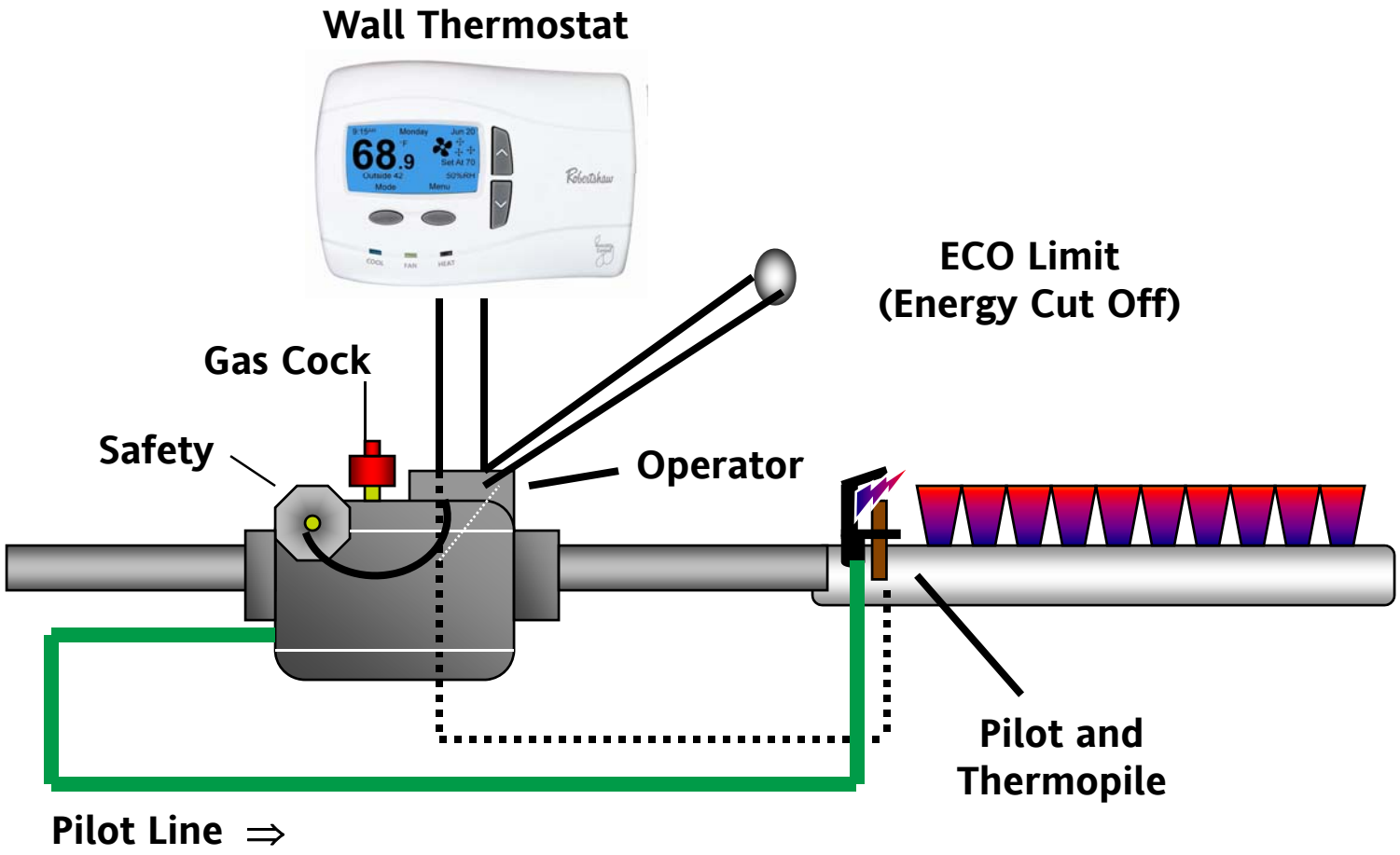
Residential Water Heating Applications

Factory Model	BTU @ 1" PD	Min - Max BTU Capacity	Standing	Intermittent	Direct	Temp Rating
220R (Uni-Line 110)	Nat 86,000	10,700 – 107,000	✓	✗	✗	32 to 175ºF
	LP 100,000	7,000 – 140,000	✓	✗	✗	
R103RV (Uni-Line 110)	Nat NA	NA	✓	✗	✗	32 to 175ºF
	LP > 35,000	3,500 – 35,000	✓	✗	✗	
2000 (Uni-Line 722)	Nat 125,000	25,000 – 170,000	✗	✓	✓	-40 to 175ºF
	LP 200,000	25,000 – 272,000	✗	✓	✓	
R110R (Uni-Line 110)	Nat 86,000	10,700 – 107,000	✓	✗	✗	32 to 175ºF
	LP 100,000	7,000 – 140,000	✓	✗	✗	

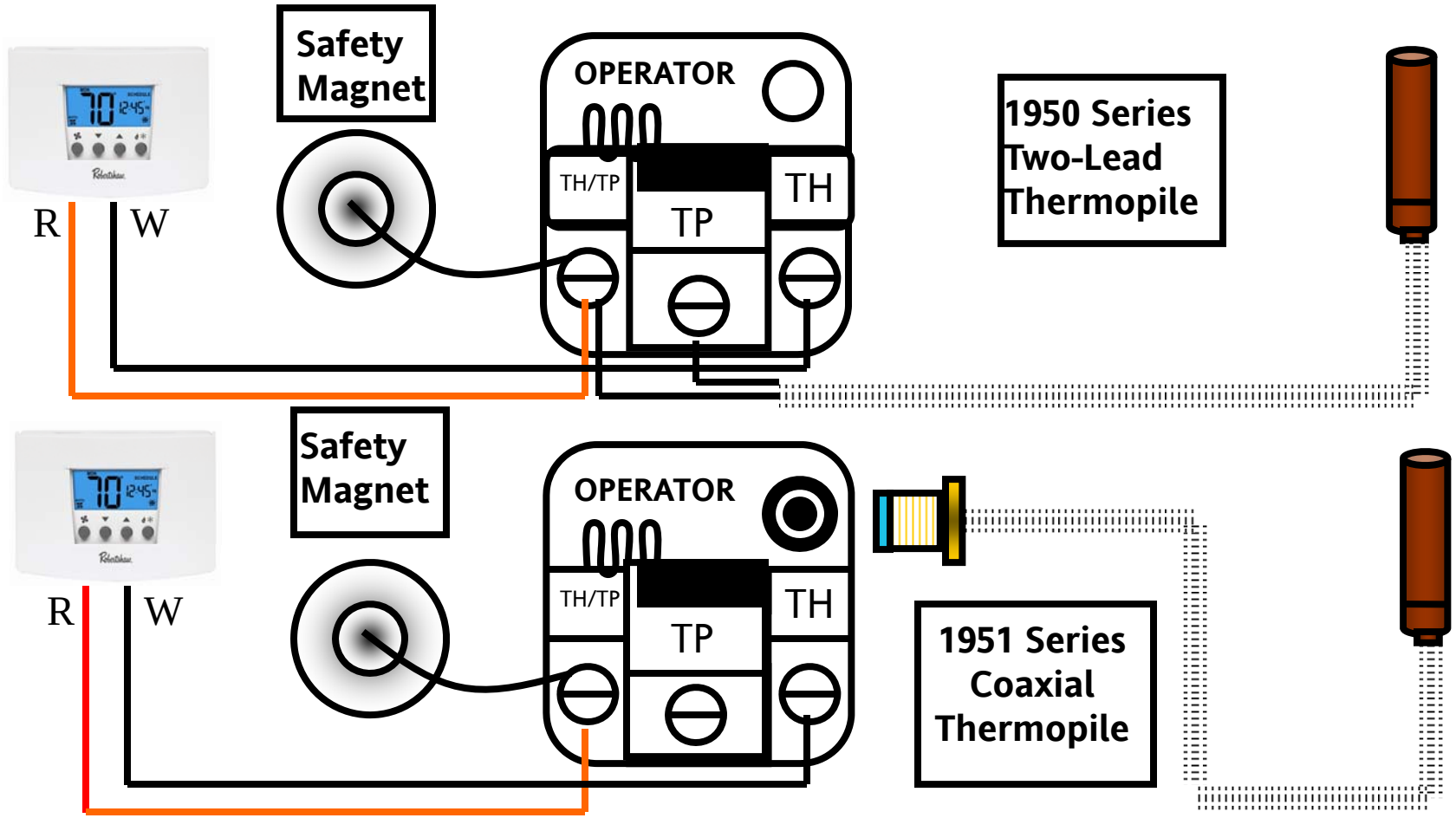
Gas Valve Actuator Types

- **Manual** – Standing pilot valve manually turned ON and OFF for each heating cycle.
- **Millivolt** – Wall thermostat actuated with manual gas cock, automatic pilot safety valve and a Millivolt operator. The automatic pilot safety is separate from gas cock and provides shutoff in case of pilot outage. Millivolt gas valves do not require external power source.
- **24 Volt, 120 Volt, and 240 Volt** – Combines a manual main and pilot gas valve, a separate automatic safety pilot valve, pilot filtration, and automatic electric valve.
- **Hydraulic** – Temperature is sensed by a capillary bulb. The bulb in the return air stream is actuated open and close by the hydraulic system.

Millivolt Actuated Gas Valve



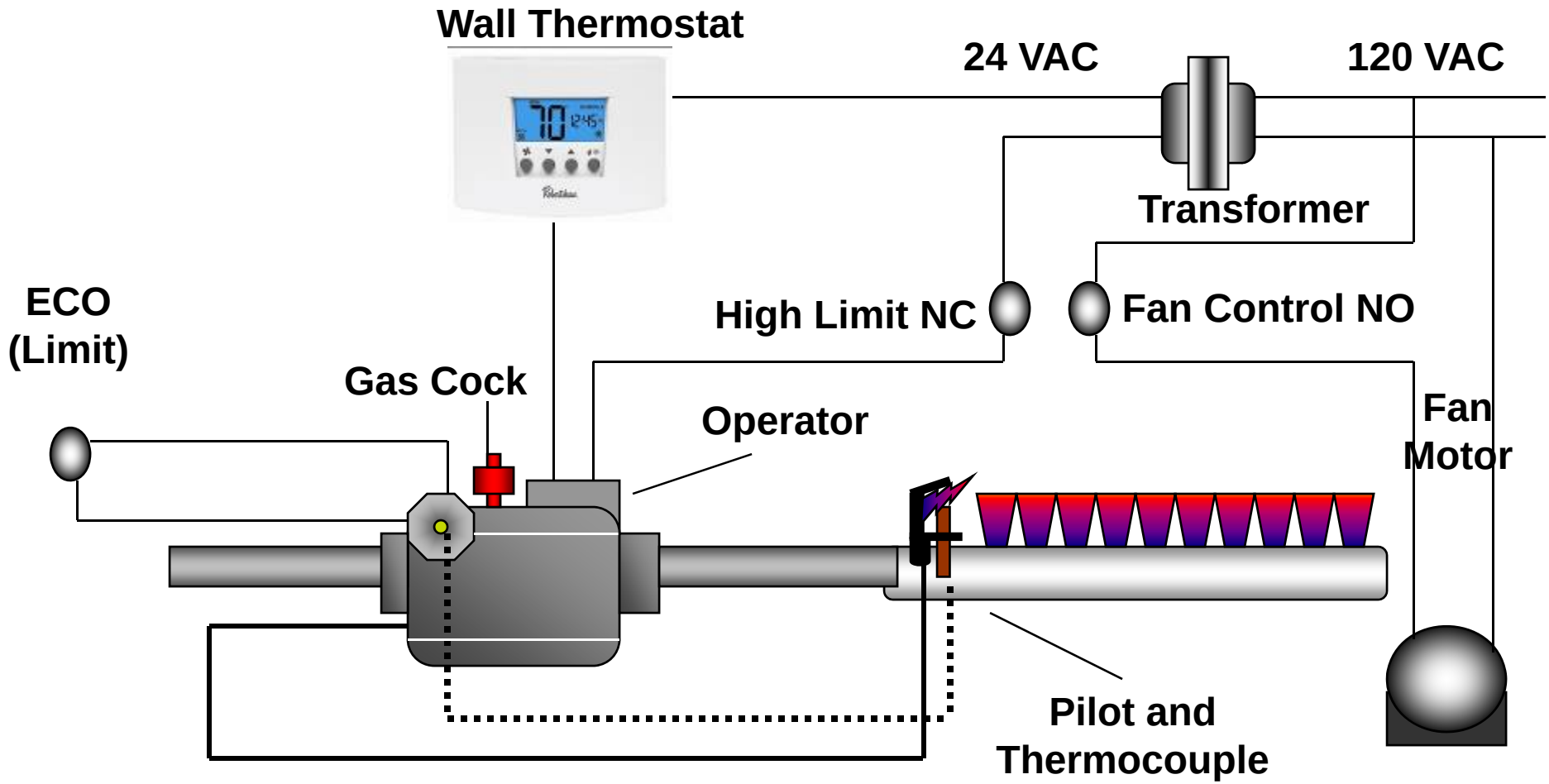
Robertshaw® 700 & 710 Millivolt Wiring



Controls

24 Volt Actuated – Standing Pilot System

Most popular Uni-Line® part is 710-402, Factory Part 7000-ERLC



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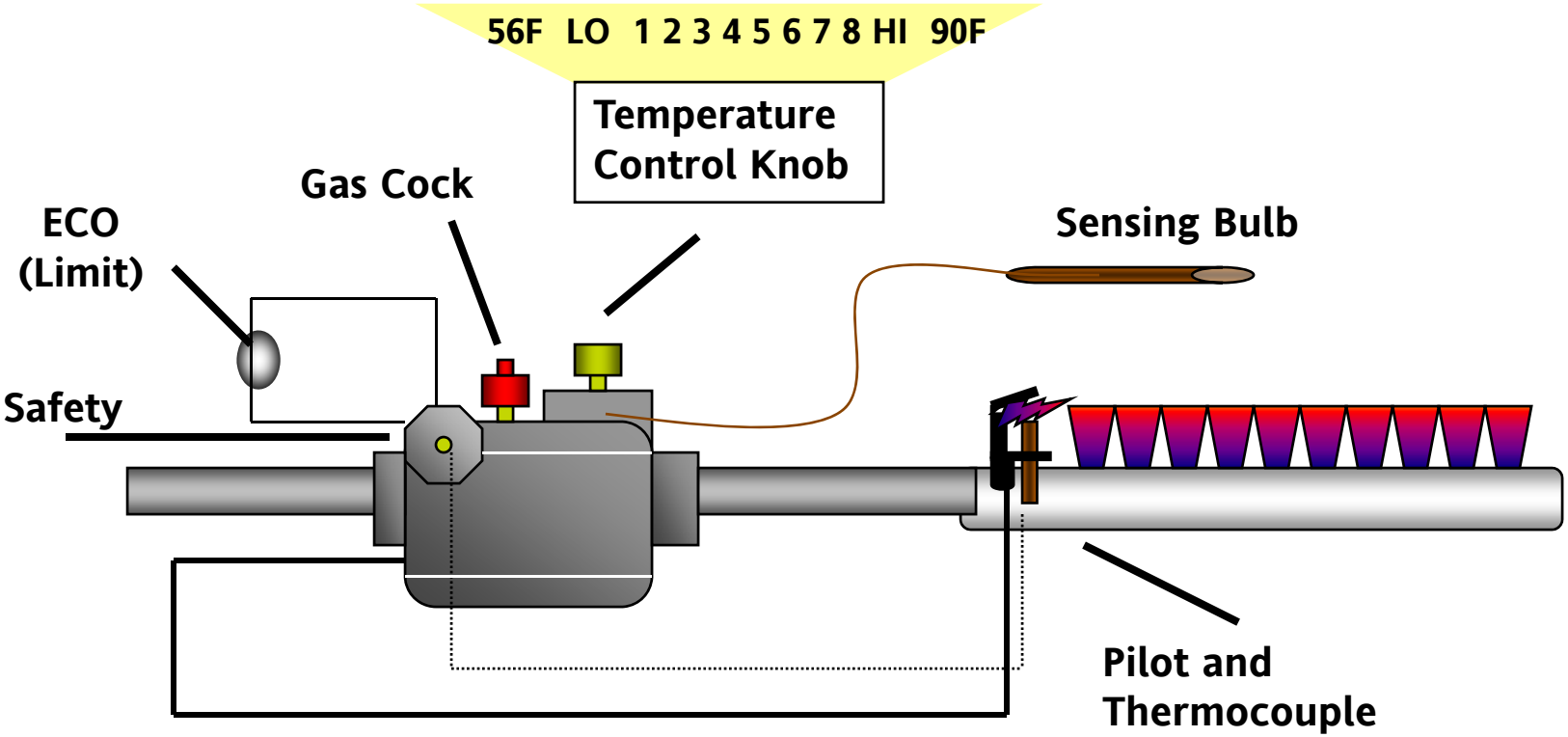
Hydraulic Actuated – Standing Pilot System



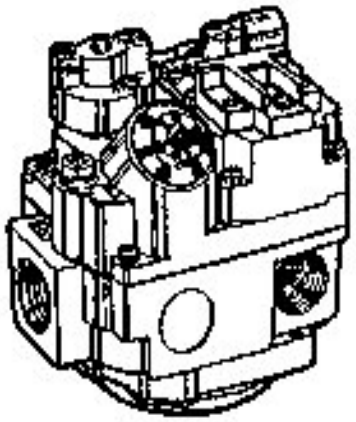
Additional Gas Valve Characteristics

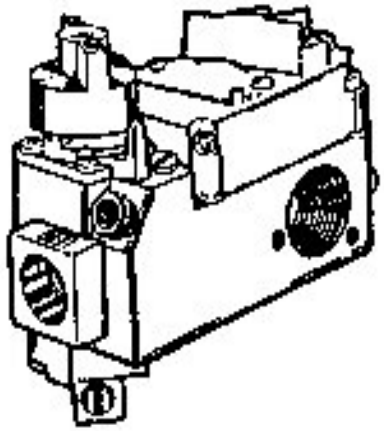
- Combination Gas Valves
- Open Valve Options
  - Standard Opening
  - Slow Opening
  - Step Opening
  - Two-stage Models
- Close Valve Options
  - Snap Action
  - Snap Throttle

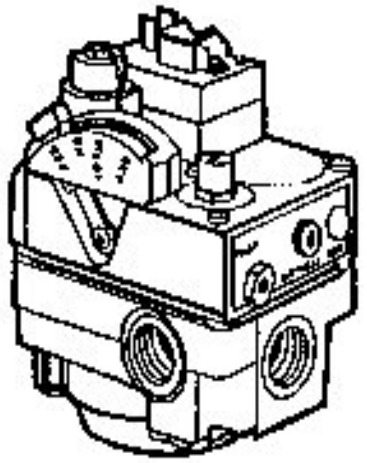
Combination Gas Valves

Combination valves include three components

- Regulation
- Safety valve
- Main valve actuated by thermostat or bulb







Additional Gas Valve Characteristics

LEGEND

OPENING CHARACTERISTICS

STANDARD OPEN

instant full flow

SLOW OPEN

S7A = 0 - 5 sec. to full flow

S7B = 5 - 10 sec. to full flow

S7C = 10 - 30 sec. to full flow

STEP OPEN

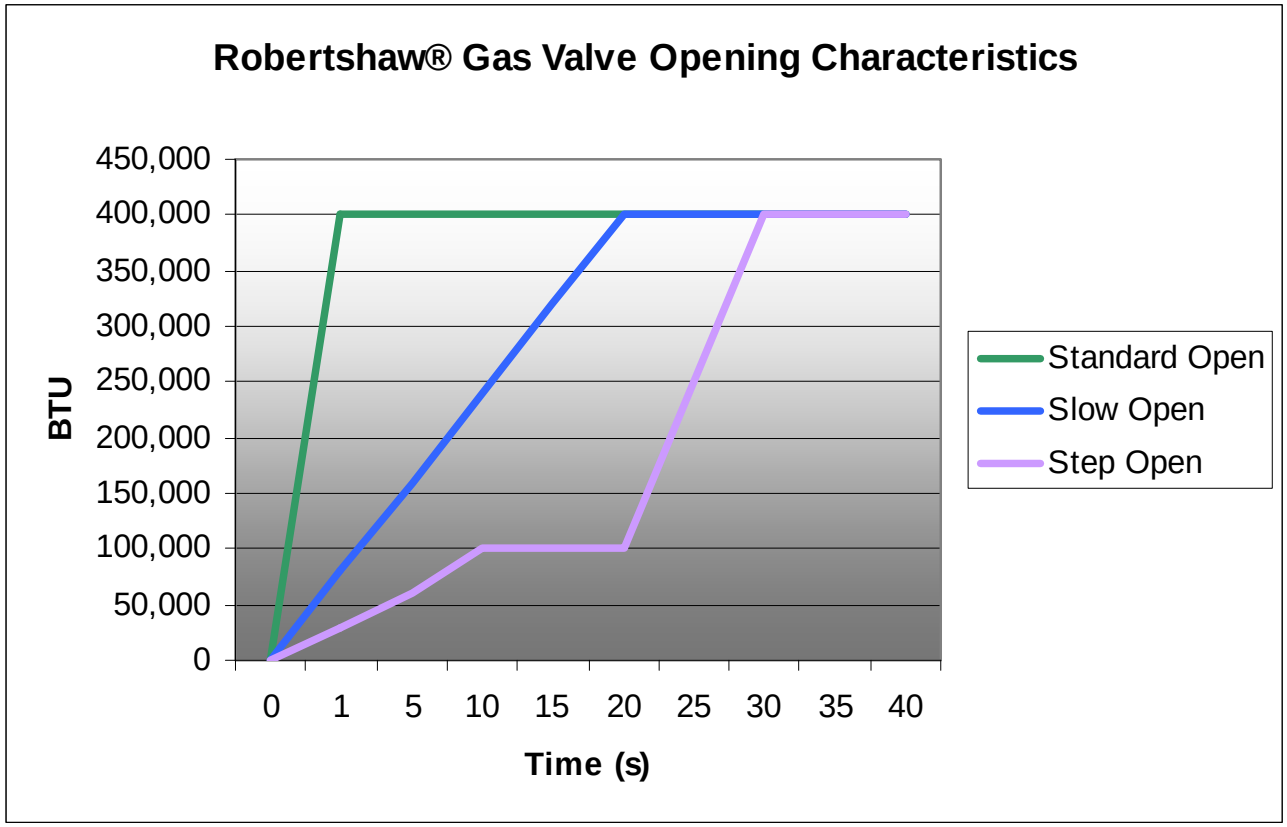
SO1 = 30% of full flow

SO2 = 40% of full flow

SO3 = 50% of full flow

SO4 = 60% of full flow

SO5 = 70% of full flow



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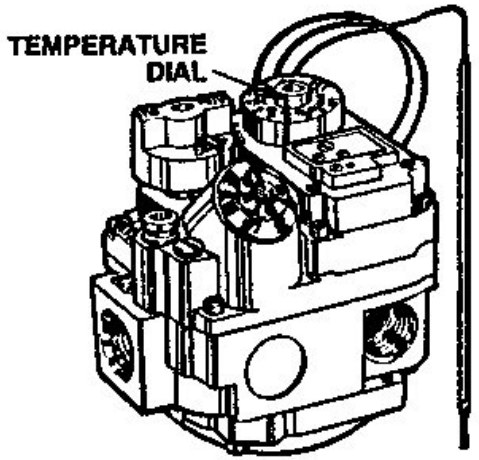
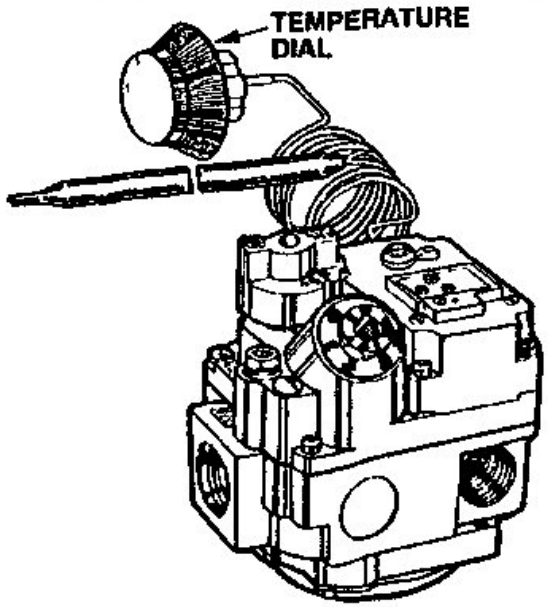
Additional Characteristics for Two-Stage

- Robertshaw® two-stage gas valves use a two-stage, two-pressure regulator which responds to a two-stage controller (thermostat)
- Available in capacities from 29,000 to 960,000 BTU/Hr
- Piping sizes from 3/8 to 1 inch
- Can be used with either natural gas or liquid propane
- Two-stage has the ability to vary the gas pressure delivered to the main burner(s) through the use of a solenoid operated two-pressure regulator
- First stage actuator of the gas valve is energized
- When heat demand increases, the second stage regulator is energized
- First stage setting is determined as a percentage of the full output of the valve and is factory set
- Second stage pressure regulator setting is nominal 3.5” WC for natural gas and 11” for LP

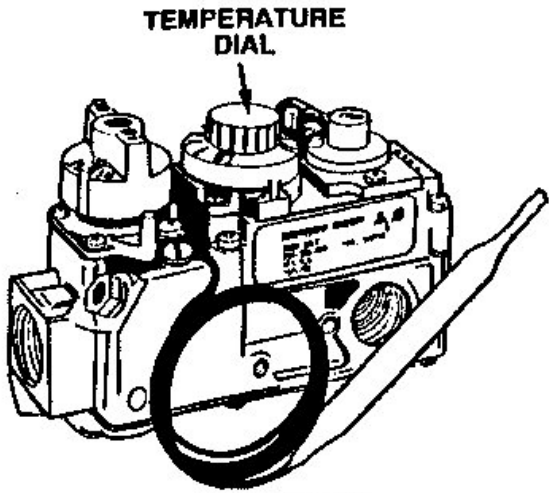
Snap-Action And Snap-Throttle Hydraulic Valves



HYDRAULIC
700-202



HYDRAULIC WITH
REMOTE DIAL
700-206



HYDRAULIC
710-205

Gas Valve Manufacturers

Attributes	Robertshaw®	Honeywell	White-Rodgers	Dexen	SIT
US Based Engineering	✓	✓	✓	✗	✗
US Based Technical Services	✓	✓	✗	✗	✗
Space & Central	✓	✓	✓	✓	✓
Residential Water	✓	✓	✓	✗	✗
Hearth Products	✓	✓	✗	✓	✓
Pilot, Thermocouple and Ignition Controls	✓	✓	✓	✗	✓

Ignition Control Systems

- Standing Pilot
- Intermittent Pilot Ignition (IPI)
- Direct Spark Ignition (DSI)
- Hot Surface Ignition (HSI)

Ignition Systems

Four Types of Ignition Systems

- Standing pilot – Pilot is manually ignited and stays on constantly. When the thermostat calls for heat, and the pilot flame is making good contact with the thermocouple, the gas valve allows gas to flow to main burner until the call for heat is satisfied.
- Intermittent pilot (also known as “spark to pilot”) – Pilot is ignited by a spark generated by an ignition module and electrode. When enough heat is generated in the thermocouple, the gas valve allows gas to the main burner and is ignited by the pilot until the call for heat is satisfied.
- Direct spark – When the thermostat calls for heat, the main burner is ignited by a direct spark or ceramic (glow bar) igniter. Eliminates the pilot, but requires flame sensor and more expensive ignition module.
- Hot Surface Ignition – Similar to Direct spark except it uses a “glowbar” or ceramic ignitor to heat up to ignition combustion temperature within 17 or 34 seconds. There are Silicon Carbide (more fragile) and Silicon Nitride versions available. Requires flame sensor.

Acronyms

GRD	=	Ground
IGN	=	Ignition
LP	=	Liquid Propane
MV	=	Main Valve
NO	=	Normally Open
NC	=	Normally Closed
PV	=	Pilot Valve
V AC	=	Voltage Alternating Current
V DC	=	Voltage Direct Current

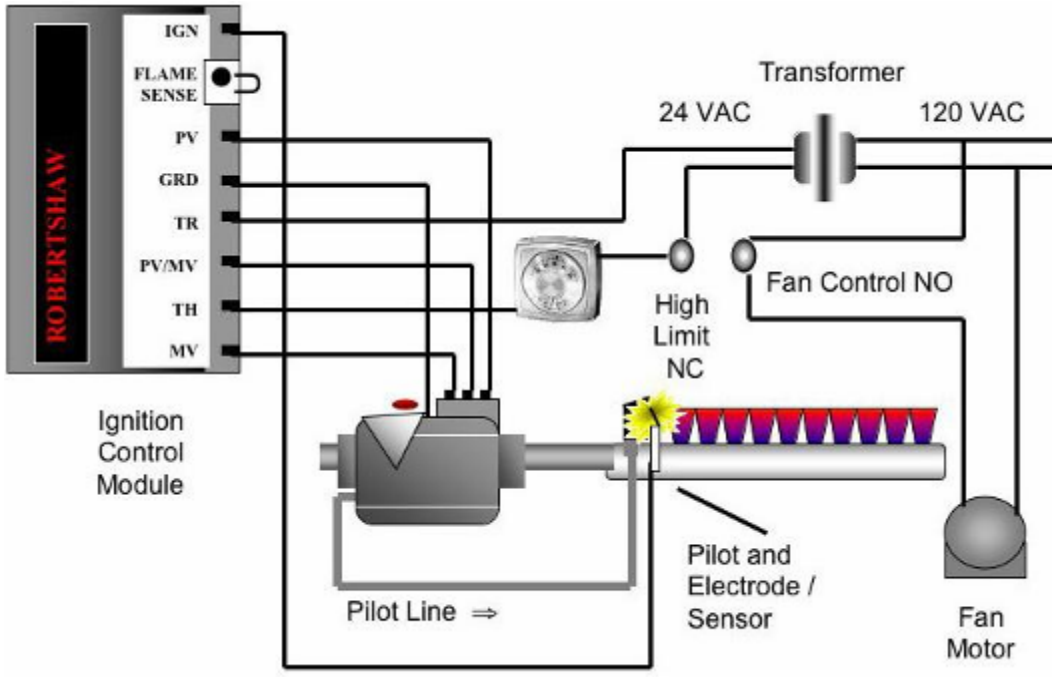
Definitions

- Sensors - Senses the variable change in temperature and sends a signal to the controller.
- Transmitters - Interprets signal from sensor to display condition of temperature variable.
- Transformer - An electromagnetic device that either raises or lowers the voltage of an alternating current electrical system.
- Voltage - The electrical potential pressure behind the flow of electricity, measured in terms of Volts.
- Current - The movement of an electrical charge through a circuit, measured in terms of Amps.
- Hertz - A unit of measurement for frequency in cycles per second of a waveform.
- Relay - An electromechanical device that opens or closes contacts when a current is passed through a coil.

Gases Used In Applications

- Liquid Propane tends to hover at ground level
- Natural Gas rises, goes up the flue
- Manometer measures gas pressure
  - Inches of Water Column

Ignition Control System

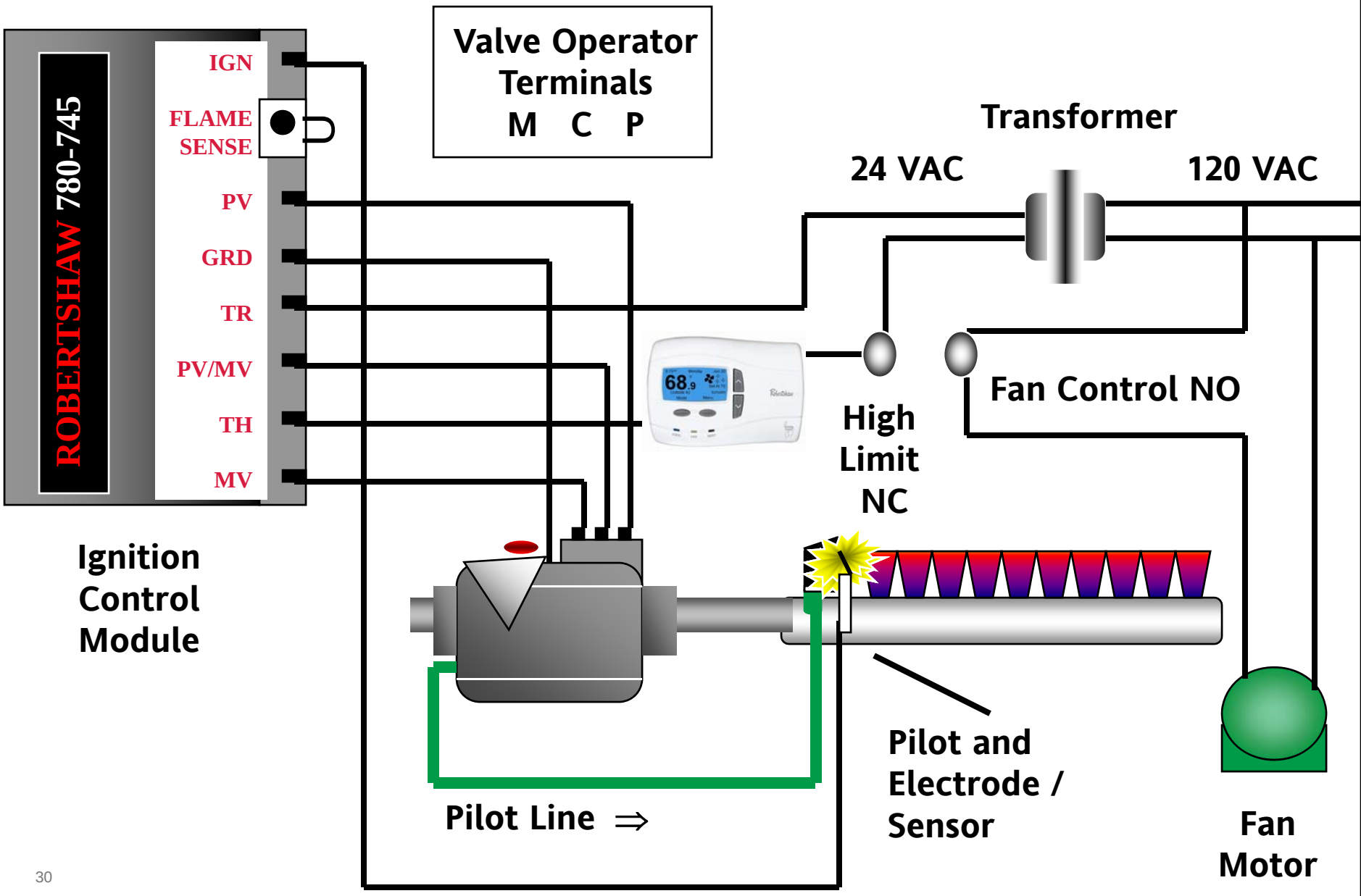


1. Thermostat calls for heat
2. Ignition controller requests a spark to the electrode which ignites the gas
3. Control uses flame rectification or sensor to identify if flame is present
4. Ignition controller sends signal to open gas valve
5. When thermostat is satisfied, gas valve closes to shut off main burner gas

Feature List for Ignition Controls

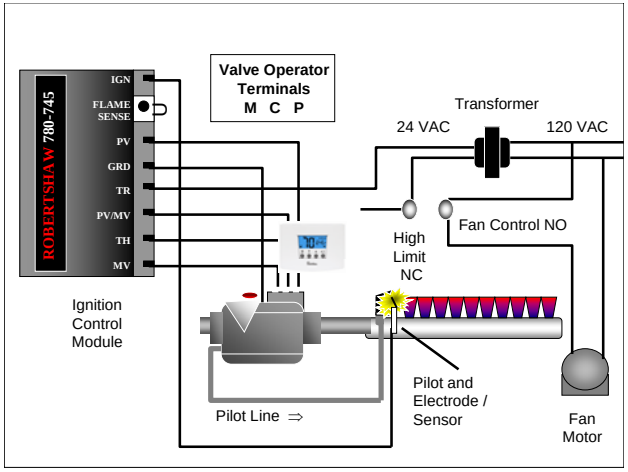
- Approvals
  - CSA
  - UL
- Ease of Use
  - Local vs. Remote Sensing
    - Some use Jumper
  - Diagnostic LEDs
- Application Timings
  - Trial Attempts (1, 3, infinite)
  - Ignition Timing (seconds)
  - Pre/post/inter-purge settings
- Physical
  - 24V AC @ 50 / 60 Hz
  - Surface Mount Technology (SMT)
  - Conformal coating
  - Installable in NEMA-3R boxes
  - Quick connects or plugs
- Safety
  - Hard Lockout
  - Auto-Restart Lockout
    - Eliminates service calls

Pilot Ignition System



Intermittent Pilot Checkout Procedure

- Turn on main gas supply
- Turn on manual gas valve
- Turn on electrical power
- Set thermostat to call for heat, spark begins
- Air purged from gas line
- Pilot Ignition - main burner ignition
- Turn manual gas valve off - burner & pilot go out
- Sparking begins - turn manual valve on
- Pilot ignites - main burner ignites



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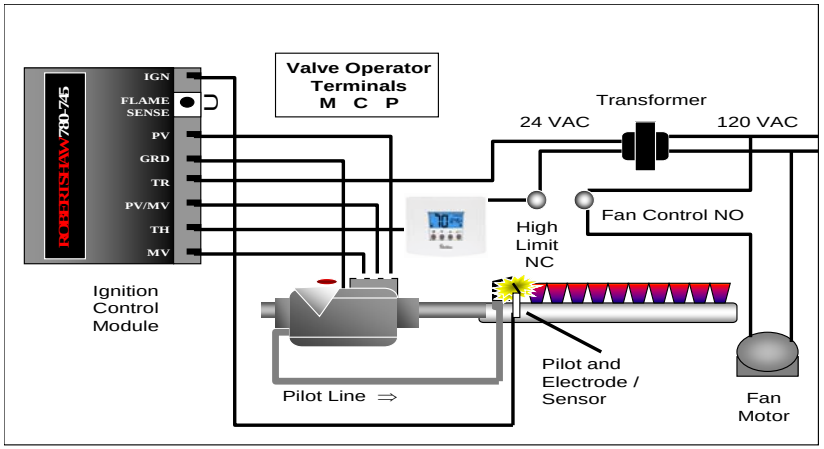
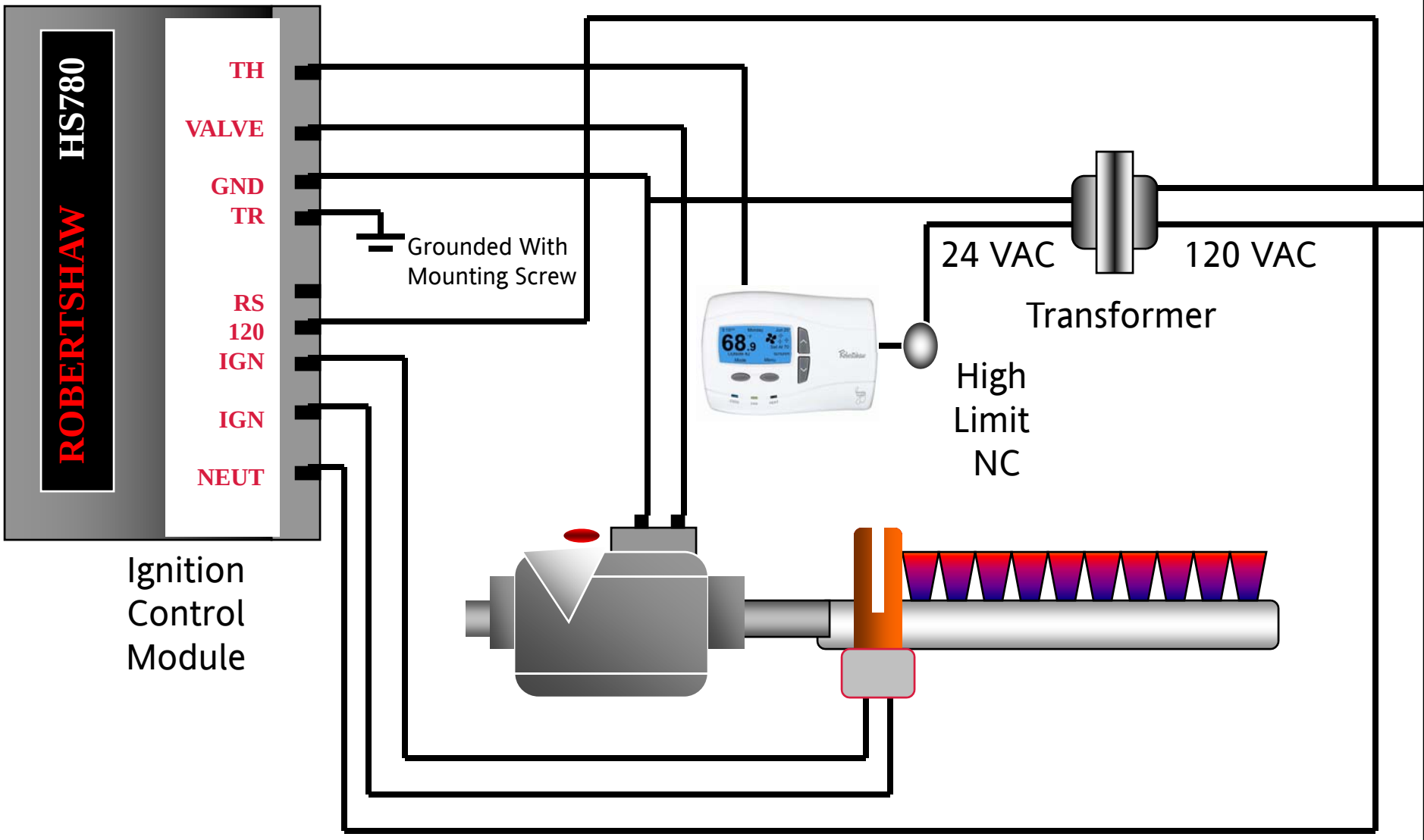
Intermittent Pilot Sequence of Operation

- Thermostat calls for heat
- Primary Valve (PV) opens
- Pilot gas flows
- Sparking begins at burner
- Pilot gas ignites
- Pilot flame impinges on electrode / sensor
- Main gas valve (MV) opens
- Main burner ignites
- Once thermostat satisfied, switch contacts open
- Main burner and pilot off

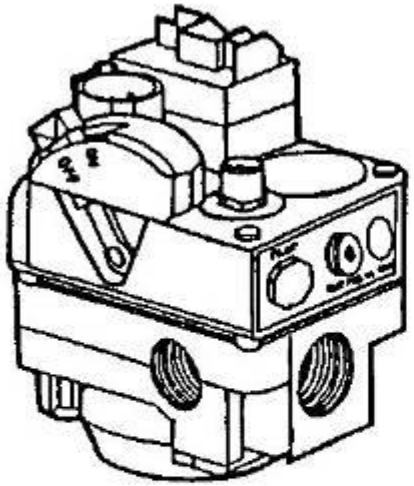


Hot Surface Ignition (HSI)

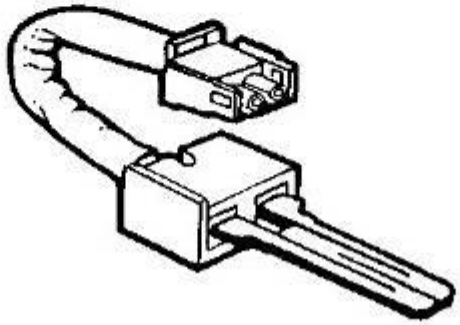


Hot Surface Ignition System

Gas Valve



Ignition Control



Hot Surface Ignitor

Hot Surface Terminology

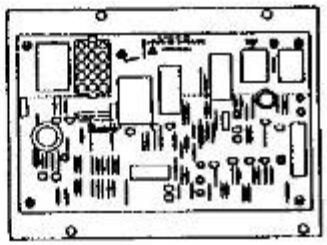
- Pre-Purge Cycle - Allows draft blower to purge the combustion chamber prior to start of equipment.
- Ignition Attempts - Number of times the system will attempt to light the ignition if a flame is not detected. After last try, unit goes into lockout.
- Valve Trial Time or Lockout Timing - Number of seconds the main valve is left open for ignition. If flame is not detected in a specified time:
  1. The unit goes into lockout if it is a single try for ignition control or
  2. The unit sequences to next ignition attempt cycle if it is a multi-try.
- Sensor Type - The presence of a flame can be detected two ways:
  1. Local Sense, using a Hot Surface Ignitor to ignite the gas and detect the presence of a flame.
  2. Remote Sense, using a sense rod that impinges into the main burner flame.
- Ignitor Warm-Up Time - Time required for hot surface ignitor to come up to operating temperature. An induced draft blower may also come on during this time period to purge the combustion chamber prior to the main valve opening.

Hot Surface Control Nomenclature

HOT SURFACE IGNITION

HS-780 - 34 - P - L/ 3 - 08 - A - X - X

- R = REMOTE LOCKOUT CONNECTOR
- M = MANUAL RESET
- A = 120VAC MODULE SUPPLY VOLTAGE
  B = 208/240 MODULE SUPPLY VOLTAGE
  C = 277VAC MODULE SUPPLY VOLTAGE
  A = 24 VOLT MODULE SUPPLY VOLTAGE
- 04 = 4 SECOND VALVE TRIAL TIME
  06 = 6 SECOND VALVE TRIAL TIME
  08 = 8 SECOND VALVE TRIAL TIME
  12 = 12 SECOND VALVE TRIAL TIME
- 1 = SINGLE IGNITION ATTEMPT, THEN LOCKOUT
  2 = 2 SINGLE ATTEMPTS, THEN LOCKOUT
  3 = 3 IGNITION ATTEMPTS, THEN LOCKOUT
- L = LOCAL FLAME SENSE USING IGNITOR
  R = REMOTE FLAME SENSE USING SEPARATE SENSING ROD
- N = NON PRE-PURGE (IMMEDIATE IGNITION CYCLE)
  P = PRE-PURGE CYCLE PRIOR TO IGNITION CYCLE
- 17 = 17 SECOND PRE-PURGE/IGNITOR WARM-UP TIME
  34 = 34 SECOND PRE-PURGE/IGNITOR WARM-UP TIME
- HS-780 = BASIC SIMICON HOT SURFACE IGNITION CONTROL



Hot Surface Sequence of Operation

- Thermostat calls for heat, 24 Volts to ignition module
- Combustion blower & other relays are energized
- Non-purge modules - Ignition is powered in 1 second
- Pre-purge modules - Ignition powered in 17 or 34 seconds
- Ignitor heats to approximately 2500 degrees Fahrenheit
- After heat up, valve is activated allowing gas to flow to burner
- Ignitor shuts off at end of trial time and becomes the sensor
- If flame not sensed during trial time, the system shuts down
- If flame is sensed, system runs to satisfy thermostat demand

Manufacturers

- Johnson Controls®
- White-Rodgers®
- Honeywell®
- RAM
- Fenwal®
- Robertshaw®

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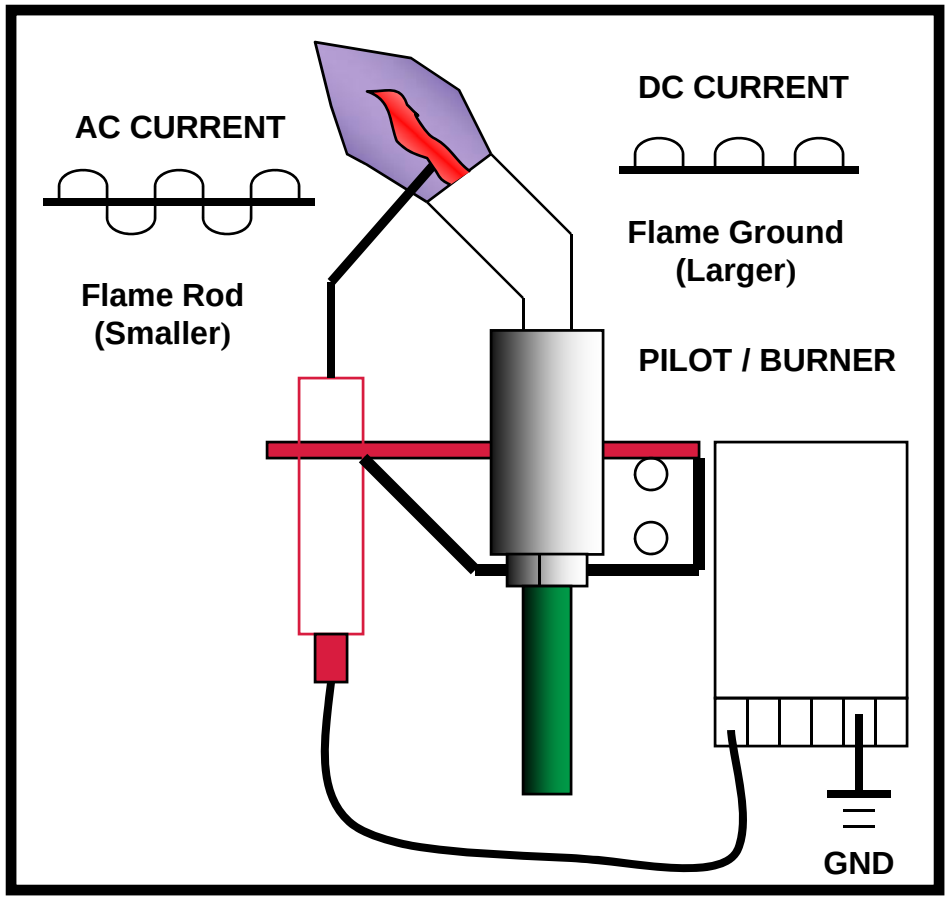
Flame Rectification



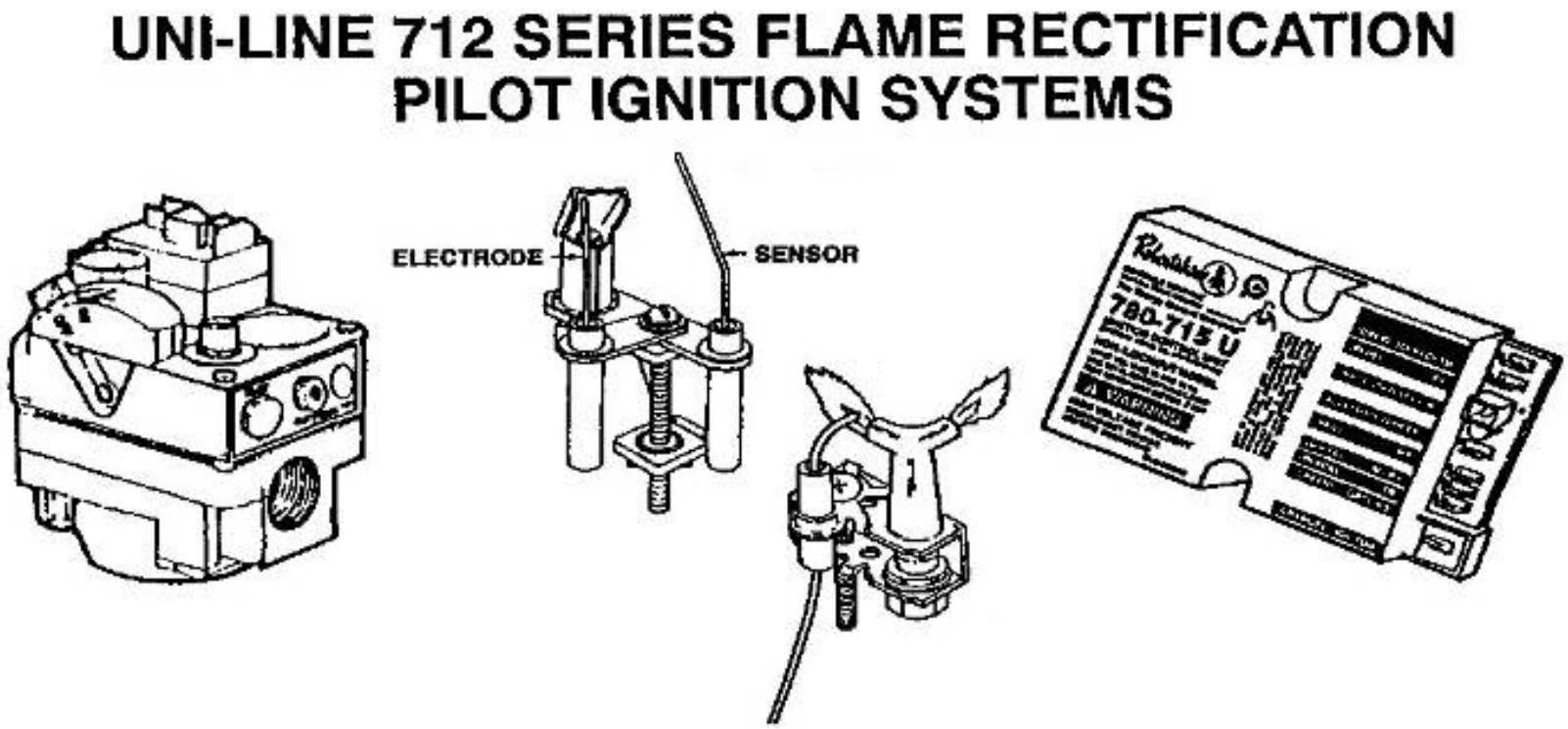
Used On:

- IPI Intermittent Pilot Ignition
- DSI Direct Spark Ignition
- HSI Hot Surface Ignition

How it Works:

- Rectifies AC Current into DC
- Requires flame to ground
- Proves pilot or burner ignition

Flame Rectification Pilot Ignitions

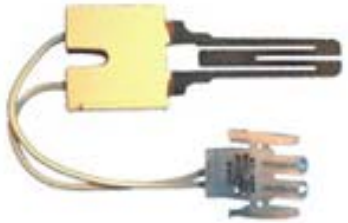


Controls

Hot Surface Igniters

- Hot Surface Igniter Types
  - Silicon Carbide (fragile)
  - Silicon Nitride

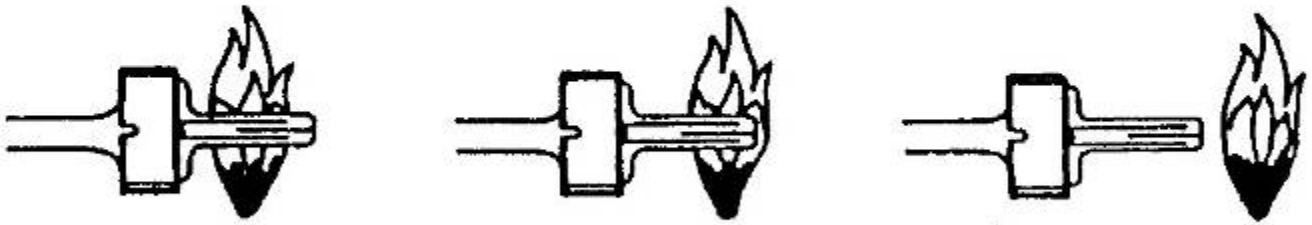
- Robertshaw® 41-400 Series
  - Silicon Carbide
  - Uni-Line® Catalog Page 121



- Robertshaw® 41-400N Series
  - Silicon Nitride

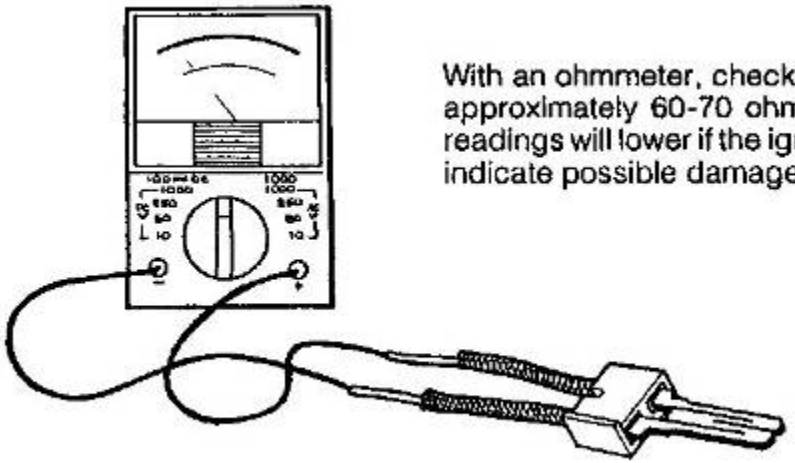
Ignitor Position

POSITIONING OF IGNITOR



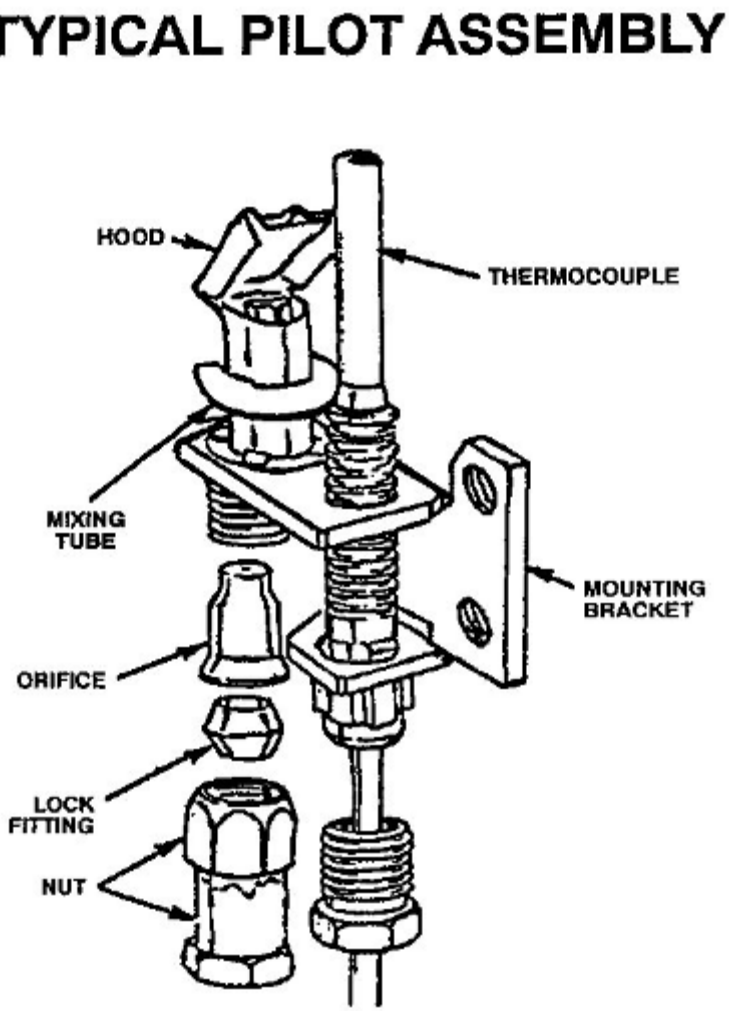
NO YES NO

IGNITOR SHOULD EXTEND INTO FLAME AS SHOWN IN CENTER EXAMPLE.



With an ohmmeter, check resistance of the ignitor. It should be approximately 60-70 ohms at room temperature. (Resistance readings will lower if the ignitor is warm. High resistance readings indicate possible damage of the ignitor.)

Pilot Basics



Pilot Parts

- Robertshaw® 1820 Series with *Left* or *Right* flame pattern type
- Pilot Uni-Kits® are *with or without thermopile* pre-mounted

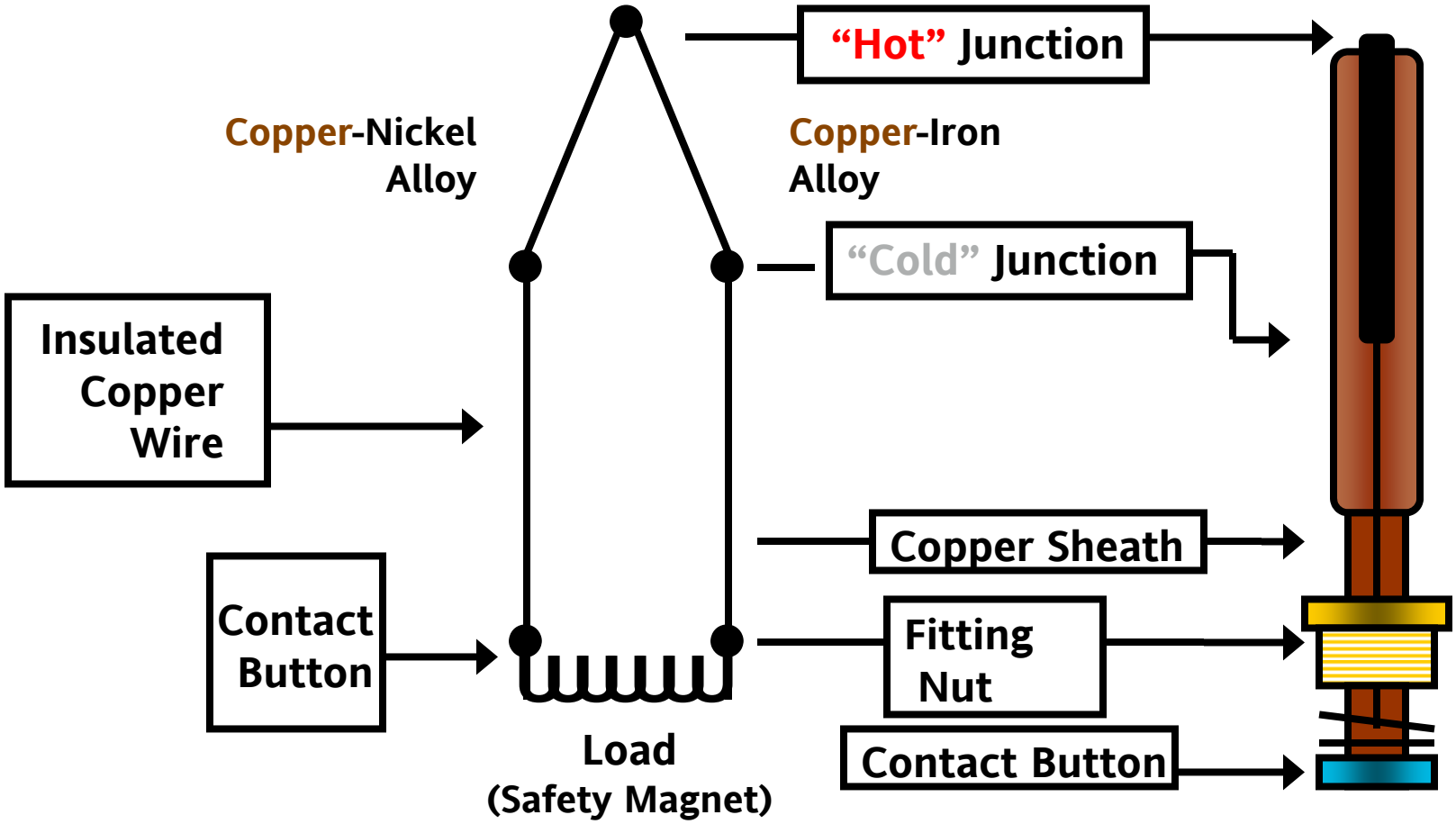
Product Number	1820-009
Description	1820 SERIES PG9 REPLACEMENT PILOT UNI-KITS®
Factory No.	
Hood Type	
Mounting Bracket Type	
Flame Pattern Type	90° Right
Comments	
Lead Length	
Photo No.	
With Thermopile	1950-532 Thermopile
Replaces - ITT General	PG9A42JTL02

Product Number	1820-019
Description	1820 SERIES PG9 REPLACEMENT PILOT UNI-KITS®
Factory No.	
Hood Type	
Mounting Bracket Type	
Flame Pattern Type	90° Left
Comments	
Lead Length	
Photo No.	
With Thermopile	1950-532 Thermopile
Replaces - ITT General Part	PG9A41JTL020

Product Number	1820-029
Description	1820 SERIES PG9 REPLACEMENT PILOT UNI-KITS®
Factory No.	
Hood Type	
Mounting Bracket Type	
Flame Pattern Type	90° Right
Comments	
Lead Length	
Photo No.	
With Thermopile	Pilot Only
Replaces - ITT General Part	

Product Number	1820-039
Description	1820 SERIES PG9 REPLACEMENT PILOT UNI-KITS®
Factory No.	
Hood Type	
Mounting Bracket Type	
Flame Pattern Type	90° Left
Comments	
Lead Length	
Photo No.	
With Thermopile	Pilot Only
Replaces - ITT General Part	

Thermocouple Basics

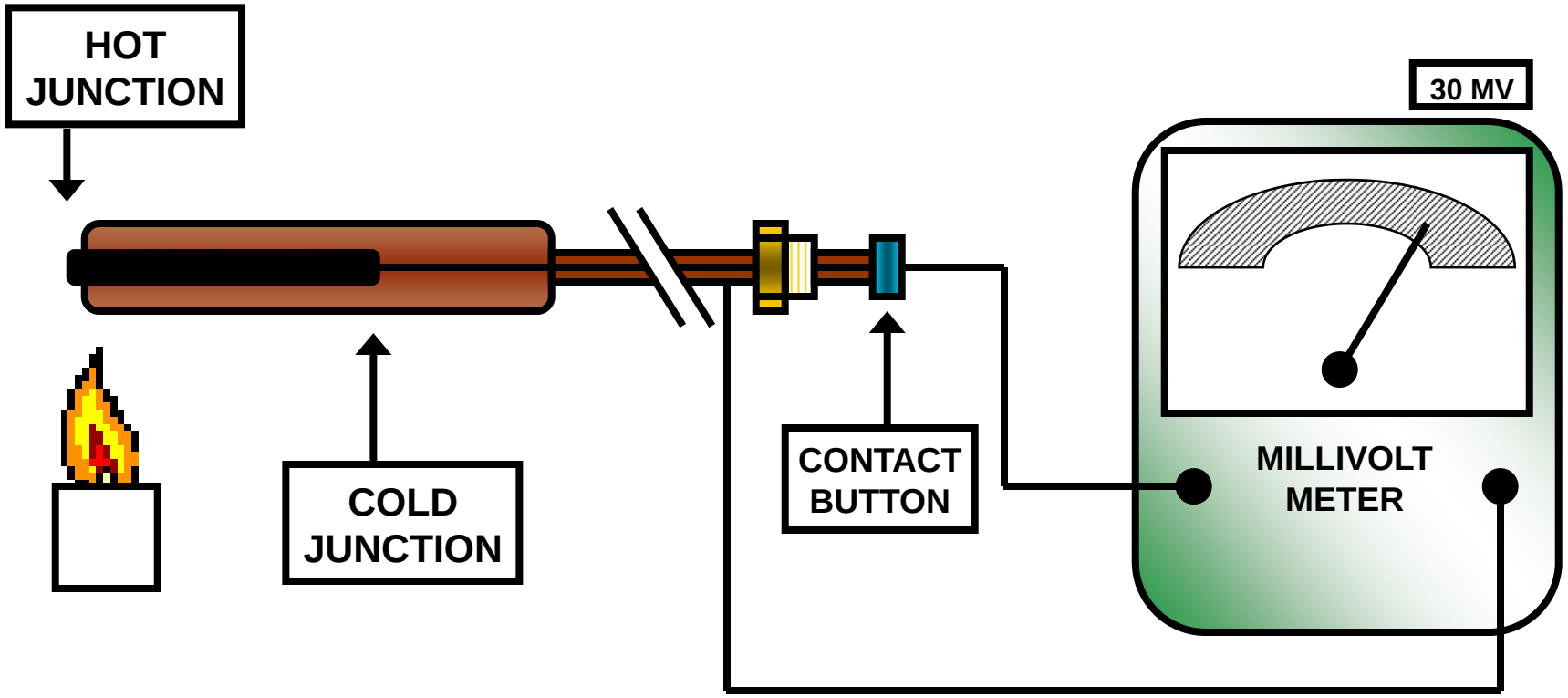


Thermocouple Parts

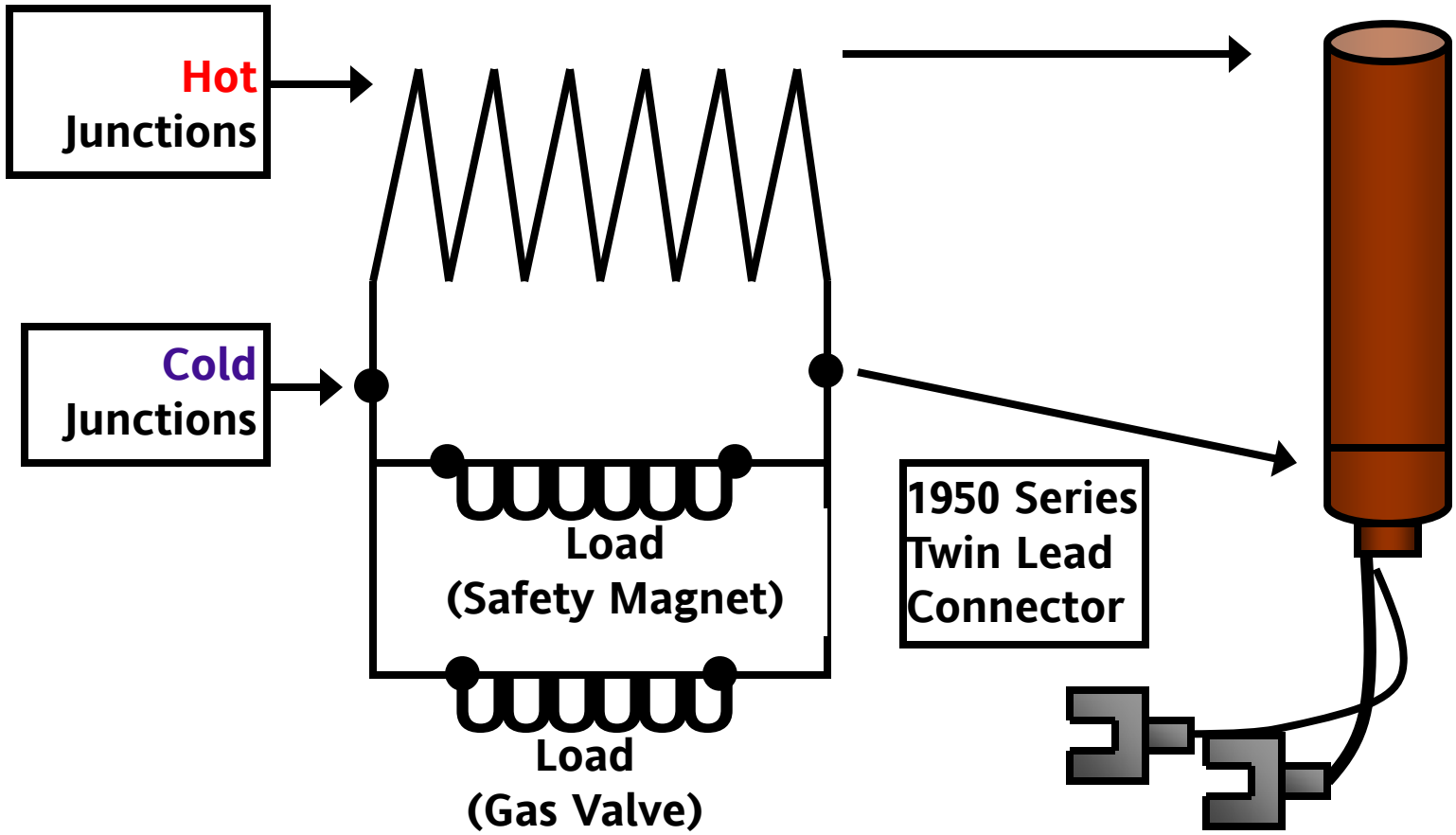
- The 1980 series offers easy installation into most pilot burners
- Uses Snap-Fit® technology
- End of part number refers to various lengths:
  - 1980-012 is 12 inches
  - 1980-072 is 72 inches

Thermocouple Test

Open circuit typically 20 to 25 Millivolts

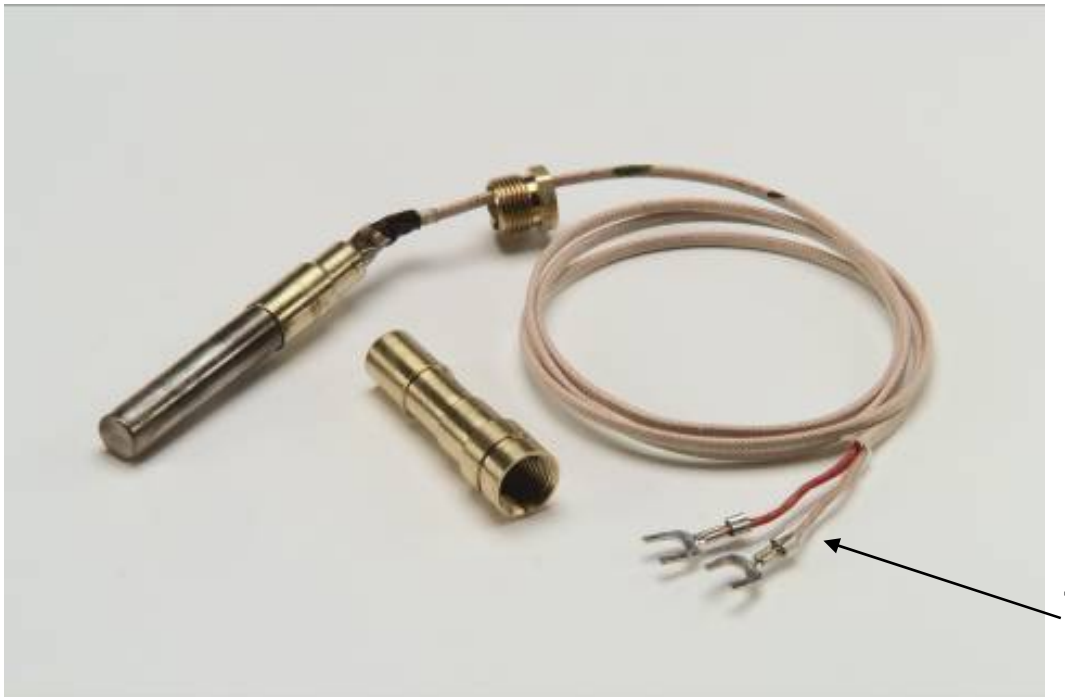


Thermopile Basics



Thermopile Parts

- The 1950 series thermopiles have two lead wire connections and are primarily used in HVAC applications
- The 1951 coaxial series used on Commercial Cooking applications



Gas Valve Installation Tips

Determine:

- Natural Gas or Liquid Propane
- Inlet and Outlet Size
- BTU Requirement
- Ignition Method to be Used
- Outlet Pressure Setting Requirement
- Ambient Temperature
- Orientation of Gas Valve
  - Valves should not to be mounted upside down
- Actuator Type: 24 Volts, Millivolt, Hydraulic, Line Voltage
- Opening Speed of Gas Valve

Troubleshooting Tips for Gas Systems

Condition	Possible Cause	Possible Cure
Flame Too Large	1. Outlet pressure too high 2. Defective regulator 3. Orifice too large	1. Outlet pressure too high 2. Defective regulator 3. Orifice too large
Noisy Flame	1. Excessive primary air 2. Noisy Pilot 3. Burr in orifice	1. Adjust air shutter 2. See Pilot Troubleshooting slide 3. Remove burr or replace orifice
Yellow Tip Flame	1. Too little primary air 2. Clogged burner ports 3. Misaligned orifice	1. Adjust air shutter 2. Clean burner ports 3. Realign orifice and burner
Floating Flame	1. Blocked venting 2. Insufficient primary air	1. Inspect vent and clean 2. Adjust air shutter

Troubleshooting Tips for Gas Systems

Condition	Possible Cause	Possible Cure
Delayed Ignition	1. Improper ignition location 2. Pilot flame too small 3. Burner ports clogged 4. Low outlet pressure	1. Reposition ignition source 2. Check orifice and clean 3. Clean burner ports 4. Adjust pressure regulator
Failure to Ignite	1. Main gas “Off” 2. Poor electrical connections 3. Defective gas valve 4. Defective thermostat	1. Open manual valve 2. Check, clean, & tighten 3. Replace with new 4. Replace with new
Burner won’t turn “Off”	1. Poor thermostat location 2. Defective gas valve 3. Defective thermostat	1. Relocate thermostat 2. Replace with new 3. Replace with new
Rapid Burn Cycles	1. Clogged furnace filters 2. Excess t-stat anticipation 3. Poor thermostat location	1. Clean or replace 2. Adjust t-stat anticipator 3. Relocate thermostat

- When all else fails… Check supply is in the “ON” position

Questions To Ask When Selecting Ignition Control Module

1. What are you heating? What is OEM Factory Number?
2. What is the supply voltage?
3. What is the control voltage?
4. Do you want to clear gas before, during, and/or after heating cycle?
5. How many trials for ignition would you like?
6. How many seconds between trials?
7. What style of heating (direct spark, hot surface, or intermittent pilot)?
8. Do you want remote or local sensing of flame (dual rod or single rod)?
9. How do you want to handle lockout? How long?
10. Do you want board enclosed or open?
11. What type of connectors do you want?
12. Do you need to change voltage levels, switch machines on or off, detect air pressure, replace parts, or need a kit?

Troubleshooting Tips

Problem # 1: Hot Surface Igniter Does Not Glow Red

Possible Causes:

- No main power
- Faulty transformer
- Faulty thermostat- check call for heat
- Faulty limit switch
- Faulty blower interlock switch
- Faulty hot surface ignitor
- Faulty ignition control
- Remember to wait for purge time, 17 or 34 seconds

Troubleshooting:

- With power on and thermostat at its highest position, check voltage between “TH” and “TR” on HS780 module
  - If 24 Volts is not present, check transformer output
  - If no 24 Volts present on secondary side, change transformer
- Check for 120 Volts at the igniter across “IGN” and “GND”
  - If voltage present, change ignitor
  - If no voltage present, change module

Troubleshooting Tips

Problem # 2: Igniter Glows Red but Main Burner Will Not Light

Possible Causes:

- Improper igniter or sensor alignment
- Faulty ignition control
- Faulty gas valve
- High inlet gas pressures
- Polarity reversed
- No earth ground

Troubleshooting:

- Check availability of gas at gas valve, check valve upstream is in ON position
- Check pressure is OK
- Check “GRD” and “PV/MV” by reversing wires
  - If reversed the gas valve will not open
- Check proper ignition position and properly grounded
- Check for 24 Volts at gas valve terminals
    - “1” and “2” on a 7200 series, “TH” and “TR” on a 7000 series
  - If Yes, check wire resistance or change gas valve
  - If no, change the 780 series module

Troubleshooting Tips

Problem # 3: Main Burner Shuts Off before the Thermostat is Satisfied

Possible Causes:

- Improper ignitor or sensor alignment
- Faulty ignition control
- Contaminated ignitor and/or sensor
- Bad burner ground

Troubleshooting:

- Check polarity
- Check for proper ignitor position
- Check for proper ignition control grounding
- Visually inspect ignitor and remote sensor for any contamination
  - Clean and replace
- Check main burner ground
- If above steps are OK, replace ignitor

Troubleshooting Tips

Problem # 4: Main Burner Does Not Shut Off When Thermostat is Satisfied

Possible Causes:

- Faulty gas valve
- Faulty ignition control

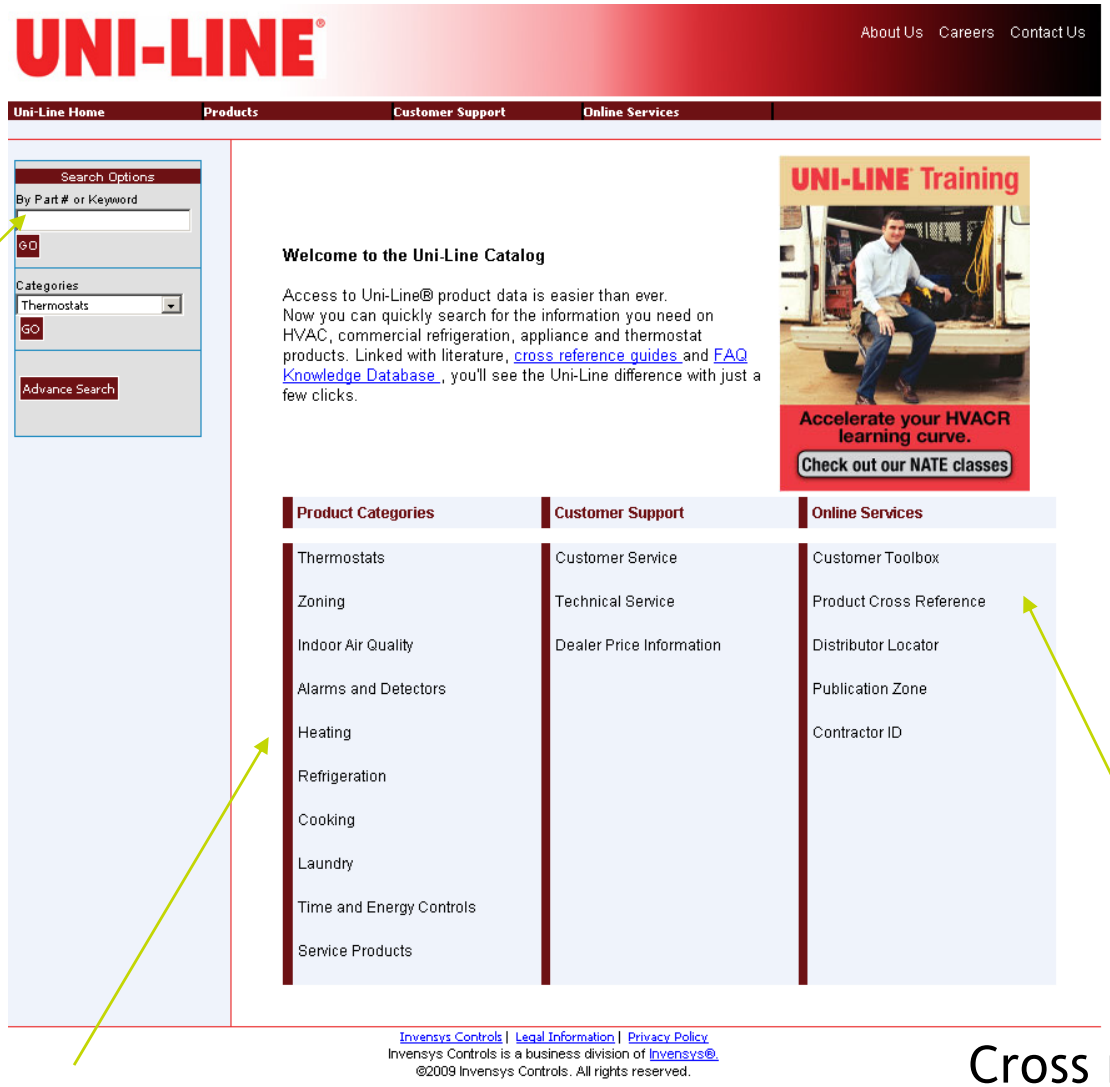
Troubleshooting:

- Check thermostat to make sure contacts are open, check for 24 Volts between “TH” and “TR”
  - Should be Zero, if gas valve is stuck open, replace valve
- Check for 24 Volts between “PV/MV” and “GND”
  - If 24 Volts present, replace ignition control
  - If 24 Volts not present, replace gas valve

Proper Pilot Flame Troubleshooting Tips

Correct Flame ✓ Tip of Thermocouple or Thermopile is 3/8" to 1/2" into pilot flame.	**Wavy Blue Flame** ✓ Draft Condition at Pilot
Noisy, Lifting, Blowing Flame ✓ High Gas Pressure ✓ Wrong Pilot Orifice	**Hard Sharp Flame** ✓ High Gas Pressure ✓ Pilot Orifice Too Small
Lazy Yellow Flame ✓ Clogged Primary Air Opening ✓ Low Gas Pressure ✓ Clogged Pilot Orifice	**Small Blue Flame** ✓ Wrong Pilot Orifice Size ✓ Low Gas Pressure ✓ Clogged Pilot Tube

Website Tools: www.Uni-Line.com



Enter part numbers to search

Click here for more Heating information

Cross reference

invensys Controls

When You Have Uni-Line® Questions

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Technical Service Fax	**1-630-260-7294**
Customer Service	**1-800-304-6563**
Customer Service Fax	**1-800-426-0804**

Website:

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General Information Websites for:

Robertshaw®, Paragon®, Eliwell™, Ranco®, and Publication Zone®

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www.RobertshawTstats.com

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