

## 36H Stepper Gas Control Product Information

The 36H Stepper Gas Valve is a modulating combination gas valve and regulator for use on a wide range of gas fired appliances. Included in the design is an electronic board that interprets the appropriate pulse width modulation (PWM), 0-10 VDC, 2-10 VDC, 0-20 mA, and 4-20mA signal from the IFC to drive a stepper motor that controls outlet pressure. The 36H Stepper valve is designed specifically for direct burner/direct spark ignition markets.

### Features include:

- Inlet and outlet screens help protect internal parts from debris.
- Electronic control for gas pressure modulation
- Intuitive rotary switch for field adjustment of outlet pressure
- Easy LP conversion using optional F92-1021 conversion kit
- 1/2" x 1/2" as well as 3/4" x 3/4" NPT, straight through or right angle outlet
- 1/8" NPT Pressure Taps
- Electrical on/off gas valve switch

Information in this manual is provided to qualified HVAC Professionals Only for the installation and replacement of gas valves. Homeowners must contact their local HVAC Contractor for gas valve replacement. Any gas valve suspected of damage or if it has been flooded with water must be replaced immediately. **There are no serviceable parts on a gas valve.**

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# General Specifications

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## STANDARD FEATURES

- Inlet/Outlet screen
- Ambient temperature for -40°F to 175°F
- Limited horizontal mounting
- Quiet redundant valve
- Electrical shut-off
- Outlet pressure tap (1/8" N.P.T.)
- Inlet pressure tap (1/8" N.P.T.)
- 5 pin electrical connector
- Maximum pressure (1/2 PSI)
- CSA approved
- PWM signal: Low level : 0 to 0.3 Volts, high level: 3 to 5.5 Volts, 13.1-17.0 Hz for 1.0 to 1.1 seconds
- Modulation: 35% to 100% gas opening with 1% increments
- Internally leak limited Vent Outlet: accepts 1/8" NPT fitting
- Rotary dip switch for pressure regulation adjustment
- Precalibrated for LP - simplifies conversion
- Inlet and Outlet plugs included
  - The plugs must be removed prior to installing the inlet pipe or manifold.
  - After OEM functional testing is complete, the inlet plug must be replaced prior to shipping the furnace to the end user.

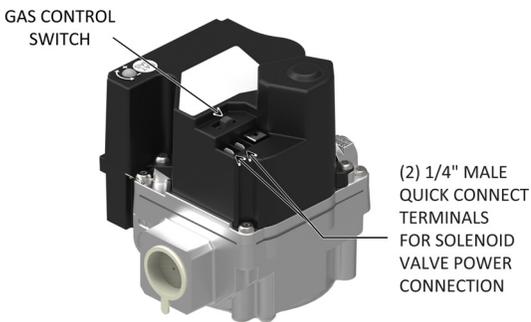
Current Requirements	
Voltage Frequency	Total Current
24V, 60 HZ	0.410A

# General Specifications

## OPTIONAL FEATURES

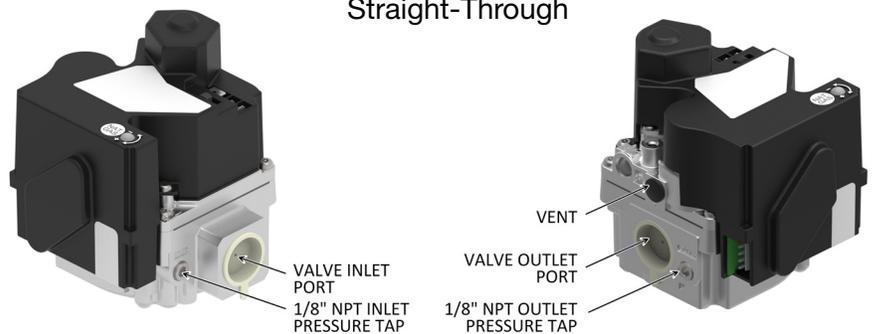
- Ground Terminal
- Natural / LP field conversion kit (White-Rodgers PN: F92-1021)
- Vent Tap (Hose Barb Fitting)
- Harsh Environment Model
- Top Pressure Taps
- Side Outlet

## ELECTRICAL CONNECTIONS



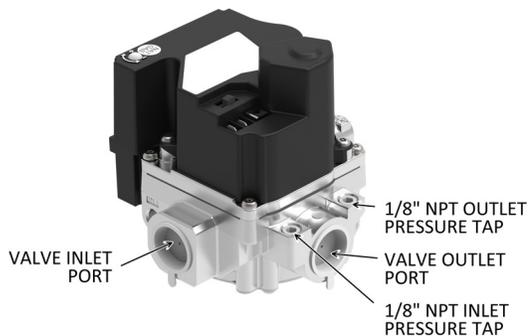
## STANDARD PRESSURE TAPS

Straight-Through

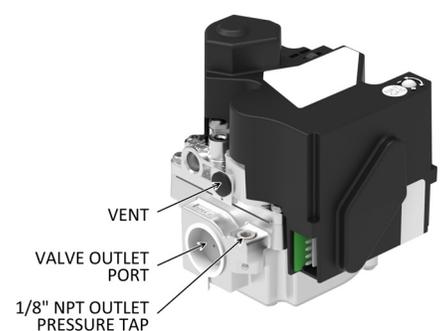


## TOP PRESSURE TAPS

Side-Outlet



Straight-Through



## CAPACITY & REGULATOR ADJUSTMENT RANGE \*

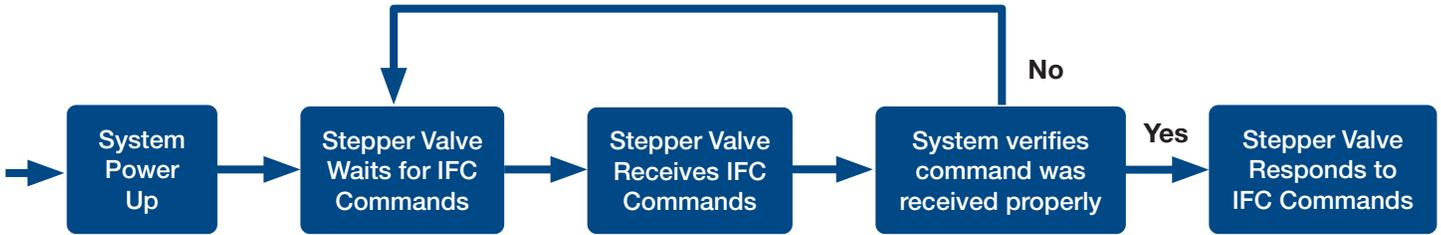
Pipe Sizes	Adjustment Range (in. W.C.)	Capacity (BTU/hr.) <sup>†</sup>
3/4" x 3/4" NPT	0.40 - 11.5	100,000 - 400,000
1/2" x 1/2" NPT		40,000 - 250,000

\* for both Natural (.64 Sp. Gr.) and LP (1.53 Sp. Gr.) Gases

<sup>†</sup> can regulate down to 20% of capacity

# General Specifications

## GENERAL OPERATION OVERVIEW



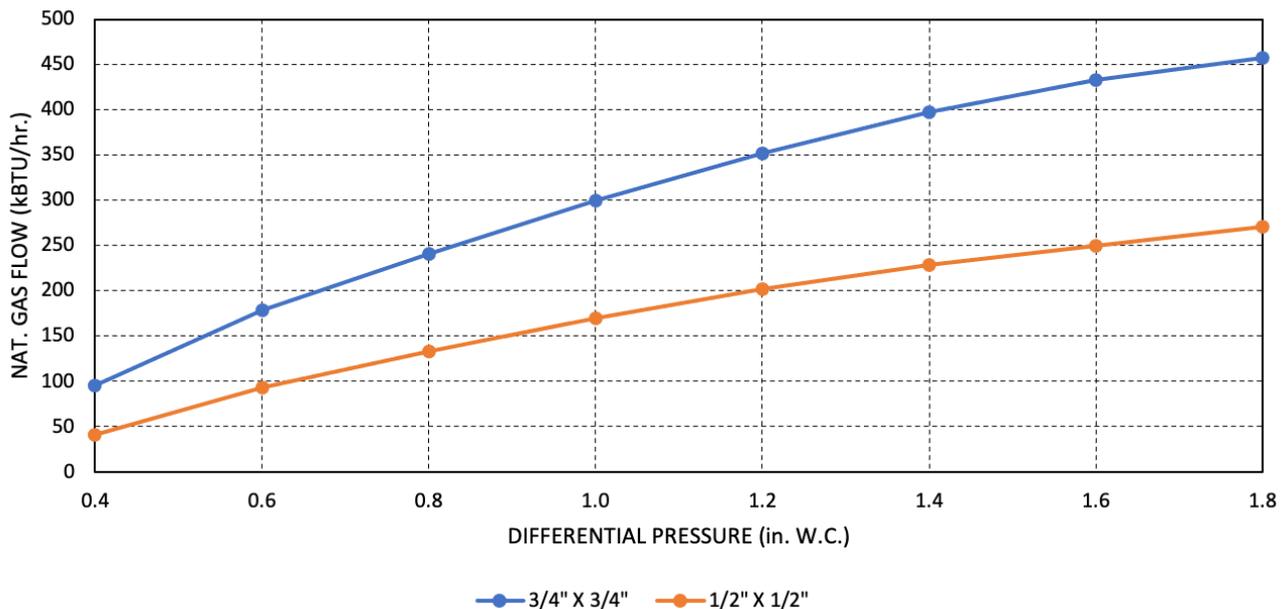
### Stepper Valve Operation Sequence and IFC Command Types

Contact your White-Rodgers representative for further information on the definition of IFC commands and 36H Stepper Valve responses.

## 1" PRESSURE DROP CAPACITY

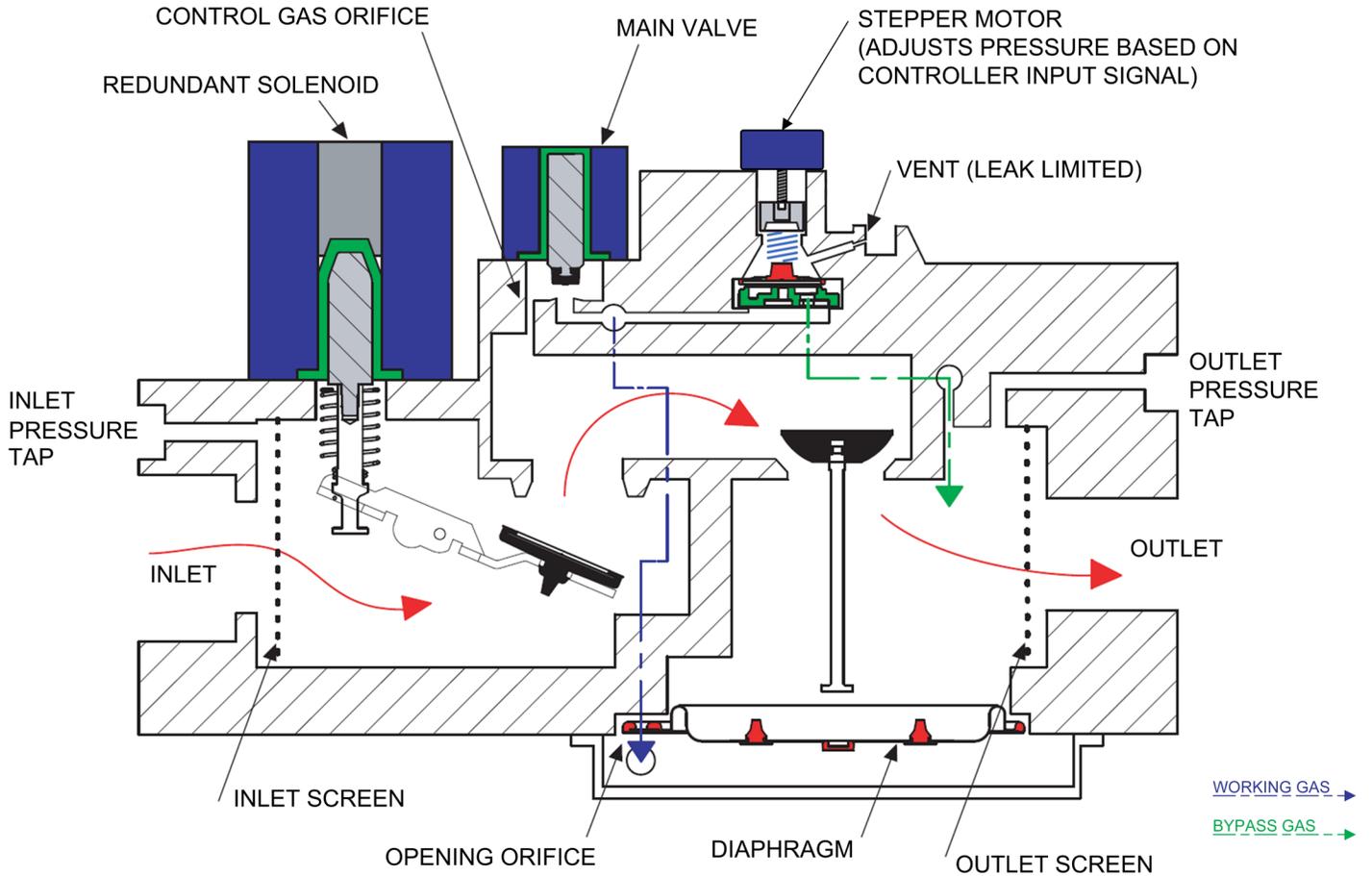
Pipe Sizes	CSA Std. Gas, .64 Sp. Gr. (1,000 BTU/cu. Ft.)	LP Gas, 1.53 Sp. Gr. (2,500 BTU/cu. Ft.)
3/4" x 3/4" NPT	300,000 BTU/HR	486,000 BTU/HR
1/2" x 1/2" NPT	170,000 BTU/HR	275,000 BTU/HR

### 1" PRESSURE DROP CAPACITY (UPRIGHT ORIENTATION)



# General Specifications

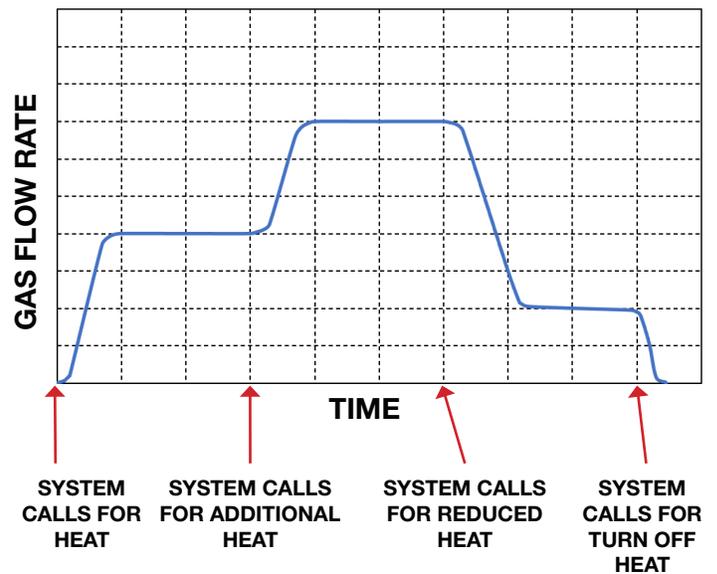
## SCHEMATIC GAS FLOW DIAGRAM



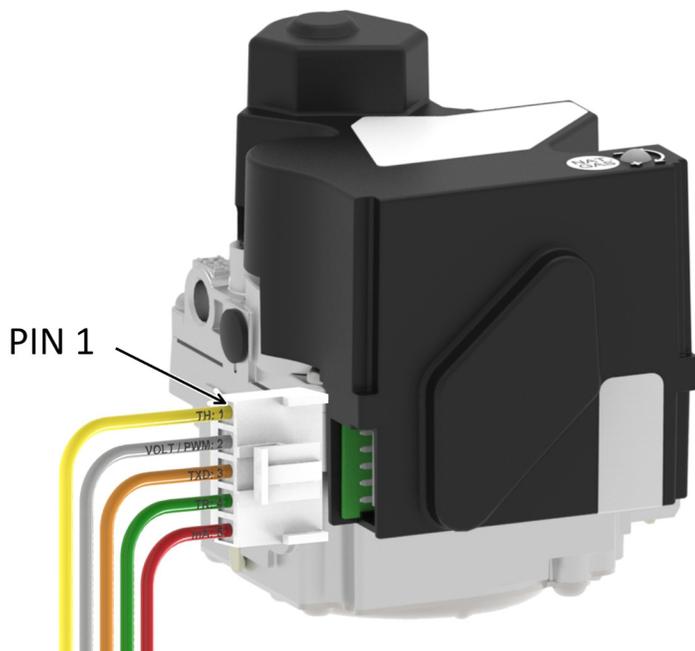
# Application Information

## TYPICAL HEATING CYCLE

A typical example of how the 36H Stepper valve will modulate in response to a call for heat. The on-board electronics interpret the system signal and drives the stepper motor to the correct position to adjust the outlet pressure.



## ELECTRICAL CONNECTIONS



**Harness Interface:** JST 5-pin connector S5P – VH or equivalent with the following pin out configuration (mating connector VHR-5N). Use PIN SVH-21T-P1122-18AWG, or PIN SVH-41T-P1120-16AWG

**Pin 1:** (TH) - Constant 24VAC

**Pin 2:** (VOLT/PWM) - 0-10VDC Analog Input Signal or PWM Duty Cycle Input Signal

**Pin 3:** (TXD) - is a PWM output signal that will echo back any PWM, VDC, or mA input signal received from the controller. The VDC and mA signals are converted to a PWM duty cycle signal. This PWM echo signal can be read using an oscilloscope or multimeter that has a duty cycle function.

**Pin 4:** (TR) - Reference Ground for Analog Input Signals (VDC/mA) and for Power Supply

**Pin 5:** (mA) - 0-20mA or 4-20mA Analog Input Signal

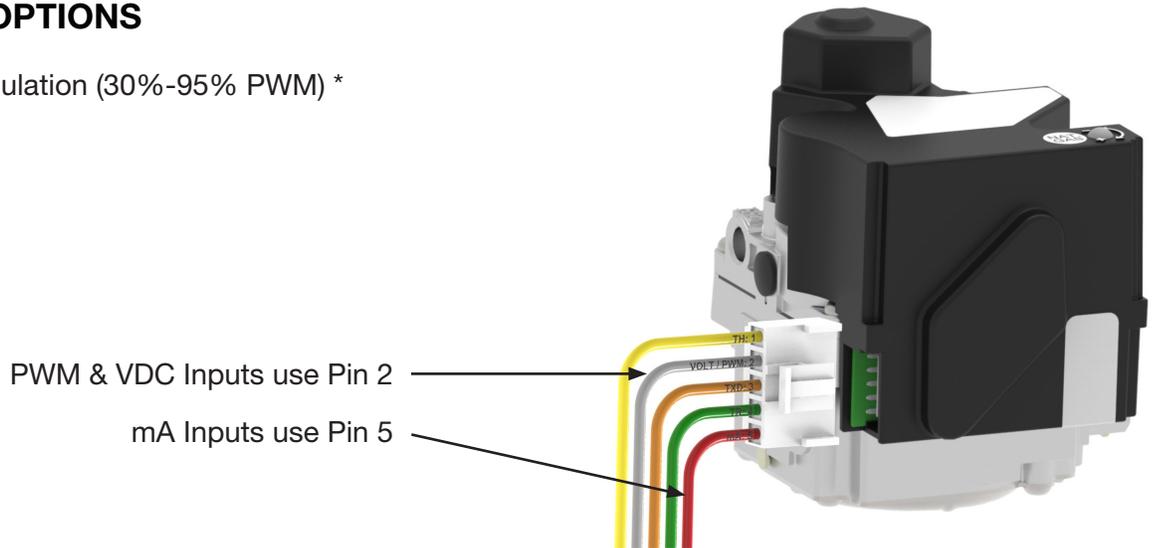
Voltage Input ..... 24VAC +/- 15% @ 60 Hz

Main Valve Input ..... At 24 VAC @ 60 Hz; Amp max current 0.41

# Application Information

## SIGNAL INPUT OPTIONS

1. Pulse-width Modulation (30%-95% PWM) \*
2. 0-10 VDC
3. 2-10 VDC \*
4. 0-20 mA
5. 4-20 mA \*



All models include Echo Feedback (Pin 3) to send information back to the furnace control to confirm signal received, to notify when move is complete, and to communicate any errors that may occur. (See [Echo Feedback section on page 8 of this document for details.](#))

\* These models can receive diagnostic command signals to send the motor to the home position, to move the motor towards and away from home in 1% increments, to query the last requested motor position, and to query if the valve is configured for NAT or LP gas (i.e. if the jumper is in place or not). (See [Diagnostic Command Signals section on page 8 of this document for details.](#))

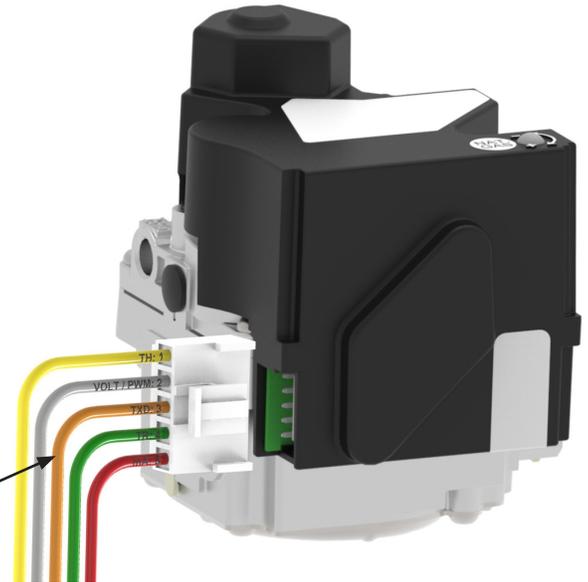
## CONTROL SCHEME NOTES

1. It is recommended to utilize the echo feedback output to ensure that the valve and controller are in agreement.
  - a. See the [“Echo Feedback” section on page 8 of this document](#)
2. The maximum typical move from minimum flow to maximum flow takes approximately 4.5 seconds.
3. The motor can be sent to the home position by sending it one of the following three signals, depending on the model type: 5% PWM | 0.198-0.365VDC | 0.394-0.730mA
4. Sending the valve to the home position does not fully shut off the valve. To completely close off the valve to gas flow, power shall be turned off at the main/redundant solenoid valve.
5. A “go home command” may be sent after certain control faults such as flame rollout, temperature limit trips, and lockouts.
  - a. If a “go home command” is necessary, it should be limited to **once every 1,000 cycles** to reduce stress on the mechanical components.
  - b. After a power outage and when power is restored to Pin #1 on the 5-pin connector on the motor circuit, the valve will automatically be sent to the home position upon the first call for heat, followed by a move to the requested position. If the valve was at maximum flow prior to the power reset, the travel time could be as high as 14 seconds if after the reset the control is requesting a near maximum flow.
6. The valve should not be left in the “home” position for extended periods. All home commands should be followed by a 30-95% PWM signal.
7. The valve is shipped from the factory with the regulation, or motor position, set at the maximum flow for Natural Gas and shall be shipped to the field in this position.

# Application Information

## ECHO FEEDBACK (TXD Pin 3)

1. Available on all five input signal types
2. Signal is sent back to controller as a PWM signal for all input types
  - a. PWM Signal is 5VDC @ 13.1Hz to 17.0 Hz for 1.0 to 1.1 seconds
3. Will echo back requested move command
4. Will echo back a done command when move is complete (25%)
5. Can echo back motor position or gas type queries for PWM, 2-10VDC, and 4-20mA models.
6. Various fault codes to notify if there are concerns with input signals, hardware, firmware or the valve was reset.
7. Echo Feedback is sent back to controller on TXD Pin 3



## DIAGNOSTIC COMMAND SIGNALS (PWM, 2-10VDC, AND 4-20mA MODELS)

PWM Input Signal	4-20 mA Input Signal	2-10 VDC Input Signal	Description	Corresponding PWM% Echo Command
4% to 6%	.394 - .730	.198 - .365	Go to home position	5%
7% to 9%	.731 – 1.068	.366 - .534	LP/NAT Query	30% for NAT 70% for LP
10% to 12%	1.069 – 1.405	.535 - .702	Go 1% toward home	Move Command
14% to 16%	1.518 – 1.854	.760 - .927	Query current valve position with 1% resolution	30% to 95%
19% to 21%	2.080 – 2.416	1.040 – 1.208	Go 1% away from home	Move Command

# Application Information

## FINE-TUNE ADJUSTMENT (ROTARY DIP SWITCH)

1. The Rotary Dip Switch is used to fine-tune the outlet pressure at both the minimum and maximum outlet settings.
2. Rotary Dip Switch adjustment will only be accepted while the valve is not receiving a command from the control and while the motor position is 35% to 100% flow.
3. If the motor position is 35% to 67%, the clockwise or counterclockwise rotary adjustment is defining the lower (35%) offset setpoint.  
**Maximum of 64 clicks.**
4. If the motor position is 68% to 100%, the clockwise or counterclockwise rotary adjustment is defining the upper (100%) offset setpoint.  
**Maximum of 64 clicks.**



Fine-Tune Adjustment under plug

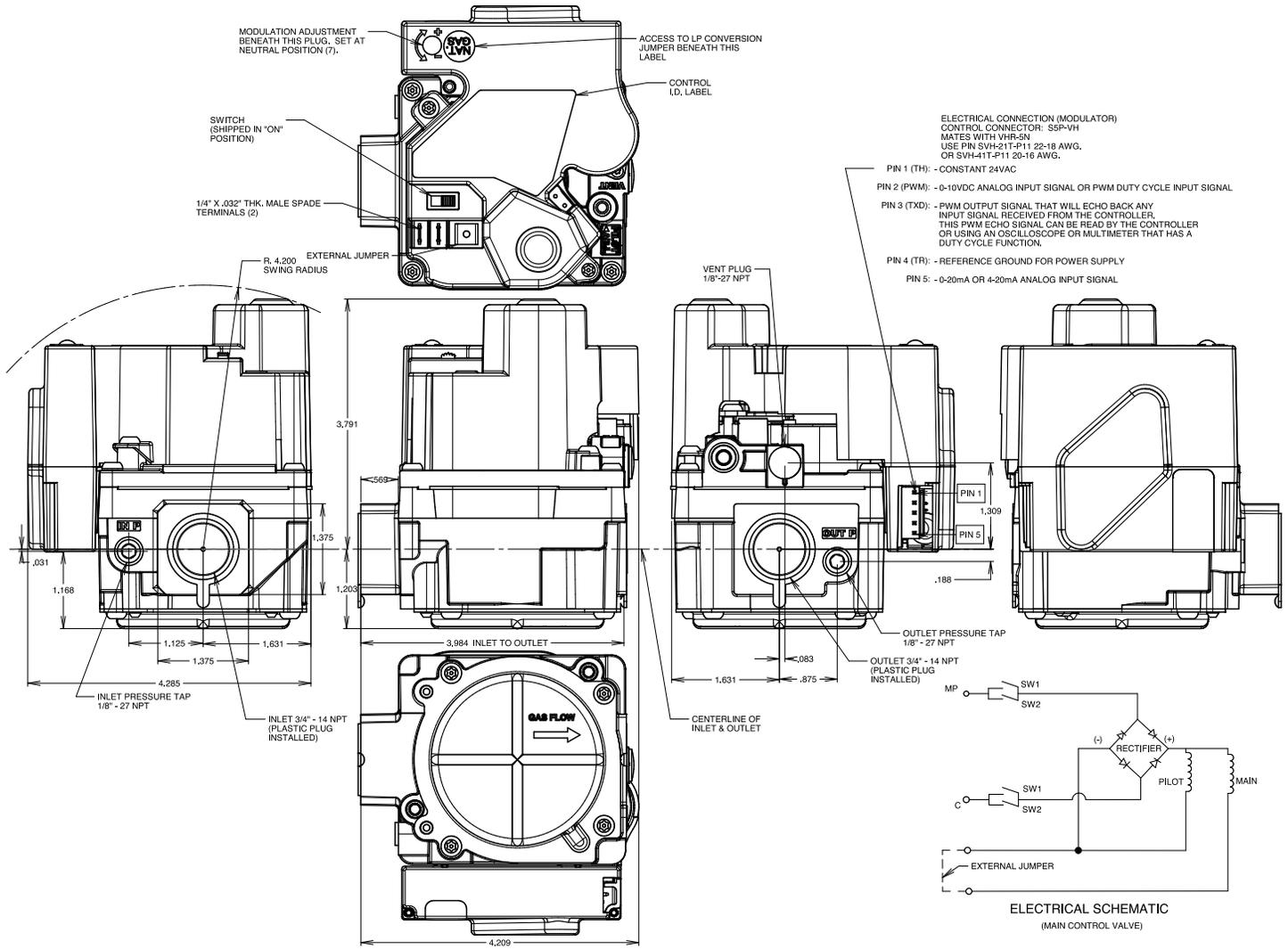
## INPUT SIGNAL VS. PERCENT FLOW AND ECHO COMMAND

PWM Input Signal	0-10 VDC Input Signal	2-10 VDC Input Signal	4-20 mA Input Signal	0-20 mA Input Signal	Percent Flow	PWM Echo Command
30	0	2	4	0	35%	30
35	0.769	2.615	5.231	1.538	40%	35
40	1.538	3.231	6.462	3.077	45%	40
45	2.308	3.846	7.692	4.615	50%	45
50	3.077	4.462	8.923	6.154	55%	50
55	3.846	5.077	10.154	7.692	60%	55
60	4.615	5.692	11.385	9.231	65%	60
65	5.385	6.308	12.615	10.769	70%	65
70	6.154	6.923	13.846	12.308	75%	70
75	6.923	7.538	15.077	13.846	80%	75
80	7.692	8.154	16.308	15.385	85%	80
85	8.462	8.769	17.538	16.923	90%	85
90	9.231	9.385	18.769	18.462	95%	90
95	10	10	20	20	100%	95

Note: This is a summarized table. Percent flow can be in 1% increments. These signals can be customized for specific customer applications.

# Application Information

## DIMENSIONS

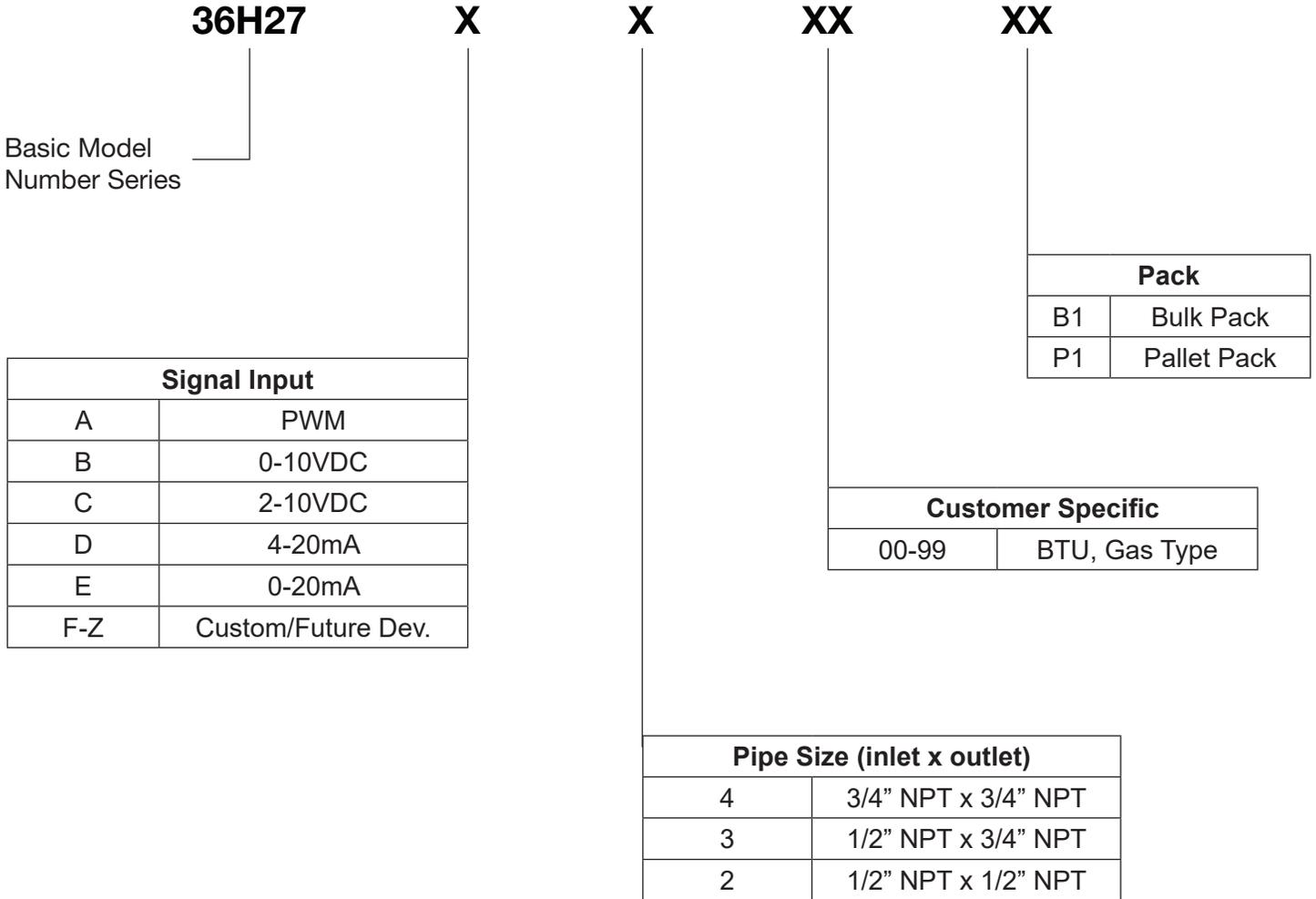


## KEY DIMENSIONS

Length .....	4.75"
Width .....	4.3"
Height .....	5.0"
Swing Radius .....	4.2"

# Stepper Models Available

## 36H27-A400B1



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