

# ASPE NYC Chapter

Review of Technical Applications &  
Specifications  
for

***Hermetically Sealed Gas  
Booster Systems***



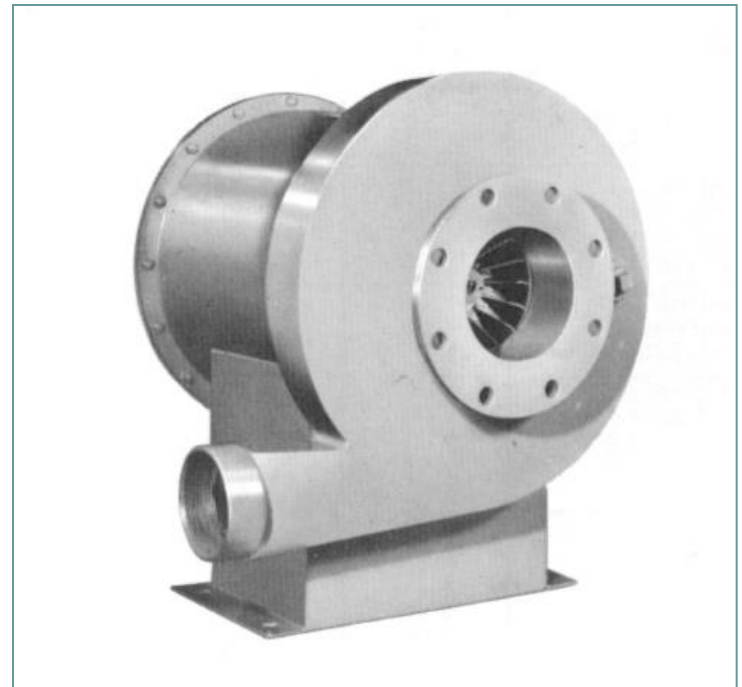
## ***TOPICS FOR DISCUSSION***

- ***WHAT IS A GAS BOOSTER***
- ***TYPES OF GAS BOOSTERS***
- ***WHY USE A GAS BOOSTER***
- ***SYSTEM CONSIDERATIONS***
- ***BOOSTER SELECTION***
- ***ANCILLARY DEVICES***
- ***COMPLETE U.L. PACKAGES***
- ***CONTROL STRATEGIES***
- ***SPECIAL APPLICATIONS***

# WHAT IS A GAS BOOSTER ?

***Centrifugal Blower Designed to Compress a Variable Volume of Natural Gas (CFH) Depending on Consumption***

***While Elevating the Operating Pressure of That Volume to a Relatively Constant Pressure***



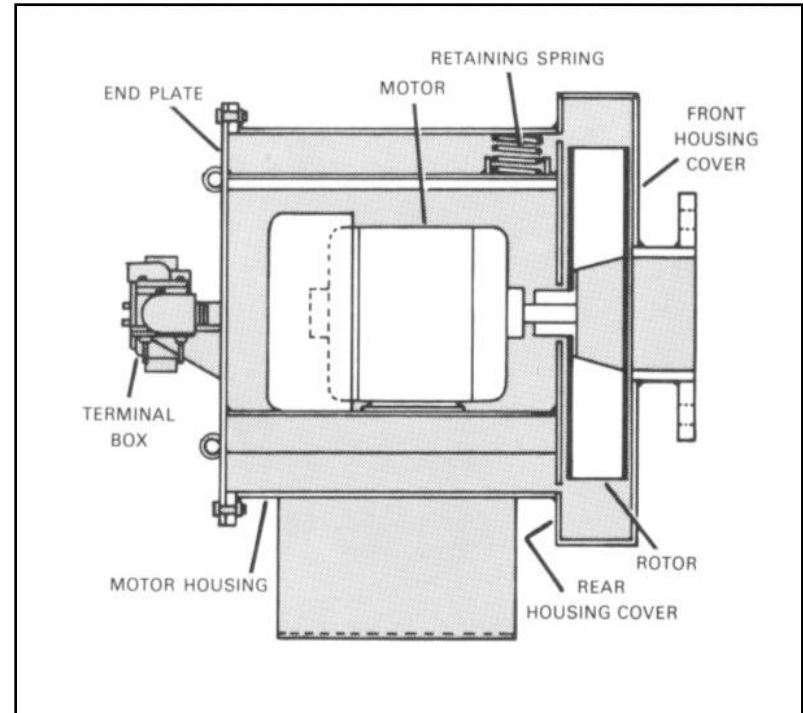
***0 to 100% Of Flow Capacity The Outlet Pressure Shall Remain The Same***

# WHAT IS A HERMETICALLY SEALED GAS BOOSTER?

**Direct Driven Explosion Proof  
Motor and Blower Totally  
Enclosed in a Welded Steel  
Housing (Totally Sealed)**

**Designed So That Gas  
Cannot Leak Out Or Air  
Cannot Leak In**

**UL Listed**



**NFPA 70 NATIONAL ELECTRICAL CODE**

**Hazardous Location Rating**

**(HERMETICALLY SEALED DEVICES)**

# TYPES OF HERMETICALLY SEALED GAS BOOSTERS



***Single Stage, Hermetic Internal  
Blower Design***

***Flows From 50 to 100,000 CFH  
With Differential Pressures to  
34.6" W.C.***

***Single Stage, External Magnetic  
Drive Design***

***Flows From 2 to 1200 CFH  
With Differential Pressures to  
15" W.C.***

***Both U.L. Listed and Approved For Use By Both Con Edison & Keyspan***

***Design Which Best Suits The Application For Flow & Pressure***

# **TYPES OF HERMETICALLY SEALED GAS BOOSTERS**

## **[Continued]**



**Multi Stage, Hermetic Internal Blower Design**  
**Flows From 1,000 to 100,000 CFH**  
**With Differential Pressures to 83" W.C. (Optional 5 PSI NO U.L.)**

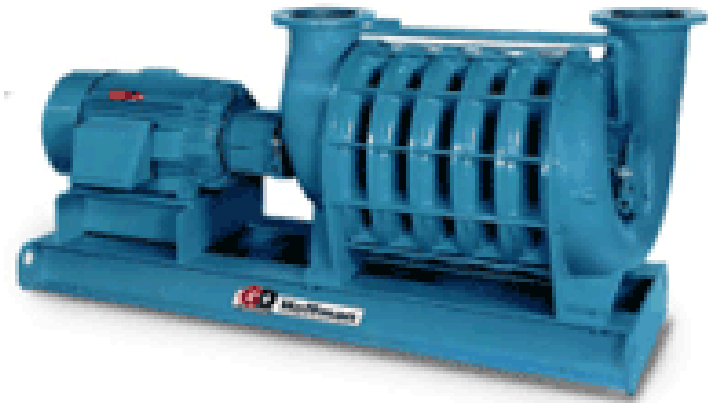


**Multi Stage, Rotary Screw Design**  
**Flows From 2500 to 200,000 CFH**  
**With Differential Pressures to 100 PSI.**  
**Industrial Outdoor Applications Or Indoor Requiring Special Requirements**

# **TYPES OF NON HERMETICALLY SEALED GAS BOOSTERS**



***Multi Stage, Liquid Ring  
Compressor Design  
Flows From 10,000 to 200,000  
CFH With Differential Pressures  
to 25 PSI***



***Multi Stage, External Drive Design  
Flows From 2500 to 200,000 CFH  
With Differential Pressures to  
10-15 PSI.***

***Industrial Outdoor Applications  
Or  
Indoor Requiring Special Requirements***

## WHY USE A GAS BOOSTER?

***New High Efficiency Gas Fired Equipment Often Requires Pressures Higher than that Available by Local Utility Company***

***Utility Company Minimum Guaranteed Pressure = 4" w.c.***



Commercial  
Cooking  
7" W.C.



Heating & DHW  
Boilers  
14" W.C.



Power  
Generation  
1-3 PSI

## WHY USE A GAS BOOSTER?

***When Gas Piping Sizes Can be Dramatically Reduced by Increasing the Amount of Inlet Gas Service Pressure Available***

15,000 Cfh delivered @ ½ psi (14" w.c.)

4" pipe (screw)  
6" pipe (weld)

- ***Eliminate The Need For Welded Piping***
- ***Reduced installation Cost***



# SYSTEM CONSIDERATIONS (CHECK LIST)

- CODE REQUIREMENTS**
  - Local Building Code Requirements*
  - NFPA 54*
  - Utility Company*
- PERFORMANCE REQUIREMENTS**
  - Flow & Pressure*
  - Turndown*
- PIPING CONSIDERATIONS**
  - Riser Layout*
  - Cooling Loop*
  - Pressure Regulation*
- EQUIPMENT SELECTION**
  - Single or Multiple Boosters*
  - Specific Model Choice*
  - Fully Assembled or Knocked Down*
- LOCATION SELECTION**
  - Indoor or Outdoor*
  - Hazardous or Non Hazardous*
- CONTROL CONSIDERATIONS**
  - NEMA Rating*
  - Proper Start/ Stop*
  - Back Up Power*

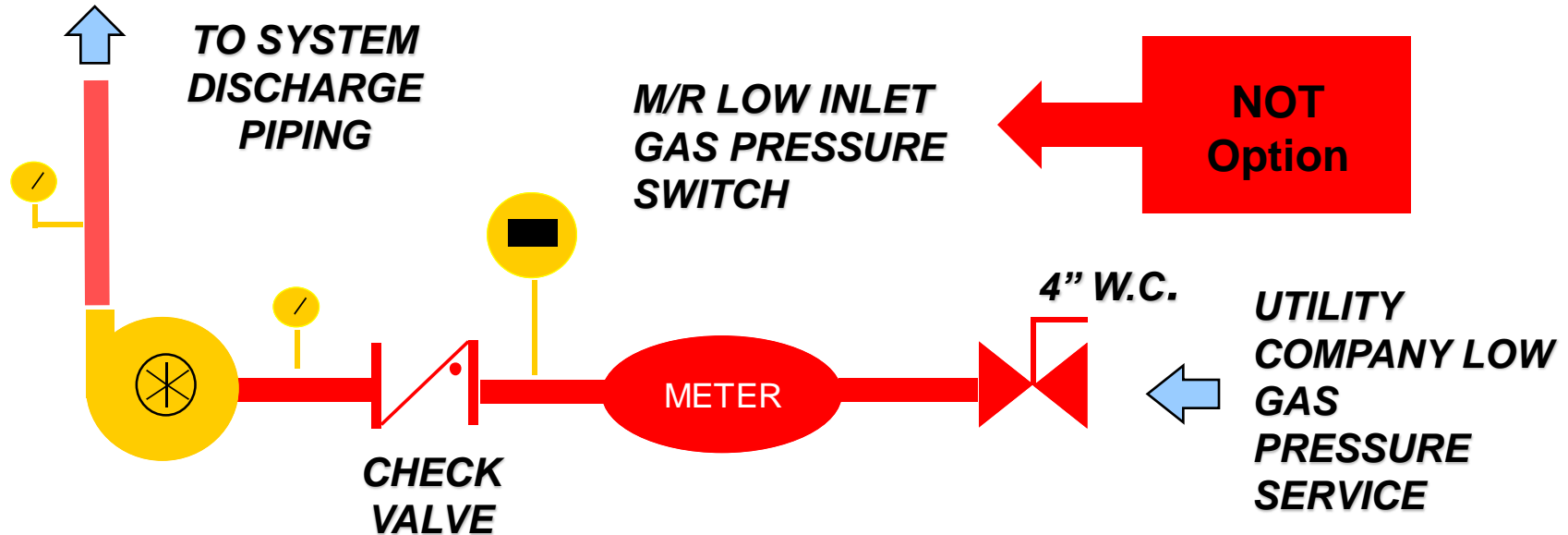
**OVERALL SYSTEM EVALUATION TO DETERMINE EQUIPMENT SELECTION**

## **UTILITY COMPANY REQUIREMENTS**

- ***KEYSPAN/ TC2005***
- ***CON EDISON SPECIFICATION G2040-9***

***Both Utility Company Guidelines  
Outline Approved Usages, Protective  
Devices & Design Responsibility in the  
installation of Gas Booster Systems***

# PIPING CONSIDERATIONS



Assume the minimum utility company available pressure is 4" w.c. at the head of service.

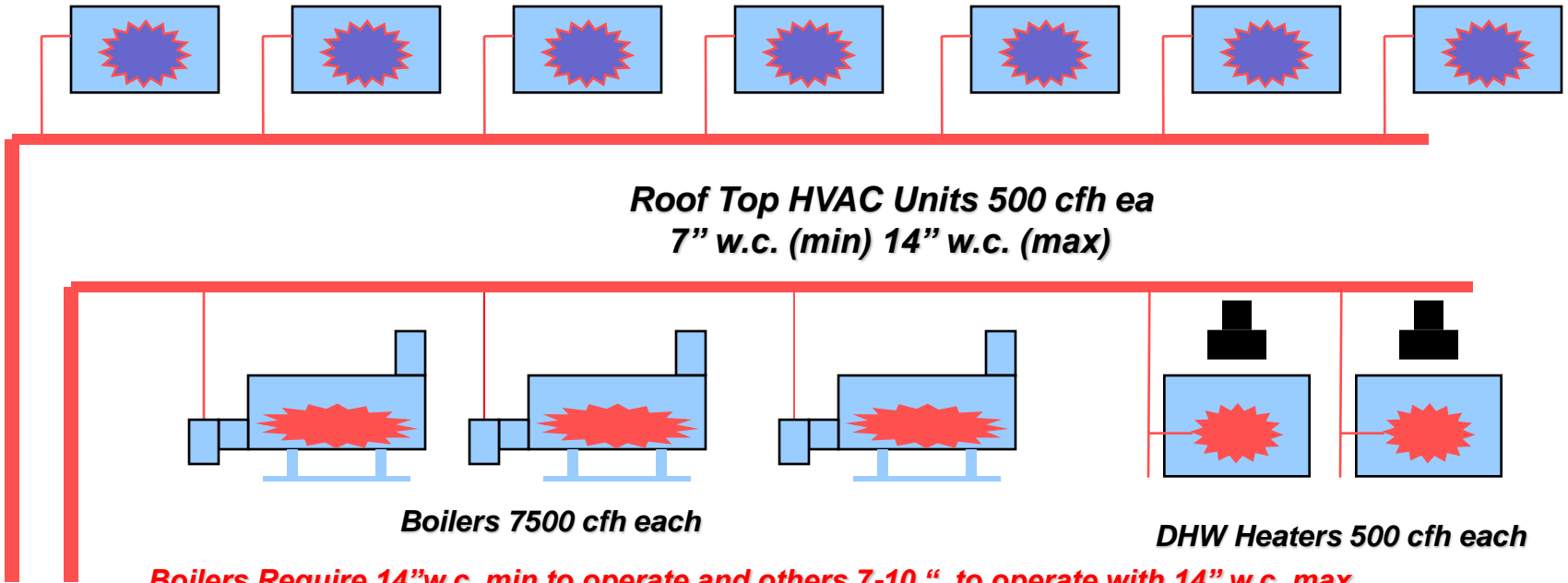
Size booster inlet piping for a minimal pressure drop.

Locate the utility required low inlet gas pressure switch just down stream of the gas meter.

Select a check valve that best meets the system flow requirements. Oversized valves can cause chattering or may even fail to open during low flow conditions.

Size discharge piping for an acceptable maximum pressure drop. Do not exceed a velocity of 2300 ft/min.

# PRESSURE/FLOW CONSIDERATIONS



**Boilers Require 14" w.c. min to operate and others 7-10 " to operate with 14" w.c. max**

Evaluate the entire gas system for type of use, flow requirements and minimum & maximum pressure requirements.

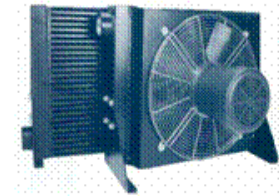
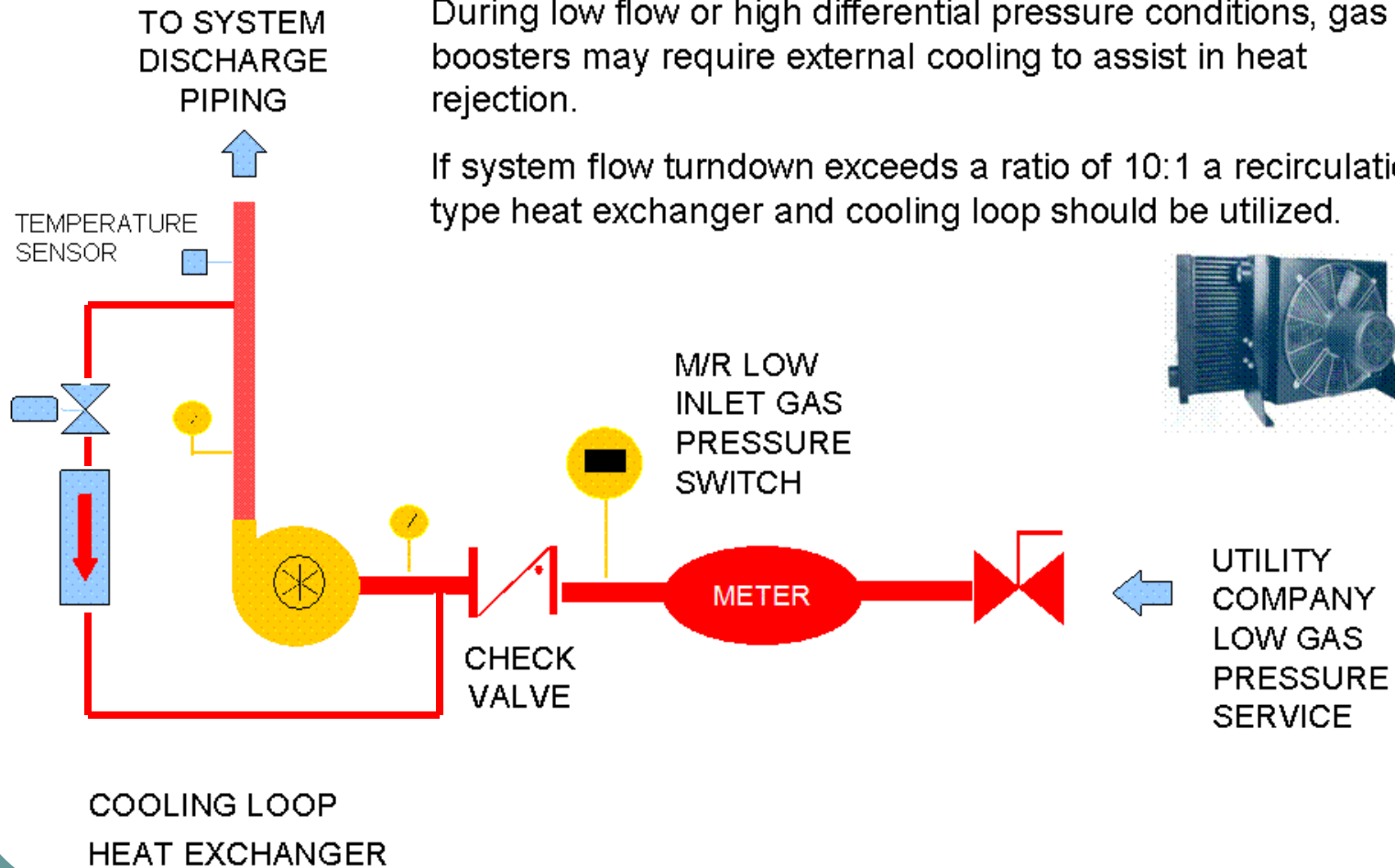
Provide an adequate amount of pressure but be aware of the maximum system pressure so as to not violate local building codes or equipment manufacturer's approvals and listings.

<b>RTUs</b>	<b>3,500 cfh</b>
<b>Dom HW Htrs</b>	<b>1,000 cfh</b>
<b>Boilers</b>	<b>22,500 cfh</b>
<b>Total Load</b>	<b>27,000 cfh</b>
<b>Minimum pressure Needed</b>	<b>14" w.c.</b>

# COOLING LOOPS

During low flow or high differential pressure conditions, gas boosters may require external cooling to assist in heat rejection.

If system flow turndown exceeds a ratio of 10:1 a recirculation type heat exchanger and cooling loop should be utilized.



# REGULATORS

If the system discharge pressure must be fixed to a set pressure than the use of an ANSI rated, lock up type gas pressure regulator should be utilized.

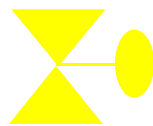
Line regulators will require venting unless certified to ANSI Z21.80 with vent limiter

M/R LOW  
INLET GAS  
PRESSURE  
SWITCH

TO SYSTEM  
DISCHARGE  
PIPING



14" W.C.

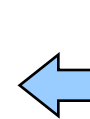


18" W.C.



METER

4"  
W.C.

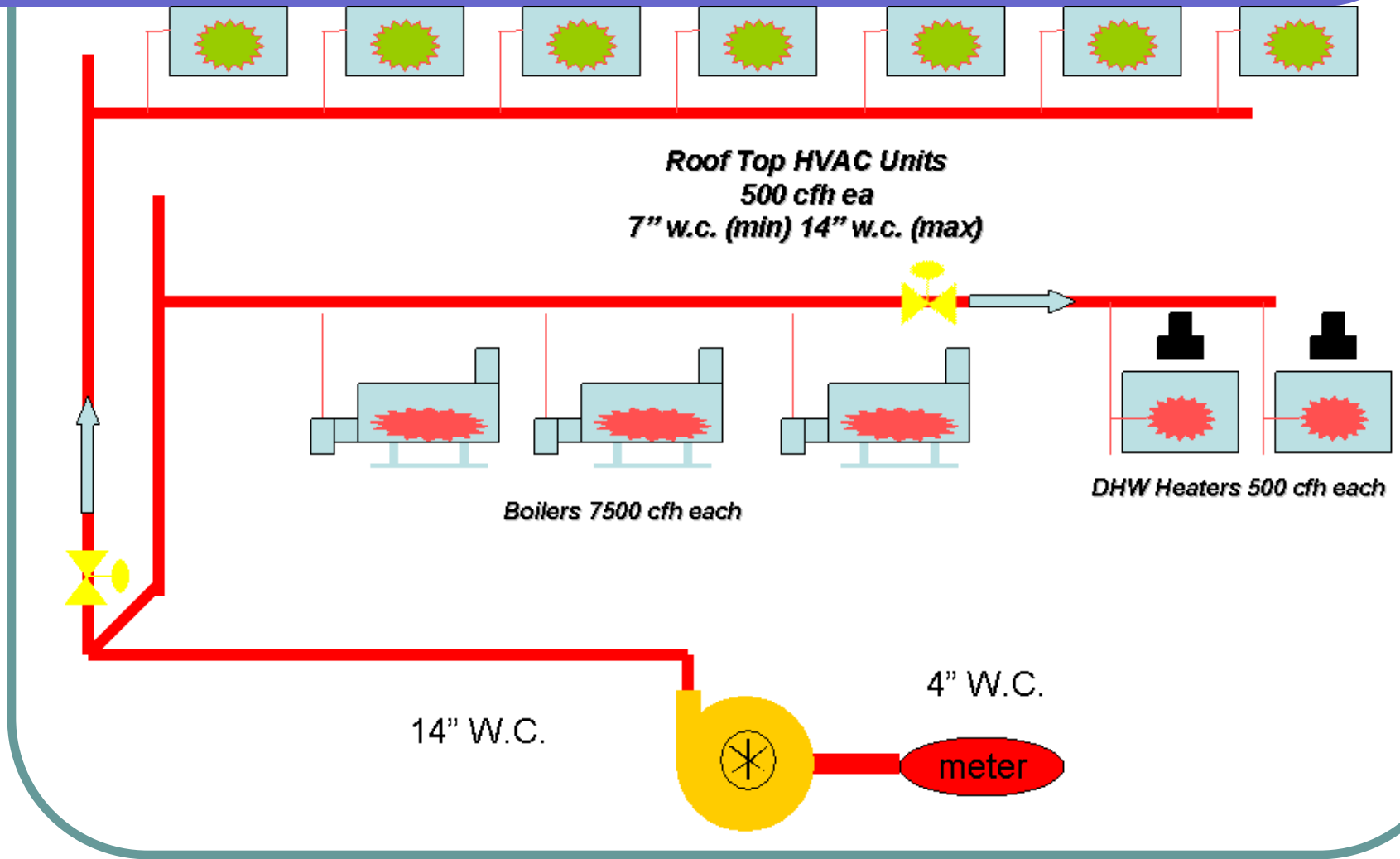


UTILITY  
COMPANY  
LOW GAS  
PRESSURE  
SERVICE

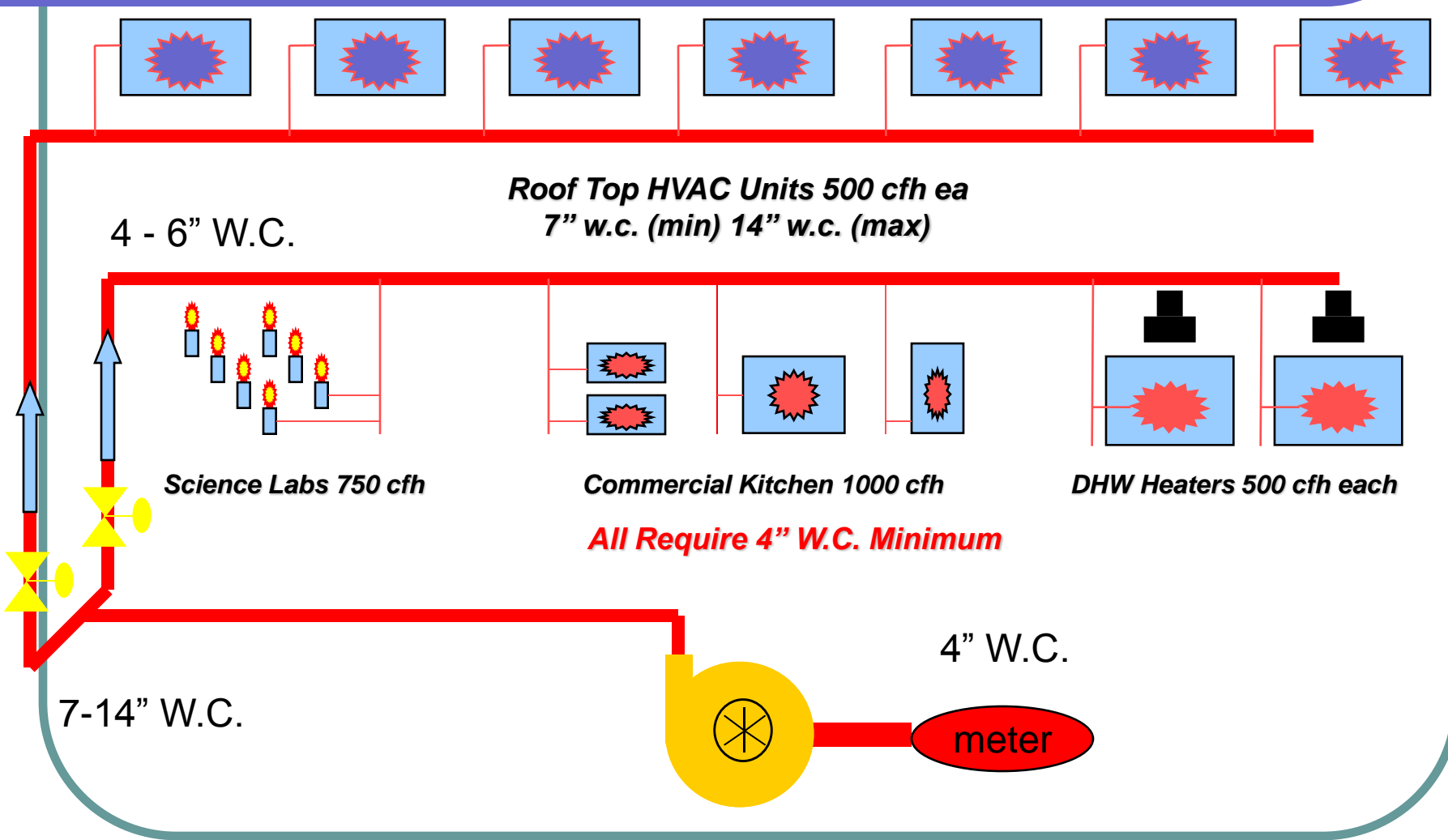
CHECK  
VALVE

SINGLE  
POINT OF  
REGULATION

# REGULATORS



# REGULATORS



## BASIC GAS BOOSTER SELECTION

**Total Flow Capacity** = **6,250 CFH**

**Gas Pressure Available @ Service** = **4" W.C.**

**Total Pressure Loss of Piping** = **.5" W.C.**

**Gas Pressure Required @ Equip** = **10" W.C.**

**Gas Pressure Required @ Equip** = **10" W.C.**

**Total Pressure Loss of Piping** = **.5" W.C.**

**Total Pressure Required** = **10.5" W.C.**

**Gas Pressure @ Booster Inlet** = **(3.5" W.C)**

**Total Boost Required** = **7.0" W.C.**

**Select a Booster Rated for 6,300 CFH with @ 7.0" w.c. Boost**

# GAS BOOSTER FLOW & PRESSURE RATINGS

Catalog Number	Motor H.P.	Air - 1.0 Sp. Gr.		Nat. Gas - 0.65 Sp. Gr.	
		CFH	Added Pressure, " w.c.	CFH	Added Pressure, " w.c.
HB-3412-1/2	1/2	8,600	10.38	9,000	6.40
HB-4412-1/2	1/2	8,600	10.38	12,000	6.75
HB-4412-1	1	16,000	9.16	16,000	5.95
HB-3314-1/2	1/2	3,600	13.84	5,400	9.00
HB-4414-1	1	14,000	10.90	14,000	7.00
HB-4614-1	1	12,000	13.84	18,000	9.00
HB-4614-1-1/2	1-1/2	21,000	13.84	21,000	9.00
HB-4615-1	1	15,300	17.30	15,300	11.25
HB-6615-1-1/2	1-1/2	22,000	15.40	28,000	10.00
HB-6615-2	2	28,000	15.40	35,000	9.70
HB-4617-1	1	9,000	20.76	15,000	13.49
HB-4617-1-1/2	1-1/2	15,000	20.76	18,000	12.63
HB-6617-2	2	19,000	19.90	25,000	12.90
HB-6617-3	3	32,000	20.76	35,000	13.49
HB-8817-5	5	55,000	20.76	80,000	13.49
HB-4619-1-1/2	1-1/2	8,850	27.68	13,000	17.30
HB-4619-2	2	12,250	27.68	18,000	17.30
HB-6619-3	3	21,500	27.68	27,000	17.30
HB-6619-5	5	41,200	27.68	49,000	17.30
HB-8819-7-1/2	7-1/2	57,000	27.68	70,000	17.30
HB-8819-10	10	70,000	27.68	80,000	17.00
HB-4623-3	3	8,000	36.90	11,600	24.20
HB-4623-5	5	22,600	41.52	29,500	26.99
HB-6623-7-1/2	7-1/2	37,000	41.52	40,000	26.99
HB-6623-10	10	42,000	41.52	47,000	25.78
HB-8823-15	15	85,000	41.52	87,000	26.99
HB-8823-20	20	100,000	38.06	100,000	24.74
HB-4628-5	5	6,000	55.36	12,000	34.60
HB-4628-7-1/2	7-1/2	17,700	55.36	24,000	34.60
HB-4628-10	10	28,000	55.36	28,000	34.60
HB-8828-10	10	32,000	55.36	40,000	34.60
HB-8828-15	15	53,000	55.36	63,000	34.60
HB-8828-20	20	78,000	55.36	90,000	34.60



**Closest & best choice would be rated 14,000 CFH with 7" w.c. differential**

## ***PACKAGED SYSTEMS & ANCILLARY DEVICES***

In order to ensure total system integration, we provide complete gas booster packages including all the required accessory devices to complete the installation.

Isolating valves, flexible connectors, pressure gauges, pressure regulators and external cooling devices are available.

Specially designed control systems which incorporate microprocessor devices can be built to meet any customized requirements.

All systems can be provided knocked down for field assembly and installation or as a completely factory assembled package unit ready for field gas and electrical connections.



# PIPING ACCESORIES



150# Rated Stainless Steel, Braided Flexible Connector



175# Rated Resilient Seat Butterfly Valve



## Complete U.L. Listed Gas Booster Systems

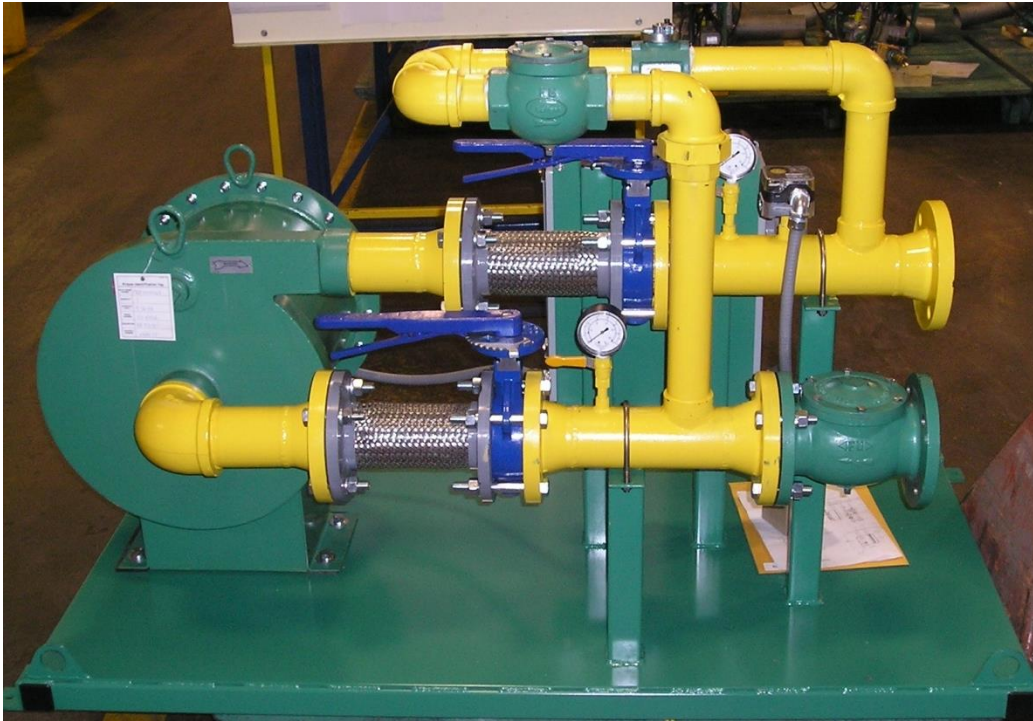
- All Systems are Available Fully Assembled or Knocked Down
- Fully Engineered and Completely Integrated
- Certified & Tested Design
- Single Source Responsibility
- Flow Rates from 2 to 100,000 CFH
- Differential Pressures to 3 PSI standard
- Single and Multiple Pump Systems



# Complete U.L. Listed Gas Booster Systems

## **Booster System with Simple Recirculation Loop**

½ HP 5,400 CFH 9" W.C.



**Pre Assembled,  
Mounted and  
Wired**

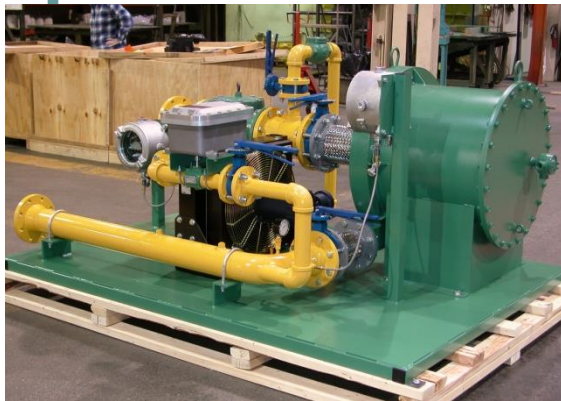
**Performance &  
Leak Tested**

# Complete U.L. Listed Gas Booster Systems

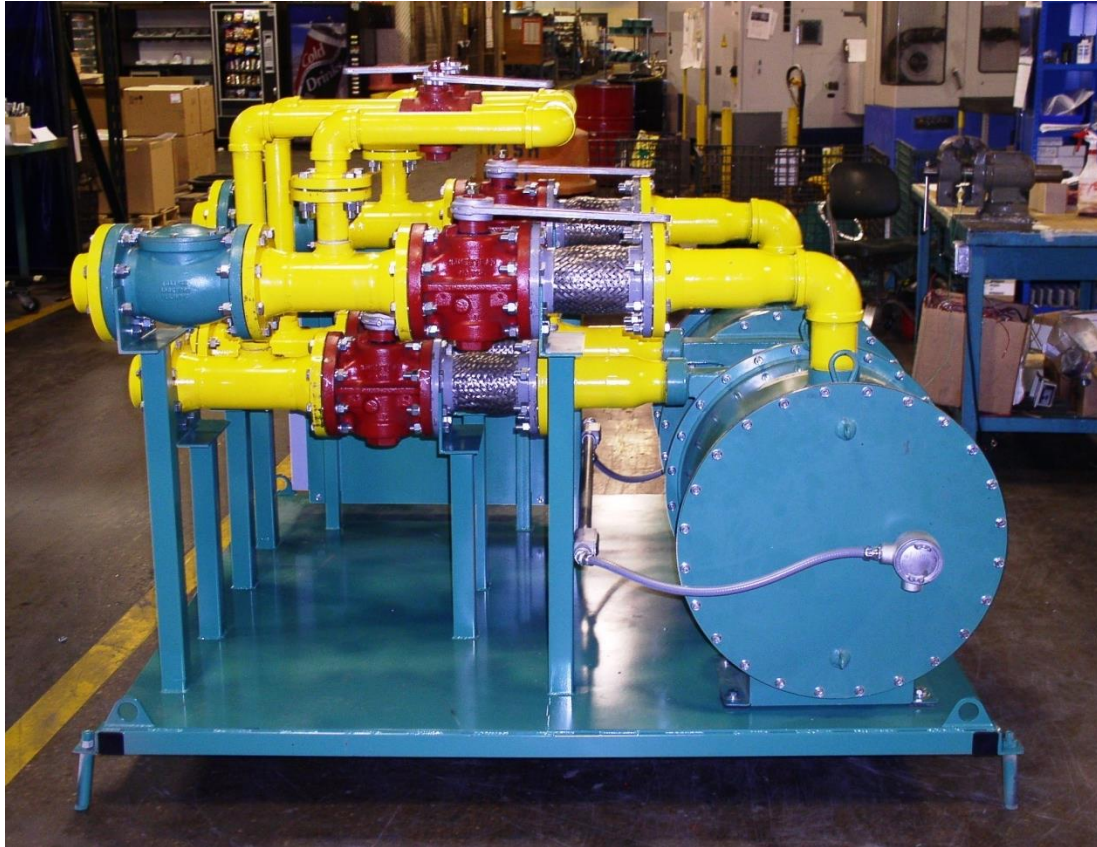


**Booster System with Recirculation Loop & Air to Gas Heat Exchanger**

5 HP 25,000 CFH 34" W.C.



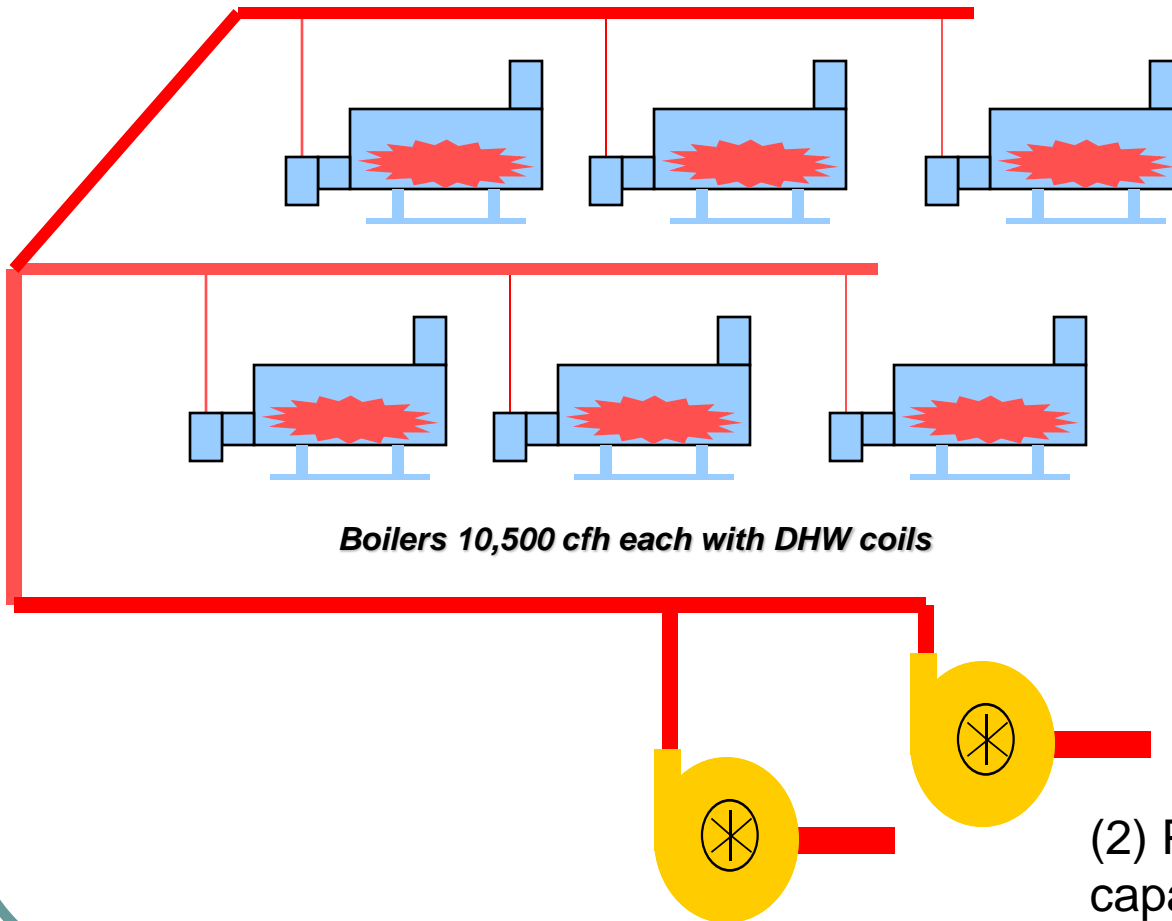
## ***Complete U.L. Listed Gas Booster Systems (Duplex/Triplex)***



***Redundant  
Operation***

***Staging to  
Match Loads  
More Closely***

# Complete U.L. Listed Gas Booster Systems (Duplex)



**Boilers 10,500 cfh each with DHW coils**

**(6) Boilers Total Heating Load**

**63,000 Cfh**

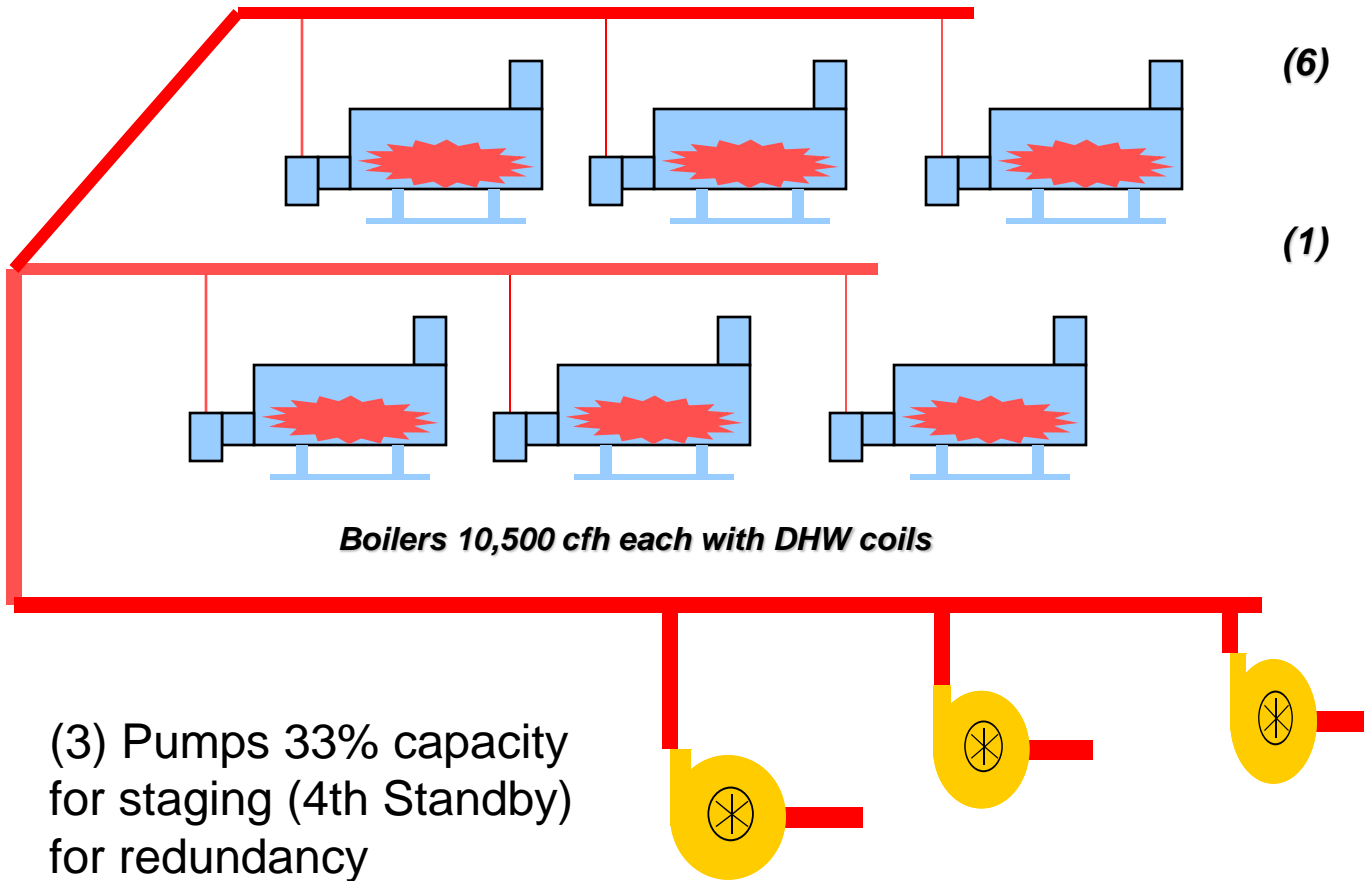
**(1) Boiler Total DHW Load**

**2500 Cfh (4:1)**

**One large pump  
100% capacity**

**(2) Pumps 100%  
capacity for redundancy**

# Complete U.L. Listed Gas Booster Systems (Duplex)



## Installation Environment

**LOCATION!  
LOCATION!  
LOCATION!**



There is no specific code requirement for the location of a hermetically sealed gas booster. It may be installed in any room, ceiling area or closet without special requirements. (Not Applicable for Non Hermetics)

**However**, if a gas booster is installed in a dedicated gas meter room or a hazardous area (NFPA 70) be aware that accessory controls such as control panels, other motors and pressure switches may need to be explosion proof.

The gas booster may also be installed outdoors with additional protection against corrosion and the proper weather resistant controls. (Outdoor Enclosures)

### ***Indoor Installation Locations are not Limited to the Gas Meter Room***

- ***Any mechanical, boiler or storage room free from debris or clutter***
- ***Clean, dry area where access for service is reasonable with good lighting***
- ***Booster should be secured firmly to a level floor with or without a cement pad***
- ***Suspension from the ceiling or wall is acceptable as long as it meets basic and practical requirements for structural support.***

## OUTDOOR ENCLOSURES

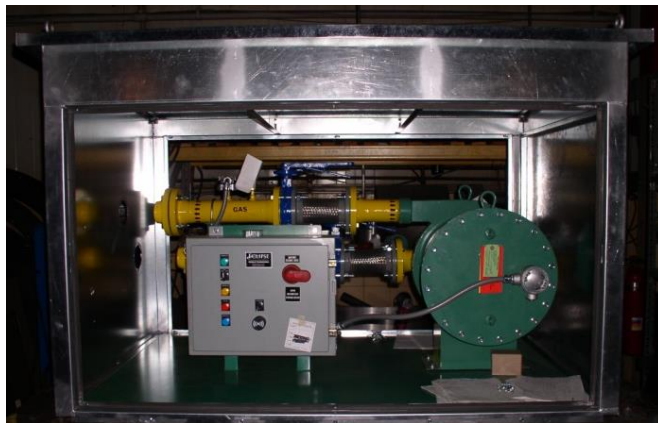
### ***All Fully Assembled Gas Booster Systems Are Available With Factory Fabricated Outdoor Enclosures***

- ***Epoxy Coated***
- ***Completely Lockable***
- ***Fully Gasketed***
- ***Removable Side Panels***
- ***Sealed Piping Connections***
- ***Fully Vented***

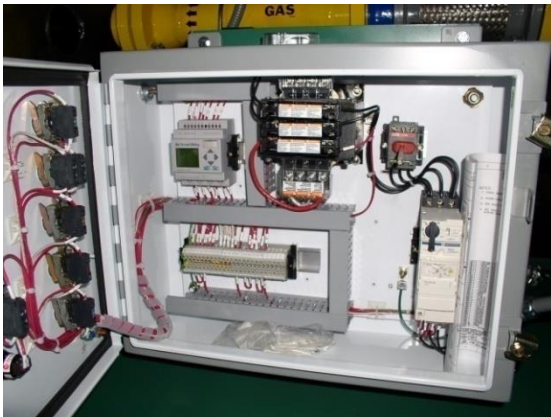


# OUTDOOR ENCLOSURES

***HB Series Fully  
Integrated Outdoor  
Enclosures with  
Removable Side  
Panels and Ventilated  
Top***



# Fully Integrated Gas Booster Control Systems



**Tested and Proven, Fully Integrated  
Control Systems Ensure Safe and Reliable  
Gas Booster Operation  
For Standard and NEMA 7 Explosion Proof  
Locations**



# **CONTROL STRATEGIES**

## ***NEMA Rating:***

Once you have established the location for the gas booster the NEMA rating of the control system can be coordinated. Standard is NEMA 4 optionally available NEMA 7 (explosion proof)

## ***Single or Multiple Units:***

Determine the number of boosters in the system and then consider control strategies which address issues of staging, sequencing, back up operation on failure and alarm indication. Interface to remote automation systems requiring additional inputs or outputs must be considered separately.

## ***Start/Stop:***

Much consideration must be given to how to start and stop the gas booster pump. The pump should only operate when the gas fired equipment is operating therefore, hard wired interlocks with that equipment are the most reliable method of providing start/stop signals.

If wiring interlocks are not a practical choice due to distance or number of wiring points, our FCM/PFCM series flow modules are viable alternatives.

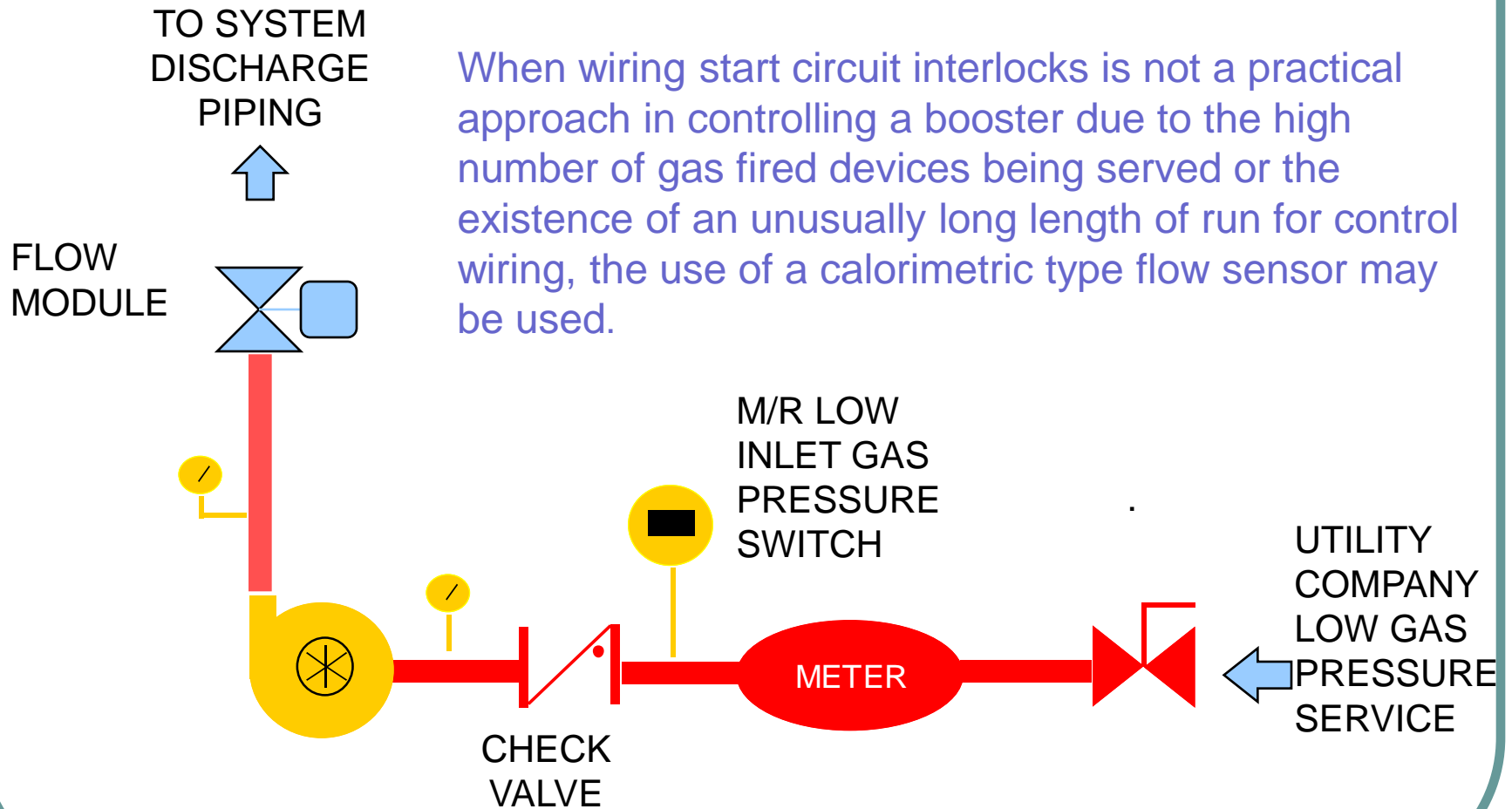
## **CONTROL INTERLOCKS**

Dry contacts wired from each gas fired appliance being served

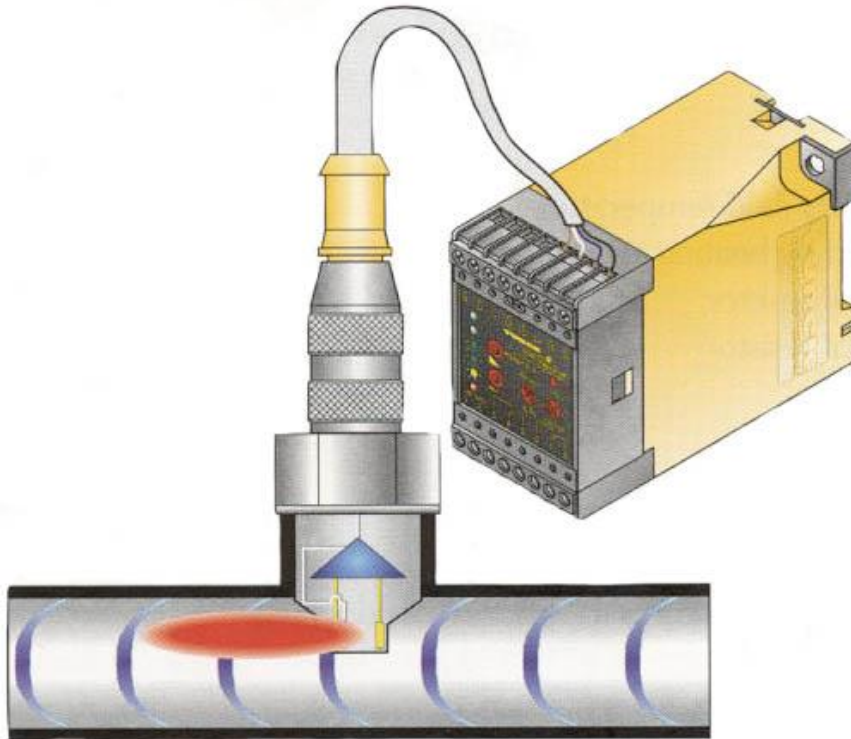
Set to close when gas fired equipment is enabled or called into operation. Open when all equipment is shutdown.

Wired in parallel so any single appliance can activate the booster

# FLOW CONTROL MODULE



# FLOW CONTROL MODULE



Microprocessor  
Flow Controller  
with LED Readout



Explosion Proof  
Stainless Steel  
Insertion Sensor

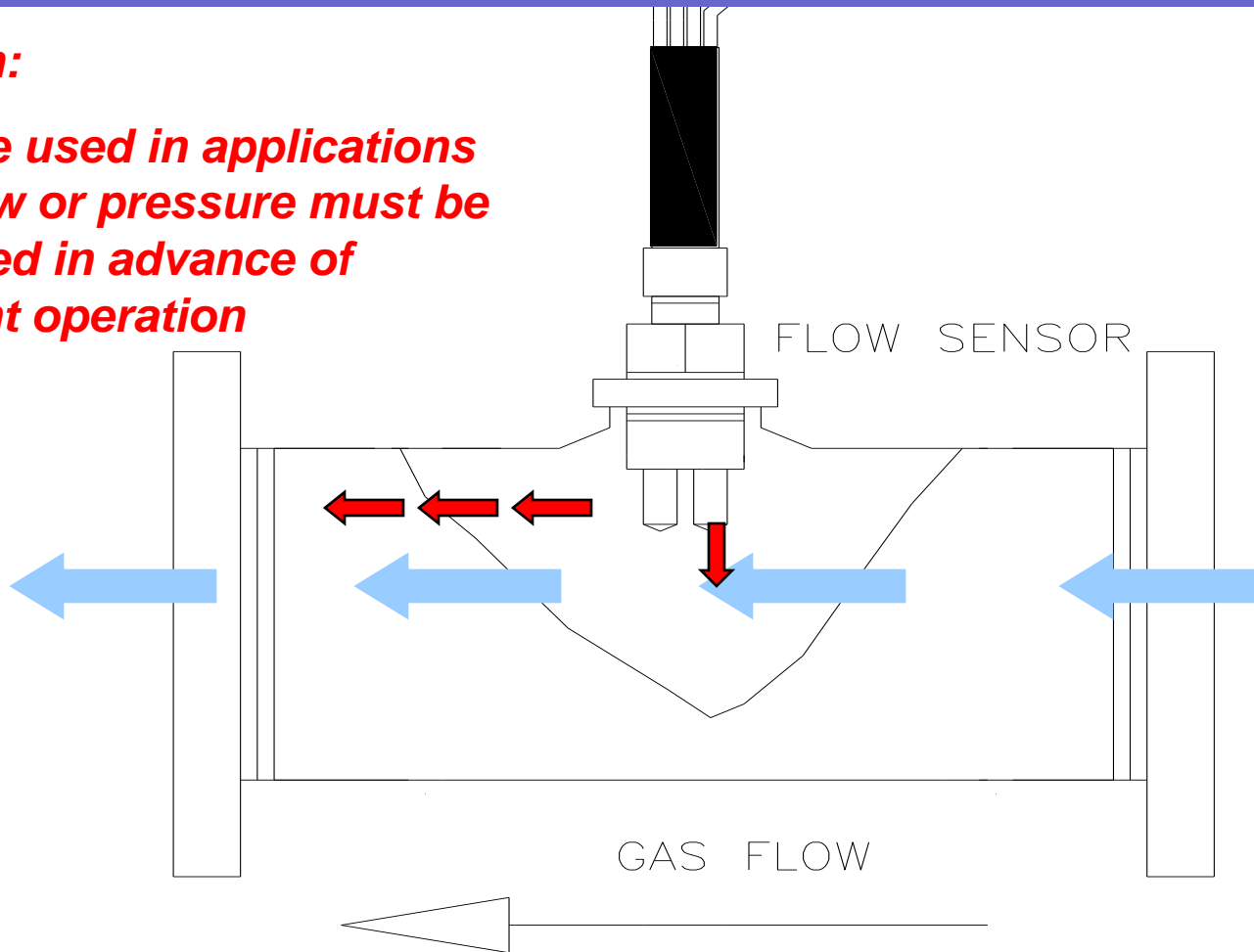


Intrinsically Safe  
Cable Assembly  
with Quick  
Connection End

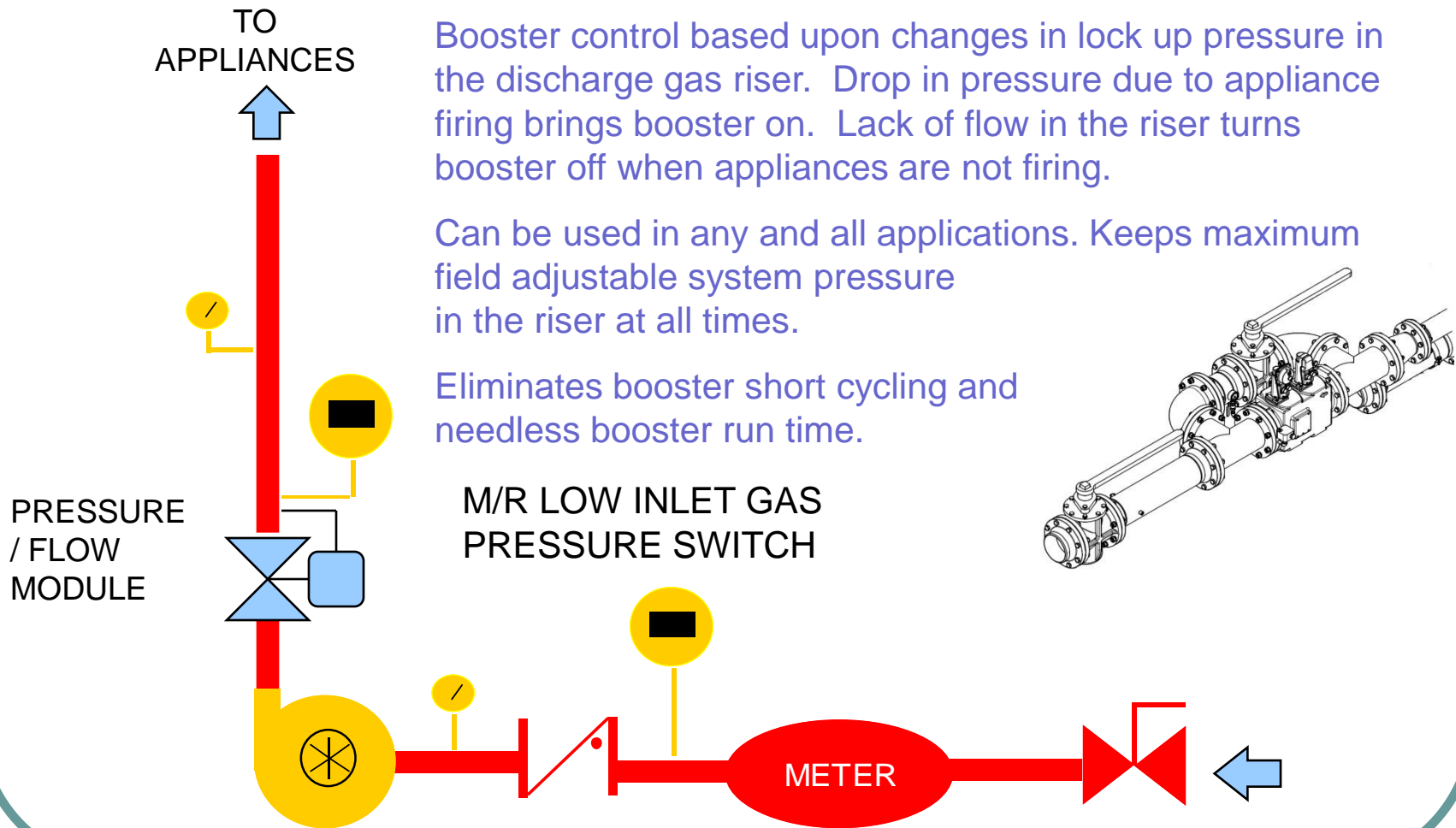
# FLOW CONTROL MODULE

## **Limitation:**

**Cannot be used in applications where flow or pressure must be established in advance of equipment operation**



# PRESSURE / FLOW COMPENSATION MODULE



## *Alternate Methods of Gas Booster Control*

- ***Manual On/Off Selection***
- ***Automatic Time of Day Selection***
- ***Automatic enable/disable on:***
  - ***Minimum inlet pressure***
  - ***Space or outdoor temperature***
  - ***Building automation system signals (BMS Activation)***

### ***Variable Speed Control Utilizing VFD & Downstream Pressure Sensing***

- ***Provides Additional Motor Diagnostics  
(Voltage, Current & Temperature)***
- ***Energy Savings Capabilities***
- ***Soft Start Feature***
- ***Improved Downstream Pressure Control  
Allows for Pressure Charging of***
- ***Assists With Overheating During Low Flow  
Conditions***

### ***Standby & Emergency Power Generating Applications:***



- ***Provide Battery Backup Capabilities for Black Start Operation Utilizing UPS System***
- ***Proper Interlock Timing of Gas Booster to a Call For Generator Operation***
- ***Maintain Locked Up Downstream Pressure to Generator Equipment***

### ***Standby & Emergency Power Generating Applications***

- ***Provide Battery Backup Capabilities for Black Start Operation Utilizing UPS System***
  - ***Sized to Provide 6 Minutes of Battery***
  - ***Backup to allow for Generator Start***
  - ***Match the Appropriate Voltage to Gas Booster***
  - ***120/220 Single Phase***
  - ***208/230 Three Phase***
  - ***460 Three Phase***
  - ***Shipped Loose for Best Choice of Location***

# ADVANCED NETWORK COMMUNICATIONS



HDMI COLOR GRAPHIC USER  
INTERFACE  
NETWORK COMMUNICATIONS  
OF ALL OPERATING SYSTEM  
CONDITIONS UTILIZING  
LON, BACHNET, MODBUS OR  
ETHERNET PROTOCOLS



Gas Leak  
Detection

Enable/Disable

Pressures, Temperatures & Flows

Scheduling, Trending & History

# ***Gas Booster Systems***



***Questions ?***