

# North American Gas Pressure Regulators

7335 Regulators reduce gas supply pressures to discharge pressures ranging from 48 psi to atmospheric. Flow capacities on natural gas range from 9000 to 200 000 cfh. Regulators are suitable for natural gas, propane, LP gas, or dry air.

## SPECIFICATIONS

- Body Sizes and End Connections:** 1" to 3" NPT
- Maximum Operating Inlet Pressure:** See Table 2
- Capacities:** See Table 1
- Maximum Emergency Inlet Pressure:** See Table 2
- Maximum Outlet (Casing) Pressure:** See Table 2
- Maximum Operating Outlet Pressure to Avoid Internal Parts Damage - The Outlet Pressure Rating:** See Table 2
- Temperature Capabilities:** -20° to 150°F (-29° to 66°C)
- Pressure Registration:** An external, downstream control line is required.

## RATIO REGULATOR SERVICE

7335-0 Regulators that can be set for zero outlet pressures can be used as cross-connected ratio regulators. The regulator 1" vent is connected to the combustion air line with 1/2" pipe or 5/8", or 3/4" OD tubing (bushing up to 1" at the regulator). For maximum diaphragm pressure differential, See Table 2.

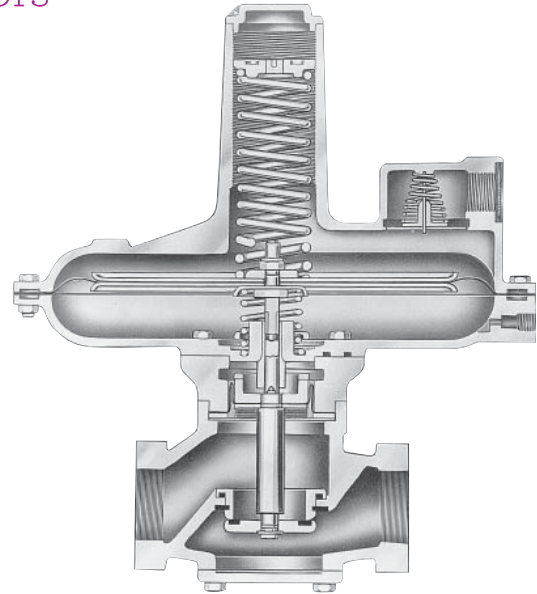
## INSTALLATION

Regulators should be installed in horizontal clean pipe with unions on each side to facilitate removal for servicing. Apply pipe compound to threaded pipe ends only.

If 7335 Regulator is used with other downstream regulators, they should be separated by at least 15 pipe diameters to avoid interaction.

At higher capacities, it is necessary to increase discharge pipe size (use a reducing coupling). Use Figure 4 to select proper discharge pipe size.

Figure 3 is a guide for piping and installation. An external line is required to sense downstream pressure and provide control feedback to regulator. When necessary, an orifice is added to this line to dampen pulsation. Correct size is largest orifice that effectively controls pulsation.



## OVERPRESSURE PROTECTION

Like most pressure-reducing regulators, the 7335 regulators have outlet pressure ratings that are lower than the inlet pressure ratings. Therefore, a pressure relieving or pressure limiting device is needed if the inlet pressure can exceed the outlet pressure rating, see "Table 2". This regulator does not have an internal relief feature.

To determine wide-open flow capacity of a regulator for relief sizing, use the following formulas.

$$\text{If } \left( \frac{P_1}{P_0} < 1.894 \right): \quad Q = K\sqrt{P_0 (P_1 - P_0)}$$

$$\text{If } \left( \frac{P_1}{P_0} \geq 1.894 \right): \quad Q = \frac{KP_1}{2}$$

$P_0$  = outlet pressure, psia\*

$P_1$  = inlet pressure, psia

$Q$  = flow rate, SCFH

$K$  = regulator constant (see below)

\* =  $P_0$  is the regulator maximum allowable outlet pressure determined by the regulator's outlet pressure rating and the pressure ratings of downstream system components.

| Regulator Size | K      |
|----------------|--------|
| 1"             | 1400   |
| 1½"            | 2750   |
| 2"             | 4750   |
| 3"             | 11 000 |

**Table 1. Natural gas capacities, in cfh.**

| Regulator designation | Outlet press., psi | Outlet press. droop* psi | Inlet pressure, psi |         |         |         |         |         |
|-----------------------|--------------------|--------------------------|---------------------|---------|---------|---------|---------|---------|
|                       |                    |                          | 5                   | 10      | 15      | 25      | 40      | 50      |
| 7335-1-0              | 0                  | 0.6                      | 11 200              | 14 500  | 17 300  | 23 200  | 32 000  | 38 000  |
| 7335-1-8              | 8                  | 1.2                      | 9 900               | 13 700  | 16 500  | 22 700  | 31 200  | 37 700  |
| 7335-1-16             | 16                 | 1.8                      | 9 800               | 13 500  | 16 000  | 22 500  | 31 000  | 37 000  |
| 7335-1-32             | 32                 | 4                        | 9 000               | 12 200  | 15 000  | 21 400  | 30 100  | 35 500  |
| 7335-1-48             | 48                 | 4                        | 7 500               | 11 500  | 14 300  | 20 000  | 20 000  | 20 000  |
| 7335-3-0              | 0                  | 0.6                      | 19 500              | 30 000  | 37 000  | 50 000  | 68 000  | 80 000  |
| 7335-3-8              | 8                  | 1.2                      | 18 500              | 28 000  | 36 200  | 49 000  | 67 000  | 79 000  |
| 7335-3-16             | 16                 | 1.8                      | 18 000              | 27 500  | 35 700  | 48 000  | 66 500  | 78 000  |
| 7335-3-32             | 32                 | 4                        | 16 400              | 25 100  | 34 000  | 46 000  | 64 000  | 75 000  |
| 7335-3-48             | 48                 | 8                        | 14 000              | 25 000  | 31 500  | 45 500  | 63 500  | 63 500  |
| 7335-4-0              | 0                  | 0.6                      | 35 000              | 52 000  | 68 000  | 90 000  | 125 000 | 150 000 |
| 7335-4-8              | 8                  | 1.2                      | 34 500              | 51 000  | 67 500  | 89 000  | 124 000 | 148 000 |
| 7335-4-16             | 16                 | 1.8                      | 34 000              | 50 000  | 66 000  | 88 500  | 121 500 | 146 000 |
| 7335-4-32             | 32                 | 4                        | 30 000              | 49 000  | 64 500  | 84 500  | 118 000 | 143 000 |
| 7335-4-48             | 48                 | 8                        | 27 500              | 46 500  | 61 500  | 84 000  | 116 500 | 116 500 |
| 7335-6-A0             | 0                  | 0.6                      | 80 000              | 125 000 | 145 000 | 190 000 | 260 000 | —       |
| 7335-6-A8             | 8                  | 1.2                      | 78 000              | 120 000 | 145 000 | 190 000 | 260 000 | —       |
| 7335-6-A16            | 16                 | 1.8                      | 75 000              | 115 000 | 140 000 | 190 000 | 260 000 | —       |
| 7335-6-32             | 32                 | 4                        | 65 000              | 100 000 | 135 000 | 183 000 | 200 000 | —       |
| 7335-6-48             | 48                 | 8                        | 55 000              | 90 000  | 125 000 | 175 000 | 200 000 | —       |

Note: — = Exceeds the regulator’s maximum operating inlet pressure

**Table 2. 7335 Inlet and outlet pressure ratings.**

| Regulator designation | Max. Oper. Inlet press., psi | Max. Emer. inlet press., psi | Max. Outlet (casing) press., psi | Max. Oper. Outlet press., psi | Max. Diaphragm press. diff., psi |
|-----------------------|------------------------------|------------------------------|----------------------------------|-------------------------------|----------------------------------|
| 7335-1-0              | 60                           | 70                           | 25                               | Setpoint +5                   | 2                                |
| 7335-1-8              |                              |                              |                                  |                               |                                  |
| 7335-1-16             |                              |                              |                                  |                               |                                  |
| 7335-1-32             |                              |                              |                                  |                               |                                  |
| 7335-1-48             |                              |                              |                                  |                               |                                  |
| 7335-3-0              | 60                           | 70                           | 20                               | Setpoint +5                   | 2                                |
| 7335-3-8              |                              |                              |                                  |                               |                                  |
| 7335-3-16             |                              |                              |                                  |                               |                                  |
| 7335-3-32             |                              |                              |                                  |                               |                                  |
| 7335-3-48             |                              |                              |                                  |                               |                                  |
| 7335-4-0              | 60                           | 70                           | 20                               | Setpoint +5                   | 2                                |
| 7335-4-8              |                              |                              |                                  |                               |                                  |
| 7335-4-16             |                              |                              |                                  |                               |                                  |
| 7335-4-32             |                              |                              |                                  |                               |                                  |
| 7335-4-48             |                              |                              |                                  |                               |                                  |
| 7335-6-A0             | 40                           | 50                           | 10                               | Setpoint +2                   | 1                                |
| 7335-6-A8             |                              |                              | 10                               |                               |                                  |
| 7335-6-A16            |                              |                              | 10                               |                               |                                  |
| 7335-6-32             |                              |                              | 20                               |                               |                                  |
| 7335-6-48             |                              |                              | 20                               |                               |                                  |

Note: When regulator flow is at maximum capacity, discharge pressure will be lowered from setpoint by approximately 10%. The "Pressure Droop" should be taken into account when selecting a regulator and spring range.

## Corrections for Gravity

For gases with specific gravity other than 0.6, apply correction factor from Table 3. Divide desired flow by factor to get equivalent flow of natural gas. Select regulator with appropriate capacity and discharge pressure.

Multiply regulator's natural gas capacity by gravity factor to get its capacity with different gas.

Table 3. Gravity corrections

| Gas gravity | Factor | Example Gas |
|-------------|--------|-------------|
| 0.4         | 1.22   | Coke Oven   |
| 0.6         | 1.00   | Natural     |
| 1.0         | 0.774  | Air         |
| 1.5         | 0.632  | Propane     |
| 2.0         | 0.547  | Butane      |

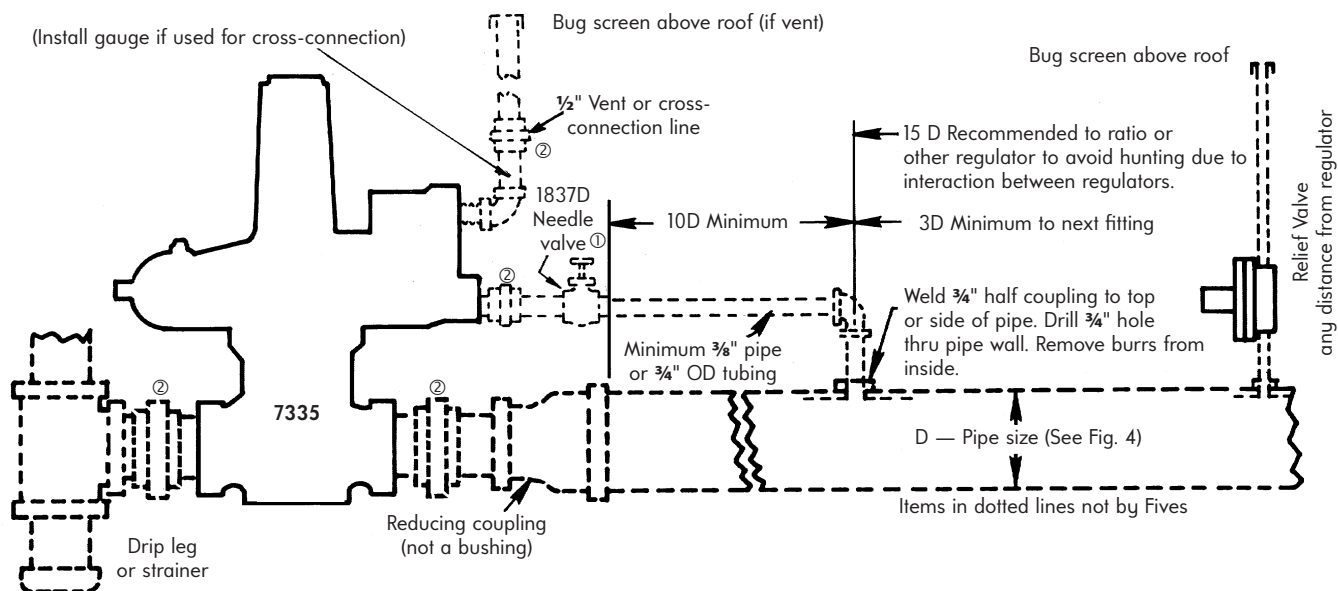


Figure 3. Detail of regulator and relief valve installation.

- ① When necessary to dampen pulsation, use a fixed orifice, or an 1837D Needle Valve with internal bypass, which allows on-line "tuning out" of outlet pressure pulsation.
- ② Use pipe unions to simplify regulator removal for repair or replacement.

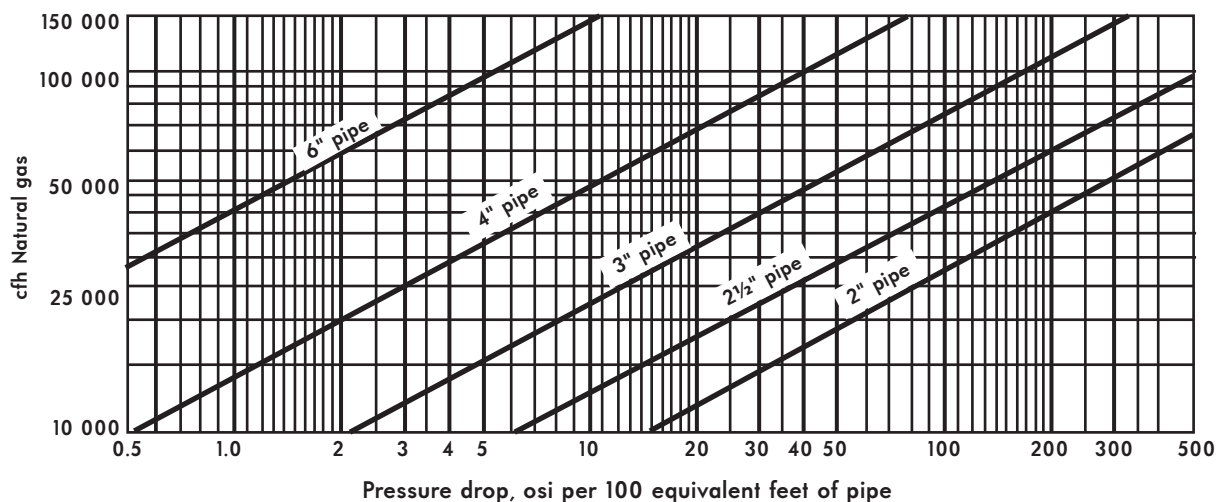
Figure 4a. Quick approximation for downstream pipe size.

| cfh Natural Gas | Outlet Pressure |       |        |        |
|-----------------|-----------------|-------|--------|--------|
|                 | Zero            | 8 osi | 16 osi | 32 osi |
| 0               | 2½"             | 2½"   | 2"     | 2"     |
| 10 000          | 3"              | 3"    | 3"     | 3"     |
| 20 000          | 4"              | 4"    | 4"     | 4"     |
| 30 000          | 6"              | 6"    | 6"     | 6"     |
| 40 000          | 8"              | 8"    | 8"     | 8"     |
| 50 000          | 10"             | 8"    | 8"     | 8"     |
| 60 000          | 10"             | 8"    | 8"     | 8"     |
| 70 000          | 10"             | 8"    | 8"     | 8"     |
| 80 000          | 10"             | 8"    | 8"     | 8"     |
| 90 000          | 10"             | 8"    | 8"     | 8"     |
| 100 000         | 10"             | 8"    | 8"     | 8"     |
| 150 000         | 10"             | 8"    | 8"     | 8"     |
| 200 000         | 10"             | 8"    | 8"     | 8"     |

**Accurate calculation for downstream pipe size per Figure 4b.**

1. Determine maximum allowable pressure drop ( $\Delta P_D$ ) downstream of 7335.  $\Delta P_D = 7335$  outlet pressure minus pressure required at inlet of gas flow control device.
2. Start with downstream pipe size indicated in Figure 4a. Using that pipe size, determine equivalent length ( $L_D$ ) of pipe and fittings between 7335 and gas flow control device. (For equivalent lengths of valves and fittings, see Table 5.22 in North American COMBUSTION HANDBOOK)
3. Correct  $\Delta P_D \div L_D$  to 100 equivalent feet of pipe:  
 $\Delta P_D \div L_D / 100 = \Delta P_{100}$ .
4. On Figure 4b, locate maximum cfh natural gas pipe must carry, read across to (diagonal) pipe size line, then down to pressure drop per 100 equivalent feet of pipe. If result is less than  $\Delta P_{100}$ , pipe is sufficient. If result exceeds  $\Delta P_{100}$  pipe is undersized--repeat procedure for larger sizes until a satisfactory pressure drop results.

Figure 4b. Accurate evaluation for downstream pipe size.



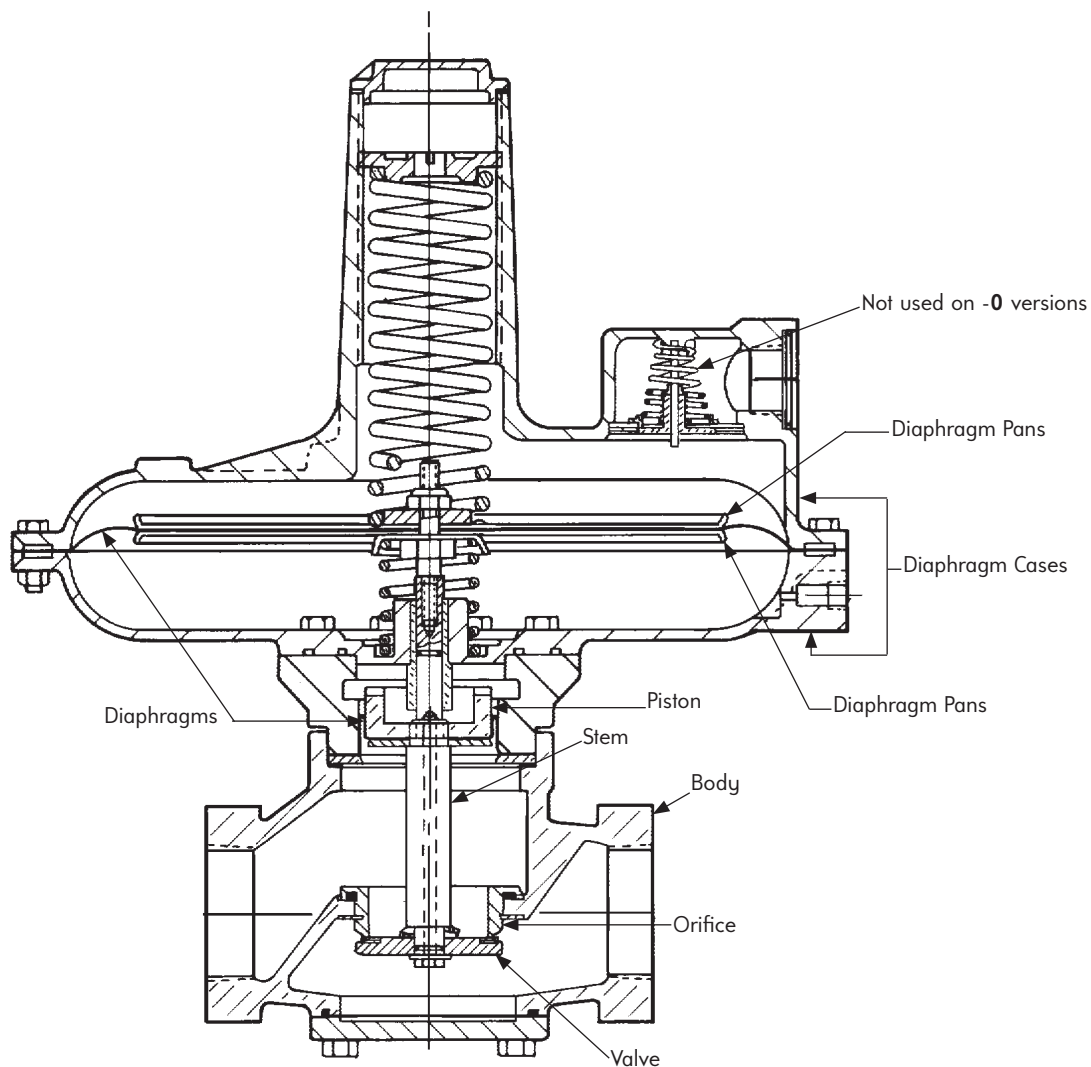


Figure 6. Assembly Diagram

### Materials of Construction

**Body:** cast iron

**Diaphragm cases:** Aluminum

**Diaphragms:** Buna-N or nylon

**Piston:**

Powdered iron - zinc plated (3/4" to 2" sizes)

Aluminum (3" size)

**Stem:** Stainless steel

**Diaphragm pans:** Stainless steel

**Orifice:**

Brass (3/4" to 1-1/4" sizes)

Cast Iron (1-1/2" to 3" sizes)

**Valve:** Plated steel with Buna-n seat

**O-rings:** Buna-n

Table 5. Spring identification

| Regulator designation | Spring <sup>③</sup>      |                        | (Atmospheric)<br>-0.6 to +0.7 osi | Outlet pressure range |             |              |              |
|-----------------------|--------------------------|------------------------|-----------------------------------|-----------------------|-------------|--------------|--------------|
|                       | R number                 | Color                  |                                   | 3.5 to 8 osi          | 8 to 16 osi | 16 to 32 osi | 24 to 48 osi |
| 7335-1-0              | R690-5510<br>R690-5507   | Red-Black<br>Black-Red | •                                 |                       |             |              |              |
| 7335-1-8              | R690-5511                | Green-Black            |                                   | •                     |             |              |              |
| 7335-1-16             | R690-5514                | Green                  |                                   |                       | •           |              |              |
| 7335-1-32             | R690-5513                | Orange                 |                                   |                       |             | •            |              |
| 7335-1-48             | R690-5518                | Cadmium                |                                   |                       |             |              | •            |
| 7335-3-0              | R690-5510<br>R690-5508   | Red-Black<br>Black     | •                                 |                       |             |              |              |
| 7335-3-8              | R690-5514                | Green                  |                                   | •                     |             |              |              |
| 7335-3-16             | R690-5513                | Orange                 |                                   |                       | •           |              |              |
| 7335-3-32             | R690-5515                | Black                  |                                   |                       |             | •            |              |
| 7335-3-48             | R690-5518                | Cadmium                |                                   |                       |             |              | •            |
| 7335-4-0              | R690-5510<br>R690-5508   | Red-Black<br>Black     | •                                 |                       |             |              |              |
| 7335-4-8              | R690-5514                | Green                  |                                   | •                     |             |              |              |
| 7335-4-16             | R690-5513                | Orange                 |                                   |                       | •           |              |              |
| 7335-4-32             | R690-5515                | Black                  |                                   |                       |             | •            |              |
| 7335-4-48             | R690-5518                | Cadmium                |                                   |                       |             |              | •            |
| 7335-6-A0             | R690-5509 <sup>④</sup> ‡ | Black                  | •                                 |                       |             |              |              |
| 7335-6-A8             | R690-5516†               | Green                  |                                   | •                     |             |              |              |
| 7335-6-A16            | R690-5517†               | Orange                 |                                   |                       | •           |              |              |
| 7335-6-32             | R690-5515†               | Black                  |                                   |                       |             | •            |              |
| 7335-6-48             | R690-5518                | Cadmium                |                                   |                       |             |              | •            |

③ Where two springs are listed, first spring is main, second is counterspring.

④ 7335-6-A0 uses a reversed main spring, no counterspring.

† This is only spring suitable for this regulator.

‡ These springs will only fit -6-A regulators.

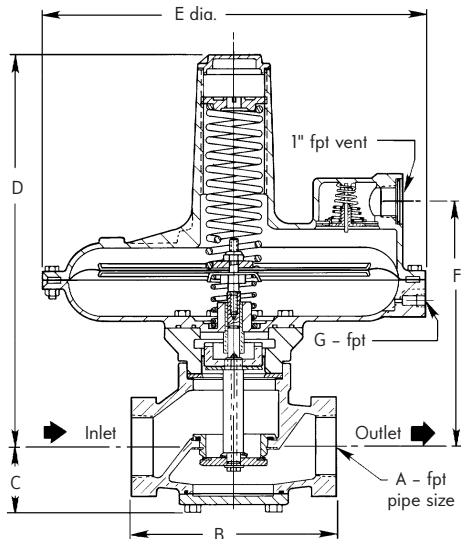


Figure 7. Dimensions

DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC. IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.

**WARNING:** Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and Insurance Underwriters' recommendations, and care in operation.

| Regulator designation | Dimensions in inches |     |                                |                                 |                                 |                                 |   | Wt, lb |
|-----------------------|----------------------|-----|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---|--------|
|                       | A                    | B   | C                              | D                               | E                               | F                               | G |        |
| 7335-1                | 1                    | 5¾  | 17/8                           | 13 <sup>9</sup> / <sub>16</sub> | 10 <sup>3</sup> / <sub>16</sub> | 8                               | ¼ | 25     |
| 7335-3                | 1½                   | 7½  | 2 <sup>3</sup> / <sub>8</sub>  | 14 <sup>1</sup> / <sub>8</sub>  | 14                              | 8¾                              | ¼ | 40     |
| 7335-4                | 2                    | 7½  | 2 <sup>3</sup> / <sub>8</sub>  | 14 <sup>1</sup> / <sub>8</sub>  | 14                              | 8¾                              | ¼ | 40     |
| 7335-6-A              | 3                    | 11¾ | 3 <sup>9</sup> / <sub>16</sub> | 19                              | 18                              | 10 <sup>5</sup> / <sub>16</sub> | ¼ | 90     |
| 7335-6                | 3                    | 11¾ | 3 <sup>9</sup> / <sub>16</sub> | 15½                             | 14                              | 10 <sup>3</sup> / <sub>16</sub> | ¼ | 75     |



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