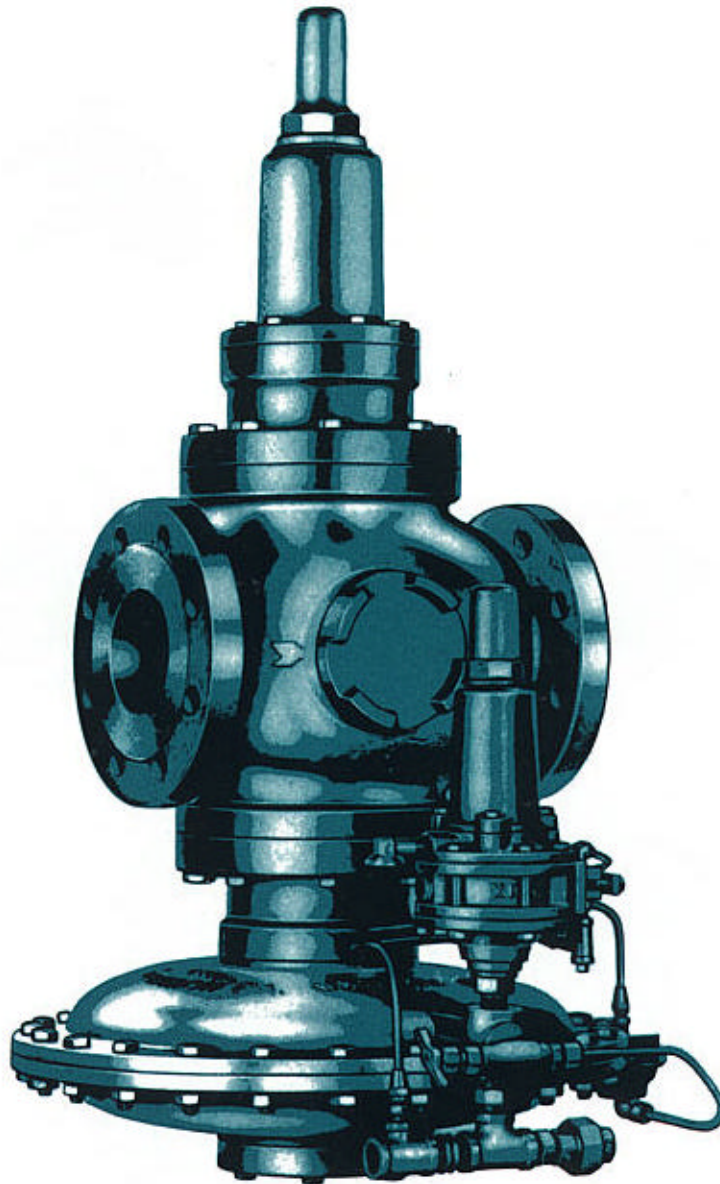




Model 441-VPC

Pilot Operated Regulators



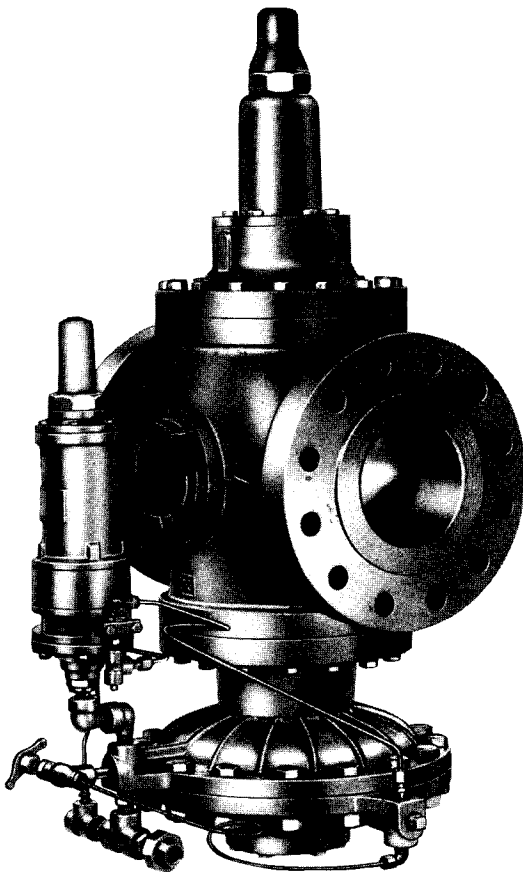
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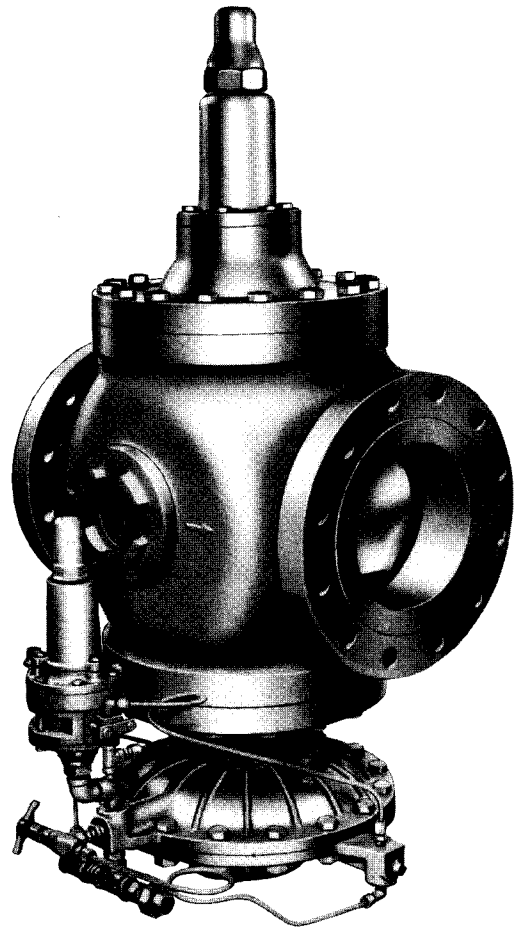
Taking the Measure of Tomorrow

**Pilot Operated Balanced Valve
Gas Pressure Regulator
for**

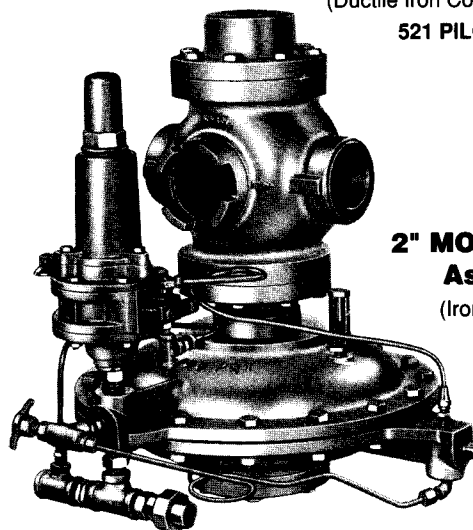
- District and Station Regulator Sets
- Distribution Systems
- Transmission Systems
- Compression Stations
- Large Capacity Industrial Systems
- Boilers—Burners—Furnaces—Ovens



**6" MODEL 441-VPC
Assembly F**
(Steel Construction)
53 PILOT



**8" MODEL 441-VPC
Assembly C**
(Ductile Iron Construction)
521 PILOT



**2" MODEL 441-VPC
Assembly A**
(Iron Construction)
511 PILOT

*ULTRA-PRECISION REGULATOR • LARGE CAPACITY • LOW-MEDIUM-HIGH PRESSURES
HEAVY DUTY CONSTRUCTION • WEATHER-PROOF & WATERTIGHT • BROAD RANGEABILITY*



441-VPC Operation

The Model 441-VPC is a gas pressure regulator which uses a separate device, the PILOT, for sensing the regulated pressure and controlling the overall operation.

The PILOT is actually a small regulator. However, it is a very specialized type. It senses the regulated pressure and puts out a power signal (LOADING PRESSURE) which operates the

main valve and thereby controls the flow of gas. Furthermore, it performs each of these related functions with a high degree of accuracy.

The result is precision regulation of pressure to a set point from minimum to maximum flow. The 441-VPC is especially recommended where exceptionally close control is required.

How It Works

Operation is basically simple. It is illustrated by the drawing on this page.

Outlet pressure is the regulated or controlled pressure and is shown in dark gray. Inlet pressure is black, and loading pressure is light gray.

The downstream control line brings outlet pressure to the control diaphragm (A) of the pilot. (A) is opposed and balanced by spring (D) which is compressed for the desired OUTLET PRESSURE SET POINT with adjustment screw (J); in to increase outlet pressure, and out to decrease it.

A small supply of inlet gas enters the pilot through orifice (O). Valve (X) reduces it to loading pressure which works against diaphragm (B) to position main valve (V) and control the flow of gas.

(V) opens when loading pressure increases and the opening force developed by (B) exceeds the closing force of spring (F).

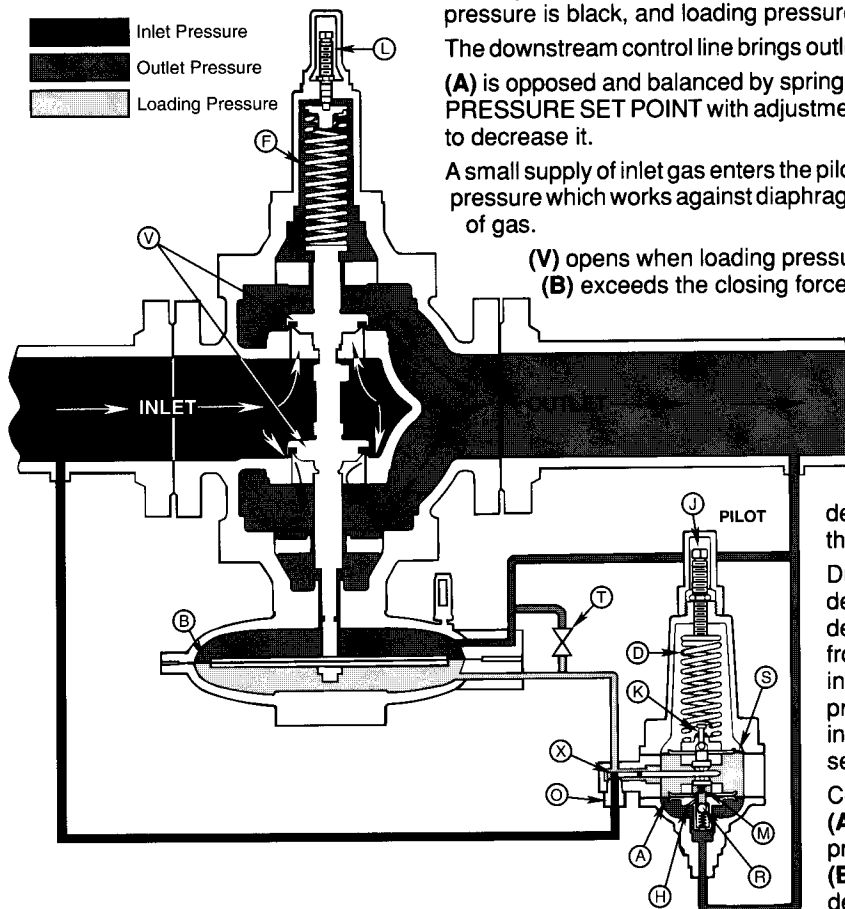
Conversely, (V) closes when loading pressure decreases and (F) thereby exceeds (B).

(H) is a small opening which bleeds loading pressure downstream (light gray to dark gray). Loading pressure increases when (X) opens up to allow the input of inlet pressure to exceed the bleedoff through (H). And, conversely, it decreases when (X) closes down so that the bleedoff through (H) becomes the greater.

During normal operation, if outlet pressure begins to decrease, the force from (A) likewise begins to decrease. This permits spring (D) to lift (X) further from its seat admitting more inlet pressure and thus increasing the loading pressure. As the loading pressure increases, (B) pushes (V) further open to increase flow until outlet pressure is restored to the set point.

Conversely, when outlet pressure begins to increase, (A) pushes (X) toward its seat causing loading pressure to decrease. As loading pressure decreases, (B) allows spring (F) to push (V) toward its seats to decrease flow until set point is restored.

If tight shut off is required, (A) seats (X) tight, loading pressure simultaneously bleeds down through (H) until it equalizes with outlet pressure, and the full power of (F) closes (V). Note that at tight shut off the bleed through (H) stops because (X) closes off the supply of inlet pressure.



Additional Information

(R) is a ball type relief valve that limits the amount by which loading pressure can exceed outlet pressure in the event that (X) is damaged or blocked open.

(T) is the starting valve. It is used to guard against any excess in pressure differential across main diaphragm (B) during start up.

(M) is a mechanical relief. It limits the closing force which can be exerted on the lever arm to seat (X).

(S) is the seal diaphragm which encloses the loading pressure within the pilot loading chamber. It prevents variations in loading pressure from affecting (X). It does this by counteracting the effects of these variations on (A).

(K) is a sensitivity adjustment for use when very fine trimming of proportional band is wanted. It is only used when outlet

pressure is less than 28" w.c.

(L) adjusts the compression in spring (F). The compression in (F) determines the minimum operating differential of the regulator (see chart "Pressure Ranges" on page 3). It must at least be large enough to close (V) tight. (L) is an advantage on those installations where the difference between inlet and outlet pressure is usually small and the compression in (F) must be as low as possible. (L) can also be used for PROGRAMMING MULTIPLE REGULATORS IN PARALLEL RUNS. It is set at the plant to provide a certain closing force, and seldom requires field adjustment. (L) is included on all Model 441-VPC regulators except for the 2" and 3" sizes of assemblies "A" and "B" which use a standard fixed compression spring arrangement.

Operation

CAUTION

Air operated units should not be used at high pressures. The loading pressure will bleed off when the pilot is locked up. This can cause a high differential across main diaphragm (B) and cause valve damage.

Where required, the 441-VPC can be arranged to be operated with compressed air instead of inlet pressure gas.

This is often done where inlet pressures are too low and there is not enough differential across the regulator for the pilot to put out the required amount of loading pressure.

Air operation assures adequate loading pressure, in spite of what occurs to the inlet gas pressure.

Air operation is also used to prevent plugging or gumming in

the pilot system when the gas contains large amounts of impurities, as in coke oven gas or sewage sludge gas.

For air operation, the inlet gas supply to the pilot is entirely eliminated. In its place, a supply of compressed air or instrument air is connected at (O.). In addition, the downstream bleed (H) is eliminated and replaced with a bleed to atmosphere and starting valve (T) is omitted.

These changes allow the 441-VPC to be operated with air, yet prevent any mixing of the air with the gas. Additional protection against mixing is also provided by the general arrangement of the 441-VPC diaphragm assembly which isolates the loading pressure chamber as remotely as possible from the remainder of the regulator.

Either way, the standard arrangement for using inlet pressure gas or alternate operation with compressed air, the Model 441-VPC will provide unexcelled performance.

Installation

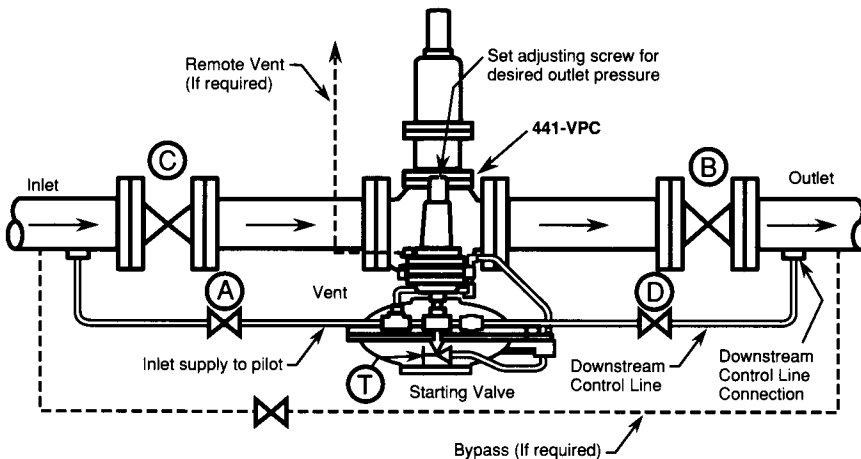
The following sketch shows a typical installation arrangement for the Model 441-VPC.

Particular attention should be given the downstream control line because it can be critical, especially at low pressures. A regulator will work to deliver the pressure for which it is adjusted at the point in the system where the connection is located.

As a general rule, this connection should be at least five (5) pipe diameters downstream from the regulator and be in as

straight a run of pipe as possible. Where downstream piping increases in size near the regulator, it is generally best to locate the connection in the larger size pipe. The connection itself should be clean and smooth to avoid any concentrations of turbulence which could tend to create a false signal.

As an additional precaution, the inlet piping should be adequately cleaned or purged to remove any dirt or debris which could damage the regulator or impair its operation. If this is not feasible, a strainer or filter should be installed ahead of the regulator.



SEE RM-1370 FOR INSTALLATION AND MAINTENANCE INSTRUCTIONS

To Put Into Service

1. Open starting valve T.
2. In the following order, slowing and carefully open valves A, B, C and D.
3. Close starting valve T.
4. Set adjusting screw for desired outlet pressure (turn clockwise to increase and counterclockwise to decrease). Only make this adjustment when gas is actually flowing. Upon completing adjustment, firmly tighten locknut and replace seal cap.
5. A final check is a worthwhile precaution to be sure everything is in proper working order and the installation is tight and free of leaks.

Over Pressurization Protection

Protection must be provided for the downstream piping system and the regulator's low pressure chambers to assure against the potential over pressurization due to a regulator malfunction or a failure of the regulator to lock-up. The allowable over pressurization is the lowest of the maximum pressures permitted by federal codes, state codes, Equimeter Bulletin RDS-1498, or other applicable standards. The method of providing over pressure protection could be a relief valve, a monitor regulator, a shut off device or any similar device.

Temperature Limits

The 441-VPC Regulator can be used for flowing temperatures from - 20°F. to 150°F.

Buried Service

The 441-VPC Regulator is *not* recommended for buried service.

CAUTION

It is the user's responsibility to assure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from any potential sources of ignition. Where vent lines are used, it is the user's responsibility to assure that each regulator is individually vented and that common vent lines are not used.

CAUTION

Mounting Positions

Model 441-VPC Regulators are designed to be installed in horizontal lines only, with the pilot spring cage pointing either up or down.

441-VPC

Capacity in 1000 scfh of natural gas

(0.6 Specific Gravity — 14.65 psia. — 60°F.)

INLET PRESSURE psi	OUTLET PRESSURE psi	2" 441-VPC		3" 441-VPC			4" 441-VPC		
		1 ³ / ₄ " Valve	1 ¹ / ₂ " Reduced Valve	2 ¹ / ₂ " Valve	1 ³ / ₄ " Reduced Valve	1 ¹ / ₂ " Reduced Valve	3" Valve	2 ¹ / ₈ " Reduced Valve	1 ³ / ₄ " Reduced Valve
2	7" w.c.	27.2	21.3	44.4	33.1	21.3	88.7	44.4	27.1
	0.5	25.6	20.0	41.7	31.1	20.0	83.3	41.7	25.4
3	7" w.c.	34.3	26.9	55.9	41.7	26.9	111	55.9	34.1
	0.5	33.2	26.0	54.1	40.4	26.0	108	54.1	33.0
	1.0	29.9	23.4	48.8	36.4	23.4	97.5	48.8	29.8
5	7" w.c.	45.2	35.4	73.7	55.0	35.4	147	73.7	44.9
	0.5	44.7	35.0	72.8	54.3	35.0	145	72.8	44.4
	1	42.5	33.3	69.2	51.7	33.3	138	69.2	42.2
	2	38.1	29.9	62.1	46.4	29.9	124	62.1	37.9
7	3	32.1	25.2	52.4	39.1	25.2	104	52.4	31.9
	7" w.c.	53.9	42.2	87.9	65.6	42.2	175	87.9	53.6
	0.5	53.4	41.8	87.0	64.9	41.8	173	87.0	53.1
	1	52.3	41.0	85.2	63.6	41.0	170	85.2	52.0
	3	45.2	35.4	73.7	55.0	35.4	147	73.7	44.9
10	5	33.8	26.4	55.0	41.1	26.4	110	55.0	33.6
	7" w.c.	64.8	50.8	105	78.9	50.8	211	105	64.5
	0.5	64.3	50.3	104	78.2	50.3	209	104	63.9
	1	63.7	49.9	103	77.5	49.9	207	103	63.4
	3	60.5	47.4	98.5	73.6	47.4	197	98.5	60.1
	5	53.9	42.2	87.9	65.6	42.2	175	87.9	53.6
12	7	43.6	34.1	71.0	53.0	34.1	142	71.0	43.3
	7" w.c.	71.4	55.9	116	86.8	55.9	232	116	71.0
	0.5	70.8	55.5	115	86.2	55.5	230	115	70.4
	1	70.3	55.0	114	85.5	55.0	228	114	69.9
	3	68.6	53.8	111	83.5	53.8	223	111	68.3
	5	63.7	49.9	103	77.5	49.9	207	103	63.4
	7	56.6	44.4	92.3	68.9	44.4	184	92.3	56.3
15	10	38.1	29.9	62.1	46.4	29.9	124	62.1	37.9
	1 & Less	80.1	62.7	130	97.4	62.7	260	130	79.6
	3	79.0	61.9	128	96.1	61.9	257	128	78.6
	5	76.3	59.7	124	92.8	59.7	248	124	75.8
	8	68.1	53.3	111	82.8	53.3	221	111	67.7
20	12	48.5	38.0	79.0	59.0	38.0	157	79.0	48.2
	3 & Less	94.2	73.8	153	114	73.8	307	153	93.7
	6	92.6	72.6	151	112	72.6	301	151	92.1
	10	85.5	67.0	139	104	67.0	278	139	85.1
25	15	65.9	51.6	107	80.2	51.6	214	107	65.5
	6 & Less	108	84.5	175	131	84.5	351	175	107
	10	104	81.9	170	127	81.9	340	170	104
	15	93.7	73.4	152	114	73.4	305	152	93.2
30	20	71.4	55.9	116	86.8	55.9	232	116	71.0
	9 & Less	121	94.8	197	147	94.8	393	197	120
	15	114	89.6	186	139	89.6	372	186	113
	20	101	79.4	165	123	79.4	330	165	100
40	25	76.3	59.7	124	92.8	59.7	248	124	75.8
	14 & Less	148	116	241	180	116	482	241	147
	20	143	112	233	174	112	466	233	142
	25	132	103	215	161	103	431	215	131
50	30	115	90.1	187	140	90.1	374	187	114
	19 & Less	175	137	286	213	137	571	286	174
	25	171	134	278	208	134	557	278	170
	30	162	127	264	197	127	528	264	161
60	40	127	99.5	207	154	99.5	413	207	126
	24 & Less	202	158	330	246	158	660	330	201
	30	199	156	325	242	156	649	325	198
	40	179	141	293	218	141	585	293	178
	50	138	108	225	168	108	450	225	137

441-VPC
Capacity Tables



INLET PRESSURE psi	OUTLET PRESSURE psi	6" 441-VPC			8" 441-VPC		
		4 1/4" Valve	3" Reduced Valve	2 1/8" Reduced Value	7 1/8" Large Size Valve	5 3/4" Valve	4 1/4" Reduced Valve
2	7" w.c.	165	92.5	44.4	415	315	165
	0.5	155	86.9	41.7	390	296	155
3	7" w.c.	208	116	55.9	523	397	208
	0.5	201	112	54.1	506	384	201
	1	181	101	48.8	456	346	181
5	7" w.c.	274	153	73.7	689	523	274
	0.5	270	151	72.8	680	516	270
	1	257	144	69.2	647	491	257
	2	231	129	62.1	581	441	231
7	3	194	109	52.4	489	371	194
	7" w.c.	326	183	87.9	821	623	326
	0.5	323	181	87.0	813	617	323
	1	316	177	85.2	796	604	316
	3	274	153	73.7	689	523	274
10	5	204	114	55.0	514	390	204
	7" w.c.	392	220	105	987	749	392
	0.5	389	218	104	979	743	389
	1	386	216	103	971	737	386
	3	366	205	98.5	921	699	366
	5	326	183	87.9	821	623	326
12	7	264	148	71.0	664	504	264
	7" w.c.	432	242	116	1087	825	432
	0.5	429	240	115	1079	819	429
	1	425	238	114	1070	812	425
	3	415	233	111	1045	793	415
	5	386	216	103	971	737	386
15	7	343	192	92.3	863	655	343
	10	231	129	62.1	581	441	231
	1 & Less	485	272	130	1220	926	485
	3	478	268	128	1203	913	478
	5	462	259	124	1162	882	462
20	8	412	231	111	1037	787	412
	12	293	164	79.0	738	560	293
	3 & Less	571	320	153	1436	1090	571
	6	561	314	151	1411	1071	561
25	10	518	290	139	1303	989	518
	15	399	223	107	1004	762	399
	6 & Less	653	366	175	1643	1247	653
	10	633	355	170	1593	1209	633
30	15	567	318	152	1427	1083	567
	20	432	242	116	1087	825	432
	9 & Less	732	410	197	1842	1398	732
	15	693	388	186	1743	1323	693
40	20	613	344	165	1543	1171	613
	25	462	259	124	1162	882	462
	14 & Less	897	503	241	2257	1713	897
	20	868	486	233	2183	1657	868
50	25	802	449	215	2017	1531	802
	30	696	390	187	1751	1329	696
	19 & less	1062	595	286	2672	2028	1062
	25	1036	581	278	2606	1978	1036
60	30	983	551	264	2473	1877	983
	40	769	431	207	1934	1468	769
	24 & Less	1227	688	330	3087	2343	1227
	30	1207	677	325	3037	2305	1207
60	40	1089	610	293	2739	2079	1089
	50	838	470	225	2108	1600	838

Refer to Page 9 for notes.

441-VPC

Capacity in 1000 scfh of natural gas

(0.6 Specific Gravity — 14.65 psia. — 60°F.)

INLET PRESSURE psi	OUTLET PRESSURE psi	2" 441-VPC		3" 441-VPC			4" 441-VPC		
		1 ³ / ₄ " Valve	1 ¹ / ₂ " Reduced Valve	2 ¹ / ₈ " Valve	1 ³ / ₄ " Reduced Valve	1 ¹ / ₂ " Reduced Valve	3" Valve	2 ¹ / ₈ " Reduced Valve	1 ³ / ₄ " Reduced Valve
80	35 & Less	256	201	418	312	201	835	418	255
	40	254	199	413	309	199	826	413	252
	50	239	187	389	291	187	778	389	237
	60	210	164	342	256	164	684	342	209
100	46 & Less	311	244	508	379	244	1014	508	310
	50	309	242	504	376	242	1007	504	307
	60	297	233	484	362	233	968	484	296
	80	236	185	385	287	185	770	385	235
125	60 & Less	379	297	618	461	297	1234	618	377
	80	355	278	579	432	278	1156	579	353
	100	291	228	475	354	228	949	475	290
150	72 & Less	447	350	728	543	350	1454	728	444
	80	443	347	722	539	347	1442	722	440
	100	412	323	672	502	323	1343	672	410
	125	321	252	524	391	252	1046	524	319
175	85 & Less	515	404	840	627	404	1678	840	512
	100	505	395	823	614	395	1644	823	502
	125	455	356	741	553	356	1481	741	452
	150	349	273	569	425	273	1137	569	347
200	98 & Less	584	457	952	710	457	1901	952	581
	125	557	436	908	678	436	1814	908	554
	150	494	387	805	601	387	1609	805	491
	175	374	293	611	456	293	1220	611	372
225	111 & Less	652	511	1063	793	511	2123	1063	648
	125	643	504	1048	783	504	2095	1048	640
	150	605	474	986	736	474	1971	986	602
	175	530	415	864	645	415	1726	864	527
	200	399	312	650	485	312	1298	650	396
250	125 & Less	720	564	1174	876	564	2345	1174	716
	150	698	547	1138	850	547	2274	1138	694
	175	649	509	1058	790	509	2114	1058	646
	200	564	442	919	686	442	1836	919	561
	225	421	330	687	513	330	1373	687	419
300	152 & Less	856	671	1396	1042	671	2788	1396	852
	175	838	657	1366	1020	657	2730	1366	834
	200	798	625	1301	971	625	2599	1301	794
	250	626	491	1021	762	491	2040	1021	623
350	167 & Less	993	778	1618	1208	778	3232	1618	987
	200	977	766	1593	1189	766	3182	1593	972
	250	886	694	1443	1078	694	2884	1443	881
	300	683	535	1113	831	535	2224	1113	679
400	204 & Less	1129	884	1840	1373	884	3675	1840	1123
	250	1085	850	1769	1320	850	3533	1769	1079
	300	966	757	1574	1175	757	3145	1574	961
500	257 & Less	1401	1098	2284	1705	1098	4562	2284	1394
	300	1366	1071	2227	1662	1071	4449	2227	1359
	400	1109	869	1808	1349	869	3611	1808	1103
600	309 & Less	1674	1311	2728	2036	1311	5449	2728	1665
	400	1569	1229	2556	1908	1229	5107	2556	1560
	500	1236	968	2014	1503	968	4023	2014	1229
800	415 & Less	2219	1738	3616	2699	1738			
	500	2140	1677	3488	2604	1677			
	600	1910	1496	3112	2323	1496			
1000	521 & Less	2764	2165	4504	3362	2165			
	600	2702	2117	4402	3287	2117			
1200	600 & Less	3309	2592	5392	4025	2592			

Refer to Page 9 for notes.

INLET PRESSURE psi	OUTLET PRESSURE psi	6" 441-VPC			8" 441-VPC		
		4 1/4" Valve	3" Reduced Valve	2 1/8" Reduced Valve	7 1/8" Large Size Valve	5 3/4" Valve	4 1/4" Reduced Valve
80	35 & Less	1554	871	418	3909	2967	1554
	40	1537	862	413	3867	2935	1537
	50	1448	812	389	3643	2765	1448
	60	1273	714	342	3203	2431	1273
100	46 & Less	1887	1058	508	4747	3603	1887
	50	1874	1050	504	4714	3578	1874
	60	1801	1010	484	4531	3439	1801
	80	1432	803	385	3602	2734	1432
125	60 & Less	2296	1287	618	5776	4384	2296
	80	2151	1206	579	5411	4107	2151
	100	1765	989	475	4440	3370	1765
150	72 & Less	2706	1517	728	6806	5166	2706
	80	2683	1504	722	6748	5122	2683
	100	2498	1400	672	6283	4769	2498
	125	1947	1091	524	4897	3717	1947
175	85 & less	3121	1750	840	7851	5959	3121
	100	3059	1715	823	7694	5840	3059
	125	2755	1544	741	6930	5260	2755
	150	2115	1185	569	5320	4038	2115
200	98 & Less	3537	1983	952	9987	6753	3537
	125	3376	1892	908	8491	6445	3376
	150	2993	1678	805	7528	5714	2993
	175	2270	1272	611	5710	4334	2270
225	111 & Less	3950	2214	1063	9935	7541	3950
	125	3897	2184	1048	9802	7440	3897
	150	3666	2055	986	9221	6999	3666
	175	3211	1800	864	8076	6130	3211
	200	2415	1354	650	6075	4611	2415
250	125 & Less	4362	2445	1174	10972	8328	4362
	150	4230	2371	1138	10640	8076	4230
	175	3933	2205	1058	9893	7509	3933
	200	3415	1914	919	8590	6520	3415
	225	2554	1432	687	6424	4876	2554
300	152 & Less	5187	2908	1396	13047	9903	5187
	175	5078	2847	1366	12773	9695	5078
	200	4834	2710	1301	12159	9229	4834
	250	3795	2127	1021	9545	7245	3795
350	167 & Less	6012	3370	1618	15122	11478	6012
	200	5920	3319	1593	14890	11302	5920
	250	5365	3008	1443	13495	10243	5365
	300	4138	2320	1113	10408*	7900	4138
400	204 & Less	6837	3833	1840	—	13053	6837
	250	6573	3685	1769	—	12549	6573
	300	5851	3280	1574	—	11170	5851
500	257 & Less	8487	4758	2284	—	16203	8487
	300	8276	4639	2227	—	15800	8276
	400	6718	3766	1808	—	12826	6718
600	309 & Less	10137	5683	2728	—	19353	10137
	400	9500	5326	2556	—	18137	9500
	500	7484	4195	2014	—	14288	7484

*Maximum inlet pressure for 7 1/8" large size valve is 350 psi.

Notes for Capacity Tables on Pages 6 to 9.

1. Regulators should be sized for the **minimum expected inlet pressure and maximum required outlet pressure.**
2. For **best overall performance**, use the full table capacity values.
3. For **smaller capacities** see Model 243-RPC (Bulletin R 1343), Model 1100 (Bulletin R 1341), and Model 1200 (Bulletin R 1342).

441-VPC

Special Capacity Information

"K" FACTORS	2" 441-VPC		3" 441-VPC			4" 441-VPC		
	1 ³ / ₄ " Valve	1 ¹ / ₂ " Reduced Valve	2 ¹ / ₈ " Valve	1 ³ / ₄ " Reduced Valve	1 ¹ / ₂ " Reduced Valve	3" Valve	2 ¹ / ₈ " Reduced Valve	1 ³ / ₄ " Reduced Valve
"K" FACTORS STANDARD VALVES	5450	4270	8880	6630	4270	17740	8880	5420
K" FACTORS V-PORT VALVES	5260	4160	8440	6390	4160	13850	8440	5260
V-PORT* MULTIPLIERS	.965	.974	.950	.964	.974	.781	.950	.970
"K" FACTORS	6" 441-VPC			8" 441-VPC			*For capacities with V-Port Valves, multiply the capacity from pages 6-9 by its multiplier.	
	4 ¹ / ₄ " Valve	3" Reduced Valve	2 ¹ / ₈ " Reduced Valve	7 ¹ / ₈ " Valve	5 ³ / ₄ " Reduced Valve	4 ¹ / ₄ " Reduced Valve		
"K" FACTORS STANDARD VALVES	33000	18500	8880	83000	63000	33000		
"K" FACTORS V-PORT VALVES	25500	14430	8440	64000	49140	25500		
V-PORT* MULTIPLIERS	.773	.780	.950	.773	.780	.773		

Capacities at Other Pressures

Capacity for pressure reductions not listed in the table can be calculated with the following formulae:

$$1. Q = K \sqrt{P_0 (P_1 - P_0)} \quad \dots \text{ (for } \frac{P_1}{P_0} \text{ less than 1.894)}$$

$$2. Q = \frac{KP_1}{2} \quad \dots \text{ (for } \frac{P_1}{P_0} \text{ greater than 1.894)}$$

Q = maximum capacity of the regulator (in SCFH of 0.6 specific gravity natural gas).

K = the "K" factor, the regulator constant (from above table).

P₁ = absolute inlet pressure (psia).

P₀ = absolute outlet pressure (psia).

Materials of Construction

Bodies	See Page 3
Diaphragm Housings	See Page 3
511, 521 & 53 Pilots Spring Housings	Cast Iron
511 & 521 Pilots Upper Diaphragm Case	Cast Iron
53 Pilot Upper Diaphragm Case and Stop Plate	Steel
511, 521 & 53 Pilots Body	Cast Iron
511, 521 & 53 Pilots Lower Diaphragm Case	Cast Iron
521 Pilot Stop Plate	Steel
Diaphragm Plates	Steel
Diaphragms	Buna-N on Nylon Fabric
Diaphragm Connecting Stems & Bushings	Stainless Steel
Valve Stems	Brass or Stainless Steel
Soft Seat Valve Material	Molded Polyurethane
Valve Holder	Steel
Valve Retainer	Plated Steel
Orifice	CRS or Stainless Steel
Pilot Orifice	Stainless Steel
Pilot Valve Seat	Molded Polyurethane
Pilot Tubing	1/4" Steel
Tubing Connections	Steel Compression Fittings

Metrication

Use the following for metric conversions:

Std. Meters ³ /Hr. x 35.21 = Std. Ft. ³ /Hr. (SCFH)
Std. Ft. ³ /Hr. (SCFH) x 0.0283 = Std. Meters ³ /hr.
Kilograms/centimeter ² (kg/cm ²) x 14.22 = psi
psi x 0.0703 = Kilograms/centimeter ² (Kg/cm ²)
Kilo Pascals (KPa) x 0.145 = psi
psi x 6.90 = Kilo Pascals (KPa)
Bars x 14.50 = psi
psi x .0689 = Bars
millimeters water (mm H ₂ O) x .0394 = in. w.c.
in w.c. x 25.4 = millimeters water (mm H ₂ O)
millimeters mercury (mm Hg) x 1.868 = in. w.c.
in w.c. x 0.535 = millimeters mercury (mm Hg)

Other Gases

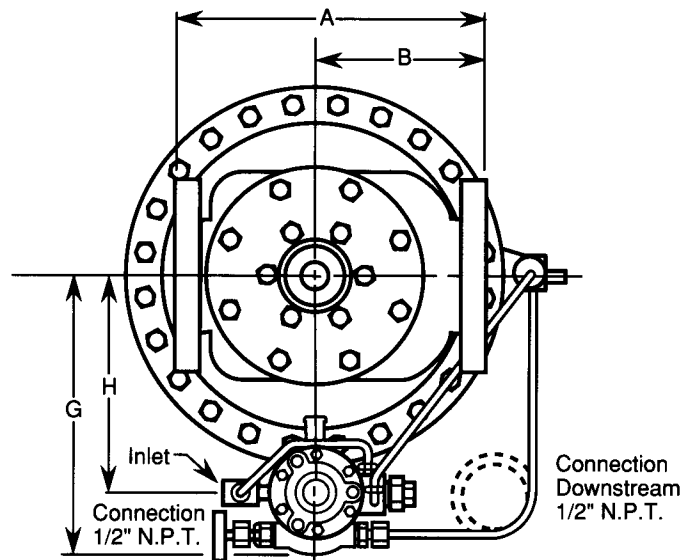
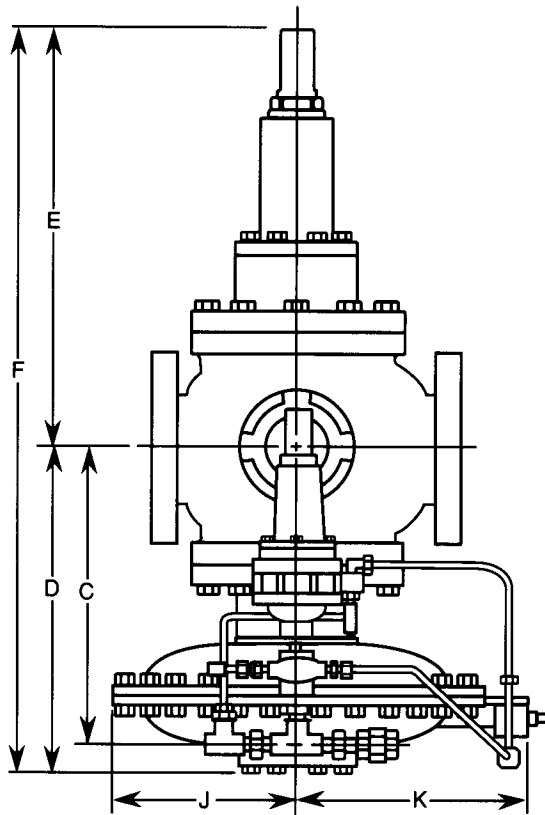
For capacities (in SCFH) of other gases, multiply the table valves on pages 6, 7, 8 and 9 by the correction factor from the table below:

OTHER GASES	CORRECTION FACTOR
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63
For other noncorrosive gases: CORRECTION FACTOR = $\sqrt{\frac{0.6}{\text{Specific Gravity of the Gas}}}$	

441-VPC Dimensions



PIPE SIZE	Screwed		Flanged ANSI 125 lb.		Flanged ANSI 250 lb.		Flanged ANSI 300 lb.		Flanged ANSI 600 lb.	
	A	B	A	B	A	B	A	B	A	B
2"	10	5 ³ / ₁₆	10	5 ³ / ₁₆	10 ¹ / ₂	5 ⁹ / ₁₆	10 ¹ / ₂	5 ⁹ / ₁₆	11 ¹ / ₄	5 ⁵ / ₁₆
3"	11 ³ / ₄	6 ¹ / ₈	12 ¹ / ₂	6 ¹ / ₂	12 ¹ / ₂	6 ¹ / ₂	13 ¹ / ₄	6 ⁷ / ₈
4"	13 ⁷ / ₈	7 ⁵ / ₈	14 ¹ / ₂	7 ¹⁵ / ₁₆	14 ¹ / ₂	7 ¹⁵ / ₁₆
6"	17 ³ / ₄	9 ⁷ / ₁₆	18 ⁵ / ₈	9 ⁷ / ₈	18 ⁵ / ₈	9 ⁵ / ₈
8"	21 ³ / ₈	11 ⁷ / ₁₆	22 ³ / ₈	12	22 ³ / ₈	12



Connection Downstream 1/2" N.P.T.

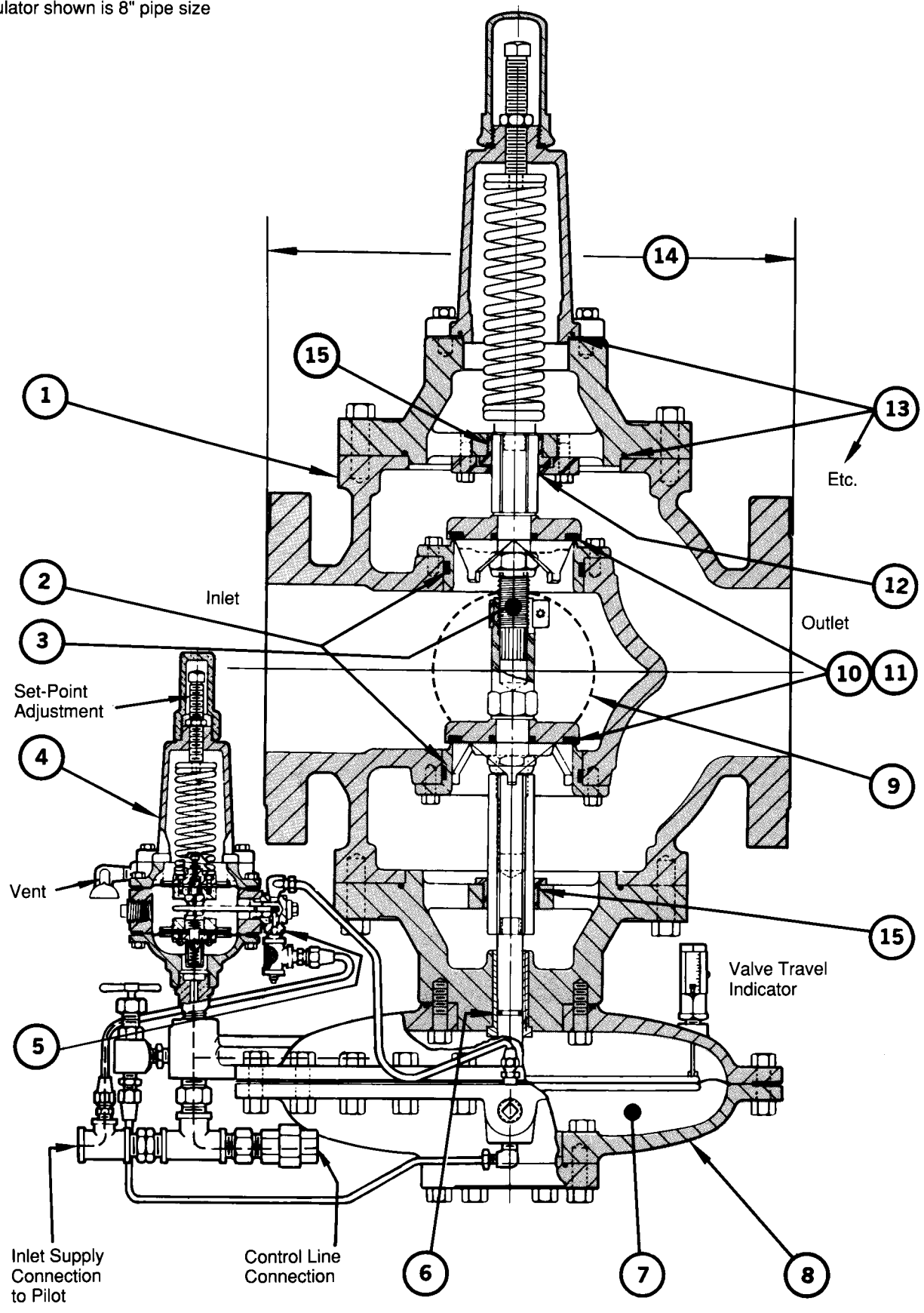
ASSEMBLY	PIPE SIZE	C (approx.)	D	E	F	G	H	J	K	SHIPPING WEIGHT Lbs.
A and B	2" & 3"	12	15	7	22	12 ⁷ / ₈	9 ¹ / ₂	8	10 ¹ / ₂	200 to 255
	4"	15	17 ¹ / ₄	21	38 ¹ / ₄	14 ¹ / ₂	11 ³ / ₁₆	9 ³ / ₄	12 ¹ / ₈	375 to 425
	6"	17	19 ¹ / ₈	22 ⁷ / ₈	42	14 ¹ / ₂	11 ³ / ₁₆	9 ³ / ₄	12 ¹ / ₈	575 to 630
	8"	19 ¹ / ₂	21 ¹ / ₂	25 ¹ / ₂	47	14 ¹ / ₂	11 ³ / ₁₆	9 ³ / ₄	12 ¹ / ₈	700 to 800
C	2" & 3"	12	15	20	35	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	250 to 300
	4"	15	17 ¹ / ₄	21	38 ¹ / ₄	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	430 to 450
	6"	17	19 ¹ / ₈	22 ⁷ / ₈	42	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	630 to 650
	8"	19 ¹ / ₂	21 ¹ / ₂	25 ¹ / ₂	47	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	800 to 830
E F and G	2" & 3"	12	15	20	35	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	270 to 330
	4"	15	17 ¹ / ₄	21	38 ¹ / ₄	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	500 to 550
	6"	17	19	23	42	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	700 to 800
	8"	19 ¹ / ₂	21 ¹ / ₂	25 ¹ / ₄	46 ³ / ₄	13	9 ¹ / ₂	8 ¹ / ₈	10 ⁵ / ₈	950 to 1100

All dimensions are in inches

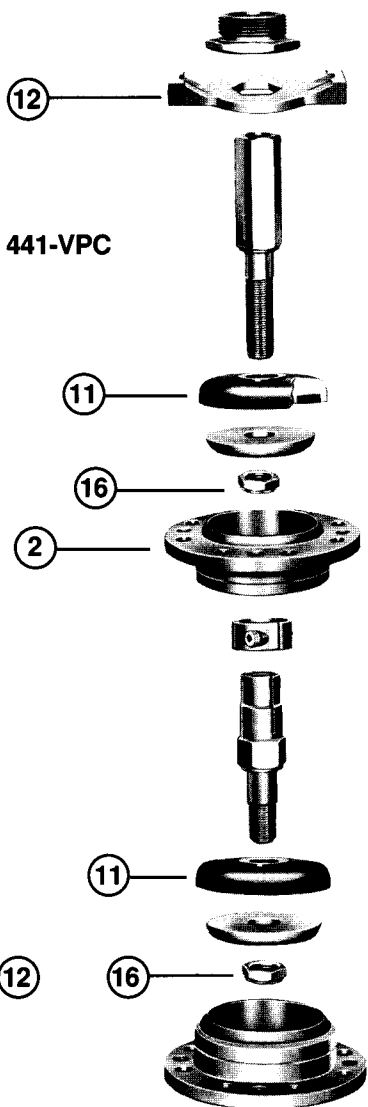
441-VPC

Design Features

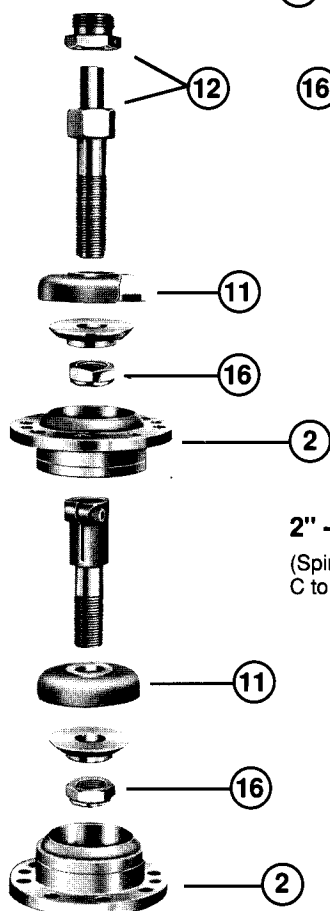
Regulator shown is 8" pipe size



4" - 6" - 8" 441-VPC



2" - 3" 441-VPC
 (Spin Stop (12) on Assemblies C to G is hex type as above)



Features

1. **Standardized "441" Bodies and Inner Valve Assemblies** — easy maintenance — parts are interchangeable with other 441 models.
2. **Flanged Removable Seats (Orifices)** — easily changed — no special tools needed. *Models produced in mid 1992 and later feature O-Ring seals completely interchangeable with previous designs.
3. **Simplified Valve Adjustment** — easy to adjust for tight lock-up — accurate.
4. **Selection of Pilots** — for maximum accuracy, sensitivity, stability — (see page 14).
5. **Readily Accessible Pilot Orifice** — easy to remove for inspection or servicing.
6. **O-Ring Stem Seal** — with removable stainless steel bushing.
7. **Isolated Loading Pressure System** — loading pressure is remotely separated from the remainder of the regulator.
8. **Bottom Mounted Diaphragm Assembly** — out of the way for easier access to valve assembly — provides maximum overall compactness.
9. **Side Inspection Plates** — on both sides of body — quickly removable — O-ring sealed — give easier inspection and servicing.
10. **Balanced Valve, Double Seat** — high capacity — smooth throttling — reduced size valves and V-ports also available.
11. **Molded Polyurethane Soft Seats** — positive tight shut-off — high erosion resistance — will not blow out — hard seats also available.
12. **Spin Stop** — a sturdy guide which neutralizes valve torque — prevents the inner valve from turning or unscrewing.
13. **O-Ring Body Seals** — eliminate gaskets — give more dependable pressure tightness.
14. **Standard Face to Face Dimensions**
15. **Bushing Guided Inner Valve** — above and below the valve assembly — assure correct stem alignment at all times and flush seating.
16. **Lock Nuts** — tight locking — won't vibrate loose

Other Large Capacity Regulators in the "441" Family

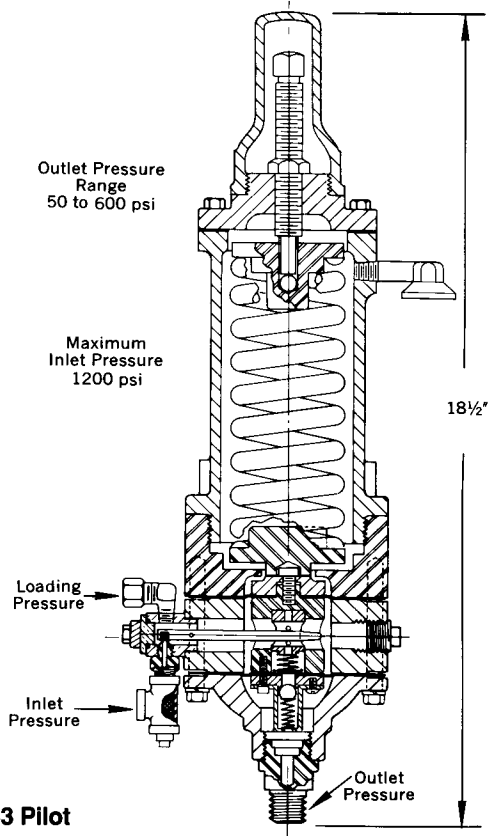
The different models in the "441" family all use the same 441 series of bodies and inner valve assemblies. This provides the advantage of interchangeability for many of the parts, size for size. In addition, procedures for servicing the valve assemblies and adjusting for tight lock-up are essentially alike.

Other models are as follows:

- Models 441-S low pressure regulators (Bulletin R 1350).
- Model 441-57S "roll-out" diaphragm regulator for outlets of 3 to 100 psi (Bulletin R 1360)
- Model 441-X57 high pressure regulators with "roll-out" diaphragm and auxiliary piston (Bulletin R 1361).

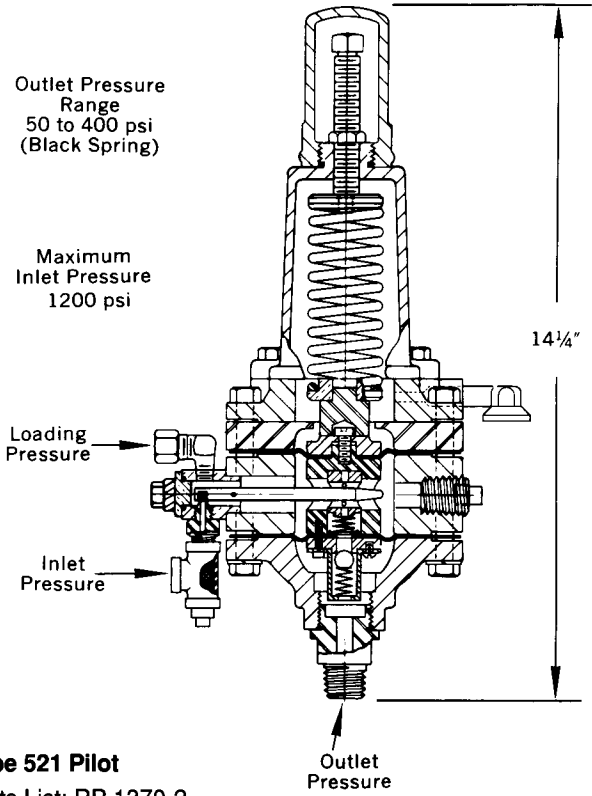
441-VPC

Pilots



Type 53 Pilot

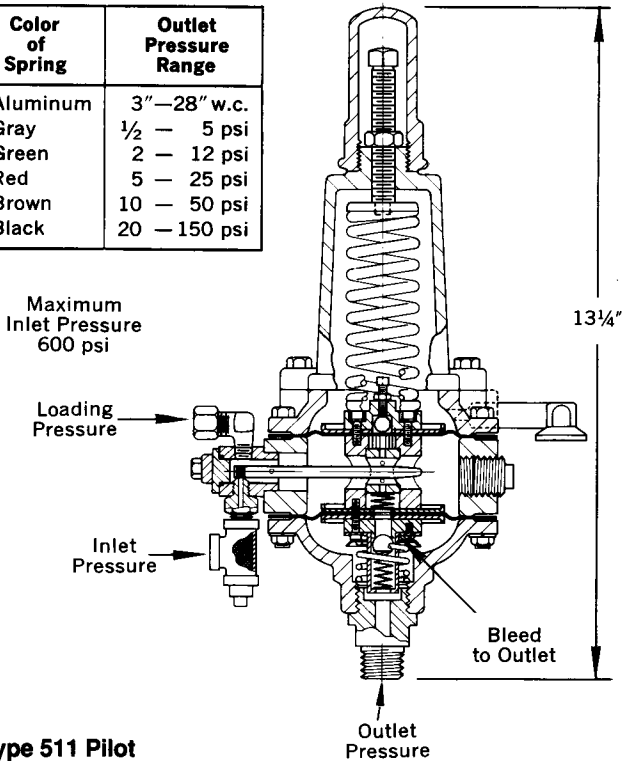
Parts List: RP 1370-2



Type 521 Pilot

Parts List: RP 1370-2

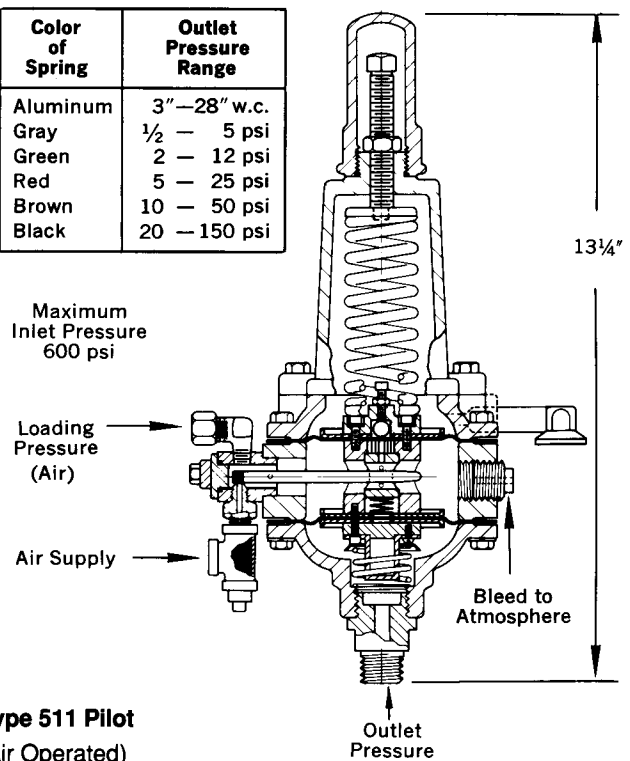
Color of Spring	Outlet Pressure Range
Aluminum	3"–28" w.c.
Gray	1/2 – 5 psi
Green	2 – 12 psi
Red	5 – 25 psi
Brown	10 – 50 psi
Black	20 – 150 psi



Type 511 Pilot

Parts List: RP 1370-1

Color of Spring	Outlet Pressure Range
Aluminum	3"–28" w.c.
Gray	1/2 – 5 psi
Green	2 – 12 psi
Red	5 – 25 psi
Brown	10 – 50 psi
Black	20 – 150 psi



Type 511 Pilot

(Air Operated)

Parts List: RP 1370-1



Pilots

The illustrations on page 14 show the pilots which are used on the Model 441- VPC.

Refer to the "Pressure Range" table on page 3 for the assemblies on which types 511, 521, and 53 are used.

These units have been designed for maximum sensitivity and stability and will produce precision pressure control. For a general description of pilot operation, please refer to page 5.

When inlet pressure varies widely or where air loading is used, a small regulator can be installed ahead of the pilot to maintain a constant pilot supply pressure, similar to what is usually done for instrument control.

Periodic Inspection

Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service and applicable laws and regulations. See bulletin RM-1370 for complete field service instructions and warranty obligation.

How to Order

SPECIFY:

1. Pipe size and MODEL 441-VPC.
2. Assembly letter ("A," "B," etc., refer to page 3).
3. Piping connections (refer to "Construction" table, page 3).
4. Type of pilot (refer to pages 3 and 14).
5. Outlet pressure (also spring range if 511 Pilot, page 14).
6. Inlet pressure (also, maximum and minimum inlet pressures, if available).
7. Capacity required (SCFH).
8. Kind of gas (natural gas, propane, etc.).
9. Trim (standard or stainless steel).
10. If a reduced valve is required, specify size.

Installation and Maintenance see RM 1370

Maximum Emergency Pressures:

The maximum pressure the regulator inlet may be subjected to under abnormal conditions without causing damage to the regulator is:

2" Screwed assembly A with 511 pilot	275 psi
2" Flanged assembly A with 511 pilot	195 psi
3", 4", 6" and 8" assembly A with 511 pilot	195 psi
2", 3", 4", 6" and 8" assemblies B and C with 511 or 521 pilot	625 psi
2", 3", 4" 6" and 8" assembly E with 511 or 521 pilot	650 psi
2", 3", 4" 6" and 8" assembly F with 511 pilot	700 psi
2", 3" 4", 6" and 8" assembly F with 521 or 53 pilot ..	820 psi
2" and 3" assembly G with 511 pilot	700 psi
2" and 3" assembly G with 521 or 53 pilot	1320 psi

The maximum pressure that may be applied to the control line connection without causing damage to the internal parts of the regulator is set-point +25 psi. Set-point is defined as the outlet pressure a regulator is adjusted to deliver.

If any of the above pressure limits are exceeded, the regulator must be taken out of service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced.

The maximum pressure that can be safely contained by the diaphragm case and pilot is:

2" and 3" assembly A with 511	225 psi
4", 6" and 8" assembly A with 511 pilot	175 psi
2", 3", 4", 6" and 8" assemblies B, C, E, F and G with 511 pilot	225 psi
2", 3", 4", 6" and 8" assemblies B, C, E, F and G with 521 pilot	465 psi
2" and 3" assemblies F and G with 53 pilot	700 psi

Safely contained means no leakage as well as no bursting.

Before using any of the above data, make sure this entire section is clearly understood.

Monitoring

The Model 441-VPC can be used as a monitor; a stand-by regulator installed in series which assumes control if a failure in the operating regulator causes the outlet pressure to exceed the set-point.

It can be used to monitor another 441-VPC or to monitor a different regulator. However, note that whenever any standard pilot operated regulator, such as a 441-VPC, is used as a monitor a load limiting regulator should be installed in the inlet supply to the pilot. Its purpose is to prevent chattering in the small relief valve (Item R, Page 4) located in the lower end of the pilot. Use a small capacity regulator. Adjust it for a set-point 5 psi more than the set-point of the 441- VPC with 511 pilot, 10 psi more with 521 pilot and 15 psi more with 53 pilot.

A more simple arrangement for monitoring the 441-VPC employs one of the Equimeter 441 series of self-operated spring regulators. These can be furnished with an identical inner valve to help simplify maintenance and spare parts. In addition, they offer simple design plus excellent standby regulation.

The recommended units are as follows:

- For low pressure use the Model 441-S (Bulletin R 1350)
- For outlet pressures of 3 to 100 psi use the Model 441-57S (Bulletin R 1360)
- For outlet pressures of 75 to 250 psi use the Model 441-X57 (Bulletin R 1361)

For additional information to help with your monitoring requirements, please contact your Equimeter Sales Office.