

# PROPORTIONAIR

THE FUTURE OF CONTROL™



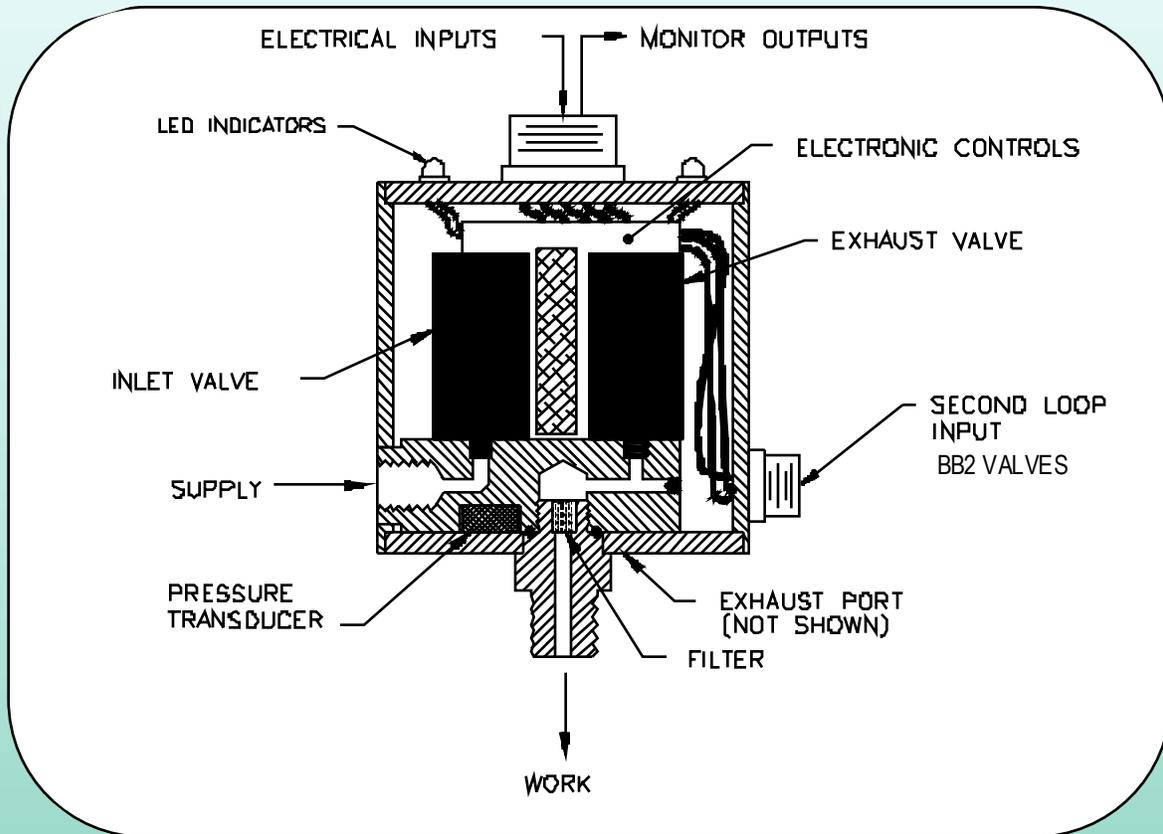
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## **BB1 & BB2**

**PRESSURE CONTROL VALVES**

- \* *Eliminates time consuming manual regulators*
- \* *Increase productivity by reducing cycle times*
- \* *Can be mounted directly on the machine*
- \* *Simplifies installation and design*
- \* *Suitable for European installations*

## THE INSIDE STORY OF THE BB CONTROL VALVE



### FEATURES

- ◆ Electronic control of pressure
- ◆ Quick response
- ◆ Immune to shock and vibration
- ◆ Mounts in any position
- ◆ CE approved
- ◆ Can be field recalibrated
- ◆ Analog or digital command option
- ◆ Non air consuming in steady state

### BENEFITS

- ◆ Eliminates time consuming manual regulators
- ◆ Increase productivity by reducing cycle times
- ◆ Can be mounted directly on the machine
- ◆ Simplifies installation and design
- ◆ Suitable for European installations
- ◆ Saves costly downtime
- ◆ Allows many control options
- ◆ Reduces noise and saves energy

### APPLICATIONS

- ◆ Automotive manufacturing
- ◆ Instrumentation
- ◆ Spray painting
- ◆ Resistance welding
- ◆ Paper manufacturing
- ◆ Food processing
- ◆ Metal processing
- ◆ Environmental waste management

## FUNCTIONAL DESCRIPTION

### THEORY OF OPERATION

The BB series valve uses Proportion-Air closed loop technology for pressure control. It gives an output pressure proportional to an electrical command signal input.

#### BB1

The BB1 is a complete closed loop servo system consisting of valves, manifold, housing and electronic controls.

Pressure is controlled by the use of two solenoid valves.

One valve functions as inlet control, the other as exhaust.

The pressure output is measured by a pressure transducer internal to the BB1 and provides a feedback signal to the electronic controls. This feedback signal is compared with the command signal input. A difference between the two signals causes one of the solenoid valves to open, allowing flow in or out of the system. Accurate pressure is maintained by controlling these two valves.

#### BB2

The BB2 is similar to the BB1 but uses a double loop control scheme. In addition to the internal pressure transducer, the BB2 receives an electrical signal from an external sensing device that is provided with the valve. This primary feedback signal is compared against the command signal input. This comparison is then summed with the internal pressure transducer signal. The gain of the circuit is such that priority is given to the external feedback signal. A difference between the command signal and the feedback signal causes one of the solenoid valves to be activated. Since the external feedback signal is electrical, control is not limited to pressure. Using other types of sensors allows control over parameters such as force, position, flow, etc. Usually in these applications the BB2 valve functions as pilot to a slave valve controlling the end result. With a sensor providing system feedback, the package becomes a closed loop servo system.

### COMMAND SIGNAL

Command signal inputs come in one of three choices; analog-voltage, analog-current, or 8 bit digital. Analog driven units give virtually an infinite range of pressure outputs from zero to full scale†. Digital units give 255 increments of pressure plus zero. For multiplexing situations (many valves run off the same buss line) there is a digital latching version. This option gives the ability to address which valves are to respond to signal changes, while others remain dormant. An additional latch bit is required for use on digital latching valves.

### OUTPUT SIGNALS

The BB has monitor options available for output to a panel meter or for data acquisition needs. These outputs consist of an analog monitor signal and a one bit TTL signal. The BB1 analog monitor signal is an amplified signal from the internal pressure transducer. The BB2 analog monitor signal output is a signal from the external transducer connected to the BB2.

Providing this monitor signal as part of our standard package eliminates the need for the customer to purchase a separate transducer since the signal is a true depiction of downstream pressure.

All valves come with a red LED light to indicate power to the valve. When ordered with monitor option, an additional green LED and a TTL output are also included. The TTL is a logic signal that is at 0 Vdc when the output is within 1% of the command and 5 Vdc when outside 1%. The green LED is a mirror image of this signal, being lit when within 1%.

## BB GENERAL SPECIFICATIONS

ELECTRICAL	MINIMUM	TYPICAL	MAXIMUM
Supply Voltage	15VDC	-	24VDC
Supply Current	100mADC	-	250mADC
Command Signal			
Voltage	0VDC	-	10VDC
Current	4mADC	-	20mADC Sinking
Current (S191 & S143)	4mADC	-	20mADC Differential
Analog Monitor Output			
Voltage	0VDC	-	10VDC
Current	4mADC	-	20mADC Sinking
Current (S216)	4mADC	-	20mADC Sourcing
Command Signal Impedance			
Voltage	4230	-	5170 $\Omega$
Current	420	-	520 $\Omega$
Current (S191)	-	100 $\Omega$	-
Current (S143)	-	25.5 $\Omega$	-
TTL Monitor Output	0VDC	-	5VDC @ 20MADC
Digital Input Signal	2.5	-	24VDC @ 1mADC
Digital Latch Time	-	200 $\mu$ s	-
Digital Latch Logic	-	Latched-High	-
PNEUMATIC	MINIMUM	TYPICAL	MAXIMUM
Inlet Pressure	Full Vacuum	110% of full scale calibration	330 psig (22.75 bar)
Pressure Range	Full Vacuum	-	300 psig (20.68 bar) <sup>(1)</sup>
Flow Rate	-	-	1.2 SCFM max & 100 psig inlet (34L/min @ 6.89 BAR)
Flow Rate (S81)	-	-	3.5 SCFM max @ 100 psig inlet (99L/min @ 6.89 BAR)
Cv (Kv) Capacity	-	0.04 (0.3)	-
Cv (Kv) Capacity	-	0.13 (0.11)	-
Filtration Required	40 micron	20 micron	-
Repeatability	-	$\pm 0.02\%$ F.S.	$\pm 0.0\%$ F.S.
Accuracy (Pressure)	-	$\pm 0.2\%$ F.S.	-
Linearity/Hysteresis	-	$\pm 0.15\%$ F.S.	-
Critical Volume	-	1 in <sup>3</sup>	-
PHYSICAL	MINIMUM	TYPICAL	MAXIMUM
Operating Temperature	32°F (0°C)	-	158°F (70°C)
Environment Protection	-	NEMA 1/IP50	-
Weight			
BB1	-	1.3 lbs (0.5 kg)	-
BB2	-	1.5 lbs (0.68 kg)	-
Housing	-	Anodized Aluminum	-
Finish	Black Anodized	Black Anodized	-
Electrical Connector	-	3 pin, 5 pin or 18 pin digital	-

(1) Pressure ranges are customer specified.

# PERFORMANCE CHARACTERISTICS

## LINEARITY

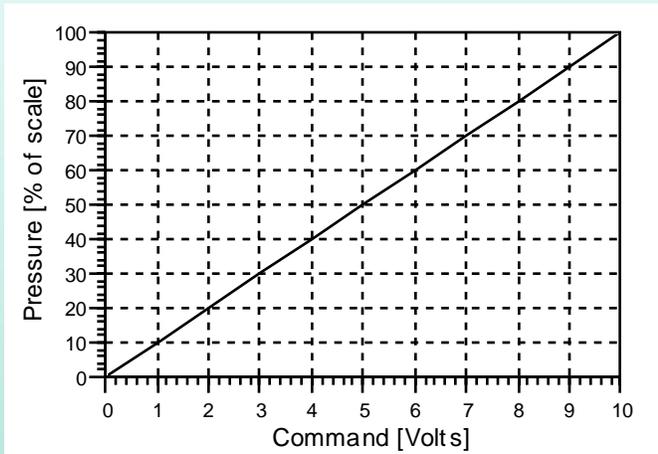


Fig. 1 This chart shows linear characteristics of BB products when given a ramp signal from 0-10 volts. Characteristics would be similar for 4-20 mA units.

## RESPONSE TO STEP INPUT

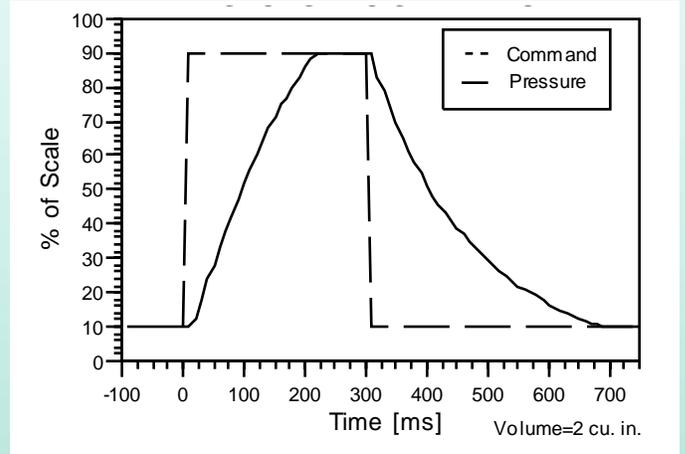
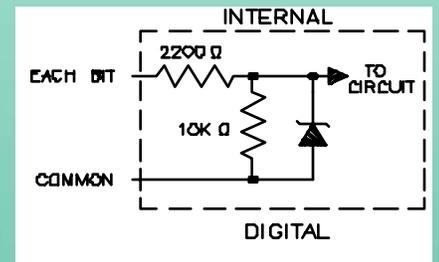
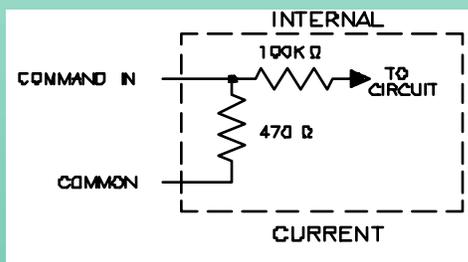
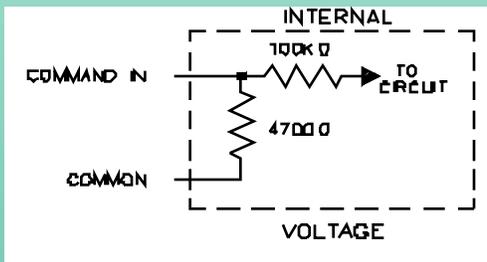


Fig. 2 Times for BB control valve to fill/exhaust a closed chamber. Step command signal is superimposed over pressure trace. Time is determined by difference between command signal and pressure achieved.

## TECHNICAL INFORMATION

BB2 control valves have a variety of command signal options. The following diagrams illustrate information concerning these command options.



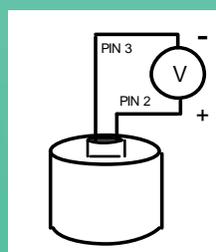
## MONITOR SIGNAL OUTPUTS (OPTIONAL)

BB2 products ordered with the monitor signal (F option) have two additional output lines, analog output and TTL output. The analog output is a buffered signal from the internal pressure transducer. The TTL signal is a conditional on/off signal to use for diagnostic purposes. This signal is LOW when the pressure is within 1% of final setting.

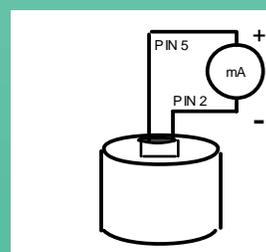
### Analog Output

Voltage = 0-10 VDC sourcing  
Current = 4-20 mA sinking  
(open collector)

#### Voltage

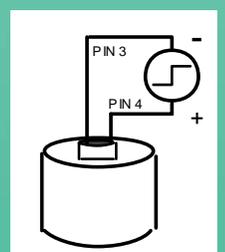


#### Current



#### TTL Output

Low = 0 VDC  
High = 5 VDC

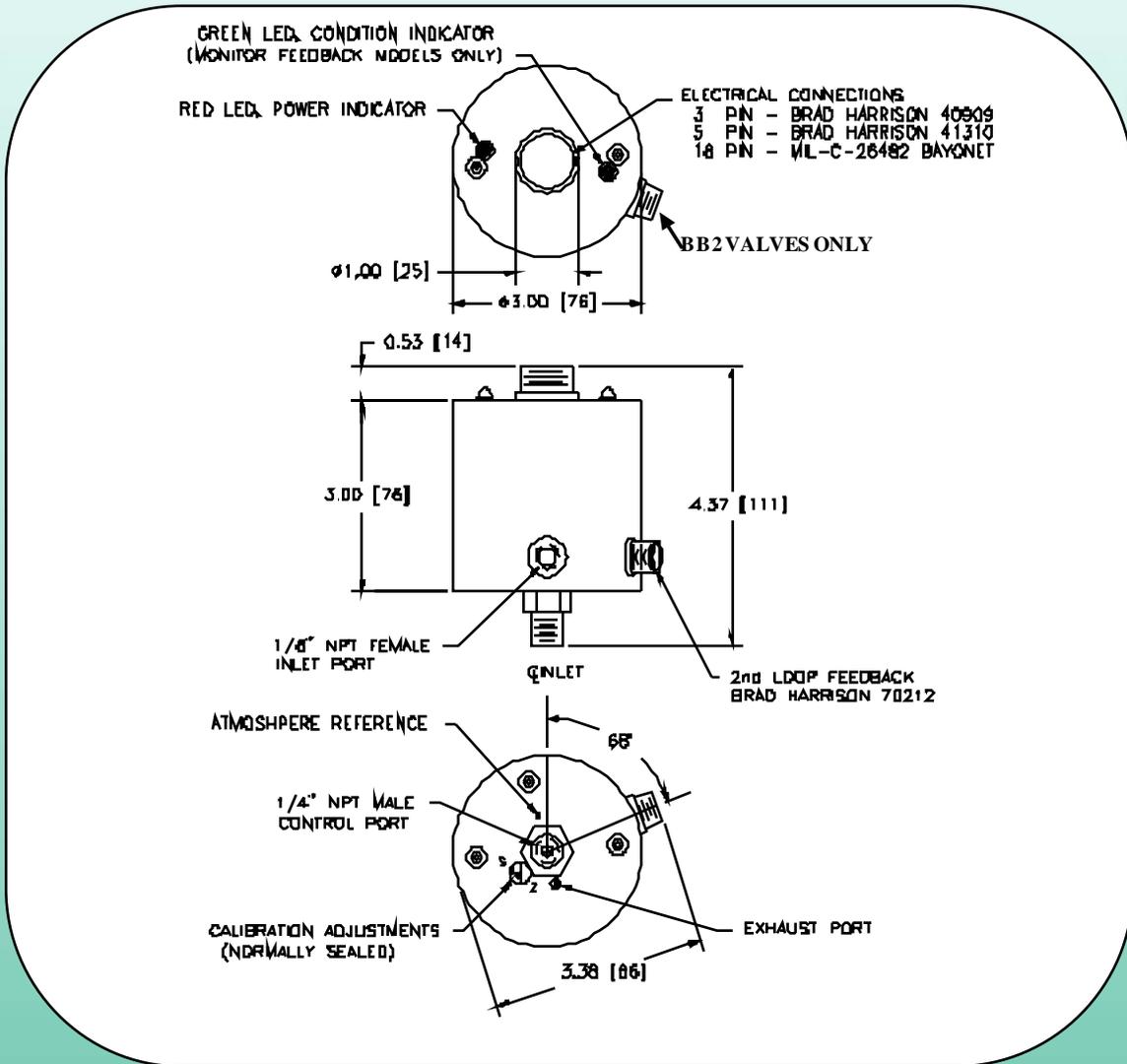


# DIMENSIONS BB

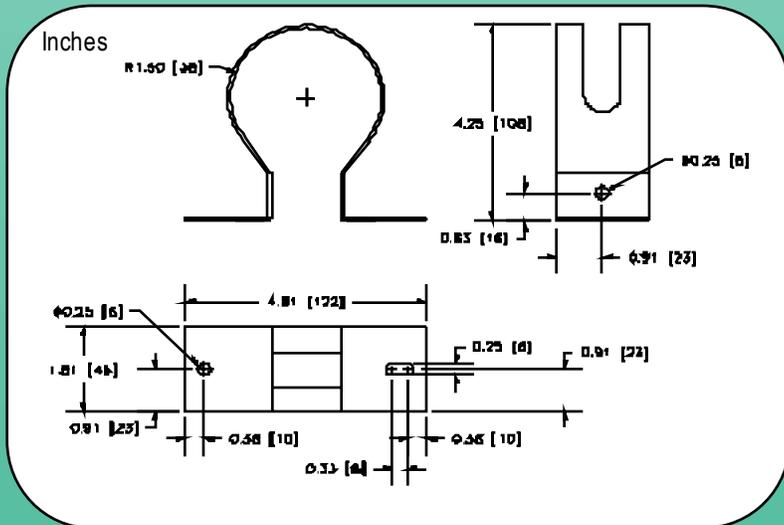
DIMENSIONS ARE FOR REFERENCE USE ONLY

Inches (mm)

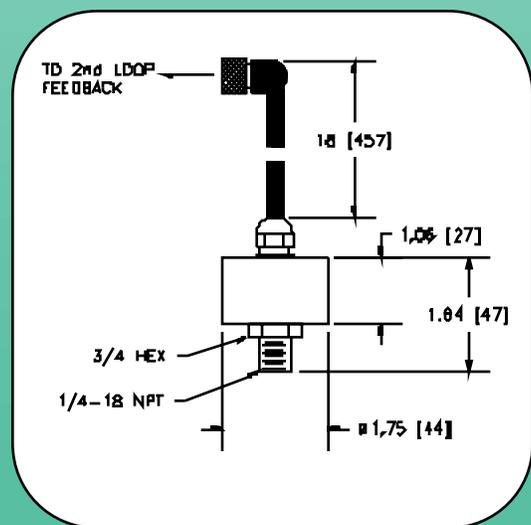
## BB VALVE



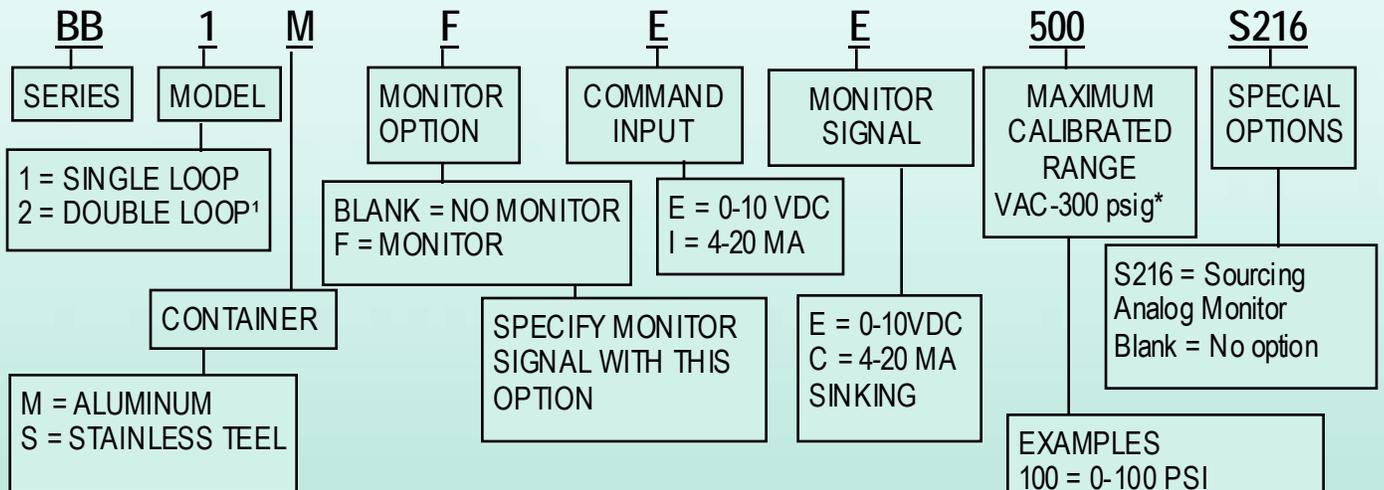
## BKT-01 BRACKET



## DS SERIES PRESSURE TRANSDUCER



## BB ORDERING INFORMATION



<sup>1</sup> For the BB2 to work properly, an external feedback source must be connected to the BB2. ADS Series external pressure transducer is supplied with all BB2 valves that do not have option # S59 (BB2 built without the external pressure transducer). The transducer provided with the BB2 has been scaled to match the pressure range specified when the BB2 was ordered. For complete information on the DS Series, please refer to brochure # BRDS-WT.

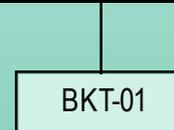
\* Check special options for Pressure ranges not starting at "0" psig .

## ACCESSORIES

### POWER CORD

3 PIN CORDS	
H6033	3' length
H6036	6' length
H6312	12' length
H6315	15' length
H6320	20' length
5 PIN CORDS	
H6053	3' length
H6056	6' length
H6512	12' length
H6515	15' length
H6520	20' length
DIGITAL CORDS	
13 PC-10	10' length (Additional lengths available)
H618P	Electrical Connector. No Cord.

### MOUNTING BRACKETS



## HIGH FLOW PACKAGE OPTIONS

BB1 & BB2 pressure control valves coupled to PSR Series volume boosters for higher flow capabilities.

BB1/PSR ASSEMBLY<sup>1</sup>



BB2/PSR ASSEMBLY<sup>2</sup>



<sup>1</sup> For a complete information on the BB1/PSR assembly, see brochure # BRBB1-QB1/PSR.

<sup>2</sup> For a complete information on the BB2/PSR assembly, see brochure # BRBB2-QB2/PSR.

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***WE MAKE ONE PRODUCT THOUSANDS OF WAYS***

Proportion-Air products are warranted to the original purchaser only against defects in material or workmanship for one (1) year from the date of manufacture. The extent of Proportion-Air's liability under this warranty is limited to repair or replacement of the defective unit at Proportion-Air's option. Proportion-Air shall have no liability under this warranty where improper installation or filtration occurred.

All specifications are subject to change without notice. THIS WARRANTY IS GIVEN IN LIEU OF, AND BUYER HEREBY EXPRESSLY WAIVES, WARRANTIES OR LIABILITIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY OBLIGATION OF PROPORTION-AIR WITH REGARD TO CONSEQUENTIAL DAMAGES, WARRANTIES OF MERCHANTABILITY, DESCRIPTION, AND FITNESS FOR A PARTICULAR PURPOSE.

WARNING: Installation and use of this product should be under the supervision and control of properly qualified personnel in order to avoid the risk of injury or death.