Bud Orr Custom Deluxe MegaBooster

Manual Version 2.0

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Concept Of Operations

Purpose

The purpose of the Megabooster is to take pre-charge air source of around 2000 PSI and boost the pressure to 3000 or 4500 PSI; the pressures found in the Nitrogen/Compressed Air cylinders commonly used in paintball.

Advantages

Cost savings of renting 2200 PSI cylinders versus 6000 PSI cylinders (source cylinders) giving the owner a more economical and efficient use of money spent on Nitrogen.

Allows fields and stores to fill 3000 and 4500 PSI paintball cylinders without having to maintain a high pressure (HP) air compressor. The megabooster works with pre-charge air from source cylinders and will boost pressures from as low as 900 PSI up to 3000 or 4500 PSI.

Compared to a HP cascade fill station, gives a higher percentage of usable air per source (cascade) cylinder.

The Megabooster is an easy to use, low maintenance* device

Low maintenance means we recommend rebuilding the Megabooster once a year, the cost of the rebuild kit runs $56.

Can be used with more than one source cylinder, thereby eliminating the need for cylinder changes during busy times.

6) Allows room for future upgrades to the system, including the addition of a High Pressure (HP) air compressor, allowing the owner to refill the source cylinders

7) WGP now makes custom length Parker® hoses and carries a full line of HP fittings and hoses.

Configurations

The Megabooster currently is available in two configurations:

Single-ended booster- This booster has one LP piston and one HP piston. This model was introduced in response to the need for a lower cost Booster system for fields and stores who do not have the need for the more expensive double-ended system. This configuration requires a drive air source of 130 to 140 PSI @minimum 6 CFM.

Double-ended booster – This booster has one LP piston and two HP pistons, which means that it pumps twice on every stroke, and therefore pumps faster than the single-ended booster. This configuration requires a drive air source of 100 to 130 PSI @minimum 6 CFM.

Both systems are shipped as a "turn-key" system, meaning you can simply unpack, set up, and if you already have your source cylinders, a Low Pressure (LP) 100 to 140 PSI @ 6 CFM air compressor, and required hoses (available from us), immediately begin using the Megabooster.

Booster Theory

The Megabooster takes High Pressure Air (HPA)/Nitrogen (900-3500 PSI) and boosts the pressure into the small cylinders commonly used in paintball. The Megabooster does this by using a low pressure air source (100-140 PSI) against a large Piston (LP piston), which pushes a valve, thereby compressing the HPA/Nitrogen. Both the single and double-ended Megabooster use a piston ratio. The 100-140 PSI air is known as the "drive air" and is typically delivered operator to "throttle" the speed of the Megabooster. This drive air pushes against the LP piston, which then pushes the smaller piston and compresses the HP air from the source cylinders through a one-way valve and into the output line. A gauge on the output line tells the operator the pressure in the output line to the receiving cylinder.

"Drive"Air Requirements

The Minimum requirements for this compressor are at least 6 Cubic Feet per Minute (CFM) at 90 PSI. When purchasing a compressor, take care to look at the rating, since most compressors are rated at Both 45 PSI and 90 PSI. A good compressor should also have a tank of at least 30 to 60 gallon capacity. The larger standup models with tanks of 80 gallons are a better choice. Typically, these compressors will cost around $400. Another important requirement for the drive air (LP) is an air drier.

When compressing atmospheric air, condensation (moisture) is formed. This moisture can cause problems in the Megabooster. Higher end compressors will include a moisture trap, but these moisture traps usually will not provide a high enough level of moisture removal or flow. Industrial moisture traps are available from WGP and are highly recommended. We also recommend when you install the new air compressor, you bypass the standard pressure regulator on the unit and draw your LPl air directly from the cylinder. We are happy to provide further help in accomplishing this.

For remote locations that do not have access to power, commercial compressors that run off of a small gas powered engine are also available. The same CFM requirements listed above apply.

Remote locations can also use a Nitrogen cylinder with a high-flow regulator (available from WGP) as drive air (LP). This is a unique setup and we are happy to assist you in setting up this type of system, although due to the high CFM requirements of this type of setup, we do not recommend it. We have found the use of Nitrogen for drive air be costly and inefficient.

Source Air

Your source/cascade air can come from a couple of sources, mostly either pre-filled nitrogen cylinders or High Pressure Air (HPA) from an industrial HP air compressor. Either way, the source air is stored in one or more cylinders typically called your source bank of cylinders. Nitrogen cylinders are available in several different pressures, including 2200, 3000, 3600, and 6000 PSI. If you use the 3600 or 6000 PSI cylinders, you can fill through the booster until the pressure drops to the point that a boost is required.

Air Hoses

Two types of air hoses are required for the Megabooster: LP and HP. The LP hose connects the LP air compressor to the Megabooster and supplies the drive air. These hoses are available from auto supply and hardware stores, but are not made to handle the workload required in paintball use. LP hoses from Wal-Mart and automotive supply places are too small and restrict the flow too much, regardless of what CFM your air compressor is capable of. LP hose and fittings from WGP are from Parker®, come with a 1-year warranty, and are made to custom lengths from the factory.

HP hose and fittings are also Parker®, also come with a limited 1 year warranty, and is also custom made at the factory. Including multiple source cylinder "cascade" setups, HP hose and fittings can be made to specific applications.

CGA Fittings

The Compressed Gas Association (CGA), National Gas Outlet (NGO), and Transportation Canada (TC) sets the standards for valves on most cylinders that involve compressed air and other gases. For example, the CGA fitting on a CO2 cylinder is CGA 320, and can be found stamped into the valve body. The most common CGA fitting for Nitrogen cylinders is the CGA 580 connector. The CGA 580 connector is found on 2200 PSI cylinders; which we highly recommend for use the Megabooster system. We have found the 2200 PSI cylinders cost work on Nitrogen cylinders up to 6000 PSI. For us to build your system, you must first decide on what types of cylinders you are planning on using , and getting the CGA fitting number to WGP. Your Nitrogen provider should be able to provide that information. This will enable WGP to properly set up your system for your specific needs.

Caution

OSHA requirements are that all a compressed air cylinders be secured in position. Using a strap or chain that holds the tanks against the wall or a support will satisfy their requirement.

Training

WGP staff is always ready to assist you with any type of support you may need; anything from a simple to a question to personally coming out, setting the system up, and trainings your staff is available. For more information on on-site setup and training, please contact Bud or Jerry at (562) 802-9533.

Air Volume Theory

How many fills can I get out of a cylinder? To figure out this question, we must first understand how cylinders are rated. The small fiber-wrapped cylinders used in paintball are commonly referred to as 68 cubic inch and 114 cubic inch cylinders. These numbers refer to the water volume, or true volume, of these cylinders. Using this water volume figure, we can figure out the air volume of the cylinder. To do this, we will follow 3 steps:

Step 1 Convert cubic inches to cubic feet (water volume)
Step 2 Determine pressure constant numbers
Step 3 Multiply cubic feet by pressure constant
This will give you Standard Cubic Feet (SCF)

Step One **Convert cubic inches to cubic feet**

Dividing our water volume size (in cubic inches) by 1728, which will give us the **water volume** in cubic feet of the cylinder.
Example: a 68 cubic inch cylinder divided by 1728 equals .039 cubic feet

Step Two Find **the constant**

Find the constant that will allow you to calculate the amount of air in a given **water volume** amount of a cylinder. The constants are:

Air

1800 PSI = 124.57
3000 PSI = 198.95
4500 PSI = 274.64

Nitrogen
1800 PSI = 122.25
3000 PSI = 193.82
4500 PSI = 266.61

As you can see, the numbers for Air and Nitrogen are a little different, this is because Air is 78% Nitrogen and 21% Oxygen, while Nitrogen is pure and has no oxygen. That 21% Oxygen makes a difference.

Step Three Multiply cubic feet by the constant

A 68 cubic inch cylinder, which is .039 cubic feet true volume, is multiplied by the pressure constant of the cylinder (3000 PSI). We are filling with pure nitrogen. .039 multiplied by 193.82 equals 7.56 Standard cubic Feet (SCF). This means that our 68 cubic inch, 3000 PSI cylinder when filled with Nitrogen will use 7.56 cubic feet of air from the source cylinder. (Note: This is only if the paintball cylinder is completely empty)

Or, for you lazier folks like myself, a cheat sheet is attached in the rear as appendix A:

Frequently Asked Questions

Q: "How any Nitrogen cylinders will I need for my tournament players this weekend?"

A: To find this, we need to keep in mind that the Mega booster system can boost air pressure from your source cylinders until the pressure drops to around 900 PSI. You can continue to pull air from source pressure below 900 OSI, bur it starts becoming counterproductive. If we consider a 200 PSI source cylinder and we only use down to 900 PSI, then we are effectively using 59% of the air volume in that cylinder. The volume of air in a standard 2200 PSI Nitrogen cylinder is 255 SCF. If we only use 59% of the air in a cylinder, then .59 times 255 equals 150.5 SCF of usable air in a 200 PSI standard Nitrogen cylinder. If we are only filling 68 ci 3000 PSI cylinders that are empty, then using the 7.56 SCF rating we calculated earlier, we find that we can get roughly 19 fills per source cylinder. Keep in mind this math is based on empty cylinder fills; many cylinders you will fill will have some air left in them and will be simply "topped off" If it costs $10 to get the 2200 PSI cylinders filled, and you get 19 fills from each tank, (Keeping in mind this number works for cylinders that were empty, many times players

are looking to “top off” their cylinders), then 19 fills per source cylinder into $10 per fill is $.53 per fill for the nitrogen.

Q: Should I lubricate my Megabooster?
A: The Megabooster is designed to be used without lubrication other than the lubrication put on at the factory. Ensure there is not an inline-oilier that came with you drive air LP compressor.

Q: My Megabooster seizes up every now and then, but if it sits awhile, it begins to work again.
A: Typically that is caused by moisture in the drive air line. This moisture causes a small piston which pushes on the shuttle valve to cock sideways, and prevents the booster from operating. To fix this problem immediately, go to Appendix B. The long-term solution to this problem is t add an industrial, LP high-flow moisture filter between you compressor and you Megabooster. These moisture filters are available from WGP

Q: Can I use my Megabooster to fill my source cylinders?
A: Certain models of the Megabooster can fill the bulk cylinders, but based on our testing of these systems, it would take up to 8-10 hours to fill one source cylinder, depending on pressure and size of cylinder. The Megabooster is designed to run in short burst such as filling paintball cylinders, not for sustained operation that would cause excessive wear and heat build-up.

Q: Can I fill both the Paintball Mania Style connectors and the quick disconnect connectors with this system?
A: Yes, Figure 1 shows the fill whip with Quick Disconnect adapter included with Megabooster system.

Q: Can I use CO2 cylinders as my drive air source?

A: We do not recommend it. The problem is that the Megabooster requires such as high flow of air to power the system it causes a quick and raped drop of temperature and pressure in the CO2 cylinder. This, combined with impurities common in CO2 can cause problems with the Megabooster.

Q: Are the bleed-off valves rebuildable?
A: Yes, the knob has a small white (Teflon) seal installed, and WGP carries the replacement knobs.

Q: Does WGP carry spare parts and rebuild kits for the Megabooster?
A: Yes, WGP carries a full line of parts and rebuild kits from Teledyne. WGP also offers a unit replacement in the event of catastrophic failure. We will send you another booster system for replacement, which minimizes your down time.

Q: What is the warranty period?
A: WGP offers a 90 day warranty period on the booster and valves, and 1 year on all hoses.

Q: What do I do if I have a problem while under warranty?
A: WGP is the only Teledyne authorized factory warranty repair facility. Call (562) 802 9533 and talk to Kevin or Bud. We can take care of most any problem you have with your Megabooster.

Q: How do I make sure I have the most current version of this manual?
A: Go to www.worr.com/megabooster/ for instruction on upgrading your manual.

Step and Installation

Tools required for Installation

Drill	Drill Bits
2, 11/16” Wrenches	Crescent Wrench
Teflon Tape	

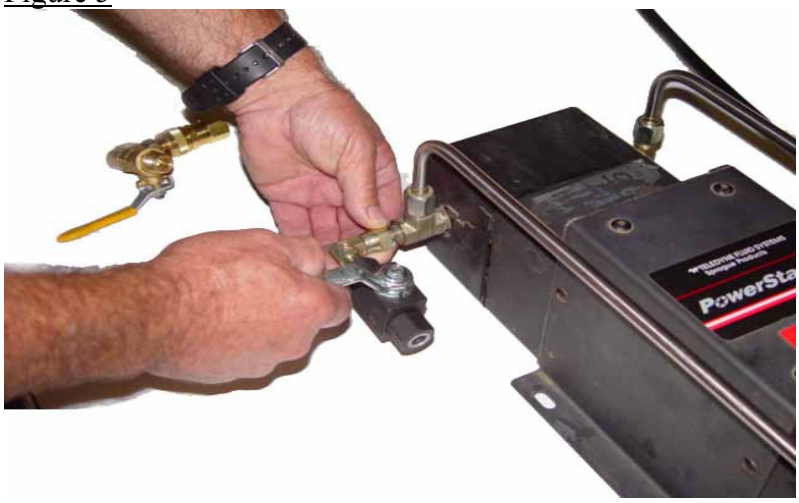
First, unpack all items from the box, and compare these items against the packaging checklist. The major components are shown in the picture to the right. Inspect all components for damage during shipping. WGP recommend you use appropriate safety gear when installing the Megabooster, including safety glasses and gloves. Looking at the end of the Megabooster you will see arrows molded in to the plastic to help show the direction of airflow.

Warning

The Megabooster must be secured to a table or wall using 4 hefty wood screws or bolts, and the 2 U-bolts included with the Megabooster. Failure to secure the Megabooster could cause serious bodily injury in the event of component failure. Do not tamper with or remove the relief valve on booster.

Step 1. Begin by securing the Megabooster to the mounting surface, such as a table or bench, as shown in Figure 3.

Figure 5



Step 2. After securing the Megabooster, next install the inlet side air valve. Do this by attaching the compression fitting to the inlet side of the Megabooster. To properly orient the Megabooster, see Figure 3. Note that the small red plug where the drive air assembly attaches is close to you when the system is ready for use. Once attached, tighten the compression nut to 20 ft/lbs (Figure 5)

Step 3. Locate the output side (Figure 6) and install the compression fitting the same as with the inlet side, also torquing the compression nut to 20 ft/lbs. Correct placement of the outlet side can be seen in Figure 6. Once this is accomplished, the holes for the U-bolts (provided) can be drilled and the U-bolts installed, as in figure 4. Again, ensure the flat plates are installed on the bottom of the U-bolts underneath the mounting surface before the nuts are installed.

Step 4 Install the drive air assembly (Figure 7) onto the Megabooster. Remove the red plug in the top of the Megabooster. The pipe threads on the Drive Air Assembly should be coated with 2 wraps of Teflon tape. If not, install 2 wraps of Teflon tape leaving the first 2 threads uncovered, and screw the Drive Air Assembly into the top of the Megabooster. Tighten until the Drive Air Assembly is aligned as in Figure 15. Note that the Drive Air Assembly has a quick-disconnect fitting installed, and is ready to attach to you LP hose from the air compressor.

Step 7 Attach you LP drive air to the _" Quick Disconnect adaptor

The unit is now installed and ready for use. Please proceed to operating instructions, and ensure operators wear appropriate safety gear.

Operating Instructions

Warning

When operating the Megabooster the operator must wear appropriate safety fear, including safety classes and gloves. They also must give their undivided attention to the operation of the unit. We recommend the operator be responsible for operation the Megabooster system only! Have someone else collect the money and inspect cylinders!

Step 1. Pay Attention!!! Different paintball cylinders have different configurations. Some systems have shutoff built into the regulator body. If the player does not open the shutoff after connecting the fill whip to the system, you can easily exceed the pressure rating of the fill whip with only a few strokes of the Megabooster.

Step 2 Perform a simple inspection of the player's cylinder. A checklist is provided as appendix E, **but do not fill cylinders with the following**:

1. Expired hydrostatic test date: A HPA cylinder must be hydrostatically tested every 3 years. DO NOT fill cylinders that are out of date!
2. Any scratches or dings which turn the fiber wrapping white. The white color indicates an impact of sufficient force to possibly compromise the integrity of the fiber wrap. WGP recommends the use of removable covers, which provide protection to the HP cylinder.
3. Cylinders with any stickers or non-removable labels which would prevent you from properly inspecting the cylinder.
4. ANY type of after-market modification that could possibly compromise the integrity of the system, which includes the cylinder, regulator/valve, and air lines.

Note the pressure rating of the cylinder

Step 3. Connect the cylinder to the fill hose. If the cylinder has the screw-on connector such as the Paintball Mania Systems, the fill hose can be screwed directly onto the cylinder. If the cylinder has a small quick-disconnect connector, screw the adapter into the fill whip, and connect to the cylinder.

Step 4. Ensure the fill side lever is in the off position (straight up), and the bleed valve is closed.

CAUTION

When closing the bleed valve, close it only enough to stop the leak. The bleed valve uses a soft Teflon seal, which can easily be damaged if over-tightened. Read the attached appendix C to this manual regarding proper operation of the bleed valve.

Caution

Ensure at this point that if the paintball cylinder has an on-off valve built into the regulator, the on-off valve is opened. Failure to open the on-off valve on the paintball cylinder can result in fill line overpressure with only a few strokes of the Megabooster

Step 5 Slowly open the input-side fill lever to allow HP air to enter the Megabooster.

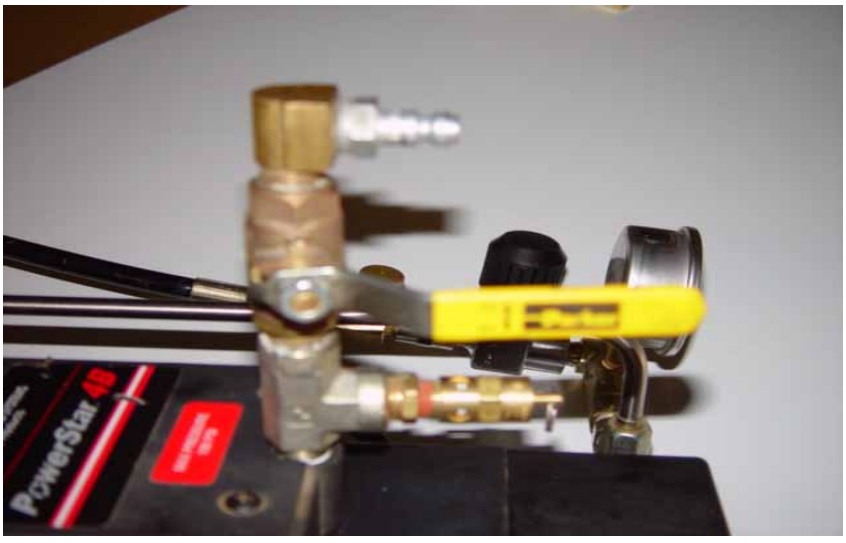
Warning

When working with compressed air or gases, always open and close valves slowly, this lessens the initial pressure shock, which is the primary cause for component failure.

Figure 14

Step 6. Slowly open the fill lever (Figure 14) to allow pressure from the paintball cylinder to equalize the pressure in the fill line from the Megabooster to the paintball cylinder. At this stage note the pressure on the Megabooster gauge. DO NOT pay attention to the gauge on the paintball tank, the Megabooster gauge is much more accurate.

Figure 15



Step 7. Slowly open the drive air valve (Figure 15) allowing the Megabooster to begin operation. Pay careful attention to the Megabooster pressure gauge, as the gauge will climb very quickly if the paintball cylinder valve is not open. Slowly open the drive air valve, filling the cylinder. As the pressure approaches the rating of the cylinder, slowly begin to close the drive air valve, “throttling” the speed of the Megabooster as the pressure approaches the rating of the cylinder.

Step 8 when the gauge pressure reaches the pressure rating of the paintball cylinder; stop the Megabooster by closing the drive air valve.

Step 9 If equipped, have the player shut off the paintball cylinder valve.

Step 10 Slowly close the fill lever.

Step 11 Slowly unscrew the bleed-off valve, allowing the residual pressure in the fill line to bleed off.

Step 12. Tighten the bleed-off valve lightly

Warning
When closing the bleed valve, close it only enough to stop the leak. The bled valve uses a soft Teflon seal, which can easily be damaged if over-tightened. Read the attached appendix to this manual regarding proper operation of the bleed valve.

Step 13 Disconnect the fill line from the paintball cylinder

Appendix A
Air Volume Cheat Sheet

Nitrogen
4500 PSI
45 in_ = 6.94 SCF
68 in_ = 10.49 SCF
114 in_ = 17.59 SCF
3000 PSI
45 in_ = 5.05 SCF
68 in_ = 7.63 SCF
114 in_ = 12.79 SCF

Air

4500 PSI
45 in_ = 7.15 SCF
68 in_ = 7.83 SCF
114 in_ = 13.12 SCF

3000 PSI
45 in_ = 5.18 SCF

68 in_ = 7.83 SCF
114 in_ = 13.12 SCF

Appendix B
Quick Repair
Cocked Pilot Valve Piston

Warning

Prior to working on the Megabooster, ensure all air is bleed from both the High Pressure (HP) and Low Pressure (LP) air lines.

Symptom: The Megabooster fails to operate. When drive air is applied, no movement of the piston is detected.

Diagnosis: This problem is commonly caused by moisture in the drive-air line. While common in high-humidity environments, this problem can occur in lower-humidity areas during times of high use.

Cure: The following procedure is a short-term fix only. Long term resolution of the problem includes installing a high-flow moisture separator in the LP drive air line, available from WGP.

Step 1. Remove the 12 small screws holding the main cover on the Megabooster. To remove this cover, the screws securing the Megabooster to the table will also have to be removed.

Step 2 With the end drive air input hole closest to you, you will notice a small black or clear aluminum box secured to the left side of the booster with 2 screws diagonally located to each other. Remove these 2 screws, taking care not to let the box fall off.

Step 3. Looking inside the small black box, notice a small, black O-ring in the lower right hand corner. Take care not to lose this O-ring

Step 4 Looking into the black box, notice there is a small piston. This piston will probably be “cocked” at tan angle. The moisture from the drive air causes this piston to get “cocked” and is what prevents the Megabooster from operation correctly.

Step 5 Remove the piston, clean and dry thoroughly, along with the black box. Reinstall black box, talking care to make sure the piston goes back in with the nipple facing the Megabooster, and the small black O-ring is still in place.

Step 6 Repeat with black plastic box on the other side of valve body. Make sure the six-way spool will move inside the body. Often small pieces of Teflon tape will get stuck between spool and valve body. Don’t worry about timing the pistons to spool. Push both back into boxes and reassemble. Make sure they are at right angels to the box body.

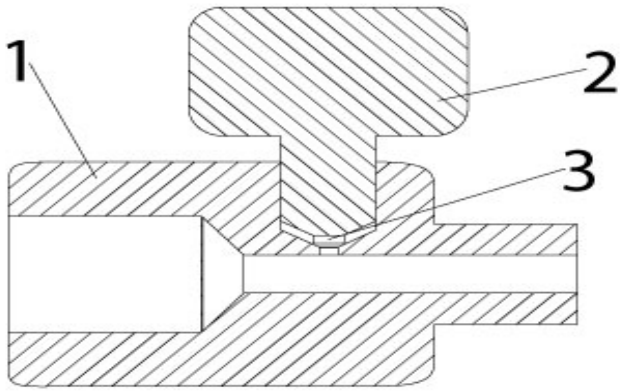
Step 7 Reinstall the Megabooster cover, and re-secure the Megabooster to the table. DO NOT attempt to use the Megabooster without the main cover installed or without securing it to the table.

Appendix C

OPERATION AND MAINTENANCE
MODEL 712 BLEED VALVES

These bleed valves are designed to vent high pressure or condensate from charging lines, filters, separators and other volumes where pressure must be relieved to disconnect lines, tanks etc. They have an exclusive seal design that permits opening and closing thousands of times without loss of sealing ability. Light finger pressure is all that's required. Excessive torquing of the knob can cause premature failure of the unit.

Specificatons
*maximum rated press.6000 PSI
*materials seals: Teflon
body: aluminum
* ports _" MNPT X _" PNPT
* size 1" dia. X 2 "long



Installation:
Use a small drop of Teflon tape just enough to cover the 2-3 threads. Avoid over torquing the pipe threads. Torque that can easily be applied with a hand wrench is enough. Excessive torque can cause eventual cracking and leakage.

Operation:
These valves require only a light finger torque to seal at pressures to 6000 PSI. Full flow is achieved by opening the bleed valve _ to _ turns. Avoid opening the valve more than this. If opened several turns the bleed screw will separate from the body.

Maintenance:
No routine maintenance is required. The valve can be disassembled and reassembled by a qualified valve repair person following the drawing and notes herein. While replacing the Teflon seat pry out the old seat with a pen knife. Drop the new seat in place. It will fit loosely until lightened the first time. When first tightening, hold the seat upward so it will not fall out of place. If time allows or a spare is available it is recommended the valve be returned to WGP for repairs.

Notes

1. Use a small amount of Slick 50 grease on threads
2. To assemble or change seat, drop seat 3 into screw 2. Hold screw so seat is upward. Screw body 1 onto screw while continuing to hold in this position so seat won't fall out of place. Once tightened seat will deform and be locked in place.

Appendix D
Megabooster Pricing
(All prices subject to change without notice)

Single End System $1250
Includes:
Booster
Fill Whip
Fill Adaptor
Drive Air Assembly
Pressure Gauge
(HP and LP Hose sold separately, below)

Double End System $1850
Includes
Booster
Fill Whip
Fill Adapter
Drive Air Assembly

What they do not include:

HP Air Hoses (HPH):
$4 per foot + $12 per hose section for fittings
(2 foot minimum)
CGA connectors for HP cylinders (CGA###):
$12
LP hose for drive air (LPH):
$2 per foot + $12 per hose section for fittings
Cascade Inline Shutoff (CIS):
$45 per shutoff Note: Addition of the CIS will require the addition of one extra hose section.

LP High Flow Moisture separator (LPHFMS) $85
This moisture separator prevents moisture from entering the booster through the drive air, which can cause the system to temporarily lock up. Instructions on fixing this problem can be found in Appendix B of the Megabooster Owners Manual

HP High-Flow Pressure Regulator (HPHFPR) $210
The HPHFPR allows the user to regulate HP air down to either 3000 PSI (for using source air cylinders over 3000 PSI) or down to 130 PSI for using HP cylinders as drive air at remote locations.

Fill Whips (FW) $40
Having an extra fill whip around is always good, in case a player accidentally exceeds the bend radius on the fill whip and causes failure.
HP bleed Valve Knob w/seat $16
The gold HP bleed valve has a Teflon seat and over-tightening can cause failure of the seal. This replacement knob allows for quick replacement. Replacements seal are available below.

HP Inline Bleed Valve Complete $30
This is the latest inline bleed valve being used by WGP, and easily attaches in place of your old bleed valve and “T’ configuration. Easily rebuild able, this bleed valve is an excellent addition to your booster.

HP Bleed Valve Seat $3
This is the small Teflon seal found in the HP Bleed Valve Knob, and allows the user to replace the seal.

Megabooster Rebuild Kit $56
This kit contains most major seals contained within the Megabooster system. WGP recommends only factory trained technicians install these kits.