

Air/Hydraulic Micro-Injection System

Training Manual - Part 1

**Part 1 - Assembly, Getting
Started, & Arborplug
Micro-injection**



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An Introduction to Arborjet VIPER Injection Methodology

Arborjet's Tree Injection technologies are designed by arborists interested in improving methods of systemically treating trees. Our greatest concern is to insure that our methods target pest problems in a safe, environmentally responsible way.

Arborjet has designed VIPER tree injection technology to optimize the treatment application and minimize tree wounding. VIPER is an acronym for "Volume-Injection Pressure-Enhanced Reservoir" and refers to the interfacing of our patented Arborplug with our injection needle. The development of this technology was based on three distinct factors: (1) the method—or ease, speed and accuracy of injection, (2) conditions favorable to injection uptake, and (3) translocation and efficacy of the injectable product. The foremost requirements of an injection device are to deliver systemic product to the functional sapwood, to accurately measure the amount of product applied, and to keep the product in the tree. Our VIPER method accomplishes these objectives, is faster than any other system and induces the least tree wounding.

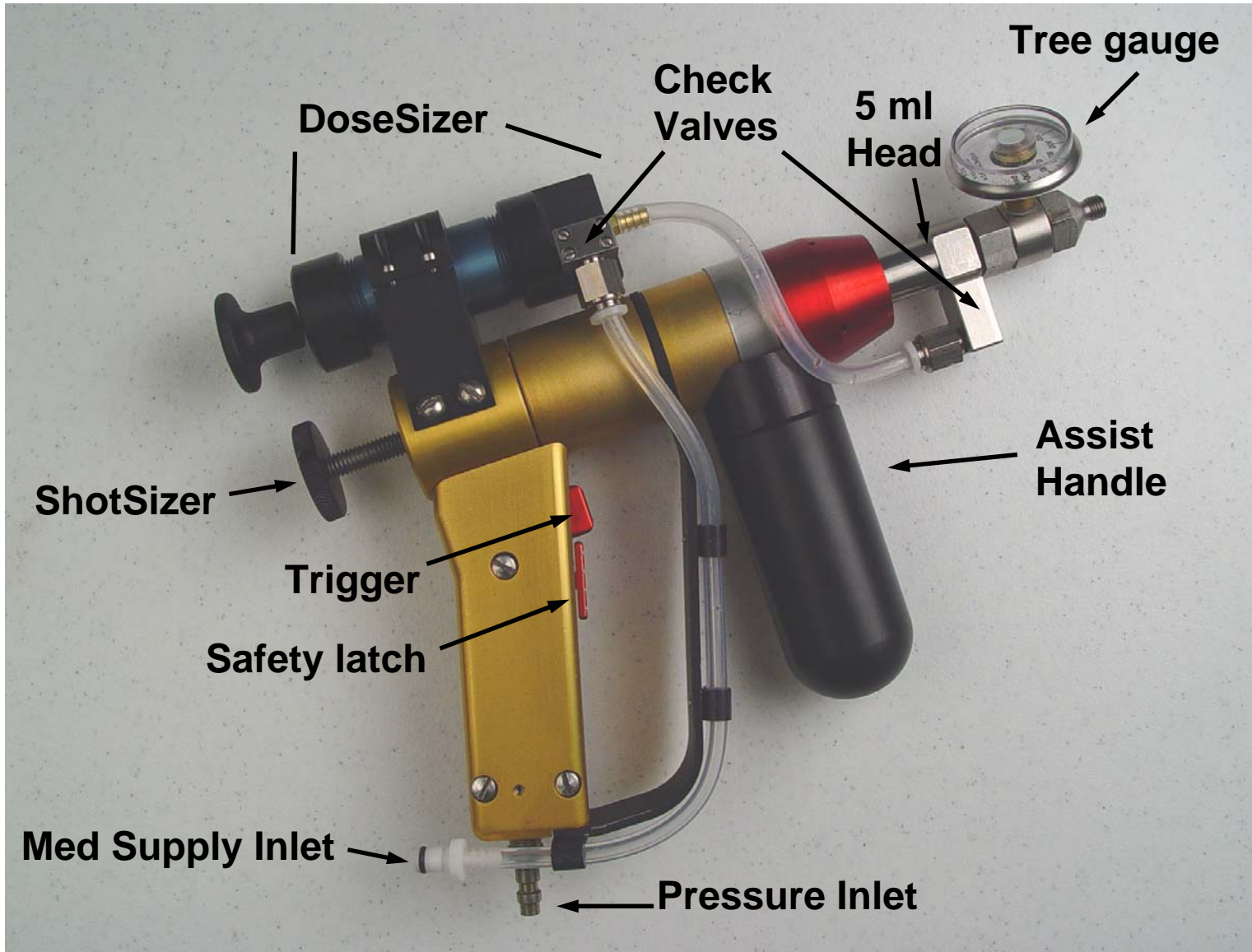
For technical assistance, call from 9 am to 5 pm EST Monday through Friday at 1-866-272-6758. Or join our website forum at www.arborjet.com to communicate with others about Arborjet injection. We welcome your comments and questions concerning the Arborjet Injection System.

Safety Reminder

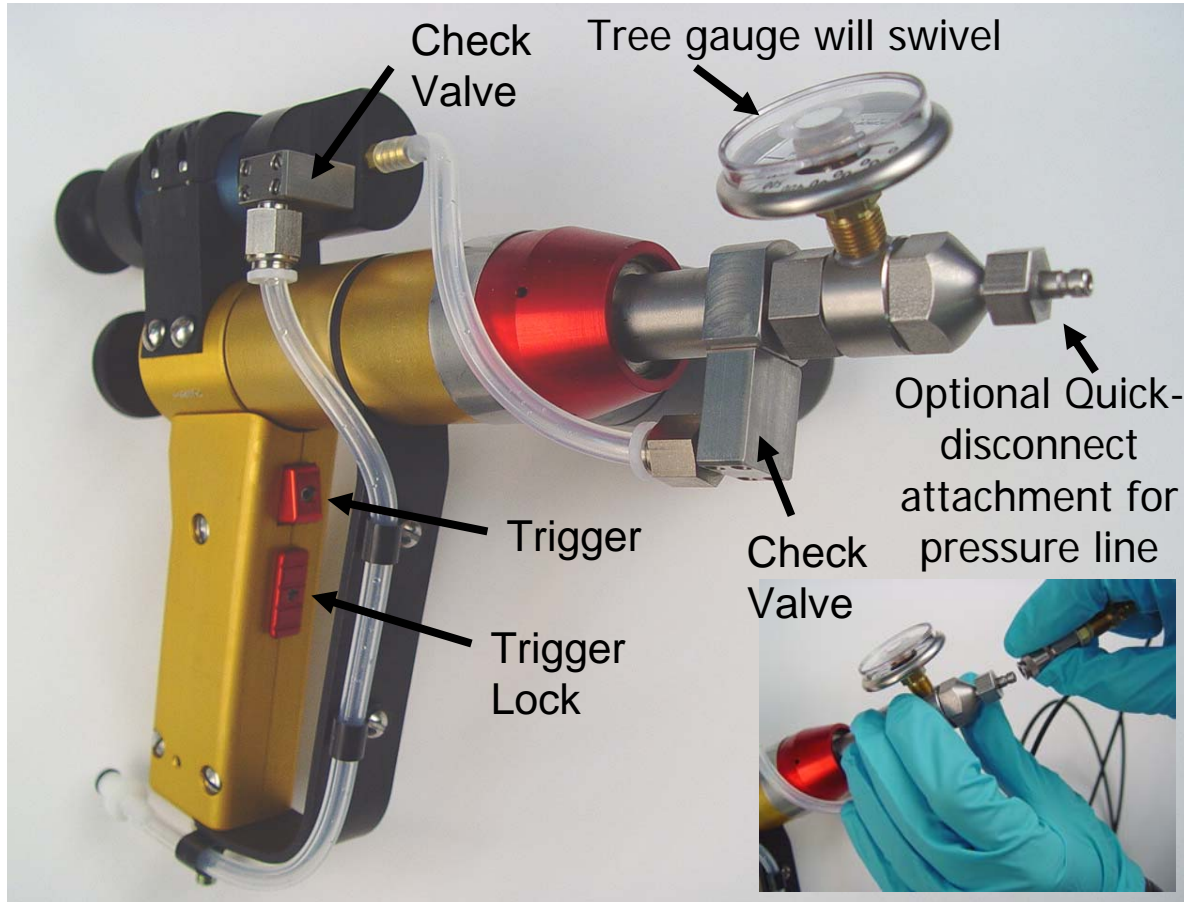


Always wear safety glasses and protective gloves (e.g. disposable nitrile) when setting up, operating or maintaining the Arborjet Air/Hydraulic System. Read label of injectable product for further precautions and warnings.

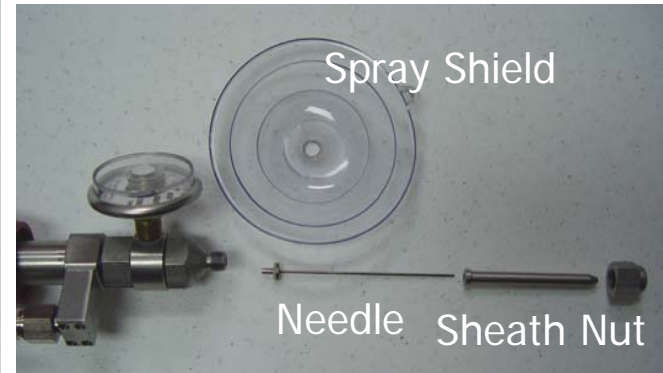
Parts of the Air/Hydraulic Device



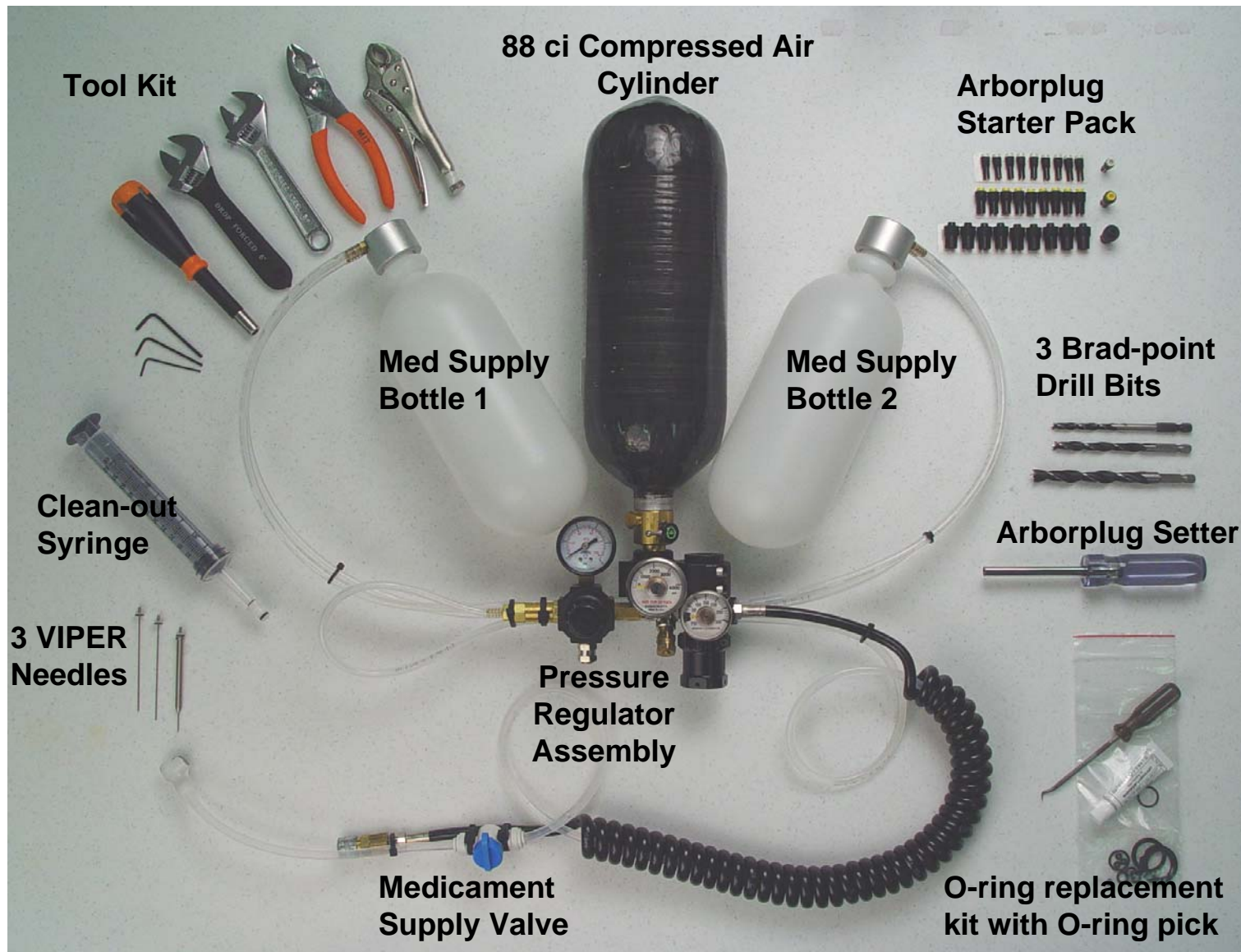
Parts of the Air/Hydraulic Device



VIPER Needle Assembly



Parts of the Air/Hydraulic Kit



Utility Belt Setup

Tool Kit Includes:

- Adjustable wrenches (2)
- Allen keys (3)
- Screw driver
- Pliers
- Vise grips

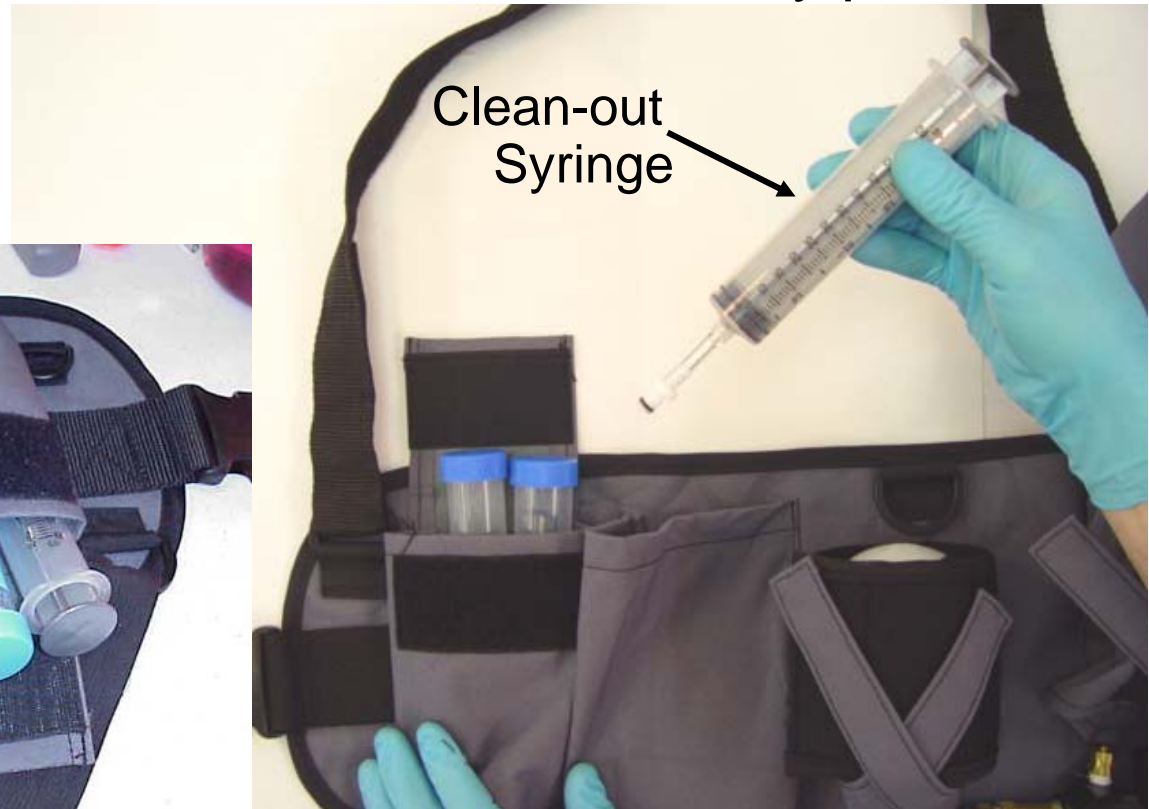
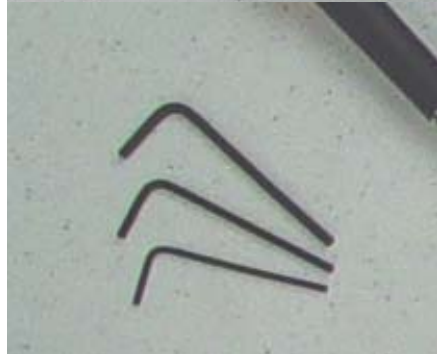


Tool kit can be conveniently stored in one of two accessory pockets.



Utility Belt Setup

- Storage Vials can hold Allen keys, Drill bits, O-rings, and/or other parts.
- Clean-out Syringe and Storage Vials can be stored in second accessory pocket.



Utility Belt Setup



- Remaining sleeve is available for a water bottle or an eye-wash bottle (not included in kit).

Pressure Bottle Assembly



- Fill pressure supply bottle with air or nitrogen.
- Scuba or Paintball Shop can fill cylinders with the adaptor included in all Air/Hydraulic kits.
CAUTION: Do **not** fill with CO2
CAUTION: Fill to a **maximum** of 3000 psi.

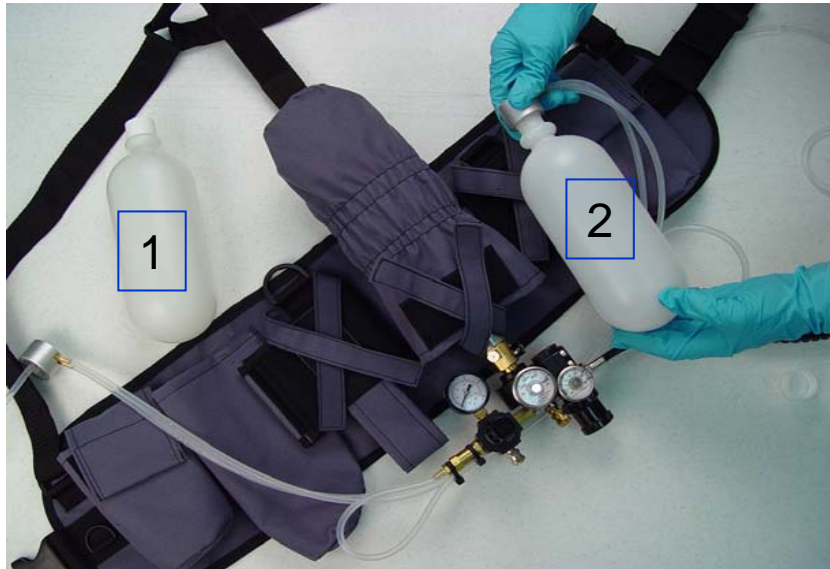
Pressure Bottle Assembly



- Spread utility belt out on flat surface.
- Orient shoulder straps away from you.
- Insert compressed air cylinder into sleeve.
- Secure with velcro-straps.



Filling and Attaching Medicament Bottles



Filling and Attaching Medicament Bottles:

- Load product into left-side medicament bottle [1], when loading 1000mL or less.
- When using over 1000mL, load additional product into right-side bottle [2].
- Holding bottle upright, screw bottle [2] into right-side med bottle adaptor.
- Both bottles must be attached. Right-side bottle [2] can be empty.



Filling and Attaching Medicament Bottles



- Screw left-side med bottle [1] into left-side med bottle adaptor
- **REMINDER:** If loading 1000mL or less, load into the left-side bottle [1] and leave [2] empty. If loading over 1000mL, fill [1] with 1000mL, and then additional product into medicament bottle [2] —**see product label for dosage recommendations.**
- Secure both bottles in utility belt with Velcro straps.

Utility Belt Assembled



Assembled Utility Belt:

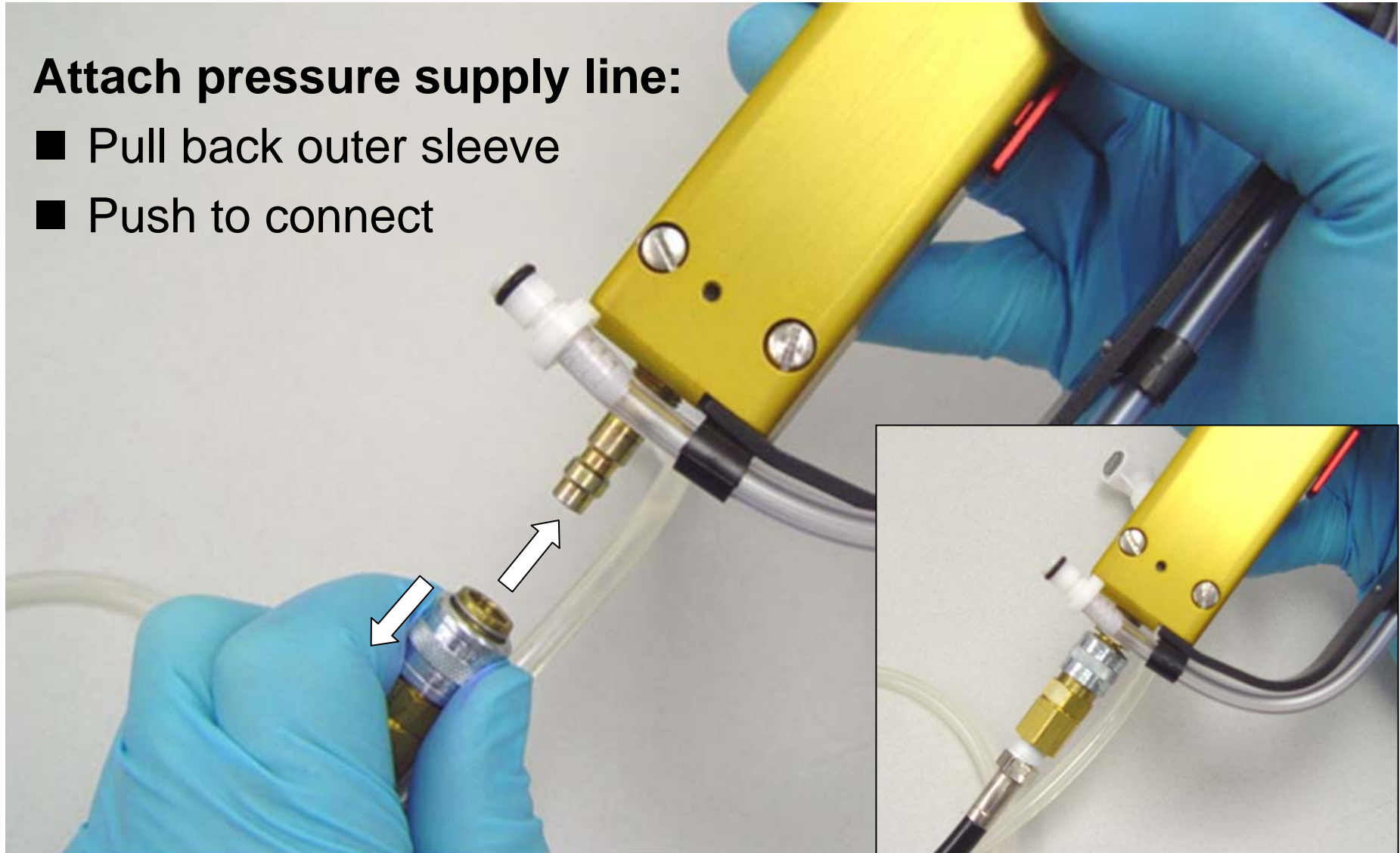
1. Left accessory pocket
2. Water/eye wash bottle pocket
3. Left-side Med Bottle [1]
4. Pressure cylinder sleeve
5. Right-side Med Bottle [2]
6. Right accessory pocket

**YOUR UTILITY
BELT IS SET-UP!**

Connecting the Device

Attach pressure supply line:

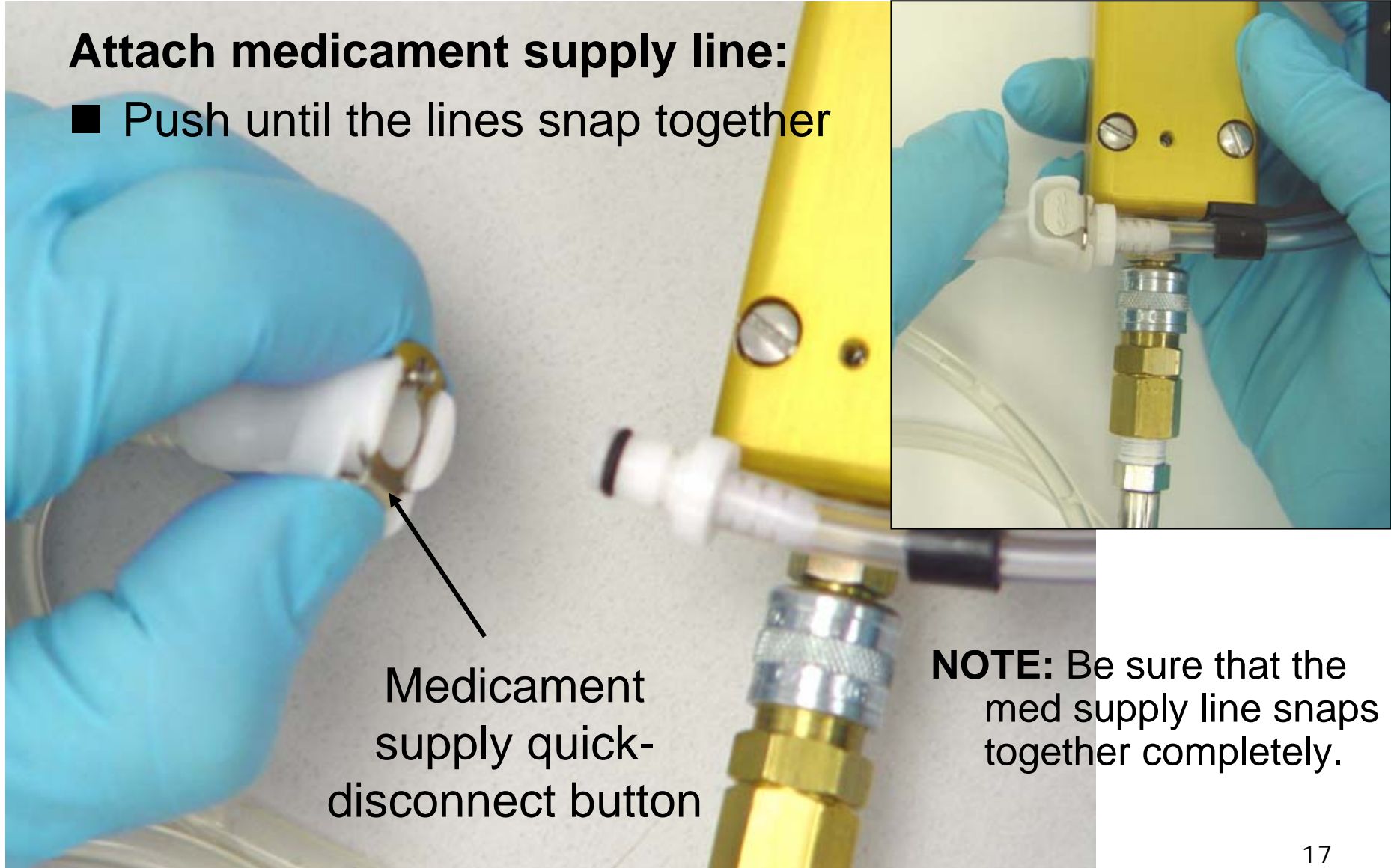
- Pull back outer sleeve
- Push to connect



Connecting the Device

Attach medicament supply line:

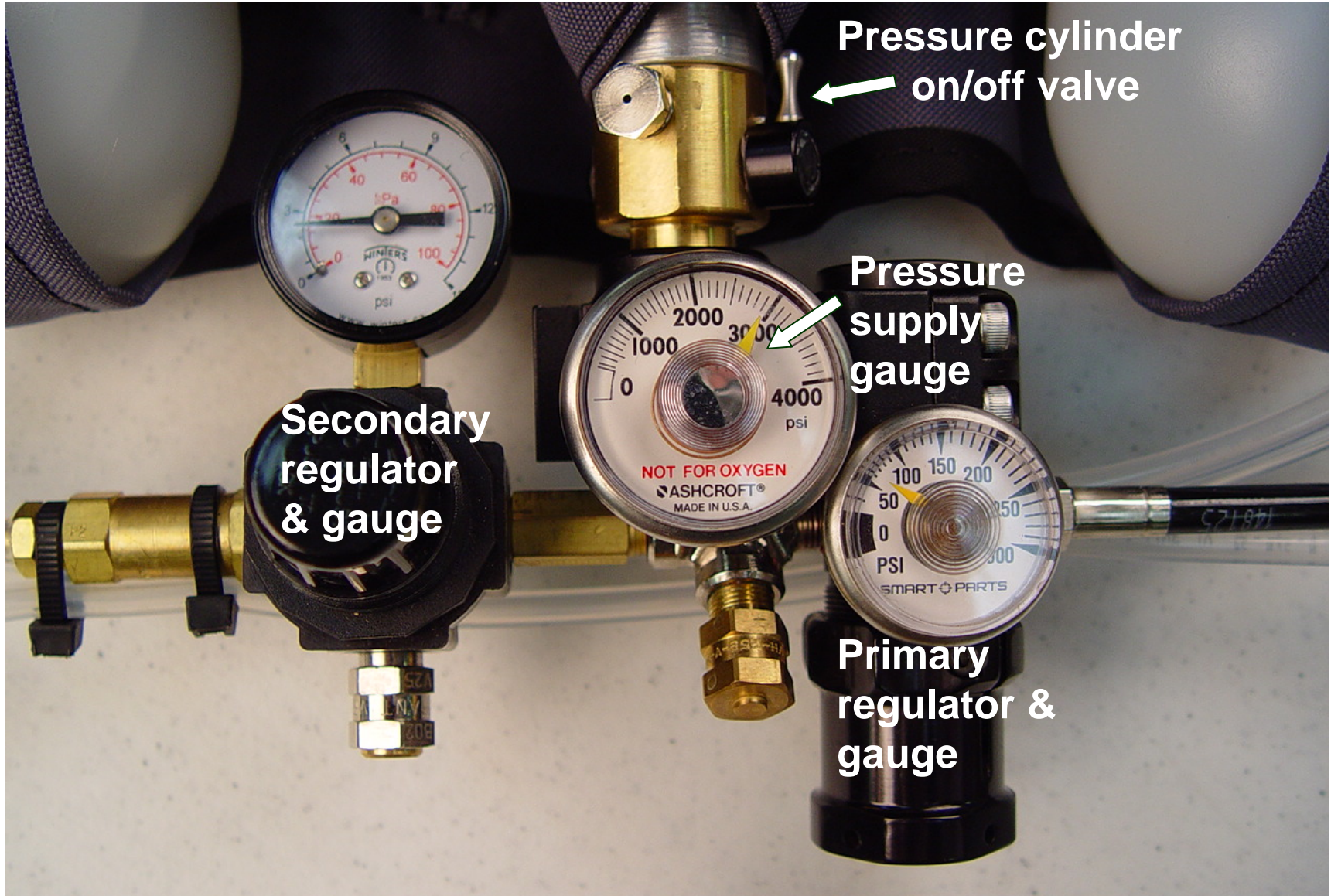
- Push until the lines snap together



Medicament supply quick-disconnect button

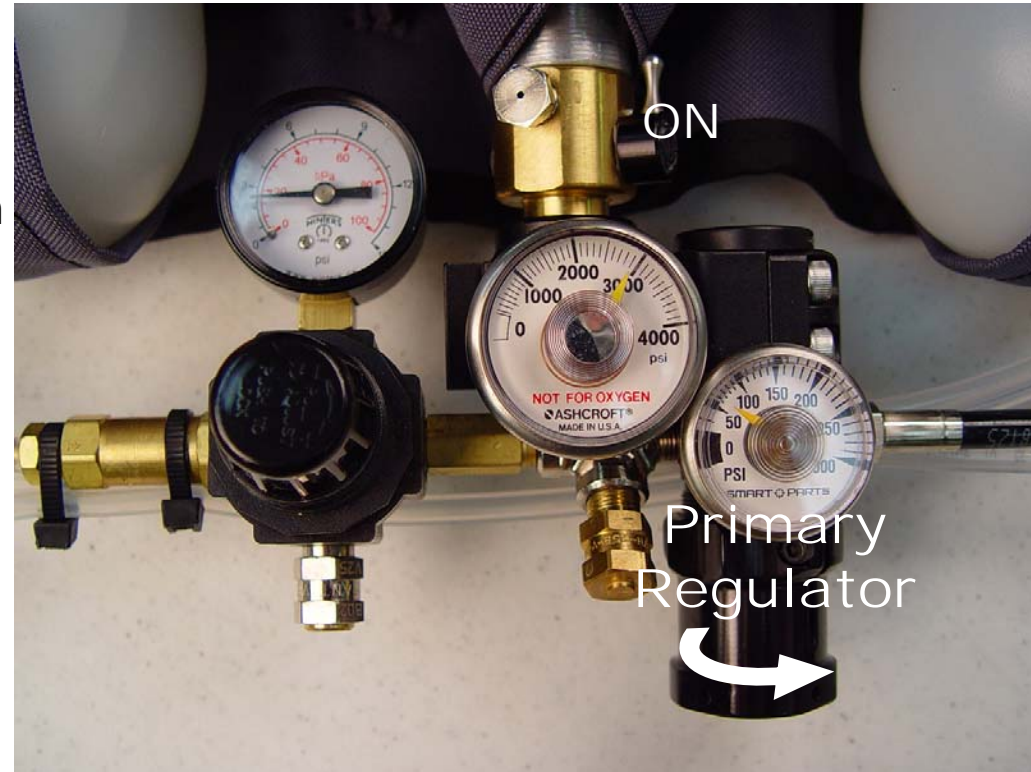
NOTE: Be sure that the med supply line snaps together completely.

Regulator Components



Primary Regulator

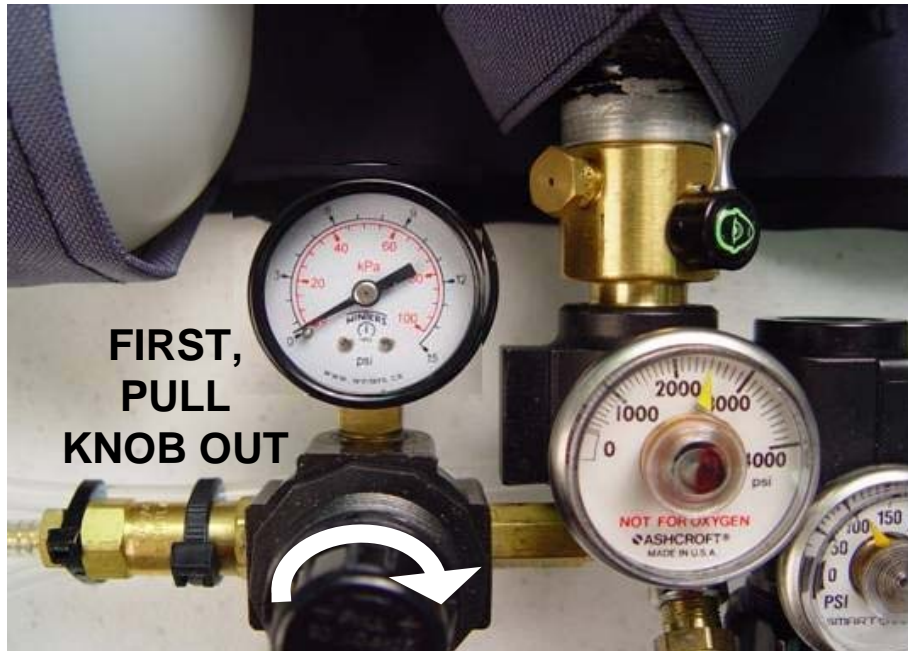
- Turn ON the compressed air supply to pressurize the system.
- Pressure supply valve is “ON” when lever is pointing up.
- Check gauge for pressure supply. (Full should be 3000psi)



Setting The Primary Regulator:

- Turn knob counter-clockwise to zero, then increase by turning clockwise.
- Set primary (delivery) pressure above 50 but less than 100 psi.

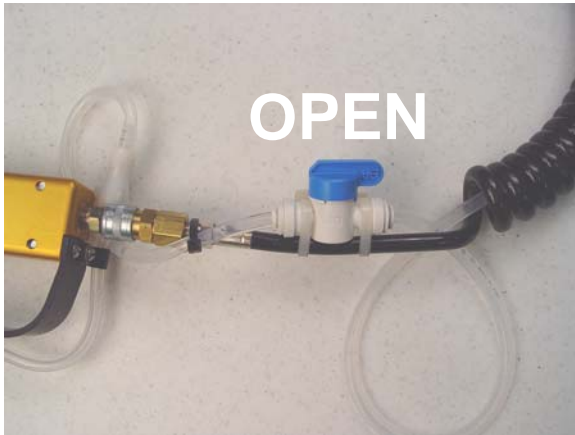
Secondary Regulator



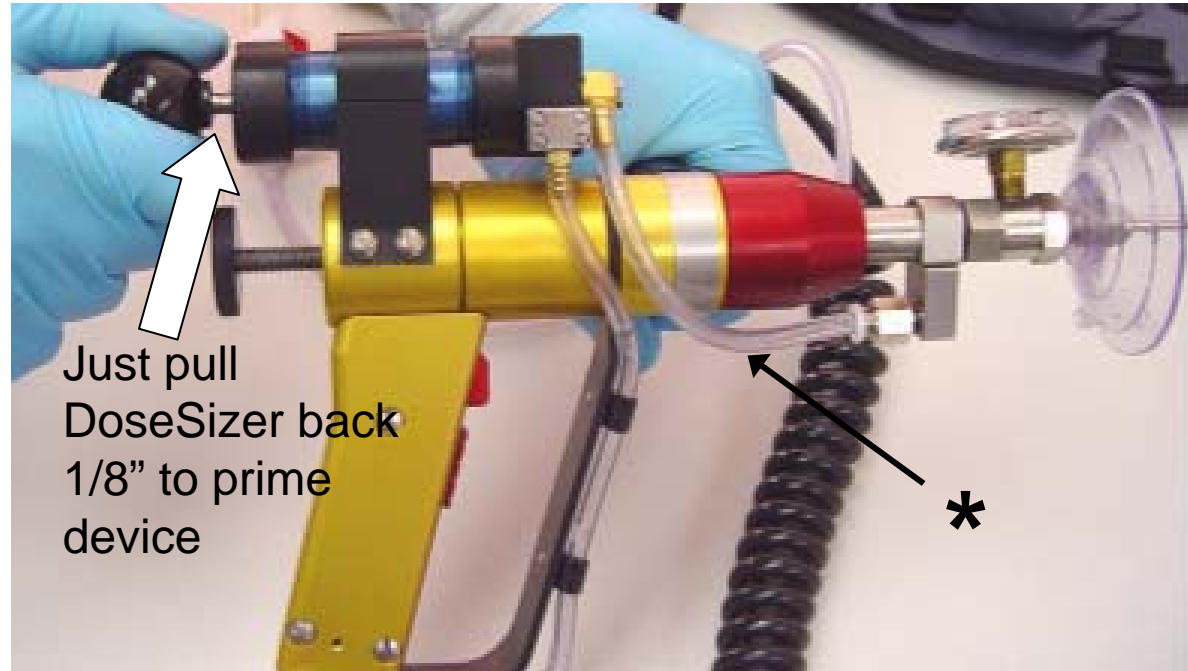
Setting the Secondary Regulator:

- Secondary regulator sets pressure inside medicament bottles.
- Pull the plastic adjustment knob out and then turn.
- Clock-wise to increase, counter clock-wise to decrease.
- Set between 10 and 15 psi Push knob in to lock.

Priming the Supply Lines



Make sure supply line valve is OPEN

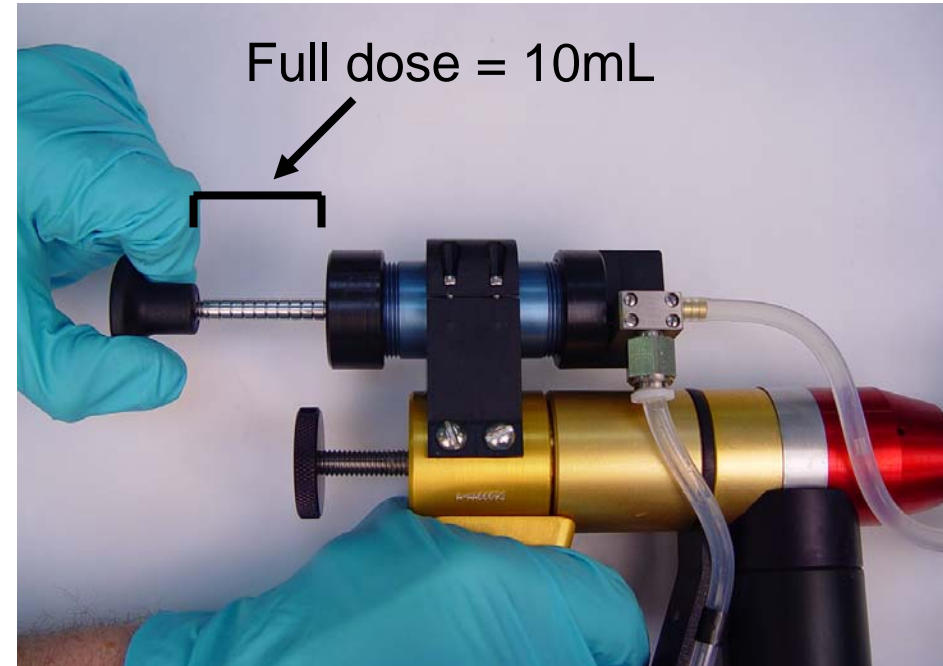
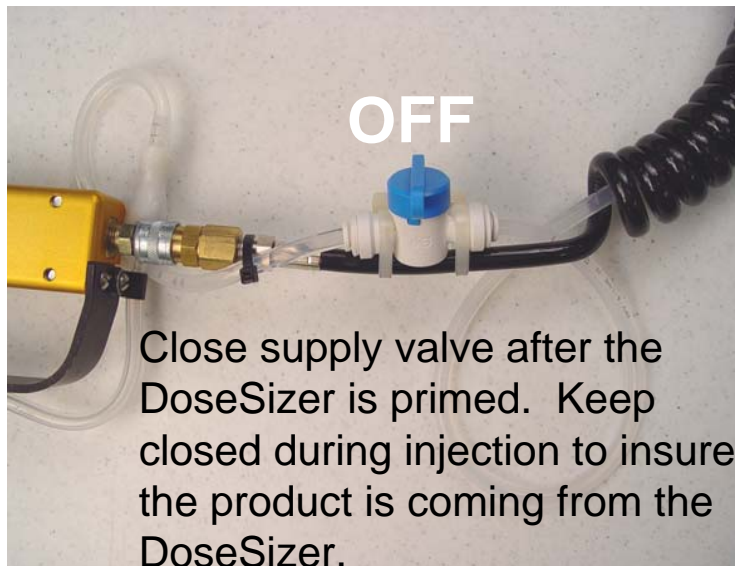
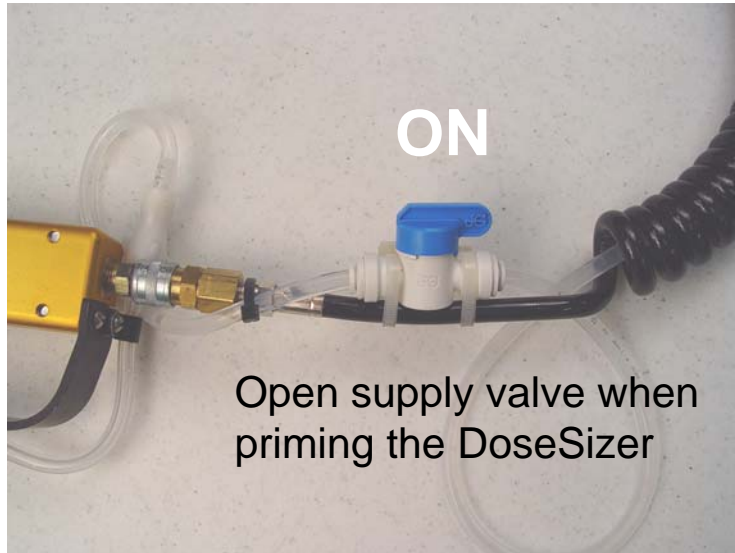


Just pull
DoseSizer back
1/8" to prime
device

Prime the Supply Lines:

- Pull the DoseSizer knob back **NOT MORE THAN** 1/8" just to allow flow when trigger is pressed.
- Press the trigger 5-10 times or just until medicament has filled the line between the DoseSizer and Shot Head (*SEE ARROW). Device is now primed.

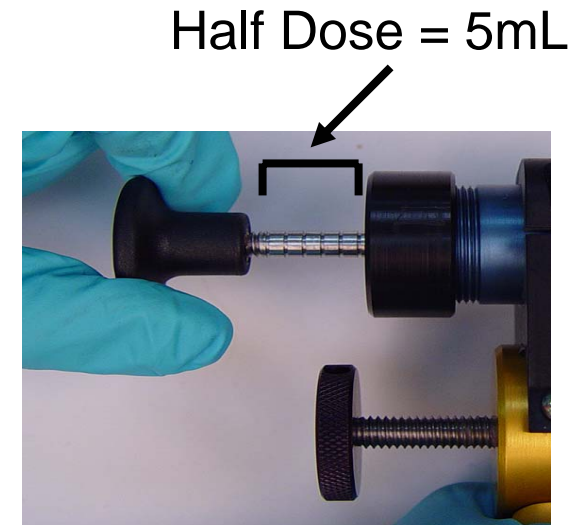
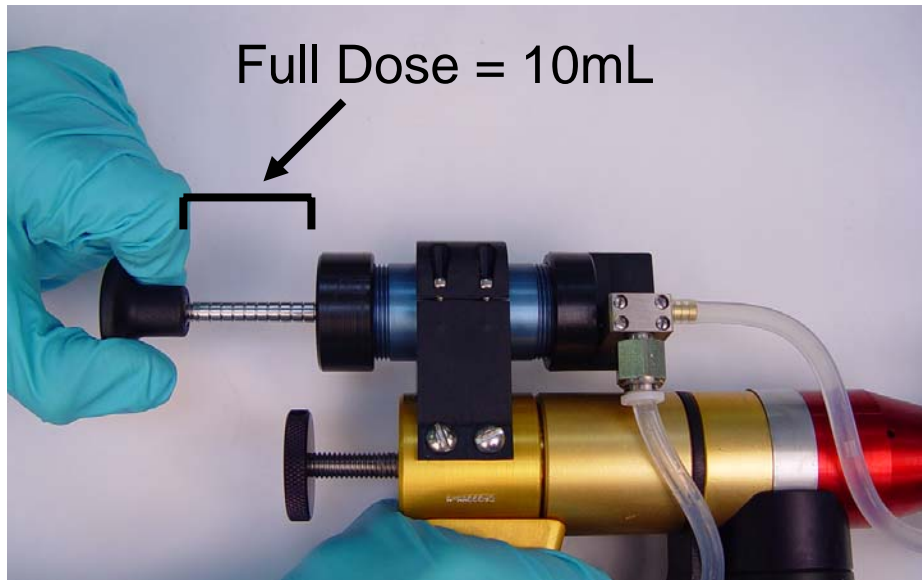
DoseSizer Priming



Prepare for Injection:

- Fill the DoseSizer with 10 mL of product by **SLOWLY** pulling knob back to the last/tenth notch.

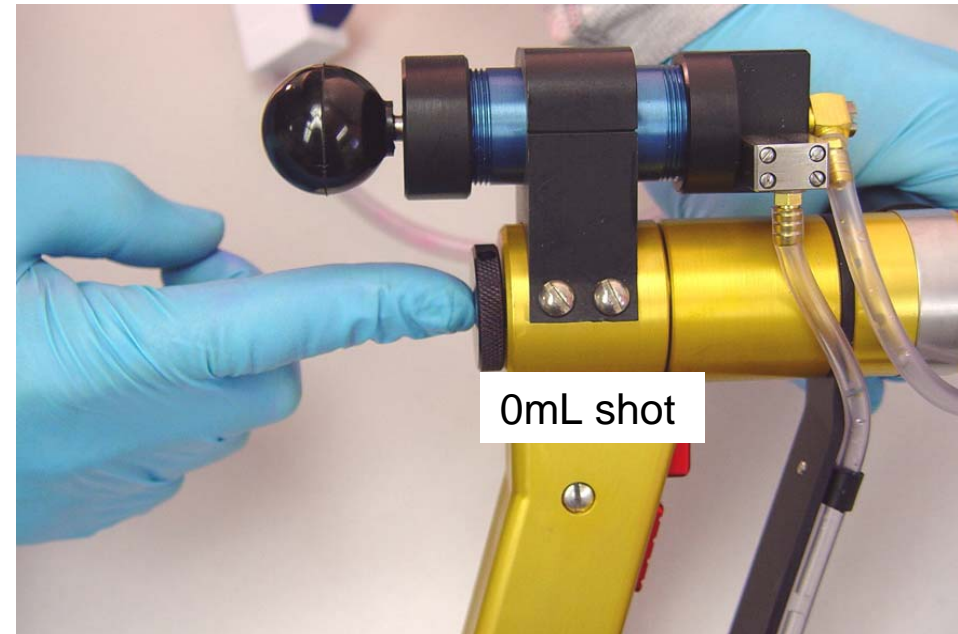
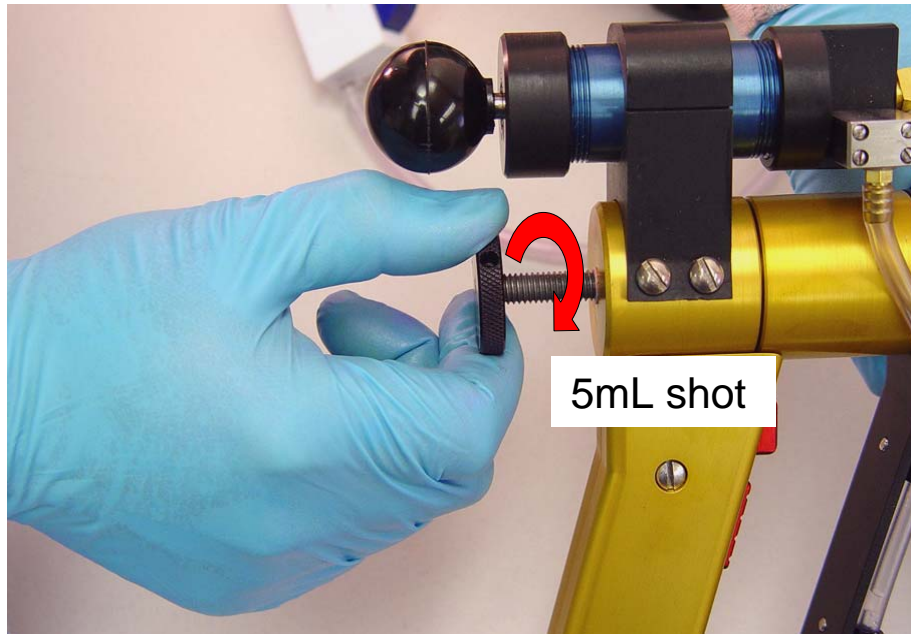
DoseSizer Priming



- Each notch on the DoseSizer represents 1mL of product.
- Check the DoseSizer rod each time the trigger is pulled to see how much product has been injected.
- Pull back DoseSizer knob only to 5 mL, if only 5 mL is to be injected.
- Use the DoseSizer to monitor progress of delivery and uptake

REMINDER: Close the medicament supply valve before injecting each primed DoseSizer. In other words, The medicament supply valve should be opened and closed every 10mL applied to the injection site.

ShotSizer Adjustment



- The ShotSizer adjusts the shot volume delivered each trigger pull. The ShotSizer should be left fully open for high volume injections.
- Turn counter-clockwise to increase volume, up to 5 mL per trigger pull.
- Turn clockwise to decrease volume, down to 0 mL per trigger pull.
- NOTE: See ShotSizer Table on next Page.
- To verify precise calibration, discharge into a 10mL graduated cylinder.

ShotSizer Adjustment

Calibrating the ShotSizer

| 5.0 mL Shot Head | |
|--|--------------------------------|
| Number of turns (counter-clockwise) from closed position | Volume per shot (in mL) |
| 18 | 5.0 |
| 16 | 4.5 |
| 14.5 | 4.0 |
| 12.5 | 3.5 |
| 11 | 3.0 |
| 9 | 2.5 |
| 7 | 2.0 |
| 6 | 1.5 |
| 4 | 1.0 |
| 2 | 0.5 |

Ready for Micro-injection

System is assembled, setup, pressurized, primed, and ready for micro-injection.



**NOW YOU ARE
FULLY
ASSEMBLED!**

Ready for Micro-injection

Adjust the shoulder straps...



**NOW YOU
ARE READY
TO INJECT!**

Adjust the belt strap...



When to Micro-inject

Season and Environmental Conditions that Favor Uptake of Injectable Material:

| | |
|---------------------------|---|
| Time of Year | Active growth—tree in full leaf |
| Weather Conditions | Sunny, warm, breezy, low humidity |
| Soil Conditions | Moist soil conditions, soil temperatures above 40°F |

Selecting Arborplugs and Drill Bits

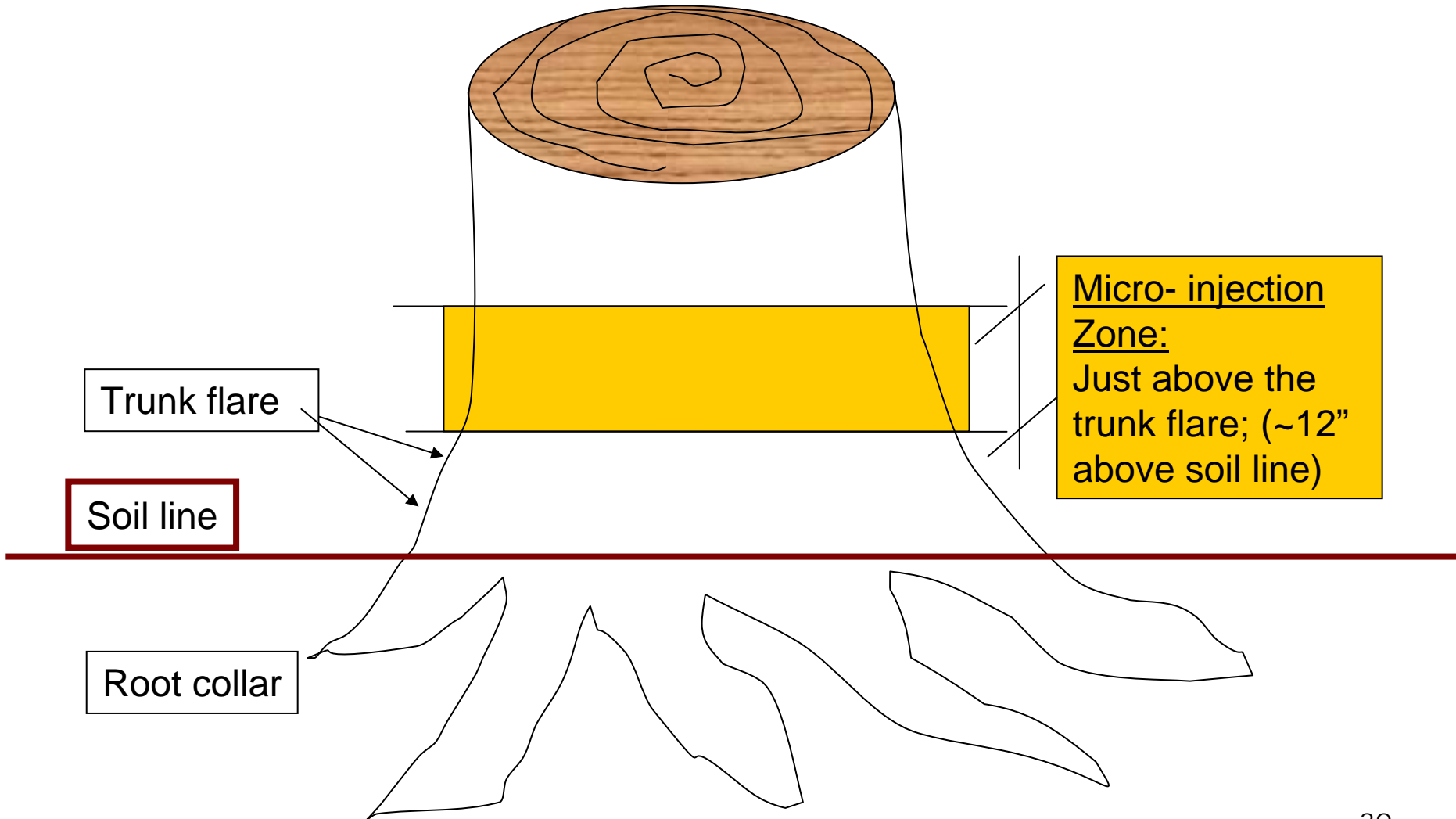
Select Arborplugs based on tree size and type:

- For small, or fast-growing trees, use #2 (7/32") Arborplugs.
- For trees of medium size and density use #3 (9/32") Arborplugs
- For large or dense-wooded trees, and conifers use #4 (3/8") Arborplugs.

| Arborplug Size | Drillbit Size |
|----------------|---------------|
| # 2 | 7/32" |
| # 3 | 9/32" |
| # 4 | 3/8" |



Selecting Micro-injection Target Sites



Drilling Technique

- Use sharp, high-helix brad-point drill bits.
- Select drill bit size that matches Arborplug selected.
- Drill 5/8" into sapwood (bark depth* + 5/8").
HELP* Find **bark depth** by drilling just through bark. Bark will be softer than sapwood, so resistance will change when the drill makes contact with the sapwood. At that point remove drill and measure bark depth. Add 5/8" and mark total depth on drill bit with a stop collar or tape. Remember that total drill depth will change since bark depth is variable, even on the same tree.
- Drill each site only once; try to drill sapwood in one smooth, continuous motion.
- In small trees (<4"), space drill sites in spiral pattern along trunk to avoid girdling.

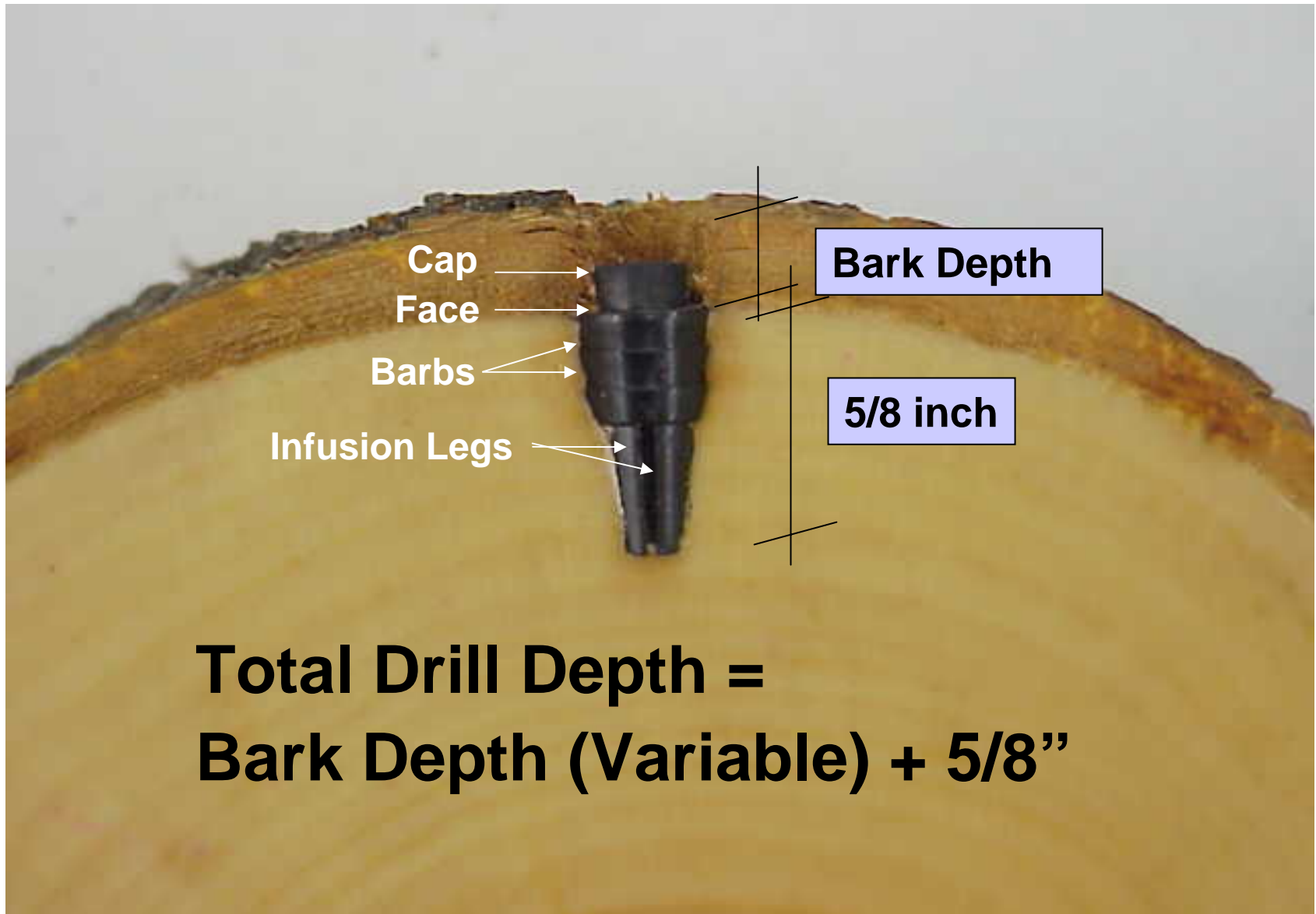


Setting the Arborplugs



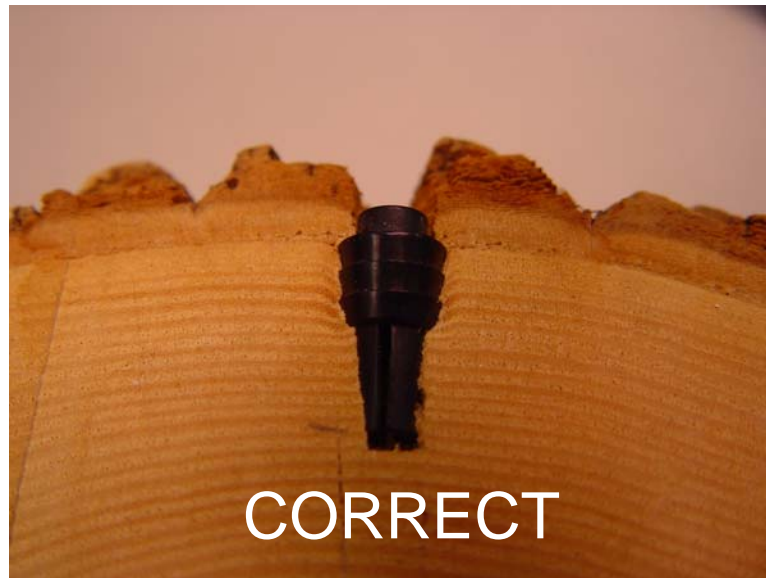
- Set Arborplug into drill hole and tap in with set tool and hammer until Arborplug face is flush with cambial-sapwood interface.
- The **Total Depth** of the Arborplug will be different in every tree and location around each tree. Xylem (sapwood) depth is always **5/8"**, however, **Bark Depth** will determine the **Total Depth** of the Arborplug, and it's very important the Arborplug is set correctly as instructed.

Setting the Arborplugs



**Total Drill Depth =
Bark Depth (Variable) + 5/8"**

Correctly and Incorrectly Set Arborplugs



Air/Hydraulic Micro-injection



Inject product using the method in Part 1, and the rates indicated on the label.

