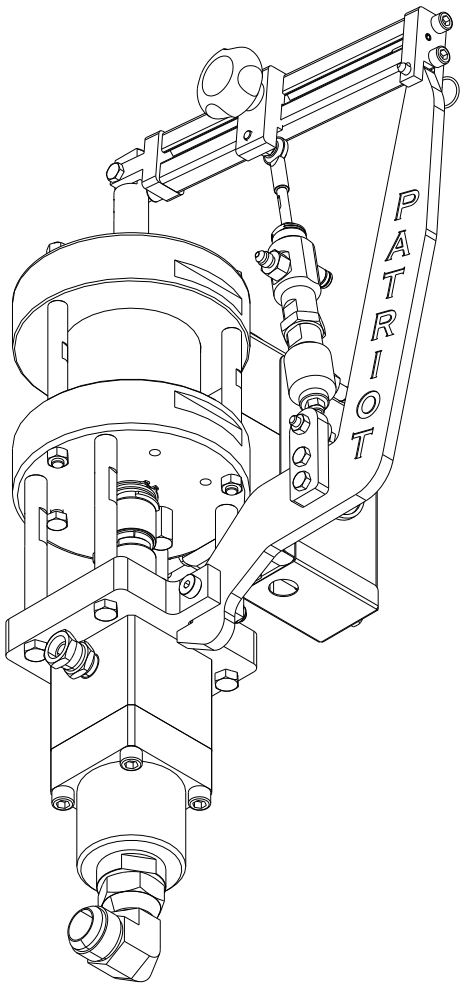
TESTING & ADJUSTING THE PATRIOT METERING SYSTEM



MAGNUM VENUS PLASTECH

Patriot Testing and Adjusting Manual

Revision 1\2008

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CHAPTER

1

PATRIOT TESTING AND ADJUSTING MANUAL
PATRIOT METERING OPERATION

Introduction

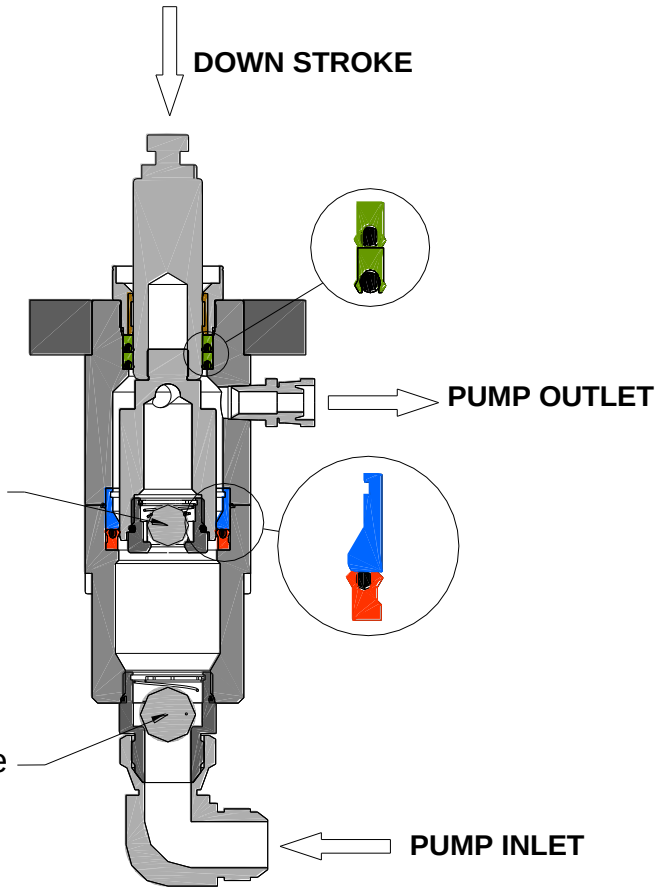
The Patriot metering system can be adapted to a variety of applications in a wide range of configurations. The Patriot metering systems is based on a “double acting piston pump”. Double acting piston pumps are a two ball style pump which delivers material on both the up and down stroke. They are driven by an air motor of which there are a variety of sizes.

There are two basic resin metering sizes; **Standard** – lower to mid range output systems, gel coat applications, chopper and wet out systems. **High Output** – used for high volume chopper systems and special or automatic equipment.

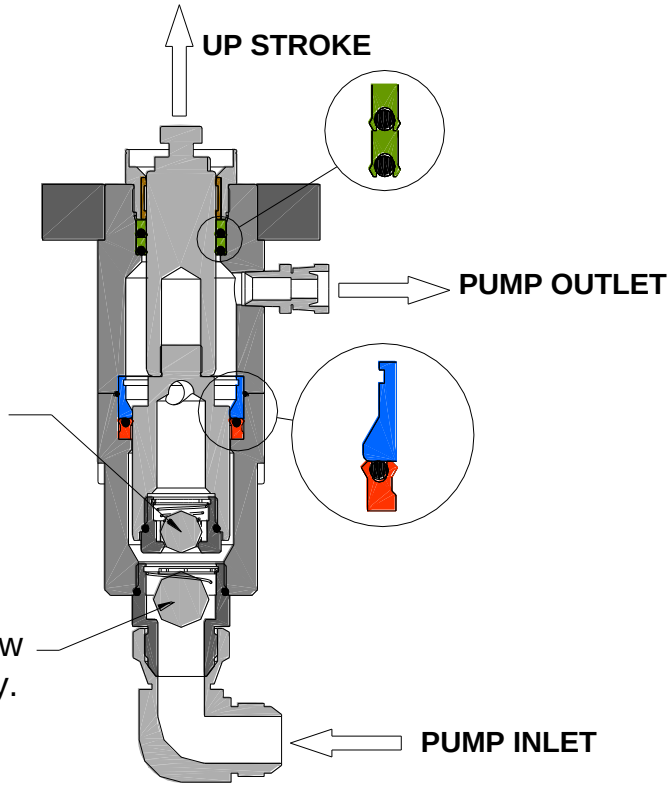
Each Patriot metering system has a corresponding catalyst / initiator meter which is attached by a drive linkage. The catalyst / initiator meter works on the same principles as the resin meter but are driven through a linkage attached to the resin meter. The initiator meter and resin meter have a fixed ratio to each other, in that they move together metering a given amount of resin and initiator. This leads us to one of the major principles; since the initiator meter is attached to and driven by the resin meter, you can never get more of one component just less of the other. The initiator meter can not run on its own and pump extra initiator; you can only have a problem with the resin meter and deliver less resin causing fast cure. The same is true for the initiator meter, the resin meter can not run on its own (as long as the linkage is connected) and pump extra resin; you can only deliver less initiator causing slow or inconsistent cure.

A word about accumulators – the accumulators come into affect at the top and bottom of the stroke during the split second when the pump is not moving and no material is being delivered. At that moment the pressure in the accumulator pushes the material in the accumulator out, helping to maintain an even flow of material.

DOWN STROKE: The down stroke is the displacement stroke, meaning the material in the inlet body is displaced by the piston and forced out the pump. The inlet valve ball seats sealing the inlet body this forces the material to flow up and out of the pump. The piston body ball lifts off its seat and allows material to flow through the piston and out the pump.



UP STROKE: The piston seal seals on the piston, the piston body ball seals in its seat; everything above the piston body is pushed out. A vacuum is created below the piston body and new material is drawn in.



CHAPTER

2

PATRIOT TESTING AND ADJUSTING MANUAL
ESTABLISHING A FAN

Introduction

If you know what is happening on both the upstroke and down stroke of the pump you will know where to look when you have a problem. Adjusting your pumping system will be easier with some understanding of pump ratios and fluid pressure.

Adjusting & Establishing a Fan Pattern

Magnum Venus Plastech spray equipment provides one of the most efficient methods of quickly applying material to a surface or mold. To make the most of our low-pressure metering systems and airless, internal mix guns, the operator must understand how to adjust the system for maximum efficiency**.**

Note: Because conditions and material vary widely, we cannot give you specific instructions for every material. We do offer guidelines and tests so that you can tune your Magnum Venus Plastech equipment to meet your needs.

The basic idea is to use just enough pressure to the power head to establish the spray fan, and no more.

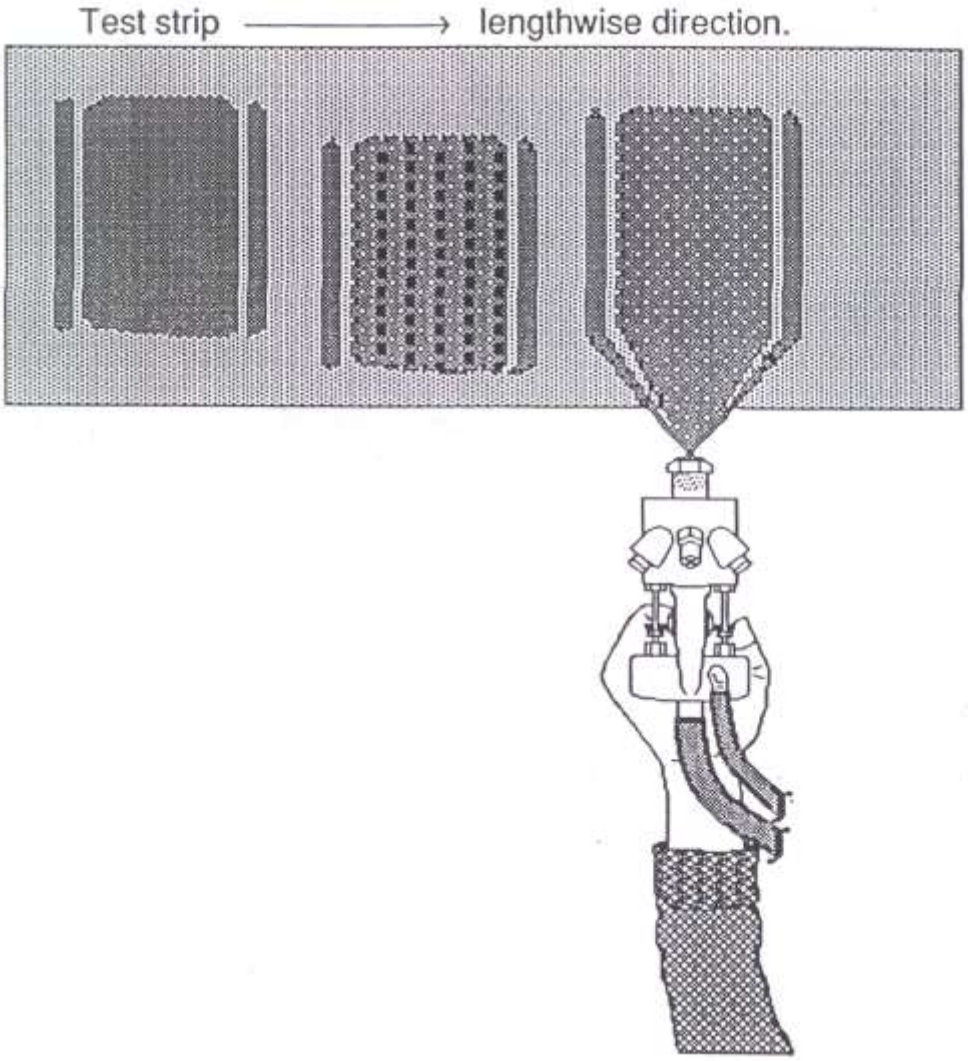
1. Lay out a strip of material for the test. For testing the material can be paper or cardboard.

2. Adjust the main pressure regulator until the operating pressure is 20psi.

Definition: Operating Pressure is the air pressure used to operate the air motor attached to the resin pump. The gauge and regulator are usually labeled "Main Pressure" or "Pump Pressure".

3. Do a short test spray on the material.

Note: To save material and make identification easier, spray perpendicular (across the material strip) tests.



4. Flush the gun into an appropriate container after every test shot.

Note: It may be that 20psi will be adequate pressure to establish a fan pattern.

5. If the first test shot had an established fan pattern, back off 5psi and shoot another pattern. Keep backing the pressure off until the unit no longer produces a fan. Then increase the operating pressure until there is just enough to form a soft-looking spray fan.

6. If the pressure was not adequate to form a well-defined fan pattern, increase the main pressure by 5psi and do another short test spray. Repeat step 6 until a well-defined spray pattern has been obtained, then follow step 5.

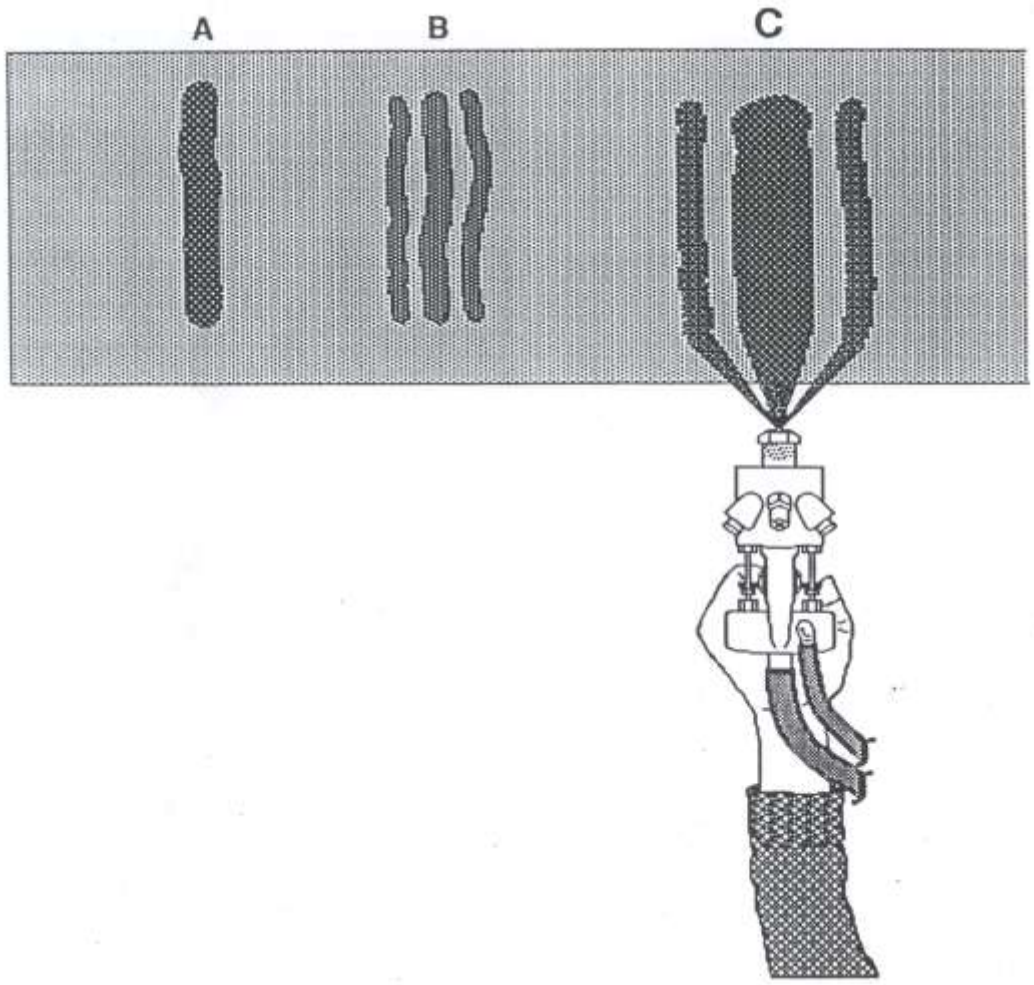
Note: Photocopy page Appendix A to make written notes about the operating pressure and material temperatures that finally produced a well-defined spray fan pattern.

Adjusting Procedure

What to look for in the test shots:

A. One narrow stream: The operating pressure is very low for the material you are using.

Solutions:
Increase the operating pressure.
Increase the material's temperature
Use a smaller Nozzle size.

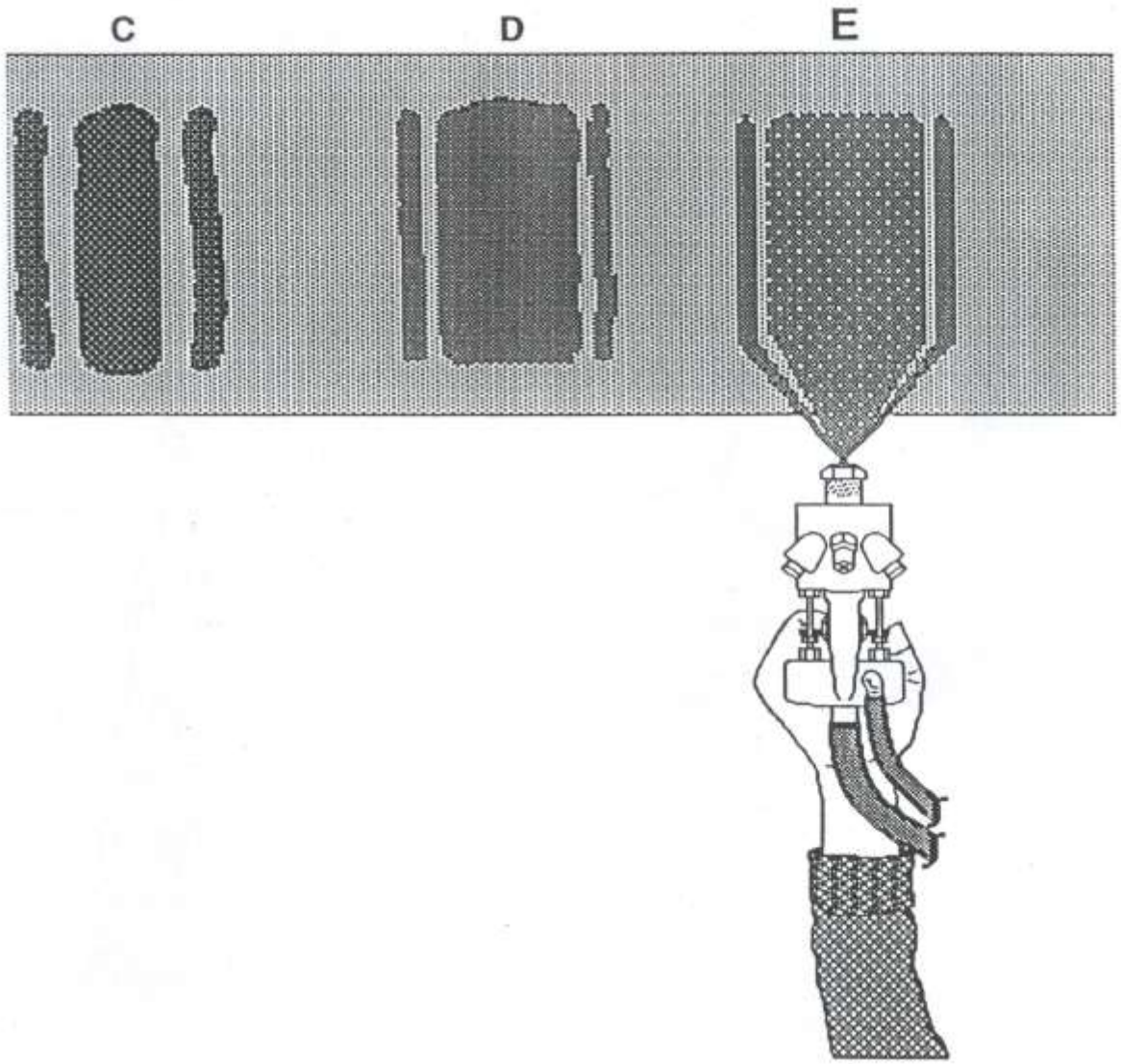


B. Three heavy fingers: Horns are beginning to develop, but the operating pressure is still very low.

Solutions:
Increase operating pressure.
Increase material's temperature.
Use smaller nozzle size.

C. Middle of the stream is wider: but not the full width it should be for the nozzle.

Solutions:
Increase operating pressure.
Increase material's temperature.



D. The pattern is at or near full width: There are well-defined fingers; however there is little or no white frothing (air bubbles) in the center of the sprayed material. Result "D" is a usable pattern for an experienced operator.

Solutions:
Slightly increase operating pressure.
Slightly increase material's temperature.

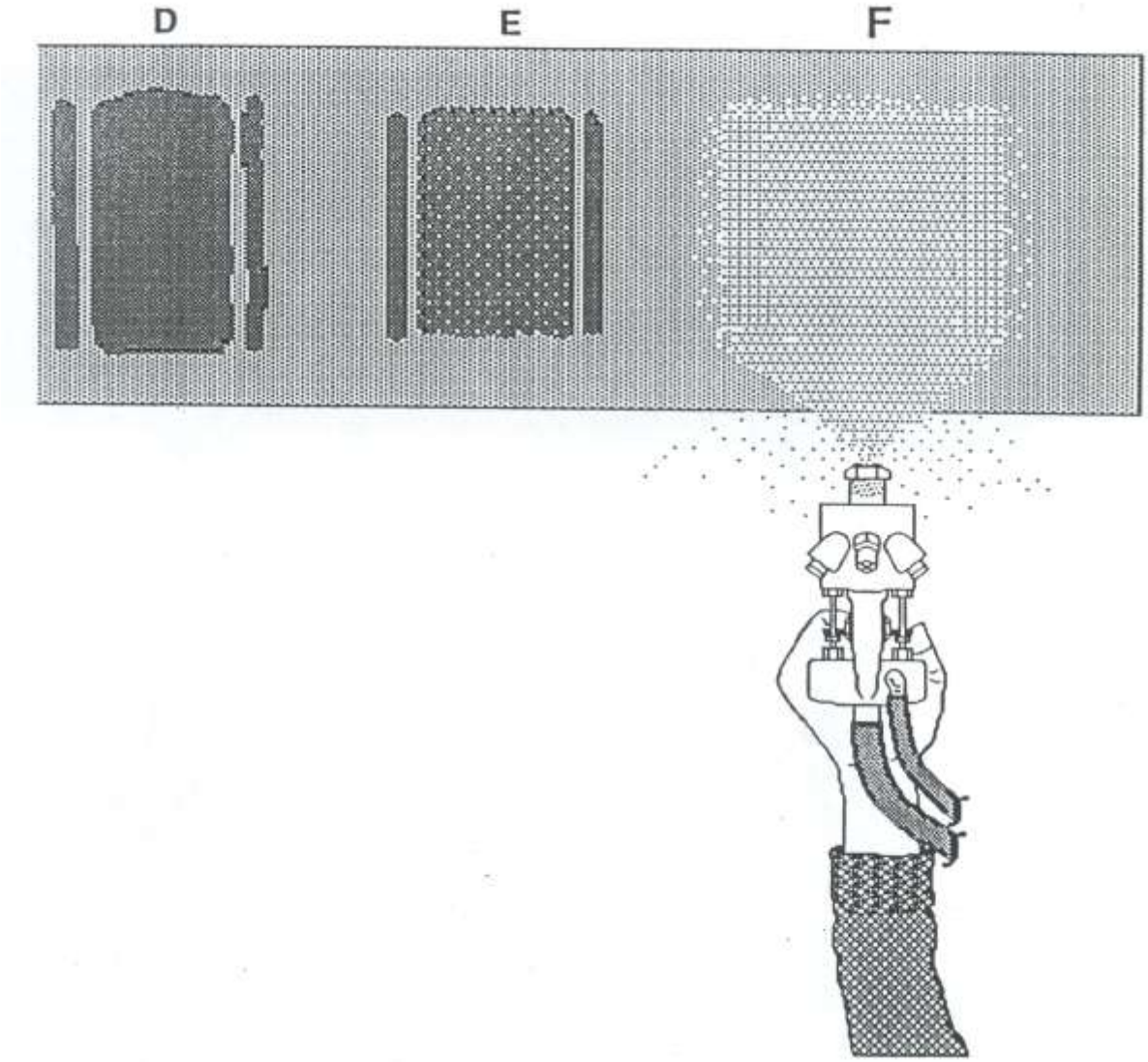
E. The pattern is full width: The fingers are well-defined. A small amount of frothing appears in the sprayed material; however it should disappear in less than 2 minutes.

Note: This is considered the best general set of conditions for the fan pattern. Make written notes of the <u>main pressure</u> and the material temperature readings (Appendix A).

F. The pattern is too wide: and the fingers are poorly defined. Heavy misting is seen and smelled, and there is significant overspray (material laid down beyond the main pattern). The heavy white frothing does not disappear within 2 minutes.

Note: This is the most common mistake in running Magnum Venus Plastech equipment.

Solution:
Back off the pressure until the fan pattern fails, then add 5 psi or so to get the fan pattern back.



CHAPTER

3

PATRIOT TESTING AND ADJUSTING MANUAL
SPRAY TESTING

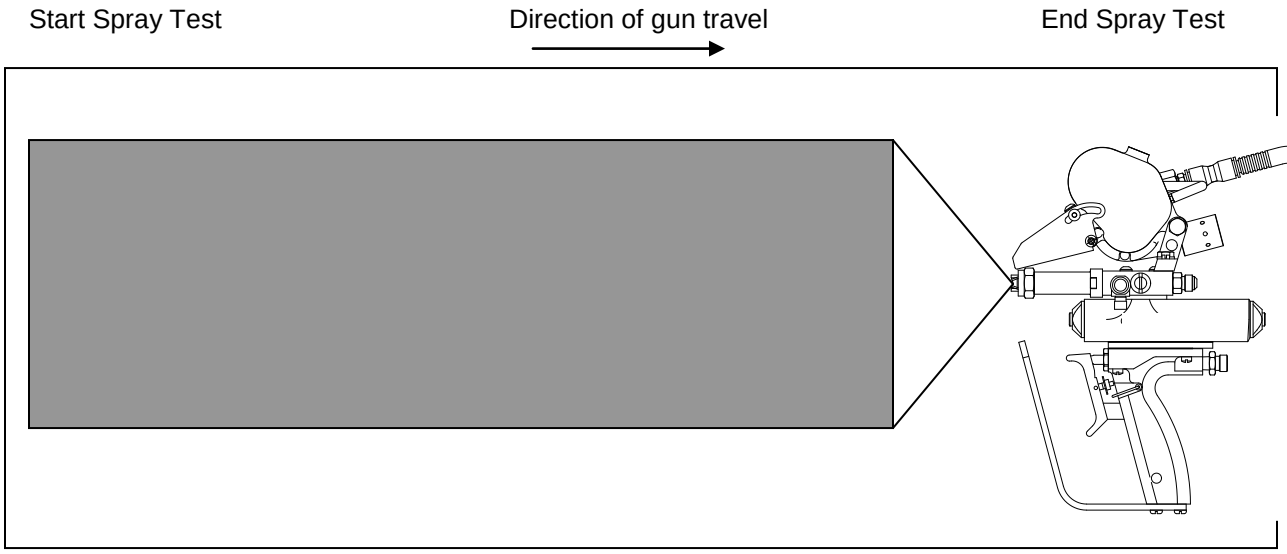
Spray tests are used to fine-tune the adjustments on your Magnum Venus Plastech dispensing equipment and to check the condition of your hardware and materials. Turn the chopper air pressure to zero, do the spray test without chop.

Note: Using a Color-Reactive material (materials that change color when they are catalyzed) make this testing easier and more accurate. MVP recommends using a dyed catalyst or a color-reactive material.

1. Lay a sheet of test material on a flat surface.

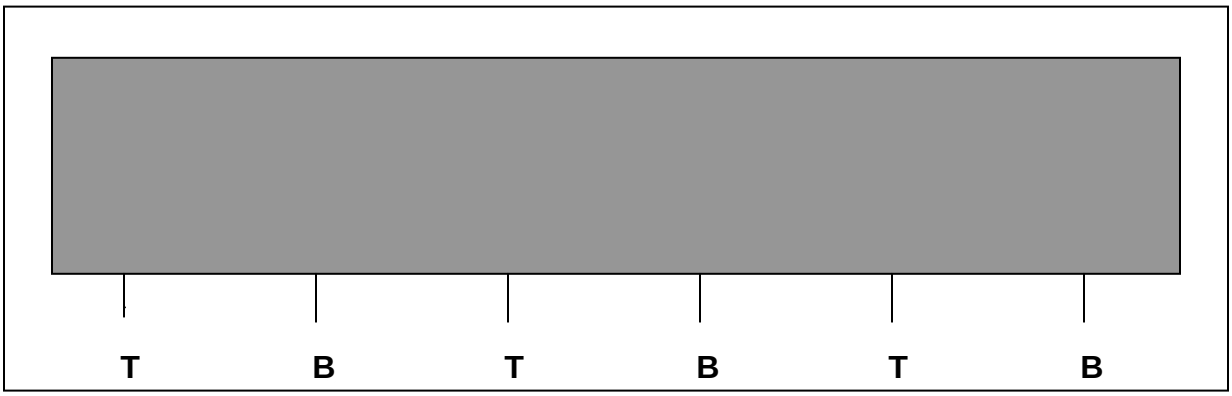
Note: The temperature of the surface can affect the reaction time of many chemicals. The coldness of a concrete floor can cause changes in cure times.

2. Pull the trigger and start spraying material along the test strip.



Spraying the test Sheet

3. When you hear the pump reverse direction, have an assistant mark the spot on the test strip and indicate whether the pump was at the top “T” or the bottom “B” of the stroke.



Marking the pump position
Fig. 3

4. Continue spraying for four or five complete pump cycles with an assistant marking the test strip every time the pump gets to the top or bottom of the stroke. Your completed test strip should look something like figure 3 (above).

5. Use a tongue depressor to test several areas on the strip: top of stroke, bottom of stroke, and the up- and down-stroke in several places. Repeat testing for material hardening several times to find out if some areas are hardening faster or slower than other areas.

Note: Color-reactive materials (materials that change color when they harden) make this testing very easy and accurate. Magnum Venus Plastech recommends using color-reactive materials whenever possible.

6. Make written notes directly on the test strip to show what happened. Pay particular attention to areas that harden faster or slower than other areas because that indicates a problem.

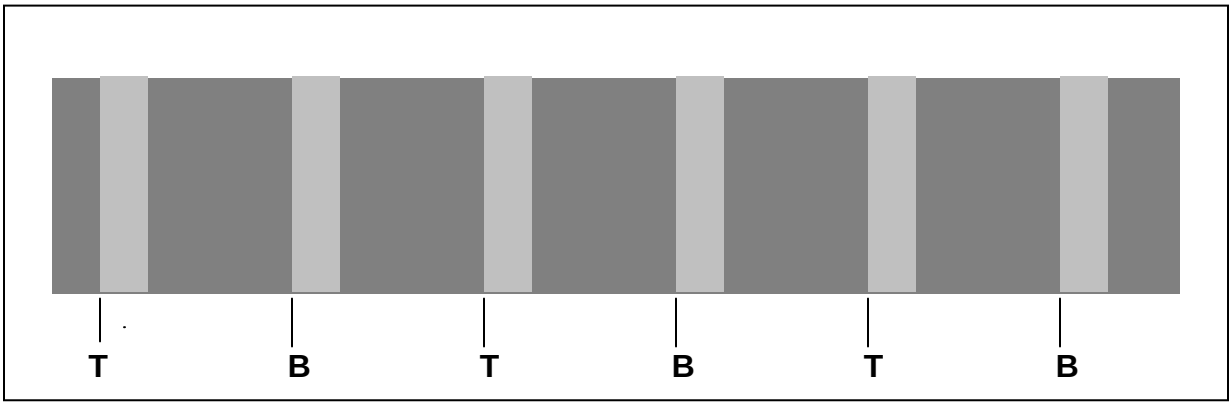
TEST RESULTS

What Do They Mean?

If all areas of the test spray harden at the same time, there is no problem and you may go on to part production.

If there are areas with little or no hardening (or extremely fast hardening) check the following descriptions for the one that best matches your results and follow the suggested procedure to fix the problem: A rule of thumb is when you have slow or no cure it is a catalyst metering problem and if you have a hot spot or fast cure the problem is the resin metering. Fast cure can be the product of higher temperatures if it is over the whole part and consistent.

The tests performed below can also be adapted to pour applications by pouring a saw tooth shaped bead of material. Where the top of the saw tooth is the top of the stroke and the valley is the bottom of the stroke.



Improper cure at the top and bottom of the stroke indicates an accumulator issue either catalyst or resin.

Result 1:
Material delivered at the top and bottom of the stroke is not curing or curing more slowly than the material delivered in the middle of the up- and down-stroke, see figure above.

Indicates: Low/no catalyst at top (T) and bottom (B) of the pump stroke.

Probable Cause: There is no or improper accumulator effect in the catalyst system. Normally this is only a problem at high pressures.

Solution: Check to be sure you are using the proper catalyst hose, with core. Install a catalyst accumulator if needed. Check for a restriction in the catalyst system. See chapter 5 for accumulator charging procedures

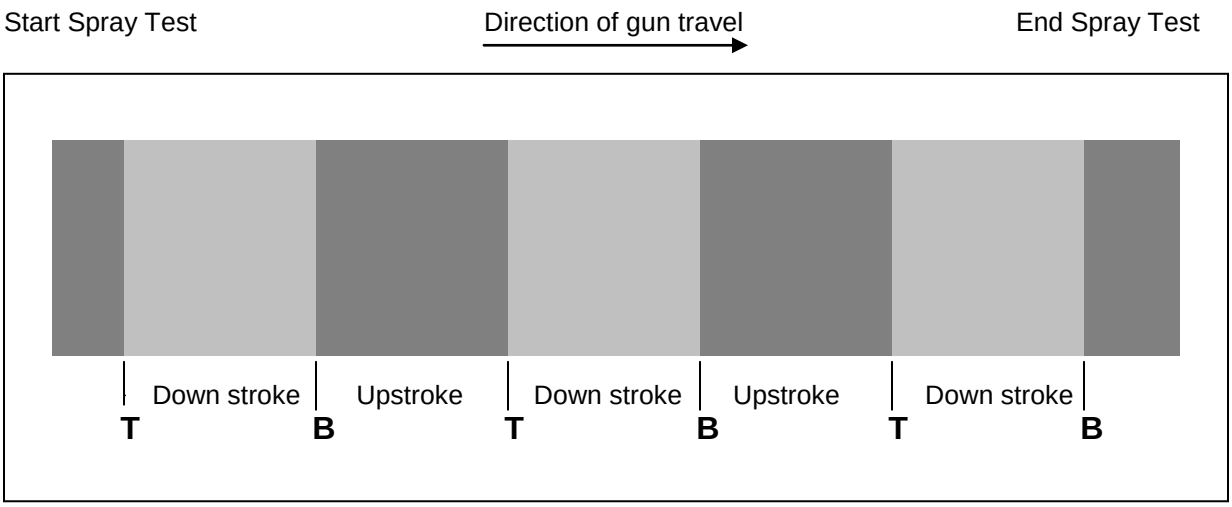
Result 2:
Material delivered at the top and bottom of the stroke is hot (curing very rapidly). Also thin areas of material might be noticeable compared to the volume delivered in the middle of the stroke, see figure above.

Indicates: Low resin at the top (T) and bottom (B) of the pump stroke.

Probable Cause: There is no or improper accumulator effect in the resin system.

Solution: Resin accumulator full of hard material or has a blockage, clean resin accumulator. Clean resin filter and reinstall. Incorrect accumulator installed. Pump pressure is too high, lower resin pressure. See chapter 5 for accumulator charging procedures

NOTE: Use caution as there may be some material still in the accumulator, a long narrow rod can be inserted up through the filter body to lift the polyball off the seat and allow any remaining material to drain if desired.



Result 3:
Material delivered on the catalyst pump up-stroke (from the bottom of the stroke to the top) is not curing or slow cure (see figure above).

Indicates: No catalyst is being delivered on the up-stroke.

Probable Cause: Worn or damaged catalyst piston seal
Damaged catalyst pump cylinder.
Worn or damaged piston body ball.
Damaged piston body ball seat.

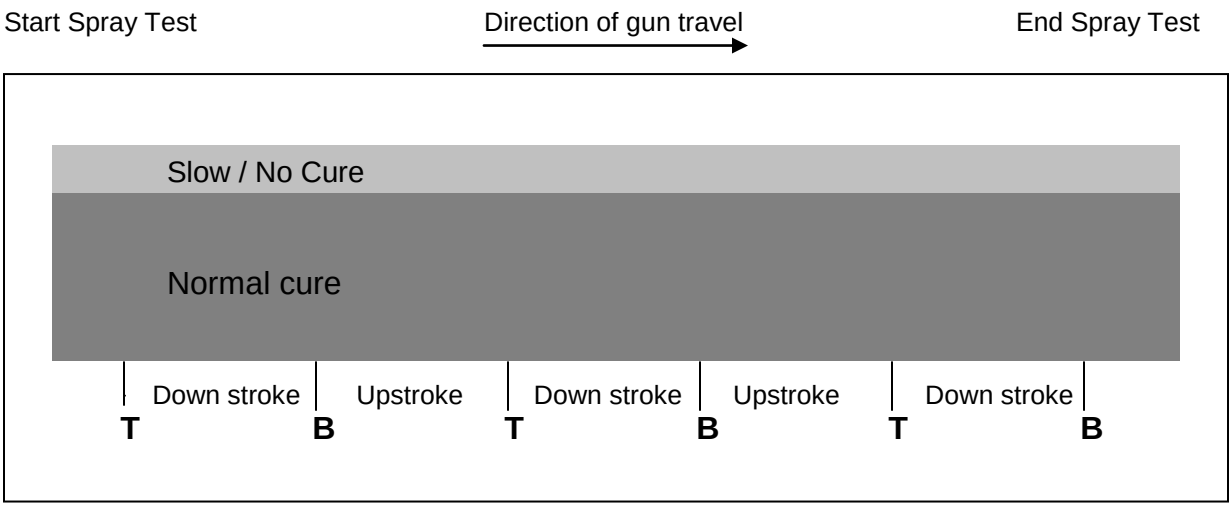
Solution: Replace worn and damaged parts, see Service and Repair Manual.

Result 4:
Material delivered on the catalyst pump down-stroke (from the top of the stroke to the bottom) is not curing or slow cure (see figure above).

Indicates: No catalyst is being delivered on the down-stroke.

Probable Cause: Worn or damaged inlet body.
Worn or damaged inlet body ball.
Worn or damaged inlet body O-ring.

Solution: Replace worn and damaged parts, see Service and Repair Manual.



Result 5:
Material is delivered with streaks running the length of the test spray. Some strips cure normally, some not at all, other cure at faster or slower rates (see figure above). <u>This is not a pumping problem, it is a mixing problem.</u>

Indicates: a mixing problem and the fan is delivering streams of poorly catalyzed resin and/or pure catalyst.

Probable Cause: the Static or Turbulent Mixer is worn, clogged or damaged in some way. A scratched or damaged Mix Chamber can also cause this problem.

Solution: shut down the system and inspect the Mixer and Mix Chamber. Repair or replace as needed.

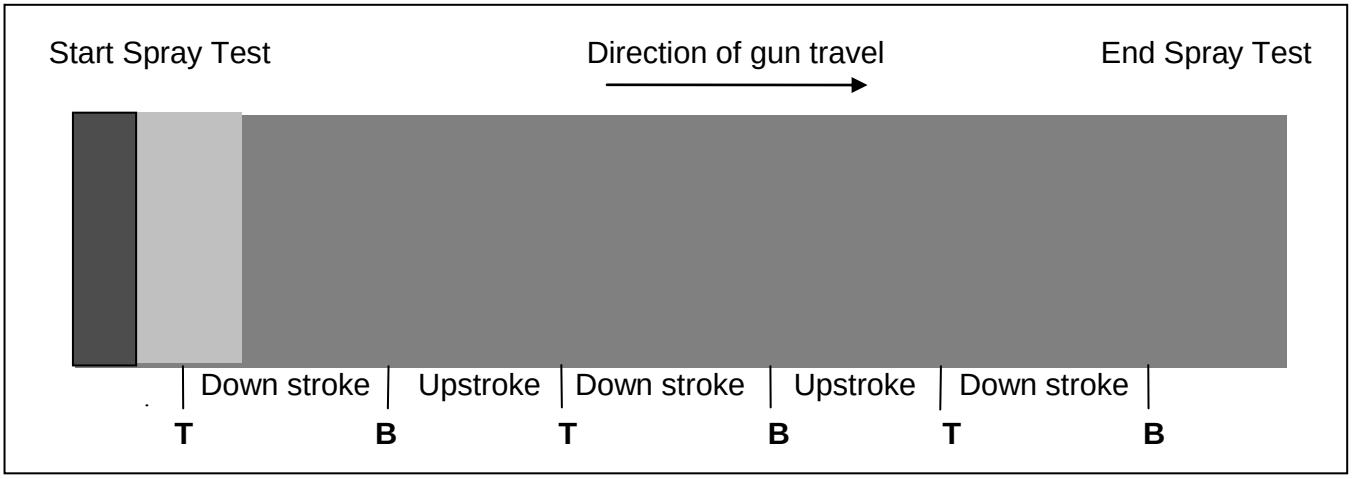
For needle style guns:

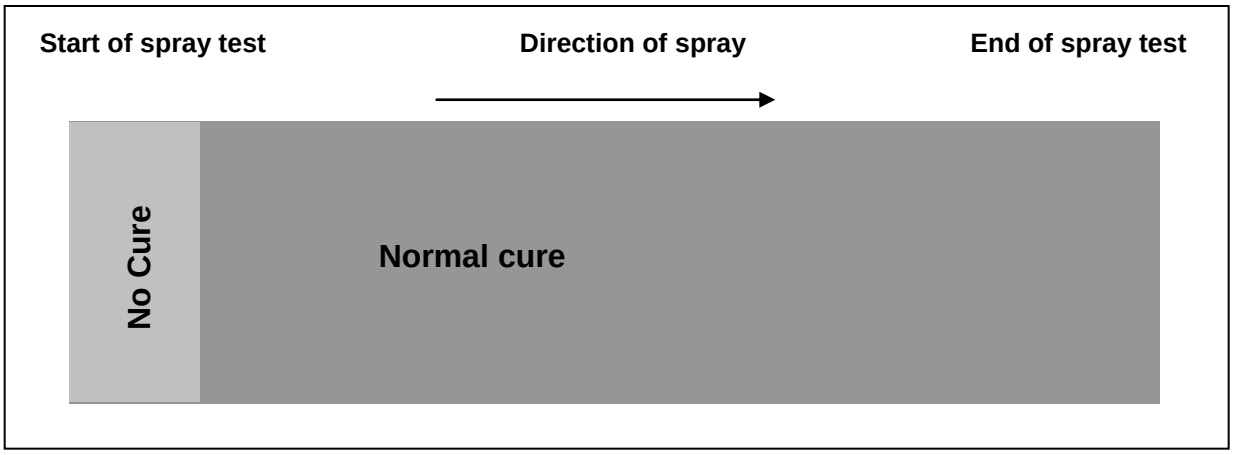
Result 6:
Material delivered at the beginning of the test strip is hot (low in resin), followed immediately by material that is cold (low in catalyst), followed by material that is properly mixed and cures. (See below)

Indicates: system is unbalanced at the beginning of the spray. Low resin is delivered upon pulling the trigger of the gun followed by low catalyst delivery. After a moment or two, the system balances and properly mixed material is delivered.

Probable Cause: The catalyst needle on the gun opens before the resin needle.

Solution: Adjust the catalyst and resin needles to the proper settings.





Result 7:
Material delivered at the beginning of the test spray is cold (low catalyst), followed by material that is properly mixed and cures. (See above)

Indicates: The system is unbalanced at the beginning of the spray. No catalyst at the beginning of the spray, followed by normal mix and spray.

Probable Cause: The resin needle is opening too much before the catalyst needle. This means a shot of pure uncatalyzed resin will be delivered until the catalyst needle is opened.

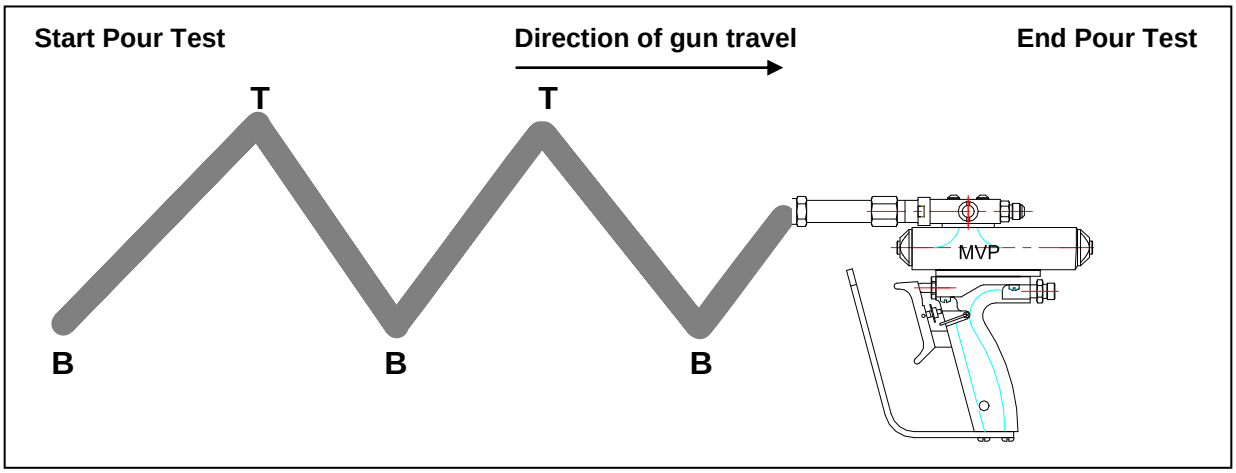
Solution: Adjust the catalyst and resin needles to the proper settings.

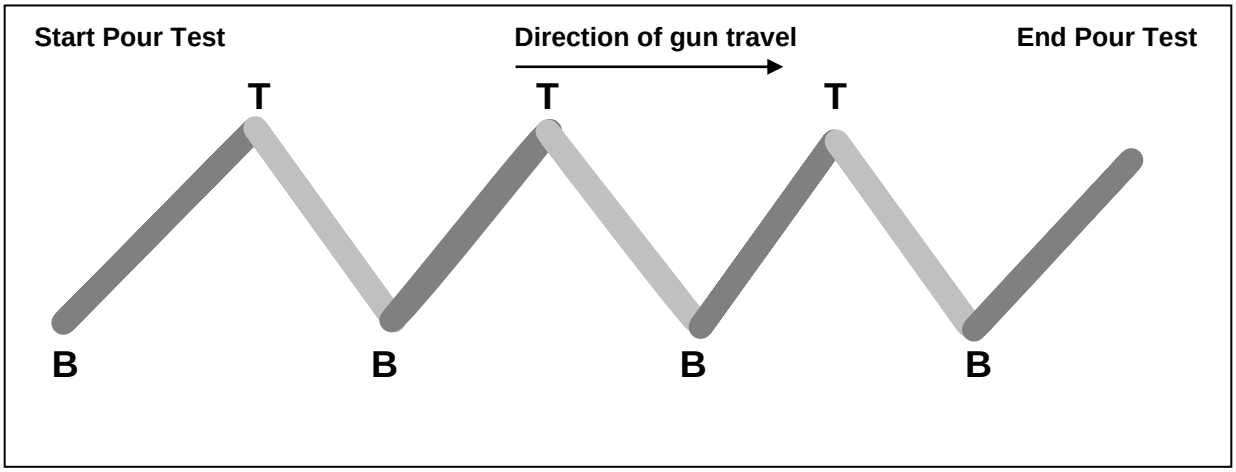
CHAPTER

4

PATRIOT TESTING AND ADJUSTING MANUAL
POUR TESTING

The same process and results that are used for testing the spray can be used for testing a pour system. By pouring a bead of material in an up and down ”zig zag” pattern then observing the results.



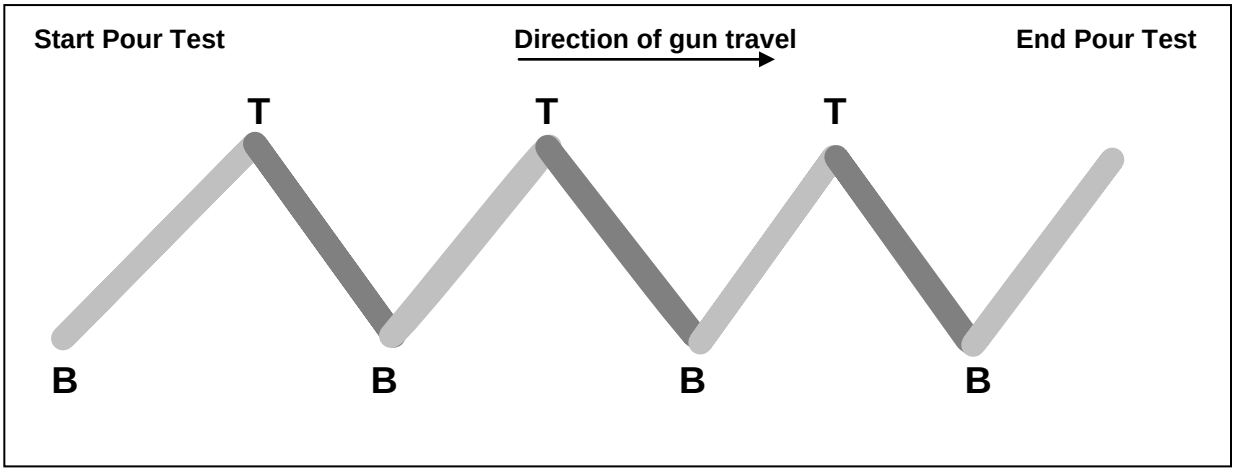


Result 8:
Material delivered on the catalyst pump down-stroke (from the top of the stroke to the bottom) is not curing or slow cure (see figure above).

Indicates: No catalyst is being delivered on the down-stroke.

Probable Cause: Worn or damaged inlet body.
Worn or damaged inlet body ball.
Worn or damaged inlet body O-ring.

Solution: Replace worn and damaged parts, see Service and Repair Manual.

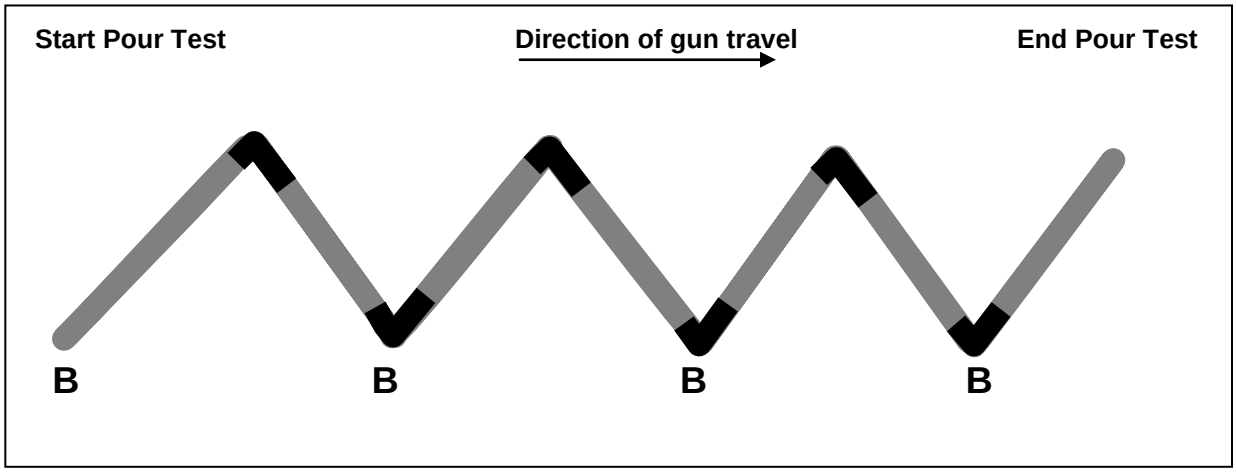


Result 9:
Material delivered on the catalyst pump up-stroke (from the bottom of the stroke to the top) is not curing or slow cure (see figure above).

Indicates: No catalyst is being delivered on the up-stroke.

Probable Cause: Worn or damaged catalyst piston seal
Damaged catalyst pump cylinder.
Worn or damaged piston body ball.
Damaged piston body ball seat.

Solution: Replace worn and damaged parts, see Service and Repair Manual.



Result 10:
Material delivered at the top and bottom of the stroke is not curing or curing more slowly than the material delivered in the middle of the up- and down-stroke, see figure above.

Indicates: Low/no catalyst at top (T) and bottom (B) of the pump stroke.

Probable Cause: There is no or improper accumulator effect in the catalyst system. Normally this is only a problem at high pressures.

Solution: Check to be sure you are using the proper catalyst hose, with or without core. Install a catalyst accumulator if needed. Check for a restriction in the catalyst system. See chapter 5 for accumulator charging procedures

Result 11:
Material delivered at the top and bottom of the stroke is hot (curing very rapidly). Also thin areas of material might be noticeable compared to the volume delivered in the middle of the stroke, see figure above.

Indicates: Low resin at the top (T) and bottom (B) of the pump stroke.

Probable Cause: There is no or improper accumulator effect in the resin system.

Solution: Resin accumulator full of hard material or has a blockage. Clean resin accumulator, filter and reinstall. Incorrect accumulator installed. Pump pressure is too high, lower resin pressure. See chapter 5 for accumulator charging procedures

NOTE: Use caution as there may be some material still in the accumulator, a long narrow rod can be inserted up through the filter body to lift the polyball off the seat and allow any remaining material to drain if desired.

CHAPTER

5

PATRIOT TESTING AND ADJUSTING MANUAL
CHARGEABLE ACCUMULATORS

Introduction:

Many applications will not require charging the accumulators; in those applications the accumulator can be used as a surge chamber. These are low pressure spray or pour applications where fluid pressures are medium to low.

In some cases only a line pressure charge on the resin accumulator will be necessary. These will be applications where a medium fluid pressure is being used, most likely a spray or a medium viscosity pour application. The line charge procedure uses the charging hose attached to the air manifold.

For high fluid pressure applications charging the accumulators to 280psi to 300psi may be required. These are applications using filled resins or spray putties. This will require a charging pump or similar device a high pressure tank and regulators can also be used.

If you do a test and find it necessary to charge the resin accumulator or both accumulators repeat the test after performing the charging procedure to confirm an even cure.

- ## Charging Procedures: Line Charge

1. Shut off air to the resin pump by either turning regulator to zero or turning the pump control valve to the off position.

2. Lock the gun in the on position over an appropriate container, or open the ball valve at the bottom of the resin filter if one is installed.

Note: For catalyst charging lock the gun in the open position over an appropriate container, or open the recirculation/dump valve on the manifold.

3. Relieve any existing charge by inserting a blunt object (allen wrench) into the top of the charging valve.

4. Push the quick coupling on charging hose onto the charging valve on top of the resin accumulator. Hold the in place for approximately 5 seconds.

Note: During charging of the accumulator, if air is heard exiting the front of the gun or appropriate valve, this indicates that the polyball in the accumulator is not seating properly. Repair the accumulator as needed.

5. Remove the charging hose from the resin accumulator. Check the top of the accumulator for air leaks by applying a light fluid (water) to the top of the accumulator valve body. If air leaks remove and repair charging valve.

6. Close the gun and flush into appropriate container or close the resin return valve.

7. Normally in line charge applications the catalyst accumulator will not need to be charged. If needed follow the above procedures on the catalyst system.

- ## Charging Procedures: Using Hand pump

8. Shut off air to the resin pump by either turning regulator to zero or turning the pump control valve to off position.

9. Lock the gun in the on position over an appropriate container, or open the ball valve at the bottom of the resin filter if one is installed.

Note: For catalyst charging lock the gun in the open position over an appropriate container, or open the recirculation/dump valve on the manifold.

10. Relieve any existing charge by inserting a blunt object (allen wrench) into the top of the charging valve.

11. Attach charging pump to the resin accumulator by connecting the black charging hose to the charging valve on top of the resin accumulator.

Note: Do not over tighten charging pump hose.

12. Pull the charging pump handle all the way out, connect air hose to male quick disconnect on charging pump.

Note: not pulling out the handle of the charging pump before attaching the air line can cause damage to the charging pump or bodily injury.

13. Pump charging pump handle with steady even strokes until gauge on charging pump read approximately 280psi.

Note: Gauge will only show accurate reading on the down / in stroke, while pressure is building (peak pressure). During charging of accumulator, if air is heard exiting the front of the gun or appropriate valve, this indicates that the polyball in the accumulator is not seating properly. Repair the accumulator as needed.

Note: <u>A general rule of thumb…</u>

For Spray Application:
Charge Accumulators to 280psi to 300psi.

Note: The above is a general rule of thumb… some materials and applications may require different charging pressures to achieve an even flow of material. Increase or decrease the charge by 5psi increments as required to fine tune the accumulator charge.

14. Disconnect air hose form the charging pump and remove the charging pump hose from the resin accumulator. Check the top of the accumulator for air leaks by applying a light fluid (water) to the top of the accumulator valve body. If air leaks remove and repair charging valve.

15. Close the gun and flush into appropriate container or close the appropriate. For the catalyst, close the recirculation valve on the catalyst manifold.

16. Repeat the above procedures for the catalyst accumulator.

- ## Charging Procedures: Using High Pressure Tank & Regulators

17. Shut off air to the resin pump by either turning regulator to zero or turning the pump control valve to off position.

18. Lock the gun in the on position over an appropriate container, or open the ball valve at the bottom of the resin filter.

Note: For catalyst charging lock the gun in the open position over an appropriate container, or open the recirculation/dump valve on the manifold.

19. Relieve any existing charge by inserting a blunt object (allen wrench) into the top of the charging valve.

20. Attach charging system to the resin accumulator by connecting the black charging hose to the charging valve on top of the resin accumulator.

Note: Do not over tighten charging pump hose.

21. Open the main regulator on the top of the tank.

22. Set the desired pressure on the charging regulator attached to the charging valve.

23. Slowly open the ball valve connected to the charging hose to charge the accumulator. Allow approximately 5 seconds for charging before closing the valve again.

Note: During charging of the accumulator, if air is heard exiting the front of the gun or appropriate valve, this indicates that the polyball in the accumulator is not seating properly. Repair the accumulator as needed.

Note: <u>A general rule of thumb…</u>

For Spray Application:
Charge Accumulators to 280psi to 300psi.

Note: The above is a general rule of thumb… some materials and applications may require different charging pressures to achieve an even flow of material. Increase or decrease the charge by 5psi increments as required to fine tune the accumulator charge.

24. Disconnect charging hose from the resin accumulator. Check the top of the accumulator for air leaks by applying a light fluid (water) to the top of the accumulator valve body. If air leaks remove and repair charging valve.

25. Close the gun and flush into appropriate container or close the resin return valve at the bottom of the filter. For the catalyst, close the recirculation valve on the catalyst manifold.

26. Repeat the above procedures for the catalyst accumulator.

CHAPTER

6

PATRIOT TESTING AND ADJUSTING MANUAL
APPENDIX

TEST NOTES

Name of materials being used:
_____
_____
_____

Catalyst Percentage: _____%

Catalyst type: _____

Material is being: □ **Sprayed** □ **Poured** □

Other:_____

This material was successfully applied under the following conditions:

□ **Winter** □ **Spring** □ **Summer** □ **Fall**

Air temperature of the factory _____ **degrees**

Relative humidity of the factory _____ **%**

Other conditions:
_____
_____
_____

Power head pressure_____**psi**

Catalyst Accumulator charge _____**psi**

Resin Accumulator charge _____**psi**

In-line Heater setting _____

Nozzle size _____

Nozzle Fan Angle _____**degrees**

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