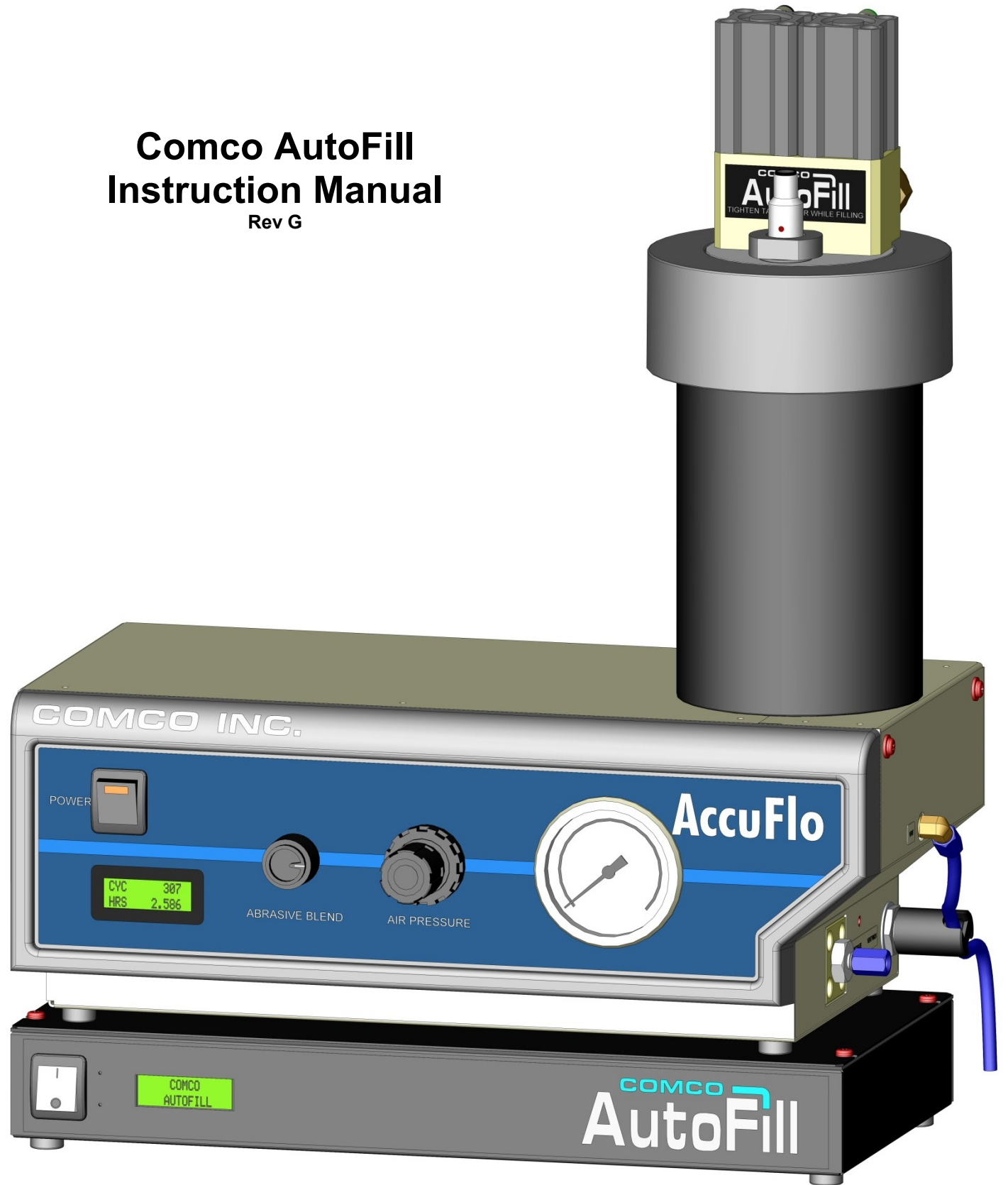


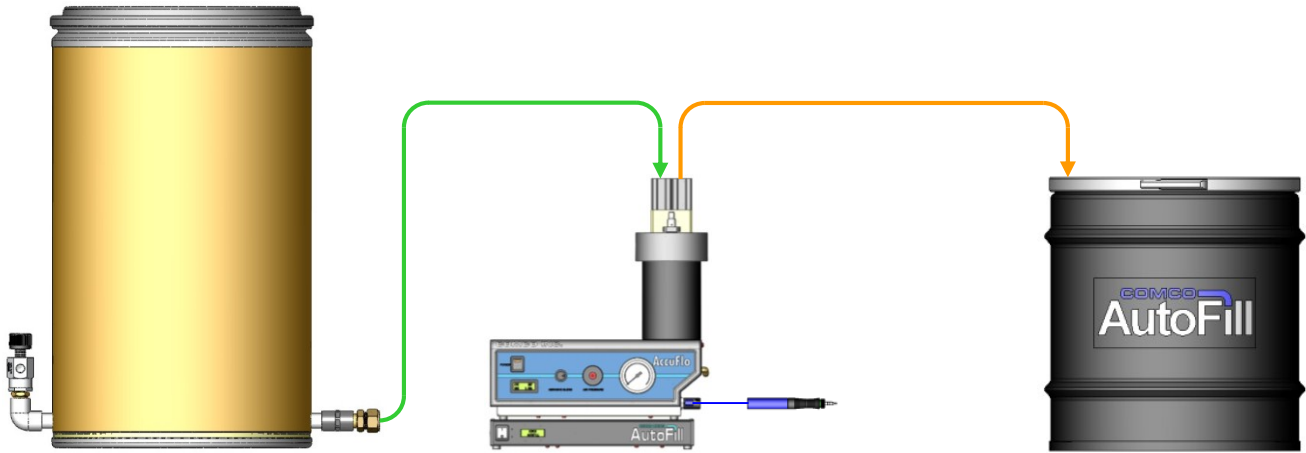
Comco AutoFill Instruction Manual

Rev G



Introduction

Comco's AutoFill is an add-on module for an AccuFlo blaster that will automatically refill the tank with powder. The filling operation is totally automatic and requires no operator involvement, which leads to both cleaner powder and a cleaner work environment. Plus, the filling speed is often much faster than an operator could achieve manually.



Powder is stored in a special drum with a conic bottom. A drum vibrator is used to move the powder into an air stream that passes under the powder. AutoFill uses vacuum (orange line) to draw powder (green line) into the AccuFlo tank from the powder drum. AutoFill uses a “tank full” sensor to determine when to stop filling the AccuFlo tank. Once the AccuFlo tank is full, the AccuFlo will automatically pressurize and be ready for use. Fill times depend on the type of powder being used and the lengths of hoses in the system, and are typically in the 1-3 minute range.

AutoFill monitors the AccuFlo for time spent blasting. After 30 minutes of blasting – which does not include non-blasting idle time – AutoFill will request a fill cycle. AutoFill monitors the AccuFlo to know if it is blasting and will never interrupt a blast cycle. After the blast cycle has ended, AutoFill will wait 2 seconds before refilling the AccuFlo.

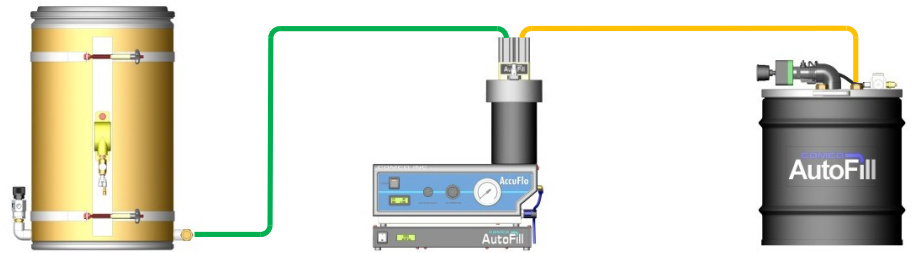
AutoFill's timers are customizable to suit any blasting situation. Customers running very rich, high media flows may wish to adjust the 30 minute countdown timer to something lower, to avoid running the tank empty. Customers who have blast programs that consist of several blasts cycles with gaps in between may wish to extend the 2 second delay, to avoid refills in the program gaps.

AutoFill can run stand-alone or it can be host-controlled using three optional-use inputs and outputs:

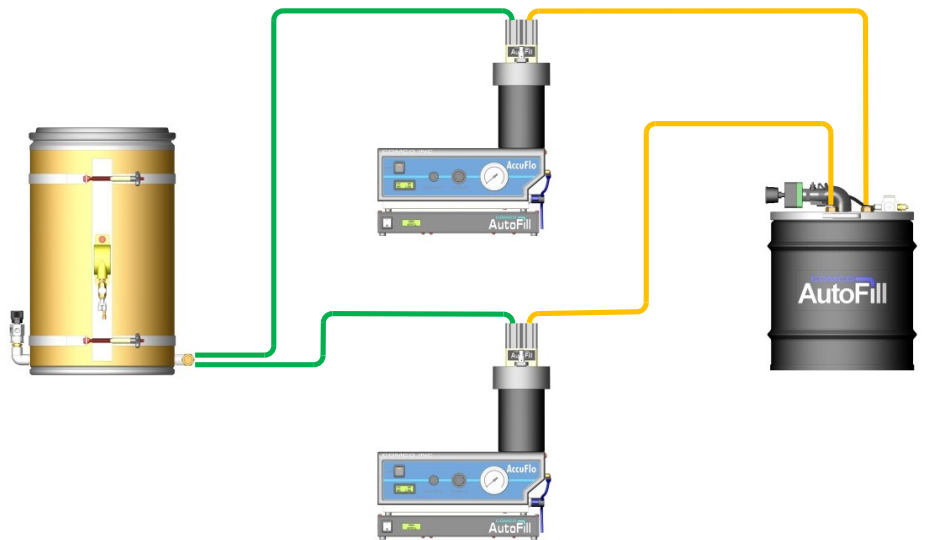
- The “Force Fill” input allows a host PLC or automatic machine to initiate a fill cycle.
- The “Inhibit Fill” input disallows the AutoFill from filling under any circumstance.
- The “Ok to Blast” output indicates that the countdown timer has not reached zero and that the blaster is available for blasting.

Each powder drum can feed up to two blasters, and each vacuum generator can fill up to two blasters, which creates three possible filling configurations:

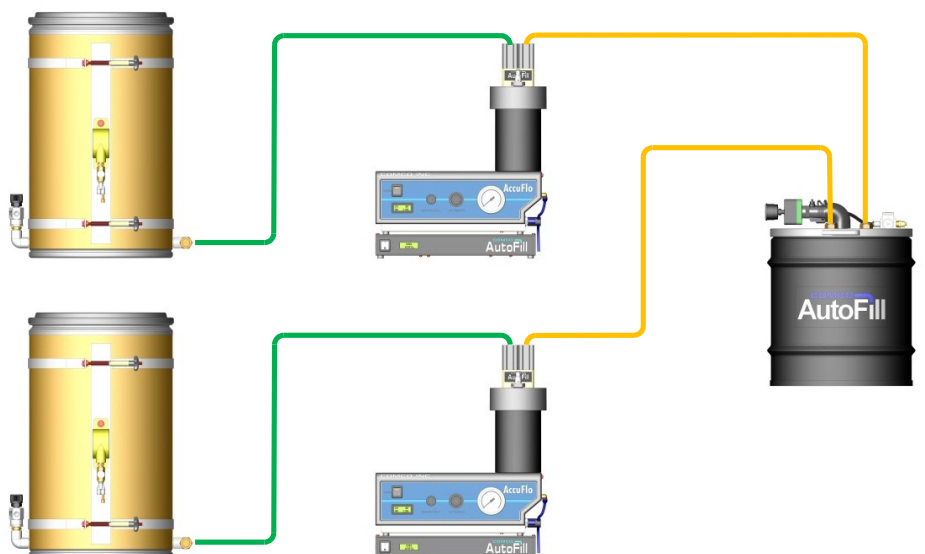
Configuration A
One powder drum feeding one blaster



Configuration B
One powder drum feeding two blasters



Configuration C
Two powder drums feeding two blasters

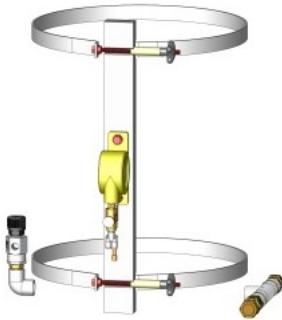


AutoFill is comprised of several items that must be selected according to the system requirements:



Part 1: Powder Drum

Full line of Comco powders available.



Part 2: Drum Accessories

MB2395 - POWDER DRUM KIT, AUTOFILL

One required for each Powder Drum.

Includes a drum vibrator, powder flow control, and drum outlet capable of feeding one or two AccuFlos.



Part 3: AccuFlo Accessories

MB2390 - AUTOFILL, ACCUFLO

One required for each AccuFlo.

Includes the control box, tank cover, and all hoses. Includes 25' of fill hose and 10' of vacuum hose. AccuFlo not included.



Part 4: Vacuum Generator

MB2380 - VACUUM GENERATOR, AUTOFILL

One vacuum generator can fill one or two AccuFlos.

Includes the vacuum generator, 8' of air supply hose and 10' of dust venting hose.



Part 5: Cables

MB2327-X - CABLE ASSEMBLY (Several to choose from)

See **Figure 1** to determine which cables are needed.

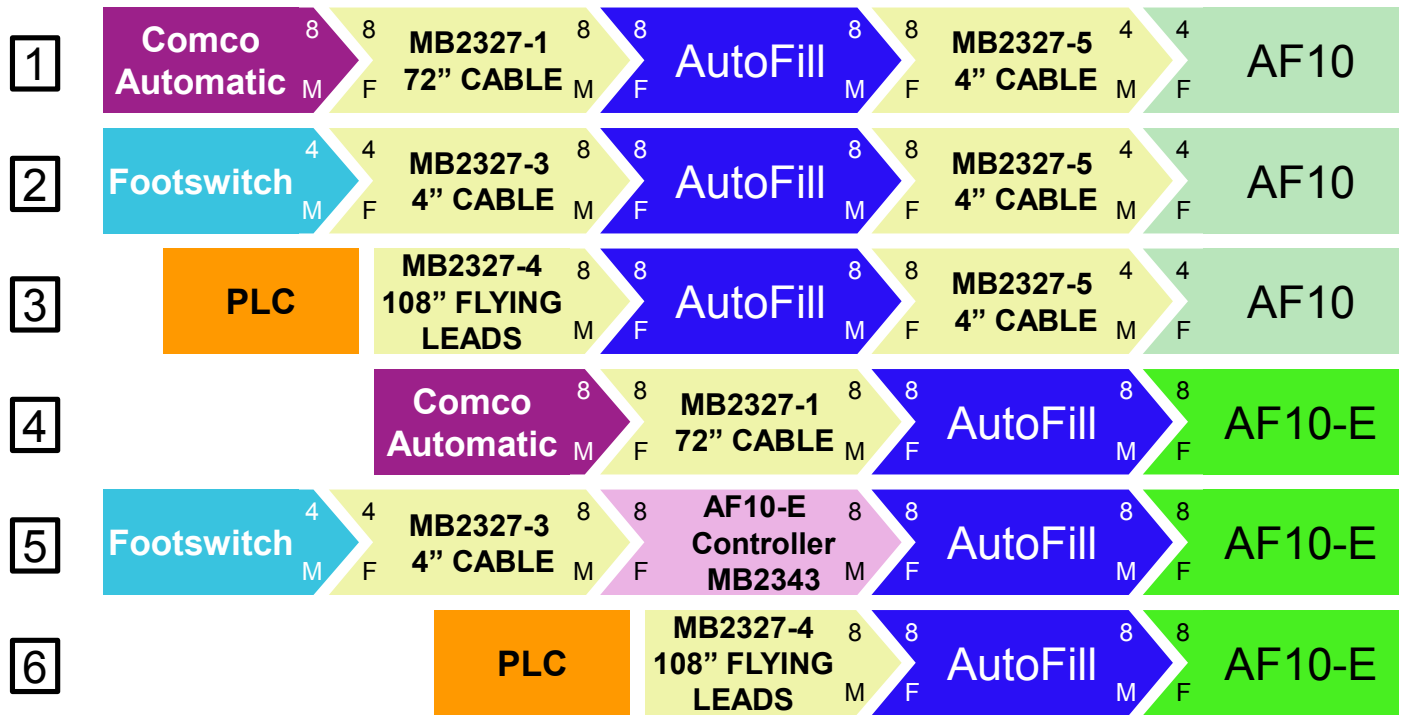


Figure 1 - Cables

Examples:

Single AF10-ET-2 with a footswitch running X-Powder (*Configuration A + Figure 1, Case 5*)

- 1x PD1033-125 – Drum of 100µm glass bead.
- 1x MB2395 – Drum vibrator, flow control, and outlet.
- 1x MB2390 – Control box, tank cover, and hoses.
- 1x MB2380 – Vacuum generator.
- 1x MB2327-3 – Adapter cable.
- 1x MB2343 – Control box for electronic regulator.

Four AF10-ET-1 controlled by a Comco JetCenter, all running C-Powder (*Two Configuration B + Figure 1, Case 4*)

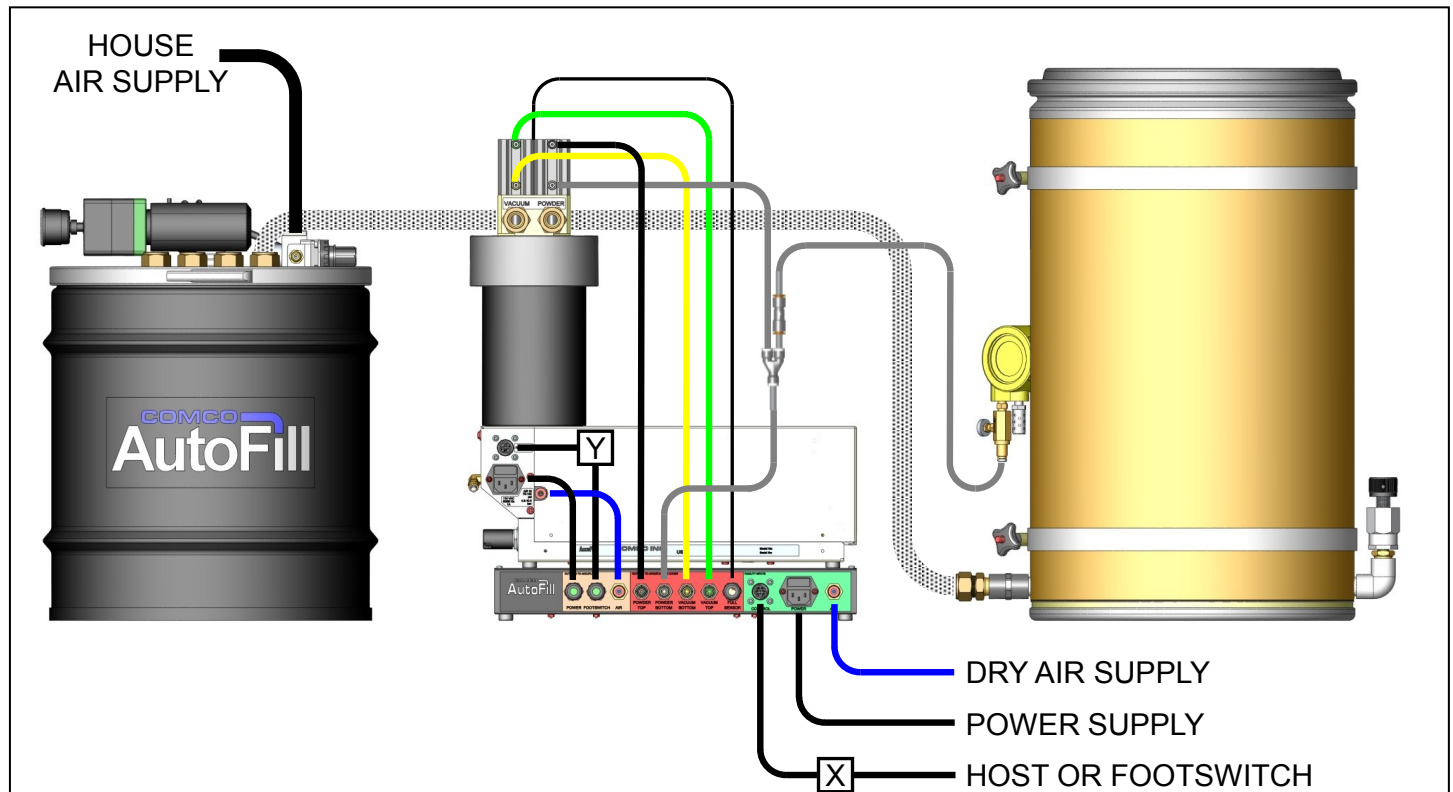
- 2x PD1003-175 – Drums of 50µm aluminum oxide.
- 2x MB2395 – Two drum vibrators, two flow controls, and two outlets.
- 4x MB2390 – Four control boxes, four tank covers, and hoses.
- 2x MB2380 – Two vacuum generators.
- 4x MB2327-1 – Four adapter cables.

Two AF10-T-1 blasters controlled by a PLC, one running K-Powder, one running G-powder (*Configuration C + Figure 1, Case 3*)

- 1x PD1027-75 – Drum of 50µm crushed glass.
- 1x PD1007-100 – Drum of 50µm sodium barcarbonate.
- 1x MB2395 – Drum vibrator, flow control, and outlet.
- 2x MB2390 – Two control boxes, two tank covers, and hoses.
- 1x MB2380 – Vacuum generator.
- 2x MB2327-4 – Two flying leads cables for PLC integration.
- 2x MB2327-5 – Two adapter cables.

Set-up:

1. Position the control box in the desired location and put the AccuFlo on top of it.
2. Remove the standard AccuFlo tank cover and install the new tank cover that includes the PowderGate valves and tank full sensor.
3. Position the vacuum generator in the desired location.
 - Route the clear tubing to the dust collector. This will capture any fine particles that make it thru the HEPA filter, keeping the area cleaner. Alternatively, replace the hose with the silencer.
 - Shorter lengths of vacuum hose will reduce fill time. All testing was done with a 10' hose.
4. Position the powder drum in the desired location.
 - Minimize hose length to improve fill times. All testing was done with a 25' hose that included a 10' vertical up then down run.
5. Make all pneumatic and electrical connections as shown in **Figure 2**. Cables X and Y are based on data shown in **Figure 1**. Cable Y is not always necessary. Cap unused vacuum generator connection and/or drum vibrator connection as appropriate. If this is the first time connecting AutoFill, make sure the flow control on the powder drum is fully open (fully CCW).

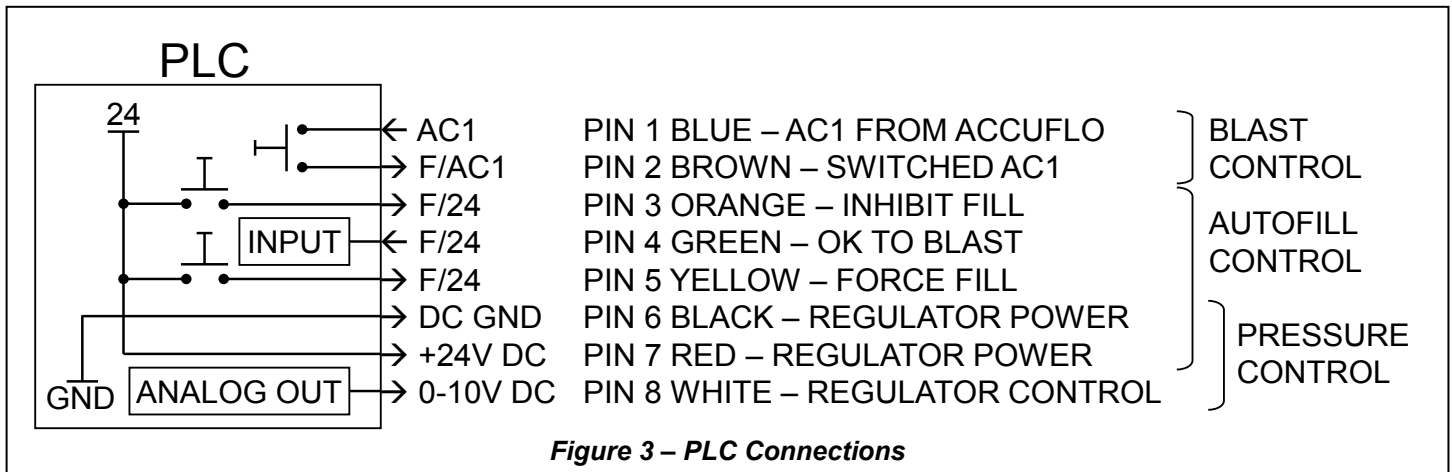


Notes:

1. Connect AutoFill to the same voltage as required by the attached AccuFlo, 115 or 230 VAC, single phase.
2. House air supply: dryer than 35°F dewpoint, cleaner than 10 ppm oil.
3. Dry air supply: dryer than -25°F dewpoint, cleaner than 10 ppm oil.
4. Cables X & Y will vary depending on installation. See Figure 1.
5. All hose connections are color coded.
6. Unused connections on the vacuum drum, powder drum vibrator, and drum outlet must be capped or plugged.

Figure 2 - Connections

6. If AutoFill and the AccuFlo are to be controlled by a PLC, wire the PLC according to the diagram in **Figure 3**. For non-electronic regulator AccuFlos, the only mandatory signal is for Blast Control. For electronic regulator (AF10-E) AccuFlos, both Blast Control and Pressure Control signals are required. The electronic regulator requires 60mA of power and has an internal resistance of 100ohm on the control line. The AutoFill Control signals are optional in all cases. (In **Figure 3**, “F” indicates a floating line that is neither tied to ground nor a voltage.)



First Time Operation

During the first fill, the following adjustments need to be made:

1. Adjust the Powder Drum Flow Control - The flow control on the powder drum regulates how much air is used to convey the media from the drum to the AccuFlo. Too much air and the fill cycle will take too long; too little air and the hose may clog with media. Since clearing a clogged hose is difficult and time consuming it is highly recommended to run the filling stream too lean at the expense of filling time. The flow control valve is fully open by default, which makes for a very lean filling stream. While filling, close this valve by turning the knob clockwise (CW) until the filling stream is so rich that it starts to surge in the hose, then open the valve (CCW) until the stream is smooth again.

2. Tighten the AutoFill Tank Cover - While the tank is filling and the tank is under vacuum, tighten the tank cover. Failure to tighten the tank cover while the tank is under vacuum may cause the tank cover to work its way loose, leading to a leaky tank cover.

Stand-Alone Operation

AutoFill will attempt to refill the AccuFlo when first turned on or whenever the countdown timer on the LCD reaches zero. AutoFill starts a fill cycle by turning off power to the AccuFlo to let it vent. After a 10s venting period it opens the vacuum PowderGate to create vacuum within the AccuFlo tank. The powder PowderGate is then opened to allow the vacuum to draw powder from the powder drum. The drum vibrator is activated to help feed powder into the conveying air stream. The AccuFlo tank is monitored by a full sensor, which when tripped, ends the fill cycle. The PowderGate valves go thru a cleaning cycle and then power is then restored to the blaster.

AutoFill is prevented from filling if any of the following items are inhibiting a fill:

1. The AccuFlo is blasting. AutoFill will never interrupt a blast cycle to refill.
2. The AccuFlo was recently blasting and the 2 second Fill Delay time duration has not yet expired. This is useful in cases where a blast cycle includes pauses in blasting, to avoid fills during those brief pauses.
3. The “Inhibit Fill” input is active. This is described in Host-Controlled Operation.

While filling, the LCD on the AutoFill control box shows how many fill cycles have been completed, as well as how long the current fill cycle has been running. The fill cycle counter is useful for planning routine maintenance. The timer is useful to know if the fill cycle is running as normal, or if it has run longer than normal indicating an empty powder drum.

Refer to Advanced Options Menu to adjust the default 30 min Countdown and/or the 2 second Fill Delay if the default values are inappropriate for your application. Refer to Troubleshooting to help remedy any performance issues.

Host-Controlled Operation

The following inputs and outputs allow host automation (such as a PLC or other automatic machine) to control when a fill is allowed or disallowed, and to monitor when one is required. The fill cycle is the same as in Stand-Alone Operation, but the timing of when it happens can be controlled by the host automation:

- Force Fill (input) – This is active when held to 24vdc as shown in **Figure 3**. When supplied 24vdc, this input will draw a maximum of 10mA. This will start a fill cycle provided nothing is inhibiting a fill (as listed in Stand-Alone Operation) and that the tank full sensor is not already detecting a full tank.
- Inhibit Fill (input) – This is active when held to 24vdc as shown in **Figure 3**. When supplied 24vdc, this input will draw a maximum of 10mA. This will prevent filling the tank under all circumstances. It is recommended to hold this at 24vdc whenever an automatic program is executing. If Inhibit is activated during a fill, the fill operation will be cancelled and the blaster returned to service. Since the fill will have been cancelled with an unknown amount of powder in the tank, the countdown timer will default to 60s of blasting until the next fill.
- Ok to Blast (output) – This is held at 24vdc when active. This will drive a 1000ohm load. A 24vdc signal on this output indicates that it is okay to use the blaster: the countdown timer has not reached zero nor is the blaster currently filling. A floating signal on this output indicates that either the countdown timer has reached zero, or that the blaster is in the process of filling.

Maintenance

Maintenance Frequency Table - Number of fill cycles between maintenances:

	A - 10 µm aluminum oxide J - 17.5 µm aluminum oxide B - 25 µm aluminum oxide E - 20 µm silicon carbide F - 50 µm silicon carbide K - 50 µm crushed glass P - 50 µm pumice R - 100 µm wheat starch U - 25 µm sodium bicarbonate G - 50 µm sodium bicarbonate W - 100 µm sodium bicarbonate	C - 50 µm aluminum oxide S - 100 µm aluminum oxide N - 150 µm aluminum oxide H - 250 µm walnut shell T - 35 µm glass bead D - 50 µm glass bead X - 100 µm glass bead Y - 50 µm melamine M - 200 µm melamine
Vacuum Generator: Empty steel drum of powder	250	250
Vacuum Generator: Clean HEPA filter	250	500
Vacuum Generator: Replace HEPA filter	500	1000
Vacuum Generator: Clean venturi tubes	500	
Tank Cover: Replace PowderGate seals	500	500

Note 1: Use the fill counter shown on the LCD during a fill to help track when maintenance is due.

Note 2: If the vacuum generator is shared by two AutoFills then the maintenance is due when the sum total of AutoFill usage reaches the indicated maintenance level. For example, two AutoFills running J powder at two fills per day will require the Vacuum Generator's first service at 2×2 fills per day = 4 fills per day. $250 / 4 = 63$ days.

Note 3: The numbers in this table were developed experimentally in lab conditions and actual use may cause them to vary considerably.

Vacuum Generator

The vacuum generator will ingest approximately 0.5% of the powder conveyed out of the powder drums. This will cause the vacuum generator to fill up with powder, the internal HEPA filter to clog up, and the venturi tubes inside the vacuum pump to become dirty.

Referring to **Figure 4**, open and lower the clamping ring around the top of the vacuum generator. Use a soft face hammer to separate the cover from the drum by striking the edge of the cover upwards. Disassemble the HEPA filter and clean (or replace: ST6320-RF). Dump any powder into the trash.



Figure 4 – Opening the Vacuum Generator and accessing the HEPA filter

Cleaning the venturi tubes requires disassembly of the Piab vacuum pump. Referring to **Figure 5**, separate the halves of the Piab vacuum generator by releasing the lock and then pushing down on the edge of a table to open the slide fit. Note that some Piab models have a small brass lock (shown here), and others release by turning two coin-slot plugs on the end of the black half. Remove the venturi tubes by removing the white plastic locking plates. Blow out both halves of the housing and the venturi tubes. Replace the venturi tubes if any of the rubber flaps inside the windows are torn (ST6354 each). When reassembling, make sure the white plastic locking plates go back in the same location from where they were removed: one in each window of the black housing.

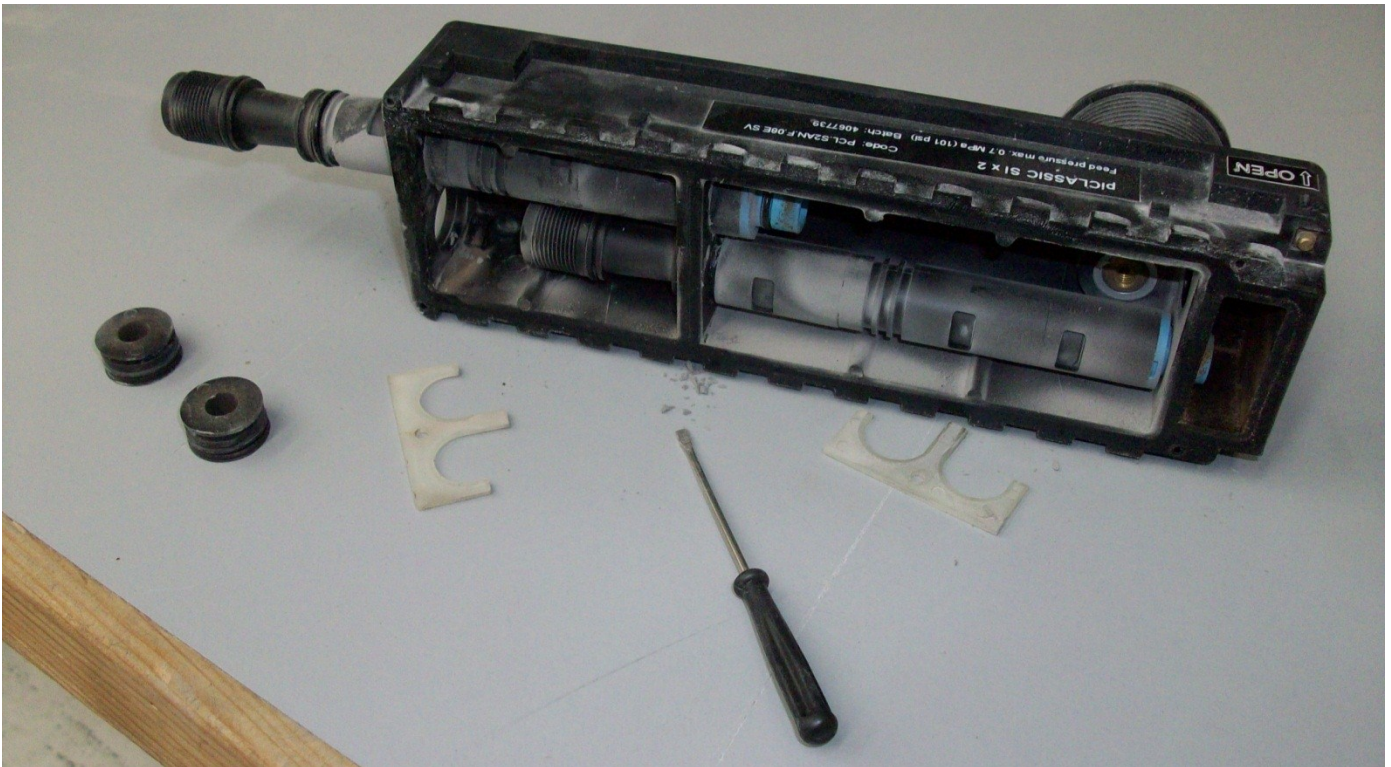
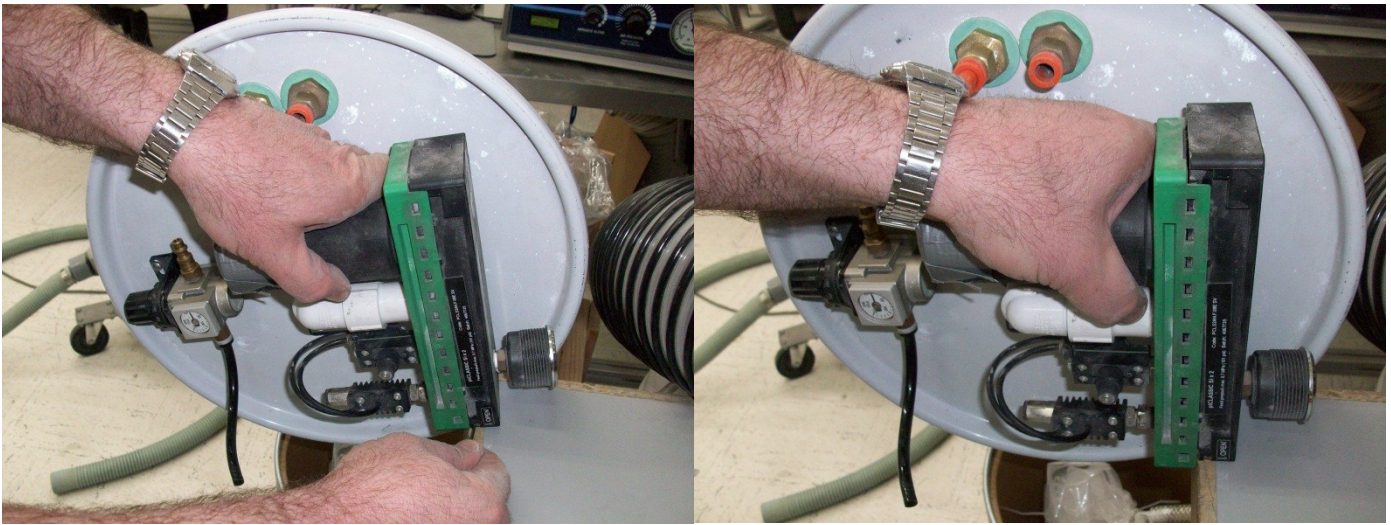


Figure 5 – Disassembling the Piab vacuum generator

PowderGate Service

The PowderGates in the tank cover each work by forcing a plunger between a pair of seals. It is important that these seals don't leak beyond 0.1 scfm to avoid impacting the amount of media output from the blaster as well as to keep media from blowing out the flow control knob on the powder drum. These seals will wear with normal use and need periodic replacement.

Referring to **Figure 6**, remove the tank cover and turn over. Remove the two screws from the inside surface of the tank cover and pull the PowderGate assembly upward and away.



Figure 6 – Accessing the PowderGate seals

Pull the seals out of the tank cover, noting their orientation. Clean the bores and install new seals (four ST5847-10) in the same orientation as before. The seals will be going into the holes with their o-ring face first, and you'll need to gently work them into the bores sharp edges first. It is critical that the seals be installed in the correct direction! (**Figure 7**)

Reset any displaced o-rings into the PowderGate block and reassemble.

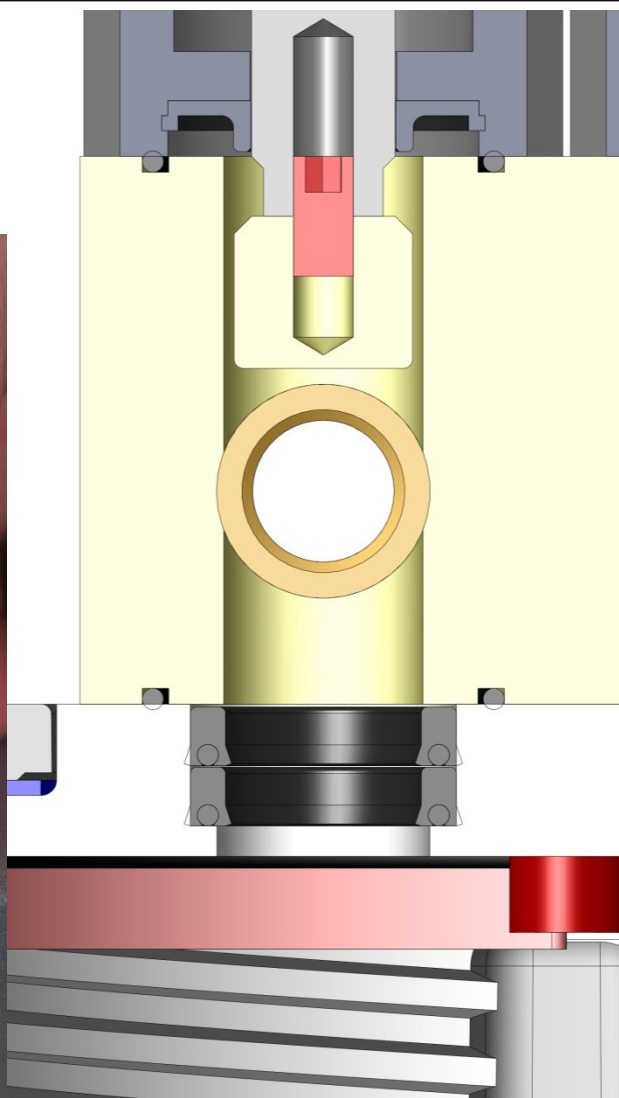
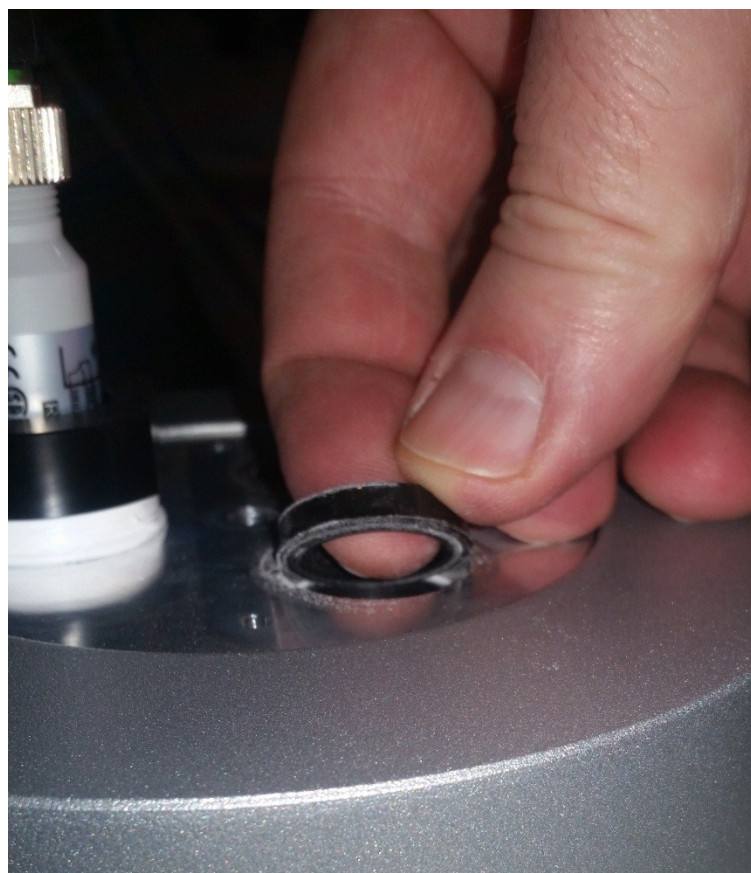


Figure 7 - Seal orientation is critical

Troubleshooting

Symptom	Cause	Remedy
Takes too long to fill, or won't fill at all	Powder drum empty	Tip drum to verify empty.
	Drum vibrator not running	Adjust flow control on vibrator to make sure it's running during a fill.
	Powder drum flow control open too much	Adjust flow control as outlined in <u>First Time Operation</u> .
	Fill tube clogged	
	Vacuum generator ineffective	Clean (or repair) vacuum generator as outlined in <u>Maintenance: Vacuum Generator</u> .
	Vacuum hose too long	Reposition vacuum generator closer to AccuFlo and remove excess vacuum hose.
	Fill hose too long or has too much vertical	Move the powder drum closer to the AccuFlo. While the AccuFlo can fill from a long distance, much of the filling energy is lost to powder transport. Same goes for powder hoses that make long vertical runs.
AccuFlo runs empty before the countdown timer ends	Countdown timer too long	Decrease Countdown under <u>Advanced Options Menu</u> .
AccuFlo fills too frequently	Countdown timer too short	Increase Countdown under <u>Advanced Options Menu</u> .
Blast cycle being interrupted by AutoFill	Pauses in blast cycle make AutoFill think it's ok to fill	Increase the Fill Delay time under <u>Advanced Options Menu</u> .
AccuFlo tank cover leaks	Alternating cycles of pressure and vacuum cause the tank cover to loosen	Make sure that the sealing surface is clean and to firmly tighten the tank cover when the tank is filling.
Vacuum generator filling with powder	Normal operation	The suction air will carry a small percentage (<1%) of the powder thru the AccuFlo tank and into the vacuum generator. Refer to <u>Maintenance: Vacuum Generator</u> .
AutoFill spontaneously resetting	ESD occurring nearby	Ground all metal objects. The typical cause is the AutoFill is sitting on an ungrounded metal table or cart, and that surface is charging up while blasting. Once it charges up enough, it will spark over to the grounded control box. This ESD spark can cause the control box to reset.

Symptom	Cause	Remedy
Vacuum generator blowing powder	Powder is getting past HEPA filter.	Replace the filter with a new HEPA filter. (The HEPA filter is rated to capture 99.97% of 0.3um particles and larger, so some blow-by is to be expected.)
		Replace the vacuum pump's silencer with the 10' section of clear hose included with the vacuum generator. Route this hose to a dust collector.
Air leaks visible in powder fill tube	PowderGate leaking	Inspect PowderGate seals for wear or damage as outlined in <u>Maintenance: PowderGate Service</u>
Inconsistent powder output from blaster during blasting		
Powder coming out of flow control at powder drum		
Vacuum generator running constantly	Vacuum leaks	Check for vacuum leaks including an ill-fitting vacuum drum cover or disconnected vacuum hoses.
	Automatic shutoff on vacuum pump set incorrectly	Adjust screw on vacuum pump's external valve to stop the vacuum pump running when at full vacuum.
Vacuum generator pulsing on/off during a fill	HEPA filter is clogged	Service HEPA filter as outlined in <u>Maintenance: Vacuum Generator</u>

Advanced Options Menu

The AutoFill control box has two hidden buttons next to the power switch, as shown in **Figure 8**. Use a small object to press *Next* to enter the Advanced Options Menu. The Advanced Options Menu can be accessed whenever AutoFill is idle by pressing *Next*, or by holding *Next* when first powering AutoFill on. The Advanced Options Menu is not accessible during blasting or during a fill. The menu options are advanced by pressing the *Next* button. To make a change, press the *Select* button. The list of available variables are shown in the following table.

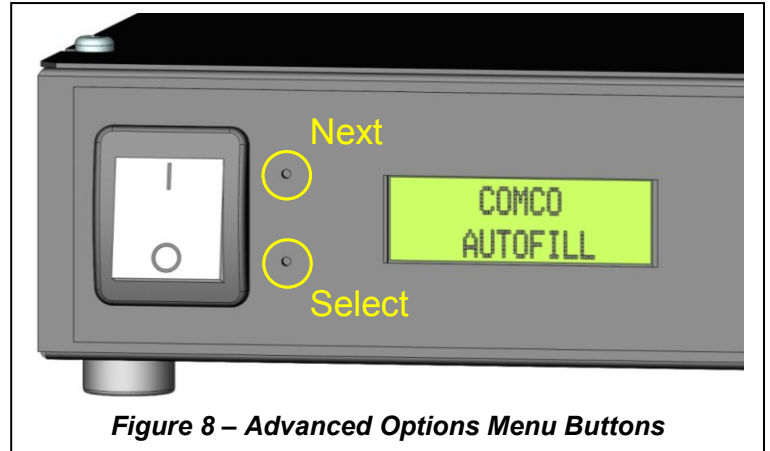


Figure 8 – Advanced Options Menu Buttons

Variable	Default Value	Range	Usage
Countdown	30m	1 - 120m	Dictates how many minutes of active blast time need to happen before a fill cycle is requested. Time when the blaster is sitting idle is not counted.
Fill Delay	2s	0 - 30s	Sets the amount of time after a blast has ended and before an automatic fill is allowed. This is used in semi-automatic operations that involve a series of blasts and pauses during each program cycle. Set this value to something longer than the longest pause in the program to make sure that the tank only refills between programs. (Alternatively, this parameter can be set to a low value and the host can provide the optional "Inhibit Fill" input into the AutoFill to prevent fills while a program is running.)
Test Mode	DISABLED	ENABLED DISABLED	Test mode ignores the state of the footswitch. This mode allows AutoFill to be paired with a super-high flow AccuFlo that is run continuously for endurance testing at the factory.
Fill Counter	NO	NO YES	Select YES to reset the fill counter to zero.
Diagnostics	0000		This code is used by Comco engineers to understand how long the EEPROM memory is lasting. This memory is used to store the fill counter data and the settings in this list.
Exit/Reboot?			<i>Select</i> allows exiting from the Advanced Options Menu and will reboot the AutoFill control box. Parameters are saved after exiting each individual parameter. The Advanced Options Menu can be exited with no harm by cycling power at any time.

Revision History

TS709 Rev NC – Original release to production. Firmware version 1.4.

TS709 Rev A – ECN 7960. Firmware version 2.0.

TS709 Rev B – ECN 7976. Firmware version 2.2.

TS709 Rev C – ECN 7994. Firmware version 3.0. Replaced analog tank level sensor with tank full sensor & firmware estimation. Replaced powder pick-up tube with powder nugget.

TS709 Rev D – On page 5, clarified voltage requirements.

TS709 Rev E – ECN 8068. Firmware version 3.1.

- Firmware changed to use a countdown timer until a refill, essentially a rewording of prior version's "minutes to tank empty". A few minor bugs were also fixed.
- Added explanation of how to feed multiple blasters off one powder reservoir.
- Minor overhaul of manual for informational and organizational clarity.

TS709 Rev F - ECN 8100. Firmware version 4.0. Major redesign of AutoFill tank cover and associated firmware used to drive the valves. Tank cover now has two PG valves: one for powder and one for vacuum. PG design changed to be less susceptible to being held open by powder contamination. PG for vacuum replaces old vacuum path thru the vent pinch for improved fill performance and reduced maintenance.

TS709 Rev G - ECN 8100. Firmware version 5.0. AccuFlo no longer requires modification and uses its vent line to dump tank pressure into the workstation. Updated part numbers to make things less confusing.