

# **OPERATORS INSTRUCTIONS- Pharmafill ABF/DABF Automatic Bottle filling Systems**

**The ABF and DABF automatic bottle filling systems are very similar. A DABF is basically two ABF's combined and served by a wider, dual lane conveyor. The following information refers to the ABF and DABF bottle indexing control system in general and the AC1 specifically.**

**POWER-** Power to the TCA2, AC1 and AS1 is turned on by a rocker switch located on the side of the AC1 control enclosure attached to the rear of the LP2 lift platform. To turn on the TCA2 and AC1 you must push the ON button on the white AC1 control box. TCA2 power is turned on by the main power rocker switch on the PC3 panel main power. Several fuses protect the power circuits of the AC1, the TC2 and the AS1. You also need compressed air at 80 psi - 5 cfm to operate the bottle indexing cylinders.

## **COMPONENTS**

### *Description of the machines and systems that make the ABF or DABF line*

1. TABLET COUNTING MACHINE- Usually a Pharmafill TCA2. The ABF2 uses one TCA2R. The DABF2 uses two tablet counters, a TCA2R and a TCA2L.
2. LIFT PLATFORM- Usually a LPA2 - the adjustable support base for a TCA2. The LPA2 has a hand crank that raises and lowers the TCA2 so the filling funnels are ideally positioned above bottle openings. The AS1 is inside the LPA2.
3. AIR SUPPLY- The AS1 turbine blower is mounted inside the lower enclosure of the LPA2. It supplies low pressure air to the Air Guide System on a TCA2 machine. Two air filters are mounted outside the lower enclosure that filter air to and from the AS1 before it is directed at product on the TCA2 turntable.
4. AUTOMATIC BOTTLE INDEXING CONTROL- The AC1 is attached to the rear of the LPA2. It contains the PLC which is the electronic heart of the control system, the air valves, air lines, the relays, and sensors for fill station, backlog and backup. The main power switch is located on the AC1 side panel.
5. CONVEYOR- A conveyor serves the automatic tablet counting operation. An ABF2 has a single lane CV4.5 conveyor. A DABF2 has a dual lane CV10 conveyor with a separate lane for each tablet counter. Conveyors may be any length between 6' and 30' long. Conveyors are variable speed and include all necessary guide rails.
6. BOTTLE STOP CYLINDERS- Five pneumatic air cylinders are attached to the conveyor rail to control the position of bottles along the filling line. Each cylinder uses air pressure to extend a piston rod in front of a bottle to keep the bottle in position along the filling line. When the pressure is removed a spring inside the cylinder retracts the rod and the bottle can move along the conveyor track. Cylinders are attached to the AC1.

7. BOTTLE DETECTING SENSORS- 4 photoelectric sensors are attached to the conveyor rails to detect bottles. Two sensors monitor each filling station. the other two are the backup and backlog sensors. Sensors are connected to the AC1. These sensors are part of the INTERLOCKS function.

### **OPERATOR CONTROL PANEL**

#### Description of lights and switches located on panel

1. ON BUTTON- Push this button after the AC1 power rocker switch is turned on, to deliver power to the AC1 and the tablet counter.
2. STOP BUTTON (RED)- Located on top of the control box. This is the emergency stop button for the line. Push this button to turn off the TCA2 and the AC1 electronics.
3. INTERLOCKS SWITCH- This switch turns the interlock function on/off. The Interlock function automatically stops the filling operation when a bottle is not in correct position.
4. MODE SWITCH - SETUP/MANUAL/AUTO- Selects 1 of 3 operating modes in coordination with the RUN/HOLD switch.
  - a. SETUP- automatically locates the bottles in correct position under the filling stations
  - b. MANUAL- the tablet counter can be used as a semiautomatic machine.
  - c. AUTO- the line is ready for full automatic operation.
5. RUN/HOLD SWITCH- This switch is a part of the PLC function. The HOLD position allows changes in MODE to take effect. Filling stops and power stays on, when this switch is in HOLD. In the RUN position the operation selected by the MODE switch will begin if conditions are correct. Switch to HOLD before changing the MODE switch. The READY light should flash in HOLD and be steady in the RUN position.
6. READY LIGHT (GREEN)- When this light is flashing the system is ready to operate and may be switched from HOLD to RUN. When the light is on steady, the switch is in the RUN position and system is operating normally. If the light is off, the system can not operate. To operate, some action is necessary. The following action may be taken:
  - a. Move the RUN/HOLD switch to RUN
  - b. If the INTERLOCK switch is on, confirm that bottles are in correct positions along the conveyor line. Otherwise turn off the INTERLOCKS
  - c. Be sure the tablet counting machine (TC2) main power is on.
  - d. Reset the DC3 counter to 0000 to send a signal from the diverter head to the PLC.When the power to the system is initially turned on, the PLC waits for a signal from the TC diverter head. This signal 'tells' the PLC which filling station will be used first by the system. If the PLC fails to detect this signal the READY light will not turn on. The signal is usually generated automatically however sometimes it isn't and must be manually produced in the following way. Pass something (like your finger) through the scanner light beam and generate a count of at least 1 on the DC3 counter display. Push the DC3 reset button which will make the diverter head change filling stations (diverter flag will move). This should send the missing signal to the PLC.

7. CHECK STATIONS LIGHT (RED)- with INTERLOCK switch turned on. When this light is on, the photoelectric bottle detecting sensor located at the filling station in use, has failed to detect a bottle and has turned off the filling operation. The green READY LIGHT will be off. To correct this condition you must move the RUN/HOLD switch to HOLD and put a bottle in the correct position below the filling station in use. If a bottle is already in the correct location check to see if the sensor is located properly to detect the bottle. When bottles are in the correct position turn the RUN/HOLD switch to RUN.

8. CHECK BACKLOG LIGHT (RED)- with INTERLOCKS switch turned on. The backup and backlog sensors look for the presence or absence of a bottle for more than 3 seconds. The backlog sensor verifies there is a supply of bottles available to the filling machine. If this sensor fails to detect a bottle for more than 3 seconds the tablet counter will stop. The backup sensor verifies that bottles are moving down the line. If a bottle fails to move past the sensor and is detected for more than 3 seconds the tablet counter will stop. If the filling operation stops due to the action of either sensor the CHECK BACKLOG light will go on. Unlike the CHECK STATIONS condition though, it is not necessary to operate the RUN/HOLD switch. As soon as the problem is corrected the filling operation will resume.

## **OPERATION**

### *Description of automatic filling line operation: startup and operations*

1. Startup- electrical connections- Be sure the electrical connections between the TCA2, AC1, AC1 control box and AS1 air supply are correct. Connect the AC1 power cable to a 115 Vac outlet. Conveyor and turntables have a separate power cable.

2. Switches on- Turn on the main power switch on the side of the AC1. The switch should light but no other evidence of power will be displayed. Push the ON button on the AC1 control box. Turn on the TCA2 tablet counter main power rocker switch. The TCA2 counter panel should light with a 0000 display. Turn on the motor and feeder switches with the speed controls fully CCW (at lowest setting).

3. AC1 control box switches and lights- To start switches should be as follows: HOLD, SETUP, INTERLOCKS off. If the TCA2 does not appear to have power push the ON button and move the HOLD switch from HOLD to RUN to HOLD again. If the READY light is not flashing, generate an input from the diverter head. Block the scanner beam to make a count on the DC3 electronic counter. Push the DC3 reset button. The diverter head should change filling station and the READY light should flash.

4. Bottle stop cylinders- There are 2 electric air valves in the AC1. One controls the operation of cylinders 0, 1 and 2. The other controls cylinders 3 and 4. Cylinders 0 and 2 are always in the same condition, rod out or rod in. Cylinder 1 is always the opposite of cylinder 2. Cylinder 3 is always the opposite of cylinder 4. This means if cylinder 4 extends, cylinder 3 immediately retracts. When neither filling station is changing bottles, cylinders 0, 2 and 4 are extended. Look at the data sheet that describes how to adjust the cylinder positions.

5 Bottle setup operation- Position all 5 bottle stop cylinders to fit the bottle diameter that is to be filled. Check the diagram that shows proper bottle stop spacing. Line up empty bottles behind cylinder-1. Turn on the conveyor and set speed control to 7. The green READY light should be flashing. The MODE switch should be in the SETUP position. Move the RUN/HOLD switch from HOLD to RUN. Bottles should move into position. Depending on whether the left or the right station is the first to fill, bottle pattern will be as follows. Left station first- there will be 2 bottles between the left and right stations. Right filling station first- there will be 4 bottles between the left and right stations. After a station fills a bottle the diverter flag changes pill flow to the other station and the filled bottle moves out of the unused station.

6. Automatic operation- Move the MODE switch to AUTO (automatic). Switch from RUN to HOLD to RUN again. The READY light should be lit. Adjust the vibrator feed and turntable speed to deliver pills through the scanner and diverter head to the filling stations. As bottles fill, the diverter flag will change pill flow to the opposite filling station and the filled bottle will be replaced by an empty one.

7. Drop time and move time- These are adjustments that are located inside the AC1. under a small access panel located in the middle of the AC1 enclosure cover. Read the pertinent data sheet to understand how to make these two adjustments.

8. Interlocks- When INTERLOCKS are on, the fill station sensors must be correctly positioned to see a bottle under each filling station, and the backup and backlog sensors must be set up. The backlog sensor should be located on the guide rail about 6 to 8 bottles ahead of the filling operation. The back up sensor is usually located about 6 to 8 bottles after the filling operation. If you want to run the line without the benefit of these sensors turn off the INTERLOCKS to disable the sensors.

### **GENERAL COMMENTS**

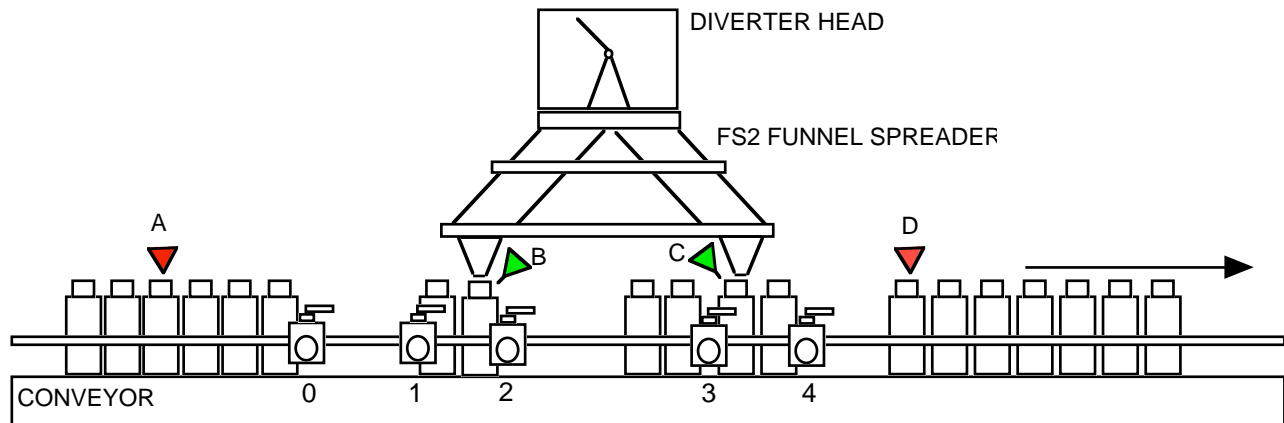
\* Always use the SETUP mode to locate bottles under the filling stations when starting the line. This will coordinate PLC control of the bottle indexing air cylinders with the filling station in use. If you have a problem where the diverter head changes filling stations and then bottles move out of the fill station in use it is because the PLC did not have the correct start up signal when power was turned on. Use the SETUP mode to straighten out the problem.

\* Be sure to set the DROP TIME and MOVE TIME delay adjustments according to the instructions in order to get maximum fill rates with small bottle counts (60 or less). If either delay is set too long, a bottle will arrive late at the next filling station and you will get a FILL STATION light or a possible pill spill.

\* Deitz Co can supply all other machines that complete a tablet counting/bottle filling operation such as the cotton inserter, capper, labeler, neck bander etc.

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# PHARMAFILL ABF AND DABF BOTTLE INDEXING BOTTLE STOP ARRANGEMENT-ADJUSTMENT



*To control the movement of bottles under the fill stations we use 5 air cylinders and 4 bottle position photoelectric sensors. In the drawing air cylinders are numbered 0 to 4 and sensors are depicted as triangles- A, B,C and D aimed at certain bottle positions.*

**SENSORS** – Aimed at certain locations along the conveyor line. They will quickly make the filling operation stop if a bottle fails to move into position.

- \* **Sensor A** – Bottle backlog sensor looks for bottles upstream from the fill operation. If it does not detect a bottle for 5 seconds, filling stops because you are running out of empty bottles.
- \* **Sensors B and C** – Look for bottles at each fill station. The fill station sensor in use is in control of the fill operation. When the diverter flag changes flow to the other station the other sensor takes control. This allows bottles to move at one station while the other is filling.
- \* **Sensor D** – Bottle backup sensor looks for bottles downstream from the fill operation. If it detects a bottle that does not move for 5 seconds, filling stops because there is a blockage downstream.

**LIGHTS & INTERLOCK SWITCH** – Indicates if a sensor is disabling the fill operation

- \* **Light-Check Backlog** – Indicates that sensor A or D have caused filling to stop. When the reason for the backlog indication is corrected filling will begin again.
- \* **Light-Check Fill Station** – Indicates fill station sensor B or C does not detect a bottle at the fill station in use. You must put a bottle in the empty fill station position and cycle the run-hold switch to begin filling again
- \* **Interlock On-Off Switch** – Disables the sensors when the interlock switch is turned off.

**BOTTLE STOP AIR CYLINDERS** – Bottle stops (BS) work by extending the cylinder shaft in front of a bottle, stopping its movement. They position bottles under each fill station, allowing 2 bottles to move each cycle and one holds back the mass of empty bottles upstream from the fill station. Position the cylinders carefully so an extended shaft never hits a bottle.

- \* **BS-0** – Holds back the mass of empty bottles upstream of the fill stations because the pressure of empty bottles overwhelmed fill station BS-1. Technical information described BS-1 to 4 so we called the new addition BS-0. It is located 2 bottles to the left of BS-1.
- \* **BS-1** – Left fill station 'spacing' BS. It extends whenever BS-2 stop retracts. It is located between the second and third bottles to the left of BS-2. In this way, only two bottles move forward when the fill station moves bottles in and out.
- \* **BS-2** – Holds an empty bottle under the left fill station. There should always be another empty bottle to the left of the bottle being filled.
- \* **BS-3** – Right fill station 'spacing' BS. It extends whenever BS-4 retracts. It is located between the second and third bottle to the left of BS-4. It functions like BS-1.
- \* **BS-4** – Holds an empty bottle under the right fill station. Unlike at BS-2, the second bottle and not the first is being filled. The bottle closest to BS-4 is the filled bottle that has moved down stream from the other filling station.

***\* It is important that you note this difference in filling station-bottle stop location. The left station BS and right station BS arrangement is not identical. Always have an even number of bottles (either 2 or 4) between BS #2 and BS #4 to index correctly.***

**\*Automatic Bottle Set-up** – Put AC1 control box switches in hold and set-up. Line up the bottles behind BS-1 (not -0). Pass a finger through the TCA2 scanner beam to generate a count. Push reset on the DC3 counter and the diverter head should change filling stations. Move switch from hold to run. Bottles should automatically index in correct pattern for fully automatic filling operations. If the right filling station is the first to fill there will be 4 bottles behind BS-4 and 2 bottles behind BS -2. If the left station is the first to fill there will be 2 bottles behind BS -4 and 2 behind BS-2.

**Problem?** Sometimes the PLC that operates the ABF2 bottle indexing system gets bad information and will set up incorrectly. This usually results in the TC2 switching to a fill station that is in the process of moving bottles. The machine will quickly stop filling if the interlocks are on. If this happens switch from run to hold and redo the set up procedure.

*The following adjustments are found inside the rear enclosure of the AC1 automatic bottle indexing electronics cabinet. These adjustments are generally made when the machines are put in service and do not require further attention.*

**\*Drop time** – Applies a time delay to the the operation of the bottle stops when the tablet counter diverter head changes filling stations. The last pill counted in a nearly full bottle must drop a certain distance through the FS2 funnel spreader to get into the bottle. The bottle stops must not release the bottles until the last pill has dropped into the bottle even though the diverter head has switched to the other filling station. Set the drop time so that this happens. If drop time is too short the last pill will drop from the fill funnel after the bottle has moved (or is moving). If drop time is too long, the bottle will not move immediately after the pill is in and the cycle time of the machine will be unnecessarily long. To get the maximum number of bottles filled per minute you must set the drop time to be slightly longer than the time it takes a pill to go from where the scanner detects the pill to the moment it enters the bottle.

**\*Move Time** – Determines the time duration of the bottle stop operation. Adjustment depends on conveyor speed and bottle size. It must be set so that 2 bottles can move from BS-2 to completely past BS-3 when there is a fill station change. If bottles are large and conveyor speed is slow the move time adjustment will be longer than for small bottles on a fast conveyor. If move time is too short the BS-3 center shaft will hit a bottle during the move cycle. If it is too long the bottles may not get in position by the time the diverter head changes to the next fill station and the 'check fill station' sensor will stop the filling operation.

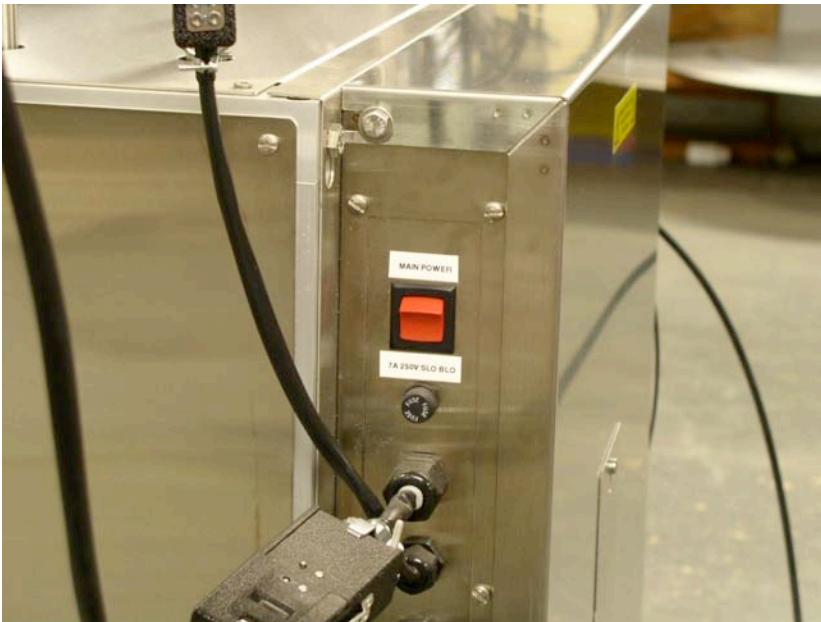
If you have bottle indexing problems please call Deitz Co. for assistance. We can usually tell you why an ABF line is acting up and how to correct the problem in short order.

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### **AC1 CONTROL BOX:**

Normally located to the left side of the TCA2 tablet counter, attached to the LPA2 lift platform top plate. This control box has switches and lights that are part of the AC1 automatic bottle indexing control package. The emergency stop button is on top of the control box.



### **MAIN POWER SWITCH:**

The red rocker type switch shown in the picture turns on/off power to the entire ABF2 line including the conveyor if the conveyor is plugged into the 115 Vac receptacle on the other side of the AC1. The main fuse is below the main power switch.



### **MOVE TIME/DROP TIME:**

These two time delay adjustments are located behind a movable panel on the rear of the AC1 cover. Adjust these delays to keep bottles from moving from their fill station before the last pill of a count has dropped into the bottle (DROP TIME) and to control how long the bottle stop air cylinders for each fill station are in the MOVE condition (MOVE TIME).



### **COMPRESSED AIR FILTER-REG:**

Attach compressed air to this regulator. 80 PSI @ 5 CFM. The filter will remove particulate and water. Your factory compressor should also have a filter so the air coming from the compressor to this ABF filter should be reasonably clean. You can change the pressure level by turning the knob at the top of the regulator. Drain water from the clear bowl when necessary by pushing the small plastic rod at the bottom of the bowl.



### **AS1-BLOWER CONNECTION:**

The AS1 air supply is located inside the base of the LPA lift platform. To connect the AS1 to power, plug the AS1 cable into the connector labeled BLOWER. The AS1 will turn on automatically when the AC1 READY light is on.

**If you have an LP2 instead of an LPA2 there is no blower installed**



### **AS1 AIR FILTERS:**

These two filters clean the air as it enters and exits the AS1 blower. They are located at the base of the LPA2 lift platform. To get access to the filter twist the black metal covers and pull away from the mating half. Filters should be cleaned periodically and replaced when too dirty to clean or if a filter gets a hole. In general the output filter will be clean if the input filter is working OK.



## ***ABF2/DABF2 maintenance requirements***

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The ABF2 consists of a tablet counting (TC) machine, LP2 lift platform, AC1 automatic bottle indexing control package and a conveyor. Conveyor length varies. The DABF consists of two TC, LPA2, and AC1 and usually has a 9' long dual lane conveyor

A. The TCA2 tablet counter is the primary machine component of an ABF2 and DABF2. It should be cleaned according to your cleaning protocol prior to use. Use cleaning solution or diluted alcohol (and water) to wipe down all surfaces that have product contact. See the specific tablet counter maintenance data sheet. The FS2 funnel spreader is attached to the TCA2 and is part of the ABF2 installation. It should not be cleaned with alcohol. The evaporation rate and cooling effect of alcohol will cause the clear tubes to crack.

### **B. Maintenance and Service Procedures**

1. The LP2 lift platform mechanism requires routine maintenance. There should be a light grease film on the threaded rod inside the cabinet. Also inside the cabinet is the AS1 air supply with two filters. See the AS1 maintenance instructions for details.

2. The AC1 includes the filter-regulator for compressed air to the bottle indexing cylinders. The water separator function of the regulator should be checked and drained if necessary. Maintain at least 80 PSI pressure.

3. The tabletop chain surface (plastic) of the conveyor should be kept clean. There is no routine service required for the motor. The chain drive from the motor should have a light coating of grease. If a conveyor plastic link breaks it is easily replaced. It is important to have spare links on hand. A single pin under the conveyor link can be hammered out to separate the links. Drive out the pin from the small hole side only.

4. The conveyor speed control for the conveyor has a fuse located inside the housing on the printed circuit board. If the conveyor fails to operate check the fuse. The fuse will blow if the conveyor jams up or if the conveyor is plugged in while the speed control is set to full speed.

5. The conveyor drive includes a clutch assembly. If the clutch is adjusted too loose the conveyor will stop under a light load although the motor is running. Remove the chain cover and tighten the large nut on the clutch to make it less able to slip. Make gradual adjustments until the load can be handled. If you over tighten the clutch will not function as it was designed.

Maintenance problem that is difficult to solve? Call Deitz Co (732)681-0200