

# ***Autopak 3000***

## **Installation and Operation Manual**

## SECTION 1 – INTRODUCTION

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### SYSTEM CONCEPT

The Autopak 3000 is a weigh meter and system controller specifically designed to direct the operation of automated bag, FIBC and rigid container filling machines. Incorporating micro-computer based technology, the Autopak 3000 provides flexible and accurate control of a wide variety of packing systems. Installation is uncomplicated and easily tailored to different types of filling applications.

The Autopak 3000 incorporates many selectable features designed to make operation of the controller both easy and accurate. These features are selected using a menu driven protocol presented on the front panel display.

Provision for process parameter entry is conveniently available through the front panel push-button keyboard. Weight data, process status and error messages are shown on the front panel display. The status of inputs and outputs is shown on front panel single point indicators.

Three serial data communication ports are included as standard features. An RS-232 port is available to drive the optional printer. A second RS-232 port is available to drive the optional remote display. An Ethernet port is available to provide performance data from the factory floor.

The Autopak 3000 is the latest in a family of products proven through years of production service, filling millions of containers in the harshest of environments. The module is surrounded by an enclosing steel case to prevent contamination in hostile environments. All terminations to the controller are made using the interface cable set supplied with the controller.

### GENERAL SPECIFICATION

**Scale Capacity**— The standard Autopak 3000 can control the delivery of up to 1,000 lb (450 kg) of product to a single container. Bulk filling versions of the controller can control the delivery of up to 10,000 lb (4,500 kg) of product.

**Resolution**— Standard Autopak 3000s have an internal resolution of 0.01 pounds to facilitate the accurate delivery of product. The display is,

however, rounded off to a resolution of 0.05 pounds to improve readability of the process weight. Bulk filling versions of the controller have an internal resolution of 0.1 pounds and a display resolution of 0.5 pounds.

**Accuracy**— *Automatic check weigh feedback* and *auto-tare* features are incorporated to insure repeatable weights. Variations of  $\pm 1$  ounce are achievable when filling 100 pound containers.

**Analog Input**— A 5 Vdc power source is supplied for driving up to four 350-ohm load cells connected in parallel. This supply is short circuit protected and remote sensing is standard.

**Calibration**— When selected from the keyboard, the automated calibration directs the operator to enter calibration weight data. Zero and span adjustments are performed automatically.

**Inputs**— Eight inputs are available. The function of each input is defined by the application software. The standard universal input specification is 115–230 Vac, 50–60 Hz, single phase, 0.010 amps. The eight inputs share a common return circuit. Low voltage dc or other input specifications are available upon request.

**Outputs**— Sixteen outputs are available. The function of each output is defined by the application software. The standard universal output specification is 115–230 Vac, 50–60 Hz, single phase, 0.050 amps minimum, 2 amps maximum. The sixteen outputs share a common return circuit. Low voltage dc or other output specifications are available upon request.

**Power**— The universal power specification is 115–230 Vac, 50–60 Hz, single phase, 10 watts maximum, not including output load currents.

**Physical**— The module measures 12" wide by 7" high by 2" deep (305mm x 180mm x 50mm). The module is mounted in a panel opening using the perimeter screw pattern. Terminations are made on the bottom edge of the module using the cable set supplied with the controller.

**Environmental**— Operating temperature range: 0°C to 50°C; Storage temperature range: -20°C to 80°C; humidity up to 95% RH, non-condensing.

## SECTION 2 – ENCLOSURE INSTALLATION AND WIRING

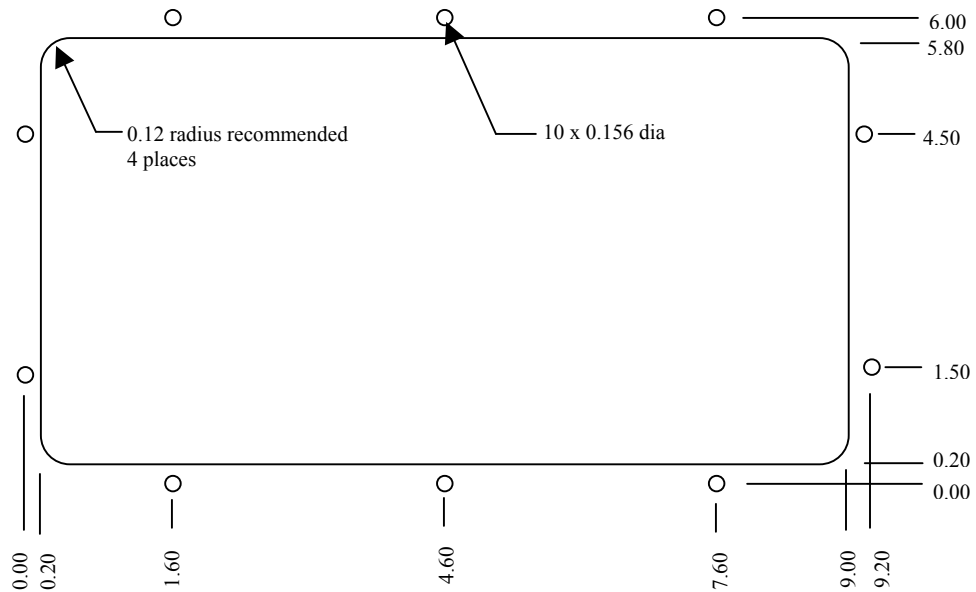
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### INTRODUCTION

This section presents information regarding the physical installation of the Autopak 3000 control module and the connection of its electrical interface. Machine specific electrical schematics and wiring diagrams are available upon request from the equipment manufacturer.

### PANEL CUTOUT

Refer to illustration for panel cutout dimensions. The controller is mounted to the back of the panel using ten size 6-32 screws. These screws should be 3/8" maximum in length to prevent damage to internal components. A gasket is recommended between the panel and the unit to provide a dust tight seal of the front panel.



## PRODUCT LABEL

Refer to illustration for example of the product label which is located on the back of the unit.

<b>MANUFACTURER</b> <b>BARRETT ENGINEERING</b> 606 L Street Fortuna, California USA 95540 707-725-9898		<b>REPRESENTATIVE</b> <b>PAC21</b> 11888 Western Avenue Stanton, California USA 90680 714-891-7000		<table border="1"> <tr> <th>ELEMENT</th> <th>VOLTAGE</th> <th>CURRENT</th> </tr> <tr> <td>MAINS</td> <td>15 – 230 Vac</td> <td>1.125 Amps</td> </tr> <tr> <td>INPUTS</td> <td>50 – 60 Hz</td> <td>1.010 Amps Each</td> </tr> <tr> <td>OUTPUTS</td> <td>Single Phase</td> <td>1.100 A min Eacl 1.000 A max Eac</td> </tr> </table>		ELEMENT	VOLTAGE	CURRENT	MAINS	15 – 230 Vac	1.125 Amps	INPUTS	50 – 60 Hz	1.010 Amps Each	OUTPUTS	Single Phase	1.100 A min Eacl 1.000 A max Eac	<b>MODEL</b> AUTOPAK 3001 <b>SERIAL NUMBER</b> xxxxxxxx <b>NOTICE</b> No User Serviceable Parts Inside		<b>barrett engineering</b> <b>NOTICE</b> – Recommended Mounting Screw Ten pieces, Screw, 6-32 x 3/8 max length
ELEMENT	VOLTAGE	CURRENT																		
MAINS	15 – 230 Vac	1.125 Amps																		
INPUTS	50 – 60 Hz	1.010 Amps Each																		
OUTPUTS	Single Phase	1.100 A min Eacl 1.000 A max Eac																		
<b>ETHERNET</b> RJ-45	<b>INPUTS 1-8</b> COLOR CODE 1. = Brown 2. = Red 3. = Orange 4. = Yellow 5. = Green 6. = Blue 7. = Violet 8. = Gray C. = White	<b>OUTPUT 1-8</b> COLOR CODE 1. = Brown 2. = Red 3. = Orange 4. = Yellow 5. = Green 6. = Blue 7. = Violet 8. = Gray C. = Black	<b>OUTPUT 9-16</b> COLOR CODE 1. = Brown 2. = Red 3. = Orange 4. = Yellow 5. = Green 6. = Blue 7. = Violet 8. = Gray C. = Black	<b>LOAD CELL</b> COLOR CODE -Volt. = Red Sen. = Red +Sig. = Green -Sig. = White Sen. = Black -Volt. = Black Type — 3500 Full Bridge	<b>REMOTE DSF</b> COLOR CODE Volt. = Red Rtn. = Black TxD. = Orange CTS. = Yellow	<b>MAIN POWER</b> COLOR CODE L1. = Black L2. = White CG. = Green														

## FUSE PROTECTION

No over current protection is provided within the control unit. Peripheral fuse protection is required and is the responsibility of the user. Recommended values are shown below.

Main Power and Input Circuits: 0.5 A Slo-Blo

Output Circuits: Sized to output load.

## POWER CONNECTION DEFINITIONS

Following are the definitions for the main power connections:

Term	Color	Function
1	Black	L1 – Hot AC
2	Green	Chassis Ground
3	White	L2 – Neutral AC

## LOAD CELL CONNECTION DEFINITION

Following are the definitions for the load cell connections:

Term	Color	Function
1	Red	+Voltage
2	Green	+Signal
3	Black	–Voltage
4	Red	+Sense
5	White	–Signal
6	Black	–Sense

## INPUT DEFINITIONS

Following are the input definitions for Auger, Air, and Impeller control sequences:

Input	Color	Function	Trigger
1	Brown	Stop/Safety	Level
2	Red	Start	Leading edge
3	Orange	Hold	Leading edge
4	Yellow	Man Dschg	Leading edge
5	Green	Interlock	Level
6	Blue	Not Used	
7	Violet	Not Used	
8	Gray	Not Used	
C	White	AC Neutral	

## REMOTE DISPLAY CONNECTIONS

Following are the definitions for the remote display connections:

Term	Color	Function
1	Red	+Voltage
2	Black	Return Voltage
3	Yellow	CTS Input
4	Orange	Transmitted Data

## OUTPUT DEFINITIONS

Following are the output definitions for the standard control sequences. Output sequence diagrams are available upon request from the equipment manufacturer.

<b>Output</b>	<b>Color</b>	<b>Auger</b>	<b>Air</b>	<b>Impeller</b>
1	Brown	Bag Clamp	Bag Clamp	Bag Clamp
2	Red	Pre-Start	Pre-Start	Pre-Start
3	Orange	Bulk	Bulk	Bulk
4	Yellow	Trim	Trim	Trim
5	Green	Mid-Cycle	Mid-Cycle	Mid-Cycle
6	Blue	Auxiliary 1	Product	Motor
7	Violet	Auxiliary 2	Air 1	Auxiliary 1
8	Gray	Auxiliary 3	Air 2	Auxiliary 2
C	Black	AC Hot	AC Hot	AC Hot
9	Brown	Reverse	Air Relief	Reverse
10	Red	Post Fill	Post Fill	Post Fill
11	Orange	Discharge	Discharge	Discharge
12	Yellow	Alarm	Alarm	Alarm
13	Green	Not Used	Not Used	Not Used
14	Blue	Not Used	Not Used	Not Used
15	Violet	Not Used	Not Used	Not Used
16	Gray	Not Used	Not Used	Not Used
C	Black	AC Hot	AC Hot	AC Hot

## SECTION 3 –KEYBOARD FUNCTIONS

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### INTRODUCTION

This section presents information regarding the functions available through and the operation of the front panel keyboard. Machine specific sequence timing diagrams are available upon request from the equipment manufacturer

### GENERAL NOTES

All keyboard push-buttons respond with tactile feedback when pushed. Also, all push-button activity is acknowledged with an audio tone. A single beep acknowledges acceptance of the selected function, while a sequence of three beeps indicates an incorrect selection. In almost all cases an accepted keyboard selection is also acknowledged with a message, or modification of a message, in the display.

The following subsections outline the process of configuring the controller and the entry of parameters. Button selection is shown on the left with the display response shown on the right. As appropriate, technical notes are provided to give insight into the operation and programming of the controller.

An arrowhead [ $\triangleright$ ] at the right of the display indicates that other selections are available from a menu. Pushing the down-arrow button will display the next item from the circular menu.

When completing a data entry or menu selection process, the information present in the display will be accepted as the requested entry.

The EXIT button will end an operation at any point in the entry process. For example, it is not necessary to cycle through the entire setup function if the required change has been made early in the process. Simply pushing the EXIT button will terminate the setup function.

The CLEAR button is used to reset a displayed data value to zero.

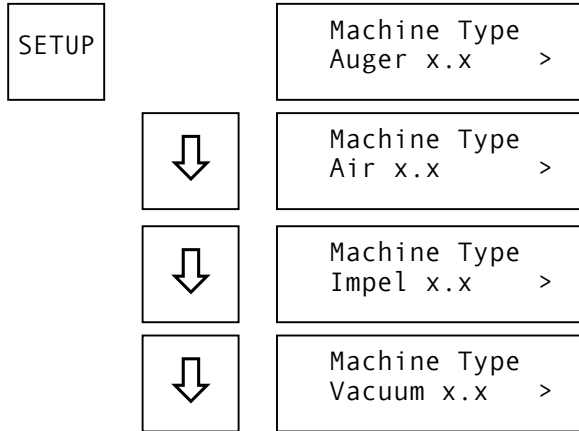
The DECIMAL POINT button must be pushed before the fractional portion of a data value can be programmed.

## SETUP FUNCTION

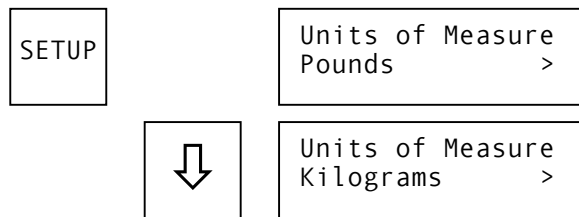
The *setup function* is a process used to configure the operation of the filling equipment.

The first time that a controller is powered in an installation, it is necessary to execute setup to select the *Machine Type*. Failure to do so may result in damage to the equipment.

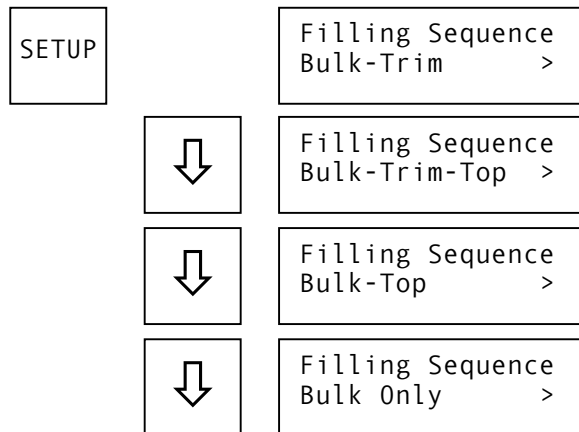
### Select Machine Type



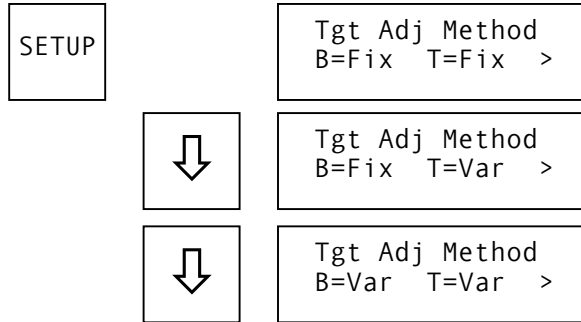
### Select Units of Measure



### Select Filling Sequence

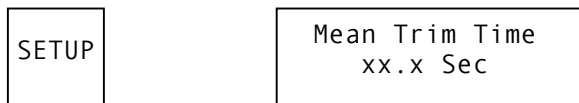


### Select Target Adjustment Method

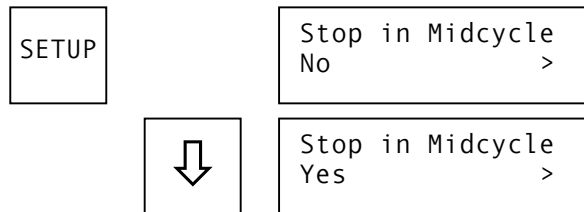


### Enter Mean Trim Time

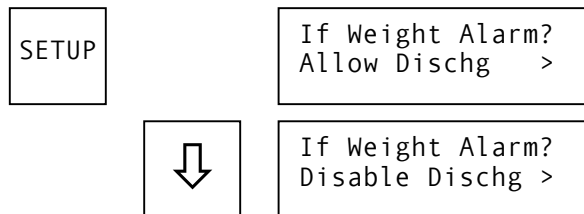
Available only if *Var Bulk Targeting* selected.



### Select Mid-Cycle Control Method



### Select Discharge Action if Weight Alarm

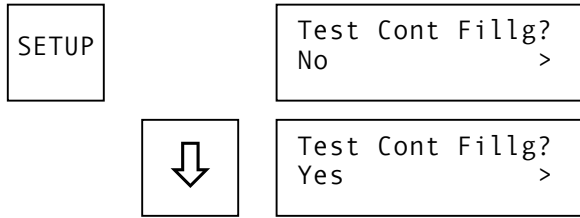


### Enter High and Low Weight Tolerances

*High* and *Low Tolerances* are added or subtracted, respectively, to the desired weight to determent the limits of acceptable operations. Entry of zero will disable these functions.

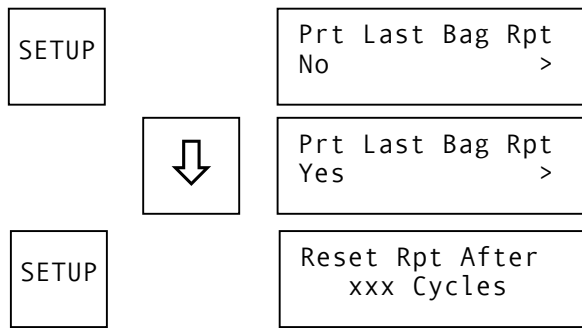


### Select Broken Bag Continuous Filling Test



### Select Bag Report and Counter Reset Value

If the optional printer is installed, *Bag Reports* may be enabled. A report may be automatically reset after a specified number of cycles to facilitate the printing of a pallet summary. Entry of zero will disable this function.

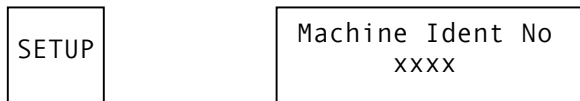


### Select Frequency of Auto Tare Operation

Entry of one will cause the system to auto tare before each fill cycle. Entry of twp, etc. will cause the system to skip auto tare updates and will reuse the tare value from the last update. Entry of zero will disable the auto tare function and enforce gross weight filling.

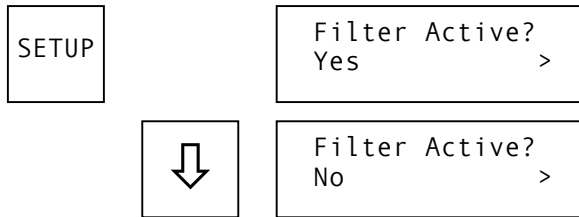


### Enter Machine Identification Number

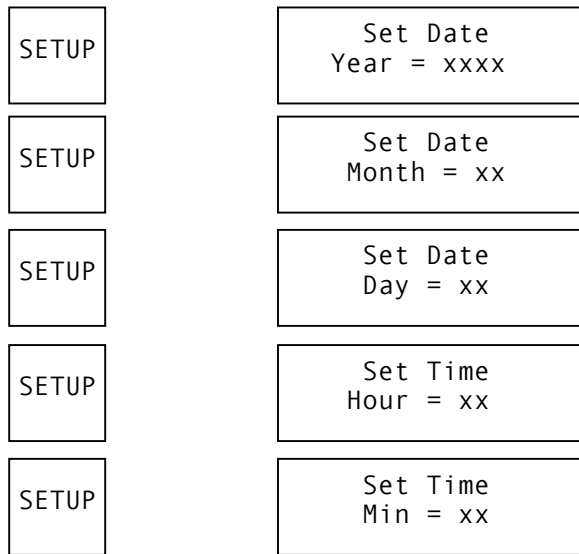


### Select Digital Filter Mode

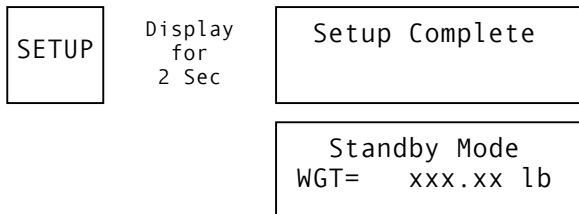
If the weight display seems erratic, an additional filter may be selected. The addition of this filter slows the system's response. It is recommended that the system be operated without selection of this filter.



### Set Data and Time

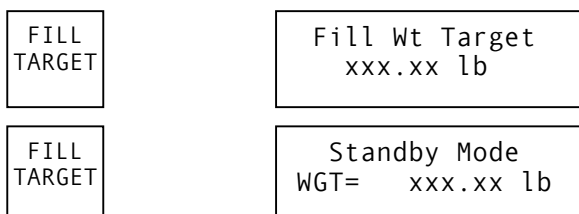


### Setup Function Completed



### FILL WEIGHT TARGET ENTRY

This function is used to enter the desired weight of product in the container.



### TRIM OFFSET ENTRY

The offset from the desired weight at which point the trim filling mode will terminate.

TRIM  
OFFSET

Trim Offset  
xxx.xx lb

TRIM  
OFFSET

Standby Mode  
WGT= xxx.xx lb

### BULK OFFSET ENTRY

The offset from the trim mode ending point at which point the bulk filling mode will terminate and the trim filling mode will commence.

BULK  
OFFSET

Bulk Offset  
xxx.xx lb

BULK  
OFFSET

Standby Mode  
WGT= xxx.xx lb

### MID-CYCLE TARGET ENTRY

The weight targets at which the mid-cycle output will be triggered. Up to three such points may be defined. The targets must appear with increasing magnitude. Entry of zero will disable the selected mid-cycle function. Function is active only during the bulk phase of the filling cycle.

MID  
TARGET

Mid Cyc 1 Target  
xxx.xx lb

MID  
TARGET

Mid Cyc 2 Target  
xxx.xx lb

MID  
TARGET

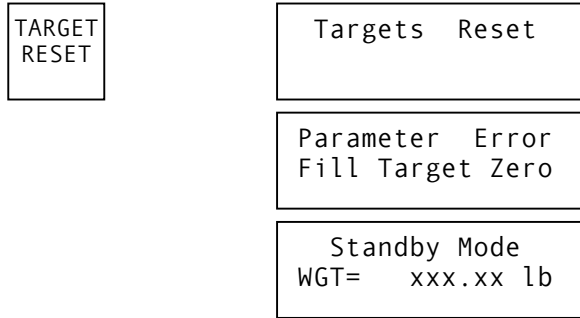
Mid Cyc 2 Target  
xxx.xx lb

MID  
TARGET

Standby Mode  
WGT= xxx.xx lb

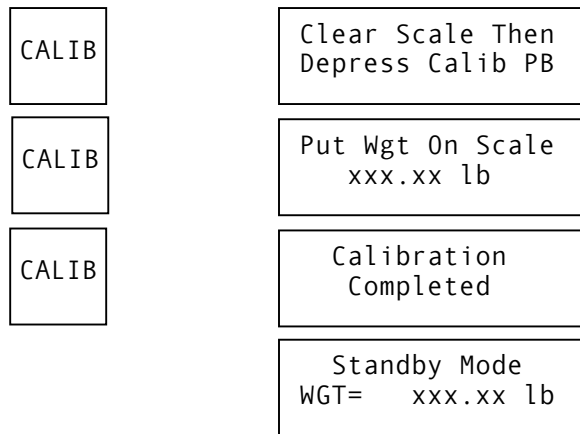
### TARGET RESET FUNCTION

Resets weight targets to their original settings, even if they have been adjusted by the variable targeting protocol.



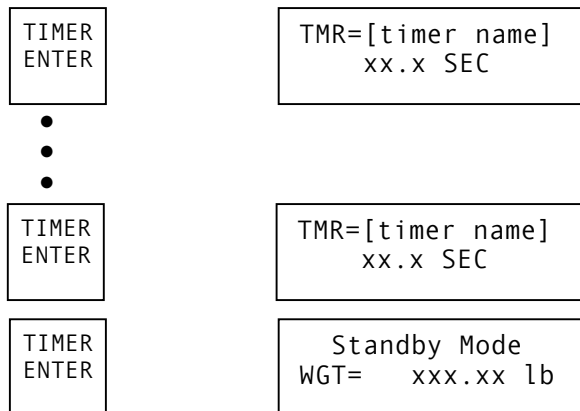
### LOAD CELL CALIBRATION FUNCTION

calibrating the load cell input to units of weight.



### TIMER ENTRY FUNCTION

Timers are available to adjust the process for optimal performance. Timers are programmed by name using the Timer Entry Function



### RECIPE SAVE FUNCTION

Weight parameters may be saved as recipes. Up to nine recipes may be saved for later recall.

RECIPE SAVE	Save Data Info As Recipe No x
RECIPE SAVE	Standby Mode WGT= xxx.xx lb

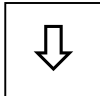
### RECIPE RECALL FUNCTION

Any one of up to nine previously saved recipes may be recalled.

RECIPE RECALL	Recall Data Info As Recipe No x
RECIPE RECALL	Standby Mode WGT= xxx.xx lb

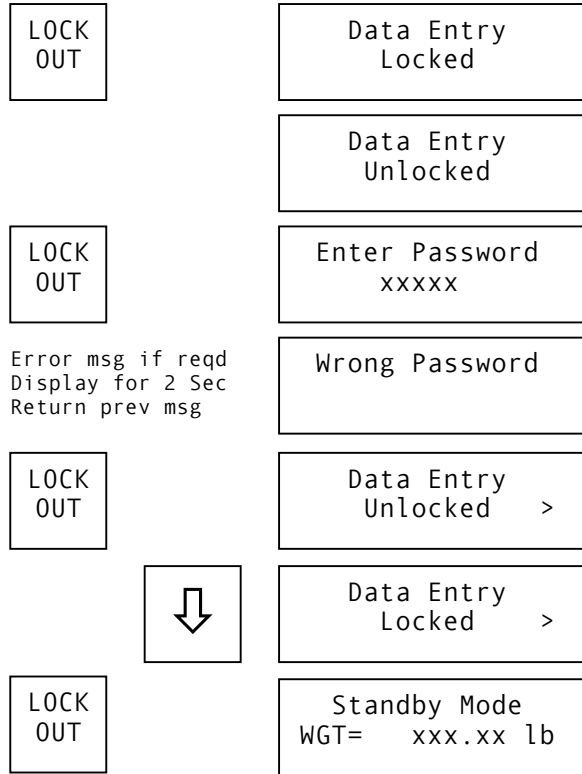
### ACCUMULATOR RECALL FUNCTION

A variety of operating statistics, as illustrated below, may be displayed.

ACCUM RECALL	Units= xx Total= xx lb
ACCUM RECALL	Avg Wt= x.xx lb 2Sigma= x.xx lb
ACCUM RECALL	Bulk Rate= x.x Trim Rate= x.x
ACCUM RECALL	Clr Accumulator? No >
	
ACCUM RECALL	Clr Accumulator? Yes >
ACCUM RECALL	<i>Accum Status Msg</i>
	Display for 2 Sec
	Standby Mode WGT= xxx.xx lb

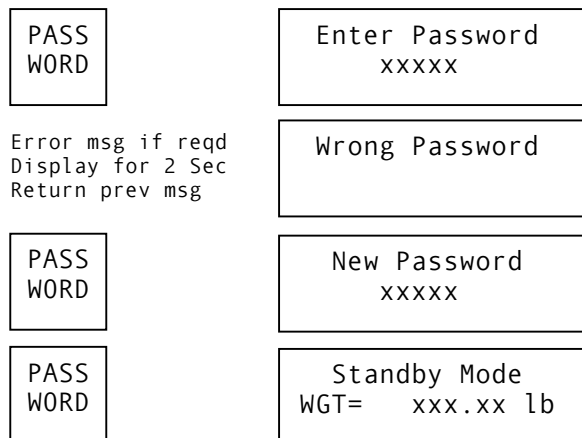
## LOCKOUT CONTROL FUNCTION

Facilities are provided to prevent unauthorized access to the operating parameters.



## PASSWORD CONTROL FUNCTION

Facilities are provided to prevent unauthorized access to the operating parameters.



## PRINT ACCUMULATOR REPORT

If the optional printer is installed, the statistical data in the accumulator report may be printed.

PRINT	With Printer Only	Printing Rpt....
Display for 2 Sec	Without Printer	Printer Not Available
		Standby Mode WGT= xxx.xx lb

## COUNTER RESET FUNCTION

If the optional printer is installed, the printing of a *Last Bag Weight Report* can be selected. In addition, selection can be made to reset this report after a certain number of filling cycle to support palletizing operations. The COUNT RESET button allows the bag counter to be reset and synchronized with the palletizing operation.

COUNT RESET	With Printer Only	Batch Cntr Reset
Display for 2 Sec	Without Printer	Printer Not Available
		Standby Mode WGT= xxx.xx lb

# **AUTOPAK 3000**

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## SECTION 1

### 1.1 INTRODUCTION TO AUTOPAK 3000

The **AUTOPAK 3000** packer controller has been developed as a dedicated microprocessor based controller for complete control of all inputs, weight monitoring, and outputs required to fully control an automatic filling machine.

The controller has extraordinary versatility to provide the user with many options ranging from the most basic manual packer operation to very complex fully automatic packing cycles.

This manual will enable the user to understand the capabilities of the system and how to make adjustments and changes to maximize packer performance. This manual should be studied carefully for full understanding of the unit.

Each **AUTOPAK 3000** controller is pre-programmed at the factory to provide what is believed to be the best mode and timing cycle for the packer and product involved. It is advisable to consult the factory prior to changing the pre-programmed cycle and mode functions. Weight and time functions are easily programmed by the user as required.

The filling sequence mode for each machine may be varied. The following operating modes are possible for this machine:

1. Bulk only
2. Bulk – Trim
3. Bulk – Trim – Top-off

The filling mode is programmed to drive outputs consistent with electro-mechanical delivery systems provided.

With machine type and filling sequence established, remaining functions are selected accordingly. These include the following:

- A. Weight Range
  - To 100 lb. by .05 lb.
  - To 200 lb. by .1 lb.
  - To 400 lb. by .2 lb.
  - To 1000 lb. by .5 lb.
- B. Fixed or variable bulk target selection
- C. Fixed or variable trim target selection.
- D. Gross or net filling.
- E. Midcycle Control ON/OFF

H. Packer I.D. (used with printer and computer options).

It is only necessary to input time and desired weight settings on the front panel to put the **AUTOPAK 3000** in operation.

## 1.2 ENCLOSURE

The **AUTOPAK 3000** is provided in a NEMA-4 type enclosure, which is both dust tight and watertight. All electrical connections to the board are made through terminal strips inside the enclosure. Refer to wiring schematic for the particular machine.

## 1.3 POWER

The 4 DC voltage service connection is the only power connection required for operation of the packer controller. Power for the transducer and all system circuits is provided by internal power supplies. The service voltage and current requirements are indicated on the information label attached to the system enclosure.

## 1.4 SYSTEM INPUTS

The **AUTOPAK 3000** is capable of driving up to four transducer devices, which are typically 350 OHM, strain gauge type load-cells. Refer to Section 1.8 for details on circuit characteristics and calibration. Standard filling machines are fitted with one load-cell.

Inputs are provided for safety interlocks, such as guard micro switches, and for emergency stop switches, which are remotely located.

A remote start input is provided to synchronize the operation of the controller with other equipment. In addition, remote stop, and hold inputs are provided.

A bag-in-place integrity input is available to be used with the bag sensing system to prevent the system from starting the filling operation if a bag is not properly positioned on the filling spout.

A conveyor synchronization input is provided to synchronize the discharge function with a transfer conveyor system.

## 1.5 SYSTEM OUTPUTS

All controlled output functions are connected to the system PLC. The function of each output is defined and controlled by the system program. The system provides for the control of the following sixteen output functions for each configuration:

	<u>AUGER</u>	<u>IMPELLER</u>	<u>AIR</u>	<u>VACUUM</u>
1.	Bag Clamp	Bag Clamp	Bag Clamp	Screens
2.	Pre-Start	Pre-Start	Pre-Start	Boot
3.	Bulk Fill	Bulk Fill	Bulk Fill	Doors
4.	Trim Fill	Trim Fill	Trim Fill	Chair Lift
5.	Mid-Cycle	Mid-Cycle	Mid-Cycle	Vacuum/ATM
6.	Aux 1	Motor	Product	Purge
7.	Aux 2	Aux 1	Air 1	Bulk
8.	Aux 3	Aux 2	Air 2	Trim
9.	Reverse	Reverse	Air Relief	Cleanout
10.	Post Fill	Post Fill	Post Fill	Bag Discharge
11.	Discharge	Discharge	Discharge	
12.	Alarm	Alarm	Alarm	

The following output cycle diagram shows the state of outputs for the type of machine and cycle supplied. See Figure 3000-2.

## 1.6 TIME CONTROL

While many of the system outputs are controlled by weight parameters, other outputs are functions of time. The system provides for the programming and control of fifteen timers for each configuration. Figure 2000-3 shows timing functions for the type of filler supplied.

The time values are programmed using front panel switches. Refer to Section 2.4 for a description of this procedure.

## 1.7 PROGRAMMING SWITCHES

When power is turned on, the **AUTOPAK 3000** initializes the programmable functions to the selected characteristics. If a change in function characteristic is desired, the controller must be turned OFF, the desired programming selection made, and then power turned ON again. This sequence will reinitialize the programmed functions.

The following sub-sections discuss each of these programmable functions:

### 1.6.1 SCALE CAPACITY

The maximum capacity, display level and internal resolution of the scale system is determined by the set-up menu.

Each of the capacity options has a display level of 0.05%. However, the internal resolution of the system is twice as accurate and is designed to meet the requirements of the National Bureau of Standards Handbook 44 for commercial scales.

### 1.6.2 FILLING SEQUENCE

The **AUTOPAK 3000** provides capability to use one of two distinct filling sequences. The particular sequence which should be selected for a given product is a function of the desired filling rate, consistency of product flow, unit cost of the product, and the desired total cycle time.

#### FILL SEQUENCE SELECTED

BULK ONLY  
BULK-TOP-OFF  
BULK-TRIM  
BULK-TRIM-TOP-OFF

In the “bulk only” sequence, the product is delivered to the container at the system’s maximum flow rate. This is the fastest method of filling, but the accuracy of the final weight is highly dependent upon the constancy of product delivery.

The “bulk trim” sequence delivers product more accurately than the previous method because of its two stage sequence. During the bulk portion of the sequence, product is delivered at the system’s maximum flow rate. However, before the desired weight is reached, the rate of delivery is reduced to the trim rate. This results in a more accurate final weight since the reduced flow rate is less sensitive to variations in the constancy of product delivery.

The “bulk-trim-top-off” sequence is a further step toward accuracy of the final weight. The bulk and trim functions operate in the manner previously described. Prior to discharging the bag, the weight is checked to see if it is short of the desired weight. If the bag is underweight, a “topping off” mechanism then delivers product until the desired weight is reached. While this method is the most accurate of the four, it does have the longest filling cycle time.

The “bulk-top-off” sequence is, as its name indicates, a unique combination of speed and precision which may be an appropriate delivery method for some products. The desired weight value, adjusted by an overshoot calculation, is used as the cut-off value for the bulk filling operation. If, after bulk cut-off, the weight is below the desired value, the top-off sequence will deliver product until the desired weight is reached. The advantage of this sequence is that no

container will be underweight, and a rapid filling cycle is still maintained. However, the accuracy of the final weight is still dependent upon the constancy of product delivery.

Any of the above FILL SEQUENCES may be selected in the set-up menu.

### 1.6.3 NET FILLING SELECT

The tare weight is the weight of packages, containers, carriers, or other materials that are not intended to be included in tare-weight determinations. The net-weight is determined by subtracting the tare-weight from the gross weight. The net filling feature is selected using the set-up menu

### 1.6.4 AUTOMATIC CYCLE COMPLETE

In some instances, it may be desirable to hold the container on the machine and freeze the operation of the packer if the final weight is beyond the limits of the over or under weight programmed values. This selection is made using the set-up menu.

### 1.6.5 MID-CYCLE

During the filling sequence, the process may be interrupted at a pre-selected weight by the mid-cycle function (refer to Section 2.8.2). The mid-cycle output can be used to drive vibrators or to perform other operations. In some applications, it may be desirable to stop the filling operation while the interrupt function is running. In other situations the filling operation should continue during this time. This selection is made using the set-up menu.

### 1.6.6 BULK TARGET

The bulk target is a weight value at which the bulk filling sequence ends. The target may be selected as either fixed or variable. This selection is made using the set-up menu.

In the fixed mode, the bulk target is determined by entering a weight value utilizing the BULK OFFSET touch switch on the front panel of the controller. A weight offset from the trim target weight is entered (i.e., with a desired weight of 50 lbs. and a trim target

of 49 lbs., enter a bulk offset of 5.0 lbs. to attain a bulk target weight of 44.0 lbs.).

In the variable mode, the bulk target adjusts itself so as to reduce the final weight error. Refer to Section 4 for specific details of the bulk target operation.

### 1.6.7 TRIM TARGET

The trim target is a weight value at which the trim filling sequence ends. The target may be selected as either fixed or variable. This selection is made using the set-up menu.

In the fixed mode, the trim target is determined by entering a weight value utilizing the TRIM OFFSET touch switch on the front panel of the controller. A weight offset from the desired

weight is entered (i.e., with a desired weight of 50 lbs., enter a trim offset of 2.0 lbs. to attain a trim target weight of 48.0 lbs.).

In the variable mode, the trim target adjusts itself so as to reduce the final weight error.

### 1.6.8 CONTINUOUS FILL TESTING

Continuous Fill Testing is achieved by selecting YES in the TEST CONT. FILLING menu. If the controller does not detect a change in the weight for 2 seconds, it will set itself in the HOLD mode. To continue the filling cycle the START push-button must be pushed.

### 1.7.0 TRANSDUCER

The **AUTOPAK 3000** contains a very stable, specially designed power supply for driving the strain gauge type load-cell. Connection of the load-cells is made through a connector. The maximum capacity of the load-cell is determined by system applications. The basic **AUTOPAK 3000** system uses one load-cell.

The **AUTOPAK 3000** incorporates a load-cell signal amplification and conditioning circuit of advanced and innovative design. The special care given to the development of this design results in a distinctive calibration procedure which minimizes interaction between the zero and span adjustments. The following sub-sections discuss the calibration procedure. When calibrated, the load-cell will be operating over the middle section of its range. This will provide for the most linear and accurate measurements.

Calibration is done by pushing the CALIB push-button that instructs the operator to remove all the weight from the scale (Clear the Scale).

Then the operator must push the CALIB push-button one more time. The operator will then be instructed to Install the Test Weight and enter the test weight using the key pad. Next, the operator will be instructed on the screen to Remove the Test Weight. Both ZERO and SPAN adjustments are performed automatically.

## SECTION 2

### CONTROL PANEL CHARACTERISTICS

#### 2.1 INTRODUCTION

The front panel of the **AUTOPAK 3000** is a touch switch panel incorporating graphics, display, indicators, and a membrane touch switch system. The following subsections discuss each of these features.

##### 2.1.1 GRAPHICS

The front panel is constructed from a polycarbonate plastic material and is laminated to a printed circuit board for structural support. The surface has a matte finish to minimize glare, and the graphics are printed on the back of the film to protect them from scratching and wear. When required, the panel can be cleaned using soap and water or isopropyl alcohol.

##### 2.1.2 DISPLAY

Type	Dot matrix, high visibility, vacuum fluorescent, alpha-numeric
Format	Two line by 16-characters
Zero Blanking	Leading zero suppression provided
Under Zero Indication	Minus sign at left of display; minus error message for weights 5% below zero
Overload Indication	Overload error message at 105% of scale capacity
Status Annunciators	System status messages appear in the display
Process Annunciators	The status of each of the eight inputs and sixteen outputs is indicated by single point LED annunciators

##### 2.1.4 TOUCH SWITCHES

Keyborad – The keyboard features integrated push-buttons with tactile feedback for confident operation. The graphics are printed on the back of the non-glare surface to protect them from scratching and wear. The overlay may be modified to comply with specific system/process requirements. The keyboard features include:

- Clear graphics
- Two-line by 16-character vacuum fluorescent alpha-numeric display
- Single point status indicators
- Fully sealed membrane switches

### 2.3 DATA KEY GROUP

The DATA KEY GROUP contains twelve function switches, which are used to “write” data into the display for later use by the entry functions. The ten number functions (zero through nine) will enter a value into the least significant digit location after shifting the number in the display to the left. Numbers containing as many as six digits are accepted by the entry functions. Entering more digits will cause the most significant digits to be lost as they are shifted out of the display.

As numbers are entered, the decimal point is assumed to be to the right of the display. The decimal point is not displayed until the DECIMAL POINT (.) function is entered. This will fix the relationship of the decimal point and as additional numbers are entered, the decimal point will shift to the left.

The CLEAR function will clear any numeric entries and will return the system to its previous state.

### 2.4 TIME ENTER

While many of the system outputs are controlled by weight parameters, other outputs are a function of time. Refer to Section 1.6 and Figure 2000-3 for a listing of the programmable timers used in the **AUTOPAK 3000**.

The TIME ENTER function is used to enter the desired time value for each of the timers. When the TIME ENTER switch is first pushed, the controller will begin the time programming sequence. This will be indicated by the display of the prompting message “01-xx.x,” where “01” indicates timer number one and the “xx.x” represents the current time value.

A time value is programmed in tenths of seconds. If the programmed time value is 00.0, the time function will be ignored. The maximum timer value, which can be entered is 99.9 seconds. The time value is set into the display using the DATA KEY GROUP (refer to Section 2.3). However, unlike the normal numeric entry process, only the three digits at the right of the display will shift as numbers are entered, and the decimal point will remain in a fixed position. The CLEAR function will clear only the numeric entry in the right three digits, and the system will remain in the timer programming mode.

When the desired time value is in the display, pushing the TIME ENTER switch will enter the value into the controller’s memory and advance the sequence to the next prompting message. If the current value shown in the prompt message is the desired value, simply pushing the TIME ENTER switch will advance the sequence to the next prompt message. This sequence will continue until all fifteen timers have been programmed. To exit from the timer menu, push EXIT. The controller will automatically return to its normal state after the last timer has been programmed.

## 2.8 WEIGHT PROGRAMMING KEY GROUP

### 2.8.1 FILL WEIGHT

The FILL WEIGHT function is used to enter the desired final weight for a filling sequence. If the gross filling mode has been selected (Refer to Section 1.7.3), the programmed fill weight will represent a gross weight. If the net weight-filling mode has been selected (Refer to Section 1.7.3), the programmed fill weight will represent the net weight, that is, the weight of material added between the auto tare sequence and the final cut-off.

When the FILL WEIGHT switch is first pushed, the display will show the current programmed fill weight. This number may be modified by using the DATA KEY GROUP (Refer to Section 2.7). When the display contains the desired final weight, pushing the fill weight switch will enter the value into the controller's memory and the system will return to its normal state.

If the number in the display has more digits to the right of the decimal point than have been pre-selected by the scale capacity feature (refer to Section 1.7.1), the number will be truncated to produce the correct format. If the number in the display has fewer digits to the right of the decimal point than have been pre-selected, the number will be extended with zeros. If the resolution of the number in the display does not match the resolution of the pre-selected range, the number will be rounded up to the correct resolution.

If the number in the display exceeds the scale capacity, the display will show the error message. The error message will be displayed for one second after which the system will return to the fill weight data entry mode.

If the FILL WEIGHT switch is depressed while the system is in a different data entry mode, the error message will be displayed. The error message will be displayed for one second after which the system will return to the previous state, that is, the selected data entry mode.

If the FILL WEIGHT switch is depressed while a filling operation is in progress, the function will be ignored.

To recall the previously entered weight value, depress the FILL WEIGHT switch again. Depress the switch once again and the system will return to its normal state.

### 2.8.2 MIDCYCLE

The MIDCYCLE function is used to enter the weight at which the system will begin midcycle output. During the cycle, the midcycle output will be energized for the duration of time stored by TIMER No. 8. Therefore, the MIDCYCLE function involves entering both weight and time data into the memory of the controller.

The midcycle output can be used to drive vibrators or other devices, which are best, controlled by a weight initiated signal of a programmable time duration.

When the MIDCYCLE switch is first pushed, the display will show the current programmed midcycle control weight. This number may be modified by using the DATA KEY GROUP (Refer to Section 2.7). When the display contains the desired weight, pushing the MIDCYCLE switch will enter the value into the controller's memory and the system will return to its normal state.

If the number in the display has more digits to the right of the decimal point than have been pre-selected by the scale capacity feature, the number will be truncated to produce the correct format. If the number in the display has fewer digits to the right of the decimal point than have been pre-selected, the number will be extended with zeros. If the resolution of the number in the display does not match the resolution of the pre-selected range, the number will be rounded up to the correct resolution. If the number in the display exceeds the programmed final weight, the display will show the error message.

The error message will be displayed for one second after which the system will return to the MIDCYCLE data entry mode. If the number entered by the MIDCYCLE function is zero, the midcycle output is disabled.

### WARNING

If the midcycle time is zero, and the midcycle weight is a value above zero, the midpoint output will be energized for a period of 0.1 seconds.

If the MIDCYCLE switch is depressed while the system is in a different data entry mode, the error message will be displayed. The error message will be displayed for one second after which the system will return to the previous state, that is, the selected data entry mode.

If the MIDCYCLE switch is depressed while a filling operation is in progress, the function will be ignored.

It is important to note that the midcycle output is enabled the moment the filling sequence begins and not after auto tare has occurred. Therefore, the value of midcycle weight should exceed the tare weight of the container being filled.

To recall the previously entered weight value, depress the MIDCYCLE switch. Depress the switch once again and the system will return to its normal state.

### 2.8.3 BULK OFFSET

The BULK OFFSET function is used to enter a weight offset from the trim target weight at which point the bulk filling sequence ends. This function is used in conjunction with the fixed bulk target mode, which is selected by the first section of programming switch B. If the variable bulk target mode is selected, the weight offset entered will be ignored by the controller.

When the BULK OFFSET switch is first pushed, the display will show the current programmed offset value. This number may be modified using the DATA KEY GROUP (Refer to Section

2.7). When the display contains the desired offset value, pushing the BULK OFFSET switch will enter the value into the controller's memory and the system will return to its normal state.

If the number in the display has more digits to the right of the decimal point than have been pre-selected by the scale capacity feature, the number will be truncated to produce the correct format. If the number in the display has fewer digits to the right of the decimal point than have been pre-selected, the number will be extended with zeros. If the resolution of the number in the display does not match the resolution of the pre-selected range, the number will be rounded up to the correct resolution.

If the number in the display exceeds the programmed final weight, the display will show the error message. The error message will be displayed for one second after which the system will return to the BULK OFFSET data entry mode.

If the BULK OFFSET switch is depressed while the system is in a different data entry mode, the error message will be displayed. The error message will be displayed for one second after which the system will return to the previous state, that is, the selected data entry mode.

If the BULK OFFSET switch is depressed while a filling operation is in progress, the function will be ignored.

To recall previously entered offset value, depress the BULK OFFSET switch again. Depress the switch once again and the system will return to its normal state.

#### 2.8.4 TRIM OFFSET

The TRIM OFFSET function is used to enter a weight offset from the desired weight at which point the trim filling sequence ends. This function is used in conjunction with the fixed trim target mode, which is selected by the second section of programming switch B. If the variable trim target mode is selected, the weight offset entered will be ignored by the controller.

When the TRIM OFFSET is first pushed, the display will show the current programmed offset value. This number may be modified using the DATA KEY GROUP (Refer to Section 2.7). When the display contains the desired offset value, pushing the TRIM OFFSET switch will enter the value into the controller's memory and the system will return to its normal state.

If the number in the display has more digits to the right of the decimal point than have been pre-selected by the scale capacity feature, the number will be truncated to produce the correct format. If the number in the display has fewer digits to the right of the decimal point that have been pre-selected, the number will be extended with zeros. If the resolution of the number in the display does not match the resolution of the pre-selected range, the number will be rounded up to the correct resolution.

If the TRIM OFFSET switch is depressed while the system is in a different data entry mode, the error message will be displayed. The error message will be displayed for one second after which the system will return to the previous state, that is, the selected data entry mode.

If the TRIM OFFSET switch is depressed while a filling operation is in progress, the function will be ignored.

To recall previously entered offset value, depress the TRIM OFFSET switch. Depress the switch once again and the system will return to its normal state.

#### 2.8.6 TARGET RESET

Depressing the TARGET RESET switch will erase the current bulk and trim target values from the controller's memory and replace them with calculated values for the "Weighment No. 1" condition (Refer to Section 4 for a discussion of target calculations).

When the TARGET RESET switch is depressed, the message "-0000-" will be displayed for one second as a confirmation of the function.

#### 2.9 SEQUENCE MONITOR GROUP

At the left side of the control panel are sixteen LED indicators with associated descriptions below each LED. During the filling sequence the appropriate LEDs will illuminate so as to assist the operator in following the filling sequence of the system. Illumination of an LED occurs coincident with the energizing of the appropriate system output.

## SECTION 4

### CUT OFF TARGETS

#### 4.1 INTRODUCTION

The **AUTOPAK 3000** controller has been designed so that both the bulk and trim target weights may be selected to operate in a fixed or variable mode. In the fixed mode, the controller will cut-off bulk and/or trim flow based on programmed bulk/trim offset weight values.

In the variable mode, the controller will cut-off bulk and/or trim flow based on weight data stored from previous weighments. In this manner, the controller automatically monitors and adjusts target points to reduce the error between desired weight and actual weight.

The filling sequence employed has a great bearing upon the operation of the cutoff targets.

In a bulk only filling sequence, the trim target is not applicable. The bulk target for the first weighment after the TARGET CLEAR switch has been depressed will be equal to the desired weight if the variable bulk target mode has been selected. If the fixed bulk target mode has been selected, the target for the first weighment will be calculated as programmed. Subsequent weighments will produce variable or fixed target calculations depending on the selected mode of operation.

In a bulk-trim filling sequence, both bulk and trim targets operate. The trim targets for the first weighment after the TARGET CLEAR switch has been depressed will be equal to the desired weight if the variable trim target mode has been selected. If the fixed trim target mode has been selected, the trim target for the first weighment will be calculated as programmed.

In a bulk-trim filling sequence, the bulk target for the first weighment after the TARGET CLEAR switch has been depressed will be set to 75% of the desired weight if the variable bulk target has been selected. If the fixed bulk target mode has been selected, the target for the first weighment will be calculated as programmed in relationship to the previously determined trim target. Subsequent weighments will produce variable or fixed bulk and trim target calculations, depending on the selected mode of operation.

#### 4.2 FIXED BULK TARGET

When this mode is utilized, the bulk target weight will always be fixed by the bulk offset weight value programmed into the controller.

The bulk offset weight value is not an offset from the desired weight unless the “bulk only” filling sequence is selected. With two stage filling operations, it is an offset from the trim target weight.

### 4.3 VARIABLE BULK TARGET - BULK ONLY FILLING SEQUENCE

When this mode is utilized, the target weight will, except for first weighment condition, automatically adjust itself based on data gathered from previous weighments. The bulk target automatically adjusts to compensate for overshoot to obtain weighments as close as possible to the desired weight value.

Following each weighment, the processor calculates the final weight error and saves this information in a table with the error data from the previous two weighments. A correction value equal to the reverse sign of 1/2 of the average error of the last three weighments is calculated and applied to the bulk target.

The process would proceed as following:

	Desired Weight 50.0#	
Weighment No. 1	Final Cutoff	50.0
	Overshoot	<u>.7</u>
	Final Weight	50.7#
	Error	+ .7#

First Weighment Correction 100% - .7#

New Target Weight is 50.0 - .7 = 49.3 Cutoff

Weighment No. 2	Final Cutoff	49.3#
	Overshoot	<u>.8</u>
	Final Weight	50.1#
	Error	+ .1#

Correction Calculation (1.2 average error of preceding weighments)

Weighment X	0
Weighment Y	0
Weighment #2	<u>+.1</u>
Total Error	+.1#
Average Error	.1/3 + +.03#
1/2 Average Error	+.03/2 = +.015#
Correction	-.015
New Target Weight is	49.3 - .015 = 49.29#

Weightment No. 3	Final Cut-off	49.29
	Overshoot	<u>.70</u>
	Final Weight	49.99#
	Error	- .01#

Average error of preceding 3 weighments:

Weightment Y	0
Weightment #2	+ .1
Weightment #3	<u>-.01</u>
Total Error	+ .09#
Average Error	.09/3 = +.03
1/2 Average Error	+ .03/2 = +.015
Correction	-.015
New Target Weight is 49.29 - .015 = 49.27#	

Weightment No. 4	Final cut-off	49.27
	Overshoot	<u>.70</u>
	Final Weight	49.97#
	Error	- .03#

Average error of preceding 3 weighments:

Weightment #2	+ .1
Weightment #3	-.01
Weightment #4	-.03
Total Error	+ .06
Average Error	.06/3 = +.02
1/2 Average Error	+ .02/2 = +.01
Correction	-.01

New Target Weight is 49.27# - .01 = 49.26#

Weightment No. 5	Final cut-off	49.26
	Overshoot	<u>.60</u>
	Final Weight	49.86#
	Error	- .14#

Average error of preceding 3 weighments

Weightment #3	-.01
Weightment #4	-.03
Weightment #5	<u>-.14</u>
Total Error	-.18#
Average Error	.18/3 = -.06#
1/2 Average Error	-.06/2 = -.03
Correction:	+.03

New Target Weight is 49.26#+ .03# = 49.29#

It may be seen that, utilizing this process, the controller will quickly "home in" on the proper cut-off point to obtain 50.0# with overshoot in the range of .6 to .8# in this example.

#### 4.4 VARIABLE BULK TARGET - BULK TRIM FILLING SEQUENCE

When this mode is utilized, the target weight will, except for first weighment condition, automatically adjust itself to maintain a trim time (seconds) as programmed by the user (Timer No. 15). The bulk target will move upward or downward based on the trim filling rate (lbs./sec.) as calculated internally by the controller. It is important to note that the bulk target calculation is offset from the trim target weight whether it be fixed or variable, not the desired weight. In the following example, a fixed trim target of 49.0# is assumed.

For example, the user desires a 2 second trim period. On weighment #1, the controller will switch to trim at 75% of the desired final weight. A one second "Free Fall" time will be allowed at which point the weight will be internally recorded.

Assume that 50# is the desired weight. The TARGET CLEAR key has been depressed. At 37.5# the unit switches to trim. In the following 1 second, 5 additional lbs. fall, giving a weight of 42.5#. The machine then fills the remaining 7.5# in 15 seconds. The trim rate is then determined to be ½# per second.

On weighment No. 2 the bulk target will be recalculated on this basis:

Desired Weight 50#

Trim Target Weight 49#

Desired Trim Time – 2 seconds

Trim Rate ½# per second

Bulk Fill free fall weight 5#

Corrected Bulk Target = 49# minus 1# minus 5# or 43#.

Weighment No. 2 should then produce a cycle whereby the machine switches to trim at 43#. 5# of product fall in the following 1 second. Two additional seconds are required at ½# per second to deliver the final 1# to reach 49#.

This process continues forward on ensuing weighments to maintain a desired trim time of 2 seconds.

#### 4.6 FIXED TRIM TARGET

When this mode is utilized, the trim target weight will always be fixed by the trim offset value programmed into the controller. The target is calculated by subtracting the offset value from the desired weight.

#### 4.7 VARIABLE TRIM TARGET

When this mode is utilized, the target weight will, except for first weighment conditions, automatically adjust itself based on data gathered from previous weighments. The trim target automatically adjusts itself to compensate for overshoot to obtain weighments as close as possible to the desired weight value.

As with the variable bulk target in the bulk only filling mode, the processor calculates the final weight error and applies a correction value of the reverse sign of 1/2 of the average error of the last three weighments to the variable trim target.

A minimum trim time of 1/2 second has been established in the program. If the trim time does not meet this minimum requirement, the variable bulk target is adjusted downward by 20% of the previous bulk target when compared to the desired weight. For example, if the previous was less than 1/2 second, then the next variable bulk target value will be  $50 - [40 + (50-40)(20\%)] = 38.0\#$ .

#### 4.7 TOP OFF TARGET

If the machine is equipped mechanically with topping off devices and is programmed through programming switch A to operate in top-off mode, a top-off target is employed. This target is the desired final weight setting. Since the top-off fill is very slow, the top-off overshoot is minimized. Therefore, weighments which do require topping off should be just over the set weight.

## SECTION 5

### OPERATION

#### 5.1 INTRODUCTION

This section assumes that the unit is properly preprogrammed and that the scale set-up and calibration is complete. All mechanical and other aspects of the installation are complete and we are essentially ready to begin filling. It is only necessary to enter weight and review and correct any time values as required. Each unit is furnished with a listing of the time values and dip switch settings as set up by the factory prior to shipping. Begin as follows:

#### 5.2 TIMER REVIEW

Press TIME ENTER - Timer 01 will display. Check to see that the time value on Timer 01 (bag sense) is correct. If a change is required, press the proper digit keys to enter a revised value.

Press TIME ENTER again. Timer 02 will display.

Continue through all fifteen timers. After Timer No. 15 is displayed, press TIME ENTER again. The unit will return to “weight display” (Refer to Section 2.4.)

#### 5.3 FILL WEIGHT ENTRY

To enter the desired material weight, press the FILL WEIGHT key, and then press the required digits to store the desired weight (i.e., 50.0). Then press FILL WEIGHT. The new weight setting will now be stored in memory. (Refer to Section 2.8.1.)

#### 5.4 TOLERANCE ENTRY

Repeat the above procedure to enter the “over” and “under” tolerance values desired. (Refer to Section 2.8.5)

#### 5.5 MIDCYCLE ENTRY

If the fill cycle is to be automatically stopped at a selected weight for vibration or other reasons, enter this weight value accordingly. (Refer to Section 2.8.2)

#### 5.6 BULK OFFSET ENTRY

If the controller is programmed to utilize a fixed bulk target, this offset value in units and tenths below the desired weight in the bulk only filling sequence or below the trim target weight in the bulk-trim filling sequence must be entered. (Refer to Section 2.8.3.)

#### 5.7 TRIM OFFSET

If the controller is programmed to utilize a fixed trim target, enter this offset value in units and tenths below the desired weight. (Refer to Section 2.8.4.)

### 5.8 RECALL

To check the above entries, simply depress the appropriate key. To return to the normal state, depress the key once again.

### 5.9 TARGET RESET

If it is desired to reset the target weights to an initial state, press TARGET CLEAR. The new target values will be determined according to the selected filling mode and fixed/variable target selections. The following table indicates how the targets will be calculated to return the controller to the “first weighment” condition. (Refer to Section 2.8.6 and Section 4.)

	FIXED TARGET	VARIABLE TARGET
Trim Target	Fill Weight-Trim Offset	Fill Weight
Bulk Target	Trim Target-Bulk Offset	75% of Fill Weight

### 5.10 FILLING

Press START. The clamp will come down. After a preset time, the unit will auto tare and the display will go to zero if the new fill mode has been selected. Filling will begin. The proper cycle should follow and final weight will be slightly above set weight. After the proper time, the clamp will release the display will switch from ”Net” to “Gross” weight. The controller will then begin to make target corrections to bring the weight into line. Ensure that the filling sequence is operating properly by watching the sequence monitor along the bottom of the front panel. Figure 2000-6 shows a typical bulk-trim sequence.

### 5.11 HOLD

If, during filling, the HOLD button is pressed, filling will stop. The cycle will freeze at that point. Pressing start will enable the filling operation to continue.

### 5.12 RESET

If the cycle is to be discontinued, press STOP/RESET. This will cancel the remainder of the cycle. The partially filled container must be removed.

## **SECTION 6**

### **STATISTICS**

#### **6.1 INTRODUCTION**

The statistics package enables the user to utilize an additional portion of the touch panel keyboard to accumulate and recall data related to the filling operation. This data includes total units packed, total weight packed, average weight, and 2 sigma level of accuracy for the 50 most recent weighments.

In addition, the bulk and trim rate of the preceding fill cycle may be recalled.

The following sections discuss the function and operation of the eight function buttons located in the statistics group.

#### **6.2 UNITS FILLED**

The UNITS FILLED function will cause the display to show the total number of filling operations completed since the accumulator memory was last cleared. The number will remain in the display until the UNITS FILLED key is pushed again, after which the system will return to its previous state. The largest number which can be displayed is 99,999.

While this function is active, the SCALE INACTIVE indicator will be lit. If the UNITS FILLED switch is pushed while a filling operation is in progress, the function will be ignored.

#### **6.3 TOTAL WEIGHT**

The TOTAL WEIGHT function will cause the display to show the total weight processed since the accumulator memory was last cleared. The number will remain in the display until the TOTAL WEIGHT key is pushed again, after which the system will return to its previous state. The total weight will be shown to the nearest pound or nearest 0.5 kilogram, and the largest number which can be displayed is 999,999.

While this function is active the SCALE INACTIVE indicator will be lit. If the TOTAL WEIGHT switch is pushed while a filling operation is in progress, the function will be ignored.

#### **6.4 AVERAGE WEIGHT**

The AVERAGE WEIGHT function will cause the display to show the average weight processed per filling operation since the accumulator memory was last cleared. The number will remain in the display until the AVERAGE WEIGHT key is pushed again, after which the system will return to its previous state. The resolution of the average weight display is determined by the pre-selected scale capacity (Refer to Section 1.7.1).

While this function is active the SCALE INACTIVE indicator will be lit. If the AVERAGE WEIGHT switch is pushed while a filling operation is in progress, the function will be ignored.

## 6.2 2-SIGMA

The 2-SIGMA function will cause the display to show the two sigma value of the standard deviation for the most recent 50 filling operations. The number will remain in the display until the 2-SIGMA key is pushed again, after which the system will return to its previous state. The display will indicate deviation to the closest tenth of an ounce in the LB. mode or to the nearest gram in the KG. mode.

While this function is active the SCALE INACTIVE indicator will be lit. If the 2-SIGMA switch is pushed while a filling operation is in progress, the function will be ignored.

## 6.6 BULK RATE

The BULK RATE function will cause the display to show the material flow rate during the bulk fill portion of the latest filling operation. The rate is calculated by dividing the weight delivered during the bulk fill operation by the elapsed time. Note that this rate calculation will not include material in free fall at the end of the bulk fill operation. The number will remain in the display until the BULK RATE key is pushed again, after which the system will return to its previous state.

While this function is active the SCALE INACTIVE indicator will be lit. If the BULK WEIGHT switch is pushed while a filling operation is in progress, the function will be ignored.

## 6.7 TRIM WEIGHT

The TRIM WEIGHT function will cause the display to show the material flow rate during the trim fill portion of the latest filling operation. The rate is calculated by dividing the weight delivered during the trim fill operation by the elapsed time. Note that this rate calculation will not include material in free fall at the end of the trim fill operation. The number will remain in the display until the TRIM RATE key is pushed again, after which the system will return to its previous state.

While this function is active the SCALE INACTIVE indicator will be lit. If the TRIM RATE switch is pushed while a filling operation is in progress, the function will be ignored.

## 6.8 ACCUMULATOR CLEAR

The ACCUMULATOR CLEAR function will clear all of the accumulator memories by replacing their contents with zero.

The message -0000- will be displayed as a visual indication of function execution. The message will be displayed for one second after which the system will return to its previous state. If the ACCUMULATOR CLEAR switch is pushed while a filling operation is in progress, the function will be ignored.

