9127

Semi-Automatic Filling System

Controller Hardware Technical Description and Operation

(240 VAC Systems)

90282300A
(7/97)

CUSTOMER FEEDBACK

Your feedback is important to us! If you have a problem with this product or its documentation, or a suggestion on how we can serve you better, please fill out and send this form to us. Or, send your feedback via email to: quality_feedback.mtwt@mt.com. If you are in the United States, you can mail this postpaid form to the address on the reverse side or fax it to (614) 438-4355. If you are outside the United States, please apply the appropriate amount of postage before mailing.

Your Name:		Date:
Organization Name:		METTLER TOLEDO Order Number:
Address:		Part / Product Name:
		Part / Model Number:
		Serial Number:
		Company Name for Installation:
Phone Number: ( )	Fax Number: ( )	Contact Name:
E-mail Address:		Phone Number:

Please check the appropriate box to indicate how well this product met your expectations in its intended use?	
	Met and exceeded my needs
	Met all needs
	Met most needs
	Met some needs
	Did not meet my needs

Comments/Questions:

DO NOT WRITE IN SPACE BELOW; FOR METTLER TOLEDO USE ONLY

☐ Retail ☐ Light Industrial ☐ Heavy Industrial ☐ Custom

RESPONSE: Include Root Cause Analysis and Corrective Action Taken.

B12745800A

FOLD THIS FLAP FIRST

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 414 COLUMBUS, OH

POSTAGE WILL BE PAID BY ADDRESSEE

Mettler-Toledo, Inc.
Quality Manager - MTWI
P.O. Box 1705
Columbus, OH 43216
USA

Please seal with tape.

INTRODUCTION

This publication is provided solely as a guide for individuals who have received Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

METTLER TOLEDO
1900 Polaris Parkway
Columbus, Ohio 43240
Phone (US and Canada): (614) 438-4511
Phone (International): (614) 438-4888

FCC Notice

This device complies with Part 15 of the FCC Rules and the Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

METTLER TOLEDO RESERVES THE RIGHT TO MAKE REFINEMENTS OR CHANGES WITHOUT NOTICE.

PRECAUTIONS

READ this manual BEFORE operating or servicing this equipment.

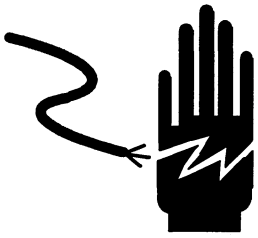
FOLLOW these instructions carefully.

SAVE this manual for future reference.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

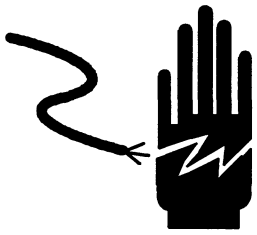
ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.

CALL METTLER TOLEDO for parts, information, and service.



⚠ WARNING

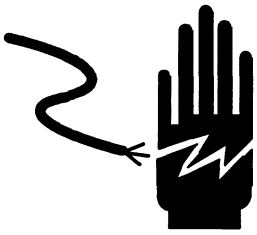
ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.



⚠ WARNING

FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY.

DO NOT REMOVE THE GROUND PRONG.



⚠ WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.

⚠ CAUTION

BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.

CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

⚠ WARNING

The container selection control switch is not connected to the Fill Control board, multiple container control is a function of the Allen Bradley MicroLogix controller only. This means there is no cross checking between the selected Product ID and the selected container. Operator must insure that the proper container selection is made BEFORE starting the filling operation.

The container selection can only be changed when the lance is in the up position.

CONTENTS

CHAPTER 1 OVERVIEW **1-1**

Hazardous Area Applications (analog) *1-1*
Non-Hazardous Applications *1-1*
General *1-3*

CHAPTER 2 POWER REQUIREMENTS **2-1**

CHAPTER 3 CONTROLLER **3-1**

Power-Up *3-1*
Hardware Interlocks 3-1
Emergency Stop 3-1
Stop Auto Fill 3-1
Container In Position 3-1
Sub-Surface filling only; 3-2
Lance Out Of Container 3-2

CHAPTER 4 SEMI-AUTOMATIC FILL SEQUENCE **4-1**

9127 Lance, Sub-Surface, Multiple Containers *4-1*
9127 Lance, Surface, Multiple Containers *4-2*
9127 Lance, Sub-Surface, Single Containers *4-3*
9127 Lance, Surface, Single Containers: *4-5*
9102 Lance *4-6*

CHAPTER 5 TUNING THE FILLING SYSTEM **5-1**

Adjusting the Fill Valve *5-1*

CHAPTER 6 MANUAL FILL SEQUENCE **6-1**

CHAPTER 7 INDICATOR SECTION **7-1**

General *7-2*
Load Cell Excitation *7-2*
Lynx Setup Requirements *7-3*
Jaguar Setup Requirements *7-4*

CHAPTER 8 OPERATORS **8-1**

PURGE OK (HAZARDOUS AREA ONLY) *8-1*
AUTO ALARM INDICATOR LIGHT *8-1*
FILLING INDICATOR LIGHT *8-1*
FILL CONTROL, AUTO/MAN *8-1*
MANUAL LANCE, UP/DOWN *8-1*
MANUAL FILL *8-2*
START AUTO FILL PUSH-BUTTON *8-2*
STOP AUTO FILL PUSH-BUTTON *8-2*
EMERGENCY STOP *8-2*
CONTAINER *8-3*

CHAPTER 9 TSM-300 MICRO-PROCESSOR **9-1**

GENERAL *9-1*
SERIAL CHANNELS *9-1*
Channel 1 9-1
Channel 2 9-1

Channel 3 9-1
Channel 4 9-2
PARALLEL PORT *9-2*
POWER SUPPLY VOLTAGES *9-2*
JUMPER SETTINGS 9-3
SWITCH SW1 SETTINGS 9-4
SW1 SETTING DESCRIPTIONS: 9-4
HOST MULTI-DROP ADDRESSING 9-6

CHAPTER 10 SPARE PARTS LISTING 10-1

General *10-1*
Operators *10-1*
TSM-300 Micro-Processor *10-1*

CHAPTER 11 TROUBLE SHOOTING 11-1

Display Messages *11-1*
Sensors *11-3*
Air Pilot Controls *11-4*
16 I/O Rack *11-5*
P.L.C. *11-6*

CHAPTER 12 P.L.C. LADDER DIAGRAM 12-1

Chapter 1 OVERVIEW

The Mettler Toledo Semi-Automatic / Manual Filler Controller is designed to fill containers using the product weight as the unit of measure. An optional Mettler Toledo printer can be connected to the Filler Controller to record product weights. Also an optional User provided Host device may be connected to the Filler Controller.

The complete Semi-Automatic / Manual Filler System, includes a Mettler Toledo scale platform, a Mettler Toledo Filler Lance assembly (for product delivery to the container), and a Filler Controller.

Hazardous Area Applications (analog)

The Mettler Toledo load cell platform is connected to a Hazardous Area Protection Module, housed in a NEMA 7/9 enclosure external of the Controller, for hazardous area protection. Refer to Mettler Installation Guide A118164 for instructions of the Hazardous Area Protection Module. The Hazardous Area Protection Module is connected to the Controller by way of screw pressure terminals. Refer to the Controller wiring diagrams for connections.

The Filler Lance Assembly is connected to the Controller, via 1/4 inch O.D. air lines, plus intrinsic safe wires for detection of the Filler Lance location. Optional powered drip cup and / or Start and Stop push buttons will increase the number of intrinsic safe wires and air lines.

Refer to the Controller External Wiring Diagram for all of the connections required.

Non-Hazardous Applications

The Mettler Toledo load cell platform is connected directly to the Controller by way of screw pressure terminals, refer to the Controller wiring diagrams for connections.

The Filler Lance Assembly is connected to the Controller, via 120 V.A.C. wires for lance and ball valve control plus detection of the Filler Lance location. Optional powered drip cup and / or Start and Stop push buttons will increase the number of wires.

Refer to the Controller External Wiring Diagram for all of the connections required.

General

The Filler Controller consist of 4 (four) major sections:

1. The indicator section. A Mettler Toledo Model Lynx (optional Jaguar) Indicator Terminal. The continuous data output of the Indicator Terminal is processed by the TSM-300 microprocessor based single board computer.
2. The microprocessor section. The TSM-300 microprocessor based single board computer provides:

   A. Scale weight data monitoring and coincidence outputs of the user defined Setpoints.

   B. Interface, of the user defined Setpoints, through a high level optical isolator P.C. Board, to control the Mettler Toledo Lance assembly.

   C. User interface, via an alpha / numeric keyboard and a local 19 character alpha / numeric display, for setup configuration.

3. The input / output section.

   A. (Hazardous Area applications) Intrinsic Safe, switch operated relays and screw pressure connection terminals.(inputs) Used to sense Filler Lance position. Optional drip cup position and remote Start / Stop push buttons are added to the inputs per order. The option of more than one container size will increase the number of components, per order.

   (Non-Hazardous applications) Screw pressure connection terminals.(inputs) Used to sense Filler Lance position. Optional drip cup position and remote Start / Stop push buttons are added to the inputs per order. The option of more than one container size will increase the number of components, per order.

   B. (Hazardous Area applications) Quick-connect air line fittings, location on bottom of enclosure, are provided Filler Lance action control. Optional powered drip cup will added an additional air line, per order only.

   (Non-Hazardous applications) Screw pressure terminals for output connections for Filler Lance action control. Optional powered drip cup will add an additional terminal, per order only.

   C. ASCII data connection terminals (screw pressure type) for connection of a printer or other data receiving device.

(1) RS-232

(2) 20 mA. current loop.

D. ASCII data connection terminals (screw pressure type) for connection of a user provided Host device.

(1) RS-232

(2) RS-422

E. Automatic / Manual operators and indicator lamps located on front of enclosure.

4. Allen Bradley MicroLogix P.L.C. Controller.

The MicroLogix controller provides support to the TSM-300 controller board programming. This support is in the form of providing multiplexing of multiple container height sensor probe inputs, and optional powered drip cup control. The MicroLogix controller also provides all manual function control. The P.L.C. is simply used as a hard contact relay replacement. A hard copy of the P.L.C. program is provided within this document.

Within the MicroLogix programming is a fixed 0.60 timer for Manual Filling, this means Manual Filling will be in a less than the full open mode.

Spare parts listings, for Mettler Toledo supplied equipment, that is external of the Controller enclosure will be contained in Technical Manuals or Installation Instructions provided for that external equipment. Mettler Toledo part numbers for parts not listed in this document can be found on the enclosure assembly diagram provided with your Controller documentation.

Chapter 2 POWER REQUIREMENTS

The 9127 Container Filling system requires a 240 V.A.C., 1.5 Amp., single phase, noise free, grounded, 50/60 Hertz power source.

To assure reliable operation a separate ground lug is provided, within the enclosure (left side), for connection to an effective earth ground.

If the filler lance is in a hazardous area, an additional effective earth ground connection must be made to a lug on the right lower section of the rear panel. This ground connection is for the intrinsic safe sensor probe barriers.

The Filler Controller requires AC power that is free of power noise, sags and surges. The AC power must not be "shared with" equipment that is known to generate AC power noise in the form of line spikes, voltage sags, or voltage surges. The term "shared with" means that the Filler Controller is connected on the same line or distribution box as the noise generating equipment. The Filler Controller does not have a noise isolation transformer or other noise elimination devices included in its design.

Chapter 3 CONTROLLER

Power-Up

If the EMERGENCY STOP switch is pressed in, on power-up the Filler Controller will not have Control Power applied to the output circuits, . The display of the TSM-300 will display ****EMERGENCY STOP**** indicating that the Control Power is off.

To turn the Control Power ON, the operator must pull out the EMERGENCY STOP switch.

NOTE: That during power-up the TSM-300 will perform various internal checks and will display various messages. Refer to the Sequence of Operation for the program operation of the TSM-300.

Hardware Interlocks

Emergency Stop

The Filler Controller includes an EMERGENCY STOP button on the front door, plus the capability to connect a remote EMERGENCY STOP button. Pressing either the local or remote EMERGENCY STOP will de-energize the "RPO" relay and remove Control Power to the outputs of the Filler Controller. The display of the TSM-300 will display ****EMERGENCY STOP**** indicating that the Control Power is off. To restore the Control Power, the operator must pull out the EMERGENCY STOP switch. If a remote EMERGENCY STOP switch is not connected, a jumper from terminal "1A" to "50" must be installed. While the Control Power is off, the Filler Lance can not be maintained in an up position and will in time fall down.

Stop Auto Fill

The Filler Controller includes a STOP AUTO FILL button on the front door, plus the capability to connect a remote STOP AUTO FILL button. Pressing either the local or remote STOP AUTO FILL will stop a filling cycle. If a remote STOP AUTO FILL switch is not used, a jumper must be added to the Controller, refer to the External Wiring diagram for termination.

Container In Position

The Filler Controller includes a Container in position 24 V.D.C. input circuit. If this circuit is not closed it will cause either a LANCE FAULT or POSITION FAULT error. If the user does not have a device to

connect on this input circuit, a jumper from terminal "+24" to terminal "53" must be installed.

Sub-Surface filling only;

Lance Out Of Container

The Filler Controller monitors the Lance out of Container limit input, both in TSM-300 software and the MicroLogix controller. The MicroLogix interlock works by a seal circuit that is enable by the lance moving through the In Container Limit. If the Lance should raise to the Out of Container limit the seal circuit is broken, removing the Out of Container input to the TSM-300 processor and there-by removing power to the feed valve circuits.

Chapter 4 SEMI-AUTOMATIC FILL SEQUENCE

The following pages describe the normal Semi-Automatic Container Filling sequence. It is assumed that the filler lance is up, a Run ID has been selected, and there are no filling sequence errors.

If the Controller has a selector switch for different container sizes the operator must select the proper container size before proceeding.

If an error should occur, the use of the Start push button will clear most errors and continue the filling cycle.

9127 Lance, Sub-Surface, Multiple Containers

Press the START button to accept the displayed ID as the Run ID, for start of skid.

If the Controller has a selector switch for different container sizes the operator must select the proper container size before proceeding.

1. Press the START button
2. The Drum Complete output is turned off
3. The weight on the scale is checked for the minimum container weight.
4. The lance raise control valve is deactivated, the lance lower control valve is activated, the lance is lowered into the container.
5. When the "Lance Down" input comes on there is a delay looking for no scale motion.
6. The indicator is tared, to a Net Zero indication, Net mode of the indicator is confirmed.
7. The fill valve and foot valve, on the lance, open.

   A. If programmed for Slow-Fast-Slow filling, the fill valve will be partial open (refer to "Slow Time 1") , material flows into the container. When the scale reading equals the value entered for "Slw Fill Wt", the lance raise and raise fast control valves are activated. When the lance raises and the "Lance Down" input goes off, the lance raise fast control valve is deactivated. The lance raise control valve is pulsed on and off (Refer to "Raise Duty Cycl"), until the "Lance In-Drum" input comes on. The fill valve at this time is also fully opened.

B. If programmed for Fast-Slow filling, the fill valve will be fully opened. The lance raise and raise fast control valves are activated. When the lance raises and the "Lance Down" input goes off, the lance raise fast control valve is deactivated. The lance raise control valve is pulsed on and off (Refer to "Raise Duty Cycl"), until the "Lance In-Drum" input comes on.

8. The container becomes filled to a weight value equal to "Setpoint" minus "Dribble" minus "Preact" the fill valve partially closes (refer to "Slow Time 2"). The container continues to fill, but at a slower rate.
9. The container becomes filled to a weight value equal to "Setpoint" minus "Preact", the fill valve is closed, the foot valve remains open, unless or until scale weight equals or exceeds "Setpoint". If the lance "In-Drum" input is not on, the raise lance control valve is activated until the "In-Drum" input comes on.
10. When the "In-Drum" input is on, "Tolerance Delay" is started, and check for no scale motion. At the end of "Tolerance Delay" the foot valve is closed.
11. Container "Tolerance Check" is made.
12. Container weight data is stored, internally, and optionally data is sent to a printer.
13. The lance raise and raise fast control valves are activated until the "Lance Up" input comes on, then the lance raise fast control valve is deactivated (raise control valve remains activated).
14. The Drum Complete output is turned on.

The above sequence, steps 1 through 14 are repeated for each remaining container on the skid. The Start push button must be pressed again at the start of each new skid, then steps 1 through 14 are followed.

9127 Lance, Surface, Multiple Containers

Press the START button to accept the displayed ID as the Run ID, for start of skid.

If the Controller has a selector switch for different container sizes the operator must select the proper container size before proceeding.

1. Press the START button
2. The Drum Complete output is turned off
3. The weight on the scale is checked for the minimum container weight.

4. The lance raise control valve is deactivated, the lance lower control valve is activated, the lance is lowered into the container.
5. When the "Lance Down" input comes on there is a delay looking for no scale motion.
6. The indicator is tared, to a Net Zero indication, Net mode of the indicator is confirmed.
7. The fill valve and foot valve, on the lance, open.
   A. If programmed for Slow-Fast-Slow filling, the fill valve will be partial open (refer to "Slow Time 1") , material flows into the container. When the scale reading equals the value entered for "Slw Fill Wt", the fill valve is fully opened.
   B. If programmed for Fast-Slow filling, the fill valve will be fully opened.
8. The container becomes filled to a weight value equal to "Setpoint" minus "Dribble" minus "Preact" the fill valve partially closes (refer to "Slow Time 2"). The container continues to fill, but at a slower rate.
9. The container becomes filled to a weight value equal to "Setpoint" minus "Preact", the fill valve is closed, the foot valve remains open, unless or until scale weight equals or exceeds "Setpoint".
10. "Tolerance Delay" is started, and a check for no scale motion is made. At the end of "Tolerance Delay" the foot valve is closed.
11. Container "Tolerance Check" is made.
12. Container weight data is stored, internally, and optionally data is sent to a printer.
13. The lance raise control valve is activated until the "Lance Up" input comes on (raise control valve remains activated).
14. The Drum Complete output is turned on.

The above sequence, steps 1 through 14 are repeated for each remaining container on the skid. The Start push button must be pressed again at the start of each new skid, then steps 1 through 14 are followed.

9127 Lance, Sub-Surface, Single Containers

If the Controller has a selector switch for different container sizes the operator must select the proper container size before proceeding.

1. Press the START button
2. The Drum Complete output is turned off

3. The weight on the scale is checked for the minimum container weight and not exceeding the maximum container weight.
4. The lance raise control valve is deactivated, the lance lower control valve is activated, the lance is lowered into the container.
5. When the "Lance Down" input comes on there is a delay looking for no scale motion.
6. The indicator is tared, to a Net Zero indication, Net mode on indicator is confirmed.
7. The fill valve and foot valve, on the lance, open.
   A. If programmed for Slow-Fast-Slow filling, the fill valve will be partial open (refer to "Slow Time 1") , material flows into the container. When the scale reading equals the value entered for "Slw Fill Wt", the lance raise and raise fast control valves are activated. When the lance raises and the "Lance Down" input goes off, the lance raise fast control valve is deactivated. The lance raise control valve is pulsed on and off (Refer to "Raise Duty Cycl"), until the "Lance In-Drum" input comes on. The fill valve at this time is also fully opened.
   B. If programmed for Fast-Slow filling, the fill valve will be fully opened. The lance raise and raise fast control valves are activated. When the lance raises and the "Lance Down" input goes off, the lance raise fast control valve is deactivated. The lance raise control valve is pulsed on and off (Refer to "Raise Duty Cycl"), until the "Lance In-Drum" input comes on.
8. The container becomes filled to a weight value equal to "Setpoint" minus "Dribble" minus "Preact" the fill valve partially closes (refer to "Slow Time 2"). The container continues to fill, but at a slower rate.
9. The container becomes filled to a weight value equal to "Setpoint" minus "Preact", the fill valve is closed, the foot valve remains open, unless or until scale weight equals or exceeds "Setpoint". If the lance "In-Drum" input is not on, the raise lance control valve is activated until the "In-Drum" input comes on.
10. When the "In-Drum" input is on, "Tolerance Delay" is started, and check for no scale motion. At the end of "Tolerance Delay" the foot valve is closed.
11. Container "Tolerance Check" is made.
12. Container weight data is stored, internally, and optionally data is sent to a printer.
13. The lance raise and raise fast control valves are activated until the "Lance Up" input comes on, then the lance raise fast control valve is deactivated (raise control valve remains activated).
14. The Drum Complete output is turned on.

The above sequence, steps 1 through 14 are repeated for each container.

9127 Lance, Surface, Single Containers:

If the Controller has a selector switch for different container sizes the operator must select the proper container size before proceeding.

1. Press the START button
2. The Drum Complete output is turned off
3. The weight on the scale is checked for the minimum container weight, and not exceeding the maximum container weight.
4. The lance raise control valve is deactivated, the lance lower control valve is activated, the lance is lowered into the container.
5. When the "Lance Down" input comes on there is a delay looking for no scale motion.
6. The indicator is tared, to a Net Zero indication, Net mode of the indicator is confirmed.
7. The fill valve and foot valve, on the lance, open.
   A. If programmed for Slow-Fast-Slow filling, the fill valve will be partial open (refer to "Slow Time 1") , material flows into the container. When the scale reading equals the value entered for "Slw Fill Wt", the fill valve is fully opened.
   B. If programmed for Fast-Slow filling, the fill valve will be fully opened.
8. The container becomes filled to a weight value equal to "Setpoint" minus "Dribble" minus "Preact" the fill valve partially closes (refer to "Slow Time 2"). The container continues to fill, but at a slower rate.
9. The container becomes filled to a weight value equal to "Setpoint" minus "Preact", the fill valve is closed, the foot valve remains open, unless or until scale weight equals or exceeds "Setpoint".
10. "Tolerance Delay" is started, and a check for no scale motion is made. At the end of "Tolerance Delay" the foot valve is closed.
11. Container "Tolerance Check" is made.
12. Container weight data is stored, internally, and optionally data is sent to a printer.
13. The lance raise control valve is activated until the "Lance Up" input comes on (raise control valve remains activated).
14. The Drum Complete output is turned on.

The above sequence, steps 1 through 14 are repeated for each container.

9102 Lance

If the Controller has a selector switch for different container sizes the operator must select the proper container size before proceeding.

1. The operator should place an empty container on the scale, then align the drum to the Lance and lower the Lance into the container.
2. Press the START button
3. The Drum Complete output is turned off
4. The weight on the scale is checked for the minimum container weight and not exceeding the maximum container weight.
5. If the lance is not down, the operator will be prompted to lower the Lance.
6. When the "Lance Down" input comes on there is a delay looking for no scale motion.

   The indicator is tared, to a Net Zero indication, Net mode of the indicator is confirmed.
7. The fill valve and foot valve, on the lance, open.

   A. If programmed for Slow-Fast-Slow filling, the fill valve will be partial open (refer to "Slow Time 1") , material flows into the container. When the scale reading equals the value entered for "Slw Fill Wt", the fill valve is fully opened.

   B. If programmed for Fast-Slow filling, the fill valve will be fully opened.
8. The container becomes filled to a weight value equal to "Setpoint" minus "Dribble" minus "Preact" the fill valve partially closes (refer to "Slow Time 2"). The container continues to fill, but at a slower rate.
9. The container becomes filled to a weight value equal to "Setpoint" minus "Preact", the fill valve is closed, the foot valve remains open, unless or until scale weight equals or exceeds "Setpoint".
10. "Tolerance Delay" is started, and a check for no scale motion is made. At the end of "Tolerance Delay" the foot valve is closed.
11. Container "Tolerance Check" is made.
12. Container weight data is stored, internally, and optionally data is sent to a printer.
13. The operator is prompted to raised the Lance from out of the container. The now full container should be removed from the scale.
14. The Drum Complete output is turned on.

The above sequence, steps 1 through 14 are repeated for each container.

Chapter 5 TUNING THE FILLING SYSTEM

Adjusting the Fill Valve

The Fill Ball Valve is controllable for slow filling with two adjustable times within the setup of the controller. These two timers are in the Product ID Setup, and are called "Slow Time 1" and "Slow time 2".

Depending on pump pressure, tightness of the ball valve actuator seals, and viscosity of the material, these timers will have to be adjusted. Proper settings of these timers will increase fill accuracy and reduce foaming.

"Slow Time 1" controls the fill valve from fully closed to partial open (slow filling at the start of container filling).

Larger the value entered, larger will the opening in the ball valve will be.

The default value of 0.40 may not open the ball valve, if it does not, enter a value of 0.45. If this new value opens the valve allow a couple more containers to be filled before doing any more adjustment.

If it is determined the valve needs to be open or be closed more do it only in 0.02 to 0.03 increment steps. Test a couple more containers being filled before adjusting again.

Adjustments to this timer may have to be in 0.01 increment steps to get the best results.

"Slow Time 2" controls the fill ball valve from fully opened to partial open (dribble fill at the end of container filling).

The Product ID setup parameter "Dribble" should be set to a value of 25 or greater, to allow material velocity to slow down before cutoff. Slowing down the material flow velocity will reduce the chances of pump seals being damaged. The "Dribble" value also factors into the setting of "Slow Time 2", if the fill valve can not reach its slow fill position before cutoff, adjusting "Slow Time 2" will have no effect.

Larger the value entered for "Slow Time 2", **smaller** will the opening in the valve will be.

The "Slow Time 2" default value of 1.00 may not work as a starting value. Enter a value of 1.10.

If the fill valve closes and stops fill, the timer value must be made smaller.

If it is determined the valve needs to be open more, because fill stopped, do it only in 0.02 to 0.03 increment steps. Test a couple more containers being filled before adjusting again. Adjustments to this timer may have to be in 0.01 increment steps to get the best results.

If the fill valve is open too much, increase the timer value in steps of 0.03 increments. Always fill a couple of containers to confirm repeat action. Once a value has been entered that closes the fill valve, back off the timer setting as described earlier.

Sub-Surface lance, raising during fast fill, there are two means of controlling the rise rate of the sub-surface lance. One is a setup parameter in Product ID setup called "Raise Duty Cycl", the other is a mechanical flow control for raising the lance (slow).

The parameter "Raise Duty Cycl" is described in the Operator Manual of the 9127. In general the smaller the value entered, slower the lance will raise. This may not be enough control if the material flow rate is small.

The mechanical flow control for raising the lance (slow) may have to be adjusted for the best results. **Do not adjust the raise fast flow control.**

Looking at the knob of the flow control, turning the knob clock-wise will slow down the lance, turning the knob counter clock-wise will speed up the lance.

Be carefully speeding up the lance, allowing it to go too fast may cause "Position Faults".

If the material flow rate is at 3 pounds a second or less, adjustment of the flow control to slow down the lance may cause "Lance Faults". If "Lance Faults" occur increase the General Setup parameter "Raise Time".

Chapter 6 MANUAL FILL SEQUENCE

⚠ WARNING

Permit only qualified personnel who are trained in the operation of the weighing system to operate this equipment. When operating this equipment in the Manual/Jog mode, the setpoint features are not functional and filling will continue until the Manual/Jog button is released.

Failure to observe these precautions could result in bodily injury!

1) Position an empty container under the Filler Lance Assembly, align the Lance tip over the fill hole of the container.

2) Position the FILL CONTROL selector switch to the MANUAL position. If more than one container size switch control was provided, the operator must also select the proper container.

NOTE: (Sub-Surface) Filling will not occur unless the lance is below the top of the container opening. (Surface) Filling will not occur unless the lance is fully down.

3) Lower the lance assembly into the container fill hole by turning the MANUAL LANCE selector switch to the DOWN position and holding the switch in the DOWN position until the lance is in the container.

4) Tare the empty container weight by pressing the TARE button on the 8510 indicator on the Controller front door.

NOTE: The operator must watch the display of the indicator for the weight reading of material being filled into the container

5) Fill the container by pressing and holding the MANUAL FILL push button in, the FILLING indicator lamp will turn on while the MANUAL FILL push button is held in.

6) Raise the lance, after filling the container to the desired weight, by turning the MANUAL LANCE selector switch to the UP position and hold in the UP position until the lance is up and clear of the container.

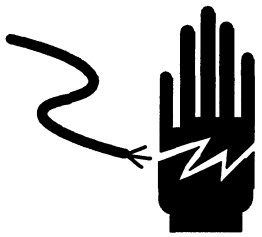
7) Cap filling hole of the container, remove full container from scale.

8) Repeat the sequence until all container are filled.

Hazardous Area applications require the connection of a ground to the container before filling.

While the FILL CONTROL selector switch is in the MANUAL position, if the Filler Lance is up, the Controller will maintain the Lance in the up position.

Chapter 7 INDICATOR SECTION



WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.

WARNING

THIS MODULE AND ITS ASSOCIATED EQUIPMENT MUST BE INSTALLED, ADJUSTED, & MAINTAINED BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL EQUIPMENT IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

Use the Mettler Toledo Indicator Terminal Technical Manual, provided with the Controller, for calibration and configuration setup.

NOTICE: Do not push the indicator's ZERO button during the filling operation. Over filling of the drum may occur.

NOTICE: Do not push the indicator's TARE button during the Automatic filling operation. This will cause a fatal error.

General

The indicator section of the Mettler Toledo Drumfiller Controller uses a Lynx Indicator Terminal as a standard , optional Indicator Terminal is the Jaguar.
The RS-232 of the COMM1 port provides output data to the TSM-300 microprocessor and input from the TSM-300 for TARE and CLEAR commands.

Load Cell Excitation

Non-Hazardous Area (analog): The Indicator Terminal supplies 12.0 V.D.C. load cell excitation voltage for up to four (4) 350 ohm analog load cells (87.5 ohms max. load). The Indicator Terminal load cell connections are wired out to the input terminals (by Mettler Toledo) on the left side of the enclosure. Refer to Drumfiller System wiring diagrams for wiring.

Hazardous Area (analog): The Indicator Terminal supplies 5.0 V.D.C. load cell excitation voltage for up to four (4) 350 ohm analog load cells (87.5 ohms max. load). The Indicator Terminal load cell connections are wired out to terminals on the left side of the Controller (by Mettler Toledo). The Installer must wire these terminals to terminals in the Hazardous Area Protection (H.A.P.) modules located external (by Installer) of the Drumfiller Controller. The output wires of the H.A.P. modules are wired to junction boxes that include terminals to provide hook-up of the scale platforms. Refer to Drumfiller System wiring diagrams for wiring.

Lynx Setup Requirements

Application Environment:

Weight Units:

Enable 2nd Unit = 'N'

Tare Operation:

Tare Ena? = 'Y'

Tare Intlk? = 'N'

PB Tare? = 'Y'

KB Tare? = 'N'

Auto Tr? = 'N'

Zero Operation:

Factory Default

Stability Detection:

Factory Default

Vibration Rejection:

Factory Default

Serial Interface:

Port? = COM1

Baud Rate = 9600

Data Bits = 7

Parity = Even

XON/XOFF = 'N'

Checksum = 'Y'

Connection:

Output = Continuous

Format = Standard

Status Byt = Standard

Frequency = A/D Synchronized

Input = Command

Jaguar Setup Requirements

Application Environment:
- Alt Weight Units: Unit Switching = 'N'
- Tare Operation:
  - Enable Tare = 'Y'
  - Tare Interlck? = 'N'
  - Enable PB Tare? = 'Y'
  - Enable KB Tare? = 'N'
  - Enb Auto Tr? = 'N'
- Zero Operation:
  - Factory Default
- Application Type:
  - Process Application = 'Y'
- Vibration Rejection:
  - Factory Default
- Stability Detect:
  - Factory Default

Configure Serial:
- Configure Port:
  - Select Port:
    - Location = Local
    - Assign Port = Com1
      - Port Parameters:
        - Baud Rate = 9600
        - Data Bits = 7
        - Parity = Even
        - Flow = None
  - Add Connection:
    - Type = Serial Out
    - Enter Scale# = A
    - Mode = Continuous
    - Status = Standard
    - Checksum = 'Y'
  - Add Connection:
    - Type = CTPZSU In

Chapter 8 OPERATORS

The operator interface devices for the Filler are located on the door of the Controller. The pilot lights are rated NEMA 7/9. These devices are as follows.

PURGE OK (HAZARDOUS AREA ONLY)

Green, pilot light, illuminates to indicate that the Purge hardware Timer Module has timed out and power is on in the Controller.

AUTO ALARM INDICATOR LIGHT

Red, pilot light, illuminates to indicate that a Filler error has occurred during an Automatic filling cycle.

FILLING INDICATOR LIGHT

Clear, pilot light, illuminates to indicate that the lance Foot valve should be open and the ball valve should be in the Slow Fill mode or Fast Fill mode.

FILL CONTROL, AUTO/MAN

Two position, key operated, selector switch which selects either the Semi-Automatic, or Manual control mode.

MANUAL LANCE, UP/DOWN

Three position, spring return to center, selector switch which controls the lance position in Manual Mode.

MANUAL FILL

Black, flush head, push-button, turns on the fast fill when the Fill Control selector is in the Manual Mode.

START AUTO FILL PUSH-BUTTON

Green, flush head, push-button, pressed to initiate a Semi-Automatic container filling operation or re-start the Semi-Automatic container filling operation.

STOP AUTO FILL PUSH-BUTTON

Red, extended head, push-button, pressed to pause the Semi-Automatic container filling operation.

EMERGENCY STOP

Red, mushroom head, maintained, push-pull switch, removes power to all Controller outputs, when pressed.

CONTAINER

(Optional) CONTAINER, 3 / 2 / 1
A two (2) or three (3) position key operated, selector switch. Provides the hardware interface to the Lance limit switches, for filling one of up to three heights of containers.
Container 1 is for the tallest container, container 3 the shortest container.

WARNING:
The container selection control switch is not connected to the TSM-300 board, multiple container control is a function of the Allen Bradley MicroLogix controller only. This means there is no cross checking between the selected Product ID and the selected container. Operators must insure that the proper container selection is made BEFORE starting the filling operation.

The container selection can only be changed when the lance is in the up position.

Chapter 9 TSM-300 MICRO-PROCESSOR

GENERAL

The Mettler Toledo TSM-300 is a single board micro-processor which permits up to four serial input/output devices to be interfaced together. The TSM-300 also provides an alpha/numeric display and keyboard connection for operator interfacing. Additionally the TSM-300 provides sixteen (16) parallel, TTL, I/O lines consisting of eight (8) inputs and eight (8) outputs.

The CPU of the TSM-300 is an Intel 8085, programming is stored in an Eprom, the program is written in the Toledo Scale Micro-computer (TSM) language.

SERIAL CHANNELS

There are four bi-directional serial communication channels which are used to receive data from or transmit data to an external device. The actual operation of these channels are dependent on the application program.

Each serial channel has two (2) circuit types which may be used for device interfacing. This configuration permits the connection of eight (8) external devices, four (4) inputs and four (4) outputs. If a device uses both the input and output of a port, the number of available device connections is decreased by one.

A brief description of the four channels follows:

Channel 1

This channel is capable of communications using RS-232 and/or four wire type RS-422.

Channel 2

This channel is capable of communications using RS-232 and/or 20 milliamp (mA) current loop. The current loop is active transmit and passive receive.

Channel 3

This channel is capable of communications using RS-232 and/or four wire type RS-422.

Channel 4

This channel is capable of communications using RS-232 and/or 20 milliamp (mA) current loop. The current loop is active transmit and passive receive.

PARALLEL PORT

The parallel port has sixteen (16) independent, TTL, input/output lines, eight (8) lines are available for input control signals and eight (8) are available for output control signals. Also available on this port are two fused supply (+5 V.D.C. and +12 V.D.C.) which may be used to trigger the I/O lines.

POWER SUPPLY VOLTAGES

The TSM-300 requires an external 12 V.D.C. power source at 1.5 Amps. this +12 V.D.C. is then used by the TSM-300 to generate the various D.C. voltages required by the TSM-300. The voltages generated by the TSM-300 are +5 V.D.C. and +12 V.D.C.. There is also a +2.4 V.D.C. battery supply used by the TSM-300 for memory backup during power failure.

+2.4 V.D.C. Battery Supply:

This voltage is generated by the battery and is used to maintain the RAM memory during power failure. The battery is a NICAD type and is kept charged by the +5 V.D.C. supply.

+5 V.D.C. Supply:

This voltage is used to operate all logic circuits on the TSM-300 board. It is generated on the P.C. Board using an LM340 voltage regulator and is filtered by a 4.7 ufd. capacitor. Operating tolerance of this supply is +/- 0.15 V.D.C. with a maximum A.C. ripple of 0.04 V.A.C..

+5 V.D.C. Fused Supply:
This voltage is generated on the TSM-300 board and is fused (F2) at 0.3 Amps.. This supply is not used on the P.C. Board, but is made available on the parallel I/O port for optional control of the I/O lines. The fuse is located on the TSM-300 board and is labeled F2.

+12 V.D.C. Supply:
This +12 V.D.C. supply is generated by the external power source and is used as a raw supply for the +5 V.D.C., it is also used to operate various communication circuits. This voltage must be filtered by the external power supply.

Power Supply Voltage specifications are:

Loaded Output (at 120 V.A.C. input)
12.5 V.D.C., +/- 0.5 V.D.C. at 1.5 Amps.
Unloaded Output (at 120 V.A.C. input)
18.1 V.D.C. Maximum

+12 V.D.C. Fused Supply:
This voltage is taken directly from the standard +12 V.D.C. supply input, is fused at 0.125 Amps. and may be used for control of the output lines. The fuse is located on the TSM-300 board and is labeled F1.

JUMPER SETTINGS

The jumpers on the TSM-300 board must be properly positioned for correct operation of the Filler Controller.

Refer to FIGURE 1 for jumper locations

W1 - Out
W2 - Out
W3 - Short pin 2 to 3
W4 - Short pin 1 to 2
W5 - Short pin 1 to 2
W6 - Out
W7 - In
W8 - In (*)
W9 - In (*)
W10 - Short pin 2 to 3 (RAM)
W11 - Out
W12 - Out
W13 - Short pin 1 to 2 and pin 3 to 4 (**)
W14 - Short pin 1 to 2 and pin 3 to 4 (**)

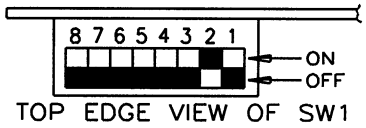
(*) = Configures pull up resistors on Channel #3 (RS-422 / RS-485) TA and TB lines. If receiving device has pull-up / pull down resistors remove these jumpers.

(**) = Configures Channels #2 and #4 current loops for active transmit and passive receive.

SWITCH SW1 SETTINGS

The settings of SW1 on the TSM-300 board must be properly positioned for correct operation of the Filler Controller as required for the user's application.

Refer to FIGURE 1. for the location of SW1



SW1-1 = (*)
SW1-2 = (*)
SW1-3 = (*)
SW1-4 = (*)
SW1-5 = (*)
SW1-6 = (*)
SW1-7 = (*)
SW1-8 = Off

(*) = Application selected

SW1 SETTING DESCRIPTIONS:

SW1 - 1, On = Surface Filler
SW1 - 1, Off = Sub-Surface Filler

SW1 - 2, On = Multiple Containers
SW1 - 2, Off = Single Containers

SW1 - 3, On = 9102 Lance
SW1 - 3, Off = 9127 Lance (normal)

SW1 - 4, Multi-Drop Addressing
SW1 - 5, Multi-Drop Addressing
SW1 - 6, Multi-Drop Addressing

SW1 - 7, On = Auto Jog Enabled
SW1-7, Off = Auto Jog Disabled

SW1 - 8, On = Force Cold Start
SW1 - 8, Off = Normal operation

See Operator Manual for more information on Force Cold Start.

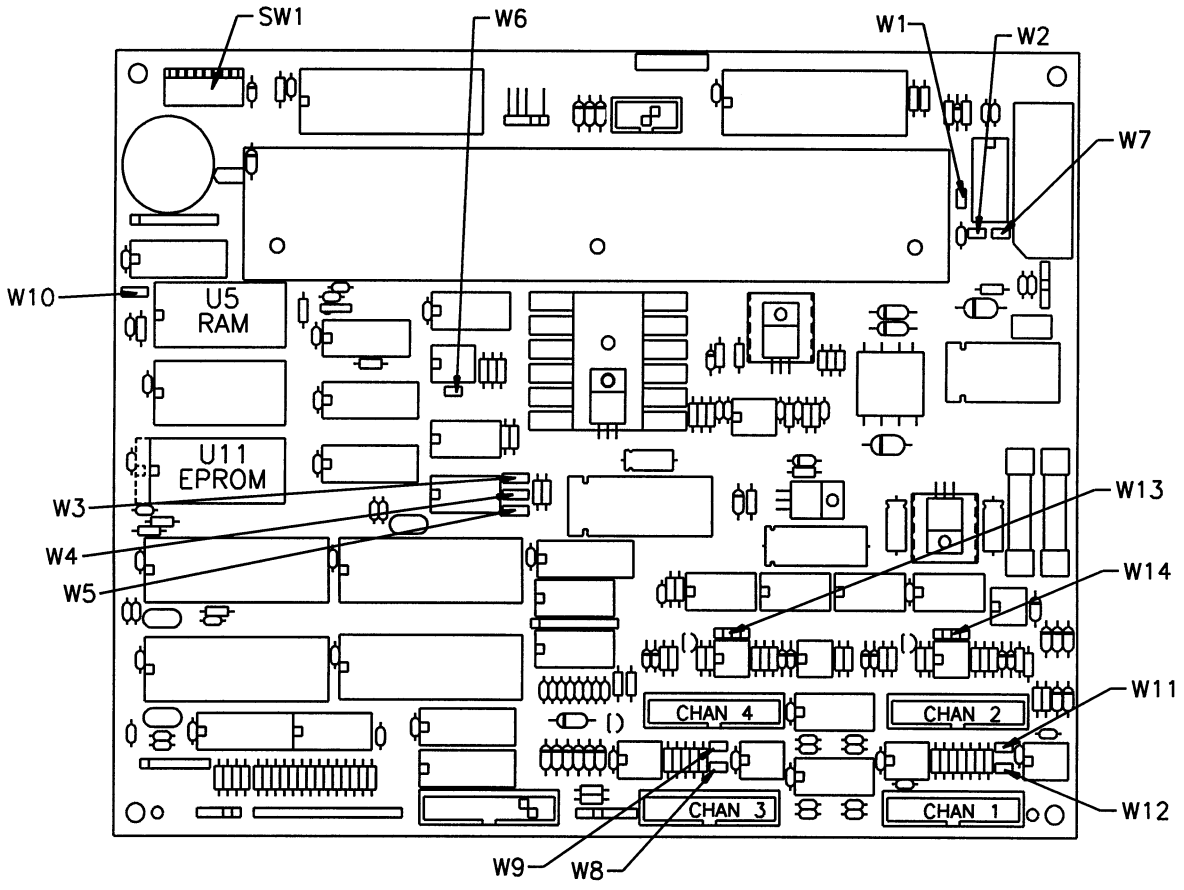

SW1
W6
W1
W2
W7
W10
U5
RAM
U11
EPROM
W3
W4
W5
W13
W14
W11
W12
CHAN 4
CHAN 2
CHAN 3
CHAN 1
W9
W8

Figure 1

HOST MULTI-DROP ADDRESSING

Multi-Drop Addressing			
SW1-4	SW1-5	SW1-6	Filler No.
OFF	OFF	OFF	00
ON	OFF	OFF	01
OFFD	ON	OFF	02
ON	ON	OFF	03
OFF	OFF	ON	04
ON	OFF	ON	05
OFF	ON	ON	06
ON	ON	ON	07

Chapter 10 SPARE PARTS LISTING

General

DESCRIPTION	PART NUMBER
FUSE, 1.5 AMP., SLO-BLO	(*) 12465400A
POWER SUPPLY, 12 V.D.C.	(*) 15265700A
POWER SUPPLY, 24 V.D.C.	(*) 90179000A
INPUT MODULE, D.C..	(*) 13636500A
OUTPUT MODULE, D.C..	(*) 13636800A
OUTPUT MODULE, DRY CONTACT	(*) 15127200A
FUSE, OUTPUT MODULE, 4 AMP., 250 V.A.C	(*) 13637500A
RELAY, 4-FORM-C, 240 V.A.C. COIL	KT665008AAM
P.L.C., ALLEN-BRADLEY MICROLOGIX, D.C INPUTS	KT665025AEB
@INTRINSIC SAFE SWITCH ISOLATOR	(*) 90298400A
@3-WAY SOLENOID VALVE, 24 V.D.C.	KN775364020

Operators

DESCRIPTION	PART NUMBER
CONTACT BLOCK, 1-N.O. 1-N.C.	KT665006PAF
PILOT LIGHT, GREEN, NEMA 7/9	(*) 15226100A
PILOT LIGHT, RED, NEMA 7/9	(*) 15225900A
PILOT LIGHT, CLEAR, NEMA 7/9	(*) 15226000A
LAMP, #6S6, 30 VOLT	KT665005EAS
LAMP, #6S6, 145 VOLT.	(*) 15226200A

(*) May have letter prefix

@ Hazardous Area Application only

TSM-300 Micro-Processor

DESCRIPTION	PART NUMBER
PCB ASS'Y, MAIN LOGIC, WITH EPROM	(*)90126900A
GASKET, DISPLAY	(*)13212700A
GASKET, KEYBOARD	(*)13212800A
DISPLAY GLASS	(*)15225200A
DISPLAY LENS	(*)13212600A
DISPLAY FILTER, CONDUCTIVE	(*)15225400A
KEYBOARD ASSEMBLY	(*)15225600A

(*) May have letter prefix

Chapter 11 TROUBLE SHOOTING

This section is intended to be an aid, but does not cover all possible conditions that may occur.

Knowing if you are working on a Surface or Sub-Surface system would an aid in trouble shooting. To determine Surface or Sub-Surface, look at the vertical section of the lance filler pipe, while the lance is down, if the pipe is long enough to reach near the bottom of the containers, it is a Sub-Surface system. Another check would be on the lance air control valves, a valve marked "Raise Fast" would mean the system is Sub-Surface.

Display Messages

The 19 character display can be helpful in trouble shooting problems. The 9127 Operator Manual includes an index of display prompts, referring to the section about the display prompt will give the user information about what the Controller is doing or expects.

****EMERGENCY STOP**,** This message is displayed, and the front door switch is not pressed in. The problem may be a remote switch has been pushed. Or if no remote is connected the jumper wire from terminal "1A" to terminal "50" has not been installed. The Emergency Stop circuit must be closed for the Controller to run. The coil of relay RPO is part of this circuit, if the lamp inside the relay, RPO, is off then Control Power is off. Also, if relay RPO is on (energized), the lamp on the 16 I/O rack slot #0 should also be on (the 16 I/O rack slots are counted 0, 1, 2, 3 etc.). If the lamp on the 16 I/O rack slot #0 is on, but the message is still displayed, the input module may be bad, or the 5 volt logic wiring to the TSM-300 board has become faulty.

Stopped- Push Start, This message is displayed, the START button has been pushed, yet the message remains. The problem may be a remote switch has been dis-connected or locked in the pushed position. Or if no remote is connected, a jumper has not been installed, see wiring diagrams for connections. The Stop Auto Fill circuit must be closed for the Controller to run. If the lamp on the 16 I/O rack slot #3 is not on, the circuit is open. (the 16 I/O rack slots are counted 0, 1, 2, 3 etc.) If the lamp on the 16 I/O rack slot #3 is on, but the message is still displayed, the input module may be bad, or the 5 volt logic wiring to the TSM-300 board has become faulty.

Position Fault, This error message is displayed, after the Filler Lance came down. The problem may be that the Container in Position circuit is open. If not using a Container in Position device, a jumper from terminal "+24" to terminal "53" must be installed. To confirm the Container in Position circuit is closed, the P.L.C. input lamp #17, should be on.

Another cause may be a sensor failure, if filling never started before the error message was displayed check the Out-of-Container sensor on Sub-Surface fillers. The Out-of-Container logic circuit must be closed for the system to fill properly, the loss of input will cause "Position Fault" or "Sensor" errors. If the Out of Container circuit closes again fill will automatically restart.

Lance Fault, This message is an indication of a possible lance movement problem, a sensor probe failure, or the System Setup, General Setup, variable "Raise Time" is set to a too small of value, for the application.

At the start of a fill cycle, the lance is lowered into the container, the 9127 waits for a maximum of 30 seconds for the lance down input to come on, if it does not, "Lance Fault" is displayed and the alarm output is turned on.

At the end of a fill cycle, after "Tolerance Check", the lance is raised fast. The 9127 waits for a number of seconds equal to the value of "Raise Time", for the Lance Up input to come on, if it does not, "Lance Fault" is displayed and the alarm output is turned on.

Sub-Surface lance applications only: After the 9127 receives weight data from the indicator that equals the Setpoint minus the Preact values, the lance is raised to the "In Drum" position (if not already there). The 9127 waits for a number of seconds equal to the value of "Raise Time", for the Lance In Drum input to come on, if it does not, "Lance Fault" is displayed and the alarm output is turned on.

Sensor Error, This message is an indication that either the Lance Down or Lance Out-of-Container (sub-surface only) sensor probe is not functioning properly or that the container in position input is not on. When the operator presses the Start Auto Fill button, a check is made of the Lance Down sensor. If the Lance Down sensor is on (but the Fill Lance is Up), this is a Sensor Error. Check the Lance Down sensor, if no metal material is near it, the sensor may have failed "on".
On Sub-Surface systems, after the Lance Down sensor check, the Filler Lance is lowered. As the Lance goes down, the Lance Out-of-Container sensor is checked for being off (or goes off) and comes back on again, before the Lance Down sensor comes on. If this sequence does not occur it is a Sensor Error. The Out-of-Container sensor may have failed or it may be improperly adjusted to sense the target on the moving section of the Filler Lance.

Sensors

The position of the Filler Lance and optional drip cup are sensed by the use of inductive sensor probes, they sense metallic objects near the end of the probe. The effective sensing range is 5 millimeters, less than 3/16 inch.

Surface fillers will have sensors for Lance Up and Lance Down, Sub-Surface fillers will have additional sensors for Out of Container and In Container.

Non-Hazardous applications use 2 wire, 24 V.D.C. sensors, all sensors are Normally Open action sensors. The sensors have a built in L.E.D. to indicate that they are on (conducting).

Hazardous Area applications use a 2 wire, Intrinsic safe D.C. sensor and an isolation barrier device (Switch Isolator installed in the Controller). The isolation devices provide the intrinsic safe voltage to the sensors. The sensors being D.C. devices, are polarity sensitive, the brown wire is positive and the blue wire is negative. By default these sensors are Normally Closed devices. The intrinsic safe sensors have a built in L.E.D. to indicate that they are on (conducting).

The Switch Isolator, handles up to two sensors (or switches). There is a L.E.D. for each input. When the Switch Isolator channel L.E.D. is on, the associated relay output should be energized.

Switch Isolators, have three fuction switches. Switch 1 (S1) controls the first input channel, in position 1 the sensor probe will act as a normally closed device, in postion 2 the sensor probe will act as a normally open device. Switch 2 (S2) controls the second input channel, in position 1 the sensor probe will act as a normally closed device, in postion 2 the sensor probe will act as a normally open device. Switch 3 (S3) controls the Switch Isolator input circuits, position 1 is for sensor probes, position 2 is for switches.

Putting a piece of metal near the end of the sensor should cause the sensor L.E.D. to go off if on, or come on if off, provided of course, that metal is not already at the end of the sensor.

Refer to the Controller schematic wiring diagram for more information about Switch Isolators.

Air Pilot Controls

An air pilot control system is used for Hazardous Area Filler Lances, only. The electric to air solenoids are located in the Controller, on the rear panel, upper right side. Each air pilot solenoid valve has a manual over ride button, the manual over ride is the red rubber cap in the center of the solenoid, pressing on the rubber cap will cause air to come out the associated output connection..

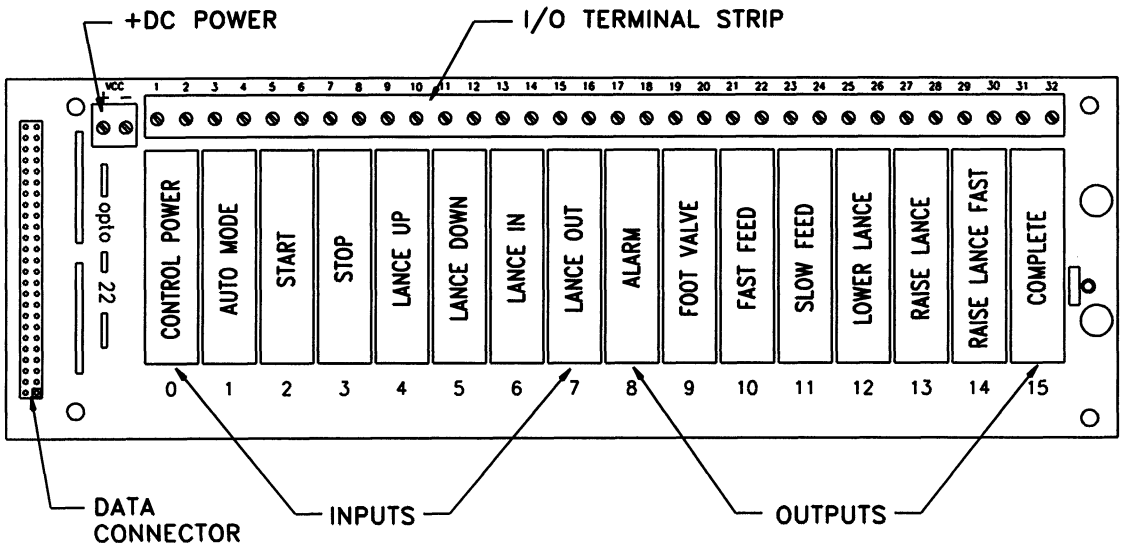
On the lower right side of the Controller is the air entrance regulator for the air pilot control. This regulator should be set for 25 P.S.I. maximum, 15 P.S.I. minimum. A higher setting will cause unexpected results that will include product spillage. A too low of a setting will cause the lance system to not work at all.

16 I/O Rack

The Opto 22, Generation 4, 16 position, I/O rack is used to provided high level interfacing between the TSM-300 board and the rest of the system. Each input or output module includes a status lamp.

The input module status lamp indicates that the high level input is present, but not that the low level logic is on also. Use the 9127 Test Mode, Test Inputs, to check that the logic signal is coming to the TSM-300 board.

The output module status lamp indicates that the low level logic signal to turn it on is present, not that the output is working. Use a volt meter



to check that the high level output is really "on". Each output module has a replaceable fuse. The diagram below shows the usage of each input and output.

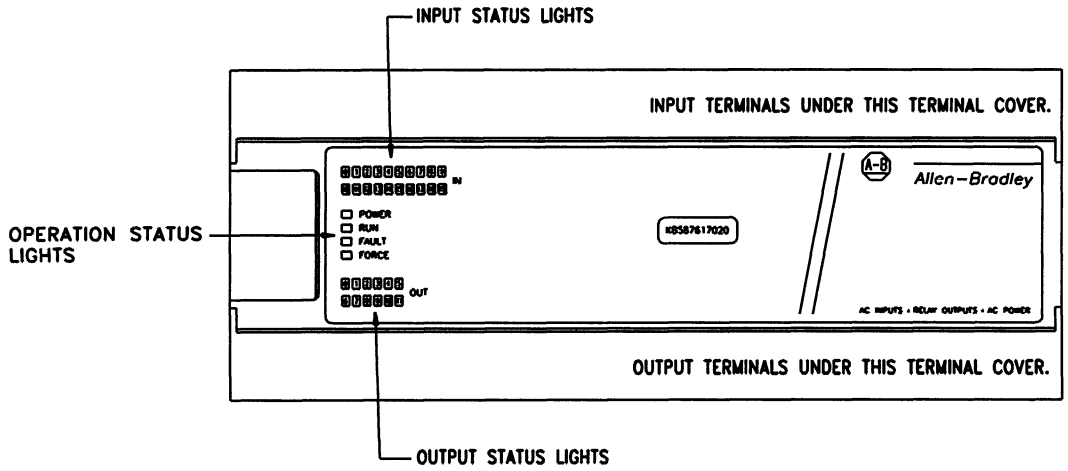
P.L.C.

The MicroLogix controller provides support to the TSM-300 controller board programming. This support is in the form of providing high voltage level multiplexing of multiple container height sensor probe inputs, detection for drum in position, detection of proper operation of the out-of-container sensor, and optional powered drip cup control. The P.L.C. is simply used as a hard contact relay replacement.

The MicroLogix controller also provides all manual function control, including maintaining the lance in an up position when in the Manual Mode. Within the MicroLogix programming is a fixed 0.60 second timer to provide slow fill for Manual Filling.

A hard copy of the P.L.C. program is provided within this document.

Each input and output of the P.L.C. has a status lamp. Plus there are status lamps for the P.L.C. itself. When an input status lamp is on when voltage is present at its input terminal. When an output status lamp is on, voltage should be present at its output terminal. Refer to the system schematic wiring diagram.



Once power is turned on, the P.L.C. goes through internal checks and loads it's program into memory, the "Power" status light should be on. If properly functioning the "Run" should turn on, within 30 seconds of applying power. If after 30 seconds the "Fault" lamp is on, order a replacement P.L.C.

Chapter 12 P.L.C. LADDER DIAGRAM

```
9127 P.L.C. PROGRAM LISTING                                   July 29, 1997
Program Listing          Processor File: B902597.ACH                   Rung 2:0

Rung 2:0
WHEN THE LANCE IS UP AND CONTAINER SIZE 1 IS SELECTED, IT IS LATCHED IN AS THE
SELECTION.
| CONTAINER |LANCE UP  |CONTAINER |CONTAINER |                   CONTAINER  |
| SIZE 1    |SENSOR    |SIZE 2    |SIZE 3    |                   SIZE 1 IS  |
| SELECTED  |PROBE     |SELECTED  |SELECTED  |                   SELECTED   |
| INPUT     |INPUT     |INPUT     |INPUT     |                              |
|  SELCT_1    LANCE_UP  SELCT_2    SELCT_3                          SIZE_1  |
|    I:0        I:0       I:0        I:0                              B3    |
|----] [--------] [--------]/[--------]/[-----------------------------(L)-----|
|      10         5         11         12                              0    |

Rung 2:1
WHEN THE LANCE IS UP, SELECTING CONTAINER SIZE 2 OR 3 WILL RESET THE SIZE 1
SELECTED LATCH.
|   CONTAINER    LANCE UP |                                      CONTAINER  |
|   SIZE 2       SENSOR   |                                      SIZE 1 IS  |
|   SELECTED     PROBE    |                                      SELECTED   |
|   INPUT        INPUT    |                                                 |
|    SELCT_2       LANCE_UP                                         SIZE_1  |
|      I:0          I:0                                               B3    |
|-+----] [-----+----] [------------------------------------------------(U)-----|
| |      11    |      5                                               0    |
| | CONTAINER  |                                                           |
| | SIZE 3     |                                                           |
| | SELECTED   |                                                           |
| | INPUT      |                                                           |
| |  SELCT_3   |                                                           |
| |    I:0     |                                                           |
| +----] [-----+                                                           |
|        12                                                                |

Rung 2:2
WHEN THE LANCE IS UP AND CONTAINER SIZE 2 IS SELECTED, IT IS LATCHED IN AS THE
SELECTION.
| CONTAINER |LANCE UP  |CONTAINER |CONTAINER |                   CONTAINER  |
| SIZE 2    |SENSOR    |SIZE 1    |SIZE 3    |                   SIZE 2 IS  |
| SELECTED  |PROBE     |SELECTED  |SELECTED  |                   SELECTED   |
| INPUT     |INPUT     |INPUT     |INPUT     |                              |
|  SELCT_2    LANCE_UP  SELCT_1    SELCT_3                          SIZE_2  |
|    I:0        I:0       I:0        I:0                              B3    |
|----] [--------] [--------]/[--------]/[-----------------------------(L)-----|
|      11         5         10         12                              1    |
```

```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997
Program Listing          Processor File: B902597.ACH                 Rung 2:3

Rung 2:3
WHEN THE LANCE IS UP, SELECTING SIZE 1 OR 3 WILL RESET THE SIZE 2 LATCH.
|   CONTAINER    LANCE UP  |                                          CONTAINER  |
|   SIZE 1       SENSOR    |                                          SIZE 2 IS  |
|   SELECTED     PROBE     |                                          SELECTED   |
|   INPUT        INPUT     |                                                     |
|    SELCT_1       LANCE_UP                                             SIZE_2   |
|      I:0          I:0                                                  B3     |
|-+----] [-----+----] [-------------------------------------------------(U)-----|
| |      10    |       5                                                  1     |
| | CONTAINER  |                                                                |
| | SIZE 3     |                                                                |
| | SELECTED   |                                                                |
| | INPUT      |                                                                |
| |  SELCT_3   |                                                                |
| |    I:0     |                                                                |
| +----] [-----+                                                               |
|        12                                                                    |

Rung 2:4
WHEN THE LANCE IS UP, SELECTING CONTAINER SIZE 3 IS LATCHED IN AS THE
SELECTION.
| CONTAINER |LANCE UP   |CONTAINER |CONTAINER |                        CONTAINER  |
| SIZE 3    |SENSOR     |SIZE 1    |SIZE 2    |                        SIZE 3 IS  |
| SELECTED  |PROBE      |SELECTED  |SELECTED  |                        SELECTED   |
| INPUT     |INPUT      |INPUT     |INPUT     |                                   |
|  SELCT_3     LANCE_UP  SELCT_1    SELCT_2                              SIZE_3   |
|    I:0         I:0       I:0        I:0                                 B3     |
|----] [--------] [--------]/[--------]/[-------------------------------(L)-----|
|      12          5         10         11                                 2     |

Rung 2:5
WHEN THE LANCE IS UP SELECTING SIZE 1 OR 2 WILL RESET THE SIZE 3 LATCH.
|   CONTAINER    LANCE UP  |                                          CONTAINER  |
|   SIZE 1       SENSOR    |                                          SIZE 3 IS  |
|   SELECTED     PROBE     |                                          SELECTED   |
|   INPUT        INPUT     |                                                     |
|    SELCT_1       LANCE_UP                                             SIZE_3   |
|      I:0          I:0                                                  B3     |
|-+----] [-----+----] [-------------------------------------------------(U)-----|
| |      10    |       5                                                  2     |
| | CONTAINER  |                                                                |
| | SIZE 2     |                                                                |
| | SELECTED   |                                                                |
| | INPUT      |                                                                |
| |  SELCT_2   |                                                                |
| |    I:0     |                                                                |
| +----] [-----+                                                               |
|        11                                                                    |
```

```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997
Program Listing          Processor File: B902597.ACH                  Rung 2:6

Rung 2:6
WHEN THE SURFACE MODE INPUT IS NOT ON JUMP TO THE SUB-SURFACE MODE SUBROUTINE.
| SURFACE                                                                    |
| MODE                                                                       |
| INPUT                                                                      |
| SURF_MODE                                                                  |
|    I:0                                                  +JSR--------------+ |
|----]/[--------------------------------------------------+JUMP TO SUBROUTINE+-|
|       0                                                 |SBR file number  3| |
|                                                         +------------------+ |

Rung 2:7
WHEN THE SURFACE MODE INPUT IS ON JUMP TO THE SURFACE MODE SUBROUTINE.
| SURFACE                                                                    |
| MODE                                                                       |
| INPUT                                                                      |
| SURF_MODE                                                                  |
|    I:0                                                  +JSR--------------+ |
|----] [--------------------------------------------------+JUMP TO SUBROUTINE+-|
|       0                                                 |SBR file number  4| |
|                                                         +------------------+ |

Rung 2:8
THE LANCE UP OUTPUT IS TURNED ON WHEN THE LANCE UP INPUT IS ON. THERE IS ONLY
ONE LANCE UP INPUT SENSOR.
| LANCE UP  |                                                          LANCE UP   |
| SENSOR    |                                                          OUTPUT TO  |
| PROBE     |                                                          THE TSM300 |
| INPUT     |                                                           BOARD     |
|   LANCE_UP                                                         LNC_IS_UP  |
|    I:0                                                                O:0     |
|----] [-------------------------------------------------------------( )-----|
|       5                                                                0    |

Rung 2:9
IN THE SUB-SURFACE MODE, WHEN THE LANCE IS SAFELY IN THE CONTAINER, TURN ON
THE LANCE OUT OF CONTAINER OUTPUT. THIS PROVIDES INPUT TO THE TSM-300 PROGRAM
ONLY WHILE THE LANCE IS IN THE CONTAINER.
| SURFACE   |SUBSURFACE|                                                   LANCE OUT  |
| MODE      | LANCE    |                                                   OF         |
| INPUT     |SAFELY    |                                                   CONTAINER  |
|           |DOWN, OK  |                                                   OUTPUT TO  |
|           |TO FILL   |                                                   TSM300 BD. |
| SURF_MODE    SUB_SAFE                                                      LNC_IS_OUT |
|    I:0          B3                                                           O:0     |
|----]/[--------] [-------------------------------------------------------( )-----|
|       0          5                                                           3    |
```

```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997
Program Listing          Processor File: B902597.ACH                Rung 2:10

Rung 2:10
IN THE SUB-SURFACE MODE, THE LANCE IN CONTAINER OUTPUT IS TURNED ON WHEN THE
SELECTED IN CONTAINER INPUT SENSOR IN ON.
| SURFACE    |SUBSURFACE|                                                  LANCE IN   |
| MODE       | LANCE IN |                                                  CONTAINER  |
| INPUT      |CONTAINER.|                                                  OUTPUT TO  |
|            |          |                                                  TSM300     |
|                       |                                                  BOARD      |
| SURF_MODE      IN_SUB                                                    LNC_IS_IN  |
|    I:0           B3                                                       O:0      |
|----]/[--------] [-----------------------------------------------------( )-----|
|       0          3                                                        2      |

Rung 2:11
IN THE SUB-SURFACE MODE, WHEN THE LANCE DOWN INPUT IS ON THE LANCE DOWN OUTPUT
TO THE TSM-300 IS ON. IN THE SURFACE MODE, THE LANCE DOWN OUTPUT IS ON ONLY
WHEN THE SELECTED DOWN INPUT SENSOR IS ON.
|   SURFACE    |LANCE DOWN                                                 LANCE DOWN |
|   MODE       | CONTAINER                                                  OUTPUT TO |
|   INPUT      |SIZE 1 OR                                                   TSM300    |
|              |SUBSURFACE                                                 BOARD      |
|              | DOWN                                                                 |
|   SURF_MODE  LNC_DOWN_1                                                  LNC_IS_DWN |
|      I:0        I:0                                                        O:0      |
|-+----]/[--------] [-----+-------------------------------------------( )-----|
| |       0          6    |                                                  1     |
| | SURFACE    |SURFACE    |                                                       |
| | MODE       |LANCE      |                                                       |
| | INPUT      |SAFELY     |                                                       |
| |            |DOWN, OK   |                                                       |
| |            |TO FILL    |                                                       |
| | SURF_MODE  SURF_SAFE   |                                                       |
| |    I:0          B3     |                                                       |
| +----] [--------] [-----+                                                       |
|         0          6                                                            |
```

```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997
Program Listing          Processor File: B902597.ACH                Rung 2:12

Rung 2:12
WHEN IN THE MANUAL MODE, WHEN THE OPERATOR PLACES THE MANUAL LANCE SWITCH IN
THE UP POSITION, TURN ON THE RAISE LANCE OUTPUT. WHILE IN THE MANUAL MODE, IF
THE LANCE UP INPUT IS ON, AND THE OPERATOR DOESN'T WANT TO LOWER THE LANCE,
KEEP THE RAISE LANCE OUTPUT ON TO KEEP THE LANCE UP.
|   MANUAL                  MANUAL    |                              MANUAL     |
|   RAISE                   MODE      |                              MODE       |
|   LANCE                   INPUT     |                              RAISE      |
|   INPUT                             |                              LANCE      |
|                                     |                              OUTPUT     |
|   MANL_RAISE                 MANUAL                                RAISE_LANC |
|      I:0                     I:0                                      O:0     |
|-+----] [-----------------+----] [-------------------------------------( )-----|
| |       2                |       1                                      8    |
| | LANCE UP  |MANUAL      |                                                     |
| | SENSOR    |LOWER       |                                                     |
| | PROBE     |LANCE       |                                                     |
| | INPUT     |INPUT       |                                                     |
| |   LANCE_UP MANUAL_LWR  |                                                     |
| |    I:0        I:0      |                                                     |
| +----] [--------]/[-----+                                                     |
|         5          3                                                        |

Rung 2:13
WHEN IN THE SUB-SURFACE MODE, WHEN THE OPERATOR WANTS TO RAISE THE LANCE, TURN
ON THE RAISE FAST OUTPUT.
| SURFACE   |MANUAL     |MANUAL     |                                  MANUAL     |
| MODE      |RAISE      |MODE       |                                  MODE       |
| INPUT     |LANCE      |INPUT      |                                  RAISE      |
|           |INPUT      |           |                                  LANCE FAST |
|                                   |                                   OUTPUT    |
| SURF_MODE  MANL_RAISE    MANUAL                                    RAISE_FAST |
|    I:0        I:0        I:0                                          O:0     |
|----]/[--------] [--------] [-----------------------------------------( )-----|
|       0          2          1                                           9    |
```

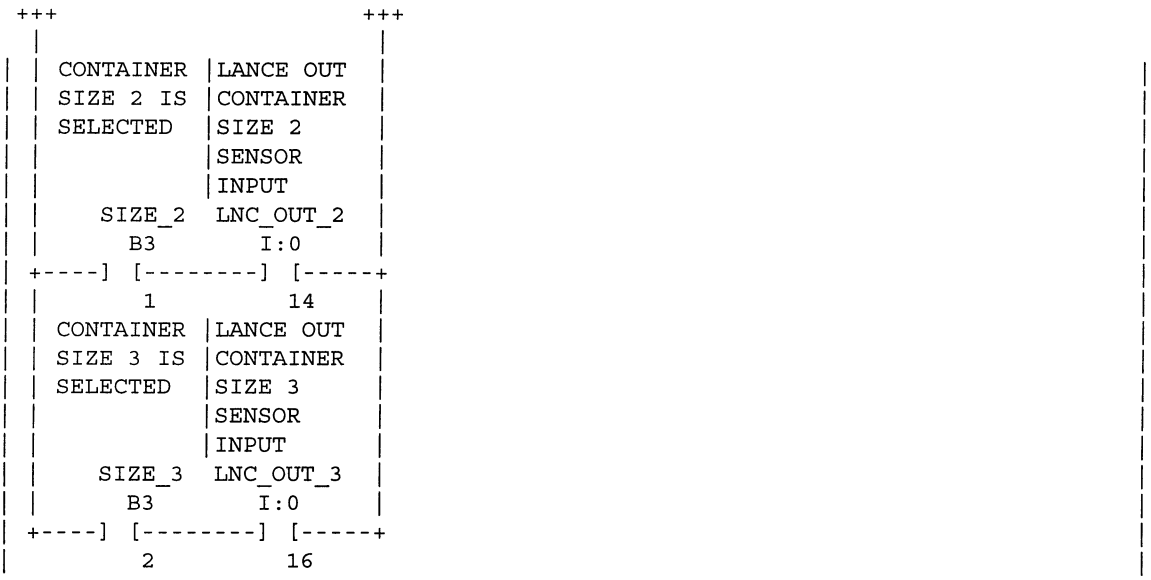
```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997
Program Listing          Processor File: B902597.ACH                Rung 2:14

Rung 2:14
WHEN IN THE MANUAL MODE, WHEN THE OPERATOR PLACES THE MANUAL LANCE SWITCH IN
THE DOWN POSITION, TURN ON THE LOWER LANCE OUTPUT, AFTER THE DRIP CUP IS OUT
OF THE WAY.
|   MANUAL     |MANUAL       DRIP CUP  |                                LOWER      |
|   MODE       |LOWER        UNDER     |                                LANCE      |
|   INPUT      |LANCE        LANCE     |                                OUTPUT     |
|              |INPUT        SENSOR    |                                           |
|                            INPUT     |                                           |
|      MANUAL  MANUAL_LWR   CUP_UNDER                                LOWER_LANC |
|      I:0        I:0          I:0                                      O:0      |
|-+----] [--------] [-----+----]/[-----------------------------------( )-----|
| |       1           3    |       9                                    7     |
| | MANUAL     |LOWER       |                                                   |
| | MODE       |LANCE       |                                                   |
| | INPUT      |COMMAND     |                                                   |
| |            |INPUT       |                                                   |
| |    MANUAL    LOWER_IN   |                                                   |
| |    I:0         I:0      |                                                   |
| +----]/[--------] [-----+                                                    |
|         1          18                                                        |

Rung 2:15
IF THE LANCE IS NOT BEING LOWERED AND THE LANCE IS UP, FORCE THE DRIP CUP
UNDER THE LANCE TIP.
|   MANUAL     |LOWER        LANCE UP  |                                DRIP CUP   |
|   MODE       |LANCE        SENSOR    |                                UNDER      |
|   INPUT      |COMMAND      PROBE     |                                LANCE TIP  |
|              |INPUT        INPUT     |                                OUTPUT     |
|      MANUAL    LOWER_IN     LANCE_UP                                  DRIP_CUP  |
|      I:0         I:0          I:0                                     O:0      |
|-+----]/[--------]/[-----+----] [-----------------------------------( )-----|
| |       1          18    |       5                                    10     |
| | MANUAL     |MANUAL      |                                                   |
| | MODE       |LOWER       |                                                   |
| | INPUT      |LANCE       |                                                   |
| |            |INPUT       |                                                   |
| |    MANUAL  MANUAL_LWR   |                                                   |
| |    I:0        I:0       |                                                   |
| +----] [--------]/[-----+                                                    |
|         1          3                                                         |
```

```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997
Program Listing          Processor File: B902597.ACH                Rung 2:16

Rung 2:16
IN THE MANUAL MODE, WHEN THE LANCE IS SAFELY POSITIONED DOWN, TURN ON THE FOOT
VALVE OUTPUT.
|   SURFACE   |SUBSURFACE   MANUAL    |MANUAL    |                  MANUAL     |
|   MODE      | LANCE       FEED      |MODE      |                  MODE       |
|   INPUT     |SAFELY       SWITCH    |INPUT     |                  FOOT VALVE |
|             |DOWN, OK     INPUT     |          |                   OUTPUT    |
|             |TO FILL                                                         |
|   SURF_MODE    SUB_SAFE     MAN_FEED    MANUAL                    FOOT_VALVE |
|      I:0          B3         I:0        I:0                         O:0      |
|-+----]/[--------] [-----+----] [--------] [-------------------------( )-----|
| |       0          5    |       4          1                          4    |
| | SURFACE   |SURFACE    |                                                    |
| | MODE      |LANCE      |                                                    |
| | INPUT     |SAFELY     |                                                    |
| |           |DOWN, OK   |                                                    |
| |           |TO FILL    |                                                    |
| | SURF_MODE  SURF_SAFE  |                                                    |
| |    I:0          B3    |                                                    |
| +----] [--------] [-----+                                                    |
|         0          6                                                         |

Rung 2:17
WHEN THE FOOT VALVE OUTPUT IS ON, START THE SLOW FILL TIMER.
| MANUAL                                                        MANUAL       |
| MODE                                                          MODE SLOW    |
| FOOT VALVE                                                    FILL         |
|  OUTPUT                                                       TIMER        |
| FOOT_VALVE                                                                 |
|    O:0                                              +TON---------------+   |
|----] [----------------------------------------------+TIMER ON DELAY    +-(EN)-|
|       4                                             |Timer    SLW_TIMER+-(DN) |
|                                                     |Time Base     0.01|     |
|                                                     |Preset          60|     |
|                                                     |Accum            0|     |
|                                                     +------------------+     |

Rung 2:18
| MANUAL      MANUAL                                                 MANUAL     |
| MODE        MODE                                                   MODE       |
| FOOT VALVE  SLOW FILL                                              FAST FILL  |
|  OUTPUT     TIMER                                                  OUTPUT     |
|             DELAY                                                             |
| FOOT_VALVE SLW_TIMER/DN                                            FAST_FILL  |
|    O:0         T4:0                                                  O:0      |
|----] [---------]/[-----------------------------------------------------( )-----|
|       4           DN                                                    5    |
```

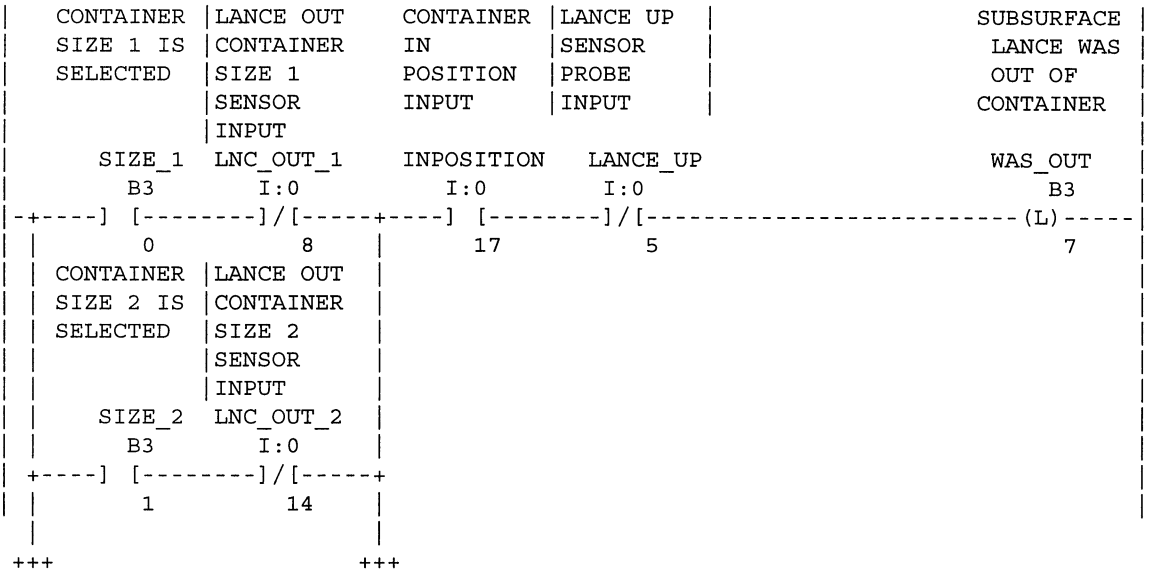
```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997
Program Listing          Processor File: B902597.ACH                Rung 2:19

Rung 2:19
| MANUAL      MANUAL                                                MANUAL     |
| MODE        MODE                                                  MODE       |
| FOOT VALVE  SLOW FILL                                             SLOW FILL  |
|  OUTPUT     TIME                                                  OUTPUT     |
|             DELAY                                                            |
| FOOT_VALVE SLW_TIMER/DN                                           SLOW_FILL  |
|    O:0         T4:0                                                 O:0      |
|----] [---------] [-------------------------------------------------( )-----|
|       4          DN                                                   6     |

Rung 2:20
|                                                                              |
|-------------------------------------+END+-------------------------------------|
|                                                                              |
```

```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997
Program Listing          Processor File: B902597.ACH                 Rung 3:0

Rung 3:0
WHEN THE SELECTED CONTAINER SIZE, IN CONTAINER INPUT IS ON, TURN ON A BIT TO
INDICATE THAT THE INPUT IS ON.
|   CONTAINER |LANCE IN                                                SUBSURFACE |
|   SIZE 1 IS |CONT. 1                                                  LANCE IN  |
|   SELECTED  |OR                                                      CONTAINER. |
|             |LANCE DOWN                                                         |
|             |CONT. 2                                                            |
|      SIZE_1    LNC_IN_1                                                 IN_SUB  |
|        B3       I:0                                                     B3     |
|-+----] [--------] [-----+-----------------------------------------( )-----|
| |       0          7    |                                                3     |
| | CONTAINER |LANCE IN   |                                                      |
| | SIZE 2 IS |CONT. 2    |                                                      |
| | SELECTED  |OR         |                                                      |
| |           |LANCE DOWN |                                                      |
| |           |CONT. 2    |                                                      |
| |    SIZE_2    LNC_IN_2 |                                                      |
| |      B3       I:0     |                                                      |
| +----] [--------] [-----+                                                      |
| |       1         13    |                                                      |
| | CONTAINER |LANCE IN   |                                                      |
| | SIZE 3 IS |CONT. 3    |                                                      |
| | SELECTED  |OR         |                                                      |
| |           |LANCE DOWN |                                                      |
| |           | CONT. 3   |                                                      |
| |    SIZE_3    LNC_IN_3 |                                                      |
| |      B3       I:0     |                                                      |
| +----] [--------] [-----+                                                      |
|         2         15                                                          |

Rung 3:1
WHEN THE SELECTED CONTAINER SIZE, OUT-OF-CONTAINER INPUT IS ON, TURN ON A BIT
TO INDICATE SO. THE LANCE OUT-OF-CONTAINER INPUTS ARE NORMALLY ON UNLESS THE
LANCE IS AT THE OUT-OF-CONTAINER POSITION. THE OUT-OF-CONTAINER SENSORS ARE
NOMALLY CLOSED. THE CONTAINER IN-POSITION INPUT MUST ALWAYS BE ON FOR THIS
LOGIC TO WORK.
|   CONTAINER |LANCE OUT    CONTAINER |                                SUBSURFACE |
|   SIZE 1 IS |CONTAINER    IN        |                                 LANCE NOT |
|   SELECTED  |SIZE 1       POSITION  |                                 OUT OF    |
|             |SENSOR       INPUT     |                                CONTAINER  |
|             |INPUT                                                            |
|      SIZE_1  LNC_OUT_1    INPOSITION                                 NOT_OUT   |
|        B3       I:0          I:0                                       B3     |
|-+----] [--------] [-----+----] [-------------------------------------( )-----|
| |       0          8    |      17                                        4     |
  |                        |
 +++                      +++
```

```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997
Program Listing          Processor File: B902597.ACH                  Rung 3:1
```




```
Rung 3:2
WHILE THE SUB-SURFACE LANCE IS COMING DOWN, THE PROX. FLAG LEAVES THE LANCE UP
SENSOR PROBE. THEN THE FLAG SHOULD BECOME SENSED BY THE OUT-OF-CONTAINER SENSOR
MAKING THE INPUT GO OFF, ONCE THE FLAG LEAVES THE OUT-OF-CONTAINER SENSOR THE
INPUT SHOULD COME BACK ON.
```



```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997
Program Listing          Processor File: B902597.ACH                  Rung 3:2

 +++                      +++
  |                        |
| | CONTAINER |LANCE OUT   |                                                  |
| | SIZE 3 IS |CONTAINER   |                                                  |
| | SELECTED  |SIZE 3      |                                                  |
| |           |SENSOR      |                                                  |
| |           |INPUT       |                                                  |
| |    SIZE_3  LNC_OUT_3   |                                                  |
| |      B3       I:0      |                                                  |
| +----] [--------]/[-----+                                                  |
|         2         16                                                       |
```

Rung 3:3
THE LANCE WAS OUT-OF-CONTAINER LATCH IS RESET WHEN THE LANCE IS UP OR THE SUB-SURFACE SAFE BIT IS ON.

```
|   LANCE UP                                                        SUBSURFACE |
|   SENSOR                                                           LANCE WAS |
|   PROBE                                                            OUT OF    |
|   INPUT                                                           CONTAINER  |
|     LANCE_UP                                                       WAS_OUT   |
|      I:0                                                              B3     |
|-+----] [-----+-------------------------------------------------------(U)-----|
| |       5    |                                                         7     |
| | SUBSURFACE |                                                               |
| |  LANCE     |                                                               |
| | SAFELY     |                                                               |
| | DOWN, OK   |                                                               |
| | TO FILL    |                                                               |
| |   SUB_SAFE |                                                               |
| |      B3    |                                                               |
| +----] [-----+                                                               |
|         5                                                                    |
```

Rung 3:4
WHEN THE LANCE IN-CONTAINER BIT IS ON, THE LANCE WAS OUT-OF-CONTAINER LATCH IS ON, THE LANCE IS NOT UP, AND THE LANCE OUT-OF-CONTAINER BIT IS ON, THE SUB-SURFACE MODE IS SAFE TO DO FILLING, UNTIL THE LANCE OUT-OF-CONTAINER BIT GOES OFF. THIS FORCES A POSITIVE CHECK THAT THE OUT-OF-CONTAINER SENSOR IS WORKING AND ADJUSTED PROPERLY, ELSE NO FILLING WILL HAPPEN.

```
|   SUBSURFACE|SUBSURFACE|SUBSURFACE   CONTAINER |LANCE UP  |       SUBSURFACE |
|    LANCE IN | LANCE WAS| LANCE NOT   IN        |SENSOR    |        LANCE     |
|   CONTAINER.| OUT OF   | OUT OF      POSITION  |PROBE     |       SAFELY     |
|             |CONTAINER |CONTAINER    INPUT     |INPUT     |       DOWN, OK   |
|                                                            |       TO FILL    |
|      IN_SUB   WAS_OUT    NOT_OUT     INPOSITION   LANCE_UP          SUB_SAFE |
|        B3         B3         B3         I:0         I:0                B3     |
|-+----] [--------] [--------] [-----+----] [--------]/[---------------( )-----|
| |       3          7          4    |      17          5                 5     |
  |                                   |
 +++                                 +++
```

```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997
Program Listing          Processor File: B902597.ACH                  Rung 3:4

 +++                                  +++
  |                                    |
| | SUBSURFACE|SUBSURFACE             |                                    |
| |  LANCE    | LANCE NOT             |                                    |
| | SAFELY    | OUT OF                |                                    |
| | DOWN, OK  |CONTAINER              |                                    |
| | TO FILL   |                       |                                    |
| |   SUB_SAFE  NOT_OUT               |                                    |
| |      B3         B3                |                                    |
| +----] [--------] [-----------------+                                    |
|         5          4                                                     |

Rung 3:5
|                                                                          |
|-------------------------------------+END+-------------------------------|
|                                                                          |
```

```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997
Program Listing          Processor File: B902597.ACH                  Rung 4:0

Rung 4:0
IN THE SURFACE MODE, WHEN THE SELECTED LANCE DOWN INPUT IS ON, SET A BIT ON TO
INDICATE THE LANCE IS DOWN. THE CONTAINER IN POSITION INPUT MUST BE ON AND THE
LANCE NOT UP FOR THIS LOGIC TO WORK.
|   CONTAINER |LANCE DOWN   CONTAINER |LANCE UP  |                  SURFACE    |
|   SIZE 1 IS | CONTAINER   IN        |SENSOR    |                  LANCE      |
|   SELECTED  |SIZE 1 OR    POSITION  |PROBE     |                  SAFELY     |
|             |SUBSURFACE   INPUT     |INPUT     |                  DOWN, OK   |
|             | DOWN                             |                  TO FILL    |
|      SIZE_1  LNC_DOWN_1   INPOSITION   LANCE_UP                   SURF_SAFE  |
|        B3       I:0          I:0        I:0                          B3     |
|-+----] [--------] [-----+----] [--------]/[-------------------------( )-----|
| |       0          6    |      17          5                          6    |
| | CONTAINER |LANCE IN   |                                                    |
| | SIZE 2 IS |CONT. 2    |                                                    |
| | SELECTED  |OR         |                                                    |
| |           |LANCE DOWN |                                                    |
| |           |CONT. 2    |                                                    |
| |    SIZE_2    LNC_IN_2 |                                                    |
| |      B3       I:0     |                                                    |
| +----] [--------] [-----+                                                    |
| |       1         13    |                                                    |
| | CONTAINER |LANCE IN   |                                                    |
| | SIZE 3 IS |CONT. 3    |                                                    |
| | SELECTED  |OR         |                                                    |
| |           |LANCE DOWN |                                                    |
| |           | CONT. 3   |                                                    |
| |    SIZE_3    LNC_IN_3 |                                                    |
| |      B3       I:0     |                                                    |
| +----] [--------] [-----+                                                    |
|         2         15                                                         |

Rung 4:1
|                                                                              |
|-----------------------------------+END+-----------------------------------|
|                                                                              |
```

```
9127 P.L.C. PROGRAM LISTING                                  July 29, 1997   Cross Reference
Processor File: B902597.ACH

Address      Symbol /     Comment /
             Instruction  File Number:Rung Number

3
             -JSR-  2:6

4
             -JSR-  2:7

B3/0         SIZE_1       CONTAINER SIZE 1 IS SELECTED
             -] [-  3:0 3:1 3:2 4:0
             -(L)-  2:0
             -(U)-  2:1

B3/1         SIZE_2       CONTAINER SIZE 2 IS SELECTED
             -] [-  3:0 3:1 3:2 4:0
             -(L)-  2:2
             -(U)-  2:3

B3/2         SIZE_3       CONTAINER SIZE 3 IS SELECTED
             -] [-  3:0 3:1 3:2 4:0
             -(L)-  2:4
             -(U)-  2:5

B3/3         IN_SUB       SUBSURFACE LANCE IN CONTAINER.
             -] [-  2:10 3:4
             -( )-  3:0

B3/4         NOT_OUT      SUBSURFACE LANCE NOT OUT OF CONTAINER
             -] [-  3:4 3:4
             -( )-  3:1

B3/5         SUB_SAFE     SUBSURFACE LANCE SAFELY DOWN, OK TO FILL
             -] [-  2:9 2:16 3:3 3:4
             -( )-  3:4

B3/6         SURF_SAFE    SURFACE LANCE  SAFELY DOWN, OK TO FILL
             -] [-  2:11 2:16
             -( )-  4:0

B3/7         WAS_OUT      SUBSURFACE LANCE WAS OUT OF CONTAINER
             -] [-  3:4
             -(L)-  3:2
             -(U)-  3:3

I:0/0        SURF_MODE    SURFACE MODE INPUT
             -] [-  2:7 2:11 2:16
             -]/[-  2:6 2:9 2:10 2:11 2:13 2:16
```

```
9127 P.L.C. PROGRAM LISTING                                    July 29, 1997   Cross Reference
Processor File: B902597.ACH

Address      Symbol /      Comment /
             Instruction   File Number:Rung Number

I:0/1        MANUAL        MANUAL MODE INPUT
             -] [-  2:12 2:13 2:14 2:15 2:16
             -]/[-  2:14 2:15

I:0/2        MANL_RAISE    MANUAL RAISE  LANCE INPUT
             -] [-  2:12 2:13

I:0/3        MANUAL_LWR    MANUAL LOWER LANCE INPUT
             -] [-  2:14
             -]/[-  2:12 2:15

I:0/4        MAN_FEED      MANUAL FEED SWITCH INPUT
             -] [-  2:16

I:0/5        LANCE_UP      LANCE UP SENSOR PROBE INPUT
             -] [-  2:0 2:1 2:2 2:3 2:4 2:5 2:8 2:12 2:15 3:3
             -]/[-  3:2 3:4 4:0

I:0/6        LNC_DOWN_1    LANCE DOWN CONTAINERSIZE 1 OR SUBSURFACE DOWN
             -] [-  2:11 4:0

I:0/7        LNC_IN_1      LANCE IN CONT. 1 OR LANCE DOWNCONT. 2
             -] [-  3:0

I:0/8        LNC_OUT_1     LANCE OUT CONTAINER SIZE 1 SENSOR INPUT
             -] [-  3:1
             -]/[-  3:2

I:0/9        CUP_UNDER     DRIP CUP UNDER LANCE SENSOR INPUT
             -]/[-  2:14

I:0/10       SELCT_1       CONTAINER SIZE 1 SELECTED INPUT
             -] [-  2:0 2:3 2:5
             -]/[-  2:2 2:4

I:0/11       SELCT_2       CONTAINER SIZE 2 SELECTED INPUT
             -] [-  2:1 2:2 2:5
             -]/[-  2:0 2:4

I:0/12       SELCT_3       CONTAINER SIZE 3 SELECTED INPUT
             -] [-  2:1 2:3 2:4
             -]/[-  2:0 2:2

I:0/13       LNC_IN_2      LANCE IN CONT. 2 OR LANCE DOWNCONT. 2
             -] [-  3:0 4:0
```

```
9127 P.L.C. PROGRAM LISTING                              July 29, 1997   Cross Reference
Processor File: B902597.ACH

Address      Symbol /     Comment /
             Instruction  File Number:Rung Number

I:0/14       LNC_OUT_2    LANCE OUT CONTAINER SIZE 2 SENSOR INPUT
             -] [-  3:1
             -]/[-  3:2

I:0/15       LNC_IN_3     LANCE IN CONT. 3 OR LANCE DOWN CONT. 3
             -] [-  3:0 4:0

I:0/16       LNC_OUT_3    LANCE OUT CONTAINER SIZE 3 SENSOR INPUT
             -] [-  3:1
             -]/[-  3:2

I:0/17       INPOSITION   CONTAINER IN POSITION INPUT
             -] [-  3:1 3:2 3:4 4:0

I:0/18       LOWER_IN     LOWER LANCE COMMAND INPUT
             -] [-  2:14
             -]/[-  2:15

O:0/0        LNC_IS_UP    LANCE UP OUTPUT TO THE TSM300 BOARD
             -( )-  2:8

O:0/1        LNC_IS_DWN   LANCE DOWN OUTPUT TO TSM300 BOARD
             -( )-  2:11

O:0/2        LNC_IS_IN    LANCE IN CONTAINER OUTPUT TO TSM300 BOARD
             -( )-  2:10

O:0/3        LNC_IS_OUT   LANCE OUT OF  CONTAINER OUTPUT TO TSM300 BD.
             -( )-  2:9

O:0/4        FOOT_VALVE   MANUAL MODE FOOT VALVE OUTPUT
             -] [-  2:17 2:18 2:19
             -( )-  2:16

O:0/5        FAST_FILL    MANUAL MODE FAST FILL OUTPUT
             -( )-  2:18

O:0/6        SLOW_FILL    MANUAL MODE SLOW FILL OUTPUT
             -( )-  2:19

O:0/7        LOWER_LANC   LOWER LANCE OUTPUT
             -( )-  2:14

O:0/8        RAISE_LANC   MANUAL MODE RAISE LANCE OUTPUT
             -( )-  2:12

O:0/9        RAISE_FAST   MANUAL MODE RAISE LANCE FAST OUTPUT
             -( )-  2:13
```

```
9127 P.L.C. PROGRAM LISTING                          July 29, 1997   Cross Reference
Processor File: B902597.ACH

Address       Symbol /      Comment /
              Instruction   File Number:Rung Number

O:0/10        DRIP_CUP      DRIP CUP UNDER LANCE TIP OUTPUT
              -( )-  2:15

T4:0          SLW_TIMER     MANUAL MODE SLOW FILL TIMER
              -TON-  2:17

T4:0/DN                     MANUAL MODE SLOW FILL TIME DELAY
              -] [-  2:19
              -]/[-  2:18
```

METTLER TOLEDO
1900 Polaris Parkway
Columbus, Ohio 43240
Phone (US and Canada): (614) 438-4511
Phone (International): (614) 438-4888
www.mt.com

P/N: 90282300A

7-97