

# Tri-Flo<sup>®</sup> Liquid Level Control

For All Models

Service & Installation Manual



**Tri-Clover Inc.**



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# INTRODUCTION

## INTRODUCTION

### SAFETY INFORMATION

Safety is very important!

**DO NOT attempt to modify any Tri-Clover product.** To do so could create unsafe conditions and void all warranties. DO NOT place any Tri-Clover product in an application where general product service ratings are exceeded.

### GENERAL

This manual contains installation, operation and repair instructions, troubleshooting, and parts list for Models 30-101, 30-102, 30-103 and 30-104 Level Controls manufactured by Tri-Clover Inc., Kenosha, Wisconsin.

All Tri-Clover Level Controls should be considered in the same category as precision instruments and are to be handled in the same manner. While it is a rugged instrument, any abuse, rough handling, or improper installation may affect its operating efficiency. The air pilot valve assembly, which is the heart of the Level Control, is a precision made three-way pilot valve. This pilot valve controls the flow of air to and from the valve. The actual movement of the plunger is .007 of an inch. Because of the short travel any small particle or foreign material could affect plunger travel and cause erratic operation.

### DESCRIPTION

The Tri-Clover Level Controls are designed to provide responsive and accurate control of liquid levels in open and closed tanks and kettles. Models 30-101 and 30-102 are designed for closed tank mounting. Models 30-103 and 30-104 are easily adaptable to open tank mounting by means of a simple bracket.

### PRINCIPLE OF OPERATION

The float arm or "flexible shaft" with the ball float is the force (when actuated by a change in liquid level) that positions the plunger in the pilot valve - which in turn controls the air signal required to regulate the throttling valve. The flexible shaft has a flattened section of tube which is the fulcrum, and also provides the tension required to keep the float riding on the liquid level. Any strain or force exerted on this shaft in any other way than a vertical motion will cause malfunction of the unit by destroying this built-in tension. The vertical motion of the shaft is protected by limit stop pins to keep the shaft well within its elastic limit during operation. These Level Controls operate on the change of force which results from the buoyancy of the float - not on the motion of a float riding on a liquid level. (The actual motion of the float is approximately  $1/32$ " ). The response of the Level Controls is such that a buoyancy change of less than six ounces will provide full actuation of the pilot valve.

# INTRODUCTION

## ADVANTAGES

There are no pivots - no rubbing parts. The buoyant force is transmitted by the tongue of the flexible shaft from inside a pressure vessel. There is no friction because the tongue does not touch the shaft.

There are no packing glands or stuffing boxes which reduces maintenance problems and provides a complete sanitary unit.

There is no need for adjustment after the system is installed even if the float is submerged or left dry for long periods.

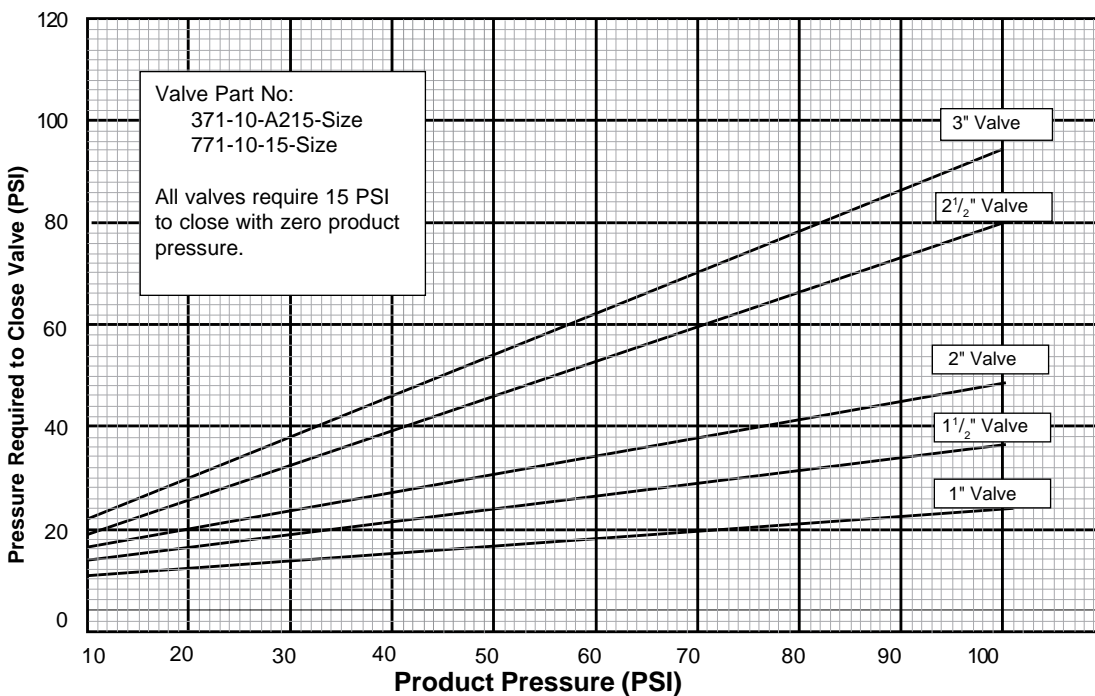


Figure 1 — Valve Supply Pressure vs. Product Pressure

# INSTALLATION

## INSTALLATION INFORMATION

### GENERAL

These Level Controls must be mounted with the flexible shaft in a horizontal position. The flattened section of the flexible shaft must be parallel to the liquid level. In installations where there is the possibility of constant or severe agitation and surging, the Level Control ball float should be suitably baffled or mounted in a float chamber.

The air supply must be dry, filtered and regulated. For best results the 33-13B Filter and Regulator should be used. Depending on valve style, several different actuators can be used - Type 15 & A215 diaphragm (normally open type) or A20 & A220 Piston (normally closed type). Refer to Figure 1 for operating pressure for valves with diaphragm actuators.

The Type 15 & A15 Diaphragm Actuator can usually be actuated with a standard air supply of 20 PSI. This reading should appear on the "Supply" gauge of the Level Control. If the unit is used in an installation having high product pressure, the air pressure supply to the Level Control can be increased to 30-32 PSI (maximum). The Level Control will require readjustment in this case. When valves (using 20 PSI air pressure) are located twenty feet or more from the Level Control, there is usually a time lag between level change and valve action. This time lag can be shortened by using a 1:1 booster relay (Figure 2) to speed the valve action.

The Type A20 & A220 Piston Actuator requires an air pressure supply in excess of 30 PSI to function properly. To achieve this high pressure, while using a standard 20 PSI air supply from the Level Control, a booster relay of the proper ratio (1:2 or 1:3) must be used (see Figure 2).

### MOUNTING

The Models 30-101 and 30-102 Controls can be mounted to the side of a tank by use of a 4" Tri-Clamp® connection. The ferrule should be welded in the tank at the proper position to maintain the desired level. The level to be maintained will be approximately 1/2 of the way up on the float ball.

The Models 30-103 and 30-104 Controls must be rigidly mounted over the tank. There are two 1/4 x 20 bolts in the bottom of the housing for mounting. After the controller housing is mounted, insert the float rod assembly in the float adapter, adjust the proper height for maintaining the liquid level, and tighten the thumbscrew. All level controls are furnished with 4 foot hoses and couplers to facilitate easy removal for cleaning or inspection. Before connecting air to Level Control, all air lines should be blown clear of scale, chips and foreign material.

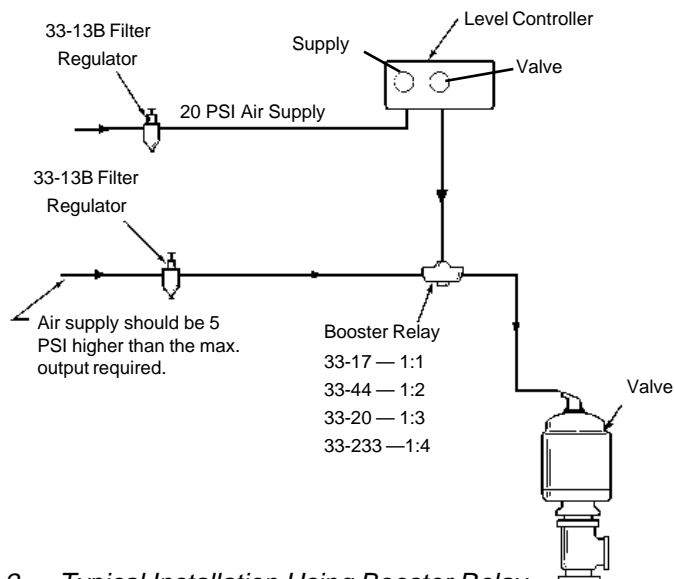


Figure 2 — Typical Installation Using Booster Relay

# INSTALLATION

## LEVEL CONTROLS 30-101 & 30-103

(Level rise decreases valve air)

1. Level Control should be mounted in a horizontal position. Check horizontal alignment and relation of flattened section to liquid level. Vessel, hopper or filler bowl should be empty. Model 30-103 should have the float connected to the flexible shaft.
2. Make air connections to Level Control and Valve. (Check for leaks at all connections between Level Control and Valve).
3. Air supply gauge should read 20 PSI (or other than standard 20 PSI as required).
4. Remove hole plug.
5. If "Valve" gauge reads less than pressure rating shown on "Supply" gauge, turn adjusting screw counterclockwise until both readings are the same, or until air stops escaping from the unit. If "Valve" gauge reads the same as "Supply" gauge, turn adjusting screw clockwise until reading is less than supply gauge - then turn adjusting screw counterclockwise until both readings are the same or until air stops escaping from the unit.

**IMPORTANT:** Do not turn adjusting screw too far - it takes less than  $\frac{1}{3}$  of a turn to cause full actuation of pilot valve. If adjusting screw is turned too far, back-off until air starts to bleed again.

6. Replace hole plug. Level Control is ready to operate.

## LEVEL CONTROLS 30-102 & 30-104

(Level rise increases valve air)

1. Level Control should be mounted in a horizontal position. Check horizontal alignment and relation of flattened section to liquid level. Vessel, hopper or filler bowl should be empty. Model 30-104 should have the float connected to the flexible shaft.
2. Make air connections to Level Control and Valve. (Check for leaks at all connections between Level Control and Valve).
3. Air Supply Gauge should read 20 PSI (or other than standard 20 PSI as required).
4. Remove hole plug.
5. If "Valve" gauge shows a reading, turn adjusting screw counterclockwise until reading is zero or until air stops escaping from the unit. If "Valve" gauge reads zero, turn adjusting screw clockwise until there is a reading - then turn the adjusting screw counterclockwise until reading is zero or until air stops escaping from the unit.

**IMPORTANT:** Do not turn adjusting screw too far - it takes less than  $\frac{1}{3}$  of a turn to cause full actuation of pilot valve. If adjusting screw is turned too far, back-off until air starts to bleed again.

6. Replace hole plug. Level control is ready to operate.

# TROUBLESHOOTING

Tri-Clover Liquid Level Controls are relatively maintenance free. Like any piece of machinery, however, occasional problems can arise. The troubleshooting chart provides a means of determining and correcting most of your Level Control problems. Any service or repair above and beyond what has been mentioned should be performed at Tri-Clover. The control should be returned to the factory for reconditioning.

Problem	Possible Cause	Possible Solution
Valve gauge reads substantially less than supply gauge - Models 30-101 and 30-103.	a. Controller "zero" adjustment is not correct.	a. Make adjustment as outlined under "Adjusting Level Controls" - Models 30-101 and 30-103.
Valve gauge reads other than zero - Models 30-102 and 30-104.	a. Controller "zero" adjustments is not correct.	a. Make adjustment as outlined under "Adjusting Level Controls" - Models 30-102 and 30-104.
Normally open valve does not close off completely.	a. Insufficient air pressure from the controller. b. Foreign material in line. c. Damaged seat. d. If actuator is supplied with positioner, adjust positioner.	a. Refer to chart for required air pressure to close off against product pressure. b. Inspect valve and remove foreign material. c. Inspect valve and relap valve seat. d. Refer to throttling service brochure.
Valve action is sluggish or too slow.	a. Air supply line is too small. b. Valve is located too far from controller. c. Dirt or foreign material in the air pilot assembly. d. Models 30-101 and 30-102, float arm assembly is bent and hitting limit stop pins. e. Models 30-103 and 30-104, flexible shaft assembly is bent or missaligned and hitting the housing assembly.	a. Increase air supply line to $\frac{3}{8}$ polyflow or larger. b. Use a 1:1 booster relay to the valve. c. Clean air pilot block assembly with solvent. d. Repair or replace float arm assembly. e. Repair or replace flexible shaft.
Constant hunting or excessive pulsation of the valve.	a. Throttling valve is too large. b. Excessive turbulence in the vessel. c. Excessive air pressure. d. Valve is located too far from controller.	a. Contact Tri-Clover for proper recommendation. b. Install baffle to eliminate turbulence on the float bulb. c. Lower the air pressure to 20 PSI or consult the chart. d. Use a 1:1 booster relay to the valve.

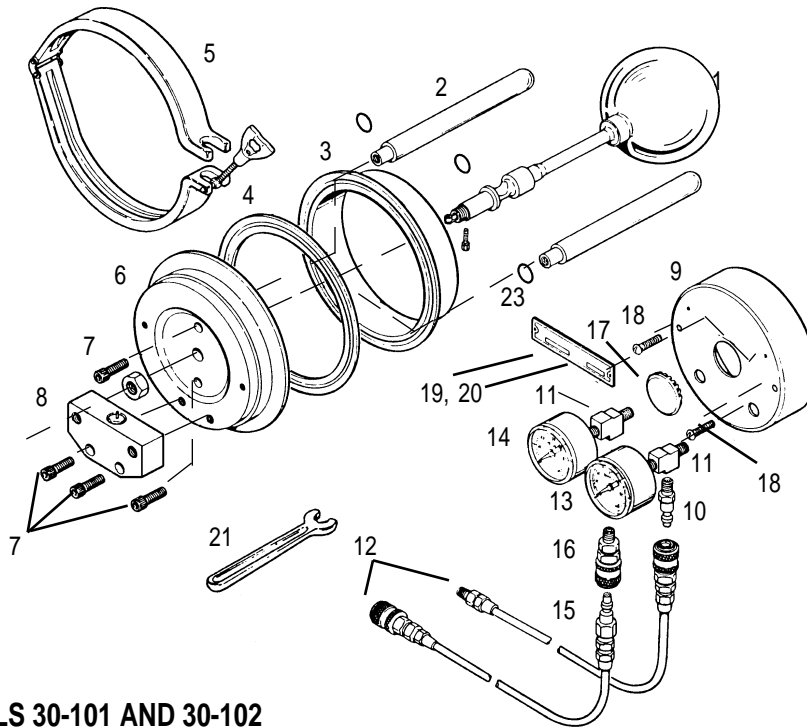
# PARTS LIST

## MODELS 30-101, 30-102 AND MODELS 30-103 AND 30-104

All orders for repair parts must contain the following data.

1. Complete model number (located on nameplate).
2. Control serial number (located on nameplate).
3. Description and part key number from the parts list.

The following exploded views and accompanying parts list facilitate ordering repair parts from the factory. All parts of the control are exploded and keyed to the parts list.

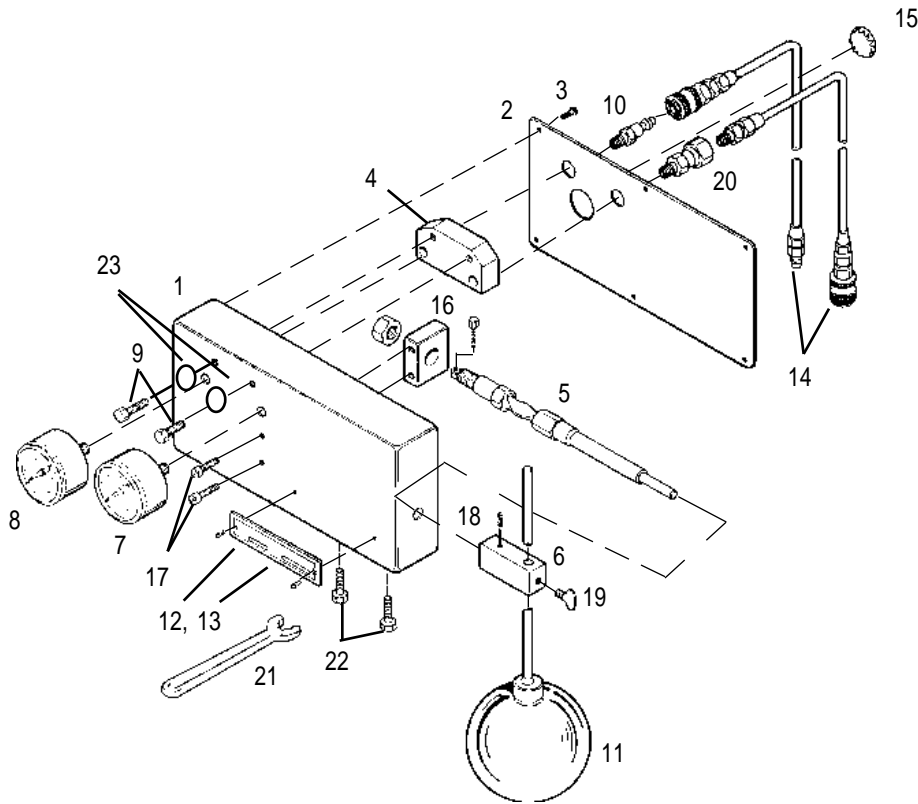


### MODELS 30-101 AND 30-102

KEY	DESCRIPTION	PART NO	QUANTITY
1	Ball Float and Float Arm Assembly	55-4-316	1
2	Limit Stop Pin	9-12-316	2
3	Ferrule	L14AM7-4-316L	1
4	Gasket	40MP-U-4	1
5	Clamp	13MHHM-4-S	1
6	Cap - Special 4 inch	32-481-316	1
7	Screw, Socket Head Cap	14-16	4
8	Air Pilot Assembly	54-2	1
9	Cover	23-3-S	1
10	Plug - Coupler	25-361-210-06-S	1
11	Tee - Street	42-15-58CP	2
12	Hose Assembly - Air	41-10-4'	2
13	Gauge - Valve, 0-60 PSI	54-53-VM	1
14	Gauge - Supply, 0-60 PSI	54-53-SM	1
15	Plug - Coupler	37-19	1
16	Body - Coupler	37-91	1
17	Plug - Hole	13-28	1
18	Screw - Truss Head	14-46	2
19	Label	38-273	1
20	Label	38-274	1
21	Wrench	07-1152	1

# PARTS LIST

## MODELS 30-103 AND 30-104



KEY	DESCRIPTION	PARTS NO	QUANTITY
1	Housing Assembly (Used on Model 30-103)	44-195-01	1
1	Housing Assembly (Used on Model 30-104)	44-93-01	1
2	Cover (Used on Model 30-103)	44-195-02	1
2	Cover (Used on Model 30-104)	44-93-02	1
3	Screw	14-103	6
4	Air Pilot Assembly	54-41	1
5	Flexible Shaft	19-123	1
6	Float Adapter	37-17A-316L	1
7	Gauge - Valve, 0-60 PSI	54-53-VM	1
8	Gauge - Valve, 0-60 PSI	54-53-SM	1
9	Screw	SC1309H-SS	2
10	Adapter - Air Coupler	25-361-210-06-S	1
11	Float and Rod Assembly	55-2-316	1
12	Label	38-273	1
13	Label	38-274	1
14	Hose Assembly - Air	41-10-4	2
15	Plug - Hose	13-28	1
16	Support - Flexible Shaft	10-208	1
17	Screw	14-88	2
18	Set Screw	SC1303A-SS	1
19	Thumbscrew	14-119	1
20	Connector	42-7	1
21	Wrench	07-1152	1
22	Screw - Hex Head	SC1108H-SS	2
23	Washer	WA1300-SS	2

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### Terms, Warranty Provisions, Notice of Claims and Limitation of Liability

Prices and all terms and conditions of sale are established in current price sheets and are subject to change without notice. All orders are subject to acceptance by Tri-Clover Inc. at its Kenosha, Wisconsin or Distribution Center\* offices only. No assignment of the purchaser's rights may be made without consent of Tri-Clover Inc.

Each Tri-Clover item is warranted to be free from manufacturing defects for a period of one (1) year from the date of shipment, providing it has been used as recommended and in accordance with recognized piping practice, and providing it has not been worn out due to severe service, such as encountered under extremely corrosive or abrasive conditions.

**This warranty is expressly in lieu of any other warranties, express or implied, including but not limited to, any implied warranty of merchantability or fitness for a particular purpose.**

All claims must be in writing and must be mailed or delivered by purchaser within thirty (30) days after purchaser learns of the facts upon which such claim is based. Any claim not made in

writing and within the time period specified above shall be deemed waived.

**Purchaser's sole and exclusive remedy and Tri-Clover Inc.'s maximum liability for claims arising hereunder or for negligence for any and all losses and damages resulting from any cause shall be either the repair or replacement of defective items or, at Tri-Clover Inc.'s option, the refund of the purchase price for such items. In no event, including in the case of a claim for negligence, shall Tri-Clover be liable for incidental or consequential damages including loss of profits.**

No person, including any representative, employee or agent of Tri-Clover, is authorized to assume on behalf of Tri-Clover Inc., any liability or responsibility in addition to or different from that described in this provision. Any and all representations, promises, warranties or statements that are in addition to or different from the terms of this provision are of no force or effect.

*\*Distribution Centers in Union City, California and Memphis, Tennessee*



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