Model 286

Multi-Channel Liquid Level Controller

Model 286 Description

The Model 286 Liquid Level Controller is a microprocessor-based instrument designed to provide multiple sensor (up to 4) capacitance-based monitoring and control of liquid levels. Selectable operation modes (Normal Auto-Fill, Auto-Changeover, and Pre-Cool) and user configurations provide broad system flexibility. Advanced features include external inputs for auto-fill interrupts and multiple calibrations per channel for changing conditions.

Partial List of Features

- **Capacitance-based level measurement**
- **Monitor up to 4 liquid levels simultaneously**
- **Control up to 2 liquid levels simultaneously**
- **Three (3) selectable Auto-Fill modes**
- **Multiple calibrations per sensor input**
- **External input for Auto-Fill Interrupt signal**
- **Simple menu driven display**
- **User defined Hi/Low alarms with relays**
- **Spare inputs for customized applications**
- **Optional RS-232 or RS-422 computer interface and optional 4-20 mA or 0-10 V analog outputs**

Multiple Sensor Monitoring and Control

The Model 286 is capable of monitoring four independent, capacitance level sensors and controlling liquid level in up to two vessels by directly energizing two solenoid-operated flow control valves.

Multiple Calibrations per Sensor

Each of the four sensor inputs to the Model 286 can have up to four independent calibrations, which are user-selectable. The user simply selects the desired calibration using the interface menu. All calibration data is passcode protected and stored in nonvolatile memory.

Convenient Display and Direct Keypad Entry

The instrument is equipped with a 16-character x 2-line backlit LCD display which provides liquid level and setpoint indication in inches, centimeters, or percent as selected by the user. The default display indicates liquid level and fill/loss rate. The current liquid level is updated and visible even while using most configuration menus. A keypad is provided for direct entry of values for setpoints, sensor lengths, and other functions. The keypad also provides a convenient menu-type interface for configuring various instrument settings that require selection from a list of options.

Controller Modes

The Model 286 provides three controller modes: *Normal* for two independent auto-fill systems, *Auto-Changeover* for switching between supply vessels, and *Pre-Cool* for cooling hot supply lines prior to an auto-fill sequence. The preferred mode can be selected via the front panel keypad or remote interface. The level controller logic varies based on the selected mode.

User Initiated Auto-Fill Interrupt Feature

It is recognized that during some operations, such as critical data collection, the coincidental initiation of an auto-fill cycle can cause unwanted vibrations or other problems. The Model 286 allows users to temporarily disable the auto-fill function of the instrument simply by providing an open contact across one of the specified inputs on the rear panel. The auto-fill will remain disabled until this contact is closed. The Model 286 also features two spare inputs that can be factory configured to customize the unit for specific applications.

Model 286 General Specifications

Input Power	100-120 or 200-240 VAC
Signal Output Options	4-20 mA or 0-10 Vdc
Hi, Lo, A, B Alarms	Audible + front panel LED
Alarm Relay Rating	N.O. 10VA, 0.5A max
Controller Output	AC line voltage @ 2A max
Linearity	0.1%
Accuracy	0.1%
Communication Options	RS-232 or RS-422
Operating Environment	0 to 50 °C, non-condensing
Weight	4.2 lbs (1.9 kg)
Dimensions	3.8"H x 8.4"W x 11.4"D
Mounting Options	Single or Dual rack mounting

Rear View of Model 286

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Controller Modes

The Model 286 is unique by offering three modes for level control. The function of each mode is summarized below and a diagram is provided to help illustrate the function. The controller modes provide flexibility for solving a wide range of level control problems with a minimum of external hardware or logic.

Normal Mode

In the normal mode, as shown in Figure 1, Channels 1 and 2 of the Model 286 act as independent auto-fill systems. As each level falls below the "B" setpoint, an independent fill cycle is initiated and fills the controlled dewar to the "A" setpoint via two separate solid-state-relay-controlled AC outputs which drive solenoid-actuated valves. The A and B setpoints for Channels 1 and 2 operate as independent liquid level control bands.

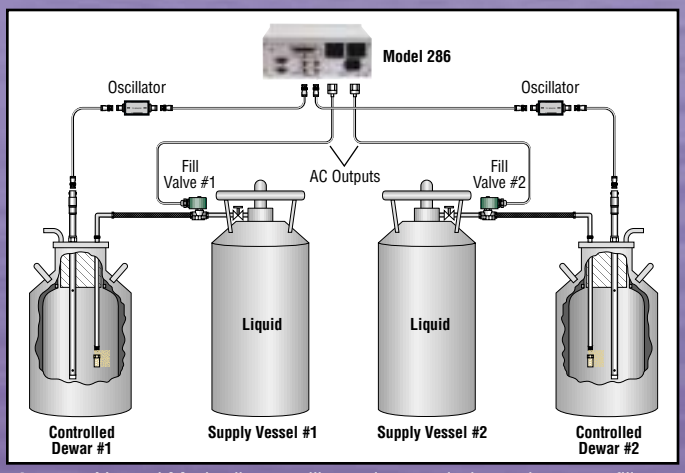

Figure 1 Normal Mode diagram illustrating two independent auto-fill systems.

Auto-Changeover Mode

In auto-changeover mode, as illustrated in Figure 2, the Model 286 monitors and controls a liquid level measured by Channel 1, and uses liquid supplied from two supply vessels. The A and B setpoints for Channel 1 function as the liquid level control band for the controlled dewar. The dual AC outputs control a fill valve for each of the two supply vessels. The instrument either monitors dry contacts to determine availability of liquid from each of the two supply vessels or determines availability by fill timeouts, or by using channels 3 and 4 to monitor supply vessels. The Model 286 automatically switches from one supply vessel to the next. This allows one of the two supply vessels to be replaced when empty without interrupting the availability of liquid to the controlled dewar.

Mode	Feature	Channel			
		Ch 1	Ch 2	Ch 3	Ch 4
Normal	Hi/Lo/Rate Alarm	X	X	X	X
	Hi/Lo Level Contact	X	X	X[1]	X[1]
	4-20 mA or 0-10 Vdc Output	X	X		
	A - B Control Band	X	X		
	AC Valve Output	Output 1	Output 2		
	External Contact Sensing	X	X		
Auto-Changeover	Hi/Lo/Rate Alarm	X		X	X
	Hi/Lo Level Contact	X		X[1]	X[1]
	4-20 mA or 0-10 Vdc Output	X			
	A - B Control Band	X			
	AC Valve Output	Output 1&2[2]			
	External Contact Sensing	X[4]			
Pre-Cool	Hi/Lo/Rate Alarm	X		X	X
	Hi/Lo Level Contact	X		X[1]	X[1]
	4-20 mA or 0-10 Vdc Output	X			
	A - B Control Band	X			
	AC Valve Output	Output 1&2[3]			
	External Contact Sensing				

[1] Available for the channel if the alarm contacts have been assigned to Channels 3 & 4. In this condition, the alarm contacts are not available for Channels 1 & 2.

[2] AC Outputs 1 and 2 are used to control fill from two storage vessels.

[3] AC Output 1 is used to control a fill valve, and AC Output 2 controls a vent valve.

[4] Remote contact inputs can be used to indicate if a storage vessel contains liquid.

Pre-Cool Mode

The pre-cool mode, as illustrated in Figure 3, provides for cooling of a cryogen transfer line before opening the transfer line to the controlled dewar. The A and B setpoints for Channel 1 function as the liquid level control band for the controlled dewar. AC Output 1 controls a fill valve for the controlled dewar, while AC Output 2 controls a vent valve. When a fill cycle is initiated, the vent valve is opened for a user-defined time, after which the vent valve is closed and the fill valve to the controlled dewar is opened. During the time the vent valve is open, the cryogen cools the transfer line, so that a minimal amount of warm gas enters the controlled dewar.

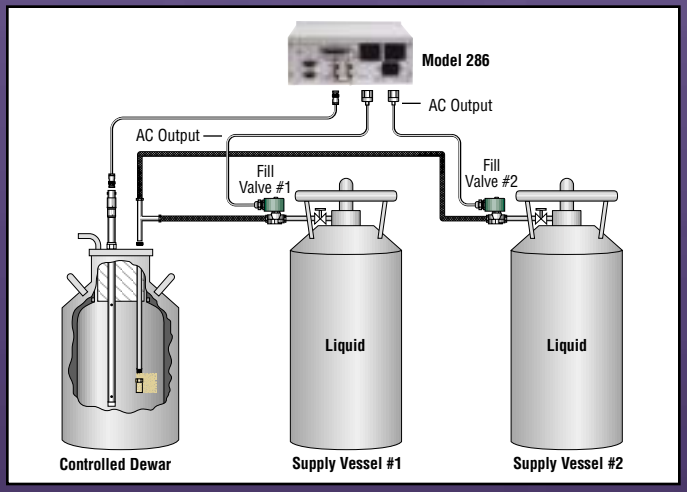

Figure 2. Auto-Changeover Mode diagram illustrating the two supply vessels and one controlled dewar.

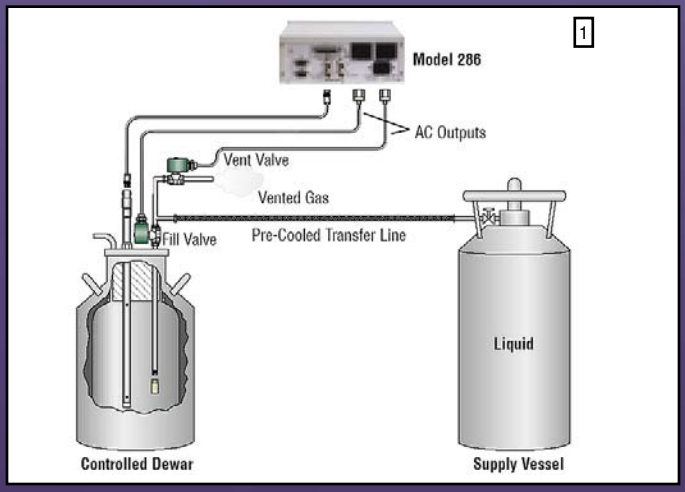

Figure 3. Pre-Cool Mode diagram illustrating one supply vessel, a vent valve, and one controlled dewar.