



Cryogenic Liquid Autofill Systems

Why automate your liquid nitrogen filling process?

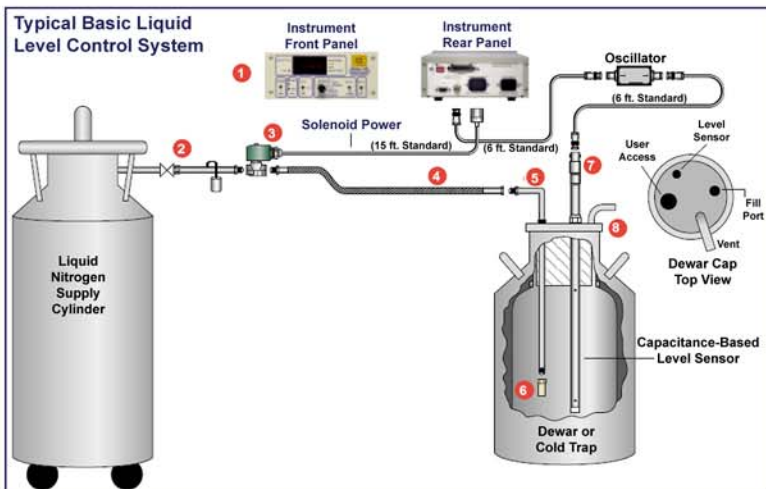
Protect your investment by not running out of liquid nitrogen.

Protect your people from handling hazardous cryogenics.

Extend your equipment up-time by running weekends and holidays without special assistance.

Convenience of a continuous level reading and alarms that can be remotely monitored from your workstation.

Standard Dewars



Small Dewars and . . .



Typical basic system

(other configurations and sizes available)

1. **Controller Instrument:** Model 186 or Model 286
2. **Dewar Adapter with Safety Pressure Relief Valve:** 100 psi pressure relief valve with gooseneck; 1/2" SAE flare nut x 3/8" Male NPT
3. **Solenoid Valve:** 9/32" orifice with 3/8" Female NPT
4. **High Efficiency Vacuum-Jacketed Transfer Line:** 6 ft. (183 cm) or 12 ft. (366 cm) Std. x 1/4" I.D. 3/4" OD with 1/2" SAE flare nut on one end and integral dewar nozzle on other end.
5. **Dewar Nozzle:** length to fit application, 1/2" or 3/8" OD with threaded male tip (optional extensions)
6. **Phase Separator:** 1.25" (3 cm) length x 1" O.D. x 3/8" Female NPT (other sizes available)
7. **Liquid Level Sensor:** 3/8" O.D. Std. (1/4", 1/2", and 3/4" O.D. also available)
8. **Dewar Cap Assembly**

. . . Very Small Dewars

For very small volume dewars (less than 1-liter) such as those used for infrared detection and imaging, the "trombone" solution is recommended. This is depicted below where a 250-cc. dewar combines a pre-cooled transfer line with phase separator and flow-through sensor to minimize losses and time between fills. Gravity-feed (not shown), in conjunction with a controlled "remote" dewar mounted above the target dewar, provides another solution for filling very small dewars. This is especially applicable where the target dewar must be kept continuously full. All level measurements and fill operations take place in this remote reservoir. **Please contact an AMI Sales Representative to discuss your dewar autofill needs.**





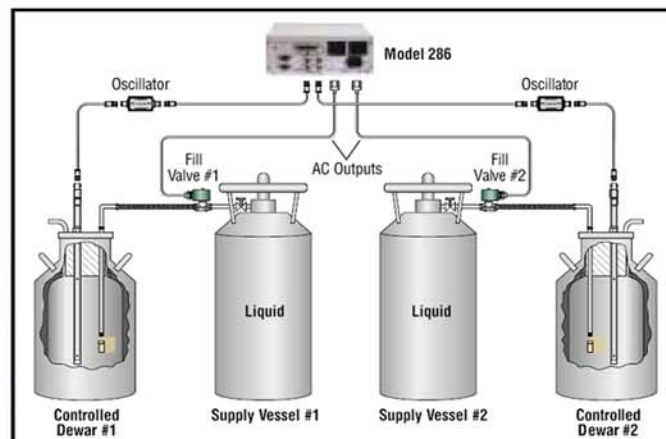
Model 286 Based Auto-Fill Systems

Controller Modes

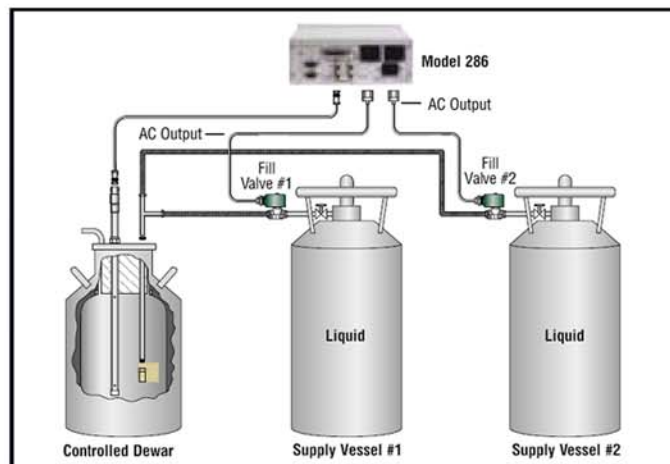
The Model 286 is unique and flexible, offering three modes for level control. The function of each mode is summarized here and a diagram is provided to help illustrate the function. The controller modes provide flexibility for solving a wide range of level control problems with a minimum of external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

Normal Mode ►

In Normal Mode, Channels 1 and 2 of the Model 286 act as independent auto-fill systems equivalent to two Model 186 instruments filling two independent target dewars. The "A" and "B" setpoints for Channels 1 and 2 operate as independent liquid level control bands. As a level falls below its "B" setpoint, a fill cycle is initiated and the controlled dewar is filled to the "A" setpoint via the solenoid valve connected to the associated AC output connector.



Normal Mode diagram illustrating two independent auto-fill systems.



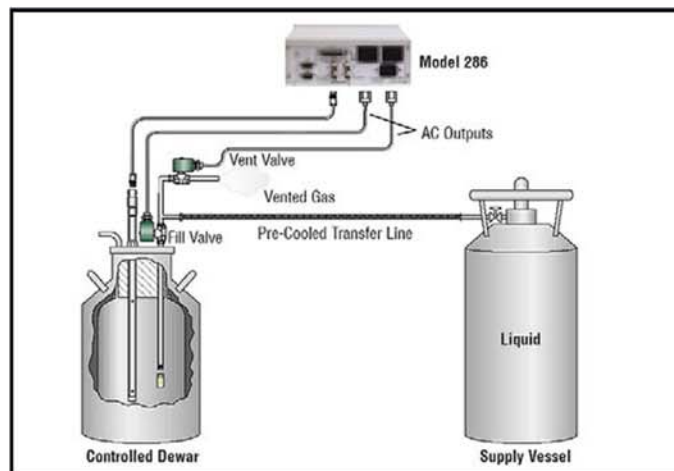
Auto-Changeover Mode diagram illustrating the two supply vessels and one controlled dewar.

◀ Auto-Changeover Mode

In Auto-changeover Mode, the Model 286 maintains the liquid level of the controlled (target) dewar by operating individual solenoid valves controlling the liquid flow from either of two supply vessels. The level control band for the target vessel is established by the instrument A and B setpoints. When level reaches the lower "B" setpoint, the Model 286 automatically initiates flow from the currently selected supply dewar. The instrument can incorporate user pre-set timeouts on target dewar filling to determine when the current supply vessel is empty or, alternatively, the availability of liquid from the two supply vessels can be determined via dry contacts or from the sensor-monitoring capabilities of the instrument (channels 3 and 4). The Model 286 automatically switches from the current (empty) supply vessel to the other. This allows the empty vessel to be replaced without interrupting the availability of liquid to the target dewar.

Pre-Cool Mode ►

The Pre-cool Mode provides for cooling of a cryogen transfer line before opening the transfer line to the controlled dewar. The level control band for the target vessel is established by the A and B setpoints of the Model 286. The instrument operates a target dewar fill solenoid valve, as well as a vent solenoid valve at the target dewar. When a fill cycle is initiated (level has dropped to the "B" setpoint), the vent valve is opened for a user pre-set time, after which the vent valve is closed and the fill valve is opened until the "A" setpoint is reached. During the time the vent valve is open, the cryogen cools the transfer line, so that a minimal amount of heat enters the controlled dewar.



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





Auto-fill Product Features and Specifications

Model 186 and Model 286 Instruments - General

The Model 186 and Model 286 Liquid Level Controllers are microprocessor-based instruments designed to provide monitoring and level control of cryogenic and other liquids. Low line voltage detection and watchdog timer circuitry provide fail-safe operation; non-volatile random access memory maintains instrument set-up and calibration without battery backup. Level monitoring is achieved through use of one or more capacitance based sensors, while solenoid operated flow control valve(s), in conjunction with user defined control-band set-points, provide the level control. User-defined set-points establish level alarm points - visible and audible alarms are available locally at the front panel, while remote alarming can be implemented through use of the dry relay contacts available through a rear panel connector. Also available are optional 4-20mA or 0-10V analog output signaling, computer interface, and single or dual rack mounting.

Model 186 Specific

The Model 186 is designed to monitor and control the liquid level in a single vessel using a single capacitance based sensor and single solenoid operated flow control valve. Optional RS-232, RS-422, or IEEE 488 computer interfaces are available.

Model 286 Specific

The Model 286 Liquid Level Controller provides monitoring of up to four capacitance based sensors and control of up to two liquid levels. Selectable operating modes (Normal Auto-Fill, Auto-Changeover, and Pre-Cool), along with the many possible user-defined configurations, provide broad system flexibility. Advanced features include external inputs for autofill interrupts (fill-inhibit) and multiple stored calibrations per sensor input to meet changing or variable user requirements. Optional RS-232 or RS-422 computer interfaces are available.

Instrument Specifications

	Model 186	Model 286
Input Power	90-132 or 180-264 Vac 50-60 Hz	90-132 or 180-264 Vac 50-60 Hz
Instrument Temperature Range	0-50 °C non-condensing	0-40 °C non-condensing
Measurement Range	255.9 inches (650.0 cm)	3936.9 inches (10,000 cm)
Display Type	3.5 Digit LED	16-character x 2-line backlit character mode LCD
Display Accuracy	±0.1 (% , inches, or cm)	±0.1 (% , inches, or cm)
Display Units	%, inches, or cm	%, inches, or cm
Alarms	Audible, LED	Audible, LED
Alarm Relay	10VA SPST (NO) @ 0.5A max. current	10VA SPST (NO) @ 0.5A max. current
Controller Output	AC Line Voltage @ 1A max. current	(2) AC Line Voltage @ 1A max. current
Analog Signal Options	0-10V or 4-20mA	(2) 0-10V or 4-20mA
Digital Signal Options	RS-232, RS-422 or IEEE-488	RS-232 or RS-422
Dimensions (HxWxD)	3.8" x 8.4" x 11.1" (9.7 cm x 21.3 cm x 28.2 cm) Rack Mount: 3.5" x 19" x 11.1" (8.9 cm x 48.3 cm x 28.2 cm)	3.8" x 8.4" x 11.4" (9.7 cm x 21.3 cm x 29.0 cm) Rack Mount: 3.5" x 19" x 11.4" (8.9 cm x 48.3 cm x 29.0 cm)
Weight	3.6 lb (1.64 Kg) Rack Mount: 4.3 lb (1.95 Kg)	4.2 lb (1.64 Kg) Rack Mount: 4.9 lb (1.95 Kg)





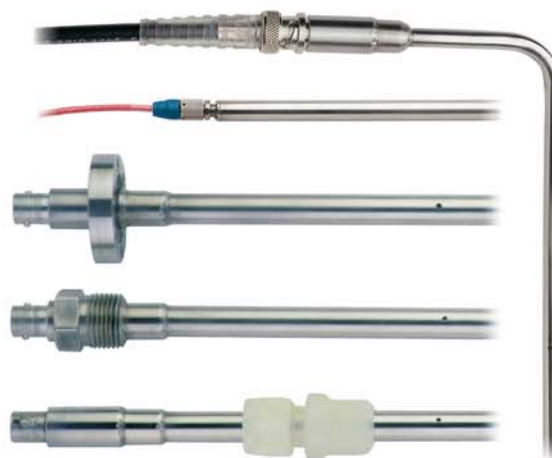
Auto-fill Product Features and Specifications

Liquid Level Sensors

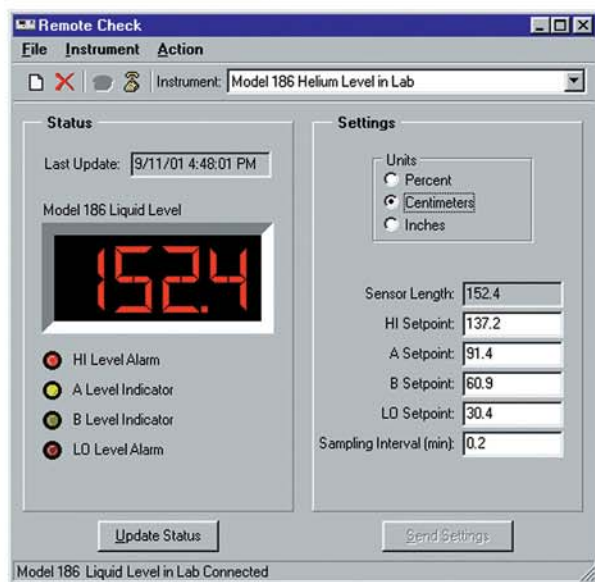
The capacitance-based liquid level sensor, used for auto-fill applications in conjunction with the Model 186 or 286, is manufactured of stainless steel tubing. Sensors can be supplied in single-section overall lengths of up to 19-1/2 feet. Multi-section lengths in excess of 19-1/2 feet are also available. Three standard sensor mounting configurations are available. The typical configuration includes a hermetically sealed BNC connector with an adjustable 3/8" male NPT nylon feed-through. For higher pressure or vacuum applications, a welded stainless steel 3/8" male NPT fitting or conflat flange fitting is available. Twelve feet (two x 6 feet) of connecting coaxial cable and in-line oscillator/transmitter are included with the sensor. With additional cable, the sensor can be remotely mounted up to 500 feet without affecting performance.

	Standard	Optional/Custom
Outside Diameter	1/4" or 3/8" O.D.	1/2" or 3/4" O.D. Rugged Service (High Capacitance)
Overall Length	Single section: up to 234" (595 cm)	Multi-section: over 234" (595 cm)
Mounting Fittings/ Configurations	1/4" or 3/8" NPT Nylon Swagelok	Vacuum or High Pressure welded*: • 3/8" male NPT • Conflat flange
Electrical Connection	Hermetically Sealed BNC	Microdot*
Other	Radius bends up to 90° (1/4" O.D.)	Flow through configurations*

*Others available



Remote Check



Remote Check software is a user-friendly interface compatible with Windows 9x, 2000, XP, or NT 4.0. Users can easily check, monitor and adjust the liquid levels in their system by connecting the instrument to an external modem or PC serial port. Instruments in multiple locations can be easily monitored with a single host computer by simply selecting them from the user-defined pull down menu.

