SeeLevel II™

Stationary Tank Fluid Monitors

Printed in Canada

GARNET

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Introduction

Since introducing our first products with our patented technology in 1993, Garnet Instruments Ltd. has become a leader in liquid management solutions. Our innovations provide reliable and accurate equipment in 3 specific families of products:

- **Tank Trucks**
- **Stationary Tanks**
- **RV Holding Tanks**

Stationary Tanks

Ideal for remote locations, Garnet's self-powered engineered system operates reliably for years on battery power. Easy to install and virtually maintenance-free, the SeeLevel™ line of stationary tank gauges is industry's choice for accurate, reliable, trouble-free operation of their liquid management systems.

Garnet's SeeLevel™ line of stationary tank gauges not only provide data on tank volume and temperature, but also automates client-driven actions. Programmable high or low levels may trigger client-defined actions such as:

- Alerts to management
- Actuation of valves, pumps, or other control equipment
- Shutdowns and call-outs

Clients needing knowledge relating to their stores of chemical, water / brine, refined products, crude, or any other liquids rely on Garnet every day. Reporting with wireless, SCADA network (Modbus), WITS, or via satellite or cell through our secure internet portal - our customers' ability to view data from any location provides them with peace of mind.

About the Company

Garnet Instruments Ltd., based in Sherwood Park, Alberta manufactures gauges and systems to measure liquid levels in applications such as truck cargo tanks, portable tanks, large stationary tanks, RV holding tanks, and more. A technology development company, we also develop automated systems based on measurements, such as our line of overfill control and liquid dispensing systems for the trucking industry. Our extensive line of products and technologies are designed and manufactured entirely in-house.

Our mission is to produce quality digital measurement systems which are rugged, reliable and accurate – and supported by unparalleled customer service. Accordingly, we actively invest in the latest technologies and automation in engineering, prototyping, manufacturing, testing, shipping, service and administration.

Garnet Technologies Inc., our wholly-owned, US-based subsidiary, markets, distributes, and supports our products in the United States of America.

Regardless of your application requirements for level management and related equipment, Garnet has solutions that are:

- Accurate
- Reliable under all environmental and temperature extremes
- Suited for hazardous and non-hazardous areas, corrosive fluids, and oilfield chemicals
- Self-powered
- Intrinsically safe

Call Garnet or your local dealer today to determine which system is right for you.

SeeLevel II™ Tank Fluid Monitors
900 Series

Model 900-D4

Model 900-D6

The Garnet Model 900 series of tank fluid monitors utilize a patented, microprocessor-based digital system that measures the fluid level and temperature in tanks up to 32 feet high*. Self-powered, CSA approved, and intrinsically safe - the system accurately displays the fluid level in units programmed by the user. Designed for simple installation and servicing, and with a full array of remote communication options and diagnostic features, the Garnet 900 lines are the cost-effective, reliable, and safe solution for remotely monitoring your tank volumes and temperatures.

* Contact Garnet for applications with taller tanks.

Standard 900 Series Features

- Battery powered system requires no external power: ideal for portable applications, remote locations, and simple, low cost fixed installations.
- CSA certified system with NO explosion proof housings and built in diagnostics results in greatly simplified installation and servicing.
- Integrated product temperature measurement: no additional sensors are required.
- Fully digital system with 1/4" measurement increments (+/-1/8" accuracy) means recalibration is never required.
- Multiple remote communication options including alarms, analog 4-20mA or 1-5V, Modbus, wireless, cellular, and satellite.
- Single sender bar per tank provides total fluid level and optional water/oil interface level.
- Large, backlit, easy to read LCD readout of levels, volumes, temperatures, alarm status, and programming menu items.
- Field programmable with a front panel keypad. With security codes to control access, the display can also be turned off or have features limited for rental tank applications.
- Fully weatherproof enclosures with operation over the full outdoor temperature range.

Display Functions

- Receives the level and temperature information via optical fibre from the sender bar.
- Applies the programmed calibration data to show the level in the appropriate volumetric units in accordance with the tank size and shape.
- Generates four alarm outputs in accordance with the fluid level, has programmable turn on, turn off, and polarity values. The alarms are divided between the tanks on dual and quad displays.
- Monitors gauge functions and battery condition and shows diagnostic information
- Sends out volume, temperature, diagnostic, and alarm data via the optional remote communication channel.

Display Features

- All programming of calibrations and options is done via the keypad on the front of the display, no additional equipment is required. However, Garnet does have test equipment available to simplify installation, programming, and troubleshooting.
- Three levels of security codes allow the operator to control access to the various functions of the display.
- Battery condition for both the display and the sender bar are shown at the push of a button on the front panel keypad.
- Each of the four 0.5" LCD displays is backlit for easy viewing in all lighting conditions. The backlight comes on for a few seconds when a button is pressed.
- Housed in a weatherproof NEMA 4, 4X, 12, 13 rated fibreglass enclosure measuring 8" by 6" by 4".
- Multiple configurations available:
  - Single version shows inches of level, volume, temperature, and alarm status full time.
  - Dual version shows the volume and temperature of two tanks full time, with inches of level and alarm status for each available at the press of a button.
  - Quad version shows volume full time, with temperature, inches of level, and alarm status available at the press of a button.
  - Interface version shows total, below interface, and above interface volumes full time, as well as temperature. Inches of level and alarm status are available at the press of a button.

SeeLevel II™ Display Options

900-D4 Series

SeeLevel II Tank Monitor - Single	SeeLevel II Tank Monitor - Dual	SeeLevel II Tank Monitor - Interface
		
Model 900-D4S	**Model 900-D4D**	**Model 900-D4I**

Readouts: Four digits
Batteries: Four standard alkaline "AA" cells, lifetime from 3 to 5 years
Configurations available: Single, dual, and interface.
Remote Communication Options: Analog 4-20mA or 1-5V outputs for each volume and temperature, and Modbus digital communications. These options allow remote monitoring via wired connections, which must provide the required external power.

900-D6 Series

SeeLevel II Tank Monitor - Single	SeeLevel II Tank Monitor - Dual	SeeLevel II Tank Monitor - Quad	SeeLevel II Tank Monitor - Interface
			
Model 900-D6S	**Model 900-D6D**	**Model 900-D6Q**	**Model 900-D6I**

Readouts: Five digits
Batteries: 4 to 8 standard alkaline "D" cells or Lithium "AA" cells, lifetime can vary between one and five years depending on communication options and the frequency of reporting.
Configurations available: Single, dual, quad, and interface.
Remote Communication Options: Modbus, WITS/Pason, wireless, cellular, and satellite. These options allow remote monitoring in both wired (external power required) and stand-alone battery powered applications.

Sender Bar Functions

- Measures the fluid level by measuring the position of the float (two floats for interface applications) by using fixed position reed switches, digital interpolation and error correction, and ultra-low power microprocessor circuitry.
- Measures average product temperature with digital temperature sensors located every 16" throughout the length of the bar. Only the sensors below the fluid level are included in the averaging calculation.
- Monitors its own functions and battery condition.
- Transmits the level, temperature, and diagnostic information via optical fibre to the display.

Sender Bar Features

- Class I, Div 1 CSA certified, intrinsically safe.
- Operates for 5 years from Lithium battery module.
- Weatherproof junction box at the top of the bar for optical fibre connection and battery access, servicing an be done without powering down gauge or making the area non-hazardous.
- Electronics housed within a 1" corrosion resistant sealed tube running from the bottom to the top of the tank.
- Several corrosion resistant float sizes and types available to facilitate easy installation and operation with various fluids.
- Only a simple 1" NPT fitting required at the top of the tank for installation of compression fitting, accurate alignment is not required.
- Both weighted and welded in bottom anchors available to suit the application, including tank in-service kits.
- Optional oil/water interface level available using a weighted float.

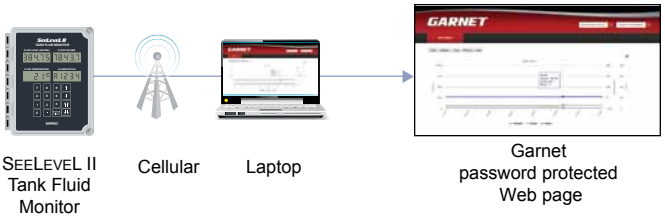
900SST - Stainless Steel Sender Bar

Single Application	Interface Application	Features
		• Tube size and material: 1″ OD 316 stainless steel, with carbon steel or 316 stainless steel compression fitting • Poly float sizes and material: 3.75″, 6.5″, or 7.25″ (standard) diameter by 4.5″ tall. Rotationally molded medium density polyethylene. • Stainless steel float sizes and material: 6″ diameter by 4.75″ tall 316 stainless steel or high pressure 7″ spherical float 316 stainless steel • Applications: Portable and mobile tanks, up to 16 foot tall fixed location tanks.

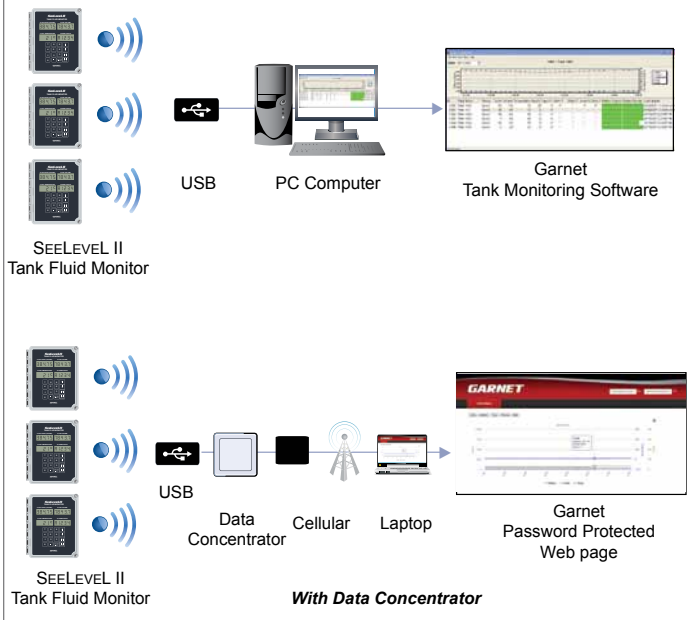
900PT - Polyethylene Sender Bar

Single Application	Interface Application	Features
		• Tube size and material: 1″ nominal OD polyethylene with aluminum liner, with carbon steel or 316 stainless steel compression fitting • Float size and material: 3.75″, 6.5″, or 7.25″ (standard) diameter by 4.5″ tall. Rotationally molded low density polyethylene. • Applications: Flexible poly tube can be coiled up for shipping and to ease installation in tall tanks. Poly yields a lower cost per foot than stainless steel. Due to reduced rigidity, this version is best suited for fixed location tanks.

Cellular

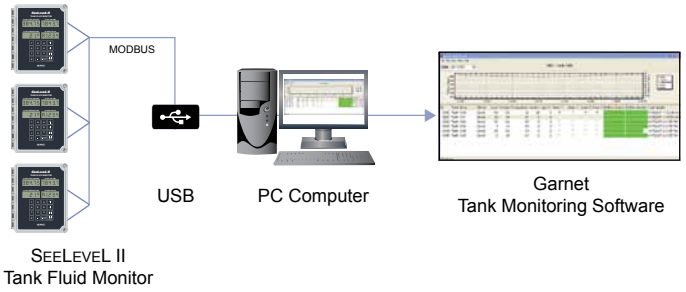
901 Cellular	Features
	• View the 900D6 data remotely on Garnet's password protected web page • Real time and historical data logging included • Sends SMS message when alarm occurs • No external power required, runs on eight "D" cell batteries • Monthly subscription fees apply

Wireless

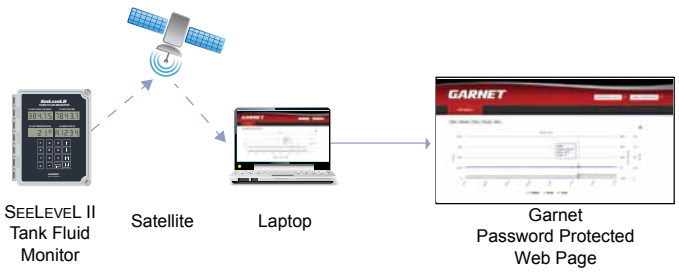
902 Wireless	Features
	• Remotely monitor Garnet 900-D6 gauges on site at a central location • Real time and historical data logging included • Adds a 900MHz radio modem to the Garnet 900-D6 gauges • No external power required, runs on four "D" cell batteries • Uses the Garnet Tank Monitor software for communication and data logging on site or connect to a 950-Data Concentrator with cellular modem and access data from Garnet's password protected web page

SeeLevel II™ Communication Options

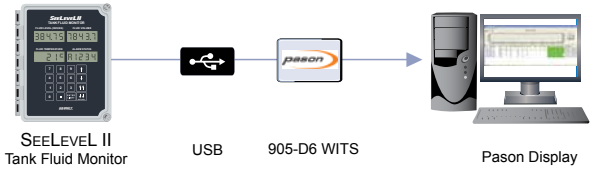
Modbus

903 Modbus	Features
	• Connect Garnet 900-D4 or 900-D6 gauges directly to your PLC, HMI, SCADA systems, or Garnet Tank Monitoring software • Modbus RTU (9600 baud 8,1,N) over RS232, RS485, or RS422 supported • Adds two 1-5V 10 bit analog inputs • Retains 4-20mA or 1-5V connections from 900D4 • External 12VDC to 24 VDC power required • Can use Garnet Tank Monitoring software for communications and datalogging

Satellite

904 Satellite	Features
	• View the 900-D6 data remotely on Garnet's password protected web page • Real time and historical data logging included • No external power required, runs on eight "D" cell batteries • Monitors daily GPS location • Monthly subscription fees apply

WITS (Pason)

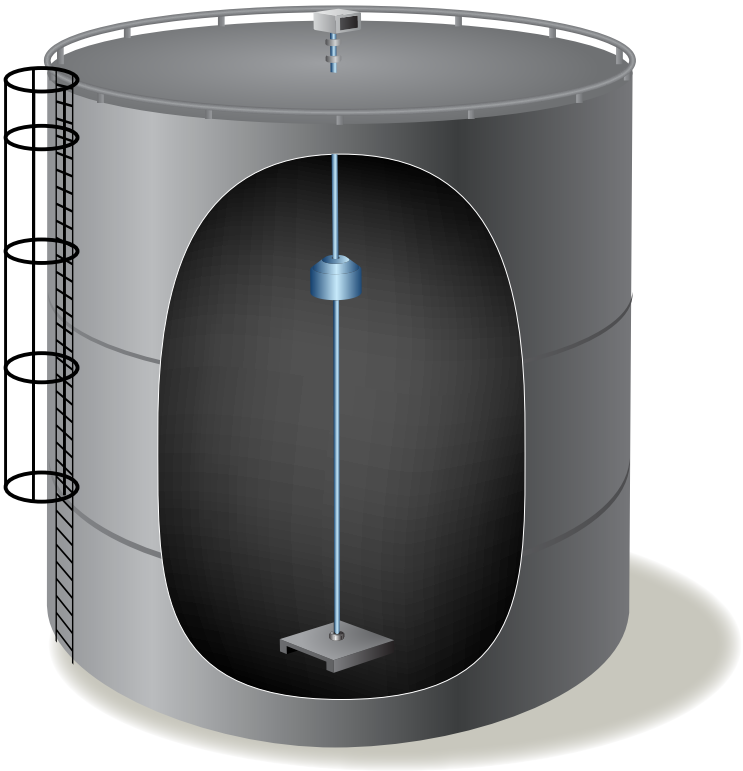
905 WITS (Pason)	Features
	• View the 900-D6 volume and temperature data remotely via WITS platform (eg. Pason System) • With Pason or comparable system, view real-time and historic data logging,view data remotely (online) via host platform • Uses RS 232 or RS 422 interfaces • Operates on 6-24 VDC external power

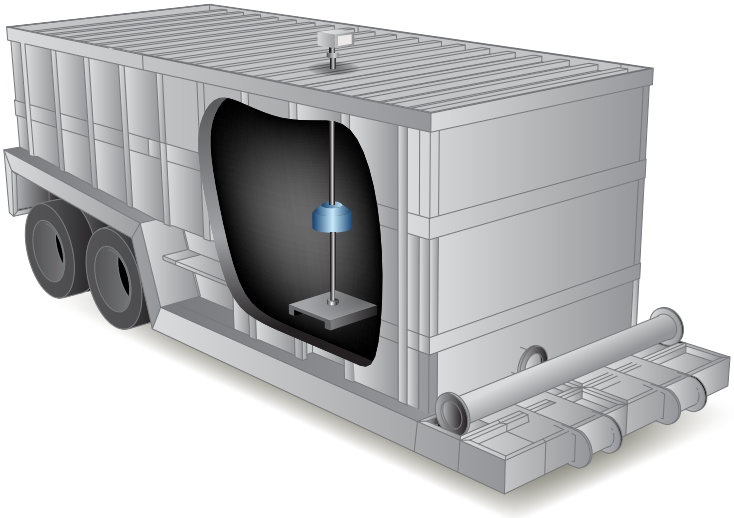
SeeLevel II™

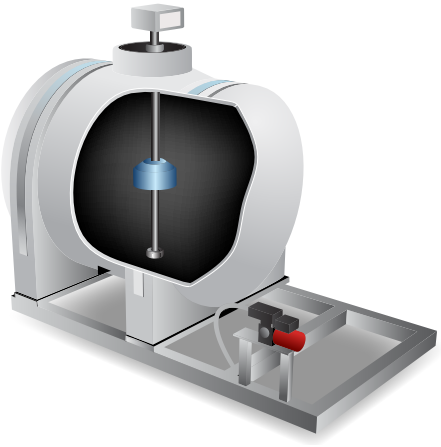
Tank Fluid Monitors

- ✔ No recalibration required
- ✔ Self-powered
- ✔ Temperature monitoring
- ✔ Intrinsically safe
- ✔ +/-1/8” accuracy

A Solution For All Your Liquid Measurement Needs







SeeLevel II™ Specifications

Principle of operation: Reed switches in sender bar are activated by magnets in the float, and are read by a microprocessor. Signal from the sender bar is transmitted to the display through plastic fibre optic cable, providing electrical isolation for hazardous environments.

Maximum tank height:	32 feet (9 m), greater lengths are in development	
Resolution:	1/4 inch (6 mm).	
Accuracy:	+/- 1/8 inch (3 mm), temperature drift is zero.	
Specific gravity sensitivity:	Total volume float sinks one inch (25 mm) in water, interface float must be specified for specific gravity.	
Hysteresis:	1/16 inch (1.5 mm) (Difference between reading with float rising and reading with float falling. Eliminates display flicker.)	
Maximum fibre optic length:	200 feet (60 m). Fibre can be cut with a knife.	
Ambient temperature range:	-40 °F to +140 °F (-40 °C to +60 °C), product temperature range is -40 °F to +194 °F (-40 °C to +90 °C)	
Alarms:	Four alarms, each consisting of a transistor conducting to ground when the alarm is "on". Each transistor has a rating of 1.0 ADC at 24 volts DC. Alarms default "off" if the signal from the sender bar is corrupted or lost. Alarm temperature drift is zero.	
Temperature sensors:	Sensors located inside the sender bar, spaced 16" apart. Temperature measurement range is from -40 °F to +210 °F (–40 °C to +99 °C); accuracy is +/- 4 °F (+/- 2 °C) worst case.	
Display enclosure:	NEMA 4 rated non metallic enclosure, nominally 8" high by 6" wide by 4" deep.	
Bar construction:	Nominal 1" OD polyethylene tube or 1" OD stainless steel tube houses reed switches and temperature sensors.	
Fitting requirements:	Sender bars are held in place at the top with a compression fitting, requires a one inch female NPT thread in the tank top. At tank bottom either a weighted anchor or a weld in anchor can be used.	
Diagnostics:	Display shows if signal from sender bar is corrupted or lost or if the float has failed.	
	900-D4	**900-D6**
Battery lifetime:	5 years continuous operation for both sender bar and display. Sender bar powered by a replaceable lithium battery module. Display powered by four alkaline "AA" cells.	5 years continuous operation for both sender bar and display. Sender bar powered by a replaceable lithium battery module. Display powered by four alkaline "D" cells.
Display type:	½" four LCD with LED backlight.	½" five digit LCD with LED backlight.
Remote communications:	Two wire 4-20 mA outputs for fluid volumes and temperature, optically isolated, require a minimum of 8 volts, maximum of 28 volts. Optional Modbus remote communications available.	Optional Modbus, wireless, cellular, satellite or Pason remote communications available.
4-20 mA output temp. drift:	+/- 20ppm/ °C	n/a
Power requirements:	***Display/Sender Bar:*** None (operate from internal batteries). The Modbus option requires an external 12 – 24 VDC power. ***Alarms:*** External indicators must provide their own power. 4-20 mA transmitter must be externally powered.	***Display/Sender Bar:*** None (operate from internal batteries). The Modbus option requires an external 12 – 24 VDC power. The Wireless option requires four "D" cell batteries. The Cellular option requires external 12 - 24 VDC power. ***Alarms:*** External indicators must provide their own power.

Programming: The 900-D4 and 900-D6 series monitors have several programming options, all of which are field programmable at any time from the front panel keypad. Programmable security codes prevent unauthorized access and controls which gauge features are active. All memories are retained even if the batteries are dead or removed. For upright tanks with a linear calibration (equal volume per inch of depth throughout the tank) the volume reading can be calibrated by entering a single number for volume per inch of depth. For tanks on their side with a nonlinear calibration, the volume reading can be calibrated by entering a table of values for inches of depth verses volume. The volume offset can be set to specify where the zero volume point is in the tank. The temperature can be set to read in °F or °C. The alarms can be set independently to any point in the tank, and can be set to turn on or off as the fluid level rises.

900-D4S: The full scale of the volume 4-20mA outputs are calibrated from the keypad, there are no analog controls to adjust.

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