Adsistor® Technology
ORVR and EVR Sensor Modules

General Description

The Adsistor ORVR and EVR sensor modules represent new gas sensing technology and are intended for use in conjunction with gasoline dispensers to enhance vapor recovery efficiency and provide compatibility between Phase II vacuum assist recovery systems and ORVR vehicles. This technology was developed using active service station dispensing equipment in the field. The EVR sensor module provides a means for gasoline dispenser manufacturers to monitor both hydrocarbon vapor concentration and vacuum in the vapor recovery line of a gasoline dispenser. The ORVR sensor module monitors hydrocarbon vapor concentration only.

Vacuum Monitoring for Proper A/L Ratio

The EVR sensor module is mounted inside the dispenser at a point in the vapor recovery path between the vacuum assist pump and the hose connections. From this location the EVR module's pressure sensor can detect deviations from normal vacuum levels caused by malfunctioning vacuum pumps, trapped liquid, or leaking hoses & fittings. The EVR sensor module provides a 0.5-10Vdc analog output signal (green lead) that is proportional to the vacuum in the vapor recovery line. The vacuum range of the sensor module is 0-1.45 psig, which is equivalent to 0-10 kPa, or 0-40 inches water column. This permits monitoring for the proper vacuum levels associated with differing product delivery rates which are induced by different nozzle latch positions. The sensor module produces 6.2V/psig, 0.24V/inch H_2O, 0.9V/kPa with 5% accuracy/repeatability (see fig. 1). The EVR sensor module is also available with a 5-40Hz frequency output for vacuum level.

Vapor Monitoring for ORVR/Phase II Compatibility

Both the ORVR and EVR sensor modules permit the vapor recovery system to discriminate between ORVR vehicles and non-ORVR vehicles. A sensor module is placed in the gasoline dispenser's vapor recovery line were it is able detect the absence of saturated gasoline vapor. When this condition is detected, the vehicle at the dispenser is identified as ORVR and the vacuum assist pump is turned off. Unsaturated air is thus prevented from being introduced into the piping and storage tank head space, which improves recovery efficiency and prevents the formation of flammable mixtures. An additional advantage to this approach is that in the event an ORVR vehicle's dynamic seal fails to work due to mechanical damage, ORVR system malfunction, or product delivery rates below 4 gpm (which might be caused by the combination of a dirty dispenser fuel filter and use of the low clip position on the nozzle) the Adsistor will detect that the vehicle is sourcing vapor and the vacuum assist pump can be instructed to recover the vapors just as if it were not an ORVR vehicle. It is also possible that dynamic seals of some vehicles may function properly at pumping rates well below 4 gpm. If the dynamic seal is functioning, a decision to turn on the vapor recovery pump based solely on a low product delivery rate will result in unsaturated air being introduced into the piping and tank. In this case, the Adsistor will detect the absence of saturated vapors which will indicate that the dynamic seal is intact and therefore, the recovery pump should not be turned on. Vapor recovery efficiency and safety are thereby maintained under all circumstances. The ORVR and EVR sensor modules produce a 0.5-6Vdc output signal (violet lead). This output signal voltage is proportional to the log of the hydrocarbon concentration. Unsaturated air in the vapor recovery line is indicated when the output voltage drops below 5Vdc (see fig. 2). A 5-40Hz frequency output is also available for vapor concentration.

Sensitivity/Response Time. The ORVR & EVR modules sensitivity has been adjusted to the conditions assumed to exist in the field. 90% response to changing vapor concentration (increasing/decreasing) should occur within 1 second. Future field testing may indicate further sensitivity adjustments. It can be assumed that unsaturated air is present whenever the output is less than 5 volts.

Operating Temperature. The ORVR & EVR modules are designed to operate from -40C to 70C.

Submersion in Liquid Gasoline. The Adsistor vapor sensor & vacuum sensor inside the modules are not damaged by brief exposure to liquid gasoline. They are not intended for continuous submersion in liquid gasoline, however. If the Adsistor becomes submerged, this condition will be indicated by the module's output remaining at 6 volts for more than 2 minutes. When removed from liquid gasoline and placed into saturated gasoline vapor, the sensor will become operational as soon as the output decreases to 5 volts. This will generally occur within 3 minutes. When placed into air the sensor will become operational within 1 minute. Proper installation will prevent liquid product from coming into contact with the Adsistor (see installation instructions, below).

Maximum Vacuum. The vacuum sensor inside the module measures from 0 to 1.45 psig. The maximum vacuum to which the EVR module can be exposed is 10 psig, 75kPa, 270" H_2O.

Power Requirements. Both the ORVR & EVR modules require +18 to +35Vdc @ 30mA.

Intrinsically Safe. UL approval pending for Class I, Div. 1, Group D locations.

Mechanical Dimensions. ORVR- Height: 2.5", Dia: 1.65". EVR- Height: 3", Dia: 2.25". Both: 1/4" NPT brass nipple for insertion into vapor recovery stream; 22 ga. leads with PVC jacket CSA/UL AWM 600V 6" length; PVC enclosure with UL 94 VO epoxy potting compound.

Installation. The sensor module should be mounted inside the dispenser at a point in the vapor recovery line between the vacuum assist pump and the hose connections, with the PVC enclosure up and the brass adapter down.

Hook-up.

EVR Module
RED: +18 to +35Vdc
BLACK: ground
VIOLET: vapor output, 0.5-6Vdc signal
GREEN: vacuum output, 0.5-10Vdc signal

ORVR Module
RED: +18 to +35Vdc
BLACK: ground
VIOLET: vapor output, 0.5-6Vdc signal

IMPORTANT NOTE - Electrical power must be applied to the module while the dispenser is on and the recovery line is active.

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Fig. 1
Vacuum Output Signal (Green Lead)

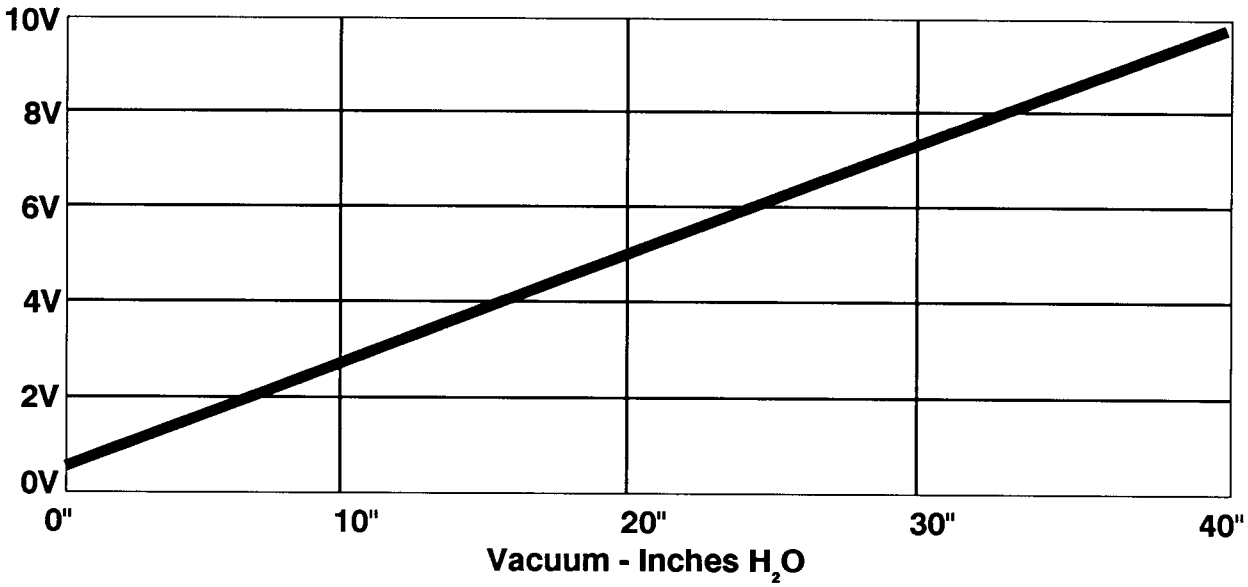
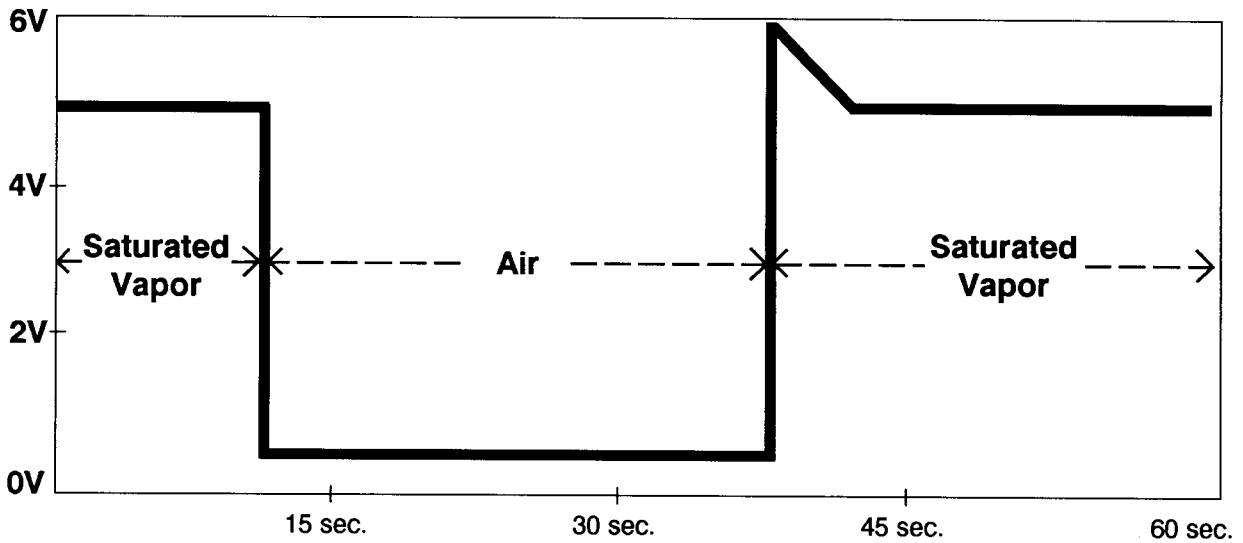
Fig. 2
Vapor Output Signal (Violet Lead)