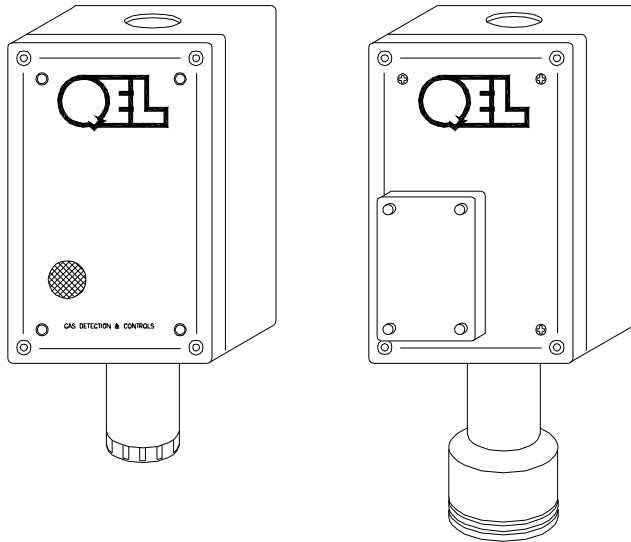


**MODEL QTS-1800 SERIES  
WALL MOUNT DIGITAL AND ANALOG  
TRANSMITTER/SENSOR**



**INSTALLATION  
OPERATION AND MAINTENANCE  
MANUAL**

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QTS-1800 Series Transmitter Operation And Maintenance Manual

<b>General Specifications</b>	
<b>Item</b>	<b>Specification</b>
Sensor Type	Solid State
Dimensions	4.2"W x 8.6"H x 2.6"D (107mm x 218mm x 66mm)
Environment	Temperature -4°F to 104°F (-20°C to 40°C)
Humidity	0-99% non-condensing
Enclosure	NEMA 1 ABS plastic fire retardant cover (94 V-O) NEMA 4X ABS plastic fire retardant cover (94 V-O)
Package Type	Wall mount Wall mount with splashguard option
Output	4-20mA Analog Linear
Communication	RS-485 Digital for interface to QEL QDCS-4000 Monitor (Option)
Power	24 VAC/VDC (nominal) 18-50 VDC 15-36 VAC @ 47-63 Hz

* = As Delivered		<b>Analog Warning/Alarm Setting</b>	
* Gas Type	Range	Low (Warning)	High (Alarm)
Carbon Monoxide	0 - 125 ppm in VE (Vehicle Exhaust)	50 ppm (in VE)	100 ppm (in VE)
Propane	0 - 50% LEL	10 %LEL	20 %LEL
Ammonia	0 - 500 ppm	50 ppm	300 ppm
R11, R12, R22	0 - 1000 ppm	500 ppm	1000 ppm
R134A	0 - 1000 ppm	500 ppm	1000 ppm
R123	0 to 100 ppm	10 ppm	50 ppm

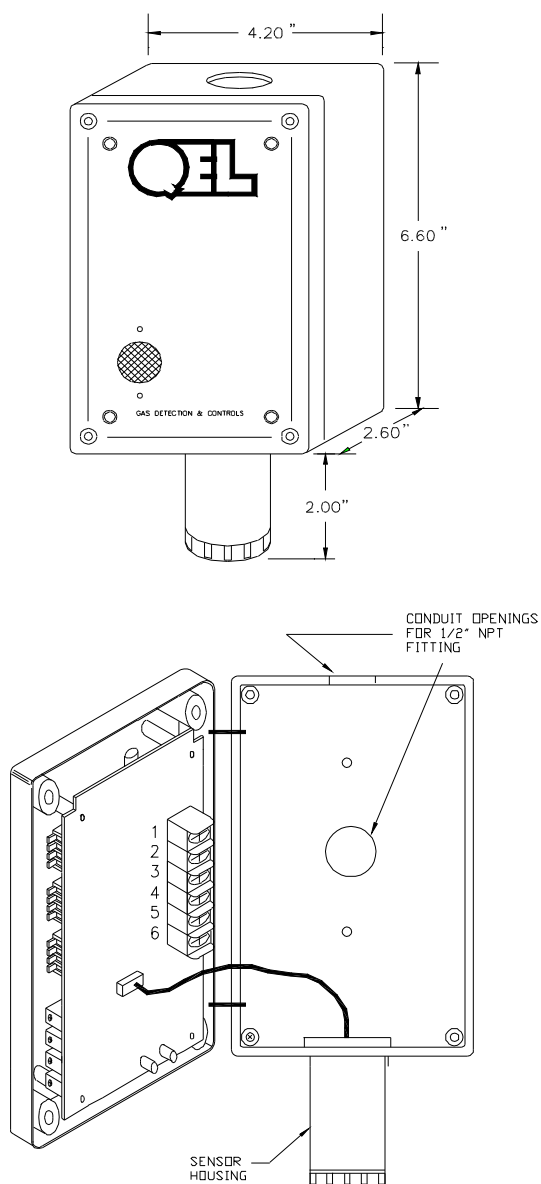
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## 1 Introduction

The QTS-1800 Series Transmitter series is a microprocessor-based sensor/transmitter, using a variety of solid-state sensors for detection of hydrocarbons and other gases. Refer to the front of this manual for specifics of gas type, range and sensor type and other settings. These sensors have varying degrees of interfering response to humidity and temperature. Depending upon the gas being sensed and the application, there may be a humidity sensor and/or a temperature sensor on the unit to allow the microprocessor to adjust the reading according to changes in the atmosphere.

The sensors used are to some degree all non-specific, which is to say that they will respond to other gases which may be present, notably hydrocarbons and solvents, and this can cause nuisance alarms. The microprocessor cannot distinguish between these gases and the target gas.



### 1.1 Mounting Method

The unit is supplied with a 1/2" conduit entry hole at the top end and on the rear. Screw holes are provided on the rear, which match a standard switch box.

## 1.2 Mounting Height

The various gases detected by this series have different weights and the mounting heights vary accordingly:

Gas Type	Mounting Height
CO	4-6 ft (1.2m - 1.8m) above floor
Combustible - Methane	1 ft (0.31m) below ceiling
Combustible - Other gases	1 ft (0.31m) above floor
Ammonia	1 ft (0.31m) below ceiling
Freons	1 ft (0.31m) above floor

## 2 Wiring

The Solid State Transmitter may be purchased with one or both of two modes of operation and signaling: Analog and/or Digital. It is necessary to know which type you have and install according to one following methods.

Parameter	Specification
24VDC operation - 4 wire	12-24AWG
Wire Size – Minimum	24AWG (0.51mm)
Wire Size – Maximum	14AWG (0.16mm)
Recommended for RS-485	Belden 9841 or equivalent

### 2.1 Digital Multi-Drop Installations

Communication is via digital data communications over an RS-485 two-wire data link for use with the QDCS-4000 monitor. The power supplied is 24 VDC.

#### 2.1.1 RS-485 Cable Type

While it is theoretically feasible to use ordinary wiring techniques in many applications involving few sensors operating over short distances, it is not recommended. General installation techniques leave the communications line susceptible to noise, internal signal reflections and garbling.

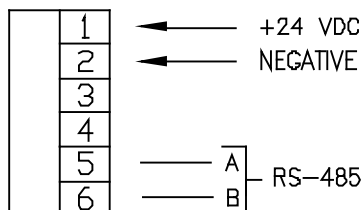
QEL recommends a true RS-485 cable (e.g. Belden 9841 or equiv.) two wire, shielded, 120-Ohm characteristic impedance.

It is recommended to terminate each the ends of the line with a 120-Ohm impedance-matching resistor. The 120-Ohm line is also referred to as the RS-485 bus. A correctly terminated RS-485 bus will therefore have a 120-Ohm termination at each end. For most installations, the Monitor end will be terminated, as well as the transmitter at the end of the bus. If the monitor is not installed at the end of the bus, the two transmitters at the ends of the bus will require a termination resistor.

#### 2.1.2 Cable Shield Grounding

Cable shields must be grounded and only at one end. Ungrounded cables become capacitively coupled antennas. Grounding at more than one place produces ground loops.

DIGITAL INSTALLATION  
 RS-485 MULTIDROP OPTION  
 24 VDC OPERATION  
 4 WIRE  
 FOR USE WITH QDCS-4000 MONITOR

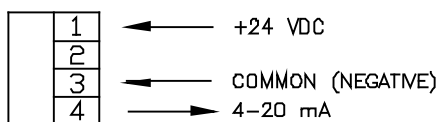


## 2.2 Analog Signaling (4-20) Installations

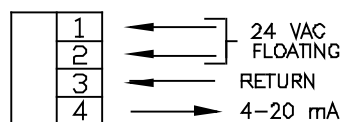
The signal out is a 4 - 20 mA linear signal.

This device may be installed with either 24 VDC power or with 24 VAC power as per the following drawings. In the case of AC power the installation must be floating. **Do not connect one side of the transformer secondary to ground;** this will cause an internal short to Signal Common and blow the fuse or damage the card.

ANALOG INSTALLATION  
 24 VDC OPERATION  
 3-WIRE



ANALOG INSTALLATION  
 24 VAC OPERATION  
 4 WIRE



## 2.3 Operating Voltages

Analog Installation      24 VAC/VDC (nominal)  
                                   18-50 VDC  
                                   15-36 VAC @ 47-63 Hz

## 2.4 Fuses

Before replacing the fuses, inspect the Circuit Card Assembly (CCA) for any obvious damage such as overheated components. If any damage is observed, the CCA should be replaced.

## 3 Calibration

The sensor element response is non-linear and the signal must be linearized as part of the algorithm implemented. Two gas concentrations are required to define the characteristic response of the sensor. The gas must be humidified after it leaves the tank. The calibration adapter has a reservoir for passing the gas through a wetted sponge to humidify the gas.

If the transmitter is equipped with a humidity sensor, the humidified gas must also go to the humidity sensor to enable the microprocessor to calculate the humidity response as shown. The Humidity Calibration Cover plugs directly into the humidity sensor access hole on the front cover.

### 3.1 Equipment Needed

To calibrate the QTS-1800 successfully, a calibration kit can be purchased from our factory. The calibration kit is designed to match the requirements for the product and will ensure a reliable calibration.

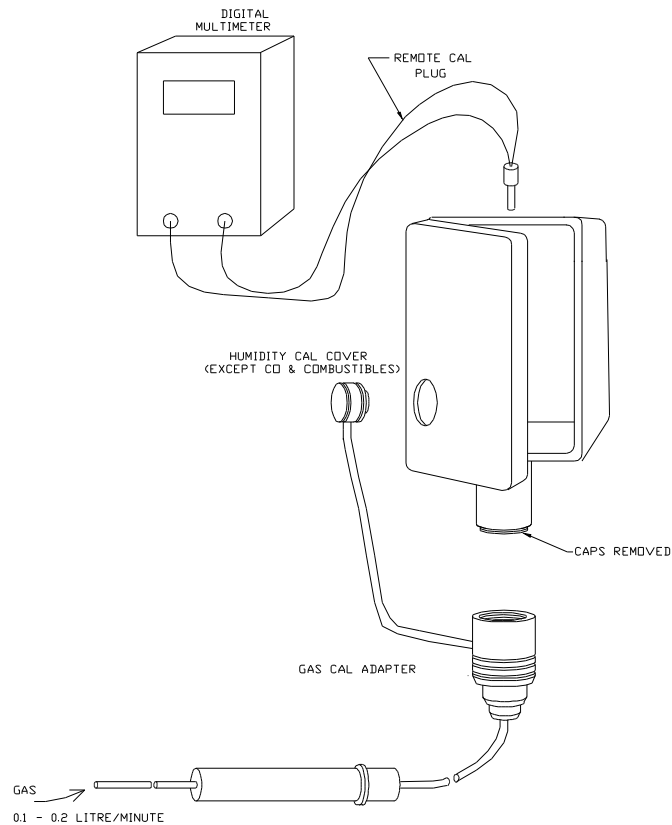
Please note that the microprocessor is programmed to expect only certain concentrations of gas and the concentrations must be as indicated in the calibration gas concentration table below.

The items required for calibration are as follows:

- Two concentrations of gas:  
CONC 1 = the lower concentration gas  
CONC 2 = the higher concentration gas
- Regulator to supply gas at 0.1 - 0.2 liter/minute (2-4 SCFH)
- Single calibration adaptor for the bottom sensor (CO and combustibles only) or  
Dual Calibration adaptor for bottom sensor + cover humidity sensor (all gas except CO and combustibles)
- Digital Multi-meter for 0-20 mA reading (3 1/2 Digit recommended)
- Meter Remote Calibration Plug

### 3.2 Calibration Set-up

The figure below shows some of the calibration equipment required for calibration of the unit.

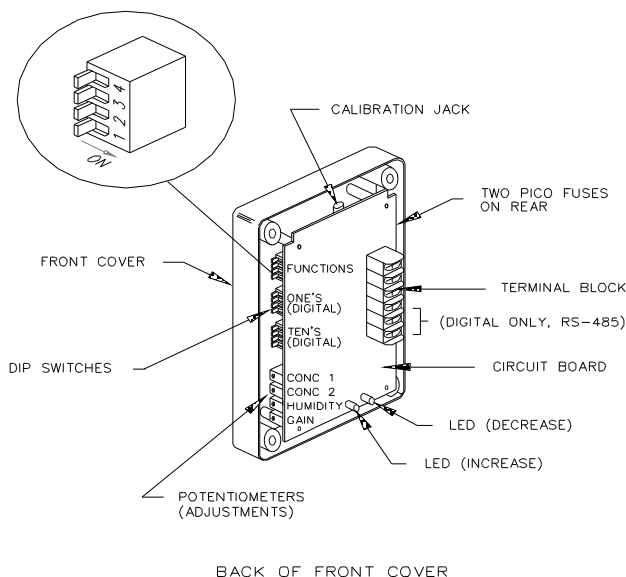


### 3.3 Calibration Facility Locations

Additional circuitry, switches and connectors is provided to facilitate calibration of the unit. Please take note of the following in the figure below:

- Calibration selection DIP switch (detailed view in circle).
- Calibration jack (at top of CCA).
- Increase and Decrease LEDs.
- Adjustment potentiometers.

The function of each item will be described below in the calibration procedure.



### 3.4 Calibration Gas Required

Please note that for the calibration of each gas type, two specific concentrations are required as listed in the table below. It is important to obtain the exact concentration for each calibration point, since the concentration, levels are hard-coded in the firmware and form an important part of the algorithm used.

If the correct calibration gas is not used or the humidity attachment is not used, the product will not meet its specification after calibration.

Gas	CONC 1	CONC 2
CO	50 ppm (humidified) in VE equivalent	100 ppm (humidified) in VE equivalent
Combustible	10% LEL (applicable gas)	20% LEL (applicable gas)
NH <sub>3</sub> (Ammonia)	50 ppm (humidified)	300 ppm (humidified)
R11	500 ppm (humidified)	1000 ppm (humidified)
R12	500 ppm (humidified)	1000 ppm (humidified)
R22	500 ppm (humidified)	1000 ppm (humidified)
R123	30 ppm (humidified)	100 ppm (humidified)
R134A	500 ppm (humidified)	1000 ppm (humidified)

### 3.5 Procedure

All calibrations are done with prescribed concentrations of gas (See table above). Calibration requires two concentrations for gas and one for humidity. When the DIP switches for calibration are set, the microprocessor calculates adjustments for temperature and humidity compensation as appropriate and compares the reading to the pot adjustment.



If the pot setting is above the reading, the DECREASE LED will be ON; if it is below, the INCREASE LED will be ON. When the setting is correct, the calibration LEDs will flash alternately.

The circuit board is supplied with a jack to measure the output signal using a digital multi-meter (20 mA scale). Inserting the plug for measuring diverts the signal through to internal ground, thus giving a FAIL (0.0 mA) reading at the monitoring equipment.

When calibrating this transmitter, refer to the Functions set of 4 DIP switches. Setting these switches tells the microprocessors which of the two concentrations of gas you are applying. A reading may be monitored by applying gas with the switches off. The switches are labeled CONC 1 for the lower concentration and CONC 2 for the higher concentration.

**Concentration 1:** Set CONC 1 DIP switch to ON, CONC 2 DIP switch to OFF. The analog signal goes to 4.0 mA. Apply gas as shown. Wait about 5 minutes for both sensors to stabilize. Adjust the CONC 1 potentiometer until the Calibration LEDs switch from one to the other. Switch OFF the DIP switch and remove gas.

**Concentration 2:** Set CONC 1 DIP switch to OFF, CONC 2 DIP switch to ON. The analog signal goes to 4.0 mA. Apply gas as shown. Wait about 5 minutes for both sensors to stabilize. Adjust the CONC 2 potentiometer until the Calibration LEDs switch from one to the other. Switch OFF the DIP switch and remove the gas.

### 3.6 Humidity Calibration

Humidity calibration (Pot #3) is a factory setting and should not be attempted in the field.

Set CONC 1 and CONC 2 DIP switch settings both ON. The Analog signal goes to 4.00 mA. Apply 44% Relative Humidity to the Humidity sensor and adjust Pot #3 per the Calibration LEDs. When set turn CONC 1, CONC 2 OFF.

#### Humidity Sensor Present:

No = For CO and Combustible

Yes = R22, R11, R12, R123, R134A, Ammonia (set at factory; Calibration Concentration + 44% relative humidity)

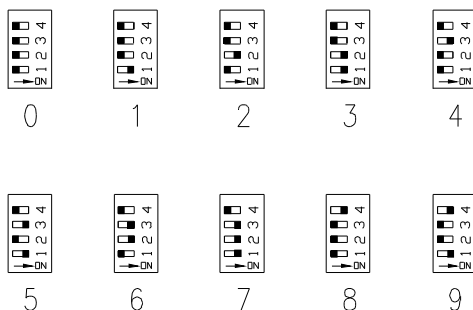
### 3.7 Electronic Setup (Gain)

When calibration mode is entered, the microprocessor puts out an equivalent of 4.0 mA. Adjust the GAIN potentiometer to get 4.0 mA reading on the meter.

## 4 Digital Addressing (Digital Model Only)

For the digital model, there are two sets of four DIP switches on the circuit board for setting the address: an upper group (ten) and a lower group (one's). They are arranged as ordinary numbers - the one's switch can be set to numbers from 0 to 9, and the ten's switch can be set only from 0 to 7 as shown and are arranged, e.g. 13 is coded '1' on the lower group and '3' on the upper group. The highest allowable address is '79'.

**Note:** Position 4 of the ten switches must be ON for digital operation.

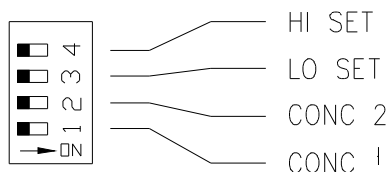


#### 4.1 Analog/Digital Signal Options In A Digital System

When making direct measurements of a device installed for digital operation, it is necessary to switch the ten's switch position 4 to OFF to access analog (4 to 20 mA) signals during operations such as calibration, or to take good quality direct local readings. Analog local readings are available during normal operation, but you may find that there may be excessive noise.

**Note:** Activating the analog function will take the sensor out of the digital communication loop, and it will show fail on the main panel.

### 5 Alarm Settings (Digital Model Only)



There is no possibility of indicating an alarm condition for the analog transmitters, however with the digital communication link, the digital transmitter does indicate its alarm condition to the host monitor (QDCS-4000 Monitor). LED's on the transmitter circuit board indicate status as well.

The digital transmitters have the common alarm settings built in to the software of the microprocessor, for instance 50 and 100 ppm of CO.

In order to provide a choice there are Function DIP switches on the circuit board, "LO SET" and "HI SET" (or Set 1 and Set 2), which allow choice between two common settings for WARNING and ALARM.

Refer to the specification page in front of this manual for the settings for your particular device, depending on gas type.

QTS-1800 Series Transmitter Operation And Maintenance Manual

When the HI SET and LO SET DIP switches are off, the unit performs no alarm or warning level evaluation for the digital communication. No indication is given via the LEDs on the circuit card either.

* = As Delivered			Digital Alarm Setting Set 1 (LO SET)		Digital Alarm Setting Set 2 (HI SET)	
* Gas Type	Range		Low (Warning)	High (Alarm)	Low (Warning)	High (Alarm)
Carbon Monoxide	0 - 125 ppm in VE (Vehicle Exhaust)		25 ppm in VE	75 ppm in VE	50ppm in VE	100 ppm in VE
Propane	0 - 50% LEL		5 %LEL	10 %LEL	10% LEL	20% LEL
Ammonia	0 - 500 ppm		30 ppm	200 ppm	50 ppm	300 ppm
R11, R12, R22	0 - 1000 ppm		400 ppm	900 ppm	500 ppm	1000 ppm
R134A	0 - 1000 ppm		400 ppm	900 ppm	500 ppm	1000 ppm
R123	0 to 100 ppm		10 ppm	30 ppm	30 ppm	50 ppm

## 6 Warranty Statement

The information contained in this manual is based upon data considered accurate; however, no warranty is expressed or implied regarding the accuracy of this data. All QEL equipment is warranted against defects in material and workmanship for a period of two years from date of shipment with the following exceptions:

Electrochemical Sensors (Toxic)	Six Months
Catalytic Sensors (Combustible)	One Year

During the warranty period we will repair or replace, at our discretion, any components or complete units that prove, in our opinion, to be defective. We are not liable for consequential or incidental damage to auxiliary interfaced equipment.

A returned material authorization number should be obtained from the factory prior to returning any goods. All return shipments must be shipped freight prepaid and a copy of the maintenance records should accompany the unit concerned.

Warranty should be considered F.O.B. the factory. Labour and travel time are chargeable for any field site visits required for warranty work.

### LIMITED LIABILITY

All QEL systems shall be installed by a qualified technician/electrician and maintained in strict accordance with data provided for individual systems in the form of installation/maintenance manuals. QEL assumes no responsibility for improper installation, maintenance, etc., and stresses the importance of reading all manuals. QEL shall not be responsible for any liability arising from auxiliary interfaced equipment nor any damage resulting from the installation or operation of this equipment.

QEL's total liability is contained as above with no other liability expressed or implied as the purchaser is entirely responsible for installation and maintenance of systems.

This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for QEL any liability in connection with the sales of our products other than that set forth herein.

NOTE: Due to on-going product development, QEL reserves the right to change specifications without notice and will assume no responsibility for any costs as a result of modifications.

For further information or assistance, contact:

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