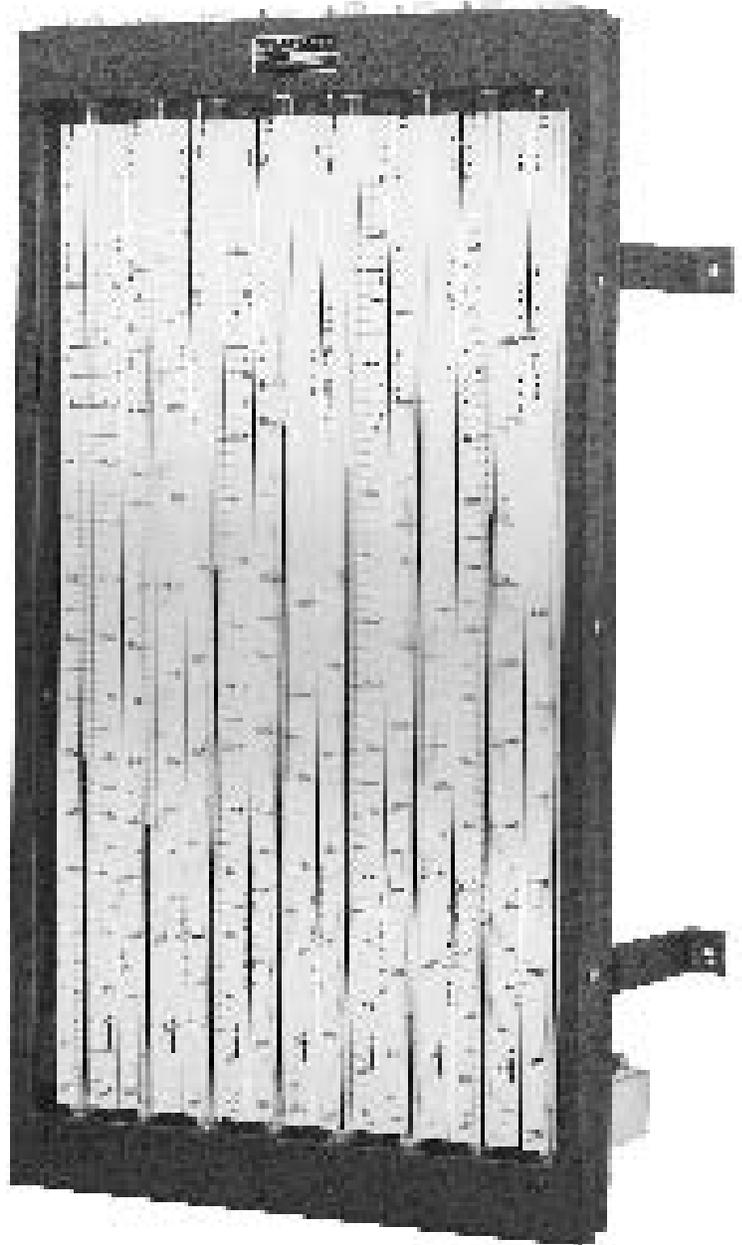


King-Gage®

Multi-Tube Liquid Level Indicators -

Service Manual -

- Service and Maintenance Instructions
- Cleaning and Renewal Instructions
- Replacement of Glass Indicating Tube
- Replacement Kits



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The information contained in this manual was accurate at the time of release. Specifications are subject to change without notice.

Warranty - All King Engineering products are guaranteed to be free from defects in material and workmanship for one year from the date of purchase. Any product or part found to be defective under normal use within one year of purchase will be repaired or replaced at no charge if returned to the company at Ann Arbor, Michigan within ten days of discovery of the defect. No other warranties, whether expressed, implied or statutory, including the warranties of fitness for a particular purpose or merchantability, are given by this agreement.

The exclusive remedy for nonconformity of these goods shall be repair and/or replacement of the nonconforming goods or parts.

Seller will not be liable for consequential damages resulting from breach of this agreement. The term "consequential damages" shall include but shall not be limited to damage to all machines, equipment and goods other than the goods sold hereby, interruption of production, loss of profits, delays of any kind, administrative expense and overhead.

Revisions:

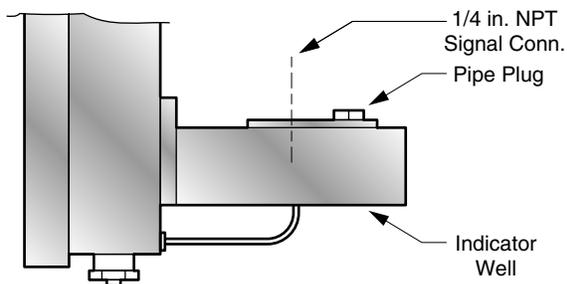
- (A) July, 1979 – Original Release.
- (B) June, 1995 – Revised & Redrawn per ECR no. 3318
- (C) February, 1996 – Added 599x Models
- (D) July, 1998 – Address Correction

Service and Maintenance Instructions

This section covers the occasional cleaning and, even less frequent, servicing of the Multi-Tube Indicator. Listed below are some of the more common conditions which require cleaning and renewal.

- A. If the inside of the glass tube is coated, the indicating liquid is dirty and should be replaced.
Note: When mercury is used, a few drops of **King ClearGard Liquid** (p/n 6003-x) placed on top of the mercury column will improve the meniscus and tend to eliminate deposits on the inside of the glass tube.
- B. It is important that the vent plug be installed at the top of the indicator to prevent dirt and dust from entering top of glass tube.
- C. Discolored indicating liquid is usually the result of excessive ultraviolet light or direct sunlight on the indicator. In addition, some objectionable vapors in the atmosphere may also be responsible for discoloration of the indicating liquid. However, this condition does not usually affect the specific gravity of the indicating liquid or the accuracy of the Multi-Tube reading.
- D. If the indicating liquid in the Multi-Tube bubbles, some of the indicating liquid has been pushed out of the glass tube (due to an overpressure condition). Liquid should be added as outlined in "Cleaning and Renewal Instructions".

Should any of the above conditions exist, it is advisable that the indicating tube and the liquid well be cleaned. New liquid should be added. (Be sure to replace liquid with the same type originally furnished with the Multi-Tube. Proper indicating liquid for operation is listed on edge of indicator scale.)



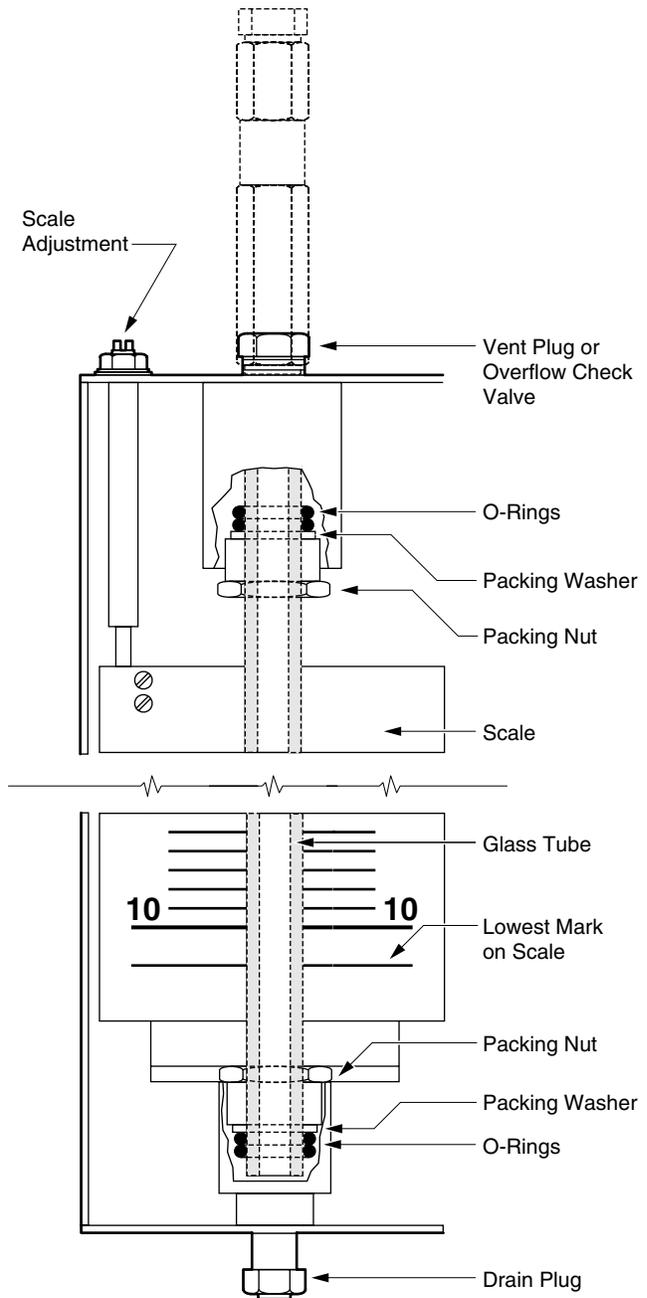
Detail - Side View of Indicator Well

Cleaning and Renewal Instructions

1. Turn off air supply to Control Unit.
2. Disconnect gauge signal transmission tubing from connection at the Multi-Tube.
3. Remove front cover.
4. Remove vent plug and Overflow Check Valve (if applicable) from connection at top of glass tube.
5. Open drain plug and drain entire contents of indicator well.
6. Close drain plug. Place several ounces of the proper cleaning fluid in the Multi-Tube through the top of the glass tube:
 - Mercury Indicators.....Use Acetone only
 - Colored liquid indicators.....Use Alcohol
7. Thread a 1/4" pipe fitting with a flexible hose attached into the signal connection port of the indicator, and blow into it so that the cleaning fluid rises to the top of the glass tube. A finger placed lightly over the top of the tube will prevent any spilling. Let the fluid drop to the bottom and repeat the procedure as necessary.
8. Remove the drain plug completely and blow the indicator dry using clean, dry compressed air or inert gas, blowing it through both the top and bottom of the glass tube. Be sure the indicator is completely dry.
9. Replace and tighten drain plug.
10. Carefully fill the indicator through the top of the indicator well (pipe plug) using the same type of indicating liquid originally furnished (see detail). Fill until the liquid rests at the first mark on the scale (see detail, page 4). Using the flexible hose, alternately pressurize and vent the indicator causing the liquid to rise and fall several times to remove any air trapped in the lower block or connecting passages. Reset liquid level to first scale mark by adding or draining liquid or by adjusting scale.
11. Reassemble indicator, reconnect gauge signal tubing, turn air supply on and leak-check connection at Indicator.

Replacement of Glass Indicating Tube

1. Turn off air supply. Disconnect transmission tubing.
2. Drain indicating liquid from Multi-Tube, remove front cover.
3. Loosen the upper and lower glass tube packing nuts (3/4" Hex). **Note:** It may be necessary to remove the indicator scale(s) and the reflector.
4. Free the tube from the seals by twisting or rotating the tube back and forth gently, then carefully slide the indicator tube upwards until it is free at the bottom. Then, carefully bending the tube out at the bottom, pull the tube down until it is completely free.
5. Remove old gaskets/o-rings and washers. Clean gasket seats of all foreign material.
6. It is highly recommended that new glass tube packing gaskets and new glass tube packing o-rings be used when replacing the glass tube indicator. Place the packing nuts, washers and o-rings on the tube and then insert the top of the tube into the top tube block. The bottom end of the tube should then be placed in the lower tube block.
7. Center the tube in the upper and lower connections so that it is not touching the bottom in either connection. If the tube has a bow in it, turn the tube so that the bow is towards the back.
8. Proceed to thread the packing nuts into the connections, pushing the gaskets and washers ahead of them. Tighten each nut about one-half turn at a time, alternating from one to the other.
9. If the old tube has been broken, it is recommended that the well be flushed out as previously described in Cleaning and Renewal.
10. Fill the Multi-Tube with indicating liquid as previously outlined in Cleaning and Renewal Instructions.
11. Replace front cover, reconnect transmission tubing and actuate.



Detail - Internal View

Glass Tube Replacement Kit P/N 5164-x

Applicable for MULTI-TUBE Indicator models:

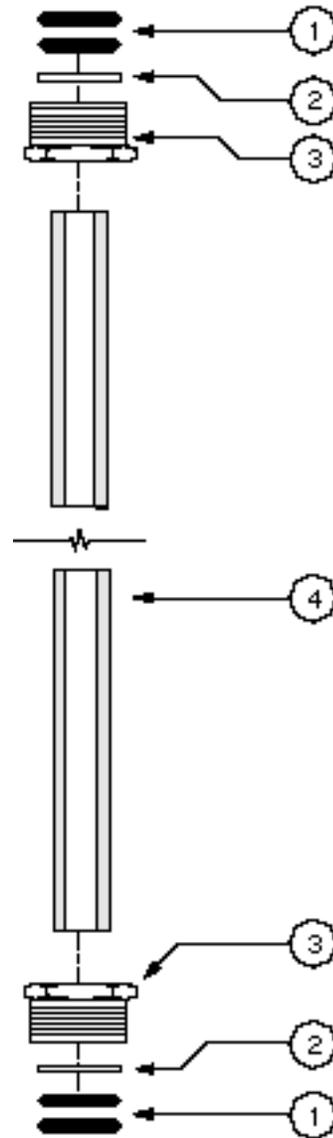
- 3230** Multi-Tube Indicator, Wall Mount
- 3240** Multi-Tube Indicator, Flush Mount
- 3250** Multi-Tube Indicator, Wall Mount
- 3260** Multi-Tube Indicator, Flush Mount

Parts List

Item	Part No.	Description	Qty.
1	6554-21	O-Ring	4
2	4029	Packing Washer	2
3	7515-4	Packing Nut	2
4	8113-x	Glass Tube	1

Specify Complete P/N to Order:

Indicator Range	Kit P/N
140"	5164-140
130"	5164-130
120"	5164-120
116"	5164-116
110"	5164-110
108"	5164-108
100"	5164-100
92"	5164-92
90"	5164-90
84"	5164-84
80"	5164-80
76"	5164-76
70"	5164-70
68"	5164-68
60"	5164-60
52"	5164-52
50"	5164-50
44"	5164-44
40"	5164-40
36"	5164-36
35"	5164-35
30"	5164-30
28"	5164-28
24"	5164-24
20"	5164-20
16"	5164-16
12"	5164-12
6"	5164-6



Indicator Fluids

Mercury 13.546 sp. gr.; scale factor = 0.074

Red Liquid 2.94 sp. gr.; scale factor = 0.337

Purple Liquid 1.75 sp. gr.; scale factor = 0.566

Ounces of Colored Liquid (amount required)

No. of Tubes	1	2	4	6	8	10
Range						
20	1.5 oz.	3.0	6.0	9.0	12.0	15.0
30	1.7 oz.	3.4	6.8	10.2	13.6	17.0
40	1.9 oz.	3.8	7.6	11.4	15.2	19.0
50	2.1 oz.	4.2	8.4	12.6	16.8	21.0
60	2.3 oz.	4.6	9.2	13.8	18.4	23.0
80	2.7 oz.	5.4	10.8	16.2	21.6	27.0

Pounds Instrument - Grade Mercury (amount required)

No. of Tubes	1	2	4	6	8	10
Range						
20	1.3 lb.	2.6	5.2	7.8	10.4	13.0
30	1.5 lb.	3.0	6.0	9.0	12.0	15.0
40	1.7 lb.	3.4	6.8	10.2	13.6	17.0
50	1.9 lb.	3.8	7.6	11.4	15.2	19.0
60	2.0 lb.	4.0	8.0	12.0	16.0	20.0
80	2.4 lb.	4.8	9.6	14.4	19.2	24.0

Indicator Scales

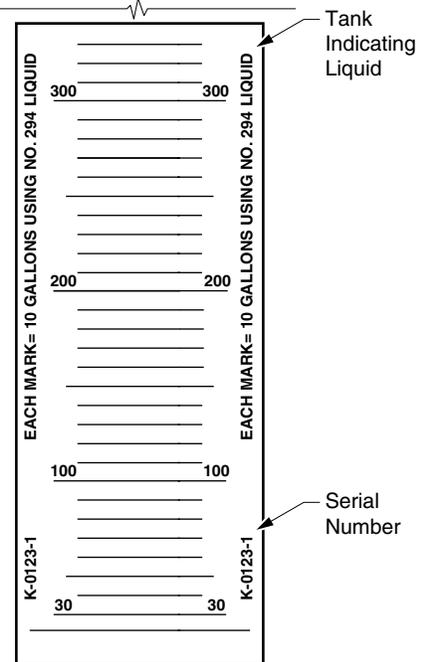
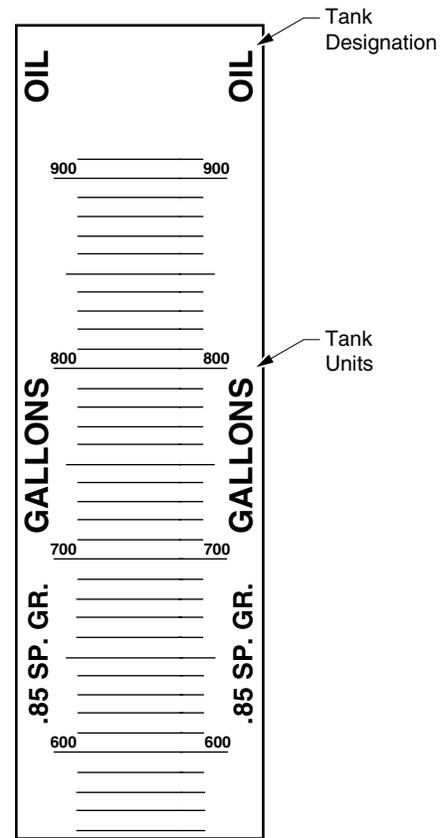
Each system scale is individually calibrated and custom marked in any specified unit of measurement (depth, total weight or volume). An optional 2nd scale unit can be included to combine different measurements such as depth and volume. Scales are manufactured for the individual tank geometry and specific gravity of tanks contents. Due to the factory calibrated scale, the Multi-Tube Tank Level Indicator can be used for almost any kind and shape of tank.

Scale markings include;

- Tank Designation
- Tank Units of Measure
- Product Density
- Tank Indicating Liquid
- Serial Number

Reference Documentation

- SP&D - 1010-12.00Service Parts & Dimensions, Model 3250 Multi-Tube Indicator
- SP&D - 1010-12.11Service Parts & Dimensions, Model 3260 Flush Mount Multi-Tube Indicator
- SP&D - 1010-13.00Service Parts & Dimensions, Model 3230 Wall Mount Multi-Tube Indicator
- SP&D - 1010-13.11Service Parts & Dimensions, Model 3240 Flush Mount Multi-Tube Indicator



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