

BAILEY METER COMPANY
WICKLIFFE, OHIO 44092

INSTRUCTION SECTION P31 4

TYPES LH13 AND LU13 PNEUMATIC LEVEL TRANSMITTERS

INDEX

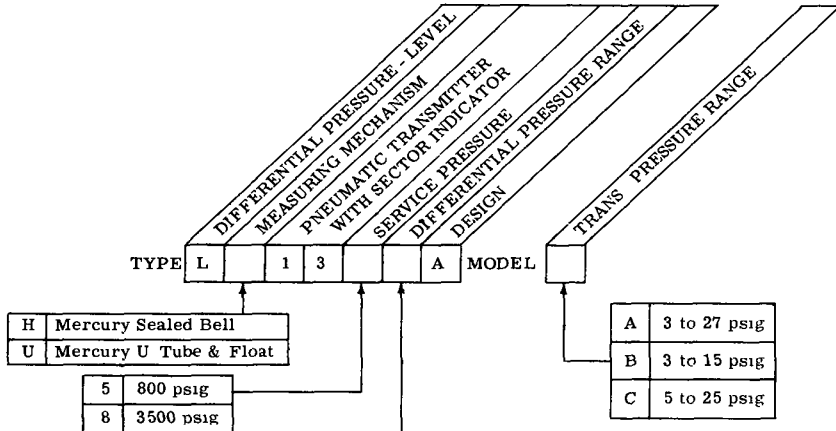
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The Pneumatic Level Transmitter receives motion through a spindle and linkage proportional to the differential pressure applied either to a mercury sealed bell (Type LH) or mercury U-tube (Type LU) level mechanism, and transforms this motion into a pneumatic pressure proportional to measured level. This Instruction Section covers only the indicating and transmitting mechanism. For instructions covering the level measuring mechanism, see "Cross-References" below.

CROSS REFERENCES

<u>Instrument or Equipment</u>	<u>Instruction Section</u>
Type LU Level Mechanism	M31-1
Type LH Level Mechanism	M31 3
Bailey Booster Unit	P99 3

EXPLANATION OF NOMENCLATURE



	Type	Minimum Range Span	Top Range Valve
1	LH	12	30
	LH	30	50
2	LU	15*	50*
	LU	20	50
3	LU	20	50
4	LU	50	100
5	LU	100	200
6	LU	200	400
7	LH	50	70

All values in inches of H₂O at 68F Range values indicate measuring limits Refer to Specification Sheet for actual range

*Type LU1352 has a reduced scale length (75% of standard length) It is used for scale spans between 15 and 20 inches H₂O

An "X" in any Nomenclature position indicates that the unit includes a special feature not covered by Nomenclature

INSTALLATION

Mounting

1 Mount Transmitter as shown in Figure 1 or 2 Wall mounting brackets are furnished with each Transmitter Note the amount of clearance required above pressure casing for removal of bell mechanism of Type LH13 Transmitter Locate Transmitter as close as possible to point of measurement, but where ambient temperature does not exceed 140F

2 After mounting, level unit at machined surface of level mechanism pressure casing Level instrument from left to right and from front to back before fastening securely

Connecting Piping

3. For details covering typical level measurement installations and connecting piping requirements, refer to Instruction Section on level mechanism (see "Cross References" on page 1)

Pneumatic Tubing

4. Make tubing connections to air supply and air loading connections at Transmitter (1/8 inch NPT). For instructions on installation and maintenance of pneumatic tubing, see Instruction Section G18 2.

Supply Pressure

5. Connect Transmitter to source of clean, dry air supply. Supply pressures required are listed below. If loading pressure range is special, supply pressure must be at least 3 psi greater than the top range value.

Loading Pressure Range	Supply Pressure
3 to 27 psig	30 psig
3 to 15 psig	18 psig
5 to 25 psig	28 psig

PREPARATION FOR SERVICE

To prepare the instrument for service and to place the Transmitter in operation, refer to "Preparation for Service" in the Instruction Section covering the level mechanism (see "Cross References" on page 1). Before placing the Transmitter in service, however, check the calibration as outlined below.

ADJUSTMENT AND CALIBRATION

The Pneumatic Transmitter was factory calibrated by applying differential pressures across the level mechanism equal to various points of the measured range and adjusting the Transmitter linkage to obtain correct Transmitter indicating pointer and output loading pressure readings. Correct differential heads used in factory calibration of the Transmitter are listed on the Specification Sheet in the front of this Instruction Book. Before placing instrument in service, check the calibration to determine that indicating pointer and output loading pressure readings correspond to the scale readings shown on the Specification Sheet when applicable differential heads are applied.

Calibration Testing Outfit

To check the calibration, a testing outfit similar to one of the types shown in Figure 3 should be used. Style A illustrates a portable testing outfit used by Bailey Meter Company service engineers. Style B shows a testing outfit which can be set up readily from parts obtainable in a plant stock room. To use the Style A calibration outfit:

1. For a Type LU13 Transmitter, put cover gasket in place on top of pressure casing and bolt on reservoir dam as shown in Figure 3. (Reservoir dam is not required for calibration of Type LH13 Transmitter.) Assemble rest of calibration outfit as illustrated.

2. With equalizing valve open, slowly pour water into Lucite cylinder H until reservoir dam is at least half full. Open petcock and squeeze rubber tubing to let out any trapped air. Raise or lower cylinder H several times, opening petcock each time cylinder is raised. (Water running from petcock removes any trapped air bubbles. Tapping pipe will also help air to escape.)

3 With equalizing valve still open and cylinder H attached to lower end of extension rod, allow water levels in cylinder and reservoir dam (or pressure casing for Type LH13 to equalize. With levels equal, float should be resting on bottom stop (its zero position)

4 Close equalizing valve and keep it closed during calibration test unless advised otherwise

5 In checking calibration, always observe the following

a. Add water to cylinder H whenever it is to be raised so that water level never goes below bottom of cylinder (This prevents air from getting into tubing)

b. Calibrating heads are applied to Transmitter by raising or lowering cylinder H to the required scale height. Before taking any differential head reading, adjust scale so that point of hook gage just touches surface of water in reservoir dam (Type LU13) or pressure casing (Type LH13)

To use the Style B testing outfit

1 Assemble calibration outfit as illustrated in Figure 3. The glass tubes may be mounted on a board. With equalizing valve and petcock on H side open, pour clean water into glass tube on L side until water comes out open petcock

2 Close petcock and tap H pipe lightly while pouring in more water on L side. Allow water levels in H and L to equalize. (Squeeze rubber tube connections to help remove trapped air)

3 Close equalizing valve. Pour water into glass tube on H side to apply calibrating heads to the instrument as required in the calibration check outlined below

Black Level Pointer

1 Apply head to level mechanism equal to maximum level listed on Specification Sheet. This is the initial head

NOTE: Most Level Transmitters are calibrated so that differential at maximum level reading is greater than zero because of the temperature difference in the two legs of connecting piping at boiler drum. The first differential head reading, therefore, should be taken at the point corresponding to highest level shown on Specification Sheet. Transmitter indicating pointer motion should not begin until after this head has been applied to instrument. If pointer moves at applied head greater than initial head, add mercury to instrument, if pointer moves at applied head less than initial head, remove mercury from instrument.

If black pointer does not indicate maximum scale with initial head applied to level mechanism, set pointer at maximum scale with pointer zero adjustment (Figure 6).

2 Apply midrange and maximum range values of differential head to level mechanism. If black pointer does not read midscale and minimum scale respectively, proceed to step 3. If readings are correct, check calibration of "Output Loading Pressure" below

3 Apply maximum differential to level mechanism. Black pointer should indicate minimum scale reading. If not, loosen two screws on range arm (Figure 6) and decrease range by moving range arm to left, or increase range by moving range arm to right

4 Repeat steps 1 thru 3 above until correct maximum and minimum scale readings are obtained

5 Apply midrange differential to level mechanism. Black pointer should indicate midrange scale reading. If not, check alignment as follows (refer to Figure 5)

a. Line A should be parallel to line B

b. Connecting link should form a 90 degree angle with line A and line B

c Adjust range arm, range arm sector, and connecting link, until above relationships exist

6 Repeat steps 1 thru 5 until correct scale readings are obtained when minimum, midrange, and maximum range differential heads are applied to the level mechanism

Output Loading Pressure

The loading pressures referred to in the following procedure are based on a 3 to 27 psig control loading pressure range. If the loading pressure range is other than 3 to 27 psig, substitute the corresponding values of loading pressure for the range desired. (See Table 1 for conversion values.)

1. Connect suitable test gage to output loading pressure connection of Transmitter. If Transmitter is being bench tested, avoid pulsations in loading pressure by inserting a volume chamber or 30 feet of 1/4-inch copper tubing in loading pressure line between Transmitter and test gage.

2. Disconnect connecting link from range arm (Figure 4) so that black pointer may be moved freely by hand.

3. Set black pointer at midrange level on scale. Output loading pressure should read 15 psig. If not, adjust vane-pointer alignment screw (Figure 6) to position transmitting unit range arm so that left end of connecting wire is on extended centerline of black pointer. Reset pneumatic output to midrange value by adjusting spring tension adjustment (Figure 4).

4. Set black level pointer for maximum and minimum level, and note loading pressure gage readings. Gage should read maximum and minimum range values respectively (27 and 3 psig for a 3 to 27 psig range). If not, adjust as required below.

a. If loading pressure output though in error- is linear (i.e., loading pressure range evenly divided on both sides of 15 psig):

(1) decrease range by turning transmitting unit range adjustment (Figure 4) counterclockwise, or

(2) increase range by turning transmitting unit range adjustment clockwise.

b. If loading pressure output is not linear (i.e., loading pressure range not equally divided on both sides of 15 psig), turn vane-pointer alignment screw to decrease error.

5. Repeat steps 3 thru 4 until correct loading pressure readings are obtained at maximum, minimum, and midrange scale values.

6. If above steps give correct loading pressure readings, check calibration of "Red Loading Pressure Pointer". If correct readings cannot be obtained, proceed to step 7 below.

7. With black pointer at midrange scale, make the following checks:

a. Check that nozzle is perpendicular to vane. If not, loosen nozzle clamp screw (Figure 4), and adjust nozzle position until vane is vertical.

b. Vane (front) drive arm should be parallel to centerline of black pointer and at 90 degree angle with the connecting wire (Figure 6). If not, adjust vane pointer alignment screw and vane adjustable arm until the above relationship exists.

8. Repeat steps 2 thru 7 until correct minimum, midrange, and maximum range loading pressure readings are obtained.

TABLE 1 - Per Cent Scale Reading Vs Output Loading Pressure for Standard Pressure Ranges

Percent Chart or Scale	Model A 3-27 PSIG	Model B 3 15 PSIG	Model C 5-25 PSIG
0	3 0	3 0	5 0
10	5 4	4 2	7 0
20	7 8	5 4	9 0
30	10 2	6 6	11 0
40	12 6	7 8	13 0
50	15 0	9 0	15 0
60	17 4	10 2	17 0
70	19 8	11 4	19 0
80	22 2	12 6	21 0
90	24 6	13 8	23 0
100	27 0	15 0	25 0

Red Loading Pressure Pointer

The red loading pressure pointer should give the same scale readings as the black level pointer at all times when the black pointer and transmitting unit are in correct calibration. Thus, the red pointer indicates that the output loading pressure is correct for the measured level if both the black and red pointers read the same.

- 1 Set black pointer at maximum scale (minimum differential head) and turn nozzle pointer alignment screw (Figure 6) so that red pointer indicates maximum scale.
- 2 Set black pointer at minimum scale (maximum differential head), and note red pointer reading. If red pointer reading is not correct, turn loading pressure range adjustment (Figure 6) clockwise to increase readings, or counterclockwise to decrease reading.
- 3 Repeat steps 1 and 2 until red pointer is opposite black pointer at maximum and minimum scale values.
- 4 If correct minimum, midrange and maximum range values of red pointer, black pointer, and output loading pressure are obtained, reconnect connecting link and place Transmitter in service. If red pointer readings are not correct, proceed to step 5 below.
- 5 With black pointer at midrange scale, make sure that nozzle (rear) drive arm is parallel to vane (front) drive arm and to centerline of black pointer (Figure 6). If not, adjust nozzle adjustable arm until above relationship exists.
6. Repeat steps 1 thru 5 until correct readings are obtained over full scale.

ROUTINE MAINTENANCE

- 1 Keep Transmitter clean. Deposits of oil and dirt make operation of instrument sluggish and inaccurate.
- 2 Keep air supply to Transmitter free of dirt, oil, and moisture.
- 3 Make following monthly checks:
 - a Push orifice clean out plunger, on Booster Unit to keep orifice open and clean.
 - b Inspect nozzle tip and vane. Remove any dirt or oil deposits. If necessary, clean with a common solvent.

c. Inspect Booster unit exhaust valve. If an accumulation of oil, dirt, or moisture is found, replace filter in the supply pressure port as outlined in Instruction Section P99-3 and check quality of instrument air supply

CORRECTIVE MAINTENANCE

1. Damaged parts. If any parts or linkage become damaged, bent, or broken, repair or replace these parts. Recheck the instrument calibration after repair or replacement of any parts which affect the calibration.

2. Calibration out of adjustment. Readjust as outlined on page 3.

3. Booster Unit. See Instruction Section P99 3.

REPLACEMENT PARTS

Parts drawings of the indicating and transmitting mechanism for Type LH13 and Type LU13 Pneumatic Level Transmitters are shown in Figures 7 and 8. (Parts drawings for the Type LH13 or Type LU13 level measuring mechanism are shown in Instruction Section M31-3 or Instruction Section M31-1 respectively. A parts drawing of the Booster Unit is shown in Instruction Section P99-3.)

These parts drawings are generally applicable to the assemblies illustrated. However, there may be individual differences in particular instruments because of:

a. Design changes made since the printing of this Instruction Section

b. Special design of the equipment furnished, to make it suitable for a special application

Therefore, when ordering parts, assure receipt of correct replacements for the equipment by specifying

1. Type, Model, and Serial Number of equipment for which parts are desired.

2. The Parts Drawing on which each part is illustrated. The Parts Drawing Number is given in the title for the Figure.

TYPE	STANDARD DIFFERENTIAL PRESSURE	D.M.A.
LH 38	30 H ₂ O	3 3/8
LH 382	50 H ₂ O	3 3/8
LH 387	70 H ₂ O	4 3/8

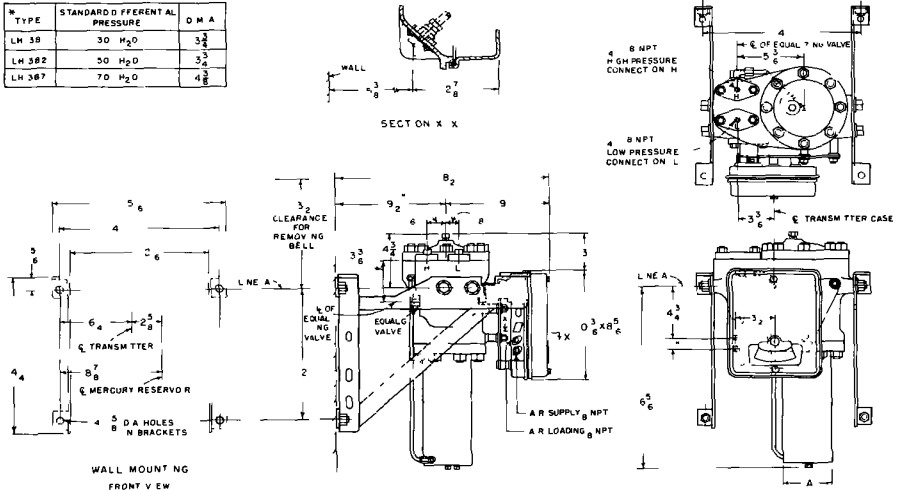


FIGURE 1 - Mounting Dimensions, Type LH138□A Level Transmitter

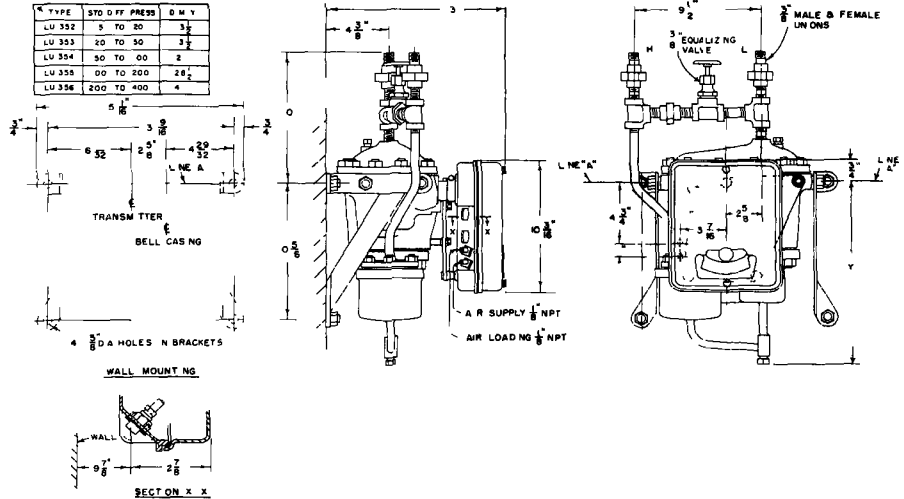


FIGURE 2 - Mounting Dimensions, Type LU135□A Level Transmitter

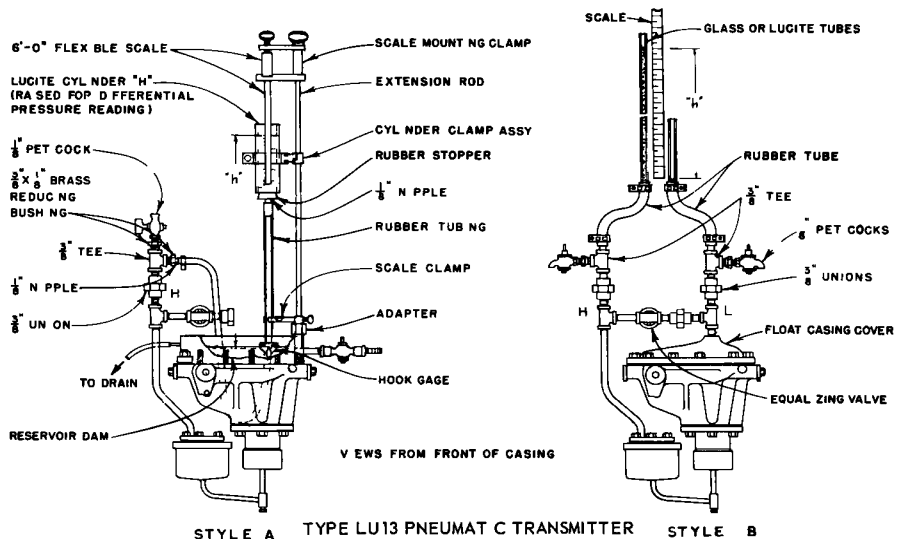
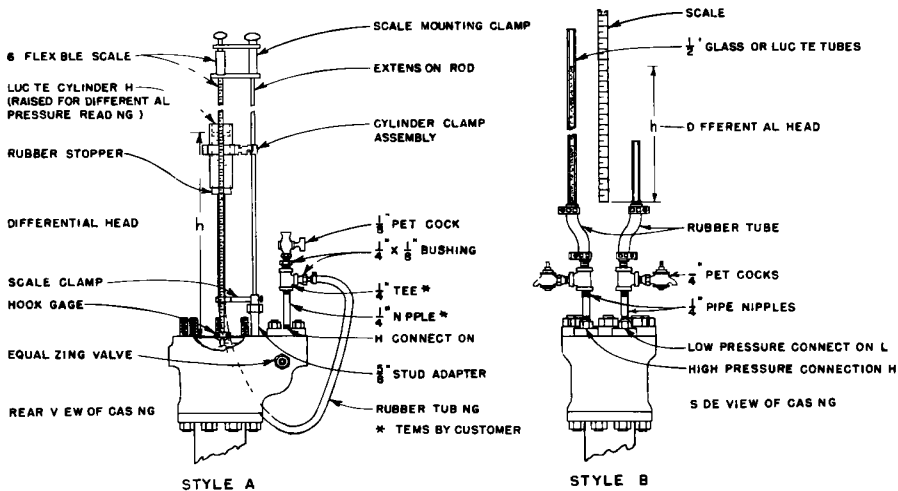


FIGURE 3 - Calibration Testing Outfits

Style A Outfit may be purchased from Bailey Meter Co., Pt. No. 198207-1. (For maximum differentials up to 120" H₂O only.) Style B Outfit can be built by customer.

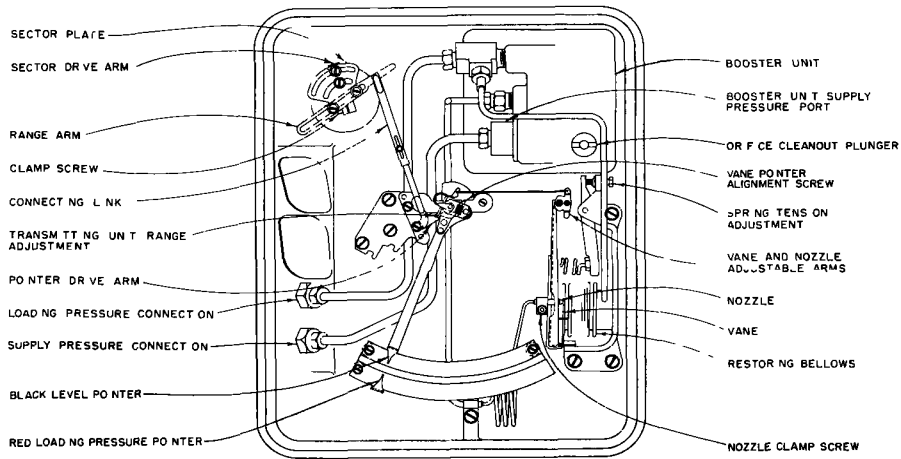


FIGURE 4 - Indicating and Level Transmitting Mechanism

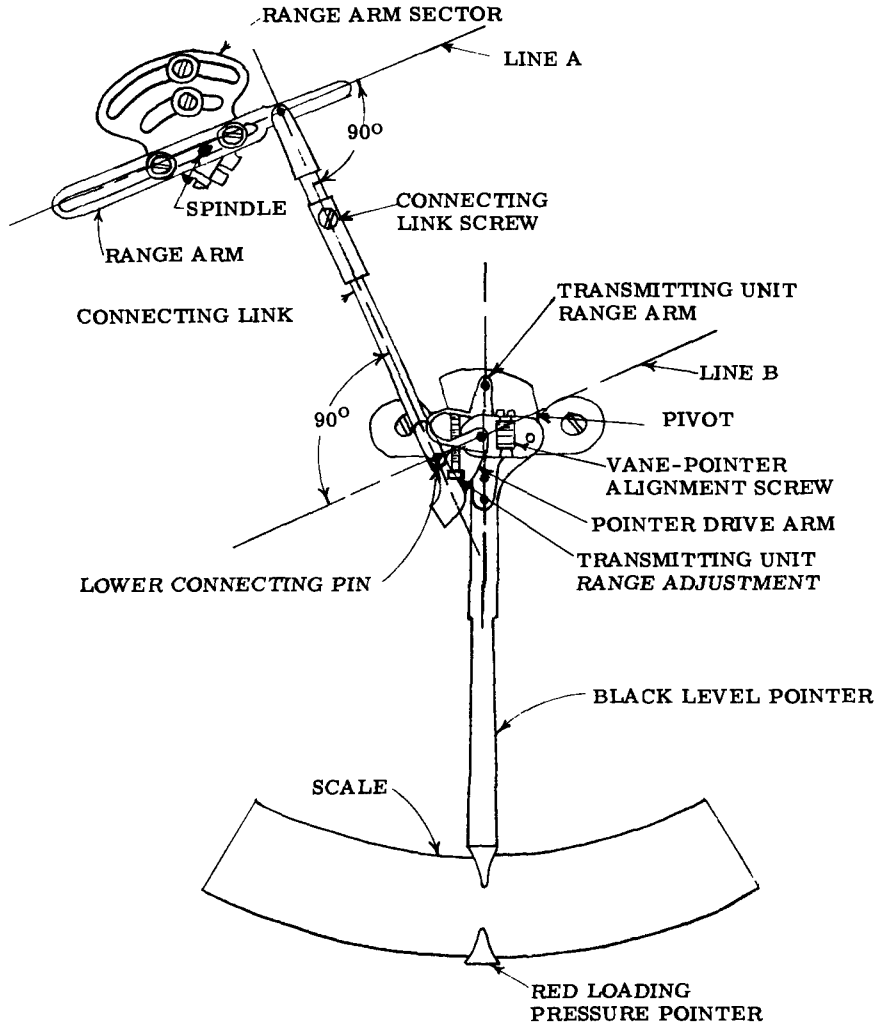


FIGURE 5 - Spindle-Level Pointer Linkage at 50% Scale

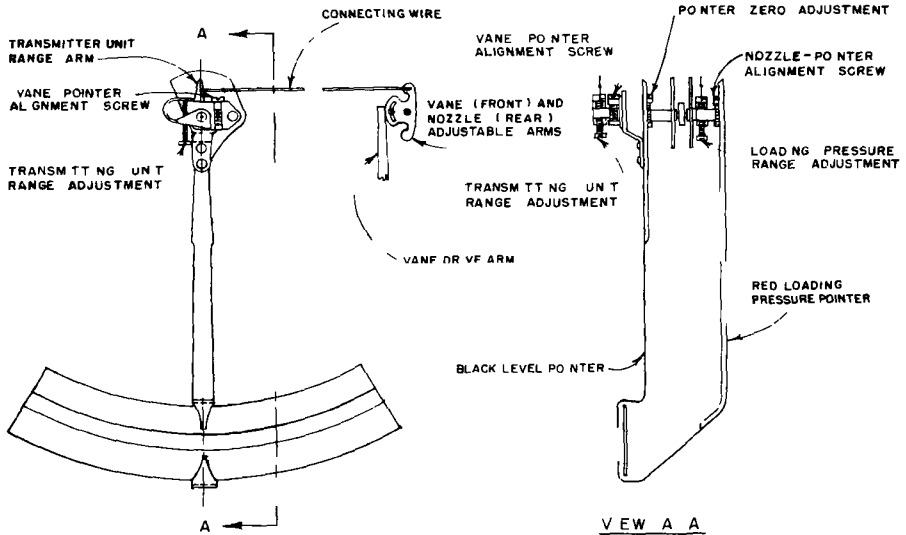
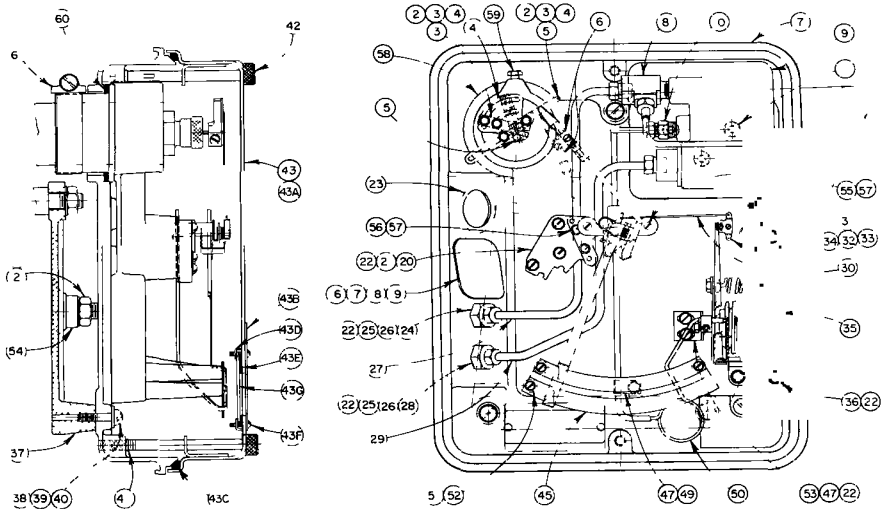


FIGURE 6 - Pointer Mechanism Adjustments



L S T O F P A R T S											
TEM NO	PART NO	N A M E	QTY	TEM NO	PART NO	N A M E	QTY	TEM NO	PART NO	N A M E	QTY
	3/8 6	JAM NUT	3 REQ	26	6 32	HEX NUT	4 REQ				
2	3/8	NT TOOTH LOCKW	3 REQ	27	68 846	LOAD NG A R L N E					
3	68 6	DR VE ARM		28	53 76 2 28	SUPPLY CONNECTOR					
4	68 7	SECTOR PLATE		29	68 845	SUPPLY A R L N E					
5	68 8	ADJUSTABLE ARM		30	68 842	L N K		45	SEE TABLE	SCALE	
6	SEE TABLE	L N K ASSEMBLY		31	49 26	SCREW	4 REQ	47	6 32 X 1/4	RD HD NT SEMS	3 REQ
7	68 806 3	HOUS NG		32	68 507	WASHER	4 REQ				
8	95 7 4	TEE		33	68 825	SPECIAL NUT					
9	SEE TABLE 2	BOOSTER UN T		34	68 822	ADJUSTABLE ARM	2 REQ	49	68 839	CAP LLARY CL P	
0	95 05 4 5	MALE CONNECTOR		35	SEE TABLE 2	BELLOWS & VANE MECH		50	68 66	NOZZLE A R L N E	
1	0 32 X 1/2	HEX HD EXT SEMS	3 REQ	36	6 32 X 3/8	MU HU SCREW	3 REQ	51	3 48 X 1/8	RD HD SCREW	3 REQ
2	2 56 X 1/8	RD HD SCREW	4 REQ	37	66 720 1	SUPPORT BRACKET		52	NO 3	NT TOOTH LOCKW	3 REQ
3	NO 2 MED	LOCKWASHER	4 REQ	38	0 32 X	RD HD SCREW	3 REQ	53	68 84	OVERTRAVEL STOP	
4	97 34	WASHER	4 REQ	39	NO 0	NT TOOTH LOCKW	3 REQ	54	99 34 20	SPACER	
5	6 32 X 5/6	FL HD SCREW		40	NO 0 MED	WASHER	3 REQ	55	4 40X 3/8	RD HD SCREW	
6	68 022	COVER PLATE		41	98 73 6	RETAN NG R NG	2 REQ	56	4 40X 4	RD HD SCREW	
7	8 32 X 5/6	RD HD SCREW	2 REQ	42	53 409 2	COVER SCREW	2 REQ	57	NO 4 MED	LOCKWASHER	
8	NO 8	NT TOOTH LOCKW	2 REQ	43	68 854	COVER ASSY NCLUDES		58	68 654	MECHAN SM SUPPORT BRKT	
9	8 32	HEX NUT STL	2 REQ	43A	68 855	COVER		59	66 6969	LOCAT NG SCREW	
20	SEE TABLE	PO NTER MECH ASSY		43B	96 778	STYL NG PLATE		60	66 6968	GASKET	
21	6 32 X 1/2	RD HD SCREW	3 REQ	43C	53 6543	SEAL NG STR P		6	97 234	HOSE CLAMP	
22	NO 6	EXT TOOTH LOCKW	REQ	43D	5 84 3	CLAMP	2 REQ				
23	99 8 6	PLUG BUTTON		43E	68 522	GASKET					
24	53 76 2 27	LOAD NG CONNECTOR		43F	NO 2 X 3/8	TYPE Z SELF TAP SCR	4 REQ				
25	6 32 X 5/6	RD HD SCREW	4 REQ	43G	68 69	W N DOW					

TABLE NO 1			
TRANSM TTER TYPE	TEM NO 6 L N K ASSY	TEM NO 20 PO NTER MECHAN SM ASSY	TEM NO 45 SCALE
LH 3 LU 3	66 6957 0 *	68 116 1	SEE SPECIFICAT ON SHEET N NSTRCT ON BOOK

* SPEC FY TYPE, RANGE AND SERIAL NUMBER OF TRANSM TTER

TABLE NO 2			
TRANSM TTER MODEL	RANGE	TEM NO 9 BOOSTER UN T **	TEM NO 35 BELLOWS AND VANE MECHAN SM (SEE PTS DWG P99 57)
A	3 27 PS G	53 6500	68 8 3
B	3 5 PS G	53 6500 2	68 8 3 2

** SEE PARTS DRAW NG P99 56 N NSTRCT ON SECT ON P99 3

FIGURE 7 - Parts Drawing P99-59, Type LH13 and LU13 Level Transmitter Mechanism



