

Bailey**SECTION
M31-1****TYPE LU LEVEL MECHANISM****INDEX**

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This instruction section covers the measuring component of a Bailey Type LU Recorder, Indicator, or Transmitter. The mechanism consists of a mercury reservoir and float chamber assembly containing a float in the low pressure side. The instrument measures the difference between a constant reference pressure and a variable pressure corresponding to the actual level within the drum or tank. The two pressures are balanced across the mercury reservoir and float chamber assembly so that the difference in mercury level and resulting float rise are proportional to the pressure differential and to liquid level in the drum or tank. Motion of the float is transmitted by a spindle and connecting linkage to the recording, indicating, or transmitting mechanism (see "Cross References" below).

CROSS REFERENCES

<u>Instrument or Equipment</u>	<u>Instruction Section</u>
Instrument Connecting Piping	G18-1
Bailey Recorders and Indicators	M11 1
Type LU12 Electric Transmitter	
Model K or P (AC Voltage Output)	E31-1
Model VA (DC Voltage Output)	E31-6
Type LU13 Pneumatic Transmitter	P31 4

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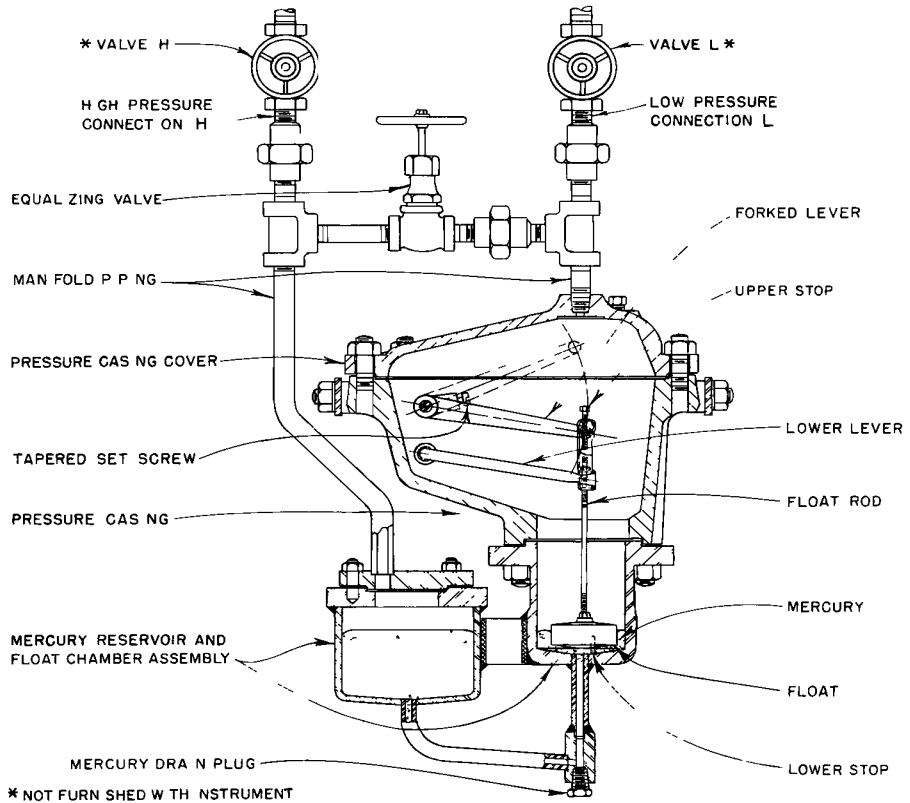


FIGURE 1 Type LU Level Mechanism

PREPARATION FOR SERVICE

1. Install instrument as outlined under "Installation" in instruction section covering Recorder, Indicator, or Transmitter (see "Cross References" on page 1)

2. Make piping connections from boiler drum, tank, or heater to instrument as described in Instruction Section G18-1 "Instrument Connecting Piping".

3. Remove strings, blocking, and packing from inside pressure casing. Handle all moving parts with care to prevent damage and misalignment

4. To clear pressure casing passages (Figure 1), remove mercury drain plug and blow compressed air thru lower passages. Replace plug and tighten securely.

5. Mercury to operate level mechanism is shipped in a plastic container. Carefully pour mercury into pressure casing. Do not spill mercury during this operation.

6. For a Type LU Recorder or Indicator see "Preparation for Service" in Instruction Section M11-1.

7. Check instrument calibration. (For Type LU Recorder or Indicator, see page 4. For an Electric or Pneumatic Transmitter, refer to applicable Instruction Section listed under "Cross References" page 1).

8. Close pressure casing as follows.

a. Fill casing with water

b. Position cover gasket in recess of pressure casing (Figure 1).

c. Place cover on casing and assemble cover nuts. Tighten nuts to 25 30 ft lb torque

d. Remove plug from top of pressure casing cover. Pour water thru plug hole until pressure casing is completely filled with water. Replace plug, tighten securely.

e. Open equalizing valve. Pour water thru H and L connections until both pipes are filled with water

9. Place instrument in service as outlined under "Operation".

OPERATION

Starting Instrument

1. If instrument was removed from service temporarily without disconnecting or draining piping (equalized and isolated), return it to service as follows.

a. Open equalizing valve (Figure 1)

b. Slowly open instrument valve L and close equalizing valve.

c. Slowly open instrument valve H. Instrument should respond immediately when valve H is opened.

2. If instrument is being placed in service for the first time or following a period of time in which the process was shut down, proceed as follows

a. Blow down connecting piping as outlined in Instruction Section G18 1.

b. Open equalizing valve and connect unions below instrument valves H and L and tight

c. Loosen union at H slightly. Crack valve H and allow water to bleed thru union until water flows smoothly and free of bubbles. Tighten union and close valve H. Repeat this operation on L side of instrument.

d. Slowly open valve L and close equalizing valve. Slowly open valve H. Instrument should respond immediately.

3. For a Type LU12 Electric Transmitter, energize electrical circuit. For a Type LU13 Pneumatic Transmitter, turn on air supply to unit.

4. Check for leakage as outlined under "Inspecting for Leakage" below

Inspecting for Leakage

1. Check for leakage at pressure casing joints. If leakage exists, remove instrument from service (page 4) and check gasket for damage or incorrect installation, replace if

defective. To return instrument to service, perform steps 8 and 9 under "Preparation for Service".

2. Inspect front pressure tight bearing for leakage. Refer to "Corrective Maintenance", page 6

3. Inspect connecting piping installation for leakage. Tighten or repair piping as necessary.

Removing from Service

1. To remove instrument from service, close valves H and L and immediately open equalizing valve (Figure 1).

2. To return instrument to service, follow instructions under "Starting Instrument" above.

ADJUSTMENT AND CALIBRATION

The following procedure pertains to calibration of Type LU Recorders and Indicators only. For Type LU Electric or Pneumatic Transmitters, refer to "Adjustment and Calibration", in applicable Instruction Section (see "Cross References" page 1).

The Type LU Recorder and Indicator is factory calibrated under predetermined operating conditions for a specific installation by establishing correct pen or pointer readings for water column differentials applied over a given range. Before placing the instrument in service, however, check adjustments as outlined below (If instrument operating conditions, i.e., distance between drum connections, range, pressure, etc., are to be changed, consult Bailey Meter Company for recalibration procedures.)

NOTE If instrument has been in service, remove it from service and clean it thoroughly (see "Service Outline", page 7) before checking calibration

Use of Style A Calibration Outfit.

1. Assemble calibration outfit as shown in Figure 2. (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 flows from petcock.

2. Close petcock and allow water levels in H and L to equalize (squeeze rubber tubing to remove trapped air)

3. Close equalizing valve. Slowly pour water into glass tube on H side. Take calibration readings as described below

Use of Style B Calibration Outfit.

1. Position cover gasket on top of pressure casing then bolt on reservoir dam and assemble outfit as shown in Figure 2

2. With equalizing valve open, slowly pour water into cylinder H until reservoir dam is half full. Open petcock and squeeze rubber tubing to remove trapped air. Raise and lower cylinder H

several times, opening petcock to release trapped air each time cylinder is above petcock.

3. With cylinder H at lower end of extension rod, allow water levels in cylinder and reservoir dam to equalize. With levels equal, float should rest on bottom stop and pen or pointer should read maximum chart or scale (its zero position). If not, reset pen or pointer zero (at maximum chart or scale). Refer to "Preparation for Service" in Instruction Section M11.1. Then close equalizing valve

4. When checking calibration, always observe the following.

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

b. Before taking any differential head reading, adjust scale so point of hook gage just touches surface of water in pressure casing

Calibration Procedure

The following assumes the use of the Style B calibration outfit described above

1. Refer to Specification Sheet in front of this Instruction Book for instrument differential pressure range

2. Raise cylinder H to minimum differential shown on Specification Sheet. This is the initial head. Pen or pointer should read maximum chart or scale with initial head applied and should begin to move as soon as initial head is exceeded. If not, vary amount of mercury in pressure casing (with an eyedropper) until both conditions are satisfied

3. Raise cylinder H to one of the differential heads given on Specification Sheet and note chart or scale reading. Raise cylinder a few inches then return to same differential head and note reading. Repeat this operation at three additional points over the measured range. Average chart or scale reading should be within the limits noted below. If not, refer to step 4

Type LU Level Mechanism

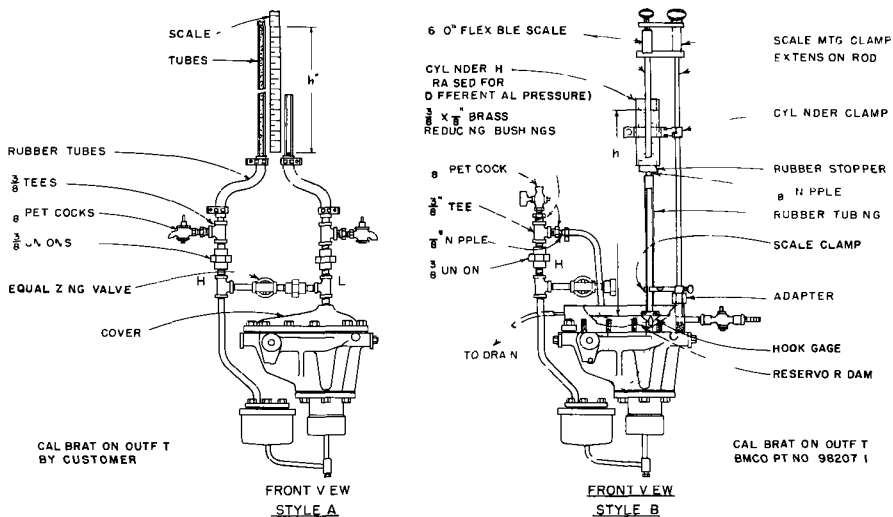


FIGURE 2 Typical Calibration Outfits

NOTE Readings taken with pen or pointer coming up to a differential head or scale reading will be slightly less than readings taken coming down to the same head. When calibrating the instrument, therefore, use the average of these two readings. Average readings should not differ from the correct value by more than 1% of chart or scale span. If the difference between up and down readings is greater than 1% of chart or scale span, check for excessive friction in mechanism (see step 5 under "Service Outline")

4. If average readings (step 3) are incorrect, adjust as follows:

a. Apply maximum differential head. If average reading is low, increase pointer travel by loosening clamp screw holding drive arm slider assembly (Figure 3) and move assembly slightly to the left, if average reading is high, decrease pointer travel by moving assembly slightly to the right. Move the slider only enough to decrease the error by one-half. Retighten clamp screw.

b. Apply minimum differential head (see step 2). If pen or pointer does not read maximum chart or scale, loosen two clamp screws and reset pen or pointer. Repeat steps 4a and 4b

until correct minimum and maximum chart or scale readings are obtained.

c. Apply 50% differential head. If average reading is incorrect, lengthen or shorten drive link slightly until pen or pointer reads 50% chart or scale. Move drive link only enough to decrease the error by one-half.

d. Repeat step 4 until average readings are correct at minimum, maximum, and 50% chart or scale. Then repeat steps 3 and 4 until correct average readings are obtained.

5. Perform steps 8 and 9 under "Preparation for Service".

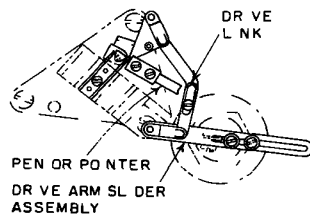


FIGURE 3 Recorder and Indicator Linkage Adjustments

ROUTINE MAINTENANCE

1 Thoroughly clean and flush pressure casing once a year Refer to "Service Outline", page 7

2. Periodically check for leakage at connecting piping joints (If connecting piping becomes hot, piping or equalizing valve may have sprung a leak. Immediately remove instrument from service for repair Refer to Instruction Section G18-1 for connecting piping specification.)

3. Periodically blow down connecting piping to prevent plugging with dirt, scale, or sediment. If connecting piping tends to collect considerable dirt, install settling chambers (see Instruction Section G18-1).

4 Do not oil moving parts Oil, instead of being beneficial, causes dirt to accumulate and interfere with operation

CORRECTIVE MAINTENANCE

For corrective maintenance procedures for Recorder, Indicator, or Transmitter, refer to applicable instruction section under "Cross References" page 1

Front Pressure Tight Bearing

If front pressure tight bearing (Figure 4) shows evidence of leakage, tighten bearing cap to finger tightness. If leakage continues, replace washer and follower assembly as follows.

1. Close instrument valves H and L and open equalizing valve (Figure 1)

2 When pen or pointer reaches maximum chart or scale (minimum differential), loosen drive arm set screw and pull drive arm from spindle Carefully remove drive arm (do not bend or scratch spindle)

3 Remove bearing cap and washer and follower assembly

4. Place new washer and follower assembly on spindle Reassemble bearing cap, tighten to finger tightness

5 Assemble drive arm to spindle and tighten set screw. Make certain pen or pointer reads maximum chart or scale (minimum differential)

6. To return instrument to service, refer to "Operation", page 3

Pen or Pointer Fails to Go to Maximum Chart or Scale

1. Close valves H and L Open equalizing valve

2. Pen or pointer should go to maximum chart or scale reading. If not, clean thoroughly as outlined under "Service Outline" and check calibration

Instrument Does Not Check Gage Glass or Other Known Standard

NOTE: Bailey Type LU Level Mechanisms are calibrated to show drum water level if the water temperature in the glass or lower piping is below the saturation point, the instrument may not check gage glass reading and the glass gage will indicate a level lower than true level

1 Check level mechanism and recording indicating, or transmitting component for friction

2 For a recorder, make certain correct chart is used.

3. Check pointer or pen zero (see "Pen or Pointer Fails to Go to Maximum Chart or Scale")

4 Inspect level mechanism, connecting piping, and connections at drum or tank in stallation for leakage

5. Check instrument calibration as outlined under "Adjustment and Calibration"

Replacing Spindle

If spindle becomes bent or scratched, replace as follows

1 Remove instrument from service and remove pressure casing cover (see "Service Outline", page 7).

2. Disconnect drive arm linkage. Remove drive arm, front pressure tight bearing cap, and washer and follower assembly (Figure 4).

3. Remove rear thrust bearing cap (Figure 4). Loosen recessed head screws in spindle hub clamps and pull thrust bearing off spindle.

4. Remove tapered set screw from forked lever (Figure 5). Remove front pressure tight bearing body. Hold forked lever in one hand and work spindle out thru front pressure casing.

5. Insert rounded end of new spindle thru pressure casing arm and forked lever into rear bearing. (Do not bend or scratch front bearing surface.) Replace front pressure tight bearing body and washer and follower assembly. Align tapered hole in middle of spindle with hole in forked lever and insert tapered set screw.

6. When reassembling rear thrust bearing to new spindle, push spindle toward rear thrust bearing so spindle does not rub against front pressure tight bearing body. Tighten spindle hub clamps in position which will allow full travel of forked lever. To check travel, lift forked lever to maximum position.

7. Attach drive arm and linkage. Make certain pen or pointer is at correct maximum scale position.

Service Outline

Thoroughly clean instrument once a year as outlined below.

1. Remove instrument from service (see page 4). Remove plug from pressure casing.

cover then remove cover and gasket from casing.

2. Siphon water from pressure casing to 1/4-inch above mercury level. Do not draw out mercury with water.

3. Remove mercury drain plug (Figure 1). Drain mercury into glass or earthen container (or other material which will not amalgamate with mercury).

4. Thoroughly flush casing. With brush and scouring powder, remove grease, dirt, or sediment from float and pressure casing walls. Wipe with clean cloth.

5. Move forked lever up and down. If excessive friction exists from front pressure tight bearing, replace bearing washer and follower assembly as outlined on page 6. Check mechanism for friction.

6. Install mercury drain plug. Pour mercury into casing. Avoid spilling mercury during this operation.

7. Check instrument calibration. For Type LU Recorder or Indicator, refer to "Adjustment and Calibration" in this instruction section. For Type LU Electric or Pneumatic Transmitter, refer to applicable instruction section (see Cross References on page 1).

8. Follow steps 8 and 9 under "Preparation for Service" to return instrument to service.

REPLACEMENT PARTS

Spare Parts Kits

The Spare Parts Kits shown in Figure 5 should be carried in stock. Specify the Spare Parts Kit part number to order a complete kit.

Ordering Individual Parts

Figures 4 and 5 are Parts Drawings of the Type LU Level Mechanism. Normally, these drawings will apply to the units furnished. However, there may be individual differences in specific units because of

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

b. Special design of equipment furnished to make it suitable for a specific application.

Therefore, when ordering parts, assure receipt of correct replacements by specifying on the order

1. Complete Nomenclature and Serial Number (stamped on instrument nameplate) or equipment for which parts are desired.

2. The Parts Drawing on which each part is illustrated (The Parts Drawing Number is given in the Figure Caption.)

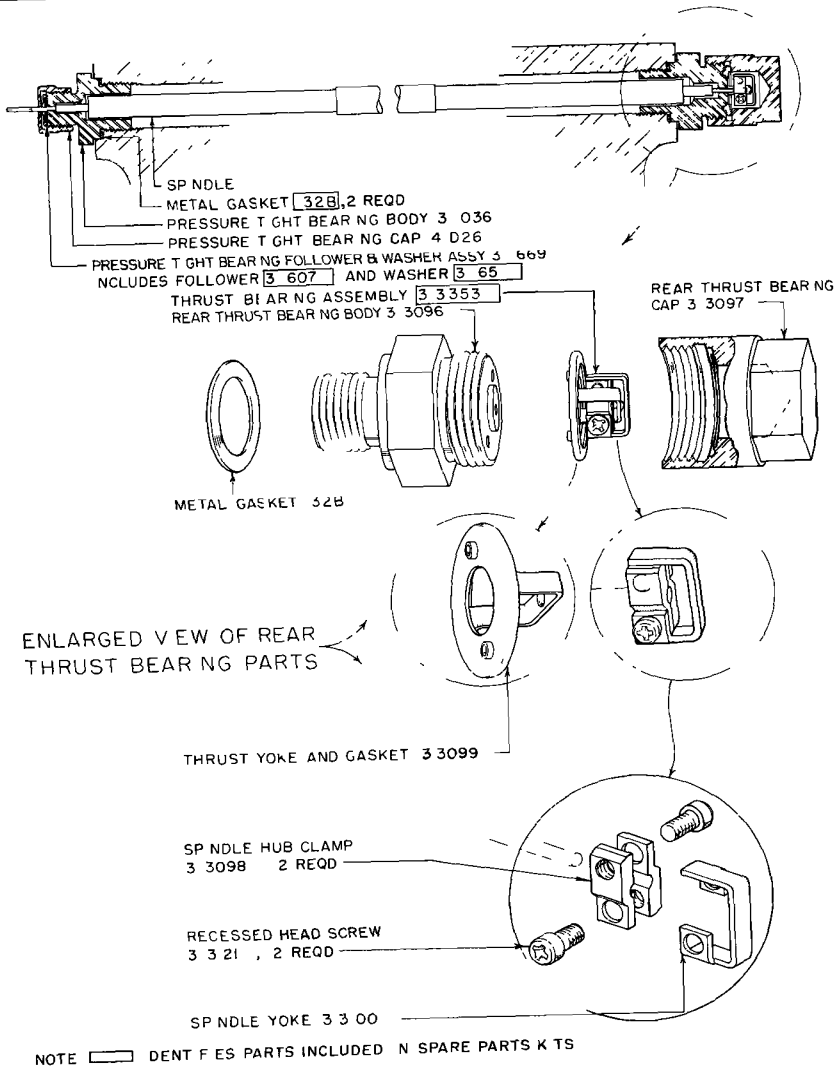
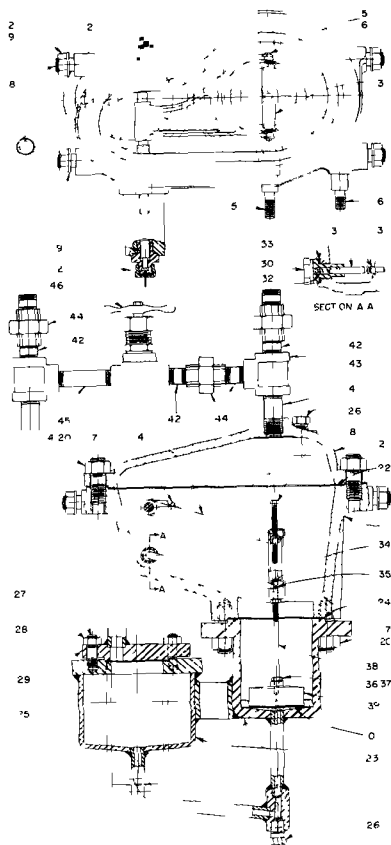


FIGURE 4 Parts Drawing M99 15 Rear Thrust Bearing and Spindle Assembly

Type LU Level Mechanism



ITEM	PART NO	NAME
1	311220 1	MOUNTING WASHER 4 REQD
2		SPINDLE BEARING ASSY SEE PTS DWG M9 ⁰ 15
3	34252 1	FLOAT SUPPORT
4	31177 1	FORGED LEVER ASSY INCLS ITEMS 5 6 & "
5	31908 1	YOKER PIVOT SCR 2 REQD
6	R3640 0005	02 DIA MONEL WIRE 3 INCHES REQD EACH SCR
7	311102 1	TAPERED SET SCR
8	34537 1	STOP SCR 1 5 8 INCHES LONG FOR BU & CU
	34537 2	STOP SCR 2 5 8 INCHES LONG FOR LU IF TOO LONG CUT TO LENGTH REQD
9	311011 1	SPINDLE FCR TYPES BU3 & LU3
	311049 1	SPINDLE FCR TYPES BU1 BU4 CU165 LU16 & LU4
10	234	MERCURY APPROX 13 LBS REQD
11	312012 1	PRESS CASING HD ASSY INCLS ITEMS 13 18 FOR TYPES BU3D & LU3D
	312012 2	PRESS CASING HD ASSY (INCLS ITEMS 12 17) FOR TYPES BU1D BU4D CU165 & LU4D
12	9 16 18x3	4 HEX HD CAP SCR STL 4 REQD FOR CU1 & DU4
13	311049 1	LOWER LEVER STUD
14	318150 2	COVER STUD 11 REQD
15	315932 1	STUD
16	315932 2	STUD 2 REQD
17	316150 5	STUD 6 REQD
18	316150 1	STUD 4 REQD
19	9 16 18	HEX NUT 4 REQD FOR BU3D & LU3D
20	315521 1	HIGH STRENGTH NUT 17 REQD
21	311093 3	COVER
22	311009 3	GASKET
23		SEE TABLE FLOAT CHAMBER & MERCURY RESERVOIR ASSY INCLS ITEMS 24 25 & 26
24	34262 4	GASKET
25	34262 8	GASKFT
26	195148 1	PLUG 2 REQD
27	34710 1	STUD 5 REQD
28	197443 2	HIGH STRENGTH NLT 5 REQD
29	34711 1	FLANGE ASSY
30	311007 1	LEVER BEARING PLUG
31	311215 1	BEARING PLUG SPRINGER
32	311216 1	BEARING PLUG PLUNGER
33	132B	WASHER
34	311005	LOWER LEVER
35	311001 2	LOWER LEVER PIN
36	197170 1	SHK LA WASH SST 4 REQD
37	10-32	HEX NUT STL 4 REQD
38	34251 1	FLOAT ROD
39	34696 1	FLOAT
41	1070 1 13 16	3 8 INCH NIPPLE
42	1070 1 5 8	3 8 INCH NIPPLE 3 REQD
43	19561 3 8	TEE 2 REQD
44	19520 1	UNION & NIPPLE ASSY (3 8 INCH)
45	312416 2	3 8 INCH NIPPLE
46	195191 3 8	EQUALIZING VALVE

TYPF	MAX DIFF HD	ITEM 23
□□□□03	50 IN H ₂ O	343570 1
□□□□04	100 IN H ₂ O	343571 2
□□□□05	200 IN H ₂ O	343570 3
□□□□06	400 IN H ₂ O	343570 4

SPARE PARTS KITS	
NO 254004 1 FOR BU1 BU4 CU165 LU16 & LU4	NO 254004 2 FOR BU3 & LU3
CONTAINS 1 EACH ITEMS 4 6 1 1 F 7 9 22 24 25 34 35 CONTAINS 1 EACH PT NOS 31168 1 311651 1 313553 1 CONTAINS 2 EACH ITEMS 5 & 33 ONE IN PT NO 132B* & PT NO 311651 1	

* SHOWN ON P. W. M. 11

FIGURE 5 Parts Drawing M21-5, Type LU Level Mechanism

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