



NATIONAL STANDARDS COMMISSION

NATIONAL MEASUREMENT (PATTERNS OF INSTRUMENTS) REGULATIONS

REGULATION 9

PROVISIONAL CERTIFICATE OF APPROVAL No P10/1/3

This is to certify that an approval has been granted that the pattern and variants of the

Acme Model LGD 100 LPG Driveway Flowmeter

submitted by Acme Oil Equipment Services Pty Ltd
253 Ingles Street
Port Melbourne Vic 3207

are suitable for use for trade.

Conditions of Approval

General

This approval is subject to review on or after 1/8/83.

Instruments purporting to comply with this approval shall be marked NSC No P10/1/3.

This approval may be withdrawn if instruments are constructed and used other than as described in the drawings and specifications lodged with the Commission.

Special

The initial verification of each driveway flowmeter shall be carried out under the supervision of a government-licensed LPG installer (where such exists), or a person experienced in the design and installation of LPG systems.

Instruments installed under this approval are to be tested at six-monthly intervals after the initial verification test. Such tests are to be arranged by the submitter and supervised by the State Weights and Measures Authority; the results are to be sent to the Commission.

The Commission reserves the right to inspect and test any installation covered by this approval at any time without notice.

In the event of unsatisfactory performance, this approval may be modified or cancelled.

Signed

Executive Director

Descriptive Advice

Pattern: approved 1/10/81

- Acme model LGD 100 attendant-operated driveway flowmeter for dispensing liquefied petroleum gases.

Technical Schedule No P10/1/3 describes the pattern.

Variant: approved 14/4/82

1. The pattern in an alternate housing, known as a model LGD 101E.

Technical Schedule No P10/1/3 Variation No 1 describes variant 1.

Variants: approved 7/1/83

2. The pattern in an alternative housing, and known as a model LGD 101S.

3. With internal safety control (ISC) valves replacing several valves of the pattern.

4. With an electrically-operated nozzle release replacing the spring-loaded device of the pattern.

Technical Schedule No P10/1/3 Variation No 2 describes variants 2 to 4.

Variant: approved 12/1/83

5. The pattern or variants connected to a Micro-M console.

Technical Schedule No P10/1/3 Variation No 3 describes variant 5.

Variants: approved 10/8/84

6. With an Eclipse model MVR 79 indicator in lieu of the indicator of the pattern.

7. In alternative housings.

Technical Schedule No P10/1/3 Variation No 4 describes variants 6 and 7.

Filing Advice

Certificate of Approval No P10/1/3 dated 7/2/83 is superseded by this Certificate and may be destroyed.

The documentation for this approval now comprises:

Certificate of Approval No P10/1/3 dated 7/8/85
Technical Schedule No P10/1/3 dated 9/11/81
Technical Schedule No P10/1/3 Variation No 1 dated 3/5/82
Technical Schedule No P10/1/3 Variation No 2 dated 28/1/83
Technical Schedule No P10/1/3 Variation No 3 dated 7/2/83
Technical Schedule No P10/1/3 Variation No 4 dated 7/8/85
Test Procedure No P10/1/3 dated 9/11/81
Figures 1 to 10 dated 9/11/81
Figures 11 to 17 dated 3/5/82.



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No P10/1/3

Pattern: Acme Model LGD 100 LPG Driveway Flowmeter

Submitter: Acme Oil Equipment Services Pty Ltd,
253 Ingles Street,
Port Melbourne, Victoria, 3207.

1. Description of Pattern

The pattern is an Acme Model LGD 100 driveway flowmeter for the delivery of liquefied petroleum gas of density 0.500 to 0.515 kg/L at 15°C, at temperatures between 0 and 45°C (Figures 1 and 2). The maximum and minimum flow rates are 80 L/min and 24 L/min respectively.

The hydraulic diagram for the driveway flowmeter is shown in Figure 3.

1.1 Range

Volume	999.99 L in 0.01 L increments
Price	\$399.99 in 1c increments
Unit Price	99.9 c/L in 0.1c increments
Totaliser	9999999 L in 1 L increments

1.2 Component Structure and Conditions for Installation*

The component parts of each driveway flowmeter are listed in Figure 4 and comprise those components listed in (iii) to (xi) below.

(i) Supply tank

The supply tank is large enough to supply liquefied petroleum gas at a rate that does not cause the pressure in the supply tank to drop to the point where vapour production occurs in the line between supply tank and pump. The capacity of the supply tank is such that the maximum delivery of the driveway flowmeter in one minute is not greater than approximately 2.5% of the tank capacity.

The supply tank is located higher than the pump so that the liquid level always creates sufficient pressure at the pump inlet at maximum flow rate (that is, above the vapour pressure) to prevent gas being formed.

(ii) Pump

The pump is positioned as close as possible to the supply tank, with short inlet connections, and having as few restrictions as possible. There are to be no restrictive fittings within ten pipe diameters of the pump inlet. The inlet pipe to the pump is larger than the outlet from the pump. The inlet line should, where possible, slope upwards towards the supply tank.

The external pump by-pass relief valve is installed in a line returning to the supply tank; this line should have no low spots which could trap liquid, and where possible should slope upwards towards the supply tank. The external by-pass setting is 100 to 140 kPa lower than the internal pump relief valve setting, where fitted.

* This approval relates to the metrological performance of the metering system; inspectors are advised that the system must comply with the requirements of other statutory authorities relating to safety, handling, storage and transportation of liquefied petroleum gas.

(iii) Meter

Neptune type 4D 32 mm liquefied petroleum gas meter. An internal by-pass allows a portion of the incoming liquid to pass to the temperature compensator without being included in the measurement. A pressure gauge and drain valve are fitted at the bottom of the meter (Figures 2 and 3). This valve is sealed in the closed position.

(iv) Gas purger

The meter is protected from the measurement of vapour by correct installation and by a Neptune 32 mm gas purger which incorporates an inlet non-return valve with soft seat and internal hydrostatic relief valve, a strainer and a float chamber (Figure 5). The gas purger is vented through a non-return valve, via a vapour return line not less than 20 mm in diameter, to the vapour space in the supply tank. The vapour return line is constructed without low spots or traps which could prevent free flow of vapour in either direction.

A thermometer pocket is situated in the strainer cover (Figure 5).

(v) Temperature compensator

A Neptune Type 1 Style 22 temperature compensator is attached to the top of the meter (Figures 6 and 7). Liquid flowing through the internal meter by-pass flows into the chamber between the temperature compensator and meter, along the temperature-sensing capsule in the space between the capsule and a surrounding shield, and returns through a pipe to the bottom of the gas purger.

The expansion and contraction of the temperature-sensing capsule with changes in temperature of the liquid are transmitted by means of a pin-and-lever system to a variable-ratio drive which changes the coupling ratio between the meter and indicator so that the indicated volume is the equivalent volume at a temperature of 15°C. An adjustment screw fitted to the bottom of the lever permits calibration of the compensator.

(vi) Driveway flowmeter indicator

A Production Engineering Model Retron 80 driveway flowmeter indicator is used. This electronic indicator is mounted in two parts; the digital display in the top housing of the driveway flowmeter and the computational unit in the main housing. The computer is driven through a gear assembly from the output shaft of the temperature compensator (Figures 1 and 2). The unit price change and test button are located on the computer unit.

When the nozzle is removed from its holster in the side of the driveway flowmeter the pump motor immediately starts. There is a delay of between 6 and 10 seconds before the displays on the indicator reset by displaying all "8's" and then all "0's" with the unit price displayed. The nozzle is then connected to the purchaser's storage tank. In this way the same conditions apply at the commencement of each delivery, that is with the delivery hose being pressurised so that only liquid exists in it. The registration on the totaliser also has the same 6-10 second delay.

(vii) Differential valve

A Neptune 32 mm spring loaded diaphragm valve maintains pressure in the metering chamber to prevent the formation of gas. A pressure-equalising pipe is connected from the differential valve through an excess-flow valve (which has no bleed hole) to the supply tank, through the vapour return line from the gas-purger vent (Figure 3). The differential valve is set at 100 kPa (i.e. 100 kPa above the vapour pressure).

(viii) Vapour indicator

A sight glass is fitted in the outlet of the meter either before or after the pressure differential valve so that it may be seen if vapour is being metered (Figure 3).

(ix) Outlet piping

The pipe connection from the differential valve to the hose is fitted with an excess-flow valve and stop valve (Figure 3).

(x) Hose

The dispenser is fitted with a hose complying with the SAA code for hoses in use with liquefied petroleum gases of bore not exceeding 20 mm. Nozzle removal operates a spring loaded lever assembly which activates a microswitch in the Retron 80 and initiates the reset mechanism referred to in (vi) above.

(xi) Nozzle

The nozzle used is a REGO model A7197 B (Figure 8).

(xii)

To facilitate pressure equalisation when the driveway flowmeter is being tested with a pressure prover, provision is made for a vapour line from the prover to the vapour space of the supply tank either directly or via a tee in the vapour return line from the gas purger using a 1 3/4" Acme Male Adaptor. This provision is sealed off when not in use. During normal customer delivery there is no vapour return connection between the receiving container and the supply tank.

2. Marking

The instrument data plate permanently fixed to the external housing of the driveway flowmeter is marked with the following:

Manufacturer's name or mark	
Year of manufacture	
Serial number	
NSC approval number in the form:	NSC No P10/1/3
Maximum flow rate in the form:	80 L/min
Minimum flow rate in the form:	24 L/min
Liquid temperature range	0°C to 45°C
Approved for LPG of density 0.5 to 0.515 kg/L only	
Density for which temperature compensator is set	
Maximum operating pressure	

3. Sealing

The totaliser and computer are sealed to prevent removal of the top cover of the Retron 80 casting. Figures 9 and 10 illustrate one method of doing this using sealing plugs.

The meter, temperature compensator calibration adjustments, and meter drain valve are sealed, for example, with a single wire and lead seal (Figure 2), or by a similar method.

The gear assembly is sealed inside a metal box with a lead and wire seal and/or stamping plug, or similar method (Figure 2).

TEST PROCEDURE No P10/1/3

The following test procedure is to be followed at each six-monthly reverification test. The tests are to be arranged so that one is carried out in the hotter period of each year and the other in the cooler period. One test should also be arranged when there is a low liquid level in the supply tank to ensure that there is still sufficient pressure at the inlet to the pump to avoid gas being generated.

1. Visual Inspection

Visually inspect the complete installation to ensure that the pump, supply tank, dispenser and pipework are installed in accordance with the description of the pattern. If the system is not installed correctly (for example, if a restrictive valve or fitting is installed in the pipeline), gas may be generated and will show in the sight glass, where the purger does not eliminate all the gas.

2. Meter test with temperature compensator de-activated

Tolerance \pm 0.5% at normal flow rate
 \pm 1.0% at minimum flow rate

- (i) Carry out at least three runs into the prover at the normal flow rate at which the meter is used. Read the temperature and pressure at the meter and at the prover. Correct for the changes in volume of the liquid due to any difference in pressure and temperature between the meter and the prover and for changes in the volume of the prover due to any difference in pressure and temperature from the reference temperature and pressure at which it was calibrated.
- (ii) Repeat the above test at the minimum flow rate of the meter or 24 L/min, whichever is the greater.
- (iii) During the test runs, note whether any gas is showing in the sight glass located after the meter.

3. Meter test with temperature compensator activated

Tolerance \pm (0.7% + 0.02% per °C difference from 15°C) at normal flow rate
 \pm (1.2% + 0.02% per °C difference from 15°C) at minimum flow rate.

- (i) Carry out at least three runs into the prover at the normal flow rate. Read the temperature and pressure at the meter and the prover. After correcting the prover volume reading to its calibration temperature and pressure, reduce the volume to its equivalent volume at 15°C using the temperature indicated at the meter and the appropriate table for the density of the liquid for which the meter temperature compensator is set.* Compare the calibrated volume with the meter indicated volume.
- (ii) Repeat the above test at the minimum flow rate of the meter or 24 L/min, whichever is the greater.

4. Computation tests on indicator

- (i) Remove the nozzle from its holster. Check that there is a delay of not less than six but not more than ten seconds before the displays on the indicator reset by displaying all "8's" then all "0's" with the unit price displayed.
- (ii) Deliver an amount of LPG equivalent to, say, \$1.00.

* ASTM-IP Petroleum Measurement Table 54 - Volume Reduction to 15°C (Metric Edition).

- (iii) Press the test button once (on the computer). The total price indicator will indicate \$1.01.
- (iv) Continue the delivery to, say, \$2.00.
- (v) Return the nozzle to its hang-up. The total price on the driveway flowmeter will blank out indicating a price-computation error.
- (vi) Try to start a new delivery. This should not be possible.

Note: The instrument is now in a computation error mode. To bring the instrument out of this mode turn the power to the driveway flowmeter off for at least one minute, after which the instrument will have reverted to its normal operation mode.



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No P10/1/3

VARIATION No 1

Pattern: Acme Model LGD 100 LPG Driveway Flowmeter

Submittor: Acme Oil Equipment Services Pty Ltd,
253 Ingles Street,
Port Melbourne, Victoria, 3207.

1. Description of Variant 1

The pattern in an alternate housing as shown in Figure 11, and known as a model LGD 101E.

The hydraulic configuration is shown in Figures 12, 13 and 14. The only differences in the hydraulics from the pattern are the repositioning of the sight glass before the differential valve and the addition of a needle bleed valve in the outlet line to allow drainage of the outlet line if the dry break coupling operates.

2. Sealing

As for the pattern with the following exceptions:

- (i) The totaliser and computer are sealed to prevent removal of the top cover of the Retron 80 casting. (Figure 15 shows a typical method).
- (ii) The meter, temperature compensator calibration adjustments, and meter drain valve are sealed, for example with a lead and wire seal (Figure 16) or by a similar method.
- (iii) The needle drain valve in the outlet line is sealed closed (Figure 17).



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No P10/1/3

VARIATION No 2

Pattern: Acme Model LGD 100 LPG Driveway Flowmeter

Submittor: Acme Oil Equipment Services Pty Ltd
253 Ingles Street
Port Melbourne, Victoria, 3207.

1. Description of Variants

1.1 Variant 2

The pattern in an alternative housing and known as a model LGD 101S.

1.2 Variant 3

With internal safety control (ISC) valves fitted, replacing the excess flow valve, main isolating ball valve, and the hydrostatic relief valve of the pattern.

1.3 Variant 4

With an electrically-operated nozzle-release replacing the spring-loaded device of the pattern.



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No P10/1/3

VARIATION No 3

Pattern: Acme Model LGD 100 LPG Driveway Flowmeter

Submittor: Acme Oil Equipment Services Pty Ltd
253 Ingles Street
Port Melbourne, Victoria, 3207.

1. Description of Variant 5

The pattern or variants connected to a Micro-M console. The Micro-M is used primarily to record and process managerial information but does have control over Authorisation, Emergency Stop and similar functions.

The Micro-M console is approved in NSC Certificate of Approval No 5/6A/68.

7/2/83



NATIONAL STANDARDS COMMISSION

TECHNICAL SCHEDULE No P10/1/3

VARIATION No 4

Pattern: Acme Model LGD 100 LPG Driveway Flowmeter

Submitter: Acme Oil Equipment Services Pty Ltd
253 Ingles Street
Port Melbourne Vic 3207

1. Description of Variants

1.1 Variant 6

With an Eclipse model MVR 79 price-computing indicator, with or without electronic temperature compensation, in lieu of the Retron 80 indicator of the pattern and known as models LGD 103E and LGD SC. When used without electronic temperature compensation, the Neptune mechanical temperature compensator must be retained.

1.2 Variant 7

In alternative housings.



NATIONAL STANDARDS COMMISSION

NOTIFICATION OF CHANGE

PROVISIONAL CERTIFICATE OF APPROVAL No P10/1/3

CHANGE No 1

The following change is made to the description of the

Acme Model LGD 100 LPG Driveway Flowmeter

given in Technical Schedule No P10/1/3 dated 9/11/81

In Figure P10/1/3 - 3, the diameter of the Acme Connector should be 1 3/4" NOT 1 1/4".

Signed

Executive Director

2/2/82

FG

P10/1/3
24/7/85



NATIONAL STANDARDS COMMISSION

NOTIFICATION OF CHANGE

CERTIFICATE OF APPROVAL No P10/1/3

CHANGE No 2

The following changes are made to the approval documentation for the

Acme Model LGD 100 LPG Driveway Flowmeter

submitted by Acme Oil Equipment Services Pty Ltd
253 Ingles Street
Port Melbourne Vic 3207.

All references to Minimum Flow Rate should be changed from 24 L/min to 15 L/min, viz.,

1. In Technical Schedule No P10/1/3 dated 9/11/81, paragraph 1 on page 1 and paragraph 2 on page 3.
2. In Test Procedure No P10/1/3 dated 9/11/81, paragraphs 2(ii) and 3(ii), both on page 1.

Signed

Executive Director

J E.

P10/1/3
20/6/86



NATIONAL STANDARDS COMMISSION

NOTIFICATION OF CHANGE

PROVISIONAL CERTIFICATE OF APPROVAL No P10/1/3

CHANGE No 3

The following changes are made to the approval documentation for the

Acme Model LGD 100 LPG Driveway Flowmeter

submitted by Acme Oil Equipment Services Pty Ltd
253 Ingles Street
Port Melbourne Vic 3207.

In Test Procedure No P10/1/3 dated 9/11/81:

- a) Delete references to Tolerances from clauses 2 and 3.
- b) Insert the following before clause 1;

The maximum permissible error applied during a verification test from normal flow rate to the minimum flow rate * specified in the Technical Schedule is:

± 1.0% with the temperature compensator deactivated

and ± (1.2% + 0.02% per °C difference from 15°C) with the temperature compensator activated.

* The minimum flow rate for driveway flowmeters is 15 L/min unless otherwise specified in the Technical Schedule.

Signed

Executive Director

National Standards Commission



NOTIFICATION OF CHANGE

VARIOUS CERTIFICATES OF APPROVAL

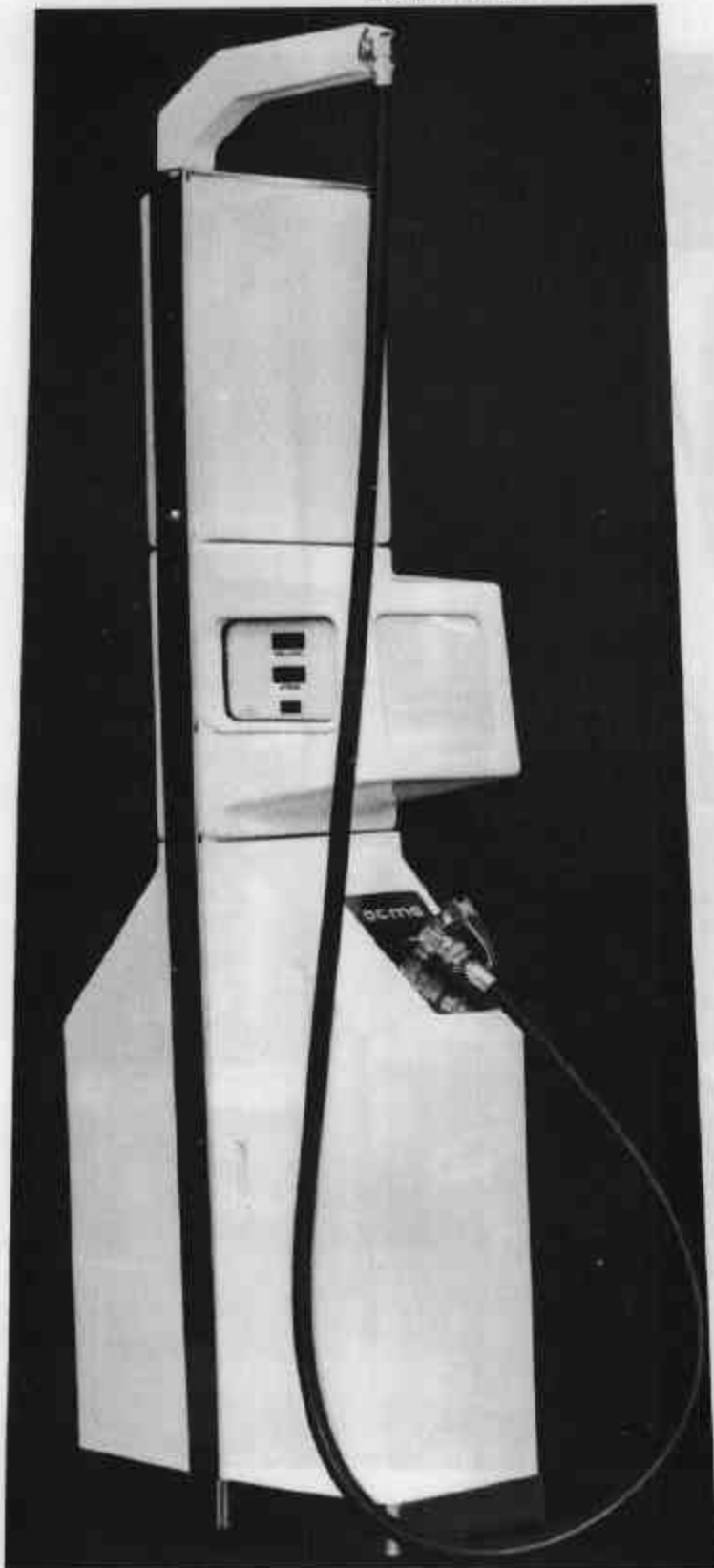
The following changes are made to the approval documentation for various LPG flowmeter approvals as listed below:

In the approvals listed below, remove from the Certificate, Technical Schedule and Test Procedure, any Condition of Approval or clause that refers to instruments being verified, re-verified or calibrated at specific intervals. (Note that the re-verification period is determined by the Trade Measurement Authority in the State or Territory in which the instrument is located.)

APPROVAL NUMBER	PATTERN
10/1/2	Halco Neptune 32/38 mm LPG Flowmeter
P10/1/3	Acme Model LGD 100 LPG Driveway Flowmeter
10/1/3A	Acme Model LGD 105S LPG Driveway Flowmeter
P10/1/5	Batchen Model Mk II LPG Driveway Flowmeter
P10/1/6	Wayne Model ELC1 LPG Driveway Flowmeter
10/1/6A	Email Model ELC1 LPG Driveway Flowmeter
P10/1/7	Indeng Model MKO LPG Driveway Flowmeter
10/1/8	Gilbarco Model T093D LPG Driveway Flowmeter
10/1/8A	Gilbarco Model T093D LPG Driveway Flowmeter
10/1/9	Batchen Model Commander LPG Driveway Flowmeter
P10/1/10	LPG Engineering Model Stargas LPG Driveway Flowmeter
10/1/10A	LPG Engineering Model Stargas LPG Driveway Flowmeter
10/1/11	LPG Engineering Model Stargas EPSN LPG Driveway Flowmeter
10/1/12	CleverHead Model 93 LPG Driveway Flowmeter
10/1/13	Batchen Model SCB Commander LPG Driveway Flowmeter
P10/2/2	Liquid Controls Model MA-7-GY-10 Bulk LPG Flowmeter
10/2/3	Neptune Model 4D 32 mm Bulk LPG Flowmeter
P10/2/4	Euromatic Model FL 11/2-125 Turbine Bulk LPG Flowmeter

Signed and sealed by a person authorised under Regulation 9 of the National Measurement (Patterns of Measuring Instruments) Regulations to exercise the powers and functions of the Commission under this Regulation.

FIGURE P10/1/3 - 1

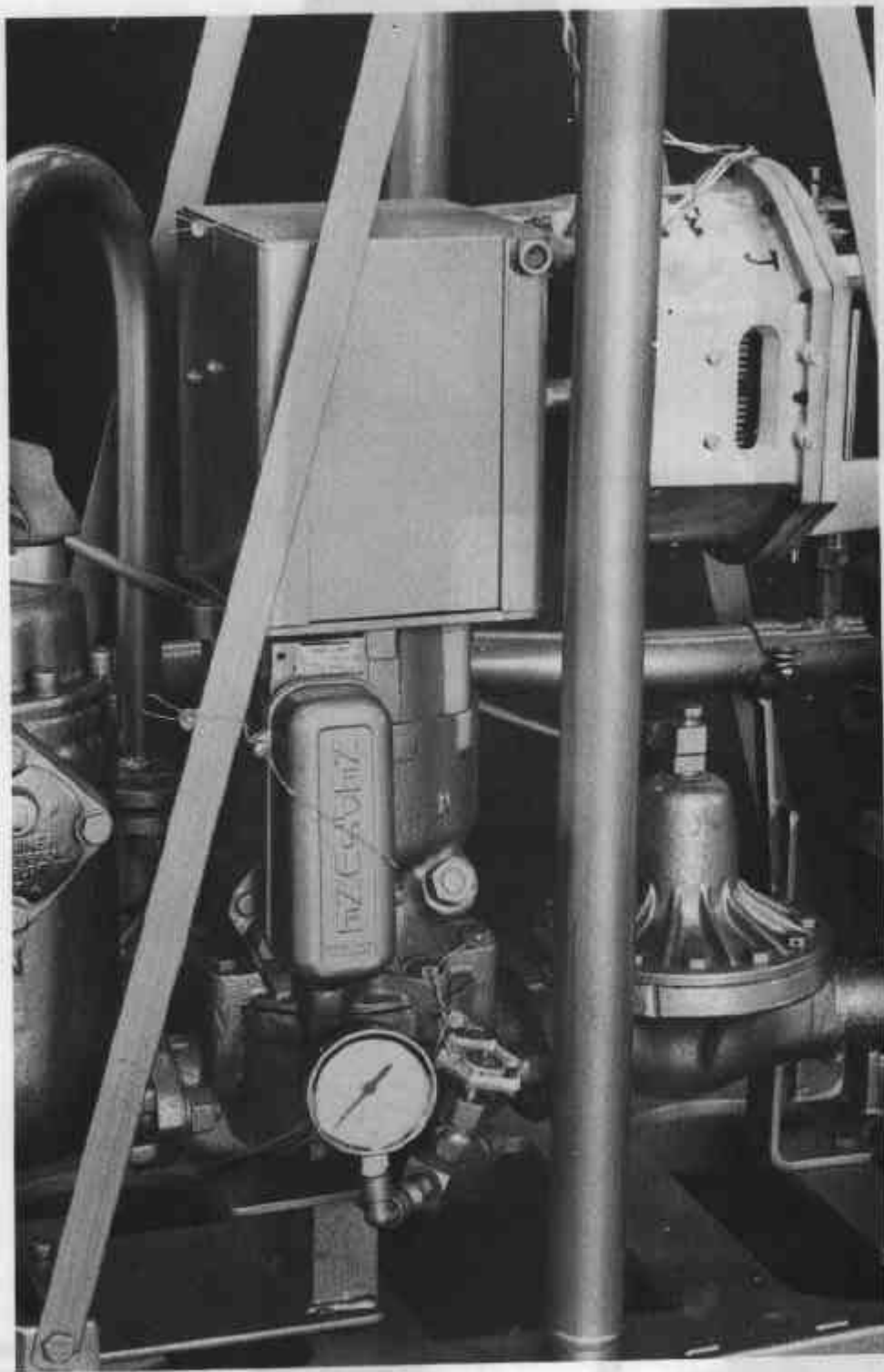


Acme Model LGD 100
LPG Driveway Flowmeter

9/11/81

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FIGURE P10/1/3 - 2

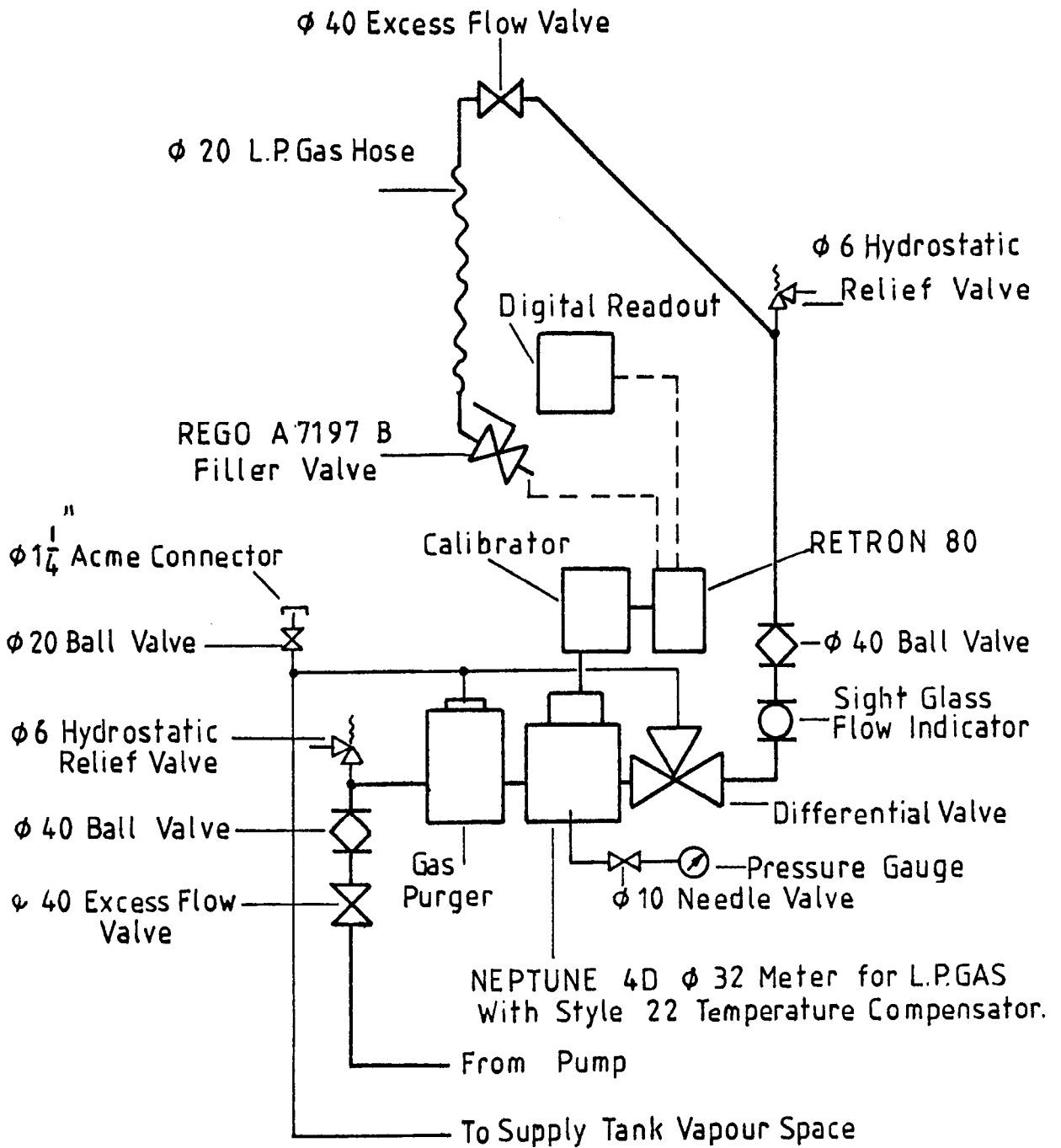


With Covers Removed

9/11/81

10/1/81

FIGURE P10/1/3 - 3



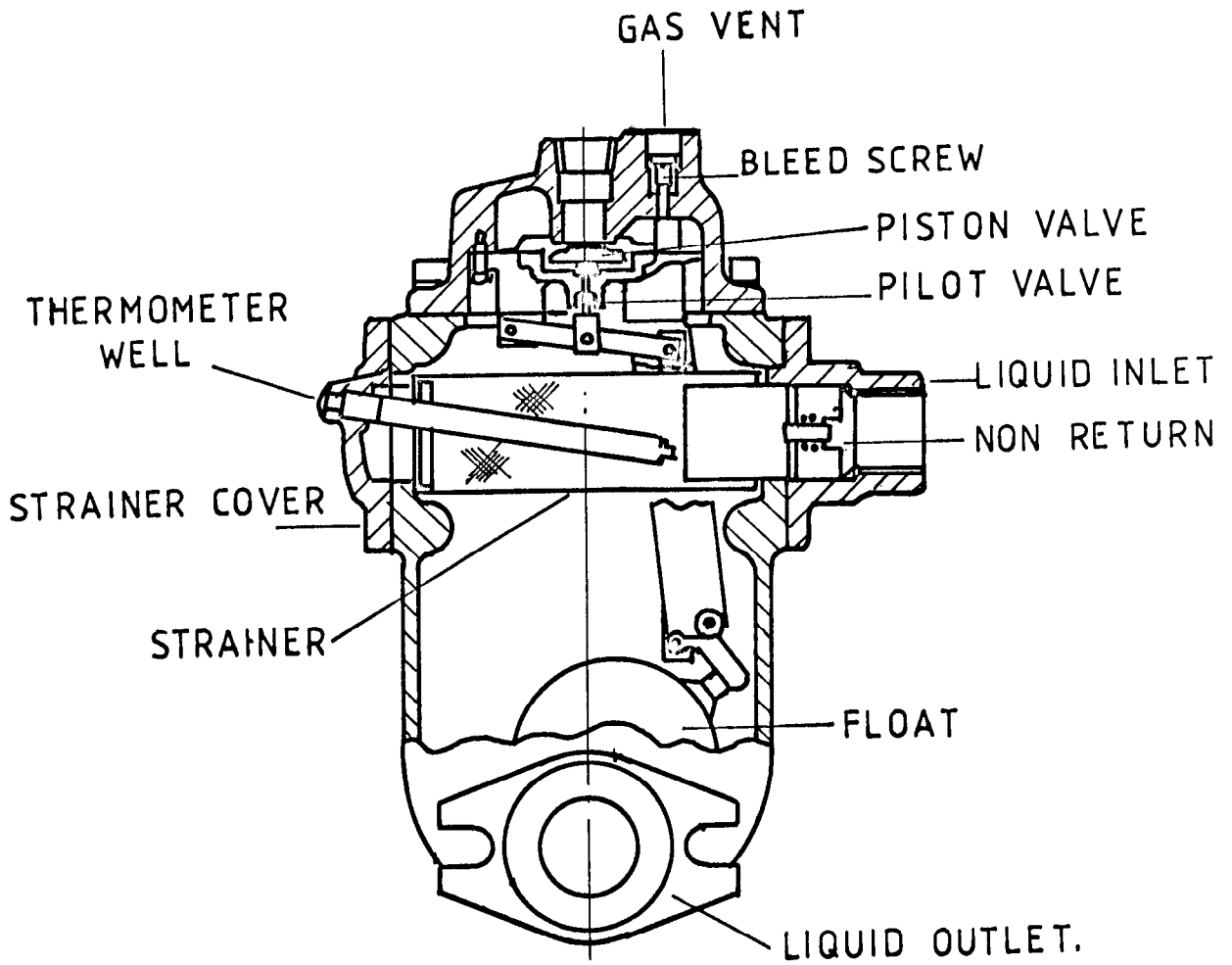
Hydraulic Diagram

FIGURE P10/1/3 - 4

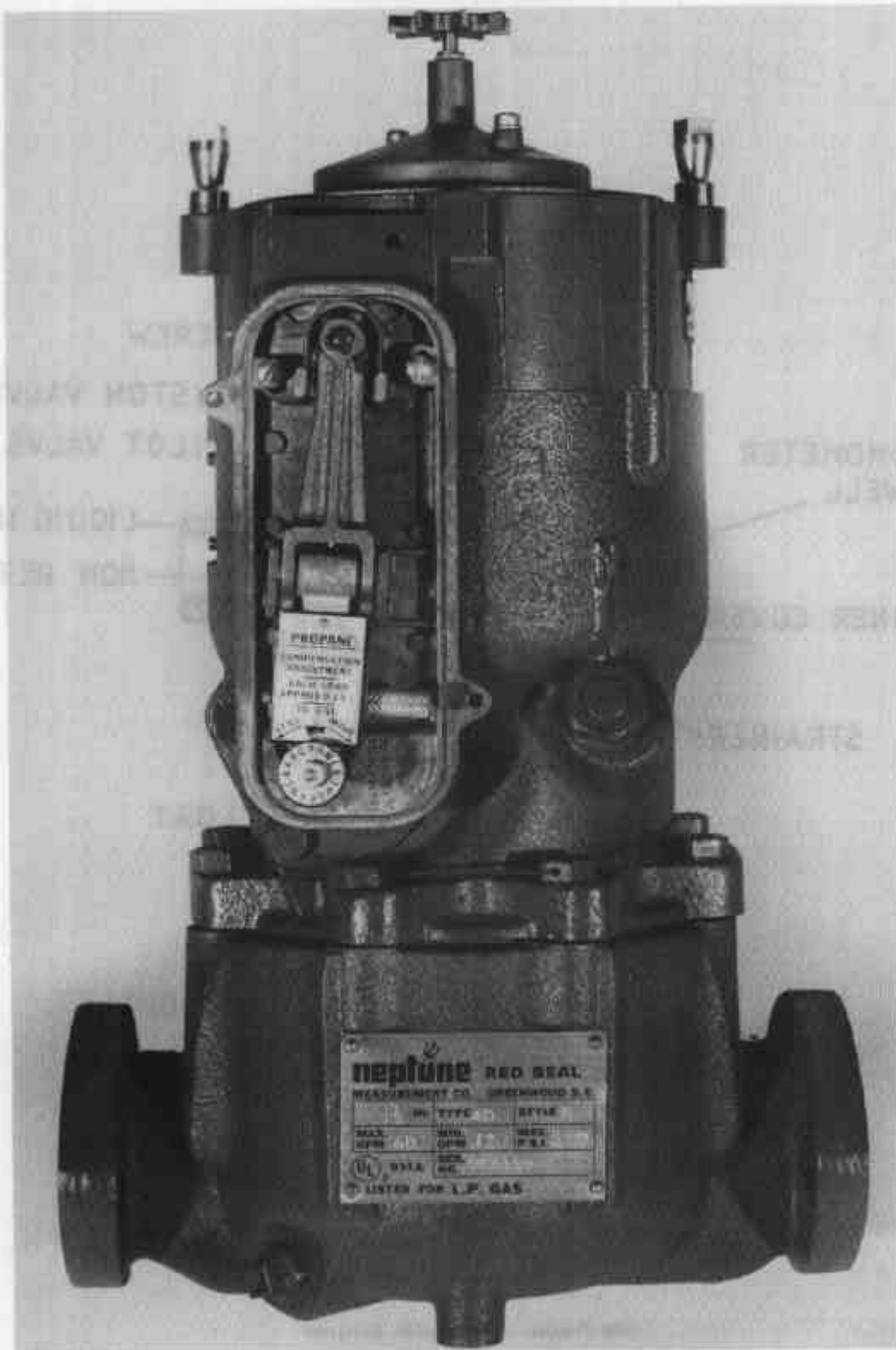
Meter:	Neptune 32 mm Model 4D complete with gas purger, Style 22 temperature compensator and differential valve.
Computer:	Production Engineering Model Retron 80
Nozzle:	Rego A7197 B
Excess Flow Valve:	40 mm In Line - Rego 1519 A3 or Fisher F131
Hydrostatic Relief Valve:	6 mm - 1/4" N.P.T. Thread. Rego 3127K or Fisher H124
Sight Glass:	Clam 40 mm Steel Flow Indicator
Delivery Hose:	Standard commercial hose approved for L.P. Gas. 20 mm n.b.
Ball Valves:	Cast iron, steel or bronze construction - standard commercial product approved for L.P. Gas.

Component Table for Acme LGD 100 LPG Driveway Flowmeter

FIGURE P10/1/3 - 5



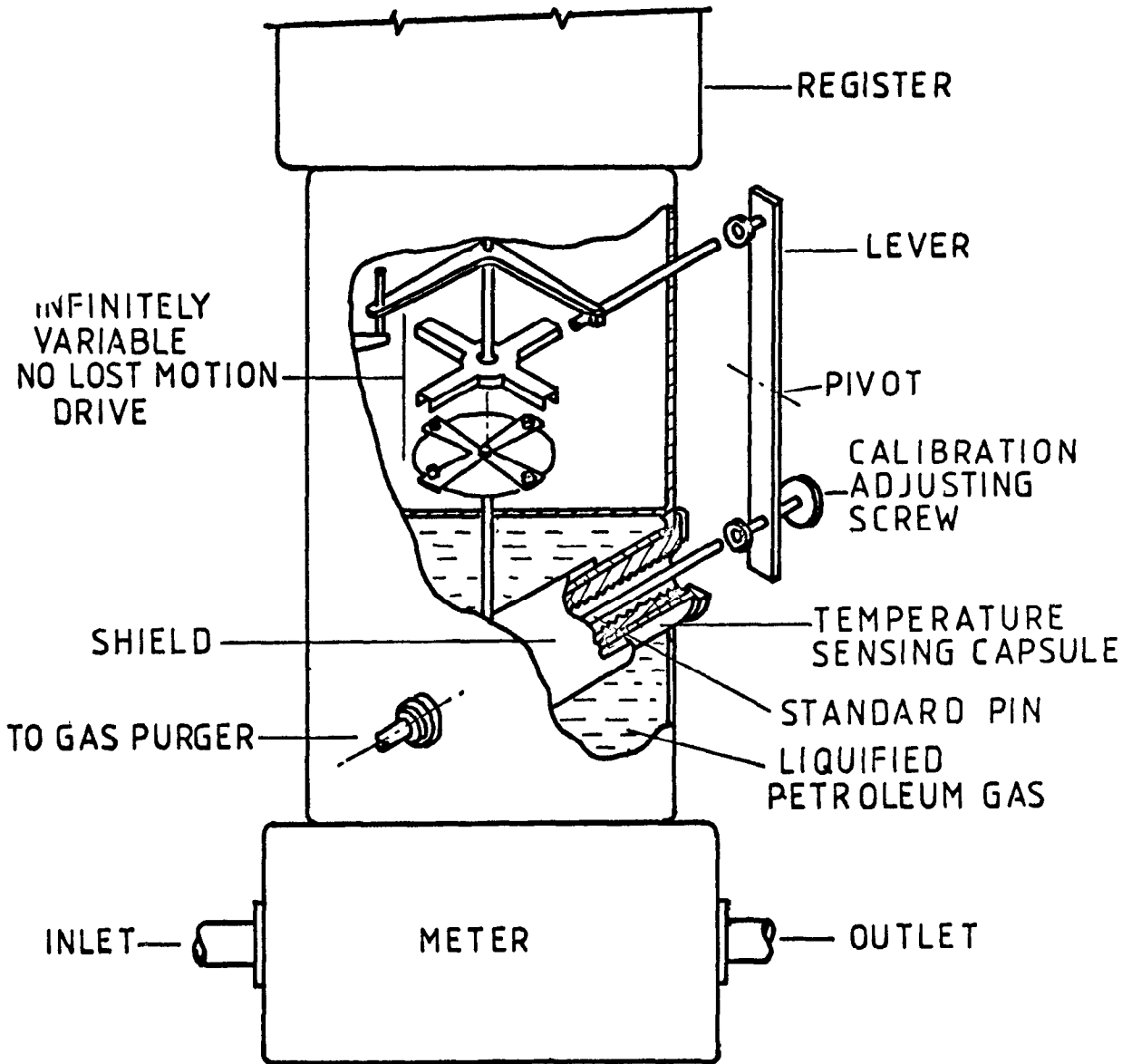
Gas Purger - Schematic Diagram



Temperature Compensator with Cover off Calibrations
Adjuster Removed

9/11/81

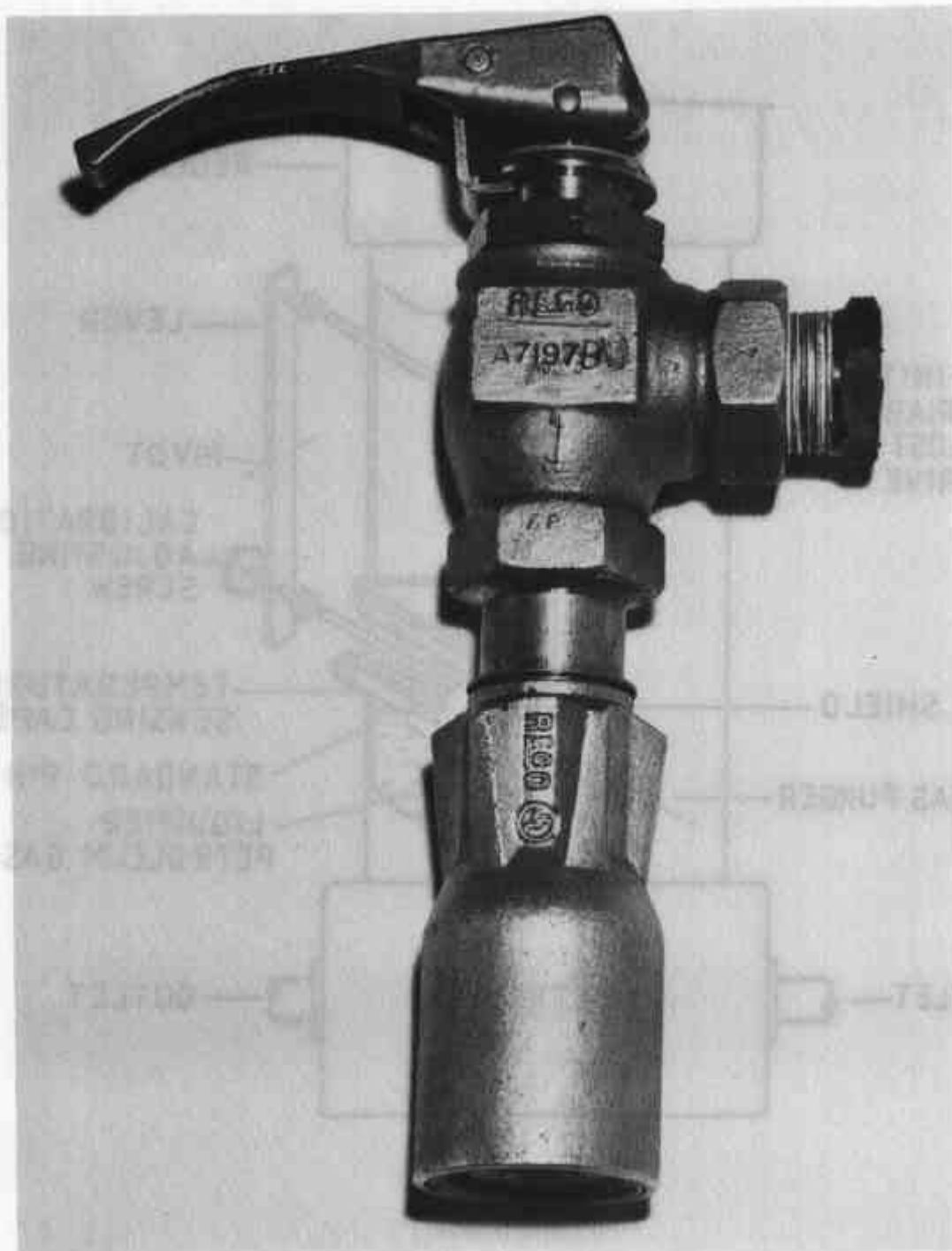
FIGURE P10/1/3 - 7



Temperature Compensator - Schematic Diagram

9/11/81

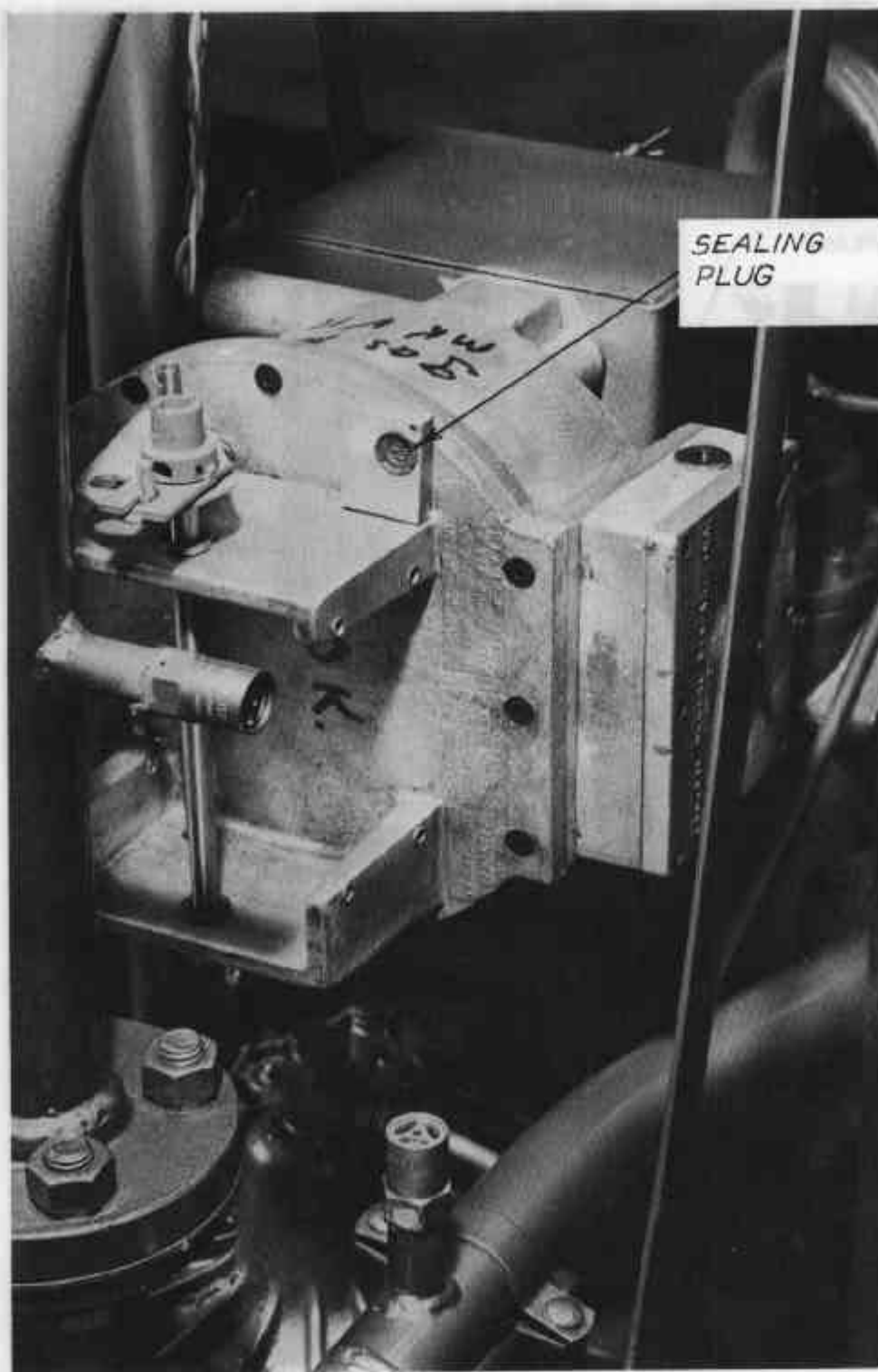
FIGURE P10/1/3 - 8



Rego Nozzle Model A7197 B

9/11/81

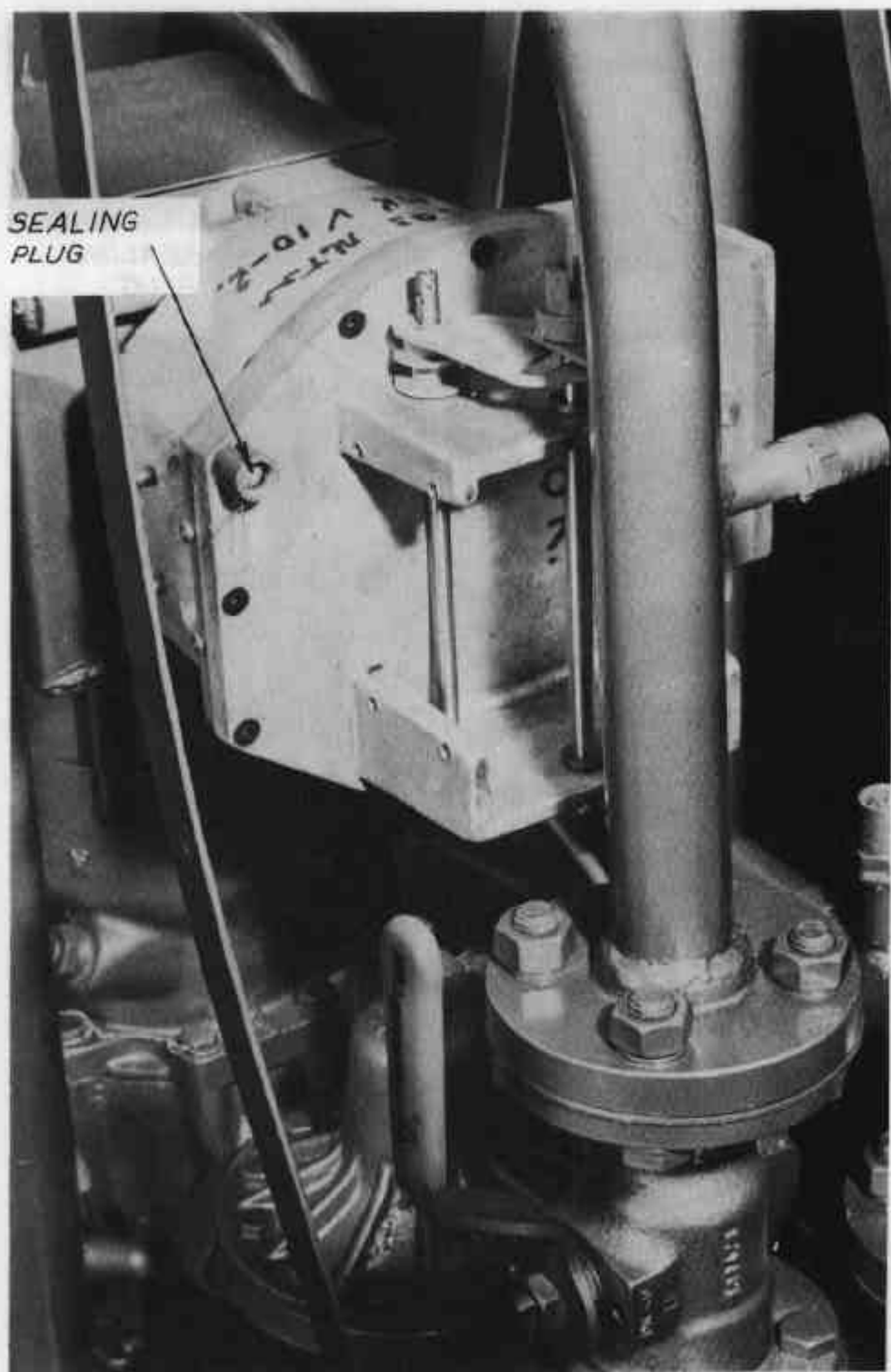
FIGURE P10/1/3 - 9



Sealing of Retron 80 Computer
(See Figure 10 also)

9/11/81

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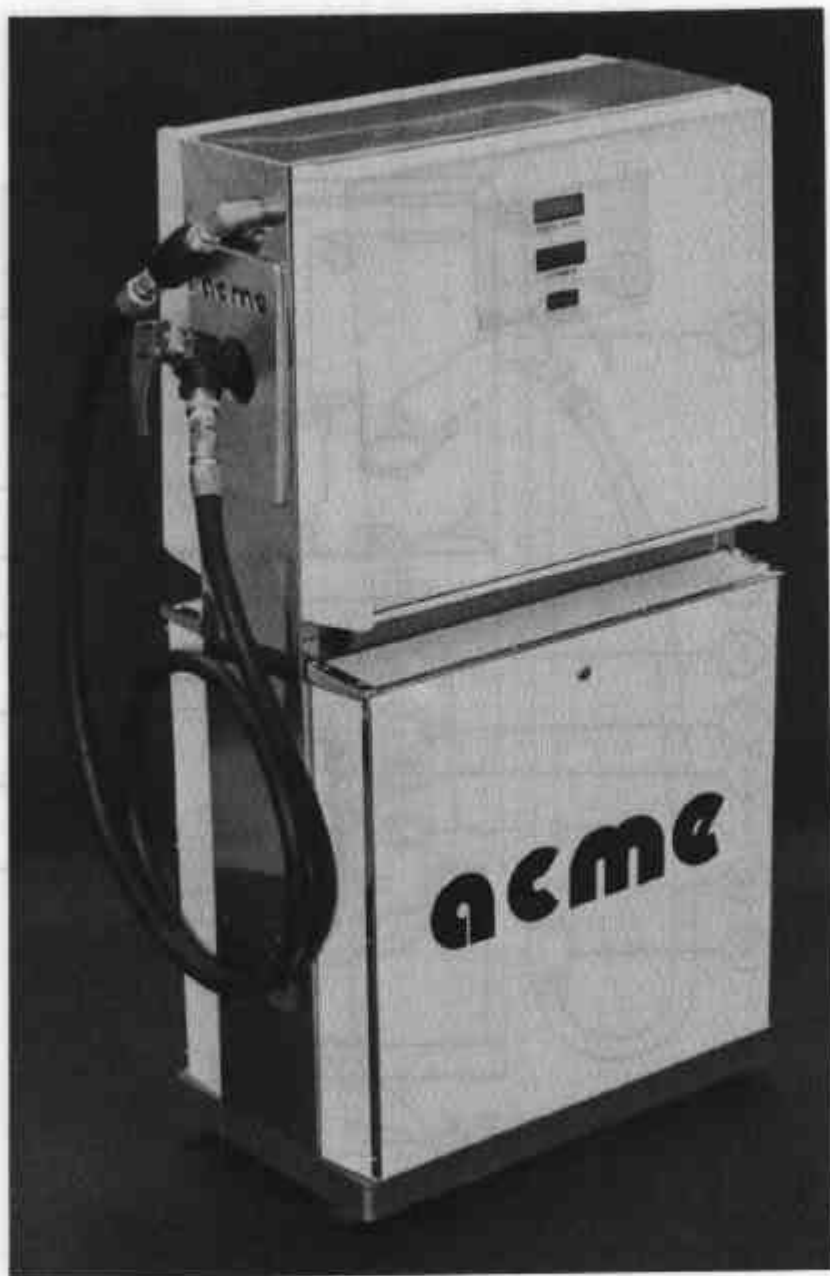


Sealing of Retron 80 Computer
(See Figure 9)

9/11/81

10/1/81

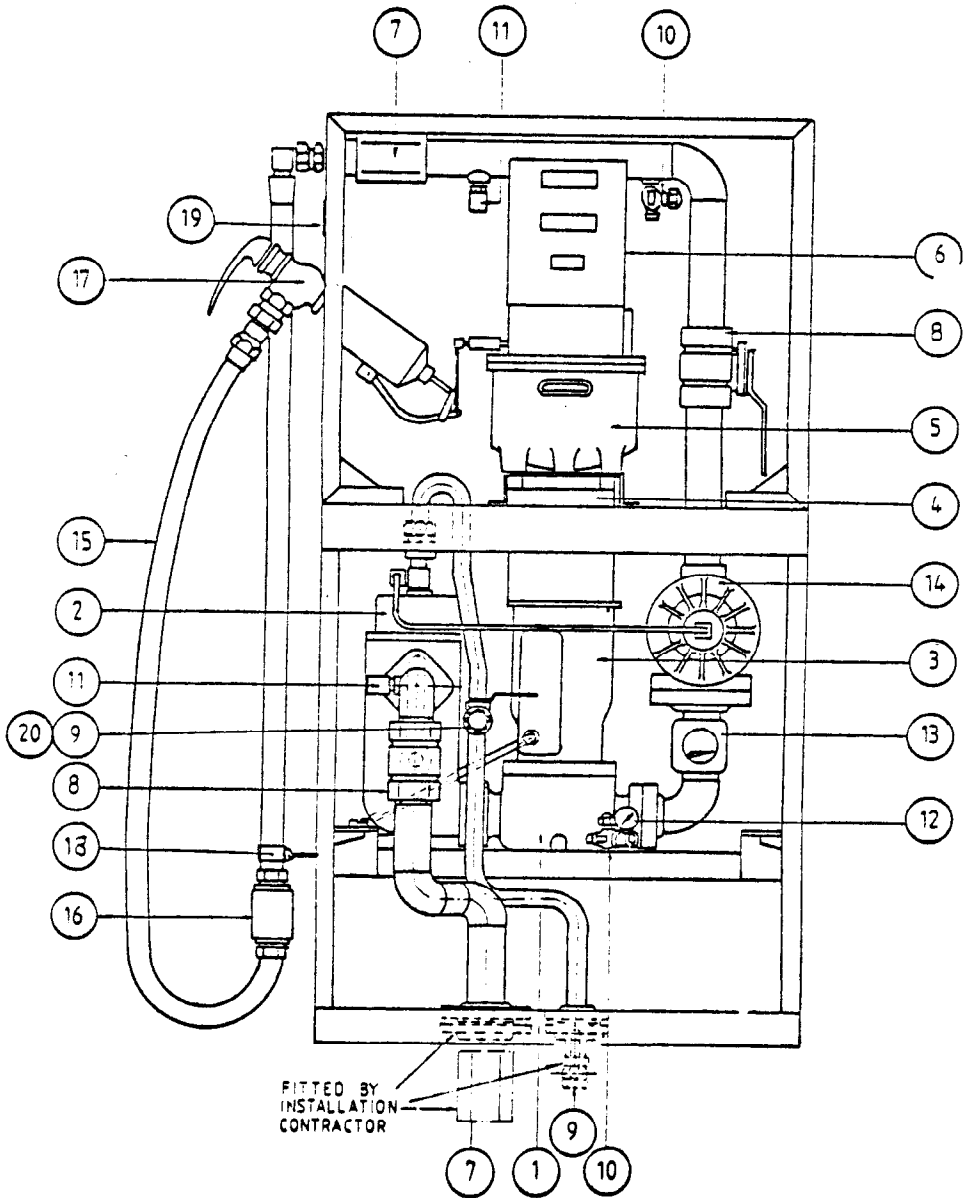
FIGURE P10/1/3 - 11



Acme Model LGD 101E - Variant 1

3/5/82

FIGURE P10/1/3 - 12



Acme Model LGD 101E Hydraulic Diagram

FIGURE P10/1/3 - 14

KEY TO ITEM NUMBERS ON FIGURES 12 AND 13

Model LGD 101E

1. Neptune Model 4D ϕ 32 Meter for LPG.
2. Gas Purger.
3. Neptune Temperature Compensator Style 22.
4. Calibrator.
5. Retron 80 for LPG.
6. Display Panel
7. ϕ 40 Excess Flow Valve.
8. ϕ 40 Ball Valve Liquid Line.
9. ϕ 20 Ball Valve Vapour Line.
10. ϕ 10 Needle Valve Bleed Line.
11. ϕ 6 Hydrostatic Relief Valve.
12. Pressure Gauge.
13. Sight Glass.
14. Differential Valve.
15. ϕ 20 Hose Assembly.
16. Dry Break Coupling.
17. Nozzle Rego A71978.
18. Hose Retractor.
19. NSC Approval Plate.
20. ϕ 1 $\frac{3}{4}$ " Acme Adaptor.

Key To Figures 12 And 13

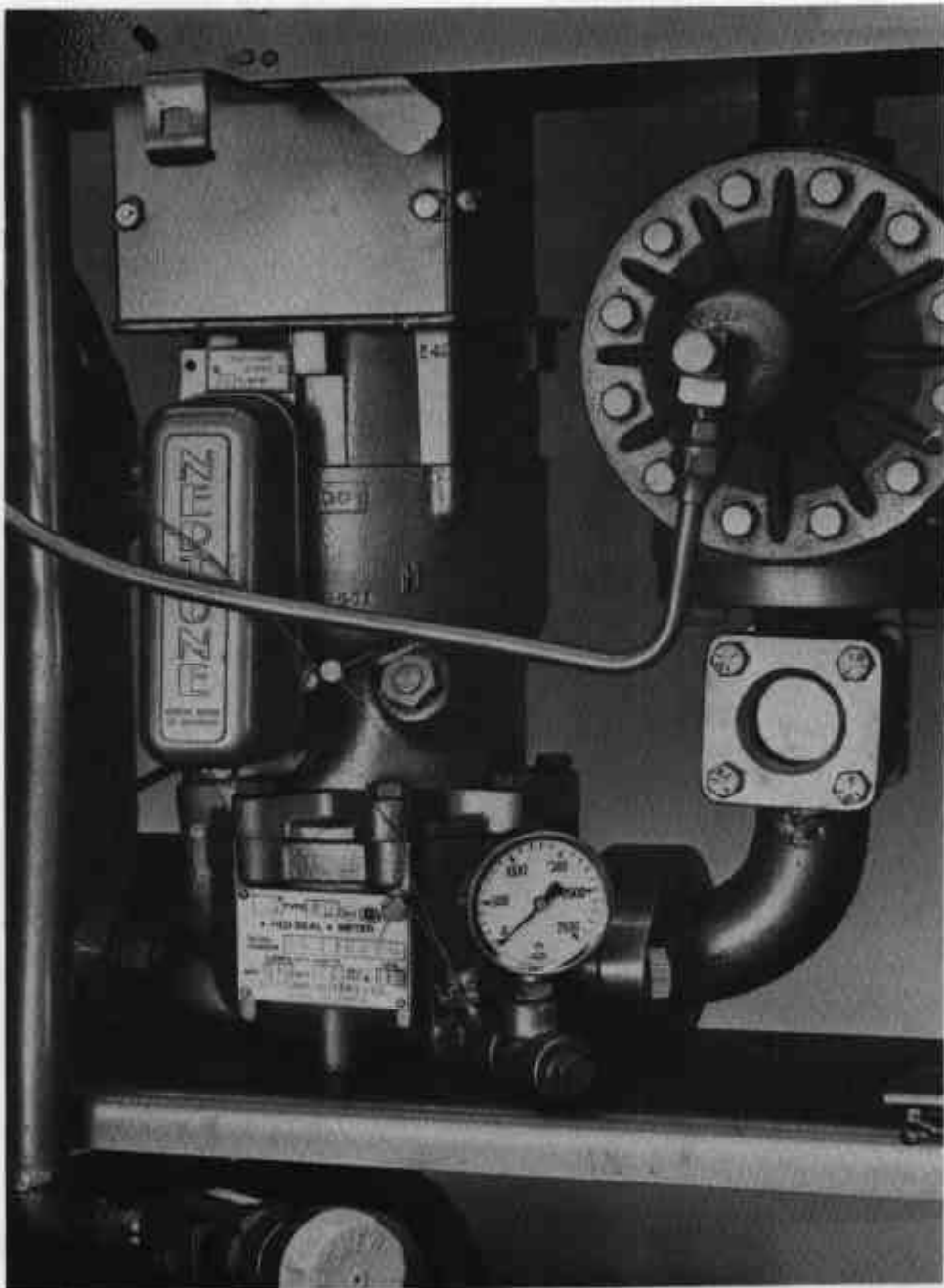
FIGURE P10/1/3 - 15



Sealing Of Retron 80

3/5/82

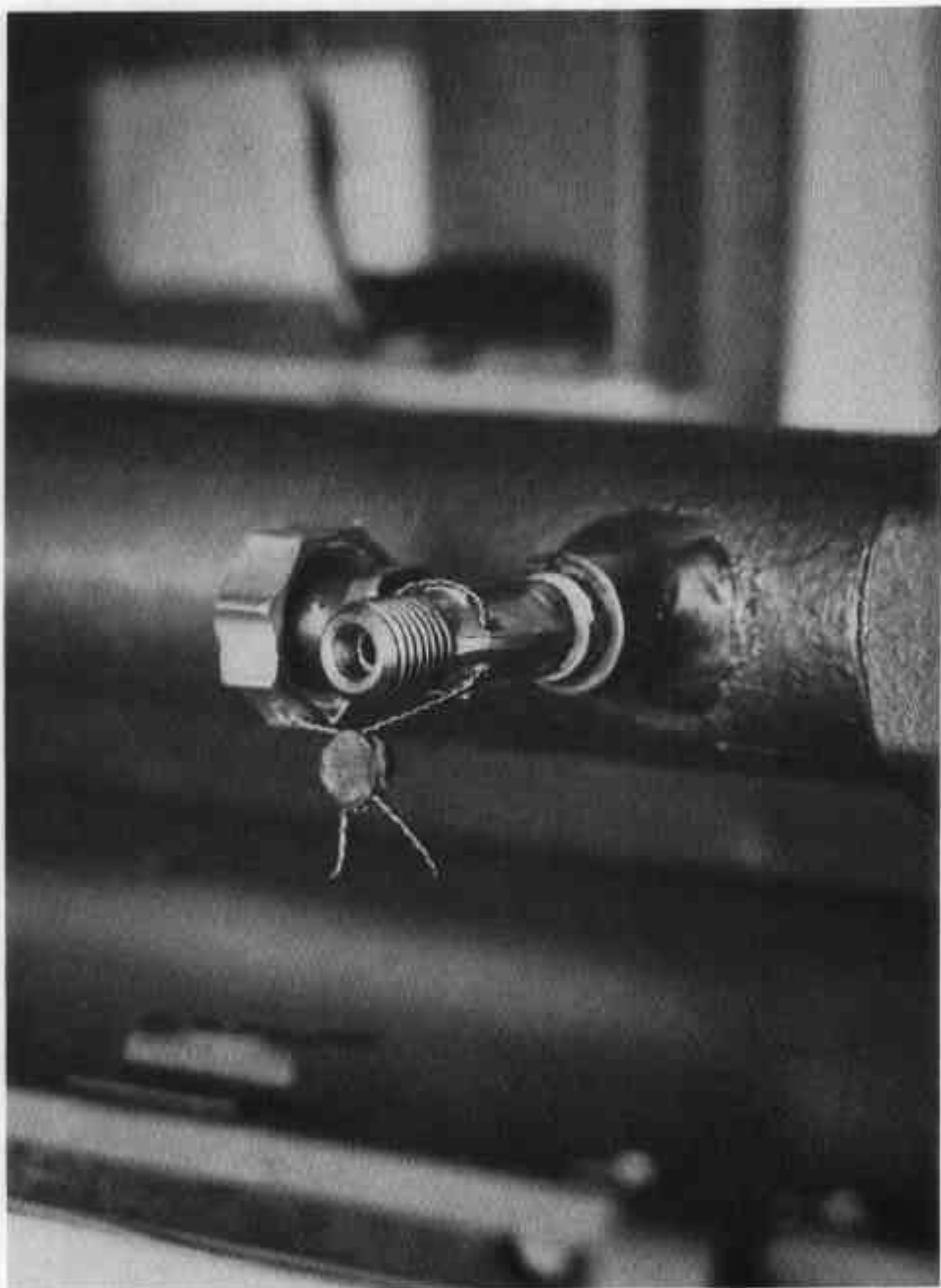
FIGURE P10/1/3 - 16



Sealing Of Calibration Adjustments Etc

3/5/82

FIGURE P10/1/3 - 17



Sealing Of Needle Drain Valve

3/5/82