

BINTECH

REMOTE LEVEL SENSING DISPLAY SYSTEM

Fault Testing Note 1

These notes describe the fault testing procedures and fault analysis of the Bintech pit display unit BI-1030 and the internal office display unit BI-1240 with the Bintech BI-2000 magnetic level sensor, Pretop PR5343B transmitter.



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BINTECH LPG LEVEL SENSOR FAULT FINDING

Fault finding in the Bintech LPG level sensor system requires checking of :

- The BI-1030 or BI-1240 Indicator (and aslave indicator at an operator's console (eg PM4) or elsewhere, (The BI-1030 and BI-1240 are essentially electrically equivalent)
- The tank sensor,
- The tank sensor transmitter PR5343 (or 5333),
- The interconnecting wiring.

The parameters that can be measured or observed using simple test equipment are:

- Indicator display values,
- Supply voltages,
- Loop currents,
- Resistance of the sensor,
- Position of the float (with the sensor and float accessible) .

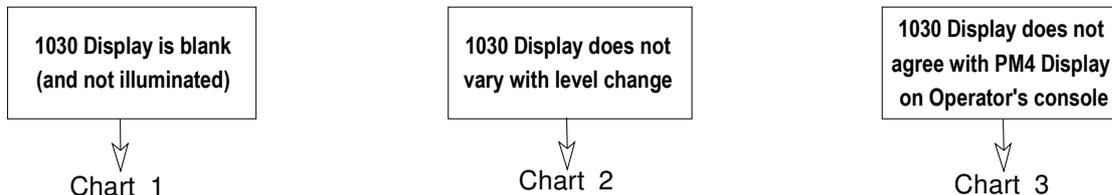
Some simple tests are:

- An underground LPG tank at ullage should contain 88% of maximum capacity.
- An empty tank will indicate about 4 to 6% of maximum (as the float can never drop below this point).
- With the loop short circuited, the mains powered BI-1030/1240 should display about 130% of the maximum value (ie. a loop current of about 26mA).
- With the BN (Brown) and BK (Black) wires linked at the PR5343/33 the BI-1030 should display the minimum value (ie. a loop current of 4 mA).
- With the BN and BK wires disconnected from the PR5343/33 the BI-1030/1240 should display about 115% of the maximum value (ie. a loop current of about 23mA).
- A 2.5 m sensor with the float at the bottom should read about 5 to10 ohm between BN and BK.
- A 2.5 m sensor with the float at the top (100% fill) should read about 21200 ohm (5900 ohm for a 56ohm/ 20mm sensor) between BN and BK and proportionally less for a 1.5m or shorter sensor.
- The resistance between BK and BU should be at least **greater** than the maximum for BN and BK as shown in Appendix B of the Installation and Commissioning Note 3.
- The resistance between BN and BK **plus** the resistance between BN and BU should be approx. equal to the resistance between BK and BU (within +/- 200 ohm or +/- 56ohm for old style sensor).

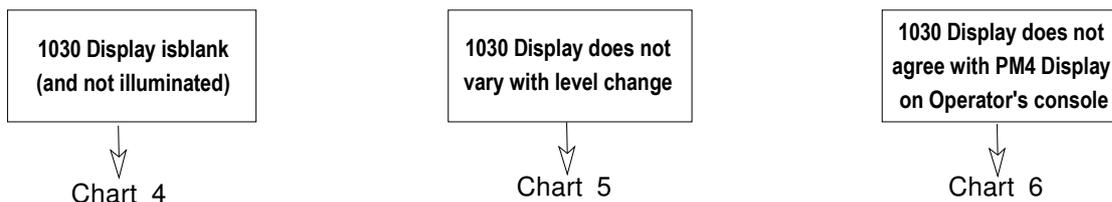
Note that the BI-1030 and BI-1240 indicators are factory calibrated and adjustment in the field should not be made without appropriate test equipment.

A number of fault conditions are shown in separate charts:

BI-1030/1240 is 240 Vac powered and provides the loop current to the sensor



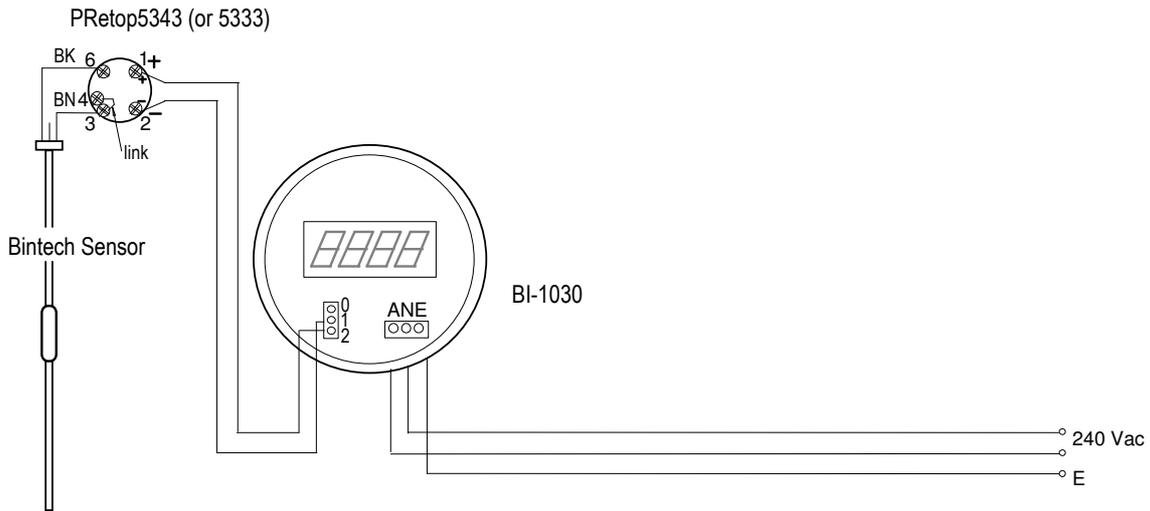
BI-1030/1240 is loop powered with loop current provided from an external source



SIMPLE FAULT TESTING OF THE BINTECH REMOTE DISPLAY SYSTEM

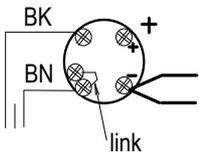
Some simple tests for a standard sensor and typical configuration are:

- With the current loop short circuited, the mains powered BI-1030/1240 should display about 130% of the maximum value (ie. a loop current of about 26mA).
- With the BN and BK wires linked at the PR5343/33 the BI-1030 should display the minimum value (ie. a loop current of 4 mA)
- With the BN and BK wires disconnected from the PR5343/33 the BI-1030 should display about 115% of the maximum value (ie. a loop current of about 23mA).



Typical System Connections - 240 Vac Powering

PRetop5343/5333



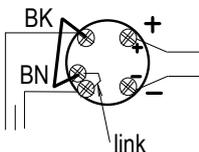
Short circuit the loop
(use terminal 1 or 2
as a link terminal)

1030 Indicator should read approx:

130% (% calibration)
or 23.7 kl (17.4 kl tank)

This test confirms correct operation of the BI-1030

PRetop5343/5333



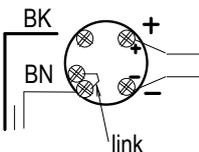
Loop terminals 4 & 6
(keep link between
terminals 3 & 4)

1030 Indicator should read approx:

3.5% (% calibration)
or 0.6 kl (17.4 kl tank)

This test confirms correct operation of the PR5343/33

PRetop5343/5333



Lift off BK (or BN) wire

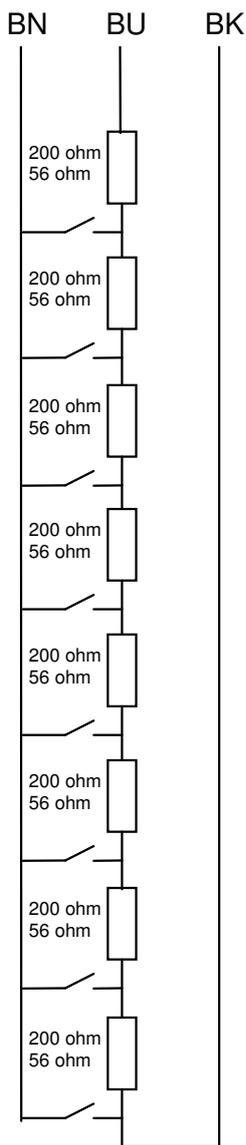
1030 Indicator should read approx:

115% (% calibration)
or 20.5 kl (17.4 kl tank)

This test confirms correct operation of the PR5343/33

Testing the Sensor and Resistor chain

The schematic below illustrates the configuration of typical sensor chains as used with the PR5343/33 transmitters. The PR5343 is used with the 200 ohm chain and the PR5333 with the older 56 ohm chain. Other transmitters may use a different resistor chain. Each reed switch is encapsulated with its associated resistor and a series of them is mounted on a long strip within the length of the sensor. The switches are spaced 18 mm apart (20 mm for 56 ohm). In operation, the magnet fitted in the float rises with the liquid and operates the reed switches sequentially increasing the resistance between the BN and BK wires. The changes in resistance are detected in the PR5343/33 and are translated into a 4 to 20 mA current. With the tank empty, the resistance between BN and BK has been factory set to be nominally zero (but typically 4 to 8 ohm due to the lead resistances).



The sensors are mounted onto the turret of the tank and the resistor chains are typically 200 mm longer than the maximum liquid level height in the tank. Only the BN and BK wires are used in normal operation and the BU wire is insulated off. During fault finding it may be necessary to expose the BU wire for resistance measurements.

As the resistor chain is always longer than the maximum level height, the resistance between BU and BK should be greater than the maximum resistance between BN and BK as quoted in the system Installation Instructions (Bintech Installation Note 3) for each Tank Size.

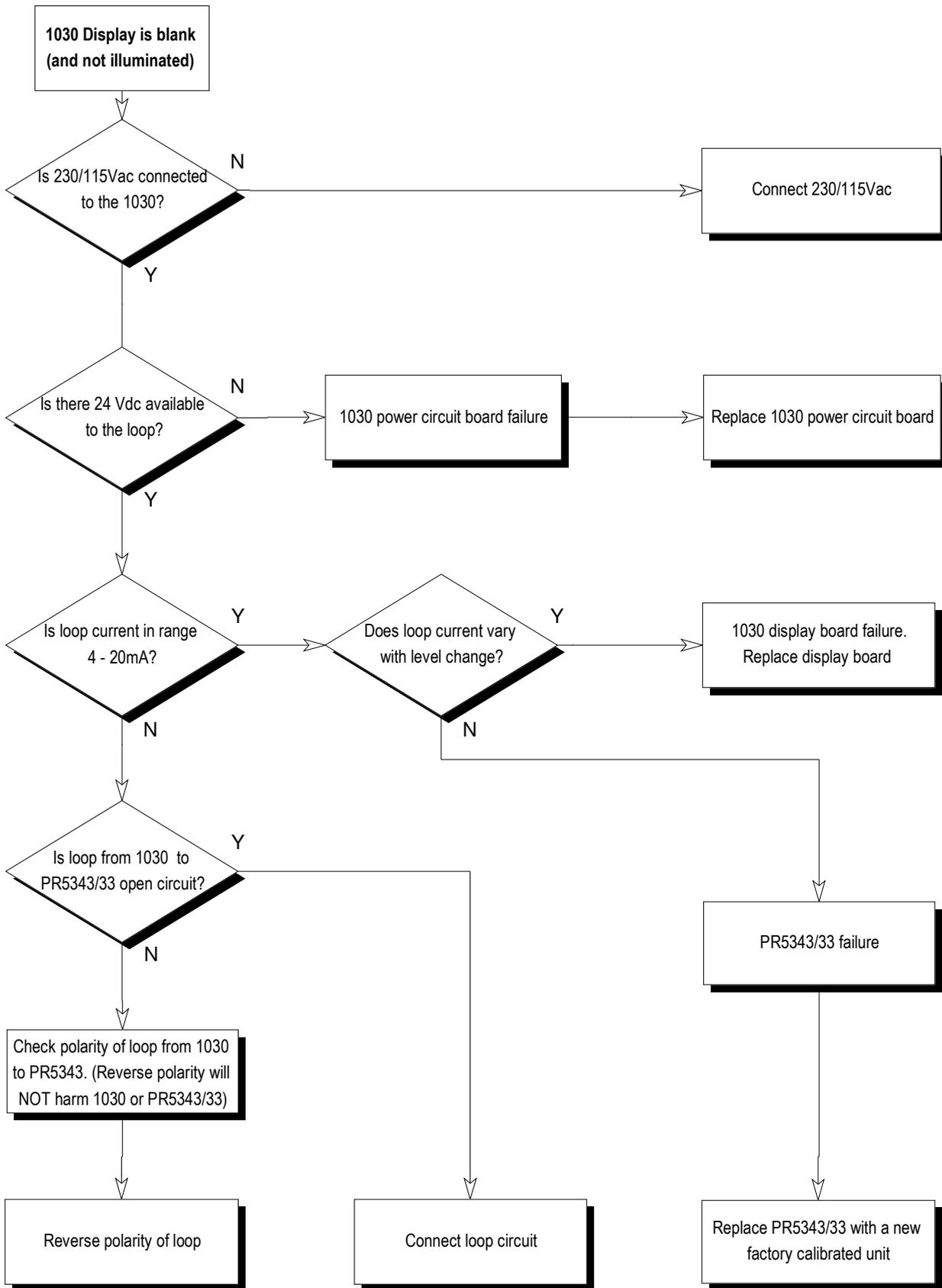
Simple tests on the Sensor

With BN, BK and BU unterminated from the PR5343/33.

- The resistance between BN and BK should be as per the calibration chart supplied with each sensor for the **known contents and float level**.
If the resistance is less than the value quoted then possibly the float has been trapped in the valve gear or pipe work in the tank or the float has failed and sunk.
- The resistance between BK and BU should be typically at least 22000 ohm (560 ohm for 56 ohm chain) greater than the maximum fill resistance given in the sensor calibration chart.
If the resistance is not greater than the value quoted then possibly a switch in the resistor chain has failed and locked closed.

BINTECH LPG LEVEL SENSOR FAULT FINDING
(BI-1030/1240 Internal mains powered)
(The BI-1030 and BI-1240 are essentially electrically equivalent)

Chart 1



BINTECH LPG LEVEL SENSOR FAULT FINDING
(BI-1030/1240 Internal mains powered)

Chart 2

(BI-1030 and BI-1240 are essentially electrically equivalent)



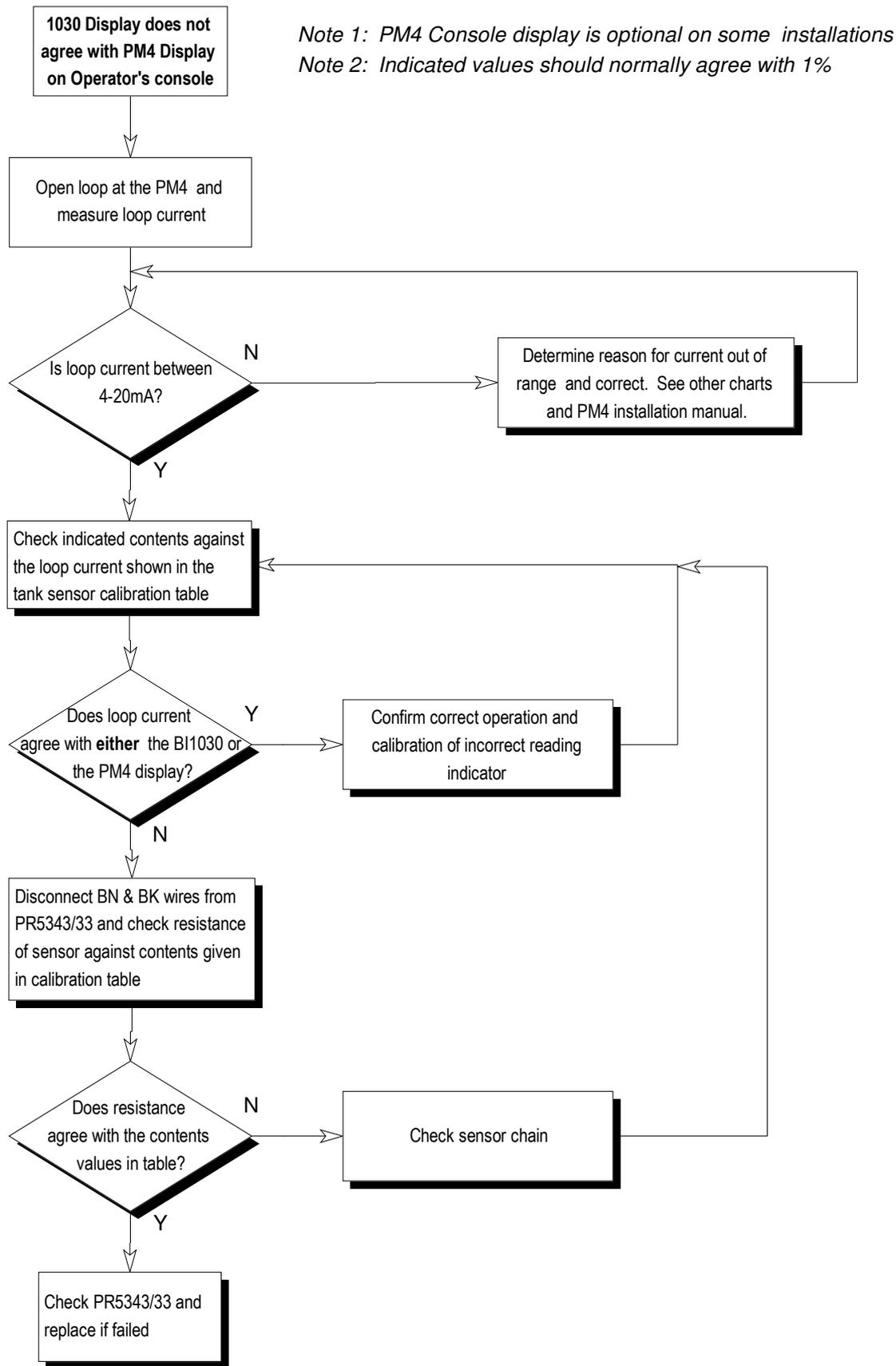
Note 1 Maximum resistance of a 2500mm sensor is:
 21200 ohm approx. (200 ohm at 18mm spacing)
 6000 ohm approx. (56 ohm at 20mm spacing)

BINTECH LPG LEVEL SENSOR FAULT FINDING

(BI-1030/1240 Internal mains powered)

Chart 3

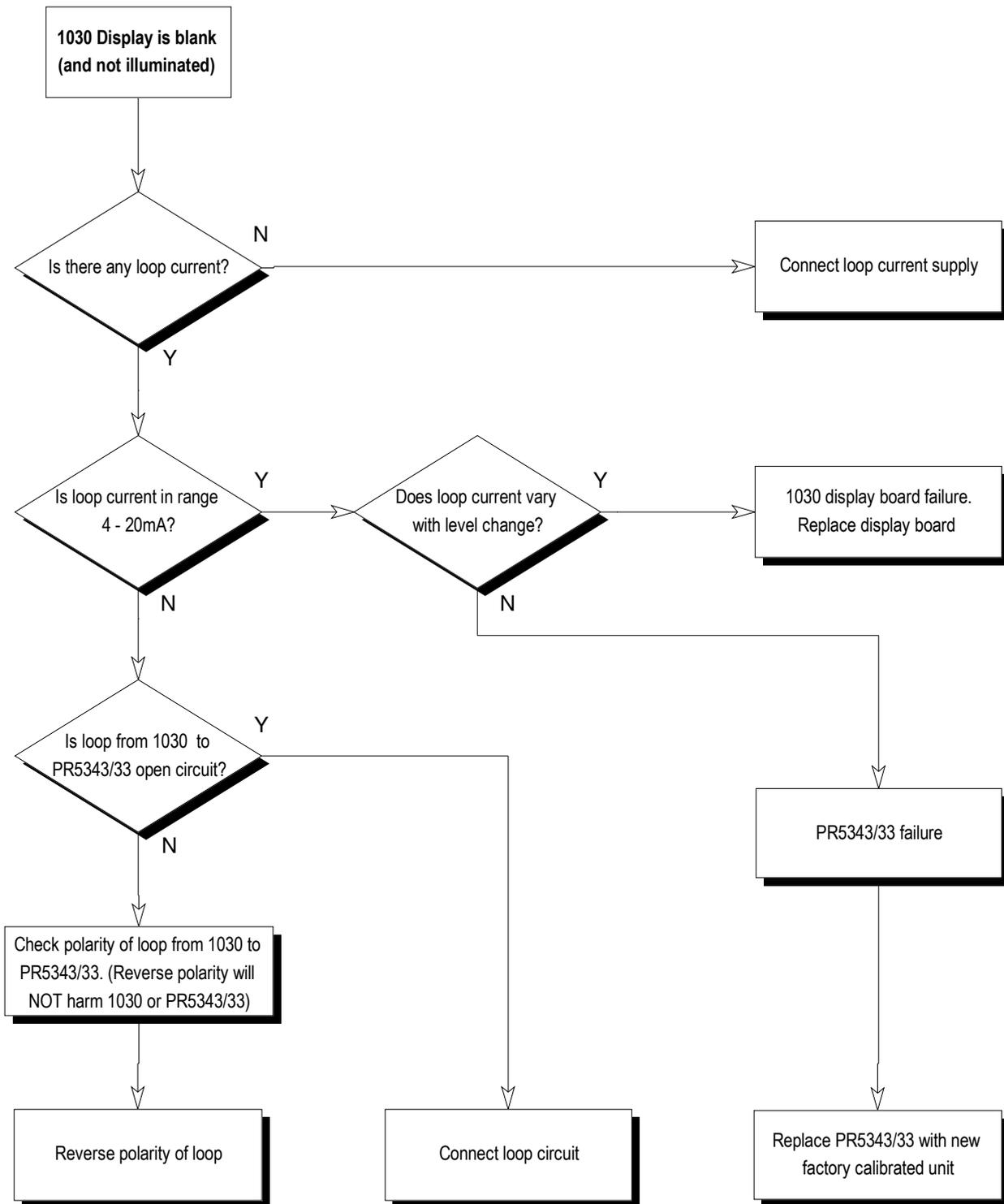
(The BI-1030 and BI-1240 are essentially electrically equivalent)



**BINTECH LPG LEVEL SENSOR FAULT FINDING
(BI-1030/1240 loop powered)**

Chart 4

(The BI-1030 and BI-1240 are essentially electrically equivalent)



**BINTECH LPG LEVEL SENSOR FAULT
FINDING**

Chart 5

**(BI-1030/1240 loop powered)
(The BI-1030 and BI-1240 are essentially electrically equivalent)**



**BINTECH LPG LEVEL SENSOR FAULT
FINDING**

Chart 6

**(BI-1030/1240 loop powered)
(BI-1030 and BI-1240 are essentially electrically equivalent)**

Note 1: PM4 Console display is optional on some installations
Note 2: Indicated values should normally agree with 1%

