Operation Manual

Gas Analyzer
Model 113

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I. SCOPE

This manual is provided for the operator of the analyzer. Technical data, Section II, and principles of operation, Section III, are provided to acquaint the operator with the unit.

In addition to operating instructions, Section IV, calibration instructions are included, as field calibration can be performed by the operator.

II. TECHNICAL DATA

1. Ranges

Halon:	0-10%
CO_2	0-100%
FE-13	
FM-200	0-10%
Inergen	

2. Principle of Operation

Thermal conductivity

3. Basic Components

Quantity	Part Number	Description
1		Analyzer
1		Power Cord
3		Sample Line (50ft. long, ¼” O.D. x 1/8” I.D.)
1		Line (3ft. long with quick disconnect fitting at one end)

4. Sampling System Characteristics

Sample line internal volume	0.48 liters
Sample flow rate into the unit	1.5 liters/minute
Response time (0-95% or 95-0%)	60 seconds

5. Dimensions

7.5”H x 21”L x 17”D

6. Weight

Analyzer	30 lbs.
Analyzer with all components	35 lbs.

7. Electrical Requirements

Source
Receptacle

8. Accuracy

   ±2% of full scale between line voltages of 98vac to 127vac

9. Linearity

   ±2% FS

10. Zero Drift

Maximum	+1.5% FS/30 minutes
Typical	+2.0% FS/2 hours

11. Readability

    ±1% FS

12. Operating Temperature Range

    32 ° – 104 ° F (0 ° - 40 ° C)

    Maximum calibration deviation of ±2% of full scale with a ±10 ° F (±6 ° C) variation in temperature

13. Operating Humidity Range

    0-95% non condensing

    Maximum deviation of ±2% of full scale or less with a change in relative humidity of 20-95%

III. Principles Of Operation

1. Thermal Conductivity Measurements

   The analyzer uses the thermal conductivity properties of the selected gas to measure its' concentration in air. There are three independent channels in the analyzer. Each channel uses two glow-wire sensors that function electrically as heated resistors connected to a bridge circuit.

   One glow-wire is mounted inside a "blind cell" (air filled) for reference. When this reference sensor reaches thermal equilibrium, it acts as a fixed resistance in the bridge circuit. The second glow wire is mounted inside the "sample cell". At alignment, the sample cell is filled with air and its' sensor is balanced against the reference sensor.

   During sampling, the air/sample gas mixture that is a better insulator than air only, is introduced into the sample cell. Therefore, as gas concentration increases, the glow-wire becomes increasingly insulated from the cell wall and its' temperature increases. With increased temperature, the resistance of the glow-wire increases, thus unbalancing the bridge with respect to the constant resistance of the reference sensor.

   The bridge circuit output is amplified to drive the recorder arm in the chart recorder or converted to an analog signal. Circuit operation is the same for all sample gases except that different span (gain) components are selected for each gas. Recording is not continuous, but occurs at the end of the timing cycle described in the next paragraph.

2. Timing Cycle

   Air or gas flowing through the sample cell cools the glow-wire mounted in the sample cell. This cooling effect opposes the heating effect of the sample gas in the mixture.

   A 5 second timing cycle is used in the analyzer to eliminate the cooling effect of sample flow. Through electronic circuitry, a solenoid valve is opened. This allows a sample to be pumped into the sample cell. After 2 seconds the solenoid valve closes. With flow interrupted, the cell reaches a thermal equilibrium that is a function of gas concentration. At the end of 3 seconds the gas concentration is sent to the chart recorder or data logging device. This completes the 5 second cycle.

IV. OPERATING INSTRUCTIONS

NOTE:

Refer to Figure 1 for illustration of controls and indicators.

1. Connect all sample lines to sample input fittings on analyzer front panel. All sample lines must be connected and free of obstructions or constrictions for proper operation of the unit.
2. Connect power cord between unit and appropriate power source (120vac or 220vac).
3. Energize unit by setting power switch to ON position. Observe that green POWER lamp illuminates.
4. Set GAS SELECTOR switch for gas reading desired.
5. Place end of sample lines at desired locations.
6. Allow unit to stabilize with all lines pulling room air. Adjust ZERO knobs as necessary to obtain zero traces on recorders.
7. Sampling may now begin. (Make allowance for response time when interpreting recorder traces.)

Figure 1
Panel Layout

V. HALON CALIBRATION

NOTE:

Refer to Figure 2 for set-up diagram.

Calibration gas required is 100% Halon.

2. Set GAS SELECTOR switch to Halon.
3. Connect 1ft. calibration jumper between channel 1 and channel 3 sample input fittings.
4. Set power switch to on.
5. Turn small locking knob on flowmeter and pull meter to vertical position.
6. Adjust zero knob on all three channels for zero recorder traces.
7. Connect 3ft. calibration line between Halon calibration gas cylinder and bottom fitting on flowmeter.
8. Connect 18” Teflon calibration line between channel 2 sample input fitting and free end of T-fitting at top of flowmeter. (Push Teflon line onto inlet fitting. Make sure that sample line is free from constrictions and that short piece of line of T-fitting is not obstructed.)
9. Adjust pressure regulator of Halon calibration gas cylinder to 20 psig ($\pm$5 psig).
10. Adjust flow control (large knob) of flowmeter for reading of 60mm.
11. Adjust span control for each channel for specified recorder trace.
12. Shut off Halon gas.
13. Disconnect 3 ft. calibration line from fitting at bottom of flowmeter.
14. Touch-up ZERO knob on all three channels (after trace levels off at baseline).
15. Reconnect 3 ft. calibration line at bottom fitting of flowmeter.
16. Repeat steps 8 through 11.
17. Disconnect all lines.
18. Lower flowmeter into panel and secure it by turning small locking knob.

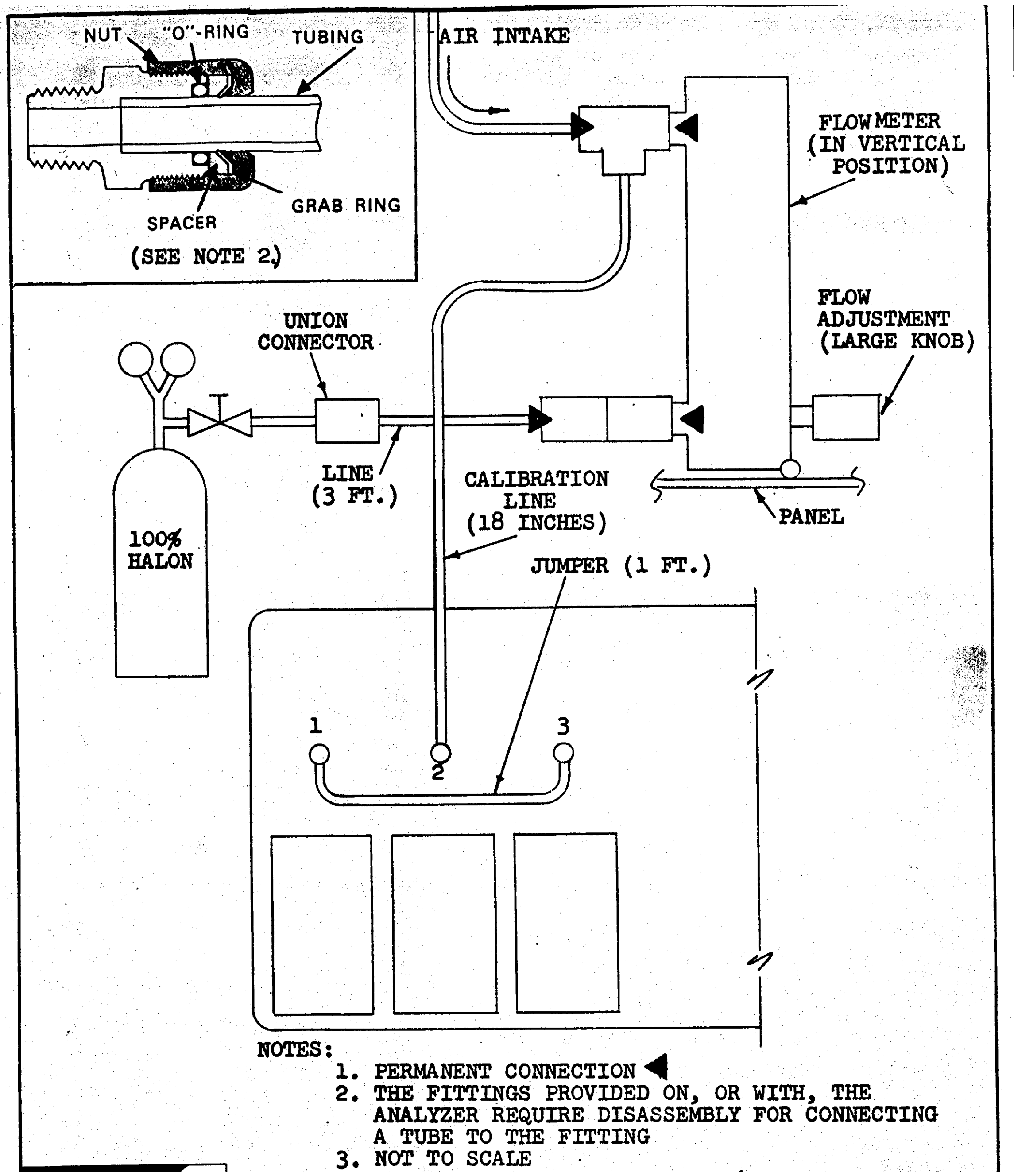

Figure 2
Halon Calibration Diagram

VI. CO_2 CALIBRATION

NOTE:

Refer to figure 3 for set-up diagram.

Calibration gas required is 100% CO_2.

1. Set GAS SELECTOR switch to CO_2.
2. Connect 1ft. calibration jumper between channel 1 and channel 3 sample input fittings.
3. Set power switch to on.
4. Turn small locking knob on flowmeter and pull flowmeter to vertical position.
5. Adjust zero knob on all three channels for zero recorder traces.
6. Connect fitting on 3ft. calibration line to bottom fitting on flowmeter.
7. Attach calibration T-fitting to other end of calibration line.
8. Connect 50 ft. sample line between channel 2 input fitting and open end of the calibration T-fitting.
9. Connect convenient length of tubing between CO_2 calibration gas cylinder and remaining end of calibration T-fitting. (A sample line may be use for this purpose.)
10. Turn flow control (large knob) of flowmeter to fully CCW (open).
11. Adjust pressure regulator of CO_2 calibration gas cylinder for flowmeter reading of 10mm or more. (Ignore pressure regulator reading on CO_2 cylinder.)
12. Adjust span control for each channel for 100% recorder trace.
13. Shut off CO_2 gas at cylinder.
14. Disconnect 3 ft. calibration line from fitting at bottom of flowmeter.
15. Touch-up ZERO knob on all three channels (after trace levels off at baseline).
16. Reconnect 3 ft. calibration line at bottom fitting of flowmeter.
17. Repeat steps 11, 12 and 13.
18. Disconnect all lines.
19. Lower flowmeter into panel and secure it by turning small locking knob.

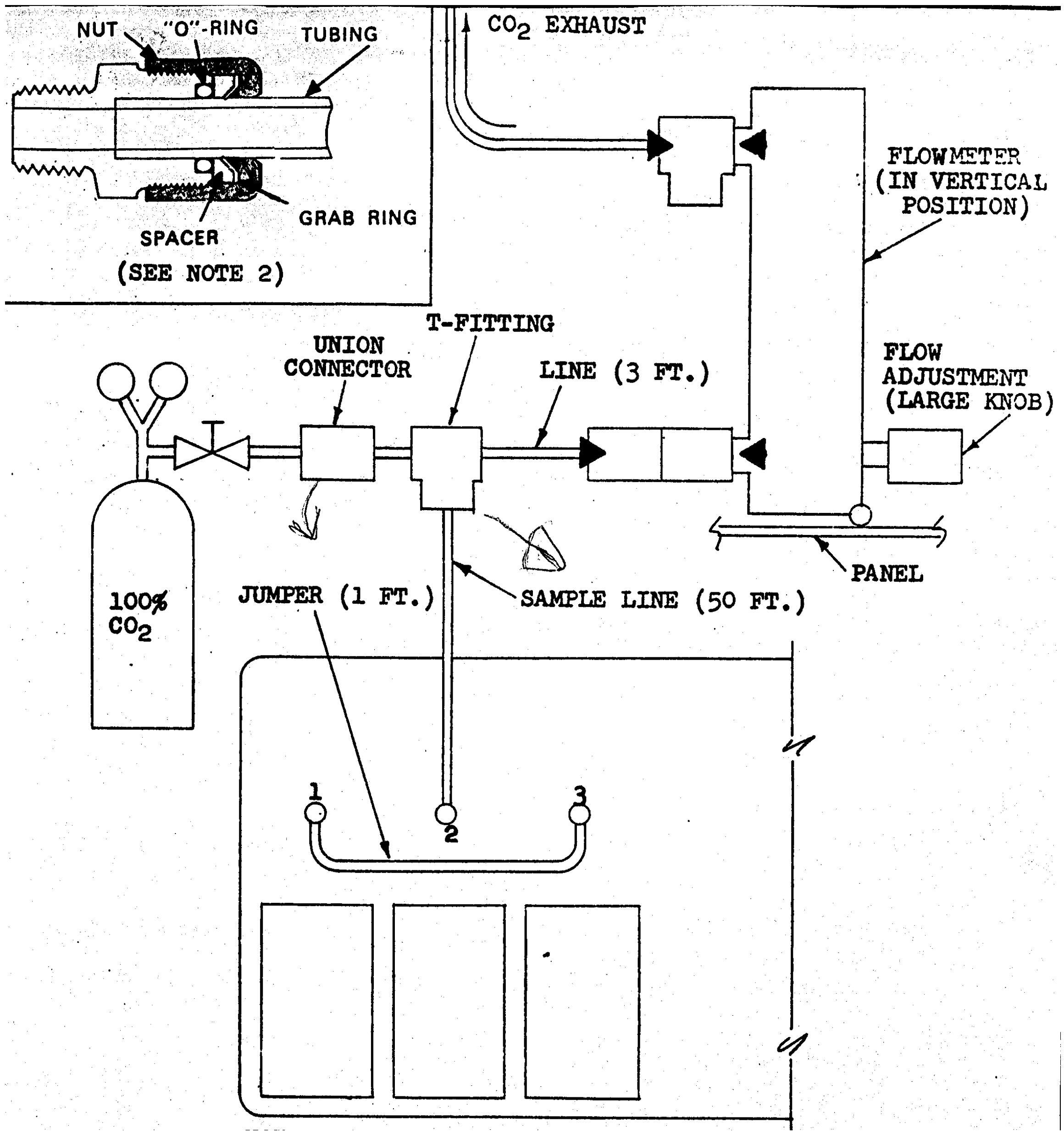

Figure 3
CO2 Calibration Diagram

VII. CALIBRATION CERTIFICATION

It is very expensive to fail a discharge test, and easily preventable, if it was only due to a Test Analyzer being out of calibration. In order for you to assure the accurate calibration of your analyzer at the test site, Tripoint Instruments would like to clarify exactly how a unit is factory calibrated.

When a Test Analyzer is returned for repair and/or factory calibration, it is semi-disassembled, all orifices cleaned, internal filters replaced, the vacuum pump cleaned and pressure checked, and all manifold connections tightened.

We allow the unit to warm up approximately 30 minutes and introduce certified diluted gas mixtures into the unit. All three span controls (pots) are adjusted to make the three recorders each read as required. Then and only then, we prepare calibration reference values by introducing 100% gas through the flow meter with the float at a reading as required per the operation manual. The values are then recorded on the calibration certificate.

In repeating the 100% gas field calibration check at the site, if the readings found do not exceed 2% of the values placed on the certificate, you know that your system is functioning properly and that the dilution by the vacuum system of the 100% gas has not changed. More importantly, the unit should have the same calibration as when it left the factory.

When the unit has been used on numerous tests, it is not unusual for dirt to get into the vacuum pump or in the lines and even into the orifices. Clogged filters, differences in line voltage (which is very common), temperature changes or changes in barometric pressure can also cause the unit, even if it is in perfect calibration, to give higher readings. This is due to the fact that the vacuum system is drawing in less air and thus not diluting the 100% gas to the same degree as when checked out at the factory.

If each time one gets a higher reading the span pots are turned down, the unit will be slowly brought out of calibration and will now be reading lower values than actual test results.

However, if you use a source of certified gas mixture just before each test at the site, you can verify and check the calibration. If necessary, you can adjust the unit to make all the recorders read the same value as the calibration gas. This will eliminate all errors. Your unit will now be in perfect calibration and there can be no doubt as to the results obtained on any test.

Tripoint Instruments highly recommends that you check the calibration of the Test Analyzer before every test using an exact known concentration of gas. We believe that this is a very good practice and should only take about 15 minutes of your time. It does seem very foolish to risk the chance of failing an expensive discharge test due to the unit being out of calibration.

We also suggest that at least once a year, or after 25 discharge tests, which ever comes first, that each test analyzer be sent back to our service facilities for preventive maintenance and factory calibration.

Units are factory calibrated with gas mixtures generated by a certified gas mixing device: Dial-a-Gas Model 1KM200/a-F.

This gas mixing device is checked against a NBS-traceable bubble flow meter.

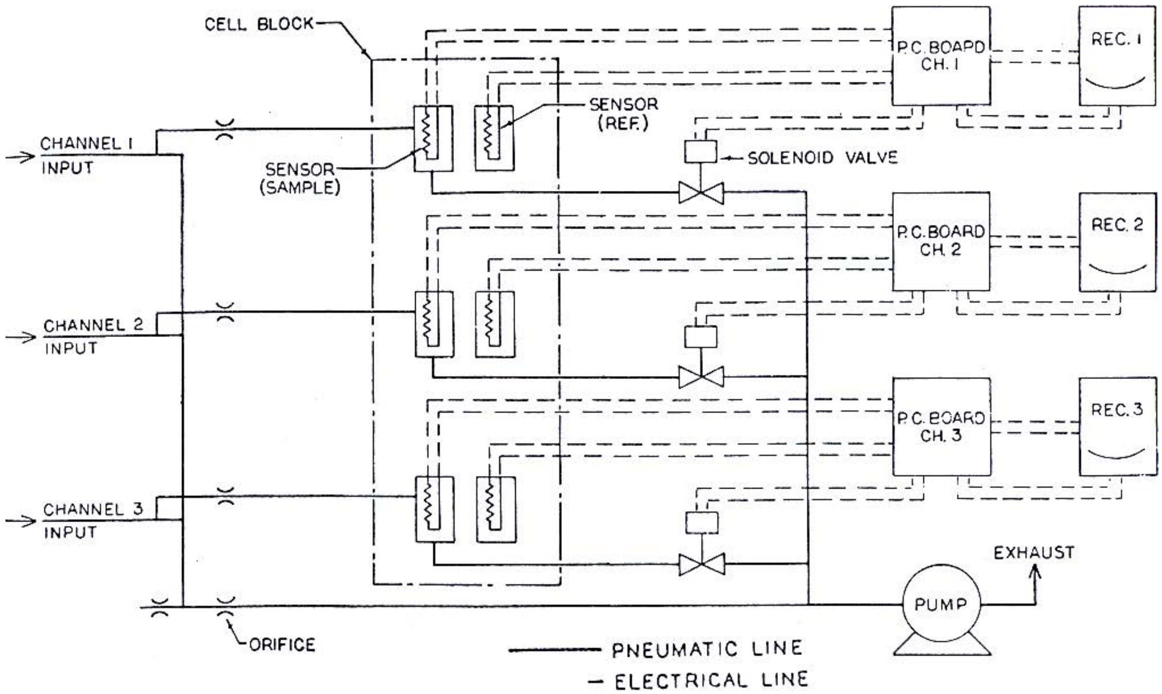

Figure 4
Internal Flow Diagram

VIII. RECOMMENDED SPARES

Quantity	Part Number	Description
6		Chart Paper, roll
3		Filter, Sample Line
3		Fuse, ?A
3		Sample Line (50ft. long, ¼" O.D. x 1/8" I.D.)
3		Lamp
1		Quick Disconnect Fitting
1		T-Fitting
1		Union Connector
1		Power Cord

Refer to current price list for pricing.

IX. OPERATING HINTS

1. Warm-up Time and Sample Line Location

   Allow the unit to warm-up for 10 minutes before adjusting the baseline with the sample line placed in the location where the sampling is to be performed. The baseline on the recorder may shift by 2% of full scale periodically. Take this into account when adjusting the recorder scale.

2. Field Calibration: Environmental Conditions and Interpretation of Results

   When performing the field calibration, try to calibrate the unit under the same environmental conditions as those anticipated for actual use. Temperature and humidity will not significantly affect the calibration, but will cause a shift in the baseline. A difference to 3% of the full scale from the field calibration reference figures is not indicative of the need to recalibrate. Small differences in calibration readings from references are most probably due to flowmeter or recorder errors. For example, the recorder accuracy is typically $\pm 2\%$ and the flowmeter accuracy is $\pm 5\%$. The field calibration serves to alert the user to gross calibration errors due to malfunction or misadjustment of the unit. Typically, the analyzer needs to be recalibrated only infrequently. Analyzer malfunctions will always result in large deviations in the recorder readings or in total lack of operation.

3. Need for Repetition During Calibration

   When calibrating the analyzer or performing a field calibration, repeat the procedure at least two times. The initial zero may deviate by 2% of full scale due to “out-gasing” of absorbed Halon or CO_2 from the 50 ft. PVC sample lines.

4. Calibration Gases

   Certified gas mixtures of Halon or CO_2 in air may be used with the CO_2 or gas mixture set-up.

   NOTE:

   > These gases must be supplied to the sampling lines at ambient temperature and pressures, with a slight excess vented through the calibration flowmeter.

   100% concentrations of liquefied CO_2 or Halon can also be used when calibrating the unit. These gasses must be supplied to the analyzer in diluted and gaseous form. Therefore, cylinders of liquefied CO_2 and Halon must not have siphon or diptubes.