



TECHNOLOGIES

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MODEL

R-1/R-2

FLOW CONTROL

INSTRUCTION MANUAL
FOR THE
R-1, R-2 FLOW CONTROL

FLOW CONTROL MODEL:
R-1____ R-2____

RECORD SERIAL NUMBERS BELOW
FLOW CONTROL _____

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Warranty and Claims

We warrant that any equipment of our own manufacture or manufactured for us pursuant to our specifications which shall not be, at the time of shipment thereof by or for us, free from defects in material or workmanship under normal use and service will be repaired or replaced (at our option) by us free of charge, provided that written notice of such defect is received by us within eighteen (18) months from date of shipment. All equipment requiring repair or replacement under this warranty shall be returned to us at our factory, or at such other location as we may designate, transportation prepaid. We shall examine such returned equipment and if it is found to be defective as a result of defective materials or workmanship, it shall be repaired or replaced as aforesaid. Our obligation does not include the cost of furnishing any labor in connection with the installation of such repaired or replaced equipment or parts thereof, nor does it include the responsibility or cost of transportation. In addition, instead of repairing or replacing the equipment returned to us as aforesaid, we may, at our option, take back the defective equipment and refund in full settlement the purchase price thereof paid to Buyer. If you are returning equipment from outside the United States, a statement should appear on the documentation accompanying the equipment being returned declaring that the goods being returned for repair are American goods, the name of the firm who purchased the goods, and the shipment date.

This warranty shall not apply to any equipment (or part thereof) which has been tampered with or altered after leaving our control, or which has been repaired by anyone except us, or which has been subject to misuse, neglect, abuse, or improper use. Misuse or abuse of the equipment, or any part thereof, shall be construed to include, but shall not be limited to, damage by negligence, accident, fire, or force of the elements. Improper use or misapplication shall be construed to include improper or inadequate protection against shock, vibration, high or low temperature, overpressure, excess voltage and the like, or operating the equipment with or in a corrosive, explosive or combustible medium unless the equipment is specifically designed for such service, or exposure to any other service or environment of greater severity than that for which the equipment was designed.

This warranty does not apply to used or second-hand equipment, nor extend to anyone other than the original purchaser from us.

THIS WARRANTY IS GIVEN AND ACCEPTED IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF FITNESS OR OF MERCHANTABILITY OTHER THAN AS EXPRESSLY SET FORTH HEREIN, AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON OUR PART. IN NO EVENT SHALL WE BE LIABLE UNDER THIS WARRANTY OR ANY OTHER PROVISION OF THIS AGREEMENT FOR ANY ANTICIPATED OR LOST PROFITS, INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, TIME CHARGES, OR ANY OTHER LOSSES INCURRED BY THE ORIGINAL PURCHASER OR ANY THIRD PARTY IN CONNECTION WITH THE PURCHASE, INSTALLATION, REPAIR, OR OPERATION OF EQUIPMENT, OR ANY PART THEREOF, COVERED BY THIS WARRANTY OR OTHERWISE, WE MAKE NO WARRANTY, EXPRESS, OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF FITNESS OR OF MERCHANTABILITY, AS TO ANY OTHER MANUFACTURER'S EQUIPMENT, WHETHER SOLD SEPARATELY OR IN CONJUNCTION WITH THE EQUIPMENT OF OUR MANUFACTURE. WE DO NOT AUTHORIZE ANY REPRESENTATIVE OR OTHER PERSON TO ASSUME FOR US ANY OTHER LIABILITY IN CONNECTION WITH EQUIPMENT, OR ANY PART THEREOF, COVERED BY THIS WARRANTY.

*****CAUTION*****

DO NOT USE THIS INSTRUMENT IN THE PRESENCE OF FLAMMABLE ANESTHETICS OR FLUORINATED GASES.

NOT FOR USE WITH ANESTHETIC GAS MIXTURES.

**THIS INSTRUMENT MUST BE ELECTRICALLY GROUNDED.
DO NOT USE AN UNGROUNDED CONNECTOR OF ANY KIND.**

DO NOT OPEN CABINET WITHOUT PRIOR FACTORY AUTHORIZATION.

I

GENERAL INFORMATION

1.1 INTRODUCTION

The Model R-1 (R-2) Flow Control is frequently used as an integral part of any gas measurement system. The Flow Control is frequently used in conjunction with the S-3A Oxygen analyzer and CD-3A Carbon Dioxide analyzer. The Model R-1 Flow Control contains the flow meter, pump, and needle valve in a single cabinet. The Model R-2 Flow Control contains 2 flow meters, pump, and 2 needle valves in a single cabinet.

1.2 FLOW DIAGRAM

The preferred flow arrangement is to draw the gas through the gas analyzer with the pump and then vent it to the room or into a hood. Flow meter calibration curves are shown below.

1.3 CONTROLS/INDICATORS

The front panel controls/indicators are:

ON/OFF SWITCH: All power to unit switched on and off.

FLOWMETER: Displays the flow rate. See Flow Rate Graph below for conversion to ml/min.

FLOW ADJUST: Adjusts the flow rate.

The rear panel controls/indicators are:

POWER SUPPLY FUSE: 0.25 Amp for 230 VAC units. No fuse on 117VAC units.

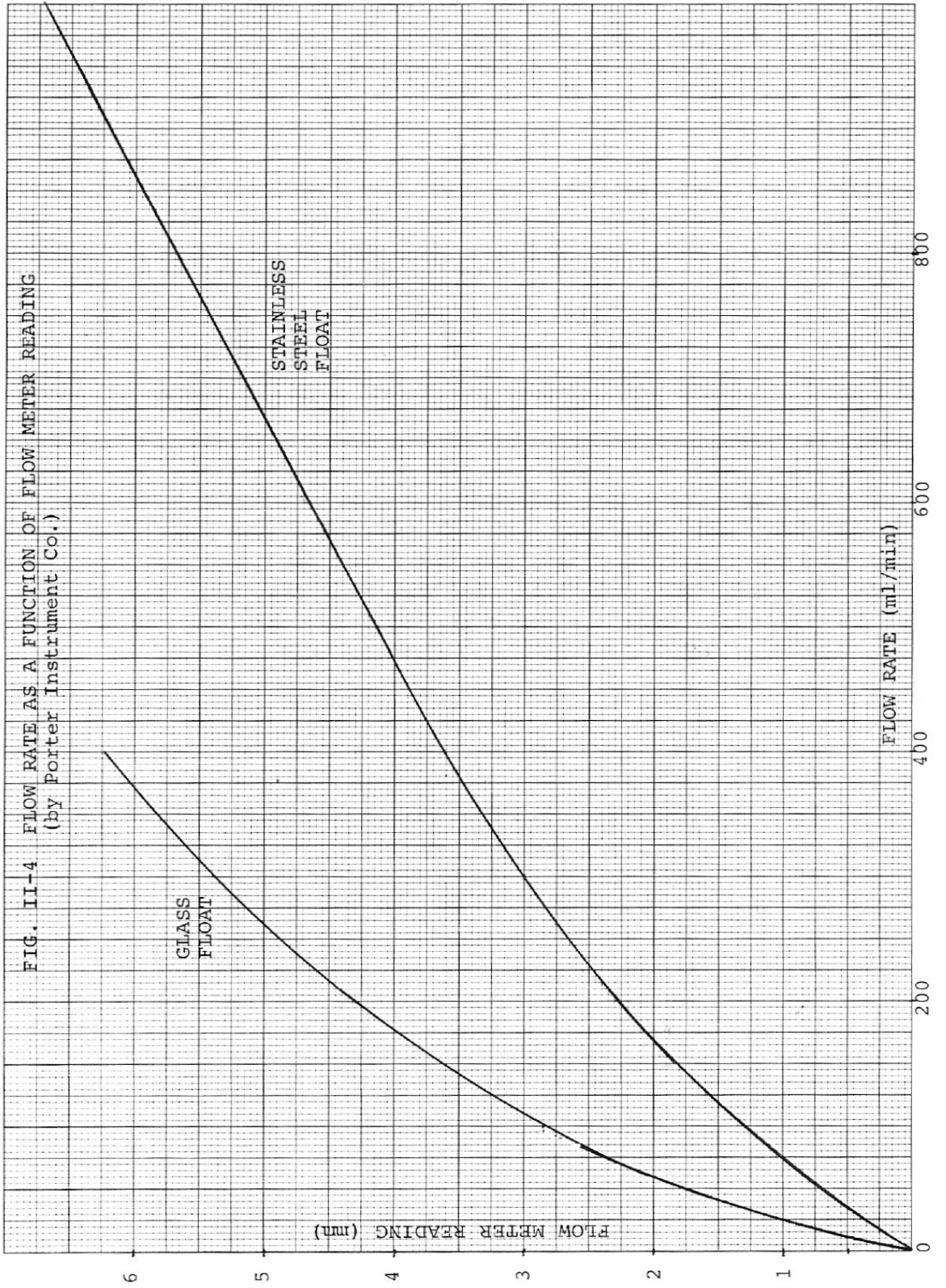
1.4 INSPECTION AND INSTALLATION

1.4.1 Inspection

The Model R-1 (R-2) Flow Control has been thoroughly inspected and carefully packed prior to shipment. When the instrument is received, it should be examined both before and after unpacking for any physical damage that may have occurred in transit. Install and operate the instrument as soon as possible to check for any internal damage. Save all packing materials until this inspection is complete. If damage is found, a claim should be filed promptly with the carrier and AEI Technologies should be notified so that we can arrange for any repair or replacement necessary.

1.4.2 Installation

The Flow Control is shipped ready for use.



R-1/R-2 OPERATING INSTRUCTIONS

2.1 INTRODUCTION

The following sections provide much of the information necessary to Connection and Use the R-1 (R-2) Flow Control.

2.2 GAS CONNECTIONS

2.2.1 General

The tubing on the Model R-1 (R-2) Flow Control is 1/8 inch O.D. For normal use connect the OUT port of the Sensor to the IN port of the R-1 (R-2) Flow Control using 1/8 inch I.D. soft PVC tubing. As shipped, the Flow Control inputs are protected by flexible tubing that should be removed. The gas supply system must be free of leaks, water, and sources of contamination.

When certain that the sample tubing connections are correctly connected, secure them onto the Flow Control IN [OUT] port tubes using the cable ties provided. Use 3 cable ties rotated 120 degrees from each other on each port tube.

Flow rates of 50—500 ml/min are typically used. The Model R-1 Flow Control provides a convenient means of maintaining suitable constant flow rates. **IMPORTANT: The Sample (unknown) and Calibration gases should be flowed at the same rate so that the total gas pressure in the system remains the same.** Some variation in flow rate is permissible if the total system pressure is not altered within the accuracy required. If separate lines are used for the calibration and unknown gases, the lengths and diameters of the tubing should be the same to insure equal pressure drops. The same mode of flow (i.e., forcing or drawing the gas through the system) must be used for both calibration and unknown gases.

2.2.2 Preferred Gas Flow Arrangement

To adjust the flow rate partially close the flow meter needle valve by turning it clockwise until the desired flow rate is achieved; but do not over tighten.

With the single-channel R-1, the inlet and outlet of the pump are independent of those of the needle valve and flow meter. This permits the flow control to be used in three modes of operation below. The R-1 is shipped as in Arrangement (A) below.

The Model R—2 Flow Control handles two independent gas streams (e.g., unknown and reference gases through a double-cell sensor, or two unknown gases). It contains two needle valves, two flow meters, and one pump. Only Arrangement (A) below can be used with the R-2. NOTE: The OUT port of the flowmeter has been connected at the factory to the IN port of the pump with a piece of tubing.

Arrangement (A) With the R-1, connect meter OUT to pump IN using the short piece of tubing provided). Turn the pump ON with the toggle switch and turn the

needle valve(s) off to finger tightness (do not overtighten). Connect sensor(s) OUT to meter(s) IN and the sample gas(es) to sensor IN(S). Slowly open the needle valve(s) until the desired flow rate is achieved. (100 ml/min is suitable for most applications).

Arrangement (B) Disconnect the tubing between meter OUT and pump IN. Turn the pump on and the needle valve off (do not overtighten). Connect pressurized sample gas to meter IN and adjust gas flow rate to desired value with the needle valve. Again turn the needle valve off and connect meter OUT to sensor IN. Carefully turn the needle valve on until the flow meter reads the desired value.

Arrangement (C) Disconnect the tubing between meter OUT and pump IN. Turn the pump on and needle valve off (do not overtighten). Connect sample gas to pump IN and connect pump OUT to meter IN. Connect meter OUT to sensor IN. Open the needle valve until the desired flow rate is achieved.

2.2.3 Pump Fluctuations

For some users, slight pump fluctuations have interfered with very accurate measurements. If this is a problem, insert a surge tank (bottle) in the line between the flowmeter and the pump. A volume of 1000 ml is suitable.

2.3 ELECTRICAL CONNECTIONS

The Model R-1 (R-2) Flow Control should be plugged into a 117VAC (230VAC for Model R-1V) grounded three-terminal receptacle.

CAUTION: This instrument must be electrically grounded. Do not use an ungrounded adaptor of any kind.

R-1/R-2 MAINTENANCE AND REPAIR

4.1 INTRODUCTION

This equipment has been designed for reliable long-term operation with a minimum of maintenance. If difficulty is experienced, the gas handling system should be checked carefully as flow problems constitute the most probable source of error. It is recommended that AEI Technologies be contacted before any servicing or repair of the instrument itself is attempted.

4.2 FLOW SYSTEM

Leaks (see Section 4.3), contamination, or line blockage can result in error in measurement. These problems may be subtle and difficult to find. Line blockage will decrease gas flow and can be detected by lowered flowmeter readings. NOTE: Regularly check the system for leaks.

If the same mode of flow (i.e., drawing or forcing the gas through the cell) is not used for calibration and unknown gases, erroneous readings may result.

4.3 LEAK TEST

This test should be performed before any measurements are taken on the initial setup of the system and frequently thereafter. Gas leaks are one of the most common sources of error in gas measurement. The simplest method to test for leaks in the system is as follows:

- Turn on the R-1 Flow Control.
- Block the sample gas input using a clamp or your finger. It should initially be blocked at the farthest point in the sample gas tubing path from the R-1. In other words, blocked as close to the source of the sample as possible.
- Observe the balls on the R-1 flowmeter. Both balls will slowly drop to “0” and stay there without any bouncing if there is no leak. Even a slight movement of the balls indicates a leak.
- If the balls do not drop or they are bouncing, there is a leak in the system. The source of the leak can be further located by blocking the sample gas flow at other locations in the sample gas tubing path.



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