APEX SOURCE TESTING EQUIPMENT
INSTRUMENTS

INSTRUCTION MANUAL

FLOW CONTROL DRAWERS
MANUAL / PLC CONTROL SERIES
Model 510 Series

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TABLE OF CONTENTS

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A: LIMITED WARRANTY

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DESIGN CHANGES

Design changes are made from time to time. Some items may differ slightly from catalog illustrations or descriptions. Changes are made in the interest of better performance, quality and delivery.

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Great care has been taken in preparation of this literature; however, we cannot be responsible for any omissions or typographical errors.

Revision I, 15 February 2007
Revision II, 6 June 2007
Revision III, 28 April 2009
Revision IV, May 7 2010

B: DESCRIPTION

The Apex Instruments Model 510 Flow Control Drawer allows easy control of sample and calibration gases. With the Model 510, you may choose whether to control sample gases or cal gases, manually or by PLC / PC.

The standard Model 510 is configured for five gas channels, and 11 calibration gases (zero and 10 gases). Manual control switches are provided for selection of system or direct calibration. Eight flowmeters are included: one for total sample flow and seven for visual indication and control of stack calibration gas flow, individual analyzer flow, and bypass.

Model 510 has a provision for system bias checks. System integrity is verified by comparing the calibration gas flow to the stack filter head and through the entire sample system to the calibration gas introduced directly to the continuous gas analyzer common sample manifold. This check indicates problems such as system leakage and gas component loss.

Features:
• Manual or PLC control of sample and calibration gases
• Up to 5 gas analyzer channels
• Up to 11 cal gas channels (including zero and span)
• Multiple flowmeters: cal gas to probe, total flow to analyzers, individual analyzer channels

The Model 510 Flow Control Drawer is a 19" rack mountable integrated gas flow control system for monitoring and controlling of:

1. Total Extracted Sample Flow
2. Individual Analyzer Sample Flow
3. Bypass Flow Control
4. Calibration Gas Flow
5. Verify system integrity / Bias Check (Sample Loss Due to Leaks or Gas Absorption)
6. Calibration Gas Leak Detection

Optional Upgrade to the Model 510:
• Low flow switch (Dry Contact)

C: SPECIFICATIONS

Input Cal-Gas Channels:	
Flowmeters Available:	Sample 0 – 10 LPM
	Vent 0 - 10 LPM
Output Gas Channels:	
Flowmeters Available:	0 - 0.5 LPM 0 - 1.0 LPM 0 - 2.5 LPM 0 - 5.0 LPM
Voltage:	110 - 220VAC, 50/60 Hz
Power:	25 Watts
Mounting Dimensions:	4U (7"), 19" Rack Mount 18" Depth (h x w x d) (17.8cm x 48.3cm x 45.7cm)
Weight:	Approx. 24 lbs
Pressure Gauge:	0-15 psi
Connections:	¼ inch stainless steel bulkhead

D: OPERATION

General Overview
Sample gas is extracted from the process through a filter probe, such as an Apex Instruments Heated Filter Probe, to remove particulate. The filtered gas is then transported to an Apex Instruments Sample Conditioning System where the moisture is removed. The Sample Conditioning System supplies a clean, dry sample when it enters the back panel of the Model 510 Flow Control Drawer. The stack probe filter and sample pump performance are indicated by the Flow Control Drawer Pressure Gauge.

Note: Please refer to the attached Model 510 Front Panel **(ILL. 1)** for an example of an integrated continuous emissions monitoring system flow schematic **(ILL. 6, 7, & 8)** using the Model 510 Flow Control Drawer.

Flow from the Sample Conditioning System enters the Model 510 Flow Drawer Sample / calibration manifold. Here, either sample or calibration gas (for direct calibration) can be directed to the atmospheric pressure sample manifold and then on to the individual analyzer gas channels. Individual sample flowmeters indicate the flow rate of each gas channel. A bypass flowmeter vents excess sample gas not used by the continuous gas channels and also acts as an atmospheric vent.

The Model 510 Flow Control Drawer has the ability to switch the sample and as many as (11) calibration gases to the analyzer rack directly or via the total sampling system. This is done through multiple sets of solenoid valves: (1) the calibration gas solenoid valves which are mounted on a common manifold at the rear of the drawer, and (2) The system/direct solenoid valves located in the front of the drawer. A block & bleed solenoid valve, which prevents the manifolds from being pressurized during sampling, is also part of the system/direct solenoid valve set.

The calibration function will only take place when both a calibration gas solenoid valve and the Cal solenoid valve and System or Direct solenoid valve have been selected. Also, AUTO control is not allowed in the MANUAL mode.

The Model 510 has a provision for system bias checks. System integrity is verified by comparison of calibration gas flow through the stack filter assembly to calibration gas flow directly to the gas analyzers. This check indicates problems such as system leakage and gas component loss.

There are (3) vertical terminal block assemblies on the back panel provided for computer interface **(ILL. 5)**. The 12 and 2 single-point terminal blocks are used for computer control.

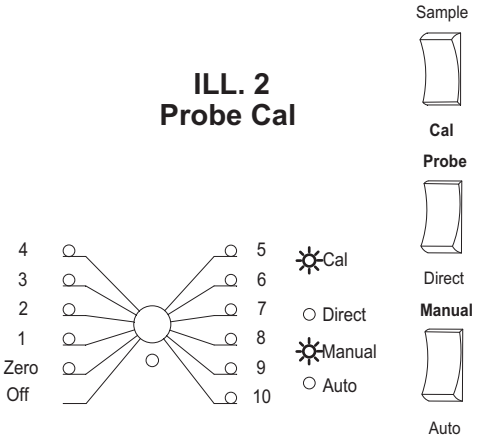
Flow Sensor (*Option*)
Mass flow sensor / Dry contract

Manual Mode Operation

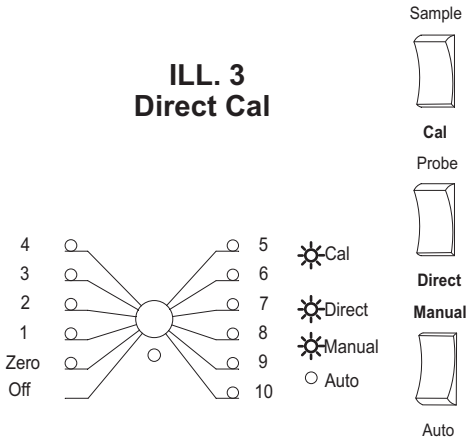
To enter the Manual mode, toggle the Manual/Auto switch to the manual position. While in the Manual mode, the operator can perform manual calibrations. In this mode, all switches on the front panel are enabled for local operator control and AUTO Control is disabled. All Calibration Gas (CG) functions, Direct / System, are available for the local operator. When the Manual switch is OFF, the AUTO mode has control and can remotely duplicate Manual control functions. The AUTO Switch provides an output to the PLC / PC.

Manual System Calibration: To perform manual system calibration, toggle the Manual/Auto switch to the Manual position. Toggle the Sample/Cal switch to the Cal position and toggle the Direct/Probe switch to the probe position. **(ILL. 2)**
Then turn the Calibration Gas rotary switch to the position indicated by the LED
This will allow the selected calibration gas to flow through the analyzer suite sampling system.

ILL. 2
Probe Cal



ILL. 3
Direct Cal



Manual Direct Calibration: To perform manual direct calibration, toggle the Direct/System Switch to the Direct position **(ILL. 3)**. Then toggle any of the Calibration Gas switches to the up position. This will allow the selected calibration gas to flow to the analyzer directly.

E. BACK PANEL CONNECTIONS**********

See drawing *Flow Control Drawer Back Panel* ***(ILL. 5)*************

Mechanical Connections Inlet/outlet Gas Bulkhead Fittings

1. All Sample Gas Connections are via 1/4" stainless steel bulkhead fittings.

2. All Bulkhead Connections are labeled and follow the following functions:

Sample in ---------- (Sample)
Calibration Gas Out to Stack Filter Assembly -------(Probe Cal)

Analyzer #1 ---------- (CH1)
Analyzer #2 ---------- (CH2)
Analyzer #3 ---------- (CH3)
Analyzer #4 ---------- (CH4)
Analyzer #5 ---------- (CH5)
Calibration Gas #1-10---------- (CG1-10)
Zero Gas # Zero Port

AUTO Mode Operation

Auto Control (AUTO): To enter AUTO Control mode operation the Manual / Auto Switch must be toggled to AUTO. Computer control is initiated through the 12 Position vertical terminal block on the back panel and the Sample / Cal along with the Direct / Probe terminal blocks. To activate a particular function, the common terminal is applied to the appropriate terminal. Pass it through a set of dry contacts on a computer controlled relay, and back to the appropriate terminal.

12 Pin Terminal Connector

1st Terminal = 24 Volt
2nd Terminal = GAS 10
3rd Terminal = GAS 9
4th Terminal = GAS 8
5th Terminal = GAS 7
6th Terminal = GAS 6
7th Terminal = GAS 5
8th Terminal = GAS 4
9 th Terminal = GAS 3
10 th Terminal = GAS 2
11 th Terminal = GAS 1
12th Terminal = GAS ZERO

Top 2 Pin Connector
Direct / Probe Calibration

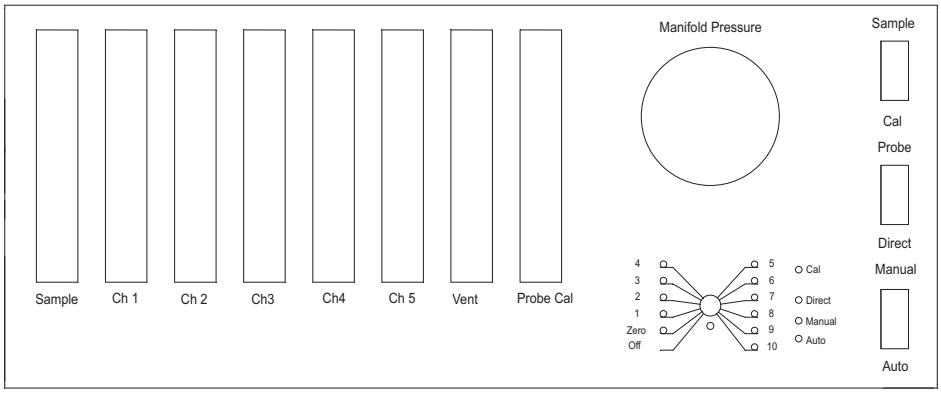
Bottom 2 Pin Connector
Sample / Calibration Mode

F: TROUBLESHOOTING

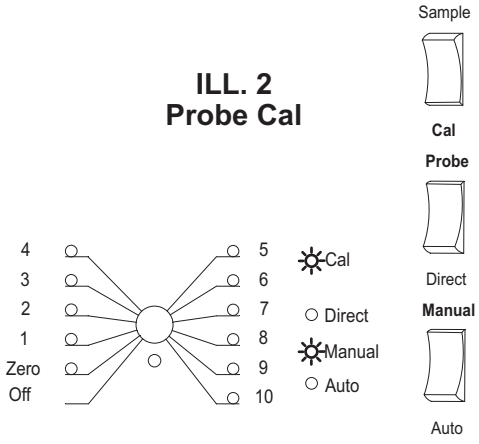
Symptom	*Check*	*Action*
Manual Control (MANUAL) Switches have no effect Inadequate sample flow No system cal gas flow	AUTO/MANUAL switch in AUTO Low sample pressure No cal gas from bottle Cal gas solenoid not operating Cal gas Flowmeter closed Block/bleed solenoid constantly vents System cal gas solenoid valve Defective	Select Manual Adjust sample pressure Cylinder to 15 psig Check cabling Replace cal gas solenoid Replace control board Adjust Flowmeter Replace solenoid SV9 Replace solenoid SV10
No direct cal gas flow	Direct cal gas solenoid valve defective	Check cables and connector boards for good connections Check Cylinder pressure Replace solenoid SV11
Computer Control (AUTO) Computer control has no effect	AUTO/MANUAL switch in Manual Computer control wiring to terminal block is wrong	Select Auto See the computer control wiring

G: Illustrations

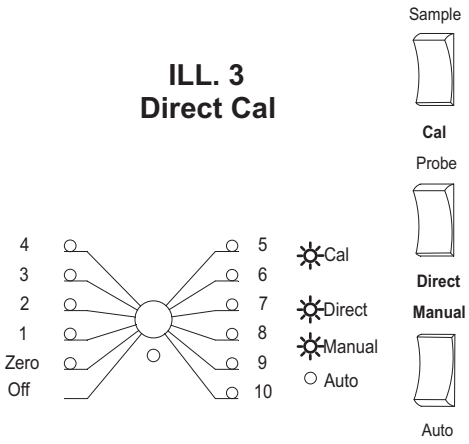
ILL. 1
Front View



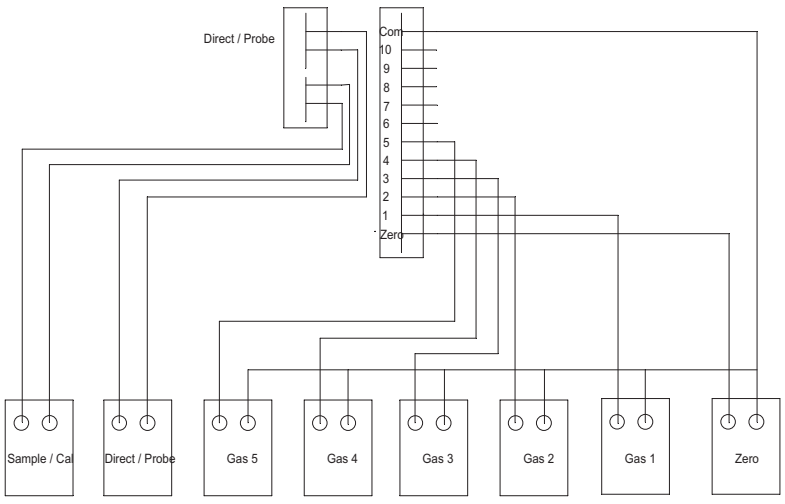
ILL. 2
Probe Cal



ILL. 3
Direct Cal



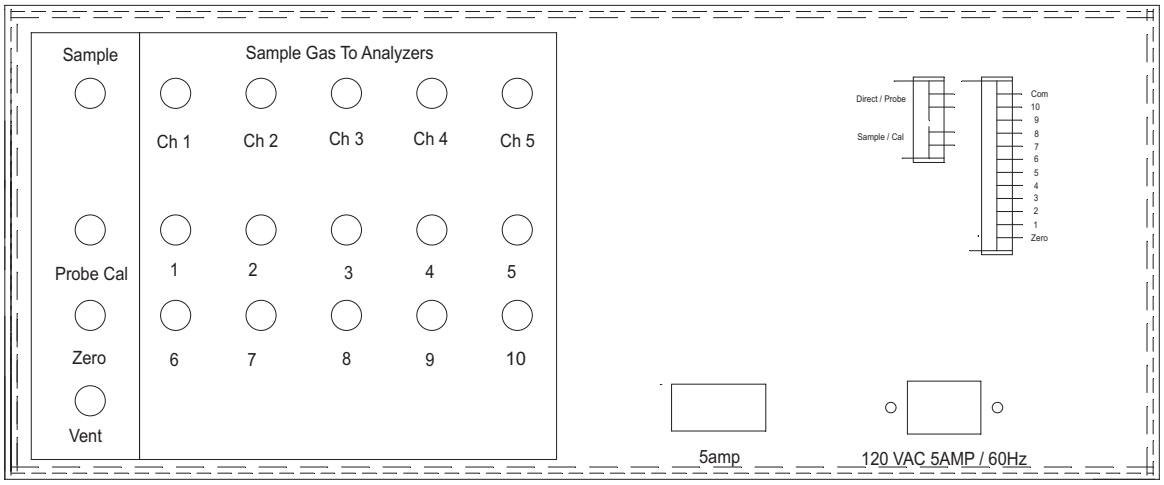
ILL. 4
Relay Logic



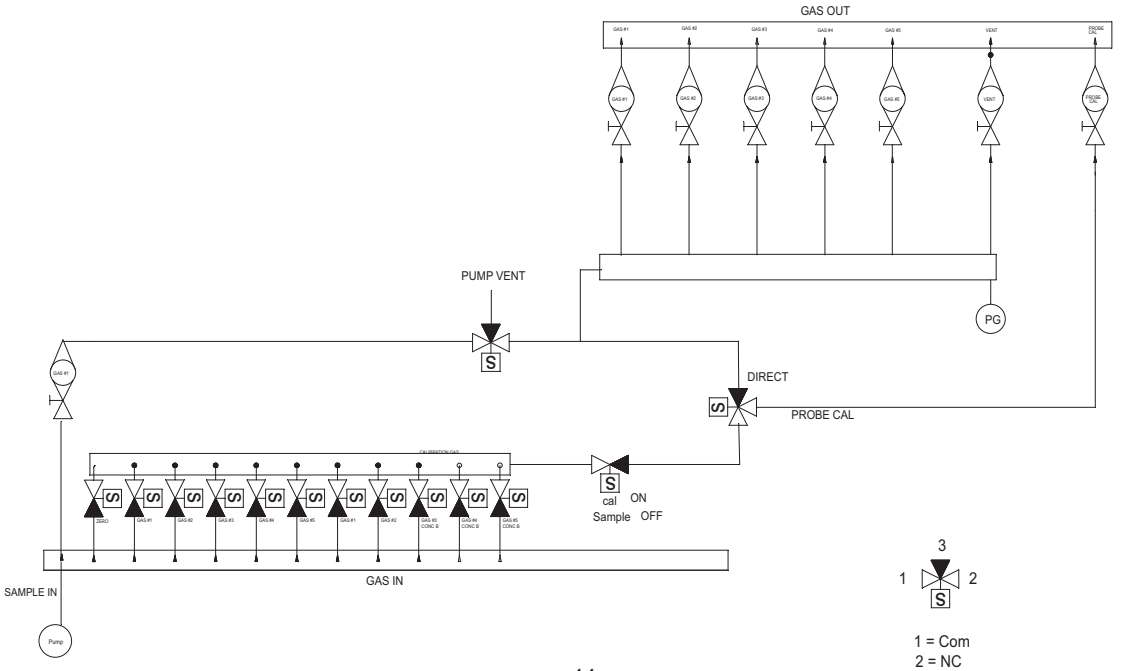
SSR / PLC

G: Illustrations Cont.

ILL. 5
Rear View

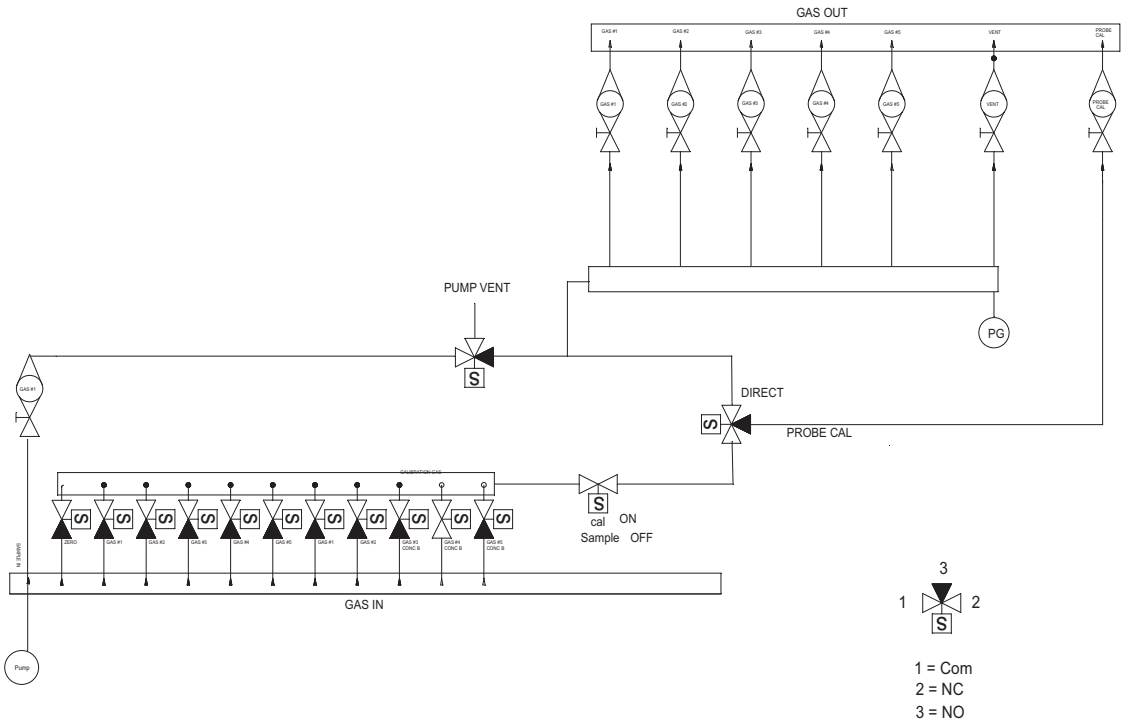


ILL. 6
Sample Mode

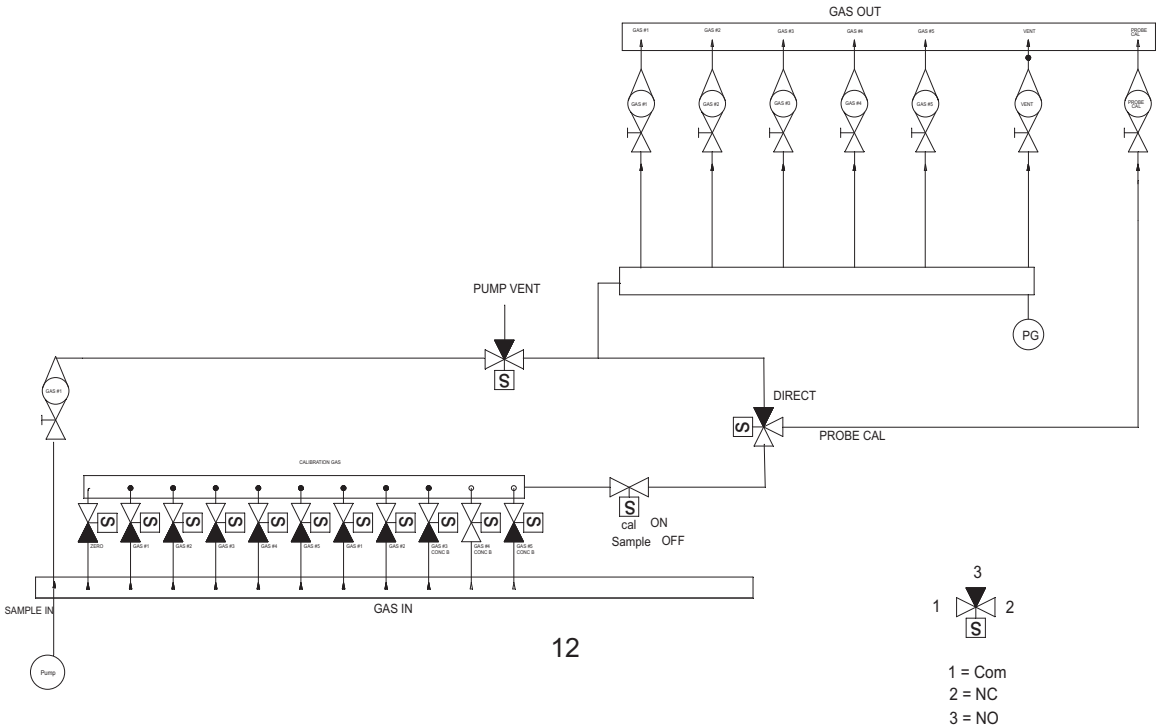


G: Illustrations Cont.

ILL. 7
Direct Cal



ILL. 8
Probe Cal



G: Illustrations Cont.

ILL. 9
Electrical/Pneumatic Schematic