

User's Manual

Model AC4/AC8 Automatic Calibration Unit
For Use With AV550G
Oxygen Analyzer Averaging Converter

I. Introduction.....	3
II. Overview.....	3
2.1 Models AC4/AC8 Multi-Channel Automatic Calibration	3
III. Installation.....	3
3.1 Location	3
3.2 Mounting.....	3
3.3 Gas Sources.....	4
3.4 Piping.....	5
IV. Wiring	6
4.1 Wiring the AC4/AC8 to the AV550G Averaging Unit	6
4.2 Pressure Switch, M1133AR, Set Point Procedure	6
V. Initial Flow Rate Set-Up.....	7
5.1 Checking for Leaks.....	7
5.2 Setting for Reference Air Flow.....	7
5.3 Balancing Pressure Drops in the Cal Lines	8
5.4 Calibration Check	9
VI. Programming	9
VII. Set-Up Menus for Calibration from the AV550G Averaging Unit.....	9
7.1 Modes.....	9
7.1.2 Calibration Setup Mode	10
7.1.3 Zero Gas Concentration	10
7.1.4 Span Gas Concentration	10
VIII. Maintenance	12
IX. Trouble shooting.....	12
9.1 Typical Calibration Problems	12
X. Spare Parts and Accessories.....	13
10.1 Spare Parts.....	13
10.2 Accessories	14
10.2.1 Zero Gas Regulator, M1132ZX.....	15
10.2.2 Pressure Regulator, M1132KD	15
10.2.3 Pressure Gauge, M1132CG	15
10.2.4 Zero Gas Pressure Switch, M1133AR.....	16
10.2.5 Fuses, M1132HG.....	16
Appendix A Wiring Diagram AC4 to AV550 to ZR22G	17
Appendix B Wiring Diagram AC8 to AV550 to ZR22G	19

I. INTRODUCTION

This manual details the operating instruction for the Yokogawa Model AC4/AC8 Automatic Calibration Unit, and the integration with the AV550G Zirconia Oxygen Averaging Converter.



IMPORTANT

The maximum input pressure for the span and zero gases is 35 psig. Exceeding 35 psig may result in damage to the AC4/AC8.

II. OVERVIEW

The AC4/AC8 Automatic Calibration System is designed to work with the AV550G Oxygen Averaging Converter, providing accurate, automatic or semi-automatic calibration of the ZR22 Zirconia Oxide Detector. The AC4/AC8 is assembled with plumbing, flow control hardware and internal solenoid wiring necessary to calibrate up to four or eight probes respectively. The end user need only provide plumbing to the individual probes, calibration gases, and interconnection wiring between the calibration unit and the converter.

Initial setup of the auto cal unit is further simplified by the use of manual overrides for all solenoids. The overrides, coupled with the flow regulation for each probe, allow for fast balancing of each calibration line. Each probe also has its own flow meter and flow control for the reference air flow.

2.1 Models AC4/AC8 Multi-Channel Automatic Calibration

UStandard Specifications

Operating Pressure:	20 psi
Maximum Pressure:	35 psi
Flow meter range:	0.15 to 1 LPM (separate flow meter for cal gas and reference air)
Flow rate:	Cal Gas – 0.6 LPM; Reference Air – 0.8 LPM
Cal tubing:	1/4" copper (standard); 1/4" stainless steel (optional)
Gas connection:	1/4" FNPT
Voltage:	110 VAC, 50/60 Hz (standard)
Ambient temp.:	80°C (176°F) maximum
Weight:	Approximately 40 lbs (18 kg)
Construction:	Outdoor installation (Indirect sunlight)
Enclosure:	NEMA 4 or NEMA 4X
Reference gas Consumption:	0.8 LPM per probe
Cal Gas Consumption (Zero & Span):	0.6 LPM per probe, during calibration only



NOTE

Instrument air is used for both span calibration gas and reference air.

Model and code

AUTO CALIBRATION UNIT FOR AV 550G	
AC4	4 Channel System
AC8	8 Channel System
ENCLOSURE	
-4	NEMA 4
-5	NEMA 4X
PLUMBING	
-C	Copper tubing , brass fittings
-S	Stainless steel tubing and fittings
REFERENCE AIR FLOW METER	
-R*U	Reference air flow meter
OPTIONS	
/SCT	Stainless Steel Tag

III. INSTALLATION

3.1 LOCATION

The following guidelines should be used when selecting a location for the auto-calibration unit.

1. The unit must be easily accessible for maintenance and inspections.
2. The unit must be near the ZR22 probes as practical. This will minimize the length and amount of tubing required for plumbing.
3. Ambient temperature will not exceed 80°C (176°F).
4. Humidity is moderate and no corrosive gases are present.
5. Minimal presence of vibration.
6. Availability of 120 VAC and clean, dry instrument air.
7. Adequate spacing for reference and zero gas plumbing.
8. Not positioned in direct sunlight.



NOTE

If ambient atmosphere contains corrosive gases or high dust, the use of air purging is recommended.

3.2 MOUNTING

The unit is designed for wall mounting by securing the four standoffs with bolts. Allow for sufficient space to connect the copper or stainless steel lines to both sides of the enclosure. Input gases (zero calibration gas and instrument air) are connected to the left side, while all probe connections (cal lines and reference air) are on the right side, when facing the unit. Refer to Figure 1 for mounting dimensions and required clearances.



IMPORTANT

Care must be taken to mount the unit as level as possible to ensure the accuracy of the flow rates. If the unit is not level, the flow rates will not be accurate!

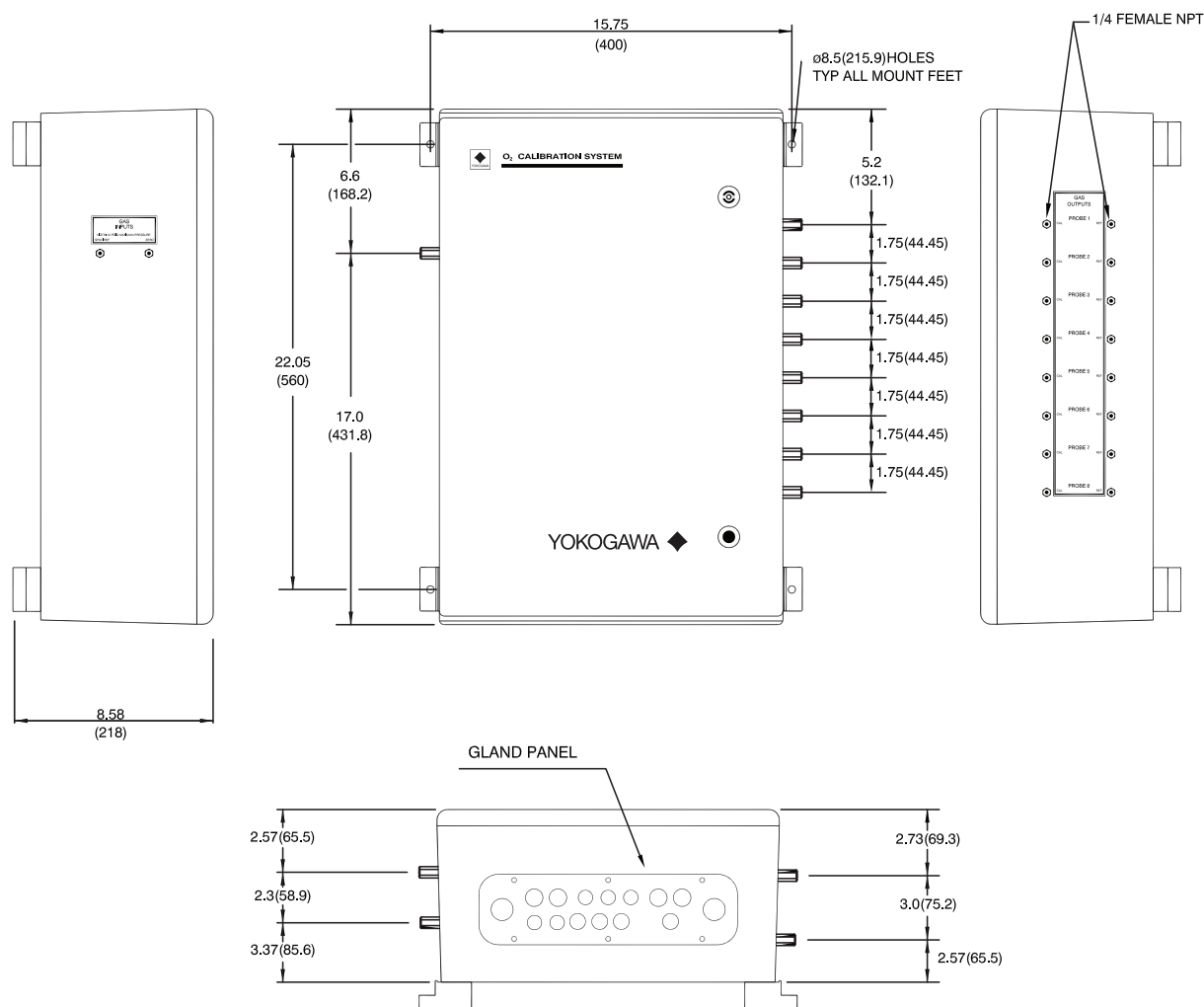


Figure 3.1: AC4/AC8 Dimensional Drawing

3.3 GAS SOURCES

Zero Gas

Typically, 1% oxygen balanced in nitrogen is used, however, an oxygen mixture between 0.5% and 8% is acceptable.

NEVER USE PURE NITROGEN FOR ZERO CALIBRATION GAS. A compressed gas cylinder containing the zero gas is fitted with a dual stage regulator. Zero calibration gas cylinders with regulators may be purchased from a local compressed gas supplier. Follow the operation and safety instructions as supplied from your gas supplier. The maximum pressure of the calibration unit is 35 psi.



NOTE

The compressed gas cylinder must have the same CGA connection fitting as the dual stage regulator (see accessories).

Span Gas

Typically, a clean dry air source is recommended, such as instrument air (20.6% oxygen). An in-line filter is recommended to remove any moisture or dirt prior to the calibration unit. A regulator must be attached to the instrument air source in order to reduce the flow to an appropriate pressure (35 psig max) prior to reaching the calibration unit.

Reference Air

The reference air is the same air as the span gas. Thus, the reference air is also clean dry instrument air. Unlike span gas, which is used only during calibration, reference air flows to the back side of the zirconium cell and should be used at all times.



IMPORTANT

When the instrument air has a nitrogen backup (used for air failure), instrument air for the reference gas should not be used. In this instance the probe must use either bottled air (20.6% oxygen balanced in nitrogen) or natural convection for reference air flow.

3.4 PIPING

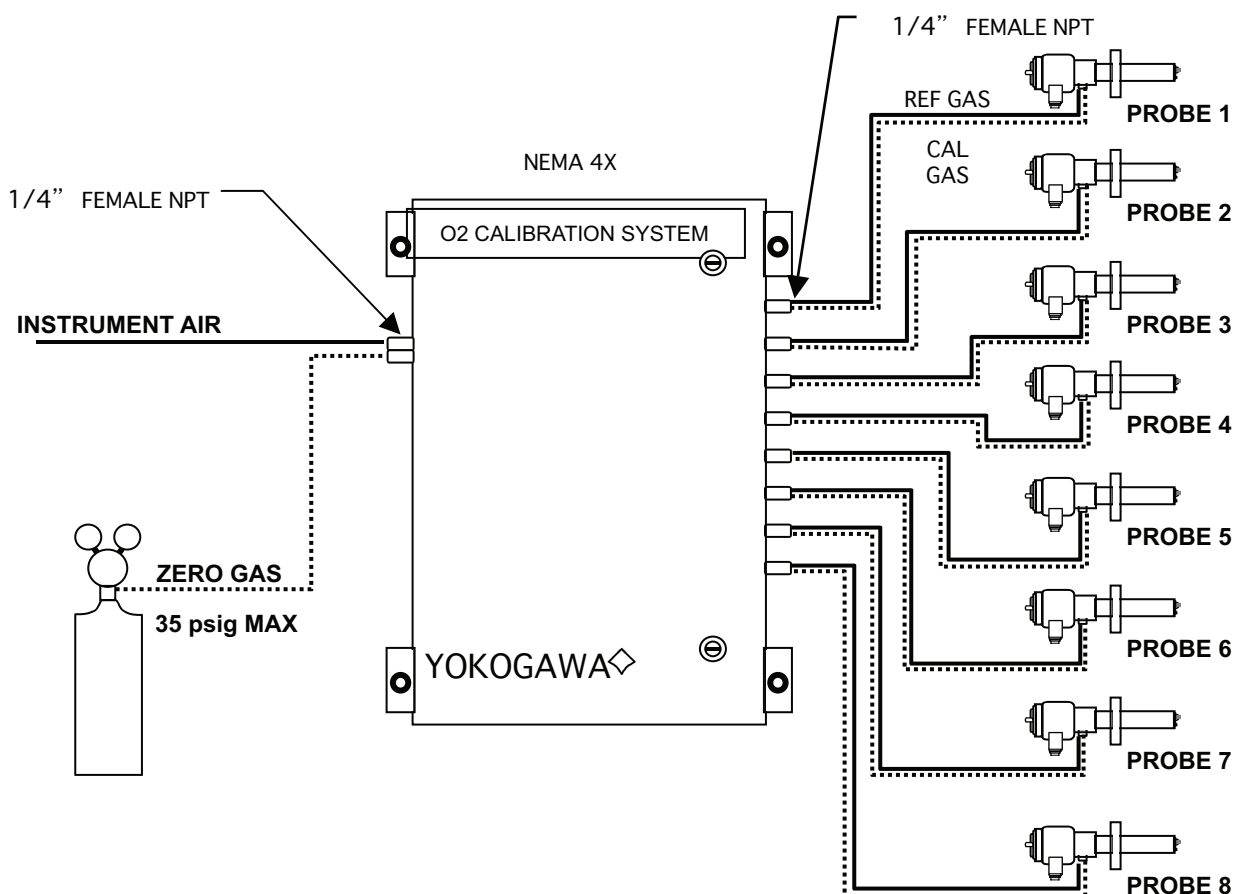


Figure 3.2

Piping Gases to the Auto Cal Unit

Piping (or tubing) is required from the instrument air line and zero gas cylinder to the calibration unit. Standard tubing is $\frac{1}{4}$ " O.D. (Outside Diameter) copper or stainless steel. Stainless steel is preferred, as it is less likely to develop leaks. The separate tubing for both the instrument air and zero gas are connected to the two separate $\frac{1}{4}$ " FNPT brass or stainless fittings on the **LEFT** side of the calibration unit.

Piping Gases to ZR22 Probes

The tubing to the ZR22 probes is run from the **RIGHT** side of the calibration unit to each of the ZR22 probes as shown in Figure 2. Quarter inch ($\frac{1}{4}$ ") tubing should be used between the auto cal unit and the probes. It is important to note **1) the reference air tubing is connected to the REF IN port at the probe; 2) cal gas tubing is connected to the CAL IN port on the probe.** The REF IN and CAL GAS ports are located on the bottom of the ZR22 probe junction box. The check gas and reference air ports require a $\frac{1}{4}$ " FNPT fitting.



NOTE

Flexible stainless steel hose is recommended for the connection between the ZR22 and the tubing. This will allow for probe movement due to thermal expansion of the duct.



IMPORTANT

To prevent leakage, all compression fittings should be installed per manufacturer's recommendations. In addition to this, a check valve is usually installed on the cal gas inlet of the ZR22 probe to protect the cal tubing from moisture contamination.

IV. WIRING

4.1 Wiring the AC4/AC8 to the AV550G Averaging unit

Please refer to appendix A for the system configuration drawing.

Solenoid, Relay and Pressure Switch wiring connections

The AC4/AC8 uses 120VAC, 60 Hz for all solenoids. Although two internal 1 amp fuses are provided for the ± 120 VAC terminal, an external 5 amp circuit breaker is recommended. Included with each fuse is an LED that is activated when the fuse is blown. Recommended wiring is 14AWG, run in conduit. If conduit is not used, wiring should have a suitable jacket to meet environmental and regulatory codes. The AC4 unit requires a maximum of 8 conductors, whereas the AC8 requires 12 conductors.



NOTE

A 120 VAC relay (included with NEMA 4 enclosure), shown at terminal K1, is required at the AV550G if a pressure switch is used. This prevents noise caused by a low voltage pressure switch signal from being run in the same cable as the 120 VAC solenoid signal.

The relay is prewired as NORMALLY CLOSED (NC) to contact input #1 at the control card (terminal 7 and 9) of the AV550G.

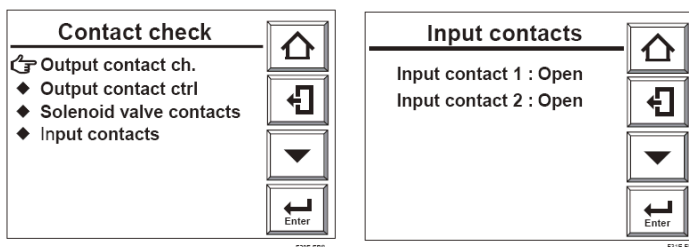


Figure 4.1 AV550G Input Contact Screen



WARNING

When the relay is deactivated, the unit will not calibrate. The relay remains closed unless a 120 VAC source is connected to energize it. Terminal 7 of the relay provides 120 VAC. Neutral voltage is connected to terminal 2 of the relay from the AC4/AC8 calibration unit.

The relay switch is designed to OPEN when energized as depicted in the flow diagram shown in Figure 4.2. A pressure switch input completes the 120 VAC signal used to energize the relay, which is wired at the calibration unit as Normally Open (NO), where Open = Low or Zero tank pressure. The AC4/AC8 unit is prewired with the jumper in place, so that the relay will be energized and OPEN. However, if the pressure switch input is used, then remove the jumper between the terminals labeled PS at the calibration unit's terminal strip, and attach the pressure switch. The pressure switch is wired as normally open.

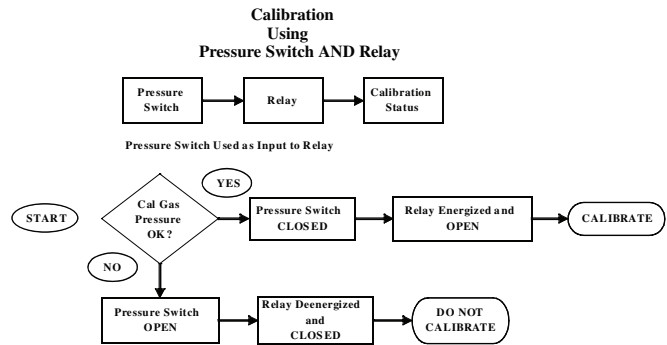


Figure 4.2: Calibration Using Pressure Switch and Relay Flow Chart

The recommended pressure switch configuration is to the high pressure side of the zero gas regulator. This is preferred because it gives the earliest warning of a decrease in zero gas pressure. The switch is threaded into the high pressure purge port of the dual stage regulator on the zero gas cylinder.

4.2 Pressure Switch, M1133AR, Set Point Procedure

For the AC4/AC8 Autocal units, a gas pressure set point is used to indicate that the calibration gas (zero gas) is low. Pressure Switch M1133AR is a cylindrical style pressure switch which uses a diaphragm or piston sensor to detect a pressure change. The recommended set point is 200 psi on the fall. At the predetermined set point, a SPST switch actuates, converting a pressure signal into an electrical signal.

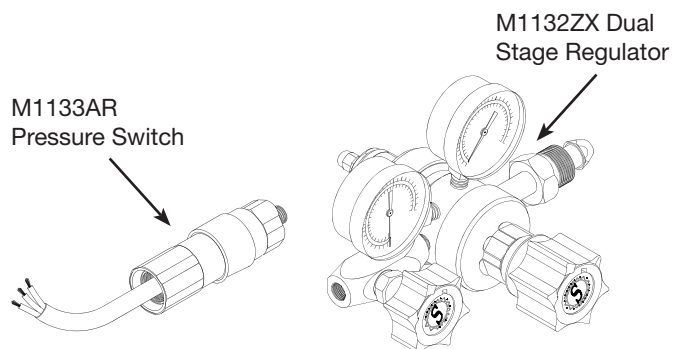


Figure 4.3: Pressure Switch and Dual Stage Regulator

The following procedure is required to adjust the set point:

1. Thread the pressure switch into the high pressure gauge port on the regulator.
2. With power disconnected, slide the cover on the switch toward the electrical termination while twisting it to overcome friction.
3. Connect the power to the terminal or leads.
4. Insert a flat head screwdriver (1/8") into the adjustment slot and turn counterclockwise to increase the setting or clockwise to decrease the setting.

For setting on fall, apply pressure equal to normal system operating pressure. Reduce source pressure to set point value. Turn the adjustment clockwise until switch “clicks” [circuit across N.C. (black) and COM (white) closes]. For setting on rise, apply desired pressure and turn adjustment left until switch “clicks” [circuit across N.O. (red) and COM (white) terminal closes].

5. After completing adjustments, slide the cover closed over the adjustment compartment. Recheck the set point value.
6. Wire the pressure switch Normally Open to the AC4/AC8 terminals at the calibration unit that are labeled PS. Remove the jumper across the PS terminals.

V. INITIAL FLOW RATE SETUP

5.1 CHECKING FOR LEAKS

Before considering your calibration unit operational, it is a good idea to check for leaks along the full distance of the cal line tubing. Additionally, perform a cal check to confirm that the gases are plumbed correctly to each probe.

1. Plug all the cal and reference air lines at the probes. This requires disconnecting the fitting at the ZR22 Probe and plugging the tubing.
2. Set the flow rate of the Zero Gas and Instrument Air to 20 psig using the regulators.

3. Locate the block solenoid shown in Figure 5. Using a flat tip screwdriver, turn the manual override screw on the block solenoid to the 90° position as shown in Figure 5.2.
4. Turn the channel solenoid valve’s manual override screw to the horizontal, or ON (NOT NORMAL) position for Uall probes in use. See Figure 5.1 and 5.3.
5. Apply leak detection spray on all compression fittings and bends of the cal line tubing for all probes. Spray both the reference air and cal gas line(s).
6. Inspect the full length of the cal lines to determine if there is a leak. Repair any leaks.
7. After repairing the leaks, if any, turn all probe channel solenoids and the block solenoid to the NORMAL position as shown in Figure 5.2 and 5.3.
8. Unplug tubing at the ZR22 probe(s) and reconnect.

5.2 SETTING REFERENCE AIR FLOW

Locate the reference flow air meters in Figure 5.1. Adjust the black flow adjustment knob on each reference air flow meter to 0.8 LPM (800cc/min).



NOTE

Reference air flow should be adjusted before the calibration adjustments are made.

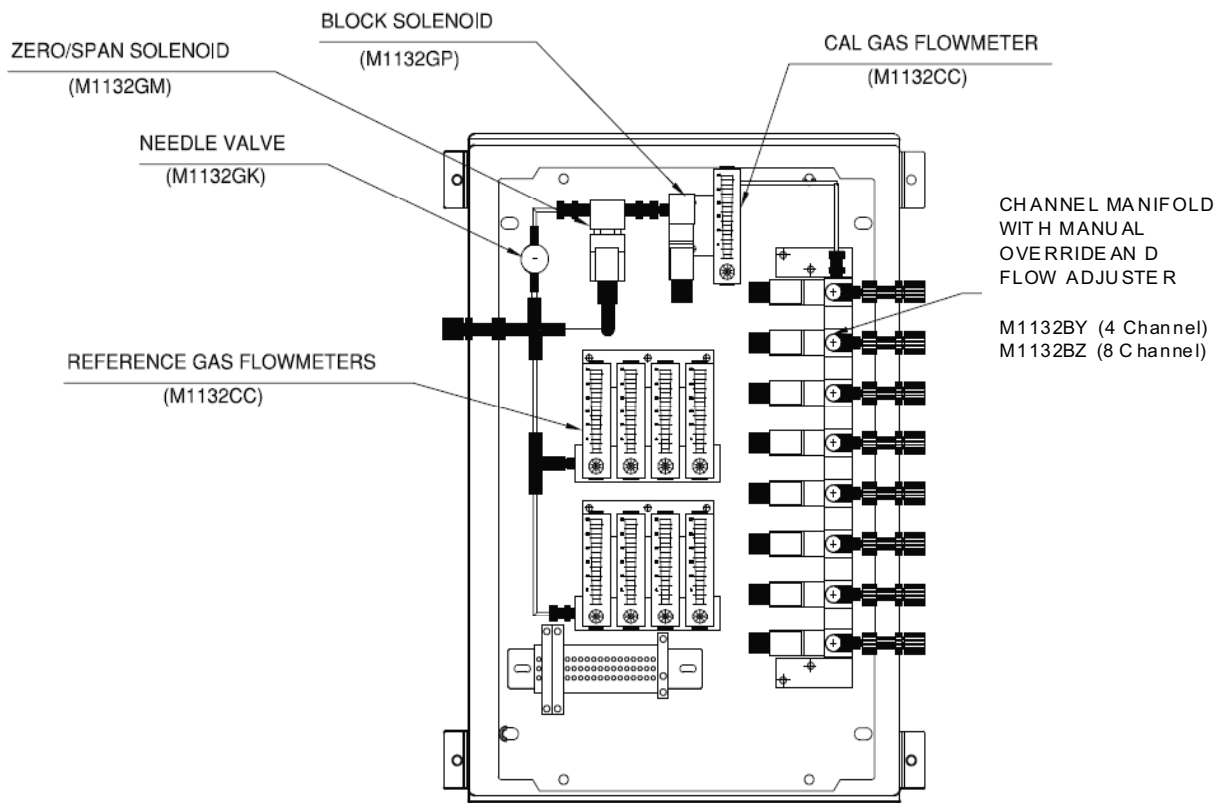


Figure 5.1 AC8 Parts Listing

5.3 BALANCING PRESSURE DROPS IN THE CAL LINES

For accurate calibrations, the auto cal system must provide a fixed flow of zero gas and span gas (0.6 LPM pr 600cc/min). To do this, the pressure drop from the AC4/AC8 to each probe must be the same regardless of the length of tubing run or number of probes. To balance the pressure drops, perform the following steps:



NOTE

Perform all adjustments with a flat tip screwdriver.

1. Ensure gas and instrument air are plumbed to the auto cal unit. Pressure should be set at 20 psig \pm 2 psig.
2. Locate the block solenoid shown in Figures 5.1 and 5.3. Using a flat tip screwdriver, turn the manual override screw on the block solenoid to the vertical position, as shown in Figure 5.2.

6. Turn the manual override on the channel solenoid for the probe to the **OFF** (normal) position.

7. Repeat steps 4, 5, and 6 for the remainder of the probes that are being used.



NOTE

DO NOT use the cal gas flow meter's adjustment knob to make this flow rate adjustment. Use the individual channel's flow adjustment screw to adjust for varying pressure drops in the tubing runs.

8. After all flow rates have been set manually to 1 LPM, turn the channel solenoid for the probe with the longest tubing run back ON to the manual override position – making sure all others are **OFF** (normal position shown in Figure 5.3). Turn the cal gas flow meter's adjustment knob to 0.6 LPM (600cc/min).

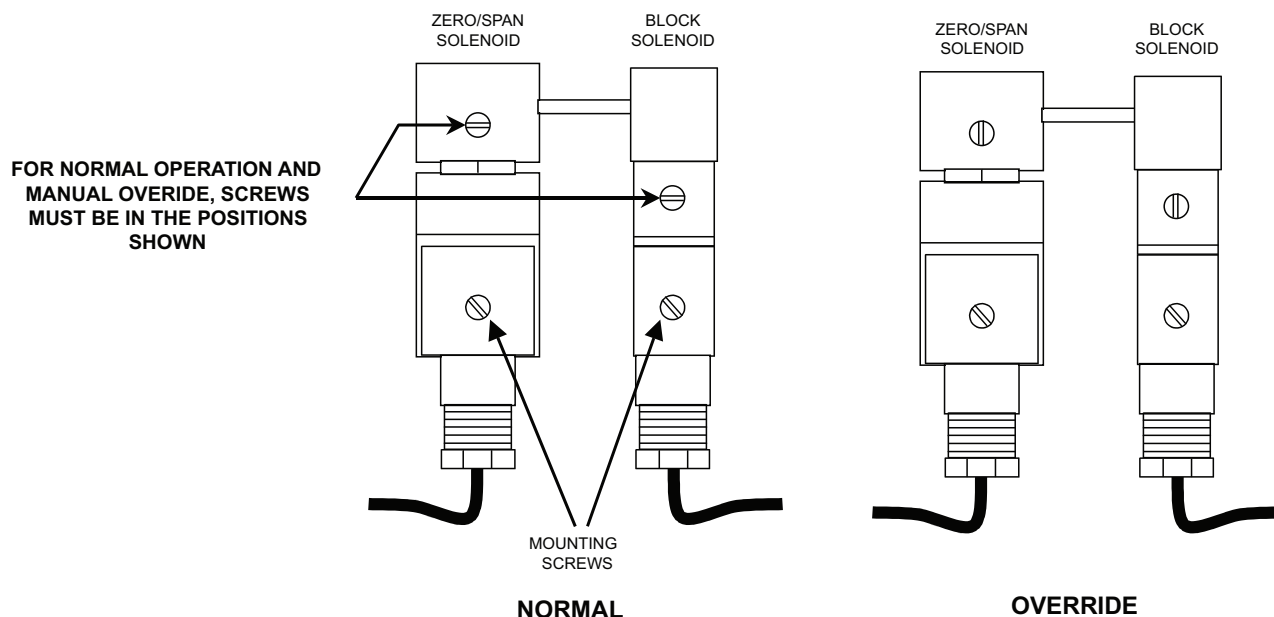


Figure 5.2: Zero and Block Solenoid

3. Locate the **cal gas flow meter** in Figure 5.1. Turn the black adjuster knob to the maximum open position. This fully opens the cal gas regulator, allowing precise adjustments of flow rates.
4. Locate the **channel solenoid valve** for the probe with the longest tubing run in Figure 5.1. Turn the manual override screw to the horizontal, or ON position. Refer to Figure 5.3.
5. Each channel has its own flow adjustment screw located on the **channel solenoid valve** as shown in Figure 5.3. Adjust the flow adjustment screw for the probe so that the flow rate shown on the cal gas flow meter is 1 LPM (1000 cc/min).



WARNING

Do not adjust the cal gas flow meter or the flow adjustment screw on the individual channel solenoids.

10. Confirm that all **channel solenoid overrides** for all used probed are turned back to the normal position as shown in Figure 5.3.



NOTE

DO NOT use the cal gas flow meter's adjustment knob to make this flow rate adjustment. If necessary, increase the air pressure.

11. Turn the block solenoid and the **zero/span solenoid** to the **normal** position.



WARNING

If reference air is used during calibration, the reference air must remain **ON** after calibration.

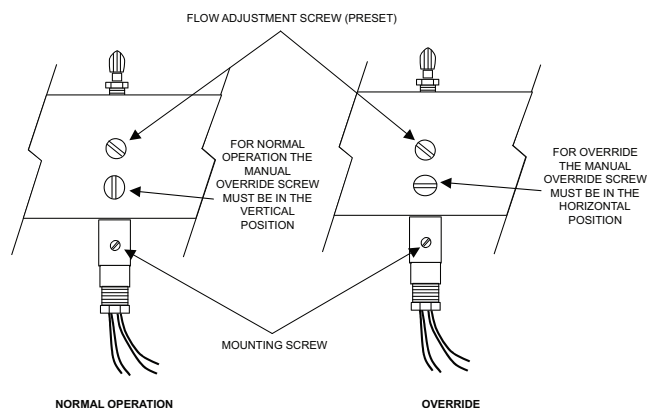


Figure 5.3: Typical Channel Solenoid

5.4 CAL CHECK

The purpose of performing a cal check at this time is to confirm that the calibration gas and reference air are plumbed correctly for each probe, along with confirming that enough time was allowed for the cal gas to flow at the probe's cell tip. Refer to the AV550G Instruction Manual for calibration codes and procedures.

VI. PROGRAMMING

All programming for the AV550G Averaging Unit is done through the display module. Please refer to the AV550G Instruction Manual, IM 11M12D01-01E, Section 9 for additional details. The following is a brief description of setup procedures.

The ZR22G Probe is calibrated by applying two known gas standards. In most applications the zero gas is around 1% oxygen with the balance nitrogen. The span gas is instrument air (20.95 % oxygen).

The zero gas concentration must be certified so the exact concentration can be programmed into the AV550G memory. Calibration values required for full auto-calibration operations are stored in the menu of the AV550G.

For additional information refer to Chapter 8 of the AV550G manual for a full explanation of all parameters.

Shipping time default setting for zero gas is 1% oxygen and for span gas is 21%. Figure 6.1

Item	Initial value
Mode	Manual
Points	Span-Zero
Zero gas conc.	1.00%
Span gas con.	21.00%
Hold time	3 min. 00 sec.
Cal. time Interval	3 min. 00 sec. 1 days 00 hrs
Starting date	yy01mm01dd01
Starting time	hh00mm00

Figure 6.1

VII. SET-UP PROCEDURES

7.1 Mode

There are three calibration modes (for zero and span calibration: manual mode, semi-automatic mode (started from the display or started by contact input) using preset calibration time and stabilization (settling) time, and auto calibration at preset intervals. Restrictions related to each mode are described here.

-When [Manual Mode] is selected:

In this mode, only Manual calibration can be performed. (Contact input used to start semi-auto calibration has no effect). Auto calibration does not start at auto calibration start time.

-When [Semi-Auto Mode] is selected:

In this mode, manual calibration or semi-automatic calibration can be performed. Auto calibration does not start at auto calibration start time.

-When [Auto Mode] is selected:

Any calibration mode is valid.



CAUTION

Indication check mode of [Auto] cannot coexist with [Auto] Calibration mode. Therefore, if the mode of indication Check is set to [Auto], you cannot set the mode of Calibration to [Auto], and vice versa.

<Setting Procedure>

- 1) From the basic panel display, if you touch the Setup key, the [Execution/Setup] display appears. Select [Maintenance].
- 2) From the [Maintenance] display, select [CalibrationSetup] the [Mode] and you can select Manual, Semi-Auto, or Auto in the selection drop down that appears. Figure 7.1.

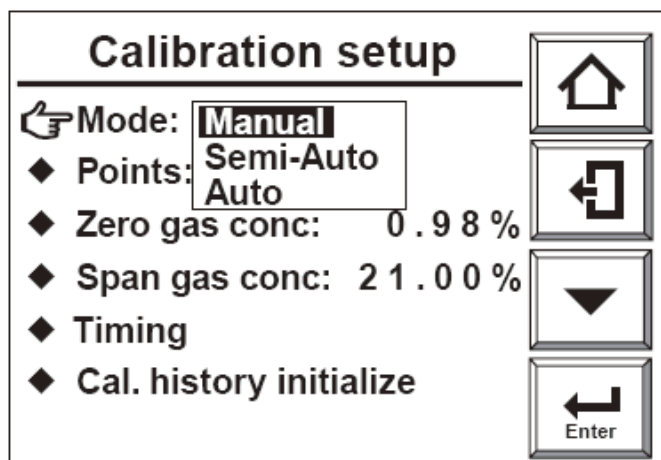


Figure 7.1 Calibration Mode Setting

7.1.2 Calibration Setup Procedure

Either Span or Zero or both calibrations can be performed. Normally select both: Span-Zero.

<Setting Procedure>

From [Maintenance]→[Calibration setup] display, select [Points], then a selection window opens and Span-Zero, Span or Zero may be selected. Figure 7.2

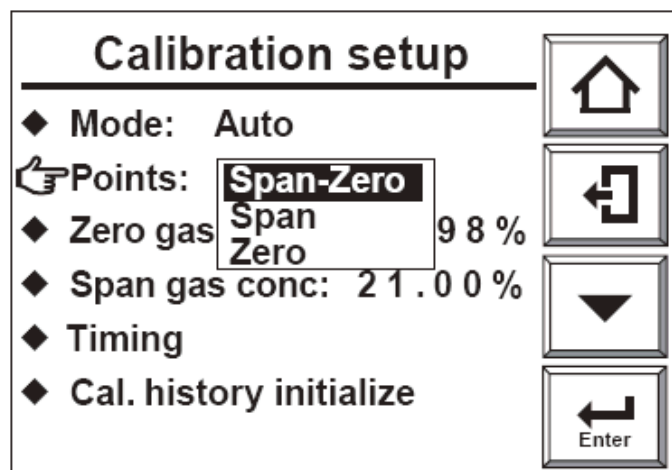


Figure 7.2 Procedures for Setting Calibration Mode.

7.1.3 Zero Gas Concentration

This sets the oxygen concentration of the zero gas used for calibration. Enter the value from the label of the corresponding gas bottle.

7.1.4 Span Gas Concentration

This sets the oxygen concentration of the span gas used for calibration. When the instrument air supply is used as the span gas, enter 21% O₂.



NOTE

When the instrument air supply is to be used as a span gas, cool the gas to -20°C below the dew point to remove moisture, oil mist and dust from the air. If this air purification is not performed, the accuracy of the calibration may be affected.

<Setting Procedure>

1) From the [Calibration setup] display, select [Zero gas conc.], and the numerical data entry display is displayed. Enter the oxygen concentration of the zero gas used for calibration. For example, enter 0.98 vol% O₂ as [00098].

2) From the [Calibration setup] display, select [Span gas conc.], and the numerical data entry display is displayed. Enter the oxygen concentration of the span gas used for calibration. For example, enter 21 vol% O₂ as [02100].

3) Calibration time setting

If the mode is [Man]:

Select [Hold time]. This is the output stabilization (settling) time required from calibration end until measurement is reentered. During this time, the calibration gas is switched to measurement gas and the measurement gas is allowed time to stabilize. Setting range is from 00 min. to 60 min 59 sec. The analog outputs of individual channels which are under calibration remain Output Hold status from the start of calibration until the end of the stabilization (settling) time, and their output is not included in the averaging group calculations during this time.

If the mode is in [Semi-Auto]:

In addition to the above [Hold] output stabilization (settling) time, there is also a [Cal. Time] setting. This is the setting time from when calibration gas flow is started until calibration is performed. The same time setting is used for both Zero and Span calibration. Setting range is from 00 min. to 60 min 59sec. Calibration time and stabilization time, and analog output status are shown on the calibration timing chart of Figure 7.3 below. For solenoid valve (SV) piping and wiring refer to Section 5 of AV550G manual.

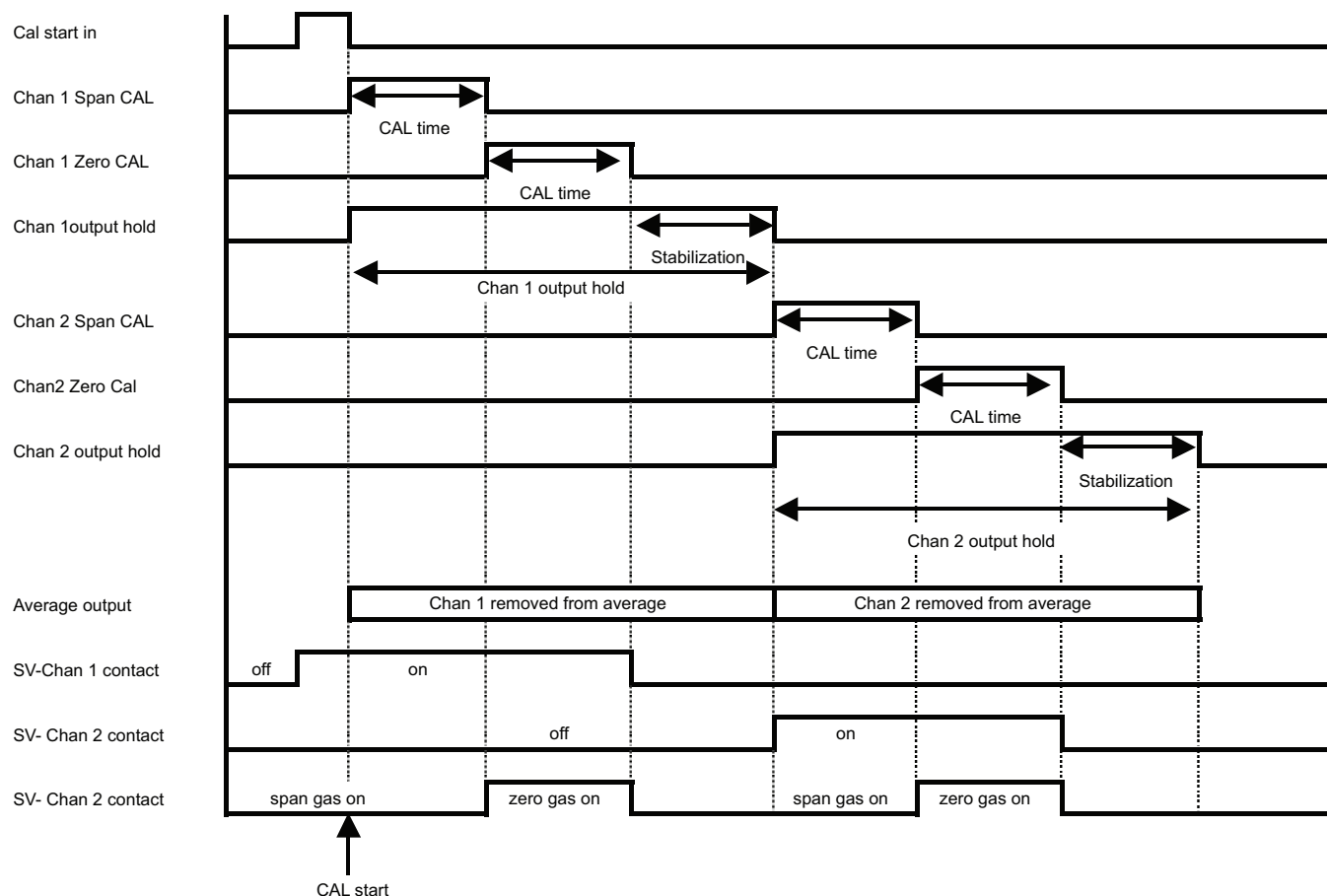


Figure 7.3

If the mode is [Auto]:

In addition to the above [Hold] output stabilization (settling) time [Cal. Time] setting, there is also Cal. [Interval], [Start date] and [Start time]. The Automatic Calibration Interval can be set in the range 00 days 00 hrs to 255 days 23 hrs once Auto Calibration starts. It is performed for all installed channels, so the interval needs to be larger than the sum of span and zero calibration times plus settling times for all channels.

The Start date and Start time are for the first calibration in the Auto Calibration cycle (repeated at the calibration interval). To set 2004 June 21 at 1:30 pm, set Start date to:

YY: 04, MM: 06, DD: 21 and Start time to HH: 13, MM: 30.

<Setting Procedure>

- 1) From the [Calibration Setup] display, select [Timing] and the display shown in Figure 7.4 appears. In this example, [Mode] is set to [Auto].
- 2) Select items and enter numerical values as required.

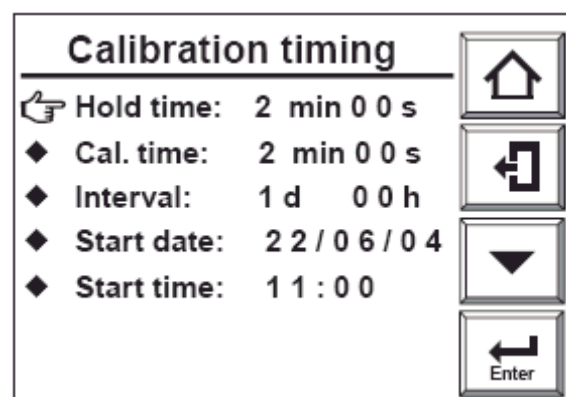


Figure 7.4 Calibration time setting

**NOTE**

When setting, keep the following points in mind:

- 1) When calibration is to be started by a contact input signal, the contact input signal on the [Input Contacts] display needs to be defined and enabled.
- 2) The starting of Auto Calibration may be delayed by the status of the channel to be calibrated, or by the status of other channels, as explained by table 7.1.

3) If the calibration interval is shorter than the sum of the stabilization time plus calibration time, the second calibration start time will conflict with the first calibration. In such a case, the second calibration will not be conducted. (When both zero and span calibrations are to be performed, the calibration time is double that required for a single (zero or span) calibration).

4) If the (Calibration) Interval is set to DD: 00, HH: 00 then auto Calibration will not be performed.

5) If the start date is set before the current date, then Auto Calibration will not start.

6) [Cal. Time] of [Calibration timing] display will be equalized to [Check time] of [Semi-auto ind. Chk] display

other commands	Purging the channel	Other channel CAL	Indication check in other channel	Blowback in other channel	Maintenance	CAL chan. in warmup status	CAL chan. in ERR status	CAL chan. now disabled
Man. Cal.	X	X	X	X	X	X	X	X
SemiAuto	X	X	X	X	X	X	X	X
AutoCal	Wait	Wait	Wait	Wait	Wait	X	X	X

X: Cannot perform calibration
Wait: Wait until other command finishes before starting calibration

Table 7.1 When Auto Calibration conflict with Other Commands

VIII. MAINTENANCE

Because of the AC4/AC8 unit's simplified construction, no routine maintenance is required, other than replacing the calibration gas when necessary. When cal gas cylinders are changed refer back to Section 7.1.2 Calibration Setup Procedure. Failure to perform the Calibration Setup Procedure upon replacing cal gases will result in an error in the zero correction values. When changing gases it is also necessary to check the zero gas flow rate.

It is recommended that periodic inspections are performed to insure a sufficient supply of calibration gases when the pressure switch input is not used. Also, periodic checks verify that the flow rate of the calibration gases, to the individual oxygen detector probes have not been accidentally changed. It is important that the zero gases flow at a rate of 0.6 LPM (600mL/min.), while the reference air (instrument air) flows at 0.8 LPM (800mL/min).

Refer to Section 10 of this manual for a listing of spare parts for the AC4/AC8.

IX. TROUBLESHOOTING

9.1 TYPICAL CALIBRATION PROBLEMS

1) Gas does not flow to the probe.

- If reference air is used, then the reference air flow meters should show 0.8 LPM at all times. If the reference air flow meters do not show 0.8 LPM, then confirm that the instrument air has been turned on by checking the regulator gauge (10 to 35 psi).
- Confirm override screws are in the NORMAL mode for the block solenoid and all channel solenoids.
- Turn block solenoid to the manual position. Cal gas flow meter should show 0.6 LPM. If cal gas flow meter shows 0 LPM, turn the black knob on the flow meter to open the flow meter. Set flow rates for all probes as according to procedures shown in Section 5 of this manual.

2) Flow meter will not go to 0.8 LPM for reference air.

- Turn the flow rate adjustment knob only, NOT the override screw.
- Only one channel should be in the manual override position. All other probes should be in the normal position.
- Check the pressure regulator at the gas source. If the pressure is below 14 psi, increase pressure in increments of 5 psi, and adjust reference flow meters. DO NOT increase pressure to greater than 35 psi. If more than 35 psi is needed, attempt to move the calibration box closer to the probes, without compromising safety or the ambient operating temperature of the auto cal unit.
- Tubing outside diameter (O.D.) should not be greater than 1/4". Tubing runs should not be in a T position, and should remain separate for each probe.
- Check for leaks at compression fittings. All NPT fittings should have Teflon tape on the threads to prevent leaks.

3) Flow meter will not go up to 0.6 LPM for cal gas.

- Same solution as above, except make adjustment to the cal gas flow meter.

4) Wrong gas flowing to the probe.

- Confirm that gases are plumbed correctly at the left side of the calibration unit.
- Turn the override screw on the three-way solenoid to the normal position.
- Perform a cal check in semi auto calibration mode. (See Section 5).



IMPORTANT

When performing an actual automatic or semi automatic calibration, and a calibration alarm occurs, it is necessary to reset the channel. Instead, recalibrate the channel to remove the calibration alarm. For additional troubleshooting procedures, refer to the AV550G manual, Section 12.

X. SPARE PARTS AND ACCESSORIES

10.1 SPARE PARTS

Refer to figure 10.1 for a list of replacement parts for the AC4/ AC8 Auto Calibration Unit.

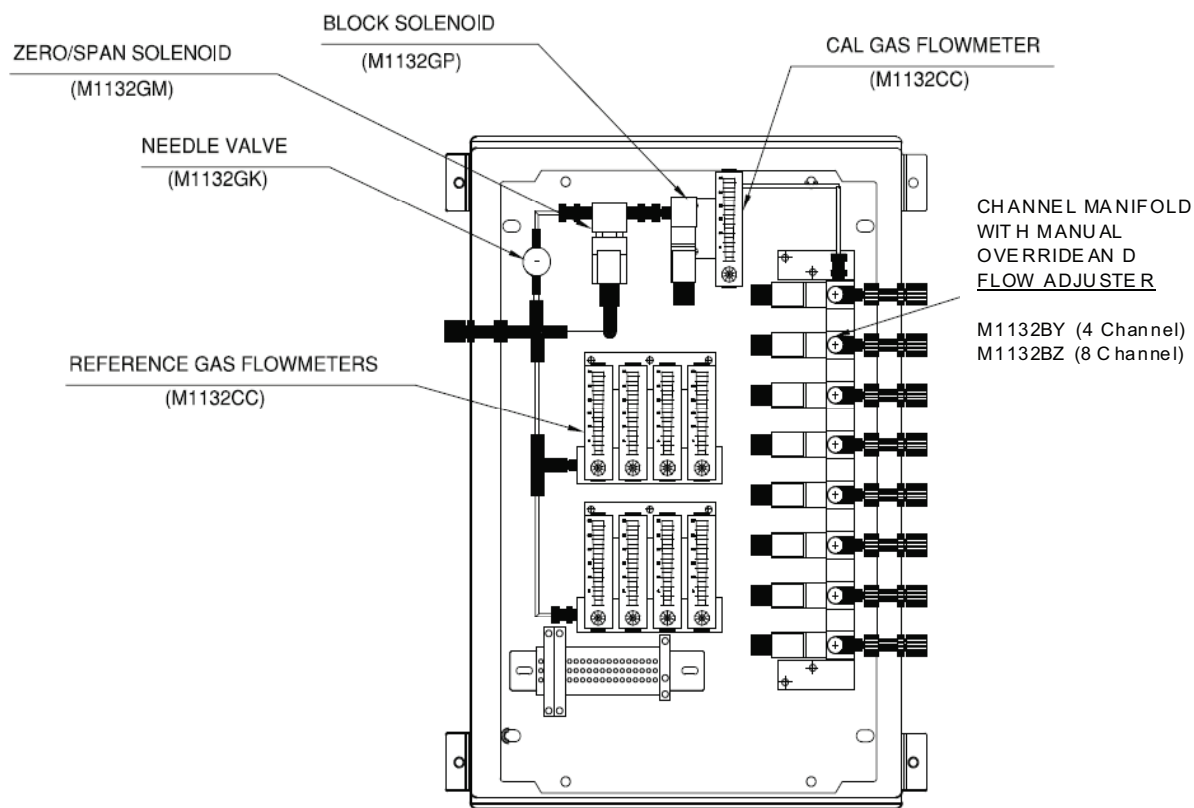


Figure 10.1

- | | |
|-----------------------------------|---------------------------|
| 1. Zero/Span Solenoid | M1132GM |
| 2. Channel Manifold | M1133BY (4 CHANNEL) |
| | M1133BZ (8 CHANNEL) |
| 3. Needle Valve | M1132GK (BRASS) |
| | M1132BX (STAINLESS STEEL) |
| 4. Reference /Cal Gas Flow Meters | M1132CC (BRASS) |
| | M1132ZC (STAINLESS STEEL) |

10.2 ACCESSORIES

10.2.1 Zero Gas Regulator, M1132ZX

This regulator controls the gas pressure of the zero gas cylinders before it reaches the calibration unit. The dual stage regulator is highly recommended for services which require a near constant delivery pressure as the calibration source decays (See M1133AR). Air diffusion and absorption, desorption and off gassing are minimized because of its stainless steel construction.



NOTE

This regulator is used on a “zero gas” cylinder with a CGA 580 connection. The Cylinder connection must be CGA580 (used for <5% oxygen balanced in nitrogen).

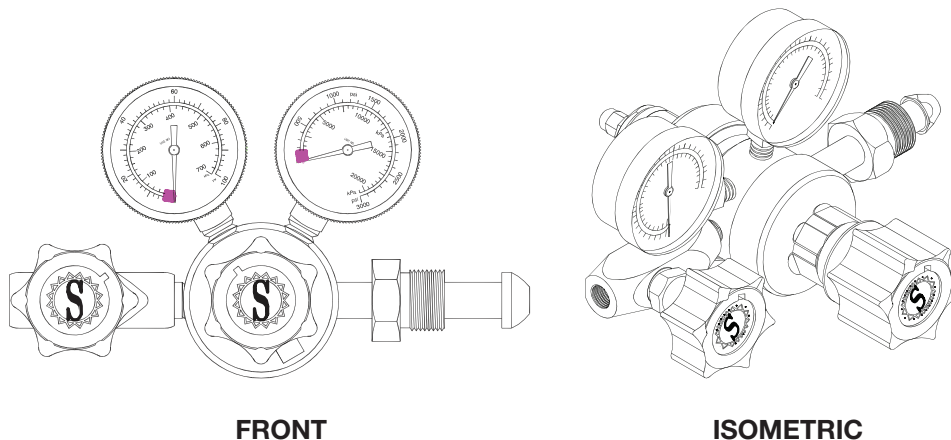


Figure 10.2 Zero Gas Regulator, M1132ZX

Maximum Inlet Pressure:	3,000 psig
Operating Temperature Range:	-40°F to 200 °F
Bonnet Vents:	1/8" NPTF
Inlet/Outlet Connection:	CGA 580 with 1/4" NPTM
Purge Ports:	1/4" NPT Female
Weight:	4.7 lbs (1.75 kg)
Material of Construction:	Body - 316L Stainless Steel Diaphragm - 316L Stainless Steel Seat/Seal – Tetzl/Teflon, Kel-F Gauges - 316L Stainless Steel Bonnet – brass, nickel-plated
Delivery pressure Range:	2 to 75 psig
Flow Capacity Air:	300 scfh
Gauges:	Delivery, 0 to 100 psig; Cylinder pressure, 0 to 3,000 psig 2" diameter

10.2.2 Pressure Regulator, M1132KD

This general purpose regulator is used to adjust the pressure of instrument air entering the AC4/AC8. Figure 10.4

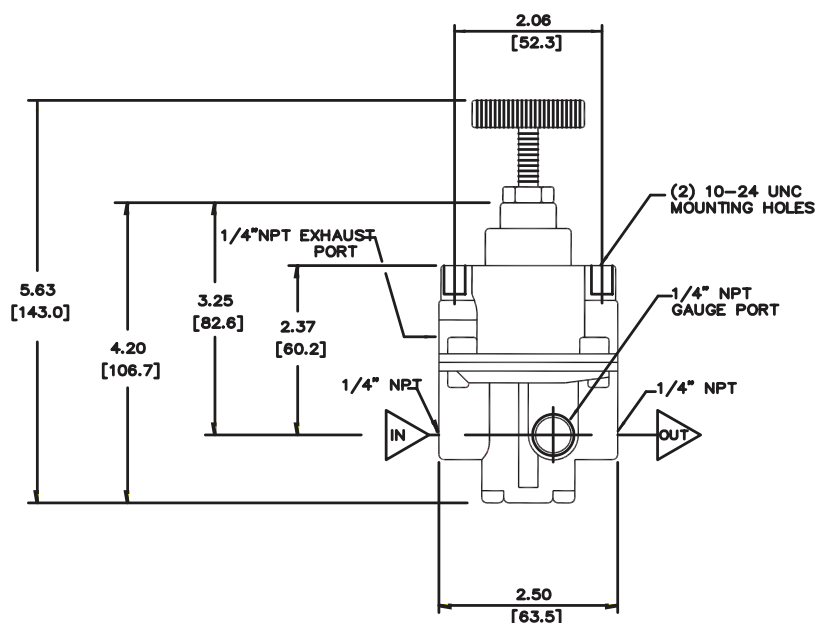


Figure 10.4 Pressure Regulator, M1132KD

Flow Capacity:	20 SCFM (33.6m ³ /hr) at 100 psig supply – 20 psig outlet
Exhaust Capacity:	0.1 SCFM (0.17m ³ /hr) – downstream pressure 5 psig above set point
Sensitivity:	1" of water
Effect of Supply Pressure Variation:	Less than 0.2 psig for 25 psi change
Maximum Supply Pressure:	250 psig
Air Consumption:	Less than 6 SCFM
Output Range:	0 to 60 psi
Port Size:	1/4" NPT
Materials:	Body – Die cast aluminum alloy; Diaphragm – Nitrile elastomer and nylon fabric; Trim – Brass, zinc plated steel, acetyl
Weight:	4.0 lbs (1.8 kg)

10.2.3 Pressure Gauge, M1132ME

The purpose of this gauge is to indicate the pressure of instrument air entering into the AC4/AC8. Figure 10.5

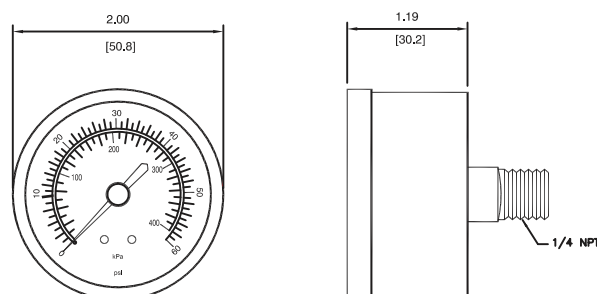


Figure 10.5 Reference Air Gauge, M1132ME

Gauge Size:	2" (50mm)
Measuring Range:	0 to 60 psi
Connection:	1/4" FNPT
Weight:	0.5 lbs (0.2 kg)

10.2.4 Zero Pressure Switch, M1133AR, Figure 10.2.6

The pressure switch is used to alert the Operator via a contact input that the zero gas cylinder needs to be replaced before the cylinder is empty. The recommended connection is to the high pressure side of the zero gas regulator. Refer to Figure 4.1.

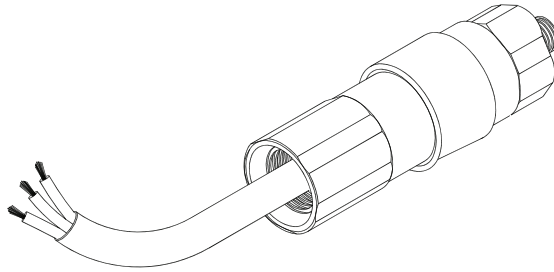


Figure 10.2.6 Zero Pressure Switch, M1133AR

Adjustable Set	30 to 575 psi on fall;
Point Ranges:	50 to 600 psi on rise.
Dead Band:	8 to 60 psi
Over Range:	2,500 psi
Proof Pressure:	3,000 psi
Storage Temperature:	-40°F to 180°F (-40 °C to 82 °C)
Ambient Temperature:	0 °F to 160 °F (-18 °C to 71 °C)
Set Point Repeatability:	1% of span
Switch Output:	One SPDT (either NC or NO)
Electrical Rating:	Rated to 5 amps resistive and 15 amps inductive (75% PF), at 125 and 120 VAC, 1/4" HP
Enclosure:	Aluminum with irradiate finish rated for 100 hours of salt spray
Electrical Connection:	One SPDT output; 1/4" NPTF, 5ft cable
Pressure Connection:	1/8" NPTM
Mounting:	NPTM pressure connection
Weight:	12oz (340g)
Approvals:	UL 508 listed, E42272; CSA C22.2, No 14-1987: LR 9690

10.2.5 Fuses, M1132HG

Two fuses are imbedded in the power supply input terminals of the AC4 and AC8 calibration units.

Current Rating:	1 amp
Slow Blow Time:	100% - 4hours maximum 135% - 1 hour maximum 200% - 5 second maximum
Size:	1'4" O.D. x 1 1/4" L
Approvals:	UL Listed, CSA approved

APPENDIX A

APPENDIX B

