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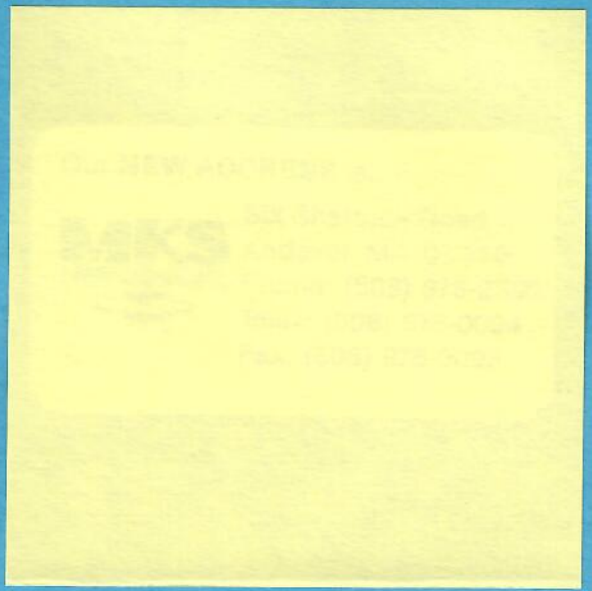
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Find the *MKS Instruments 221AA-01000C* at our website: *Click HERE*

MANUAL 195-106468A-12/83

INSTRUCTION MANUAL

MKS BARATRON
TYPE 221A
PRESSURE GAUGE



SECTION 1

GENERAL DESCRIPTION

General

The type 221A pressure gauge consists of three elements, indicator, cable and transducer. The system is shipped fully interconnected and requires only the addition of an external power supply and the appropriate readout device.

The transducer consists of a tightly tensioned diaphragm on one side of which is placed a dual electrode; i.e., a single-sided system, usable when process contamination is possible. The cavity on the electrode side is evacuated, sealed and gettered to provide a (zero) reference pressure.

The electronics (signal conditioning measuring circuits, etc.) is contained in a flange mounted aluminum box on the opposite end of the transducer cable. An electrical connector with a mate is provided to make all input power and output signal connections.

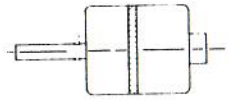
SECTION 2

INSTALLATION & OPERATION

Installation

The transducer is designed to be mounted with the pressure port mounted in the horizontal or vertical positions (see Figs. A & B) with standard vacuum fittings, such as Cajon VCR, Ultra-Torr, etc.

A



HORIZONTAL

B



VERTICAL

The vertical position offers the advantage that any foreign matter that enters the pressure port will fall away from the diaphragm and not affect the measurement.

Operation

Operation consists of connecting the external power supply and readout to the indicator through the MKS supplied connector and applying electrical power. The connections are as follows:

Pin Number	Description
1	Chassis Ground
2	DC Common
3	NC
4	NC
5	+15 Volt Input
6	- 15 Volt Input
7	DC Output Signal
8	Chassis Ground
9	DC Common
10-14	NC

The external power supply must be capable of supplying ±15 volts, ±2%, at 30 MA minimum. Noise and ripple should be less than 20 MV P-P.

The external readout may be any device capable of reading the full scale output of the 221A which is, ±10 volts into a load of 10K ohms or greater.

NOTE: The ground of any external power supply or readout should be the same as the sensor ground (chassis ground) to avoid any possible ground loops which can affect the performance and stability of the system.

For initial operation, the gauge zero should be adjusted by pumping to a pressure below the gauge resolution and adjusting the zero potentiometer at the gauge (or at the front panel if an MKS supplied PDR or PDR-C is used) until the output is zero volts. The same procedure is used to adjust the zero at any time thereafter.

Gauges with full scale values below atmospheric pressure will produce an over ranged output unless they are connected to a vacuum system and pumped down.

SECTION 3

CIRCUIT DESCRIPTION

Transducer

In the single-sided sensor the dual electrode is excited by the secondary of the transformer T1. With zero differential pressure across the diaphragm, the signal at the center tap is at AC ground. As deflection takes place, the center tap potential goes positive as the capacity of the center electrode increases more than that of the outside electrode. This output is amplified by the signal amplifiers which correct for linearity and provide a zero adjustment.

Excitation Oscillator

The 10 KHz oscillator is of the Wein Bridge type. The frequency of operation is determined by C3, C4 and R10, R11. The Wein Bridge is used as a feedback element around amplifier U3 and produces the excitation which is coupled through C5 and R12 to drive the bridge transformer and the demodulator input.

The oscillator produces a high purity sine wave which is amplitude stabilized by Q2. This FET amplifier controls the gain of the amplifier U3. Q2 in turn is controlled by amplifier Q1 which monitors the oscillator output via a peak detector. The output from the peak detector is balanced against a temperature stabilized reference created by VR1 and associated resistors. This combination produces an input to Q1 which controls the amplitude by varying the "resistance" of Q2. Adjustment of the amplitude over a limited range is provided by R3.

Signal Amplifiers

The first stage is a preamplifier which provides a high impedance input to the transducer and a lower impedance driving signal to the second stage amplifiers to reduce the possibilities of unwanted pick-up. The second stage amplifiers receive the signal from the first stage, provide linearity adjustment and zero control and then feed the output into the demodulator transformer T2.

Demodulator

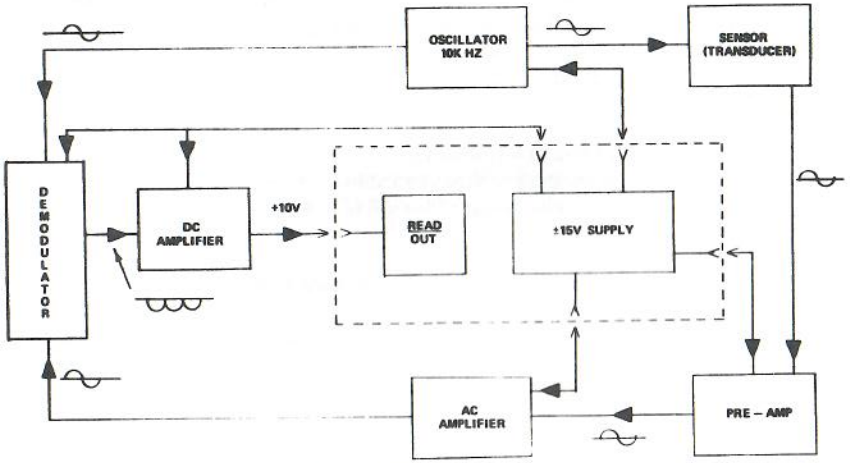
The demodulator is a synchronous type which is referenced to the excitation oscillator. This blocks out all frequencies except the desired one.

U2 is a high-speed comparator which provides a fast rising amplitude square wave that is synchronized to the zero crossing of the oscillator waveform.

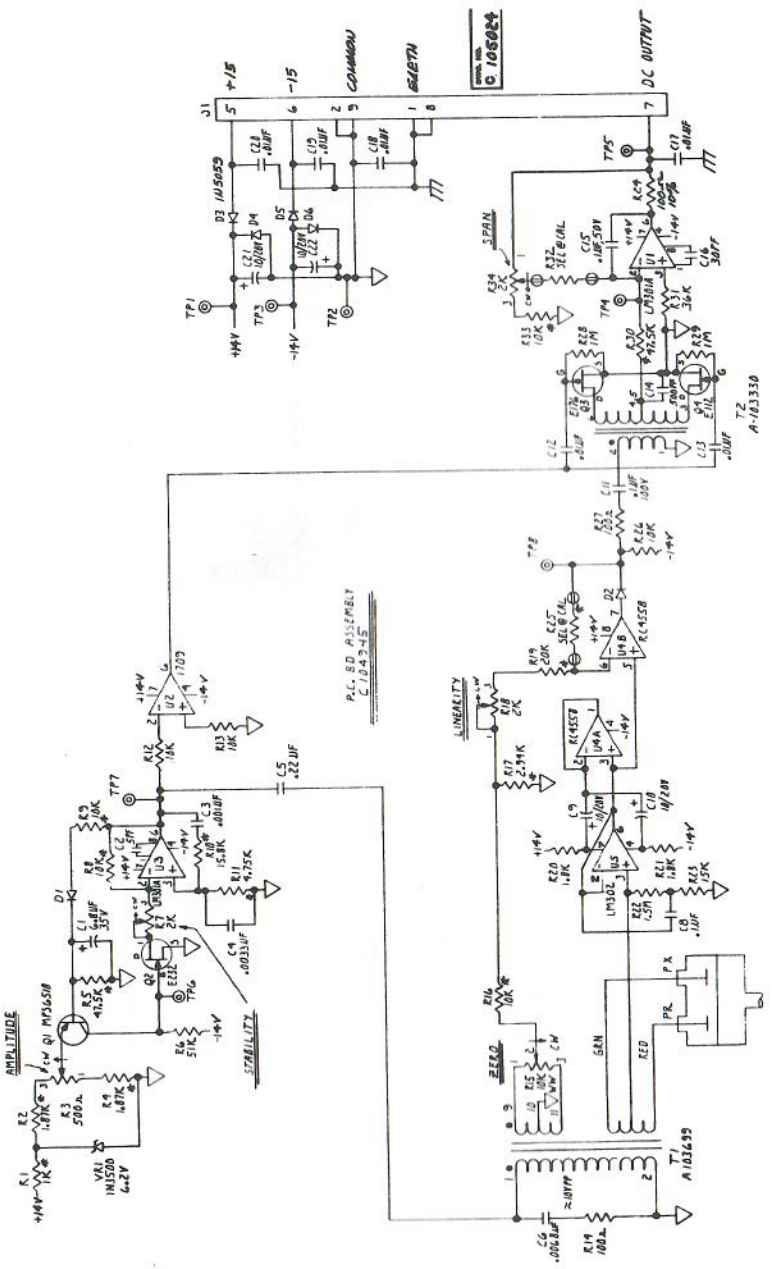
The output from this comparator is fed, via C12, and C13, to the gates of Q3 and Q4. These switches alternately ground the ends of T2 providing a rectified signal to the DC amplifier.

Output DC Amplifier

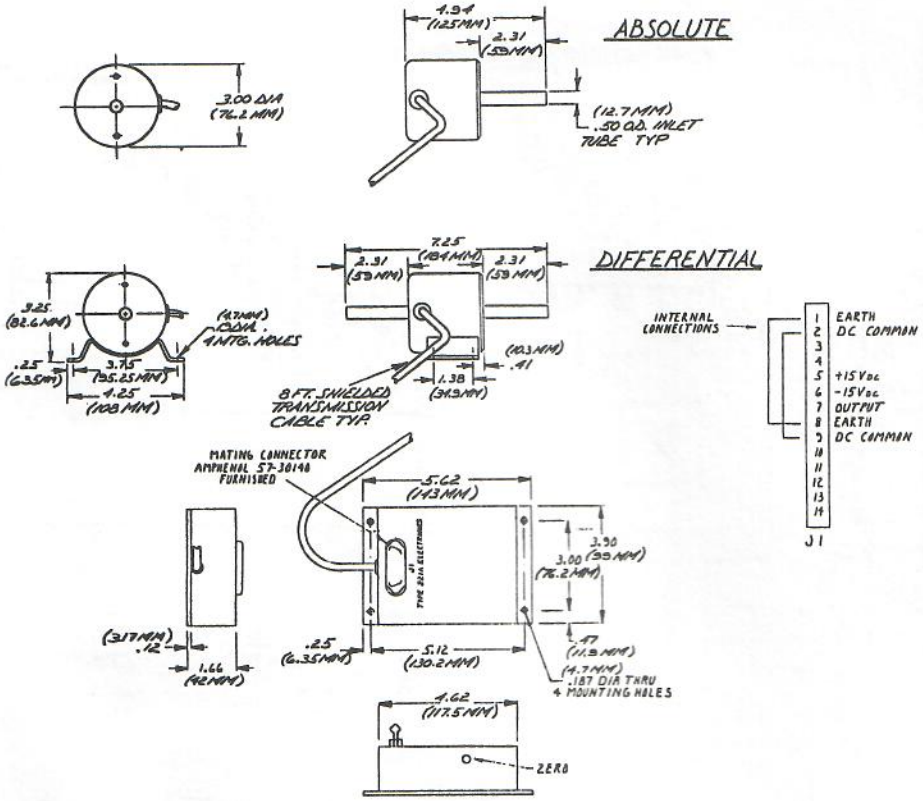
The final low impedance DC output signal is derived from U1 which operates as a DC filter to smooth the ripple from the demodulator. The gain of this stage is set in final calibration by selection of R32 while a smaller adjustment is provided by R34.



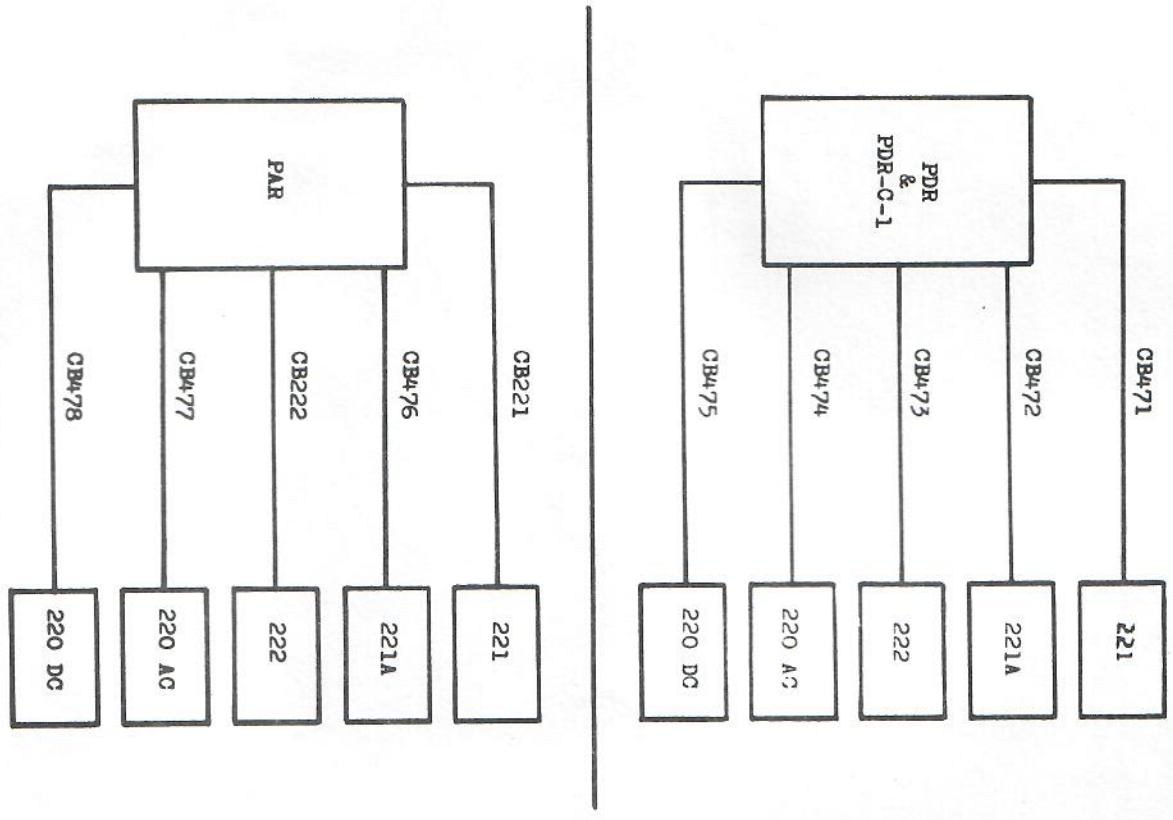
Type 221A Block Diagram



Type 221A Schematic Drawing C-105024, Rev. A



Type 221A Outline Drawing C-105023, Rev. A



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