



Vorne Industries

Model 77/719
Analog to Digital Display
User's Manual

Model 77/719 Analog to Digital Display

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1. INTRODUCTION TO THE DISPLAY

1.1 Operation

The model 77/719 accepts analog input data, converts it to digital information, scales it in accordance with user preset scale factor switches and displays the scaled data on 3.3 inch high digits. Various standard voltage and current analog input ranges are available and special ranges can be accommodated. Over range analog inputs are indicated by flashing nines on the display. Two sets of rotary dip switches are available to the user for scaling the display. One sets the bottom while the other sets the top of the analog input range. The display is linear between the two set points. Display accuracy is to three significant digits.

2. WIRING AND SPECIFICATIONS

2.1 Display

The display contains from 2 to 6 digits with 3.3" high LED characters. An optional decimal point in front of any digit position is available.

2.2 Input Ranges

1) Voltage

All three voltage input ranges (0-1 Volt, 0-5 Volt, 0-10 Volt) have an input impedance such that the maximum current drawn by the unit will be .05 milliamp at the top of the input range.

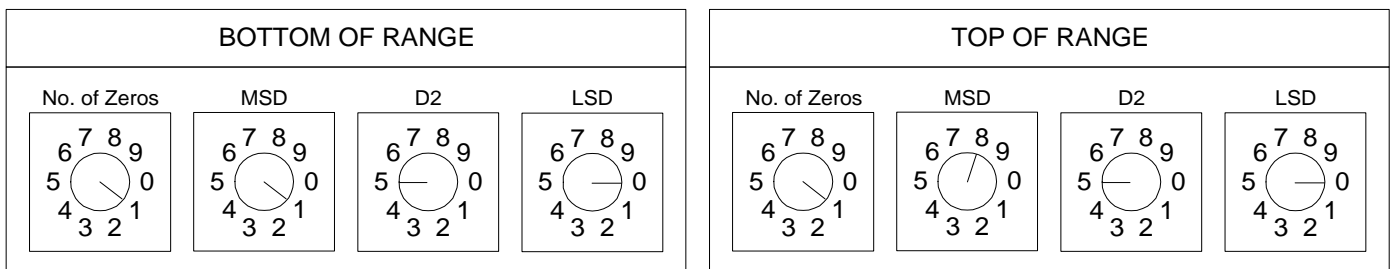
2) Current

The current input range (4-20 milliamps) has an input impedance of 44 ohms between terminals 6 and 7, thereby creating a voltage drop of less than 1 Volt at the top of the input range.

2.3 Scaling the Display

Two sets of four rotary BCD dip switches on the main logic board allow the user to select bottom-of-range ("Floor") and top-of-range ("Ceiling") values. The three rightmost switches in each set (labeled MSD, D2 and LSD) set specific numbers. The leftmost switch in each set (labeled # of zeros) determines the number of following zeros (up to 3). The bottom of range corresponds to the lowest valid analog input value, and the top of the range corresponds to the highest valid analog input value. A new setting of the scaling switches is entered after reset or power up.

Example: Bottom of range set to 1-1-5-0, top of range set to 1-8-5-0. Bottom of range = $150 \times 10^1 = 1500$;
Top of range = $850 \times 10^1 = 8500$.



2.4 Reset

Internally pulled high, this active low input requires a contact closure to ground with a minimum 10 millisecond duration. A reset input places the unit in a state equivalent to power up (ready to accept an input, display showing scaled analog input).

2.5 DC Output Voltage

A regulated output voltage of 5 or 12 volts DC at 100 milliamps can be provided for auxiliary use.

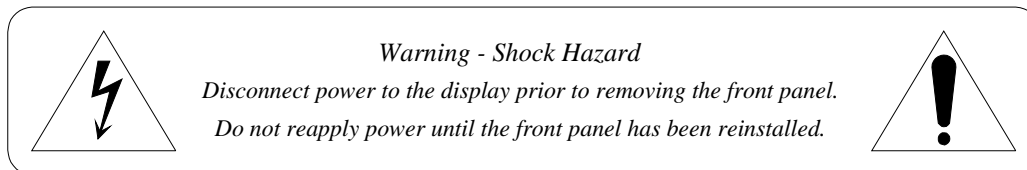
2.6 Power Requirements

120 VAC \pm 15% *, 15 VA. AC hot and neutral are wired to terminal #1 and #2 (polarity not important). Terminal #3 is Earth Ground only.

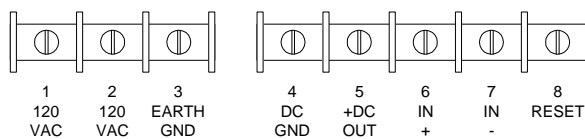
* Also available in 220 VAC & 24 VDC.

2.7 Accessing the Logic Board

All wiring points are located on the logic board of the 77/719. This board is mounted to the front panel of the display. For access, remove the six #8 screws which hold the front panel to the rest of the enclosure.



2.8 Wiring



Screw terminal strip, mounted on a PC board inside the enclosure
SAFETY GROUND : On AC power units, use a 3 wire grounded power cord with the earth ground tied to terminal 3.

3 CALIBRATION PROCEDURE

NOTE: Units are calibrated at the factory and re-calibration should not be necessary. The re-calibration procedure should be performed if any one of the following symptoms are observed:

- 1) With the minimum specified input, the unit displays backward "C"s (]]]).
- 2) With the minimum specified input, the unit displays any number not equal to the bottom range in scale mode or > 0 in percent mode.
- 3) With a maximum specified input, the unit displays any out of range number.

Please consult with the factory concerning questions about the calibration procedure or re-calibration.

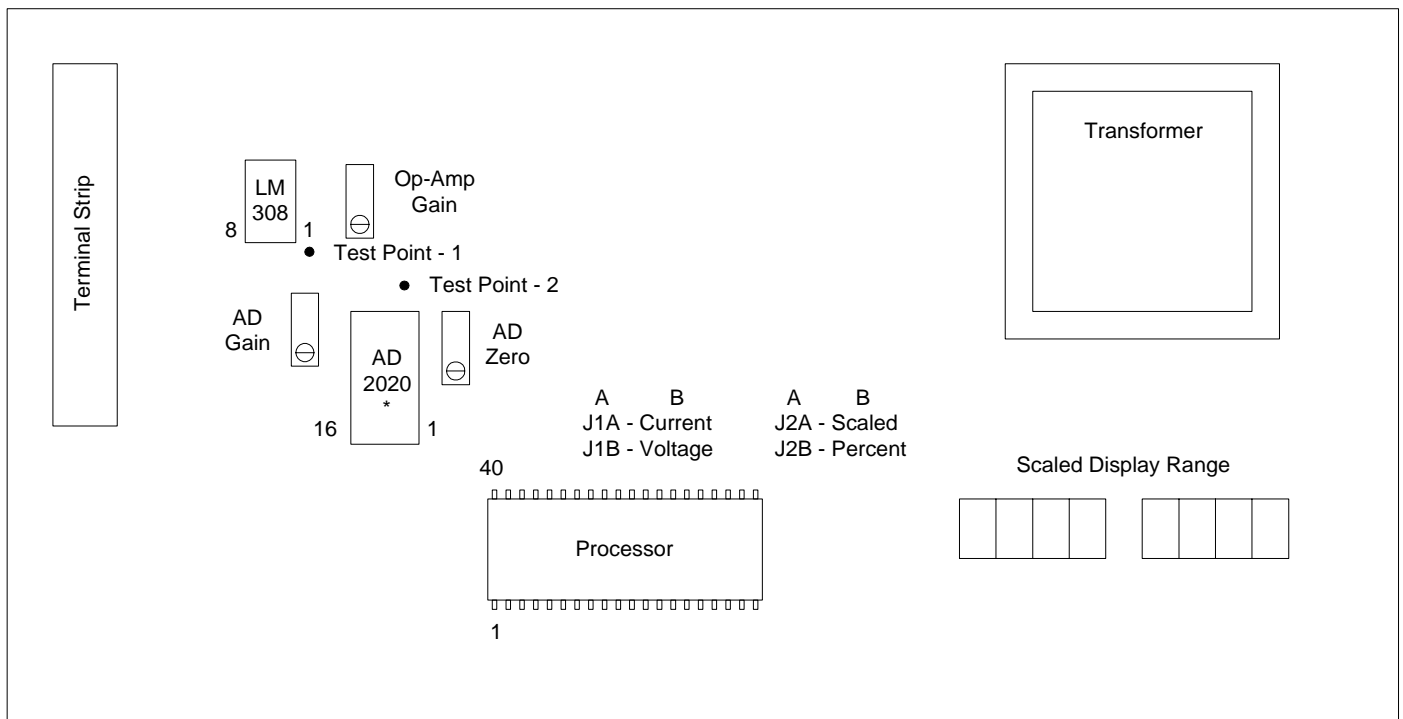
3.1 Equipment Needed

One or two digital voltmeters, capable of measuring milli volts and milliamps. The calibration instructions are written for two DVMS between test points. See Section 3.3 for a diagram of the 77/719 logic board showing calibration points.

3.2 Location of Trim Potentiometers

There are three 20 turn pots which are adjusted in the calibration procedure. The first is the Op Amp gain adjust, a 10K Ohm pot (marked on its side "103") located next to the eight pin LM308 Op Amp IC. There should also be a short piece of wire extending vertically from the logic board next to the Op Amp. This is the test point for reading the output voltage of the Op Amp. If this wire is missing reading must be taken directly from pin 6 of the LM308. The second pot is the A/D zero adjust, a 50K Ohm pot (marked on its side "503") located next to the 16 pin AD2020 A/D converter IC. The third pot is the A/D gain adjust, a 10K Ohm pot (marked on its side "103") also located next to the AD2020.

3.3 Logic Board Overview



* CA3162 is an equivalent part.

3.4 Calibration Procedure

Note: Units that have 4-20 mA or 1-5 V input are calibrated as if they are 0-20 mA, or 0-5 V respectively. This is because the microprocessor software compensates in normal scaled mode operation for this special scaling requirement.

1) Selecting Calibration Mode

Power down the display and activate the calibration mode by moving the shorting jumper near pin #21 of the microprocessor from the scaled position to the percent position. Power up the display.

2) Op Amp Gain Adjust

Use DVM #1 to read the input at terminals #6 and #7. Use DVM #2 to read the voltage (in milli volts) out of the Op Amp utilizing the test point. Adjust the input so it is at maximum at terminals #6 and #7 (DVM #1). For a 4-20 mA input, maximum is 20.00 mA. For a voltage input maximum is generally 1.000 V, 5.000 V or 10.00 V depending on the type of input ordered.

With the input at maximum, trim the Op Amp gain pot so that the op amp output (DVM#2) is 1.000 Volts exactly.

3) A/D Zero Adjust

Adjust the input at terminals #6 and #7 so it is at 0.000 (whether the input is current or voltage). Trim the A/D zero adjust pot so that the display reads 000. A lower case backwards "c" in the third position of the display indicates under range.

4) A/D Gain Adjust

Adjust the input so it is at maximum (as in step 2). Trim the A/D gain pot until the display is on the threshold between 999 and lower case backward "c"s (]]]).

3.5 Verification

To verify proper calibration use the chart below. Locate the row which is marked to correspond with the input type you have. Use the listed values as inputs on terminals 6 & 7. The displayed value should correspond with the bottom row of the chart for each input level. If there is any disparity repeat steps 2-5.

% FULL RANGE	0%	25%	50%	75%	100%
INPUT TYPE: 4-20 mA	0.00 mA	5.00 mA	10.00 mA	15.00 mA	20.00 mA
INPUT TYPE: 0-1 V	0.0 mV	250.0 mV	500.0 mV	750.0 mV	1000.0 mV
INPUT TYPE: 0-5 V	0.000 V	1.250 V	2.500 V	3.750 V	5.000 V
INPUT TYPE: 1-5 V	0.000 V	1.250 V	2.500 V	3.750 V	5.000 V
INPUT TYPE: 0-10 V	0.000 V	2.500 V	5.000 V	7.500 V	10.000 V
Display should show	000	249-251	499-501	749-751	999-]]]

3.6 Selecting Normal (scaled) Mode

Power down the display and return the shorting jumper near pin #21 of the microprocessor to the scaled position. The display will now operate per Section 1.1 (Operation).

3.7 Securing Trim Pot Setting

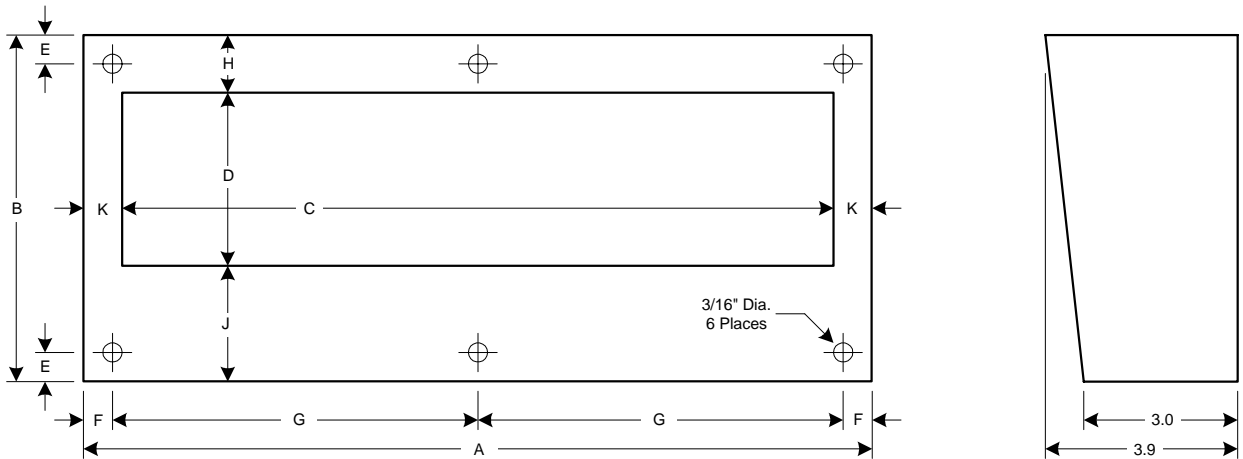
After the unit is calibrated, secure the trim pot settings by dotting silicon rubber, or nail polish on the shaft of the pots.

3.8 Notes

3.9 Dimension

(Not to scale)

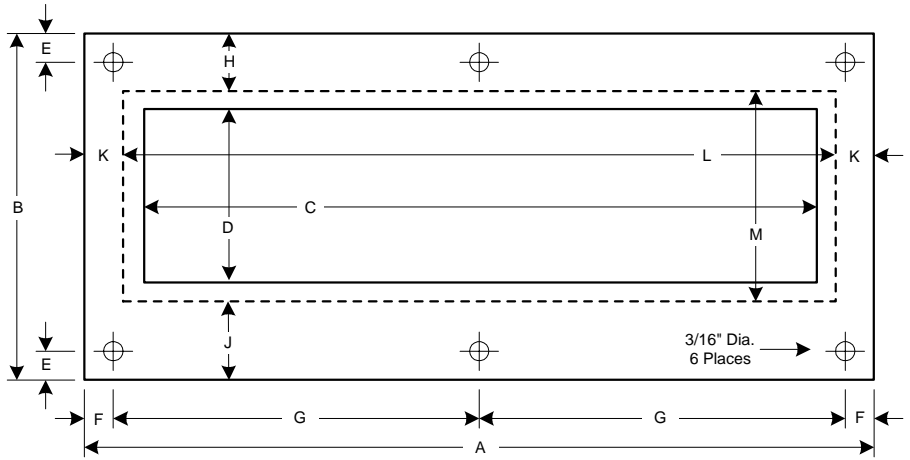
Stand Alone Enclosure



	A	B	C	D	E	F	G	H	J	K
3 digit	10.85	7.10	9.15	3.80	.35	.55	4.87	1.05	2.25	.85
4 digit	13.60	7.10	11.90	3.80	.35	.55	6.25	1.05	2.25	.85
5 digit	16.35	7.10	14.65	3.80	.35	.55	7.63	1.05	2.25	.85
6 digit	19.10	7.10	18.40	3.80	.35	.55	9.00	1.05	2.25	.35

All dimensions in inches.

Bezel Mount



--- Dotted line indicates approximate panel cutout.

	A	B	C	D	E	F	G	H	J	K	L*	M*
3 digit	11.75	7.0	9.15	3.80	.30	1.0	4.87	.45	.65	.45	10.85	5.90
4 digit	14.50	7.0	11.90	3.80	.30	1.0	6.25	.45	.65	.45	13.60	5.90
5 digit	17.25	7.0	14.65	3.80	.30	1.0	7.63	.45	.65	.45	16.35	5.90
6 digit	20.0	7.0	18.40	3.80	.30	1.0	9.00	.45	.65	.45	19.10	5.90

All dimensions in inches.

* Dimensions of panel cutout.



Vorne Industries Incorporated

1445 Industrial Drive

Itasca, IL 60143-1849

Phone: (630) 875-3600

Fax: (630) 875-3609