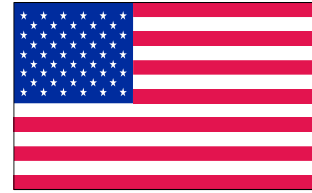


# Owner's Instruction Manual



**Electronics Inc.**  
56790 Magnetic Drive  
Mishawaka, Indiana USA  
46545-7493



[www.electronics-inc.com](http://www.electronics-inc.com)

Made in USA

## SHOT FLOW METER



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## Model 260 Monitor

## TABLE OF CONTENTS

1. PRODUCT DESCRIPTION.....	3
2. THEORY OF OPERATION.....	3
3. SENSOR SELECTION.....	3
4. INSTALLATION.....	4
5. CALIBRATION .....	4
6. OPERATION .....	5
7. MAINTENANCE .....	6
8. WARRANTY.....	6
9. SENSOR SIZE SELECTION CHART .....	7
10. 260 FRONT PANEL LAYOUT .....	8
11. HOW TO RETURN CONTROLLERS FOR REPAIR .....	9

## 1. PRODUCT DESCRIPTION

The Model 260 Shot Flow Meter measures and displays the rate of flow of steel shot passing through an inductive metal sensor. A meter, with decal for percentage flow and a digital display for actual flow rate display, are included for indications of shot flow rates. A 0-10 volt DC output signal is available for remote meter indication, data logger, or strip chart recorder. High and low flow rate alarms are included and their trip points are adjusted at the front panel. The high and low relay alarm outputs are standard mechanical relay contacts.

## 2. THEORY OF OPERATION

An inductive sensor (pick-up coil) acts as a density type detector of metallic shot, and this signal is amplified for meter display. The amplified signal is monitored by the low and high alarms, which are activated outside of the individually adjustable low and high trip points.

The 260 shot flow monitor operates as a magnetic densitometer. It reacts to the density of metallic shot inside of the sensor. If the shot velocity through the sensor is constant, then the shot flow rate may be accurately displayed on the linear scale. If the shot velocity is not constant then the flow rate display will not be linear. A correction factor must be used for different velocities (air pressures).

Placing the shot flow sensor in the low velocity section (below the media valve and above the mixing tee) of a direct pressure air blast machine usually will provide accurate and linear results.

Placing the shot flow sensor on the blast hose after the shot is accelerated by air pressure will make the shot flow rate signal sensitive to velocity changes and it will not be accurate at different air pressures. A look-up table or other scheme must be used to compensate for this type of installation.

The analog meter scale is calibrated in percentage of full scale (0-100%) and the digital display may be customer set to directly read in lbs/min or Kg/min.

## 3. SENSOR SELECTION

It is important to select the sensor size best suited for the desired flow rate. Using a sensor with too high of a flow rate range will result in display zero drift. Consult the table in the appendix for available sizes of shot flow sensors.

Two series of sensors are available for the 260-P Flow Monitor. The original series sensors, Model 299-1.0, are identified by their blue color and a 'BNC' type connection for coaxial cable. This sensor series requires an external 1.0 micro-farad capacitor located at the 260 monitor.

A newer series, model 399 - (xx), is red in color and has cable leads or optional screw terminals. This series has the 1.0 micro-farad capacitor built-in. The two series are not directly interchangeable.

The sensor is an inductor in an oscillator circuit with a base frequency of 11,400 Hertz. Shot flows through the sensor causing a frequency shift. The capacitor for the oscillator circuit is located in the 260 Flow Monitor for the 299 (blue) series. The capacitor is contained inside of the housing of the 399 (red) series.

To use a **new** (red) sensor with an **older** long chassis display module may require removal of a 1.0-microfarad capacitor located inside of the 260-display module near the top and rear of the chassis. It is approximately 1.0" long by 1/2" diameter, yellow, and marked F-Dyne MPC11-1.0-100V.

To use an **old** (blue) sensor with a **new** short chassis display module may require the addition of a 1.0 microfarad capacitor (E.I. P/N 240052) connected to the sensor connection screw terminals 4 and 5 at the rear of the 260 monitor.

The 399(xx) sensors are set to a base frequency of approximately 11,400 Hz. Flow of shot through the sensor will reduce the frequency. The 260 shot flow monitor converts the frequency signal to a voltage signal and scales it for proper meter display.

#### 4. INSTALLATION

Installation consists of:

- |                                       |                           |
|---------------------------------------|---------------------------|
| 1. Mounting sensor                    | See 299 or 399 data sheet |
| 2. Mounting electronic module         | See 260 data sheet        |
| 3. Connecting electrical wiring       | See 260 data sheet        |
| 4. Performing a calibration procedure | See section 5             |

#### 5. CALIBRATION

Calibration consists of three parts:

1. Synchronization of the digital display to the analog meter.
2. Calibration of the monitor with its flow sensor and a known amount of shot flow.
3. Setting the low and high alarm trip points.

##### 1. Synchronization

It is not necessary to have the flow sensor connected for this part of the procedure.

A. Place the meter display slide switch (located on the front panel below the digital display) into its lowest position. Adjust the low alarm trim pot (located below the alarm slide switch) counterclockwise until the analog meter indicates "zero".

B. The digital display should also indicate, "zero". If it does not, open the monitor side panel and adjust the "Digital Zero" trim pot until "zero" is achieved in the digital display. This will synchronize the digital zero to the analog zero.

C. Place the meter display slide switch in its uppermost position. Adjust the high alarm trim pot (located above the alarm slide switch) clockwise until the analog meter indicates 100%.

D. At this time the digital display should read the desired maximum flow rate value (in pounds/min or Kg/min). If it does not, adjust the "Digital Span" trim pot (located inside the monitor) until the desired value is indicated in the digital display.

E. Return the meter display slide switch to its center position.

This synchronizes the digital zero and span to the analog zero and span. This completes part 1.

## 2. Calibration

For this part the flow sensor must be connected to the monitor and a method of accurately catching shot utilized. It is recommended that the flow rate-regulating device be set to 90-98% of the system's flow rate capacity. This will provide the greatest degree of accuracy of the flow readings.

A. Be sure that the meter display slide switch is in its center position. Adjust the "Zero" trim pot (located at the lower left corner of the analog meter) until the analog meter indicates zero. If it is not possible to achieve zero with this adjustment, use the "Coarse Zero" trim pot (located inside the monitor). Both the analog meter and the digital display should indicate zero. If they do not coincide it will be necessary to repeat Part 1 in its entirety.

B. Perform a one-minute shot flow catch test and record the weight of shot caught. Observe the monitor's digital flow reading during the test.

C. Resume shot flow.

D. Adjust the "Span" trim pot (located at the upper left corner of the analog meter) until the digital display indicates the amount of abrasive caught in the one-minute test. If unable to achieve the correct setting use the "Coarse Span" trimpot (located inside the monitor).

This calibrates the monitor with the actual flow amount and completes Part 2 of the procedure.

## 3. Setting Alarm Trip Points

It is recommended that the alarm trip points be set approximately 10% above and 10% below the desired flow setting (or range where flow rates will be used).

A. Set the high alarm trip point by placing the meter display slide switch in its upper position and adjust the high alarm trim pot to the desired "High Alarm" value.

B. Set the low alarm trip point by placing the meter display slide switch in its lowest position and adjust the low alarm trim pot to the desired "Low Alarm" value.

C. Return the meter display slide switch to its center position.

This sets the alarm trip points and completes Part 3 of the procedure.

Place a "Calibration" sticker over the trim pots to prevent un-authorized re-adjustments.

## 6. OPERATION

### 1. Alarms

Place the meter display slide switch (SW-1) to its center position to show shot flow rates in both the analog meter and digital display.

The low alarm LED will be on if the shot flow rate is below the low alarm trip point. The high alarm LED will be on if the shot flow rate is above the high alarm trip point. The alarm relay outputs will come on after an adjustable time delay. The output alarms may be time-delayed to avoid false alarms.

The alarm time-delay setting is made by adjusting the "Alarm Delay" (located inside the monitor). The alarm delay timing range is 0 to 10 seconds. When either the high or low alarm is tripped, the high or low red LED on the front panel will instantly illuminate at half of its normal intensity. After the alarm time delay expires the high or low LED will glow at full brilliance and the high or low alarm relay will be activated.

### 2. Recorder Output

A recorder output signal 0 to +10 Vdc to represent 0%-100% flow rate is available at screw terminal #6 with terminal #4 the common connection. Use shielded cable with the shield and common connected to terminal #4.

## 7. MAINTENANCE

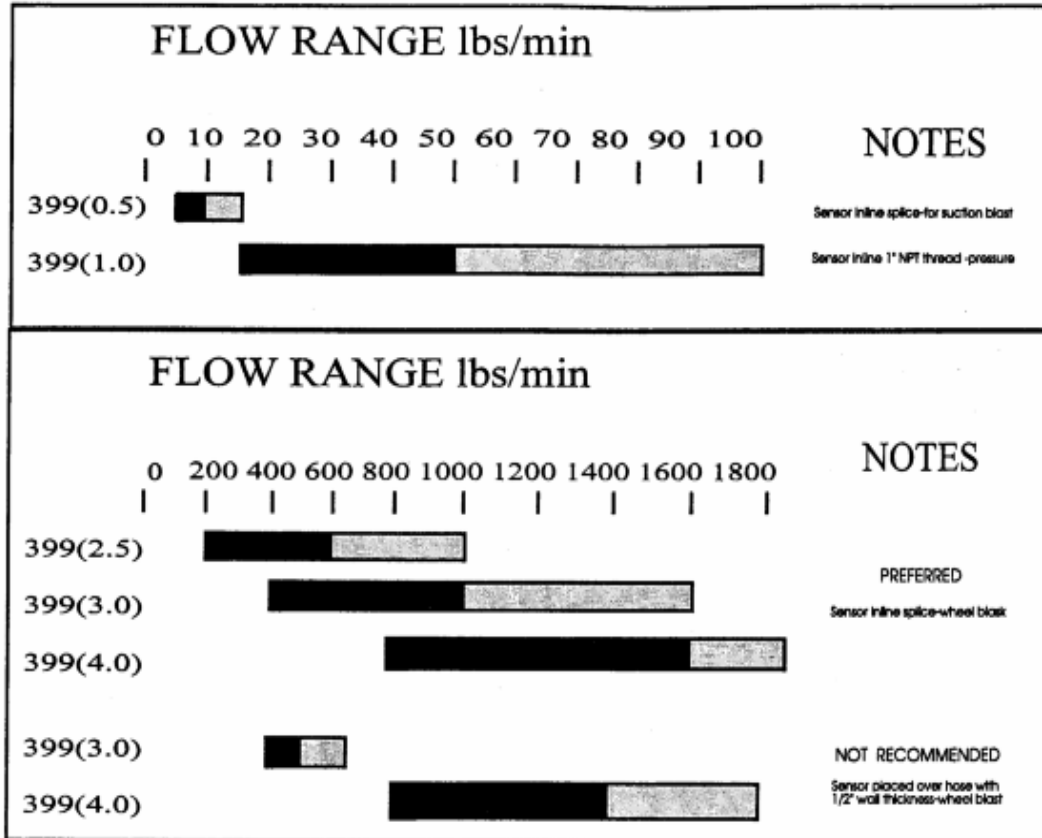
Accumulation of conductive contaminants inside of the 260 monitor should be avoided. The interior of the monitor has a protective conformal coating for mild environmental protection, but care must be exercised to insure that excessive contamination does not occur. Periodic cleaning with dry, oil-free air may be required. Clean, filtered air for positive interior air pressure may be required to keep contaminants out of the 260 shot flow rate monitor.

## 8. WARRANTY

Electronics Incorporated warrants this product to be free from defects in material and workmanship for a period of 2 years from the date of shipment from the factory. Defective units must be returned to Electronics Incorporated shipping prepaid. Electronics Incorporated will repair or replace the defective unit at its option. No consequential liability is assumed. No other warranty, including merchantability or fitness for purpose, applies expressed or implied.

**CAUTION:** *Any customer attempts to modify or repair the product during the warranty period will terminate the warranty. Standard technician labor will be quoted prior to repair work.*

9. "SENSOR SIZE SELECTION CHART"



Flow Range of Various Sensors Used with 260 Flow Meter

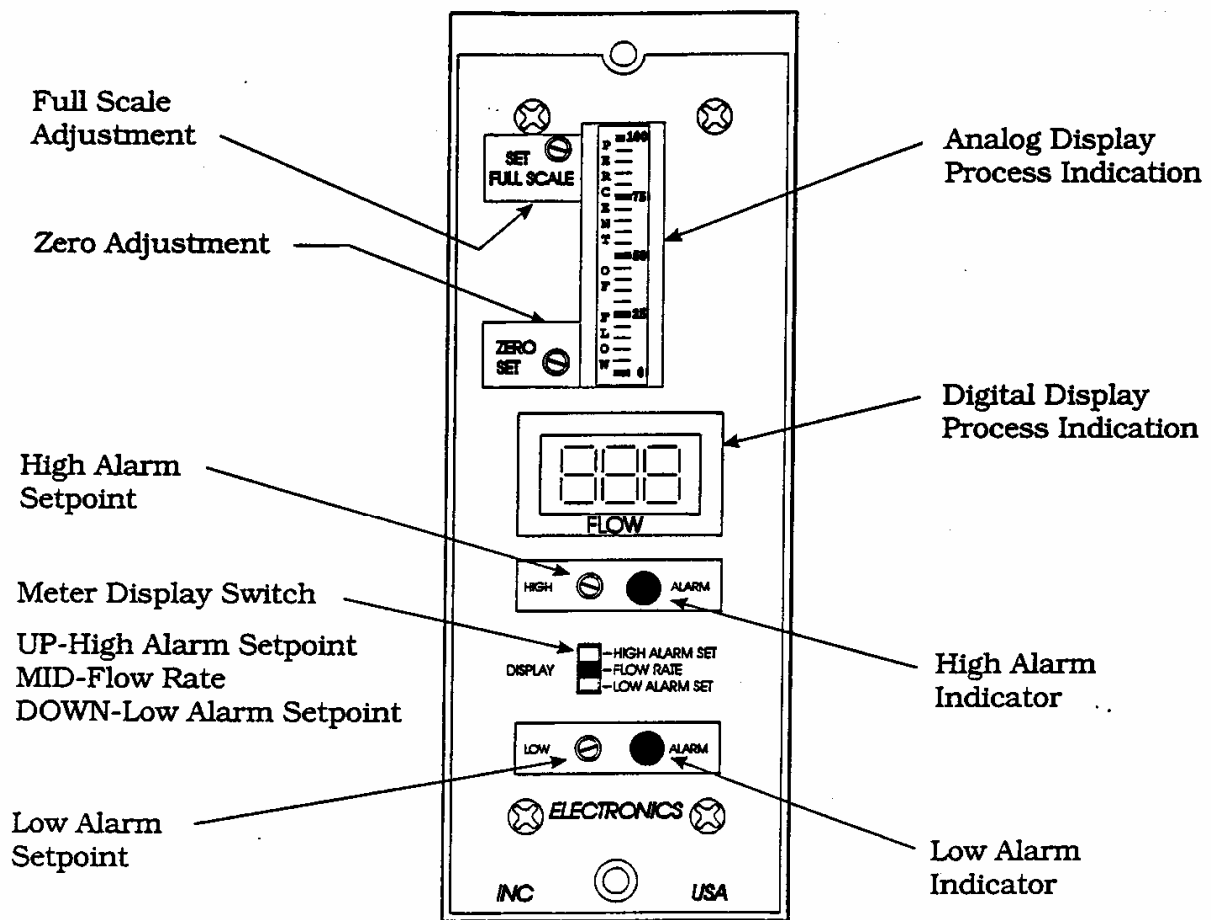
RPM WHEEL	SIZE WHEEL	HORSE POWER								
		10	15	20	25	30	40	50	60	75
3600	12"	295	435	550	700	860	1130	1360	1640	2100
3600	13"	250	370	465	600	730	965	1160	1395	1800
3600	14"	220	320	400	515	630	830	1000	1200	1549
3600	15"	190	280	350	450	550	725	870	1050	1350
2250	19.5"	285	420	525	675	825	1085	1305	1575	2025
2250	21"	240	360	450	575	700	930	1115	1345	1730
1800	24"	295	435	550	700	860	1130	1360	1640	2100

WHEEL FLOW RATES

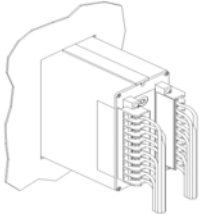
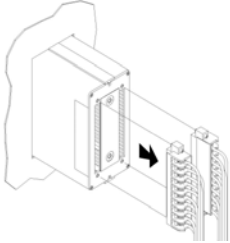
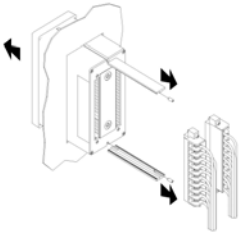
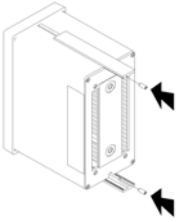

10. "FRONT PANEL LAYOUT OF THE MODEL 260 SHOT FLOW METER"

# MODEL 260 SHOT FLOW METER

## Front Panel Layout



## 11. HOW TO RETURN CONTROLLERS FOR REPAIR

<p>1</p>  <p>Installed in panel. Turn "Off" all power sources to controller before going to step</p>	<p>2</p>  <p>Remove terminal blocks and leave wires attached.</p>
<p>3</p>  <p>Remove Rails and Rail Mounting Screws. Slide controller forwards.</p>	<p>4</p>  <p>Slide Rails back on and install the Rail Mounting Screws.</p>
<p>5</p>  <p>Controller is ready to return.</p>	<p>6</p> <p>1-574-256-5001 for a Returns Goods RG Number #</p> <p>Ship controller with RG # to:</p> <p>Electronics Incorporated 56790 Magnetic Drive Mishawaka, IN 46545</p>