CE

User's Guide

omega.com™
OMEGA®

www.omega.com
e-mail: info@omega.com

FPG-101 & FPG-201 FLOW PROBE

OMEGAnet® On-Line Service www.omega.com	Internet e-mail info@omega.com

Servicing North America:

USA:
ISO 9001 Certified
One Omega Drive, P.O. Box 4047
Stamford CT 06907-0047
TEL: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1
TEL: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico:
TEL: (001) 800-826-6342 FAX: (001) 203-359-7807
En Español: (001) 203-359-7803 e-mail: espanol@omega.com
info@omega.com.mx

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen, The Netherlands
TEL: +31 (0)20 6418405 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: nl@omega.com

Czech Republic:
Rudé armády 1868, 733 01 Karviná 8
TEL: +420 (0)69 6311899 FAX: +420 (0)69 6311114
Toll Free in Czech Republic: 0800-1-66342 e-mail: czech@omega.com

France:
9, rue Denis Papin, 78190 Trappes
TEL: +33 (0)130 621 400 FAX: +33 (0)130 699 120
Toll Free in France: 0800-4-06342
e-mail: france@omega.com

Germany/Austria:
Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
TEL: +49 (0)7056 3017 FAX: +49 (0)7056 8540
Toll Free in Germany: 0800 TC-OMEGA℠
e-mail: germany@omega.com

United Kingdom:
ISO 9002 Certified
One Omega Drive, River Bend Technology Centre
Northbank, Irlam, Manchester
M44 5EX United Kingdom
TEL: +44 (0)161 777 6611 FAX: +44 (0)161 777 6622
Toll Free in United Kingdom: 0800 488 488
e-mail: sales@omega.co.uk

Omega Flow Probe FPG-101 / FPG-201

Instruction Manual

Instructions

1) Make sure the prop turns freely

2) Point the prop directly into the flow with the arrow on the bottom of the probe pointing downstream.

3) Press the right button until the "V" for velocity appears. The top number is the instantaneous velocity to the nearest 0.1 ft/sec. Push the left button to toggle between maximum ("mx") and average ("av") velocity which reads out to the nearest 0.01 ft/sec.

4) Put the probe at your measurement point. Push both the right and left buttons simultaneously and release to rezero and start the averaging. Hold in the flow for several seconds until you have a steady average velocity and then remove the probe. The average velocity will freeze once the prop stops turning.

5) Measure and calculate the cross-sectional area of your flow stream in square feet. The average velocity in feet/second times the area in square feet = flow in cubic feet per second (cfs).

6) The flow probe is waterproof. You can clean it with mild soap and water.

7) If the prop gets fouled, clean it until the prop turns freely, and start over.

Flow Measurement

The average velocity in the flow stream times the cross-sectional area is equal to the flow (Q=VxA). The cross-sectional area is measured by manually measuring the depth of flow at several points across the flow and constructing a picture of the cross section. This is most easily done using graph paper with a scale of 1' per square. Once the picture is completed, counting the number of squares gives the cross section in square feet. The cross-section in square feet times the average velocity in feet per second gives the flow in cubic feet per second (cfs). If you are working in round pipes, you need only to measure the depth of water and use the enclosed tables to determine the cross-sectional area.

The Flow Probe is used to measure the average water velocity. Naturally flowing water varies in velocity for two reasons:

1) The velocities vary across the cross-section. In general, the velocities are greater in the center of the flow and lesser near the bottom and sides of the channel.

2) The water surges in velocity with time. In a smooth running stream the velocity at a specific point can easily vary 1-2 feet per second over the period of a minute. This pulsating or surging of flow should be averaged to get a good average flow reading.

The Flow Probe can be used in three ways to determine average velocity in a stream.

1) *For small streams and pipes,* the probe can be moved slowly and smoothly throughout the flow. The goal is to move the probe smoothly and evenly back and forth from top to bottom so that the probe stays on each point in the flow for the same amount of time. Keep moving the probe for 20 - 40 seconds to get a good average value which accounts for surging. (Move the probe as if you were spray painting and attempting to get an even coat of paint over the entire surface.)

2) *For true Velocity Averaging,* the Flow Probe uses true velocity averaging. When the Readout is zeroed by pushing both buttons or when the probe is inserted into flowing water, a running average is started. As long as the probe remains in the flow, the averaging continues. One reading is taken per second, and a continuous average is displayed. For example after 10 seconds the 10 readings are added and then divided by 10 and this average is displayed. Once the average reading becomes steady, the true average velocity has been obtained. When you pull the probe from the water, this average value is frozen on the display until reset.

2) *For larger streams and rivers* where you can't easily move the Probe throughout the flow from one location, divide the stream into subsections 2-3 feet in width (Do this on the graph paper flow profile). Run a measuring tape across the stream to determine distance from the shore. At the center of each subsection, run a vertical velocity profile: Zero the averaging function and move the Probe vertically from the surface to the bottom slowly and smoothly. Move the Probe up and down for 20-40 seconds to obtain a good average. The Average Velocity times the Area of the subsection is the Flow for the subsection. Then add all the subsection flows to obtain the Total Stream Flow.

OPERATION:
The Flow Probe is set up and calibrated at the factory. You may want to set your clock if you want to use the time of day function. Otherwise nothing needs to be done except to change your batteries. Normal battery life is 1 year.

The Flow Probe computer has a simple 2- button operation. The Right button changes between Function and the Left button picks the Option. Pushing both buttons for 1 second zeros the displayed value. With a little practice, one or both buttons can be pushed with the thumb of the hand holding the top of the probe.

Push the Right button to scroll through the functions:
Velocity: "V" is instantaneous velocity to nearest 0.5 feet per second.
Push Left button to scroll between "AV" (average velocity) and "MX" (maximum velocity).
Push both buttons to zero the displayed values ("RMS" is not activated at this time).
"D" Function: Not used for this application.
Stop Watch/Clock Function: The top number is the stop watch (Push Left button to start and stop function, Push both buttons to zero) The bottom number is the time of day.

SET UP:
The set up sequence is entered automatically when the batteries are changed. You can enter the sequence at any time by holding both buttons down for 8 seconds. First all of the display segments are displayed and then "mi" appears for English units and "km" appears for metric units. The Left button scrolls between English and Metric.

For *"feet per second"* stay in "mi". Push the Right button to "CAL". This is your Probe calibration function. It was factory set at 33.31. If you change your batteries, you will have to reset this number. The Left button increases the number when the Arrow points up and decreases the number when the arrow points down.

For *"meters per second"* change to "km". Push the Right button to "CAL". This is your Probe calibration function. It was factory set at 1603. If you change your batteries, you will have to reset this number. The Left button increases the number when the arrow points up and decreases the number when the arrow points down. NOTE: In "metric" (meters per second) the numbers on the display read 10x too high (2.23 meters per second reads 22.3). When purchased in metric units, the correct decimal point is on the lens. When changing in the field to metric units, use a spot of black tape to mark the new decimal point.

Push the Right button - be sure "CAD" is not displayed.
Push the Right button - SLEEP will appear. If you are not using your Flow Probe for 1-2 month, leave it in SLEEP, to reduce battery drain.
Push the Right button - push the Left button to toggel between 24 hr and 12 hr clock
Push the Right button - push the Left button to set HOUR (time of day).
Push the Right button - push Left to set the MINUTE (time of day)
Push the Right button - you are now out of Set Up and back in Velocity ("V").

MAINTENANCE:

Probe Handle:
If the Flow Probe expansion joint becomes submerged, water will enter the Probe handle. This doesnít hurt anything but you may want to dry the Probe out by separating the two handle sections, draining the water and letting the handle dry out in a warm place before reassembling.

Battery Replacement:
The Computer is held onto the head of the Probe by a tight fitting clip which contains the electrical connectors. Pull the computer holder from the top of the probe rod (held in by a phone jack and socket). Hold the computer holder in both hands and firmly push the bottom of the computer up the sloping section until the computer pops off the holder (Point the computer at a soft object so when it pops off it doesnít shoot across the room). Pop open the battery compartment on the back of the computer with a small screwdriver. Replace the batteries with the "+" side up. You can obtain batteries from Omega Engineering, PH-BATT-3.

Cleaning:
Make sure the Turbo Prop turns freely before and after your measurements. Blow on the prop in the direction of flow. The prop should turn freely. If not, rinse the probe in clean water and remove any visible strings or hair materials from the prop bearing. This should correct the problem. If the prop does not turn freely, remove the prop screw and the prop, and wash them in clean water or soap and water. Replace prop and screw. Tighten screw firmly but make sure prop still spins freely.3) The Probe can also be used for the "6 tens method" used by the USGS. The Probe is held at the center of the subsection at a depth (from the surface) of .6 of the total depth with an Average velocity taken for 40 seconds. The .6 depth is assumed to be the average velocity point for the vertical profile. This is therefore the average velocity for the subsection as in technique #2 above (We feel that technique #2, above, is more accurate).

More detailed information on flow measurement can be found in the USGS and Bureau of Reclamation manuals available from Omega Engineering or directly from the agencies.

CALCULATIONS FOR FLOW IN PARTIALLY FILLED PIPES

B	C	B	C
0.010.	0013	0.51	0.4027
0.02	0.0037	0.52	0.4127
0.03	0.0069	0.53	0.4227
0.04	0.0105	0.54	0.4327
0.05	0.0147	0.55	0.4426
0.06	0.0192	0.56	0.4526
0.07	0.0242	0.57	0.4625
0.08	0.0294	0.58	0.4723
0.09	0.0350	0.59	0.4822
0.10	0.0409	0.60	0.4920
0.11	0.0470	0.61	0.5018
0.12	0.0534	0.62	0.5115
0.13	0.0600	0.63	0.5212
0.14	0.0668	0.64	0.5308
0.15	0.0739	0.65	0.5404
0.16	0.0811	0.66	0.5499
0.17	0.0885	0.67	0.5594
0.18	0.0961	0.68	0.5687
0.19	0.1039	0.69	0.5780
0.20	0.1118	0.70	0.5872
0.21	0.1199	0.71	0.5964
0.22	0.1281	0.72	0.6054
0.23	0.1365	0.73	0.6143
0.24	0.1449	0.74	0.6231
0.25	0.1535	0.75	0.6318
0.26	0.1623	0.76	0.6404
0.27	0.1711	0.77	0.6489
0.28	0.1800	0.78	0.6573
0.29	0.1890	0.79	0.6655
0.30	0.1982	0.80	0.6736

CALCULATIONS FOR FLOW IN PARTIALLY FILLED PIPES

Cont.

B	C	B	C
0.31	0.2074	0.81	0.6815
0.32	0.2167	0.82	0.6893
0.33	0.2266	0.83	0.6969
0.34	0.2355	0.84	0.7043
0.35	0.2450	0.85	0.7115
0.36	0.2546	0.86	0.7186
0.37	0.2644	0.87	0.7254
0.38	0.27437	0.88	0.7320
0.39	0.2836	0.89	0.7384
0.40	0.2934	0.90	0.7445
0.41	0.3032	0.91	0.7504
0.42	0.3130	0.92	0.7560
0.43	0.3229	0.93	0.7612
0.44	0.3328	0.94	0.7662
0.45	0.3428	0.95	0.7707
0.46	0.3527	0.96	0.7749
0.47	0.3627	0.97	0.7785
0.48	0.3727	0.98	0.7816
0.49	0.3827	0.99	0.7841
0.50	0.3927	1.00	0.7854

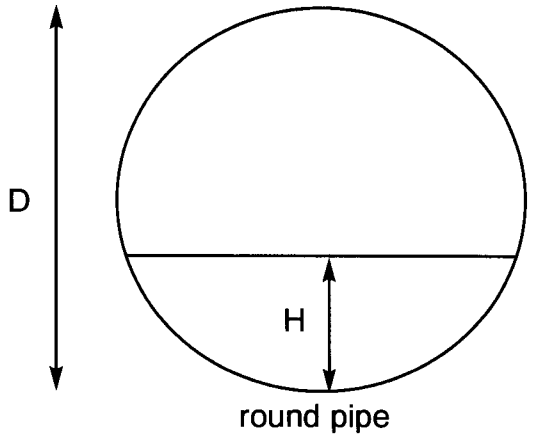
H & D In feet

H/D = Column B, Read Column C

C x D^2 = filled area, A (sq. ft.)

A x Velocity = Volumetric flow (CFS)

CFS x 448.83 = Gallons/minute



round pipe

Extensions:

The probe handle is expandable from 3′ to 6′ by loosening the locking nut on the handle, pulling out the top piece and retightening the nut. The FP201 is a three section rod expandable from 5′to 15′.

If you want to remotely read the computer, purchase a standard stereo phono jack extension cable from your local electronics supplier. Pull the computer and computer holder up off the handle. Insert the extension cable into the handle and into the computer holder. Now one person can operate the probe in the manhole or in the river while the other person operates the computer and records the data.

If you need to make sewer flow measurements from the street level or measure off bridges or high banks, you can make an extension handle by using standard schedule 40 PVC pipe:

- Use a 6″ piece of 1 1/4″ pipe.
- Using PVC cement, cement a 1 1/4″ - 1″ pipe reducer to the 6″ piece.
- Now cement a 1″ pipe of the length required to the reducer.
- Remove the computer and holder from the flow probe.
- Insert the stereo extension cable into the top of the original handle.
- Run the extension cable through the pipe.
- Slip the 1 1/4″ end over the probe handle end.
- Push on firmly and duct tape the pipe onto the handle.

Trouble Shooting the Flow Probe.

1. Blow on the propeller. The prop should spin freely and make a noise (Chatter) when you are blowing on it. The prop should be loose on the shaft when you push it with your finger. If prop does not spin freely, loosen the prop screw 1/2 turn or remove prop and clean with soap and water and reassemble.

2. On the back side of the prop on one blade is a small metal magnet covered with clear rubber. Be sure that this magnet is in place and has not been removed. This magnet is necessary to make the signal for the computer.

3. Remove the white computer holder from the pole handle grip by pulling the holder up away from the pole. It should come off with a definite "pop" sound. Make sure there is not any moisture around the plug or socket. If its wet, dry it off and place both parts by a heater overnite. .
Push the computer holder back on to handle HARD until you hear a "pop" or "snap" sound. If you don't hear this sound its not on all the way or you have a defective socket connector. "Zero" the "AV" mode and blow on the prop for 2-3 seconds. You should see a number in "AV" if it is working.

4. Remove the computer from the computer holder by pushing the bottom of the computer with your thumbs until it pops off the computer holder. You should hear a 'snap" when it comes loose. Check the two small brass contact pads on the clip. They should be clean and dry. They are springs and press against the contacts on the computer. After repeated use, they can be pushed down and stop making good contact. With a sharp pointed knife, you can pry the contacts back up to their original position.

5. Put the computer back into its clip and slide it down the clip until it "snaps" into place. Note that there is an indentation on the back of the computer and a bump on the bottom of the clip. These need to mate together with a "snap" when the computer is fully in place. "Zero" the "AV" mode and blow on the prop for 2-3 seconds. You should see a number in "AV" if it is working.

6. If the display becomes "weak" or does not light up at all, replace the battery(ies).

7. If these steps don't fix the Flow Probe, call the factory or return the Flow Probe for repair.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments