

STANDARD OPERATING PROCEDURE  
**Instructions for the use of the Global FP101 and FP201 flow probe for  
estimating velocity in wadable streams.**

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**KEY WORDS**

Water velocity, water flow, discharge

**APPROVALS**

APPROVED BY: **Original signed by:** \_\_\_\_\_ DATE: **6/26/08**  
Kean Goh, Ph.D.  
Environmental Monitoring Branch Management

APPROVED BY: \_\_\_\_\_ DATE: **6/20/08**  
Sheryl Gill  
Environmental Monitoring Branch Staff Scientist

APPROVED BY: \_\_\_\_\_ DATE: **6/30/08**  
Carissa Ganapathy  
Environmental Monitoring Branch Quality Assurance Officer

PREPARED BY: \_\_\_\_\_ DATE: **6/20/08**  
Matthew Goehring  
Environmental Monitoring Branch Scientific Aid

Environmental Monitoring Branch organization and personnel, such as management, senior scientist, quality assurance officer, project leader, etc., are defined and discussed in [SOP ADMN002.01](#).

PREVIOUS AUTHOR: Adriana Moncada

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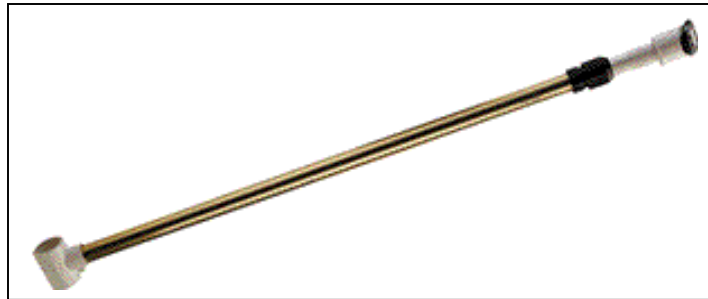
**1.0 INTRODUCTION**

**1.1 Purpose**

This Standard Operation Procedure (SOP) discusses the general procedure for estimating the average water velocity (speed) in feet per second and meters per second using the Global FP101 and FP201 Flow Probes. To determine discharge (flow) refer [SOP FSWA009](#).

**2.0 MATERIALS**

- 2.1 Global flow probe manual
- 2.2 Global FP 101 or FP201 flow probe



**Figure 1.** Global Flow Probe

DPR has two versions of Global Flow Probes. The difference between the units is the computer interface. If using the probe with the computer interface shown in Figure 2 below follow the Probe A procedures of this manual. If the unit matches the picture shown in Figure 3 skip to the Probe B procedures.



**Figure 2.** Global Flow Probe A



**Figure 3.** Global Flow Probe B

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### **3.0 PROCEDURES FOR PROBE A**

#### **3.1 Steps Prior to Calibration**

- 3.1.1 Check probe display panel prior to going to the field to make sure the batteries are working and the units displayed on the computer screen are the appropriate English or metric units.
- 3.1.2 If the units of measurement or the battery need to be changed, then the computer on the flow probe must be recalibrated.

#### **3.2 Calibrating the Flow Meter in English or Metric Units (only necessary if units of measurement or the battery needs to be changed)**

- 3.2.1 Hold the right and left button simultaneously for 8 seconds.
- 3.2.2 All of the display segments will be displayed, and then “mi” for English units and “km” for metric units will appear on the screen.
- 3.2.3 To measure in “feet per second,” shift to “mi.” Use the left button to shift between English and metric units. Push the right button to enter “CAL” mode. Push the left button to increase the number when the arrow points up and decrease the number when the arrow points down. To set the calibration to “feet per second” change the number to 33.31.
- 3.2.4 To measure in “meters per second,” shift to “km.” Use the left button to shift between English and metric units. Push the right button to enter “CAL” mode. Push the left button to increase or decrease the number. To set the calibration to “meters per second” change the number to 1603.

#### **3.3 Probe Assembly**

- 3.3.1 The Global flow probe handle is either a two or a three-section rod expandable from 5 to 10 or 15 feet. To lengthen the handle, loosen the locking nut on the handle. Pull out the top piece to correct the length and retighten the nut.
- 3.3.2 Ensure the flow probe’s propeller turns freely by blowing strongly on it.

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#### **3.4 Measuring Stream Velocity**

- 3.4.1 Place probe directly into the desired flow with the arrow inside the propeller facing downstream. Hold the probe handle either to the “right or left” side of you to make sure that your body is not blocking the flow.
- 3.4.2 Use the right button on the computer to scroll until “V” for velocity appears on the left hand side of the screen. The top number in “V” mode is the instantaneous velocity to the nearest 0.1 ft/sec or if metric to the nearest 0.1 m/sec.
- 3.4.3 Push the left button to shift between maximum (“mx”) and average (“av”) velocities to the nearest 0.01 ft/sec (displayed at the bottom of the screen).
- 3.4.3 Hold the probe for several seconds until the average velocity reading stabilizes. Then remove the probe. The average velocity will freeze once the propeller stops turning. Record the reading.

#### **4.0 MAINTENANCE (SPECIFIC TO PROBE A)**

##### **4.1 Battery Replacement:**

When replacing the battery, pull the computer holder unit from the top of the flow probe rod (the holder is connected to the probe by a jack and socket). Open the battery compartment on the back of the computer with a screwdriver or similar device. Replace the battery with the “+” side up. Use a Radio Shack 675 HP battery, or equivalent.

##### **4.2 Trouble Shooting**

- 4.2.1 If the computer is not receiving a signal:
  - 4.2.1.1 Zero the “av” mode on the prop for 5 to 7 seconds. You should see a number in “av” if the unit is working.
  - 4.2.1.2 If the display becomes weak or does not light up at all, replace the battery.
- 4.2.2 See Section 10.0 for further information on trouble shooting issues applicable to both types of units.

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**5.0 PROCEDURES FOR PROBE B**

**5.1 Probe Assembly**

5.1.1 Remove Flow Probe pole from padded case

5.1.2 Secure white end piece with computer display on to the top of the pole assembly (Figure 4). It should securely snap into place.



**Figure 4.** Flow Probe Assembly



**Figure 5.** Back of Computer Display

**5.2 Probe Operation (probe is factory calibrated and ready to go)**

5.2.1 Select the appropriate velocity measurement units.

5.2.1.1 Remove the computer display by twisting the computer module counterclockwise.

5.2.1.2 Press the indented grey button on the back of the module labeled "I, II" to switch between I (ft/sec) and II (m/sec). See Figure 5.

5.2.1.3 Reinstall computer display by twisting it clockwise back onto the housing.

5.2.2 Make sure the propeller turns freely by blowing on it in the direction of the black arrow for 5-10 seconds.

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5.2.3 Adjust the expandable probe handle to desired length, by loosening the locking nut on handle and extending the handle length to the appropriate length and then retightening the nut.

5.2.4 Reset the computer display.



**Figure 6.** Probe B Computer Display

5.2.4.1 The computer display is controlled by 2 simple buttons (Figure 6). The bottom button is used to scroll between various display functions, while the top button resets the value.

5.2.4.2 Click the bottom button to scroll between display modes and select **Ave Speed**.

5.2.4.3 Hold down the top button for 2 seconds to reset the computer display. It should read **0**.

5.2.4.4 Scroll to select the **Max Speed** function. Reset the value by pressing the top button for 2 seconds. Note you can reset both the Ave and Max values while on either display by pressing and holding down the top (reset) button for 5 seconds.

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#### **5.3 Measure Stream Velocity**

Place probe in water with the black arrow oriented downstream. Hold still until **Average Speed** reading stabilizes and then remove the probe from the water. The reading will not change once the propeller stops revolving.

#### **6.0 MAINTENANCE (SPECIFIC TO PROBE B)**

##### **6.1 Setting the Clock**

- 6.1.1 Scroll through display modes using the bottom button until **clock** appears on the display screen
- 6.1.2 On the back of the computer module press and hold the indented grey button labeled “**S**” until clock flashes (approx 5 sec). See Figure 4.
- 6.1.3 Press top button until correct hour is displayed.
- 6.1.4 Press bottom button to switch to ten minutes digit.
- 6.1.5 Press top button until correct minutes are displayed.
- 6.1.6 Press bottom button to switch to single minutes digit.
- 6.1.7 Press top button until correct minutes are displayed.
- 6.1.8 Press grey indented button, labeled “**S**”, to save the entered time.

##### **6.2 Battery Replacement (type: CR2032)**

- 6.2.1.1 Remove computer module from the probe assembly by twisting computer display counter-clockwise.
- 6.2.1.2 Remove the battery cover by using a coin to turn it counter-clockwise. See Figure 4.
- 6.2.1.3 Replace battery with the + side facing the battery cover.

##### **6.3 Calibration (only necessary after battery replacement/removal)**

- 6.3.1 The computer will be in calibration set mode following replacement of battery. You can skip the following step.



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- 6.3.1.1 If a mistake is made during calibration, this mode can be entered manually by pushing bottom button until any display mode except **Clock** or **TOTALODO** is displayed. Then press the left indented grey button on the back of the computer module labeled “I, II” to select “I”. “I” should be displayed on computer. Then press and hold the grey indented button labeled “S” for 5 seconds or until “set language” flashes on the display.
- 6.3.2 **Language:** Select the appropriate language using the top button and then press the bottom button to accept/save the selected language.
- 6.3.3 **Units:** Use the top button to select between English or metric units. Press the bottom button to accept/save the selection.
- 6.3.4 **Calibration:** Use the bottom button to select digits and the top button to change the numbers. Set the display to **0053**. Press the grey button labeled “S” on the back of the computer to save the selection. Press the indented grey button labeled “I, II” to change the display from “I” to “II”. Use the bottom button to select any display mode except **Clock** and **TOTALODO**. Then press and hold the button on the back of the computer display labeled “S” until the display flashes. Use the bottom button to select digits and the top button to change the numbers. Set the display to **0016**. Press the grey button labeled “S” on the back of the computer to save the selection.

## **7.0 GENERAL MAINTENANCE FOR BOTH MODELS OF THE GLOBAL FLOW PROBE**

### **7.1 Cleaning**

- 7.1.1 Dry out probe handle. Water can enter the probe handle when the expansion joint is submerged. After use, separate the two handle sections and drain out water. Let the handles dry out before re-assembly.
- 7.1.2 Blow on the prop to make sure the prop spins freely before and after each use. Rinse the probe with clean water and remove any debris from around the prop. If necessary remove the prop screw and prop and wash them in mild soap/water mixture and then re-



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assemble. The prop screw should be tightened firmly, but not so much that the prop doesn't spin freely.

- 7.1.3 Rinse flow probe with clean water or wash with a mild soap and water solution. Make sure to not get the computer or the top of the probe that the computer unit attaches to wet. If the computer or white housing that hold the computer gets wet, remove the white housing, separate the computer from the housing, and remove the battery from the computer and let them dry out completely before re-assembly.
- 7.1.4 Make sure small magnet is attached to prop blade. Without the magnet the computer will not register that the prop is spinning. Call tech support if missing.

## **7.2 Storage**

Store Flow Probe in provided storage case. Note: If you are not using the Flow Probe A for 1-2 months, leave it in SLEEP mode to reduce battery drainage. Sleep mode will appear on your screen by pushing the right button. Flow Probe B will automatically enter sleep mode.

## **8.0 STUDY SPECIFIC METHODS FOR OBTAINING AVERAGE VELOCITY**

### **8.1 Small streams and pipes**

Slowly and smoothly move probe throughout the cross section (up/down and side to side) for about 20-40 seconds or until the Average Speed (velocity) reading stabilizes. Stream flow can be calculated by multiplying the value of average speed by the cross section area.

### **8.2 Larger streams/rivers**

Divide the stream cross-section into 2-3 foot intervals. String a measuring tape perpendicular to the flow and obtain an average reading at the center of each subsection. Smoothly move the probe vertically from water surface to the bottom, up and down, for 20- 40 seconds to obtain an accurate average reading. The flow for each subsection can be calculated by multiplying by the cross sectional area. Summing the total flows for all subsections yields a total flow for the stream/river.

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#### **8.3 USGS Method**

Hold the Flow Probe at 0.6 times the total depth and obtain an Average Velocity from that point only for 40 seconds. The 0.6x depth represents the average velocity of the vertical profile. This value can be multiplied by the cross sectional area to get flow.

#### **9.0 CALCULATIONS**

The Flow Probes 101 and 201 measures water velocity. Discharge (flow) refers to the volume of water passing a given point per unit time. Discharge ( $\text{length}^3/\text{unit time}$ ) can be calculated by multiplying the water velocity ( $\text{length}/\text{unit time}$ ) by the cross sectional area ( $\text{length}^2$ ) of the stream/ditch. A simple height measurement can be used to calculate the cross sectional area in pipes. In natural stream channels a series of depth measurements along a transect can be used to calculate the cross sectional area. Frequently a cross section is divided into increments, with the total discharge representing the sum of the measured discharge for each increment. The most common units of discharge are  $\text{ft}^3/\text{sec}$  (cfs). See SOP FSWA009 for additional details.

#### **10.0 REMEDIAL ACTION IN CASE OF MALFUNCTION FOR BOTH UNITS**

If the prop does not spin freely, remove any debris (hair, etc) from the prop and rinse it with clean water. If it still fails to spin freely, unscrew the prop screw and remove the prop. Clean both with a mild soap and water mixture and then reassemble. Make sure that the prop screw is tight, but not so tight that it prevents the prop from spinning freely.

If the top of the probe and/or computer module is accidentally submerged, remove the white plastic computer housing from the probe. Disconnect the computer from the housing, by twisting it counter clockwise, and then remove the battery. Allow all pieces to dry completely before reassembling the unit.

If the computer is not receiving a signal, first make sure that the magnet on the propeller that registers propeller rotations is present. If not, contact Global Water tech support. Remove the computer holder from the pole handle by pulling the holder up and away from the pole. Next, make sure there is no moisture around the plug or socket. If the plug and socket are wet, dry parts off and place them in a warm place overnight. Push the computer holder back on to the handle, as hard as you can, until you hear a "pop" or "snap". If you don't hear this sound the computer holder is not on all the way or you have a defective socket connector.

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If these procedures fail to fix the problem, or another malfunction occurs contact Global Water for tech support.

Global Water  
11390 Amalgam Way  
Gold River, CA 95670  
1-800-876-1172  
(916) 638-3270

Before calling have the Model #, Serial #, P.O # the unit was purchased on, and the sales or invoice #.

**11.0 SAFETY**

Use caution when taking water flow measurements. Water levels can unexpectedly rise to dangerous levels quickly. Never enter any stream/river at levels that are unsafe for wading. Please refer to the [Field Health and Safety Program Guide](#) on the DPR internal website.

**12.0 REFERENCES**

FP101-FP202 Global Probe User's Manual, Global Water Instrumentation Inc., 11257 Coloma Road, Gold River, CA.