

2030 and 2031 Series Mechanical and Electronic Digital Flowmeter Operators Manual



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Model 2030R Flowmeter with high-speed impeller



Model 2031H Flowmeter with high-speed impeller

Model 2030 Series Mechanical Flowmeter

Small and lightweight general purpose impeller instruments for use anywhere (in rivers, estuaries, canals, sewage outfalls, pipes, harbor entrances, offshore sites) and in association with plankton nets and other samplers. Balanced (in water) for dynamic stability. Unlimited depth capability (free-flooding).

Universal bridle mounting allows single-point connection for towing or 2-point connection within net mount.

Model 2030R is a standard flowmeter. Model 2030R6 uses a high-resolution rotor for low-speed applications. Model 20307 uses seven digits to extend distance measurement from 14.5 to 145 nautical miles.

- Response with standard high-speed rotor (2030R) threshold, approximately 10 cm/sec. (1/5 knots). Speed range approximately 10 cm/sec (1/5 knot) to 7.9 meters/sec. (15 knots)
- Response with optional low-speed rotor (2030R6) threshold, approximately 6 cm/sec. (3/25 knot). Speed range approximately 6 cm/sec. (3/25 knot) to 100 cm/sec. (2 knot)

Note: Low speed rotor rotates in counterclockwise direction.

Model 2031H Series Real-Time Electronic Flowmeter

- Same uses as model 2030 series, but in addition to mechanical count, the 2031H and 2031HR6 (low-speed) models use 2 rare earth magnets which actuates a solid-state hall-effect generator, creating a signal for processing by the 2135 readout.
- Standard order of electronic flowmeter includes rotor (specify standard or low speed rotor), bridle and connecting cable. Order readout (Model 2135 or 2135MEM) additionally.

Model 2135/2135MEM Data Acquisition Readout

Hand held (1 lb .45kg) battery-operated data display and acquisition readout converts signals from the 2031H series flowmeters.

- Processed speed signal appears in (user programmable) cm/sec., ft/sec., or knots in addition to distance and elapsed time.
- Velocity- 0 to 9999 m/sec, cm/sec, ft/sec or knots.
- Comes with 10 meter cable, additional lengths available.
- Order Model 2135MEM for 512K memory module and RS232 interface. The 2315MEM uses Flow-Soft software.

Model 2135D Flowmeter Interface Module

This module and software allows users of our 2031H electronic flowmeter to use their own computer or data logger as a display and data logging device. Flow-Soft software provides a real-time display of date and time, elapsed time, speed and distance in user selectable units of measurement.



Model 2135MEM



Model 2135D

1. Description

The Flowmeter incorporates a precision molded rotor coupled directly to a six digit counter which registers each revolution of the rotor and displays it as an automobile odometer does. The counter is located within the body of the instrument and is read through the clear plastic wall. The flowmeter is properly balanced to maintain horizontal position when suspended from the towing bridle at speed.

The Model 2031H Electronic Flowmeter incorporates the features of the standard 2030R, together with a Hall effect magnetic switch, which produces a 9 volt square wave signal output (to the readout) for each half revolution of the rotor. The 2031H is used in conjunction with the Model 2135/2135MEM Data Acquisition Readout which provides a remote display of current speed in meter/second. The readout automatically converts the flowmeter counter rotations to a current speed.

Both the 2030R and the 2031H Flowmeters can be fitted with the interchangeable large diameter 2 bladed rotor for measuring low velocity flows.

Each model 2030 Flowmeter is shop tested for rotational performance using the 2030CF spin resistance tester. A test certificate for individual flowmeters is available upon request.

2. Preparing The Flowmeter For Use *(Refer to diagram for part numbers).*

- A. Remove the pan head stainless steel screw (#30), which is located at the back of the flowmeter on the end plate (#16). This screw hole provides access to the inside, for injecting tap water or silicon fluid with the supplied syringe. Silicone oil should be used in place of tap water if using flowmeter in near-freezing temperatures.
- B. Fill the syringe provided, with tap water. Hold the flowmeter nose down and inject with tap water until full. Little or no air should be visible. **CAUTION: DO NOT USE DISTILLED WATER!** The filled housing helps reduce the osmotic pressure differential and the pressure change during towing.
- C. Replace the pan head screw (with O-ring seal) after filling.
- D. ENSURE THAT THE ROTOR SET SCREW IS TIGHT BEFORE DEPLOYMENT.
- E. Immediately place into use. This is important since the flowmeter is not designed to be water tight and therefore will leak, creating an air bubble inside. At very low speeds this air bubble will tend to tilt the flowmeter away from the water-flow axis, thus providing readings which will be in error. The error produced by placing and recovering the flowmeter in the water is negligible if the sampling time is relatively long.

3. Uses of the Flowmeter

The 2030R and 2031H flowmeters are also designed to be used in towed plankton net systems. A bridle, composed of two monofilament lines, attach the flowmeter to the plankton net mouth ring, across the center.

Some low velocity investigations may require that the flowmeter be prevented from tilting away from the axis of the water flow. This is done by adding a weight to one of the bridle lines allowing it to hang freely below the flowmeter with the other bridle line being fixed to the point of suspension.

Special care should be taken when beginning measurements. The flowmeters are bi-directional. That is, the rotor will turn in either direction along with the counter. It is therefore critical that the operator be aware that the flowmeter is always pointed into the flow direction for accurate readings.

General Oceanics does not provide a method for locking down the flowmeters from turning in a current. The flowmeters begin rotating as soon as they enter the water and continue until removed. Therefore, the operator must either control the rotation or add a correction factor for the calculations to avoid additional counting when entering and exiting the water.

General Oceanics offers a clutching option to prevent backwards motion of the rotor. This option requires a special rotor with set screw, end plate, and steel ball.

4. Calculations

10 counts are equal to 1 rotor revolution on the graphic labels on all flowmeters. The cts/sec. is "counts per second" and must not be used as revolutions per second for calculations.

ROTOR CONSTANTS: Standard Speed Rotor Constant = 26,873
Low Speed Rotor Constant (R6) = 57,560

A. DISTANCE in meters = $\frac{\text{Difference in COUNTS (final - initial)} \times \text{Rotor Constant}}{999,999}$

(Example: Where the graph may indicate 100 cts/sec, this is also equal to 10 revolutions/sec). Therefore, please ensure the correct units are being used when measuring and calculating.

B. SPEED in cm/sec = $\frac{\text{Distance in meters} \times 100}{\text{Time in seconds}}$

C. VOLUME cubic meters = $\{3.14159 \times (\text{Net Mouth Radius})^2\} \times \text{Distance}$

5. Maintenance

After use, the flowmeter must be flushed clean because the majority of tap water has been exchanged with the ambient water, such as dirty, polluted or salt water. If not properly cleaned, a residue will build up on the gear counter assembly and throw the performance off. Rinse with a mixture of white vinegar and tap water (**not distilled water**). Immerse the flowmeter in the vinegar-water mixture for 3 to 4 hours, then drain the mixture, rinse the flowmeter in tap water and allow the flowmeter to air dry before returning the flowmeter to its case.

The flowmeter should be tested periodically using the Model 2030CF spin tester, which is available from General Oceanics.

6. Repairs

If the flowmeter appears to be malfunctioning due to excess debris in the housing, then the flowmeter should be disassembled and thoroughly cleaned. Please consult General Oceanics for disassembly instructions.

All flowmeters are covered by a one year warranty against defects in materials and workmanship. Flowmeters that have been damaged or do not keep an accurate count should be returned to General Oceanics for a repair estimate. Please include a "letter of work" and a purchase order number with any equipment sent back.

Table 1 – Velocity Curve for Low-Speed Rotor

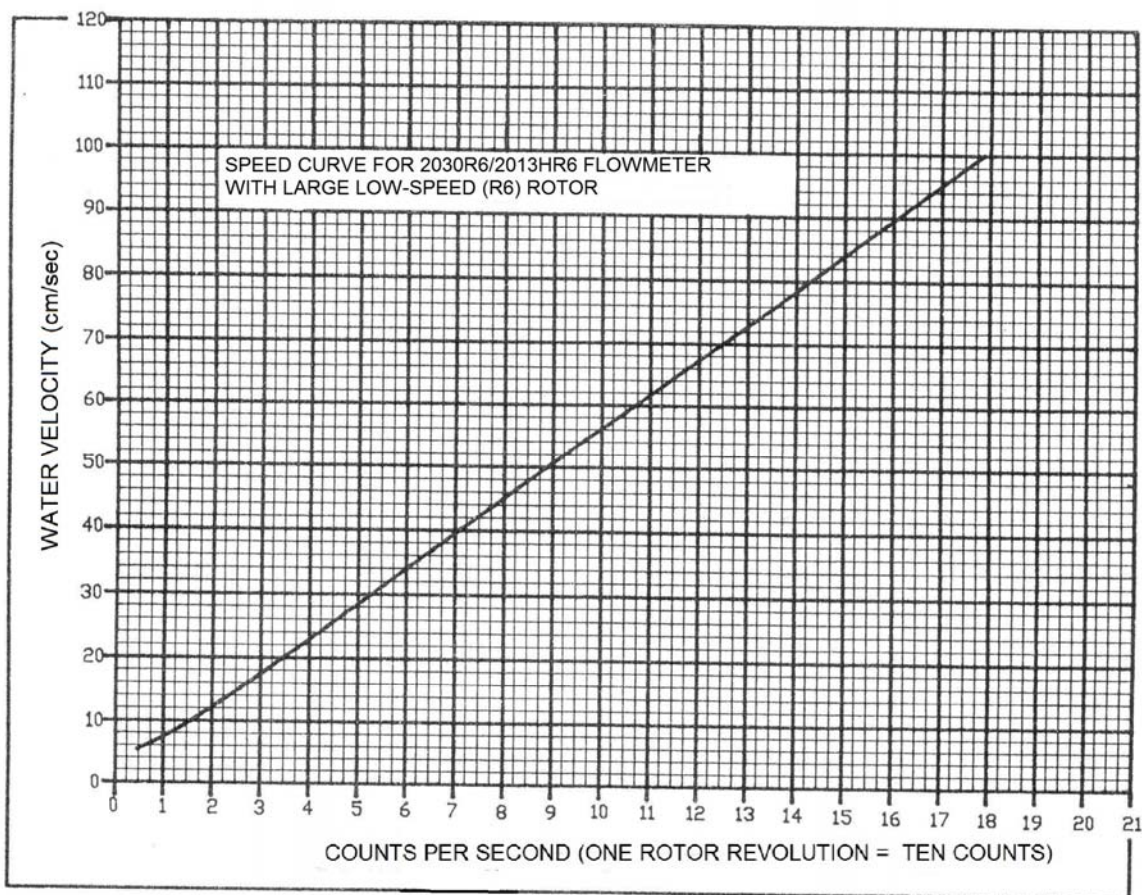
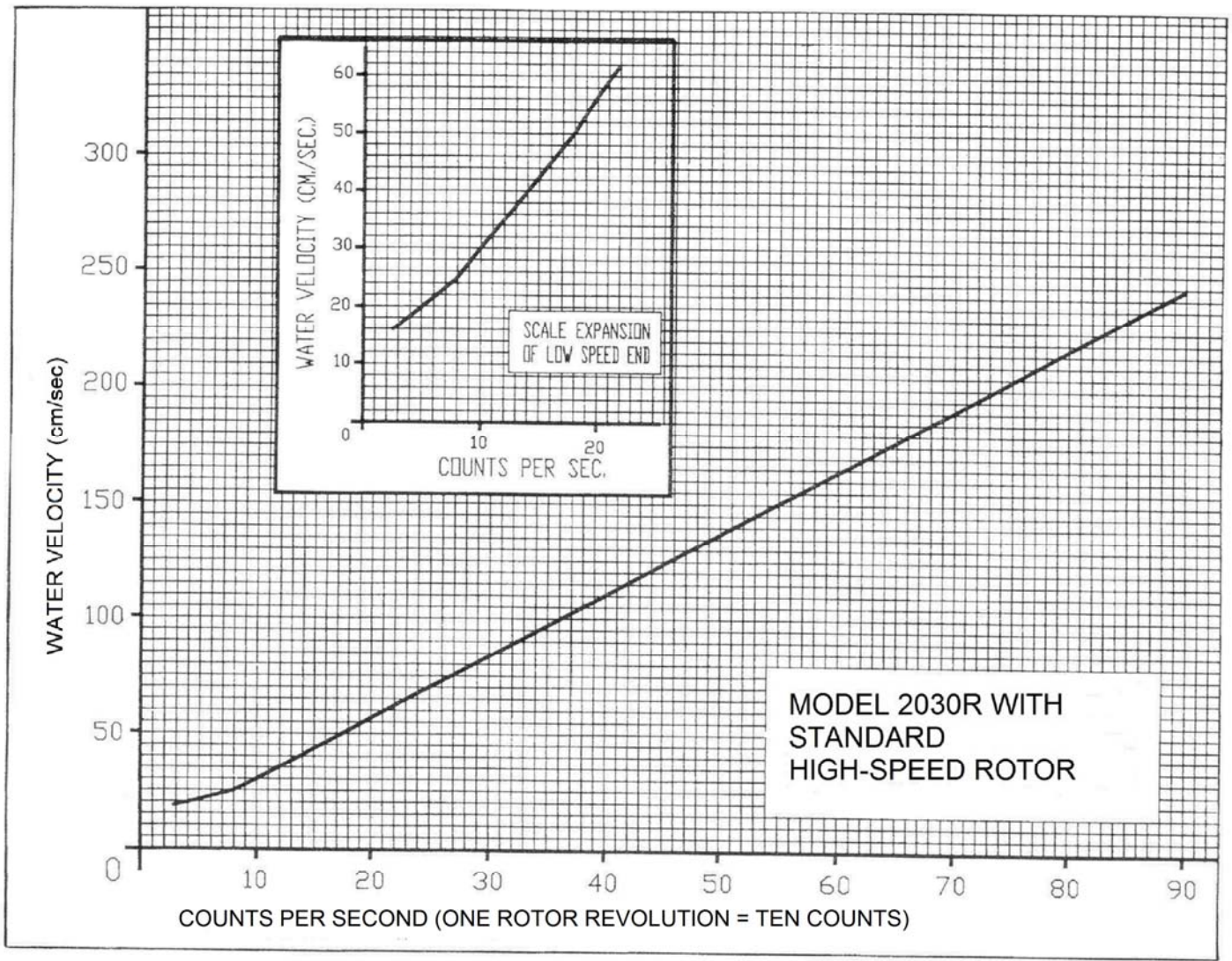
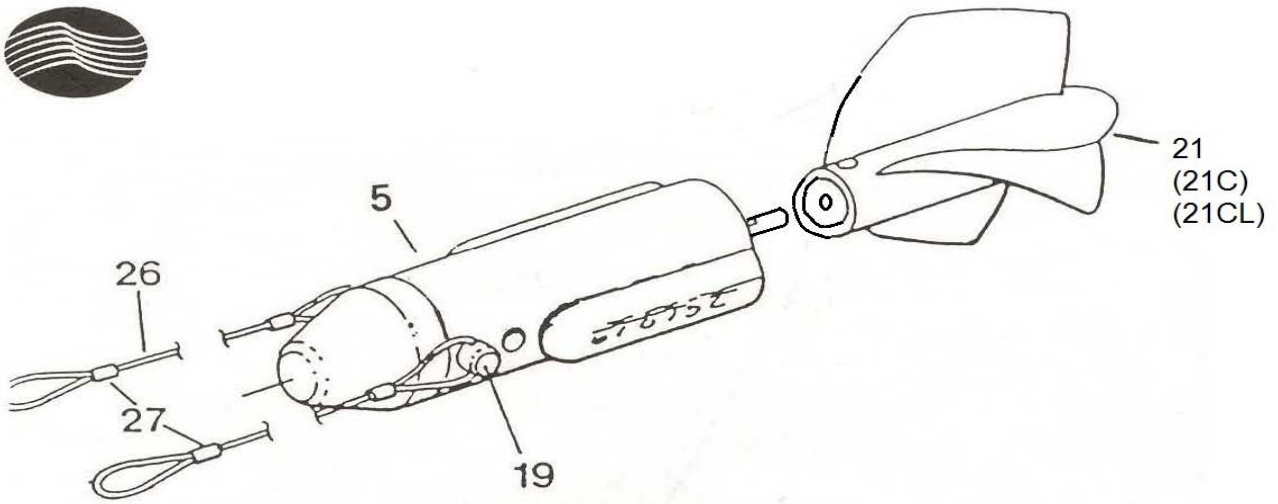


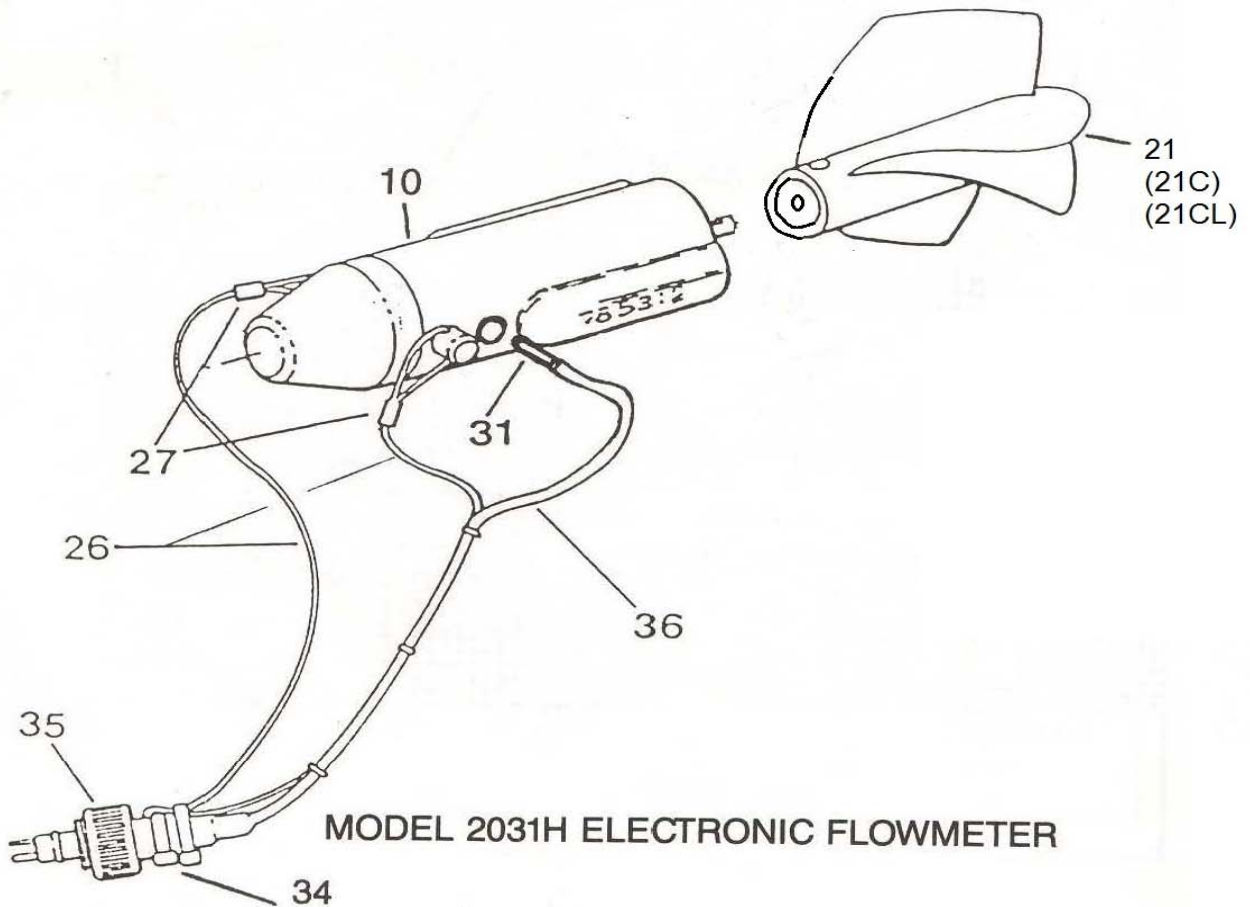
Table 2 - Velocity Curve for High-Speed Rotor



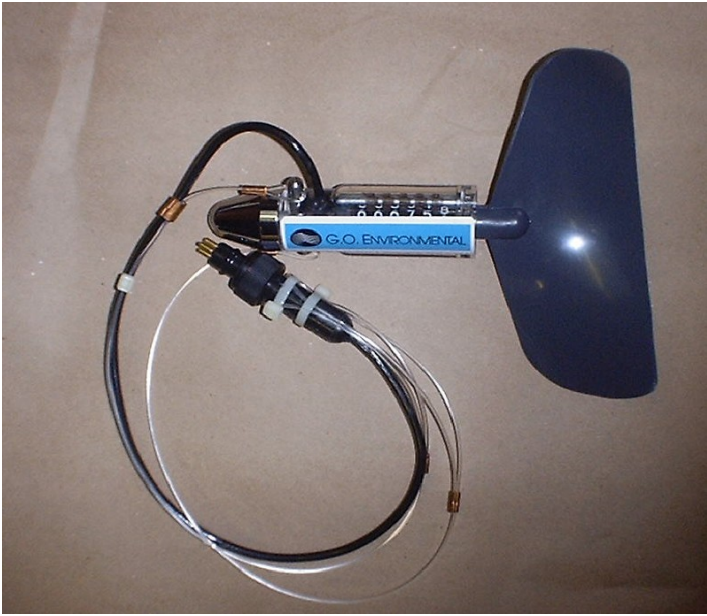
Average values from tests of 25 units. All data points within +/- 3% of average values for velocities over 15.0 cm/sec. Individual units are linear within +/- 1% for velocities over 15.0 cm/sec.



MODEL 2030R STANDARD FLOWMETER



MODEL 2031H ELECTRONIC FLOWMETER



Model 2031H with low-speed impeller

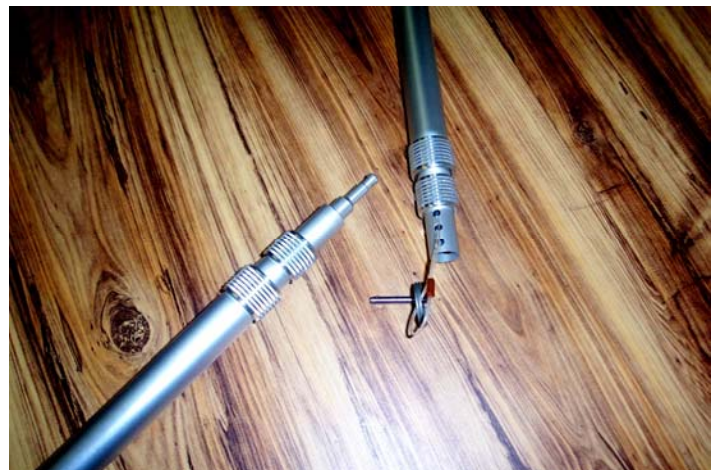


Low speed impeller

**Model 2030W Wading rod
Extendable 3-8 feet (0.9-2.4 meters)**

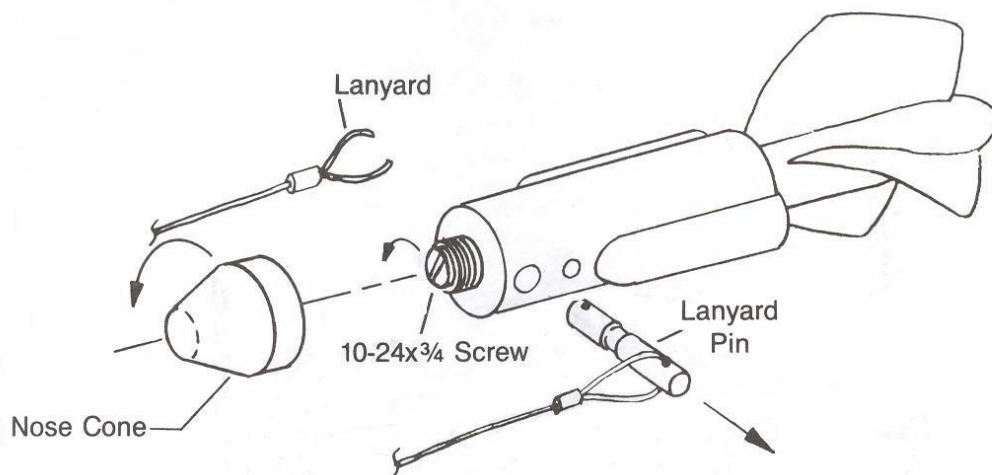


**Model 2030R flowmeter
with high speed impeller
fastened to 2030W wading rod**



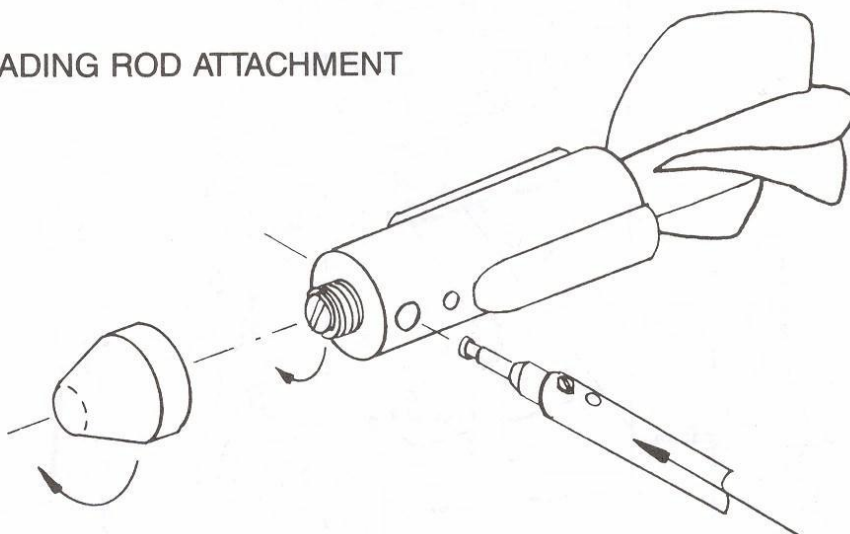
Wading rod end fittings for flowmeter and oil sheen sampler

LANYARD PIN REMOVAL



Cut loop on one lanyard, remove nosecone, loosen 10-24 x $\frac{3}{4}$ screw and remove lanyard pin.

WADING ROD ATTACHMENT



Replace lanyard pin with tip of wading rod. Tighten the 10-24x $\frac{3}{4}$ screw and replace nosecone. This method allows flowmeter to rotate freely around wading rod tip. If a rigid attachment is desired, remove washer under 10-32x $\frac{3}{4}$ screw and re-tighten. This will allow screw to seat directly against the shaft

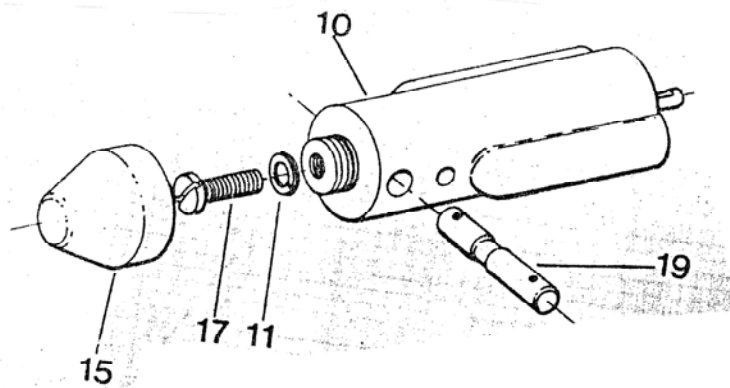
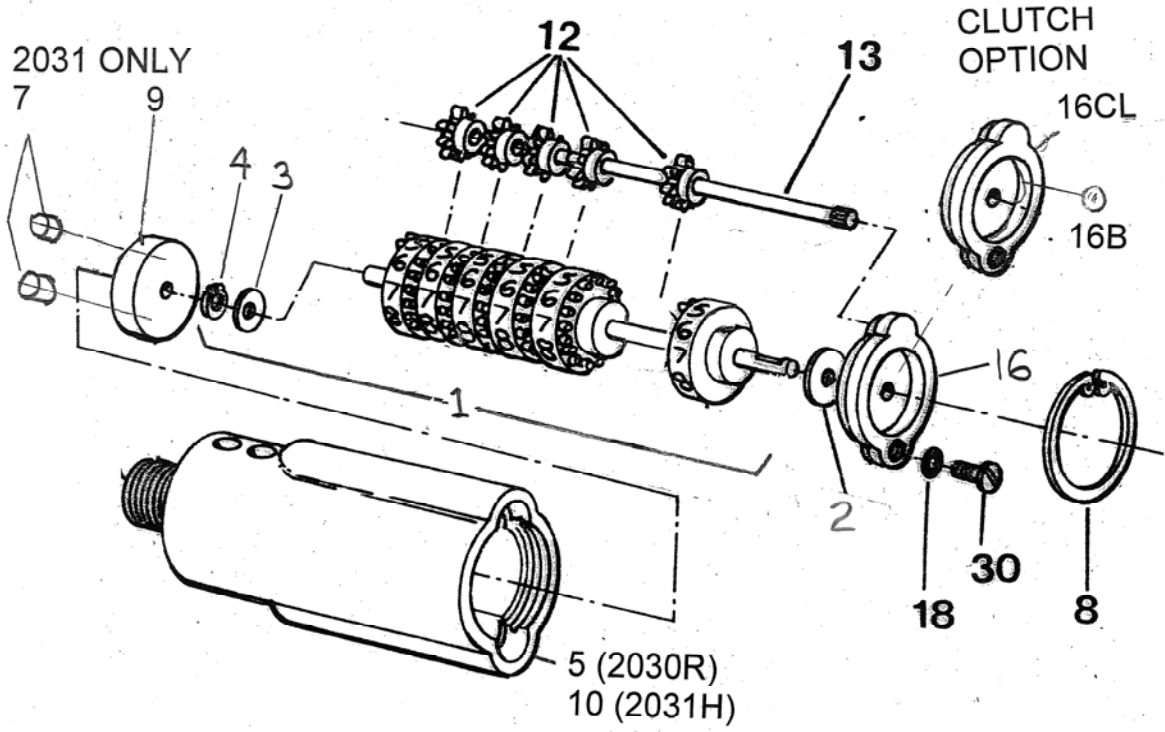
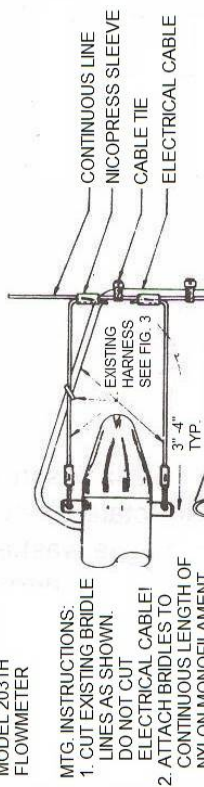




FIGURE 1
NET MOUTH MOUNT
MODEL 2031H
FLOWMETER



- MTG. INSTRUCTIONS:
1. CUT EXISTING BRIDLE LINES AS SHOWN. DO NOT CUT ELECTRICAL CABLE!
 2. ATTACH BRIDLES TO CONTINUOUS LENGTH OF NYLON MONOFILAMENT DRAWN ACROSS NET MOUTH. USE NICOPRESS SLEEVES FOR CONNECTIONS. ROUTE ELECTRICAL CABLE ALONG MONOFILAMENT AND SECURE WITH CABLE TIES.

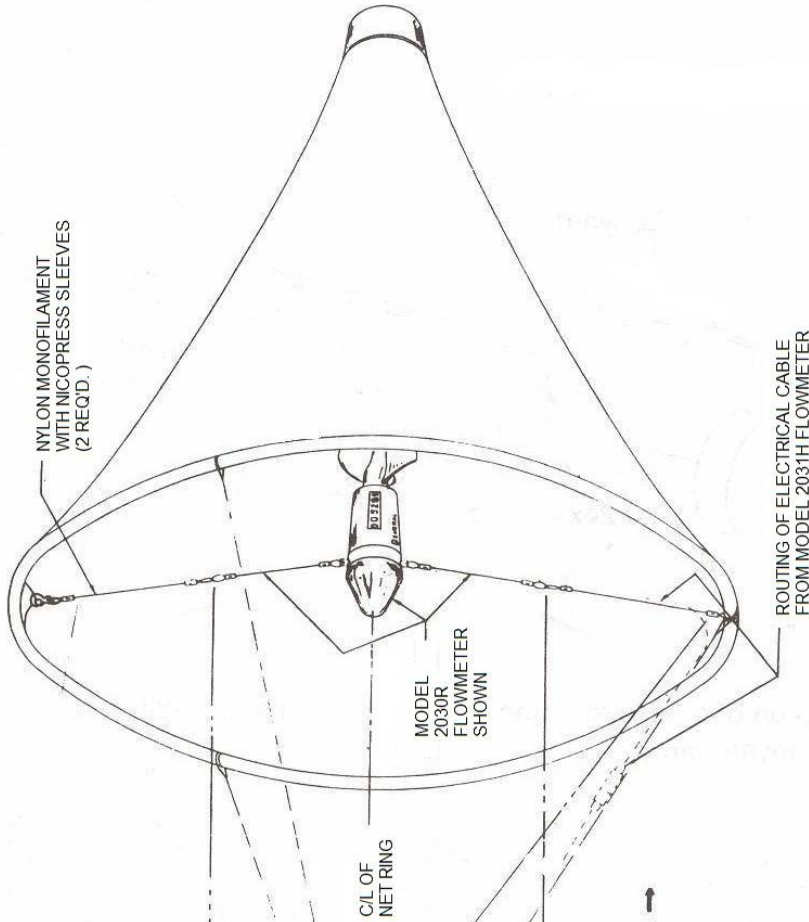


FIGURE 2
NET MOUTH MOUNT
MODEL 2030R
FLOWMETER

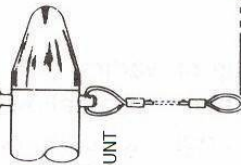


FIGURE 3
SINGLE POINT TOW
MODEL 2031H
FLOWMETER



FIGURE 4
SINGLE POINT TOW
MODEL 2030R
FLOWMETER



Table 3 - MODEL 2030R Flowmeter Parts

Refer to diagrams on pages 8 and 11 for item numbers

Item #	G.O. Stock #	Description	Qty
		COUNTER ASS'Y.	
1	2030-022	WHEEL ASS'Y., 6 FIGURE	1
13	2030-011	PINION SHAFT	1
12	2030-014	PINION GEAR	5
2	2030-017	WASHER	1
4	2030-027	RETAINING RING	1
3	2030-016	SHIM	7
15	2030-006	NOSE CONE	1
		HOUSING ASS'Y.	
5	2030-004	FLOWMETER HOUSING	1
Not shown	2030-020	SERIAL NO. LABEL	1
Not shown	48-2219	G.O. ADDRESS LABEL	1
		IMPELLER ASS'Y.	1
21	203026	HIGH-SPEED IMPELLER W/SET SCREW	1
21	203021	LOW-SPEED IMPELLER W/SET SCREW	1
		LANYARD PIN ASS'Y.	1
19	2030-103	LANYARD PIN	1
17	48-0110A	#10-24 X 3/4" ROUND HD SCREW, S/S	1
11	48-0410IS	#10 INTERNAL STAR LOCKWASHER, S/S	1
27	65-6000	NICOPRESS CLAMP, COPPER	4
26	86-6000	MONIFILAMENT LINE, 250 LB. TEST	3ft
		END PLATE ASS'Y.	1
16	2030-023	END PLATE	1
8	2030-024	RETAINING RING	1
30	48-0061A	#5-40 X 1/4" PAN HD. SCREW	1
18	81-0004A	O-RING	1
Not shown	2030-021	SYRINGE	1
		CLUTCH OPTION	
16B	30-0022	BALL	1
16C	2030-042	END PLATE (HIGH SPEED IMPELLER)	1
16CL	2030-043	END PLATE (LOW SPEED IMPELLER)	1
21C	203026C	HIGH-SPEED IMPELLER MODS.	1
21CL	203021C	LOW-SPEED IMPELLER MODS.	1

Table 4 - MODEL 2031H Electronic Flowmeter Parts

Refer to diagrams on pages 8 and 11 for item numbers

Item #	G.O. Stock #	Description	Qty
		COUNTER ASS'Y.	
1	2030-022	WHEEL ASS'Y., 6 FIGURE	1
13	2030-011	PINION SHAFT	1
12	2030-014	PINION GEAR	5
2	2030-017	WASHER	1
4	2030-027	RETAINING RING	1
3	2030-016	SHIM	7
15	2030-006	NOSE CONE	1
9	2030-10	MAGNET HOLDER	1
7	48-9954	1/8" DIA. RARE EARTH MAGNET	2
		HOUSING ASS'Y.	
10	2030-029	FLOWMETER HOUSING	1
Not shown	2030-020	SERIAL NO. LABEL	1
Not shown	48-2219	G.O. ADDRESS LABEL	1
		IMPELLER ASS'Y.	1
21	203026	HIGH-SPEED IMPELLER W/SET SCREW	1
21	203021	LOW-SPEED IMPELLER W/SET SCREW	1
		LANYARD PIN ASS'Y.	1
19	2030-103	LANYARD PIN	1
17	48-0110A	#10-24 X 3/4" ROUND HD SCREW, S/S	1
11	48-0410IS	#10 INTERNAL STAR LOCKWASHER, S/S	1
27	65-6000	NICOPRESS CLAMP, COPPER	4
26	86-6000	MONIFILAMENT LINE, 250 LB. TEST	3ft
		END PLATE ASS'Y.	1
16	2030-023	END PLATE	1
8	2030-024	RETAINING RING	1
30	48-0061A	#5-40 X 1/4" PAN HD. SCREW	1
18	81-0004A	O-RING	1
		CABLE AND SWITCH ASS'Y.	
36	51-0049	PIGTAIL ASSEMBLY, 3 CONDUCTOR	1
31	59-0122	HALL EFFECT SENSOR	1
35	59-0022	LOCKING SLEEVE	3
34	48-1220	CABLE TIE	1
6	48-0406L	#6 SPLIT LOCKWASHER, SILICON BRONZE	1
Not shown	2030-021	SYRINGE	1

Types of Flowmeter Systems

2030R	Mechanical, with Standard Rotor (2030RC w/one-way clutch)
2030R6	Mechanical, with Low Velocity Rotor
2030R6C	Mechanical, with Low Velocity Rotor and one-way clutch
20307	7-digit counter (20307C w/clutch)
20307R6	7-digit counter with Low Velocity Rotor (20307R6C w/clutch)
2031H	Electronic, with Hall Sensor (2031HC w/one-way clutch)
2031HR6	Electronic, with Hall Sensor and Low Velocity Rotor
2031HR6C	Electronic, with Hall Sensor and Low Vel. Rotor and one-way clutch

Readout for Electronic Flowmeter 2031H and 2031HR6

2135	Data Acquisition Readout
2135MEM	Data Acquisition Readout with RS232 interface
2135D	Interface Module with Flow-soft Software

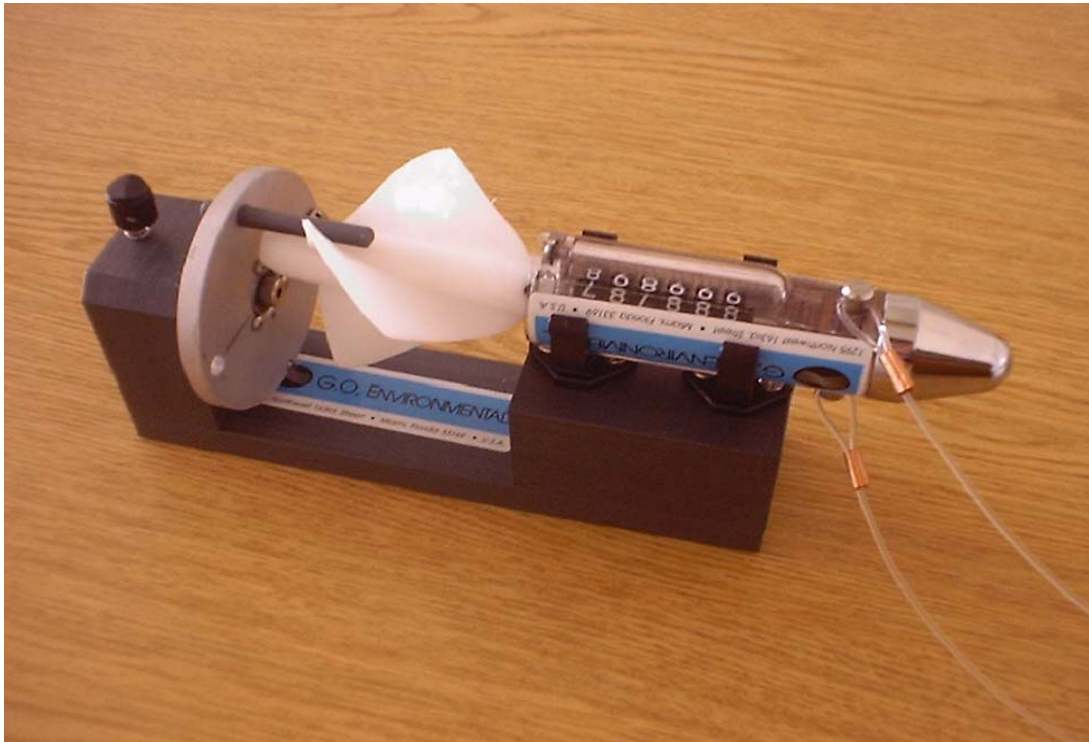
Accessories and Spare Parts

203021	Rotor, Standard (with set screw)
203026	Rotor, Low Speed (with set screw)
2031RCH	Connecting Cable for 2031H to 2135
203039	Silicon Oil, 20cS, Pint Bottle
2030W	Wading Rod, Extendable 3-8 Feet
A300841	3 point harness yoke
2030CF	Rotor Spin Tester

Extension Cables

2030HC10	10 Meters (33 ft.)
2030HC20	20 Meters (66 ft.)
2030HC30	30 Meters (99 ft.)
2030HC40	40 Meters (132 ft.)
2030HC50	50 Meters (165 ft.)

2030CF Rotor Spin Tester



UNIT CONVERSION TABLE		
MULTIPLY	BY	TO OBTAIN
Cubic Meters	264.20	Gallons
Cubic Meters	35.31	Cubic feet
Cubic Meters	1.308	Cubic yards
Cubic Meters	1000.00	Liters
Cubic Meters	61023.00	Cubic inches
Cubic feet	7.481	Gallons
Miles (nautical)	6080.00	Feet
Knots	1.152	Miles per hour
Square centimeters	0.001077	Square feet
Feet per second	0.6818	Miles per hour
Centimeters per second	0.03281	Feet per second
Meters per second	2.237	Miles per hour
Meters per second	6.00	Kilometers per hour

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