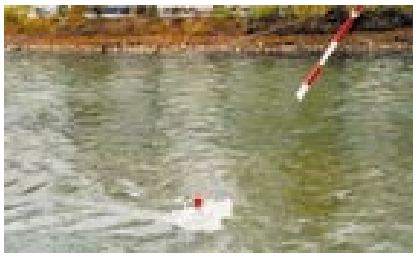
Workhorse Rio Grande

River Direct-Reading ADCP
600 kHz (1200 kHz also available)

An ADCP, operating from a small boat, completes a discharge measurement in minutes



The small, light, rugged Rio Grande ADCP allows for a flexible range of mounting options

The Workhorse Rio Grande ADCP is designed for measuring river discharge and surveying river current structure. While the boat is moving, Rio Grande rapidly measures current velocities throughout the river depth along the boat's path. Combining all this information instantaneously, Rio Grande measures river discharge while you are crossing the river.

	General profiling	Shallow water profiling
Bin size	1m	0.1m
Minimum profiling depth	4.0m	0.8m
Maximum profiling depth	53m	8m

RD Instruments

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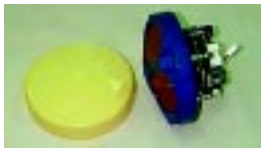
Included in a complete system:



Transducer and electronics: molded composite plastic transducer head with four beams at 20° from vertical in a convex configuration, external temperature sensor, electronics assemblies, fluxgate compass, pitch and roll sensors.

Bottom Tracking Capability: for measuring the ADCPs speed and direction over ground and water depth.
Standard and High Resolution Profiling Modes: includes a robust profiling mode for general conditions and two high-resolution profiling modes for very shallow or slow flow conditions.

Input/output cable: 5 m 12-VDC power and communications cable. Lighter socket adapter: 2.4 m 12-VDC

Manuals and software: user's guide, operation manual, river discharge guide, TRANSECT software. Utility programs are included for converting binary data files to ASCII format, system diagnostic testing, and field compass calibration.

Spares/tool kit: maintenance/tool kit.

Ship case: ruggedized shipping case.

Rio Grande 600 kHz ADCP

Profiling Features

Bottom tracking. The Rio Grande includes bottom tracking capability to measure the ADCP speed and direction over ground and to calculate discharge while you cross the river.

Water Profiling Modes. System includes general profiling capability as well as high resolution profiling modes for shallow and slow flow conditions.

Water Velocity Profiles

Depth cell size: 0.1-8 m

Number of cells: 1-128

Range: ± 5 m/s (default); ± 20 m/s (maximum)

Ping rate: >2 Hz (typ.) Accuracy: ±0.25% ±2.5 mm/s

General Profiling[1] (Mode 1):

Cell size (m)	Standard deviation (mm/s)[2]	First cell range (m)[3]	Min meas range (m)[4]	Max range (m)[5,6]
1	70	1.4	2.6	53
2	30	2.4	4.6	60
4	20	4.3	8.5	67

Shallow Profiling (Mode 8, up to 1 m/s relative velocity):

Cell size (m)	Standard deviation (mm/s)[2]	First cell range (m)[3]	Min meas range (m)[4]	At range (m)[7]
0.10	100	0.3	0.5	4
0.25	60	0.4	0.6	4
0.50	40	0.5	0.9	4

Shallow and Slow Flow Profiling (Mode 5, up to 0.5 m/s relative velocity):

Cell size (m)	Standard deviation (mm/s)[2]	First cell range (m)[3]	Min meas range (m)[4]	At range (m)[7]
0.10	8	0.3	0.9	4
0.25	5	0.4	1.4	4
0.50	3	0.5	1.9	4

Notes: 1) Blanking Distance is 25cm for all modes, Transmit is roughly equivalent to the cell size for Mode 1 and is set to 2cm for Modes 5 and 8; 2) single-ping ADCP uncertainty; 3) center of transducer to center of first cell; 4) minimum profiling range from transducer face assumes smooth bottom and one good cell; 5) nominal range at 10°C and typical backscatter; 6) maximum range is limited to 94% of distance from transducer to river bed; 7) for slower velocities, longer profiling ranges can be achieved up to a maximum of 7m.

Echo Intensity

Sampling: same intervals as velocity.
Uncertainty: ±3.0 dB (relative measure)
Dynamic range: 80 dB

Transducer and Hardware

Frequency: 614.8 kHz
Bandwidth: 150 kHz
Beamwidth: 1.5°
Ceramic Diameter: 73 mm
Beam angle: 20°
Configuration: 4-beam, convex
Max tilt: 20°
Transducer material: Polyurethane
Pressure case material: Delrin
External connector: 8-pin wet-mateable

Other Standard Sensors

Temperature
Mounted on transducer
Range: -5° to 45°C
Uncertainty: ±0.4°C
Resolution: 0.01°

Tilt
Range: ±20°
Uncertainty: ±0.5°
Resolution: 0.01°

Compass
Type: flux gate
Long Term Accuracy: ±2°
Uncertainty: ±0.5°
Resolution: 0.01°
Maximum tilt: 20°
Includes built-in field calibration procedure.
Compass and tilt specifications given for tilt angles ≤ ±15° and 60° maximum dip angle.

Data Communication

Baud rate: 300-115,200 baud
9600 is standard for communication
115,200 is standard for data download
Data Format: ASCII or Binary
Serial communication is switch-selectable for RS232 (default) or RS422
Data Recording: Optional 10-170 MB flash EPROM (same capacity as Sentinel ADCP)

Power:

DC Input: 10.5-18 VDC
Current
0.4 A (minimum power supply capability)
Power required
Transmit: 37 W @ 13V (approximate)
Process: 2.2 W
Standby: <1 mW
Maximum Cable Resistance
12 VDC 50Ω 18 VDC 25Ω
14 VDC 65Ω

Environmental

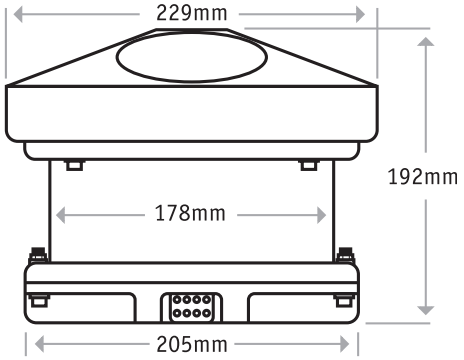
Weight in air: 7.6 kg
Weight in water: 2.2 kg
Maximum depth: 200 m
Operating temperature: -5° to 45°C (maximum 35°C at full depth)
Storage temperature: -30° to 75°c
Vibration: MIL-STD-167-1, type 1
Shock: IEC 1010

Standard Software

TRANSECT software for real-time current measurements and discharge calculation, integration of external heading, GPS, and depth-sounding data. TRANSECT consists of modules for deployment planning, data acquisition, and data playback. Utility programs are included for converting binary data files to ASCII format and system diagnostic testing.

Complete system includes Rio Grande ADCP, 5 m I/O cable, 2.4 m lighter socket adapter cord, dummy plug, documentation, TRANSECT software and utility programs, weatherproof box, tools, and spare consumables.

User supplies computer and 12V DC power.



For more information, call, e-mail or visit our web page. Ask for our Primer about BroadBand ADCP Principles of Operation to learn more about how Workhorse ADCPs work.

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REV. 1/99

Rio Grande 1200 kHz ADCP

Profiling Features

Bottom tracking. The Rio Grande includes bottom tracking capability to measure the ADCP speed and direction over ground and to calculate discharge while you cross the river.

Water Profiling Modes. System includes general profiling capability as well as high resolution profiling modes for shallow and slow flow conditions.

Water Velocity Profiles

Depth cell size: 0.05 - 4 m

Number of cells: 1-128

Range: ± 5 m/s (default); ± 20 m/s (maximum)

Ping rate: >2 Hz (typ.) Accuracy: ±0.25% ±2.5 mm/s

General Profiling[1] (Mode 1):

Cell size (m)	Standard deviation (mm/s)[2]	First cell range (m)[3]	Min meas range (m)[4]	Max range (m)[5,6]
0.5	70	0.8	1.5	14
1	30	1.3	2.5	16
2	20	2.3	4.4	18

Shallow Profiling (Mode 8, up to 1 m/s relative velocity):

Cell size (m)	Standard deviation (mm/s)[2]	First cell range (m)[3]	Min meas range (m)[4]	At range (m)[7]
0.05	150	0.3	0.4	2
0.1	100	0.3	0.5	2
0.25	60	0.4	0.6	2

Shallow and Slow Flow Profiling (Mode 5, up to 0.5 m/s relative velocity):

Cell size (m)	Standard deviation (mm/s)[2]	First cell range (m)[3]	Min meas range (m)[4]	At range (m)[7]
0.05	10	0.3	0.8	2
0.1	7	0.3	0.9	2
0.25	4	0.4	1.4	2

Notes: 1) Blanking Distance is 25cm for all modes, Transmit is roughly equivalent to the cell size for Mode 1 and is set to 2cm for Modes 5 and 8; 2) single-ping ADCP uncertainty; 3) center of transducer to center of first cell; 4) minimum profiling range from transducer face assumes smooth bottom and one good cell; 5) nominal range at 10°C and typical backscatter; 6) maximum range is limited to 94% of distance from transducer to river bed; 7) for slower velocities, longer profiling ranges can be achieved up to a maximum of 3.5m.

Echo Intensity

Sampling: same intervals as velocity.
Uncertainty: ±3.0 dB (relative measure)
Dynamic range: 80 dB

Transducer and Hardware

Frequency: 1228 kHz
Bandwidth: 300 kHz
Beamwidth: 1.0°
Ceramic Diameter: 51 mm
Beam angle: 20°
Configuration: 4-beam, convex
Max tilt: 20°
Transducer material: Polyurethane
Pressure case material: Delrin
External connector: 8-pin wet-mateable

Other Standard Sensors

Temperature
Mounted on transducer
Range: -5° to 45°C
Uncertainty: ±0.4°C
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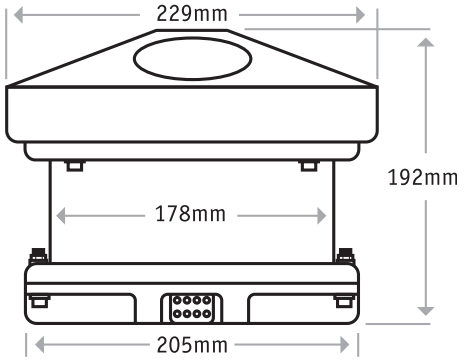

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