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ADCP Workhose Mariner 600 kHz on RV "MYA 2"

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1 ADCP Installation Overview

1.1 Sensor Equipment

The following sensors are installed on the RV "MYA 2":

Sensor	Model	Details from Manufacturer
ADCP	Teledyne RDI Workhorse	Range: 50 m
	Mariner 600 kHz	Vertical resolution cell size: 0.25-8 m Velocity accuracy: ±0.3%of water velocity Number of depth cells: 1-128 Ping rate: 2Hz
Inertial Navigation	Coda Octopus F180	Positional Accuracy: 0.2 m with L1 RTK
Svstem		Correction; 0.4 m with DGPS
- y		Heave accuracy: 5 cm or 5%
		Velocity accuracy: 0.014 m/s

Table 1: Sensor specification

1.2 Sensor Structure

Figure 1 shows the sensor structure of the ADCP hardware and Figure 2 shows the installation in the laboratory. The ADCP is hull mounted and the deck unit is permanently installed in the server rack. The operator PC receives ADCP data from one ADCP deck unit at a time, position information as well as attitude data (heading) from the Coda Octopus F180 Inertial navigation system (INS).



Figure 1: Sensor dependencies



1.3 Software

The software *VmDas* (Vessel-mount data acquisition system) is used for data acquisition and configuration of the ADCP. The software *WinADCP* can be used for visualization and export of recorded raw data. Both software packages are installed on the ADCP operator PC.



2 System Start-up

This manual is construed for the specific use of the ADCP on RV "MYA 2" and focuses on the most important parameters to be looked after during data acquisition. We recommend to additionally read the *VmDas Quick Start Guide* and *VmDas User Guide*.

2.1 Switch on ADCP

- 1. Power up the ADCP operator PC (Figure 2, right)
- 2. Power up the deck unit in the server rack (Figure 2, right)

2.2 System Test (BBTalk)

Before you start a survey you should perform a hardware system test.

- 1. Start the BBTalk program from the desktop of the operator PC.
- 2. Connect to the ADCP unit by selecting the settings as shown in Figure 3.

Device:	WorkHorse		•	
Connect Using —				
COM Port :	COM1		-	
		< Zurück	Weiter >	Abbreche
Settings				
Connection Prefer	ences			
Baud Rate:	38400		-	
Parity :	None		-	
Stop Bits :	1			
Stop Bits :	1		- -	

Figure 3: Serial connection settings in BBTalk



3. Choose menu *File* \rightarrow *Options* and select settings as shown in Figure 4.

Options	X
 Send Break On New Connection Use Software Break ("===") With Radio Mode Connect To Last Open Port On Startup Overwrite Log Files When Opening Error Checking For Script Files 	ms
 Send CK On Baud Rate Change (CB Comman Echo Characters Wait for Prompt in Script File 	d)
	Finish Abbrechen

Figure 4: Program settings in BBTalk

4. To run the tests several commands need to be sent to the ADCP.

Select the menu $File \rightarrow Send \ script \ file$ or press <F2>.

Select the file C:\Program Files (x86)\RD Instruments\RDI Tools\TestWH.rds.

This file contains a set of commands for the ADCP which is now executed one after another:

CR1, TS?, PS0, PT8, PT9, PT3, PT6.

The results are saved to a *.txt file in the folder C:\ Program Files (x86)\RD Instruments\RDI Tools\.



3 VmDas Acquisition Software

The software VmDas is used for data acquisition and playback.



- 1. Start the VmDas program from the desktop of the operator PC
- If you run VmDas for the first time you should follow the next chapters to check the configuration settings! Enter the menu *Options* → *Edit Data Options* for editing the settings described in the following chapters.
- After checking the settings carefully start the data acquisition. Select the menu *File* → *Collect Data* or press the button at the upper left of the main window. The data
 recording starts immediately and the screen looks about the same as the screenshot
 in Figure 5.

🖛 Teledyne RDI VmDas - [T	es 010 <vmdas1>]</vmdas1>						
Tile View Options	Control Chart Window	v Help					- 5 ×
			a I. 🖾 🖾				
Profiles Ship Track	1 🔿 Ship Track 2 🛛 🌾		<u>\$191 </u>	Keep on screen			
System configuration	CX/CC Convex	Ens Length 1241 bytes	Bin 1 dist 2.07 m	Time/ping 00:00.30			
Sys freq 614400 Hz	Up/down Down	Bins 50	Blank dist 1.00 m	Pings/ens 1			
Oper Mode Broad bndwdth	Bm angle 20 deg	Coord sys Beam	Bin length 1.00 m	Time/ens 00:01.00			
Leader		Heading 20.78 ± 0.0	deg				
Ens Num 45	Date 9 Jul 2014	Pitch 0.85 ± 0.00	deg Temp 18.650	C Xdcr Depth 1.30 m			
BIT Err OK	Time 09:06:06.00	Roll 2.71 ± 0.00	deg Salinity 34 ppt	Sound Vel 1517 m/s			
Raw Velo	city - Ens 45, 09 Jul 20 Velocity (m/s) Ref: Delta	14 09:06:06.00 a pos		Raw Data Quality - En:	s 45, 09 Jul 2014 (unts & Percent)9:06:06.00	
-1.0 -0.5	0.0	0.5	1.0 0	64	128	192	256
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i					-	C>	
25		<u></u> .		4	1		
			25			5	
					15		
				2			
50							
			50	~			· ·
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75		ana ing kanalana ang	a:	-	i.		
	i.	į	75				0039300393003
	į						
		i.					
100	<u>g</u>	2					
Depth (m)			0	25	50	75	100
		- Beam 1 - Beam 3 - B	eam 2 Depth (m) eam 4	RS	SI Cor	relation	- Percent good
		5.449933			Ens	Sim Mode 📃 N/	AV Sim Mode

Figure 5: VmDas screen layout during data collection (raw display mode)



3.1 Communications Settings

The Communications tab (in menu *Options* \rightarrow *Edit Data Options*) configures the serial or network connections to the ADCP and the navigation and heading sensor (F180). Ensure that the settings for the two COM ports are as shown in Figure 6 (red circle). If not, select the ADCP and NMEA1 input on the left and apply the correct settings in the bottom part.

Program Options			_ XX
Communications ADCP Setup Recording	NAV Transform Averaging D)ata Screening User Exits Sim	Inputs
- Select Hom to Set:			
Select item to Sel.	COM Port	s. Setup Ethemet Setu	ID
ADCP log t			
C NMEA 1 Input	I COM1, 38	400, N, 8, 1 1 N/A	
C NMEA 2 Input	None, 48	00. N. 8. 1	
C NMEA 3 Input	□ None, 480	00, N, 8, 1	
C Ensemble Output (Binary LTA)	None 96	00 N 8 1 0 0 0 0 5433	
C Ensemble Output (ASCII)	□ None, 960	00, N, 8, 1	
C Speed Log Output	✓ COM3, 38	400, N, 8, 1 🔲 0.0.0.0:5434	
Set Communication Parameters Here: Com Port:	Baud Rate: Parity: D	Data Bits: Stop Bits:	
COM1 -	38400 No Parity	8 • 1 • 9	Set
Port IP	TCP UDP		
Enable Network	0.0	S	et
	OK AL	obrechen	

Figure 6: Required communication settings (red circle)

3.2 ADCP Settings

The ADCP Setup tab (in menu **Options** \rightarrow **Edit Data Options**) configures the ADCP operation and auxiliary sensors (Figure 7). It is recommended to use the prepared setting files **WH600DEF_fine_res.txt** for finer resolution (128 bins, 0.5 m bin size and 0.5 m blanking distance), or the file **WH600DEF_new.txt** for a coarser resolution (50 bin, 1 m bin



size, 1 m blanking distance). Both files are located in *C:\Program Files (x86)\RD Instruments\VmDas*. If bottom tracking is activated (default setting and recommended), the *Ensemble Time* should be set to "*Ping as fast as possible*".

ommunications AD	CP Setup Recording NAV Tra	ansform Average	ging Data Screening User Exits	Sim Inputs
- ADCP Setup from	Options Water Current Profile		- Heading Sensor	
O Use Options	🔽 Set Profile Parameters		🔽 Set Sensor Type	
	Number of Bins: 50		C Internal Sensor	
	Bin Size: 1	meters	 External Analog Gyro (Synchro/Stepper) 	
	Blank Distance: 1	meters		
	Transducer 1 Depth:	meters	Set Sensor Type	
			C Internal Sensor	
	🗹 Set Processing Mode		External Analog Gyro (Syr	nchro)
	Hi-resolution (short range)	,	Bottom Track	
	 Low-resolution (long range 	;]	Saliaity	m
			35	ppt
ADCP Setup from I Use File View/Edit	ile Command File [C:\Program Files (x86)\RD Instrume	ents\VmDas\WH	600DEF_fine_res.txt	Browse
	Ensemble Time			
	Ping as fast as possible	Enersyle	la Tima 🔟	
	 Set time between ensembling 	ies Ensemb	le lime ju seconds	

Figure 7: ADCP and auxiliary sensor setup

3.3 Recording Settings

The Recording tab (in menu *Options* \rightarrow *Edit Data Options*) configures the recording options for your survey/expedition. Choose an adequate name for your survey/expedition. Set the primary path for recorded files to *C:\ADCP Data* as shown in Figure 8. If a backup is desired, check *Dual Output Directories* and provide a path (*C:\RDI\ADCP*).



Program Options		23
Communications AD	DCP Setup Recording NAV Transform Averaging Data Screening User Exits Sim Inputs	5
Deployment Files		
Name:	Probefahrt	
Number:	11 The deployment number displayed here is automatically chosen by the software each time data is collected or reprocessed. Change	
Max Size (MB):	10 the number to override the software's choice.	
Output Directories	35	
DISABLED		
Dual Output I	t Directories	
Primary Path:	D:\ADCP Data\Probefahrt\ Browse	
Backup Path:	C:\RDI\ADCP\ Browse	
	OK Abbrechen	

Figure 8: Recording settings; make sure to set correct output and backup directories.

3.4 Navigation Settings

This tab configures the navigation input sources for the ship's position and the ship's speed over ground. Ensure the settings are as shown in Figure 9.

Program Options	<u> </u>
Communications ADCP Setup Recording NAV	Transform Averaging Data Screening User Exits Sim Inputs
NMEA Ship Position (GGA) Source	NMEA Ship Speed (VTG) Source
🔽 Enable 🗌 Enable Backup	🔽 Enable 🗌 Enable Backup
NMEA1 🔽	NMEA1

Figure 9: Required navigation input settings



3.5 Transformation Settings

The Transform tab configures heading and roll/pitch input sources as well as angular offsets for each parameter. Please ensure all settings are as shown in Figure 10.

The ADCP is mounted -2.67° relative to the ship's longitudinal axis (bow-stern) which has been detected by a bottom and water track measurement. Ensure this offset is given as the EA Heading Alignment Error in the configuration!

munications ADCF Setup Recording NAV	Transform Averaging Data Screening User Exits Sim Inputs
Heading Source	Tilt Source
NMEA Port	NMEA Port
HDT 💌 NMEA1 💌	ADCP Tilt Sensor
Fixed Heading (deg)	Fixed Pitch (deg)
	ju Fixed Roll (deg)
Enable Backup Source NMFA Port	Enable Backup Source NMEA Port
ADCP Compares	
0 Fixed Heading (deg)	0 Fixed Pitch (deg)
	0 Fxed Roll (deg)
Custom NMEA: C:\RDI\VmDas	Browse
Heading Sensor Magnetic/Electrical Corrections —	ADCP Alignment Correction
	✓ Override command file E4
EV- Primary Heading error	-2.67 EA Heading alignment error
U EV: Backup Heading error	EJ Pitch alignment error
	0 El Roll alignment error
EV = Vessel true Heading - Sensor Heading	EA = Beam 3 Heading when Vessel heads North
	EJ = Vessel Roll when ADCP is level
	EI = Vessei Fitch when ADCF is level

Figure 10: Required transformation settings

3.6 Averaging Settings

This tab (in menu *Options* \rightarrow *Edit Data Options*) configures the averaging of the ADCP raw data. Configure as shown in Figure 11 or adjust the settings according to your requirements. The settings will not affect the raw data.



gram Options							
Communications ADCP Setu	p Reco	rding NAV	Transform	Averaging	Data Screening	g User Exits	Sim Inputs
Averaging Method							
Temporal							
First Time Interval (ST/	\) :	30	seconds				
Second Time Interval ((LTA):	120	seconds				
- Profile Ping Normalization F	Reference	Layer					
🔽 Enable							
	Start bin:	1					
	End bin:	20					
		120					
				ок	Abbrechen		

Figure 11: Averaging settings, adjustable to your requirements

3.7 Data Screening Settings

The Data Screening tab (in menu **Options** \rightarrow **Edit Data Options**) configures the screening settings for the visualization of the ADCP raw data. Adjust these settings according to your requirements.

You can set limits for RSSI (amplitude), correlation, percent good, error velocity, vertical velocity and fish screening. If the raw values are below the selected minimum limits the values will not be displayed nor included in the short time and long time averages. The raw data is of course not affected by these settings.

3.8 Short Term Averages (STA) in VmDas

VmDas offers the possibility to display already averaged velocities (according to the averaging settings, Figure 11) on a map including the ship movement on a map (screenshot



in Figure 12). Therefore, press the tab \square in the toolbar. You can change the references / displayed velocities under *Options* \rightarrow *Edit Display Option* (this will not affect the raw data collection).



Figure 12: Screenshot of WinADCP during data replay



4 WinADCP

The WinADCP software can be used for visualization and export of the recorded ADCP data (screenshot in Figure 13). For a detailed description, please read the *WinADCP User Manual* for help on how to use the software.





Figure 13: Screenshot of WinADCP during data replay

4.1 Exporting Data

Besides several displaying and replay features of the collected data, WinADCP is used to Export the data to ASCII-format. This is done using *Export* and then choosing *Series/Ancillary*. Here, a selection can be made which bins should be exported and which primary data types (typically the zonal, meridional and vertical velocities) and which ancillary data types should be exported (typically Lat/Lon). If bottom track is chosen as velocity reference, the exported velocities are already representing the true water velocities (i.e. ship movement corrected).

WinADCP Export	Options	
Contour Profile S File Type • TXT • MAT Bins All None • 1	Series /Ancillary Series Data Types Velocity Correlation Echo Percent Amplitude Good Image: East (u) Bm1 Bm1 PG1 Image: East (u) Bm2 Bm2 PG2 Image: Vertical (w) Bm3 Bm3 PG3 Image: Error Bm4 Bm4 PG4 Image: Magnitude Avg Avg	Ensemble First 282 Last 537 Step 1
 ✓ 2 ✓ 3 ✓ 4 ✓ 5 ✓ 6 ✓ 7 ✓ 8 ✓ 9 ✓ 10 ✓ 11 	Anc Data Types Bottom Track Water Mass- Pitch East (u) East (u) Roll North (v) North (v) Heading Vert (w) Vert (w) Temperature Error Error Orientation Dir Dir BIT BT Depth Dir Battery BT Depth Dir	 WinRiver Navigation East (u) North (v) Mag Dif ✓ Lat/Lon MicroCAT
	Write File	Quit Export

Figure 14: Data export in WinADCP