RD Instruments

Acoustic Doppler Current Profilers

Ocean Surveyor

User's Guide

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1 Introduction

Thank you for purchasing the RD Instruments (RDI) Ocean Surveyor Acoustic Doppler Current Profiler (ADCP). This booklet is designed to help first time ADCP users to unpack, set up, test, and send deployment commands to their ADCP.

This booklet should be used *with* the Ocean Surveyor Technical Manual. Where needed, there are references to detailed information and figures contained in the Ocean Surveyor Technical Manual. For example, the reference (Figure A-1) would be found in the Ocean Surveyor Technical Manual in Appendix-A.

Ocean Surveyor vessel-mount deployments are Real-Time. Real-Time use refers to the fact you are viewing the data as the ADCP collects it via a personal computer. This data is also stored on the computer to allow for data playback and processing at a later time.

2 Setup the ADCP

As a minimum, you need the following equipment to set up the Ocean Surveyor system (see Figure 1).

NOTE. Cable descriptions referenced figures are shown in Appendix-A of the Ocean Surveyor Technical Manual.

- *Ocean Surveyor* – Contains the beam former transducer circuitry and optional TCM2 compass.
- *Electronics Chassis*
  1. Contains all interfaces to/from the ADCP, computer/terminal, vessel gyros, and power.
  2. Allows either RS-232 (< 50 m) or RS-422 (> 50 m) computer-to-ADCP communications.
  3. Converts vessel-gyro heading and tilt analog signals into digital data to be used for ADCP heading, pitch, and roll. Our *TRANSECT* program supports this data. The string format of the optional gyro-signal output from the electronics chassis is: *$PRDID, ±ppp.pp, ±rrr.rr, hhh.hh* (where *p* is pitch, *r* is roll, and *h* is heading; all scaled in degrees).
- *Transducer Cable* – Connects the ADCP transducer to the main signal-processing electronics chassis (Figure A-3).
- *Serial Cable* – RS-232 (J4) or RS-422 (J3) from the electronics chassis to the computer/terminal (Figure A-4).
- *Computer* – A computer running a terminal emulator programsuch as RDI's *BBTALK*or a real-time processing program such as *TRANSECT*. Recommended minimum requirements for the computer: 80386 CPU, 18-MHz clock speed, EGA monitor, hard drive, and floppy drive. RDI programs support the following communication ports:

(1). COM1, IRQ4, addresses 3F8 through 3FF
(2). COM2, IRQ3, addresses 2F8 through 2FF
(3). COM3, IRQ5, addresses 3E8 through 3EF
(4). COM4, IRQ7, addresses 2E8 through 2EF

You also can connect the following equipment:

- *External Gyrocompass* – Supplies synchro/stepperheading information and/or synchro pitch and roll information to the chassis for conversion before transmission to the computer for processing. Chapter 7 lists gyro requirements.
- *External Navigation Device* – Supplies serial, ASCII navigation data to the computer (Figure A-6) via our *TRANSECT*and *NAVSOFT*programs. See the *TRANSECT* manual for requirements. This is an option for some ADCP applications. Users working in areas where bottom-track detection is not possible need this equipment in order to remove ADCP (Ship) motion from the data.
- *External Ensemble-Out Device* – Receives serial, ASCII ensemble data from the computer (Figure A-7) via our *TRANSECT* program. See the *TRANSECT* manual for requirements. This is an optional output from *TRANSECT*. This can be used to send ADCP data to other equipment on the ship.

3 System Interconnection

Use Figure 1 and Figure 2, and the following steps to connect the system.

a. Turn OFF or disconnect all power to all ADCP system equipment.

CAUTION. Check the I/O cable and connector carefully for water before applying power. Even a small amount of water in the connector will cause serious damage to the ADCP.

When connecting the I/O cable to the ADCP, do not over tighten the connector. The watertight seal is achieved by the o-rings on the bore and face of the connector. This seal does not require extreme force. Never use tools to tighten the connector.

b. Use Figures 2 and 3 to connect the ADCP I/O cable, electronics chassis, RS-232/422 serial cable, computer/terminal, and gyro equipment.

c. Apply power to all equipment. The electronics chassis accepts input voltages of 85-264 VAC. The electronics chassis automatically scales the input voltage to the proper level. No special jumper/switch settings are required to select the input voltage.

CAUTION. Complete the ground path. The cord and the outlet used must have functional grounds.

CAUTION. The transducer connector has transient RF pulses of one kilowatt. Do not operate the equipment without the transducer cable and transducer or a protective cover installed. Do not mate or unmate the transducer connector with power applied to the instrument.

CAUTION. Do not obstruct access to the power cord. If the system is rack mounted, the rear of the rack should be open and accessible.

CAUTION. The chassis may receive power from multiple sources. The main power cord and the synchro/stepper connector must both be disconnected before opening the electronics unit.

d. Set up the communications protocol using *BBTALK*. Here are the ADCP default settings, but you can use others (see Appendix-C, CB-command).

(1) Baud rate - 9600 (3) Stop bits - 1

(2) Parity - None (4) BREAK length - 300 ms

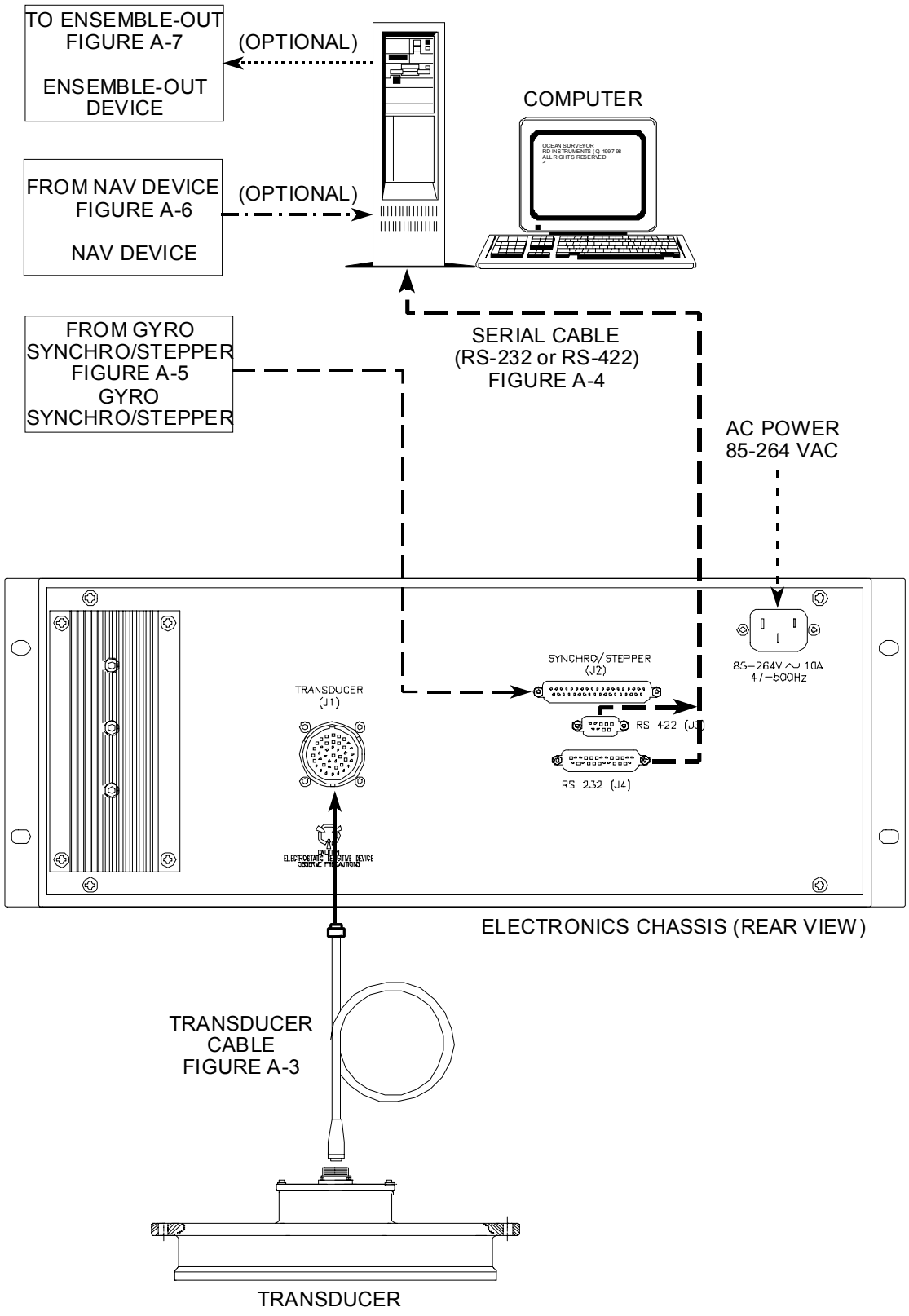

Figure 1. Ocean Surveyor Connections

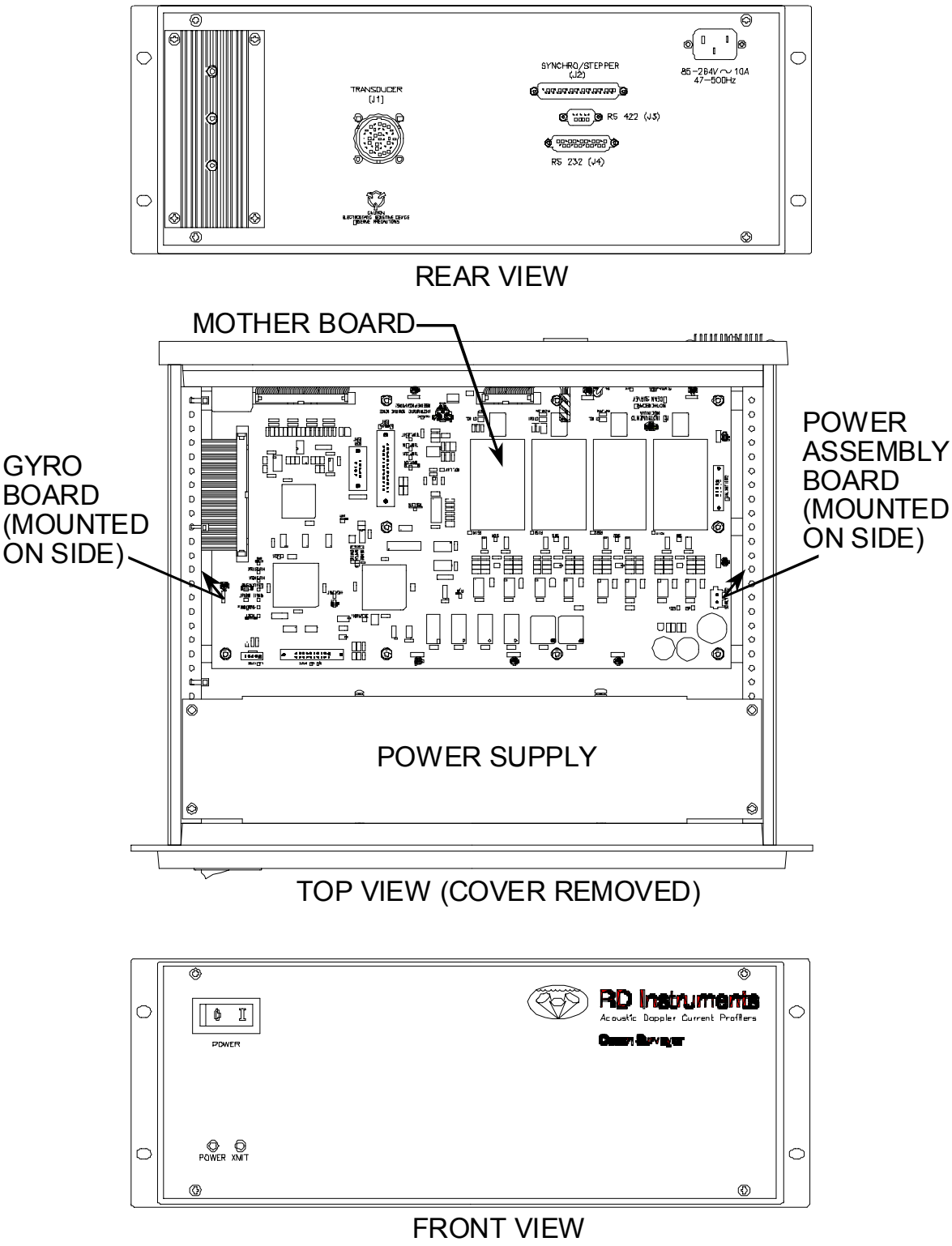

Figure 2. Ocean Surveyor Electronics Chassis

4 TRANSECT Setup

Use this section to setup the *TRANSECT* program. We assume you have created a "default" configuration file to operate your ADCP with the installed *TRANSECT* software on your computer. If you have not already done so, complete the following steps.

a. Connected your ADCP to your computer using serial (RS-232 or RS-422) communications. See Figure 1.

b. Applied power to the system.

You are now ready to begin the *TRANSECT* setup. Use the following steps to guide you.

a. Before running *TRANSECT*, at the DOS prompt type the following three lines, pressing the Enter key after each one:

```
set AUTOSAVECFG=Y
set AUTOLOADCFG=Y
set AVGNAVVELS=Y
```

Since the above setting must be entered *before* you start *TRANSECT*, you may find it easier to create a batch file that would automatically do this for you. To do this, return to the drive/directory from where you started *TRANSECT*. Using a text editor, create a file called ADCP.BAT. The first two lines of the batch file switch to the drive and directory where *TRANSECT* resides. The next lines turns ON the navigation average feature. The last line starts *TRANSECT*. For example:

```
C:
CD C:\RDI
set AUTOSAVECFG=Y
set AUTOLOADCFG=Y
set AVGNAVVELS=Y
TRANSECT
```

b. Start the program by entering TRANSECT (color monitor) or TRANSECT/M (monochrome monitor) at the DOS prompt.

c. The *TRANSECT* shell program (TRANSECT.EXE) now loads the main menu module (TRMAIN.EXE). The MAIN MENU appears on your screen (Figure 3). Chapter 3 in the *TRANSECT User's Manual* explains this menu in detail.

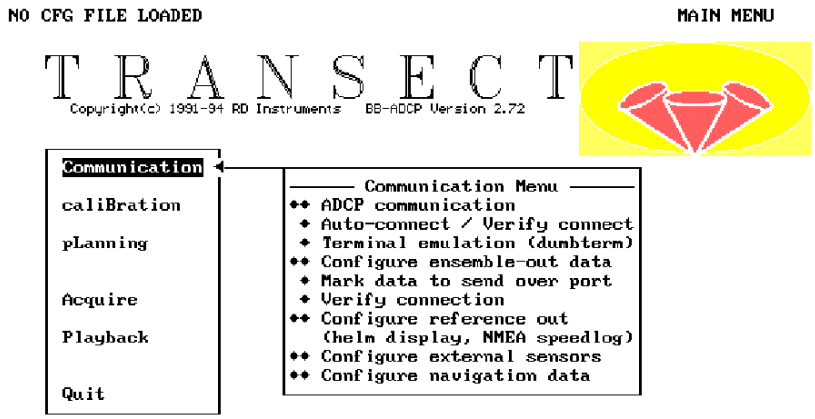

Figure 3. TRANSECT Main Menu

4.1 TRANSECT Communication Menu

a. You will now load the **COMMUNICATION** menu to set up communication between *TRANSECT* and the ADCP. There are two ways to access this (and all) **MAIN** menu options.

   1. Press the highlighted menu letter (in this case, `C`).

   2. Use the cursor control keys to highlight the desired menu item, and then press `e`.

b. The **COMMUNICATION** menu (Figure 4) now loads. The message *NO CFG FILE LOADED - USING DEFAULT SETTINGS* may appear briefly. This means that *TRANSECT* did not automatically load the last-used configuration file (assuming the TRANSECT.PTR file does not exist). Instead, *TRANSECT* will use the factory-set, default communication settings. Chapter 4 of the *TRANSECT User's Manual* explains the **COMMUNICATION** menu and its default settings.

c. A pop-up window will appear that asks you to enter the name of a configuration file to load. You are going to create a new configuration file, so press `^` to close this window.

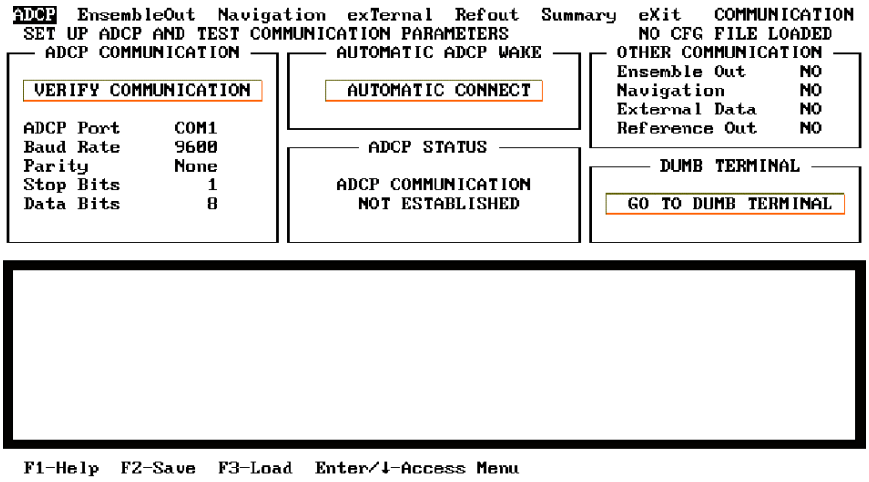

Figure 4. TRANSECT Communication - ADCP Menu

d. The **COMMUNICATION** menu has six submenus (the **ADCP** submenu is the one currently displayed). The top line on the screen lists the names of these submenus (**ADCP**, **ENSEMBLE-OUT, NAVIGATION**, **EXTERNAL**, **SUMMARY, EXIT**). We want to access the **ADCP** submenu.

e. You will now set up communications with your ADCP. Move the cursor to within the **ADCP COMMUNICATION** box to set the **ADCP PORT, BAUD RATE, PARITY, STOP BITS**, and **DATA BITS** fields to match the ADCP settings. Highlight the desired field, and then press `k` to change the field. Now highlight the **VERIFY COMMUNICATION** option and press `e`.

f. *TRANSECT* now tries to talk to the ADCP using the displayed settings. If successful, the **ADCP STATUS** box displays *ADCP COMMUNICATION ESTABLISHED*. The dumb terminal window (lower half of screen) also shows the output from the ADCP. If you cannot wake up the ADCP, or get an ADCP WAKE-UP ERRORS REPORTED message, see step (g).

g. If you do not know the ADCP port settings, or if you cannot wake the ADCP using the **VERIFY COMMUNICATION** option, select the **AUTOMATIC CONNECT** option. This option automatically searches for, and checks, the ADCP communication port settings. This process may take several minutes, especially if the ADCP is set at a lower baud rate. If successful, the **ADCP STATUS** box displays *ADCP COMMUNICATION ESTABLISHED*. If you still cannot talk to the ADCP, use the Ocean Surveyor Technical Manual to begin troubleshooting procedures.

h. After setting up communications with the ADCP, save the settings to a configuration (CFG) file. Press `m-` **SAVE** (on bottom line of screen). A pop-up window asks you for a file name. Enter the name DEFAULT (no extension needed). *TRANSECT* now saves the communication port information to the file DEFAULT.CFG. The upper right corner of the screen now shows the active drive and configuration file name. Note the other "hot keys" at the bottom of the screen. If you want more information about these or any other keys, press `l-` **HELP**.

i. If you needed to communicate to an **ENSEMBLE-OUT** `aE` (Figure 5), **NAVIGATION** `aN` (Figure 6), **EXTERNAL SENSOR DEVICE** `aT` (Figure 7), or **REFERENCE-OUT DEVICE** `aR` (Figure 8), the procedure would be similar to the one used for ADCP communications. For now, press `aS` to display the **SUMMARY** submenu (Figure 9), which shows the communication settings to all system devices. If necessary, you could make changes from here.

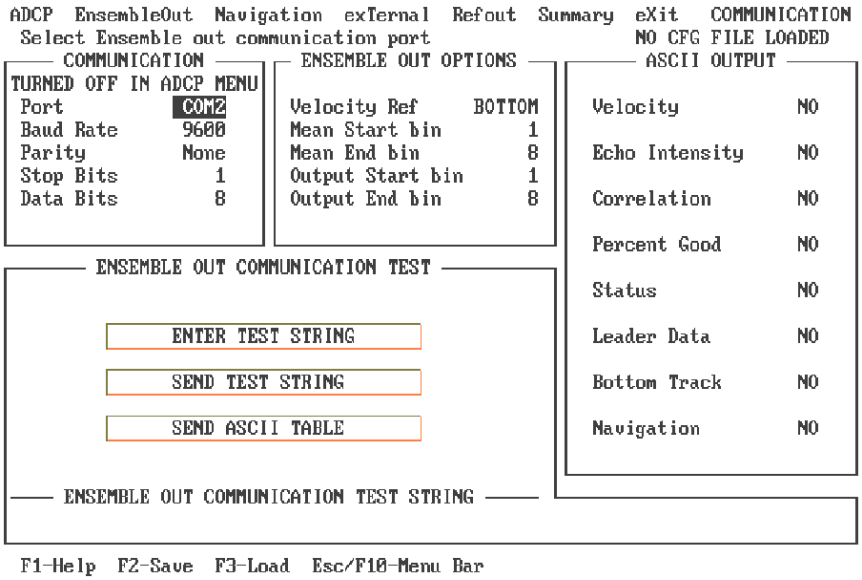

Figure 5. TRANSECT Communication - Ensemble Out Menu

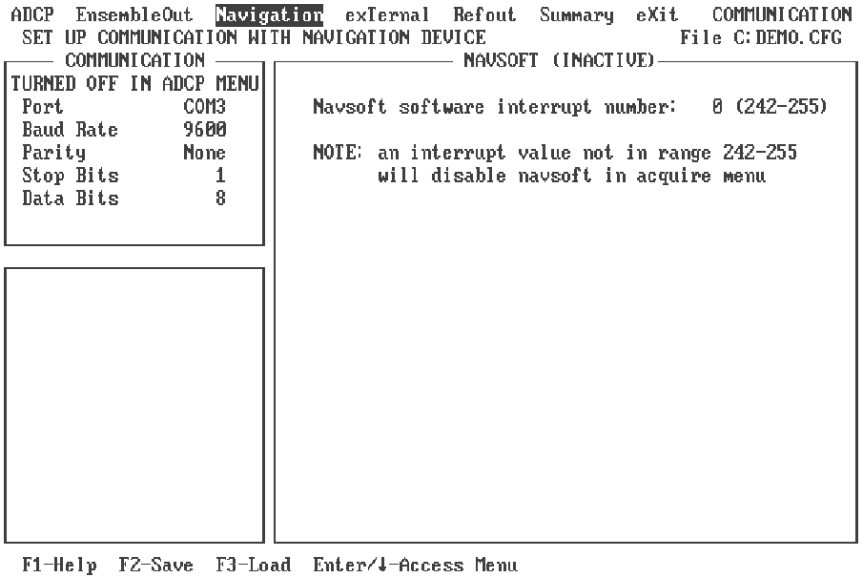

Figure 6. TRANSECT Communication - Navigation Menu

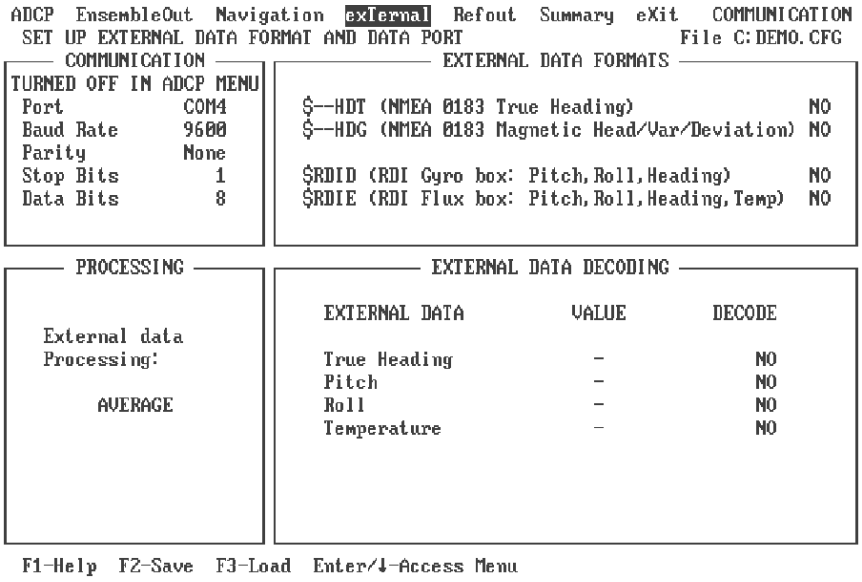

Figure 7. TRANSECT Communication - External Menu

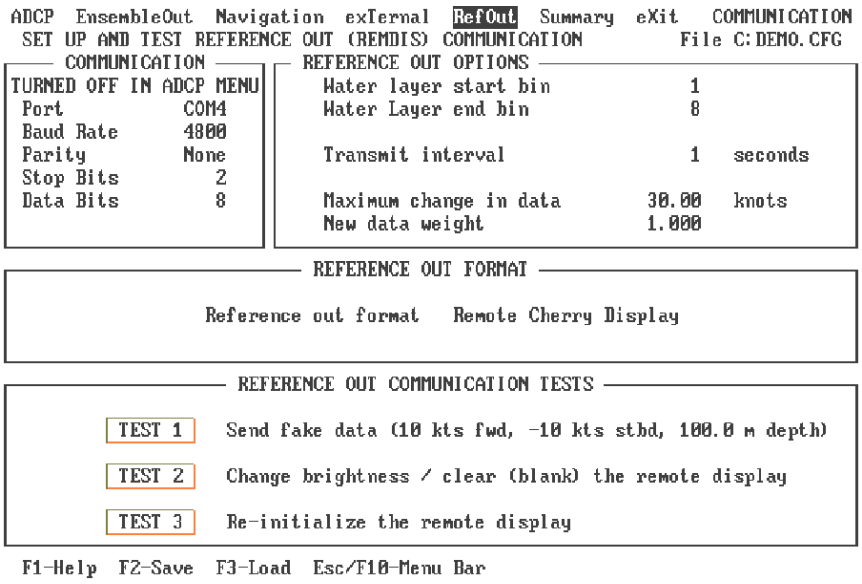

Figure 8. TRANSECT Communication - Reference Out Menu

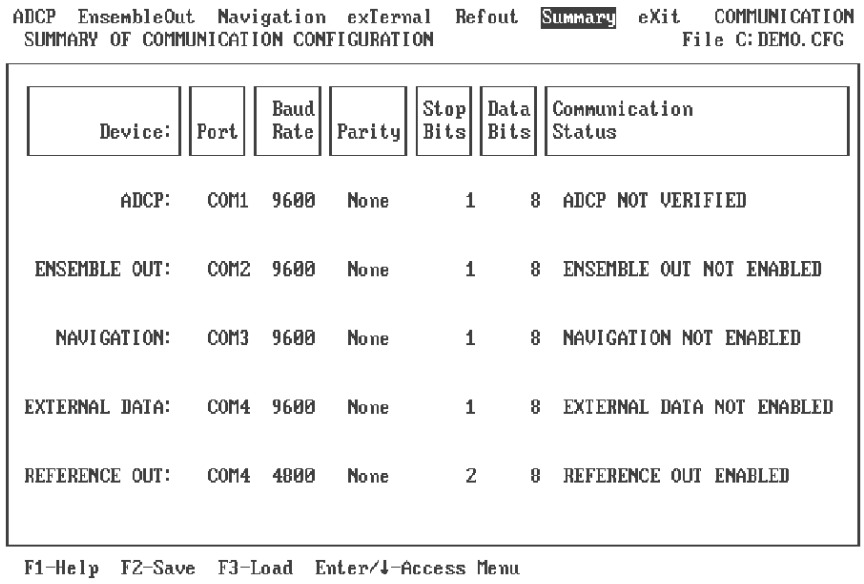

Figure 9. TRANSECT Communication - Summary Menu

4.2 TRANSECT Calibration Menu Setup

You are now back in the **MAIN** menu. The upper left corner of the screen shows the name of the configuration file (DEFAULT.CFG) now loaded. Press B to load the **CALIBRATION** menu (Figure 3). Chapter 5 of the *TRANSECT User's Manual* explains this menu in detail.

a. *TRANSECT* now tries to wake up the ADCP using the DEFAULT.CFG settings. If successful, *TRANSECT* reads ADCP clock and heading values. If not successful, either press o-**WAKE ADCP** or return to the **COMMUNICATION** menu to reestablish communication. NOTE: ^ cancels the wake-up process.

b. Press aO to select the **OFFSETS** submenu (Figure 10).

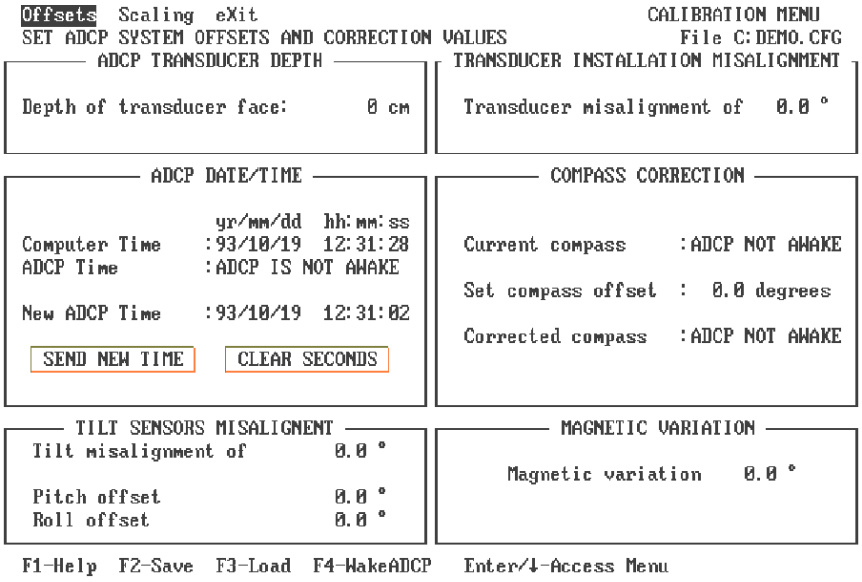

Figure 10. TRANSECT Calibration - Offsets Menu

c. Go to the **DEPTH OF TRANSDUCER FACE** field. This field sets the distance of the transducer face from the surface. Type in a value equal to the depth the ADCP transducer faces will be below the surface in cm, but do not press e. If you now press ^, the field returns to its previous value (0 cm). Instead, press the down arrow to go to the **NEW ADCP TIME** field. Moving to a new field or pressing e automatically checks data validity in the current field.

d. Enter the current date/time to the next minute. Go to the **SEND NEW TIME** option; press e when the new time is reached to send the new time to the ADCP. *TRANSECT* displays the new time in the **ADCP TIME** field. Note, the computer time is there for reference only. It is not used by the ADCP or *TRANSECT*.

e. Set the **TILT MISALIGNMENT OF, PITCH OFFSET**, and **ROLL OFFSET** fields to zero degrees. For systems with external tilt sensors, you would set these fields to account for mechanical misalignment with the ship's centerline. Set them to zero degrees.

f. Set the **TRANSDUCER MISALIGNMENT OF** field to zero degrees. For systems with external tilt sensors, you would set these fields to account for mechanical misalignment with the ship's centerline. Set to zero degrees.

g. Go to the **SET COMPASS OFFSET** field. This setting corrects for electrical misalignment between the gyro and the ADCP's Synchro Interface board. Enter a value of zero degrees.

h. Go to the **MAGNETIC VARIATION** field. This setting counteracts magnetic declination at the deployment site. East values are negative; west values are positive. Enter the value in degrees to counteract your magnetic declination.

i. Press aS to select the **SCALING** submenu (Figure 11).

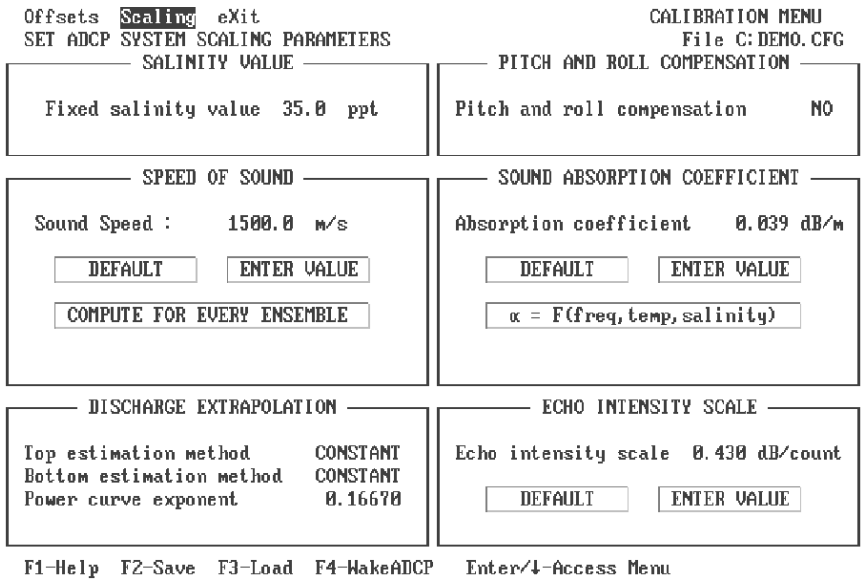

Figure 11. TRANSECT Calibration - Scaling Menu

j. If the **SALINITY VALUE** is not 35.0 ppt, go to this field and change the value to 35.0 ppt. If you are receiving pitch and roll inputs, go to the **PITCH AND ROLL COMPENSATION** field. Press `k` to set this field to YES. *TRANSECT* uses pitch and roll compensation to *map* depth cell data to the correct location in the water column.

k. Set **SPEED OF SOUND** to compute for every ensemble. Go to the **COMPUTE FOR EVERY ENSEMBLE** bar and press `e`.

l. Set **SOUND ABSORPTION COEFFICIENT**, and **ECHO INTENSITY SCALE** to their default values. In turn, go to the **DEFAULT** option in each of these boxes and press `e`. If you want to use another value, use the **ENTER VALUE** option to set in your own value. NOTE: The **SOUND ABSORPTION COEFFICIENT - DEFAULT** field will ask you for the system frequency. Select the frequency for your system.

m. If desired, set the **DISCHARGE EXTRAPOLATION** fields to their defaults (constant, constant, 0.16670).

n. Press `aX` to call the **EXIT** submenu. Select the **SAVE** option.

4.3 TRANSECT Planning Menu Setup

`You are now back in the` **MAIN** `menu. Press L to load the` **PLANNING** `menu (Figure 3). Chapter 6 of the` *`TRANSECT User's Manual`* `explains this menu in detail.`

a. Press `aS` to select the **SETUP** submenu (Figure 12).

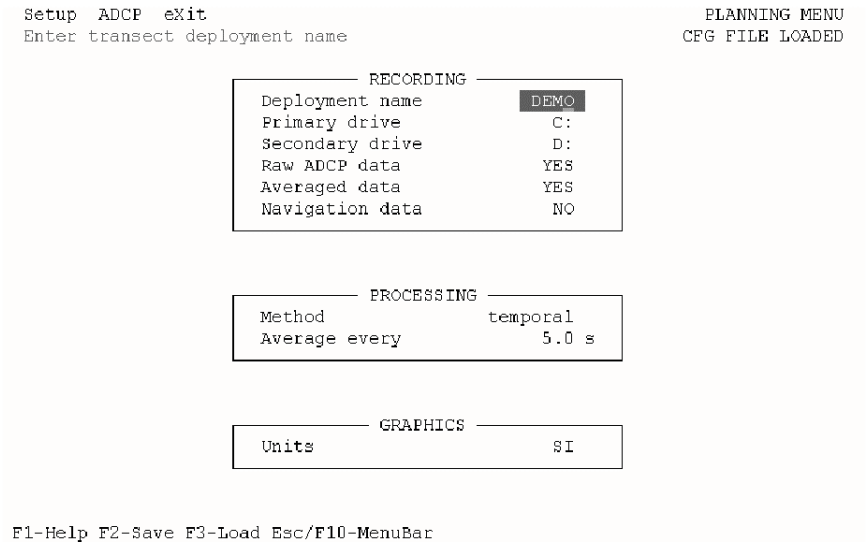

Figure 12. TRANSECT Planning - Setup Menu

b. Go to the **DEPLOYMENT NAME** field. Type in DEMO. *TRANSECT* uses this 4-character field to create the data file names made during data collection (see Appendix-A in the *TRANSECT User's Manual*). *TRANSECT* also uses the deployment name to create the storage directories on the primary and secondary drives. For example, if **PRIMARY DRIVE = C:**, **SECONDARY DRIVE = D:**, and **DEPLOYMENT NAME = DEMO**, then during data collection, *TRANSECT* creates data files with the prefix DEMO (DEMO####.###) and stores them in the C:\DEMO directory until that directory is full. *TRANSECT* then writes data to the D:\DEMO directory until full. *TRANSECT* will then stop data collection and alert you to the disk space problem.

c. In turn, go to the **PRIMARY DRIVE** and **SECONDARY DRIVE** fields. Set these fields as appropriate for your computer. *TRANSECT* checks to see if the drive exists. If not, *TRANSECT* alerts you. If you select a floppy drive that does not have a disk installed, it may take a moment for *TRANSECT* to determine if the drive exists.

d. In turn, go to the **RAW ADCP DATA**, **AVERAGED DATA**, and **NAVIGATION DATA** fields. These fields toggle the recording of the associated data during data collection. Set **RAW ADCP DATA** and **AVERAGED DATA** to YES and **NAVIGATION DATA** to NO.

e. You will now select the averaging method and interval for the display updates in the **ACQUIRE** menu and for the averaged data files. For now, we will average over time (temporal) rather than distance (spatial). Go to the **METHOD** field. If necessary, press `k` to select **TEMPORAL**. Go to the **AVERAGE EVERY** field. Enter a time that you wish to see screen updates (typically 120 seconds).

f. Go to the **UNITS** field. If necessary, press `k` to select the **SI** (metric) units of measurement for the displays.

g. Press `aA` to select the **ADCP** submenu (Figure 13).

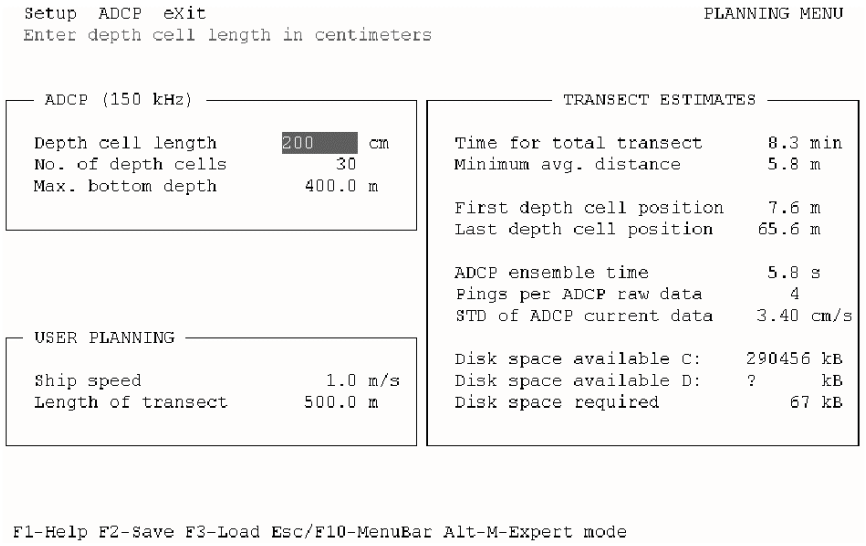

Figure 13. TRANSECT Planning - ADCP Non-Expert Menu

h. Use the default values in the non-expert mode to set the ADCP profiling parameters. The **ADCP HARDWARE** information from the configuration file and the **DEPTH CELL LENGTH, NO. OF DEPTH CELLS MAX. BOTTOM DEPTH, SHIP SPEED**, and **LENGTH OF TRANSECT** fields produce a set of **TRANSECT ESTIMATES** that help you evaluate your settings. The settings are only estimates for the ADCP ensemble. The next section describes how to calculate STD and range over your entire *TRANSECT* averaging interval. You can use the aM-Expert mode (Figure 14) to tailor your profiling parameters for special deployment requirements.

i. Press aX to call up the **EXIT** submenu. Press S to **SAVE**.

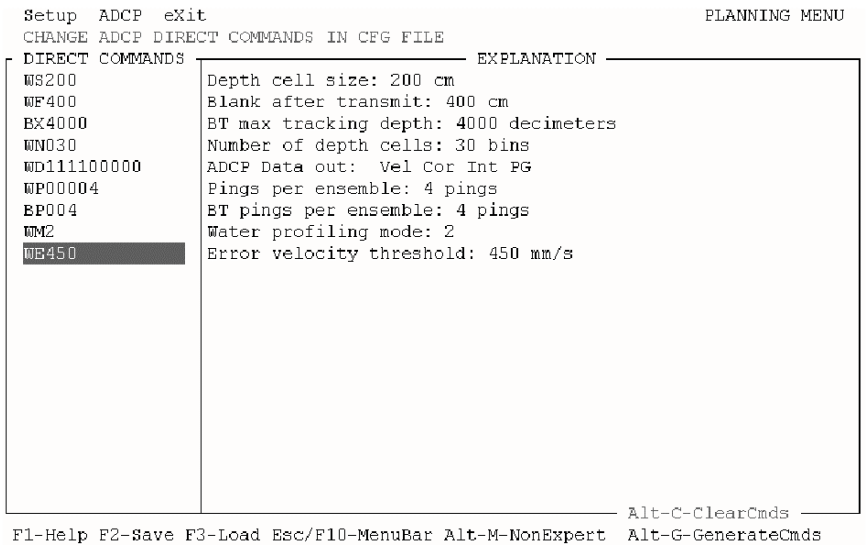

Figure 14. TRANSECT Planning - ADCP Expert Menu

4.4 Reference Layer Calculation

A reference layer is now calculated by the *TRANSECT* program from the water profile data. The user must manually edit their CFG file to select the bins that they wish to use for the reference

layer. This selection is done inside the GRAPHICS section of the CFG file. The user must select the first bin and the last bin they wish to use for the reference layer.

By default the Reference Layer will be disabled and will appear as follows:

```
Ref_Layer          (      0      0    bin )
```

To set a reference layer simply enter a bin number in the first value to select the starting bin of the reference layer. The second value selects the bin to end the reference layer. The following example will select a reference layer from bins 4 - 10. Note, the reference layer includes the bins entered and all bins between.

```
Ref_Layer          (      4      10    bin )
```

To use the reference layer you must use the ALT-R feature in the Acquire or Playback Menus of the *TRANSECT* program. To turn off the reference layer set each of the values back to 0.

4.5 Automatic Reference Changing

TRANSECT can now automatically change the reference it uses for the data. The AUTO feature can be selected during ACQUIRE or PLAYBACK by pressing the ALT-R keys. Selecting AUTO will allow the user to switch automatically from one feature to the next. This switch only occurs if the current reference is invalid. When AUTO is selected the user can determine which reference is being used by looking at the bottom right corner of the screen. The letter for the correct reference is displayed there. Please note these letters will only update when the data is actually plotted.

The order of auto switch can be set by the user by editing the CFG file. The user must edit the order of the letters in the Velocity Reference setting on the first line of the Graphic Menu setting in the CFG file. The selection of automatic switching is done through the ALT-R command in either the Acquire or Playback Menus.

The following line has been added to this section of the configuration file.

```
Velocity Reference (    AUTO    *GLNB* )
```

The order of the letters in between the asterisk (*) characters determine the order of the auto switch. The letters stand for the following references:

B = Bottom
L = Water Layer
G = Navigation
N = None

The default selection is Bottom, Navigation, Layer, None (*BGLN*).

4.6 Saving the Configuration File

Press `aX` to call the **EXIT** submenu. You have four options.

- **SAVE** writes the communication setup to the current CFG file, and then exits to the **MAIN** menu.
- **SAVE AS** lets you write the communication setup to a new CFG file, and then exits.

- **EXIT** takes you to the **MAIN** menu without saving the setup.
- **CANCEL** (or ^) closes the **EXIT** submenu, but does not exit *TRANSECT*.

Press S to **SAVE** the setup.

4.7 Sample TRANSECT Configuration File

The following sample *TRANSECT* configuration file is included on the *TRANSECT* program disk. The file name is osdef.cfg.

```
BEGIN RDI CONFIGURATION FILE

COMMUNICATIONS
{
ADCP          ( ON   COM1 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
ENSOUT        ( OFF  COM4 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
NAV           ( OFF  COM2 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
REFOUT        ( OFF  COM4 4800 N 8 2 ) [ Port Baud Parity Databits Stopbits ]
EXTERNAL      ( OFF  COM3 9600 N 8 1 ) [ Port Baud Parity Databits Stopbits ]
}

ENSEMBLE OUT
{
ENS CHOICE    ( N N N N N N N N )  [ Vel Corr Int %Gd Status Leader BTrack Nav ]
ENS OPTIONS   (BOTTOM   1   8   1   8 )  [ Ref First Last Start End ]
ENS TYPE      (  RAW )  [ RAW (default) or AVERAGED data transmitted ]
}

ADCP HARDWARE
{
Firmware        ( 14.04 )
Angle           (      30 )
Frequency       (      38 )
System          (    BEAM )
Mode            (       1 )
Orientation     (    DOWN )
Pattern         (  CONVEX )
}

DIRECT COMMANDS
{
WS2400
WF600
BX30000
WN050
WD111100000
WP00001
BP000
WM1
WV650
TP000190
TE00000200
}

RECORDING
{
Deployment ( TEST )
Drive 1    (   C  )
Drive 2    (   D  )
ADCP       ( YES )
Average    ( YES )
Navigation ( YES )
}
```

```
CALIBRATION
{
ADCP depth                 (    0.00 m      )
Heading / Magnetic offset  (   0.00      0.00 deg )
Transducer misalignment    (    0.00 deg    )
Intensity scale            (    0.43 dB/cts )
Absorption                 (   0.022 dB/m   )
Salinity                   (    35.0 ppt    )
Speed of sound correction  (      NO        )
Pitch & roll compensation  (     YES        )
Tilt Misalignment          (    0.00 deg    )
Pitch_Offset               (    0.000 deg    )
Roll_Offset                (    0.000 deg    )
Top discharge estimate     (    CONSTANT    )
Bottom discharge estimate  (    CONSTANT    )
Power curve exponent       (      0.1667   )
Edge_slope coefficient     ( -1.00000 ) [-1=Trianglar(0.3535):-2=Square(0.91):User]
}

PROCESSING
{
Average every ( 120.00 s )
Depth sounder (  NO )
MaxFileSize ( 1200 )
Refout_info (   1   8  30.00  1.000 0      1) [bins:1st last, limit, weight, format,
delaysec]
External_formats  ( N N Y N N )  [ HDT HDG RDID RDIE ]
External_decode   ( Y Y Y  N ) [ heading pitch roll temp ]
Start_Shore_distance  ( -1 ) [ cm ]
End_Shore_distance    ( -1 ) [ cm ]
Edge_distance_prompt  ( NO )
}

GRAPHICS
{
Units        ( SI )
Velocity Reference (    AUTO    *LGBN* )
Vessel             ( NONE )
Ref_Layer          (      6     15   bin )
East_Velocity      (  -25.0   25.0  cm/s )
North_Velocity     (  -25.0   25.0  cm/s )
Vert_Velocity      (  -10.0   10.0  cm/s )
Error_Velocity     (  -10.0   10.0  cm/s )
Depth              (      1     40   bin )
Intensity          (      0    200     dB)
Discharge          (  -1000   1000  m3/s )
East_Track         (   -100    100     m )
North_Track        (   -100    100     m )
Ship track         (  1 bin  100.0  cm/s )
Proj_Velocity      ( -100.0  100.0  cm/s )
Proj_Angle         (    0.0  deg from N )
Bad_Below_Bottom   (   NO  )
Line1              (                                                    )
Line2              (                                                    )
}

HISTORY
{
SOFTWARE       ( BB-TRANSECT )
Version        ( 3.03 )
}

END RDI CONFIGURATION FILE
```

4.8 Using NAVSOFT with TRANSECT

The *NAVSOFT* program is used with *TRANSECT* to collect, store, and display navigation data. *NAVSOFT* uses the program *NAVCFG* to create a configuration file to decode the navigation data.

This section describes how to operate the *NAVSOFT* program within *TRANSECT*. Before starting *TRANSECT*, you must have created at least one valid .NAV file using the *NAVCFG* program (N-5 in the *TRANSECT User's Manual*). You also should have the *TRANSECT* program ready for deployment, except for setting up *NAVSOFT* inside *TRANSECT*. If you have not yet set up *TRANSECT* and created a *TRANSECT* configuration file (.CFG) for your deployment proceed as follows.

a. Start *TRANSECT* and from the MAIN MENU, load the COMMUNICATION menu.

b. Press `aN` to go to the **NAVIGATION** submenu. Use the cursor keys to highlight the **NAVSOFT SOFTWARE INTERRUPT NUMBER**. Enter a value from 242 to 255 (0F2h to 0FFh). A value outside this range disables the *NAVSOFT* interface. You do not need to set the serial port settings in this menu because *TRANSECT* will use the settings set up in the *NAVCFG* configuration file.

c. Press `aA` to go to the ADCP submenu. Set the NAVIGATION option to YES to enable the navigation interface. *TRANSECT* is now set to "call" *NAVSOFT* during data collection.

d. EXIT the COMMUNICATION menu and SAVE your settings to a *TRANSECT* configuration file.

4.9 NAVSOFT Enhancements

Variable Field Length Decoding

The following features were included in version 3.23 of *NAVSOFT*.

The *NAVSOFT* program which is used to send navigation data to *TRANSECT* has had a feature added that now allows it to decode the variable field lengths found in the $--VTG NMEA string. The NMEA string $--VTG provides navigation speed over ground and course over ground. This output is a better source for navigation speed and direction than the dead reckoning fix done in earlier versions of *NAVSOFT*.

To use this new feature follow the normal setup instructions for the *NAVCFG* program. You must still select Latitude, Longitude, and time the normal way. This is easiest to obtain out of the NMEA $--GGA string. To select the speed and direction from the $--VTG line place the cursor on the comma before the field. Selecting the comma will command the *NAVCFG* program to decode the comma-delimited field preceding the comma you just selected. Note, this comma delimited feature is only applicable to the $--VTG line.

For this feature to work properly you must have at least 3 lines of NMEA data being transmitted by the GPS device to the ADCP computer. The order of these three lines must not change. The lines must be in this order $--GGA, followed by $--VTG and then any other NMEA line. There can be other lines around these 3 lines but the order of these lines cannot change.

To start this properly you must be sure that the start delimiter is set to $--GGA and the end delimiter is set to the starting delimiter of the third line. For example, if the output format from your navigation device had the following format:

```
$GPGLL,3401.070,N,13948.751,E
$GPGGA,054713,3401.070,N,13948.751,E,1,8,000,00011,M,0041,M
$GPVTG,336.0,T,336.0,M,014.7,N,027.3,K
$GPRMC,054713,A,3401.070,N,13948.751,E,014.7,336.0,130698,000.0,E*76
$GPZDA,054714,13,06,1998,-9
```

Your start delimiter is $GPGGA. Your end delimiter is $GPRMC. The lines $GPGLL and $PGZDA will be ignored by the *NAVSOFT* program (but will still be captured by the *TRANSECT* program in the navigation files).

Averaging Interval Change

The following features were included in version 3.20 of *NAVSOFT*.

The *NAVSOFT* program is used with *TRANSECT* to collect, store, and display navigation data. *NAVSOFT* uses the program *NAVCFG* to create a configuration file to decode the navigation data. *NAVCFG* has a feature that passes the velocity data (speed and direction) through a smoothing filter. This filter helps smooth out some of the noise associated with navigation fixes. The velocity output of this smoothing filter from *NAVSOFT* is what is sent to *TRANSECT* as the navigation speed and direction. Note that the navigation Latitude and Longitude fixes that are output from *NAVSOFT* are a simple average of all the fixes that come into *NAVSOFT*. These averaged fixes are than sent from *NAVSOFT* to *TRANSECT*.

The latitude, longitude, and smoothed velocity data that *TRANSECT* receives are handled differently:

- The latitude and longitude values are accumulated until the user-selected averaging interval is reached; these values are then averaged before being written to the screen and to the Processed data file.
- The smoothed velocity values are NOT accumulated. Each new smoothed velocity fix received overwrites the last smoothed velocity fix. This is because you cannot average smoothed data points.

The navigation velocity data is used as a reference to remove vessel motion whenever you select the navigation data as a reference (ALT-R in the Acquire or Playback menus). Since the smoothed velocity data is only the last fix read by *TRANSECT*, this data may not represent the actual velocity of the ship over the user-selected averaging interval.

Because of this, we have added a feature to disable the smoothing filter and allow *TRANSECT* to do a straight average of the velocity data. The following explains how you must set up your ADCP to use this feature. Please note that you must have *TRANSECT* version 2.80 or later to use this new feature.

a. *NAVCFG* Changes. We must first disable the smoothing filter in the navigation configuration file. This is done through the *NAVCFG* program.

   1. Type NAVCFG at the DOS prompt.

2. You will be prompted to either create a configuration file or load an existing configuration file. If you already have a configuration file, enter "2" to load an existing configuration file. If you are creating a configuration file, use Appendix N of the *TRANSECT* manual for help before continuing to step (3).

3. Press the <Page Down> key until you are in the last window of *NAVCFG* and see the entry for the VELOCITY FILTER WIDTH.

4. The cursor will be next to the VELOCITY FILTER WIDTH window. Press the space bar, and the cursor will move into the window. Enter "0" (zero).

5. Press the <Esc> key to save the configuration and return to the main menu of *NAVCFG*.

6. Enter "0" (zero) to exit *NAVCFG*.

b. *TRANSECT* Changes. You now need to tell *TRANSECT* to average the navigation data coming from *NAVSOFT*. This is done from the DOS prompt *before* you enter *TRANSECT*. Do *one* of the following steps:

- Before entering *TRANSECT*, type in the following at the DOS prompt: SET AVGNAVVELS=Y
- Since the above setting must be entered *before* you start *TRANSECT*, you may find it easier to create a batch file that would automatically do this for you. To do this, return to the drive/directory from where you started *TRANSECT*. Using a text editor, create a file called ADCP.BAT. The first two lines of the batch file switch to the drive and directory where *TRANSECT* resides. The next line turns ON the navigation average feature. The last line starts *TRANSECT*. For example:

```
C:
CD C:\RDI
SET AVGNAVVELS=Y
TRANSECT
```

5 Deploy the ADCP

At this point, you should have created a *TRANSECT* setup. You are now ready to deploy the ADCP. The following steps will help guide you through the necessary steps for deploying the ADCP.

5.1 Physical Inspection

Before using the ADCP, you must prepare the ADCP for deployment. *Read Chapter 4 of the Ocean Surveyor Technical Manual for detailed information on preparing the ADCP for deployment*.

a. Before deploying the ADCP, you must consider its physical condition. Minor dents, corrosion, and missing paint may not seem crucial to the deployment, but could prove to be damaging. Electrical continuity, the condition of the transducer faces, and watertight integrity are critical to the operation of the ADCP.

b. To help prevent shorts caused by condensation, you must let both the temperature and humidity reach equilibrium.

c. Install the top hat end-cap on the ADCP transducer. Make sure *all* of the o-rings on the waterproof I/O cable connector are installed.

d. Objects within about 100 meters (328 feet) of the surface are subject to biofouling. Soft-bodied organisms usually cause no problems, but barnacles can cut through the urethane transducer face causing transducer failure and water leakage into the ADCP. If you are deploying the ADCP in an area subject to biofouling, be sure you take steps to prevent excessive growth of sea life on the transducer faces.

The ADCP measures water velocity along four, narrow, vertically inclined acoustic beams. For accurate current measurements, the water mass in the deployment area must be free of strong acoustic reflectors (e.g., platform members, large cables) within a "15° conical sector along each beam. Figure 15 shows the clearance zone required for each beam.

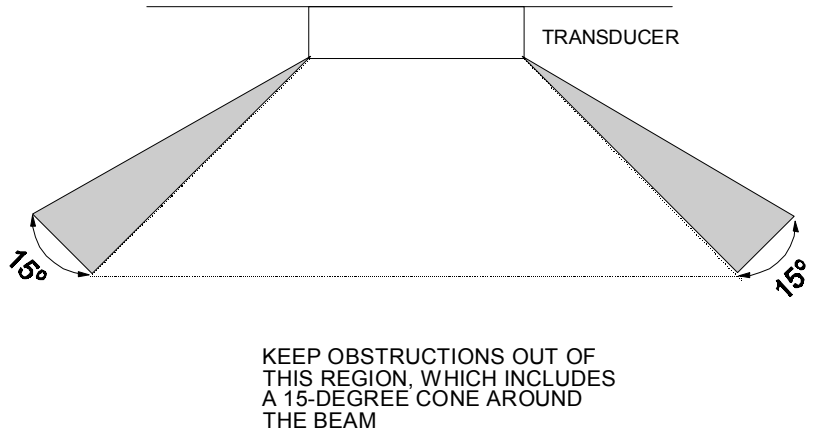

Figure 15. Beam Clearance Zone

5.2 Vessel Mount Special Considerations

Use the following suggestions when mounting the ADCP to a moving platform.

- It is desirable to rigidly mount the ADCP to the vessel. You want to avoid the free spinning of the ADCP in this application. The ADCP must stay in the water at all times.
- The ADCP must be mounted deep enough so that turbulence caused by its movement through the water does not allow air bubbles to be attached to the transducer faces.
- Avoid mounting the ADCP near motors and thrusters. They cause air bubbles and will cause bias to the internal compass.
- Avoid mountings that will cause the ADCP to see severe accelerations.

5.3 Test the ADCP

This section explains how to test the ADCP with RDI's *BBTALK* program. These tests thoroughly check the ADCP in a laboratory environment, but are no substitute for a practice deployment. These tests do not calibrate the ADCP. You should test the ADCP:

- When the ADCP is first received.
- Before each deployment or every six months.
- When instrument problems are suspected.
- After each deployment.

These test procedures assume all equipment is working. The tests can help you isolate problems to a major functional area of the ADCP. For troubleshooting information, see Chapter 6 of the Ocean Surveyor Technical Manual. For help on using *BBTALK*, see Chapter 5 of the Ocean Surveyor Technical Manual.

Use the following steps to interconnect the ADCP system and to place the ADCP in a known state.

a. Interconnect and apply power to the system as described in Figure 1.

b. Start *BBTALK* by typing BBTALKe.

c. Send PAe. You should see a message similar to the following.

```
>PA
RAM test..........PASS
ROM test..........PASS
```

6 Using Transect to Collect Data

TRANSECT is RDI's real-time software data collection program. This program creates a configuration file to operate the ADCP, checks each command, and verifies that the ADCP has received the command. You have already done most of these steps, now it is time to perform the final actions to begin collecting data.

6.1 Setting the Time

When you first start *TRANSECT*, you need to set the time so that both the ADCP's and the computer's time are synchronized.

a. Go to the **CALIBRATION-OFFSETS** menu.

b. Enter the current date/time to the *next* minute.

c. Go to the **SEND NEW TIME** option; press e when the new time is reached to send the new time to the ADCP. *TRANSECT* displays the new time in the ADCP **TIME FIELD**.

d. The computer's time is shown only as a reference and is not used by *TRANSECT*. However, if the computer's time is not correct, exit *TRANSECT*, and set the computer's time using the *DOS* TIME command.

e. Return to the **MAIN** menu by pressing aX and save the configuration file.

6.2 Collecting Data

Use the ACQUIRE menu in *TRANSECT* to begin collecting data. Refer to the *TRANSECT User's Manual* for more information on how to use this program.

6.3 TRANSECT Acquire Menu Setup

At the MAIN menu, press A to load the ACQUIRE menu (Figure 3). Chapter 7 of the *TRANSECT User's Manual* explains this menu in detail. *TRANSECT* now tries to wake up the ADCP using the settings in the CFG file. If successful, *TRANSECT* sends the profiling parameters to the ADCP.

TRANSECT will "call" *NAVSOFT*'s LOAD FILE MENU if you enabled the Navigation and *NAVSOFT* interrupt number in the COMMUNICATION menu. Select the desired .NAV configuration file and load it by pressing e. Now press ^ to return to the ACQUIRE menu. You can now operate *TRANSECT* as you normally would except you have the added navigation features.

a. Review the displayed information screen (Figure 16). Most of this information is self-explanatory, as it is a summary of the settings from the other menus and from the CFG file. If a communication option and port information is in yellow letters (color) or has an asterisk (monochrome), the communication for that item is active. *TRANSECT* will read and record data for that communication port.

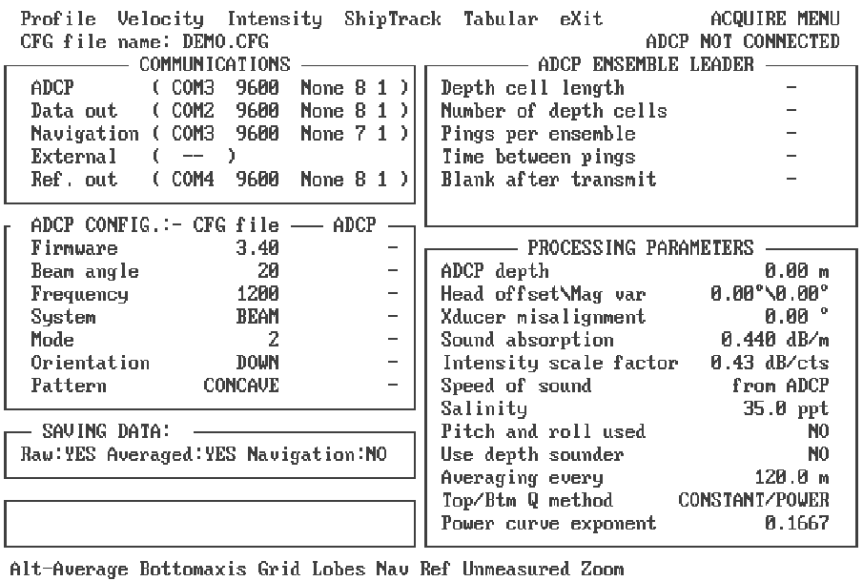

Figure 16. TRANSECT Acquire - Info Screen

b. The ADCP is now ready to collect data, but first we will review the layout of the display window. Press ^ to display the data collection screen (Figure 17). The right side of the screen shows the common data for each ensemble read from the ADCP. *TRANSECT* updates this area with each ADCP ensemble. This area also displays file information, the

active drive, the amount of free disk space, and discharge information. The left side of the screen shows the selected data display. *TRANSECT* updates this area at the end of the **AVERAGE EVERY** interval set in the **PLANNING** menu.

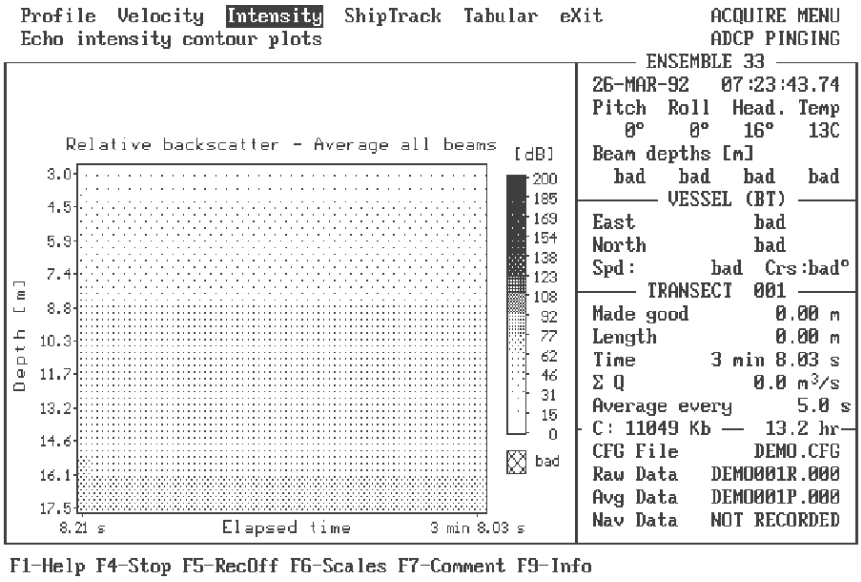

Figure 17. TRANSECT Acquire - Data Collection Screen

c. Press `aI` to select **ECHO INTENSITY** contour plot options. Now press `A` to display the **AVERAGE** of all four beams.

d. Press `o`-**COLLECT** to begin data collection. *TRANSECT* will not display real data if your system is not in water. Note that as *TRANSECT* receives data from the ADCP, the right side of the screen shows information from each ADCP ensemble. *TRANSECT* also records the raw data at this time. The averaging interval is 5.0 seconds, which means the first transect segment will be completed when the elapsed time reaches 5.0 seconds. *TRANSECT* will then make/update the display (plot) and record the processed (averaged) data.

e. Take some time to experiment with the different display options (**PROFILE**, **VELOCITY**, **SHIPTRACK**, **TABULAR**). Press `^` to see the alternate key options. Use `q` to scale the displays (Figure 18). Use `r` to add a comment to the plot.

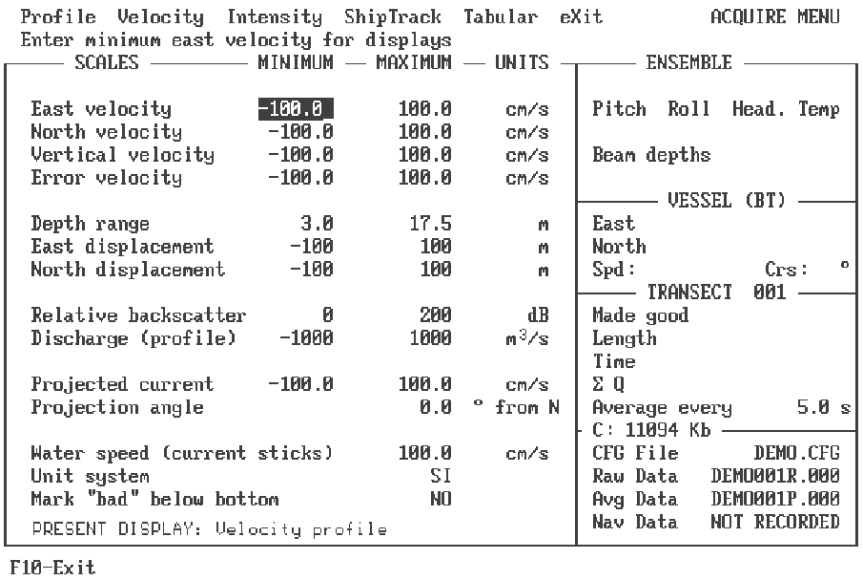

Figure 18. TRANSECT Acquire - Scales Menu

f. When you are ready to stop data collection, press `o`. Press `aX` and then `Y` to return to the **MAIN** menu. **ACQUIRE** automatically saves configuration data to the CFG file.

7 Recovering the ADCP

Before proceeding with any other action, rinse the ADCP with fresh, soapy water to remove soft-bodied marine growth. This also helps prevent the formation of salt crystals. Remove foreign material from the transducer faces as soon as possible (Chapter 4 of the Ocean Surveyor Technical Manual). Be sure to clean such critical places as the transducer assembly, and the I/O cable connector (Figure 4-1 of the Ocean Surveyor Technical Manual). If hard-bodied marine growth exists, you can remove it now or later. Dry the ADCP exterior with low-pressure compressed air or soft lint-free towels.

8 Backup the Data

Once you have stopped collecting data, you should get in the habit of backing up all data files. Here are several examples of how to backup data.

- Use PKZIP (available on RDI's BBS) to condense the files and store them on floppy disks. PKZIP has the ability to store large files (span) onto several disks.
- Backup your data to a tape drive or other device.
- Use the DOS backup command.
- Copy the data to another computer on a network.

9 TRANSECT Playback Menu

Use RDI's *TRANSECT* program PLAYBACK menu to replay ADCP recorded data. Chapter 8 of the *TRANSECT User's Manual* explains this menu in detail.

Start *TRANSECT* and press P to load the **PLAYBACK** menu (Figure 3). The first message on the screen asks you to press s to load your data files by deployment name, or n to load any file. Press s to load the previously recorded DEMO deployment (Figure 19).

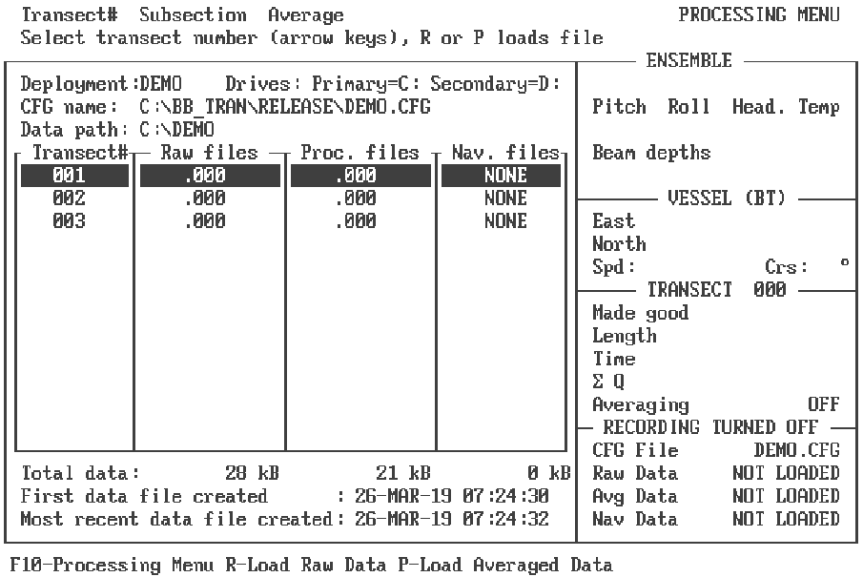

Figure 19. TRANSECT Playback - Processing Menu

a. The **PROCESSING** menu appears on the screen and lists your deployment data files. Press the down arrow to highlight transect 001. Press R (see bottom line on screen) to load the raw data file DEMO001R.000. Now press ^ twice to return to the **PLAYBACK** display menus (Figure 20). *TRANSECT* now displays the data for DEMO001R.000.

b. Most of the **PLAYBACK** options are the same as the **ACQUIRE** options. Take some time to experiment again. Use o to **PAUSE/RESUME** the playback of the data. Use the k to **STEP** through the data. Press a to see the **ALTERNATE KEY** options. Use aA to create an **ASCII-OUT DATA FILE**. Use aE to **ESTIMATE THE UNMEASURED SIDES** of a channel transect (Figure 21). Use aW to **REWIND** the data to the beginning of the file. Use the s-**PROCESSING** menu to subsection and average previously collected data.

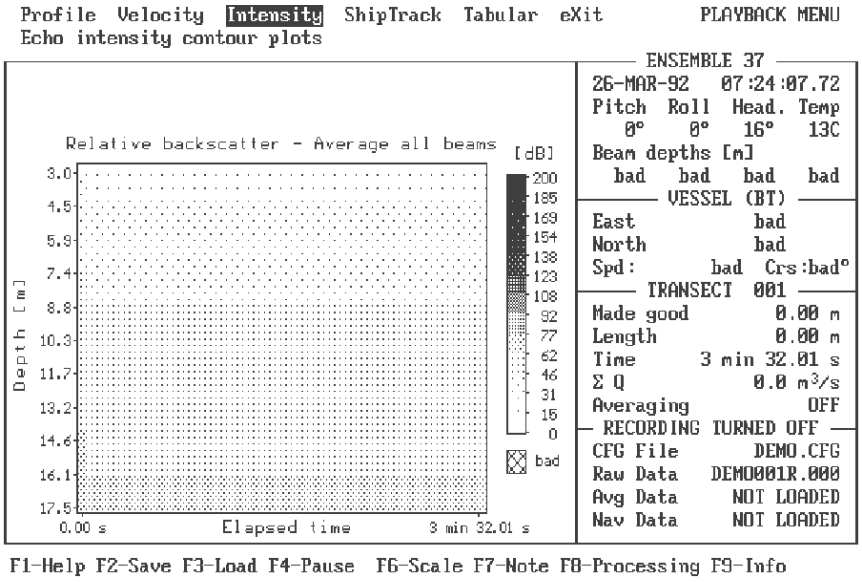

Figure 20. TRANSECT Playback Menu

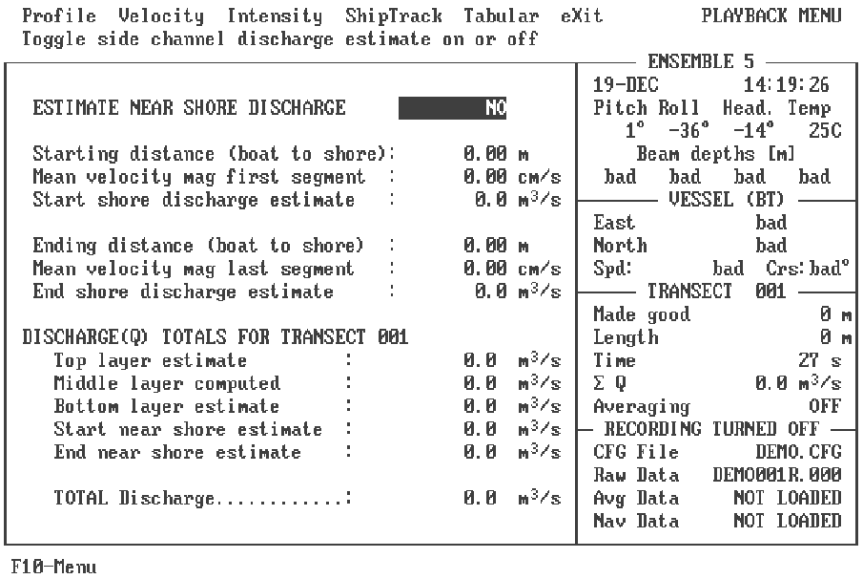

Figure 21. TRANSECT Playback - Estimate Side Menu

c. When you are ready to stop playback, press `aX` and then `Y` to return to the **MAIN** menu. **PLAYBACK** automatically saves configuration data to the CFG file.

You are now back in the **MAIN** menu. Press `Q` and then `Y` to leave the *TRANSECT* program. For more information on how to set and use the controls, refer to the individual chapters in the *TRANSECT User's Manual*. Each chapter covers one of the **MAIN** menu options.

10 Using NAVMERGE

NAVMERGE is a utility program that performs post processing of previously recorded raw navigation and *TRANSECT* processed ADCP data, and merges the navigation data into the processed ADCP data file. Actually, a new processed data file is created leaving the original intact. The new processed ADCP data file can then be played back into *TRANSECT*. The program can also produce a tabular output of the processed navigation data in a format suitable for spreadsheet analysis.

10.1 NAVMERGE Parameters

Access the drive/directory containing the NAVMERGE.EXE program and data files. The command to run *NAVMERGE* has the following format: navmerge parameters

Where parameters are the following:

Required Parameters

-Rname -Rname specifies the raw navigation data file, e.g. -rDPLY000N.000, or the starting file in a sequence.

-Cname -Cname specifies the navigation configuration file, e.g. -cLORAN.NAV. This file is obtained from the RDI NAVCFG program, and is a binary file that identifies the format of the raw navigation data. This file can have any name, but usually has the .NAV extension.

-Pname -Pname specifies the TRANSECT processed ADCP data file, for example: -pDPLY000P.000, or the starting file in a sequence.

-Oname -Oname specifies the output file, e.g. –oDPLY000.MRG, or whatever name you want to give it.

Optional Parameters

-G For those who need to decode navigation time data in GPS format. See explanation below in the section titled, GPS TIME. Most customers will not use this option.

-Mname Specifies the tabular output file, e.g. –mPNAV000.TAB, which is written in ASCII format by NAVMERGE, so that the data may be easily loaded into a spreadsheet for analysis. See description of tabular output below.

-S Causes a sequence of raw navigation and processed ADCP data files to be processed.

-Ttau Specifies a time constant for the velocity exponential smoothing filter. This value, tau, will override the value in the navigation configuration file.

-? Causes NAVMERGE to display the command line syntax and exits to DOS without further processing.

The *NAVMERGE* program will display activity dots on the screen during processing to let the user know that the program is working. Upon completion of the merging process, *NAVMERGE* will return the user to the DOS prompt. When the ratio of raw navigation data points to processed ADCP ensembles is high, the activity dots on the screen during the merge process will be slow. It just means that more navigation data is being processed between the dots.

Examples

NOTE. The file names used in the following command lines are examples, where DPLY represents a deployment name, the three digit number in the base name represents a transect number, and the three digit number in the extension represents a sequence number.

To process a single file set, i.e. a single matched pair of raw navigation and *TRANSECT* processed ADCP data files, use the following format (of course, substitute your own file names):

```
navmerge -rDPLY000n.000 -cloran.nav -pDPLY000p.000 -oDPLY000.dat
```

If you want a tabular output of the processed navigation data, add the -M option, as follows:

```
navmerge -mPNAV000.TAB -rDPLY000n.000 -cloran.nav -pDPLY000p.000 -oDPLY000.dat
```

And if you want to process a sequence of files (i.e. consecutive file extension numbers with the same base names), add the –S option to one of the previous command lines as follows:

```
navmerge -s -rDPLY000n.000 -cloran.nav -pDPLY000p.000 -oDPLY000.dat
```

This example will process the raw navigation data files DPLY000N.000 through DPLY000N.005, for example, if there are six raw navigation data files in the sequence. Similarly, the sequence of *TRANSECT* processed ADCP data files, DPLY000P.000 through DPLY000P.*nnn* will also be processed if *nnn* + 1 processed data files that exist. Processing stops when either processed ADCP data or raw navigation data is exhausted.

10.2 NAVMERGE Syntax Rules

The ordering of the command line parameters is not significant, and the option letters may be upper or lower case. The dash character preceding the option letter is required (or it may be a forward slash, "/") and there must be no intervening spaces between the "-", the option letter, and the filename introduced by that option. Parameters must be separated by one or more spaces, and there must be one or more spaces between the program name and the first parameter.

10.3 Tabular Output Data

If the -M option is used, an ASCII file is created by *NAVMERGE* and filled with the processed navigation data.

A single title line appears on the first line of the file, identifying the fields. All other lines in the file contain only numbers, i.e. the navigation data values. The field names are abbreviated, and are as follows:

VSE	Smoothed East Velocity (m/s)
VSN	Smoothed North Velocity (m/s)
DSE	East Displacement (m)
DSN	North Displacement (m)
DIST	Total Distance Traveled (m)
MLAT	Mean Latitude (degrees)
MLON	Mean Longitude (degrees)
FILW	Filter width, or time constant used in the velocity-smoothing filter. This value is obtained from the navigation configuration file (i.e. the file produced by NAVCFG), unless specified on the command line with the -T option.

Each record of processed navigation data appears on a single line, with the fields listed in the order shown above. Commas separate fields. All data is in ASCII format, and the file may be edited with any text editor. A word processing program is not recommended for editing this file as it may introduce non-ASCII control characters that will prevent the file from being properly interpreted by the analysis program (i.e. spreadsheet).

10.4 GPS Time

The RDI *NAVCFG* program, which is used to create the navigation configuration file, currently does not allow decoding of GPS time format (i.e. GPS week number and Time-Of-Week) as it is not one of the NMEA standard formats. This option has been added to tell *NAVMERGE* to treat the "Julian Day" field as a GPS week number, and to treat the "Seconds" field as a GPS Time-of-Week (i.e. seconds since midnight Saturday night/Sunday Morning). Most customers will not use this option.

NOTE. Although NAVCFG will allow you to set up your time decoding in this way, it will fail to decode the data because the values for seconds will be too large. Do not worry about the error messages given by NAVCFG if you are just going to run NAVMERGE. NAVMERGE will properly decode this data if the –G option is used.

10.5 Exiting NAVMERGE

NAVMERGE automatically exits to DOS when processing is complete.

10.6 Adding Navigation Data to TRANSECT Processed Data Files

The *TRANSECT* program can collect data in 3 different ways Raw ADCP data, Raw Navigation data, and Processed data. Each of the files contains its own data structure.

The Raw ADCP data files contain the data as the ADCP sent it out to *TRANSECT*. This means the data is in the ADCP data format. The description of this data format is found in the Ocean Surveyor Technical Manual (Appendix-D).

The Raw Navigation data files contain the data as the navigation device sent it out to *TRANSECT*. Additionally, there is a header in front of each block of navigation data that contains an ADCP ensemble number and PC time. The PC time is not useful for most cases. The ADCP raw ensemble number indicates that all data after this number was sent from the navigation device to *TRANSECT* during that particular ADCP ensemble. This allows you to link the raw Navigation data to the raw ADCP data. The format of the navigation data in this file is the same as what the navigation device sent out.

The Processed data (or average data) is the ADCP raw ensembles converted to earth coordinates and averaged over the time period set by you in the Planning Menu of *TRANSECT*. This data also can contain navigation data when *TRANSECT* is used with *NAVSOFT*. If *NAVSOFT* is not used there will be no navigation data in the file. The format for the Processed data file is found in the *TRANSECT* manual.

Sometimes you may wish to average your data over a different time period than when you originally collected the data. The only way to do this is to re-average the Raw ADCP data over a different time period in the Playback Menu. This data can then be stored in a new Processed data file. However, it is not possible to average in the Raw Navigation data into this file through *TRANSECT*. The only way this can be done is if you use the *NAVMERGE* program.

To add navigation data to a Processed data file use the following procedure.

a. Create a Processed data file with the Playback Menu of *TRANSECT*. You must use the F8 function key to save the data and set the averaging interval.

   Note: if you have a Processed data file already and wish to overwrite the navigation data in the file then just continue with the next step.

b. Use the program *NAVMERGE* to add the raw Navigation data to the Processed data file. You must have the following to complete this task.

   - Raw Navigation data created by *TRANSECT*
   - A Navigation configuration file, i.e. *.nav (see notes below if you do not have one)
   - A Processed Data file

   If you need to create a navigation configuration file use the following steps.

   1. Copy your Raw Navigation data created by *TRANSECT* to a file named DEMO.DAT.
   2. Run the program *NAVDEMO*. This program is provided with the *NAVSOFT* program and on the *TRANSECT* distribution disk.

3. Enter a 1 to select the option Configure Navigation interface. The Raw Navigation data file will now start to scroll on the screen. Follow the instructions on how to create a configuration file for the *NAVCFG* program found in the *TRANSECT* manual.

4. After completion, save the file for use with *NAVMERGE*.

11 Using BBLIST

BBLIST takes the binary data files created by our ADCP and lets you convert selected data fields to common units of measurement in an ASCII-text format. You can then use the ASCII files in programs that accept this format. *BBLIST never* alters your original ADCP binary data files. *BBLIST* lets you:

- Set processing parameters.
- Transform velocity data.
- Select the display/conversion limitations (e.g., data fields, bin range, ensemble range, output file size).
- Select the ADCP data fields to display or convert.
- Monitor and control the conversion process.
- Look at radial beam data.

11.1 Starting BBLIST

To start *BBLIST*, do the following:

BBLISTe - Starts *BBLIST* and lets you select the ADCP binary data file from within the program.

BBLIST C:\BBDATA\TEST.000 /Me - Starts *BBLIST* and loads the TEST.000 file located on the C: drive in the BBDATA directory. The /M forces *BBLIST* to use monochrome screens.

When you run the program the first time, *BBLIST* displays its introduction and copyright screen. During operation, *BBLIST* creates/updates a pointer file named BBLIST.PTR. This file saves the current working directory, the name of the last binary file used, the name of the format file (*.FMT) last used, and the color selection. This may help save you time by automatically calling up the files you used last. If you need to see the introduction screen again, you must first delete or rename the BBLIST.PTR file.

Extensive help is available while using *BBLIST* by pressing `l`. The help screen lists all of the menus and a description of each option available. You may also print the help screen file by printing the file BBLIST.DOC.

11.2 BBLIST Menus

BBLIST has four main menus (Figure 22) to guide you through the steps needed to convert an ADCP binary raw data file to an ASCII data file.

File Menu. Use this menu to save your menu settings and conversion layout selections to a configuration format file (*.FMT), to load a Ocean Surveyor binary data file or format file, to display the file information screen, or to exit *BBLIST*.

Process Menu. Use this menu to set the processing parameters for *BBLIST*. You can set the velocity reference, magnetic variation (declination), velocity measurement units, and depth measurement units.

Display Menu. Use this menu to select the type of data to view. Data available for display include ADCP setup, sensors, reference layer, bottom-track, and profile.

Convert Menu. Use this menu to convert the binary ADCP data set into ASCII. Before starting the conversion process, you can define the conversion limitations and the output format.

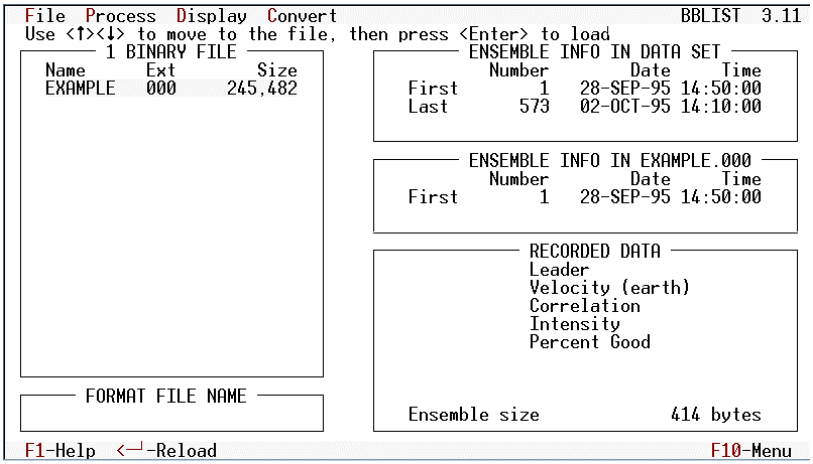

Figure 22. BBLIST Display

11.3 Using BBLIST to Convert Files

This is an example of how to convert the binary file EXAMPLE.000 to ASCII delimited text. For this example, we have chosen to extract only the magnitude, direction, and range data. Remember that *BBLIST* never changes your original data file - you can convert the raw data to as many different ASCII formats as desired.

Start BBLIST. To start *BBLIST*, type BBLISTe.

Load EXAMPLE.000 binary file. Press n to load the binary file.

Set the processing parameters. Use the PROCESS menu (Figure 23) to set the velocity reference, magnetic variation, velocity measurement units, and depth measurement units. Use the k key to toggle each setting.

Set the conversion parameters. Use the CONVERT, LIMITS menu (Figure 24) to set the conversion limitations and parameters. You may want to increase the Max file size to 1000 kB if you plan to back up the ASCII data to floppy disks.

Define the format. Consider the following:

- What data do you want to extract? For this example, we choose *magnitude*, *direction*, and *range*.
- What program will you export the ASCII data to? Does the program support space, tab, or comma delimited text? We choose space delimited text for the example. To change, select Field delimiter and press `k` to toggle between tab, comma, and space.
- Do you want vertical or horizontal placed data? For this example, we choose a vertical data format. To change, select Bin layout and press `k` to toggle between vertical and horizontal.

Begin defining the format by doing the following;

a. Select CONVERT, DEFINE FORMAT. When you first enter this screen, *BBLIST* displays only a FORMAT END marker. To begin entering data fields, press `e` to display the DEFINE FORMAT selection menu (Figure 25). If you make a mistake, select delete block and re-enter your choice.

b. Select ensemble info and press `e`. Select Number and press `e`.

c. Move the cursor to the FORMAT END marker and press `e`.

d. Select Profiles, Mag and Dir. Select M for magnitude and press `e`.

e. Move the cursor to LINE END and press `e`.

f. Select Profiles, Mag and Dir. Select D for direction and press `e`.

g. Move the cursor to LINE END and press `e`.

h. Select Profiles, Depth ref. Select R for range and press `e`. Your display should look like Figure 26.

View the format. Press `t` to view the format before converting (Figure 27). Use the `+` and `-` keys to increase the ensemble number. Press `t` again to return to the define format screen.

Save the format. Save the format to a *.FMT file for future use by pressing `m` and naming the file (example; MYFORMAT).

Begin the conversion. Select CONVERT, START CONVERSION. Enter a file name for the ASCII file data set. **Be sure to use a file name that differs from any existing file name.** Do not use the name of the binary data set. If *BBLIST* detects that the file name already exists, you are given the option to overwrite the existing files.

11.4 Using a BBLIST Format File to Convert Files

Start BBLIST. To start *BBLIST*, type BBLIST`e`.

Load EXAMPLE.000 binary file. Press `n` to load the binary file.

Load Format file. Press `n` to load the format file.

Begin the conversion. Select CONVERT, START CONVERSION. Enter a file name for the ASCII file data set. **Be sure to use a file name that differs from any existing file name.** Do not use

the name of the binary data set. If *BBLIST* detects that the file name already exists, you are given the option to overwrite the existing files.

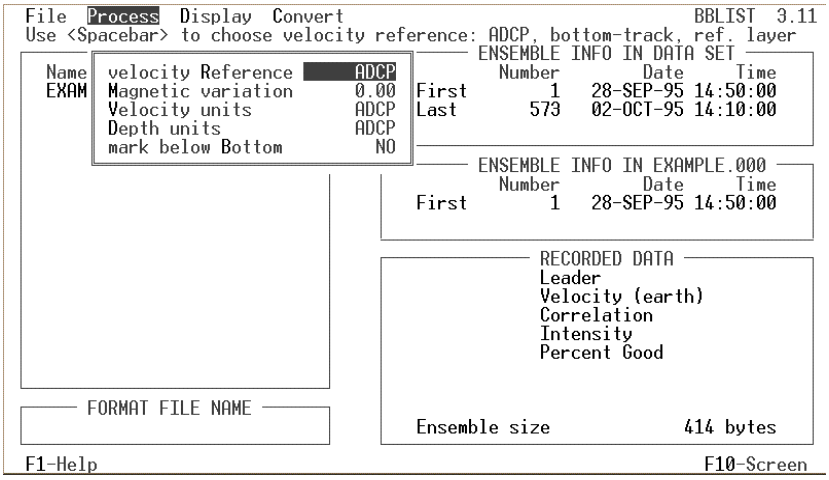

Figure 23. Set the Processing Parameters

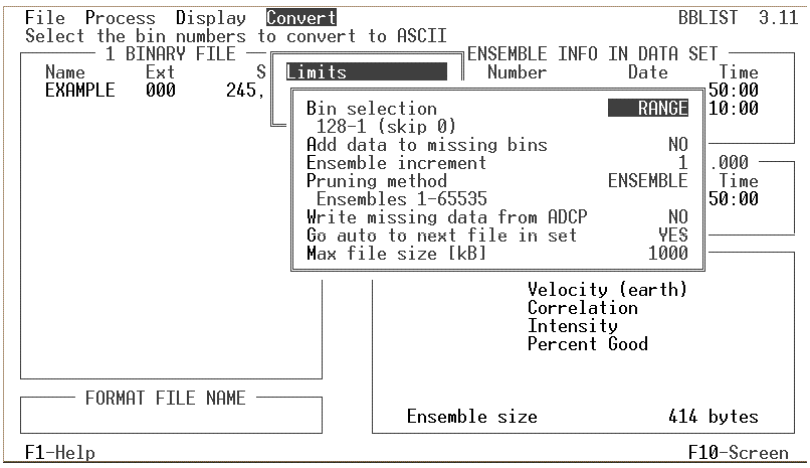

Figure 24. Set the Conversion Limitations and Parameters

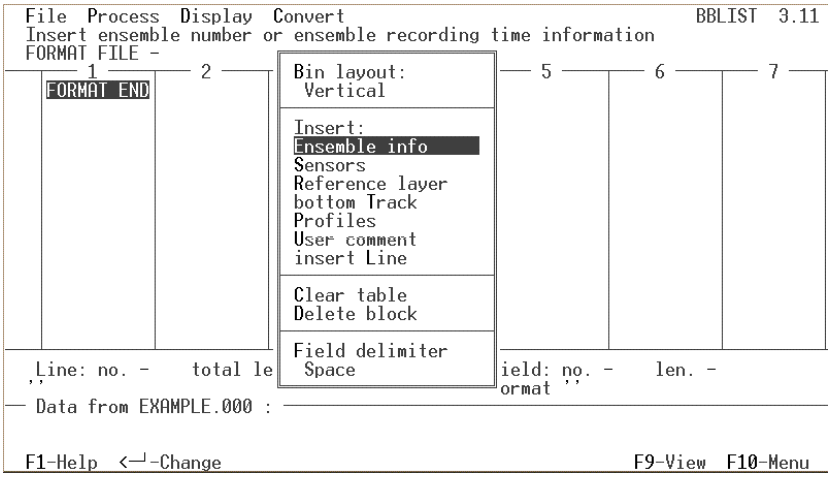

Figure 25. Define Format Selection Menu

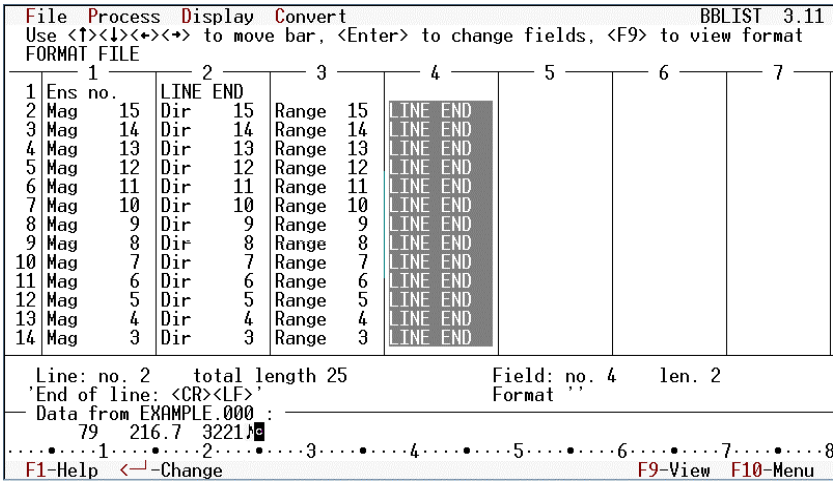

Figure 26. Defining the Format

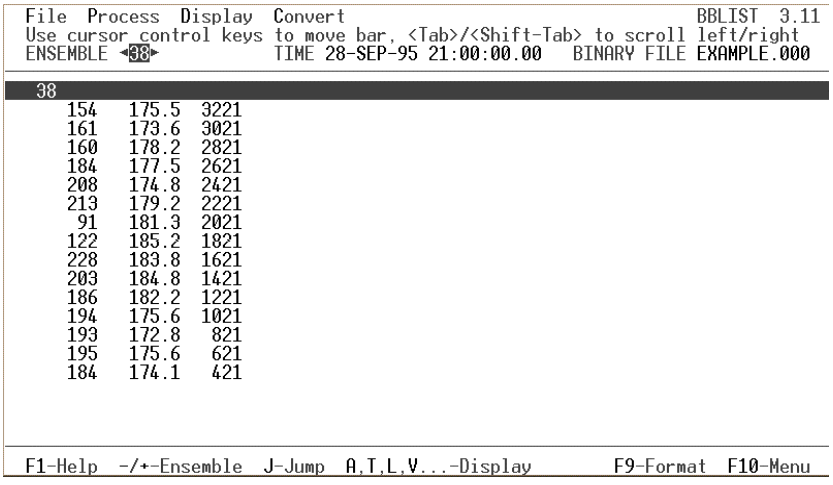

Figure 27. View the Format before Converting

11.5 Report File

When the conversion process is complete, *BBLIST* creates an ASCII report file (*.RPT). You can view this file with any text editor. This file contains the following information about the settings and data in the converted files.

- *ADCP information* - system frequency, beam angle, number of profiling beams, transducer orientation (up/down), transducer pattern (concave/convex), transducer connection (connected/disconnected), and CPU firmware version number
- *ADCP setup* - number of bins, bin length, blank after transmit length, pings per ensemble, time per ping, and profiling mode.
- *ASCII file data format* - a description on the contents of each line in the converted data file (for one ensemble).
- *Processing parameters* - velocity units, velocity reference, depth units, bin sequence, magnetic variation.

Sample BBLIST report file:

```
REPORT FOR ASCII DATA CONVERSION
--------------------------------

1. ADCP INFORMATION:

   Frequency 300 kHz
   Beam angle 20 deg
   4 beam system
   Up-looking orientation
   Convex beam pattern
   Transducer head connected
   CPU firmware 8.01

2. ADCP SETUP:
   Number of bins 15
   Bin length 200 cm
   Blank after transmit 200 cm
   Distance to first bin 421 cm
   Transmit length 207 cm
   Pings per ensemble 300
   Time per ping 1.99 s
   Profiling mode 1

3. ASCII FILE DATA FORMAT:

   Line 1: Ensemble number
   Line 2-16: Magnitude , Direction, Bin range

4. PROCESSING PARAMETERS:

   Velocity units: ADCP
   Velocity reference: BT
   Depth units: ADCP
   Bins: From 128 to 1 skip 0 bin
   Magnetic variation 0.00 deg
   Do not mark data below bottom

END OF REPORT
-------------
```

11.6 BBBATCH Program

When you have mastered the *BBLIST* program, you can use *BBBATCH* to convert binary data sets to ASCII data sets in a DOS batch mode. This comes in handy when you have several data sets to convert or have a large data set that you want to convert overnight. Here is the syntax for *BBBATCH*:

BBBATCHkBinaryFileNamekFormatFileNamekAsciiFileName

- BinaryFileName = name of the binary data set to convert (no extension needed)
- FormatFileName = name of the format file to use
- AsciiFileName = name of the ASCII data set (unique name)
- Running *BBBATCH* without any command line parameters displays the syntax.

12 Preparing the ADCP for Storage

Before storing or shipping the ADCP, remove all foreign matter and biofouling. Remove soft-bodied marine growth or foreign matter with soapy water. Waterless hand cleaners remove most petroleum-based fouling. Rinse with fresh water to remove soap residue. Dry the transducer faces with low-pressure compressed air or soft lint-free towels.

CAUTION. The soft, thin urethane coating on the transducer is easily damaged. Do not use power scrubbers, abrasive cleansers, scouring pads, high-pressure marine cleaning systems, or brushes stiffer than personal hand cleaning brushes on the transducer.

If there is heavy fouling or marine growth, the transducer may need a thorough cleaning to restore acoustic performance. Barnacles do not usually affect ADCP operation. We do, however, recommend removal of the barnacles to prevent water leakage through the transducer face. Lime dissolving liquids such as Lime-Away break down the shell-like parts. Scrubbing with a medium stiffness brush usually removes the soft-bodied parts. Do NOT use a brush stiffer than a personal hand cleaning brush. Scrubbing alternated with soaking in a lime dissolving liquid effectively removes large barnacles.

After using a lime dissolving liquid, rinse the ADCP with fresh water to remove all residues. If barnacles have entered more than 1.0 1.5 mm (0.04 0.06 in.) into the transducer face urethane, you should send the ADCP to us for repair. If you do not think you can remove barnacles without damaging the transducer faces, contact RDI.

Before storing the ADCP, you may want to cover the body of the ADCP with a light coat of a high-viscosity silicone oil or grease to help prevent corrosion. Do NOT apply grease or oil to the urethane transducer faces.

NOTES