

MODEL 881A DIGITAL SONAR HEAD (Multi-Frequency)**WIN881A.EXE: Display Software For Windows XP/Vista/7/8/10/11****VERSION 3.07****OVERVIEW**

WIN881A is a Windows program that controls, displays and records data from the multi-frequency Model 881A Digital Sonar Head c/w an interface to control the optional Model 881A Azimuth Drive for profiling applications. There is also an interface for an optional internal or external Orientation Module. The program uses a 2-Wire RS-485 COM port (115200,N,8,1) to communicate with the head and an RS-232 COM port (4800,N,8,1) for receiving GPS Lat/Lng coordinates. The head can be operated at different ranges, gains, speeds, frequencies, etc. The Windows display mode must be at least 800 x 600 pixels with small fonts selected.

SCREEN LAYOUT

The main screen of WIN881A comprises of a sonar data window on the left side with various sonar head controls and a sector size icon on the right side. Other items include an operating frequency display, a x2 Pixel Zoom window, date/time readout, Lat/Lng readout, sonar head range/bearing readout to one or two cursors and a control for displaying real time data from the head or playback data from a file. Pop-up windows are available for controlling the Azimuth Drive, displaying pitch, roll and heading angles from the Orientation Module and for displaying sonar head diagnostics.

OPERATION

To operate the sonar head, ensure that the sonar head cable is connected to a 2-Wire RS-485 serial port or an external RS-485 to RS-232 (or RS-485 to USB) converter is installed in-line. Apply 20 to 36VDC to the sonar head power wires (+V to RED, -V to BLACK) using a DC power supply capable of supplying a current of 1 Amp (or 2 Amps with the Azimuth Drive connected). Run the program WIN881A.EXE and select the button DATA FROM '**HEAD**' on the right-hand side of the display. Ensure that the correct COM port is selected (Com Ports Menu) and depending on the RS-485 serial i/o card installed in your computer, select AUTO Enable or RTS (Request To Send) Enable. To allow other programs to use available CPU time, WIN881A can be put into standby mode simply by minimizing the main window.

MAIN MENU

File Menu

Record Start (Stop)...	opens a File Name Dialog Box so the user can input a filename for logging sonar data (shot by shot) complete with date/time and Lat/Lng coordinates. The file extension is always ' .81A '. The filename and current size (kbytes) of the file are displayed at the top of the screen. File recording continues until Record Stop is selected. Available only when DATA FROM ' HEAD ' is active.
Playback...	opens a File Name Dialog Box so the user can select and playback a previously recorded ' .81A ' Sonar file. Available only when DATA FROM ' FILE ' is active.
Copy Start (Stop)...	opens a File Name Dialog Box so the user can enter a filename for a new ' .81A ' file that can be used for making smaller data files from large pre-recorded sonar files. The filename and current size (kbytes) of the file are displayed at the top of the screen. File copying continues until Copy Stop is selected. Available when DATA FROM ' FILE ' is active.
Save Screen...	opens a File Name Dialog Box so the user can enter a filename for saving the screen as a ' .BMP ' Windows Bitmap file.
Auto Frame Capture	allows the user to automatically create screen captures for time-lapsed movie file creation. Whenever there is a scan direction change or whenever the sonar scans a full 360 degrees, a ' .BMP ' file of the screen is automatically generated. An incrementing number is appended to the filename for each successive screen capture, the format is "filename-nnnn.bmp". Select 'Auto Frame Capture Start...' to begin the capture process, then select 'Auto from Capture Stop...' to finish. Available when DATA FROM ' FILE ' is active.
Exit	writes current configuration to file (WIN881A.INI), closes the program and exits to Windows.

MAIN MENU (con't)

Heads Menu

Disable Sonar Head	this feature is not implemented.
Enable Azimuth Drive	used to enable/disable interrogation of the optional Model 881A Azimuth Drive. When enabled, the Azimuth Pop-up window is displayed showing the current azimuth angle setting. The message ' Detecting Azimuth Drive... ' will flash until communications are established with the azimuth drive. After 40 seconds, if the Azimuth Drive has not replied, the message 'Azimuth Drive Not Found' is displayed. If the this message is displayed and the Azimuth Drive has not finished calibrating, re-enable the drive in order to begin another detection process. If the Azimuth Drive will not be used, disable this setting. The profiling sonar connected to the Azimuth Drive must have its Xdcr Position set to Fwd and Zero Down must be selected in the Profile Menu.
Simulate Azimuth Drive	allows the user to manually operate the Auto-Azimuth function without having an Azimuth Drive connected.
Change Azimuth...	displays the Azimuth Pop-up window and allows the user to change the Azimuth angle from 0 to 359.7 degrees in 0.3 degree increments.
Orientation Module	used to enable/disable interrogation of the optional Orientation Module.

Color Table Menu

Norm Hi	normal high intensity color table used for mapping the echo data amplitude to a color for display. Color depth is 107 colors ranging from Black (low level) through Blue, Green, Orange, Yellow, White and Red (max level).
Norm Lo	normal low intensity color table.
Green	107 shades of green.
Grey	107 shades of grey (White on Black).
Rev Grey	107 shades of grey (Black on White).
Brown/Yellow	107 mixed shades of brown and yellow.
Green/Blue	107 mixed shades of green and blue.
Green/Yellow	107 mixed shades of green and yellow.
Blue	107 shades of blue.

MAIN MENU (con't)

Options Menu

Units	to change the units of measurement from Meters to Feet.
Xdcr Position	to adjust the display of the sonar echo data relative to the physical mounting of the sonar head. If the xdcr (transducer) is physically mounted down (red side down), this switch should be set to ' Down '. If the xdcr is mounted up (red side up), ' Up ' should be selected. If this switch is set incorrectly, the sonar display will appear as a mirror image; targets which are actually on the right side will appear on the left, and vice-versa. If Profile Grid is enabled via the Profile Menu , the Xdcr Position names change to ' Fwd ' and ' Aft ' for profiling applications. The Fwd position must be selected if using a profiling sonar with an Azimuth Drive.
Sound Velocity	to change the speed of sound number used in range measurements. This number can have a range of 750 m/s (2461 ft/s) to 2250 m/s (7381 ft/s). The default is 1500 m/s (4921.3 ft/s).
User Text	to enter a text string for display in the User Text Window.
Calibrate Sonar Head	to re-calibrate the sonar head transducer to the center position.

MAIN MENU (con't)

Com Ports Menu

Sonar Head	<p>to select the serial communications port (COM1-COM8) for communicating with the connected head. Ports that are already used or unavailable are greyed out. The port that is selected must be a 2-Wire RS-485 serial port.</p> <p>Alternatively, you could use an RS-232 port with an external RS-485 to RS-232 converter connected in-line. All communication through this port is at 115200 bits per second, No Parity, 8 Data Bits and 1 Stop Bit.</p>
AUTO Enable	<p>use this mode if your RS-485 serial i/o card or converter can automatically enable its' transmit driver. Two excellent converters are the SeaLink +485I (P/N 2104) from www.sealevel.com and the Model 9365 from www.telebyteusa.com which automatically enable the transmit driver when sending data as opposed to controlling the driver via RTS (Request To Send).</p>
RTS Enable	<p>use this mode if your RS-485 serial i/o card or converter requires RTS (Request To Send) to enable its' transmit driver.</p>
GPS Input	<p>to select the serial communications port (COM1-COM8) for receiving Lat/Lng ships position coordinates from a GPS receiver. This port accepts the NMEA 0183 \$GPGLL string or the \$GPGGA string at 4800,N,8,1.</p> <p>If the program detects only one available COM port (i.e. on a laptop computer), this port will be reserved for communications with the sonar head only and GPS Input will not be available.</p> <p>As default on most computers, COM1/COM3 share IRQ4 (interrupt request #4) and COM2/COM4 share IRQ3. Ensure that the COM port you select for GPS Input does not share its IRQ with the sonar head COM port. This could cause the program to hang up!</p>
GLL	<p>to use Lat/Lng coordinates from the \$GPGLL string</p>
GGA	<p>to use Lat/Lng coordinates from the \$GPGGA string</p>

MAIN MENU (con't)

MULTI-FREQUENCY OPERATION

The default configuration for Win881A automatically adjusts the operating frequency, absorption and pulse length with range. The following Table describes this relationship:

Range (m)	Frequency (kHz)	Absorption (dB/m)	Pulse Length (μs) Polar Mode	Pulse Length (μs) Sector/Sidescan
1	1000	0.6	20	10
2	1000	0.6	20	10
3	1000	0.6	20	10
4	1000	0.6	20	10
5	1000	0.6	60	30
10	675	0.2	60	30
20	675	0.2	100	50
30	675	0.2	160	80
40	675	0.2	220	110
50	675	0.2	260	130
60	675	0.2	320	160
80	675	0.2	420	210
100	675	0.2	540	270
150	310	0.1	800	400
200	310	0.1	1000	530

The frequencies in the above table are designed for use with the Fan Beam Imaging Sonar (Model 881-000-400/401) only!

The Fan Beam Imaging Sonar (Model 881-000-402) has a fixed frequency of 675 kHz.

The Pencil Beam Profiling Sonar (Model 881-000-420/421) has a frequency limit of 600 kHz to 1 MHz.

MAIN MENU (con't)

Settings Menu

Allows the user to manually or automatically adjust the sonar head's operating frequency, absorption and pulse length.

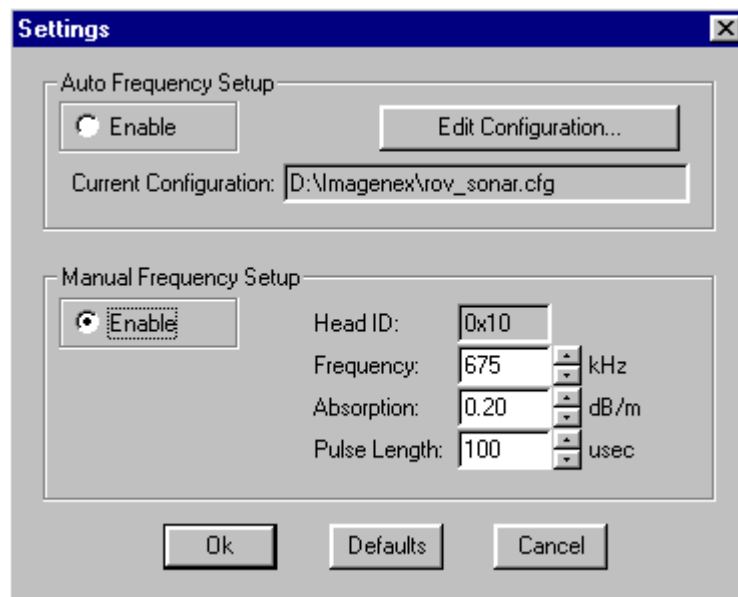
Manual Frequency Setup

select **Enable** to adjust the following parameters for the current range:

Frequency (280-1100kHz in 5kHz increments)

Absorption (0.01-2.55dB/m in 0.01 dB increments)

Pulse Length (10-1000µs in 10µs increments)



Auto Frequency Setup

select **Enable** to use the pre-programmed frequencies, absorptions and pulse lengths from the displayed Current Configuration.

MAIN MENU (con't)

Edit Configuration

to display the following User Configuration dialog box.
The following parameters can be modified for each range:

Frequency (280-1100kHz in 5kHz increments)

Absorption (0.01-2.55dB/m in 0.01 dB increments)

Pulse Length (10-1000 μ s in 10 μ s increments)

The dialog box titled "User Configuration" has a text field for "Current Configuration:" with the value "D:\Imagenex\rov_sonar.cfg". Below this is a table with four columns: "Range", "Frequency (kHz)", "Absorption (dB/m)", and "Pulse Length (us)". Each row represents a range from 1 M to 200 M. To the right of each row is a button labeled "D". At the bottom of the dialog are buttons for "Ok", "Load...", "Save As...", "Default", and "Cancel". A note at the bottom states: "*Note: Pulse Length is multiplied by 2 in Polar Mode".

Range	Frequency (kHz)	Absorption (dB/m)	Pulse Length (us)
1 M	1000	0.60	10
2 M	1000	0.60	10
3 M	1000	0.60	10
4 M	1000	0.60	10
5 M	1000	0.60	30
10 M	675	0.20	30
20 M	675	0.20	50
30 M	675	0.20	80
40 M	675	0.20	110
50 M	675	0.20	130
60 M	675	0.20	160
80 M	675	0.20	210
100 M	675	0.20	270
150 M	310	0.10	400
200 M	310	0.10	530

*Note: Pulse Length is multiplied by 2 in Polar Mode

Load...

to load a previously saved user configuration from disk.

Save As...

to save the current user configuration to disk.

Default

to load the factory default configuration. The default values for each individual range can be selected by pressing the button labeled 'D' beside each range row.

MAIN MENU (con't)

Misc Menu

Pixel Zoom (x2)	displays a x2 pixel zoom window in the lower right hand corner of the screen. A rectangular area about the cursor is displayed in this window. If the left mouse button is pressed anywhere in the sonar image window, the zoom window will be captured (held). Pressing the button a second time releases the capture.
Clear Screen Now	to clear all echo data from the sonar display.
Diagnostics	displays the Diagnostics Pop-Up Window. This window displays the header information from the connected sonar head and optional Azimuth Drive.
Sonar On When Minimized	<p>when this item is checked, the sonar head will continue to operate and log data when the sonar screen is minimized.</p> <p>If not checked, the serial port is closed and communication with the sonar head and data logging is put on hold until the screen is maximized. This allows other programs to use the serial port and available CPU time</p>

MAIN MENU (con't)

Profile Menu

Profile Mode

to set the mode of operation for the display of the digitized profile range points. The following modes are available:

Off

No profile range point is plotted, echo data is plotted normally.

Points Only

Only the profile range points are plotted, no echo data is sent from the head.

Low Mix

The profile range point is plotted along with the echo data. The echo data is plotted at 1/4 level so the profile point stands out. This mode can be useful for making Start Gain adjustments to optimize the profile points before switching to Points Only mode.

Med Mix

Same as Low Mix but the echo data is plotted at 1/2 level.

High Mix

Same as Low Mix but the echo data is plotted at full level.

Profile Grid

to display a rectangular grid for profiling applications.

Zero Down

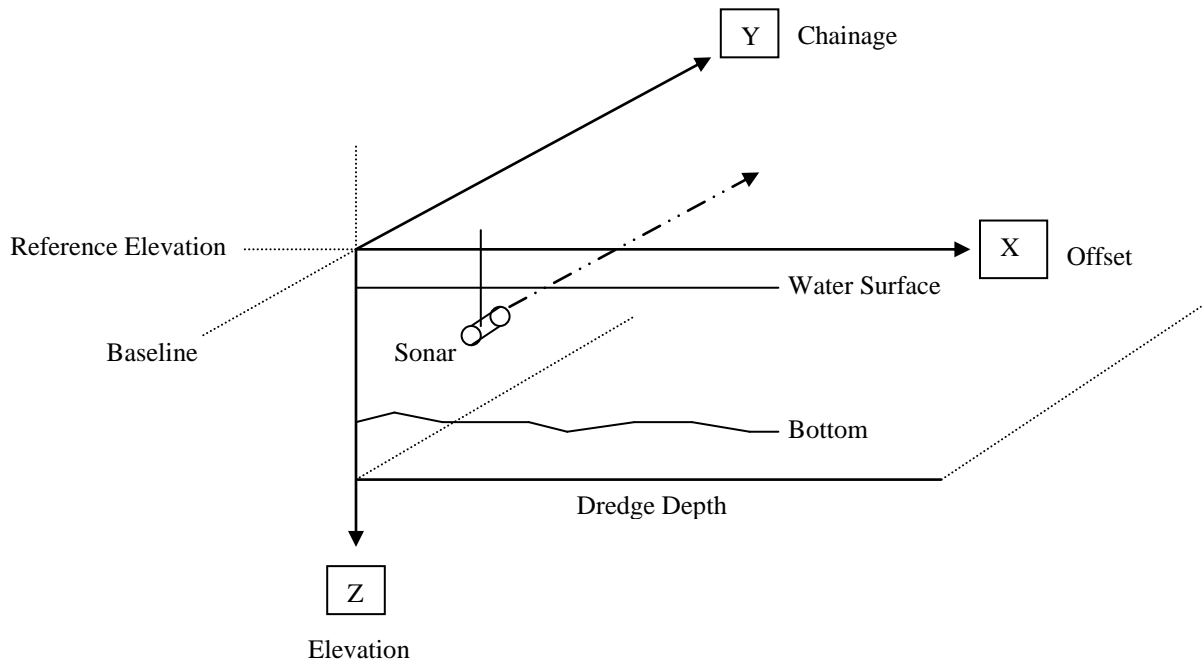
to enable plotting of profile data with the zero reference of the sonar head pointing down rather than pointing up. This allows plotting the seafloor in its correct orientation. This item is available only if **Profile Grid** is enabled. Zero Down must be selected if using a profiling sonar with an Azimuth Drive.

MAIN MENU (con't)

Profile Setup...	allows the user to alter the detection scheme used to generate the digitized profile range points.
Digitization Source	the profile range point for each ping is digitized in the sonar head and sent to the surface in the 12 byte header. The data is sampled with a resolution of 2mm for the 1, 2, 3 and 4 meter operating ranges. All other operating ranges have a 10mm sampling resolution. The surface detection resolution is (Operating Range/250) for Polar Mode and (Operating Range/500) for Sector Mode. You could select 'Surface' if you would like to alter the profile points during playback (and record to a new file using the Copy Start... function).
Detection Type	use Start of Pulse to display the profile points at the beginning of the echo pulse. Use Center of Pulse to display the profile point in the middle of the pulse. The Detection Type can only be changed when Surface Detection is used as the Sonar Head always uses Center of Pulse detection.
Minimum Range	used to set the starting range for profile digitization. Ranges less than this setting will not be digitized. The minimum range can be adjusted from 0 to 25 meters in 0.1 meter increments.
Minimum Level	used to set the detection level for profile digitization. This level can be adjusted from 10 to 90 percent of the color scale. Levels less than this setting will not be digitized. The Minimum Level can only be changed when Surface Detection is used as the Sonar Head uses its own internal level threshold.
Auto-Profile...	allows the user to automatically command the sonar to do a scan and save the digitized profile points including offsets to two different files. The first file is an ASCII file with xyz information. The second is a screen capture to a Windows bitmap file. The scan limits are based on the current angles set via the Sector and Train switches and a new ASCII file and screen capture are automatically generated for every new scan.

MAIN MENU (con't)

Vertical Scan (Chainage) use this mode for creating multiple vertical profiles of the seafloor.



Chainage (y)	this number represents the horizontal down range distance along the Y-Axis for the current profile cross-section.
Sonar Elevation (z)	this number represents the height of the sonar head in relation to the Reference Elevation along the Z-Axis.
Sonar Offset (x)	this number represents the horizontal distance of the sonar head from the baseline along the X-Axis.
Dredge Line	this number is used to display a horizontal line on the display which represents the desired dredge depth (distance below the reference elevation). The number entered here is the depth below the sonar head.

MAIN MENU (con't)

Auto-Profile (Vertical Scan)

Auto-Profile Enable when the Auto-Profile Enable is checked, pressing the Ok button will invoke 1 scan using the current sonar settings (i.e. range, gain, sector size, train angle, sound velocity). The sonar will automatically move to its' counter-clockwise position and begin scanning. When the sonar reaches its' clockwise position, the following will occur:

A message box appears asking if you would like to save the current profile. If you select Yes, a screen capture is made and an ASCII XYZ file is generated for the current scan with the profile points adjusted by the above x, y and z offsets. The Auto-Profile Dialog Box is then displayed allowing you to change the offset numbers for the next scan. When you want to stop the Auto-Profile scanning, simply disable the Auto-Profile Enable check box and press Ok. You can invoke the Auto-Profile Dialog Box at any time during a scan. When this dialog box is active, the sonar head is put on hold until the Ok button is pressed.

It is recommended that you record all data to a .81A file via the Record Start... function in the File menu as the XYZ ASCII file can not be displayed via this program.

After each scan... you can customize the scanning process by enabling or disabling the XYZ and BMP file generation. You can also omit the save scan confirmation and Auto-Profile Dialog Box display in order to gain hands-free operation.

The automatic filenames used for the ASCII file and the screen capture file are based on the current system date:

DDMMYY-NNNN.BMP
DDMMYY-NNNN.XYZ

DD = day (1-31), MMM = month (Jan, Feb, Mar...), YYYY = year
NNNN (0001-9999), this number automatically increments for each new file (each new scan).

MAIN MENU (con't)

Auto-Profile (Vertical Scan)

The **XYZ ASCII** file contains the following information:

YYYY.YY,M<CR><LF> - Chainage, M=meters, F=feet

ZZZZ.ZZ<CR><LF> - Sonar Elevation

XXXX.XX<CR><LF> - Sonar 'X' Offset

VVVV.VV<CR><LF> - Sound Velocity

dd-mmm-yyyy hh:mm:ss.hh rrr.rrr aaa.aaa bbb.bbb xxx.xxx yyy.yyy zzz.zzz<CR><LF> - 1st Point

dd-mmm-yyyy hh:mm:ss.hh rrr.rrr aaa.aaa bbb.bbb xxx.xxx yyy.yyy zzz.zzz<CR><LF> - 2nd Point

.

.

dd-mmm-yyyy hh:mm:ss.hh rrr.rrr aaa.aaa bbb.bbb xxx.xxx yyy.yyy zzz.zzz<CR><LF> - Last Point

where:

dd-mmm-yyyy = current system date

hh:mm:ss.hh = current system time

rrr.rrr = profile range

aaa.aaa = 0 (not used)

bbb.bbb = vertical scanning angle

xxx.xxx = sonar_offset + profile_range * sin (vertical angle)

yyy.yyy = chainage

zzz.zzz = sonar_elevation – profile_range * cos(vertical angle)

The above fields are TAB delimited.

The Dredge Line number is saved to the WIN881A.INI file but not to the .81A data files. The Auto-Profile function is available only when DATA FROM **'HEAD'** is active.

MAIN MENU (con't)

Horizontal Scan (Borehole)	use this mode for creating vertically stacked horizontal profiles.
Sonar X Offset (x)	this number represents the horizontal distance of the sonar head from the XYZ origin along the X-Axis.
Sonar Y Offset (y)	this number represents the horizontal distance of the sonar head from the XYZ origin along the Y-Axis.
Sonar Elevation (z)	this number represents the vertical distance of the sonar head from the XYZ origin along the Z-Axis (negative Z is down)
Auto-Elevation	the user can enter a Payout Increment distance that is automatically added to the Sonar Elevation value every scan relieving the user of manually entering a fixed down-hole increment value.

MAIN MENU (con't)

Auto-Profile (Horizontal Scan)

Auto-Profile Enable when the Auto-Profile Enable is checked, pressing the Ok button will invoke 1 scan using the current sonar settings (i.e. range, gain, sector size, train angle, sound velocity). The sonar will automatically move to its' counter-clockwise position and begin scanning. When the sonar reaches its' clockwise position, the following will occur:

A message box appears asking if you would like to save the current profile. If you select Yes, a screen capture is made and an ASCII XYZ file is generated for the current scan with the profile points adjusted by the above x, y and z offsets. The Auto-Profile Dialog Box is then displayed allowing you to change the offset numbers for the next scan. When you want to stop the Auto-Profile scanning, simply disable the Auto-Profile Enable check box and press Ok. You can invoke the Auto-Profile Dialog Box at any time during a scan. When this dialog box is active, the sonar head is put on hold until the Ok button is pressed.

It is recommended that you record all data to a .81A file via the Record Start... function in the File menu as the XYZ ASCII file can not be displayed via this program.

After each scan... you can customize the scanning process by enabling or disabling the XYZ and BMP file generation. You can also omit the save scan confirmation and Auto-Profile Dialog Box display in order to gain hands-free operation.

The automatic filenames used for the ASCII file and the screen capture file are based on the current system date:

DDMMYY-NNNN.BMP
DDMMYY-NNNN.XYZ

DD = day (1-31), MMM = month (Jan, Feb, Mar...), YYYY = year
NNNN (0001-9999), this number automatically increments for each new file (each new scan).

MAIN MENU (con't)

Auto-Profile (Horizontal Scan)

The **XYZ ASCII** file contains the following information:

```
dd-mmm-yyyy hh:mm:ss.hh xxx.xxx yyy.yyy zzz.zzz<CR><LF> - 1st Point
dd-mmm-yyyy hh:mm:ss.hh xxx.xxx yyy.yyy zzz.zzz<CR><LF> - 2nd Point
.
.
dd-mmm-yyyy hh:mm:ss.hh xxx.xxx yyy.yyy zzz.zzz<CR><LF> - Last Point
```

where:

dd-mmm-yyyy = current system date

hh:mm:ss.hh = current system time

xxx.xxx = $\text{sonar_x_offset} + \text{profile_range} * \sin(\text{horizontal angle})$

yyy.yyy = $\text{sonar_y_offset} + \text{profile_range} * \cos(\text{horizontal angle})$

zzz.zzz = sonar_elevation

The above fields are TAB delimited.

The Auto-Profile function is available only when DATA FROM '**HEAD**' is active.

MAIN MENU (con't)

Auto-Azimuth... to command the azimuth drive to automatically move to a new azimuth angle and invoke a scan with the profiling sonar head. The digitized profile points can automatically be saved to an ASCII xyz file. The profiling sonar scan limits are based on the current angles set via the Sector and Train switches.

Azimuth Start the azimuth angle for the first profile scan.

Azimuth Stop the azimuth angle for the last profile scan

Azimuth Increment the azimuth angle increment for each profile scan.

Auto-Azimuth Enable when the Auto-Azimuth Enable is checked, pressing the Ok button will command the Azimuth Drive to move to the Azimuth Start Angle and invoke 1 scan using the current sonar settings (i.e. range, gain, sector size, train angle, sound velocity). The sonar will automatically move to its' counter-clockwise position and begin scanning. When the sonar reaches its' clockwise position, an ASCII XYZ file is generated for the current scan.

The Azimuth Drive will then automatically rotate the profiling sonar by the Azimuth Increment amount and start a new scan. At the end of this scan, the data is appended to the XYZ file. This process will continue until the Azimuth Stop angle has been reached. At this point, the XYZ file is closed, the Auto-Azimuth mode is disabled and the "Scan Complete" message is displayed. Pressing Ok simply acknowledges the message and allows the sonar to continue scanning at the current azimuth angle.

If you want to abort an Auto-Azimuth scan, select the Auto-Azimuth menu and simply disable the Auto-Azimuth Enable check box and press Ok. You can invoke the Auto-Azimuth Dialog Box at any time during a scan. When this dialog box is active, the sonar head is put on hold until the Ok button is pressed.

MAIN MENU (con't)

It is recommended that you record all data to a .81A file via the Record Start... function in the File menu as the XYZ ASCII file can not be displayed via this program.

The automatic filename used for the XYZ ASCII file is based on the current system date:

DDMMMYYYY-nnnn.XYZ

DD = day (1-31), MMM = month (Jan, Feb, Mar...), YYYY = year
nnnn (0001-9999), this number automatically increments for each new file. Unlike the Auto-Profile mode which increments the file number every scan, the Auto-Azimuth XYZ file contains multiple scans.

The **XYZ ASCII file** contains the following information:

```
dd-mmm-yyyy hh:mm:ss.hh rrr.rrr aaa.aaa bbb.bbb xxx.xxx yyy.yyy zzz.zzz<CR><LF> - 1st Point
dd-mmm-yyyy hh:mm:ss.hh rrr.rrr aaa.aaa bbb.bbb xxx.xxx yyy.yyy zzz.zzz<CR><LF> - 2nd Point
.
.
dd-mmm-yyyy hh:mm:ss.hh rrr.rrr aaa.aaa bbb.bbb xxx.xxx yyy.yyy zzz.zzz<CR><LF> - Last Point
```

where:

dd-mmm-yyyy = current system date

hh:mm:ss.hh = current system time

rrr.rrr = profile range

aaa.aaa = azimuth angle

bbb.bbb = vertical scanning angle

xxx.xxx = $\text{profile_range} * \cos(\text{azimuth angle}) * \sin(\text{vertical angle})$

yyy.yyy = $-\text{profile_range} * \sin(\text{azimuth angle}) * \sin(\text{vertical angle})$

zzz.zzz = $-\text{profile_range} * \cos(\text{vertical angle})$

The above fields are TAB delimited and the scans are grouped by azimuth angle and separated by a <CR><LF>.

The Auto-Azimuth function is available only when DATA FROM **'HEAD'** is active.

MAIN MENU (con't)

Grid Menu

Grid On/Off	to display the range rings (or squares) on the sonar display.
-------------	---

About Menu

About WIN881A	displays an about box showing the software version and date of this program. Contact information for Imagenex Technology Corp. is also displayed.
---------------	---

ON SCREEN SWITCHES

DATA FROM ' HEAD '	to display data from the connected sonar head.
DATA FROM ' FILE '	to display data from a previously recorded ' .81A ' Sonar file.
Hold	to hold or freeze the display.
Rev	to reverse the current scanning direction. Available only when DATA FROM ' HEAD ' is active.
Reverse	to reverse the file playback plotting direction. Available only when DATA FROM ' FILE ' is active.
TrackBar	to re-position the file pointer during file playback. Available only when DATA FROM ' FILE ' is active.
Plot Speed	to adjust plotting speed during file playback. Available only when DATA FROM ' FILE ' is active.

The following switches are available only when DATA FROM '**HEAD**' is active:

Range	to change the sonar operating range. Ranges available are: 1m (3ft) 2m (6ft) 3m (9ft) 4m (12ft) 5m (15ft) 10m (30ft) 20m (60ft) 30m (90ft) 40m (120ft) 50m (150ft) 60m (180ft) 80m (240ft) 100m (300ft) 150m (450ft) 200m (600ft)
-------	--

ON SCREEN SWITCHES (con't)

Mode	to change the sonar display mode. Modes available are: Sector Polar SideScan
Start Gain	to change the starting gain of the head. Increase to get higher return levels, decrease to get lower return levels. The Start Gain can be adjusted from 0dB to 40dB in 1dB increments.
Speed	to change the stepping speed of the sonar. Speeds available are: Slow (0.3 deg/step) Medium (0.6 deg/step) Fast (0.9 deg/step) Faster (1.2 deg/step) Fastest (2.4 deg/step)
Sector	to change the sector size (sweep angle). Sector Mode (0 to 180 degrees in 3 degree increments) Polar Mode (0 to 360 degrees in 3 degree increments) Sidescan Mode(0 degrees)
Train	to change the training angle relative to the sonar's zero or center angle. Sector Mode (0 to 357 degrees in 3 degree increments) Polar Mode (0 to 357 degrees in 3 degree increments) Sidescan Mode (90 or 270 degrees)

KEYBOARD SWITCHES

The following switches are selected via keyboard entry (case insensitive):

C	to clear the sonar screen display.
G	to change the Start Gain of the sonar head. When the 'G' key is pressed, the Key Command Entry Box displays the prompt: Gain: ? dB . Type in a valid start gain number (0-40dB) and press <Enter> to change to the new start gain value. If the entered gain is not valid or the <Esc> key is pressed, the current gain will be used. Available only when DATA FROM ' HEAD ' is active.
H	to hold or freeze the display.
R	to change the operating range of the sonar head. When the 'R' key is pressed, the Key Command Entry Box (below the DATA FROM buttons) is displayed with the following prompt: Range: ? M (meters) or Range: ? FT (feet). Type in a valid range number: 1(3), 2(6), 3(9), 4(12), 5(15), 10(30), 20(60), 30(90), 40(120), 50(150), 60(180), 80(240), 100(300), 150(450) or 200(600) in meters or (feet) using the numeric keys and then press <Enter> to change to the new range. If the entered range is not valid or the <Esc> key is pressed, the current range will be used. Available only when DATA FROM ' HEAD ' is active.
Space Bar	to reverse the current scanning direction. Can also be used to reverse the file playback direction.

ONE CURSOR MEASUREMENT

One Cursor Measurement is used for measuring the distance and relative bearing to a target with respect to the transducer origin. When the mouse is moved into the sonar image display area, the cursor changes from an arrow to a square target cursor. The range and bearing to the target cursor is displayed in the Range/Bearing Display Box underneath the sonar image display. The area about the target cursor is also displayed in the Pixel Zoom window. Clicking the left mouse button while the cursor is in the sonar image display area captures (freezes) the zoom window image. Clicking the left button a second time allows normal zoom window updating.

TWO CURSOR MEASUREMENT

Two Cursor Measurement is used for measuring the distance and relative bearing between two targets. To invoke two cursor measurement, position the mouse cursor over a target in the sonar image display area and press the right mouse button. A target origin cursor is placed at this location. The range and bearing to this cursor becomes the new origin for future measurements. When the mouse is moved, a rubber banded line is drawn from the target origin cursor to the target cursor. The Range/Bearing Display Box shows the range and bearing to the new origin (**Org**), the range and bearing to the target cursor (**Tar**) and the range and bearing difference (**Diff**) between the two cursors. The displayed range and bearing between the two cursors is always relative to the target origin cursor. Press the right mouse button again to return to One Cursor Measurement.

MESSAGES

No Data at COM?

- no power to the sonar head
- cable not connected
- Sonar Head COM port set to the wrong port number
- computer not fast enough to keep up with the head (increase SwitchDelay in the WIN881A.INI file).

GPS Lat/Lng Not Available

- GPS receiver output not connected to serial port
- GPS receiver is not sending data
- GPS receiver not set for 4800,N,8,1
- GPS Input COM port set to the wrong port number
- GPS receiver not sending \$GPGLL or \$GPGGA

Azimuth Drive Not Found

- no power to the Azimuth Drive
- cable not connected
- Detecting Azimuth Drive... timed out before Azimuth Drive calibration complete

DATA STORAGE FILE FORMAT (.81A)

When recording the sonar data to a **.81A** file, the following bytes are appended and saved to the file every 'shot':

Byte #	Description
0 to 99	File Header (100 Bytes)
100 to 111	Sonar Return Data Header (12 Bytes)
112 to www	Sonar Return Echo Data (0, 128, 250, 252 or 500 Bytes) www = 112+above number Byte www always = 0xFC (Termination Byte from sonar head)
www+1 to xxxx	Offsets xxxx = www+12
xxxx+1 to yyyy	Zero Fill yyyy = 127, 255, 383 or 639
yyyy+1 to zzzz	Extended Bytes If Byte #34 (in the File Header) is greater than zero, multiply Byte #34 by 128 to derive the number of Extended Bytes for this shot. i.e. if Byte #34 = 0x01, Extended Bytes = 128 zzzz = yyyy+Number of Extended Bytes
N-1 N-2	Pointer To Previous Shot The last 2 bytes of this shot contain a 16-Bit number that is the sum of the number of bytes for this shot and the number of bytes for the previous shot. This number is used for reverse playback synchronization. N = (128 or 256 or 384 or 640) + Extended Bytes Number of bytes to previos shot = ((N-2)<<8) (N-1)

FILE HEADER

Bytes 0 through 99 contain the following **File Header** information:

- 0 **ASCII '8'**
- 1 **ASCII '1'**
- 2 **ASCII 'A'**

- 3 **nToReadIndex** - Index for Number of Data Bytes
 - 0 = 0 Data Bytes
 - 1 = 128 Data Bytes
 - 2 = 250 or 252 Data Bytes
 - 3 = 500 Data Bytes

DATA STORAGE FILE FORMAT (.81A) (con't)

4-5 **Total Bytes** - number of bytes that are written to the disk for this shot

Byte 4								Byte 5							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
128, 256, 384 or 640 + Number of Extended Bytes															

6-7 **nToRead** - Number of Bytes from the sonar head

Byte 6								Byte 7							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
13, 141, 263, 265 or 513															

8-19 **Date** - null terminated date string (12 bytes)
"DD-MMM-YYYY"

20-28 **Time** - null terminated time string (9 bytes)
"HH:MM:SS"

29-32 **Hundredth of Seconds** - null terminated string (4 bytes)
".hh"

33 **Units of Measurement**

Byte 33							
7	6	5	4	3	2	1	0
U	0	0	0	0	0	0	0 or 1

If 'U' = 0, type of units not stored --> assume "Meters"

If 'U' = 1, if Bit0 = 0 --> units = Meters

if Bit0 = 1 --> units = Feet

34 **Extended Bytes**

Used for adding extra information to the .81A file format (i.e. GPS Lat/Lng)
Multiply this number by 128. The resulting number of Extended Bytes is
appended to the current file shot.

0: $0 * 128 = 0$ Bytes

1: $1 * 128 = 128$ Bytes

2: $2 * 128 = 256$ Bytes, etc.

35-36 **Reserved** - always 0

DATA STORAGE FILE FORMAT (.81A) (con't)

37 **Dir, Xdcr, Mode, Step**

Byte 37							
7	6	5	4	3	2	1	0
Dir	Xdcr	Mode			Step Size		
0=ccw 1=cw	0=Dn 1=Up	0 = Sector 1 = Polar 2 = Sidescan			0 = 0.3 Deg (Slow) 1 = 0.6 Deg (Medium) 2 = 0.9 Deg (Fast) 3 = 1.2 Deg (Faster) 4 = 2.4 Deg (Fastest)		

38 **Start Gain** 0 to 40 in 1 dB increments

39 **(Sector Size)/3** 0 to 120 = 0 to 360 Degrees in 3 degree increments

40 **(Train Angle)/3** 0 to 119 = 0 to 357 Degrees in 3 degree increments

41 **Range Offset** 0 to 255 in 1m increments

42 **Absorption** 1 to 255 = 0.01 to 2.55dB/m in 0.01dB/m increments

43 **Profile Grid, Zero, Data Bits, LOGF**

Byte 43							
7	6	5	4	3	2	1	0
Profile Grid	Zero	Data Bits			LOGF		
0=OFF 1=ON	0=Up 1=Dn	0 = 4 Data Bits 1 = 8 Data Bits 2 = 14 Data Bits			0 = 10 dB 1 = 20 dB 2 = 30 dB 3 = 40 dB		

44 **(Pulse Length)/10** 0 to 100 = 0 to 1000μs in 10μs increments

DATA STORAGE FILE FORMAT (.81A) (con't)

- 45 **Profile**
0 = Off
1 = Points Only
2 = Low Mix
3 = Medium Mix
4 = High Mix

- 46-47 **Sound Velocity**

Byte 46								Byte 47							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
V	Sound Velocity (in meters/second) * 10														

If 'V' = 0, Sound Velocity = 1500.0 m/s

If 'V' = 1, Sound Velocity = [((Byte 46 & 0x7F)<<8) | (Byte 47)]/10.0

- 48-79 **User Text** - null terminated text string (32 bytes)

- 80-81 **Operating Frequency**

Byte 80								Byte 81							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Operating Frequency (in kHz)															

- 82-83 **Azimuth Drive Head Position**

Byte 82								Byte 83							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
A	Azimuth Head Pos (0-1199)														

If 'A' = 0, Azimuth Head Pos not available

If 'A' = 1, Azimuth Head Pos = [((Byte 82 & 0x7F)<<8) | (Byte 83)]

Azimuth Angle = (0.3 * Azimuth Head Pos) – 180 (in degrees)

- 84-90 **Reserved** - always 0

- 91-92 **Vertical Angle Offset**

Byte 91								Byte 92							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
(Vertical Angle Offset + 180) * 10															

- 93-99 **Reserved** - always 0

DATA STORAGE FILE FORMAT (.81A) (con't)

SONAR RETURN DATA HEADER SONAR RETURN ECHO DATA OFFSETS ZERO FILL

The following bytes contain the **Sonar Return Data** that is acquired directly from the sonar head serial COM port:

If Header is ASCII **'IPX'**:

Bytes 100 through 112 (13 bytes)
Bytes 113 through 124 (12 bytes - **Offsets**)
 Bytes 113-116: X-Offset (4-byte float, meters or feet)
 Bytes 117-120: Y-Offset (4-byte float, meters or feet)
 Bytes 121-124: Z-Offset (4-byte float, meters or feet)
Bytes 125 through 127 (3 bytes - **Zero Fill**)

If Header is ASCII **'IMX'**:

8-Bit
Bytes 100 through 364 (265 bytes)
Bytes 365 through 376 (12 bytes - **Offsets**)
 Bytes 365-368: X-Offset (4-byte float, meters or feet)
 Bytes 369-372: Y-Offset (4-byte float, meters or feet)
 Bytes 373-376: Z-Offset (4-byte float, meters or feet)
Bytes 377 through 383 (7 bytes - **Zero Fill**)

If Header is ASCII **'IGX'**:

8-Bit
Bytes 100 through 612 (513 bytes)
Bytes 613 through 624 (12 bytes - **Offsets**)
 Bytes 613-616: X-Offset (4-byte float, meters or feet)
 Bytes 617-620: Y-Offset (4-byte float, meters or feet)
 Bytes 621-624: Z-Offset (4-byte float, meters or feet)
Bytes 625 through 639 (15 bytes - **Zero Fill**)

DATA STORAGE FILE FORMAT (.81A) (con't)

EXTENDED BYTES (starting at yyyy+1)

- 0-11 **GPS Ships Position Latitude** – null terminated text string (12 bytes)
 “**dd.mm.xxx_N**”
 dd = Degrees
 mm = Minutes
 xxx = Decimal Minutes
 _ = Space
 N = North or S = South
- 12-24 **GPS Ships Position Longitude** – null terminated text string (13 bytes)
 “**ddd.mm.xxx_E**”
 ddd = Degrees
 mm = Minutes
 xxx = Decimal Minutes
 _ = Space
 E = East or W = West
- 32-41 **KP POINT** – null terminated text string (10 bytes)
 “**xxxx.xx_M**”
 xxxx.xx = Meters
 _ = Space

-----\$GPGGA Fields -----

- 48-59 **UTC Time** – null terminated text string (12 bytes)
 “**HH:MM:SS.hh**”
- 60 **Fix Quality**
- 61 **Number of Satellites**
- 62-65 **Horizontal Dilution of Position** – four bytes (floating point)
- 66-69 **Altitude** – four bytes (floating point)
- 70-73 **Height of Geoid** – four bytes (floating point)