ISIS SONAR®

User's Manual, Volume 2
Appendices

Software documentation through v6.6

June 2004

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Safety Precautions

Please adhere to the hardware and software precautions mentioned below. In addition, observe all safety precautions mentioned in this manual.

When working with the overall system

1. Before handling components inside your computer system, exit all applications and shut down the operating system in accordance with procedures applicable to them.
2. Turn off the power to the computer and disconnect all cables that may be feeding electrical power to the system you will be working on.
3. Wear a grounded, anti-static wrist-strap. This is especially important if you are removing, replacing, or installing a printed circuit board of any kind.

Failure to adhere to these and other safety precautions mentioned in the manual could result in harm to property or personnel!

When working with magneto-optical cartridge disks

- Please refer to the Appendix entitled “Mass Storage Options” for important details covering the handling of M-O disks!
- Never boot your system with a writable M-O cartridge inserted into the drive!
- Use magneto-optical media that has 512 bytes per sector, not 1024 bytes per sector, and use the AFDisk software utility to format magneto-optical media. Never use Windows 95 to format M-O media!

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Preface Using This Manual

This book is the second part of a two-part set from Triton Elics International, Inc.: ***Isis User's Manual, Volume 2.*** It contains supplementary information, such as file format structure, navigation templates, and other infrequently accessed Isis information. ***Isis User's Manual, Volume 1,*** contains most of the most frequently accessed functions and information relevant to the software. ***Isis User's Manual, Volume 2,*** complements Volume 1.

Throughout this manual, warnings, hints and important statements are separated from the text, ***italicized*** and denoted by the following symbols.

Denotes a warning or caution.

Denotes an important statement, tip, or hint.

Skills You'll Need to Know Before Using Isis

To use Isis, you should know basic Windows concepts, such as working with icons on the Windows desktop. You can find this information in the Microsoft on-line Help system built into the Windows systems.

Finally, you should already be comfortable using the basics of Isis before delving into Volume 2.

Appendix A Q-MIPS File Format

Isis and VISTA support a number of file formats: Q-MIPS, BAC, GAC, and XTF. Each has distinct advantages. This appendix explains the structure and use of the Q-MIPS format.

A.1 General Description

The Q-MIPS file format is perhaps the mostly widely known and used file format for VIS_TA and other applications capable of displaying sidescan data imagery. Q-MIPS-style data files are stored in binary format. Each data file consists of a 1024-byte file header followed by ping records. Each ping record consists of a number of imagery channels followed by a 256-byte footer record.
The following format description is current for Q-MIPS version 6.69, Q-MIPS/DSP version 1.16 and Isis . Both Isis and TrakMap use this same data format. Q-MIPS and Q-MIPS/DSP are limited to four sonar channels and eight imagery channels at 1024 pixels per channel (four raw, four corrected).
Table A-5 on page 9 and Table A-6 on page 16 describe each field in the header and footer structures respectively. For specific C-language header and footer structures used by Q-MIPS (and Q-MIPS/DSP) and Isis, refer to **UPDATES.DOC** and **QMIPSFMT.H** respectively. These files are included with every software release.

A.2 Header and Footer Data

For Q-MIPS systems, you can set some of the values in the header and footer in the configurable files called **QMIPS.DAT** and **SONAR.DAT**. Refer to Appendix A of the Q-MIPS User's Manual for descriptions of these files. Isis relies on setup configurations saved in the binary ISIS.CFG file for many of these values. You can change many of the startup defaults loaded from the QMIPS.DAT, SONARS.DAT and ISIS.CFG files without quitting and re-starting the Q-MIPS or Isis program. Generally, display-related parameters can be changed on-the-fly during collection. The current destination file must be closed before changing most acquisition- and storage-related parameters from the menus.

Many other values are controlled by strings received over RS-232 serial interfaces from the navigation system and/or any serial device. Refer to Appendix E of the *Q-MIPS User's Manual* or ***'Serial Interfaces' (Appendix D)*** of this manual for descriptions of the values that can be set in this manner. Navigation telemetry values are replicated in their respective fields from ping to ping until a new navigation string is received at the serial port. Then the values present in the string are used to update the appropriate fields in the footer. If desired, the Q-MIPS or Isis system time can be synchronized to the time indicated in the telemetry string.
All binary data are stored according to the Intel representation scheme. This is an important distinction if you plan to read or write Q-MIPS-style data using Motorola-based, MIPS-based, or SPARC-based platforms.

A.3 Imagery Data

Regardless of how many samples are collected per channel per ping, the data are decimated (or replicated) to be stored at 1024 pixels per channel per ping by Q-MIPS or the user-specified number of pings by Isis. For a discussion of available decimation methods, refer to the description of the **ch1_sampleScheme** field under the heading Channel 1 Sonar Parameters in Table A-6 on page 16.
Isis can save both 8-bit and 16-bit data in Q-MIPS format.

A.3.1 Eight-Bit Data

Each sample is an unsigned 8-bit value with a range of 0-255. Assuming that the DSP card in Isis still has a factory jumper-setting configuration, the input range is 5 volts. During the conversion from 16-bit to 8-bit, the sign bit is omitted. So 0-255 represents a voltage range of 0 5 volts or 0 -5 volts depending on the original input signal. Note that for side-scan, the important quality to log is the ***magnitude*** of the signal from zero, not the actual signed voltage.

A.3.2 Sixteen-Bit Data

The A/D converter on the Isis DSP card samples at 18 bits, with the 16 most significant bits being available for storage. With 16 bits being saved, the entire sample is logged. Each sample is a signed value.

16 bits represent -32768 to +32767. This corresponds to an input voltage range of -5 to +5 volts. To convert a sample from the Q-MIPS file, use the following formula:

volts = (sample / 32768) x 5

Equation A-1. Formula for converting a Q-MIPS sample to 16-bit format

Note that the actual range is actually -5 volts to +4.9998 volts.

Each pixel of imagery will require either one or two bytes of disk storage depending on whether the data are saved at 8 or 16 bits per pixel. The number of bits per pixel is specified for Q-MIPS in the QMIPS.DAT file and for Isis using the **Record Setup** command.

Isis and Q-MIPS can store imagery in any combination of raw and corrected for each of up to four analog channels. A corrected channel has had the water column removed and has been slant-range corrected so that the displayed waterfall record approximates a “map-view” of the data.

If both raw and corrected data are saved by Isis or Q-MIPS, 1024 raw pixels are saved followed by 1024 corrected pixels for each channel. All specified types for channel 1 (raw and/or corrected) are saved first. Then all types for channel 2 and so on. The complete order for up to the Q-MIPS maximum of eight imagery channels is shown below. Remember, when a channel is not present or a data type (raw or corrected) is not to be saved, it is omitted. That is, no padding is done. Fewer imagery channels results in fewer bytes stored per ping.

Table A-1. Relationship in Q-MIPS of channel to data type to location

Channel	Data Type	Read or Write	Location
CH1	RAW	Write only	Port
CH1	CORRECTED	Write or Read	Port
CH2	RAW	Write only	Starboard
CH2	CORRECTED	Write or Read	Starboard
CH3	RAW	Write only	Port or Subbottom
CH3	CORRECTED	Write or Read	Port or Subbottom
CH4	RAW	Write only	Starboard or Subbottom

CH4	CORRECTED	Write or Read	Starboard or Subbottom

Port channels are stored in pixel order (reverse chronological order) from far range to nadir and starboard channels are stored from nadir to far range (chronological order). This convention matches the left-to-right orientation for the waterfall display on the Q-MIPS high-resolution imagery display. The ping imagery data are followed by the footer for each ping.
Subbottom pings are normally received asynchronously with respect to side-scan pings, downsampled differently, and stored with the nearest side-scan ping. A subbottom channel is termed the asynchronous channel and must be received on the last (highest number) channel present. The asynchronous ping rate is generally slower than the side-scan ping rate so the data are replicated ping-by-ping until a new asynchronous ping is received.
When computing the size of Q-MIPS format files to estimate survey storage media requirements or throughput rates, use the equations shown in Equation A-2 on page 4 and Equation A-3 on page 4:
BPP = NIC x PPC x (BPX/8) + PFS in bytes

Equation A-2. Calculating bytes per ping
File Size = 1024 + (NP x BPP) in bytes

Equation A-3. Calculating file size using bytes per ping
where, in Equation A-3, the meaning of the variables are shown in:Table A-2
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Table A-2. Variables for calculating bytes per ping

BPP	=	Bytes per ping
NIC	=	imagery channels being saved (raw and corrected)
NP	=	number of pings stored in file
PPC	=	pixels per channel per ping (always 1024 for Q-MIPS)
PFS	=	ping footer size = 256
BPX	=	bits per pixel (user-defined as 8 or 16)

For example, a data file written by Q-MIPS with 3 pings of raw and corrected imagery for each of two sidescan channels at eight bits per pixel would be configured as follows:

Table A-3. Sample configuration illustrating file size

Size of Data in Bytes	Description
[1024]	Q-MIPS Header
[1024] [1024] [1024] [1024] [256]	Ping 1, Four channels, 1024 bytes each; Q-MIPS footer
[1024] [1024] [1024] [1024] [256]	Ping 2
[1024] [1024] [1024] [1024] [256]	Ping 3

The amount of memory all the data would occupy is:

14080 bytes [(1024 x 13) + (256 x 3)]

A.4 Binary Data Representation

The Q-MIPS format header and footer structures are made up of fields in six number representation schemes or types. For each type shown in Table A-4 on page 6, the type definition from the C-language Q-MIPS source code is shown in parentheses and the range of numbers that can be represented by that type is shown in brackets.

Note: Q-MIPS and Isis will never store a 12-bit value in a 12-bit field. All sonar values are stored as 8 or 16 bit.

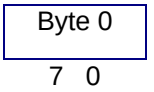
Table A-4. Data representation types for Q-MIPS headers and footers

Data Types	Type Definitions and Possible Range of Values
SHORT	signed, two's complement integer two bytes INT format [-32,768 to 32,767] or four bytes LONG [-2,147,483,648 to 2,147,483,647] format
USHORT	unsigned integer two bytes WORD format [0 to 65,535] or four bytes DWORD format [0 to 4,294,967,296]
FLOAT	floating point number in IEEE single precision standard four-byte format FLOAT format [10-38 to1038]
DOUBLE	IEEE double precision standard eight-byte DOUBLE format [10-308 to 10 308]
CHAR	signed character one byte CHAR format [-128 to 127]; can be interpreted by ASCII code or as an 8-bit signed integer
BYTE	unsigned character one byte BYTE format [0 to 255]; can be interpreted by ASCII code or as an 8-bit unsigned integer

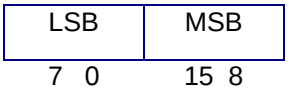
The exact byte and word ordering for each of these types and the IEEE floating point formats are described below. Any unused fields are filled with zeros, that is, each bit within the field will be a zero instead of a one. The integers will return the value **0**, the floating point numbers will return the value **0.0**, and the characters will return the value **0** or the null character **\0**, depending on how they are interpreted. In Table A-5 on page 9 and Table A-6 on page 16, which describe the complete header and footer formats, respectively, one column indicates the type for each field.

The Q-MIPS format data are stored according to the Intel processor scheme for representation of numbers in memory. This is described below. If a number is represented by *N* bytes from most significant (MSB, Byte *N*-1) to least significant (LSB, Byte 0), and *N* x 8 bits from bit *N* x 8 -1 (MSB) to bit 0 (LSB), the stored bytes are found in the order described below. The bits within each byte are always in order from most significant (bit 7) to least significant (bit 0). All Intel 80x86 chips are Little Endian.

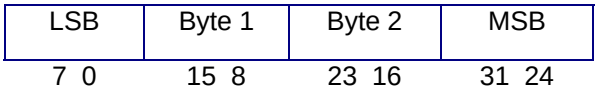
1-Byte Character



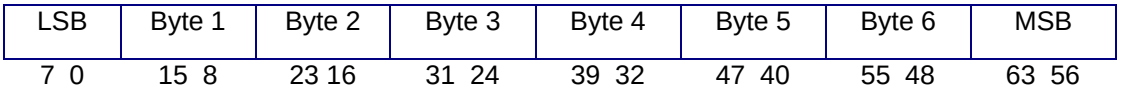
2-Byte Integer



4-Byte Number — Integer or Floating Point



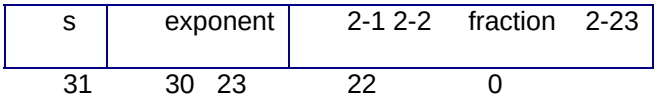
8-Byte Number — Integer or Floating Point



Integer numbers are organized exactly as above, where each bit has a unique significance equal to two raised to the power equal to the number of the bit position.

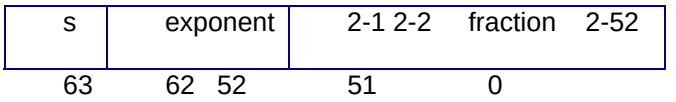
Floating point numbers are represented according to the IEEE Standard floating point formats described next. The formats are described in bit order from MSB to LSB. Remember that the bytes are “out of order” as described above according to the Intel processor number representation convention.

4-Byte IEEE Floating Point Number



value = (-1)s x 1.fraction x 2exponent - 127

8-Byte IEEE Floating Point Number



value = (-1)s x 1.fraction x 2exponent - 1023

Table A-5 on page 9 and Table A-6 on page 16 specify the formats for the Q-MIPS header and footer structures respectively. Character fields that contain more than one byte are arrays of characters interpreted as strings of text such as the name of the sonar or the software revision. In the Q-MIPS data format, only characters are arranged in arrays. The different sizes (in bytes) of the integer and float fields indicates their different precisions as described above. In order to save space and save you some reading time, two footnote symbols have been used to represent information common to many of the fields. The symbols are defined below and appear at the bottom of each of the tables.

† **Single dagger**: This field is for ***storage only*** and is not used in any Q-MIPS or Isis calculations.

* **Asterisk**: This field is set to the ***value received over the serial navigation interface*** (specified in navigation template) or among telemetry from various digital towfish. If a value is not received, the field remains zero.

Table A-5. Q-MIPS header format description

Offset	Element Name	Bytes Used	Value Type	Remarks, Values, Ranges, Units, Examples, etc.
Format and Revision				
0000	fileFormat	1	BYTE	50 for Q-MIPS files, 1 for old S-MIPS files.
0001	systemType	1	BYTE	0 is Q-MIPS, 84 is Q-MIPS/DSP, 202 is Isis.
0002	softwareRev	6	BYTE	Null-terminated string, e.g. “6.61\0” or “Isis” for Isis-recorded files.
0008	spare1	20	BYTE	Not currently used, all zeros.
Digitizer Parameters				
0028	sampleRate	2	USHORT	[0...750], Q-MIPS digitizing rate in ksamples/ second; not valid for Isis — set to 20.
0030	numImageryChannels	2	USHORT	[1...8], number of channels; up to 4 Q-MIPS channels, raw and/or processed; up to 4 Isis channels.
0032	bitsPerPixel	2	USHORT	[8 or 16], Q-MIPS analog data are limited by 12-bit resolution of A/D converter; Isis analog and all digital data can be 16-bit.
0034	pixelsPerChannelPerPing	2	USHORT	Always 1024 for files created by Q-MIPS; [0...65535] for Isis

0036	speedOfSoundInWater	4	FLOAT	Sound velocity divided by two in meters/sec loaded from QMIPS.DAT; specified with Isis Speed of Sound command; usually 750.
0040	noLongerUsed	4	FLOAT	Was initial sonar signal divisor in Q-MIPS version 5.19 and earlier. Not currently used, zeros.
0044	asyncChannelNumber	2	USHORT	[0...4] for Q-MIPS, 0 if no async channel. The async channel must be the last (highest number) channel collected; not used by Isis.
0046	numSonarChannels	2	USHORT	[1...4], number of analog sonar channels being digitized. In Q-MIPS, divide sample rate by this number to get the per-channel sampling rate.
0048	ch1_processingAvailable	2	USHORT	[0...3], indicates the presence of, and processing applied to, each of the four input channels: 0: not present; 1: raw only; 2: corrected only; 3: both raw and corrected.
0050	ch2_processingAvailable	2	USHORT	
0052	ch3_processingAvailable	2	USHORT	
0054	ch4_processingAvailable	2	USHORT	
Navigation System Parameters				
0056	navLatency[1]	2	USHORT	latency of navigation, in ms.

[1] Isis version 2.14 and later

0058	navSystemName	100	BYTE	Not currently used, all null chars (0). Prior to version 6.00, set to SERIAL_INPUT for serial port nav. Could also be QUILS II, SONARDYNE, or NOTHING in older versions.
0158	projectionType	12	BYTE	Not currently used, all null chars (0).
0170	spheriodType	2	BYTE	Not currently used, all null chars (0).
0182	zone	2	USHORT	Not used, all zeros (was UTM zone).
0184	originLat	4	FLOAT	Origin of the local coordinate system in decimal degrees for conversion from nav system.
0188	originLong	4	FLOAT	northings and eastings to Latitude and Longitude; not currently used, all zeros.
0192	offsetLat	4	FLOAT	Offset of the local coordinate system in meters from origin; not currently used; all zeros.
0196	offsetLong	4	FLOAT	
0200	navUnits	2	USHORT	[0...3], units for nav data, 0: meters, 1: feet, 2: yards, 3: degrees (Latitude & Longitude); feet and yards are not currently used.
Site Parameters				
0202	diveNumber	2	USHORT	All fields in this section are currently not in use. They
0204	blockNumber	2	USHORT	
0206	trackNumber	2	USHORT	

0208	runNumber	2	USHORT	are all set to 0.
0210	spare4[100]	100	BYTE	
Annotation				
0310	operatorAnnotation	100	BYTE	Not currently used, all null chars (0).
0410	sonarName	40	BYTE	Sonar name from SONARS.DAT for Q-MIPS; “Isis Analog Server” for Isis.
Sonar Parameters				
0450	triggerDirection	2	USHORT	Sonar trigger edge direction for Q-MIPS, 1: positive-going, 0: look for level, -1: negative-going, from SONARS.DAT or Record Mode set-up; not used by Isis.
0452	triggerMagnitude	4	USHORT	Sonar trigger threshold in A/D units (2.4mV) for Q-MIPS, from SONARS.DAT or Record Mode set-up; not used by Isis.
0456	triggerWidth	4	FLOAT	Duration of sonar trigger in seconds for Q-MIPS, from SONARS.DAT or Record Mode set-up; not used by Isis.
0460	ch1_frequency	2	USHORT	Sonar carrier frequency in kHz from SONARS.DAT for Q-MIPS; defaults to 100 for Isis. *
0462	ch2_frequency	2	USHORT	
0464	ch3_frequency	2	USHORT	
0466	ch4_frequency	2	USHORT	
0468	ch1_horizBeamAngle	4	FLOAT	Sonar 3dB narrow beam width in degrees from

0472	ch2_horizBeamAngle	4	FLOAT	width in degrees from SONARS.DAT. Used in mensuration and zoom display correction; not currently used by Isis.
0476	ch3_horizBeamAngle	4	FLOAT	
0480	ch4_horizBeamAngle	4	FLOAT	
Storage File Name				
0484	thisFileName[45]	45	CHAR	Original path name of current destination file.
0529	reserved2	1	CHAR	Unused, the null character (0).
More Sonar Parameters				
0530	ch1_halfWaveRectify	2	USHORT	Boolean, 1: channel is half-wave rectified, 0: this channel is not rectified; set to 0 for Isis.
0532	ch2_halfWaveRectify	2	USHORT	
0534	ch3_halfWaveRectify	2	USHORT	
0536	ch4_halfWaveRectify	2	USHORT	
0538	ch1_tiltAngle	4	FLOAT	Sonar transducer tilt angle down from horizontal in degrees, from SONARS.DAT. Used in beam angle compensation; defaults to 30 for Isis
0542	ch2_tiltAngle	4	FLOAT	
0546	ch3_tiltAngle	4	FLOAT	
0550	ch4_tiltAngle	4	FLOAT	
0554	ch1_beamWidth_3dB	4	FLOAT	Sonar 3dB fan (vertical) beam width in degrees from SONARS.DAT. Used in beam angle compensation; defaults to 50 for Isis
0558	ch2_beamWidth_3dB	4	FLOAT	
0562	ch3_beamWidth_3dB	4	FLOAT	
0566	ch4_beamWidth_3dB	4	FLOAT	
0570	ch1_realSampleRate	4	FLOAT	Used in DSP only.
0574	ch2_realSampleRate	4	FLOAT	
0578	ch3_realSampleRate	4	FLOAT	
0582	ch4_realSampleRate	4	FLOAT	

Reserved Space				
0586	spare5[438]	454	BYTE	Unused; all zeros.

†For storage only, not used in any Q-MIPS calculations.
*Set to the value received from navigation system or digital towfish; otherwise zero.

Table A-6. Q-MIPS footer format description

Offset	Element Name	Bytes Used	Value Type	Remarks, Values, Ranges, Units, Examples, etc.
Date and Time				
0000	day	1	BYTE	[1...31], day of the month.
0001	month	1	BYTE	[1...12], month of the year.
0002	year	1	BYTE	[0...99], year within the century.
0003	hour	1	BYTE	[0...23], hour of the day, 24-hour time.
0004	minute	1	BYTE	[0...59], minute within the hour.
0005	seconds	1	BYTE	[0...59], seconds within the minute.
0006	thousandsSeconds	2	USHORT	[0...999], thousandths of seconds. Time is kept by Q-MIPS or Isis system clock which can be synchronized to the nav system time at each nav fix (use AB in template).
Magnetometer Readings				
0008	magX	4	FLOAT	Magnetometer reading on x, y, and z axes,
0012	magY	4	FLOAT	units are not specified, the value provided by
0016	magZ	4	FLOAT	the telemetry is stored with no

				conversion. †*
Ping Number, Ship Speed, Asynchronous Window Offset and Auxiliary Storage				
0020	pingNumber	4	USHORT	Ping number starts at 1 in each Q-MIPS file, 0 in each Isis file and is incremented automatically. Max = 4.29×10^9.
0024	asyncByteOffset	2	USHORT	When non-zero in Q-MIPS, indicates the presence of a unique asynchronous ping being stored with this ping, when 0 indicates the most recent asynchronous ping (if any) is being replicated; not used by Isis
0026	shipSpeed	2	USHORT	Speed of ship in knots multiplied by 100. *
0028	auxVal1	4	FLOAT	Auxiliary telemetry values, user-defined; displayed in Isis Sensors box. †*
0032	auxVal2	4	FLOAT	
0036	auxVal3	4	FLOAT	
0040	auxVal5	4	FLOAT	
Digitizer Parameters				
0044	auxAltitude	4	FLOAT	Altitude in meters from subbottom sensor if provided in nav telemetry (DSP, Isis) or from bottom detect on array processor (Q-MIPS).
0048	triggerChannel	2	USHORT	[1...4], Channel on which the sonar trigger is to be detected, from QMIPS.DAT.
0050	altSource	2	USHORT	Altitude source for water column removal and correction for slant range, 0: telemetry, 1-4: water column detection channel, 5: manual entry by user, set in QMI_PS.DAT or by user.
0052	waterColumn	4	USHORT	Number of samples in the water column as determined from altSource.

0056	triggerPeriod	4	USHORT	Number of samples in the trigger period determined from ping to ping by Q-MIPS.
0060	ch1_signalDivisor	2	USHORT	Chan 1 signal divisor •100. Set to 1 for Isis. For Q-MIPS, raw, signed, 12-bit, digitized sample is divided by this and truncated to 8 bits for display. The sign bit is dropped. The default divisor of 8 fits the 11-bit unsigned value into an unsigned 8-bit value. Value of 1 leaves the samples unchanged.
Towfish Telemetry				
0062	telemFishDepth	4	FLOAT	Depth of sonar source below sea level in meters. *
0066	telemFishHeading	4	FLOAT	Magnetic heading of fish in degrees. *
0070	telemFishPitch	4	FLOAT	Fish pitch in degrees, positive nose up. *
0074	telemFishRoll	4	FLOAT	Fish roll in degrees, positive is defined as starboard down. *
0078	telemFishAlt	4	FLOAT	Fish altitude above the sea floor in meters, from navigation telemetry or manual entry, takes precedence over auxAltitude. In Isis this is the tracked altitude. *
0082	telemSbotAlt	4	FLOAT	Subbottom sensor altitude above the sea floor in meters. Not used by Isis. *
0086	telemSpeedLog	4	FLOAT	Vehicle speed in meters per second from electromotive impeller speed log. †*
0090	soundVelocity	2	USHORT	One-way sound velocity multiplied by 30. Not used by Isis. †*

Channel 1 Sonar Parameters and Sampling Rate				
0092	ch1_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.
0096	ch1_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters. Not used in Isis.
0100	ch1_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. Not used in Isis. *
0102	ch1_sampleScheme	2	USHORT	[1...5] For storage, digitized samples are decimated to 1024 samples per channel per ping using one of five methods defined as 1: average, 2: maximum, 3: minimum, 4: rms, or 5: none (meaning the first sample in the group to be downsampled is taken). The method is defined for each channel in QMIPS.DAT. Another parameter, *screen* downsample (0: skip, 1: average, 2: maximum, 3: minimum) is not stored but is also defined in QMIPS.DAT and may be changed from the keyboard. Set to 2 in Isis.
0104	ch1_rawRange	2	USHORT	Raw maximum slant range in meters, stored even if only processed imagery is saved, zero if channel is not present. On any asynchronous channel, this holds the async range.
0106	ch1_initialGain	1	BYTE	Initial channel gain. †*
0107	reservedForFloatSamp	2	USHORT	Sample rate in Hz used in DSP only.
0108	ch1_gain	1	BYTE	Channel gain. †*

0110	sampleRate	2	USHORT	Aggregate sample rate in kHz, set by user in Q-MIPS record mode setup. Not used in Isis.
0112	ch1_correctedRange	2	USHORT	Single-side range of corrected channel in meters, zero if corrected data are not saved. On any asynchronous channel, this holds the async delay in meters multiplied by 100. Not currently used in Isis.
Channel 2 Sonar Parameters				
0114	ch2_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.
0118	ch2_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters. Not used in Isis.
0122	ch2_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. Not used in Isis. *
0124	ch2_sampleScheme	2	USHORT	[1...5] See ch1_sampleScheme description.
0126	ch2_rawRange	2	USHORT	See ch1_rawRange description. †
0128	ch2_initialGain	1	BYTE	Initial channel gain. †*
0129	ch2_gain	1	BYTE	Channel gain. †*
0130	oceanTide	2	USHORT	Altitude above Geoide (from RTK)
0132	ch2_signalDivisor	2	USHORT	Signal divisor multiplied by 100, see under Digitizer Parameters ch1_signalDivisor.
0134	ch2_correctedRange	2	USHORT	See ch1_correctedRange description.

				description.
Channel 3 Sonar Parameters and Range to Fish				
0136	ch3_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.
0140	ch3_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters.
0144	ch3_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. *
0146	ch3_sampleScheme	2	USHORT	[1...5] See ch1_sampleScheme description.
0148	ch3_rawRange	2	USHORT	See ch1_rawRange description.
0150	ch3_initialGain	1	BYTE	Initial channel gain. †*
0151	ch3_gain	1	BYTE	Channel gain. †*
0152	range_to_fish	2	USHORT	Distance to fish in meters multiplied by 10.*
0154	ch3_signalDivisor	2	USHORT	Signal divisor multiplied by 100, see under Digitizer Parameters ch1_signalDivisor.
0156	ch3_correctedRange	2	USHORT	See ch1_correctedRange description
Channel 4 Sonar Parameters and Bearing to Fish				
0158	ch4_floatRawRange	4	FLOAT	Higher resolution raw maximum slant range in meters. Used in DSP and Isis; not Q-MIPS.

0162	ch4_delayRange	4	FLOAT	Channel delay in meters, entered in Q-MIPS DIGITIZER menu in seconds and converted to meters. Not used in Isis.
0166	ch4_bandWidth	2	USHORT	Sonar channel bandwidth in kHz. Not used in Isis.*
0168	ch4_sampleScheme	2	USHORT	[1...5] See ch1_sampleScheme description.
0170	ch4_rawRange	2	USHORT	See ch1_rawRange description.
0172	ch4_initialGain	1	BYTE	Initial channel gain. †*
0173	ch4_gain	1	BYTE	Channel gain. †*
0174	bearing_to_fish	2	USHORT	Bearing to fish in degrees multiplied by 100.*
0176	ch4_signalDivisor	2	USHORT	Signal divisor multiplied by 100, see under Digitizer Parameters ch1_signalDivisor.
0178	ch4_correctedRange	2	USHORT	See ch1_correctedRange description.

Nav System Parameters and Additional Fish Telemetry				
0180	waterTemperature	2	USHORT	CTD water temperature frequency times 100. †*
0184	eventNumber	4	SHORT	Last unique event or contact number; corresponds to contacts file in Q-MIPS.
0186	auxVal6	4	FLOAT	Auxiliary telemetry value, user-defined; displayed in Isis Sensors box. †*
0190	shipLatitude	8	DOUBLE	Ship's latitude in decimal degrees. †*

0198	shipLongitude	8	DOUBLE	Ship's longitude in decimal degrees. †*
0206	navEasting	4	FLOAT	Computed fish position in meters if navUnits are m. When the navUnits are degrees, the navEasting and navNorthing fields are combined into one double-precision floating point value to hold navLatitude.
0210	navNorthing	4	FLOAT	
0214	cableTension	4	FLOAT	Cable tension in from serial port. †*
0218	conductivity	4	FLOAT	CTD Conductivity frequency. †*
0222	navFishHeading	4	FLOAT	For backward compatibility with S-MIPS files only. All zeros. Not currently used.
0226	navFishSpeed	4	FLOAT	Fish speed in knots from nav telemetry or computed from navigation telemetry N and E velocities, used in imagery display calculations. If speed is not available from navigation telemetry, navFishSpeed is set to shipSpeed or calculated from point-to-point towfish position.
0230	navShipGyro	4	FLOAT	Ship's heading in degrees displayed on status monitor. †*
0234	auxVal4	4	FLOAT	Auxiliary telemetry value, user-defined; displayed in Isis Sensors box. †*
0238	navLongitude	8	DOUBLE	Computed fish position in decimal degrees if navUnits are degrees, otherwise zero.

0246	fishLayback	2	USHORT	Towfish layback (horizontal distance) in meters from navigation telemetry or manual entry, used in position calculations.
0248	navFixHour	1	BYTE	
0249	navFixMinute	1	BYTE	Time of the most recent navigation fix.
0250	navFixSeconds	1	BYTE	
0251	relativeBearingToFish	1	CHAR	Bearing to towfish in integral degrees off ship's course, ship to fish straight back is 000, to starboard is -090; calculated and stored only when you have entered a non-zero layback and a lateral offset (Veeder Root). Used in position calculations when non-zero. Not used in Isis.
0252	julianDay	2	USHORT	Number of days since the first of the year, since Q-MIPS v5.18. Month and day are calculated from this value.*
0254	cableOut	2	USHORT	Cable out in meters from navigation telemetry, manual entry or computed as a percentage of telemetered fish layback. †

† For storage only, not used in any Q-MIPS calculations.
* Set to the value received from navigation system or digital towfish; otherwise zero

Appendix B Isis BAC and GAC File Formats

Isis supports a number of file formats: Q-MIPS, BAC, GAC, and XTF. Each has distinct advantages. This appendix explains the BAC and GAC formats.

B.1 BAC File Format

You can create a BAC file from transducer beam patterns, or Q-MIPS or Isis can create it by using theoretical or empirical beam patterns. Although these files generally have the BAC (Beam Angle Compensation) extension, they reflect the measured or inferred beam *pattern* of the sonar rather than the *compensation* that will be applied. In this way, Q-MIPS and Isis need not be concerned with the origin of a BAC that is applied.

All BAC files are ASCII and consist of paired signal intensity values in decibels for each degree off vertical. A sample beam pattern (**SM28.BAC**) file is shown in Figure B-1.

```
/* Beam patterns in dB (angle off vertical, port, starboard)
*/
22.183 21.703     /* (Max level bias in dB, port &
starboard) */
131   /* number of angle bins */
012.858     12.166 /* angle off vertical, port (dB),
starboard (dB) */
112.858     12.166
212.858     12.166
312.858     12.166
412.858     12.166
...
...
...
1290.552    0.599
1300.000    0.000 /* angle off vertical, port (dB),
starboard (dB) */
```

Figure B-1. Sample BAC beam pattern file

B.2 GAC File Format

Q-MIPS or Isis can create Grazing Angle Compensation files, either theoretically or empirically. The GAC files are ASCII and consist of paired multiplicative corrections for each degree of grazing angle from 0 (far range) to 45. A sample GAC file (**SM28.GAC**) is shown in Figure B-2.

```
/* Grazing Angle Corrections */
46    /* number of angle bins */
01.858697   1.253826 /* grazing angle, port, starboard
corrections */
11.809185   1.233621
21.759672   1.213416
31.710160   1.193211
41.660647   1.173006
...
...
...
441.000000  1.000000
451.000000  1.000000 /* grazing angle, port, starboard
corrections */
```

Figure B-2. Sample GAC beam pattern file

Appendix C Mass Storage Options

Isis does not restrict you to recording your data on just one kind of medium. You can record to mass storage devices such a fixed hard disk, removable tape, or removable magneto-optical disk.

C.1 SCSI Bus Configuration

All Isis optional mass storage devices, which are internal, are SCSI devices and thus require the use of the Isis SCSI adapter card. Each drive and its adapter card has a unique ID (0 to 7) on the SCSI bus. SCSI devices are daisy-chained with internal devices connected to the adapter's internal connector; external devices are connected to the adapter's external connector on the Isis back panel.

Each end of the SCSI bus must be terminated. The Isis system is delivered with the hard drive terminated at the internal end of the SCSI bus. If additional external devices are connected to Isis, the last daisy-chained external device must be terminated. If no external devices are connected, the adapter will automatically terminate itself. The SCSI bus should be terminated only at its extreme ends. Isis can access SCSI devices as shown in Table C-1.

Do not over-terminate the SCSI bus. Improper termination can cause the SCSI adapter to fail!

Table C-1. SCSI designations and what they mean to Isis

SCSI ID	Drive Designation	Device
0	C: and D:	Hard drive
1	reserved	none
2	reserved	none
3	Y:	First Exabyte drive
4	Z:	Second Exabyte drive
5	E:	First M-O drive
6	F:	Second M-O drive
7	reserved for controller	none

C.2 Using Exabyte Tape Drives with Isis

Isis supports all current models of Exabyte tape drives. To complete the support, the stand-alone utility program **EXABYTE.EXE** is distributed with every Isis system that uses an Exabyte tape drive. The program may be used to copy files between hard disk and Exabyte tape drives. To copy a file from one Exabyte tape drive to another using **EXABYTE.EXE**, it is necessary to first copy the file from tape to hard disk, then from hard disk to the other tape.

If you have used software other than Isis to create a DAT or SEG-Y file, you can use the Exabyte utility to read or write (copy) the file. However, when using Isis software to write or read these file types, keep in mind the limitations shown in Table C-2:

Table C-2. Isis software's ability to write or read DAT and SEG-Y files

File Type	Write It?	Read It?
.DAT	no	yes
.SEG	yes	yes

Note: EXABYTE.EXE only recognizes standard DOS file structures. The utility cannot be used to work with SEG-Y format tapes written by Isis. Refer to ***'Using the SEG-Y Format on Exabyte Tape'*** on page 32 for a discussion on how Isis interprets the SEG-Y format.

You can also use **EXABYTE.EXE** to archive disk files to tape.

Tape motion is controlled in Isis via the Playback and Record mode Tape Control dialog boxes. Refer to Figure 3-7 on page 39 in the *Isis User's Manual, Volume 1*, for a discussion of the Tape Control dialog boxes.

To start the Exabyte program

- Type **`EXABYTE Y: [Enter]`**, or type **`EXABYTE Z: [Enter]`**

The following options are available through **`EXABYTE.EXE`**:

3. **Directory:** This option displays the contents of a tape. It will also display the names of files copied to it with the Exabyte program.

   In Isis, the **Directory** option only recognizes the file format that the Exabyte program writes to the tape during record mode or the Exabyte program's **Copy file** option.

4. **Copy File:** You use **Copy file** to copy files to or from an Exabyte drive. Choose either **Copy To** and **Copy From**.

- Option #1: **Copy To:** With this option, you can copy a single file or multiple files. The file will be copied to the tape at the current tape position. Any files that reside on the tape after the current position will probably be lost.For example, to copy all DAT Q-MIPS files in the **D:\QMIPS** directory to an Exabyte tape, use the **Copy to** option and specify **D:\QMIPS*.DAT** as the source name to copy.

- Option #2: **Copy From:** If you choose this option, Exabyte will prompt you for the number of the file (obtained from the Directory option) to be copied to hard disk, and prompt you to enter the destination path and name of the file to be created on the hard drive. Once the number is entered, the utility rewinds the tape and copies the file.

3. **Rewind tape:** The rewind option will position the tape at the beginning of the tape. If the erase option is specified at this point, the entire tape will be erased.

4. **Erase tape:** The erase option will erase the tape from the current tape position to the end. Before erasing the tape, the Exabyte program will ask you to confirm your intention. The tape will be automatically rewound at the end of the erase pass.

To erase the entire tape

- Choose **Rewind.**
- Choose **Erase**.

To erase the tape after a specific file

1. Get a Directory.
2. Choose the **Copy To** option.
3. Enter the number of the last file you want to save.
4. Copy that file to the file name **NULL** (the file will appear to copy, but no hard disk file will be created).
5. Choose **Erase**.

C.3 Using the SEG-Y Format on Exabyte Tape

Technically speaking, only genuine SEG-Y data can be written to SEG-Y tape media. However, few people still use SEG-Y tape any more; most now use Exabyte tape. Isis uses true SEG-Y data format on Exabyte tape. Except for the difference in the two tape media types, our format is indeed true SEG-Y.

SEG-Y requires a 3200-byte EBCDIC record followed by a 400-byte binary header at the beginning of the tape. Each trace starts with a 240-byte trace header followed by the trace data. The three headers are all documented in **SEGYFMT.H**. If you do not find this file on your Isis system, you can download it from our FTP site (no password needed).

The first 3200 bytes are written as a single block. This block is followed by a 400-byte single block. (You must change block size to read the tape — this is required by the SEG-Y specification.) When trying to read SEG-Y format, if the read software does not change block size, then it will fail to read the data. Isis includes these blocks according to specification.

As stated elsewhere in this manual, you can also use a "modified" SEG-Y format on optical disks. The disk format is "modified" because of the difference in the types of media: Tape access is sequential ("flat file") whereas disk access is random. However, the SEG-Y specification only accommodates sequential, flat-file access, so Triton Elics has modified the SEG-Y format to work with disks.

Refer to ***'Setting Up Tape to Record or Play Back'*** in the *Isis User's Manual, Volume 1*, to see how to set up Isis for recording on tape.

C.4 Using Magneto-Optical Drives with Isis

Isis can recognize and use up to two multi-function magneto-optical drives if they are logically attached to the SCSI controller as drives E: and F: in a DOS or Windows environment. For 486-based systems, the SCSI controller is an Adaptec AHA 1542C (or 1542B, 1542CF); for Pentium-based systems, the SCSI controller is an AIC-7870 on the CPU board. The two drives should be configured for SCSI ID numbers 5 (for drive E:) and 6 (for drive F:). The M-O drives installed in an Isis system have large capacities (one or more gigabytes per M-O) and can read from and write to several types of cartridges.

C.4.1 Different Sector Sizes, Different Purposes

Magneto-optical ("M-O") cartridges come low-level formatted with either 1024-byte sectors or 512-byte sectors. The 1024 size is typically used for UNIX systems, while 512-byte sectors are more common for Microsoft operating systems. Isis, which run under Microsoft operating systems, expects to "see" (read) 512-byte sectors. Isis can also read 1024-byte sectors if the M-O was high-level formatted for DOS, but performance suffers: For an M-O low-level formatted at 1024-bytes per sector, Isis reads the M-O at about 10% of normal.

Whenever you are using an application such as Isis on Microsoft's Windows 95, Windows NT, Windows 3.11 or DOS, use cartridges low-level formatted for 512-bytes/ sector. Never use 1024 bytes/sector M-O cartridges with Isis!

Note: An M-O cartridge's capacity is independent of its low-level bytes per sector format; one cannot deduce the bytes per sector from the M-O's capacity. The only way to know the bytes per sector of a given M-O is to inspect the labeling on the cartridge and read how many bytes per sector the manufacturer says it has.

C.4.2 Typical HP Cartridge Types

The following table lists HP model numbers for Isis-compatible media. Compatible media are also available from several other manufacturers.

Table C-3. HP magneto-optical media that are compatible with Isis

Capacity	Rewritable
600 MB	92279A
1.2 GB	92279T
2.4 GB	92279F

Triton Elics recommends you use HP media cartridges because they are very reliable and have a 30-year warranty.

Media cartridges with 512-byte sectors written by other compatible magneto-optical drives (for example, Sony and other ISO-standard drives) can also be read by the HP multi-function drives.

C.4.3 High-Level Formatting Considerations

In general, you need one hard disk partition per side of the M-O. You accomplish this using AFDISK. In addition to knowing the low-level format of an M-O cartridge, such as the number of bytes (typical 512 or 1024) per sector, you need to take into account the M-O cartridge's high-level format that will be used with Isis. An M-O cartridge that will be used with Isis must be high-level formatted with one ***DOS*** hard disk partition.

To high-level format an M-O cartridge, refer to C.4.3.2 ('Formatting the M-O after Backing up Your M-O's Data') on page 32.

If you believe your data disk already has been high-level formatted with what AFDISK calls Standard Hard Disk Format (***i.e.***, the DOS high-level format), then exit Windows and re-start Windows 95 with the **WIN/D:F** command. You should now be able to read the 1024 Byte/sector M-O disk, albeit slowly.

C.4.3.1 Backing Up Your M-O Data Before Reformatting

Because formatting destroys any data existing on the cartridge, you will want to back up your M-O data before formatting.

To back up your data from the M-O

1. With the M-O cartridge in Drive E:, exit Windows 95. (When the message comes up that allows you to go to DOS, close Windows completely and go to DOS — not just the DOS shell).
2. In DOS, use **COPY** or **XCOPY** to copy your files from your M-O to your D: drive.

C.4.3.2 Formatting the M-O after Backing up Your M-O's Data

As noted above, HP cartridges come pre-formatted with 512-byte (or 1024-byte) sectors, but high-level formatting must be completed and a DOS-style partition must be created on these cartridges before they can be used.

If your data is backed up as indicated in the previous subsection, you now are ready to reformat your M-O with a high-level format suitable for DOS and Windows. You use the AFDISK utility to do this to both sides. This will erase any data on the cartridge!

To high-level format side #1 of a magneto-optical cartridge

1. Exit Windows completely (don't just shell out to DOS).
2. At the DOS prompt, go to the **C:\ASPI** directory, where **AFDISK.EXE** utility is located.
3. Insert a new cartridge in the **E:** or **F:** drive.
4. Type **AFDISK**, and press **[Enter]** to run AFDISK.
5. In AFDISK, take the following steps to partition and label the cartridge.
   a. Use the arrow keys to highlight the SCSI ID of the drive which holds the cartridge to be partitioned. This will be **5** for drive **E:** or **6** for drive **F:**. Verify that the model number of the SCSI device that you choose is C1716T. Once the drive is highlighted, press **[Enter]** to select it. Do ***NOT*** select SCSI ID 0!

When formatting M-O cartridges, care must be taken not to erase the hard drive. NEVER use the AFDISK.EXE to access SCSI ID 0!

If the media in the selected drive is unformatted, AFDISK displays a message:

```
This disk is unformatted.
--Press <Esc> to continue--
```

If this message does not appear, STOP! The cartridge may already contain data. Formatting or creating a partition will delete any previously saved data!

a. Press **[Esc]**. The system notifies you of the formatting options:

AFDISK allows users the option of a floppy format or a hard disk format for the medium selected. Hit the **[F1]** key for more information on disk formats
--Press <Esc> to continue--

b. Press **[Esc]** to display the formatting options.

c. Use the arrow keys to select **Standard Hard Disk Forma**t and press **[Enter]** to select this option. AFDISK will display a message asking you to wait while the disk is formatted. This will take about ten seconds.

- When the formatting is completed, logical drive information will be displayed in the lower left corner of the display and a partition table for the cartridge will be displayed in the upper right hand corner of the display.

d. Verify that no partitions exist (the partition table is empty).

- If the partition table is ***not*** empty, you are attempting to partition a cartridge side that has already been partitioned. **STOP**. ***The cartridge may contain data that will be lost if you modify the partition table.***
- If the partition table is empty, press the **[Insert]** key to create a partition.

e. Press **[Enter]** to accept the full capacity of one side of the cartridge as the partition size.

f. Press **[Enter]** to create the partition.

g. Press **[Esc]** to quit AFDISK. AFDISK will ask you to re-start the computer by pressing **[Ctrl] [Alt] [Del]**. Do this and wait for the system to go through its start-up routine.

h. At the DOS prompt, type **LABEL E:** (or **F:**) to assign a volume label to this side of the cartridge.

To high-level format side #2 of a magneto-optical cartridge

1. Eject the cartridge you just formatted.
2. Turn it over and insert it again.
3. Run AFDISK again from the DOS prompt.

4. Repeat steps 7 through 15 of the procedure, 'To high-level format side #1 of a magneto-optical cartridge'.

Partitioned cartridges, inserted into the HP drives, function as DOS logical drives. All DOS and Q-MIPS commands function normally on rewritable cartridges. Write-once cartridges, however, cannot be erased functionally once they have been written.

To partition a new MO using AFDISK.EXE with NT

1. Download a file from our FTP site called EBD_95.ZIP.
2. Unzip it to a floppy.
3. With the floppy in the drive, make the floppy bootable by typing this command from any DOS or Win95 machine:

```
SYS C: A:
```

4. Shut down the NT machine that is equipped with the MO drive or drives.
5. Put the floppy in the NT machine, restart it, and allow the machine to reboot from the floppy.
6. Put a new (never before formatted or partitioned) MO cartridge in your MO drive.
7. At the `a:\` prompt, type `AFDISK` and press [Enter].
8. Select the MO drive you want to partition.

If your MO cartridge is new (unformatted), you will get the message, **This disk is not formatted** If your MO cartridge is not new (has already been formatted/partitioned), AFDISK will say it cannot proceed. Continue with ***'To high-level format side #1 of a magneto-optical cartridge'*** on page 32.

C.4.3.3 Restoring Your Backed Up Data after Reformatting

Your reformatted M-O is now ready to receive the data you backed up.

To restore your backed up data to the newly formatted M-O

- Copy your files from the D: drive back to your newly formatted M-O cartridge on E:

C.4.3.4 Restarting Windows 95 after Restoring Your M-O's Data

If you have restored your data to your M-O, you are now ready to resume using it with Windows 95.

To make Windows 95 see your M-O if it has 1024 bytes per sector

- Re-start Windows 95 by typing **WIN/D:F**.

This will permit Win 95 to recognize your low-level formatted M-O disk that has 1024 bytes/sector. As previously noted, reading the 1024 bytes/sector M-O will be slow (about 10% normal).

Appendix D Serial Interfaces

As noted in **Chapter 3, 'Using the File Menu'**, ***Isis User's Manual, Volume 1***, Isis supports up to 16 serial **com** ports, many of which can be used to feed navigation information to Isis from external devices that can transmit over serial ports. You can manage the output of an external device's transmission by writing your own serial interface string and using it as a template for the device.
This appendix explains:

- the connections you need to hook up your serial input device to your Isis system
- how the Isis software receives the data from the serial device
- what tokens can be used to make a serial interface template, and
- what a typical template looks like

D.1 Connection

Serial (RS232) input to Isis is done through the 9-pin **com** connector(s) found on the back panel of the Isis. The basic Isis system is equipped with a **com**1 port. **com**2 is reserved for the trackball. Additional **com** ports are available as options. The **com** ports are female IBM AT DB-9 serial connectors. Triton Elics ships them with the pinouts shown in Table D-1. If your Nav system pinouts differ from these defaults, you may want to write them in here.

Table D-1. Isis pinouts for COM1 serial port

Isis uses these pins	for these functions	Your Nav System uses
Pin 1 <----------	Carrier Detect ----------	_____
*Pin 2 <----------	Receive Data ----------	_____
*Pin 3 ---------->	Transmit Data ---------->	_____
Pin 4 ---------->	Data Terminal Ready ->	_____
*Pin 5 ----------	Ground ----------	_____
Pin 6 <----------	Data Set Ready ----------	_____

Pin 7 ----------	Request To Send ------>	_____
Pin 8 <----------	Clear To Send ----------	_____
Pin 9 <----------	Ring Indicator ----------	_____

*Only pins 2, 3, and 5 are needed for a complete interface. All other pins are physically connected but not used by the Isis software.

Some serial communications devices use DB-25 connectors. These may be connected to Isis with the installation of a DB-9 to DB-25 converter or similar cable, which may be purchased at an electrical supply shop.
The serial cable should be connected to Isis with the power OFF.

D.2 Receive Data Format

Because Isis can connect to many different navigation or telemetry systems, a generic user-definable method has been developed to allow easy integration of new interfaces. Isis can accept and store a wide range of navigation and telemetry information. Although both binary and ASCII data may be received over a serial port, use of a user-defined navigation template requires serial data to be received in ASCII.

Note: All values transmitted over the serial port ***must*** be separated (delimited) by a non-numeric character. Numeric characters are included in the following set:

```
{0123456789.-}
```

Here's what happens when Isis gets data from a serial interface:

1. Isis receives a single transmission string from the serial port. This string is terminated with any character (or characters) having an ASCII value of less than 14. This includes carriage return and line feed (CR, LF).
2. Isis parses the serial transmission based on the alphanumeric combination of characters.
3. Isis assigns each number in the string to the respective field described by the Serial Template, described next.

D.3 Template Construction

For each **com** port and its associated serial device that will be communicating with Isis, you can use a ready-made template or create your own to be used as the interface.

To select or create a template in Isis

1. From the File menu, select **Record Setup**, then **Serial Ports**.
2. Choose a **com** port to be used with a given serial device you have in mind.
3. Enable status by clicking in the **Status** box. A check mark will be visible in the **On** box when status is enabled.
4. Either:

   - Refer to the buttons displaying ready-made "server" software types (**NMEA0183**, **TSS**, **Seatex MRU**, **SeaBat #1**, **SeaBat #2**), choose one to be your template, and choose **OK.**

   or

   - Create your own in the Navigation/Telemetry text box provided and choose **OK**. (A sample user-defined template appears in Figure D-1.)

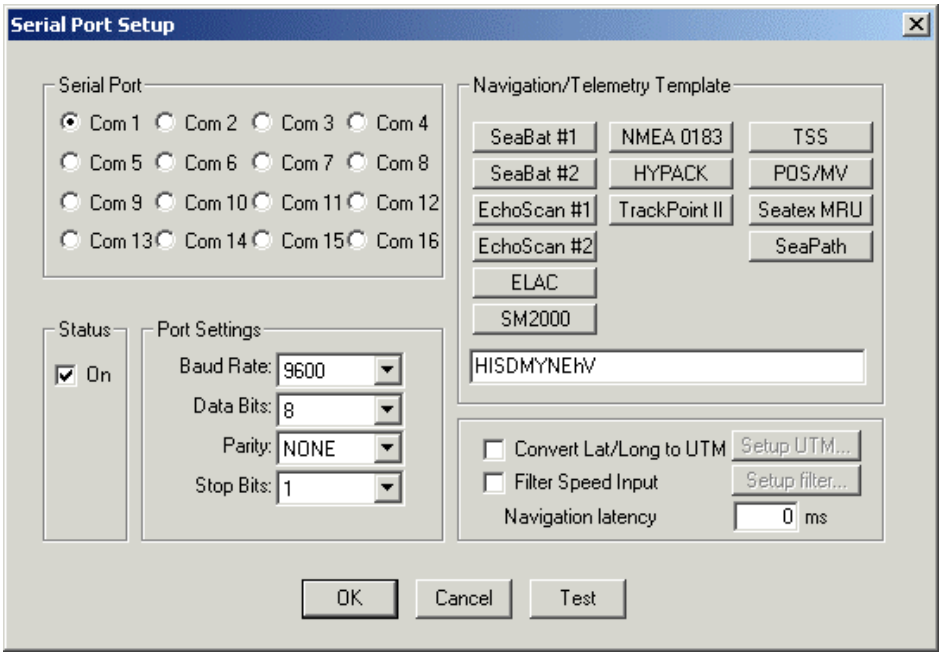


Figure D-1. Sample of a user-defined navigation or telemetry template

The template can accept up to 200 characters from the list shown in **'Values Allowed Over Serial Interfaces and Stored by Isis'.**

D.3.1 Example of Template Construction

Say a simple data logger transmits data over a serial port at 2400 baud, 1 stop bit, 8 data bits and even parity. An example of a string transmitted over such a serial port might be

4/20/90 17:31:22 NORTH 93285.35 EAST 319294.29, H:344.0

Before Isis can use the above data, you need to set up a **com** port to receive it. You do so in the Serial Port Setup dialog box (Figure D-1 in this book). In this case, you would set the Baud Rate to **2400**, Data Bits to **8**, Stop Bits to **1** and Parity to **Even**.

Second, create the serial navigation template. The example transmission string previously mentioned shows that data is formatted by the data logger in the following order:

```
day month year hour minute second north east heading
```

For this example, we will assume that the heading is "course made good," that the heading has been processed by the data logger, and that no other heading is available. Consequently, the towfish will have to use that heading. Also assume that Isis will synchronize its system time and date to that of the data logger. This set of assumptions will enable Isis to correctly return coordinates for imagery pixels when the cursor is moved around the graphics display.

When you construct a template to match the data transmitted with the template codes just described, the result would be a string in a tokenized format:

```
DMYHISNEh
```

Isis interprets the tokenized ***DMYHISNEh*** string as follows:

D	**=**	**day**	**20**
M	**=**	**month**	**4**
Y	**=**	**year**	**90**
H	**=**	**hour**	**17**
I	**=**	**minute**	**31**
S	**=**	**second**	**22**
N	**=**	**northing**	**93285.35**
E	**=**	**easting**	**319294.29**
h	**=**	**towfish heading**	**344.0**

All letters sent with the serial transmission will be ignored except for those used to separate the individual values.

Note: For date and time, Isis uses the NMEA0183 standard. See **'How Isis Works with NMEA0183 Strings'** in Volume 2

As soon as you put Isis in Record mode, Isis will begin monitoring the serial ports for transmissions. To test the interface, use the **COM Port Test** option in the Tools menu (see **'Com Port Test'**, **Isis User's Manual, Volume 1**) or choose **Test** in the Serial Port Setup dialog box. Both access methods lead to the same **com** Port Test dialog box.

Template entries are CASE SENSITIVE (that is, upper or lower case entries are treated as unique entries) and must not contain any space characters. Values are decoded as METERS except where noted. For Isis to interpret northings and eastings as feet, the template entries must include an upper case F.

D.3.2 Values Allowed Over Serial Interfaces and Stored by Isis

Isis has a wide range of user-defined tokens that you can use in your templates. When some of the user-defined tokens are surrounded by delimiters, the meaning of the token changes. Isis can use and store many character tokens over a serial interface (Table D-2).

Note: In Table D-2, some tokens are enclosed in delimiters. Delimited tokens are distinct from non-delimited tokens. In the table, we have used braces as delimiters, but we could have used parentheses or brackets — all are valid; Isis treats them the same. Both types of tokens (delimited and non-delimited) are explained in the table.

Table D-2. Delimited and non-delimited tokens used by Isis

Token	Meaning
0	(zero char) Fish depth in meters. (Manual depth overrides this value.)

1	Auxiliary Value 1
2	Auxiliary Value 2
3	Auxiliary Value 3
4	Auxiliary Value 4
5	Auxiliary Value 5
6	Auxiliary Value 6
7	Fish Altitude in (meters)
8	Fish Pitch (degrees)
9	Fish Roll (degrees)
;	Pressure temperature (CTD data)
>	Bearing to Fish (degrees). This is the same as the **{bf}** token.
?	Range to Fish (meters)
D	Day
E	Easting (or longitude if **$** is included in the nav template) for the fish position — see **{lom}** in this table.
F	Causes Northing and Easting to be converted from feet to meters according to the equation (N|E) * (39.37/12.0)
G	Gyro (direction ship is pointing)
H	Hour
I	Minute
J	Julian day
L	Latency in seconds (age of the navigation at point when first serial character received): "fix Late" (seconds to subtract from transmitted time). This template character now accepts nav latency in decimal form. Receive time in milliseconds, minus this value, is posted in the XTF file's **NavMillisecond_Clock** field.
M	Month
N	Northing (or latitude if **$** is included in the nav template) for the fish position — see **{lam}** in this table.
O	[capital "Oh"] Next event number to use (changing value forces event). In ***Isis User's Manual, Volume 1,*** refer to the sections ***'Mark Event'*** on page 143, for setting events, to ***'Overlay'*** on page 123 for displaying event marks, and to ***'5.6 Sending Isis Imagery to a Plotter/Printer,'*** starting on page 90, ***Isis User's Manual, Volume 1,*** for information on annotating and printing events.
P	Cable Tension
Q	Conductivity frequency (CTD data)

S	Seconds. This can be a decimal number to include a fraction of a second.
T	Velocity East ***Note:*** If speed (**V**) is ***not*** specified, and velocity North and East ***are*** specified, then speed is computed from the velocity north and east.
U	Velocity North. Fish Speed = sqrt(T*T+U*U) * 1.9438445 ***Note:*** If speed (**V**) is ***not*** specified, and velocity North and East ***are*** specified, then speed is computed from the velocity north and east.
V	Fish Speed (knots) — main speed used for image correction
W	Fish Depth in feet (if no manual depth is set)
Y	Year
Z	Benthos flag is set TRUE. Characters 121 132 (inclusive, zero-based indexing) in the receive string are stored as downlink and saturation information. The characters are then blanked-out to prevent parsing errors.
a	Auxiliary Altitude (meters)
b	Temperature Frequency (CTD data)
e	Magnetometer X
g	Channel 1 Gain Code (0 255)
h	Fish Heading (degrees)
i	Current Line ID
j	Channel 2 Gain Code (0 255)
k	Channel 3 Gain Code (0 255)
l	[small letter “ell”] Layback (in meters)
m	Fish Speed. (m/s) (This value is multiplied by 1.9438445 to become knots.)
n	Channel 4 Gain Code (0 255)
o	[small letter “oh”] Cable Out (in meters)
q	Channel 1 Initial Gain Code (0 255)
r	Channel 2 Initial Gain Code (0 255)
s	Speed log (knots) from impeller or other such sensor; stored only
t	Channel 3 Initial Gain Code (0 255)
u	Channel 4 Initial Gain Code (0 255)
v	Ship Speed (in knots; stored only)
w	Magnetometer Y
x	Ship Longitude (decimal degrees) or easting (meters); stored

	only
y	Ship Latitude (decimal degrees) or northing (meters); stored only
z	Magnetometer Z
{0}	[character zero between delimiters] Non-zero fish depth. Isis accepts this depth value of if it is non-zero and there is no manual depth set.
{DOT}	Distance off track (meters)
{KP}	KP (Kilometer post) (Kilometers)
{align=n}	The template token {align=***n***} causes Isis to set an absolute parsing point in the input string. Alignment occurs after the ***nth*** character. If the alignment value is **0**, as in **{align=0}**, the token causes processing to start with the first character in the input string. If **{align=}** is given without specifying ***n***, **0** (zero) is used as the value. If ***n*** is specified to be negative or beyond the size of the current input string, further processing halts at that point. Any processing that happened before the **{align=*n}*** token was encountered, still occurs. See ***'Examples of Character Alignment'*** on page 53.
{bf}	Bearing to Fish (degrees). This is the same as the **>** token.
{d}	Pressure in decibars. Value is converted to psia by multiplying by 1.45038. Fish depth then is computed as described for **{p}** in this table.
{hy}	Yaw Heading. Yaw is computed to be (0.99 * old value + 0.01 * new value), which performs an exponential-decay smoothing.
{h}	Heave. When processing multibeam data, distance below the sea surface is computed to be (depth offset + sensor depth - heave).
{i}	Changed every occurrence of the letters '**E**' or '**e**' to a blank space. Useful in causing Isis to ignore scientific notation.
{KLEIN595}	Makes Isis aware of strings coming from a Klein 595 sonar.
{le}	Electronics-bottle leak detector.
{lam}	Serial template to parse fish latitude stored with separate degrees and minutes. Example: **S 44 38.231 W 121 17.455**. The template to parse this is **{lam}N{lom}E**, where **N** is the token for the fish position.
{log}	If **0** is sent over serial port, causes switch to display only. If **1** is sent, data are logged.
{logn}	Behaves like **{log}**, except that when a **1** is sent, it will be

	followed by a file name to be used for the file name switch.
{lom}	Serial template to parse fish longitude stored with separate degrees and minutes. Example: **S 44 38.231 W 121 17.455**. The template to parse this is **{lam}N{lom}E**, where **E** is the token for the fish position.
{lp}	Power-bottle leak detector
{ms}	Ship speed in m/s. Converted to knots by multiplying by 1.9438445.
{m}	Conductivity in MMHO/cm. Converted to Siemens/meter by dividing by 10.0.
{pattern= input_string}	Isis finds any pattern of characters in ***input_string***. Processing of the string proceeds from that point forward. Pattern matching is case-sensitive. If a match is not found, processing stops. Any processing that happened before the **{pattern=*input_string}*** token was encountered, still occurs. To specify a '**}**' character as part of a pattern string, put a '\' character in front of it. For example, **{pattern=\}}** will cause Isis to look for a closed-brace character. To specify a '\' character as part of a pattern string, use two backslashes (\\). See ***'Examples of Pattern Matching'***.
{pf}	Pressure Frequency (CTD data)
{p}	***{p}*** is pressure in psia. Fish depth is then computed from pressure according to a standard UNESCO formula as follows: $Z_s(P,\phi)$ = 9.72659x10sP – 2.512x10-1P2 + 2.279x10-4P3 – 1.82x10-7P4 [g(ϕ) + 1.092x10-4P] Where g(ϕ), the international formula for gravity, is given by: g(ϕ) = 9.780318 (1 + 5.2788 x 10^{-3} $\sin^2\phi$ + 2.36 x 10^{-5} $\sin^4\phi$) Z = depth in meters P = pressure in MPa ϕ = latitude The above equation is true for oceanographers' standard ocean, defined as an ideal medium with a temperature of 0 C and salinity of 35 parts per thousand. Other methods for calculating

	pressure or depth can be found at: **http://www.npl.co.uk/npl/acoustics/techguides/soundseawater/content.html#PD**
{c}	Conductivity in Siemens/meter
{tv}	Turbidity. This is the same as the | ("pipe" symbol) token.
{t}	Ocean tide (only if manual tide isn't set)
{v1}	Voltage value 1 (displayed in Window→Status and Control →Towfish Status in +95 field). Voltage values are displayed but not stored.
{v2}	Voltage value 2 (displayed in -95 field)
{v3}	Voltage value 3 (displayed in +15 field)
{v4}	Voltage value 4 (displayed in -15 field)
{v5}	Voltage value 5 (displayed in +5 field)
{v}	Velocity of sound in m/s (one-way travel). Isis defaults to 1500 m/s.
{w}	Water temperature (degrees C)
{y}	Yaw in degrees
|	("pipe" symbol) Turbidity. This is the same as the {tv} token.

D.3.2.1 Examples of Pattern Matching

Given the hypothetical template string:

ap{pattern=compass}h

and the hypothetical input string:

```
altitude 38.3, pressure 93.535, diag code 9a8dc8339,
compass 173.44
```

Isis parses the aforementioned sample string by applying the **{pattern=*input_string*}** template as follows:

1. Finds the first numeric character. In this case, it's **3**.
2. Assigns 38.3 to the **a** token, or auxiliary altitude.

3. Finds the next numeric character. In this case, it's **9**.

4. Assigns 93.535 to **p** token, or pressure (psia).

5. Searches the input string, starting after 93.535, for an occurrence of the pattern **compass**.

6. Finds the next numeric character following the token **compass**. In this case, it's **1**.

7. Assigns 173.44 to **h** token, or heading.

See Table D-2 for rules that apply to this token.

D.3.2.2 Examples of Character Alignment

Given the hypothetical template string:

{align=3}8

and the hypothetical input string:

9A946.35

Isis parses the aforementioned sample string by applying the **{align=*n*}** template as follows:

1. Isis sets the processing point after the third character in the input string. In this case, the current processing points to the **4** character.

2. Isis assigns 46.35 to the **8** token (pitch).

See Table D-2 for rules that apply to this token.

D.3.3 Performing Math on Template Tokens

You can use any of the four basic mathematical operators with your template tokens.

+ **addition operator: add to next value**

- **subtraction operator: subtract from next value**

* **multiplication operator: multiply by next value**

/ **division operator: divide by next value**

You construct an expression according to the following syntax:

{OperatorValue}Token

- ***Operator*** is one of the operators cited above.

- ***Value*** is a numerical value or constant that will be applied to ***Token***.
- Token is any token cited in 'Values Allowed Over Serial Interfaces and Stored by Isis'.

Note: ***Operator*** and ***Value*** must be contiguous without intervening spaces, and the operator-value pair must be contained within delimiters of braces, parentheses, or brackets. ***Token*** must immediately follow the closing delimiter, without a space. If more than one math operator is specified on a single variable, the order of operation is: multiply, subtract, divide, add.

Example of math performed on a template token:

```
{/10}G
```

This instructs Isis to take the current value for Gyro, divide it by ten, and store it. This is a useful routine because raw Gyro output is stored in integer form, where all digits up to the rightmost digit represent whole degrees, while the rightmost digit represents tenths of degrees. If the stored integer is greater than 360, Isis will regard the number as out of bounds—unless it is first "translated" by the foregoing routine to express the number as a combination of degrees and tenths of degrees.

Another example:

```
{*57.2957795}h
```

In the foregoing example, the transmitted value is converted from radians to degrees and that result is assigned to the serial template token **h**, which is towfish heading.

Another example:

```
{*0.90}{+10.5}o
```

This operation computes Cable Out by taking 90% of the transmitted value, adds 10.5 and assigns the result as Cable Out (the serial template token **o**).

A final example:

```
{-100}{/3.2808}o
```

This instructs Isis to subtract 100 feet from the Cable-Out value (token **o**), divide the result by 3.2808, and store it. The number 3.2808 is a constant used to convert feet to meters.

In the above examples, you just as easily could have used parentheses **()**, or brackets **[]** instead of braces **{}**. Isis treats them the same.

D.3.4 Template Instructions That Do Not Evaluate to a Number

Certain letter designators do not correspond to a value transmitted over the serial interface (and therefore do not evaluate to a number). Instead, these special letter designators act as signals to Isis that certain instructions are to occur before parsing the navigation. These designators, shown in Table D-1, should be placed at the front of the template.

Table D-1. Template letter designators that do not return a number

Letter	Meaning
A	Forces Isis to synchronize to transmitted time
B	Forces Isis to synchronize to transmitted date.
F	Tells Isis to interpret northings and eastings as feet.
R	Flag which triggers an event closure (sent by MOSNAV) in Isis — used for verification only.
X	Placeholder only; tells Isis to ignore the next value.
Z	Benthos SIS-7000 uplink flag: convert depth (m), conductivity, and pressure from frequency to real values.
P	DTDAS flag is set TRUE.
-	Tells Isis to reverse the sign of the next value. Use this in front of longitudes which are transmitted as positive values in the western hemisphere. ***Note:*** This is not the same as the subtraction operator for described in ***'Performing Math on Template Tokens'***.
!	The character that follows '**!**' is compared to the first character in the receive string. If they don't match, the string is rejected. Example: **!$** in the template will cause Isis to reject any serial update that doesn't begin with a dollar-sign (**$**) character.
$	Informs Isis that northing and easting are actually latitude and longitude (otherwise, UTM). As a result, Isis will interpret this to be a NMEA string.

Event	When this word is received, the number that follows the word **Event** is taken to be the next event number. In ***Isis User's Manual, Volume 1,*** refer to the sections ***'Mark Event'*** on page for setting events, to ***'Overlay'*** on page for displaying event marks, and to ***'5.6 Sending Isis Imagery to a Plotter/Printer,'*** for information on annotating and printing events. See also Table D-1.
Replay	When this word is received, the number that follows the word **Replay** is taken to be the contact requested. That contact will be recalled from mass storage if the appropriate volume is available. See also Table D-1.
{CONIN}	Monitor serial port for contact REPLAY messages.
{CONOUT}	Send contact logging messages to nav computer over serial port. See also ***D.6 ('Transmit Data Format')***.
{TELEMOUT}	When a contact is logged in the Target utility, information about the contact is transmitted back over the serial port.

Note: For information on using CTD data with your nav interface, refer to ***Appendix G ('How Isis Processes CTD Data')***.

D.4 Special, Ready-Made Templates That Isis Can Use

By default, Isis uses its own internal parsing rules to handle template strings. However, you can override that mode of operation by having Isis use a specific template that Isis recognizes. Isis will use certain "canned" templates "as is," without further modification, should you deem those templates apply to your survey situation. These templates also appear in the Serial Port Setup dialog box (Figure D-1). Their meanings are shown in Table 4-1.

Table 4-1. Special, ready-made templates Isis can use "as is"

Template	Use or Location in Isis Software
NMEA0183	This is a widely recognized, industry-standard interface specification.
TSS	This template configures the serial port for input from a TSS motion sensor, specifically the "TSS1" string described in the TSS documentation.

SEATEX	This template configures the serial port for input from a Seatex MRU.
CMSSS	This template is used for a special navigation string generated by German Hydrographic Bureau (BSH) navigation systems. It is not applicable to other types of navigation input.
HYPACK	This template also appears in the Serial Port Setup dialog box. Also see ***4.2, 'Serial Port Setup'*** in Volume 1, and ***6.8, 'Hypack DDE (Record Only)'*** in Volume 1.
POS/MV	This template also appears in the Serial Port Setup dialog box. Also see ***'4.2 Serial Port Setup,'***, Volume 1.
TrackPointII	This template also appears in the Serial Port Setup dialog box. Also see ***4.2, 'Serial Port Setup,'***, Volume 1.
SeaPath	This template also appears in the Serial Port Setup dialog box.

All except **CMSSS** are selectable from the Serial Port Setup dialog box (Figure D-1) in Isis software. To specify a CMSSS template, type **CMSSS** in the Navigation/Telemetry Template portion of the Serial Port Setup dialog box.

D.4.1 How Isis Works with NMEA0183 Strings

Isis can interpret several standard NMEA0183 strings, called ***sentences***. To have Isis use NMEA type of transmissions instead of other types, choose the NMEA0183 navigation template shown in the Serial Port Setup dialog box. If you choose **NMEA 0183** in the Isis serial port setup dialog box, Isis ignores standard parsing rules and instead decodes the transmitted string as a NMEA0183-compatible data packet.

Isis recognizes the following NMEA0183 packet types:

GGA, RMC, GLL, VTG, ZDA, HDM, HDT, SHR, KLA, TSP

In addition, you can add tokens to prevent the use of any specific packet. For example, if a GPS receiver is transmitting both GGA and GLL packets, the navigation may jitter between two positions. In such a case, you can prevent the parsing of **GLL** by specifying **NOGLL** in the same template after NMEA0183. The following tokens prevent the parsing of the respective packets:

NOGGA, NORMC, NOGLL, NOVTG, NOZDA,
NOHDM, NOHDT, NOSHR, NOKLA, NOTSP

D.4.1.1 How Isis Deals With Heading Issues in NMEA0183 Strings

Isis can process heading packets that can occur in NMEA0183 strings. Two packets in particular affect the behavior of Isis:

HEHDT
HCHDT

When both are being received, **HEHDT** takes priority over **HCHDT**.

D.4.1.2 How Isis Deals With Time Issues in NMEA0183 Strings

Isis can be synchronized or de-synchronized with the computer clock with respect to NMEA0183 strings. Syncing the Isis computer clock is now determined by taking the time from a single packet type. The priority is:

NMEA_ZDA 4 // This is most preferable.
NMEA_RMC 3
NMEA_GLL 2
NMEA_GGA 1 // This is least preferable.
NMEA_ANY 0
NOCLOCK // This prevents Isis from synchronizing Isis system clock with GPS time. By default, Isis always synchronizes the system clock with GPS time.

Some parts of the NMEA0183 template are not affected by the **NO** modifier. Additional tokens **after** NMEA0183 further control the processing of NMEA packets:

POS=NODIFF //This causes Isis to use only non-differential positions from GGA packets.
POS=DIF //This causes Isis to use only differential positions from GGA packets.
NOCLOCK //This prevents Isis from synchronizing Isis system clock with GPS time. By default, Isis always synchronizes the system clock with GPS time.
UTM //This forces nav as UTM (meters). By default, when NMEA0183 is selected as a template, navigation is

assumed to be in lat/long degrees. This token overrides this behavior and forces nav back to UTM.

SAVERAW //This causes Isis to save the exact serial string to the current XTF file before processing in "raw" format.

SHIPPOS //This tells Isis that the position coming in on the selected com port will be assigned to the ship position only. This is useful when a navigation system is sending sensor position on one com port while a GPS receiver is reporting ship position on another com port.

If only one nav input is available, do not use {SHIPPOS}.

All NMEA sentences are preceded by six characters. The first three characters are **$XX**, where **XX** is the two-letter code for the source of the navigation solution. For example:

$GPGPS
$LCLORAN C

Isis ignores these first three characters. As many as three more characters can follow the first three. The next three characters after the first three characters in each string identify the specific NMEA sentence to follow. All sentences are comma-delimited and end with ***XX**, where **XX** is a checksum. Isis (and Q-MIPS) support five sentences, shown next:

$PKLA // Serial output from Klein 2000. For further information on this feature, consult the manufacturer's documentation.

$EGTSP // Serial output EG&G DF1000. For further information on this feature, consult the manufacturer's documentation.

RMC // Recommended Sentence C with date, time, latitude, longitude and heading
GGA // Time and position (in latitude and longitude)
GLL // Latitude and longitude
VTG // Course and speed made good
ZDA // Time and date

Each of the first four of these sentences can be disregarded by adding to the navigation template, **NOGGA**, **NORMC**, **NOGLL**, and / or **NOVTG** respectively.

In addition, Isis now supports these strings:

VTG // Heading, Speed
ZDA // Date, Time
HDM // Gyro
SHR // Position, Date, Time

D.4.1.3 Real-Time Kinematic

Certain GPS receivers can use a mode known as ***Real-Time Kinematic***, or RTK for short. This RTK mode can measure the antenna height (Height above Geoid) very accurately.

There are at least two methods of transmitting this data to a recording instrument such as Isis. The first is in a modified version of the NMEA0183 **GGA** string; the second is a special string used by Trimble RTK receivers known as a **GGK** string.

Isis stores the altitude information from these strings (if they are present) as Ocean Tide. The priority assigned to the strings is that if a normal **GGA** string and a **GGK** string co-exist, then the altitude information in the **GGK** string will be stored in the XTF file.

The Trimble **GGK** string takes this form:

$PTNL,GGK,023157.00,032800,4740.019328,N,12223.743061,W,1,06, 2.6,EHT53.271,M*55

where the value **EHT53.271** will be saved into OceanTide field in the XTF file. When **GGK** is not present, the **Altitude above Geoid** from the **GGA** message is stored as OceanTide.

D.4.2 Disabling ASCII Reports Produced by NMEA Packets

Some GPS (or Loran) receivers will produce, by default, copious ASCII reports in addition to the standard NMEA0183 packets over the serial interface. These reports can contain receiver diagnostic information, satellite position, and other similar data items. The sheer size of these reports can overload the Isis input buffer and cause the system to work unnecessarily hard as it tries to parse the reports.

Completely disable the GPS ASCII reporting mechanism before using Isis.

In most cases, you can disable the ASCII reports by working through the menus on the front of the GPS receiver. You only want the standard NMEA0183 data packets to go through the serial interface: **$GPGLL**, **$GPGGA**, **$GPZDA**, etc. With the ASCII reporting mechanism disabled, Isis will ignore all **$GPxxx** messages that Isis doesn't specifically parse.

To verify from Isis that ASCII reports aren't being sent by the GPS receiver, use the **Test** button in the Serial Port Setup dialog box to monitor the serial data. You can also monitor serial data from the **com** Port Test submenu found in the Tools menu.

D.5 Special Serial Receive Strings

Except when using NMEA0183 functions, some strings, when received over any active serial port, cause Isis to perform special internal functions (Table D-1).

Table D-1. Special serial receive strings for Isis

String	Meaning of String Function
Event n	Generates an event mark in Isis. When followed by a number, the user can specify the event number. When the Event line is received alone, Isis assigns the next available event number (counting begins at the value specified in the file EVENT.NUM, which Isis checks at startup). The event number is displayed in the Window/Status and Control/Sensors dialog box. A red line will be displayed across the sonar data if enabled in View→Overlay. (Note: This string is not case sensitive.)
NOTE (followed by ASCII string up to 200 characters long)	This causes the following to happen: 1. If plotting is active with annotation of "notes," the string is printed on the plotter. 2. If saving in XTF format, the string is saved into the XTF file. 3. The string is displayed at the bottom of the Parameter display in the "Note" field. (Isis version 2.56 and later)
REPLAY n	Causes Isis to instruct the Target utility to replay a contact. For example, REPLAY 45, when received over any active serial port, causes Target to display contact 45. The template for the com port must be prepared with the token {CONIN} to enable Isis to monitor the serial port for "contact in" instructions; Playback Mode only.

REQUEST_AMPc,n,m,s	This feature returns a string representing a sub-sampled sidescan record. This can be used to inspect the performance of the sonar when operated on a remote system (for example, an AUV). The variables c, n, m, and s mean: **c** = channel bit flags. Bit 0=channel 1, bit 1 = channel 2, etc. **n** = number of samples to return. These will be evenly spaced across the record. **m** = mode. A mode can have a value of 0, 1, or 2: 0=return percentage of max possible signal 1=return percentage of max observed signal on ping/channel **2**=return raw digital values **s** = skip number of center-track samples to skip over when computing the max value used to determine percentage of max observed signal. Example: REQUEST_AMP3,5,2,0... ...returns back over the same serial port a string like: (Chan=0,Min=0,Max=217):0,19,12,24,13 (Chan=1,Min=0,Max=220):0,13,13,3,6 The Min and Max values are the extremes of the digital levels found on the given channels. Sending REQUEST_AMP3,0,0,0 will cause only the Min/Max info to be sent.
REQUEST_FREESPACE	Causes Isis to transmit data back over the same serial port. Data includes total disk space and remaining disk space on the storage volume currently in use.
REQUEST_TEMPLATE	Causes Isis to transmit the template string currently assigned to the given com port back over that com port. This can be used by an external computer to configure data packets for transmission to Isis.
SAVERAW	Causes Isis to log the all data received over a serial port to the XTF file before parsing; Record Mode only. The transmitted strings are time stamped and placed in XTF_HEADER_RAW_SERIAL packets.

START_LOGGING {filename}	Causes Isis to start logging sonar data in record mode. Record mode must have already been started in DISPLAY ONLY mode. When **START_LOGGING** is followed by a fully qualified path and file name, Isis uses that name for saving. Otherwise, Isis generates its own file name.
START_PLOTTING	Causes Isis to turn on the plotter. The plotter must have been already specified in the File/Print dialog box. NMEAO0183 recognizes this too.
STOP_LOGGING	Causes Isis to stop logging and return to DISPLAY ONLY mode; Record Mode only.
STOP_PLOTTING	Causes Isis to turn off plotting.
STOP_PROGRAM	If Isis is in Record Mode, sending this string to Isis will cause Isis to stop recording and then exit. This string is applicable to Windows 95, Windows NT, Windows 2000 or XP operating systems.
STOP_PROGRAM_ SHUTDOWN	If you are running Isis in Record Mode in a Windows NT environment, sending this string to Isis will cause Isis to stop recording, exit, and then power down the computer, if the computer has auto-shutdown capability. This string is applicable to Isis running on a Windows NT, 2000, or XP operating system.

D.6 Transmit Data Format

When a target is logged during an Isis session, pertinent target data can be automatically transmitted out the **com** port on which the navigation data are being received.

To transmit the data format

1. Set up the **com** port with the token **{CONOUT}** to the end of string out of which you want the contact information to go to.
2. Mark the contact by logging a target in Isis (double-click in imagery).
3. Save the contact (press **F9**).

When you do this, pertinent target data are automatically transmitted out the **com** port which was set up in step #1.
The “Contact Digitize” or CD string contains the information shown in Table D-2.

Table D-2. Contact Digitize strings and their meanings

String	Meaning
ccc	contact number. This corresponds to the digits in the file name portion of the currently saved contact. You can use more than three digits in the name.
dd	day of the month, 1… 31
MMM	month of the year, JAN, FEB, …
yyyy	year [four digits]
hh	hour of the day, 00… 23
mm	minute of the hour, 00… 59
ss	second of the minute, 00… 59
ee.e	longitude or eastings (depending on available navigation); longitude is accurate to seven decimal places; eastings are in meters * 10, and therefore will have no decimal point.
nn.n	latitude or northings (depending on available navigation); latitude is accurate to seven decimal places; northings are in meters * 10, and therefore will have no decimal point.
hh.h	heading to tenths of a degree
rr	range in integral meters
tt	contact type, 1…12
ff	sonar carrier frequency in kHz
vol	disk volume label
file	disk file name with drive letter but no extension
pp	ping number

The CD message is comma-delimited, terminated with the line-feed character (ASCII 012), and is transmitted as follows:

CD,ccc,dd MMM 19yy,hh:mm:ss,ee.e,nn.n,hh.h,rr,tt,ff,vol,file,pp

D.7 Logging and Transmitting to a Serial Port

If you have Isis in Record mode, logging can now be controlled via a serial port.

To log to any serial port and transmit:

1. In Isis, turn on serial port (**File→Record Setup→Serial Port Setup**).
2. From the remote system, transmit either of the following strings:

   START_LOGGING ***{optional file name}*** to begin data logging. Isis will create a file name if none is supplied. If you don't provide a path name, Isis uses the path specified in the **Configure→Hypack DDE** dialog box.

   STOP_LOGGING to stop logging but continue displaying data.