

Mullti-Site Mission Planning User's Guide

A Module of the Prism Software Suite

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1 Introduction to Mission Planning

The Multi-Site Mission Planning software program (MP) lets you plan a project that uses Global Positioning System (GPS) satellite measurements. It gives you the ability to determine the visibility, availability, and geometric dilution of precision (GDOP) of the GPS satellites for any location in the world. MP also has the unique capability to support satellite planning for more than one site and to let you evaluate the times satellites are visible to all the selected sites.

You want to plan your project so you have a good window, a constellation of working GPS satellites that will return good results. A good window has at least four satellites available, with good visibility, and a PDOP less than 5. Trying to collect data during a poor window returns a poor solution.

MP uses the Navstar Global Positioning System, a continuous world-wide satellite-based radio navigation system being deployed by the United States Air Force. This facility lets you obtain navigation and geodetic positions in three dimensions, velocity in three dimensions, plus highly accurate time.

When altitude is known, you need only three satellites to determine time and position. When four satellites are in view simultaneously, in addition to position, time can be deter-mined from the signals, so an accurate user clock is not required.

The satellites orbit at an altitude of approximately 10,898 miles with a period of about 12 hours. Each satellite appears over the same area of the earth 4 minutes 3 seconds earlier each day. From time to time, the individual satellite orbits may be adjusted and the satellite location data will be changed to reflect the new satellite orbit information.

The MP program reads in the satellite location data file (called an almanac) and calculates the satellite orbits and locations. This provides the planning information for projects that depend on GPS satellite measurements. MP requires a current almanac.

When an almanac is over 60 days from the planning date (earlier or later), you'll see a warning message indicating this fact. MP can continue, calculating and displaying planning information, however you must be very careful using information that is not current.

You can get a current almanac from the Ashtech GPS receiver by using GPPS post-processing software (option G of the HOSE module *) or the Prism software suite (the ALMANAC button under the TRANSFER function**). If you have a modem and communications software, you can get current almanac data from the Ashtech computerized bulletin board; call Ashtech Customer Support for instructions.

Designed as a module in the Prism software product family, the MP program displays its array of functions in an Options Grid. MP is fully compatible with the other Prism software packages and gives you the ability to work back and forth between programs.

For example, you can determine the best times and strategy to conduct measurements at different locations. MP provides all the tools necessary to enter the sites of interest, create a database of multiple sites, enter site-unique obstructions, and determine the best time to make your GPS satellite measurements.

MP provides an invaluable tool to assist you in planning the project. During some periods, fewer than four satellites may be in view, or the satellite geometry may dilute the precision of the measurements. Also, the specific time that each satellite is visible at a location changes each day. Finally, some sites may have buildings or other obstructions which block visibility. MP provides the ability to handle each of these constraints and determine the best time to obtain GPS measurements at each site.

MP can automatically determine the satellite visibility for more than one site. You can enter individual site locations, obstructions, and local time. In the Multi-Site mode, MP shows only the times satellites are common to and visible to all the specified multi-sites. You can quickly determine the number of satellites in view, which satellites they are, and the best time to observe the sites.

* For details, see the Ashtech XII GPPS Post-processing System Manual, document no. 600040.

** For procedures on downloading an almanac, see the *Transfer User's Guide*, document number 600149.

Using the Mission Planning Manual

In this manual, each option on the Mission Planning Options Grid has a reference section, in alphabetic order to make it easier to find. Each discussion starts with a general descrip-tion of the function and an illustration of its top-level screen. Where appropriate, there is a step-by-step procedure for doing useful work. Descriptions of menus and panels follow.

For quick access to the information, refer to the page index at the end of this manual. Remember, the top level for this manual is the Mission Planning Options Grid.

Hardware and Software Requirements

The MP software runs on an industry-standard computer, an IBM Personal Computer, 286/386/486 or compatible, using the industry-standard disk operating system DOS. Like all computer programs, MP achieves results faster when a more powerful computer is used.

MP can run on the minimum setup shown in Table 1.1; however to significantly reduce your processing time, use the recommended system. It has been Ashtech's experience that the recommended system is a cost-effective investment and will better utilize your time.

	Minimum Requirement	Recomended
Operating system	DOS 3.3	DOS 5.0
Processor	80386	80486/25
Co-processor	80387	80387
Memory	640K	4 M
Hard disk	32 M	100+ M
Mouse	Microsoft of compatible	Microsoft or compatible
Graphics card	EGA	VGA
Printer	Epson FX-80	HP LaserJet
Communication software	Any communication software (e.g. Windows Terminal program)	Procomm Plus

 Table 1.1
 System Requirements

Since MP is a graphics-based system, you need a VGA, EGA, or compatible graphics board. For an EGA board, 256k bytes of video memory are necessary. Although the program may work with some gray scale or monochrome monitors, a color monitor is strongly recommended. The monitor should have a 640x350 pixel display and 16-color resolution. MP will not work with CGA, Hercules, or MDA boards and monitors.

Installing the Mission Planning Program

The MP package consists of an executable file MP.EXE, sample project data in USASITES.PRJ (typical United States cities), sample almanac data (with a name resembling ALM92.153), and a sample configuration file (MPSETUP). If you installed the Prism product disks, these files were put on your hard disk in the directory named \PRISM.

- 1. Turn on your computer. Insert the disk marked "Multi-Site Mission Planning Software" into your floppy disk drive.
- 2. Type the following commands at the DOS prompt, using a directory name such as MISHPLAN for the directory name. These commands create a directory on your hard disk and copy the software and sample data from the floppy disk into that directory.

C: <Enter> MD C:\DIR-NAME<Enter> CD C:\DIR-NAME<Enter> COPY A*.* <Enter>

The <ENTER> notation represents the Enter key on your keyboard. Sometimes it is labeled CR or RETURN; sometimes it has a symbol on it that looks like

MP was designed for use with a mouse. For operating MP without a mouse, see p. 11). Connect the mouse to your computer and install its driver according to the instructions pro-vided with it. Typically you must copy the mouse driver from the diskette to the hard disk and add an execute instruction to your CONFIG.SYS file. The instruction in CONFIG.SYS will resemble: DEVICE=C:\DOS\MOUSE.SYS. You must re-boot the computer to start the mouse driver on your computer system.

After all the files have been transferred to your hard disk, you have specified your path appropriately, and you have config-ured your mouse, you are ready to begin using the Multi-Site Mission Planning System. If you wish to run Mission Plan-ning under Prism, at the DOS prompt, type:

PRISM <ENTER>

Prism begins execution. You'll see the logo and copyright screen, followed by Prism's top-level Options Grid, as shown in Figure 1.1.



Figure 1.1: Options Grid

To enter the portion of the software package containing the mission planning programs, move the pointer to the PLANNING icon (upper left corner of the Prism Options Grid), and click on it (Figure 1.2. This will take you directly to the Main Menu, Figure 1.3.



Figure 1.2 Planning Icon



Figure 1.3: Main Menu

All descriptions in this manual start at this level. It is also the point to which you return when you click on the QUIT button from within each Mission Planning module.

The next chapter describes each function and offers some suggestions for using each Mission Planning module.

Program Reference

This chapter provides details for using the MP modules. It opens with a description of how to execute the standalone program from DOS. When you are running MP from Prism, you can skip to *Using the Mission Planning Program* on page.

MP requires at least one input data file: an almanac file containing satellite ephemeris information. The almanac files are named in the form ALMYY.DDD, where YY are the last two digits of the year and DDD represents the Julian day. Ashtech suggests that you store your current almanac* and the MP executable program in the same directory.

Another type of input file is the project file. It is named xxxxxxx.prj, where xxxxxxx is the project name, up to 8 characters. An optional input file is the MPSETUP file. MPSETUP provides information about the configuration - almanac, printer, project file, and time interval.

MP can output two types of data files: project data and system configuration. The project data files contain the site information and can be created or modified by MP. The MPSETUP file contains a set of configuration specifications that you saved. MP can optionally print planning information, however this does not go to a file.

*For details on how to download a current almanac from the computerized bulletin board, see Appendix A. For details on downloading one from a receiver, see *Transfer User's Guide* in the Prism documentation set.

Program Execution

The program, project, and almanac files may be in the same directory. When this is the case and you wish to run them without running Prism, change to this directory, and at the DOS prompt, type:

MP <ENTER>

When executed directly from DOS, MP displays the Ashtech copyright and version number, as shown in Figure 2.1.

GPS MULTI-SITE MISSION PLANNING

COPYRIGHT (C) 1990–1993 BY ASHTECH, INC. ALL RIGHTS RESERVED VERSION 3.0

Figure 2.1 Copyright and Version Display

MP then checks the computer and hard disk for the proper environment. MP requires about 420 kilobytes of free memory to execute properly. If you do not have enough memory, MP displays an error message similar to this:

NOT ENOUGH FREE MEMORY TO RUN THIS PROGRAM

press any key to exit

Occasionally you may want to use a particular almanac file rather than the most recent one. To use a specific almanac file, specify its name on the execute line. When a file resides in a directory other than the one from which you execute MP, the full path name must be explicit. For example:

MP C:\PROJECT\ALM90.341 <ENTER>

In this case, the almanac file name reflects the date that the almanac data was collected. It was collected on Julian day 341 (December 7) of 1990.

Ashtech recommends that you use a current almanac file. You can download one from a receiver or from the bulletin board. Since new GPS satellites are being launched and others are being re-positioned in their orbits, satellite locations will be the most accurate in a current almanac.

When executing directly from DOS or from Prism, if an almanac file is not specified on the execute line or in the setup configuration file, the most recent almanac in the current directory is used. If MP cannot find an almanac file for satellite information, you'll see

:NO ALMANAC FILES IN CURRENT DIRECTORY

press any button to exit

If you are using the keyboard, messages such as this will request that you press <ENTER> to continue.)

If everything is satisfactory, the MP Main Menu will be displayed, as shown in Figure 2.2.



Figure 2.2 Main Menu

There are six key areas on the Main Menu:

- 1) Satellite panel horizontal rows, top of display
- 2) Project panel table along right edge of display
- 3) Selected location lower left corner of display
- 4) Cutoff angle left of Ashtech logo
- 5) Planning date and time bottom edge of display
- 6) Options Grid central area, 9 icons

The Options Grid and the screens for each option are displayed in the window. During execution of a program option, whenever data in the first five areas is changed, the program updates the display and planning results using the new values.

To make a selection, use the mouse to move the pointer to the area you want to select or change. Whenever the pointer is positioned within an option box or button that can be invoked, the box or button will be highlighted. Press the left mouse button to start the highlighted function.

Using the Mission Planning Program

The Prism package provides a consistent method of executing the various associated modules. Each module is fully compatible with the others and is designed so that only rudimentary computer knowledge is required. If you know little more than how to turn on your PC and load DOS, you will find that you can readily become proficient with this software.

The following conventions make it easier for you to get up to speed quickly and work back and forth between programs due to the consistency shared by the individual functions: making selections with the pointer, specifying the directory that your data files are coming from and going to, entering text, and exiting from one module to the next higher level of the software.

Making a Selection

There are two ways to make a selection depending upon whether you are using a mouse or the keyboard; if the mouse driver is loaded, the keyboard method will not work.

To make a selection with a mouse, drag the mouse (left, right, up, or down) so that the pointer on the screen tracks to the desired area, and then click (press) the left mouse button. To make a selection from the keyboard (a mouseless configuration), use the keys on the numeric keypad, Figure 2.3.



Figure 2.3 Numeric Keypad

The arrows show the direction the pointer travels when a given key is pressed. To increase the velocity of the pointer, depress the CAPS LOCK key.) When the pointer is on the desired area, press the <ENTER> key. The left mouse button or <ENTER> is also used to register a point (as in the Obstruction Editor) or toggle a switch (various options throughout the software).

Many items display a check mark when selected. Some echo the selection opposite an appropriate label; for example, on the main screen, the coordinates of the site selected from the PROJECT panel are displayed opposite LOCATION.

Exiting

When you are ready to exit the MP program, press the right mouse button, or in a mouseless configuration, press the ESC key. This is a direct exit that works from all Mission Planning screens. In response, the program displays the message shown in Figure 2.4, asking for confirmation.



Figure 2.4 Exit Confirmation

Selecting the EXIT button takes you up a level to the Options Grid of Prism the top level. Selecting EXIT goes to the DOS prompt when running MP directly from DOS. Selecting the CONTINUE button returns to the Mission Planning software. If you are using a mouse, press any mouse button. If you are using a keyboard (a mouseless configuration), press <ENTER>.

Satellite Selection

The top of the screen displays the satellites (SV) which were found in the almanac file, as shown in Figure 2.5.



Figure 2.5 Satellites Found in Almanac File

The check marks (_) in the line labeled USED indicate those satellites in use by the program. The small box below indi-cates when a satellite was marked unhealthy in the almanac file; when the box is red, a satellite is unhealthy and is not used initially.

You can control which satellites are used in your planning. To remove a satellite, move the pointer to the box immediately below its satellite number and select it, that is, press the left mouse button or, if using the keyboard, press <ENTER>. MP erases the check mark and ignores that satellite.

To include a particular satellite (that does not have a check mark yet), move the pointer to its box and select it. The check mark will indicate that the satellite will be included.

To block the use of all satellites, move the pointer to the button marked ALL SV OFF and select it. MP removes the check marks from all satellites indicating that none is selected. Similarly, with the ALL SV ON button, you can include all satellites, even the unhealthy ones.

Site List

If MP finds a file in your directory with the .PRJ extension, it automatically uses it as the active main project. If MP finds more than one project file in your directory and an MPSETUP configuration file, MP uses the project file specified in MPSETUP. If you have no project files, create one with the Project Manager option. When there are several project files and no MPSETUP, you must specify the project via the **Project Manager** option, described later. MP is distributed

with USASITES.PRJ, which contains typical United States cities as a sample project. The sites in the project file are displayed on the right side of the screen, as shown in Figure 2.6. If information about obstructions has been saved with the site, a small green box will flag that fact, as shown by the Ashtech site entry.



Figure 2.6 Sites in Sample Project File

To select a site to be used in planning, move the pointer to the row containing the site name, and select it. MP puts a check mark in the box to the left of the site name, as shown by the Ashtech site entry, and displays its coordinates in the LOCATION area (lower left corner of display). De-select a site in the same way; the check mark is removed.

If you have more than 19 sites in the project file, you can scroll through the panel by moving the pointer to the \uparrow (up-arrow button) or the \downarrow (down-arrow button) and selecting it. The double up-arrow and double down-arrow let you page up or down 18 sites at a time.

Selecting Several Sites: Multi-Site Planning

MP can evaluate satellite planning information for several sites at the same time. To select several sites, press and hold the <SHIFT> key on the keyboard, then move the pointer to the first site in the PROJECT panel and select it (click the left mouse button or press <ENTER>). Then move the pointer to the second site and select it. Continue selecting sites in this manner. You can specify up to ten sites in Multi-Site mode, however, each added site will increase the computation time required to produce the planning displays and reports.

After you have flagged all the desired sites, release the <SHIFT> key. Moving the pointer out of the PROJECT panel has the same effect as releasing the <SHIFT> key; it ends multiple-site selection.

The LOCATION area reflects that Multi-Site mode has been invoked and how many of sites you have specified, as shown in Figure 2.7.

LOCATION: MULTI-SITE MODE 2 SITES SELECTED

Figure 2.7 Location Area

In Multi-Site mode, MP does not report latitude or longitude. In addition, the Satellite Visibility display shows only the times the common satellites are visible from all the selected sites. Similarly, the Satellite Availability display shows only the total common satellites visible. The GDOP graph shows the worst value for each dilution of precision among the sites. The LOCAL-GMT time offset will use the first site time offset. If the selected sites are in different time zones, you'll see a warning message to that effect. The Site Editor, Obstruction Editor, and Sky Plot do not work in Multi-Site mode.

To select each site in Multi-Site mode, scroll the site list up or down to display your desired sites. If you have selected sites which are on different pages of the site list, when you print (select the PRINT button), the site list will show only the sites you have specified.

To interrupt calculations while in Multi-Site mode, press the <ESC> key. The program returns to single-site mode with no sites selected.

To exit Multi-Site mode, select an individual site in the project file, a new project file, or a new point in the world.

The Selected Location

Near the bottom of the display you will see a label LOCATION. This area contains the name of the site currently being evaluated along with its latitude (LAT) and longitude (LON). When no site has been selected, this area reports NOT selected. As you select each new site, this area shows the corresponding name and location.

Cutoff Angle

The cutoff angle area con-tains a value to use for the lower limit of the angle to the horizon; this value will be used for the satellite visibility calculations (Figure 2.8). To change the cutoff angle, move the pointer to the box and select it.



Figure 2.8 Cutoff Angle

If you are using a mouse, press and hold the left button, and drag the mouse left to decrease the cutoff angle. To increase the angle, drag the mouse to the right. When the desired angle is displayed, release the mouse button.

If you are using the keyboard, to decrease the cutoff angle, press the <-> key to the right of the numeric keypad. Each click reduces the angle by 1°. Conversely, to increase the angle, use the <+> key (also to the right of the numeric keypad).

To reduce the effect of the troposphere, make survey measurements with a cutoff angle at least 10° above the horizon. For long baselines (over 15,000 meters), Ashtech recommends that dual-frequency receiver measurements be performed and the cutoff angle be greater than 10° . For short baselines and single-frequency measurements, the cutoff angle will normally be 15° .

Planning Date and Time

Below the cutoff angle is the area for planning time containing notations for day, month, year, and hours. When you first execute the MP software, this area reports the current date stored in the computer, and a 24-hour time-frame bar, as shown in Figure 2.9.



Figure 2.9 Time Frame Bar

You can change these values the same way you change the cutoff angle. For example, to change the month, move the pointer to the DATE area so that it comes to rest on the month, 01 in this case, as shown in Figure 2.10:



Figure 2.10 Date Area

Mouse: with the pointer on the month, press and hold the left mouse button; dragging the mouse left displays an earlier month, and moving it to the right, a future month. Release the mouse button when the desired month is showing.

Keyboard: with the pointer on the month, press <+> (on the numeric keypad to advance the month, <-> to display an earlier month.

You can change the display to any planning date. However, since the satellite almanac data changes from time to time, planning more than 60 days beyond the almanac data may produce inaccurate information. If you select a planning

day which is out-of-range in relation to your selected almanac data, you'll see this message:

WARNING! THE ALMANAC FILE IS OVER 60 DAYS OLD

press any button to continue

The scheduled time for the survey is displayed at the bottom of the screen. It is a bar (local time) with time intervals that are used to screen the data. There is also a box showing the local time offset from Greenwich Mean Time (GMT), as shown in Figure 2.11.



Figure 2.11 Local Time Offset from GMT

When you start MP, the time bar is set for a 24-hour time frame. On that bar, a right-facing arrow (\rightarrow) shows the starting time and a left-arrow (\leftarrow) shows ending time. The highlighted line connecting the arrows shows the time slot for the mission. The time is local to the currently selected site and can be set in ½ hour increments.

To change the starting time, move the pointer to the right-facing arrow on the time bar (Figure 2.12).



Figure 2.12 Setting Starting Time

Mouse: press and hold the left mouse button. Dragging the mouse right or left will slide the right-arrow to the right or left along the bar to a new start time. After you have positioned the right-arrow to your desired start time, release the mouse button. The highlighted line will change to the new time frame.

Keyboard: with the pointer on the right-facing arrow, press the <+> key (on the numeric keypad) to slide the right-arrow to the right along the bar to a new start time or press <-> to slide it to the left.

The ending time is changed by sliding the left-facing arrow along the bar in the same fashion (Figure 2.13).



Figure 2.13 Setting Ending Time

If you slide the right-facing arrow left past the 0 hour, it will reappear on the right at the 24th hour. You can also slide one time arrow over the other; this can provide a time frame that wraps over the midnight point. For example, if you slide the right-arrow to the 20-hour point and the left-arrow to the 4-hour point, you schedule a time frame from 20:00 to 04:00 hours, an eight-hour period.

Setting Local-GMT Offset

In the LOCAL-GMT button, you will see the local time offset from GMT. This can also be changed. It can be adjusted in ½-hour intervals to match all time zones. To change the offset, move the pointer to the LOCAL-GMT button (Figure 2.14).

LOCAL-GMT: -07.0 HOURS

Figure 2.14 Local-GMT Offset

Mouse: with the pointer on the LOCAL-GMT button, press and hold the left mouse button. Sliding the mouse right increases the offset value while sliding the mouse left decreases it. Release the mouse button when the desired GMT offset value is displayed.

Keyboard: with the pointer on the LOCAL-GMT button, pressing <+> (on the numeric key-pad) increases the offset value, while <-> decreases it.

Function Summary

The **Options Grid** is the primary display area for the Mission Planning program, showing nine program options. When you select an option, the grid is replaced in the window area by the selected option. In the center, above the window, is the name of the option.

When you exit from an option, the Options Grid reappears. You always have access to the areas around the window to allow dynamic changes to the satellite visibility for your survey.

When MP begins execution, the Options Grid is displayed in the window area. The nine program options are shown as icons (pictorial representations), as shown in Figure 2.15.

TE-TTUN E90	TE MIS	NOTE	PL	A N N I N G	
SU: 1 2 3 5 7 9 12 13 14 15 16 17	18 19 20 21 22 2	324252627	28 29	31 011 511 01	, T
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			05	Anchorage, AK	
S	S		06	Atlanta, GA	\mathbf{T}
			07	Austin, TX	
All the second			08	Baltimore, MD	
PROJECT CONTRACT			09	Baton Rouge, LA	
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			13	Charlotte, NC	
19 51	%		14	Chattanooga, TN	\downarrow
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LOCATION: NOT SELECTED	CUT	OFE ANGLE!	150		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13	14 15 16 17 18	192021222	24	- ACHTECH	
	1 0 0 0 - CMT				

Figure 2.15 Options Grid

The options, from left to right and top to bottom are as listed in Table 2.1. :

Table 2.1 Options

Option	Function
Survey mark icons	Starts the Site Editor which lets you alter several site parameters.
Obstruction icon	Starts the Obstruction Editor which lets you indicate graphically those obstructions that may block visibility to the satellites.
Sky plot icon	Displays the paths of GPS satellites over a site.
Project manager	Lets you create and edit the project database files.

Table 2.1 Options

Option	Function
World map icon	For specifying a location for planning.
Setup	Sets the printer, the almanac file, and time interval.
Visibility bar graph	Displays the visibility of satellites.
Availability bar chart	Shows blocks of satellite availability.
GDOP graph	Plots Geometric Dilutions of Precision.

To execute an option, move the pointer to the corresponding icon or label and select it. You'll see the appropriate display fill the window. Each option is covered in the reference section that follows in alphabetic order to make it easier to find.

The GDOP Graph Option

The GDOP option, Figure 2.16, graphs the GDOPS (Geometric Dilution of Precision) for the specified site. The graph is a plot of precision versus time. Dilution which exceeds 20 is not plotted. For those times when only three satellites are visible, a fixed altitude is used in the calculations. Each DOP has its own color to help you identify the corresponding dilution-of-precision parameter. In Multi-Site mode, GDOP graphs show the worst value for each dilution of precision among the sites.



Figure 2.16 GDOP Graph Option

Selecting the GDOP icon (bottom right icon on the Options Grid) displays a plot similar to Figure 2.17, using the visible satellites:



Figure 2.17 Typical Plot of Visible Satellites

The example was drawn with the PDOP, HDOP, VDOP, and TDOP functions on. The default graph shows only PDOP on. The row of toggles at the top of the window lets you specify any DOP parameter and note the various effects of the satellite geometry. You can toggle the various DOPs individually or in combination.

When you change cutoff angle, date, time interval, or site, the DOP graph is recalculated for those conditions. You'll see a message "calculations in progress...".

GDOP Menu

The GDOP menu, Figure 2.18, shows options for 2D and 3D mode.



Figure 2.18 GDOP Menu

2-D MODE - lets you fix altitude in all calculations. HDOP and VDOP buttons are dimmed (HDOP = PDOP, VDOP = 0)

3-D MODE - fix altitude is used only when three satellites are visible

OBSTRUCTIONS - You can toggle the OBSTRUCTIONS button ON or OFF and see how the obstructions affect DOPS over the specified site.

AVAILABILITY - lets you overlay the satellite availability plot so you can see the effect with a varying number of satellites, as shown in Figure 2.19.



Figure 2.19 Satellite Availability Plot

PRINT GRAPH - sends the graphical display to your printer. It takes up to five minutes to print the display.

PRINT TABLE - sends the table of GDOPS to your printer. The table lists PDOPS, GDOPS, HDOPS, VDOPS, TDOPS, and the number of visible satellites at a given time. The numeric value of each DOP appears when the value is less than 25.0. Four asterisks (****) flag values greater than 25.0 while four dashes (----) mean that fewer than three satellites were visible. In this example, titles and data have been condensed:

GPS MULTI-SITE MISSION PLANNING

GEOMETRIC DILUTION OF PRECISION

Local Time PDOP GDOP HDOP VDOP TDOPNumber

LOCATION: ASHTECH LAT:37°22'08".80N LON:122°00'03".60WALT:10.00m

LOCAL TIME-GMT: -08.0(h) DATE OF TABLE: 11/Oct/91 (DAY: 284)

DATE OF ALMANAC: 21/Apr/93 CUTOFF ANGLE: 15° OBSTRUCTIONS: off

SV USED:01,02,03,11,12,13,14,15,16,17,18,19,20,21,23,24,25,26,27,28,29,31

IMPORTANT NOTE: FIXED ALTITUDE USED IN ALL CALCULATIONS WHEN ONLY THREE SATELLITES ARE VISIBLE*

Of SV						
00:00:00	1.1	1.2	1.1	0.3	7	
00:15:00	1.3	1.4	1.3	0.5	6	
00:30:00	2.3	2.4	2.3	0.6	4	
00:45:00	1.7	1.8	1.7	0.6	5	
01:00:00	11.8	12.0	11.8	2.1	4	
01:15:00	10.3	10.4	10.3	1.6	4	
01:30:00	1.3	1.4	1.3	0.4	5	
01:45:00	1.5	1.5	1.4	0.5	4	
02:00:00	1.4	1.5	1.4	0.5	4	

02:15:00	1.4	1.5	1.4	0.5	4
02:30:00	1.4	1.5	1.4	0.5	4
02:45:00	1.5	1.6	1.5	0.6	4
03:00:00	1.4	1.5	1.4	0.5	4

QUIT - exits the option & returns to the Options grid.

In 2-D mode there are no values in VDOP column because VDOP = 0.0. Values in the HDOP column = values in PDOP because HDOP = PDOP in 2-D mode.

*This note appears in 3-D mode. If you use PRINT TABLE option in 2-D mode the note will be "**IMPORTANT NOTE: FIXED ALTITUDES USED IN ALL CALCULATIONS**."

The Obstruction Editor Option

Typically in planning a project using GPS satellites, a field team does a preliminary survey of the sites to be measured, and notes any peculiar field conditions. When a tall building, mountain, tree, or other obstruction blocks visibility to the horizon, the field team documents it on a pre-survey form. Then, using the pre-survey form, you enter these obstructions into the site database via the Obstruction Editor option (Figure 2.20).



Figure 2.20 Obstruction Editor Option

When you call up the Obstruction Editor (top center icon in the Mission Planning Options Grid), you'll see the display shown in Figure 2.21.



Figure 2.21 Obstruction Editor Display

The site is located at the center of the concentric circles. The top of the plot - a polar plot - is north, the right side is east, the bottom is south, and the left side is west. The outer circle represents the horizon of a top-down view of the site and the base of any obstructions.

The Obstruction Editor lets you indicate graphically those obstructions which may block visibility to the satellites. These obstructions can be used in determining the visibility and availability with respect to the satellites. While the display may seem complex, this graphics editor makes it is very easy to enter the site obstructions. Ashtech recommends that you practice entering and deleting lines or obstructions using the following procedure.

To put in an obstruction,

- 1. Select a site from the PROJECT panel.
- 2. Move the pointer to a position where the obstruction starts, usually near the horizon, at the azimuth indi-cated on the pre-survey form.

The ELEVATION/AZIMUTH box in the lower right (Figure 2.22) reports the corresponding position in degrees.



Figure 2.22 Elevation/Azimuth Box

- 3. To register a point, press and release the left mouse button or, if using the keyboard, press <ENTER>.
- 4. Move the pointer to the elevation to which the obstruction ascends, and register that point. A line will connect the two points.

Continue entering points and connecting lines until the obstruction is adequately defined. When you register the last point on the horizon, or a point outside the circle, MP fills in the obstruction and gives it a number, as shown in Figure 2.23.



Figure 2.23 Typical Drawn Obstruction

You can also fill in an obstruction by moving the pointer to the FINISH obstruction button and selecting it.

5. Click on the SAVE OBSTRUCTIONS button.

Up to ten obstructions can be entered for each site. Each obstruction can contain up to fifteen line segments (Figure 2.24).



Figure 2.24 Obstruction Line Segments

If you have not specified a site from the project file, the obstructions can be used for planning with a site entered from the Site Editor as a temporary site or a site selected from the World Map option.

Obstruction Editor Menu

The Obstruction Editor offers you these functions, available by selecting a button on its menu (Figure 2.25).

FINISH OBSTRUCTION
REMOVE LAST LINE
REMOVE OBSTRUCTION
REMOVE ALL
SAVE 2NO I TOURT 280
PRINT OBSTRUCTIONS
QUIT

Figure 2.25 Obstruction Editor Menu

FINISH OBSTRUCTION - provides closure (a final line segment) for the obstruction being entered and fills in the outlined shape.

REMOVE LAST LINE - Before the obstruction has been filled, deletes the last point you registered and its connecting line.

REMOVE OBSTRUCTION - lets you select an obstruction by number and delete it, renum-bering the remaining obstructions as necessary.

REMOVE ALL - removes all obstructions associated with the site.

SAVE OBSTRUCTIONS - After you have entered and edited all site obstructions, this button saves them in the project file associated with the specified site. Once a site has obstructions associated with it, MP updates the site list; it colors green the small box to the left of the check mark for the selected site. Note that if you know a site has no obstructions, you can use the green box to indicate that you know these site conditions.

PRINT OBSTRUCTIONS - provides a printout of the obstructions for the site.

QUIT - exits Obstruction Editor and returns to Mission Planning Options Grid.

The Project Manager Option

The Project Manager option, Figure 2.26, lets you create and edit your project database files. When you invoke it (middle left option in the Mission Planning Options Grid), you'll see a display similar to Figure 2.27, where, in the PROJECT SELECTION panel, MP lists all projects found in the directory:



Figure 2.26 Project Manager Option

16 P 3 14 10 L T	1-SITE HISSION	PLANNING
SU: 1 2 3 5 7 9 12 131 USED: VVVVVVVV	4 15 16 17 18 19 20 21 22 23 24 25 26 27 /	282931 ALL SU ON ✓ ✓ ✓ ALL SU OFF
TEMP: NOT LOADED	>>> PROJECT MANAGER <<<	MAIN: USASITES.PRJ
A	PROJECT SELECTION	01 ASHTECH, Inc.
	01 USASITES .PRJ	02 Akron, OH
		03 Albuquerque, NM
		04 Amarillo, TX
		05 Anchorage, AK
T		06 Atlanta, GA
		07 Austin, TX
		08 Baltimore, MD
	LOAD TAGGED AS MAIN	09 Baton Rouge, LA
	LOAD TAGGED AS TEMP	10 Birmingham, AL
	SORT TAGGED FILE	11 Boston, MA
	DELETE TAGGED FILE	12 Buffalo, NY
	OBEATE NEW ETLE	13 Charlotte, NC
↓		14 Chattanooga, TN 🗸
	MOVE TAGGED	15 Chicago, IL
	SITES TO MAIN	16 Cincinnati, OH
	CORV TOCCED	17 Cleveland, OH
	SITES TO MOIN	18 Colorado Springs
	STIES TO THIM	19 Columbus, GA 🛛 🖤
LOCATION: NOT SELECTED	CUTOFF ANGLE:	15°
LAT: LON:	DATE: 30/Sep/9	93
→ -++++++++++++++++++++++++++++++++++++		+
	0 11 12 13 14 15 16 17 18 19 20 21 22 23	ASHTECH

Figure 2.27 Typical Project Selection Panel

In this case, MP found only one project file -USACITIES.PRJ - labeled it 01, and put a check mark by it. The selected project will always have a check mark to its left. MP can use up to 50 projects in a directory.

For several of the functions, you need to work with two project files. The file that is the source is identified as the "temp" project and is loaded into the panel on the left. The file that is the destination is identified as the "main" project and is loaded into the panel on the right.

Project Manager Menu

The Project Manager menu, Figure 2.28, offers several function buttons. Their descriptions are listed here top-to-bottom, the same order they have on the screen.



Figure 2.28 Project Manager Menu

LOAD TAGGED AS MAIN - puts the specified sites into the MAIN project panel on the right side of the display, ready for another operation. The label MAIN can be thought of as "destination". Select the file before selecting this function.

LOAD TAGGED AS TEMP - puts the specified sites into the TEMP project panel on the left side of the display, ready for another operation. The label TEMP can be thought of as "source". Select the file before selecting this function.

SORT TAGGED FILE - sorts the sites of the specified project file in ascending alpha-numeric order. Select the file before selecting this function.

DELETE TAGGED FILE - deletes the specified project file from your directory. Select the file before selecting this function. MP will ask for confirmation before proceeding, as shown in Figure 2.29.



Figure 2.29 Delete Confirmation

CREATE NEW FILE - You can create a new project file by moving the pointer to this function button and selecting it. You'll see a new entry in the PROJECT SELECTION panel, and a flashing cursor (Figure 2.30). Type in a name for the project, up to 8 characters. MP will supply a .PRJ extension. Press <ENTER> to complete the function. A project file can contain up to 99 different site entries.

PROJECT SELECTION			
\checkmark	01	USASITES.PRJ	$\mathbf{\Lambda}$
	02		
		—	
			\mathbf{V}

Figure 2.30 Create New File

MOVE TAGGED SITES TO MAIN/COPY TAGGED SITES TO MAIN - You can move site and obstruction data from one project file to another. You can also copy it, leaving the source version intact. Use these options when you want to move previously defined local control points or other well-known landmarks from one project file to another. It saves you from reentering site data via the Site Editor and Obstruction Editor.

To use this feature,

- 1. Under PROJECT SELECTION, specify the project file that will be the source. Then select LOAD TAGGED AS TEMP.
- 2. Next specify the project file that will be the destination. Specify LOAD TAGGED AS MAIN.
- 3. On the TEMP side, tag each site you want to move or duplicate by moving the pointer to it and selecting it.
- 4. After you have selected all the sites, move the pointer to the MOVE TAGGED SITES TO MAIN option or the COPY TAGGED SITES TO MAIN option and select it. The tagged sites will be moved or copied to the project you specified as MAIN.

QUIT- exits from the Project Manager option and returns to the Mission Planning Options Grid.

The Satellite Availability Option

The Satellite Availability option, Figure 2.31, displays how many satellites are available over a site during a specified time. In Multi-Site mode, the Satellite Availability display includes only satellites that are visible to all sites.



Figure 2.31 Satellite Availability Option

Select the site or sites first, then select the Satellite Availability icon (vertical bar chart - bottom center icon on the Options Grid). Its display will resemble Figure 2.32.



Figure 2.32 Typical Satellite Availability Display

The color-coding (like a traffic signal) quickly reports a go/no-go situation in terms of the number of satellites available. When four or more satellites are visible at the site, the block is green. It is yellow when three satellites are visible, and red when fewer than three are visible.

The sample reflects a 24-hour time frame and shows that at least two satellites are always visible throughout the day at the selected site.

When you change the cutoff angle, date, time interval or site, MP reflects the new conditions in the satellite availability display. If you are using the keyboard to change these parameters, the display is updated after you press a key other than <+> or <->.

Satellite Availability Menu

Figure 2.33 shows the Satellite Availability menu.



Figure 2.33 Satellite Availability Menu

OBSTRUCTIONS - lets you toggle the obstructions on or off to see how they affect the satellite availability. When you select the OBSTRUCTIONS OFF button under this option, the button changes to OBSTRUCTIONS ON and the obstructions for the site reduce the availability graph for satellites which are not visible.

Compare these two examples; Figure 2.34 shows the availability with obstructions on, Figure 2.35 with obstructions off.



Figure 2.34 Example, Obstructions On



Figure 2.35 Example, Obstructions Off

PRINT - sends a printout of the satellite availabilities for the site to your printer. It takes from one to five minutes to plot the graph.

QUIT - exits this option and returns to the Mission Planning Options Grid.

The Satellite Visibility Option

The Satellite Visibility option provides a graphic representation of satellite visibility over a specified site within the specified time frame, as shown in . Each satellite is seen as a unique colored bar with the SV number at both ends of

the bar as well as on the Y axis. The X axis reflects the time frame. In Multi-Site mode, the Satellite Visibility display shows only the times the common satellites are visible to all of the selected sites.



Figure 2.36 Satellite Visibility Option

When you select the Satellite Visibility icon (horizontal bar graph icon, lower left in the Mission Planning Options Grid), you'll see a screen similar to Figure 2.37.



Figure 2.37 Typical Satellite Visibility Plot

When you change the cutoff angle, date, time interval or site, MP reflects the new conditions in the satellite visibility dis-play. If you are using the keyboard to change these parameters, the display is updated after you press a key other than <+> or <->.

The satellite visibility menu, Figure 2.38, lets you monitor satellite visibility.



Figure 2.38 Satellite Visibility Menu

OBSTRUCTIONS - lets you toggle the obstructions on or off to see how they affect the satellite visibility. When you toggle the OBSTRUCTIONS OFF button, it changes to OBSTRUCTIONS ON and you'll see the shorter bars, reflecting the more limited visibility, a direct result of the obstructions around that site.

Compare these two examples. Figure 2.39 shows the satellite visibility with obstructions on, Figure 2.40 with obstructions off.



Figure 2.39 Satellite Visibility, Obstructions On



Figure 2.40 Satellite Visibility, Obstructions Off

PRINT - sends a printout of the satellites' visibility for the site to your printer. It takes from one to five minutes to plot this graph.

QUIT - exits this option and returns to the Mission Planning Options Grid.

SCROLL BARS (arrows at right edge of SV visibility display) - are displayed only if the number of used SVs is more than 24. You can use the scroll bars to scroll up or down the list of charts of visibility for each satellite.

The Setup Option

The setup option, Figure 2.41, lets you specify the almanac file, printer, and time interval for the satellite planning information.



Figure 2.41 Setup Option

When you select SETUP on the Mission Planning Options Grid, you'll see a display similar to Figure 2.42.

	>>> SETUP <<<			PRO	JECT: USASITES.PI	RJ
		[71	Sacramento, CA	*
HENHINHC SELECTIC	h FRIMIEN SELECTION			72	San Antonio, TX	•
🖌 ALM92.153	EPSON EX			73	San Diego, CA	
	EPSON FX			74	San Francisco, C	A
	EPSON LQ		\sim	75	San Jose, CA	_
	EPSON LX			76	Seattle, WA	_1↑
	EPSON MX			77	Shreveport, LA	
	HP LASERJET II			78	Spokane, WA	
	✓ HP LASERJET IIP,III	Ī		79	St Louis, MO	
	IBM GRAPHICS	Ī		80	St Paul, MN	
	IBM PROPRINTER	Ī		81	St Petersburg, F	
	OKIDATA DOT MATRIX	Ī		82	Stockton, CA	
	TEXAS INSTRUMENTS	Ī		83	Tampa, FL	
					=1	
85 Tueson, AZ						
86 Tulsa, OK						
87 Washington, D.C.						
SAVE 15 MINU	TES DISPLAY/PRINT TIME	- İ		88	Wichita, KS	
SETUP V 5 MINL	TES DISPLAY/PRINT TIME QUIT			89	Yonkers, NY	-*

Figure 2.42 Setup Options Grid

Setup Option Panels

Almanac Selection - MP normally uses the most recent almanac data found in the current directory. It displays, in the ALMANAC SELECTION panel, the names of the almanac files it finds and puts a check mark by the almanac it is using. To use a different almanac file, move the pointer to its name and select it. To use an almanac residing in another directory, specify its full path name on the execute line as described on page 7.

Printer Selection - In the PRINTER SELECTION panel (Figure 2.43), you'll see several different printers which are supported by MP. To specify one, move the pointer to its name and select it. It is important that you use the correct one so that the plots and displays are output properly.



Figure 2.43 Printer Selection

Setup Menu

Figure 2.44 shows the setup menu.



Figure 2.44 Setup Menu

Normally MP displays and prints planning data on the basis of a 15-minute time interval. It also offers a 5-minute interval that expands the coverage of the displays. After you select the other time interval, MP calculates and prints all satellite planning data using the specified interval.

If the time frame for the survey is less than 8 hours, MP displays and uses a 5-minute resolution. Note that a 5-minute setting increases the time needed for satellite computations.

SAVE SETUP - To save a configuration, select the SAVE SETUP button. The current specifications are saved in MPSETUP, the setup configuration file, in the current directory.

QUIT - exits this option and returns to the Mission Planning Options Grid.

The Site Editor Option

The Site Editor lets you enter and alter several site parameters and then save the information as an actual site or use it as a working site for planning your survey.

Selecting the Site Editor icon (representing a survey monument) displays the screen shown in Figure 2.45. If you have specified a particular site, the fields will contain data from that site:

>>> SITE EDITOR <<<			PROJECT: USASITES.PRJ
		DELETE	71 Sacramento, CA 📝
SITE NAME	San Jose, CA	TAGGED SITE	72 San Antonio, TX
			73 San Diego, CA
LATITUDE	37°20'16".00 N		74 San Francisco, CA
		THUGED STIL	🔽 75 San Jose, CA
LUNGITUDE	121°53'24".00 W	ADD NEW SITE	76 Seattle, WA
ALTITUDE	: 27.00 (m)	TO FILE	77 Shreveport, LA
			78 Spokane, WA
LOCAL TIME-CMT	- -02 0 (b)		79 St Louis, MO
LOCHE TITLE-ditt			80 St Paul, MN
			81 St Petersburg, FL
SITE DESCRIPTION			82 Stockton, CA
			83 Tampa, FL
			84 Toledo, OH
			85 Tueson, AZ
SITE OBSTRUCTIONS: YES			86 Tulsa, OK
SITE NUMBER : 75 B7 Washington, D.C.			87 Washington, D.C.
B8 Wichita, KS			88 Wichita, KS
SELECT AS TEMP	SITE CLEAR PAGE	QUIT	89 Yonkers, NY 🛛 🔻

Figure 2.45 Site Editor Screen

The site parameters that can be altered are: site name, latitude, longitude, altitude, the local-time/GMT offset, and site description. When an entry field is highlighted, indicating that its contents can be modified, type in the new information. If you make a typing error, you can erase it with the
backspace> or <delete> keys and re-type the entry.

When the Mission Planning software is used with a mouse, there are two cursors: the pointer and the text cursor.

When MP is used without a mouse, you are limited to a single cursor. It is necessary to indicate whether you are in pointing mode or in text entry mode.

- To go to pointing mode in a mouseless environment, press the <F1> key; the text cursor is replaced by the pointer so you can select the buttons.
- 2. To return to text-entry mode in a mouseless environ-ment, move the pointer to an entry field and press the <ENTER> key; the pointer is replaced with the text cursor.

You can move the cursor sideways in a field using the left- or right-arrow keys $(\leftarrow, \rightarrow)$. The up- and down-arrow (\uparrow, \downarrow) keys move the cursor up or down one field. The <HOME> key moves the cursor to the beginning of the line while the

<END> key moves the cursor to the end of the line. The <PGUP> key moves the cursor to the top field and the <PGDN> key moves it to the bottom line. When you press the <ENTER> key, the next entry field will be highlighted.

Site Editor Fields

These are the fields that define a site in terms of its usability for survey planning.

SITE NAME - Up to 17 characters can be entered in the site name field.

LATITUDE - Has five entry fields consisting of whole degrees, minutes, seconds, hundredths of seconds and direction. The direction can be either N for north or S for south.

LONGITUDE - Similar to LATITUDE. Longitude can be either E for east or W for west.

ALTITUDE - is in meters and can be entered with two decimal places.

LOCAL TIME-GMT - Enter the local-time/GMT offset time in hours. The time can be entered as a positive or negative number of hours relative to GMT. Offset can be entered in ½-hour increments to accommodate all time zones.

SITE DESCRIPTION - is three lines of 32 characters each. Enter any text which you would like to save with the site information.

SITE OBSTRUCTIONS - indicates whether any obstructions have been registered and saved for the site using the Obstruction Editor (Figure 2.46. (For details on registering and saving obstructions for a site, refer to p. 24).



Figure 2.46 Site Obstructions

You cannot modify obstructions from the Site Editor. You can, however, delete site obstructions when they have been saved for this site from this screen. Move the pointer to this button and select it, then move the pointer to the YES button and confirm the deletion.

Site Editor Buttons

Three of the Site Editor's buttons are displayed along the right edge of the display window, as shown in Figure 2.47.



Figure 2.47 Site Editor Buttons - 1

DELETE TAGGED SITE - deletes the selected site from the project database file. To delete a site, select it on the PROJECT panel, then click on this button.

REPLACE TAGGED SITE - saves the parameters over the existing site information in the project database. To replace site information, select it on the PROJECT panel, alter the entry fields as desired, then click on this button.

ADD NEW SITE TO FILE - adds the site to the project database. To add a site, put the desired information into the entry fields, then click on this button. The site name will appear at the bottom of the PROJECT panel and will be added to the project database file.

In addition to these buttons, the Site Editor displays three buttons across the bottom of the window, as shown in Figure 2.48:



Figure 2.48 Site Editor Buttons - 2

SELECT AS TEMP SITE - uses the site parameters entered as the working site for all satellite planning options.

CLEAR PAGE - clears the information from site entry fields.

QUIT - returns to the Mission Planning Options Grid.

The Sky Plot Option

The Sky Plot option, Figure 2.49, displays the paths of GPS satellites over a site, as shown in Figure 2.51.



Figure 2.49 Sky Plot Option

Selecting the Sky Plot option (Figure 2.50), the top right icon on the Mission Planning Options Grid, gives you a view of the satellites' paths over the selected site. This example shows a typical sky plot; the time frame has been shortened to simplify the display.



Figure 2.50 Sky Plot Options

The site is located at the center of the sky plot. Above the site, the satellites follow the path displayed for the specified time frame. Each satellite's path is identified by a color and its satellite number, both of which match the color and SV number shown in the satellite selection boxes.

The large circle at the end of each path is the rising location of the satellite, or where the satellite was at beginning of the time frame. The smaller circles show the movement of the satellite at each one-hour point. If there is a continuous obstruction (a "doughnut") around the entire horizon, you are looking at a cutoff angle greater than 0° .

As you change the cutoff angle, date, time interval or site, MP reflects the new conditions in the sky plot. If you are using the keyboard to change these parameters, the display is not updated immediately. It will be updated after you press a key other than <+> or <->.

Sky Plot Menu

The Sky Plot option menu, Figure 2.51, offers two levels of display. The regular Sky Plot has buttons in the display window. The Full-Screen Sky Plot discards the buttons and uses the full field for display. In addition, the regular Sky Plot provides an option not offered on the Full Screen - the ability to send a table of information to your printer.

OBSTRUCTIONS OFF
FULL SCREEN
PRINT GRAPH
PRINT TABLE
QUIT

Figure 2.51 Sky Plot Options

OBSTRUCTIONS - lets you toggle the obstructions on or off to see how they affect the view of the satellites' paths. When you select the OBSTRUCTIONS OFF button, it changes to OBSTRUCTIONS ON and you'll see the sky plot re-painted with the site's specified obstructions.

Compare two samples of sky plots over a site that has obstructions registered to it; Figure 2.52 shows the sky plot with the obstructions off; Figure 2.53 is the same site in the same time frame, but with obstructions on.



Figure 2.52 Sky Plot, Obstructions Off



Figure 2.53 Sky Plot, Obstructions On

To determine exactly where a satellite is blocked by an obstruction, move the pointer to the obstruction and read its coordinates in the ELEVATION and AZIMUTH box (lower right).

ELEVATION:	23
AZIMUTH:	88

Figure 2.54 Elevation and Azimuth Box

FULL SCREEN - To change the display to a Full-Screen Sky Plot, move the pointer to the FULL SCREEN button and select it. The display resembles Figure 2.55; its functions are described later.



Figure 2.55 Typical Full-Screen Sky Plot

PRINT GRAPH - This Sky Plot option sends the display to a printer. The printout can be used by the survey crew during actual field measurements to visualize where the satellites will be located during the survey. It takes one to five minutes to print the graphics display.

PRINT TABLE - prints a table of satellite elevation (degrees above the horizon) and azimuth (degrees true) versus time (local to the site). In this example, titles and data have been condensed:

GPS MULTI-SITE MISSION PLANNING

SATELLITE VISIBILITY

LOCATION: ASHTECH LAT:37°22'08".80 N LON:122°00'03".60 W ALT:10.00m

LOCAL TIME-GMT: -08.0(h) DATE OF TABLE: 01/Jun/91 (DAY: 152)

DATE OF ALMANAC: 03/Jun/91 CUTOFF ANGLE:15° OBSTRUCTIONS: off SV Number 2 3 6 11 12 13 14 LocalTime EL:AZ EL:AZ EL:AZ EL:AZ EL:AZ EL:AZ EL:AZ 09:15:00 22:218 ---|----- 21:99 ---|-----|----09:45:00 35:226 ---- 19:276 28:84 --- |----- |----- |----10:00:00 41:231 ---|---- 23:283 31:76 ---|-----|----10:15:00 47:237 --- 27:289 32:68 --- ---10:45:00 59:253 --- 34:304 30: 51 --- ---11:00:00 64:265 ---|---- 38:312 27:43 ---|-----|----11:15:00 68:280 ---|---- 42:320 23:37 ---|-----|----11:30:00 71:300 ---|---- 46:328 19:32 ---|-----|----11:45:00 72:323 ---|---- 50:337 ----|------|-----|-----|-----12:00:00 71:345 ----- 54:347 -------- 15:184 -----12:15:00 68: 4 --- 58:359 ---- 22:185 ----12:30:00 65: 19 --- 62: 12 ---- 30:186 -|---12:45:00 61: 32 --- 64: 28 ---- 37:187 ----13:00:00 56: 42 --- 66: 47 ---- 45:189 -|---

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QUIT - exits from the Sky Plot option and returns to the Mission Planning Options Grid.

Full-Screen Sky Plot Menu

Figure 2.56 shows the options for full-screen sky plot.



Figure 2.56 Full-Screen Sky Plot Menu

PRINT GRAPH - (Full-Screen Sky Plot option) sends full-screen display to the printer. Can be used the same way as the regular Sky Plot but since it is larger and more detailed, you can more accurately see how the satellites are moving across the sky.

GRID - (Full-Screen Sky Plot option) outputs the full-screen display with a grid so the printout can be carried to the site where obstructions can be marked, as shown in Figure 2.57. These obstructions can then be put into the online site data via the Obstruction Editor. To turn off the grid, toggle the GRID ON button.



Figure 2.57 Typical Full-Screen Sky Plot Option

RETURN - (Full-Screen Sky Plot option) goes back to the regular Sky Plot display.

Point on the World Map

The World Map option, Figure 2.58, lets you indicate your planning loca-tion by moving the pointer to the corresponding area on the world map and clicking on it.



Figure 2.58 World Map Option

To get to the world map, select the World Map icon on the Options Grid (center icon). MP gives the world map display shown in Figure 2.59.



Figure 2.59 World Map Display

To use a location for planning,

- 1. Move the pointer, checking the bottom of the window for MP's report of its latitude and longitude.
- 2. At the intended site, press the left mouse button (or the <ENTER> key when you are using the keyboard).

In response, MP displays a flashing circle over that location and uses it for planning. In the LOCATION area, you'll see its site name along with its latitude and longitude (Figure 2.60). Note that a spot "in the neighborhood" is good enough for planning purposes.



Figure 2.60 Typical Location Area

MP also makes a rough estimate of the LOCAL-GMT time offset for that site. You may need to adjust it, as described previously.

Alternatively you can select a site from the PROJECT panel. Move the pointer to the site name and click on it. MP will put a flashing circle over that location on the world map, display its name and location, and use it for planning.

QUIT - To exit this option and return to the Mission Planning Options Grid, move the pointer to the QUIT button and select it.

Customer Support

Mission Planning provides an effective and efficient way to plan the occupation of sites for GPS survey measurements.

If you have any problems or need further help, call Ashtech customer support. Before you call, please refer to the documentation that came with your system (both receiver and software manuals); many common problems are identified within them and suggestions are offered for solving them. Before calling, please make the following checks:

- Check cables and power supplies. Many hardware problems are related to these simple problems.
- If the problem seems to be with your computer, reboot it to clear the system's RAM.

If the problem still exists, contact the Ashtech customer support team. Have the following information at hand (Table 2.2):

Table 2.2	Information	Required	for Tech	Support
-----------	-------------	----------	----------	---------

Information	Your Actual Numbers
Receiver model	
Receiver serial number	
Software versiion	
Sorfware serial number	
Firmware version	
Almanac file name	
A clear concise description of the problem	

The Ashtech numbers are:

800 Hot Line: 1-800-229-2400 Local Voice Line: (408) 524-1400

FAX: (408) 524-1500

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