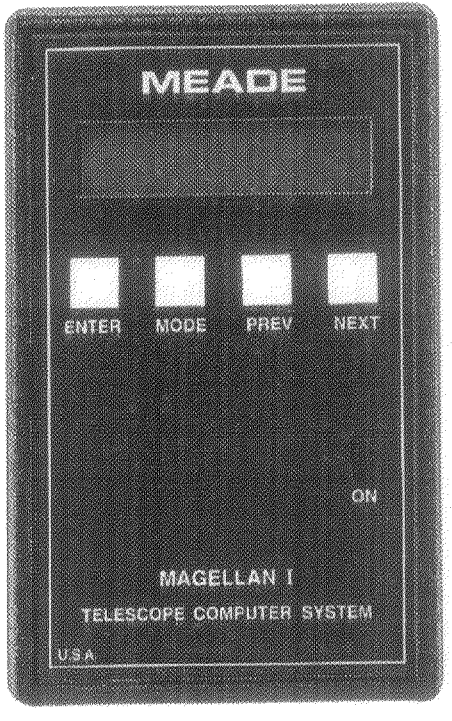
Meade Magellan I
User Guide



Meade Instruments Corporation

WARNING!

Never use the Magellan to look at the Sun! Looking at or near the Sun will cause *instant* and *irreversible* damage to your eye. Eye damage is often painless, so there is no warning to the observer that damage has occurred until it is too late. Do not point a telescope or its viewfinder at or near the Sun. Do not look through a telescope or its viewfinder as it is moving. Children should always have adult supervision while observing.

WARNING

This equipment has been tested and found to comply with the limits for a CLASS B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions contained in this manual, may cause harmful interference to radio and television communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio of television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that of the receiver.
- Consult the dealer or an experienced audio television technician.

NOTE: Connecting this device to peripheral devices that do not comply with CLASS B requirements or using an unshielded peripheral data cable could also result in harmful interference to radio or television reception.

The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

To ensure that the use of this product does not contribute to interference, it is necessary to use shielded I/O cables.

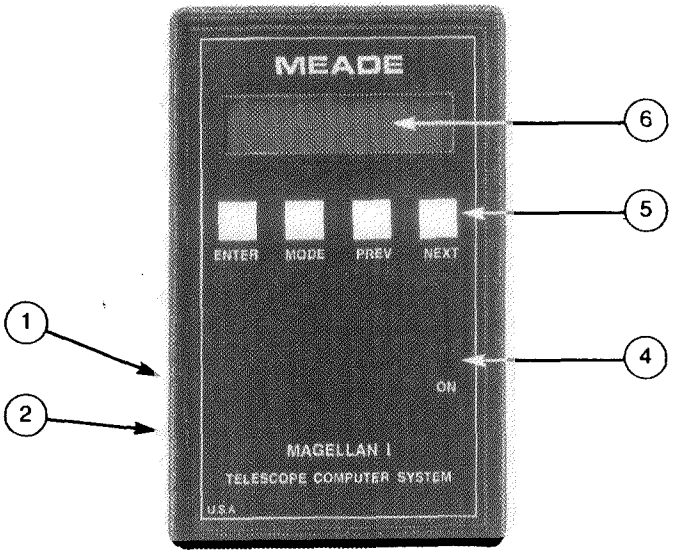
I. Introduction

With the purchase of the Meade® Magellan I Telescope Computer-Corrector System, the most advanced computerized telescope controller ever designed, more quality observing time can be spent actually *observing* objects instead of *searching* for them.

Listed below are just a few of the exciting features provided with the Magellan I system.

A. Features

- **Fast 2-Star Alignment:** Point the telescope at two bright stars selected from the database and the computer is aligned in seconds.
- **Object Database:** With a touch of a finger, access the name, location, size and object type of 12,218 deep sky objects, stars and planets — all programmed within the Magellan I computer system.
- **SYNC Command:** With the push of a button, the sync command updates the system's microprocessor to the position of any database object currently in the telescope's field, eliminating any slight effects of alignment errors.
- **Liquid Crystal Display:** Information on the telescope's location and object descriptions are displayed on a large, two-line, 32-character, red backlit screen with 16 levels of illumination.



(1) RS-232 port
(2) Encoder port
(3) Battery compartment
(4) On/Off switch
(5) Control pushbuttons
(6) Liquid crystal display (LCD)

Fig. 1: Magellan I Handbox Controller

- **Digital Readouts on Both Axes:** The large, 32-character screen displays both the Right Ascension (R.A.) and Declination (Dec) coordinates of where the telescope is pointing — to a precision of 5.3 arc-minutes (0.09 degrees).
- **Battery Operated:** Power Magellan I with a single 9 volt transistor radio battery for hours of computer-assisted observation time.
- **RS-232 Communication Port:** Through this port, connect Magellan I to a personal computer and use Epoch 2000 (or other compatible software) to display the telescope's position in the sky directly on the computer's star map.

B. Principles of Operation

The Magellan I system is quite simple in its basic operation. All telescopes have two axes of rotation, with one axis perpendicular to the other. By rotating a telescope along these two axes, a user can point to any object in the sky. On some telescopes, like the Meade Starfinder Dobsonians, the telescope axis of rotation is basically aligned with the surface of the Earth. This configuration is referred to as an "Altazimuth" (Alt/Az) configuration. Telescopes with clock drives, such as the Meade Starfinder Equatorials or the Meade LX10 have one of the axes "set" so that rotation around the celestial pole is possible. This configuration is called a "Polar" configuration. Magellan I has been designed to understand the relationship between the moving sky and a telescope aligned with either an Alt/Az configuration or a Polar configuration. For Magellan I to operate properly, it must first have information about where the telescope is pointing. This information is gathered by installing encoders on both of the telescope's axes of rotation. Each encoder divides its axis into 4,096 reference points. As the telescope is moved along an axis, the encoder counts and keeps track of how many encoder "points" the telescope travels over. These encoders are included with the Magellan I system and must be installed on your telescope. Different encoders are needed for different telescopes, therefore a separate instruction sheet will be provided with the system which is designed specifically for your type of telescope.

Once Magellan I has the capability of determining various positions of the telescope, it will need to know how these positions relate to the sky. Relating the telescope's position to the sky is done through a process called "Alignment" and can be accomplished quickly by locating and identifying two bright stars. Alignment procedures are discussed later in the manual. Once the alignment is complete, Magellan I knows where in the sky the telescope is pointing and can direct an observer to any of the 12,218 objects within its vast database.

II. Installing the Encoders

It will be necessary for the user to install encoders that will keep track of the telescope's movement. Because the Magellan I can

be attached to a variety of Meade Telescopes, specific installation instructions are not included in this manual. Instead, **a separate sheet with instructions for your specific type of telescope** has been included with the system, along with the specialized brackets and encoders required by the telescope.

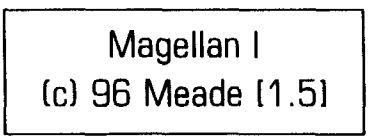
NOTE: Read the separate instruction sheet carefully before starting the installation process. Gather the required parts and necessary tools before disassembling the telescope.

III. Getting Started

With the encoders installed and plugged into the Magellan I hand controller, the process of alignment can begin.

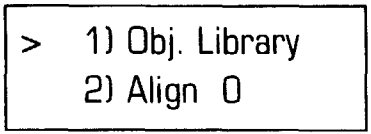
A. Turning on the Power:

An introductory screen will appear identifying the Magellan I system and which version of the software is being utilized (the number in brackets). The software version may vary from the sample screen shown below.



Introductory Screen

After about 5 seconds, the system defaults to Telescope Mode.



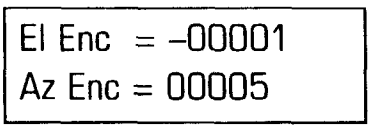
Default Telescope Mode Screen

B. Moving the Telescope:

To confirm that the encoders are activated and recording the telescope's motion, see if the telescope's coordinates change as the telescope is moved. To display the telescope coordinates:

1. Displaying the Coordinates:

Press the **MODE** button one time. This button changes the mode of operation of the Magellan I System. By pressing the **MODE** button one time, Magellan I will be in the Coordinate Mode.



Coordinate Mode Display (numbers will vary)

Because the telescope has not been aligned, these coordinates represent "raw" encoder counts. Once the telescope has been

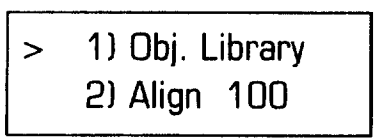
aligned, the display will show R.A. and Dec coordinates. As the telescope moves, the coordinates should change. If the coordinates don't change, check the encoders to confirm they have been properly installed.

To exit the Coordinate Mode, press the **MODE** button three times, passing through Time Mode (p. 24) and Blank Mode (for adjusting the lighted keypad) (p. 24), before ending up at the default Telescope Mode.

2. Changing the Encoder Rates:

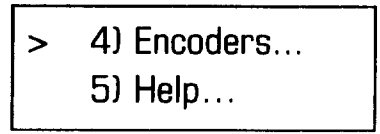
If the standard encoder rates are different from the default rates programmed into Magellan I, a note will appear in the encoder installation instructions. If such a note appears within the instructions, it will be necessary to change the encoder rates.

To change the encoder rates, make sure that Magellan I is in the default Telescope Mode by pressing **MODE** until the default screen is displayed.

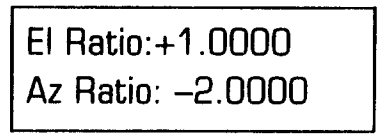


Default Telescope Mode Screen

Using the **NEXT** button, scroll down until the arrow points to the "Encoders" option. Press **ENTER.**



Telescope Mode Screen



Encoder Screen

Press and hold **ENTER** for a couple of seconds. A blinking cursor will appear over the first entry point. From the separate "Encoder Installation" instruction sheet provided with the encoders for your specific type of telescope, find the new encoder values and enter them into the system using the **PREV** and **NEXT** buttons. When the correct values have been entered, press **ENTER.**

IV. Aligning Magellan I

Alignment of the telescope is the most critical procedure for the successful use of Magellan I. The alignment procedure allows Magellan I to determine the orientation and position of the telescope and to thereafter guide the telescope accurately to objects in the sky.

Before beginning, check the telescope's stability. The telescope must be rigid for the Magellan I System to operate properly. The frame must be assembled with all bolts secure so that no shifting movements result while operating the telescope. Also, make sure that the telescope mount is on stable, hard ground.

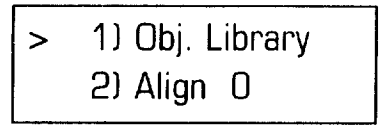
If your telescope has an equatorial mount, polar align the telescope as instructed by the telescope's instruction manual. If your telescope has an altazimuth configuration, utilize one of the two Alt/Az alignment options provided in this manual.

A. Alignment For Equatorial Telescopes:

1. With the telescope polar aligned, center the north (or south) celestial pole in the telescope's field of view by aligning the telescope's declination to +90° (or -90°). When aligned, lock the declination in place. By polar aligning the telescope and setting the declination to +90° (or -90°) the telescope's two axes are perpendicular to each other.

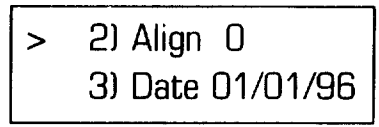
NOTE: The north celestial pole is not the same as Polaris (the North Star). The declination of Polaris is +89.02°. The south celestial pole is not the same as Sigma Octans (the South Star). The declination of Sigma Octans is -89.08°.

2. With the telescope properly aligned, choose Option 2 — the "Align" option — from the default Telescope Mode. If the Magellan I is not in the Telescope Mode, press the **MODE** button to cycle through the four different modes until the following screen is displayed:



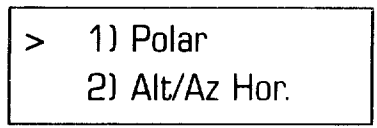
Default Telescope Mode Screen

3. Press the **NEXT** button one time. The arrow will now point to the "Align" option.



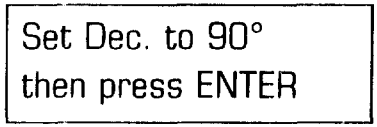
Telescope Mode Screen

4. Press the **ENTER** button. The following screen will appear.



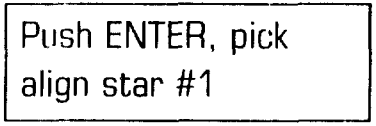
Alignment Screen #1

5. Pressing **ENTER** will chose the alignment option for a Polar Aligned telescope.



Polar Alignment Screen #1

If the telescope has been aligned as described in step 1 above, press **ENTER**. This is the first step in the alignment process and informs Magellan I of the location of the celestial pole. The system is now ready for the first alignment star.



Polar Alignment Screen #2

6. Pressing **ENTER** one more time, as directed by the display, will bring up an alphabetical list of alignment stars (found in Appendix A). This list consists of bright stars spread throughout the sky, making it possible to achieve alignment during any season or any time of the night. Choose a few familiar stars that can be easily identified as it will be necessary to manually sight in on these stars to align Magellan I. Basic star maps are provided in Appendix B.

   HINTS — For Choosing an Alignment Star:

   — Select stars that are not near the celestial pole.

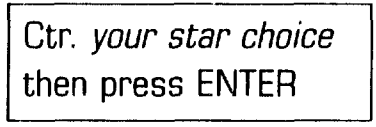
   — Select stars that are not close together. Stars that are separated by at least 25° work the best.

   — Do not choose Polaris as one of the alignment stars.

   — Do not select a star between the north celestial pole and the northern horizon. (If aligning the telescope while in the southern hemisphere, don't choose a star between the south celestial pole and the southern horizon.)

Following these guidelines when choosing alignment stars will greatly enhance the accuracy of Magellan I.

7. Use the **PREV** and **NEXT** buttons to scroll through the list. Press **ENTER** when the arrow points to the star of your choice. Then, center that star in the telescope's field of view.



Polar Alignment Screen #3

HINTS: For Centering an Alignment Star: Centering a star is easier when using an eyepiece with crosshairs. If an eyepiece with crosshairs is not available, change the focus of the telescope so that the star is out of focus and therefore larger. A larger circle is easier to center than a pinpoint.

Once the selected star is centered in the field of view, press **ENTER.**

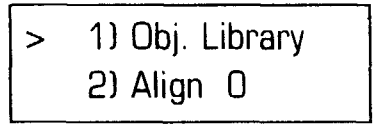
8. At this point, the basic alignment is done and the alignment mode may be exited by pressing the **MODE** button. However, Magellan I does provide the option of choosing a second alignment star. With a two star alignment, the degree of pointing accuracy increases greatly.
9. If you wish to choose a second alignment star, follow the same procedure as when selecting the first alignment star. When the second star is entered into the system, exit the alignment mode by pressing **MODE.**
10. Turn to page 11 (*C. Alignment Errors:*) to evaluate the success of the alignment process.

B. Alt/Az Alignment for Dobsonian Telescopes:

There are two choices for the Alt/Az alignment method: *Alt/Az Hor.* and *Alt/Az Vert.* The preferred method (Alt/Az Hor.) requires that the bubble level and the telescope start in the horizontal position. This is the preferred method simply because of the reduced physical contortions required by the user.

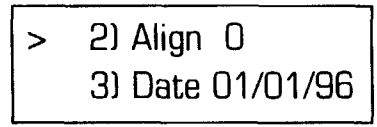
1. Alt/Az Hor.: The purpose of this alignment is to find the telescope elevation that is perpendicular to the azimuth axis of rotation.

a. Choose Option 2 — the "Align" option — from the default Telescope Mode. If the Magellan I is not in the Telescope Mode, press the **MODE** button to cycle through the four different modes until the following screen is visible:



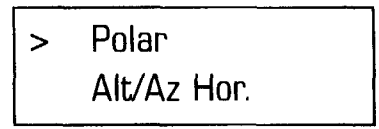
Default Telescope Mode Screen

b. Press the **NEXT** button one time. The arrow will now point to the "Align" option.



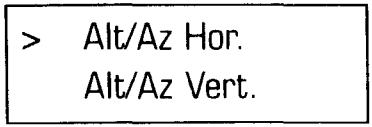
Telescope Mode Screen

c. Press the **ENTER** button. The following screen will appear.

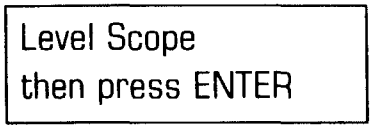


Alignment Screen #1

d. Press **NEXT** to move the arrow to the Alt/Az Hor. option and press **ENTER.**



Alignment Screen



Alt/Az Hor. Alignment Screen #1

To level the telescope:

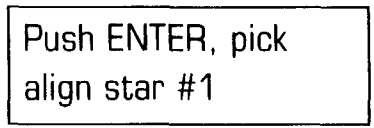
Place a bubble level on the rocker box base of the telescope under one of the two elevation bearings. The telescope does not have to be on level ground.

Rotate the telescope base until the bubble level reads level (this will occur in at least two locations, 180° apart.)

Then, without moving the telescope base from this level position, tilt the telescope tube horizontally and place the bubble level along the top side of the tube. Adjust the tilt of the tube until the bubble level again reads level.

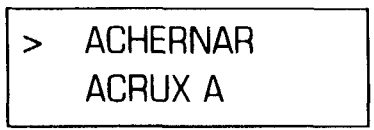
Note: When this horizontal position has been located, the user may wish to scribe lines on the telescope bearing and the side panel to locate the true horizontal for future alignments.

Press **ENTER** when the telescope is level.



Alt/Az Hor. Alignment Screen #2

e. Pressing **ENTER** one more time, as directed by the display, will bring up an alphabetical list of alignment stars (found in Appendix A). This list consists of bright stars spread throughout the sky, making it possible to achieve alignment during any season or any time of the night. Choose a few familiar stars that can be easily identified as it will be necessary to manually sight in on these stars to align Magellan I. Basic star maps are provided in Appendix B.



Alt/Az Hor. Alignment Screen #3

HINTS — For Choosing an Alignment Star:

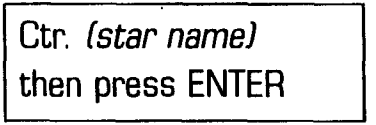
— Select stars that are not near the celestial pole.

— Select stars that are not close together. Stars that are separated by at least 25° work the best.

— Do not choose Polaris as one of the alignment stars.

— Do not select a star between the north celestial pole and the northern horizon. (If aligning the telescope while in the southern hemisphere, don't choose a star between the south celestial pole and the southern horizon.)

Following these guidelines when choosing alignment stars will greatly enhance the accuracy of Magellan I.



Alt/Az Hor. Alignment Screen #4

HINTS — For Centering an Alignment Star: Centering a star is easier when using an eyepiece with crosshairs. If an eyepiece with crosshairs is not available, change the focus of the telescope so that the star is out of focus and therefore larger. A larger circle is easier to center than a pinpoint.

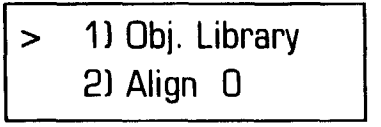
Once the selected star is centered in the field of view, press **ENTER.**

f. To select the second alignment star, follow the same procedure as when selecting the first alignment star. When the second star is entered into the system, exit the alignment mode by pressing **MODE.**

g. Turn to page 11 (*C. Alignment Errors:*) to evaluate the success of the alignment process.

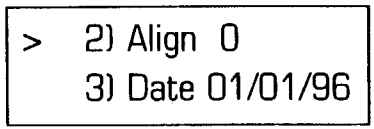
2. **Alt/Az Vert.:** The Alt/Az Vertical method of alignment requires that the telescope be exactly perpendicular to its base (parallel to the axis of rotation).

a. Choose Option 2 — the "Align" option — from the default Telescope Mode. If the Magellan I is not in the Telescope Mode, press the **MODE** button to cycle through the four different modes until the following screen is displayed:



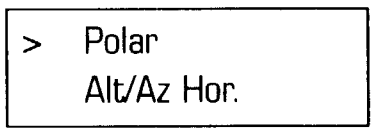
Default Telescope Mode Screen

b. Press the **NEXT** button one time. The arrow will now point to the "Align" option.



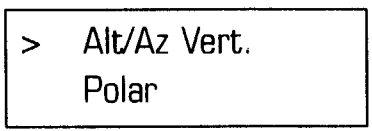
Telescope Mode Screen

c. Press the **ENTER** button. The following screen will appear.

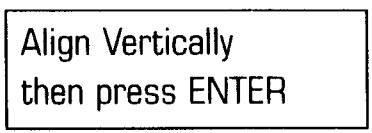


Alignment Screen #1

d. Press **NEXT** two times to move the arrow to the Alt/Az Vert. option.



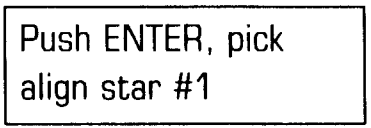
Alignment Screen



Alt/Az Vert. Alignment Screen #1

To vertically align the telescope, place the telescope in a vertical position and rotating the telescope while observing the starfield in the eyepiece. If the telescope is perpendicular to the base, the stars will appear to rotate around the center of the field of view. If the telescope is not perpendicular to the base, the stars will disappear out of the field of view as you rotate the telescope. Adjust the tilt of the telescope as required to achieve this effect. When you have determined the vertical position, scribe marks on the base and telescope that will allow this position to be found in future sessions.

Press **ENTER** when the telescope is vertically aligned.



Alt/Az Vert. Alignment Screen #2

e. Pressing **ENTER** one more time, as directed by the display, will bring up an alphabetical list of alignment stars (found in Appendix A). This list consists of bright stars spread throughout the sky, making it possible to achieve alignment during any season or any time of the night. Choose a few familiar stars that can be easily identified as it will be necessary to manually sight in on these stars to align Magellan I. Basic star maps are provided in Appendix B.

Alt/Az Vert. Alignment Screen #3

HINTS — For Choosing an Alignment Star:

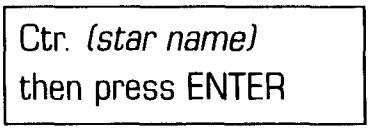
— Select stars that are not near the celestial pole.

— Select stars that are not close together. Stars that are separated by at least 25° work the best.

— Do not choose Polaris as one of the alignment stars.

— Do not select a star between the north celestial pole and the northern horizon. (If aligning the telescope while in the southern hemisphere, don't choose a star between the south celestial pole and the southern horizon.)

Following these guidelines when choosing alignment stars will greatly enhance the accuracy of Magellan I.



Alt/Az Vert. Alignment Screen #4

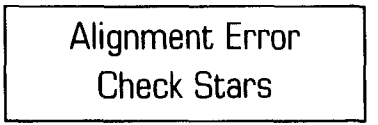
HINTS — For Centering an Alignment Star: Centering a star is easier when using an eyepiece with crosshairs. If an eyepiece with crosshairs is not available, change the focus of the telescope so that the star is out of focus and therefore larger. A larger circle is easier to center than a pinpoint.

Once the selected star is centered in the field of view, press **ENTER.**

f. To select the second alignment star, follow the same procedure as when selecting the first alignment star. When the second star is entered into the system, exit the alignment mode by pressing **MODE.**

C. Alignment Errors:

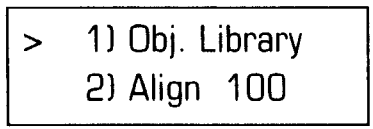
If an error occurs during the alignment procedure, Magellan I can detect these errors based on calculations of expected values. For example, if the wrong star is centered during alignment, Magellan I will detect that the distance between stars is not what it should be. If this variation exceeds predetermined limits, Magellan I will display the following message:



If this message appears, press **ENTER** and begin the alignment procedure again.

D. A Successful Alignment:

After exiting the Alignment mode, the accuracy of the alignment procedure is shown on the default Telescope screen. A number will be appear next to the "Align" function. This number gives a relative value of merit for alignment quality. (100 = 100%)



Default Telescope Mode Screen

Values between 90 and 110 are accepted but may affect pointing accuracy when moving to other objects. Values out of this range are not acceptable and will require another alignment attempt. A value of "0" indicates that the telescope has not been aligned.

V. Selecting and Locating Objects:

With the Magellan I aligned with the telescope, there are essentially two ways to locate objects in the sky. Either choose an object from the 12,218-object database stored within the Magellan I system, or use the R.A. and Dec coordinates of an object taken from an astronomical publication and manually move to the coordinates.

A. Using the 12,218-Object Database

With the push of one button, an observer can enter into the computer database. The data within Magellan I has been separated into six different categories for easy access.

NGC Objects: New General Catalog objects. This listing of 7,840 non-stellar astronomical objects is an enhancement of the RNGC (Revised New General Catalog). Angular sizes are given in arc-seconds and are displayed in a convenient scaled format. Magnitudes are given to 0.1 magnitude where possible.

IC Objects: Index Catalog objects. This excerpted listing contains 4,093 objects and is an extension of the NGC catalog, including objects of interest to amateur astronomers.

Star: Accesses the Alignment Stars found in Appendix A (page 28).

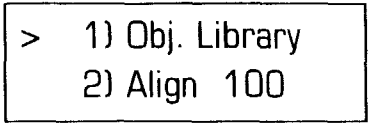
Planet: Accesses the eight major planets in the solar system.

User Obj.: Allows easy access to favorite objects, stored in a personalized user library. (See page 23)

Messier Objects: Accesses all 110 Messier objects, some of the best deep-sky objects around.

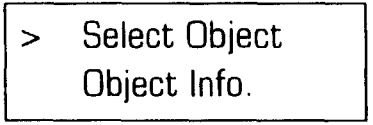
1. Selecting a Deep Sky Object:

From the default telescope mode, press **ENTER** for Obj. Library.



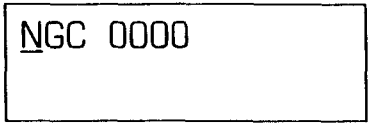
Default Telescope Mode Screen

Pressing **ENTER** again to Select Object.



Object Library Screen

Displayed on the screen is the NGC category, the first of the six easy-access categories.

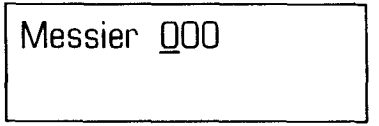


1st NGC Screen

To cycle through the six categories, press the **PREV** or **NEXT** buttons. The six categories are: NGC, IC, Star, Planet, User Obj, Messier.

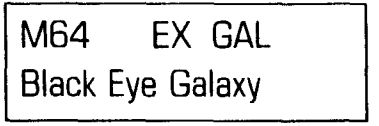
To choose a category, press **ENTER** when the desired category is visible on the display.

For Example: To locate M64, the Black Eye Galaxy, press the **PREV** or **NEXT** button until the Messier option is visible on the display. Press **ENTER** to move to the first entry point.



1st Messier Screen

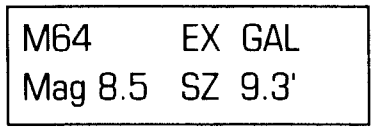
The **PREV** and **NEXT** buttons are used to change the number highlighted by the blinking cursor. When the correct number is displayed, press **ENTER** to move to the next entry point. When the three numbers have been entered, pressing **ENTER** again displays the following screen.



2nd Messier Object Screen

If the object has a "common" name, such as the Black Eye Galaxy, the name will appear on the second line of the screen. The next screen will display the magnitude and size of the object. If there is no common name, the magnitude and size will

be displayed on the 2nd screen. Advance to the next screen by pressing **ENTER**.



3rd Messier Object Screen

Within these Object Screens, the following abbreviations may be found:

EX — Represents a Visual Quality Rating: Objects in the database have been assigned a Visual Quality Rating (VQ). A large number of VQs have been obtained by observing the objects. To make the VQs as useful as possible, all observations have been made with the same telescope and eyepiece under essentially identical observing conditions. Only when viewing very small objects was a higher power eyepiece used. The VQ will vary, largely due to sky conditions.

Visual Quality Rating

SU	Super
EX	Excellent
VG	Very Good
G	Good
FR	Fair
PR	Poor
VP	Very Poor

Almost all of the objects in the CNGC are visible with the standard instrumentation and observing conditions used to obtain the Visual Quality Ratings. It is a good indication of what can be expected with similar equipment by experienced deep-sky observers in excellent sky conditions. Naturally, smaller telescopes and/or less optimal observing conditions will lower the apparent quality of all objects.

GAL — Represents an Object Classification.

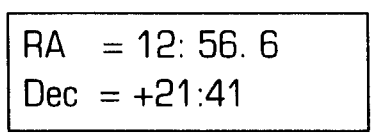
Object Classification

GAL	Galaxy	PNEB	Planetary Nebula
OPEN	Open Star Cluster	DNEB	Diffuse Nebula
GLOB	Globular Star Cluster		
MLTS	Multiple Star System		

Mag — Represents the visual magnitude rating of the object.

SZ — Represents the size of the object in arc minutes.

Pressing **ENTER** again displays the RA and Dec coordinates for the object.



Messier Object 4th Screen

Pressing **ENTER** again displays the distance (in degrees altitude and azimuth) to the object from the telescope's current location. Using these two numbers to find the target object is explained in the following section.

Messier Object 5th Screen
(numbers depend on telescope's current location)

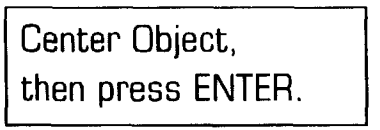
Pressing **ENTER** one more time displays the first screen, as Magellan I has now cycled through all five information screens.

2. Moving to a Chosen Object:

Once an object has been chosen and entered in the Magellan I system, such as M64 from the previous section, Magellan I provides a simple way to find that object in the sky. From the Object Info. option, use the **NEXT** button to cycle through the object information until the distance (in degrees altitude and azimuth) to the object from the telescope's current position is displayed. Move the telescope so that the numbers change, decreasing in value. When the telescope is within two degrees of the target object, the numbers will be replaces with a series of bars. As the telescope moves closer to the target object the bars will disappear, one by one, until only two bars remain, one on each line. At this point, the object should be within the field of view of the telescope.

SYNC Command: Once the desired object is centered in the telescope's field, "fine-tune" Magellan I alignment with the telescope by using the unique SYNC command. *The Magellan system is the only commercial telescope computer available* with this important "SYNC" command. "SYNC" is short for "synchronize" and is a method used to improve the accuracy of the telescope after it has been aligned. Alignment will not always be perfect and can have small variations that will be multiplied as the telescope sweeps long distances across the sky. These inaccuracies can be eliminated in a local area of sky by "synching" on a known object in that vicinity (confirming with the computer exactly when the known object is in the center of the eyepiece) and will help Magellan I improve its accuracy for other objects in the neighborhood.

To "SYNC' on an object, center the object within the field of view of the telescope while the object information for that object is displayed (object's name, type, etc.) Press and hold the **ENTER** key for one or two seconds. The display will read:



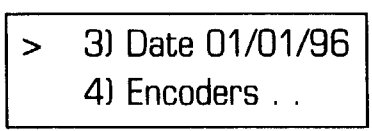
Sync Display

Pressing **ENTER** again will now synchronize the Magellan I to the coordinates of the centered object. This will improve the accuracy of Magellan I for the objects in the immediate area. While any object from the database may be used to "sync" the Magellan I , the user may wish to select a bright neighbor of a fainter object to provide the final pointing accuracy to find that faint object. The list of bright alignment stars in Appendix A may be used for this purpose.

3. Selecting the Planets:

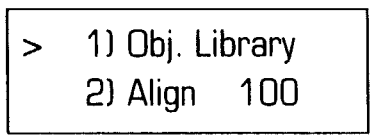
Before located a planet, it is necessary to enter the current date into Magellan I .

a. Enter the Date: Press the **MODE** button until the default Telescope screen is visible. Using the **NEXT** button, scroll through the options until the arrow points to the "Date" option.



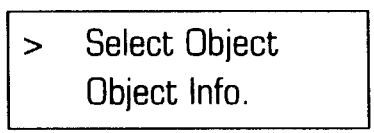
Press **ENTER.** A flashing cursor will appear over the first entry point. Enter the appropriate month, date and year by pressing the **NEXT** or **PREV** button to choose each number. When the desired number is visible, press **ENTER** to move to the next entry point. When the correct date has been entered, press **ENTER** to complete the process. The date is erased each time the power is shut off, so it will be necessary to re-enter the date each time the Magellan I is used.

b. Choosing a Planet: From the default telescope mode, press **ENTER** for Obj. Library.



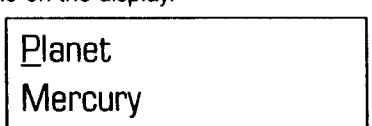
Default Telescope Mode Screen

Press **ENTER** to Select Object.



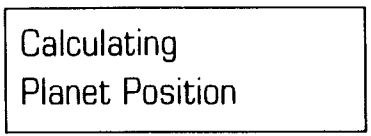
Object Library Screen

From this point, the user can access any of the six database categories. Press the **PREV** or **NEXT** button until the Planet option is visible on the display.



1st Planet screen

Press **ENTER** to access the planets. Then, press the **NEXT** button to scroll through the planets. When the desired planet is displayed on the screen, press **ENTER.**



2nd Planet screen

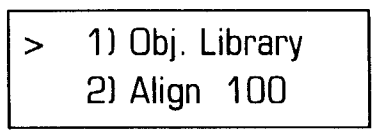
When Magellan I has calculated the planet's position, the next screen will display the planet's current information, provided the current date has been entered into the system (as instructed above).

B. Using R.A. and Dec Coordinates:

To locate an object using it's R.A. and Dec coordinates (which can be obtained from most astronomical publications), press the MODE button until the current R.A. and Dec positions are displayed on the Magellan I hand controller. Then, manually move the telescope until the coordinates on the hand controller match the coordinates of the desired target. When the two sets match, the object should be centered in the telescope's field of view.

VI. Personalizing an Observing Run

The Magellan I has several options that will make an observing more enjoyable. To access these functions, choose the first option from the default Telescope Mode Screen by pressing **ENTER** when the arrow is pointing to **1)Obj. Library.**



Default Telescope Mode Screen

A. Introducing the Object Library Functions

Within the Obj. Library, there are six selections to choose from:

Select Object: Accesses the six categories of the Magellan I database. Use the **PREV** and **NEXT** buttons to scroll through the following choices: NGC, IC, Star, Planet, User Obj., Messier.

Object Info.: Displays information about the selected library object. Pressing **ENTER** will cycle through the object's name, size and magnitude; its RA and Dec coordinates; and the distance to the object from the telescope's current position.

Start Find: Filters the library database for objects that match the specifications listed under the Parameters menu (described below) and displays the closest object's description (i.e., the name, type, magnitude and size.) Pressing **ENTER** again displays the object's RA and Dec coordinates. A third press of **ENTER** displays the distance to the object from the telescope's current position.

Field: Identifies objects within the field of view of the telescope.

Parameters: Filters the library database for objects matching criteria that you set. Scroll through the following six specifications by using the **PREV** and **NEXT** buttons and select the ones you want to change by pressing **ENTER.** The six specifications are: type, better, larger, smaller, brighter and fainter objects.

Users Library: Allows the user to create a library of 125 of his or her favorite objects to observe. Favorite objects can be pulled from the database and stored within the "User Library" for easy access.

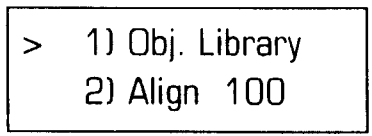
B. Utilizing the Object Library Functions

With a telescope aligned as described earlier, observers find objects on their own or let Magellan I find objects for them.

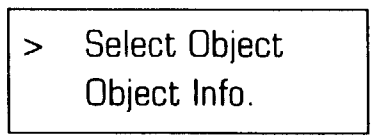
1. Identifying a "Mystery" Object:

To identify an object within the telescope's field of view, utilize the *Field* function as follows:

With the unidentified object in the field of view, choose the Obj. Library from the default Telescope Mode Screen by pressing **ENTER.**

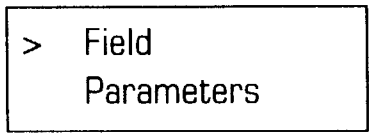


Default Telescope Mode Screen



Object Library Screen

Then, press the **NEXT** button three times, until the arrow is pointing to Field. Press **ENTER.**



Object Library Screen

Magellan I will then search through its database, comparing the telescope's current coordinates to the coordinates of 12,218 objects within the database. When it finds a match, Magellan I will display the name, type, magnitude and size of the central object.

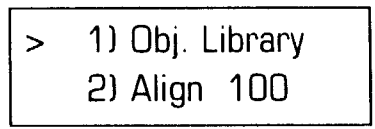
Press **ENTER** again to display its RA and Dec coordinates. Pressing **ENTER** a third time displays the distance (in degrees altitude and azimuth) to the next closest object from the telescope's current position.

The **MODE** button aborts the selected menu item and returns to the previous menu list.

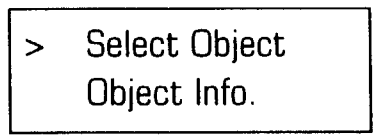
2. A Guided Tour of the Sky:

Magellan I can guide an observer through a grand tour of the night sky, with the observer setting the guidelines. The observer instructs Magellan I as to the observing parameters such as the types of objects, how faint, how bright, how large or small. Then, Magellan I does the rest.

a. Setting the Parameters: To set parameters for the type, brightness, and Visual Quality of objects to be observed, choose the first option from the default Telescope Mode Screen by pressing ENTER when the arrow is pointing to **1)Obj. Library.**

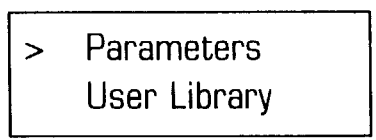


Default Telescope Mode Screen



Object Library Screen

Then, use the **NEXT** button to scroll to the "Parameters" option. Press **ENTER.**



Object Library Screen

The six Parameter options are: Type; Better; Larger; Smaller; Brighter; Fainter. Use the **NEXT** button to scroll between the choices.

Parameter - 1) Type: This function allows the user to select the type of CNGC objects they wish to locate. The symbols GPDCO represent:

G	Galaxies
P	Planetary Nebulae
D	Diffuse Nebulae
C	Globular Clusters
O	Open Star Clusters

The default setting has selected all of these objects.

Initially, the blinking cursor appears over the G symbol. If the user decides not to look for galaxies, pressing either the **PREV** or **NEXT** button will cause the symbol to disappear. The "Galaxies" option has been de-selected. Now, when the Start Find function is used, no information on galaxies will be displayed. To re-select the "Galaxies" option, press either the **PREV** or **NEXT** button once more. The G symbol will appear again. Press **ENTER** when finished with the "Galaxies" choice. The cursor will move to the "Planetary Nebulae". Choose the rest of the object types to be filtered using the process just described.

If the user wishes to recall a category symbol, move the blinking cursor over the symbol location and press either the **PREV** or **NEXT** button. After selections are made, press **ENTER.**

Parameter - 2) Better: The "Better" option defines the Visual Object Quality range (see page 14). The default range is set at the bottom of the scale at VP (very poor). This setting will list ALL of the objects within the database, from very poor to super.

To filter the visual quality of the objects to be observed, select "Better" by pressing **ENTER.** A blinking cursor will appear over the quality value. Press either the **PREV** or **NEXT** button to move to higher or lower quality settings. For example, if the observer wishes to view only objects with a Visual Object Quality range from Very Good to Super, select "VG".

Once the desired quality value range has been selected, press **ENTER** to complete the process.

Parameter - 3) Larger: The "Larger" option allows the user to set the lower apparent size limit of the objects to be observed. The default size limit is set to 000' (arc minutes).

In order to make a decisions as to the size limits that may be imposed, it helps to have a clear understanding of exactly what an arc minute of sky represents. A good example is the apparent size of the Full Moon, which could be expressed as 1/2 of a degree or 30 arc minutes, or 1800

arc seconds. Each arc minute is equal to 60 arc seconds and there are 60 arc minutes in each degree of sky.

Some beginning observers have a tough time discerning objects less than about one arc minute in size unless it is a double star or a planet. Astrophotographers and those involved with CCD imaging may want to set a higher value based on a desired image scale coverage that would be most impressive with different films or types of CCD cameras.

Enter the new value in arc minutes by pressing **ENTER** when the "Larger" option is selected. A blinking cursor will appear. Enter the desired setting by pressing PREV and **NEXT** buttons to scroll through the numbers. When the appropriate numbers are entered, press **ENTER.**

After the last number has been entered, press **ENTER** to complete the selection.

Parameter - 4) Smaller: The "Smaller" option is the upper size object limit. The default setting is 200' (arc minutes) or 3.33 degrees. This setting is high enough to cover the largest objects within the database. The user may want to lower the value because of field of view limitations of a particular eyepiece.

Other reasons for limiting the value in "Smaller" is for astrophotographic or CCD imaging requirements where the object should not exceed the imaging area of the film or the CCD chip. The process of entering the desired numbers is the same as previously described.

Parameter - 5) Brighter: The lower brightness limits based on stellar magnitude can be limited in the "Brighter" option. The default setting is a very faint level of +20.0.

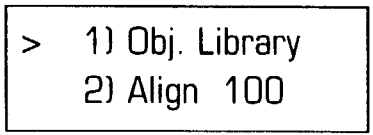
The user may want to adjust the magnitude level to a brighter value, perhaps starting with the limiting visual magnitude of the telescope. Sky conditions also greatly affect the limiting magnitude due to atmospheric haze, high clouds, light pollution, etc. The process of entering the desired numbers is the same as previously described.

Parameter - 6) Fainter: The upper level of brightness may also be adjusted with the "Fainter" option, although the user may find few applications for limiting it to a lower value. The process of entering the desired numbers is the same as previously described.

When the parameters have been set, press the MODE button twice to exit the parameter mode.

b. **Beginning the Tour:** Once the observing parameters have been set, Magellan I is ready to perform a specialized tour of the night sky.

Choose the **Obj. Library** option from the default Telescope Mode Screen by pressing **ENTER.**

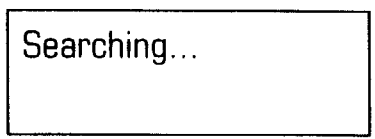


Default Telescope Mode Screen

Object Library Screen

Within the Object Library, press the **NEXT** button two times. The arrow should now be pointing to the **Start Find** option.

Activate the **Start Find** option by pressing **ENTER.**



Start Find Screen

"Searching" will appear on the display as the **Start Find** option filters the library database for objects that match the specifications you set within the Parameters menu (previously described). Then, based on these specifications, Magellan I will display the name, type, magnitude and size of the closest object to the telescope's current location.

Pressing **ENTER** will display this object's RA and Dec coordinates. Another press of **ENTER** will display two numbers — the distance (in degrees altitude and azimuth) to the object from the telescope's current position.

With these two numbers displayed, manually move the telescope and watch as the numbers change. Move the telescope in the direction that decreases the numbers. When the telescope is within two degrees of the desired object, the numbers will disappear and in their place a set of lines, or bars, will appear across the screen. As the telescope moves closer to its target, the bars will disappear, one by one. When there are only two bars visible (one on each line) the object will be within the field of view.

To see the next object on the tour, press **NEXT.**

After searching through the database again, Magellan I will display the information for the next closest object. If interested in viewing that object, press **ENTER** to see the RA and Dec coordinates. Pressing **ENTER** again will display the object's distance (in degrees altitude and azimuth) from the telescope's current location. Manually move the telescope until the numbers are replaced with bars and there are only two bars

visible, one on each line. At that point, the object will be in the field of view.

Continue this process as many times as desired to view as many objects as possible.

To see the next object on the tour, press **NEXT.** **PREV** will display the information for the farthest object (or the previous closest object).

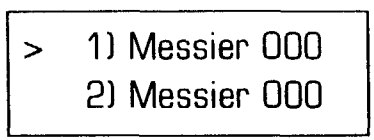
Change the parameters as often as desired and come up with an entirely different tour.

The **MODE** button aborts the selected menu item and returns to the previous menu list.

3. User Library:

This option allows the user to create a library of 125 favorite objects to observe. Pull these favorites from the database and store them within the "User Library" for easy access.

To access the User Library, select Obj. Library from the default Telescope Mode screen and press **ENTER.** Using the **PREV** and **NEXT** buttons, scroll to the option of "User Library" and press enter.



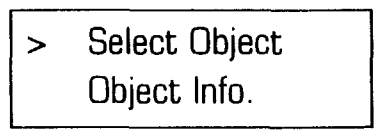
1st Library User Screen

The object can be stored at any number location from 1-125. Scroll to the desired number using the **NEXT** or **PREV** buttons and press **ENTER.** A blinking cursor will appear over the first letter of the current entry ("Messier" if nothing has been entered to this point.)

To select the type of object to be entered, use the **NEXT** or **PREV** buttons to scroll through the object types. Choose from one of the following: Messier, Planet, Star, IC, NGC. Press **ENTER** to make a selection. The cursor will now move to the first blank number. Use the **NEXT** or **PREV** buttons to scroll through the numbers. When each number is correct, press **ENTER** to move to the next entry point. When the last number has been entered, press **ENTER** again to finish the entry. Press **MODE** to exit the User Library .

To access an object from the User Library: From the default Telescope Mode, select **1) Obj. Library.**

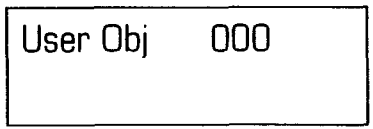
Then, press **ENTER** to choose the Select Object option.



Object Library Screen

Use the **PREV** and **NEXT** buttons to scroll through the object selections until the User Library option is visible. Pressing

ENTER moves the blinking cursor to the first entry point. Enter the location (number) of the User Library to be viewed.

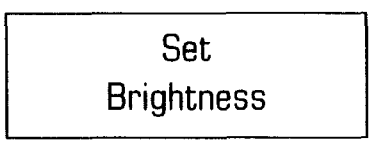


Once the location of the desired User Library object has been entered, pressing **ENTER** again displays the object's information.

The **MODE** button aborts the selected menu item and returns Magellan I to the previous menu list.

VII. Other Functions of Magellan I

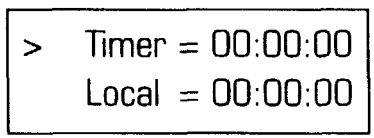
A. Lighted Keypad: To adjust the brightness of the backlit keypad and display, press the **MODE** button until the display is blank. Then, press **ENTER.** The following screen will appear.



Press the **PREV** and **NEXT** keys to adjust the brightness of the display. The brightness can be adjusted in 16 different steps, from brightest to off. Press **ENTER** when you have the desired light level is displayed. To exit, press **MODE.**

NOTE: The backlit display is designed for night viewing and therefore may be difficult to see during daylight hours or when in a lighted room. It may be necessary to make lighting adjustments at night.

B. Time Mode: The Magellan I system has two time-keeping options. The "Timer" option is excellent for timing exposures for astrophotography. The local time can also be entered. To access the "Time Mode", press the **MODE** button until the screen shown below is visible. The time is displayed as Hours:Minutes:Seconds.



Time Mode Screen

Setting the Timer — With the "Time Mode" screen visible (see above), press and hold **ENTER** for a couple of seconds. A blinking cursor appears in the second "hours" position. If an hour value is entered, the blinking cursor will move to the first position as the **PREV** or **NEXT** buttons are pressed. When each number is entered, press **ENTER** to

move the cursor to the next entry point. When the desired amount of time has been entered, press **ENTER** to set the timer. To activate the timer, press **ENTER.** Alternately stop and start the timer by repeatedly pressing **ENTER.** The timer will continue to count down even if the "Time Mode" is not displayed.

Setting the Local Time — As soon as the telescope's power is turned on, Magellan I begins keeping time. The time displayed when first setting the local time will equal the time the telescope's power has been activated. With the "Time Mode" screen visible (see above), press the **NEXT** button to select the "Local" option, then press **ENTER.** Enter the appropriate time as Hours:Minutes:Seconds. The time will begin as soon as the **ENTER** button is pressed, so press **ENTER** at the moment when the entry equals the local time. The local time will default to 00:00:00 when the power is turned off, so it will be necessary to set the time for each observing run. The local time is not mandatory for using the Magellan I System.

C. Communication Ports: Two communication ports are found on the side of the hand controller case. They are designed to accept cables using the standard high reliability telephone technology plugs. A positive snap action design prevents the cable from disconnecting during usage.

Encoder Port (2), Fig. 1: The encoder port (the larger of the two ports) accepts an 8-pin plug from the encoders which have been attached to the telescope. A cable carries the encoder signals from the telescope to the Magellan I handbox.

RS-232 Port (1), Fig. 1: The RS-232 port (the smaller of the two ports) is used to connect a personal computer to the Magellan I System for added features. Magellan I communicates telescope position information via this interface to software like Epoch 2000. The computer screen can then display star maps of the telescope field of view and other helpful functions.

D. Serial Interface — Cable Configuration: The Magellan I RS-232 connector will accept a standard 6 line telephone jack attached to a cable of up to 30 feet (perhaps more depending on cable construction). Connection to a computer will vary but typically requires a 9-pin or 25-pin DB connector. Cable and computer hardware for making these connections is readily available in most computer or electronic retail stores.

Figure 2 shows the pinouts for the 6 line telephone cable jack. Table 1 shows standard IBM compatible DB-9 and DB 25- serial port pin outs and how they should be connected to the 6 line telephone cable jack. Note that only 3 wires are required.

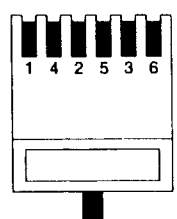


Fig. 2: RS-232 Connector Pin-Outs

Magellan I RS-232 Connector Pin Out Code

6 Line Telephone Cable Jack	*Description of Jack Pin #*	*DB-9 Connector Pin #*	*DB-25 Connector Pin #*
# 1	Not Used	Not Used	Not Used
# 2	Not Used	Not Used	Not Used
# 3	PC Transmit Data	# 3	# 2
# 4	Ground	# 5	# 7
# 5	PC Receive Data	# 2	# 3
# 6	Not Used	Not Used	Not Used

Table 1

E. RS-232 Interface Protocol: Magellan I responds to the following set of serial commands:

When using any astronomy software with your telescope, such as the Meade Epoch 2000, the following information will need to be entered under Communication/Port Set Up:

1200 Baud
8 Data Bits
0 Parity
1 Stop Bit

Intended for professional programmers, the following command set is used by Magellan I to send and receive information through a serial interface. Each transmitted command string begins with a colon (:) and ends with a pound sign (#). Each received command string ends with a pound sign (#).

:GR#
This command returns the current Right Ascension in the following format - HH:MM.T# and is written as hours:minutes.tenths of minutes.
For example - 05:47.4#

:GD#
This command returns the current Declination in the following format - sDD*MM#
The range of the response is -90*00 to +90*00. (The "*" represents ASCII 223 which appears on the handbox as a degree symbol.)
For example - +45*59#

:Gt#
This command returns the Latitude of the currently selected site in the following format - sDD*MM#
The range of the response is -90*00 to +90*00. (The "*" represents ASCII 223 which appears on the handbox as a degree symbol.)
For example - -12*34#

:GC#
This command returns the Calendar Date in the following format - MM/DD/YY#

The range of the response is 01/01/00 to 12/31/99 and is written as month, day, and year. The two digit year indicates the following: 92 through 99 = 1992 through 1999. 00 through 91 = 2000 through 2091.
For example - 01/08/99#

NOTE: To activate these commands, it is necessary to turn "On" the serial interface. From the Telescope Default Screen, press the **NEXT** button to cycle through the options until the arrow points to the **>6) Serial off** option. Press and hold **ENTER** for two seconds. When the **ENTER** button is released, the Serial option will read "On". Also, be sure and set the baud rate within your computer software as explained above.

F. Help ... : A very brief description of Magellan I functions is given by the "Help ..." function. Press **ENTER** to display the messages. Use the **PREV** and **NEXT** buttons to scroll through the text. To exit the "Help ..." function, press **MODE.**

Appendix A

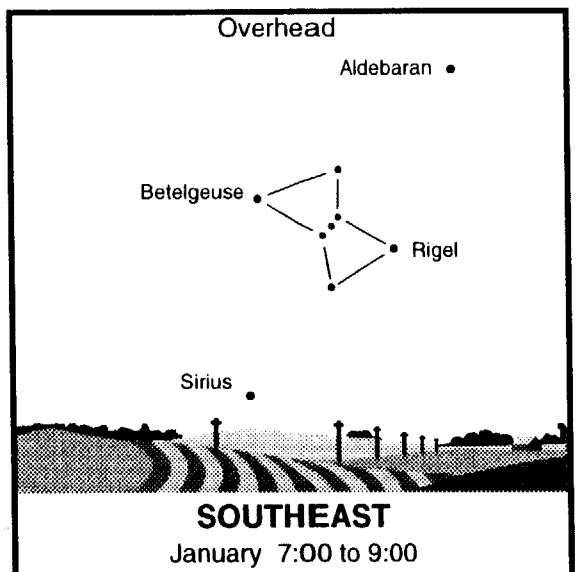
Table I: Guide Star Catalog

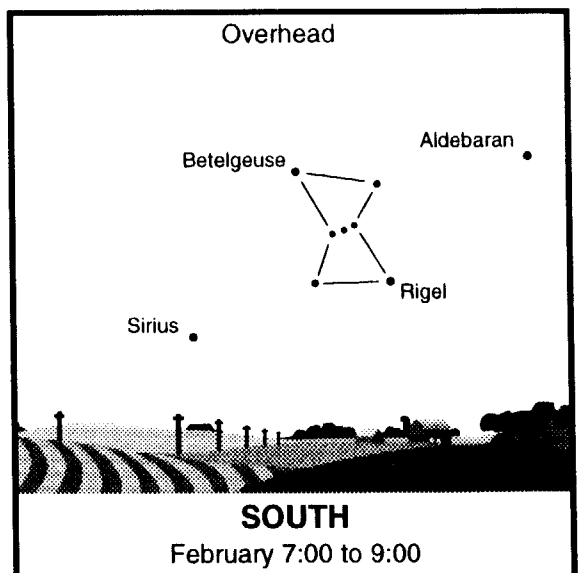
Star Name		Star #
ACHERNAR	α Eridanus	013
ACRUX A	α Crux	121
ALBIREO	β Cygnus	223
ALDEBARAN	α Taurus	033
ALKAID	η Ursa Major	140
ALNILAM	ε Orion	056
ALPHARD	α Hydra	095
ALPHEKKA	α Corona Borealis	165
ALTAIR	α Aquila	226
ANTARES	α Scorpius	177
ARCTURUS	α Bootes	147
BETELGUESE	α Orion	056
BOGARDUS	θ Auriga	058
CANOPUS	α Carina	063
CAPELLA	α Auriga	042
CASTOR	α Gemini	078
DENEB	α Cygnus	232

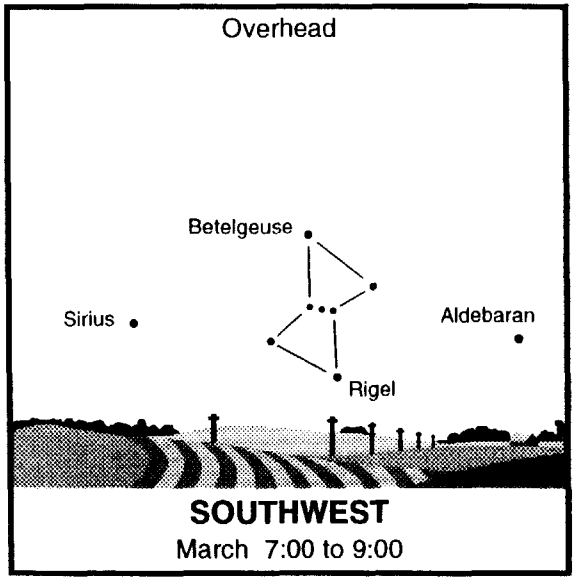
Star Name		Star #
DIPHDA	β Cetus	008
ENEBOLA	β Leo	114
ENIF	ε Pegasus	238
FOMALHAUT	α Piscis Austrinis	247
HADAR	β Centaurus	144
HAMAL	α Aries	017
MARKAB	α Pegasus	249
MIRA	o Cetus	020
POLARIS	α Ursa Minor	019
POLLUX	β Gemini	081
PROCYON	α Canis Minor	080
REGULUS	α Leo	100
RIGEL	β Orion	041
SIRIUS	α Canis Major	067
SPICA	α Virgo	138
VEGA	α Lyra	214

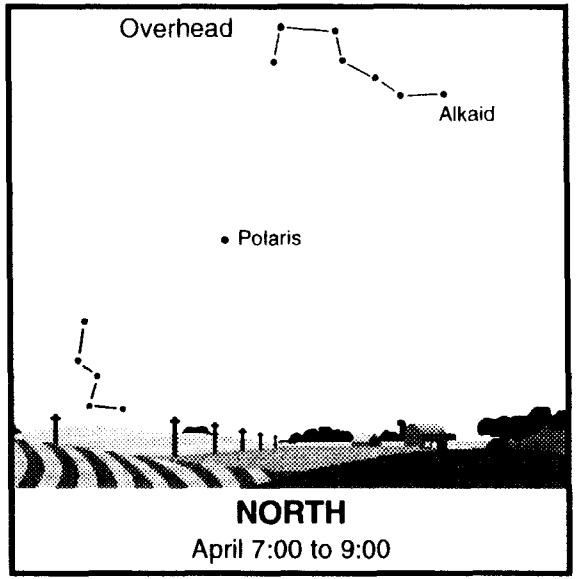
Appendix B

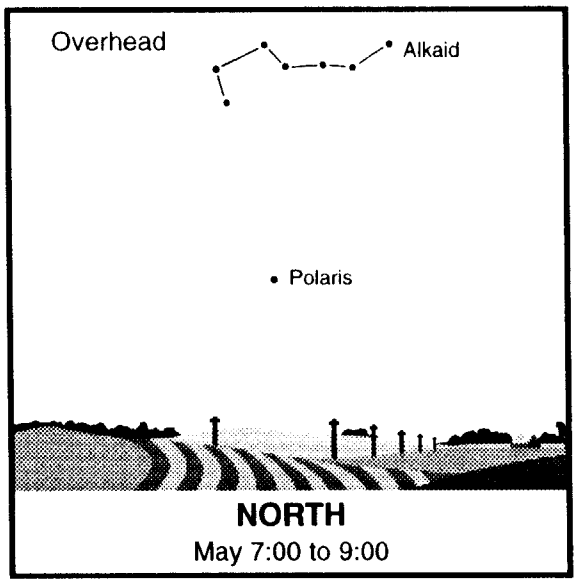
Star Charts (for Northern Hemisphere Observers)

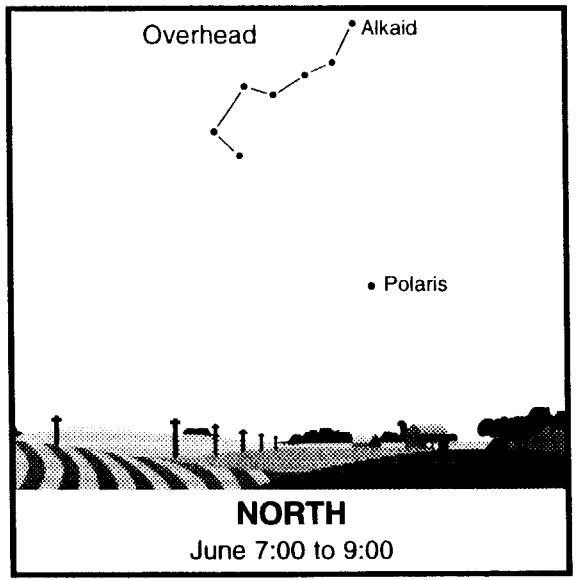


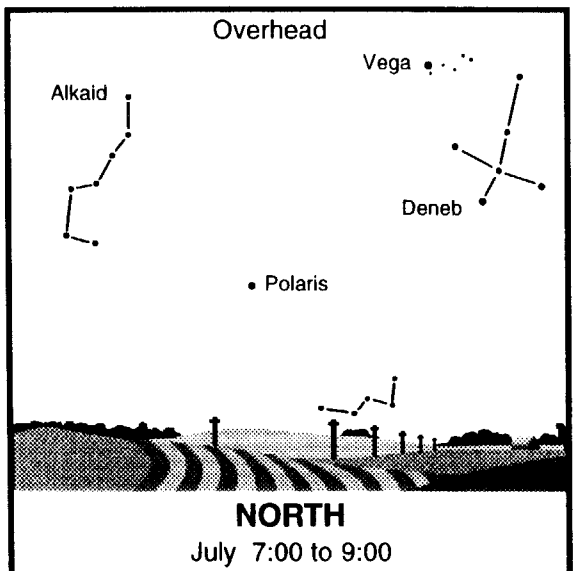


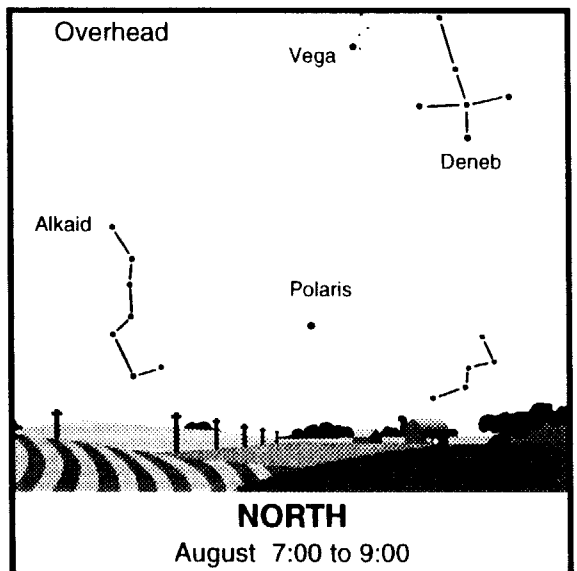

Overhead
Betelgeuse
Sirius
Aldebaran
Rigel
SOUTHWEST
March 7:00 to 9:00

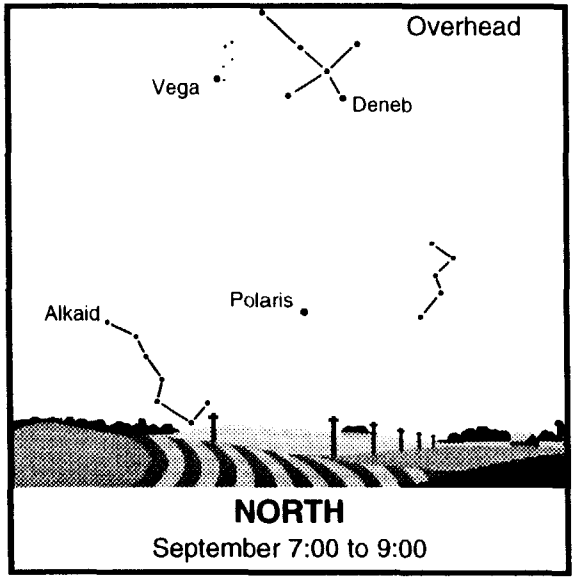

Overhead
Alkaid
Polaris
NORTH
April 7:00 to 9:00

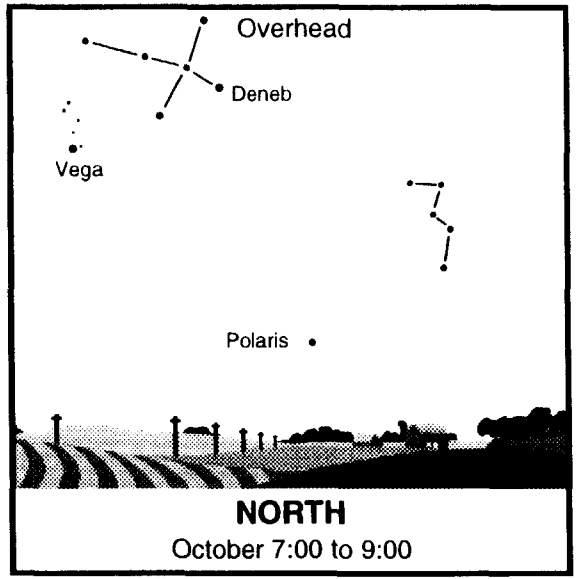

Overhead
Alkaid
Polaris
NORTH
May 7:00 to 9:00

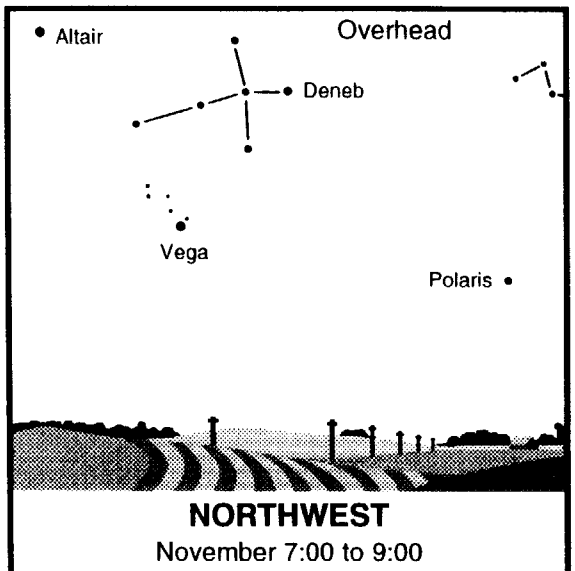

Overhead
Alkaid
Polaris
NORTH
June 7:00 to 9:00

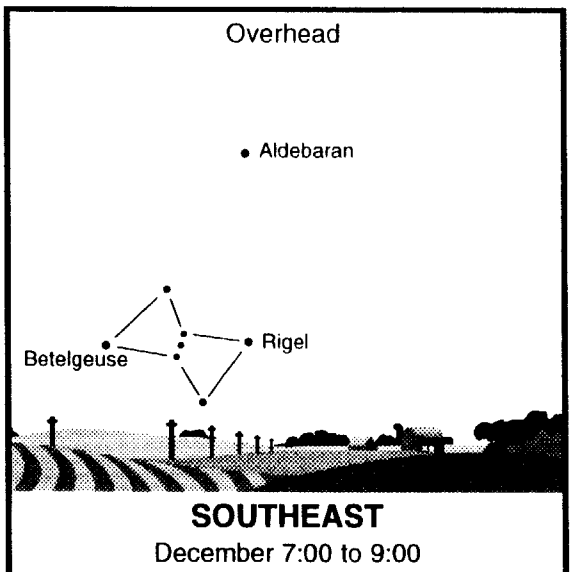

Overhead
Vega
Alkaid
Deneb
Polaris
NORTH
July 7:00 to 9:00


Overhead
Vega
Deneb
Alkaid
Polaris
NORTH
August 7:00 to 9:00


Overhead
Vega
Deneb
Alkaid
Polaris
NORTH
September 7:00 to 9:00


Overhead
Deneb
Vega
Polaris
NORTH
October 7:00 to 9:00


Altair
Overhead
Deneb
Vega
Polaris
NORTHWEST
November 7:00 to 9:00


Overhead
Aldebaran
Betelgeuse
Rigel
SOUTHEAST
December 7:00 to 9:00

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