

Meade Magellan II User Manual

I Introduction

The **Magellan Telescope Computer System** offers an electronic package that permits the location and observation of thousands of deep-sky objects as well as all of the major planets. Features include:



IMPORTANT NOTICE! Never use a telescope or spotting scope to look at the Sun! Observing the Sun, even for the shortest fraction of a second, will cause irreversible damage to your eye as well as physical damage to the telescope or spotting scope itself.

A. Features

- **Celestial Navigation:** Steer your telescope to any selected object using the distance display window. As you move the telescope, the distance to the object is continually updated. When within 1° , bars replace the distance meter, and shrink until the telescope is centered on the selected object.
- **Two Star Alignment:** Point your telescope at two bright stars selected from the named common star database, and Magellan calculates an alignment solution that directs all subsequent movements of your telescope for fast, accurate object location. No need to level the telescope or input time, latitude, and longitude!
- **12,218 - Object built-in Library:** Select an object from either the Messier catalog, the complete NGC catalog, or the complete IC catalog. Use the STAR catalog to find bright stars, multiple stars, named common stars, and planets from Mercury to Pluto.
- **Large Membrane Keypad:** Simplify Magellan operation by using the large back lighted keypad for data entry and object selection.
- **Dual Axis Drive Correction:** Control the movement of your telescope from the direction keys on the Magellan II switch panel.
- **Liquid Crystal Display:** Show information on a large, two-line, 32 character, red back lighted screen. Illumination is variable from bright to none in 16 levels.
- **Digital readouts on both axes:** Read the coordinates (RA and DEC) where your telescope is pointing, displayed to a precision of 5.3 arc-minutes (0.09°).
- **RS-232 Communications:** Connect Magellan to Epoch 2000 (or other compatible programs) and display your telescope's position in the sky directly on the computer star map.

B. Principles of Operation

The Magellan system is quite simple in its basic operation. All telescopes have two axes rotation that are perpendicular to each other. By rotating the telescope on these axis the user can point to any object in the sky. Telescopes with clock drives, like the Meade Starfinder Equatorial, have the axis of rotation such that rotation about the celestial pole is possible. This is called a "Polar" configuration.

Magellan is a sophisticated microprocessor system that is programmed to understand the relationship between the moving sky and Polar configurations of a telescope. For the Magellan to operate properly, it must have information about where the telescope is pointing. This is done by installing encoders on both telescope axes of rotation. These encoders tell Magellan which direction an axis is moved and how far. The encoders divide the rotation into 4,096 reference points or more for a complete revolution. These encoders are installed according to the installation procedures supplied with the Magellan unit, and are designed specifically for your telescope.

Now that Magellan has the capability to determine various positions of your telescope, it needs to know how these positions relate to the sky. This is where alignment of the telescope is very important. Alignment is the process of telling Magellan how to relate telescope positions with actual sky locations. Once alignment is complete, Magellan knows where in the sky you are pointing and can direct you to new objects or identify objects you find. Alignment is basically accomplished by showing Magellan the location of two objects in the sky. The alignment objects (stars) are the brightest and most easily identifiable in the sky. Once you become familiar with the location of these objects, alignment will become simple. This process is described in detail later.

Magellan will allow you to find objects too faint to be seen with the naked eye. One additional technique offered by Magellan is called "synchronizing." This is a method used to improve the accuracy of your telescope after it has been aligned. Alignment will not always be perfect and can have small variations that will be multiplied as you sweep 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. This will help Magellan to improve its accuracy for other objects in the neighborhood and will permit you to accurately find hidden objects by "synching" on a bright neighbor.

II Installation

The Magellan Telescope Computer System can be attached to a variety of Meade Telescopes. An installation instruction sheet has been included along with the specialized brackets and encoders required by your telescope. Read through all of the installation instructions before beginning work and then carefully follow each step to insure a durable and permanent result.

After the encoders and brackets have been attached to the telescope, the Magellan System may be connected and operated. The Magellan handbox is connected to the telescope control panel in the connection marked "handbox." Be sure to connect and disconnect the Magellan handbox only while the telescope is turned off. The Magellan System is now ready to perform the functions available in a standalone mode of operation.

Magellan can also be connected to Epoch 2000 or other compatible software products using the RS-232 interface. This is done by connecting your serial interface cable to the 6-pin connector on the bottom of the Magellan handbox. Details about this form of operation are found in the Serial Interface section of this manual.

III Hand Controller

A. Liquid Crystal Display

The large Liquid Crystal Display (LCD) has two rows of 16 characters for displaying Magellan function menus, telescope position and object information. The LCD has red LED's to back light the display and can be adjusted to 16 levels of brightness.

B. Keys

Magellan II has a 19-key back lighted membrane switch panel to provide expanded function and user ease of operation. The keypad permits direct entry of the number, telescope motor slewing, speed selection/display and one key catalog selection. The keypad is back lighted and can be dimmed along with the LCD display in 16 levels of brightness.

1. Enter

Pressing and releasing the ENTER key activates the menu function indicated by the LCD arrow positioned to the left of the menu item. Menu items followed by three dots (i.e. HELP...) mark expanding menus.

Several menu items require information to be edited. Holding the ENTER key down for a moment will cause a blinking cursor to appear at the edit point. Each press of a number key will move the cursor one character to the right until the last character is reached. Once the last character of the field is reached, pressing ENTER again will end editing if the field is properly formatted. Otherwise, the cursor repositions itself at the beginning of the field to allow for corrections.

2. Mode

Pressing the MODE key cycles the display through the four operating modes. During editing, pressing MODE will terminate an edit and restore the original value.

3. Find

Pressing this key while in the object find mode will cause the telescope to slew at 32x speed to the object selected. This key is only active when the object is within 2° of the present telescope position. The intention of this function is to make the final adjustment to telescope position after the larger moves have been done manually.

4. Direction (N, S, E, W)

Pressing these keys will cause the telescope to slew in the direction selected at the speed indicated by the speed LED's on the right side of the handbox. These keys are also used in some editing functions to move the cursor to a particular character in a sequence without changing characters skipped.

5. Numeric and Function

These 10 keys have dual purposes based on the mode of the Magellan handbox. For modes where data is being entered, like selection of a catalog object number, these keys are used for numeric input as indicated by the number on the key. Pressing the numeric key will enter the number into the character indicated by the cursor and move to the next logical character in the sequence. After the last number is entered, the ENTER key is pressed indicating the acceptance of the input as a whole.

When not in an editing mode these keys are assigned certain specific functions, keys 0, 1, 4 and 7 are used to change the slew rate of the telescope. They are marked with a speed value from 2x to 32x and when pressed will alter the subsequent telescope slew rates as selected by the user. Pressing these keys will also alter the speed display LED's associated with each key along the right side of the handbox.

Keys 2, 3, 5, 6 and 9 are used as catalog selection keys when not in an editing mode. The CNGC Catalog can be selected by pressing the CNGC key (3). The Star Catalog and Planets can be selected by pressing the STAR key (6). The Messier Object Catalog is selected using the M key (9). The IC Catalog is selected by pressing the 2 key. The User Catalog is selected by pressing the 5 key.

6. Prev and Next

Pressing the PREV key moves the display LCD arrow up the list of menu items, while pressing the NEXT key moves the display LCD arrow down the list of menu items. In the BRIGHTNESS mode, these keys adjust the intensity of the LCD and keypad backlighting.

C. Communication Ports

Communication ports are found on the bottom of the handbox case. These ports 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.

1. Telescope Port

The telescope port accepts a 4-pin plug from the telescope control panel. This coiled cable carries two signals and power to the Magellan Handbox from the telescope. This connector should only be connected or disconnected while the telescope power is off.

2. RS-232 Port

The RS-232 port is used to connect a personal computer to the Magellan System for added features. Magellan communicates telescope position information via this interface to software like Epoch 2000, which can then display star maps of the telescope field of view and perform other helpful functions.

IV Operations

Magellan operates under one of four modes that are cycled by pressing the MODE key. The four modes are,

- Telescope Mode

- Coordinate Mode
- Timer Mode
- Blank Mode

Some modes have sub-menus accessed by moving the LCD arrow (positioned to the left of the menu item) up or down using the PREV or NEXT key, and then pressing ENTER.

A. Telescope Mode

The default start-up mode for Magellan is Telescope Mode. This mode has telescope-related functions. The sub-menus for this mode are: Object Library, Align, Date, Encoders Reverse N/S, Reverse E/W, North hemi and Help. These functions allow the telescope to be aligned, object libraries to be accessed for pointing at these objects, and to set certain telescope functions.

1. Object Library

This menu item defaults to the top of the menu listing for quick access. All library data and object search filters are accessed from this menu. When selected, by pressing the ENTER key, a scrolling menu appears listing the object library functions. These functions include: Object Information, Start Find, Field Parameters and User Library.

The fastest method for selecting an object from the available catalogs is to press one of the catalog function keys, namely 2, 3, 5, 6 or 9. These keys will immediately access the selected catalog unless you are currently editing a character string.

a) Object Information

The display shows information about the selected library object. Pressing ENTER displays the object's description (i.e. the name, type, magnitude and size or separation). Pressing ENTER again displays the object's coordinates in Right Ascension and Declination. A third press of ENTER displays the distance to the object from the telescope's current position. This distance is continually updated as the telescope is moved allowing you to steer the telescope to the object.

As you move to various parts of the sky, you may find that object positions differ slightly from the position indicated by Magellan. These differences arise from inaccuracies in leveling (squaring) or centering stars during the initial alignment. You can make minor corrections to the alignment by "synchronizing" Magellan on any object within the Magellan catalogs. This is done by centering the known object in the field of view while the object information for that object is displayed. Press and hold the ENTER key for one or two seconds and the display will show the message, "Center object, then press ENTER." Pressing ENTER will now synchronize the Magellan to the coordinates of the centered object. This will improve the accuracy of Magellan for objects in the immediate vicinity. While any object from the object catalogs may be used to "sync" the Magellan, you may wish to select a bright neighbor of a fainter object to provide the final pointing accuracy to find that faint object. Appendix A lists the bright stars from the STAR catalog which may be used for this purpose.

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

b) Start Find

Selecting this option filters the library database for objects that match the specifications listed under the Parameters menu (see below) and displays the closest object's description (i.e. the name, type, magnitude and size). Pressing ENTER again displays the object's coordinates in Right Ascension and Declination. A third press of ENTER displays the distance to the object from the telescope's current position.

Press NEXT to display the information for the next closest object. PREV will display the information for the farthest object (or the previous closest object).

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

c) Field

This command identifies objects in the field of view of the telescope. By pressing ENTER Magellan displays the central object's description (i.e. the name, type, magnitude and size). Pressing ENTER again displays its coordinates in Right Ascension and Declination. A third press of ENTER displays the distance to the object from the telescope's current position.

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

d) Parameters

Start Find uses the specifications listed below to filter the database for matching objects. Scroll through these 6 specifications using the PREV/NEXT keys and select the ones to change by pressing ENTER.

1) Type

This menu file option allows you to select the type of CNGC objects you wish to locate. The symbols GPDCO represent:

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

Initially, the blinking cursor appears over the G symbol. If you decide not to look for galaxies, press the PREV/NEXT key and the letter will disappear, deselecting the GALAXIES category. If you wish to leave GALAXIES selected, then move the blinking cursor over to one of the other category symbols by pressing ENTER. You can then deselect the undesired categories. If you wish to recall a category symbol, move the blinking cursor over the symbol location and press the PREV/NEXT key. After your selections are made, press ENTER.

2) Better

The BETTER menu file option allows you to define the visual object quality range. At power up, the range is set at the bottom of the scale on VP. When using the START FIND menu selection, it will select all objects that are very poor through super or what could be considered an "ALL" setting. The object quality symbols are:

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

If you wish to define the visual object quality range to very good and better, press ENTER and the blinking cursor will appear on the quality value. From the quality setting press PREV/NEXT to move to higher or lower quality settings. Once you have selected the quality value required, press ENTER to complete the selection process.

3) Larger

The LARGER menu file option allows settings of the lower apparent size limit of the objects you wish to see. At power up, it is set to 000' (arc minutes). In order to make a decision as to the size limits that you may impose, it helps to have a clear understanding of exactly what an arc minute of sky is. A good example is the apparent size of the Moon, which could be expressed as 1/2 degree, 30 arc minutes, or 1800 arc seconds. Each arc minute is 60 arc seconds, and there are 60 arc minutes for each degree of sky.

Some beginning observers have a tough time discerning objects less than about 1 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 to indicate that editing is required. This will cause the cursor to blink on the first digit of the sequence. Pressing a number key on the handbox will enter that number into

the cursor position and move to the next digit. If you want to skip a position and leave it unchanged use the East (E) or West (W) keys to move the cursor. After the last digit is in place, pressing ENTER will cause Magellan to accept the data as formatted.

4) Smaller

The SMALLER menu file option is the upper size object limit. At power up, the setting is for 200' arc minutes or 3.33°. This setting is high enough to cover the largest objects in the OBJECT LIBRARY. You 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 you don't want the object to exceed the imaging area of the film or the CCD chip. Setting values by using the keypad are the same as previously described.

5) Brighter

The lower brightness limits based on stellar magnitude can be limited in the BRIGHTER menu file option. At power up, the magnitude value is set to a very faint level of +20.0. You may want to adjust the magnitude level to a brighter value starting at perhaps the limiting visual magnitude of your telescope. Sky conditions also greatly affect the limiting magnitude due to atmospheric haze, high clouds, light pollution, or combinations thereof. Setting values by using the keypad are the same as previously described.

6) Fainter

The upper level of brightness may also be adjusted with the FAINTER menu file option, although you may find few applications for limiting it to a lower value. Setting values by using the keypad are the same as previously described.

e) User Library

This option allows the user to create a user library of 125 objects selected from the existing libraries. Pressing ENTER will display the first of these 125 possible selections. Pressing PREV/NEXT will scroll through the user items. Press ENTER to select a particular user item that you want changed or added. Pressing PREV/NEXT will move you through the catalogs options, press ENTER when you have the object library you wish to choose from. You may then enter the object number with the keypad as in previous menus followed by ENTER to complete the selection.

2. Align

Alignment of your telescope is the most critical procedure for the successful use of Magellan. The alignment procedure allows Magellan to determine the orientation and position of the telescope, and to thereafter guide you accurately to objects in the sky. The alignment function is selected from the menu by pressing ENTER when "Align" is indicated by the display arrow.

Next to the word "Align" on the Magellan display there is a number ("0" after power is applied). This number represents the quality of the alignment procedure performed. It is derived from taking the measured alignment values and comparing them with what should be expected based on the distances between the alignment objects. A value of 100 (as in 100%) means that your actual alignment measurements matched those expected based on calculations. 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 that you make another attempt to align your telescope. The initial value of "0" indicates that Magellan is not aligned.

a) Polar Alignment

Polar alignment is the only alignment offered for Magellan II. Position the telescope/mount system such that it is aligned with the pole (the pole is in the center of the field of view and the telescope is at 90°(Declination). Your telescope instruction manual will provide information on this initial telescope positioning. Once in position, press ENTER as requested by the display.

At this point the first alignment star needs to be selected. Press ENTER and the alignment star catalog will appear. Scrolling with PREV/NEXT, select a star familiar to you which is near the meridian and press ENTER. Move the telescope to the selected star and center it in the eyepiece and press ENTER. At this point polar alignment is complete and you may exit by pushing the MODE key. Magellan also offers the option of selecting a second alignment star to further correct alignment inaccuracies in the original polar positioning of the telescope. The procedure for using the second alignment star is the same as for the first and Magellan will prompt the user with display messages.

If errors occur during the alignment procedure Magellan can detect these based on calculations of expected values. For example, if the wrong star is centered during alignment, Magellan will detect that the distance between stars is not what should be expected. If this variation exceeds preset limits, Magellan will display the message "Alignment Error Check Stars." If this occurs, press ENTER and begin the alignment procedure again. If the alignment is successful a number will be displayed next to the "Align" display which gives a relative value of merit for alignment quality (100 is perfect as in 100%).

3. Date

The date is required to locate planets and is in Month/Day/Year format. The date can be altered by pressing ENTER to select the date function. This causes the cursor to blink on the first date digit. The value of each digit is changed and selected by using the keypad. After the last digit of the year is selected pressing ENTER will complete the date function.

4. Encoders...

This function is used to select the encoder specifications used on the telescope. The default values may need to be changed for high resolution encoders shipped with your telescope. If the standard value of the encoder is different due to a change in gear ratios, a note will appear in the installation instructions which will direct you to change this ratio setting. Press ENTER to select the Encoder function and change the ratios as needed by using the keypad as in previous examples.

5. Reverse N/S

The Reverse N/S menu selection reverses the direction of the telescope in North and South movements (e.g., when you press the N key the scope will move South instead of North or up). This is especially useful during some guiding applications in imaging and observing. To use the Reverse N/S menu, move the LCD arrow to Reverse N/S menu, move the LCD arrow to reverse N/S and press ENTER. If you wish to return the direction commands to the original setting, press ENTER again. A check mark to the right side of the display indicates when this function is active (reversed).

6. Reverse E/W

The Reverse E/W menu selection reverses the direction of the telescope in East and West movements (e.g., when you press the W key the scope will move East). This is especially useful during some guiding applications in imaging and observing. To use the Reverse E/W menu, move the LCD arrow to Reverse E/W menu, move the LCD arrow to reverse E/W and press ENTER. If you wish to return the direction commands to the original setting, press ENTER again. A check mark to the right side of the display indicates when this function is active (reversed).

7. North Hemi.

This function overrides the telescope hemisphere directions. If you activate this function your telescope will perform sidereal tracking movements in the direction specified. This will override the internal jumpers for this information. Pressing ENTER will toggle the function between North and South setting.

8. Help...

A very brief description of Magellan functions is given by this option. Pressing ENTER will display the help messages and the PREV/NEXT keys move the user through this text. Pressing the MODE key will end the help session.

B. Coordinate Mode

This mode displays the direction coordinates of the telescope (where it is pointing). If the telescope has been aligned, the display will show RA and DEC values. If alignment has not been accomplished the display will show the raw encoder counts.

1. Encoder Display

This display shows raw encoder counts. As the telescope is moved these values will increase or decrease depending on the direction of movement and axis involved. This display will quickly show any malfunctions in the encoder system or cables.

2. Coordinate Display

If the telescope has been aligned, the display will be in RA and DEC values. You will see the RA = and DEC = coordinates of where the telescope is pointing. If you move the telescope, the coordinates display will immediately update the new position in Right Ascension (RA) and Declination (DEC).

C. Timer Mode The timer mode displays the stop watch timer and the current time.

1. Timer

This function allows the user to measure precise time periods for such activities as photographic time exposures. The timer display shows time remaining in Hours:Minutes:Seconds. The timed duration is set by holding the ENTER key for more than one second while the timer display is present and selected. The cursor will appear in the hours position of the display and will respond to the keypad to set the values of each digit. After the last digit of the seconds position is completed, pressing ENTER will return the display to the original condition. A short duration press of ENTER will start the timer counting down. Pressing ENTER quickly will toggle the timer from running to stopped and stopped to running. When running the timer will continue to count down even if the display is not visible. Upon returning to the timer display, the time remaining will be accurate and available to the user.

2. Local Time

The local time display shows local time as entered by the user. It will start at 00:00:00 when power is turned on. Local time is set by holding the ENTER key for more than one second while the Local display is present and selected. The cursor will appear in the hours position of the display and will respond to the keypad to set the values of each digit. After the last digit of the seconds position is completed, pressing ENTER will return the display to the original condition with Local time now displaying the entered value.

D. Blank Mode

This mode is used to set the brightness of the LCD backlighting.

1. Adjust Brightness

Pressing ENTER in the blank mode will cause the "Set Brightness" message to appear. Pressing the PREV key will make the backlight display brighter, while pressing the NEXT key will make the backlight dimmer. There are 16 levels of brightness available. After the lighting has been adjusted for the best viewing, press MODE to exit this function.

V Object Library

The Magellan 12,218-Object Library is a collection of the most studied and fantastic objects in the sky. This library consists of the following object databases:

- 7,840 NGC (New General Catalog) objects*: Complete catalog
- 4,093 IC (Index Catalog) objects*
- 42 stellar objects
- 110 Messier objects

- 8 major planets

* NGC 2000 and IC databases are copyrighted by Sky Publishing Corporation and used with their permission.

A. NGC

You will notice that the Messier (M) objects, and the NGC objects have been incorporated into the Meade Instruments CNGC listing. CNGC stands for "Computerized New General Catalog of Non-Stellar Astronomical Objects." The CNGC is an enhancement from the RNGC (Revised New General Catalog) in many ways. Angular sizes are given in arc-seconds on the CNGC listing, and in a convenient scaled format on the Magellan Display. Magnitudes are given to .1 magnitude where possible.

The complete CNGC contains 7840 objects, most of which appear in the RNGC with the same number. More than 400 objects were added to the RNGC to create the CNGC. Most of these "should have been" in the RNGC in the sense that they are bright and large enough to have been included. The coordinates in the CNGC listing are listed for the year 2000.

Objects have been assigned a "Visual Quality Rating", henceforth called VQ. A large number of VQ's have been obtained by observing the objects. To make the VQ's as useful as possible, all observations have been made with the same telescope and eyepiece under substantially identical observing conditions. Only for very small objects was a higher power eyepiece used. Your, "Visual Quality Rating" of a particular object will vary, largely due to sky conditions.

All, or very nearly 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.

B. IC

The Index Catalog (IC) is an extension of the NGC catalog and includes objects of interest to the amateur astronomer. The excerpted catalog of 4,093 objects is included.

C. MESSIER

The Messier Catalog has been the benchmark deep-sky catalog for years. Recently expanded to 110 objects, the Messier catalog contains most of the best deep-sky objects.

D. STAR

The STAR Catalog contains the 42 brightest stars used for alignment. This catalog also contains 8 major planets which can be found in order beginning with catalog number 901 to 909.

VI Serial Interface

Magellan software supports the RS-232 interface for transmission of telescope position information. If connected to a host running Epoch 2000 (or other compatible sky mapping software) the user can take advantage of the additional features and vastly expanded object libraries available. Capabilities vary and the user should consult the instruction manual of each program regarding details of operation.

A. Cable Configuration

The Magellan 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 your 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 pinouts and how they should be connected to the 6 line telephone cable jack. Note that only 3 wires are required.

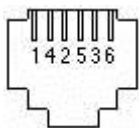


Figure 2: CCD Connector Pin-Outs

6 Line Telephone	Description	DB-9 Connector	DB-25 Connector
	Jack - Pin #	Pin #	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

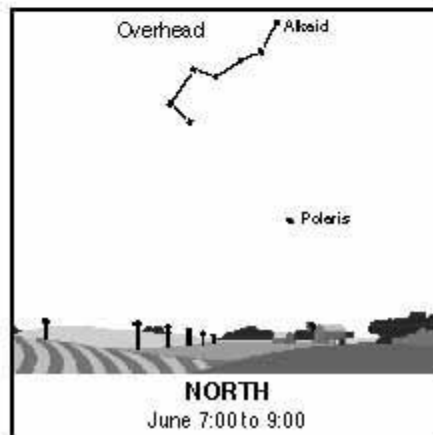
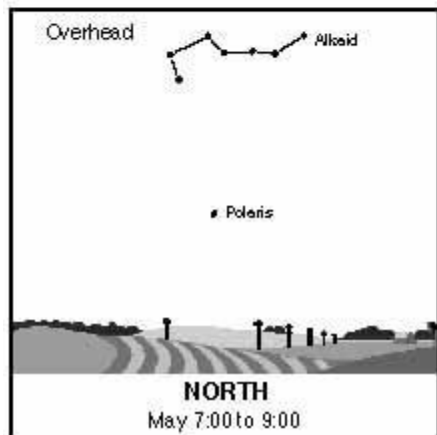
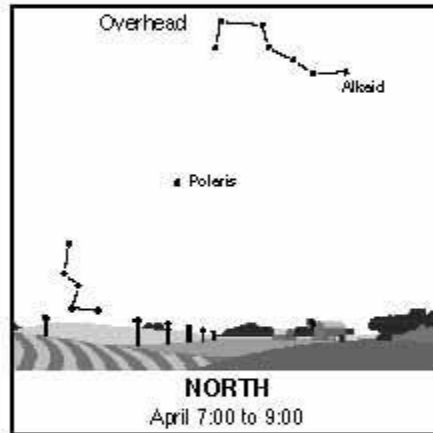
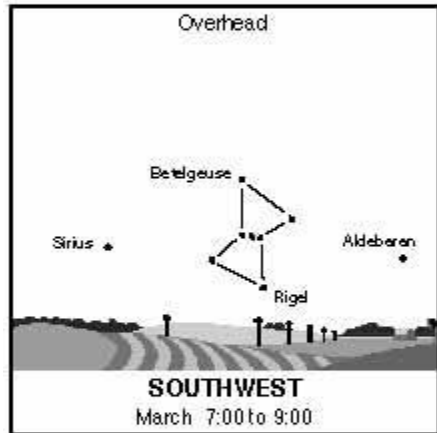
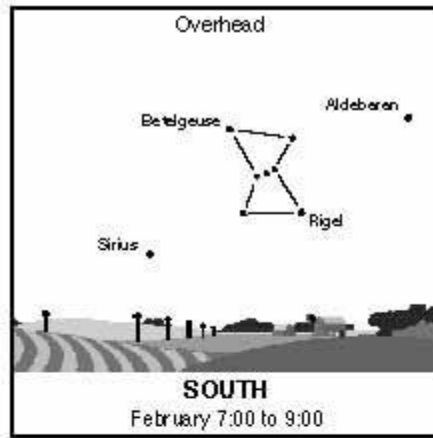
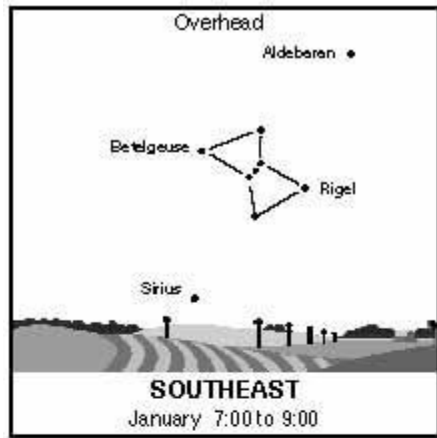
Table 1: Magellan II RS-232 Connector Pin-Out Code Legend

VII Appendix A

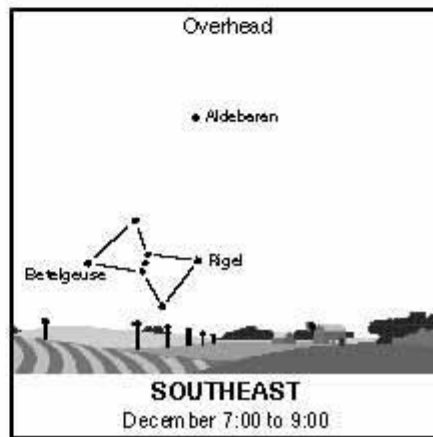
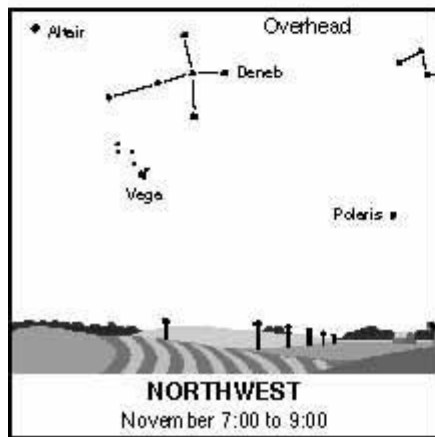
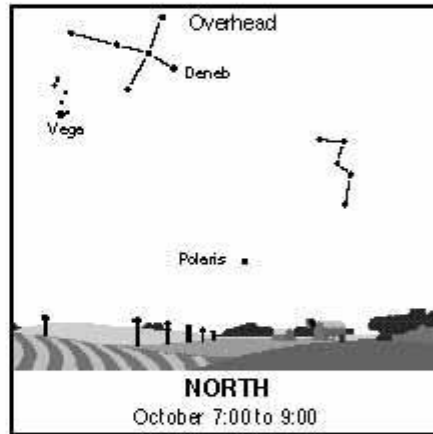
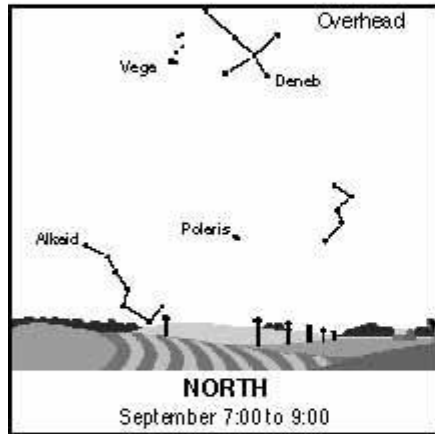
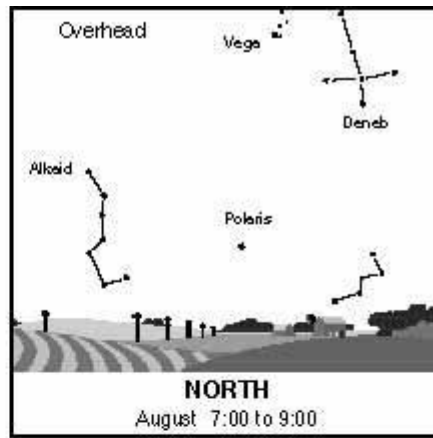
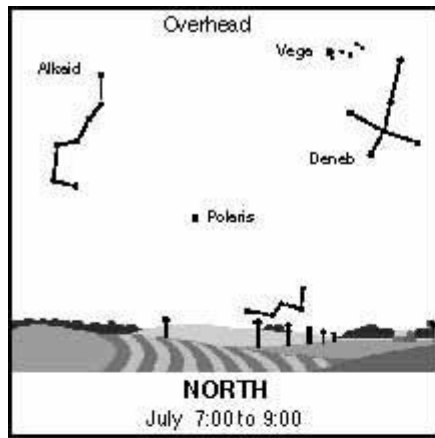
The following stars from the STAR catalog are excellent beacons for alignment and are used in that process. They are also spread throughout the sky to allow allowing a selection of several during any given night or season. They also make excellent objects for the synchronize function of Magellan which will improve the pointing accuracy for an area surrounding the "sync" object selected.

Name	Number	Name	Number
DIPHDA	8	REGULUS	100
ACHERNAR	13	DENEbola	114
HAMAL	17	ACRUX A	121
POLARIS	19	SPICA	138
MIRA	20	ALCAID	140
ALDEBARAN	33	HADAR	144
RIGEL	41	ARCTURUS	147
CAPELLA	42	ALPHEKKA	165
ALNILAM	50	ANTARES	177
BETELGUESE	56	VEGA	214
BOGARDUS	58	ALBERIO	223
CANOPUS	63	ALTAIR	226
SIRIUS	67	DENEb	232
CASTOR	78	ENIF	238
PROCYON	80	FORMALHAUT	247
POLLUX	81	MARKAB	249
ALPHARD	95		

Table 2: Star Catalog



Star Charts (for Northern Hemisphere observers, part 1)



Star Charts (for Northern Hemisphere observers, part 2)

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