

SKYSENSOR 3 D-TYPE

☆☆☆☆ Instruction Manual ☆☆☆☆

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I. BEFORE USING

Major Additional Functions to Skysensor 3 D-type

The following functions are provided with the Skysensor 3 D-type in addition to the functions of the Skysensor 3 S-type.

- ◎ Time, Longitude and Latitude Data Storage Function
The initial setting of time, longitude and latitude can be recovered by means of a built-in Lithium battery for about 5 years.

- ◎ PEC (Periodic Error Correction) Function

Manual corrections made during automatic tracking can be recorded and used to automatically correct future guides.

- ◎ Comet Tracking Function

You can track a comet that is moving at a speed different from the speed of fixed stars.

- ◎ Consecutive Automatic Search Function

Automatic search is possible for up to 8 celestial objects one after another at intervals of set time.

© Star Trekking Function

All celestial objects visible in your sky can be displayed. You can search for any of them automatically by pressing a key.

© Personal Computer Connecting Function

You can control your telescope through a personal computer.

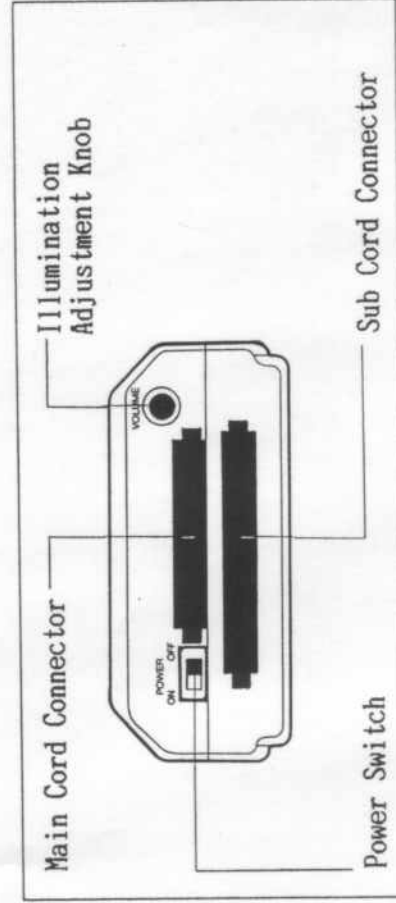
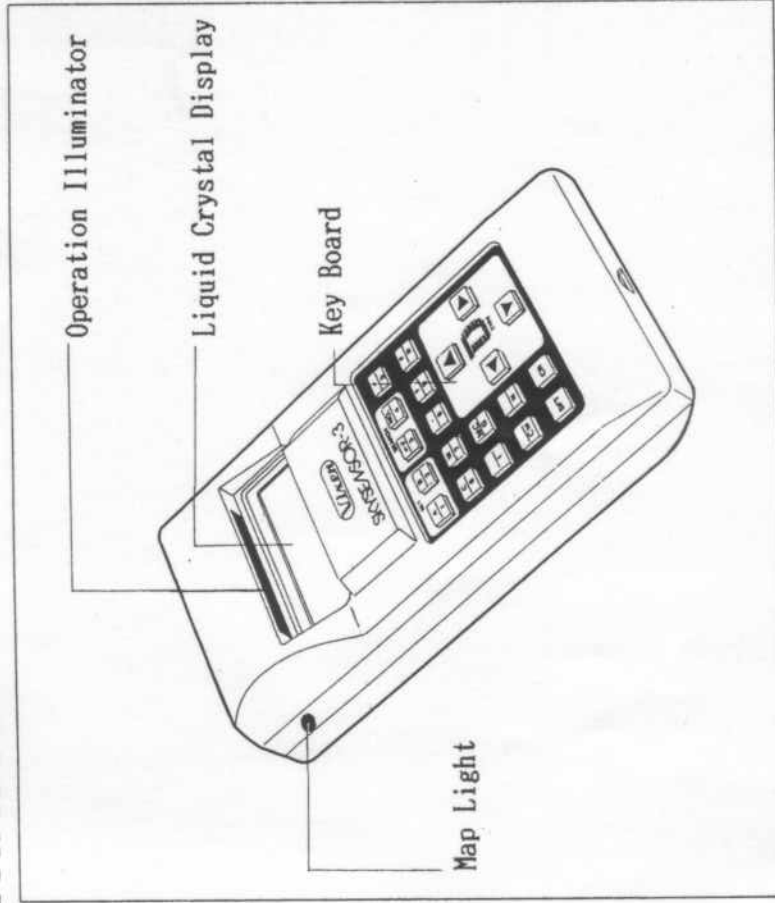
© Magnetic Card Reader Connecting Function

You can input data through a magnetic card reader.

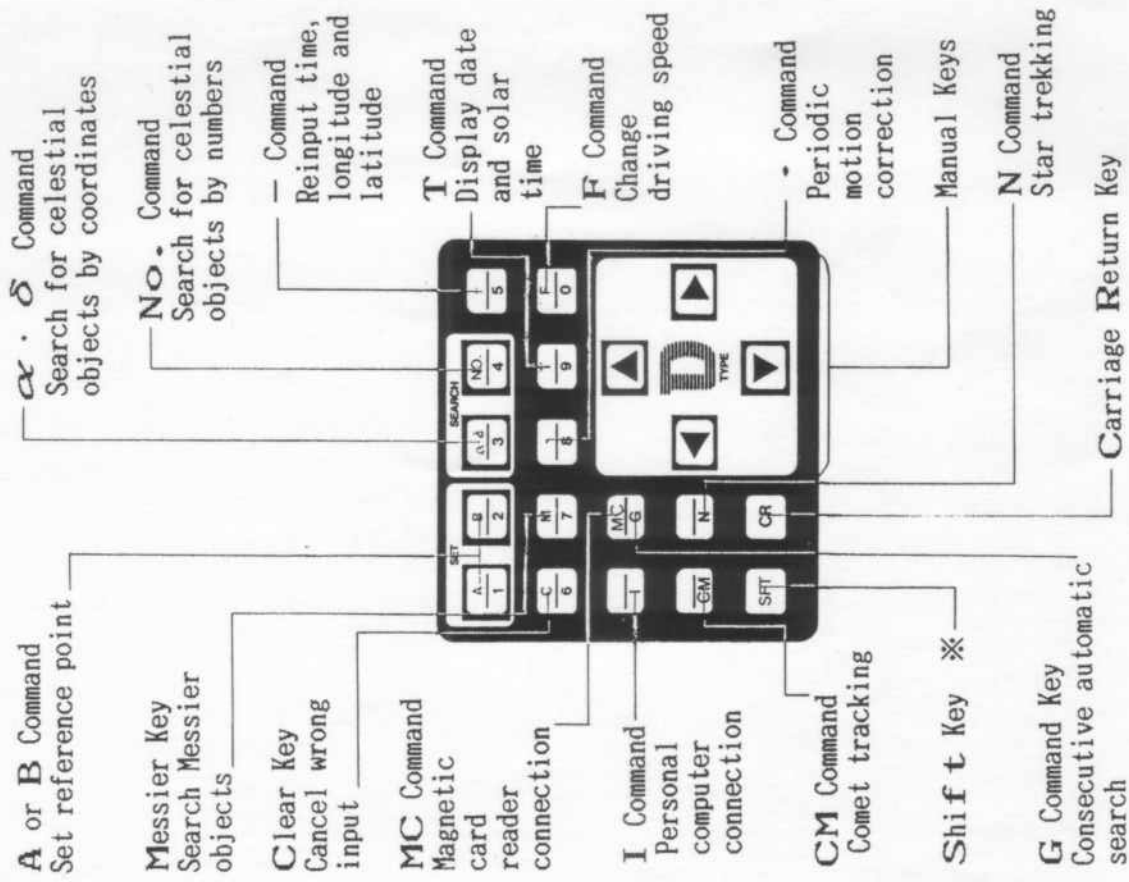
© Encoder Connecting Function

You can search for objects quickly by hand referring to the right ascension and declination displayed through encoders.

Controller



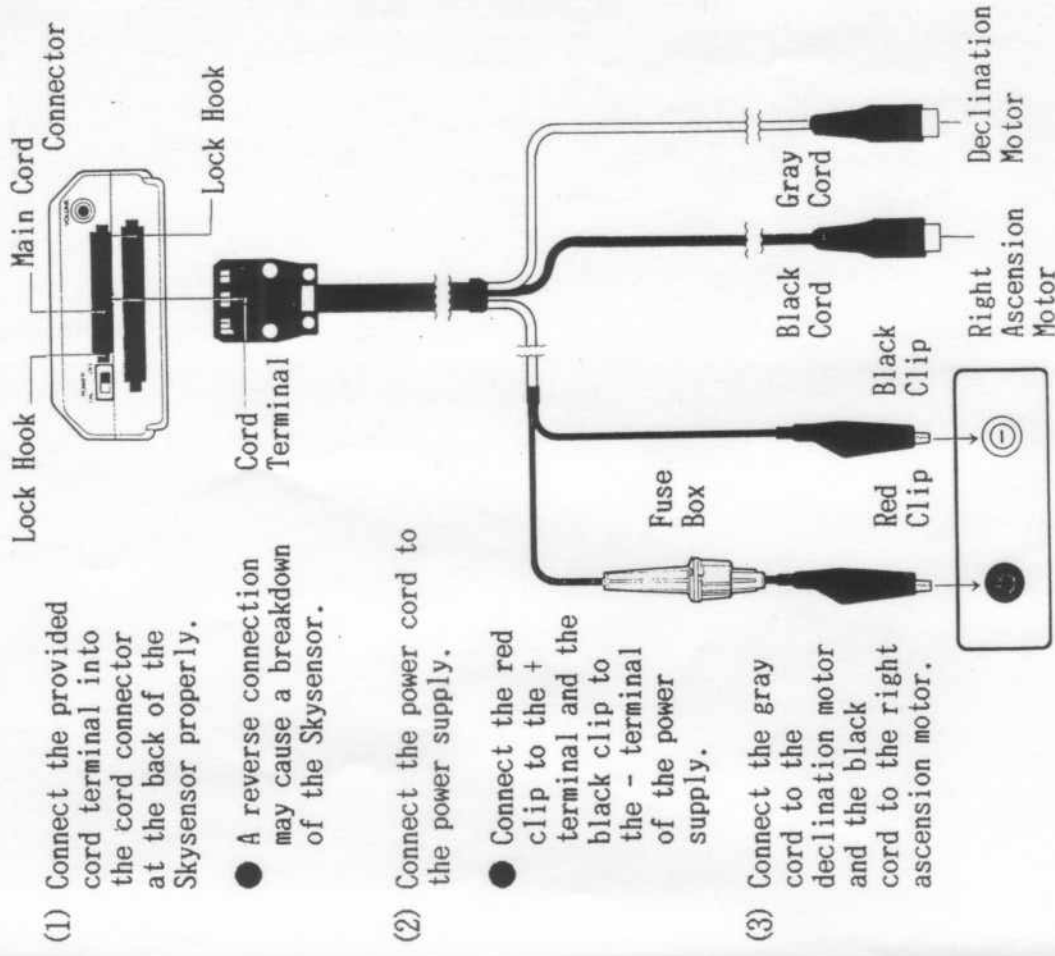
Keyboard Layout / Command Functions



Power Source

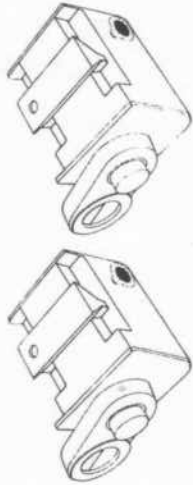
A 12V-3A DC power source is required for the Skysensor 3 D-type.
(For details, refer to page 8 of the instruction manual for the Skysensor 3 S-type.)

Connecting the Skysensor 3 D-Type



Motors

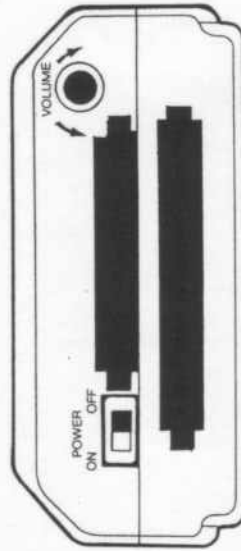
The Skysensor 3 D-type is designed to be used with two model MT-1 motors. The motors for the motor drives models MD-6 and DMD-3 SP can also be used for the Skysensor 3 D-type. However, the MD-6 motor requires a companion MT-1 motor to act as the declination motor.



Illumination

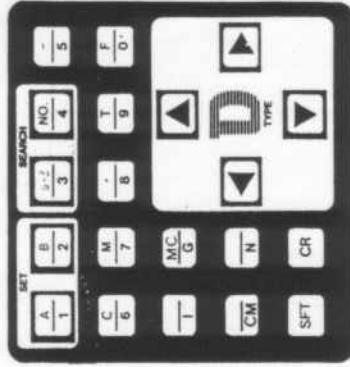
Illumination can be adjusted by turning the illumination adjustment knob at the back of Skysensor. Adjust the brightness as desired.

- The brightness of the map light is not adjustable.



II. DATA INPUT

Keyboard Operation



To input the character printed in green on the upper half of the key, press the key you wish to input after pressing **SFT**.

If you have made incorrect input, press **C** after pressing **SFT**. The command currently inputted will be canceled and new input can be made.

If you wish to entirely cancel the command you are currently executing, press **CR**. The command will be canceled and the unit will be ready for new input.

Display

When you switch on the Skysensor 3 D-type, the upper line of the display will show the local sidereal time and the declination of the celestial north pole, and the lower line will show the hour angle and declination of Polaris.

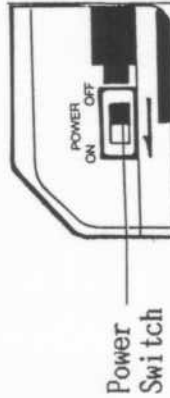
Local Sidereal Time Declination of Celestial North Pole

h	.	m	+	9	0	.	0	0	.
h	.	m	.	8	9	.	1	6	=

Hour Angle of Polaris Declination of Polaris

1. Initial Setting

A backup memory is provided with the Skysensor 3 D-type. Once you set date, time, longitude and latitude for the first observation, it is not necessary to do the initial setting for the next use.



Turn on the power switch. The right ascension motor will begin slowly rotating to move the telescope at the normal guide speed.

h	.	m	+	9	0	.	0	0	.
h	.	m	.	8	9	.	1	6	.

SFT -

- ① The - Command
Press SFT then - .

h	.	m	+	9	0	.	0	0	.
8	9	.	1	6	.	-	Y	E	A

- ② Input the current year.
(4 digits)

h	.	m	+	9	0	.	0	0	.
E	A	R	.	1	9	5	.	M	O

- ③ Input the month.
(2 digits)

h	.	m	+	9	0	.	0	0	.
M	O	N	T	H	.	0	8	.	D

Example:
If the year is 1995,
input

1 9 9 5

Example:
If the month is August,
input

0 8 or 8 CR

If December, input

1 2

Example:
If today is the 1st, input

0 1 or 1 CR

If the 25th, input

2 5

Example:
If the hour is 8 p.m.,
input

2 0

If 3 a.m., input

0 3 or 3 CR

Example:
If the minute is 5, input

0 5 or 5 CR

If 30 minutes, input

3 0

Example:
If the second is 0, input

0 0 or 0 CR

If 30 seconds, input

3 0

- ④ Input the day.
(2 digits)

h	.	m	+	9	0	.	0	0	.
8	.	D	A	T	E	.	0	1	.

- ⑤ Input the hour in 24-hour time.
(2 digits)

h	.	m	+	9	0	.	0	0	.
0	1	.	H	O	U	R	.	2	0

- ⑥ Input the minutes.
(2 digits)
MIN = Minute
SEC = Second

h	.	m	+	9	0	.	0	0	.
2	0	.	M	I	N	.	0	5	.

- ⑦ Input the seconds.
(2 digits)
LOG = Longitude
DEF = Difference
DEG = Degrees

h	.	m	+	9	0	.	0	0	.
L	O	G	.	D	E	F	.	D	E

Example:

If the standard longitude is 135°E and the local longitude is $139^{\circ}44'\text{E}$, the difference is $139^{\circ}44' - 135^{\circ}00' = 4^{\circ}44'$. So, input

or

Then, input

Example:

If the local longitude is $130^{\circ}24'$, the difference is $130^{\circ}24' - 135^{\circ}00' = -4^{\circ}36'$.

Then, input

Example:

If the latitude is 36°N , input

Example:

If the latitude is 34°S , input

- ⑧ Input the difference between your local longitude and the standard time meridian for your zone.

Your local longitude is the longitude of your observation site, which can be found on a map. (Use 3 digits for degrees and 2 digits for minutes.)

h	.	m	+	90	.	00
F	D	E	G	0	4	M I N

h	.	m	+	90	.	00
4	L	A	T	I	T	U D E D E G

- ⑨ Input the latitude of your observation site. (2 digits)

h	.	m	+	90	.	00
M	O	T	O	R	S	P E D ?

Note:

If you use the Skysensor in the Southern Hemisphere, press then before entering the latitude. Other operations are the same as those for the Northern Hemisphere.

- ⑩ Press to set the motor speed for automatic search. If you input another number, the Skysensor may not work.

h	.	m	+	90	.	00
2	E	N	C	O	D	E R I N ?

If no encoders are connected, input

- ⑪ Input if optional encoders are connected. If no encoders are connected, press .

h	.	m	+	90	.	00
E	N	C	O	D	E R I N ?	0

If encoders are connected, input

Note:

If you input , the encoders' reading of right ascension and declination will be displayed on the Skysensor. When no encoders are connected, there will be no change on the display of right ascension and declination even if you input .

The initial setting is now completed.

Battery Replacement

The built-in Lithium battery will last for about 5 years. When the battery is exhausted, replace it with a new one. To know if the battery is exhausted, try to display the current date and time by pressing then after switching on. If the displayed date and time are wrong, the battery should be replaced.

Even after the battery is exhausted, the Skysensor 3 D-type can still perform the less extensive functions of the Skysensor 3 S-type.

2. Reference Point Setting

Refer to page 17 of the manual for the Skysensor 3 S-type.

3. Search for Celestial Objects

Refer to page 19 of the manual for the Skysensor 3 S-type.

Note: Before using the Skysensor, the polar axis of your telescope must be carefully aligned. Refer to your telescope manual.

Special Function for Search

When searching for a star opposite the meridian in your southern sky, it may take a longer time in spite of a short distance. This is due to the computer programmed to have the telescope swung without bumping against its tripod.



In this case, the following will be displayed.

h	.	m	.	.
l	o	n	g	i
n	t	r	o	i
.	.	.	.	.
?	.	.	.	.

You may take either ① or ②.

- ① To continue searching, press **CR**.
- ② To stop and cancel searching, press any key other than **CR**.

If you reset the reference point by using another star which is close to your object of search and is not at the opposite side of the meridian, you will be able to search for the object faster.

4. Display of Solar Time and Local Sidereal Time

Refer to page 21 of the manual for the Skysensor 3 S-type.

5. Manual Control Keys

Refer to page 22 of the manual for the Skysensor 3 S-type.

6. PEC (Periodic Error Correction) Function

PEC is a system to improve the tracking accuracy of the drive. Once you manually correct a guide over one complete revolution of the worm gear (about 10 minutes for Super Polaris or Great Polaris telescope models), the corrections are recorded and future guides will be corrected automatically. The recorded PEC data will be kept until the power switch is turned off.



- ① Install an optional Illuminated Guiding Adapter on your telescope.

- ② The **SFT** Command
Press **SFT** then **.**

h	.	m	.	.
m	o	t	r	s
p	e	e	d	?
.	.	.	.	.
.	.	.	.	.

Example:

If you want the motor speed of 1, press



Press **1** or **2** to select the motor speed for the manual PEC guide. Following are the motor speed available.

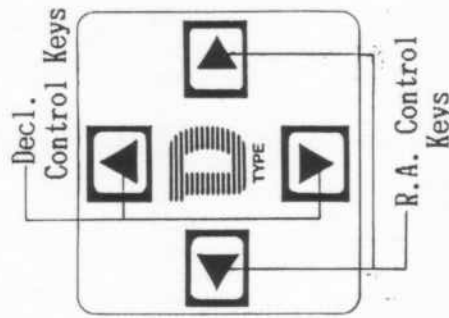
1 R. A. Motor = 1.0625 ×
Decl. Motor = 1.25 ×

2 R. A. Motor = 1.1250 ×
Decl. Motor = 1.50 ×

Note:

The motor speed should be selected by the focal length of the photographic lens you use.

1 is recommended for a lens with long focal length and **2** for a lens with short focal length.



Corrections to the guide using the manual keys during the PEC guide mode will be recorded and will improve the accuracy of future guides.



● If you want to switch motor speeds, press then and press or . The counter will reset to zero and previous corrections will be erased.

Note: 1) If you make a manual adjustment using the control handles, it will be required to record an accurate guide again for PEC operation. 2) If the power switch is turned off, the recorded PEC data will be erased. 3) By pressing during the PEC guide mode, you can turn on or off any external equipment. (An optional cord is needed)

③ After you select the motor speed, the display begins to count from 001.

[illegible]

Manually correct the guide as accurately as possible until the display counts to 0600 (10 minutes). Try to keep the star image in the center circle of the optional illuminated guiding adapter by using the manual control keys. The guide will be recorded.

④ When it has counted to 0600, the guiding is changed automatically to the PEC guide mode and the display turns to "0001 p.e.c. on".

h	.	m	.	.
0	0	p	e	n
0	0	0	0	0
0	0	0	0	0

⑤ If you press **CR** , the PEC operation can be interrupted temporarily and other commands can be inputted. To recover the PEC operation, press **SFT** then **.** .

7. Comet Tracking Function

Although the moving speed of a comet is different from that of the fixed stars in declination as well as in right ascension, you can track it after the necessary input is made. With this function, you can also track the moon, the sun, etc.



① The CM command

h	.	m	+	.	.
Def.	.	RA		h	u
				r	-

First you have to get a table of the calculated orbiting path on the comet you want to track from astronomical magazines, astronomical prompt reports, etc. On the table, select two dates. (Your observation day should be between the selected two dates.) Calculate the differences of right ascension and declination between the calculated positions of the comet on the selected two dates respectively.

① To calculate the differences, deduct the coordinates of the calculated position on the selected first date from that on the selected second date. ② The coordinates to be used for the above calculation should be for the positions at the same time on the selected first and second dates. ③ The difference should be within ± 24 hours for right ascension and within $\pm 360^\circ$ for declination.

《Example》

Example:
 1st Date: Feb. 3 Position: R.A. 2 hours 41.73 minutes
 Decl. + 27° 12.5'
 2nd Date: Feb. 8 Position: R.A. 2 hours 49.29 minutes
 Decl. + 28° 6.7'
 Difference in R.A. = 2 hrs 49.29 min. - 2 hrs 41.73 min.
 = 0 hr 7.56 min. (0 hr 7.6 min. aprox.)
 Difference in Decl. = 28° 6.7' - 27° 12.5' = 0° 54.2'
 Days = 8 - 3 = 5 days

Example: If the difference is 0 hours, input in R.A. (2 digits) ② Input the difference of hours

0 0 or 0 CR

h	.	m	+	.	.
A	h	o	u	r	0
					m
					n
					■

8. Consecutive Automatic Search Function

You can input up to 8 objects into the Skysensor 3 D-type beforehand and can search for the inputted objects automatically one after another.

① The G command Press $\boxed{G}$.

$\frac{1}{n}$	.	m	.	?	■
				N A M E ?	
		P	=		

② Input the entry number for your object of search referring to the Star Data Table. (4 digits)

h	m	.	.	.
54	R E L S E	M I N	?	■



Example 1:
Altair (α Aquila) is
No. 8254, so input

4
5
2
8

Example 2:
For NGC6940, input

0
4
9
6

Example 3:
For M42 (Orion), press

SFT M 4 2 CR

Example 4:
For 103, pr

Note:

If you want to input an object which is not listed in the Star Table, use its coordinates (right ascension and declination). Refer to page 20 of the Skysensor 3 S-type manual.

Example:

For an interval of 1 min.
30 sec., input

0 1 or 1 CR

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③ Input the difference of minutes in R.A. (2 or 3 digits)

[illegible]

④ Input the difference of degrees in Decl. (3 digits)

	m	.	n	*
c i p e g o m n	o	o	i	e

⑤ Input the difference of minutes in Decl. (3 digits)

h m . day

54.2 Def f. day

⑥ Input days. (2 digits)

[illegible]

When the above input is completed, the comet tracking mode begins, and the operation illuminator blinks on and off to confirm correct tracking.

The manual keys can be used to center the comet in the field of view.

If you want to end the comet tracking, press **CR** and the normal guide speed will resume.

Note:

note. By pressing **G** during the comet tracking mode, you can turn on or off any external equipment. But, an optional cord is required. This function is usable for the shutter release of an electronic camera.

0	1	R	E	L	S	E	S	E	C	?	.	.	.
---	---	---	---	---	---	---	---	---	---	---	---	---	---

03

h	.	m	.
EC	?	30	N A M E ?



h m s t a r



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By repeatedly pressing **N**, objects searchable in your sky can be displayed in turn. When the object you want to observe is displayed, press **G** to begin searching for it.

If Sirius (No. 8077) is now in the field of view at 21:00 on January 1st, the right display will be shown.



The next display will be an object which is the nearest to the currently displayed object in right ascension in the Star Data Table. If your telescope points east of the meridian, the next display will change toward the increase of right ascension. If it points west of the meridian, the next display will change toward the decrease of right ascension.



06h45	1m	-	16	43	
8078	3	4	STAR		■



0645	15	-	16.43	■
M41	5	0	OPEN	



06h45.1m	-16°43'
22858	OPEN



0	6	h	4	5	1	m	-	1	6	.	4	3	
:	:	:	:	:	:	:	:	:	:	:	:	:	■
								3	S	T	A	R	

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Note:

All the objects below horizon are skipped and are not displayed.

- The above display examples are for the telescope pointing east of the meridian.
- If you press **[0]**, searching will be stopped. You can then repeat steps ② to ⑤.



- ③ If you press **[SFT]** then **[-]**, the display order will be revised.

0	6	h	4	5	·	1	m	-	1	6	·	4	3	·
2	2	8	6	8	·	0	0	O	P	E	N	-		

▽

0	6	h	4	5	·	1	m	-	1	6	·	4	3	·
M	4	1	5	·	0	0	O	P	E	N	-			

- ④ If you press **[SFT]** then **[.]**, the display will change to the right ascension and declination of the currently displayed object.

0	6	h	4	5	·	1	m	-	1	6	·	4	3	·
0	6	h	4	7	·	0	m	-	2	0	·	4	5	·

- ⑤ If you want to observe the displayed object, press **[G]**. The Skysensor will begin to search for object.

0	6	h	4	5	·	1	m	-	1	6	·	4	3	·
0	6	h	4	7	·	0	m	-	2	0	·	4	5	·

- ⑥ If you press **[CR]** after searching for your last object, the command will end.

0	6	h	4	7	·	0	m	-	2	0	·	4	5	·
2	2	8	6	8	·	0	0	O	P	E	N	-		

- ⑦ If you want to finish the command during a search, press **[CR]** then **[0]**.

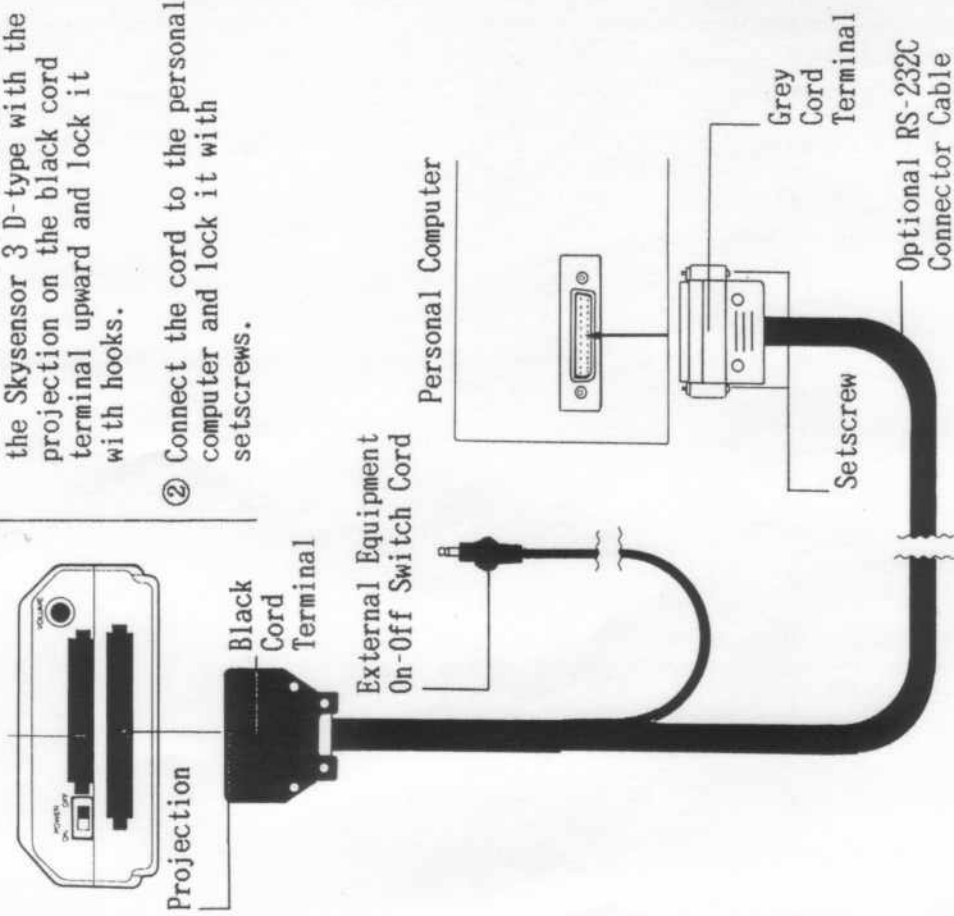
0	6	h	4	7	·	1	m	-	1	6	·	4	3	·
·	0	m	-	2	0	·	4	5	·	P	-	0	-	

III. PERSONAL COMPUTER

The Skysensor 3 D-type can be connected to and controlled by a personal computer with an optional RS-232C 25-pin connector cable and a simple terminal emulation program.

Connection with Personal Computer

- ① Plug the optional cord RS-232C into the sub cord connector of the Skysensor 3 D-type with the projection on the black cord terminal upward and lock it with hooks.
- ② Connect the cord to the personal computer and lock it with setscrews.



③ Set up the personal computer.
Configure your terminal
emulation program with
the parameters shown to
left.

Baud Rate: 1200 baud
Parity: No parity check
Stop Bit : 2 bits
Data Bit : 8 bits

④ If you press **I**, all control
will be shifted to the personal
computer from the Skysensor 3
D-type, and you will be able to
control the telescope through
the personal computer.



Note:

- 1) Keys of the Skysensor are not usable after **I** has been pressed.
- 2) In order to control the telescope through the personal computer, you must have a terminal emulation program.
- 3) Even if you do not intend to connect your computer to the Skysensor, pressing **I** inadvertently will make the Skysensor inoperable. In such a situation, reset the Skysensor by turning it off and on again.

⑤ If you want to shift the
control back to the Skysensor
3 D-type, input **I** into the
personal computer.



List of Commands Available through Personal Computer

Computer Key	Equivalent Skysensor Command	Function
	- Command	Reinput time, longitude and latitude.
	A Command	Set the reference position of the telescope by inputting coordinates.
	B Command	Set the reference position of the telescope by inputting the entry number of a star.
	$\alpha \cdot \delta$ Command	Search for an object at a high speed by its coordinates.
	No. Command	Search for an object at a high speed by its entry number.
		Display the present time and the right ascension and declination of the location to which the telescope is pointing.



I Command

Shift the input and output control to the Skysensor 3 D-type.



MC Command

Connect to a magnetic card reader.
Input to a magnetic card.
(See page 28.)



CM Command

Track a comet.



G Command

Consecutive automatic search.



(Space Bar)

N Command

Star trekking.



Stop right ascension and declination motors.

Note:

T Command

F Command

• Command

and

Manual Keys

are not operative through the personal computer. For these functions, control should be shifted to the Skysensor 3 D-type by pressing the **I** key of the personal computer.

IV. SUPPLEMENTARY EQUIPMENT

Magnetic Card Reader

If the Skysensor 3 D-type is connected to an optional magnetic card reader, you can search for the objects recorded in a magnetic card one after another automatically.

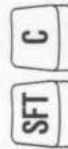


① Press **SFT** then **MC**.



② Press the magnetic card through the magnetic card reader.
(If the reading of the magnetic card is incomplete, you will be requested to do it again.)

● For further operation, refer to the instruction manual accompanying the magnetic card.



③ If you press **SFT** then **C**, the command will be finished.

Encoder

If the Skysensor 3 D-type is connected to the optional encoders installed on your telescope, the right ascension and declination of the place where the telescope is pointing will be always displayed. Referring to the displayed coordinates, you can search for the objects quickly by moving the telescope by hand.

(How to search for celestial objects with encoders)

① Finish the initial setting and reference point setting on the Skysensor according to the above-mentioned instructions.

- ② The lower line of the display will show the right ascension and declination of each object stored in the memory of the Skysensor.

Press **SFT** and **M** in succession.

Then, input your object of search.

For example, to input the Messier object

M42, press

SFT

M

4

 and

2

 and

CR

.

The right ascension and declination of

M42 will be displayed.

h	m	+	.	*
0.5 h	3.5 m	-	0.5	2.3

- ③ The upper line of the display will show the right ascension and declination of the location to which the telescope is pointing. After loosening the R.A. and Decl. clamps, move the telescope by hand until the display of the upper line almost corresponds with that of the lower line. The difference between these displays should be within ± 0.5 mm on the right ascension and within $\pm 7^\circ$ on the declination.

0.5	1.3	5	0	m	-	0.5	2.5
0.5	1.3	5	4	m	-	0.5	2.3

- ④ After fastening the R.A. and Decl. clamps, look through the telescope. You will see the object in the field of view.

Note:

The maximum error made by both the encoders and the Skysensor is ± 20 arc seconds. To be sure that the object will be seen in the field of view, use an eyepiece making the total magnification lower than 40 or the real field of view wider than 1° .

V. TROUBLESHOOTING - Part 2

Note: Part 1 can be found on page 25 of the Skysensor 3 S-type manual.

TROUBLE	CHECK	TREATMENT
RA ERR !! is displayed.	Is the inputted data correct ? Can the inputted object be seen in your sky ?	Recheck them.
NOT FOUND !! is displayed.	Is the inputted object listed in the Star Data Table ?	Input it again.
long intro ! ? is displayed.	Are you searching for an object opposite the meridian ?	Refer to "Searching for Celestial Objects".
Although the object is seen in your sky, ERR ! is displayed.	Have you input- ed data and time correctly ? Is the altitude of the object of search very low ?	Recheck it. It may be not possible to search for an object which is very close to the horizon. When searching for such an object, input 90° as the latitude of your observation site for the initial setting.

TROUBLE	CHECK	TREATMENT
The declination motor does not operate with manual control keys.	Have you set the reference point for the telescope ?	The manual control keys operate only after a reference star is set. Refer to page 17 of the Skysensor 3 S-type manual, and input the reference position. Use the handles attached to your telescope to bring the reference star into position.