APPENDIX B: ALIGNMENT STAR LIBRARY AND STAR CHARTS:

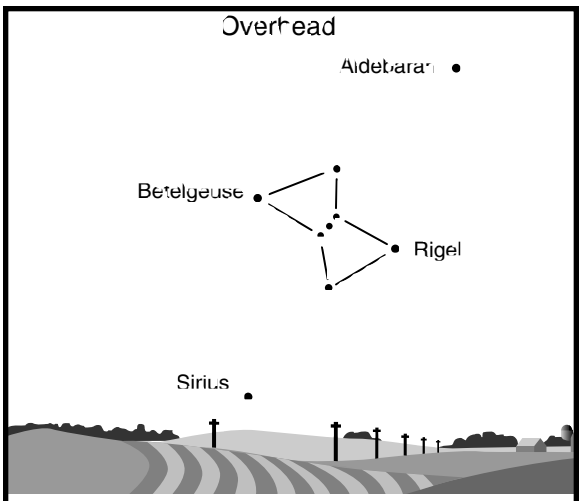
1. Alignment Stars

The CDS utilizes 33 bright and well-known stars to calibrate the telescope's Object Library during the computerized alignment process. These stars were selected to allow observers from anywhere in the world on any given night, to be able to easily and quickly make precision alignments. The CDS Alignment Star Library and Star Charts are listed below for your reference:

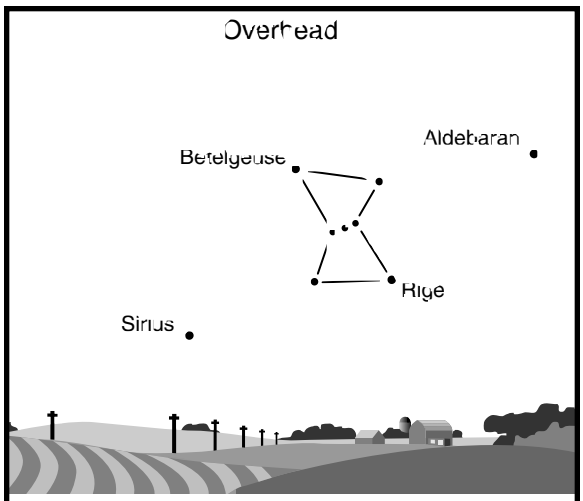
CDS ALIGNMENT STAR LIBRARY

STAR NAME	STAR #	MAGNITUDE	CONSTELL	R/A	DEC.
ACHERNAR	13	0.5	ERIDANUS	01 37.7	-57 14
ACRUX A	121	1.3	CRUX	12 26.6	-63 06
ALBIREO	223	3.1	CYGNUS	19 30.8	+27 58
ALKAID	140	1.9	URSA MAJOR	13 47.6	+49 19
ALDEBARAN	33	0.9	TAURUS	04 35.9	+16 31
ALNILAM	50	1.7	ORION	05 36.2	-01 12
ALPHARD	95	2.0	HYDRA	09 27.6	-08 39
ALPHEKKA	165	2.2	CORONA BOR.	15 35.5	+26 43
ALTAIR	226	0.8	AQUILA	19 50.8	+08 52
ANTARES	177	0.9	SCORPIUS	16 29.5	-26 26
ARCTURUS	147	0.0	BOOTES	14 15.7	+19 11
BETELGUESE	56	0.4	ORION	05 55.2	+07 25
BOGARDUS	58	2.6	AURIGA	05 59.8	+37 13
CANOPUS	63	-0.7	CARINA	06 24.0	-52 42
CAPELLA	42	0.1	AURIGA	05 16.6	+46 00
CASTOR A	78	1.9	GEMINI	07 34.6	+31 53
DENEB	232	1.3	CYGNUS	20 41.5	+45 17
DENEBOLA	114	2.1	LEO	11 49.1	+14 34
DIPHDA	8	2.0	CETUS	00 43.6	-17 59
ENIF	238	2.4	PEGASUS	21 44.2	+09 53
FOMALHAUT	247	1.2	PISCES AUST.	22 57.7	-29 38
HADAR	144	0.6	CENTAURUS	14 03.9	-60 24
HAMAL	17	2.0	ARIES	02 07.2	+23 28
MARKAB	249	2.5	PEGASUS	23 04.8	+15 12
MIRA	20	2.1	CETUS	02 19.4	-02 58
POLARIS	19	2.0	URSA MINOR	02 14.7	+89 17
POLLUX	81	1.1	GEMINI	07 45.4	+28 02
PROCYON	80	0.4	CANIS MINOR	07 39.3	+05 14
REGULUS	100	1.4	LEO	10 08.5	+11 58
RIGEL	41	0.1	ORION	05 14.6	-08 12
SIRIUS	67	-1.5	CANIS MAJOR	06 45.2	-16 43
SPICA	138	1.0	VIRGO	13 25.2	-11 10
VEGA	214	0.0	LYRA	18 37.0	+38 47

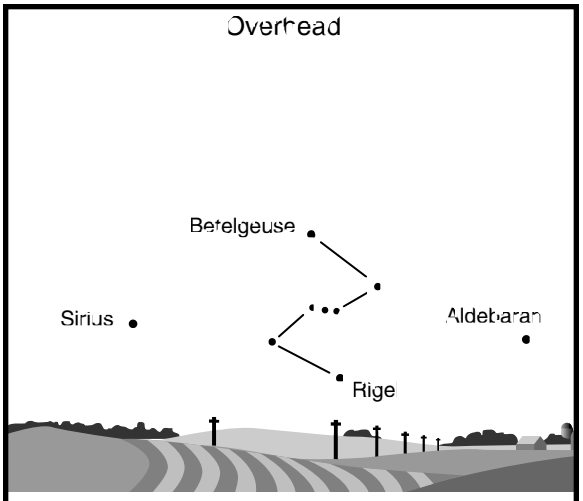
2. Star Charts (for Northern Hemisphere Observers)



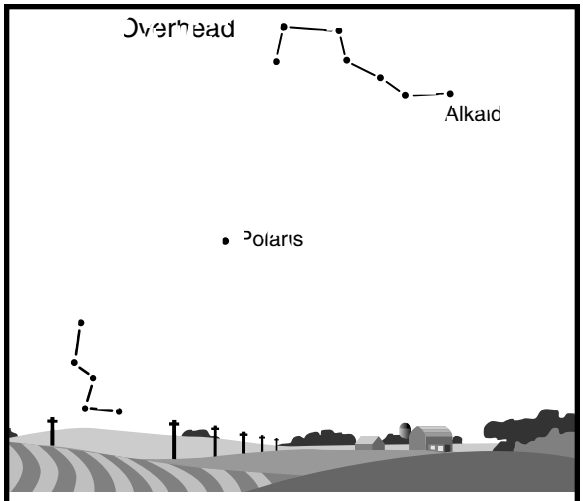
SOUTHEAST
January 7:00 to 9:00



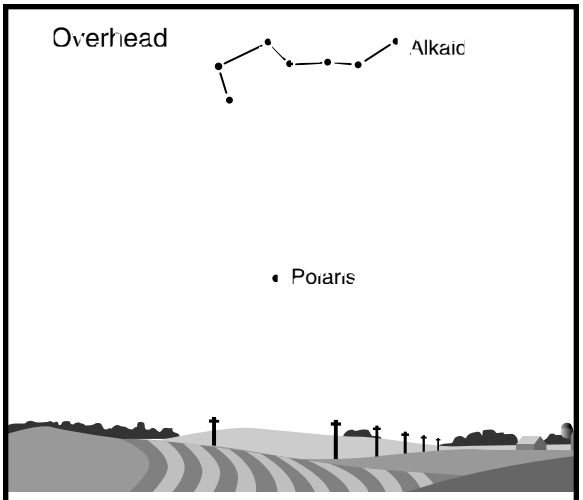
SOUTH
February 7:00 to 9:00



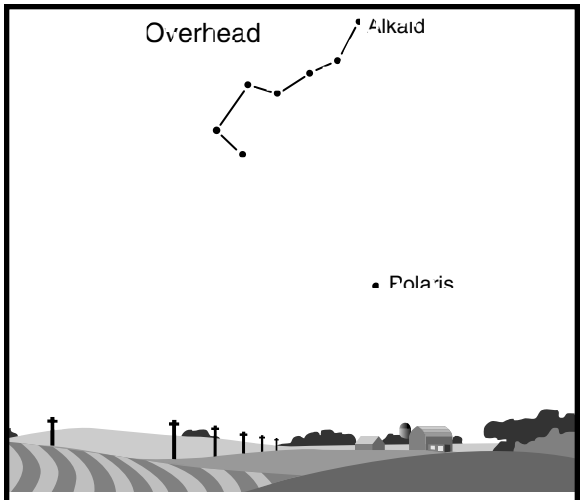
SOUTHWEST
March 7:00 to 9:00



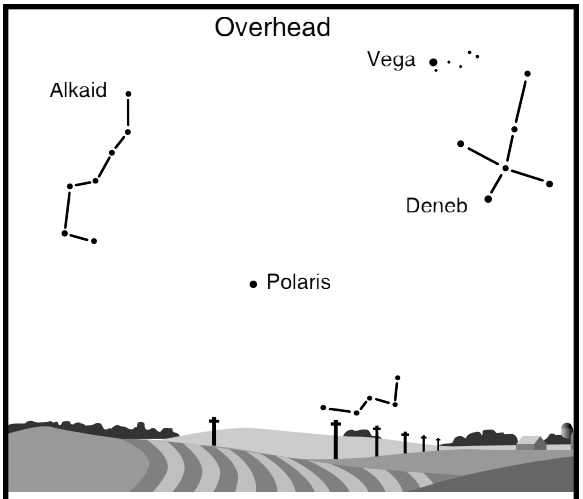
NORTH
April 7:00 to 9:00



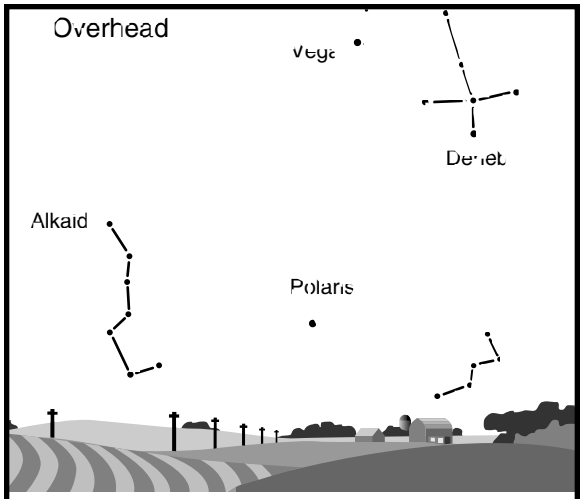
NORTH
May 7:00 to 9:00



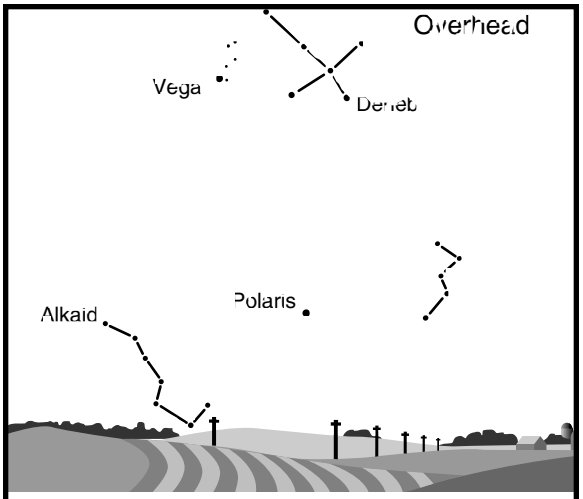
NORTH
June 7:00 to 9:00



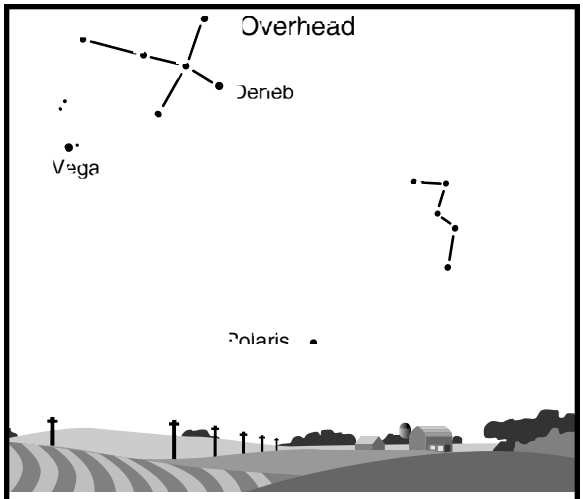
NORTH
July 7:00 to 9:00



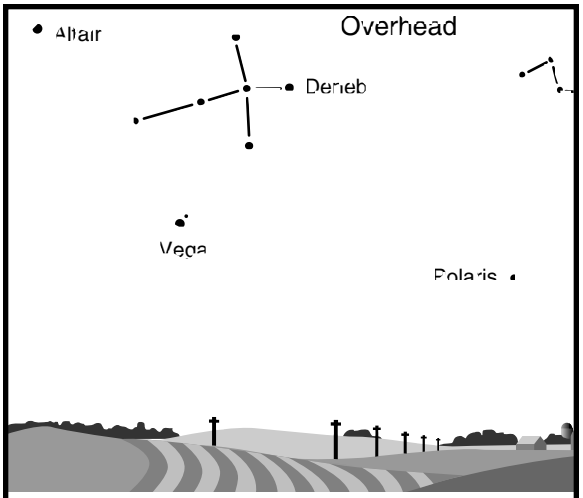
NORTH
August 7:00 to 9:00



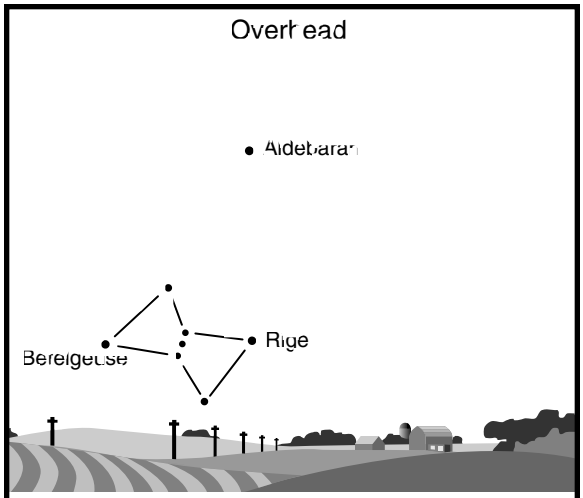
NORTH
September 7:00 to 9:00



NORTH
October 7:00 to 9:00



NORTHWEST
November 7:00 to 9:00



SOUTHEAST
December 7:00 to 9:00

APPENDIX C: #1697 CDS 64,359-Object Library

1. Overview: 64,359 Object Library

The CDS 64,359-Object Library is a collection of the most studied and fantastic objects in the sky.

This library consists of the following object databases:

- 110 Messier objects.
- 351 bright stars, interesting double stars and Sigma Octans (the southern star) in the star .
- 15,928 SAO (Smithsonian Astrophysical Observatory) Catalog of Stars: all stars brighter than 7th magnitude.
- 21,815 GCVS (General Catalog of Variable Stars) objects: complete catalog.
- 7,840 NGC (New General Catalog*) objects: complete catalog.
- 5,386 IC (Index Catalog*) objects: complete catalog.
- 12,921 UGC (Uppsala General Catalog) galaxies: complete catalog.
- 8 Major Planets and the Moon.

2. Accessing the Object Databases

A. Messier Catalog:

1. Press the M key.
2. Enter the number of the desired Messier object and press ENTER.
3. Object information will appear on the display.

B. Planets and Moon:

The CDS calculates the orbital positions of the Moon and the eight major planets for the current calendar date. To access the Moon or a planet, press the STAR key and enter the appropriate number as indicated below:

OBJECT LIBRARY PLANET LEGEND									
PLANET	**MERCURY**	**VENUS**	**MOON**	**MARS**	**JUPITER**	**SATURN**	**URANUS**	**NEPTUNE**	**PLUTO**
STAR #	**901**	**902**	**903**	**904**	**905**	**906**	**907**	**908**	**909**

C. Star, SAO and GCVS Catalogs:

1. Press the STAR key on the Hand Controller, then press ENTER.
2. Use the PREV and NEXT keys to cycle through the following options:

NAME Alphebetical listing of 33 bright alignment stars.
STAR 250 brightest stars, 100 interesting double stars and Sigma Octans (the southern hemisphere). The list of stars begins on page 27.
SAO The Smithsonian Astrophysical Observatory catalog of stars (all stars brighter than 7th magnitude).
GCVS The General Catalog of Variable Stars (complete catalog). Variable stars from the GCVS are entered using a six digit number. The first two digits, refer to the constellation where the variable star is located and is listed in the table below. The next four digits are assigned sequentially within each constellation according to the standard sequence of variable-star designations (R, S, ...). Therefore, the first variable star in the constellation of Virgo would be entered as: 860001.

3. Press Enter when the desired catalog is selected. An arrow will appear to the right of the selected catalog.

4. Press MODE to activate the curser. Using the keypad, enter the number of the desired selection into the Hand Controler and press ENTER. The object information of the selected object then appears on the screen.

D. CNGC, IC, and UGC catalogs:

1. Press the CNGC key on the Hand Controller, then press ENTER.

2. Use the PREV and NEXT keys to cycle through the following options:

NGC New General Catalog (complete catalog).
IC Index Catalog (complete catalog).
UGC Uppsala General Catalog (complete catalog).

3. Press Enter when the desired catalog is selected. An arrow will appear to the right of the selected catalog.

4. Press MODE to activate the curser. Using the keypad, enter the number of the desired selection into the Hand Controler and press ENTER. The object information of the selected object then appears on the screen.

The CDS "remembers" the database you last accessed. Each time you press the CNGC key, the same object database will be displayed on the first line of the Keypad display. To change databases, press ENTER to bring up the database menu.

3. The Meade CNGC* Catalog

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 CDS Keypad Display.

The complete **CNGC** contains 7,840 objects, most of which appear in the RNGC (Revised New General Catalog) 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 **CNGC** is enhanced from the RNGC in many ways. Angular sizes are given in arc-seconds on the **CNGC** listing, and in a convenient scaled format on the CDS display. Magnitudes are given to 0.1 magnitude where possible.

The coordinates in the **CNGC** listing are listed for the year 2000. The CDS calculates object positions upon power up to the current date (as shown on the time/date display). This makes the CDS pointing more accurate. Therefore, the **CNGC** listing and the CDS display will not exactly agree on object positions.

Objects have been assigned a "Visual Quality Rating", henceforth called **VQ**. A large number of VQs have been obtained by direct visual observations 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. A higher power eyepiece was used only for very small objects. Your "Visual Quality Rating" of a particular object will vary, largely due to sky conditions.

If the object has been rated by observation, an upper-case character (ABCDEFG) is used for the VQ on the **CNGC** listing. If the object has not been observed, the VQ has been estimated by a computer program from the object type, size, and brightness and the VQ is specified in lower-case characters (abcdefg). The VQs for visually-rated objects are a considerably more consistent guide to observability and appearance than either the computed VQs or an examination of the type, magnitude, and size data.

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.

The following guide to VQs was used in the visual observing process.

SUPER	Very bright object with very interesting shape or structure.
EXCEL	Bright object with very interesting shape or structure. OR Very bright object with moderately interesting shape or structure.
V GOOD	Bright object with moderately interesting shape or structure. OR Very bright object with little or no interesting shape or structure.
GOOD	Easy to see without averted vision with some interesting shape or structure. OR Bright object, but little or no interesting shape or structure.
FAIR	Easy to see without averted vision, but little or no interesting shape or structure.
POOR	Easy to see with averted vision. Often borderline visible without averted vision.
V POOR	A struggle to see with careful use of averted vision.
(none)	Not yet rated AND missing information for computer estimate. OR Could not see despite careful use of averted vision.

The following is a description of the format of the optional **CNGC** listing for each object:

COLUMN	NAME	DESCRIPTION
1	**CNGC #**	CNGC 0001 through CNGC 7840
2	**RA**	Right Ascension
3	**DEC**	Declination
4	**SIZE**	Size of object (arc-seconds)
5	**MAG**	Magnitude (-5.5 through 19.9)
6	**TYPE**	Type of object
7	*****	* means object is not in the RNGC
8	**ALT CAT**	Alternate catalog name and number
9	**VQ**	Visual Quality Rating (abcdefg) or (ABCDEFG)
10	**TAGS**	Object Type # (0-F) : S = Sky-Cat : T = Tirion
11	**COMMENTS**	Name, comments, other information

The following types are distinguished in the **CNGC**.

TYPE	LEGEND	DESCRIPTION
0	**None**	Unverified Southern Object
1	**OPEN**	Open Cluster
2	**GLOB**	Globular Cluster
3	**DNEB**	Diffuse Nebula
4	**PNEB**	Planetary Nebula (or SN Remnant)
5	**GAL**	Galaxy
6	**OPEN + DNEB**	Open Cluster + Diffuse Nebula
7	**None**	Non-Existent Object
8	**STAR**	Star
9	**MULTI+STAR**	Multiple Star
A	**MULTI+GAL**	Multiple Galaxy (Usually Interacting)
B	**DNEB**	Dark Nebula in front of Diffuse Nebula
C	**GAL+OPEN**	Open Cluster in External Galaxy
D	**GAL+GLOB**	Globular Cluster in External Galaxy
E	**GAL+DNEB**	Diffuse Nebula in External Galaxy
F	**GAL+OPEN+DNEB**	Open Cluster + Diffuse Nebula in Galaxy
S		Object is also listed in the *Sky Catalogue 2000*
T		Object is also listed in the *Tirion Sky Atlas 2000*

a. STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
* 1	00 08.3	+29 06		2.1v	STAR B8.5p IV:(Hg+Mn)	Alpha And	8 ST	Alpheratz
* 2	00 09.2	+59 10		2.3v	STAR F2 III-IV	Beta Cas	8 ST	Caph
* 3	00 13.2	+15 12		2.8v	STAR B2 IV	Gamma Peg	8 ST	Algenib
* 4	00 25.7	-77 15		2.8v	STAR G1 IV	Beta Hyi	8 ST	
* 5	00 26.3	-42 18		2.4v	STAR K0 IIIb	Alpha Phe	8 ST	Ankaa
* 6	00 39.4	+30 52		3.3v	STAR K3 III	Delta And A	8 ST	
* 7	00 40.5	+56 33		2.2v	STAR K0 IIIa	Alpha Cas	8 ST	Shedir
* 8	00 43.6	-17 59		2.0v	STAR G9.5 III	Beta Cet	8 ST	Diphda
* 9	00 56.7	+60 43	20	2.5v	STAR B0 IVnpe(shell) + ?	Gamma Cas	9 ST	Marj B=8.8
* 10	01 06.1	-46 43	10	3.3v	STAR G8 III	Beta Phe AB	9 ST	B=Similar mag & spectrum
* 11	01 09.8	+35 37		2.1v	STAR M0 IIIa	Beta And	8 ST	Mirach
* 12	01 25.8	+60 15		2.7v	STAR A5 IV	Delta Cas	8 ST	Ruchbah Ecl-Bin @759d
* 13	01 37.7	-57 14		0.5v	STAR B3 Vnp (shell)	Alpha Eri	8 ST	Achernar
* 14	01 54.7	+20 49		2.6v	STAR A5 V	Beta Ari	8 ST	Sharatan
* 15	01 58.7	-61 34		2.9v	STAR A9 III-IVn	Alpha Hyi	8 ST	
* 16	02 04.0	+42 21	100	2.3v	STAR K3 IIb + B9 V + A0 V	Gamma And A	9 ST	Almaak B=5.4 C=6.2
* 17	02 07.2	+23 28		2.0v	STAR K2 IIIab	Alpha Ari	8 ST	Hamal
* 18	02 09.5	+34 59		3.0v	STAR A5 IV	Beta Tri	8 ST	
* 19	02 14.7	+89 17	180	2.0v	STAR F5-8 Ib + F3 V	Alpha UMi A	9 ST	Polaris B=8.2
* 20	02 19.4	-02 58	10	2.1v	STAR M5.5-9 IIIe + Bpe	Omicron Cet A	9 ST	Mira B=9.5
* 21	02 58.3	-40 19		3.2v	STAR A5 IV	Theta Eri A	8 ST	Acamar
* 22	03 02.3	+04 05		2.5v	STAR M1.5 IIIa	Alpha Cet	8 ST	Menkar
* 23	03 04.8	+53 31		2.9v	STAR G8 III + A2 V	Gamma Per	8 ST	
* 24	03 08.2	+40 58		2.1v	STAR B8 V + F:	Beta Per	8 ST	Algol
* 25	03 24.4	+49 52		1.8v	STAR F5 Ib	Alpha Per	8 ST	Mirphak
* 26	03 43.0	+47 48		3.0v	STAR B5 IIIn	Delta Per	8 ST	
* 27	03 47.6	+27 06		2.9v	STAR B7 IIIn	Eta Tau	8 ST	Alcyone
* 28	03 47.2	-74 15		3.2v	STAR M2 III	Gamma Hyi	8 ST	
* 29	03 54.2	+31 54	130	2.9v	STAR B1 Ib + B8 V	Zeta Per A	9 ST	B=9.2
* 30	03 57.8	+40 01	90	2.9v	STAR B0.5 IV + B9.5 V	Epsilon Per A	9 ST	B=7.9
* 31	03 58.0	-13 30		3.0v	STAR M0.5 III-IIIb	Gamma Eri	8 ST	Zaurak
* 32	04 34.0	-55 02	2	3.3v	STAR A0p III:(Si) + B9 IV	Alpha Dor AB	9 ST	A=3.8 B=4.3
* 33	04 35.9	+16 31		0.9v	STAR K5 III	Alpha Tau A	8 ST	Aldebaran
* 34	04 49.9	+06 57		3.2v	STAR F6 V	Pi^3 Ori	8 ST	Hassaleh
* 35	04 57.0	+33 11		2.7v	STAR K3 II	Iota Aur	8 ST	Ayn
* 36	05 02.0	+43 49		3.0v	STAR A9 Iae + B	Epsilon Aur A	8 ST	Anz
* 37	05 05.5	-22 22		3.2v	STAR K5 III	Epsilon Lep	8 ST	
* 38	05 06.6	+41 14		3.2v	STAR B3 V	Eta Ori AB	8 ST	Hoedus II
* 39	05 07.9	-05 05		2.8v	STAR A3 IIIn	Theta Eri	8 ST	Kursa
* 40	05 12.9	-16 12		3.1v	STAR B9p IV: (Hg+Mn)	Mu Lep	8 ST	
* 41	05 14.6	-08 12	90	0.1v	STAR B8 Iae + B5 V	Beta Ori A	9 ST	Rigel B=7.6 C=7.6
* 42	05 16.6	+46 00		0.1v	STAR G6: III + G2: III	Alpha Aur AB	8 ST	Capella
* 43	05 24.5	-02 24		3.3v	STAR B1 IV + B	Eta Ori AB	8 ST	
* 44	05 25.2	+06 21		1.6v	STAR B2 III	Gamma Ori	8 ST	Bellatrix
* 45	05 26.3	+28 37		1.7v	STAR B7 III	Beta Tau	8 ST	Alnath
* 46	05 28.3	-20 46	26	2.8v	STAR G5 II + ?	Beta Lep A	9 ST	B=7.4
* 47	05 32.0	-00 19		2.2v	STAR O9.5 II	Delta Ori A	8 ST	Mintaka
* 48	05 32.7	-17 49		2.6v	STAR F0 Ib	Alpha Lep	8 ST	Arneb
* 49	05 46.5	-05 55	110	2.8v	STAR O9 III + B7 IIIp	Iota Ori A	9 ST	Nair al Saif B=7.3

STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
* 50	05 36.2	-01 12		1.7v	STAR B0 Ia	Epsilon Ori	8 ST	Alnilam
* 51	05 37.6	+21 09		3.0v	STAR B2 IIIpe (shell)	Zeta Tau	8 ST	
* 52	05 39.7	-34 04		2.6v	STAR B7 IV	Alpha Col A	8 ST	Phaet
* 53	05 40.8	-01 56	24	2.1v	STAR O9.5 Ib + B0 III	Zeta Ori A	9 ST	Alnitak B=4.2
* 54	05 47.8	-09 40		2.1v	STAR B0.5 Ia	Kappa Ori	8 ST	Saiph
* 55	05 51.0	-35 46		3.1v	STAR K1.5 III	Beta Col	8 ST	Wezn
* 56	05 55.2	+07 25		0.4v	STAR M2 Iab	Alpha Ori	8 ST	Betelgeuse
* 57	05 59.5	+44 57		1.9v	STAR A1 IV	Beta Aur	8 ST	Menkalinan
* 58	05 59.8	+37 13	40	2.6v	STAR A0p III: (si) + G2 V	Theta Aur AB	9 ST	Bogardus B=7.2 G2V
* 59	06 14.9	+22 31		3.3v	STAR M3 III	Eta Gem	8 ST	Propus
* 60	06 20.3	-30 03		3.0v	STAR B2.5 V	Zeta CMa	8 ST	Phurud
* 61	06 22.9	+22 31		2.8v	STAR M3 IIIab	Mu Gem	8 ST	Tejat Posterior
* 62	06 22.7	-17 58		2.0v	STAR B1 II-III	Beta CMa	8 ST	Murzim
* 63	06 24.0	-52 42		-0.7v	STAR A9 II	Alpha Car	8 ST	Canopus
* 64	06 37.7	+16 24		1.9v	STAR A1 IVs	Gamma Gem	8 ST	Alhena
* 65	06 37.7	-43 12		3.2v	STAR B8 IIIn	Nu Pup	8 ST	
* 66	06 44.0	+25 08		3.0v	STAR G8 Ib	Epsilon Gem	8 ST	Mebsuta
* 67	06 45.2	-16 43	95	-1.5v	STAR A0mA1 Va	Alpha CMa A	9 ST	Sirius B=8.5 50y
* 68	06 48.2	-61 56		3.3v	STAR A6 Vn	Alpha Pic	8 ST	
* 69	06 49.9	-50 37		2.9v	STAR K1 III	Tau Pup	8 ST	
* 70	06 58.6	-28 58		1.5v	STAR B2 II	Epsilon CMa A	8 ST	Adara
* 71	07 03.1	-23 50		3.0v	STAR B3 Iab	Omicron^2 CMa	8 ST	
* 72	07 08.4	-26 23		1.8v	STAR F8 Ia	Delta CMa	8 ST	Wezen
* 73	07 13.5	-44 38		2.6v	STAR M5 IIIe	L2 Pup	8 ST	HR2748
* 74	07 17.2	-37 05		2.7v	STAR K3 Ib	Pi Pup	8 ST	
* 75	07 24.2	-26 19		2.5v	STAR B5 Ia	Eta CMa	8 ST	Aludra
* 76	07 27.2	+08 17		2.9v	STAR B8 V	Beta CMi	8 ST	Gomeisa
* 77	07 29.3	-43 17	220	3.3v	STAR K5 III + G5: V	Sigma Pup A	9 ST	
* 78	07 34.6	+31 53	25	1.9v	STAR A1 V + A2mA5	Alpha Gem A	9 ST	Castor A
* 79	07 34.6	+31 53	25	2.9v	STAR A2mA5 + A1 V	Alpha Gem B	9 ST	Castor B
* 80	07 39.3	+05 14	40	0.4v	STAR F5 IV-V + ?	Alpha CMi A	9 ST	Procyon B=10.3
* 81	07 45.4	+28 02		1.1v	STAR K0 IIIb	Beta Gem	8 ST	Pollux
* 82	07 49.3	-24 52		3.3v	STAR G6 Ib	Xi Pup	8 ST	
* 83	08 03.7	-30 01		2.3v	STAR O5 Iafn	Zeta Pup	8 ST	Naos
* 84	08 07.6	-24 19		2.7v	STAR F6 IIp (var)	Rho Pup	8 ST	
* 85	08 09.5	-47 21		1.7v	STAR WC8 + O9 I:	Gamma^2 Vel	8 ST	
* 86	08 22.5	-59 31		1.9v	STAR K3: III	Epsilon Car	8 ST	Avior
* 87	08 44.7	-54 43	20	2.0v	STAR A1 IV	Delta Vel AB	9 ST	B=5.0
* 88	08 55.5	+05 56		3.1v	STAR G9 II-III	Zeta Hya	8 ST	
* 89	08 59.3	+48 03	40	3.1v	STAR A7 IVn + M1 V	Iota UMa A	9 ST	Talitha BC=10.8
* 90	09 08.0	-43 25		2.2v	STAR K4 Ib-IIa	Lambda Vel	8 ST	Suhail
* 91	09 13.3	-69 44		1.7v	STAR A1 III	Beta Car	8 ST	Miaplacidus
* 92	09 17.1	-59 17		2.2v	STAR A8 II	Iota Car	8 ST	Turais
* 93	09 21.1	+34 23		3.1v	STAR K7 IIIab	Alpha Lyn	8 ST	
* 94	09 22.1	-55 01		2.5v	STAR B2 IV-V	Kappa Vel	8 ST	
* 95	09 27.6	-08 39		2.0v	STAR K3 II-III	Alpha Hya	8 ST	Alphard
* 96	09 31.2	-57 01		3.1v	STAR K5 III	N Vel	8 ST	HR3803
* 97	09 33.0	+51 41		3.2v	STAR F6 IV	Theta UMa	8 ST	
* 98	09 45.9	+23 46		3.0v	STAR G1 II	1 Leo	8 ST	Ras Elased Aus
* 99	09 47.2	-65 05	50	3.0v	STAR A5 Ib + B7 III	Nu Car AB	9 ST	B=6.3

STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
*100	10 08.5	+11 58		1.4v	STAR B7 Vn	Alpha Leo A	8 ST	Regulus
*101	10 13.7	-70 02		3.3v	STAR B8 IIIn	Omega Car	8 ST	
*102	10 20.0	+19 51	50	2.6v	STAR K1 IIIb Fe-0.5 + *	Gamma Leo A	9 ST	Algieba B=3.5 G7 III Fe-1
*103	10 22.4	+41 30		3.1v	STAR M0 IIIp	Mu Uma	8 ST	Tania Australis
*104	10 32.0	-61 42		3.3v	STAR B4 Vne	Rho Car	8 ST	HR4140
*105	10 43.0	-64 24		2.8v	STAR B0.5 Vp	Theta Car	8 ST	
*106	10 46.8	-49 26	20	2.7v	STAR G5 III + F8: V	Mu Vel AB	9 ST	B=6.4
*107	10 49.7	-16 11		3.1v	STAR K2 III	Ny Hya	8 ST	
*108	11 01.9	+56 23		2.4v	STAR A0mA1 IV-V	Beta UMa	8 ST	Merak
*109	11 03.8	+61 45	3	1.8v	STAR K0 IIIa + A8 V	Alpha UMa AB	9 ST	Dubhe B=4.8
*110	11 09.7	+44 30		3.0v	STAR K1 III	Psi UMa	8 ST	
*111	11 14.2	+20 32		2.6v	STAR A4 V	Delta Leo	8 ST	Zosma
*112	11 14.2	+15 26		3.3v	STAR A2 Vs	Theta Leo	8 ST	Chort
*113	11 35.8	-63 02		3.1v	STAR B9 III	Lambda Cen	8 ST	
*114	11 49.1	+14 34		2.1v	STAR A3 V	Beta Leo	8 ST	Denebola
*115	11 53.8	+53 41		2.4v	STAR A0 IV-Vn	Gamma UMa	8 ST	Phad
*116	12 08.4	-50 44		2.5v	STAR B2 IVne	Delta Cen	8 ST	
*117	12 10.1	-22 37		3.0v	STAR K3 IIIa	Epsilon Crv	8 ST	Minkar
*118	12 15.1	-58 45		2.8v	STAR B2 IV	Delta Cru	8 ST	
*119	12 15.5	+57 01		3.3v	STAR A2 IV-Vn	Delta UMa	8 ST	Megrez
*120	12 15.8	-17 33		2.6v	STAR B8p III: (Hg+Mn)	Gamma Crv	8 ST	Gienah Ghurab
*121	12 26.6	-63 06	50	1.3v	STAR B0.5 IV + B1 Vn	Alpha Cru A	9 ST	Acrux A B=1.7
*122	12 26.7	-63 07	50	1.7v	STAR B1 Vn + B0.5 IV	Alpha Cru B	9 ST	Acrux B A=1.3
*123	12 29.9	-16 31	240	3.0v	STAR B9.5 III + K2 V	Delta Crv A	9 ST	Algorab B=8.3
*124	12 31.2	-57 07		1.6v	STAR M3.5 III	Gamma Cru	8 ST	Gacrux
*125	12 34.4	-23 24		2.7v	STAR G5 II	Beta Crv	8 ST	Kraz
*126	12 37.2	-69 09		2.7v	STAR B2 IV-V	Alpha Mus	8 ST	
*127	12 41.6	-48 58	50	2.9v	STAR B9.5 III + A0 III	Gamma Cen A	9 ST	B=3.0
*128	12 41.5	-48 58	50	3.0v	STAR A0 III + B9.5 III	Gamma Cen B	9 ST	A=2.9
*129	12 41.7	-01 28	40	2.8v	STAR F1 V + F1 V	Gamma Vir AB	9 ST	Porrima B=3.5
*130	12 46.2	-68 07	10	3.1v	STAR B2 V + B2.5 V	Beta Mus AB	9 ST	B=4.1
*131	12 47.7	-59 42		1.2v	STAR B0.5 III	Beta Cru	8 ST	Becrux Mimosa
*132	12 54.0	+55 58		1.8v	STAR A0p IV: (Cr+Eu)	Epsilon UMa	8 ST	Alioth
*133	12 56.1	+38 19		2.9v	STAR A0p III: (Si+Eu+Sr)	Alpha^2 CVn A	8 ST	Cor Caroli B=5.6 F0 V
*134	13 02.2	+10 58		2.8v	STAR G9 IIIab	Epsilon Vir	8 ST	Vindamiatrix
*135	13 19.0	-23 11		3.0v	STAR G8 IIIa	Gamma Hya	8 ST	
*136	13 20.6	-36 43		2.8v	STAR A2 V	Iota Cen	8 ST	
*137	13 24.0	+54 55	140	2.3v	STAR A1p IV: (Si) + A1mA7	Zeta UMa A	9 ST	Mizar B=3.9
*138	13 25.2	-11 10		1.0v	STAR B1 V	Alpha Vir	8 ST	Spica
*139	13 39.9	-53 28		2.3v	STAR B1 III	Epsilon Cen	8 ST	
*140	13 47.6	+49 19		1.9v	STAR B3 V	Eta UMa	8 ST	Alkaid
*141	13 49.6	-42 28		3.0v	STAR B2 IV-Vpne	Mu Cen	8 ST	
*142	13 54.7	+18 24		2.7v	STAR G0 IV	Eta Boo	8 ST	Mufrid
*143	13 55.6	-47 17		2.6v	STAR B2.5 IV	Zeta Cen	8 ST	
*144	14 03.9	-60 24		0.6v	STAR B1 III	Beta Cen AB	8 ST	Hadar
*145	14 06.4	-26 41		3.3v	STAR K2 IIIb	Pi Hya	8 ST	
*146	14 06.7	-36 22		2.1v	STAR K0 IIIb	Theta Cen	8 ST	Menkent
*147	14 15.7	+19 11		0.0v	STAR K1.5 III Fe-0.5	Alpha Boo	8 ST	Arcturus
*148	14 32.1	+38 19		3.0v	STAR A7 III-IV	Gamma Boo	8 ST	Seginus
*149	14 35.5	-42 10		2.4	STAR B1.5 IVpne	Eta Cen	8 ST	

STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
*150	14 39.8	-60 51	210	0.0v	STAR G2 V + K4 V	Alpha Cen A	9 ST	Rigil Kentaurus B=1.3
*151	14 39.8	-60 51	210	1.3v	STAR K4 V + G2 V	Alpha Cen B	9 ST	A=0.0
*152	14 41.9	-47 24		2.3v	STAR B1.5 III	Alpha Lup	8 ST	
*153	14 42.5	-64 59	160	3.2v	STAR A7p (Sr) + K5 V	Alpha Cir	9 ST	B=8.6
*154	14 46.6	+27 04	30	2.4v	STAR K0 II-III + A0 V	Epsilon Boo	9 ST	Izar B=5.1
*155	14 51.1	-51 03		2.8v	STAR A3 IV	Alpha Lib A	8 ST	Zuben Elgenubi
*156	14 50.6	+74 10		2.1v	STAR K4 III	Beta UMi	8 ST	Kocab
*157	14 58.5	-43 08		2.7v	STAR B2 IV	Beta Lup	8 ST	
*158	14 59.2	-42 06		3.1v	STAR B2 V	Kappa Cen	8 ST	
*159	15 04.1	-25 18		3.3v	STAR M4 III	Sigma Lib	8 ST	Brachium
*160	15 17.1	-09 23		2.6v	STAR B8 Vn	Beta Lib	8 ST	Zuben Elschemali
*161	15 18.9	-68 41		2.9v	STAR A1 IIIn	Gamma TrA	8 ST	
*162	15 21.4	-40 39		3.2v	STAR B1.5 IVn	Delta Lup	8 ST	
*163	15 20.7	+71 50		3.1v	STAR A2.5 III	Gamma UMi	8 ST	Pherkad
*164	15 24.9	+58 58		3.3v	STAR K2 III	Iota Dra	8 ST	Ed Asich
*165	15 35.5	+26 43		2.2v	STAR A0 IV	Gamma CrB	8 ST	Alphekka
*166	15 35.1	-41 10	5	2.8v	STAR B2 IVn + B2 IVn	Alpha Lup AB	9 ST	A=3.5 B=3.6
*167	15 54.3	+06 25		2.7v	STAR K2 IIIb (CN1)	Alpha Ser	8 ST	Unukalhai
*168	15 55.1	-63 26		2.9v	STAR F0 IV	Beta Tra	8 ST	
*169	15 58.9	-26 08		2.9v	STAR B1 V + B2 V	Pi Sco A	8 ST	
*170	15 59.5	+25 54		2.0v	STAR gM3: + Bep	T CrB	8 ST	Galt
*171	16 00.3	-22 38		2.3v	STAR B0.3 IV	Delta Sco AB	8 ST	Dschubba
*172	16 05.5	-19 48	10	2.6v	STAR B0.5 IV	Beta Sco AB	9 ST	Graffias B=5.0 C=4.9 @ 14"
*173	16 14.3	-03 43		2.7v	STAR M0.5 III	Delta Oph	8 ST	Yed Prior
*174	16 18.3	-04 36		3.2v	STAR G9.5 IIIb Fe-0.5	Epsilon Oph	8 ST	Yed Posterior
*175	16 21.2	-25 36	200	2.9v	STAR B1 III + B9 V	Sigma Sco A	9 ST	Alniyat B=8.3
*176	16 24.0	+61 31	60	2.7v	STAR G8 IIIab	Eta Dra A	9 ST	Booboo B=8.7
*177	16 29.5	-26 26	30	0.9v	STAR M1.5 Iab + B2.5 V	Alpha Sco A	9 ST	Antares B=5.4
*178	16 30.2	+21 29		2.8v	STAR G7 IIIa	Beta Her	8 ST	Kornephoros
*179	16 35.9	-28 13		2.8v	STAR B0 V	Tau Sco	8 ST	
*180	16 37.2	-10 34		2.6v	STAR O9.5 Vn	Zeta Oph	8 ST	Fieht
*181	16 41.3	+31 36	11	2.8v	STAR G1 IV + G7 V	Zeta Her AB	9 ST	B=5.5
*182	16 48.7	-69 02		1.9v	STAR K2 IIb - IIIa	Alpha TrA	8 ST	Artia
*183	16 50.2	-34 17		2.3v	STAR K2 III	Epsilon Sco	8 ST	
*184	16 51.9	-38 03		3.0v	STAR B1.5 IVn	Mu^1 Sco	8 ST	
*185	16 57.7	+09 22		3.2v	STAR K2 III	Kappa Oph	8 ST	
*186	16 58.7	-56 00		3.1v	STAR K4 III	Zeta Ara	8 ST	
*187	17 08.7	+65 43		3.2v	STAR B6 III	Zeta Dra	8 ST	Aldhibah
*188	17 10.4	-15 44	10	2.4v	STAR A2 Vs + A3 V	Eta Oph AB	9 ST	Sabik A=3.0 B=3.5
*189	17 12.2	-43 14		3.3v	STAR F2p V: (Cr)	Eta Sco	8 ST	
*190	17 14.7	+14 23		3.1v	STAR M5 Ib-II	Alpha Her AB	8 ST	Ras Algethi
*191	17 15.1	+24 50	90	3.1v	STAR A1 IVn + ?	Delta Her	9 ST	Sarin B=8.8
*192	17 15.1	+36 48		3.2v	STAR K3 IIab	Pi Her	8 ST	
*193	17 22.1	-25 00		3.3v	STAR B2 IV	Alpha Oph	8 ST	
*194	17 25.4	-55 32		2.9v	STAR K3 Ib-IIa	Beta Ara	8 ST	
*195	17 25.5	-56 23		3.3v	STAR B1 Ib	Gamma Ara A	8 ST	
*196	17 30.8	-37 17		2.7v	STAR B2 IV	Upsilon Sco	8 ST	
*197	17 30.4	+52 19	40	2.8v	STAR G2 Ib-IIa + ?	Beta Dra A	9 ST	Restaban B=11.5
*198	17 31.9	-49 52		3.0v	STAR B2 Vne	Alpha Ara	8 ST	
*199	17 33.7	-37 07		1.6v	STAR B1.5 IV	Lambda Sco	8 ST	Shaula

STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
*200	17 25.0	+12 33		2.1v	STAR A5 IIIn	Alpha Oph	8 ST	Rasalhague
*201	17 37.3	-43 00		1.9v	STAR F1 II	Theta Sco	8 ST	Sargas
*202	17 42.6	-39 02		2.4v	STAR B1.5 III	Kappa Sco	8 ST	
*203	17 43.5	+04 34		2.8v	STAR K2 III	Beta Oph	8 ST	Cebalrai
*204	17 47.6	-40 07		3.0	STAR F2 Ia	Iota^1 Sco	8 ST	
*205	17 49.9	-37 02		3.2v	STAR K2 III	G Sco	8 ST	HR6630
*206	17 56.6	+51 29		2.2v	STAR K5 III	Gamma Dra	8 ST	Etamin
*207	17 59.1	-09 46		3.3v	STAR K0 III	Nu Oph	8 ST	
*208	18 05.8	-30 26		3.0v	STAR K0 III	Gamma^2 Sgr	8 ST	Nash
*209	18 17.7	-36 46	40	3.1v	STAR M3.5 IIIab + G8: IV:	Eta Sgr A	9 ST	B=8.3
*210	18 21.0	-29 50		2.7v	STAR K2.5 IIIa	Delta Sgr	8 ST	
*211	18 21.3	-02 54		3.3v	STAR K0 III-IV	Eta Ser	8 ST	
*212	18 24.2	-34 23		1.9v	STAR A0 IIInp (shell)	Epsilon Sgr	8 ST	Kaus Australis
*213	18 28.0	-25 25		2.8v	STAR K1 IIIb	Lambda Sgr	8 ST	Kaus Borealis
*214	18 37.0	+38 47		0.0v	STAR A0 Va	Alpha Lyr	8 ST	Vega
*215	18 45.7	-26 59		3.2v	STAR B8.5 III	Phi Sgr	8 ST	
*216	18 55.3	-26 18		2.0v	STAR B2.5 V	Sigma Sgr	8 ST	Nunki
*217	18 58.9	+32 41		3.2v	STAR B9 III	Gamma Lyr	8 ST	Sulaphat
*218	19 02.7	-29 53	5	2.6v	STAR A2.5 V + A4: V:	Zeta Sgr AB	9 ST	Ascella A=3.2 B=3.5
*219	19 05.5	+13 53		3.0v	STAR A0 IVnn	Zeta Aql A	8 ST	
*220	19 07.0	-27 39		3.3v	STAR K1.5 IIIb	Tau Sgr	8 ST	
*221	19 09.8	-21 02	6	2.9v	STAR F2 II + ? + ?	Pi Sgr ABC	9 ST	Albaldah A=3.7 B=3.8
*222	19 12.6	+67 39		3.1v	STAR G9 III	Delta Dra	8 ST	Nodus Secundus
*223	19 30.8	+27 58	350	3.1v	STAR K3 II + B9.5 V	Beta Cyg A	9 ST	Albireo B=5.1
*224	19 45.0	+45 08	20	2.9v	STAR B9.5 III + F1 V	Delta Cyg AB	9 ST	B=6.4
*225	19 46.3	+10 37		2.7v	STAR K3 II	Gamma Aql	8 ST	Tarazed
*226	19 50.8	+08 52		0.8v	STAR A7 Vn	Alpha Aql	8 ST	Altair
*227	20 11.3	-00 50		3.2v	STAR B9.5 III	Theta Aql	8 ST	
*228	20 21.1	-14 46		3.1v	STAR K0 II + A5 V:n	Beta Cap A	8 ST	Dabih
*229	20 22.2	+40 16		2.2v	STAR F8 Ib	Gamma Cyg	8 ST	Sadr
*230	20 26.9	+15 05		1.9v	STAR B2.5 V	Alpha Pav	8 ST	Peacock
*231	20 37.6	-47 18		3.1v	STAR K0 III (Cn1)	Alpha Ind	8 ST	
*232	20 41.5	+45 17		1.3v	STAR A2 Ia	Alpha Cyg	8 ST	Deneb
*233	20 46.3	+33 58		2.5v	STAR K0 III	Epsilon Cyg	8 ST	Cat
*234	21 13.0	+30 13		3.2v	STAR G8 IIIa Ba 0.6	Zeta Cyg	8 ST	
*235	21 18.6	+62 36		2.4v	STAR A7 IV-V	Alpha Cep	8 ST	Alderamin
*236	21 28.7	+70 33		3.2v	STAR B1 III	Beta Cep	8 ST	Alphirk
*237	21 31.6	-05 35		2.9v	STAR G0 Ib	Beta Aqr	8 ST	Sadalsuud
*238	21 44.2	+09 53		2.4v	STAR K2 Ib	Epsilon Peg	8 ST	Enif '72 flare
*239	21 47.1	-16 07		2.9v	STAR A3mF2 V:	Delta Cap	8 ST	
*240	21 54.0	-37 22		3.0v	STAR B8 III	Gamma Gru	8 ST	
*241	22 05.8	-00 19		3.0v	STAR G2 Ib	Alpha Aqr	8 ST	Sadalmelik
*242	22 08.3	-46 58		1.7v	STAR B7 IV	Alpha Gru	8 ST	Al Nair
*243	22 18.6	-60 16		2.9v	STAR K3 III	Alpha Tuc	8 ST	
*244	22 42.7	-46 52		2.1v	STAR M5 III	Beta Gru	8 ST	
*245	22 43.1	+30 14		2.9v	STAR G8 II + F0 V	Eta Peg	8 ST	Matar
*246	22 53.6	-15 50		3.3v	STAR A3 IV	Delta Aqr	8 ST	Skat
*247	22 57.7	-29 38		1.2v	STAR A3 V	Alpha PsA	8 ST	Fomalhaut
*248	23 03.8	+28 05		2.4v	STAR M2 II-III	Beta Peg	8 ST	Scheat
*249	23 04.8	+15 12		2.5v	STAR B9.5 V	Alpha Peg	8 ST	Markab

STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
*250	23 39.4	+77 38		3.2v	STAR K1 III-IV	Gamma Cep	8 ST	Alrai
*251	00 06.1	+58 26	15	6.4	STAR 6.4:7.2 @308	ADS 61	9 ST	1980=1.4 @287 107y
*252	00 40.0	+21 27	66	5.5	STAR 5.5:8.7 @194	ADS 558	9 ST	1964 Yellow:Blue
*253	00 42.4	+04 11	15	7.8	STAR 7.8:9.4 @207	ADS 588	9 ST	1980=1.5 @ 200
*254	00 49.9	+27 42	44	6.3	STAR 6.3:6.3 @296	ADS 683	9 ST	1959 p(Yellow:Blue)
*255	00 54.6	+19 11	5	6.2	STAR 6.2:6.9 @211	ADS 746	9 ST	1980=0.5 @ 224 400y
*256	00 55.0	+23 38	8	6.0	STAR 6.0:6.4 @292	ADS 755	9 ST	1980=0.6 @ 259
*257	01 05.7	+21 28	299	5.6	STAR 5.6:5.8 @159	ADS 899	9 ST	1964 Yellow:pBlue
*258	01 09.5	+47 15	5	4.6	STAR 4.6:5.5 @133	ADS 940	9 ST	1980=0.5 @ 140
*259	01 13.7	+07 35	230	5.6	STAR 5.6:6.6 @063	ADS 996	9 ST	1972 Yellow:pBlue
*260	01 39.8	-56 12	113	5.8	STAR 5.8:5.8 @193	p Eri	9 ST	1980=11.1 @195
*261	02 35.5	+89 35	178	2.0	STAR 2.0:8.9 @216	ADS 1477	9 ST	Polaris North Star
*262	01 53.6	+19 18	78	4.6	STAR 4.6:4.7 @000	ADS 1507	9 ST	1969 1831=8.6
*263	01 55.9	+01 51	10	6.8	STAR 6.8:6.8 @057	ADS 1538	9 ST	1980=1.2 @053
*264	01 57.9	+23 36	385	4.7	STAR 4.7:7.7 @047	ADS 1563	9 ST	1973 Yellow:Blue
*265	02 02.0	+02 46	16	4.2	STAR 4.2:5.2 @273	ADS 1615	9 ST	pBlue:pGreen
*266	02 03.9	+42 20	98	2.2	STAR 2.2:5.1 @063	ADS 1630	9 ST	1967 Orange:Emerald
*267	02 12.4	+30 18	39	5.3	STAR 5.3:6.9 @071	ADS 1697	9 ST	1959 Yellow:Blue
*268	02 14.0	+47 29	11	6.6	STAR 6.6:7.1 @274	ADS 1709	9 ST	1980=1.1 @266
*269	02 29.1	+67 25	25	4.6	STAR 4.6:6.9 @232	ADS 1860	9 ST	1980=2.4 @234
*270	02 37.0	+24 39	383	6.6	STAR 6.6:7.4 @276	ADS 1982	9 ST	1973 Yellow:pBlue
*271	02 43.3	+03 15	28	3.6	STAR 3.6:6.2 @297	ADS 2080	9 ST	1974 Yellow:Ashen
*272	03 14.1	+00 11	11	8.8	STAR 8.8:8.8 @139	ADS 2416	9 ST	1980=1.0 @144
*273	03 17.8	+38 38	8	7.8	STAR 7.8:8.3 @259	ADS 2446	9 ST	1980=0.9 @265
*274	03 35.0	+60 02	14	6.8	STAR 6.8:7.6 @261	ADS 2612	9 ST	1980=1.3 @258
*275	03 34.5	+24 28	7	6.6	STAR 6.6:6.7 @002	ADS 2616	9 ST	1980=0.6 @006
*276	03 50.3	+25 35	4	5.8	STAR 5.8:6.2 @211	ADS 2799	9 ST	1980=0.6 @207
*277	03 54.3	-02 57	67	4.7	STAR 4.7:6.2 @347	ADS 2850	9 ST	Fixed
*278	04 09.9	+80 42	7	5.5	STAR 5.5:6.3 @120	ADS 2963	9 ST	1980=0.8 @109
*279	04 07.5	+38 05	16	7.4	STAR 7.4:8.9 @353	ADS 2995	9 ST	1980=1.4 @003
*280	04 16.0	+31 42	7	8.0	STAR 8.0:8.1 @275	ADS 3082	9 ST	1980=0.8 @270
*281	04 20.4	+27 21	496	5.1	STAR 5.1:8.5 @496	ADS 3137	9 ST	1973 Yel/Ora:Blue
*282	04 22.8	+15 03	14	7.3	STAR 7.3:8.5 @352	ADS 3169	9 ST	Purple:Blue
*283	05 07.9	+08 30	7	5.8	STAR 5.8:6.5 @349	ADS 3711	9 ST	1980=0.7 @021
*284	05 14.5	-08 12	92	0.2	STAR 0.2:6.7 @206	ADS 3823	9 ST	Rigel
*285	05 35.2	+09 56	43	3.6	STAR 3.6:5.5 @044	ADS 4179	9 ST	1959 Yellow:Purple
*286	05 35.3	-05 23	132	5.1	STAR 5.4:6.8:6.8	ADS 4186	9 ST	Trapezium in M42
*287	06 28.8	-07 02	99	4.6	STAR 4.6:5.1:5.4	ADS 5107	9 ST	Fixed White Stars
*288	06 46.3	+59 27	17	5.4	STAR 5.4:6.0 @074	ADS 5400	9 ST	1980=1.7 @079
*289	06 45.3	-16 42	45	-1.5	STAR -1.5:8.5 @005	ADS 4523	9 ST	1980=10.3 @049
*290	07 12.8	+27 14	13	7.2	STAR 7.2:7.2 @316	ADS 5871	9 ST	1980=1.3 @320 120y
*291	07 30.3	+49 59	8	8.8	STAR 8.8:8.8 @195	ADS 6117	9 ST	1980=0.8 @189
*292	07 34.6	+31 53	30	1.9	STAR 1.9:2.9 @073	ADS 6175	9 ST	1980=2.2 @095 420y
*293	08 12.2	+17 39	6	5.6	STAR 5.6:6.0 @182	ADS 6650	9 ST	Yellow:Yellow:Blue
*294	09 21.1	+38 11	11	6.5	STAR 6.5:6.7 @271	ADS 7307	9 ST	1980=1.1 @254
*295	10 16.3	+17 44	14	7.2	STAR 7.2:7.5 @181	ADS 7704	9 ST	1980=1.4 @183
*296	10 20.0	+19 51	44	2.2	STAR 2.2:3.5 @124	ADS 7724	9 ST	1980=4.3 @123
*297	11 18.3	+31 32	13	4.3	STAR 4.3:4.8 @060	ADS 8119	9 ST	1980=2.9 @105
*298	11 32.4	+61 05	6	5.8	STAR 5.8:7.1 @295	ADS 8197	9 ST	1980=0.4 @211
*299	12 16.1	+40 39	115	5.9	STAR 5.9:9.0 @260	ADS 8489	9 ST	1925 Gold:Blue

STAR CATALOG

STAR#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
*300	12 24.4	+25 35	16	6.8	STAR 6.8:7.8 @325	ADS 8539	9 ST	1980=1.5 @326
*301	12 26.6	-63 06	47	1.6	STAR 1.6:2.1 @114	Alpha Cru	9 ST	1943 White:White
*302	12 35.1	+18 22	202	5.2	STAR 5.2:6.8 @271	ADS 8600	9 ST	1963 Yellow:vBlue
*303	12 41.7	-01 28	30	3.5	STAR 3.5:3.5 @287	ADS 8630	9 ST	1980=3.9 @297 White
*304	12 53.3	+21 15	8	5.1	STAR 5.1:7.2 @194	ADS 8695	9 ST	1980=0.8 @175
*305	13 23.9	+54 55	144	2.3	STAR 2.3:4.0 @151	ADS 8891	9 ST	1967
*306	13 49.1	+26 59	34	7.6	STAR 7.6:8.0 @167	ADS 9031	9 ST	1980=3.4 @159
*307	14 15.3	+03 08	12	7.8	STAR 7.8:7.9 @239	ADS 9182	9 ST	1980=1.1 @252
*308	14 20.4	+48 30	13	8.1	STAR 8.1:8.3 @105	ADS 9229	9 ST	1980=1.2 @104 White
*309	14 40.0	-60 51	197	0.0	STAR 0.0:1.2 @214	Alpha Cen	9 ST	1980=21.8 @209
*310	14 41.2	+13 44	10	4.5	STAR 4.5:4.6 @160	ADS 9343	9 ST	1980=1.1 @305 White
*311	14 45.0	+27 04	28	2.5	STAR 2.5:5.0 @339	ADS 9372	9 ST	1971 Orange:Green
*312	14 51.4	+19 06	70	4.7	STAR 4.7:6.9 @326	ADS 9413	9 ST	Orange:Blue
*313	14 51.4	+44 56	11	8.4	STAR 8.4:8.6 @348	ADS 9418	9 ST	1980=1.1 @346
*314	15 18.4	+26 50	15	7.3	STAR 7.3:7.4 @255	ADS 9578	9 ST	1980=1.4 @250
*315	15 23.2	+30 17	10	5.6	STAR 5.6:5.9 @027	ADS 9617	9 ST	1980=0.4 @321
*316	15 24.5	+37 20	22	7.0	STAR 7.0:7.6 @012	ADS 9626	9 ST	1980=2.2 @016
*317	15 34.8	+10 32	39	4.1	STAR 4.1:5.2 @179	ADS 9701	9 ST	1960 Yel-Whi:Ashen
*318	15 39.4	+36 38	63	5.1	STAR 5.1:6.0 @305	ADS 9737	9 ST	1957
*319	16 04.4	-11 22	7	4.9	STAR 4.9:4.9 @044	ADS 9909	9 ST	1980=1.2 @021
*320	16 14.7	+33 51	69	5.6	STAR 5.6:6.6 @235	ADS 9979	9 ST	1980=6.7 @233
*321	16 29.4	-26 26	24	0.9v	STAR 0.9:5.5 @276	ADS 10074	9 ST	Antares Red:pGreen
*322	16 28.9	+18 24	17	7.7	STAR 7.7:7.8 @129	ADS 10075	9 ST	1980=1.4 @136
*323	16 30.9	+01 59	15	4.2	STAR 4.2:5.2 @022	ADS 10087	9 ST	1980=1.3 @ 013
*324	16 56.5	+65 02	14	7.1	STAR 7.1:7.3 @069	ADS 10279	9 ST	1980=1.3 @069
*325	17 05.4	+54 28	19	5.7	STAR 5.7:5.7 @025	ADS 10345	9 ST	1980=1.9 @042
*326	17 15.4	-26 35	48	5.1	STAR 5.1:5.1 @151	ADS 10417	9 ST	Orange:Orange
*327	17 14.7	+14 24	47	3.2	STAR 3.2:5.4 @107	ADS 10418	9 ST	1968 Yellow:Blue
*328	17 23.7	+37 08	40	4.6	STAR 4.6:5.5 @316	ADS 10526	9 ST	1964
*329	18 01.5	+21 36	65	5.1	STAR 5.1:5.2 @258	ADS 10993	9 ST	1953 Yellow:pRed
*330	18 03.1	-08 11	18	5.2	STAR 5.2:5.9 @280	ADS 11005	9 ST	1980=1.9 @277
*331	18 05.3	+02 32	15	4.2	STAR 4.2:6.0 @220	ADS 11046	9 ST	Yel-Ora:Ora
*332	18 25.0	+27 24	7	6.5	STAR 6.5:7.5 @126	ADS 11334	9 ST	1980=0.7 @129
*333	18 35.8	+16 58	15	6.8	STAR 6.8:7.0 @155	ADS 11483	9 ST	1980=1.6 @161
*334	18 44.4	+39 40	26	5.0	STAR 5.0:6.1 @353	ADS 11635	9 ST	1980=2.7 @355 White
*335	18 44.4	+39 36	24	5.2	STAR 5.2:5.5 @080	ADS 11635	9 ST	1980=2.3 @084 White
*336	18 57.1	+32 54	10	5.4	STAR 5.4:7.5 @021	ADS 11871	9 ST	1980=1.1 @051
*337	19 06.4	-37 03	13	4.8	STAR 4.8:5.1 @109	Gamma CrA	9 ST	1980=1.5 @157
*338	19 26.5	+27 19	20	8.1	STAR 8.1:8.4 @292	ADS 12447	9 ST	1980=1.8 @293
*339	19 30.7	+27 58	344	3.2	STAR 3.2:5.4 @054	ADS 12540	9 ST	1967 Gold:Blue
*340	19 45.5	+33 37	24	8.3	STAR 8.3:8.4 @349	ADS 12889	9 ST	1980=2.0 @357
*341	20 21.0	-14 46	2050	3.1	STAR 3.1:6.2 @267	Beta Cap	9 ST	Yellow:Blue
*342	20 46.6	+16 08	98	4.3	STAR 4.3:5.2 @268	ADS 14279	9 ST	1967 Gold:Blue-Gre
*343	20 47.5	+36 29	9	4.9	STAR 4.9:6.1 @011	ADS 14296	9 ST	White:pBlue
*344	20 59.1	+04 18	10	6.0	STAR 6.0:6.3 @285	ADS 14499	9 ST	1980=1.1 @286
*345	21 02.3	+07 11	28	7.3	STAR 7.3:7.5 @217	ADS 14556	9 ST	1961
*346	21 06.7	+38 42	297	5.2	STAR 5.2:6.0 @148	ADS 14636	9 ST	1980=29.0 @146
*347	22 28.8	+00 15	19	4.3	STAR 4.3:4.5 @207	ADS 15971	9 ST	pYellow:pBlue
*348	22 28.2	+57 42	33	9.8	STAR 9.8:11.5 @132	ADS 15972	9 ST	1980=2.6 @176 Reds
*349	22 33.0	+69 55	4	6.5	STAR 6.5:7.0 @094	ADS 16057	9 ST	1980=0.5 @086
*350	23 34.0	+31 20	4	5.6	STAR 5.6:5.7 @280	ADS 16836	9 ST	1980=0.4 @267
*351	21 12.3	-88 58		5.5	STAR VAR 5.3-5.7 F0III	Sigma Oct	8 ST	S-Pole * Sigma Oct

b. M CATALOG

M#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
M 1	05 34.5	+22 01	360	8.4	PLAN NEB EMIS SN REM	CNGC 1952	B 4 ST	M1 Crab Nebula 4kly
M 2	21 33.5	-00 50	774	6.5v	GLOB CLUS sp=F4	CNGC 7089	C 2 ST	M2 40kly
M 3	13 42.3	+28 23	972	6.4v	GLOB CLUS sp=F7	CNGC 5272	B 2 ST	M3 35kly
M 4	16 23.7	-26 31	1578	5.9v	GLOB CLUS sp=G0	CNGC 6121	B 2 ST	M4 14kly
M 5	15 18.6	+02 05	1044	5.8v	GLOB CLUS sp=F6	CNGC 5904	B 2 ST	M5 26kly
M 6	17 40.1	-32 13	900	4.2v	OPEN CLUS sp=B4	CNGC 6405	C 1 ST	M6 1500ly
M 7	17 54.0	-34 49	4800	3.3v	OPEN CLUS sp=B5	CNGC 6475	C 1 ST	M7 800ly
M 8	18 03.2	-24 23	5400	5.2	OPEN CLUS + ENEB sp=O5	CNGC 6523	B 6 ST	M8 Lagoon Nebula 5100ly
M 9	17 19.2	-18 31	558	7.9v	GLOB CLUS	CNGC 6333	D 2 ST	M9
M 10	16 57.1	-04 07	906	6.6v	GLOB CLUS sp=G1	CNGC 6254	D 2 ST	M10 20kly
M 11	18 51.1	-06 16	840	5.8v	OPEN CLUS sp=B8	CNGC 6705	C 1 ST	M11 Very rich 5600ly
M 12	16 47.2	-01 57	870	6.6v	GLOB CLUS sp=F8	CNGC 6218	D 2 ST	M12 24kly
M 13	16 41.7	+36 27	996	5.9v	GLOB CLUS sp=F6	CNGC 6205	B 2 ST	M13 Hercules Globular
M 14	17 37.6	-03 17	702	7.6v	GLOB CLUS	CNGC 6402	D 2 ST	M14
M 15	21 30.0	+12 10	738	6.4v	GLOB CLUS sp=F2	CNGC 7078	C 2 ST	M15 X-Ray Source 34kly
M 16	18 18.8	-13 47	2100	6.0v	OPEN CLUS + ENEB sp=O7	CNGC 6611	D 6 ST	M16 Eagle Nebula 5500ly
M 17	18 20.8	-16 11	2760	6.0v	DIFF ENEB + OPEN CLUS HII	CNGC 6618	B 6 ST	M17 Omega/Swan/Horseshoe
M 18	18 20.0	-17 08	540	6.9v	OPEN CLUS	CNGC 6613	D 1 ST	M18
M 19	17 02.6	-26 15	810	7.2v	GLOB CLUS OBLATE	CNGC 6273	D 2 ST	M19 Oblate Shape Globular
M 20	18 02.3	-23 02	1740	6.3v	DIFF ENEB + OPEN CLUS HII	CNGC 6514	B 6 ST	M20 Trifid Nebula 3500ly
M 21	18 04.6	-22 30	780	5.9v	OPEN CLUS	CNGC 6531	D 1 ST	M21
M 22	18 36.3	-23 56	1440	5.1v	GLOB CLUS sp=F7	CNGC 6656	C 2 ST	M22 10kly
M 23	17 57.0	-19 01	1620	5.5v	OPEN CLUS sp=B8	CNGC 6494	D 1 ST	M23 1400ly
M 24	18 20.0	-18 26	4800	4.7	OPEN CLUS	CNGC 6630	c 1 T	M24 Best with large field
M 25	18 33.5	-19 14	2400	6.5	OPEN CLUS SPARSE	CNGC 6634	c 1	M25 IC 4725 Sparse Cluster
M 26	18 45.4	-09 24	900	8.0v	OPEN CLUS	CNGC 6694	D 1 ST	M26
M 27	19 59.6	+22 43	910	7.6p	PLAN NEB	CNGC 6853	B 4 ST	M27 Dumbbell Nebula 3500ly
M 28	18 24.6	-24 52	672	6.9v	GLOB CLUS	CNGC 6626	D 2 ST	M28
M 29	20 23.9	+38 32	420	6.6v	OPEN CLUS	CNGC 6913	D 1 ST	M29
M 30	21 40.3	-23 11	660	7.5v	GLOB CLUS	CNGC 7099	D 2 S	M30
M 31	00 42.8	+41 17	10680	3.5	GALAXY Sb I-II	UGC 454	B 5 ST	M31 Andromeda Gal 178x63
M 32	00 42.8	+40 53	456	8.2	GALAXY E2	UGC 452	C 5 ST	M32 Comp of M31 7.6x5.8
M 33	01 33.9	+30 40	3720	5.7	GALAXY Sc II-III	UGC 1117	C 5 ST	M33 Triangulum Gal 62x39
M 34	02 42.0	+42 47	2100	5.2v	OPEN CLUS	CNGC 1039	C 1 ST	M34
M 35	06 08.9	+24 21	1680	5.1v	OPEN CLUS sp=B5	CNGC 2168	C 1 ST	M35 2800ly
M 36	05 36.2	+34 08	720	6.0v	OPEN CLUS	CNGC 1960	C 1 ST	M36
M 37	05 52.4	+32 33	1440	5.6v	OPEN CLUS sp=B8	CNGC 2099	C 1 ST	M37 4200ly
M 38	05 28.7	+35 51	1260	6.4v	OPEN CLUS sp=B5	CNGC 1912	C 1 ST	M38 4600ly
M 39	21 32.2	+48 26	1920	4.6v	OPEN CLUS	CNGC 7092	D 1 ST	M39
M 40	12 36.4	+25 59	972	9.6	GALAXY Sb I: + 3-SYS FNT	UGC 7772	B A ST	M40 16.2x2.8 Edge-On Lane
M 41	06 47.1	-20 45	2280	4.5v	OPEN CLUS sp=B4	CNGC 2287	C 1 ST	M41 2200ly
M 42	05 35.3	-05 23	3960	3.9	DIFF RNEB + ENEB	CNGC 1976	A 3 ST	M42 Orion Nebula Blue+Red
M 43	05 35.5	-05 16	1200	5.8	DIFF RNEB + ENEB	CNGC 1982	C 3 ST	M43 Orion Nebula Extension
M 44	08 40.1	+19 59	5700	3.1v	OPEN CLUS sp=A0	CNGC 2632	C 1 ST	M44 Praesepe/Beehive 590ly
M 45	03 47.1	+24 07	7200	1.6	OPEN CLUS + RNEB sp=B6	CNGC 1457	c 6 ST	M45 Pleiades 410ly
M 46	07 41.9	-14 49	1620	6.1v	OPEN CLUS sp=B8	CNGC 2437	C 1 ST	M46 5400ly (+CNGC 2438 PN)
M 47	07 36.6	-14 29	1800	4.4v	OPEN CLUS sp=B3	CNGC 2422	D 1 ST	M47 1600ly
M 48	08 13.7	-05 47	3240	5.8v	OPEN CLUS	CNGC 2548	D 1 ST	M48
M 49	12 29.8	+08 00	534	8.4	GALAXY E4	UGC 7629	C 5 ST	M49 8.9x7.4
M 50	07 02.9	-08 20	960	5.9v	OPEN CLUS	CNGC 2323	D 1 ST	M50
M 51	13 30.0	+47 11	660	8.4	GALAXY Sc I 2-SYS FACE	UGC 8493	B A ST	M51 11.0x7.8 Whirlpool Gal
M 52	23 24.2	+61 36	780	6.9v	OPEN CLUS	CNGC 7654	D 1 ST	M52
M 53	13 13.0	+18 10	756	7.7v	GLOB CLUS	CNGC 5024	D 2 ST	M53
M 54	18 55.2	-30 28	546	7.7v	GLOB CLUS	CNGC 6715	D 2 ST	M54

M CATALOG

M#	RA	DEC	SIZE	MAG	TYPE & DESCRIPTION	ALT NAME	Q TAGS	COMMON NAME/COMMENTS
M 55	19 40.1	-30 56	1140	7.0	GLOB CLUS sp=F5	CNGC 6809	D 2 ST	M55 20kly
M 56	19 16.6	+30 10	426	8.3v	GLOB CLUS	CNGC 6779	D 2 ST	M56
M 57	18 53.5	+33 02	150	9.7p	PLAN NEB RING-LIKE	CNGC 6720	B 4 ST	M57 Ring Nebula 5kly
M 58	12 37.8	+11 49	324	9.8	GALAXY Sb	UGC 7796	C 5 ST	M58 5.4x4.4 Near CNGC 4621
M 59	12 42.1	+11 38	306	9.8	GALAXY E3	UGC 7858	D 5 ST	M59 5.1x3.4 Near CNGC 4579
M 60	12 43.7	+11 33	432	8.8	GALAXY E1	UGC 7898	D 5 ST	M60 7.2x6.2 Near CNGC 4621
M 61	12 22.0	+04 28	360	9.7	GALAXY Sc I 2-SYS	UGC 7420	D A ST	M61 6.0x5.5 Face-On
M 62	17 01.3	-30 07	846	6.6v	GLOB CLUS OBLATE	CNGC 6266	D 2 ST	M62 Non-symmetrical
M 63	13 15.8	+42 02	738	8.6	GALAXY Sb+ II	UGC 8334	C 5 ST	M63 12.3x7.6 Sunflower Gal
M 64	12 56.7	+21 41	558	8.5	GALAXY Sb-	UGC 8062	C 5 ST	M64 9.3x5.4 Black Eye Gal
M 65	11 18.9	+13 05	600	9.3	GALAXY Sb II:	UGC 6328	C 5 ST	M65 10.0x3.3 Near M66
M 66	11 20.2	+12 59	522	9.0	GALAXY Sb+ II:	UGC 6346	C 5 ST	M66 8.7x4.4 Near M65
M 67	08 51.1	+11 49	1800	6.9v	OPEN CLUS sp=F2	CNGC 2682	D 1 ST	M67 Very old 2700ly
M 68	12 39.4	-26 46	720	8.2v	GLOB CLUS	CNGC 4590	D 2 ST	M68
M 69	18 31.4	-32 21	426	7.7v	GLOB CLUS	CNGC 6637	D 2 ST	M69
M 70	18 43.2	-32 18	468	8.1v	GLOB CLUS	CNGC 6681	D 2 ST	M70
M 71	19 53.7	+18 47	432	8.3v	GLOB CLUS	CNGC 6838	D 2 ST	M71
M 72	20 53.5	-12 33	354	9.4v	GLOB CLUS	CNGC 6981	D 2 ST	M72
M 73	20 59.0	-12 37	168	8.9p	OPEN CLUS	CNGC 6994	D 1 ST	M73
M 74	01 36.7	+15 47	612	9.2	GALAXY Sc I	UGC 1149	D 5 ST	M74 10.2x9.5
M 75	20 06.2	-21 55	360	8.6v	GLOB CLUS	CNGC 6864	D 2 ST	M75
M 76	01 42.0	+51 34	290	12.2	PLAN NEB PART OF 0651	CNGC 0650	C 4 ST	M76 Little Dumbbell Nebula
M 77	02 42.7	-00 01	414	8.8	GALAXY Sbp SEYFERT	UGC 2188	D 5 ST	M77 6.9x5.9 Seyfert Galaxy
M 78	05 46.8	+00 03	480	11.3	DIFF RNEB	CNGC 2068	C 3 ST	M78 Blue 1500ly
M 79	05 24.2	-24 31	522	8.0v	GLOB CLUS	CNGC 1904	D 2 ST	M79
M 80	16 17.1	-23 00	534	7.2v	GLOB CLUS	CNGC 6093	D 2 ST	M80
M 81	09 55.7	+69 04	1542	6.9	GALAXY Sb I-II	CNGC 3031	C 5 ST	M81 25.7x14.1 Near M82
M 82	09 55.9	+69 41	672	8.4	GALAXY P EDGE-ON	UGC 5322	C 5 ST	M82 11.2x4.6 Exploding
M 83	13 37.1	-29 51	672	8.2	GALAXY Sc I-II FACE-ON	CNGC 5236	B 5 ST	M83 11.2x10.2
M 84	12 25.1	+12 53	300	9.3	GALAXY E1	UGC 7494	C 5 ST	M84 5.0x4.4 Near M86
M 85	12 25.5	+18 11	426	9.2	GALAXY Ep 2-SYS	UGC 7508	C A ST	M85 7.1x5.2
M 86	12 26.3	+12 56	444	9.2	GALAXY E3	UGC 7532	C 5 ST	M86 7.4x5.5
M 87	12 30.9	+12 23	432	8.6	GALAXY E1 + E0 2-SYS	UGC 7654	D A ST	M87 7.2x6.8 + CNGC 4471
M 88	12 32.1	+14 25	414	9.5	GALAXY Sb+ I MULTI-ARM	UGC 7675	D 5 ST	M88 6.9x3.9
M 89	12 35.7	+12 33	252	9.8	GALAXY E0	UGC 7760	D 5 ST	M89 4.2x4.2
M 90	12 36.9	+13 09	570	9.5	GALAXY Sb+	UGC 7786	C 5 ST	M90 9.5x4.7
M 91	12 35.5	+14 29	324	10.2	GALAXY SBb + Sc 2-SYS	UGC 7753	D A ST	M91 5.4x4.4 Near CNGC 4571
M 92	17 17.2	+43 09	672	6.5v	GLOB CLUS sp=F1	CNGC 6341	D 2 ST	M92 X-Ray Source 26kly
M 93	07 44.6	-23 52	1320	6.2v	OPEN CLUS + DNEB	CNGC 2447	D 6 ST	M93 Includes dark nebula
M 94	12 50.9	+41 08	660	8.2	GALAXY Sb-p II:	UGC 7996	C 5 ST	M94 11.0x9.1
M 95	10 43.9	+11 42	444	9.7	GALAXY S(B)b II	UGC 5850	C 5 ST	M95 7.4x5.1 Near M96
M 96	10 46.7	+11 49	426	9.2	GALAXY Sbp	UGC 5882	C 5 ST	M96 7.1x5.1 Near M95
M 97	11 14.8	+55 02	194	12.0p	PLAN NEB	CNGC 3587	C 4 ST	M97 Owl Nebula 12kly
M 98	12 13.9	+14 54	570	10.1	GALAXY Sb I-II: 3-SYS	UGC 7231	D A ST	M98 9.5x3.2
M 99	12 18.9	+14 25	324	9.8	GALAXY Sc I NEAR FACE-ON	UGC 7345	D 5 ST	M99 5.4x4.8
M100	12 23.0	+15 49	414	9.4	GALAXY Sc I FACE-ON	UGC 7450	D 5 ST	M100 6.9x6.2 Brite Nucleus
M101	14 03.3	+54 21	1614	7.7	GALAXY Sc I FACE-ON	UGC 8981	C 5 S	M101 26.9x26.3 Pinwheel
M102	15 06.5	+55 45	312	10.0	GALAXY E6p 2-SYS	UGC 9723	D A ST	M102 5.2x2.3
M103	01 33.3	+60 43	360	7.4v	OPEN CLUS	CNGC 0581	D 1 ST	M103
M104	12 39.9	-11 38	534	8.3	GALAXY Sb-	CNGC 4594	C 5 ST	M104 8.9x4.1 “Sombrero”
M105	10 47.8	+12 35	270	9.3	GALAXY E1 2-SYS	UGC 5902	C A ST	M105 4.5x4.0
M106	12 19.0	+47 18	1092	8.3	GALAXY Sb+p	UGC 7353	C 5 ST	M106 18.2x7.9
M107	16 32.5	-13 02	600	8.1v	GLOB CLUS	CNGC 6171	D 2 ST	M107
M108	11 11.6	+55 41	498	10.1	GALAXY Sc NEAR EDGE-ON	UGC 6225	C 5 ST	M108 8.3x2.5 Near M97
M109	11 57.6	+53 22	456	9.8	GALAXY S(B)b+ I	UGC 6937	D 5 ST	M109 7.6x4.9
M110	00 40.4	+41 42	1044	8.0	GALAXY E6:	UGC 426	C 5 ST	M110 Comp of M31 17.4x9.8

APPENDIX D: PERSONAL COMPUTER (PC) CONTROL OF THE #1697 CDS

Remote operation of a computerized telescope has only been a fanciful dream for most amateur astronomers. The realization of fully controlling a telescope through a personal computer has previously been a staggering proposition involving high monetary cost and expert knowledge of software and hardware.

To realize this dream, the Meade #1697 Computer Drive System's internal software supports a RS-232 interface, allowing observers to utilize a PC and software such as Meade EPOCH 2000sk (see Optional Accessories, page, 18), other after-market software, or a user's own custom software to control a compatible telescope.

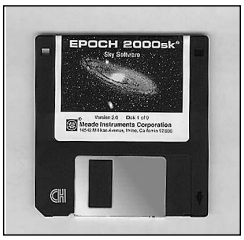


Fig. 14: EPOCH 2000sk.

The following sections are devoted to those interested in developing their own software to remotely control every feature of the CDS.

An RS-232 cable is required for serial communication between the CDS and a PC. It is possible to either purchase an RS-232 cable from your local Meade dealer, or construct your own cable. Following is a schematic for constructing your own RS-232 cable, a program to test the RS-232 communication line called CDS TEST, the CDS Command Set, and CDS DEMO, which is a program that you can enter into your computer to access the Object Library, slew to the object, and center the image. The CDS TEST and CDS DEMO programs require a serial communication program, such as Procomm*, to communicate with a PC.

1. RS-232 Cable

The input hardware uses a standard 6 line telephone jack connector, preattached to a 6 conductor flat line telephone style cable (of any length, up to 100' and perhaps even more, depending on the gauge of the cable). You will also need either a 9-pin or 25-pin RS-232 connector, whichever your computer uses for the serial port. All of the above items are available at most electronics hardware stores.

Fig. 15 shows the CDS pinouts for the 6 line telephone connector. The table below shows standard IBM compatible DB-9 and DB-25 serial port pin outs, and how they should be connected to the CDS 6 line modular connector. Note: Only 3 wires are required.

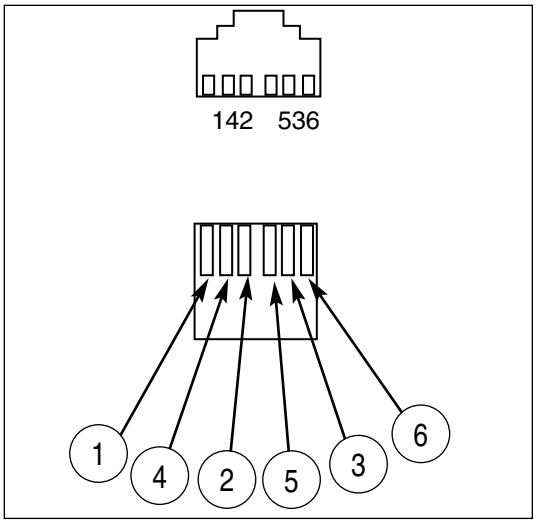


Fig. 15: CDS Modular Connector

RS-232 CONNECTOR PIN OUT CODE LEGEND			
6 WIRE MODULAR CONNECTOR	DESCRIPTION	**TO DB-9 CONNECTOR PIN#****	**TO DB-25 CONNECTOR PIN#****
#1	+12 VOLTS DC	NOT USED	NOT USED
#2	MISC. SERIAL OUT	NOT USED	NOT USED
#3	PC TRANSMIT DATA	#3	#2
#4	GROUND	#5	#7
#5	PC RECEIVE DATA	#2	#3
#6	MISC. SERIAL IN	NOT USED	NOT USED

* Procomm is a product of Datastorm Industries.

** The DB-9 and DB-25 serial port pin out numbering code is representative of a widely used standard format. Consult your computer's instruction manual for your computer's format.

2. CDS Test Program

Once you have the RS-232 cable constructed, you will want to test the cable. Below is a simple program called "CDS TEST" that is written in GW Basic programming language and will work with virtually any IBM compatible computer. CDS Test is an effective program to fully check the RS-232 line communications from your personal computer to the CDS, allowing you to concentrate on de-bugging your RS-232 cable.

To enter the following program, first load BASIC or GWBASIC (which ever your computer system uses), then type in the following program. When complete, be sure to save the program as “CDSTST.BAS.”

```
10  CLS
20  DEFINT A-X
30  OPEN "COM1:9600,N,8,1,CD0,CS0,DS0,RS," FOR RANDOM AS #1
50  key1$ = INKEY$: IF key1$ = "" THEN GOTO 50
60  REM KEY1S
70 IF key1$ = CHR$(119) THEN GOSUB 200: REM "w" key
80 IF key1$ = CHR$(101) THEN GOSUB 200: REM "e" key
90 IF key1$ = CHR$(110) THEN GOSUB 200: REM "n" key
100 IF key1$ = CHR$(115) THEN GOSUB 200: REM "s" key
105 IF key1$ = "x" THEN END: REM To exit test.
110 GOTO 50
120 END
200 REM directions
210 REM west
220   IF key1$ = "w" THEN a$ = "#:Mw#": PRINT #1, a$: REM GO west
230 REM east
240   IF key1$ = "e" THEN a$ = "#:Me#": PRINT #1, a$: REM GO east
250 REM north
260   IF key1$ = "n" THEN a$ = "#:Mn#": PRINT #1, a$: REM GO north
270 REM south:
280   IF key1$ = "s" THEN a$ = "#:Ms#": PRINT #1, a$: REM GO south
290 key1$ = INKEY$:
300 IF key1$ = CHR$(32) THEN GOTO 400 ELSE GOTO 200
400 REM  This stops motion (by hitting SPACE bar).
410 B$ = "#:Qe#": PRINT #1, B$
420 B$ = "#:Qw#": PRINT #1, B$
430 B$ = "#:Qn#": PRINT #1, B$
440 B$ = "#:Qs#": PRINT #1, B$
450 RETURN
460 END
```

To use the above program, connect the completed cable to your PC serial port and to the CDS RS-232 Port. Load BASIC (or GWBASIC), if not already loaded, and run “CDSTST.BAS.” Nothing will appear on the computer screen. Press any one of the N, S, E, or W (lower case) keys on your PC keyboard, this will move the LXD mount North, South, East, or West respectively. Press the space bar on the PC keyboard to stop. Press X to exit the program.

If the LXD mount does not respond to the N, S, E, or W keys, be sure the CAPSLOCK is OFF. If it still does not work, check the PC serial port pinouts for your computer to be sure they are wired correctly to the CDS 6 line connector.

With a successful check-out of the PC link with the CDS using “TEST”, you are now ready to write your own software program using the CDS Command Set, or to use the sample program called “DEMO” that is written in Quick Basic software language.

3. CDS Command Set

Intended for professional programmers, the CDS Command Set is used to write custom software for remote operation of the telescope with a PC. Each command is listed in a section appropriate to its type. Each entry in the command list includes the command name, any parameters, any return values, and a description. The parameters and the return data are shown in a manner that indicates their format. These formats are listed below along with examples of how the data might really appear, the legal range of values, and a short description. Below is a detailed description:

a. Command Set Formats

HH:MM.T Example: 05:47.4
Range: 00:00.0 - 23:59.9
Hours, minutes, and tenths of minutes.

sDD*MM Example: +45*59
Range: -90*00 - +90*00
Signed degrees and minutes (the '*' represents ASCII 223 which appears on the handbox as a degree symbol).

DDD*MM Example: 254*09
Range: 000*00 - 359*59
Unsigned degrees and minutes.

HH:MM:SS Example: 13:15:36
Range: 00:00:00 - 23:59:59
Hours, minutes, and seconds.

MM/DD/YY Example: 02/06/92
Range: 01/01/00 - 12/31/99 (see description)
Month, day, and year.
The two digit year indicates the following: 92 through 99 = 1992 through 1999
00 through 91 = 2000 through 2091

sHH Example: -5
Range: -24 - +24
Signed hour offset.

NNNN Example: 3456
Range: 0000 - 9999
Four digit object number.

sMM.M Example: -02.4
Range: -05.5 - 20.0
Signed magnitude value.

NNN Example: 134
Range: 000 - 200
Three digit object size (minutes).

DD* Example: 56*
Range: 00* - 90*
Higher' parameter (degrees).

TT.T Example: 59.2
Range: 56.4 - 60.1
Tracking 'frequency'. info

Example: CNGC1976 SU DNEB MAG 3.9 SZ 66.0'
Range: n/a
Object information.

Ok Example: 1
Range: 0 or 1
Status value returned after setting values.
If the value is legal 1 is returned, otherwise 0 is returned.

b. General Telescope Information

Command ACK (ASCII 6)
Returns A, L, P, or G
Gets alignment status, A for alt-az, L for land, P for polar, G for German mount polar.

Command :GR#
Returns +HH:MM.T#
Gets the current Right Ascension.

Command :GD#
Returns sDD*MM#
Gets the current declination.

Command :GA#
Returns sDD*MM#
Gets the current altitude.

Command :GZ#
Returns DDD*MM#
Gets the current azimuth.

Command :GS#
Returns HH:MM:SS#
Gets the current sidereal time.

Command :SS HH:MM:SS#
Returns Ok
Sets the sidereal time.

Command :GL# :Ga#
Returns HH:MM:SS#
Gets the local time either in 24 hour (GL) or 12 hour (Ga) format.

Command :SL HH:MM:SS#
Returns Ok
Sets the local time.
NOTE: The parameter should always be in 24 hour format.

Command :GC#
Returns MM/DD/YY#
Gets the calendar date.

Command :SC MM/DD/YY#
Returns Ok (see description)
Sets the calendar date.
NOTE: After the Ok, if the date is valid, two strings will be sent. The first will contain the message "Updating planetary data," the second (sent after the planetary calculations) will contain only blanks. Both strings will be terminated by the '#' symbol.

Command :Gt#
Returns sDD*MM#
Gets the latitude of the currently selected site.

Command :St sDD*MM#
Returns Ok
Sets the latitude of the currently selected site.

Command :Gg#
Returns DDD*MM#
Gets the longitude of the currently selected site.

Command :Sg DDD*MM#
Returns Ok
Sets the longitude of the currently selected site.

Command :GG#
Returns sHH#
Gets the offset from Greenwich Mean Time.

Command :SG sHH#
Returns Ok
Sets the offset from Greenwich Mean Time.

Command :W1# :W2# :W3# :W4#
Returns Nothing
Sets the current site number.

c. Telescope Motion

Command :Mn# :Ms# :Me# :Mw#
Returns Nothing
Starts motion in the specified direction at the current rate.

Command :MS#
Returns 0, 1, 2, or 3 (see description)
Slews telescope to current object coordinates. 0 is returned if the telescope can complete the slew, 1 is returned if the object is below the horizon, and 2 is returned if the object is below the 'higher' limit. If 1 or 2 is returned, a string containing an appropriate message is also returned. If 3 is returned, the telescope can hit the tripod.

Command :Qn# :Qs# :Qe# :Qw#
Returns Nothing
Stops motion in the specified direction. Also stops the telescope if a slew to object is in progress.

Command :Q#
Returns Nothing
Stops a slew to an object.

Command :RG# :RC# :RM# :RS#
Returns Nothing
Sets the motion rate to guide (RG), center (RC), find (RM), or slew (RS).

d. Library/Objects

Command :Gr#
Returns HH:MM.T#
Gets object Right Ascension.

Command :Sr HH:MM.T#
Returns Ok
Sets object Right Ascension.

Command :Gd#
Returns sDD*MM#
Gets object Declination.

Command :Sd sDD*MM#
Returns Ok
Sets object Declination.

Command :CM#
Returns (see description)
Sync. Matches current telescope coordinates to the object coordinates and sends a string indicating which object's coordinates were used.

Command :Gy#
Returns GPDCO#
Gets the 'type' string for the FIND operation. A capital letter means that the corresponding type is selected while a lower case letter indicates it is not.

Command :Sy GPDCO#
Returns Ok
Sets the 'type' string for the FIND operation.

Command :Gq#
Returns SU#, EX#, VG#, GD#, FR#, PR#, or VP#
Gets the current minimum quality for the FIND operation

Command :Sq#
Returns Nothing
Steps to the next minimum quality for the FIND operation.

Command :Gh#
Returns DD*#
Gets the current 'higher' limit.

Command :Sh DD#
Returns Ok
Sets the current 'higher' limit.

Command :Gb# :Gf#
Returns sMM.M#
Gets the brighter (Gb) or fainter (Gf) magnitude limit for the FIND operation.

Command :Sb sMM.M# :Sf sMM.M#
Returns Ok
Sets the brighter (Gb) or fainter (Gf) magnitude limit for the FIND operation.

Command :Gl# :Gs#
Returns NNN'#
Gets the larger (Gl) or smaller (Gs) size limit for the FIND operation.

Command :Sl NNN# :Ss NNN#
Returns Ok
Sets the larger (Gl) or smaller (Gs) size limit for the FIND operation.

Command :GF#
Returns NNN'#
Gets the field radius of the FIELD operation.

Command :SF NNN#
Returns Ok
Sets the field radius of the FIELD operation.

Command :LF#
Returns Nothing
Starts a FIND operation.

Command :LN#
Returns Nothing
Finds the next object in a FIND sequence.

Command :LB#
Returns Nothing
Finds the previous object in a FIND sequence.

Command :Lf#
Returns (see description)
Performs a FIELD operation returning a string containing the number of objects in the field and the object that is closest to the center of the field.

Command :LC NNNN# :LM NNNN# :LS NNNN#
Returns Nothing
Sets the object to the CNGC (LC), Messier (LM), or Star (LS) specified by the number. Planets are 'stars' 901-909.

Command :LI#
Returns Object Information
Gets the current object information.

e. Miscellaneous

Command :B+# :B-# :B0# :B1# :B2# :B3#
Returns Nothing
Increases (B+) or decreases (B-) reticle brightness, or sets to one of the flashing modes (B0, B1, B2, or B3).

Command :F+# :F-# :FQ# :FF# :FS#
Returns Nothing
Starts focus out (F+), starts focus in (F-), stops focus change (FQ), sets focus fast (FF), or

Command :GM# :GN# :GO# :GP#
Returns XYZ#
Gets site name (XYZ). M through P correspond to 1 through 4.

Command :SM XYZ# :SN XYZ# :SO XYZ# :SP XYZ#
Returns Ok
Sets site name.

Command :GT#
Returns TT.T#
Gets the current track 'frequency'.

Command :ST TT.T#
Returns Ok
Sets the current track 'frequency'.

Command :TM# :TQ# :T+# :T-#
Returns Nothing
Switch to manual (TM) or quartz (TM). Increment (T+) or decrement (T-) manual frequency by one tenth.

Command :Gc#
Returns (12) or (24)
Get 12/24 hour status of clock.

Command :H#
Returns Nothing
Toggle 12/24 hour mode.

Command :P#

Returns“HIGH PRECISION” when ON
“LOW PRECISION” when OFF

Toggles the High Precision Mode ON or OFF.

Command :U#
Returns Nothing

Toggles the long format ON or OFF.

When the long format is active, whenever a request to send or receive position data, the following format is used:

HH:MM:SS
Example: 05:47:45
Range: 00:00.0 - 23:59:59
Hours, minutes, and seconds.

sDD*MM:SS
Example: +45*59:45
Range: -90*00 - +90*00
Signed degrees, minutes, and seconds (the '*' represents ASCII 223 which appears on the handbox as a degree symbol).

DDD*MM:SS
Example: 254*09:45
Range: 000*00 - 359*59:59
Unsigned degrees, minutes, and seconds.

Command :Lo N#
Returns Ok

Sets the NGC object library type. 0 is the NGC library, 1 is the IC library, and 2 is the UGC library. This operation is successful only if the user has a version of the software that includes the desired library.

Command :Ls N#
Returns Ok

Sets the STAR object library type. 0 is the STAR library, 1 is the SAO library, and 2 is the GCVS library. This operation is successful only if the user has a version of the software that includes the desired library.

f. Keypad Hand Controller Specific

Command:D#
Returns (see description)
Gets the distance 'bars' string.

Command: $Q (1-5)#
Returns Nothing
Toggles Smart Drive status.

Command: ?#
Command : ?+#
Command: ?-#
Returns Page of Help Information
Starts (??) or moves through (?+ or ?-) Help.

Command: G0#
Command: G1#
Command: G2#
Returns Alignment Menu Entry
Used to implement alignment menu.

4. CDS Demo Program

The RS-232 interface communicates with your computer at 9600 Baud Rate, Parity = None, 8 Data Bits, 1 Stop Bits. For those who are familiar with programming, the CDS Command Set is written in ASCII character format and can be used to write your own programs.

The CDS Demo Program is written in Quick Basic and is intended to demonstrate how commands can be sent to the telescope and information received from the telescope. It is not a "polished" program and does not incorporate all of the RS-232 features available.

The program is set-up to operate on serial port 2 (COM2:). To operate on serial port 1 (COM1:) line 4 should be changed from "COM2:" to "COM1:". The program is as follows:

Please note that Meade Instruments does not support these programs, or programs that you may write in any way. For questions relating to after-market software programs, refer back to those manufacturers.

```
CLS
DEFINT A-X
counter = 0
OPEN "COM1:9600,N,8,1,CD0,CS0,DS0,OP0,RS,TB2048,RB2048" FOR RANDOM AS #1 hourform$ = "low "
KEY ON
KEY(1) ON
         KEY 1, "GO TO":
         ON KEY(1) GOSUB key1
KEY(2) ON
          KEY 2, " SYNC"
          ON KEY(2) GOSUB KEY2
KEY(3) ON
          KEY 3, " SLEW"
          ON KEY(3) GOSUB key3
KEY(4) ON
          KEY 4, " FIND"
          ON KEY(4) GOSUB KEY4
KEY(5) ON
          KEY 5, " CNTR"
          ON KEY(5) GOSUB KEY5
KEY(6) ON
          KEY 6, "GUIDE"
          ON KEY(6) GOSUB KEY6
KEY(7) ON
          KEY 7, " H.P."
          ON KEY(7) GOSUB key7
KEY(8) ON
          KEY 8, "FORMAT"
          ON KEY(8) GOSUB key8
KEY(9) ON
          KEY 9, " PREV"
          ON KEY(9) GOSUB key9
KEY(10) ON
          KEY 10, " NEXT"
          ON KEY(10) GOSUB key10
KEY(11) ON
       ON KEY(11) GOSUB key11
KEY(12) ON
       ON KEY(12) GOSUB key12
KEY(13) ON
       ON KEY(13) GOSUB key13
KEY(14) ON
       ON KEY(14) GOSUB key14

   GOSUB statis
   GOSUB key3: REM puts maker over key3
   GOSUB help
20 GOSUB telpos
        PRINT #1, "#:LI#": info$ = INPUT$(33, 1): REM LOCATE 10, 20: PRINT info$;
   GOSUB obdraw
   GOSUB TIME
50 key$ = INKEY$: IF key$ = "" THEN GOTO 20

REM KEYS
     IF key$ = CHR$(119) THEN GOSUB senddir: REM  a$ = "#:Mw#"
     IF key$ = CHR$(101) THEN GOSUB senddir: REM  a$ = "#:Me#"
     IF key$ = CHR$(110) THEN GOSUB senddir: REM  a$ = "#:Mn#"
     IF key$ = CHR$(115) THEN GOSUB senddir: REM  a$ = "#:Ms#"
     IF key$ = "m" THEN GOSUB objects
     IF key$ = "t" THEN GOSUB objects
     IF key$ = "c" THEN GOSUB objects
     IF key$ = "p" THEN GOSUB objects
     IF key$ = "q" THEN GOSUB objects
     IF key$ = "x" THEN CLS : END
     IF key$ = "r" THEN RUN

GOTO 20

END
```

```
senddir:
west:
        IF key$ = "w" THEN a$ = "#:Mw#": PRINT #1, a$: REM GOTO west
east:
        IF key$ = "e" THEN a$ = "#:Me#": PRINT #1, a$: REM GOTO east
north:
        IF key$ = "n" THEN a$ = "#:Mn#": PRINT #1, a$: REM GOTO north
south:
        IF key$ = "s" THEN a$ = "#:Ms#": PRINT #1, a$: REM GOTO south
        GOSUB telpos
        key$ = INKEY$:
        IF key$ = CHR$(32) THEN GOTO end1 ELSE GOTO senddir
end1:
    B$ = "#:Qe#": PRINT #1, B$
    B$ = "#:Qw#": PRINT #1, B$
    B$ = "#:Qn#": PRINT #1, B$
    B$ = "#:Qs#": PRINT #1, B$
       RETURN

telpos:

        LOCATE 6, 7: PRINT "TELESCOPE POSITION";
        c$ = "#:GR#": PRINT #1, c$;
                IF hourform$ = "high" THEN d$ = INPUT$(9, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 4, 2): RAR$ = MID$(d$, 7, 2): LOCATE 7, 10: PRINT USING "RA :
                \\:\\:\ \"; RAL$; RAM$; RAR$;
                IF hourform$ = "low " THEN d$ = INPUT$(8, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 4, 4): LOCATE 7, 10: PRINT USING "RA : \\:\  \      "; RAL$; RAM$;

        c$ = "#:GD#": PRINT #1, c$;
                IF hourform$ = "high" THEN d$ = INPUT$(10, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 5, 2): RAR$ = MID$(d$, 8, 2): LOCATE 8, 10: PRINT "DEC: "; RAL$;
                CHR$(248); RAM$; "'"; RAR$; CHR$(34);
                IF hourform$ = "low " THEN d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 5, 2): LOCATE 8, 10: PRINT "DEC: "; RAL$; CHR$(248); RAM$; "'
                ";

        c$ = "#:GA#": PRINT #1, c$;
                IF hourform$ = "high" THEN d$ = INPUT$(10, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 5, 2): RAR$ = MID$(d$, 8, 2): LOCATE 9, 10: PRINT "ALT: "; RAL$;
                CHR$(248); RAM$; "'"; RAR$; CHR$(34);
                IF hourform$ = "low " THEN d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 5, 2): LOCATE 9, 10: PRINT "ALT: "; RAL$; CHR$(248); RAM$; "'
                ";

        c$ = "#:GZ#": PRINT #1, c$;
                IF hourform$ = "high" THEN d$ = INPUT$(10, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 5, 2): RAR$ = MID$(d$, 8, 2): LOCATE 10, 10: PRINT "AZ : "; RAL$;
                CHR$(248); RAM$; "'"; RAR$; CHR$(34);
                IF hourform$ = "low " THEN d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                MID$(d$, 5, 2): LOCATE 10, 10: PRINT "AZ : "; RAL$; CHR$(248); RAM$; "'
                ";

    RETURN
TIME:
        LOCATE 1, 32: PRINT "DATE"; : LOCATE 1, 64: PRINT "TIME";
        c$ = "#:GS#": PRINT #1, c$; : d$ = INPUT$(9, 1): RAL$ = LEFT$(d$, 2): RAM$ = MID$(d$,
           4, 2):  RAR$ = MID$(d$, 7, 2): LOCATE 3, 55: PRINT USING "Siderial Time:
           \\:\\:\\"; RAL$; RAM$; RAR$;
        c$ = "#:GL#": PRINT #1, c$; : d$ = INPUT$(9, 1): RAL$ = LEFT$(d$, 2): RAM$ = MID$(d$,
           4, 2):  RAR$ = MID$(d$, 7, 2): LOCATE 2, 55: PRINT USING "Local (24hr) :
           \\:\\:\\"; RAL$; RAM$; RAR$;
        c$ = "#:GG#": PRINT #1, c$; : d$ = INPUT$(4, 1): RAL$ = LEFT$(d$, 3):
           LOCATE 3, 25: PRINT USING "GMT Offset: \  \ Hours"; RAL$;
        c$ = "#:GC#": PRINT #1, c$; : d$ = INPUT$(9, 1): RAL$ = LEFT$(d$, 2): RAM$ = MID$(d$,
           4, 2):  RAR$ = MID$(d$, 7, 2): LOCATE 2, 25: PRINT USING "Date      :  \\/\\/\\";
           RAL$; RAM$; RAR$;
        RETURN
```

```
objects:
        counter = 1
        LOCATE 21, 25
        IF key$ = "m" THEN INPUT "Enter Messier number: "; m$: o$ = "#:LM" + m$
        IF key$ = "t" THEN INPUT "Enter Star number: "; m$: o$ = "#:LS" + m$
        IF key$ = "c" THEN INPUT "Enter CNGC number: "; m$: o$ = "#:LC" + m$
        IF key$ = "p" THEN INPUT "Enter Planet number: "; m$: o$ = "#:LS" + m$
        IF key$ = "q" THEN INPUT "Enter RA: (HH:MM:SS) "; m$: o$ = "#:Sr" + m$: REM d$=
          INPUT$(1, 1)
        IF key$ = "q" THEN INPUT "Enter RA: (HH:MM:SS) "; m$: o$ = "#:Sr" + m$: REM d$=
          INPUT$(1, 1)
        o$ = o$ + "#"
        PRINT #1, o$
        LOCATE 21, 15: PRINT "                                                    ";
        PRINT #1, "#:LI#": info$ = INPUT$(33, 1): REM LOCATE 10, 20: PRINT info$;
obdraw:
         counter = 1
         LOCATE 6, 31: PRINT "    O B J E C T   I N F O R M A T I O N";
         LOCATE 7, 31: PRINT "Object:    "; LEFT$(info$, 9);
         LOCATE 8, 31: PRINT "Rating:    "; MID$(info$, 10, 7);
         LOCATE 9, 31: PRINT "Magnitude:   "; MID$(info$, 20, 5);
         LOCATE 10, 31: PRINT "Size:       "; MID$(info$, 27, 6);
         IF counter = 0 THEN LOCATE 11, 31: PRINT "RA :"; : LOCATE 12, 31: PRINT "DEC:"; :
           LOCATE 7, 60: PRINT "Distance to SLEW"; : LOCATE 9, 55: PRINT "RA :"; : LOCATE 10,
           55: PRINT "Dec:"; : REM goto  scale
         c$ = "#:Gr#": PRINT #1, c$;
                  IF hourform$ = "high" THEN d$ = INPUT$(9, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                    MID$(d$, 4, 2): RAR$ = MID$(d$, 7, 2): LOCATE 11, 31: PRINT USING "RA :
                    \\:\\:\ \"; RAL$; RAM$; RAR$;
                  IF hourform$ = "low " THEN d$ = INPUT$(8, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                    MID$(d$, 4, 4): LOCATE 11, 31: PRINT USING "RA :         \\:\  \   ";
                    RAL$; RAM$;

         c$ = "#:Gd#": PRINT #1, c$;
                  IF hourform$ = "high" THEN d$ = INPUT$(10, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                    MID$(d$, 5, 2): RAR$ = MID$(d$, 8, 2): LOCATE 12, 31: PRINT "DEC:       ";
                    RAL$; CHR$(248); RAM$; "'"; RAR$; CHR$(34);
                  IF hourform$ = "low " THEN d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ =
                    MID$(d$, 5, 2): LOCATE 12, 31: PRINT "DEC:         "; RAL$; CHR$(248);
                    RAM$; "'     ";

       REM     c$ = "#:Gr#": PRINT #1, c$; : d$ = INPUT$(8, 1): RAL$ = LEFT$(d$, 2): RAM$ =
         MID$(d$, 4, 4): LOCATE 11, 31: PRINT USING "RA :         \\:\  \"; RAL$; RAM$;
       REM     c$ = "#:Gd#": PRINT #1, c$; : d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ =
         MID$(d$, 5, 2): LOCATE 12, 31: PRINT "DEC:         "; RAL$; CHR$(248); RAM$; "'";
distbar:
         rad$ = "": decd$ = ""
         c$ = "#:D#": PRINT #1, c$: d$ = INPUT$(33, 1)

REM     LOCATE 22, 20: PRINT "XXXXX"; d$; "XXXXXXX"; ASC(d$); "XXXXX";
REM      LOCATE 23, 3: FOR I = 1 TO 33: PRINT ASC(MID$(d$, I, 1)); : NEXT I

            FOR i = 1 TO 16
            IF ASC(MID$(d$, i, 1)) = 255 THEN rad$ = rad$ + CHR$(254)
            NEXT i
            FOR i = 17 TO 33
            IF ASC(MID$(d$, i, 1)) = 255 THEN decd$ = decd$ + CHR$(254)
            NEXT i
         LOCATE 7, 59: PRINT " Distance to SLEW  ";
scale:    LOCATE 8, 59: PRINT "0"; CHR$(248); " 45"; CHR$(248); "  90"; CHR$(248); "   150+";
           CHR$(248);
         IF counter = 0 THEN RETURN

         LOCATE 9, 55: PRINT "                ";: LOCATE 9, 55: PRINT "RA  "; rad$;
         LOCATE 10, 55: PRINT "                ";: LOCATE 10, 55: PRINT "DEC "; decd$;

         RETURN
```

```
statis:
        LOCATE 1, 7: PRINT "SITE"
        c$ = "#:Gt#": PRINT #1, c$; : d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ = MID$(d$,
          5, 2): LOCATE 2, 3: PRINT "Lat. : "; RAL$; CHR$(248); RAM$; "'";
        c$ = "#:Gg#": PRINT #1, c$; : d$ = INPUT$(7, 1): RAL$ = LEFT$(d$, 3): RAM$ = MID$(d$,
          5, 2): LOCATE 3, 3: PRINT "Long.: "; RAL$; CHR$(248); RAM$; "'";
        BOXSTX = 2: BOXSTY = 3: BOXWIDE = 10: boxtall = 5: GOSUB drawbox
        RETURN

key1:
        PRINT #1, "#:MS#"
        error1$ = INPUT$(1, 1)
        IF error1$ = "1" OR error1$ = "2" THEN error2$ = INPUT$(33, 1) ELSE RETURN
        LOCATE 22, 20: PRINT LEFT$(error2$, 32)

        GOSUB clearr
        RETURN

KEY2:
        PRINT #1, "#:CM#"
        sync$ = INPUT$(33, 1)
        LOCATE 22, 20: PRINT sync$;
clearr: FOR i = 1 TO 30000: NEXT i: FOR i = 1 TO 30000: NEXT i: FOR i = 1 TO 30000: NEXT i:
        FOR i = 1 TO 30000: NEXT i: FOR i = 1 TO 30000: NEXT i: FOR i = 1 TO 30000: NEXT i:
        LOCATE 22, 20: PRINT "                                                          ";
        RETURN
key3:
        PRINT #1, "#:RS#"
        LOCATE 24, 1: PRINT "                                                                ";
        LOCATE 24, 18: PRINT CHR$(219); CHR$(178); CHR$(176); CHR$(176); CHR$(178); CHR$(219);
        RETURN
KEY4:
        PRINT #1, "#:RM#:"
            LOCATE 24, 1: PRINT "                                                            ";
          LOCATE 24, 26: PRINT CHR$(219); CHR$(178); CHR$(176); CHR$(176); CHR$(178);
CHR$(219);
        RETURN
KEY5:
        PRINT #1, "#:RC#"
            LOCATE 24, 1: PRINT "                                                            ";
          LOCATE 24, 34: PRINT CHR$(219); CHR$(178); CHR$(176); CHR$(176); CHR$(178);
            CHR$(219);
        RETURN
KEY6:
        PRINT #1, "#:RG#"
            LOCATE 24, 1: PRINT "                                                            ";
          LOCATE 24, 42: PRINT CHR$(219); CHR$(178); CHR$(176); CHR$(176); CHR$(178);
            CHR$(219);
        RETURN
key7:
        PRINT #1, "#:P#"
        notice$ = INPUT$(14, 1): LOCATE 4, 15: PRINT notice$
        RETURN
key8:
        PRINT #1, "#:U#"
        IF hourform$ = "high" THEN hourform$ = "low " ELSE hourform$ = "high"
        LOCATE 4, 40: PRINT "Number Format= "; hourform$
        RETURN
key9:
        PRINT #1, "#:LN#"
       PRINT #1, "#:LI#": info$ = INPUT$(33, 1): REM LOCATE 10, 20: PRINT info$;
        GOSUB obdraw
        RETURN
key10:
        PRINT #1, "#:LB#"
       PRINT #1, "#:LI#": info$ = INPUT$(33, 1): REM LOCATE 10, 20: PRINT info$;
        GOSUB obdraw
        RETURN
```

```
key11:
        key$ = "n"
        GOSUB north
        RETURN
key12:
        key$ = "w"
        GOSUB west
        RETURN
key13:
        key$ = "e"
        GOSUB east
        RETURN
key14:
        key$ = "s"
        GOSUB south
        RETURN

drawbox:

REM         LOCATE BOXSTX, BOXSTY:
REM         BOX$ = CHR$(201)
REM         FOR I = 1 TO BOXWIDE: BOX$ = BOX$ + CHR$(205): NEXT
REM         PRINT BOX$;
              RETURN

help:
        LOCATE 14, 10: PRINT "E W N S keys move telescope. SPACE BAR stops.";
        LOCATE 15, 10: PRINT "M key to enter Messier object.";
        LOCATE 16, 10: PRINT "T key to enter sTar.";
        LOCATE 17, 10: PRINT "P key to enter Planet (900 + orbit #).";
        LOCATE 18, 10: PRINT "C key to enter Cngc object.";
        LOCATE 19, 10: PRINT "Q key to enter Planet (900 + orbit #).";
        LOCATE 20, 10: PRINT "X to End program.";

                                                RETURN

    END
```

APPENDIX E: CARE AND MAINTENANCE OF THE CDS

1. Keeping Your Components Clean

Prevention is the best recommendation that a telescope owner can follow in keeping astronomical equipment in top working order. Proper measures taken during observations and when storing the equipment between observation runs can ensure many years of trouble free use.

Dust and moisture are the two main enemies to your telescope and electronics. If you live in a very moist climate, you may find it necessary to use a silica dessicant stored with the telescope and electronics to ward off moisture and the possibility of corrosion growing on the metal contacts of the electronics. Replace the silica dessicant as often as necessary. All of the metal surfaces should be cleaned routinely with a soft rag and alcohol to prevent corrosion.

Those living in coastal areas or tropic zones should also cover the electronic ports on the Control Panel and Keypad with gaffers tape to reduce corrosion on the metal contacts. Apply a dab of water displacement solution (such as WD-40) with a small brush on all of the interior metal contacts and the input cord metal contacts. The Keypad and all separate accessories should be kept in sealable bags with silica dessicant.

2. Behind the Power Panel

The CDS Control Panel houses the back-up replaceable clock/ calendar battery and a replaceable standard 1.0 amp slow blow fuse. The long-life lithium battery (Panasonic CR2032 3 volt or Duracell DL2032B) is stored behind the front panel of the CDS. The battery should be replaced whenever the CDS begins to lose time. The 1 amp slow blow fuse will fail in the event that the telescope is prevented from completing a GO TO function (*e.g.* the tube runs into something that keeps it from slewing).

To replace either the battery or the fuse, first remove the CDS PCB assembly from the Declination casting by removing the four screws and unplugging the 16-pin ribbon cable. With a thin flat-headed screwdriver, lift the small coin-sized battery out of its' holder. The new battery slides back in place.

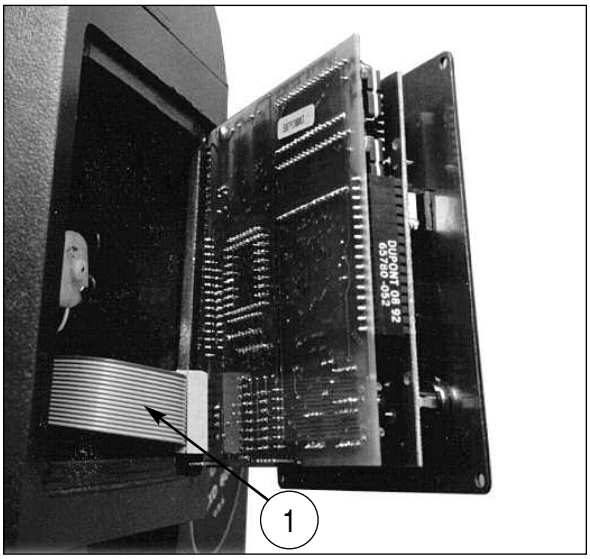


Fig. 16. CDS PCD. (1) 16-Pin Ribbon Cable.

The fuse can be removed with the aid of a small screwdriver. Loosening the two upper screws on the front side of the power panel will provide more clearance to replace the fuse if needed.

NOTICE

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

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