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Astrometry of the ω Centauri *Hubble Space Telescope* Calibration Field

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Astrometry of the ω Centauri *Hubble Space Telescope* Calibration Field[1]

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ABSTRACT

Astrometry, on the International Celestial Reference Frame (epoch J2000.0), is presented for the Walker (1994, PASP, 106, 828) stars in the ω Centauri (=NGC 5139=C 1323-1472) *Hubble Space Telescope* Wide Field/Planetary Camera (WF/PC) calibration field of Harris et al. (1993, AJ, 105, 1196). Harris et al. stars were first identified on a WFPC2 observation of the ω Cen *HST* calibration field. Relative astrometry of the Walker stars in this field was then obtained using Walker's CCD positions and astrometry derived using the STSDAS METRIC task on the positions of the Harris et al. stars on the WFPC2 observation. Finally, the relative astrometry, which was based on the *HST* Guide Star Catalog, is placed on the International Celestial Reference Frame with astrometry from the USNO-A2.0 catalog. An ASCII text version of the astrometric data of the Walker stars in the ω Cen *HST* calibration field is available electronically in the online version of the article.

Subject headings: astrometry – Galaxy: globular clusters: individual (ω Centauri, NGC 5139, C 1323-1472)

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[1]Based on observations made with the NASA/ESA *Hubble Space Telescope*, obtained from the data archive at the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc. under NASA contract NAS5-26555.

[2]Guest User, Canadian Astronomy Data Centre, which is operated by the Dominion Astrophysical Observatory for the National Research Council of Canada's Herzberg Institute of Astrophysics.

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1. INTRODUCTION

Walker (1994; hereafter W94) presented ground-based *BV* (Johnson) *RI* (Kron-Cousins) photometry of the Harris et al. (1993; hereafter H93) *Hubble Space Telescope (HST)* Wide-Field/Planetary Camera (WF/PC) calibration field in the Galactic globular cluster ω Centauri (=NGC 5139=C 1323-1472). This small ($100'' \times 100''$) field is located 13.2 arcmin southwest of the center of ω Cen at $13^{h}\,25^{m}\,37^{s}$ $-47^{\circ}\,35'\,38''$ (epoch J2000.0) [see Fig. 1 (Plate 59) of H93, Figs. 1 and 2 of W94]. Although this field has been observed over 1100 times with the *HST*, there is no astrometry available for the W94 stars in the published literature. In an effort to encourage various ongoing WFPC2 calibration efforts, I now present astrometry (J2000.0) of the W94 stars in the ω Cen *HST* calibration field on the International Celestial Reference Frame.

2. THE HARRIS ET AL. (1993) STARS

The first step of the astrometric calibration of the W94 stars in the ω Cen *HST* calibration field is to identify which H93 stars given in Table 4 of W94 are present on a WFPC2 observation of that field.

Table 1 is the combination of all the stars in Table 4 of W94 with x and y CCD positions along with their astrometry as given in Table 1 of H93. Columns 1–7 of Table 1 are from Table 4 of W94; columns 8 and 9 give the right ascensions and declinations (J2000.0) as listed in Table 1 of H93; column 10 is the identification number given in Table 5 of W94.

I determined a plate solution for the W94 observations using the data in Table 1 and the IRAF CCMAP task. A simple linear model in x and y was fitted (6 unknowns) to a tangent sky projection geometry. The CCMAP fit results are presented in the first section of Table 2. Column 1 of Table 2 gives information about the input positions and astrometry; column 2 gives the number of stars in the input dataset; columns 3 and 4 gives the fit solution for the plate scale in units of arcsec per pixel (arcsec px^{-1}); columns 5 and 6 gives the fit solutions for axis rotation in degrees; columns 7 and 8 gives the fit rms for the standard astrometric coordinates ξ and η in units of arcsec.

Walker states that the size of his pixels was 0.38 arcsec. This agrees well with the fitted plate scale of 0.39 arcsec px^{-1} given in the first section of Table 2. We see in Fig. 1 of W94 that the orientation of the W94 data is North to the left (low values of x) with East at the bottom (low values of y). This agrees well with the fitted axis rotations of $\sim 88^{\circ}$ and $\sim 268^{\circ}$ given in the first section of Table 2. This suggests that the CCD camera used by

Walker was just slightly out of alignment from a perfect East-West orientation which would have given values of 90° and 270°, respectively, for axis rotation. The respective fit rms values for the standard astrometric coordinates ξ and η was only 73.0 and 40.7 milliarcsec (mas) for the first fit with all 22 stars in Table 1; a smaller subset of 12 stars improves the respective rms fits values to 21.3 and 33.0 mas.

I chose two WFPC2 exposures, `U4PH0101R.C0H` (14-s F814W) and `U4PH0102R.C0H` (100-s F814W), which observed the ω Cen *HST* calibration field with the WF2 aperture (Biretta et al. 1996) at the same position and same roll angle. These observations were secured as part of the *HST* Cycle 7 WFPC2 calibration program CAL/WF2 7929 (PI: Casertano) and were placed in the public data archive at the Space Telescope Science Institute on 1998 March 31. The datasets were recalibrated at the Canadian Astronomy Data Centre and retrieved electronically using a guest account which was established for this purpose.

The astrometric calibration of the W94 stars began by identifying which of the H93 stars in Table 1 were present on the WF2 section of WFPC2 observation `U4PH0101R.C0H`. This was accomplished by applying the previously derived plate solutions to Table 1 using the IRAF CCTRAN task. Even the first fit with all 22 H93 stars produced a plate solution which allowed for the unambiguous identification of the H93 stars present on the WF2 section of this 14-s WFPC2 observation. Some of the H93 stars in Table 1 (e.g. H93 star 917 = W94 star 30) do not appear on the WF2 section of this WFPC2 observation; some are probable ground-based blends (e.g. H93 star 1368 = W94 star 23); some have WFPC2 stellar images are distorted by WFPC2 CCD defects (e.g. H93 star 1200 = W94 star 33); and some are so bright that they show diffraction spikes even on a short 14-s exposure (e.g. H93 star 1629 = W94 star 1).

The following list of 12 H93 stars is a clean subset of Table 1 which produced the best plate solution of the first section of Table 2 with rms fitting errors of $\sigma_\xi = 21.3$ mas (0.055 px) and $\sigma_\eta = 33.0$ mas (0.085 px) : 903, 1035, 1056, 1063, 1249, 1461, 1462, 1512, 1522, 1565, 1655, 1686. This fit had a plate scale which was identical in both directions (0.388 arcsec px^{-1}) with axis rotation values of 88.056° and 268.079°.

3. RELATIVE ASTROMETRY OF THE WALKER (1994) STARS

The next step of the astrometric calibration of the W94 stars in the ω Cen *HST* calibration field is to obtain relative astrometry of all the stars in Table 5 of W94.

Table 3 gives the W94 x and y CCD positions and the relative astrometry of the clean subset of 12 H93 stars identified in the previous section. Columns 1–4 of Table 3 are from Table 1; columns 7 and 8 give the x and y positions of these stars on the WF2 section of the WFPC2 observation `U4PH0101R.C0H` as determined using the IRAF IMEXAMINE task; columns 5 and 6 give the right ascensions and declinations (J2000.0) as determined with the STSDAS METRIC task using the `U4PH0101R.C0H` observation with the WF2 CCD positions given in columns 7 and 8.

I determined a plate solution for the W94 observations using CCMAP with the data in Table 3. A simple linear model in x and y was fitted (6 unknowns) to a tangent sky projection geometry. The CCMAP fit results are presented in the second section of Table 2. This plate solution had rms fitting errors of $\sigma_\xi = 20.3$ mas (0.052 px) and $\sigma_\eta = 22.3$ mas (0.058 px); fitted plate scales of 0.387 arcsec px^{-1} for both x and y; and axis rotation values of 88.536° and 268.583°. Note that this result is nearly identical to that of the best plate solution derived in the previous section.

I determined relative astrometry (J2000.0) for all of the W94 stars by using CCTRAN with this plate solution and the x and y CCD positions given in Table 5 of W94. Figure 1 shows the W94 stars (*circles*) which are present on the WF2 section of the 100-s WFPC2 `U4PH0102R.C0H` observation; the plotted positions of these W94 stars was determined with the STSDAS INVMETRIC task. The two WFPC2 observations, `U4PH0101R.C0H` and `U4PH0102R.C0H`, have identical astrometry; I used the deeper observation in Fig. 1 in order to better display the location of the faintest W94 stars.

4. ASTROMETRY OF THE WALKER (1994) STARS ON THE ICRF

The final step of the astrometric calibration of the W94 stars in the ω Cen *HST* calibration field is to place the relative astrometry of the W94 stars on the International Celestial Reference Frame (ICRF)[4].

The plate solution derived in the previous section is ultimately based on the *HST* Guide Star Catalog which is known to have stars with large positional errors. I demonstrate below that the plate solution determined in the previous section systematically deviates from the ICRF (J2000.0) by about 1.1 arcsec.

I used the USNO-A2.0 finder chart website[5] to find the 97 USNO-A2.0 (Monet et al.

[4]The *Hipparcos* catalog to the non-specialist.

[5]`http://ftp.nofs.navy.mil/data/fchpix/`

1998) astrometric catalog stars within a $2' \times 2'$ box centered on the field center of the ω Cen *HST* calibration field (see Table 4). Columns 2 and 3 of Table 4 give the right ascensions and declinations (J2000.0) on the International Celestial Reference Frame (ICRF); column 4 gives the red plate magnitude; column 1 gives my identification number for these nearby USNO-A2.0 stars.

Table 5 combines the W94 x and y CCD positions with astrometry from the USNO-A2.0 catalog for 20 W94 stars with probable USNO-A2.0 counterparts. Columns 1–3 of Table 5 are from Table 5 of W94; column 6 gives the my identification number of the USNO-A2.0 star in Table 4 which I associate with the W94 star; columns 4–5 give the right ascensions and declinations (J2000.0) given in Table 4.

I determined plate solutions for the W94 observations using the data in Table 5 and the CCMAP task. A simple linear model in x and y was fitted (6 unknowns) to a tangent sky projection geometry. The CCMAP fit results are presented in the third section of Table 2. The plate solution with 20 W94 stars had rms fitting errors of $\sigma_\xi = 280$ mas (0.72 px) and $\sigma_\eta = 467$ mas (1.2 px). The fitting error for η is considerably larger than the nominal 250 mas positional error for the USNO-A2.0 catalog. The plate solution based on a unambiguous subset of 12 W94 stars had rms fitting errors of $\sigma_\xi = 225$ mas (0.58 px) and $\sigma_\eta = 248$ mas (0.64 px) which does agree with the nominal USNO-A2.0 positional errors.

The plate solution based on Table 3 predicts a position for W94 star 2 (= H93 star 1438) of $13^{\rm h}\,25^{\rm m}\,35\overset{\rm s}{.}869$ $-47^\circ\,35'\,27\overset{''}{.}66$ (J2000.0). I associate this star with the 38th star in Table 4 which has the USNO-A2.0 catalog position of $13^{\rm h}\,25^{\rm m}\,35\overset{\rm s}{.}9327$ $-47^\circ\,35'\,28\overset{''}{.}6580$ (J2000.0). The difference between these positions in right ascension and declination are $\Delta\alpha_{2000} = 0\overset{\rm s}{.}0637$ and $\Delta\delta_{2000} = -0\overset{''}{.}92$, respectfully, giving an angular separation of $\sim$1.12 arcsec.

Observing that the USNO-A2.0 stars in Fig. 1 are systematically offset from the stellar images by $\sim$1.1 arcsec, we come to the odd conclusion that Table 2 indicates that the plate solutions based on H93 astrometry (Table 1) and *HST* METRIC astrometry (Table 3) are considerably more precise (i.e., have excellent fitting errors) — but are significantly less accurate (i.e., have large systematic offsets) — than the plate solutions based on USNO-A2.0 astrometry (Table 5).

The precise relative astrometry derived in the previous section can be placed on the International Celestial Reference Frame by simply adding $0\overset{\rm s}{.}0637$ and $-0\overset{''}{.}92$ to the right ascensions and declinations derived from the plate solution based on METRIC astrometry of the WF2 section of *HST* WFPC2 observation `U4PH0101R.C0H` (see Table 6). The squares shown on Fig. 1 indicate the ICRF positions of the W94 stars; these are offset from the stellar images by ~1.1 arcsec *on this particular image.* The absolute rms errors of the J2000.0 right ascensions and declinations given in Table 6 are estimated to be 0.35 angular arcsec. This estimate is the sum of the nominal 0.25 arcsec positional error of the USNO-A2.0 catalog and the estimated relative rms positional error of approximately 0.10 arcsec due to the uncertainty of the WFPC2 astrometric calibration as a function of time.

Other WFPC2 observations of this field obtained with different guide stars, roll angles, and apertures, may exhibit different offsets between the stellar images on a given WFPC2 CCD and the computed (x, y) pixel locations of the W94 stars on that chip as derived using the INVMETRIC task with Table 6.

In order to identify the W94 stars on any given WFPC2 observation of the ω Cen *HST* calibration field, the reader should first find a given W94 star (preferably W94 star 2) somewhere in observation and then measure its (x, y) centroid on the particular chip where the star is present[6]. Convert that CCD position to a right ascension and declination using the METRIC task[7]. Next, determine the difference in right ascension ($\Delta\alpha_{2000}$) and declination ($\Delta\delta_{2000}$) between the METRIC value and the ICRF position of that star as given in Table 6[8]. Add $\Delta\alpha_{2000}$ and $\Delta\delta_{2000}$ to all the right ascensions and declinations in Table 6[9]. Finally, determine the (x, y) locations of the W94 stars on the individual WFPC2 CCDs using the INVMETRIC task with the modified Table 6 positions[10] on a chip-by-chip basis.

I am grateful to Alistair Walker for sending me a glossy reprint of W94 as well as electronic versions of Tables 4 and 5 from W94. I would also like to thank Lindsey Davis,

[6]For example, the center of W94 star 2 is found at the (x, y) location of $(484.92, 266.90)$ of the WF2 section of the WFPC2 observation `U4PH0102R.COH`.

[7]The following IRAF command, `metric "u4ph0101r.c0h[2]" x=484.92 y=266.90` , gives $\alpha_{2000} = 13^h 25^m 35^s\!.8656$ and $\delta_{2000} = -47° 35' 27''\!.792$.

[8]Using IRAF sexagesimal notation, we find that $\Delta\alpha_{2000} = \alpha_{\rm METRIC} - \alpha_{\rm TABLE6} =$ (13:25:35.8656) – (13:25:35.933) $= -0^s\!.067$ and $\Delta\delta_{2000} = \delta_{\rm METRIC} - \delta_{\rm TABLE6} =$ (-47:35:27.792) – (-47:35:28.58) $= +0''\!.788$.

[9]Continuing with the example, $\alpha_{\rm TABLE6} + \Delta\alpha_{2000} = 13^h 25^m 35^s\!.866$ and $\delta_{\rm TABLE6} + \Delta\delta_{2000} = -47° 35' 27''\!.79$.

[10]The following IRAF command, `invmetric u4ph0102r.c0h[2] ra="13:25:35.866" dec="-47:35:27.79"` , gives the (x, y) CCD location of $(484.95, 266.93)$ on the WF2 section of `U4PH0102R.COH`. The small difference (0.058 px) between the computed pixel location and the measured value of $(484.92, 266.90)$ is due to (1) centroiding errors, (2) round-off errors, and (3) the small difference between the METRIC value, $13^h 25^m 35^s\!.8656$ $-47° 35' 27''\!.792$ (determined above), and the plate solution value for W94 star 2, $13^h 25^m 35^s\!.869$ $-47° 35' 27''\!.66$, which was derived with Table 3 in the previous section.

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Monet, D., Bird, A., Canzian, B., Dahn, C., Guetter, H., Harris, H., Henden, A., Levine, S., Luginbuhl, C., Monet, A. K. B., Rhodes, A., Riepe, B., Sell, S., Stone, R., Vrba, F., & Walker, R. 1998, USNO-A2.0 (U.S. Naval Observatory, Washington DC)

Walker, A. R. 1994, PASP, 106, 828 (W94)

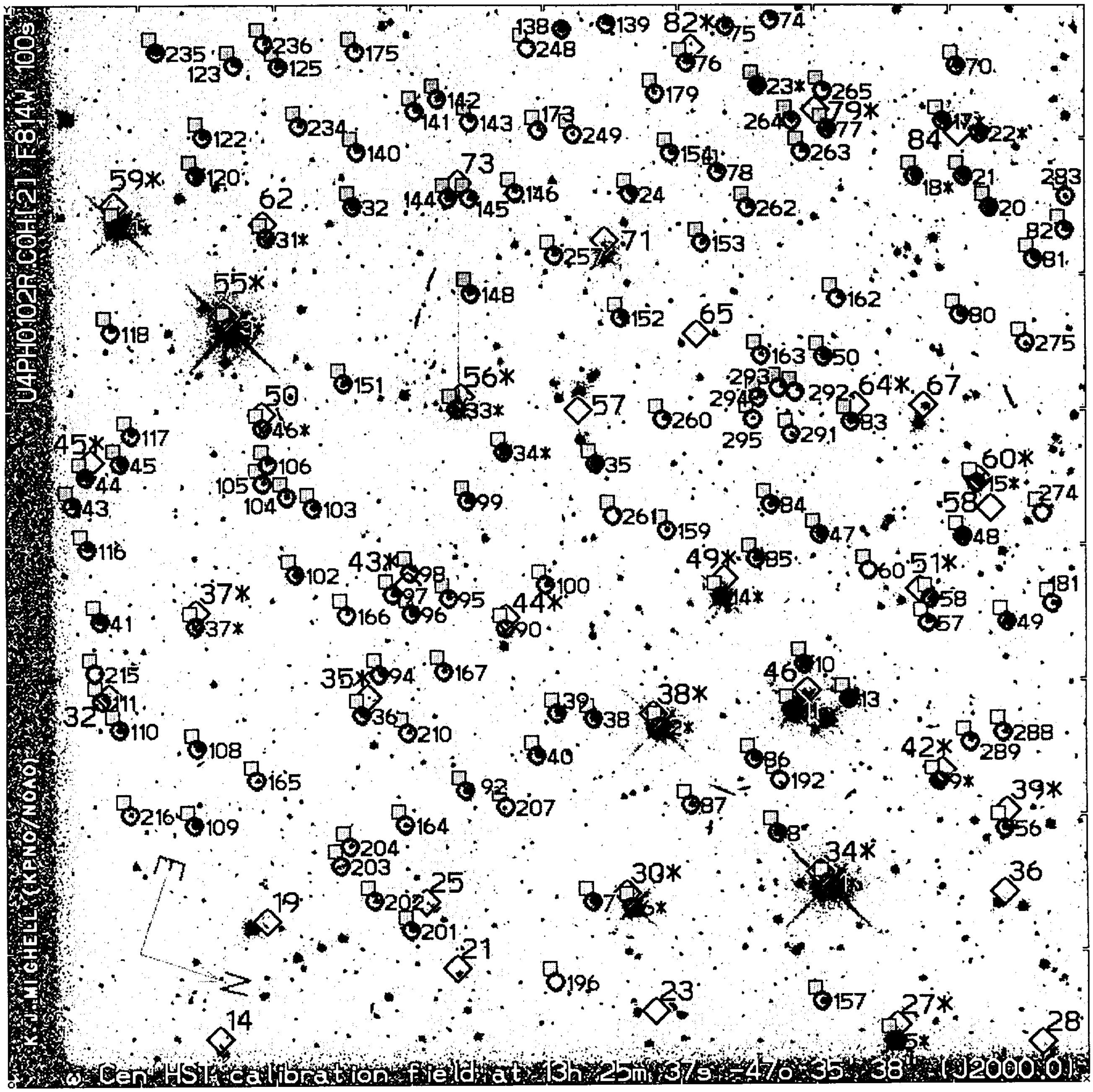

Fig. 1.— Part of the ω Centauri *Hubble Space Telescope* calibration field centered at $13^{h}\,25^{m}\,37^{s}$ -47° 35′ 38″ (epoch J2000.0). This image is the WF2 section of the 100-s F814W *HST* WFPC2 observation U4PH0102R.C0H. The numbered *diamonds* indicate the positions of the USNO-A2.0 catalog stars listed in Table 4. The numbered *circles* indicate the positions of the stars in Table 5 of Walker (1994). Asterisks indicate stars which were used to determine plate solutions (see Tables 1, 3, 5). The *squares* indicate the positions of the stars in Table 5 of Walker (1994) on the International Celestial Reference Frame. The stellar images are separated from the squares by approximately 1.1 arcsec; the astrometric system of this particular *HST* observation is systematically displaced from the ICRF by this small angular offset. The small tickmarks along the sides of the image have a separation of 100 pixels which is equivalent to an angular separation of 10 arcsec in the central region of the image.

TABLE 1

TABLE 4 OF WALKER (1994) WITH ASTROMETRY FROM HARRIS ET AL. (1993)

H93 [a] (1)	x_{W94} (px) (2)	y_{W94} (px) (3)	V (mag) (4)	$B-V$ (mag) (5)	$V-R$ (mag) (6)	$R-I$ (mag) (7)	R.A. (J2000.0) (HH:MM:SS.SS) (8)	Dec. (DD:MM:SS.S) (9)	W94 [b] (10)
903	206.3	110.7	15.519	0.816	0.485	1.047	13:25:38.11	-47:36:17.3	4
917	206.4	58.9	16.597	0.768	0.475	1.002	13:25:40.10	-47:36:16.6	30[c]
1035	179.4	103.0	18.010	0.547	0.376	0.804	13:25:38.37	-47:36:06.7	31
1036	183.3	45.1	17.430	0.708	0.443	0.934	13:25:40.60	-47:36:07.5	29[c]
1056	166.6	176.5	17.924	0.559	0.375	0.801	13:25:35.54	-47:36:02.7	37
1063	167.7	136.9	18.481	0.508	0.367	0.800	13:25:37.05	-47:36:02.7	46
1164	148.5	26.2	18.444		0.348	0.772	13:25:41.28	-47:35:53.8	27[c]
1714[d]	15.3	204.2	16.523	0.778	0.459	1.004	13:25:34.28	-47:35:04.5	5
1200	134.2	120.7	16.704		0.319	0.675	13:25:37.64	-47:35:49.5	33
1249	122.9	125.1	18.014	0.808	0.486	0.995	13:25:37.45	-47:35:45.2	34
1368	101.6	43.7	17.807		0.375	0.786	13:25:40.54	-47:35:35.8	23
1438	77.0	163.9	14.742	0.196	0.108	0.284	13:25:35.90	-47:35:28.0	2
1461	70.3	197.7	16.296	0.770	0.478	1.015	13:25:34.60	-47:35:25.7	6
1462	74.6	136.7	16.488	0.775	0.480	1.013	13:25:36.94	-47:35:26.6	14
1512	67.8	49.6	18.237	0.565	0.356	0.773	13:25:40.27	-47:35:22.8	18
1522	66.6	38.1	18.088	0.577	0.398	0.829	13:25:40.71	-47:35:22.2	17
1565	59.3	37.8	17.621	0.657	0.436	0.913	13:25:40.71	-47:35:19.4	22
1629	37.0	180.6	14.702	1.002	0.532	1.117	13:25:35.18	-47:35:12.7	1
1655	36.9	100.0	17.636	0.576	0.378	0.811	13:25:38.30	-47:35:11.5	15
1657	41.1	22.4	16.859	0.765	0.474	0.977	13:25:41.28	-47:35:12.1	16[c]
1686	24.1	155.4	17.801	0.549	0.348	0.766	13:25:36.16	-47:35:07.3	9
4626	180.2	121.0	14.685	1.313	0.69:	1.38:	13:25:37.67	-47:36:07.3	3

NOTE. — Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.

[a] Identification number given in Table 1 of Harris et al. (1993).

[b] Identification number given in Table 5 of Walker (1994).

[c] Not present in Figure 1 (WF2 section of `U4PH0102R.C0H`).

[d] Identified by Walker (1994) as 1174 which does not exist in Table 1 of Harris et al. (1993).

TABLE 2

CCMAP FIT RESULTS.

Positions & Astrometry (1)	N (stars) (2)	Plate Scale (arcsec px^{-1}) x (3)	y (4)	Axis Rotation (degrees) x (5)	y (6)	Fit RMS (arcsec) ξ (7)	η (8)
Table 1	22	0.387	0.388	88.016	268.042	0.0730	0.0407
subset of Table 1[a]	21	0.388	0.388	88.047	268.050	0.0409	0.0383
subset of Table 1[b]	20	0.388	0.388	88.029	268.050	0.0309	0.0393
subset of Table 1[c]	19	0.388	0.388	88.030	268.065	0.0309	0.0301
subset of Table 1[d]	18	0.388	0.388	88.018	268.069	0.0255	0.0291
subset of Table 1[e]	12	0.388	0.388	88.056	268.079	0.0213	0.0330
Table 3	12	0.387	0.387	88.536	268.583	0.0203	0.0223
Table 5	20	0.386	0.387	88.281	268.806	0.280	0.467
subset of Table 5[f]	19	0.386	0.387	88.288	268.697	0.288	0.395
subset of Table 5[g]	18	0.387	0.387	88.280	268.291	0.294	0.344
subset of Table 5[h]	17	0.387	0.387	88.340	268.173	0.289	0.300
subset of Table 5[i]	16	0.387	0.389	88.459	268.255	0.256	0.305
subset of Table 5[j]	15	0.388	0.389	88.508	268.130	0.248	0.291
subset of Table 5[k]	14	0.387	0.390	88.449	268.057	0.237	0.295
subset of Table 5[l]	13	0.389	0.391	88.538	267.910	0.236	0.263
subset of Table 5[m]	12	0.389	0.390	88.596	268.003	0.225	0.248

[a] Table 1 without H93 star 1629.
[b] Table 1 without H93 stars 1629, 4626.
[c] Table 1 without H93 stars 1629, 4626, 1438.
[d] Table 1 without H93 stars 1629, 4626, 1438, 1063.
[e] Table 1 without H93 stars 1629, 4626, 1438, 917, 1036, 1164, 1714, 1200, 1368, 1657.
[f] Table 5 without W94 star 97.
[g] Table 5 without W94 star 97, 77.
[h] Table 5 without W94 star 97, 77, 58.
[i] Table 5 without W94 star 97, 77, 58, 15.
[j] Table 5 without W94 star 97, 77, 58, 15, 36.
[k] Table 5 without W94 star 97, 77, 58, 15, 36, 5.
[l] Table 5 without W94 star 97, 77, 58, 15, 36, 5, 44.
[m] Table 5 without W94 star 97, 77, 58, 15, 36, 5, 44, 1.

TABLE 3

WALKER (1994) POSITIONS WITH METRIC ASTROMETRY OF POSITIONS ON U4PH0101R.C0H[2].

H93 [a] (1)	W94 [b] (2)	x_{W94} (px) (3)	y_{W94} (px) (4)	R.A. (J2000.0) (HH:MM:SS.SSSS) (5)	Dec. (DD:MM:SS.SS) (6)	x_{WF2} (px) (7)	y_{WF2} (px) (8)
903	4	206.3	110.7	13:25:38.0313	-47:36:17.131	85.23	636.22
1035	31	179.4	103.0	13:25:38.3016	-47:36:06.617	195.03	627.67
1056	37	166.6	176.5	13:25:35.4756	-47:36:02.374	142.71	341.63
1063	46	167.7	136.9	13:25:36.9886	-47:36:02.449	191.87	487.48
1249	34	122.9	125.1	13:25:37.3963	-47:35:45.069	370.83	470.21
1461	6	70.3	197.7	13:25:34.5712	-47:35:25.370	465.50	134.11
1462	14	74.6	136.7	13:25:36.9092	-47:35:26.470	531.81	363.00
1512	18	67.8	49.6	13:25:40.2329	-47:35:22.992	675.51	672.74
1522	17	66.6	38.1	13:25:40.6770	-47:35:22.423	696.00	714.20
1565	22	59.3	37.8	13:25:40.6770	-47:35:19.599	723.18	705.11
1655	15	36.9	100.0	13:25:38.2762	-47:35:11.578	719.50	446.27
1686	9	24.1	155.4	13:25:36.1408	-47:35:07.143	691.46	225.66

NOTE. — Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.

[a] Identification number given in Table 1 of Harris et al. (1993).

[b] Identification number given in Table 5 of Walker (1994).

TABLE 4

NEARBY USNO-A2.0 CATALOG STARS.

ID (1)	α_{2000} (HH:MM:SS.SSSS) (2)	δ_{2000} (DD:MM:SS.SSS) (3)	red (mag) (4)
1	13:25:31.0127	-47:36:07.230	17.2
2	13:25:31.1067	-47:34:55.500	17.9
3	13:25:31.1220	-47:35:26.210	17.5
4	13:25:31.1547	-47:36:17.070	17.0
5	13:25:31.3720	-47:36:25.530	17.3
6	13:25:31.5313	-47:36:17.120	17.3
7	13:25:31.7127	-47:36:06.160	17.1
8	13:25:31.8853	-47:35:49.170	17.5
9	13:25:31.9427	-47:34:47.570	17.0
10	13:25:32.0200	-47:35:27.500	17.8
11	13:25:32.0573	-47:35:09.470	15.7
12	13:25:32.1253	-47:36:18.990	17.4
13	13:25:32.3567	-47:36:10.120	16.5
14	13:25:32.7047	-47:35:51.070	17.8
15	13:25:32.8700	-47:35:28.550	17.3
16	13:25:32.9633	-47:35:04.510	17.4
17	13:25:33.1340	-47:34:44.800	17.7
18	13:25:33.1947	-47:34:52.160	17.2
19	13:25:33.6193	-47:35:50.670	16.0
20	13:25:33.6380	-47:35:15.920	17.2
21	13:25:33.7380	-47:35:36.320	17.9
22	13:25:33.7960	-47:36:10.600	17.2
23	13:25:33.9120	-47:35:21.510	17.1
24	13:25:34.0940	-47:34:45.640	16.6
25	13:25:34.1147	-47:35:40.020	17.7
26	13:25:34.2833	-47:36:10.290	17.8
27	13:25:34.3780	-47:35:04.560	16.5
28	13:25:34.5967	-47:34:54.330	17.9
29	13:25:34.6120	-47:36:26.850	16.9
30	13:25:34.6407	-47:35:26.230	16.3
31	13:25:34.7067	-47:34:47.750	17.7
32	13:25:34.7933	-47:36:06.860	17.8
33	13:25:34.8927	-47:36:11.700	17.8
34	13:25:35.2387	-47:35:13.280	13.8
35	13:25:35.3807	-47:35:48.880	17.3
36	13:25:35.5327	-47:35:00.290	17.5
37	13:25:35.5687	-47:36:02.850	17.4
38	13:25:35.9327	-47:35:28.580	14.6
39	13:25:36.0947	-47:35:01.960	17.7
40	13:25:36.1300	-47:34:56.680	17.8
41	13:25:36.1760	-47:36:36.650	16.7
42	13:25:36.2207	-47:35:07.260	17.4
43	13:25:36.2547	-47:35:48.740	17.5
44	13:25:36.2620	-47:35:41.140	17.5
45	13:25:36.3600	-47:36:13.630	16.9
46	13:25:36.4533	-47:35:18.430	14.3
47	13:25:36.8573	-47:34:47.690	16.4
48	13:25:36.9527	-47:36:27.460	17.5
49	13:25:37.0333	-47:35:26.800	16.2
50	13:25:37.0820	-47:36:03.000	17.3
51	13:25:37.4207	-47:35:13.040	17.2
52	13:25:37.4613	-47:36:25.420	16.1
53	13:25:37.4920	-47:34:38.460	17.8

TABLE 4—*Continued*

ID (1)	α_{2000} (HH:MM:SS.SSSS) (2)	δ_{2000} (DD:MM:SS.SSS) (3)	red (mag) (4)
54	13:25:37.5740	-47:34:41.320	15.2
55	13:25:37.6740	-47:36:07.870	14.3
56	13:25:37.6767	-47:35:49.440	16.7
57	13:25:37.8513	-47:35:40.950	16.5
58	13:25:38.1407	-47:35:10.130	16.1
59	13:25:38.1640	-47:36:18.010	15.3
60	13:25:38.3080	-47:35:11.600	17.2
61	13:25:38.3640	-47:36:31.480	15.2
62	13:25:38.3893	-47:36:07.330	17.6
63	13:25:38.4513	-47:36:23.980	17.4
64	13:25:38.5320	-47:35:21.840	17.9
65	13:25:38.6507	-47:35:34.480	17.9
66	13:25:38.6700	-47:36:23.590	17.1
67	13:25:38.6900	-47:35:17.080	17.5
68	13:25:38.6987	-47:35:00.000	16.0
69	13:25:38.7533	-47:34:47.400	16.7
70	13:25:38.9020	-47:35:06.000	16.9
71	13:25:39.0820	-47:35:43.060	15.6
72	13:25:39.0907	-47:34:40.060	14.7
73	13:25:39.1267	-47:35:54.680	17.6
74	13:25:39.2213	-47:36:30.040	17.8
75	13:25:39.8813	-47:36:28.680	16.2
76	13:25:39.9567	-47:36:23.610	16.8
77	13:25:40.0153	-47:34:48.140	15.5
78	13:25:40.1173	-47:36:16.910	16.5
79	13:25:40.4527	-47:35:31.500	17.7
80	13:25:40.5447	-47:34:58.210	16.5
81	13:25:40.5713	-47:35:50.470	17.8
82	13:25:40.5880	-47:35:41.610	17.8
83	13:25:40.6000	-47:36:06.870	16.1
84	13:25:40.6213	-47:35:21.160	14.9
85	13:25:40.8593	-47:36:01.100	17.7
86	13:25:41.0107	-47:34:43.850	16.2
87	13:25:41.1593	-47:34:58.120	17.0
88	13:25:41.4560	-47:36:24.660	17.5
89	13:25:41.4787	-47:36:18.150	16.1
90	13:25:41.7100	-47:36:01.100	17.8
91	13:25:41.9240	-47:35:04.030	16.7
92	13:25:42.0573	-47:35:21.760	16.5
93	13:25:42.1180	-47:36:31.540	15.2
94	13:25:42.1527	-47:35:37.720	16.5
95	13:25:42.3600	-47:34:52.850	13.1
96	13:25:42.6973	-47:35:31.600	17.9
97	13:25:42.7567	-47:36:23.580	17.5

NOTES. — These USNO-A2.0 stars were found within a $2' \times 2'$ box centered at the position $13^h\ 25^m\ 37^s$ $-47^\circ\ 35'\ 38''$. Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.

TABLE 5

WALKER (1994) POSITIONS WITH USNO-A2.0 ASTROMETRY FROM TABLE 4

W94[a] (1)	x_{W94} (px) (2)	y_{W94} (px) (3)	α_{2000} (HH:MM:SS.SSSS) (4)	δ_{2000} (DD:MM:SS.SSS) (5)	ID[b] (6)
1	37.0	180.6	13:25:35.2387	-47:35:13.280	34
2	77.0	163.9	13:25:35.9327	-47:35:28.580	38
3	180.2	121.0	13:25:37.6740	-47:36:07.870	55
4	206.3	110.7	13:25:38.1640	-47:36:18.010	59
5	15.3	204.2	13:25:34.3780	-47:35:04.560	27
6	70.3	197.7	13:25:34.6407	-47:35:26.230	30
9	24.1	155.4	13:25:36.2207	-47:35:07.260	42
14	74.6	136.7	13:25:37.0333	-47:35:26.800	49
15	36.9	100.0	13:25:38.3080	-47:35:11.600	60
33	134.2	120.7	13:25:37.6767	-47:35:49.440	56
36	131.2	181.3	13:25:35.3807	-47:35:48.880	35
37	166.6	176.5	13:25:35.5687	-47:36:02.850	37
44	195.8	157.1	13:25:36.3600	-47:36:13.630	45
56	9.5	159.3	13:25:36.0947	-47:35:01.960	39
58	37.3	123.5	13:25:37.4207	-47:35:13.040	51
76	115.7	44.3	13:25:40.5880	-47:35:41.610	82
77	86.4	47.0	13:25:40.4527	-47:35:31.500	79
83	63.1	97.0	13:25:38.5320	-47:35:21.840	64
97	133.6	157.9	13:25:36.2547	-47:35:48.740	43
90	111.1	156.4	13:25:36.2620	-47:35:41.140	44

NOTE. — Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.

[a]Identification number given in Table 5 of Walker (1994).

[b]Identification number from Table 4 of USNO-A2.0 star.

TABLE 6

TABLE 5 OF WALKER (1994) WITH ASTROMETRY ON THE INTERNATIONAL CELESTIAL REFERENCE FRAME.

Star (1)	x_{W94} (px) (2)	y_{W94} (px) (3)	V (mag) (4)	$B-V$ (mag) (5)	$V-R$ (mag) (6)	$R-I$ (mag) (7)	I (mag) (8)	α_{2000} (HH:MM:SS.SSS) (9)	δ_{2000} (DD:MM:SS.SS) (10)
1	37.0	180.6	14.702	1.002	0.532	1.117	13.585	13:25:35.255	-47:35:13.28
2	77.0	163.9	14.742	0.216	0.108	0.199	14.941	13:25:35.933	-47:35:28.58
3	180.2	121.0	14.685	1.312	0.690	1.380	13.305	13:25:37.676	-47:36:08.04
4	206.3	110.7	15.519	0.816	0.485	1.047	14.472	13:25:38.096	-47:36:18.03
5	15.3	204.2	16.523	0.778	0.459	1.004	15.519	13:25:34.331	-47:35:05.12
6	70.3	197.7	16.296	0.770	0.478	1.015	15.281	13:25:34.633	-47:35:26.31
7	77.7	199.4	18.787	0.564	0.359	0.802	17.985	13:25:34.575	-47:35:29.19
8	49.2	175.0	18.537	0.533	0.367	0.797	17.740	13:25:35.481	-47:35:17.94
9	24.1	155.4	17.801	0.549	0.348	0.766	17.035	13:25:36.207	-47:35:08.06
10	55.4	143.1	17.888	0.553	0.441	0.927	16.961	13:25:36.708	-47:35:20.03
11	54.5	152.2	15.194	0.090	0.025	0.144	15.050	13:25:36.359	-47:35:19.77
13	45.2	146.5	17.156	0.767	0.420	0.970	16.186	13:25:36.568	-47:35:16.12
14	74.6	136.7	16.488	0.775	0.480	1.013	15.475	13:25:36.972	-47:35:27.39
15	36.9	100.0	17.636	0.576	0.378	0.811	16.825	13:25:38.340	-47:35:12.47
16	41.1	22.4	16.859	0.765	0.474	0.977	15.882	13:25:41.313	-47:35:13.35
17	66.6	38.1	16.088	0.577	0.398	0.829	17.259	13:25:40.738	-47:35:23.35
18	67.8	49.6	18.237	0.565	0.356	0.773	17.464	13:25:40.299	-47:35:23.93
20	52.8	50.4	18.604	0.552	0.388	0.780	17.824	13:25:40.253	-47:35:18.14
21	59.4	46.6	18.574	0.532	0.369	0.773	17.801	13:25:40.405	-47:35:20.65
22	59.3	37.8	17.621	0.657	0.436	0.913	16.708	13:25:40.742	-47:35:20.53
23	101.6	43.7	17.807	9.999	0.375	0.786	17.021	13:25:40.558	-47:35:36.93
24	117.1	71.1	18.636	0.709	0.398	0.864	17.772	13:25:39.524	-47:35:43.18
27	148.5	26.2	18.444	9.999	0.348	0.772	17.672	13:25:41.273	-47:35:54.88
28	166.1	15.9	18.405	0.553	0.352	0.773	17.632	13:25:41.685	-47:36:01.58
29	183.3	45.1	17.430	0.708	0.443	0.934	16.496	13:25:40.584	-47:36:08.51
30	206.4	58.9	16.597	9.999	0.475	1.002	15.595	13:25:40.079	-47:36:17.57
31	179.4	103.0	18.010	0.547	0.376	0.804	17.206	13:25:38.364	-47:36:07.56
32	165.9	91.6	18.189	9.999	0.356	0.782	17.407	13:25:38.787	-47:36:02.24
33	134.2	120.7	16.704	9.999	0.319	0.675	16.029	13:25:37.642	-47:35:50.27
34	122.9	125.1	18.014	0.808	0.486	0.995	17.019	13:25:37.463	-47:35:45.94
35	105.7	121.4	17.786	9.999	0.396	0.825	16.961	13:25:37.588	-47:35:39.26
36	131.2	181.3	18.119	0.537	0.384	9.999	17.294	13:25:35.320	-47:35:49.69
37	166.6	176.5	17.924	0.559	0.375	0.801	17.123	13:25:35.538	-47:36:03.32
38	89.5	166.9	18.676	0.516	0.319	0.798	17.878	13:25:35.831	-47:35:33.44
39	96.2	168.2	18.451	0.543	0.333	0.749	17.702	13:25:35.787	-47:35:36.04
40	97.1	177.0	18.857	0.567	0.350	0.780	18.077	13:25:35.451	-47:35:36.47
41	184.0	181.6	18.593	0.517	0.359	0.783	17.810	13:25:35.360	-47:36:10.09
42	188.8	194.8	18.430	0.674	0.401	0.857	17.573	13:25:34.859	-47:36:12.07
43	196.2	162.9	18.632	9.999	0.369	9.999	17.853	13:25:36.087	-47:36:14.63
44	195.8	157.1	18.579	0.553	0.384	0.844	17.735	13:25:36.309	-47:36:14.42
45	190.7	152.5	18.798	0.544	0.577	0.819	17.979	13:25:36.480	-47:36:12.40
46	167.7	136.9	18.481	0.508	0.367	0.800	17.681	13:25:37.055	-47:36:03.36
47	61.1	119.2	18.786	0.679	0.422	0.873	17.913	13:25:37.628	-47:35:22.01
48	35.8	110.3	18.567	0.608	0.437	0.853	17.714	13:25:37.944	-47:35:12.15
49	22.5	122.6	18.537	0.575	0.374	0.793	17.744	13:25:37.461	-47:35:07.12
50	72.1	87.3	18.697	0.559	0.363	0.790	17.907	13:25:38.860	-47:35:25.95
56	9.5	159.3	18.282	0.538	0.367	0.764	17.518	13:25:36.044	-47:35:02.45
57	36.3	127.9	19.546	0.631	0.476	9.999	18.610	13:25:37.271	-47:35:12.51
58	37.3	123.5	18.665	0.646	0.362	0.798	17.867	13:25:37.441	-47:35:12.85
60	49.9	122.4	18.897	0.642	0.344	0.773	18.124	13:25:37.495	-47:35:17.71
62	19.8	85.6	18.940	0.565	0.422	0.865	18.075	13:25:38.874	-47:35:05.73
65	23.0	26.9	18.887	0.526	0.385	0.784	18.103	13:25:41.123	-47:35:06.40
66	28.4	18.8	19.641	0.588	0.414	0.890	18.751	13:25:41.439	-47:35:08.41
67	14.9	34.9	19.743	0.617	0.456	9.999	18.851	13:25:40.809	-47:35:03.35

TABLE 6—*Continued*

Star (1)	x_{W94} (px) (2)	y_{W94} (px) (3)	V (mag) (4)	$B-V$ (mag) (5)	$V-R$ (mag) (6)	$R-I$ (mag) (7)	I (mag) (8)	α_{2000} (HH:MM:SS.SSS) (9)	δ_{2000} (DD:MM:SS.SS) (10)
68	30.9	30.7	19.904	1.207	0.707	9.999	18.532	13:25:40.986	-47:35:09.49
70	67.8	27.5	18.875	0.562	0.409	0.814	18.061	13:25:41.144	-47:35:23.71
72	82.0	21.8	19.485	0.682	0.390	0.859	18.626	13:25:41.377	-47:35:29.15
74	103.6	31.2	19.842	0.714	0.447	0.914	18.928	13:25:41.038	-47:35:37.58
75	111.2	35.5	19.172	0.606	0.438	0.840	18.332	13:25:40.881	-47:35:40.56
76	115.7	44.3	19.059	0.641	0.388	0.823	18.236	13:25:40.548	-47:35:42.38
77	86.4	47.0	18.970	9.999	0.481	0.941	18.029	13:25:40.416	-47:35:31.09
78	103.0	61.5	19.835	0.644	0.455	0.903	18.932	13:25:39.878	-47:35:37.64
80	50.8	71.2	19.797	0.643	0.416	0.907	18.890	13:25:39.455	-47:35:17.57
81	41.7	56.6	19.591	0.705	0.444	0.848	18.743	13:25:40.005	-47:35:13.91
82	38.1	49.7	19.869	0.645	0.387	0.859	19.010	13:25:40.266	-47:35:12.45
83	63.1	97.0	19.053	0.588	0.376	0.804	18.249	13:25:38.480	-47:35:22.57
84	71.7	117.1	19.538	0.621	0.432	0.882	18.656	13:25:37.719	-47:35:26.08
85	70.8	127.7	19.471	0.536	0.475	9.999	18.566	13:25:37.313	-47:35:25.84
86	58.2	163.4	19.033	0.618	0.339	0.748	18.285	13:25:35.934	-47:35:21.31
87	66.5	175.9	20.060	0.626	0.413	0.856	19.204	13:25:35.464	-47:35:24.63
90	111.1	156.4	17.845	0.568	0.321	0.745	17.100	13:25:36.253	-47:35:41.68
92	107.6	188.1	19.346	0.596	0.387	0.859	18.487	13:25:35.037	-47:35:40.63
94	130.7	172.9	19.349	1.072	0.774	1.464	17.885	13:25:35.641	-47:35:49.41
95	123.3	155.0	20.528	0.696	0.599	1.050	19.478	13:25:36.319	-47:35:46.38
96	128.9	160.1	19.195	0.608	0.373	0.843	18.352	13:25:36.129	-47:35:48.59
97	133.6	157.9	19.753	0.563	0.418	0.932	18.821	13:25:36.218	-47:35:50.39
98	131.9	152.8	20.267	0.616	0.737	1.008	19.259	13:25:36.412	-47:35:49.68
99	126.2	136.3	19.404	0.610	0.393	0.844	18.560	13:25:37.038	-47:35:47.32
100	106.7	146.1	20.274	0.697	0.484	0.974	19.300	13:25:36.643	-47:35:39.88
102	152.3	160.8	18.988	0.563	0.375	0.806	18.182	13:25:36.125	-47:35:57.64
103	153.5	147.8	19.894	0.808	0.464	1.093	18.801	13:25:36.624	-47:35:57.98
104	158.9	147.5	20.599	0.722	0.367	1.044	19.555	13:25:36.641	-47:36:00.07
105	164.1	146.8	21.051	0.735	0.411	1.156	19.895	13:25:36.673	-47:36:02.07
106	164.4	142.9	20.406	0.668	0.432	0.965	19.441	13:25:36.822	-47:36:02.15
108	158.3	198.0	19.614	0.684	0.408	0.851	18.763	13:25:34.707	-47:36:00.32
109	153.8	211.8	18.893	0.613	0.350	9.999	18.116	13:25:34.174	-47:35:58.71
110	173.4	199.7	19.262	0.611	0.366	0.806	18.456	13:25:34.657	-47:36:06.17
111	178.4	195.7	20.180	0.805	0.510	0.995	19.185	13:25:34.815	-47:36:08.06
113	183.6	209.3	18.984	0.658	0.417	0.873	18.111	13:25:34.299	-47:36:10.20
114	212.8	192.0	18.998	0.693	0.389	0.841	18.157	13:25:34.990	-47:36:21.32
115	202.6	176.5	19.946	0.848	0.389	9.999	19.053	13:25:35.573	-47:36:17.23
116	190.8	169.7	19.263	0.583	0.338	0.836	18.427	13:25:35.822	-47:36:12.60
117	190.6	146.6	19.883	0.762	0.361	0.930	18.953	13:25:36.706	-47:36:12.31
118	200.9	129.6	20.064	0.803	0.329	0.860	19.204	13:25:37.367	-47:36:16.12
120	195.8	96.5	18.119	0.701	0.456	0.912	17.207	13:25:38.629	-47:36:13.84
122	197.1	89.4	19.474	0.608	0.416	0.882	18.592	13:25:38.902	-47:36:14.27
123	196.2	74.6	19.780	0.707	0.389	0.899	18.881	13:25:39.468	-47:36:13.78
124	197.2	60.8	19.430	0.641	0.386	0.850	18.580	13:25:39.997	-47:36:14.03
125	188.3	72.1	19.406	0.582	0.386	0.820	18.586	13:25:39.556	-47:36:10.70
129	166.3	47.5	20.879	1.107	0.554	1.101	19.778	13:25:40.476	-47:36:01.97
130	162.9	38.0	19.158	0.581	0.426	0.789	18.369	13:25:40.836	-47:36:00.56
131	158.2	30.9	20.045	0.683	0.373	0.831	19.214	13:25:41.103	-47:35:58.68
133	178.8	31.4	19.771	0.620	0.459	0.901	18.870	13:25:41.104	-47:36:06.64
134	191.9	35.7	18.816	0.557	0.368	0.776	18.040	13:25:40.952	-47:36:11.74
135	196.4	7.9	20.325	0.670	0.454	0.949	19.376	13:25:42.021	-47:36:13.21
136	146.5	11.1	20.305	0.734	0.448	0.960	19.345	13:25:41.849	-47:35:53.96
137	143.6	31.3	20.797	0.824	0.574	1.160	19.637	13:25:41.073	-47:35:53.04
138	139.9	46.5	18.714	0.585	0.381	0.818	17.896	13:25:40.488	-47:35:51.76

TABLE 6—*Continued*

Star (1)	x_{W94} (px) (2)	y_{W94} (px) (3)	V (mag) (4)	$B-V$ (mag) (5)	$V-R$ (mag) (6)	$R-I$ (mag) (7)	I (mag) (8)	α_{2000} (HH:MM:SS.SSS) (9)	δ_{2000} (DD:MM:SS.SS) (10)
139	132.4	42.6	19.185	0.659	0.450	0.919	18.266	13:25:40.630	-47:35:48.82
140	168.9	81.8	20.518	0.555	0.535	1.066	19.452	13:25:39.165	-47:36:03.30
141	161.0	70.8	20.231	9.999	0.501	1.065	19.166	13:25:39.579	-47:36:00.14
142	157.7	67.2	19.912	0.744	0.391	0.919	18.993	13:25:39.713	-47:35:58.83
143	150.5	68.9	20.492	0.802	0.515	1.059	19.433	13:25:39.641	-47:35:56.07
144	149.4	83.8	18.499	0.527	0.386	0.797	17.702	13:25:39.070	-47:35:55.79
145	145.6	82.5	19.271	9.999	0.376	0.819	18.452	13:25:39.116	-47:35:54.30
146	137.8	78.5	19.916	0.835	0.471	0.970	18.946	13:25:39.261	-47:35:51.25
148	139.3	99.1	19.214	9.999	0.431	0.854	18.360	13:25:38.474	-47:35:52.03
151	156.1	123.6	19.163	9.999	0.420	0.862	18.301	13:25:37.553	-47:35:58.76
152	110.7	93.7	19.223	0.696	0.359	0.826	18.397	13:25:38.653	-47:35:40.93
153	101.1	75.2	20.273	0.691	0.437	0.891	19.382	13:25:39.352	-47:35:37.04
154	112.5	61.4	20.594	0.743	0.603	1.408	19.186	13:25:39.891	-47:35:41.31
157	30.7	202.0	20.103	0.757	0.374	0.927	19.176	13:25:34.430	-47:35:11.05
159	88.6	128.5	21.178	0.739	0.513	1.118	20.060	13:25:37.299	-47:35:32.72
162	73.5	76.2	21.324	0.739	0.843	1.356	19.968	13:25:39.286	-47:35:26.39
163	83.2	91.1	21.500	0.996	0.715	1.229	20.271	13:25:38.725	-47:35:30.28
164	116.3	198.2	21.523	1.053	0.714	1.280	20.243	13:25:34.659	-47:35:44.09
165	145.6	199.9	21.440	0.876	0.693	1.302	20.138	13:25:34.622	-47:35:55.43
166	140.6	164.5	22.041	0.660	0.973	1.568	20.473	13:25:35.972	-47:35:53.16
167	119.4	168.2	20.863	0.808	0.638	1.168	19.695	13:25:35.810	-47:35:45.00
170	196.5	186.3	21.966	9.999	0.492	1.393	20.573	13:25:35.192	-47:36:14.96
173	137.7	65.9	20.894	0.911	0.525	1.063	19.831	13:25:39.743	-47:35:51.09
174	152.9	47.8	22.639	9.999	0.529	1.389	21.250	13:25:40.451	-47:35:56.79
175	175.6	64.2	21.457	1.035	0.580	1.263	20.194	13:25:39.846	-47:36:05.72
176	166.1	25.1	21.545	1.146	0.355	9.999	20.476	13:25:41.333	-47:36:01.67
178	119.8	31.2	21.197	1.297	0.446	1.121	20.076	13:25:41.054	-47:35:43.84
179	119.1	51.9	21.412	1.029	0.435	1.244	20.168	13:25:40.261	-47:35:43.77
181	15.7	116.6	20.938	0.880	0.587	1.130	19.808	13:25:37.684	-47:35:04.44
183	106.1	21.4	21.313	0.962	0.536	1.197	20.116	13:25:41.416	-47:35:38.45
185	137.1	20.5	21.602	9.999	0.645	1.130	20.472	13:25:41.480	-47:35:50.42
186	134.0	15.8	21.190	1.073	0.541	1.084	20.106	13:25:41.657	-47:35:49.18
192	52.2	165.7	22.423	9.999	0.444	1.088	21.335	13:25:35.840	-47:35:19.01
196	79.2	215.9	22.620	9.999	1.217	1.845	20.775	13:25:33.945	-47:35:29.92
201	108.3	216.3	20.024	0.641	0.560	1.079	18.945	13:25:33.958	-47:35:41.17
202	116.9	213.6	20.786	0.789	0.709	1.277	19.509	13:25:34.070	-47:35:44.47
203	125.1	209.4	22.517	9.999	0.921	1.885	20.632	13:25:34.239	-47:35:47.60
204	124.8	205.6	21.951	9.999	0.814	1.635	20.316	13:25:34.384	-47:35:47.44
207	99.4	188.3	22.305	9.999	0.683	1.324	20.981	13:25:35.021	-47:35:37.47
210	122.0	181.5	21.464	0.947	0.746	1.401	20.063	13:25:35.303	-47:35:46.13
215	181.3	191.2	21.948	9.999	0.732	1.470	20.478	13:25:34.990	-47:36:09.14
216	165.9	214.1	21.151	0.886	0.522	1.148	20.003	13:25:34.098	-47:36:03.41
217	198.3	204.4	20.136	0.810	0.435	0.934	19.382	13:25:34.501	-47:36:15.83
218	197.3	199.6	22.079	9.999	9.999	1.162	20.917	13:25:34.684	-47:36:15.40
219	198.1	215.9	20.063	9.999	0.417	0.898	19.165	13:25:34.060	-47:36:15.86
220	215.3	207.1	21.432	0.866	0.759	1.429	20.003	13:25:34.414	-47:36:22.43
221	211.9	205.1	21.707	1.115	0.415	1.138	20.569	13:25:34.487	-47:36:21.09
225	213.2	169.9	22.091	9.999	0.575	1.314	20.777	13:25:35.836	-47:36:21.26
226	216.3	164.2	21.618	1.054	0.589	1.391	20.227	13:25:36.057	-47:36:22.40
227	202.4	165.5	20.425	0.793	0.518	1.056	19.369	13:25:35.994	-47:36:17.05
228	198.2	169.6	21.656	0.977	0.709	1.435	20.221	13:25:35.833	-47:36:15.46
229	196.4	174.9	19.884	9.999	0.405	0.822	19.062	13:25:35.628	-47:36:14.82
230	192.9	175.9	20.949	0.822	0.498	1.031	19.918	13:25:35.587	-47:36:13.47
234	180.7	81.0	20.560	0.695	0.501	1.113	19.447	13:25:39.207	-47:36:07.85

TABLE 6—*Continued*

Star (1)	x_{W94} (px) (2)	y_{W94} (px) (3)	V (mag) (4)	$B-V$ (mag) (5)	$V-R$ (mag) (6)	$R-I$ (mag) (7)	I (mag) (8)	α_{2000} (HH:MM:SS.SSS) (9)	δ_{2000} (DD:MM:SS.SS) (10)
235	210.7	77.5	19.418	0.749	0.504	1.029	18.389	13:25:39.371	-47:36:19.41
236	192.4	68.8	21.744	0.938	0.730	1.308	20.436	13:25:39.686	-47:36:12.26
238	180.2	20.3	21.916	9.999	0.641	1.355	20.561	13:25:41.530	-47:36:07.07
240	158.4	25.3	22.569	9.999	0.732	1.439	21.130	13:25:41.318	-47:35:58.70
241	155.3	16.3	21.137	0.943	0.505	1.116	20.021	13:25:41.659	-47:35:57.41
243	150.0	18.8	22.955	9.999	0.698	1.510	21.445	13:25:41.558	-47:35:55.39
247	137.4	38.5	22.469	9.999	0.717	1.500	20.969	13:25:40.792	-47:35:50.71
248	145.1	52.2	22.452	9.999	0.612	1.631	20.821	13:25:40.275	-47:35:53.82
249	131.2	64.5	22.373	9.999	0.931	1.559	20.814	13:25:39.791	-47:35:48.57
257	126.7	86.9	20.543	9.999	9.999	0.994	19.549	13:25:38.929	-47:35:47.04
260	96.6	108.9	20.790	0.757	9.999	1.027	19.763	13:25:38.057	-47:35:35.62
261	99.1	129.4	22.170	9.999	9.999	1.134	21.036	13:25:37.275	-47:35:36.79
262	95.3	65.8	20.457	0.957	0.519	1.025	19.432	13:25:39.706	-47:35:34.71
263	89.3	52.6	20.919	0.665	0.563	1.205	19.714	13:25:40.205	-47:35:32.26
264	93.2	47.8	19.863	9.999	0.509	0.841	19.022	13:25:40.392	-47:35:33.72
265	89.6	40.4	21.211	0.938	0.362	1.235	19.976	13:25:40.672	-47:35:32.26
274	23.5	101.1	22.436	9.999	9.999	1.309	21.127	13:25:38.284	-47:35:07.31
275	37.6	72.0	22.291	9.999	0.950	1.765	20.526	13:25:39.412	-47:35:12.47
277	31.1	55.5	21.002	0.655	0.613	1.137	19.865	13:25:40.037	-47:35:09.80
278	27.6	56.2	20.461	0.792	0.555	1.049	19.412	13:25:40.007	-47:35:08.46
280	23.7	38.0	20.246	0.897	0.498	1.026	19.220	13:25:40.699	-47:35:06.78
283	40.0	43.6	21.712	9.999	9.999	1.176	20.536	13:25:40.501	-47:35:13.13
285	42.6	6.7	20.862	1.044	9.999	1.018	19.844	13:25:41.916	-47:35:13.78
286	47.4	9.1	20.841	0.872	0.426	0.988	19.853	13:25:41.828	-47:35:15.65
288	15.9	142.4	21.117	0.891	0.550	1.097	20.020	13:25:36.697	-47:35:04.76
289	21.2	146.3	21.566	0.770	0.748	1.342	20.224	13:25:36.553	-47:35:06.85
291	72.6	103.2	21.244	0.815	0.477	1.071	20.173	13:25:38.252	-47:35:26.30
292	74.7	95.4	21.987	9.999	0.708	1.327	20.660	13:25:38.553	-47:35:27.03
293	77.9	95.7	21.681	0.944	0.726	9.999	20.396	13:25:38.544	-47:35:28.27
294	80.9	98.7	20.549	9.999	0.528	1.104	19.445	13:25:38.432	-47:35:29.46
295	80.5	103.1	21.985	9.999	0.597	1.296	20.689	13:25:38.264	-47:35:29.35

NOTES. — Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.