EDITORIAL NOTICE.

The next MPCs will be published on or about July 11. No MPCs will be issued in June.

* * * * *

ERRATA.

MPC Line
10548 14 For Niepce read Niepce
10548 17 For Nicephore Niepce read Nicephore Niepce
11743 2 Add The identification 1969 TL1 = 1978 GP3 was found independently by L. D. Schmadel.
11751 5 For Istituto de Astrofisica read Istituto di Astrofisica

* * * * *

CORRECTED OBSERVATIONS.

The following observations correct those previously published.

813 1986 01 06.32797 06 33 12.60 +31 44 17.9 MPC11710 16.5 1 675
3554 1987 03 01.48507 13 53 48.28 +00 31 04.1 MPC11711 2 675
1984 AB 1986 01 06.32797 06 35 26.86 +28 13 27.3 MPC11706 3 675
1986 AZ2 * 1986 01 06.32797 06 27 33.59 +26 15 41.5 MPC11707 16.5 1 675
1987 FB * 1987 03 26.65637 13 00 20.50 -08 46 30.0 MPC11720 17 4 887

Note 1: time originally erroneously given as 1987 01 06.32788. 2: as 1987 03 01.48482. 3: as 1987 01 06.32784. 4: as 1987 03 26.56537.

* * * * *

IDENTIFICATION CHANGES.

Continuation to MPC 11682.

1970 QS1 * 1970 08 28.84325 20 59 27.60 -20 39 40.4 1970 PB1 16.5 095
1979 YB10* 1979 12 18.86962 04 33 19.95 +10 14 46.3 1979 YD 16.8 095
1986 EC5 * 1986 03 12.14649 11 31 57.60 +05 33 40.5 1986 EE1 18.0 809
IDENTIFICATIONS.

The following list of identifications with numbered minor planets continues that on MPC 11682.

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Note 1: identification by C. M. Bardwell. 2: by E. Goffin.

* * * * *

OBSERVATIONS OF COMETS.

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293 Burlington remote site. Observer T. Handley.
323 Perth Observatory, Bickley. 0.3-m astrograph. Observers M. P. Candy, P. Jekabsons, J. Johnston, M. Kempin and A. McGrath.
381 Tokyo Observatory, Kiso Station. Observer H. Kosai.
474 Mt. John University Observatory. 0.6-m reflector. Observer A. C. Gilmore. Measured by P. M. Kilmartin.
563 Seewalchen. 0.25-m f/6 reflector. Observer M. Bressler. Communicated by F. Frevert.
675 Palomar. For comet 1987o, 0.46-m Schmidt, observers C. and E. Shoemaker. Otherwise, 1.5-m reflector + CCD, observer J. Gibson.
688 Lowell Observatory, Anderson Mesa Station. 0.33-m photographic telescope and 1.8-m Perkins reflector + CCD. Observers B. A. Skiff and S. J. Bus. Measured by E. Bowell and S. J. Bus.
691 University of Arizona, Kitt Peak. 0.91-m SPACEWATCH telescope, CCD in scanning mode. Observers T. Gehrels and J. Scotti. Measured by R. McCarty.
695 Kitt Peak. 2.1-m reflector + CCD. Observers K. J. Meech and D. C. Jewitt.
805 Cerro El Roble. Observer C. Torres.
892 YGCO Hoshikawa and Nagano Stations. 0.25-m f/3.4 Wright-Schmidt. Observer T. Kojima.


Periodic Comet Schwassmann-Wachmann 1

/1974 II 1987 04 24.75972 20 38 33.35 -21 03 32.3 15 T 892
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Periodic Comet Harrington
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1987 05 03 58.42 -15 54 41.3 691

Comet Shoemaker (1987o)
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1987 05 33.52 +08 12 18.5 688
1987 06 26.26 +08 23 06.7 16.8T 688
1987 08 23.28 +08 42 27.0 657

Note 1: image out of focus.  2: image diffuse, coma diameter 13"-16".  3: no central condensation, coma diameter 1".  4: image very diffuse.  5: bad focus; image diffuse.  6: image diffuse with slight condensation, involved with star.  7: image diffuse.  8: image very faint and diffuse, coma diameter 23".  9: low in twilight.  A: poor seeing.  B: coma 15".

OBSERVATIONS OF MINOR PLANETS.

The observations are listed separately for each observatory code. Alphabetic note codes shown with some of the observations are defined according to the scheme below. Numerical codes are defined in the headings for the individual observatories.

A  earlier approximate position inferior
a  sense of motion ambiguous
B  black or dark plate
b  bad seeing
C  correction to earlier position
c  crowded star field
D  declination uncertain
d  diffuse image
E  at or near edge of plate
F  faint image
G  poor guiding
g  no guiding
I  involved with star
i  inkdot measured
M  measurement difficult

010 Caussols
J.-L. Heudier, CERGA Caussols, F-06460 Saint Vallier de Thiey, France
Observers A. Barthelemy, H. Chemin, R. Chemin, J. Ciffreo, J.-L. Heudier,
T. Laverge, C. Pollas
0.9-m Schmidt telescope
Observations in association with INAS

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E. W. Elst, Royal Observatory, B-1180 Brussels, Belgium
Observers E. W. Elst, B. I. Bilkina
Measurers E. W. Elst
Reductions E. W. Elst, C. Leterme

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Observers M. Antal, M. Muciek
Measurer M. Antal
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Observers R. Rajmohan, K. Kuppuswamy, A. Paranjpe
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413 Siding Spring
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Observers C.-I. Lagerkvist, P. Magnusson, E. Onnela
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491 Yebes  
M. de Pascual M., Observatorio Astronomico de Madrid, Alfonso XII 3,  
E-28014 Madrid, Spain
Observers M. de Pascual, J. Martin-Pintado, J. Garcia, C. Cabanas, F. Sanchez

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675 Palomar
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E. Helin, MS 183-501, Jet Propulsion Laboratory, Pasadena, CA 91109, U.S.A. (2)
C. Shoemaker, P.O. Box 984, Flagstaff, AZ 86002, U.S.A. (3)
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1.5-m reflector, 1.2-m and 0.46-m Schmidt telescopes


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1.8-m reflector + CCD (1) and 0.33-m photographic telescope
PDS scanning microdensitometer
AGK3 and Perth 70 secondary nets, global solutions
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Observer C. W. Tombaugh
Measurers E. Bowell, B. A. Skiff
0.33-m photographic telescope

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801 Oak Ridge
R. E. McCrosky, Harvard-Smithsonian Center for Astrophysics,
60 Garden Street, Cambridge, MA 02138, U.S.A.
Observers R. E. McCrosky, C.-Y. Shao, G. Schwartz
1.5-m reflector

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809 European Southern Observatory
H. U. Norgaard-Nielsen, Danish Space Research Institute, Lundtoftevøj 7, DK-2800 Lyngby, Denmark
1.5-m Danish telescope

881 Toyota
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Observers K. Suzuki, T. Urata
0.31-m f/5.7 reflector
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### 883 Shizuoka

T. Urata, 1-8-303, 1 Chome, Dobayashi, Shimizu, Shizuoka 424, Japan  
Observer M. Kizawa  
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### 887 Ojima

T. Urata, 1-8-303, 1 Chome, Dobayashi, Shimizu, Shizuoka 424, Japan  
Observers T. Niijima, T. Urata  
0.30-m f/5.8 reflector  
Copied from Nihondaira Obs. Circ.

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The orbit computers (column C) are B = C. M. Bardwell, b = F. N. Bowman, G = D. W. E. Green, I = H. Oishi, M = B. G. Marsden, N = S. Nakano, U = T. Urata.

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1978 TQ5 = 1978 WO (C. M. Bardwell)
1978 VA6 = 1978 WX11 (H. Oishi, JAM 2062)
1979 MD1 = 1979 OT7 (H. Oishi, JAM 2071)
1979 ME1 = 1979 OD1 (H. Oishi, JAM 2071)
1979 MT1 = 1979 OM8 (H. Oishi, JAM 2062)
1979 MB2 = 1979 OF1 (H. Oishi, JAM 2062)
1979 ME3 = 1979 OQ1 (H. Oishi, JAM 2063)
1979 MH3 = 1979 ON6 (H. Oishi, JAM 2063)
1979 MJ3 = 1979 OY1 (H. Oishi, JAM 2063)
1979 MO3 = 1979 OB3 (H. Oishi, JAM 2064)
1979 MS3 = 1979 OZ11 (H. Oishi, JAM 2064)
1979 MB4 = 1979 OZ9 (H. Oishi, JAM 2064)
1979 MO4 = 1979 OB5 (H. Oishi, JAM 2065)
1979 MH5 = 1979 OL4 (H. Oishi, JAM 2065)
1979 MK5 = 1979 OM5 (H. Oishi, JAM 2066)
1979 ML5 = 1979 OR11 (H. Oishi, JAM 2066)
1979 MU5 = 1979 OC5 (H. Oishi, JAM 2066)
1979 MT6 = 1979 OZ7 (H. Oishi, JAM 2066)
1979 MN8 = 1979 OC12 (H. Oishi, JAM 2066)
1979 MP8 = 1979 OM4 (H. Oishi, JAM 2067)
1979 MR8 = 1979 OE7 (H. Oishi, JAM 2068)
1979 MY8 = 1979 OX5 (H. Oishi, JAM 2068)
1985 TW1 = 1985 TY3 (F. N. Bowman)
1986 UG = 1986 WF (T. Kobayashi, NOC 1647)
(539) Pamina
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  73.77401  (1950.0)  P  Q
n  0.21760970  Peri.  95.48256  +0.97799798  -0.17204946
a  2.7374774  Node  274.46337  +0.11109036  +0.90819549
e  0.2128023  Incl.  6.79616  +0.17657545  +0.38154940
P  4.53  H  9.85  G  0.15
From 58 observations at 28 oppositions 1904-1986, mean residual 1".0.

(1387) Kama
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 116.74932  (1950.0)  P  Q
n  0.29052866  Peri.  124.93909  +0.84361673  +0.53565247
a  2.2577546  Node  202.74259  -0.51868018  +0.79501732
e  0.2088805  Incl.  5.52868  -0.13885853  +0.28464695
P  3.39  H  13.2  G  0.25
From 27 observations at 7 oppositions 1935-1986, mean residual 1".3.

(1615) Bardwell
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  5.93564  (1950.0)  P  Q
n  0.17971147  Peri.  247.94109  +0.75741485  -0.65279598
a  3.1099413  Node  152.80605  +0.60933517  +0.69930446
e  0.1929533  Incl.  1.68299  +0.23459197  +0.29125708
P  5.48  H  11.36  G  0.25
From 48 observations at 14 oppositions 1926-1986, mean residual 1".0.

(1617) Alschmitt
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  64.50777  (1950.0)  P  Q
n  0.17296349  Peri.  27.41603  -0.99406784  +0.04755776
a  3.1903115  Node  154.73167  -0.06619728  -0.97812948
e  0.1394002  Incl.  1.324682  +0.08629623  -0.20248701
P  5.70  H  10.9  G  0.25
From 34 observations at 12 oppositions 1926-1986, mean residual 1".1.

(1645) Waterfield
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 350.19172  (1950.0)  P  Q
n  0.18427273  Peri.  104.07294  +0.98346213  -0.18024758
a  3.0584074  Node  266.31346  +0.15853620  +0.90411717
e  0.1203985  Incl.  1.01589  +0.08751384  +0.38740540
P  5.35  H  11.5  G  0.25
From 78 observations at 13 oppositions 1933-1985, mean residual 0".8.

(1683) Castafioire
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  95.17826  (1950.0)  P  Q
n  0.21797929  Peri.  345.96861  +0.67765680  +0.72561954
a  2.7343822  Node  326.46313  -0.65210978  +0.51789882
e  0.1780005  Incl.  12.47603  -0.33990307  +0.45305308
P  4.52  H  11.7  G  0.25
From 42 observations at 14 oppositions 1936-1986, mean residual 1".1.
(1748) Mauderli
Epoch 1987 July 24.0 ET = JDE 2447000.5

\begin{align*}
M & = 269.32017 \\
(1950.0) & \\
\alpha & = 3.9207425 \\
\epsilon & = 0.2337500 \\
P & = 7.76
\end{align*}

From 63 observations at 12 oppositions 1951-1984, mean residual 0".8.

(1756) Giacobini
Epoch 1987 July 24.0 ET = JDE 2447000.5

\begin{align*}
M & = 116.10278 \\
(1950.0) & \\
\alpha & = 2.5498595 \\
\epsilon & = 0.2276484 \\
P & = 4.07
\end{align*}

From 45 observations at 12 oppositions 1937-1985, mean residual 1".1.

(1760) Sandra
Epoch 1987 July 24.0 ET = JDE 2447000.5

\begin{align*}
M & = 222.55338 \\
(1950.0) & \\
\alpha & = 3.1516589 \\
\epsilon & = 0.1196406 \\
P & = 5.60
\end{align*}

From 39 observations at 10 oppositions 1935-1986, mean residual 1".0.

(1764) Cogshall
Epoch 1987 July 24.0 ET = JDE 2447000.5

\begin{align*}
M & = 244.85956 \\
(1950.0) & \\
\alpha & = 3.0863550 \\
\epsilon & = 0.1292083 \\
P & = 5.42
\end{align*}

From 58 observations at 15 oppositions 1935-1986, mean residual 0".9.

(1784) Benguella
Epoch 1987 July 24.0 ET = JDE 2447000.5

\begin{align*}
M & = 349.61782 \\
(1950.0) & \\
\alpha & = 2.4054875 \\
\epsilon & = 0.1299073 \\
P & = 3.73
\end{align*}

From 34 observations at 14 oppositions 1935-1986, mean residual 0".9.

(1798) Watts
Epoch 1987 July 24.0 ET = JDE 2447000.5

\begin{align*}
M & = 52.41246 \\
(1950.0) & \\
\alpha & = 2.1987930 \\
\epsilon & = 0.1220534 \\
P & = 3.26
\end{align*}

From 31 observations at 9 oppositions 1934-1986, mean residual 0".8.
M. P. C. 11 829

(1808) Bellerophon
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 282.75432
n 0.21654010 Peri. 46.22875 a 2.7464846 e 0.1805842 P 4.55
P 0.51006364 0.77853167 +0.36568228 4.0178 Peri. 46.22875
Q -0.86009870 +0.45765685 +0.22534512
From 36 observations at 9 oppositions 1960–1983, mean residual 0".8.

(1813) Imhotep
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 194.30021
n 0.22396271 Peri. 166.42496 a 3.1711794 e 0.1783599 P 3.18
P 0.93068184 -0.34741695 +0.38130015 11.36 Peri. 166.42496
Q -0.79322543 +0.72934577 -0.04971565 H 12.5
From 29 observations at 8 oppositions 1932–1986, mean residual 1".0.

(1815) Beethoven
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 342.46969
n 0.17453112 Peri. 352.69479 a 2.1643930 e 0.30952797 P 0.55
P 0.23394429 +0.89436025 +0.38130015 H 11.36
Q -0.97123908 -0.23285835 -0.04971565 G 0.25
From 29 observations at 8 oppositions 1932–1986, mean residual 1".0.

(1818) Brahms
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 29.05006
n 0.30952797 Peri. 74.13629 a 2.1643930 e 0.1734589 P 3.18
P 0.79979507 +0.89436025 2.71821 H 14.1
Q +0.59830869 +0.23285835 +0.38130015 G 0.25
From 12 observations at 5 oppositions 1939–1986, mean residual 1".2.

(1847) Stobbe
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 233.62352
n 0.23376040 Peri. 136.95826 a 2.6098893 e 0.0195282 P 4.22
P 0.43114441 +0.7151939 -0.2309274 H 10.7
Q +0.8308306 0.8738688 -0.30764821 G 0.25
From 27 observations at 10 oppositions 1930–1985, mean residual 1".0.

(1874) Kacivelia
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 103.46536
n 0.17796833 Peri. 192.63259 a 3.1302154 e 0.3025307 P 5.54
P 0.99010707 -0.12019959 4.87528 H 11.0
Q +0.8308306 +0.93858012 -0.07238825 G 0.25
From 42 observations at 10 oppositions 1941–1984, mean residual 0".9.
(1880) McCrosky
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 137.47135 (1950.0) P Q
n 0.22546693 Peri. 186.76078 +0.54930242 +0.83219864
a 2.6735039 Node 116.58422 -0.76261899 +0.53623021
e 0.0761525 Incl. 4.84812 -0.34158325 +0.14107653
P 4.37 H 12.13 G 0.15
From 48 observations at 10 oppositions 1940-1986, mean residual 1".0.

1985 RZ4 = 1976 SL7
The identification was also found independently by C. M. Bardwell,
W. Landgraf and S. Nakano.
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 195.62967 (1950.0) P Q
n 0.22436474 Peri. 329.44813 +0.79040971 +0.61187299
a 2.6822578 Node 352.61408 -0.50555079 +0.62446419
e 0.1702682 Incl. 13.21729 -0.34593481 +0.48544405
P 4.39 H 12.5 G 0.25
Residuals in seconds of arc
760925 095 0.2- 2.0- 850915 675 0.4- 1.6- 851011 675 0.0 1.0-
760928 095 0.2+ 2.0+ 850915 675 0.1+ 1.9+ 851013 675 0.3+ 0.8+

1986 PM4 = 1986 RS = 1930 UF1 = 1934 NK = 1957 JC1 = 1972 QP = 1979 BQ1
The double designation 1986 PM4 = 1986 RS is by F. N. Bowman, E. W.
Elst and B. G. Marsden, who each found it independently (MPC 11723).
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 67.08121 (1950.0) P Q
n 0.20976097 Peri. 43.87790 +0.88597122 +0.4412454
a 2.8053505 Node 289.31681 -0.45483905 +0.77609872
e 0.1559491 Incl. 8.12938 -0.09042366 +0.44768759
P 4.70 H 12.2 G 0.25
Residuals in seconds of arc (or two decimals in units of degrees)
301017 690(0.05+ 0.02-)X 720905 095 0.5+ 1.5- 860905 071(11.5+ 5.0-)
301019 690(84.8+ 45.4-)X 790124 071 1.0+ 2.3- 860907 071 1.2- 0.6+
340709 078(0.04+ 0.00+)X 860808 071 1.0+ 0.6+ 860907 071 1.3- 1.0+
570505 076(0.06+ 0.05+)X 860808 071 1.0+ 1.9+ 860907 071 0.3+ 0.8+
720819 095 0.1- 0.8+ 860809 071 0.2+ 0.8+

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 51.52499 (1950.0) P Q
n 0.18006750 Peri. 359.11486 -0.39177386 -0.91912704
a 3.1058406 Node 113.94915 +0.84437707 -0.37708707
e 0.1365110 Incl. 2.60000 +0.36543209 -0.11409472
P 5.47 H 11.7 G 0.25
Residuals in seconds of arc
490326 094(37.9- 69.6+)X 741010 808 1.4+ 1.4- 870225 046 0.2+ 0.5-
521112 760 3.0- 1.8+ 790923 095 0.4+ 4.0- 870225 046 0.0 1.7-
521112 760 2.1- 3.1+ 820321 688 1.5+ 1.7+ 870303 046 1.0+ 0.9+
521114 760 0.3+ 1.5+ 820321 688 0.9+ 1.8+ 870303 046 1.2- 1.6+
521114 760 1.1+ 1.2+ 870224 046 1.5- 1.4-
741010 808 1.5+ 0.9- 870224 046 0.5- 1.9-
Comet Shoemaker (1987o)
T 1986 Nov. 20.58107 ET
q  5.4639015  (1950.0)  P  Q
    Peri.  17.42260 -0.24116164 -0.63176831
    Node  267.65392 -0.95485393 +0.01877152
    e  1.0  Incl.  132.49753 -0.17347920 +0.77492995
From 8 observations 1987 Apr. 25-May 8.

Comet Torres (1987j)
T 1987 Apr. 9.57652 ET
q  3.6242195  (1950.0)  P  Q
    Peri.  328.95372 -0.76313858 -0.61532525
    Node  193.79343 -0.27494689 +0.03262117
    e  1.0  Incl.  241.5116 -0.38142494 +0.78759806
From 8 observations 1987 Mar. 28-May 7.

(2847) 1959 CC1
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 217.7837 (1950.0)  P  Q
    n  0.30861991 Peri.  11.65127 -0.20580043 +0.97780793
    a  2.1686364  Node  246.48229 -0.90119987 -0.20499126
    e  0.1162429  Incl.  2.45116 -0.38142494 -0.04324623
    P  3.19  H  12.6  G  0.25
From 36 observations at 10 oppositions 1941-1986, mean residual 1".1.

(2906) Caltech
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 15.30087 (1950.0)  P  Q
    n  0.17558576 Peri.  296.65917 +0.81047593 -0.29125177
    a  3.1584683  Node  84.06748 +0.51828039 +0.76086697
    e  0.1201268  Incl.  30.72846 -0.27927920 +0.57987400
    P  5.61  H  10.0  G  0.25
From 18 observations at 5 oppositions 1974-1985, mean residual 0".8.

(3589)* 1984 AB1 = 1969 UZ1 = 1979 RA
Discovered 1984 Jan. 8 by J. Wagner at the Anderson Mesa Station of the Lowell Observatory. The identifications were found independently by L. Schmadel and W. Landgraf (MPC 9020).
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 84.13648 (1950.0)  P  Q
    n  0.29299914 Peri.  285.93619 +0.79726801 -0.59922929
    a  2.2450455  Node  110.93426 +0.57930006 +0.72571189
    e  0.1639544  Incl.  4.46544 +0.16963243 +0.33803330
    P  3.36  H  13.6  G  0.25
Residuals in seconds of arc
691017 095  1.8+  0.9-    840308 688  2.6-  0.0     840307 801  0.3-  2.3+
790901 095  2.9-  1.4-    840126 688  0.9+  1.1-    850524 801  3.1+  1.3-
810213 413  2.2-  2.0+    840126 688  0.1-  0.7+    861007 801  0.7+  1.1+
810502 413  0.8-  0.7+    840204 688  2.2+  1.0-    861029 801  0.1+  1.0+
840108 688  0.6-  1.2-    840204 688  0.7+  0.2-    861101 801  0.2+  1.2+
(3590)* 1984 CQ = 1954 JC = 1974 FE1

Discovered 1984 Feb. 5 by E. Bowell at the Anderson Mesa Station of the Lowell Observatory. The identifications are by W. Landgraf (MPC 8895).

Epoch 1987 July 24.0 ET = JDE 2447000.5

\[
\begin{array}{llll}
M & 28.68390 & (1950.0) & P \\
n & 0.29178589 & Peri. 354.77022 & -0.54484272 & -0.83350470 \\
a & 2.2512645 & Node 128.21023 & +0.77347840 & -0.54180598 \\
e & 0.0803850 & Incl. 6.70491 & +0.32384806 & -0.10824134 \\
P & 3.38 & H 13.2 & G 0.25 \\
\end{array}
\]

Residuals in seconds of arc

\[
\begin{array}{llll}
540504 760 & 2.4+ 0.7+ & 840303 809 & 0.5- 0.2+ & 840309 809 & 1.1- 0.6+ \\
740321 095 & 4.3- 3.7+ & 840303 809 & 0.0 0.0 & 840329 688 & 0.5- 0.2- \\
840128 688 & 3.1+ 2.1- & 840306 688 & 0.1- 0.2+ & 840330 688 & 1.2- 0.2- \\
840128 688 & 1.9+ 1.5- & 840306 688 & 0.7- 0.1- & 840331 688 & 1.2+ 0.3- \\
840205 688 & 2.0+ 1.4- & 840308 809 & 0.9- 0.4+ & 870127 801 & 1.4- 1.8+ \\
840226 688 & 0.5+ 0.5- & 840308 809 & 1.2- 0.5+ & 870225 801 & 0.3- 2.3+ \\
840226 688 & 0.8+ 0.5- & 840309 809 & 1.0- 0.8+ & 840331 688 & 0.5+ 0.3- \\
840303 809 & 0.5- 0.4+ & 840309 809 & 1.1- 0.9+ \\
\end{array}
\]

1985 SA

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

\[
\begin{array}{llll}
M & 221.46493 & (1950.0) & P \\
n & 0.27825352 & Peri. 180.91030 & +0.52683236 & +0.84276947 \\
a & 2.3236808 & Node 120.88901 & -0.77897775 & +0.53070432 \\
e & 0.1349598 & Incl. 7.39114 & -0.34006078 & +0.08995856 \\
P & 3.54 & H 13.2 & G 0.25 \\
\end{array}
\]

Residuals in seconds of arc

\[
\begin{array}{llll}
850916 809 & 0.2- 0.4+ & 850920 809 & 1.1+ 1.8- & 851022 809 & 0.0 0.6- \\
850916 809 & 1.0- 0.4+ & 850920 809 & 1.5- 0.3- & 860105 809 & 0.0 0.1- \\
850917 809 & 0.3- 0.8+ & 850921 809 & 1.1- 0.0 & 860105 809 & 0.1- 0.1+ \\
850917 809 & 0.2- 0.6- & 850921 809 & 0.7- 0.4- & 870101 809 & 1.0+ 0.6+ \\
850918 809 & 4.6- 0.1- & 850922 809 & 0.4- 0.3- & 870102 809 & 1.6+ 1.0+ \\
850918 809 & 3.2- 0.7- & 850922 809 & 0.3+ 0.6- & 870103 809 & 2.4- 1.2- \\
850919 809 & 1.4+ 0.3- & 850923 809 & 0.1+ 0.5+ & 850923 809 & 0.8- 0.6+ \\
\end{array}
\]

* * * * *

ORBITAL ELEMENTS BY C. M. BARDWELL, SMITHSONIAN ASTROPHYSICAL OBSERVATORY.

The identifications are by C. M. Bardwell unless otherwise stated.

(3302) 1977 RS6

Epoch 1987 July 24.0 ET = JDE 2447000.5

\[
\begin{array}{llll}
M & 240.74985 & (1950.0) & P \\
n & 0.25637993 & Peri. 168.33227 & +0.79349632 & +0.60803125 \\
a & 2.4540309 & Node 154.16673 & -0.56297152 & +0.74943249 \\
e & 0.0950988 & Incl. 3.38400 & -0.23114207 & +0.26200945 \\
P & 3.84 & H 12.9 & G 0.25 \\
\end{array}
\]

From 22 observations at 6 oppositions 1954-1987, mean residual 1".2.
(3591)* 1978 QJ2 = 1932 HB = 1973 UH1 = 1979 VD3 = 1984 UG1
Discovered 1978 Aug. 31 by N. S. Chernykh at the Crimean Astrophysical
Observatory. The identification 1978 QJ2 = 1932 HB is by L. D. Schmadel
(MPC 9291).
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 259.93841  P Q
n 0.17597158  Peri. 256.48793 +0.23967584  +0.97080900
a  3.1538500  Node  27.38481  -0.88274454  +0.22187620
e  0.1565290  Incl.  1.15106  -0.40412568  +0.09110892
P  5.60      H 11.6  G 0.25

Residuals in seconds of arc
320424 024 0.1- 1.2- 780826 414 0.3+ 0.2- 841030 046 0.8- 0.9-
731026 095 0.7- 0.1+ 780831 095 1.5- 0.8- 841030 046 0.7- 1.2-
770518 675 0.3+ 1.2- 780905 095 1.4- 0.6- 870224 046 1.2- 1.0-
770519 675 0.9+ 0.7- 780927 095 1.3- 1.5- 870224 046 2.3- 0.9-
780823 414 0.5+ 0.3+ 791114 095 0.2+ 2.5+ 870225 046 0.6- 1.4-
780823 414 3.4- 0.5+ 841028 046 5.9+ 0.3+ 870225 046 0.7- 1.6-
780824 414 1.1+ 0.6- 841029 046 2.1+ 2.1- 870227 801 1.9+ 3.5+
780826 414 0.1+ 0.7+ 841029 046 1.5+ 1.0+

(3592)* 1980 CT = 1964 VC2 = 1964 WJ = 1982 UN9
Discovered 1980 Feb. 15 by Z. Vavrova at Klet.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 84.54790  P Q
n 0.27420086  Peri. 62.46645 +0.13179768  -0.98957398
a  2.3465159  Node  20.21196  +0.83978777  +0.08033693
e  0.1896023  Incl.  9.67696  +0.52667436  +0.11953796
P  3.59      H 13.7  G 0.25

Residuals in seconds of arc
641111 330 1.3+ 2.1- 800222 046 1.3- 1.3- 850815 474 0.3- 0.1-
641127 330 1.0- 0.4- 800223 046 0.0 1.6- 870128 054 1.1+ 0.5+
800215 046 1.6- 1.1+ 800223 046 1.2+ 0.1+ 870128 801 1.0+ 1.4+
800215 046 0.6- 1.9- 821021 095 1.4+ 0.2- 870218 054 1.7+ 1.1+
800221 046 0.0 0.7- 821022 095 1.0- 0.5+ 870219 054 0.9- 0.4+
800221 046 0.1+ 0.8- 821111 095 1.4+ 0.0 870219 054 2.7- 1.6+
800222 046 0.0 1.9- 850815 474 0.6- 0.1+ 870224 801 0.1+ 0.6+

(3593)* 1981 EB20 = 1976 SH9
Discovered 1981 Mar. 2 by S. J. Bus at Siding Spring in the course of
the U.K. Schmidt-Caltech Asteroid Survey.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 52.72566  P Q
n 0.31228332  Peri. 205.05559  -0.47765042  -0.87833419
a  2.1516429  Node  273.48171  +0.80926560  -0.43124714
e  0.0937578  Incl.  1.11776  +0.34196384  -0.20628852
P  3.16      H 13.9  G 0.25
Residuals in seconds of arc

760929 095 0.5+ 1.2- 840222 809 0.7+ 0.9- 840304 809 0.2+ 0.3+
810209 413 0.2- 0.3- 840222 809 1.0+ 0.7- 840304 809 0.1+ 0.1+
810213 413 0.1+ 0.3+ 840223 809 0.4+ 1.1- 840304 809 0.1- 0.2+
810302 413 1.3- 1.1+ 840223 809 0.3+ 1.3- 840305 809 0.0 0.2+
810303 413 0.6- 0.4+ 840223 809 0.4+ 0.8- 840305 809 0.2+ 0.4+
810307 413 0.6- 0.8+ 840225 809 0.4+ 0.3- 840305 809 0.7+ 0.1+
810308 413 1.4+ 0.4- 840225 809 0.2- 0.3- 840306 809 0.6+ 0.5-
810308 095 0.2- 0.3- 840225 809 0.2+ 0.7- 840306 809 0.6+ 0.3-
810311 413 0.2- 0.7+ 840226 809 0.6- 1.1- 840306 809 0.9+ 0.2-
810311 413 1.0+ 0.1+ 840226 809 0.3- 1.1- 840306 567 0.7+ 1.6-
810316 413 0.7- 0.5+ 840226 809 0.3- 1.1- 840306 567 0.5- 2.4-
810316 413 0.9+ 0.3+ 840227 809 0.7+ 0.1+ 840308 809 0.3+ 0.3+
810329 413 0.3- 0.6+ 840227 809 0.9+ 0.3+ 840308 809 0.2+ 0.2+
810329 413 0.8+ 0.1- 840227 809 1.0+ 0.3+ 840308 809 0.4- 0.1+
810407 413 0.7- 0.2+ 840229 809 0.4- 0.5- 840309 809 0.1+ 0.2+
810407 413 0.7+ 0.4- 840229 809 0.1- 0.7- 840309 809 0.2+ 0.1+
810408 413 0.7- 0.7+ 840229 809 0.1- 0.7- 840309 809 0.4+ 0.1+
810408 413 1.6+ 0.5- 840301 809 0.0 0.4- 840310 809 0.1+ 0.1+
810411 413 0.7+ 1.1- 840301 809 0.0 0.5- 840310 809 0.1+ 0.1-
810430 413 0.0 0.6- 840302 809 0.1- 0.7- 840604 801 1.1+ 0.4+
810502 413 0.4+ 0.8- 840302 809 0.0 0.9- 861201 801 0.1- 1.4+
840222 809 0.4+ 0.7- 840302 809 0.0 1.0- 870128 801 0.2+ 1.1+

(3594)* 1983 CN = 1951 ES = 1959 EW
Discovered 1983 Feb. 11 by E. Bowell at the Anderson Mesa Station of the Lowell Observatory. The key identification 1983 CN = 1959 EW is by E. Bowell (MPC 8062).

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 33.51446              (1950.0)            P               Q
n 0.24433673            Peri. 162.74141 -0.80790228 -0.58348797
a 2.5340210             Node 340.84578 +0.50654743 -0.61586704
e 0.0281241             Incl. 14.59481 +0.30117039 -0.52938603
P 4.03                  H 12.8           G 0.25

Residuals in seconds of arc

510305 760 0.2+ 0.6- 830211 688 2.4+ 1.1- 851015 688 0.5- 0.4+
510305 760 1.4- 1.1+ 830215 688 0.3+ 1.8- 851015 688 0.5+ 0.5-
590306 690 1.0- 0.9+ 830215 688 0.3+ 0.8- 870127 801 0.7- 2.1+
590307 690 0.0 0.5+ 830219 688 1.8- 2.7- 870128 801 1.0+ 1.0+
590309 690 2.9+ 0.1+ 830219 688 2.4+ 1.8- 870224 801 0.6- 1.1+
590310 690 0.0 0.3- 830309 688 0.3- 0.2-
830211 688 1.0+ 1.5- 830309 688 3.4- 1.0-

Discovered 1985 Oct. 15 by E. Bowell at the Anderson Mesa Station of the Lowell Observatory.

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 171.89950              (1950.0)            P               Q
n 0.24672988            Peri. 118.42729 +0.98790228 +0.15477936
a 2.6635665             Node 232.69472 -0.15803699 +0.91534904
e 0.1240979            Incl.  2.78931 -0.02189174 +0.37172502
P 4.35                  H 12.9           G 0.25
Residuals in seconds of arc

370913 754 0.2+ 0.7- 760827 675 0.3+ 2.1+ 851107 688 1.1- 0.2+
370913 754 0.1- 0.8- 811125 095 2.7+ 2.2+ 851107 688 0.1- 0.6+
370914 754 0.2- 0.4+ 851015 688 1.0- 1.2- 861130 801 1.2- 0.7-
721006 095 (0.5+ 6.5+) 851015 688 0.9- 0.8- 870129 801 0.5- 0.2+
721013 095 (5.3+ 3.9+) 851020 688 0.2- 1.0- 870226 801 0.2+ 0.5+
760826 095 0.4+ 0.4+ 851020 688 1.3+ 0.6-

(3596)* 1985 VO = 1950 TR4 = 1973 SS5
Discovered 1985 Nov. 14 by P. Jensen at Brorfelde.

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 12.53783 (1950.0)  P  Q
n 0.08495245 Peri. 66.26758 +0.46043736 -0.88724674
a 5.1249006 Node 355.96971 +0.59613691 +0.33252577
e 0.0752845 Incl. 23.58274 +0.65773720 +0.31971836
P 11.60 H 9.5 G 0.25

Residuals in seconds of arc

501013 012 0.7- 0.6+ 851012 675 0.3+ 0.5- 851115 054 0.6+ 0.7-
501014 012 (39.4- 32.7-) 851012 675 0.0 0.8- 861229 801 0.2+ 0.1-
730928 095 0.5+ 0.6- 851014 675 0.3+ 0.2- 870226 801 0.1- 0.1+
850916 675 1.0- 1.5+ 851014 675 0.5- 0.8+
850916 675 0.3- 0.1- 851114 054 0.7+ 0.0

1941 HD = 1970 EA2 = 1980 TO1 = 1983 HD1 = 1987 DD1
The key identification 1941 HD = 1987 DD1 is by E. Bowell and F. N. Bowman, who found it independently.

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 338.70891 (1950.0)  P  Q
n 0.23421338 Peri. 72.60959 -0.60969464 +0.78810178
a 2.6065231 Node 159.11601 -0.78701014 -0.58919966
e 0.1402729 Incl. 13.73920 -0.09427345 -0.17815541
P 4.21 H 12.5 G 0.25

Residuals in seconds of arc

410403 062 (83.9- 15.8+) 700304 805 0.2+ 0.1- 870302 054 1.5- 1.9+
410403 062 (84.0- 13.8+) 801005 809 0.2- 0.2- 870303 688 0.0 0.2-
410419 062 0.2+ 0.9+ 801005 809 0.3+ 0.5- 870303 688 1.8- 0.1+
410421 062 0.3+ 1.1+ 830418 688 1.0+ 1.1- 870401 675 1.6+ 0.6+
410428 062 0.6- 0.2- 830418 688 0.1- 1.9- 870401 675 2.0+ 0.6-
700304 805 0.0 0.8- 870223 054 1.7- 0.4-
700304 805 1.1+ 0.7+ 870224 054 0.3- 0.6-

1973 FE1 = 1976 JE3 = 1987 HC
The key identification 1973 FE1 = 1987 HC is by E. Bowell and F. N. Bowman, who found it independently.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 82.43378 (1950.0)  P  Q
n 0.35166466 Peri. 304.74857 -0.73509494 -0.67124570
a 1.9878538 Node 194.19446 +0.67566057 -0.73690418
e 0.0569325 Incl. 22.84671 -0.05584101 -0.08008989
P 2.80 H 13.0 G 0.25

Residuals in seconds of arc

730327 095 1.0+ 0.1- 760524 095 1.7+ 0.2+ 870428 675 1.3- 0.2+
730402 095 0.0 0.4+ 870421 675 2.0+ 1.2+ 870430 675 1.0- 0.8+
730405 095 1.0- 3.2- 870424 675 0.3- 1.1- 870502 675 0.9- 0.6-
760503 095 1.8- 0.7- 870425 675 1.0+ 0.8+

The identification 1978 NU3 = 1949 OO is by W. Landgraf. The triple designation 1978 NU3 = 1978 OH = 1978 SJ is by H. Oishi (JAM 2044). The double designation 1978 NU3 = 1978 OH was independently found by O. Kippes (MPC 11722).
M. P. C. 11 836 1987 MAY 13

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 162.50983 (1950.0) P Q
n  0.27179386 Peri. 185.29867 +0.78649519 +0.61325234
a  2.3603541 Node 136.59395 -0.56262411 +0.76028044
e  0.2202161 Incl. 6.10852 -0.25471440 +0.21423172
P  3.63 H 14.5 G 0.25
Residuals in seconds of arc
490728 024  1.2+  0.4+  780709 414  0.8+  0.9-  780927 809  0.6-  0.7-
490730 024  0.2-  2.7-  780730 414  0.5-  0.2-  780928 809  0.4-  0.1+
780709 414  1.4+  0.4+  780730 414  0.3+  0.1+  780929 809  1.2-  0.9-

1978 RU = 1985 DT3
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 100.83854 (1950.0) P Q
n  0.23935946 Peri. 273.35874 +0.26387088 +0.96443840
a  2.5690340 Node 11.97415 -0.85329647 +0.24074705
e  0.2523889 Incl. 4.19863 -0.44973024 +0.10908451
P  4.12 H 14.0 G 0.25
Residuals in seconds of arc
780901 095  0.1+  0.4-  780912 095  1.1-  0.2-  781009 095  1.6-  1.3-
780905 095  1.6+  0.5+  780928 095  3.2+  1.0+  850220 675  0.6+  0.3-
780907 095  0.8-  0.2-  860908 071  0.9+  0.4-

1978 SZ6 = 1972 GD1 = 1986 RX4
The identification 1978 SZ6 = 1972 GD1 is by L. D. Schmadel.
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 332.88566 (1950.0) P Q
n  0.23394406 Peri. 124.59612 +0.24252118 -0.96929518
a  2.6085284 Node 311.31504 +0.87139525 +0.23605047
e  0.0294396 Incl. 3.10047 +0.42644320 +0.06889862
P  4.21 H 13.0 G 0.25
Residuals in seconds of arc
720412 095  0.4+  0.3-  781008 095  1.5-  0.7-  860908 071  1.4+  0.9+
780926 095  1.0+  0.8-  781011 095  0.9+  0.2+  860908 071  1.4-  1.0+
781002 095  0.0   0.3+  860908 071  0.9+  0.4-

1979 KD = 1987 HJ
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 351.92811 (1950.0) P Q
n  0.23626992 Peri. 100.60374 -0.33158471 -0.47385207
a  2.5913811 Node 345.35514 +0.34756148 +0.72112724
e  0.1616602 Incl. 13.88876 +0.32774965 +0.50541045
P  4.83 H 12.5 G 0.25
Residuals in seconds of arc
781108 026  0.6+  0.0  781202 026  0.0  0.8+  850220 675  0.9+  0.5+
781124 026  1.1+  0.3-  800220 095  0.3-  0.6-

1980 DV2 = 1985 DB4
The key identification 1978 VB = 1985 DB4 is by S. J. Bus.
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 296.11447 (1950.0) P Q
n  0.20394368 Peri. 42.57593 +0.87851078 -0.47385207
a  2.8584466 Node 345.35514 +0.34756148 +0.72112724
e  0.1616602 Incl. 13.88876 +0.32774965 +0.50541045
P  4.83 H 12.5 G 0.25
Residuals in seconds of arc
781108 026  0.6+  0.0  781202 026  0.0  0.8+  850220 675  0.9+  0.5+
781124 026  1.1+  0.3-  800220 095  0.3-  0.6-

1981 KD = 1987 HJ
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 315.92811 (1950.0) P Q
n  0.23626992 Peri. 100.60374 -0.33158471 +0.94092391
a  2.5913811 Node 149.75044 -0.91006357 -0.29982911
e  0.1552335 Incl. 7.83305 -0.24866822 -0.15736807
P  4.17 H 13.5 G 0.25
Residuals in seconds of arc

790519 809  0.3+  0.4+  790616 809  0.6+  0.0  790721 809  1.0-  1.1-
790520 809  0.2-  0.4+  790617 809  0.2-  0.5+  870430 675  0.3-  0.1-
790524 809  0.3+  0.0  790618 809  0.3+  0.3-  870502 675  0.1+  0.3-

The key identification 1980 FU = 1978 UB3 is by E. Bowell.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M  2.38390  (1950.0)  P  Q
n  0.28412150  Peri.  240.74887 -0.71280436  +0.70056188
a  2.2915755   Node   343.64477  +0.59505361  -0.62936083
e  0.1149954   Incl.    6.83474  -0.37124271  -0.33633019
P  3.47  H 14.5  G 0.25

Residuals in seconds of arc

730307 029  2.4+  1.0+  800316 809  0.5-  0.1-  800317 809  0.1-  0.2+
730307 029  1.4-  0.6+  800316 809  0.1+  0.1-  800317 809  0.3-  0.0
781026 675  0.4-  0.6-  800316 809  0.3-  0.2-  800317 809  0.3+  0.4-
781027 675  0.4+  0.3-  800316 809  0.2-  0.1-  800323 809  0.2-  0.8-
800221 095  0.4+  1.1-  800317 809  0.1-  0.5+
1981 DG3

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M  4.49220  (1950.0)  P  Q
n  0.17232852  Peri.  259.66407 -0.65722254  +0.74072299
a  3.1981498   Node   327.84608  +0.54748852  -0.59615994
e  0.0934145   Incl.   15.16707  -0.51799118  -0.30971401
P  5.72  H 11.5  G 0.25

Residuals in seconds of arc

810209 413  0.0  1.0+  810308 413  1.1-  0.2+  870327 474  0.4+  0.0+
810212 413  1.9+  0.2+  810308 413  0.0  0.4-  870327 474  0.6+  2.2+
810228 413  2.0-  0.1+  810312 413  0.8-  0.6-  810503 413  0.9-  2.7-
810306 413  1.5-  0.5+  810501 413  1.4+  0.9+
810306 413  0.1+  1.0-  810502 413  0.8+  0.3+
1981 EM5

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 130.45207  (1950.0)  P  Q
n  0.18147012  Peri.  193.94516  -0.26990112  -0.95235226
a  3.0898222   Node   271.85877  +0.89645800  -0.19468475
e  0.0543269   Incl.   8.17089  +0.35144906  -0.23478294
P  5.43  H 14.0  G 0.25

Residuals in seconds of arc

810209 413  2.3+  1.1-  810310 413  1.1-  0.2-  810408 413  0.1-  0.9+
810209 413  1.5+  0.3-  810310 413  1.1-  0.2-  810509 413  0.4+  0.0
810302 413  3.9-  0.1+  810312 413  2.3-  0.9+  810408 413  0.1-  0.9+
810302 413  1.9+  0.5-  810408 413  0.1-  0.9+  811210 675  0.2-  0.8+
810307 413  0.9-  0.0  810408 413  0.6+  0.4+  811210 675  0.2-  0.8+
810307 413  1.3+  1.1-  810409 413  1.9-  0.9+
1981 EB9 = 1978 TG1

The identification 1981 EB9 = 1978 TG1 is by K. Hurukawa (JAM 1901) and
L. D. Schmadel, who found it independently.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M  87.08882  (1950.0)  P  Q
n  0.23390316  Peri.  307.76757  +0.34675721  +0.93555069
a  2.6088325   Node   342.16254  -0.77680346  +0.24634176
e  0.1657432   Incl.  12.65623  -0.52567654  +0.25310205
P  4.21  H 13.5  G 0.25
Residuals in seconds of arc

1981 EJ9
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 214.33083 (1950.0) P Q
n 0.24008273 Peri. 203.35149 -0.91131780 -0.40849430
a 2.5638718 Node 312.43529 +0.38782851 -0.80995738
e 0.1112221 Incl. 3.98620 +0.13816264 -0.42083424
P 4.11 H 16.0 G 0.25

Residuals in seconds of arc

1981 EH11
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 15.38996 (1950.0) P Q
n 0.22955119 Peri. 359.29545 +0.95758576 +0.28053220
a 2.6417024 Node 343.93801 -0.26318062 +0.75849802
e 0.1855086 Incl. 13.76055 -0.11732632 +0.58820272
P 4.29 H 14.0 G 0.25

Residuals in seconds of arc

1981 EO14
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 56.10619 (1950.0) P Q
n 0.23101318 Peri. 338.80556 +0.74044454 +0.66611991
a 2.6305451 Node 338.62031 -0.57586289 +0.56000878
e 0.1669871 Incl. 14.22639 -0.34658883 +0.49261997
P 4.27 H 15.0 G 0.25

Residuals in seconds of arc
1981 EW14
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 320.75766 (1950.0) P Q
n 0.22780655 Peri. 47.13793 +0.91329731 -0.39667568
a 2.6551727 Node 335.78576 +0.27588474 +0.76938389
e 0.1783134 Incl. 13.01852 +0.29962581 +0.50069636
P 4.33 H 14.5 G 0.25
Residuals in seconds of arc
810209 413 2.8- 0.5- 810308 413 1.2+ 0.2- 810501 413 2.4- 1.1+ 810212 413 0.9+ 0.1- 810312 413 1.3+ 0.6- 810503 413 2.1+ 0.4- 810306 413 2.9+ 0.6- 810312 413 3.1- 0.8+ 810503 413 1.7- 0.0 810308 413 1.0- 0.1+ 810409 413 0.8- 1.0+ 810501 413 1.5+ 0.6- 810308 413 1.1+ 0.9- 810409 413 1.5- 0.7+ 810306 413 0.9- 0.1+ 810409 413 0.6+ 0.2+

1981 EC15
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 203.19975 (1950.0) P Q
n 0.23883055 Peri. 190.78999 -0.97999785 -0.19566860
a 2.5728255 Node 337.82577 +0.18899331 -0.85792133
e 0.1898603 Incl. 5.51983 +0.06233578 -0.47506294
P 4.13 H 16.0 G 0.25
Residuals in seconds of arc
810212 413 0.5- 0.5- 810306 413 0.4+ 0.7- 810501 413 0.2+ 0.5- 810212 413 0.3- 0.1+ 810308 413 1.1- 0.3+ 810503 413 0.3- 0.4+ 810213 413 1.1+ 0.9- 810308 413 0.1+ 0.2+ 810501 413 0.3- 0.4+ 810308 413 1.1+ 0.9- 810408 413 1.3+ 0.4+ 810501 413 1.5- 0.7+ 810301 413 0.6+ 0.4+ 810409 413 0.9- 0.0

1981 EX15 = 1978 NH5
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 338.61525 (1950.0) P Q
n 0.23427078 Peri. 57.07288 +0.91545074 -0.40091648
a 2.6061025 Node 326.52510 +0.3486723 +0.82621293
e 0.0815119 Incl. 3.62464 +0.20740431 +0.39577541
P 4.21 H 15.5 G 0.25
Residuals in seconds of arc
780710 675 (6.2- 9.5-) 780711 675 0.4+ 0.3+ Y 810306 413 1.0- 0.4+ 810409 413 0.6+ 0.2- 810711 675 0.4+ 0.3+ Y 810306 413 1.6- 0.5+ 810501 413 1.3+ 0.2- 810713 675 0.3- 0.5- Y 810306 413 1.6+ 0.3+ 810503 413 1.0+ 0.1- 810212 413 1.4+ 1.9- 810301 413 1.5- 0.1+ 810212 413 1.3+ 0.4+ 810408 413 (5.6- 1.0+) 850222 675 0.3- 0.2+ 810301 413 0.6+ 0.4+ 810409 413 0.9- 0.0

1981 ER18
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 243.18099 (1950.0) P Q
n 0.24068995 Peri. 130.40180 -0.42417033 -0.90528025
a 2.5595578 Node 344.64649 +0.80174995 -0.36340047
e 0.1651967 Incl. 5.06857 +0.20740431 +0.39577541
P 4.09 H 15.5 G 0.25
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<td>810307 413 1.8+ 0.5-</td>
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<td>810213 413 5.8+ 0.7+</td>
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<tr>
<td>810302 413 2.5+ 1.1-</td>
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<td>810307 413 0.3+ 0.7+</td>
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1981 ED22
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 147.60866              (1950.0)            P               Q
n   0.23320815     Peri.   41.12355     -0.81590029     +0.57817794
a   2.6140131      Node   174.19450     -0.54054806     -0.76022967
e   0.0672329      Incl.   2.33532     -0.20521822     -0.29624503
P   4.23           H   16.0           G   0.25
Residuals in seconds of arc
810209 413  0.2+  1.1-  810307 413  0.4+  0.7+  810408 413  0.6+  0.3+
810209 413  2.4+  3.0-  810311 413  1.3-  0.4+  810411 413  0.5+  1.8-
810213 413  1.2+  0.3+  810316 413  (5.1+  2.5-)  810426 413  1.0+  2.7-
810302 413  0.8-  1.8+  810407 413  1.5-  1.8+  850220 675  1.0-  1.0+
810307 413  1.5-  1.8+  810407 413  1.9+  1.5-  850222 675  0.7+  0.2-

1981 EV24
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 258.62041              (1950.0)            P               Q
n   0.23886985     Peri.  101.88625     -0.16841509     -0.98571387
a   2.5725433      Node   357.80607     +0.88130208     -0.14960765
e   0.1282204      Incl.   3.18779     +0.44152350     -0.07736747
P   4.13           H   16.0           G   0.25
Residuals in seconds of arc
791018 675  1.6+  0.4-  810302 413  0.2+  1.2-  810406 413  1.4+  0.1-
791018 675  0.6-  1.1-  810306 413  2.9-  0.0     810410 413  1.8-  0.2+
810213 413  3.0+  1.0-  810315 413  1.1-  0.2+  850220 675  1.8+  1.7+
810302 413  0.3+  0.3-  810406 413  1.5-  0.7+  850222 675  0.2+  1.9+

1981 EL32
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M  92.00751              (1950.0)            P               Q
n   0.23264853     Peri.  290.79150     +0.02800407     +0.99670524
a   2.6182034      Node   340.34563     -0.81211480     -0.02171480
e   0.0676944      Incl.   13.08042     -0.58282529     +0.07814815
P   4.24           H   15.5           G   0.25
Residuals in seconds of arc
810209 413  0.2-  0.1+  810307 413  2.5+  1.3-  810315 413  1.1+  0.0  0.5+
810213 413  0.7-  0.6+  810311 413  1.5+  0.4-  850220 675  0.5+  1.2+
810307 413  2.2-  0.2+  810315 413  0.6+  1.2-  850222 675  0.6-  0.7-

1981 EB33
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M  58.92534              (1950.0)            P               Q
n   0.23000284     Peri.  340.60543     +0.63235452     +0.76677595
a   2.6382429      Node  328.33104     -0.68005055     +0.48121016
e   0.1854718      Incl.  12.13594     -0.37102428     +0.42484283
P   4.29           H   14.5           G   0.25
Residuals in seconds of arc
810209 413  4.2+  1.8-  810307 413  2.5+  1.3-  810315 413  0.5+  1.2+
810214 413  0.9-  0.1+  810311 413  0.8-  0.8+  810429 413  0.0  0.3-
810301 413  0.8+  0.0  810311 413  0.4+  0.8-  850222 675  1.8-  0.4+
810307 413  1.5-  0.4-  810315 413  1.1-  0.6+  850223 675  1.9+  0.3-
1981 EW39

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

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<td>n</td>
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<td>e</td>
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Residuals in seconds of arc

781026 675 1.5- 0.5- 810302 413 2.1- 2.3- 810311 413 0.2+ 0.5+

81027 675 1.4+ 0.3- 810303 413 0.8+ 0.3- 810311 413 0.7+ 0.2-

810302 413 0.5+ 0.6+ 810311 413 0.5- 0.4+ 810502 413 0.6+ 0.4-

1981 EE46

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

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<td>n</td>
<td>0.18333703</td>
<td>Peri. 3.67193</td>
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<td>a</td>
<td>3.0688109</td>
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<tr>
<td>e</td>
<td>0.1431773</td>
<td>Incl. 4.76656</td>
<td>-0.26726165</td>
<td>+0.36544926</td>
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Residuals in seconds of arc

781026 675 1.6+ 0.0 810302 413 (6.9+ 2.3-) 810315 413 (3.3- 1.1-)

781027 675 1.8- 0.9- 810303 413 1.3+ 0.9+ 810315 413 0.2+ 0.5+

810209 413 0.4+ 0.1+ 810307 413 2.1- 1.3+ 810430 413 0.2+ 0.5+

810302 413 2.1- 1.0+ 810307 413 2.2+ 0.5- 810502 413 0.3+ 0.3-

1982 DU

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

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<td>e</td>
<td>0.2167290</td>
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Residuals in seconds of arc

820221 688 0.8+ 0.5+ 820323 046 2.0- 1.1- 820331 809 1.5+ 0.6+

820221 688 1.9- 0.7- 820324 046 0.2- 1.1- 820331 809 0.5+ 0.5+

820315 046 (6.0+ 1.4+) 820324 046 1.3+ 0.3- 820331 809 0.5+ 0.8+

820321 688 1.0+ 0.4+ 820325 046 1.4- 0.4- 870303 688 3.4+ 1.6+

820321 688 0.1- 1.8- 820326 046 1.4- 0.1- 870304 046 1.2- 2.0-

820323 046 0.8- 1.1+ 820326 046 1.6- 0.6+ 870304 046 3.9- 1.4-

1982 HS1 = 1987 EA1

The identification is by E. Bowell.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

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<td>Peri. 148.40591</td>
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<td>e</td>
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Residuals in seconds of arc

820418 688 0.1+ 1.4- 820526 688 1.8+ 0.4+ 870426 801 0.3+ 0.8-

820418 688 1.1- 1.8- 820526 688 1.5+ 0.4+ 870502 801 0.3+ 0.3-

820428 688 0.1- 1.5+ 870304 688 0.5+ 1.2+ 870304 688 0.3- 0.6-
1983 AN = 1987 EN
The identification is by E. Bowell.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J–P)
M 104.23110              (1950.0)            P               Q
n 0.26402332     Peri. 350.74877     +0.19500347     -0.97268352
a 2.4064419      Node  87.93147      +0.90769340     +0.113032898
e 0.1173852      Incl.  7.23968      +0.37157280     +0.19209668
P 3.73    H 12.5    G 0.25

Residuals in seconds of arc
830109 688  0.6+ 1.5+  830121 688  0.6- 0.3-  830309 688  0.8+ 0.6-
830109 688  1.2+ 0.3+  830215 688  0.7- 0.4-  870303 688  0.4+ 0.9+
830116 688  0.1- 1.4-  830215 688  0.7- 0.4-  870303 688  0.4+ 0.9+
830116 688  0.6- 0.7+  830309 688  0.7+ 1.4-  870502 801  0.2+ 0.2-

1983 RP2 = 1985 DJ4
The identification is by S. J. Bus.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J–P)
M 24.11610              (1950.0)            P               Q
n 0.28794914     Peri. 222.64463     +0.97461961     -0.22091636
a 2.2712227      Node 150.06134     +0.21993444     +0.91467346
e 0.1710388      Incl.  4.16297     +0.04177865     +0.33847958
P 3.42    H 15.0    G 0.25

Residuals in seconds of arc
830813 688  0.6- 1.1-  830904 688  0.8- 0.8+  830912 688  1.9+ 0.7-
830813 688  0.2- 0.4+  830906 688  0.9+ 1.1+  850222 675  1.0- 0.9-
830902 688  0.3- 0.3-  830906 688  2.3+ 1.4+  850223 675  0.2+ 0.2-
830902 688  1.9- 1.9+  830910 688  0.4- 0.5+  830904 688  0.3+ 1.1+
830904 688  0.3+ 1.1+  830910 688  0.3- 0.3-

The key identification 1986 CH = 1984 WN2 is by S. J. Bus. The identi-
fication 1986 CH = 1976 FF was suggested by L. D. Schmadel. The double
designation 1986 CH = 1986 AV2 is by F. N. Bowman (MPC 10817).

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J–P)
M 63.98498              (1950.0)            P               Q
n 0.19033722     Peri. 272.85082     -0.98741067     +0.03050151
a 2.9930991      Node 268.93161     +0.03294564     -0.92005469
e 0.0553074      Incl.  8.93048     -0.15470859     -0.39060086
P 5.18    H 12.0    G 0.25

Residuals in seconds of arc
760331 095  0.2+ 1.0+  860208 889  0.3- 0.5+  860302 889  1.1- 0.7+
841120 675  0.7+ 1.4+  860208 889  0.1+ 2.9+  860312 889  2.9- 0.6-
841121 675  0.7- 0.3+  860216 889  1.5+ 1.4-  860312 889  0.6- 0.8-
860112 688  1.2+ 0.4-  860216 889  1.0+ 0.2+  860112 688  1.4+ 0.1+  860302 889  0.6- 0.0

1986 TG = 1973 TB = 1985 DZ3
The key identification 1986 TG = 1985 DZ3 is by S. J. Bus. The identi-
fication 1986 TG = 1973 TB was suggested by D. W. E. Green.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J–P)
M 116.34290              (1950.0)            P               Q
n 0.20435217     Peri. 334.60680     +0.79065904     +0.61157580
a 2.1888667      Node  347.56243     -0.53635731     +0.66913567
e 0.2431865      Incl.  7.70269     -0.29526111     +0.42217592
P 3.24    H 13.5    G 0.25
Residuals in seconds of arc
731001 095  3.0+  5.1-    860930 046  0.6-  2.3+    861024 552  0.1-  0.2-
850220 675  0.4-  0.2-    860930 046  1.7+  0.9+    861024 552  0.5-  0.3-
850222 675  0.4-  0.8-    861001 046  0.8+  0.6-    861030 552  0.2-  0.3-
860903 026  2.5-  0.5+    861001 046  2.2+  0.6-    861030 552  0.6+  0.7-
860907 026  1.8-  0.3+    861001 026  0.0   0.6+    861030 552  0.2-  0.7+
860910 026  1.6+  0.4-    861003 054  1.8-  0.9+    861103 026  0.6+  0.1-
860911 026  3.8-  0.7+    861004 026  0.3+  0.2+    861104 552  1.8-  0.3+
860927 026  0.6-  0.8+    861004 054  1.2-  1.1+    861104 552  1.5+  0.4+
860929 046  0.4+  1.0+    861006 026  1.8-  0.6-    861104 552  2.1-  0.1-
860929 046  1.6+  0.1+    861008 026  1.6-  0.2-    861107 552  0.4+  0.8-
860929 046  2.4+  2.3-    861008 054  0.1-  0.2-    861107 026  0.0   1.3+
860929 026  0.4+  0.2+    861023 026  0.1-  0.5+    1986 XO2
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  8.76473              (1950.0)            P               Q
n  0.27223100     Peri.  43.25209     -0.92286006     +0.34623036
a  2.3578219      Node   155.42281     -0.35520461     -0.93444566
e  0.2248883      Incl.   23.92662     +0.14885898     -0.08328173
P  3.62           H   12.0           G   0.25
6582 P-L = 1985 DF4
The identification is by E. Bowell.
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)
M 185.01257              (1950.0)            P               Q
n  0.17634207     Peri.  103.93187     -0.42480193     -0.90528274
a  3.1494372      Node   11.20728     +0.82540545     -0.38847107
e  0.1565595      Incl.   0.75014     +0.37181871     -0.17191097
P  5.59           H   12.5           G   0.25
Residuals in seconds of arc
600924 675  0.5-  0.3-    601017 675  0.1+  0.5-    850222 675  0.5-  0.0
600926 675  0.4-  0.3-    601022 675  0.2+  0.1-    850223 675  0.5+  0.1-
600927 675  1.0+  0.6+    601024 675  1.3-  1.3+    850223 675  0.5+  0.1-
600928 675  0.1+  0.2+    601026 675  1.0+  0.7-

*    *    *    *    *

ORBITAL ELEMENTS BY B. G. MARSDEN, SMITHSONIAN ASTROPHYSICAL OBSERVATORY.

The identifications are by B. G. Marsden unless otherwise stated.

Periodic Comet Wiseman-Skiff (1987b)
Epoch 1986 Nov. 26.0 ET = JDE 2446760.5
T 1986 Nov. 22.75588 ET
q  1.5050077              (1950.0)            P               Q
n  0.15121246     Peri.  171.76257     +0.11873810     -0.94255445
a  3.4893484      Node   271.00455     +0.89221897     +0.23927434
e  0.5686852      Incl.   18.19703     +0.43571387     -0.23310705
P  6.52
Comet Levy (1987a)
Epoch 1987 Jan. 5.0 ET = JDE 2446800.5
T 1986 Dec. 17.53982 ET
q  0.9217973  (1950.0)  P  Q
z  -0.0008597  Peri.  95.26941  -0.05579536  -0.95813959
+/-0.0001122  Node  16.42016  -0.51794824  -0.21267115
e  1.0007925  Incl.  96.58870  +0.85359036  -0.19167554
From 33 observations 1987 Jan. 8-Apr. 3, mean residual 0".9.

Comet Sorrells (1986n)
Epoch 1987 Mar. 26.0 ET = JDE 2446880.5
T 1987 Mar. 9.67668 ET
q  1.7209732  (1950.0)  P  Q
z  +0.0002270  Peri.  70.22589  +0.94623377  +0.04882813
+/-0.0001017  Node  74.08720  -0.04925070  -0.95527181
e  0.9996094  Incl.  160.57824  +0.31971240  -0.29167035
From 100 observations 1986 Nov. 2-1987 May 7, mean residual 1".1.

Comet Nishikawa-Takamizawa-Tago (1987c)
Epoch 1987 Mar. 26.0 ET = JDE 2446880.5
T 1987 Mar. 17.34348 ET
q  0.8693801  (1950.0)  P  Q
z  +0.0054537  Peri.  200.40093  +0.90589836  -0.42335119
+/-0.0001987  Node  175.31018  -0.36739110  -0.95527181
e  0.9952587  Incl.  172.23847  -0.21064647  -0.47305975
From 59 observations 1987 Jan. 21-May 3, mean residual 1".1.

Comet Wilson (1986l)
Epoch 1987 May 5.0 ET = JDE 2446920.5
T 1987 Apr. 20.78339 ET
q  1.1996521  (1950.0)  P  Q
z  -0.0002960  Peri.  238.29891  -0.47929616  -0.71644202
+/-0.0000036  Node  110.95812  -0.50091689  +0.69759613
e  0.9952587  Incl.  147.12201  -0.72066467  -0.47305975
From 100 observations 1986 Aug. 5-1987 May 3, mean residual 1".1.

(3597)*  1941 UL = 1975 XW5 = 1980 VH1
Discovered 1941 Oct. 15 by L. Oterma at Turku.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  84.63720  (1950.0)  P  Q
n  0.17623708  Peri.  294.21425  +0.93481894  -0.35242097
a  3.1506816  Incl.  86.44529  +0.33963668  +0.85126587
e  0.2004433  H  11.7  \theta  0.25
P  5.59  0.25
Residuals in seconds of arc
411015 062  3.0+  3.4-  801010 095  0.5-  1.0-  850815 688  0.4-  0.8+
411027 062  0.8+  0.8-  801017 095  0.5-  2.0-  850815 688  1.5-  1.1+
411112 062  1.4-  1.2+  801106 330  3.3+  2.3+  861013 033  1.2-  0.1+
411115 062  2.2-  0.1+  801110 330  2.8+  2.1+  861013 033  1.1-  0.7+
751204 095  1.5+  0.9+  801130 330  2.7-  1.3+  861229 801  2.0-  0.1+

Discovered 1977 May 18 by E. Howell Bus at Palomar. The key identifica-
tion 1977 KK1 = 1978 QU is by A. Lowe (MPC 11050).
Discovered 1978 Aug. 8 by N. S. Chernykh at the Crimean Astrophysical Observatory. The key identification 1978 PB3 = 1977 LX is by E. Bowell (MPC 11050).

(3599)* 1978 PB3 = 1977 LX = 1979 WX6

(3600)* 1978 SL7 = 1951 AU1 = 1980 EV = 1984 AG1
Discovered 1979 Sept. 22 by N. S. Chernykh at the Crimean Astrophysical Observatory. The identifications are by E. Bowell (MPC 10830 and unpublished).

(3601)* 1979 SP9 = 1977 KH1 = 1987 BQ
Discovered 1979 Sept. 22 by N. S. Chernykh at the Crimean Astrophysical Observatory. The identifications are by E. Bowell (MPC 10830 and unpublished).
Residuals in seconds of arc

770518 675 0.4- 0.3- 790922 095 0.8- 1.1+ 870126 033 0.4- 0.2-
770519 675 0.2+ 0.4- 790928 095 0.2- 1.5- 870127 033 0.2- 0.0
780707 675 1.2- 0.4- 791016 095 1.3- 0.4+ 870128 033 0.3+ 0.2+
780708 675 0.6+ 0.0 791111 095 3.0+ 1.0- 870129 801 0.5- 0.3-
780709 675 0.7+ 0.2- 791116 095 0.3- 0.3+ 870224 801 0.6+ 0.5-

(3602)* 1981 DQ2 = 1976 YR4

Discovered 1981 Feb. 28 by S. J. Bus at Siding Spring in the course of the U.K. Schmidt-Caltech Asteroid Survey. The identification is by L. D. Schmadel (MPC 8538).

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 5.45251 (1950.0) P Q
n 0.28893241 Peri. 231.97901 -0.39480453 -0.91478238
a 2.2660625 Node 241.47957 +0.87045799 -0.34266253
e 0.1319878 Incl. 5.58128 +0.29399367 -0.21390557
P 3.41 H 14.4 G 0.25

Residuals in seconds of arc

761218 095 0.4- 2.9+ 810312 413 0.8- 0.7+ 840105 688 0.1+ 1.3-
810209 413 0.2- 1.5- 810312 413 0.5- 0.2+ 840106 552 4.2- 1.0-
810228 413 2.8- 0.1- 810407 413 2.5+ 2.3- 840108 688 3.9+ 0.6-
810228 413 0.4- 0.4+ 810408 413 0.4- 0.1- 840108 688 2.3+ 1.3+
810306 413 2.1- 1.5+ 810409 413 0.9+ 1.0- 861007 688 1.9- 1.6-
810306 413 0.6+ 0.2- 810409 413 0.7+ 0.0 861007 688 1.5+ 0.1+
810308 413 1.1- 1.0+ 810409 413 1.6+ 0.1- 861101 801 0.2+ 0.3+
810308 413 0.7+ 0.2+ 810501 413 0.5+ 1.0- 861202 801 0.9+ 1.8-


Discovered 1981 Sept. 5 by L. Brozek at Klet. The key identification 1981 RM = 1985 RC2 is by E. Bowell (MPC 10159).

Epoch 1987 July 24.0 ET = JDE 2447000.5
M 218.22027 (1950.0) P Q
n 0.23932250 Peri. 347.92226 -0.07385877 +0.99316119
a 2.5692934 Node 277.79238 -0.90716564 -0.10456990
e 0.1251930 Incl. 5.23624 -0.41424074 +0.05192285
P 4.12 H 12.9 G 0.25

Residuals in seconds of arc

760502 095 1.4- 3.8- 850914 688 0.6+ 0.3- 861203 046 0.2- 1.8-
810905 46 0.0 0.7 861129 046 (8.7+ 1.3-) 861203 046 0.0 0.2+
810905 46 0.7- 0.2- 861129 046 (8.1+ 0.4-) 861204 046 (11.6- 7.1-)
810906 46 0.8+ 0.4- 861130 046 1.2- 0.7 861207 046 (10.5+ 1.0+)
810906 46 0.6+ 0.9- 861130 046 0.3+ 1.6- 861207 046 (8.1+ 4.5+)
810906 46 0.8+ 0.2- 861201 046 (5.6- 3.7-) 861209 046 2.7+ 0.2+
810906 46 0.2- 0.7- 861201 046 1.4- 2.5- 861209 046 2.0+ 3.7+
810925 095 0.6- 1.3+ 861202 688 (6.9- 0.6+)
850914 688 0.5- 0.3- 861202 688 1.9- 1.0-

(3604)* 5550 P-L = 1971 FA1 = 1977 TK4 = 1983 AP


Epoch 1987 July 24.0 ET = JDE 2447000.5
M 334.94373 (1950.0) P Q
n 0.23495381 Peri. 155.21489 -0.99280721 -0.09738750
a 2.6010442 Node 19.57861 +0.04067918 -0.82144983
e 0.1159937 Incl. 11.99430 +0.11260132 -0.56190377
P 4.19 H 12.9 G 0.25
Residuals in seconds of arc

601017 675 1.1+ 0.1+  830112 688 2.6- 1.7+  830215 688 2.2+ 1.8-
601022 675 0.2- 0.0     830112 688 1.7+ 0.8+     840529 474 1.2+ 0.3-
601025 675 1.2+ 0.7-     830116 688 1.0+ 1.0+     840529 474 1.4- 1.3-
601026 675 0.5- 0.3+     830116 688 3.1- 2.0-     850917 801 0.3+ 0.1+
601026 675 0.7+ 1.0-     830121 688 1.7- 0.4+     861128 801 0.8+ 1.5+
710319 095 0.1+ 0.6+     830121 688 0.7+ 0.1-     870227 801 0.3+ 0.1+
771007 095 2.0- 0.7-     830215 688 1.9+ 2.8-

*    *    *    *    *

ORBITAL ELEMENTS BY S. NAKANO, SMITHSONIAN ASTROPHYSICAL OBSERVATORY.

The identifications are by S. Nakano unless otherwise stated.

(3605)*  1932 WB = 1971 GD = 1984 BY
Discovered 1932 Nov. 28 by E. Delporte at Uccle.
Epoch 1987 July 24.0 ET = JDE 2447000.5

M  13.82376  (1950.0)  P               Q
n   0.29176235  Peri.  199.44405  -0.52326368  -0.84955235
a   2.2513856   Node   282.15846   +0.79057904  -0.45471345
e   0.0795161  Incl.    3.91545  +0.31808789  -0.26738825
P   3.38       H   13.0       G   0.25

Residuals in seconds of arc
321128 012 0.9+ 2.2-  321229 012 2.3- 1.3+  840131 704 1.1+ 1.9+
321130 024 (4.9- 0.8+)  321231 012 1.6- 0.7+  840201 704 0.7- 0.1-
321130 012 0.4+ 1.8-  710402 805 0.3- 0.8-  840203 704 0.0   0.1+
321217 024 (2.3+ 6.3+)  840128 704 0.4+ 0.2-  861201 801 1.0- 2.7+
321219 012(10.7- 2.3-)  840128 704 0.0   0.8+  861229 801 1.0- 2.7+
321223 024 1.0+ 2.0-  840129 704 0.1- 0.3-  870129 801 0.9+ 1.2-
321223 012 1.5+ 2.3+  840130 704 0.0   0.2+  870202 801 0.3- 1.1-

(3606)*  1939 SF = 1973 WO = 1985 LE
Discovered 1939 Sept. 19 by Y. Vaisala at Turku.
Epoch 1987 July 24.0 ET = JDE 2447000.5

M 140.44274  (1950.0)  P               Q
n   0.23436294  Peri.  106.91585  +0.97780893  +0.05666580
a   2.6054141  Node  250.20085  -0.12083778  +0.93899032
e   0.2299058  Incl.   12.37806  +0.1713719  +0.33924351
P   4.21       H   12.4       G   0.25

Residuals in seconds of arc
390919 062 1.0+ 1.7+   731124 026 1.8- 2.0-  861228 688 0.8- 2.0+
390920 062 0.7- 0.2+   731124 026 0.8+ 1.8-  861228 688 0.1+ 0.4+
391007 062 0.9- 0.5+   850615 675 1.6+ 0.9-  861228 801 1.2+ 0.2-
391017 062 0.5- 1.4-   850615 675 0.9- 0.8-  
391020 062 0.6+ 1.4+   861205 801 0.6+ 0.2-

(3607)*  1977 DO4 = 1957 FE = 1978 NW4 = 1979 YH3
Discovered 1977 Feb. 18 by H. Kosai and K. Hurukawa at the Tokyo Observatory’s Kiso Station.
<table>
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<th>Comet</th>
<th>Date Discovered</th>
<th>Observatories</th>
<th>Epoch 1987 July 24.0 ET = JDE 2447000.5</th>
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<td>(3608)*</td>
<td>1978 SD1</td>
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<td>(3609)*</td>
<td>1980 VM1</td>
<td>European Southern Observatory</td>
<td>M 43.90679 (1950.0)</td>
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<td>1981 EA1</td>
<td>European Southern Observatory</td>
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**Residuals in seconds of arc**

### (3608)* 1978 SD1 = 1966 UO = 1977 LB1
- Discovered 1978 Sept. 27 by L. I. Chernykh at the Crimean Astrophysical Observatory.
- Epoch 1987 July 24.0 ET = JDE 2447000.5

### (3609)* 1980 VM1 = 1952 VB = 1963 UG = 1971 FE1
- Discovered 1980 Nov. 13 at the Purple Mountain Observatory. The identifications were found independently by L. D. Schmadel (MPC 11147).
- Epoch 1987 July 24.0 ET = JDE 2447000.5

- Discovered 1981 Mar. 5 by H. Debehogne and G. De Sanctis at the European Southern Observatory.
- Epoch 1987 July 24.0 ET = JDE 2447000.5
Residuals in seconds of arc

671030 029 0.3- 0.2+ 810305 809 0.7+ 0.3- 810310 809 0.4- 1.2+
671030 029 0.2- 0.2- 810307 809 0.9- 1.5- 810310 809 0.1+ 0.6+
671031 029 0.3+ 0.0 810307 809 0.3- 1.4- 810310 809 0.1+ 0.0
671031 029 1.2- 0.3- 810307 809 0.2+ 1.2- 810314 809 0.0 0.1+
671031 029 1.0+ 1.0+ 810307 809 0.6- 0.9- 810310 809 0.9+ 0.1+
750420 805 0.5+ 0.5- 810308 809 0.5- 0.9- 810314 809 0.6+ 0.1+
750420 805 0.5+ 0.5- 810308 809 0.3- 0.7- 810315 809 0.0 0.8-
780401 808 1.8- 0.1- 810308 809 1.8- 0.3+ 810315 809 0.2+ 0.9-
780401 808 1.0- 0.9+ 810309 809 1.6+ 1.3+ 810315 809 0.6- 0.9-
810305 809 0.1- 0.4- 810309 809 1.4+ 1.1+ 870130 801 0.4- 0.9+
810305 809 0.3+ 0.4- 810309 809 1.2+ 1.0+ 870225 801 1.0- 0.8+

(3611)* 1981 YY1 = 1982 BJ8 = 1971 SQ = 1985 QG
Discovered 1981 Dec. 20 at the Purple Mountain Observatory.

Epoch 1987 July 24.0 ET = JDE 2447000.5

M  91.75604  (1950.0)            P               Q
n   0.21160043     Peri.  289.93317     +0.40704542     -0.90757200
a   2.7890632      Node  135.59640     +0.88341211     +0.36247765
e   0.2130626      Incl.    8.47221     +0.23215742     +0.21195051
P   4.66           H   12.7           G   0.25

Residuals in seconds of arc
710916 808  0.4+  0.8-  850822 688  1.2+  2.0-  870224 046  1.5-  3.6-
811220 330  0.8+  0.1+  850912 688  3.3+  0.2-  870225 046  0.4+  4.1-
811223 330  3.7-  3.6+  850912 688  3.0-  1.8-  870225 046  0.0   3.1-
820120 330  2.5+  1.0-  870127 801  2.2+  1.1+
850822 688  0.6+  3.4-  870224 046  2.5-  0.1-

(3612)* 1982 TW = 1978 SH4 = 1980 BZ4
Discovered 1982 Oct. 13 by E. Bowell at the Anderson Mesa Station of the Lowell Observatory. The identification with 1980 BZ4 was erroneously given as with 1980 BX4 on MPC 10943.

Epoch 1987 July 24.0 ET = JDE 2447000.5

M 116.89342  (1950.0)            P               Q
n  0.25869098     Peri.  265.83342     +0.95441857     +0.29287243
a  2.4393935      Node  77.12918     -0.24502761     +0.87890621
e  0.1835846      Incl.    3.38377     -0.17043080     +0.37649649
P  3.81           H   13.5           G   0.25

Residuals in seconds of arc
780928 095  1.5-  2.9+  821013 688  0.1-  1.4-  821021 688  1.4+  1.0-
800122 095  0.6+  2.1+  821015 323  0.9+  1.2-  861106 688  0.3+  1.0-
820915 688  0.2-  1.0+  821017 688  0.5-  1.4-  861106 688  0.9+  0.8+
820915 688  0.3-  0.6+  821020 323  0.4+  0.4+  870104 801  2.3-  0.2+
821013 688  0.7+  0.5-  821021 688  0.6-  0.6-

(3613)* 1982 VJ11 = 1982 XY = 1949 UN = 1951 GR = 1973 FM1
Discovered 1982 Nov. 10 at the Purple Mountain Observatory.

Epoch 1987 July 24.0 ET = JDE 2447000.5

M  9.26243  (1950.0)            P               Q
n  0.27014163     Peri.  80.58547     -0.87965325     -0.45947942
a  2.36999638     Node  71.97691     +0.36968877     -0.82303346
e  0.0759312     Incl.    7.42192     +0.29923285     -0.33390805
P  3.65           H   12.7           G   0.25

Residuals in seconds of arc
491028 760  0.5+  1.0+  821110 330  0.0  1.5-  821214 381  1.1+  0.2-
510402 711  0.5-  0.7+  Y  821117 330  0.8-  0.8-  821214 381  0.3-  0.5-
510402 711(36.8-  4.4+Y)  821213 381  0.1-  0.1+  870128 801  0.5+  0.4+
730327 095  0.2-  1.7-  821213 381  0.2-  0.4+  870226 801  0.2+  0.8+
(3614)* 1983 AE1 = 1983 CW3 = 1952 DO = 1959 RE = 1974 OL
  Discovered 1983 Jan. 12 by N. G. Thomas at the Anderson Mesa Station of
  the Lowell Observatory.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 226.66529              (1950.0)            P               Q
n   0.19182392     Peri.  309.26078    -0.52334722    +0.80679633
a  2.9776081      Node  287.06643    -0.66638259   -0.58805680
e  0.1333240     Incl.  16.66850    -0.53107620   -0.05717411
P  5.14           H  10.8           G  0.25
Residuals in seconds of arc
520226 760  0.8+  1.2+    830112 688  1.0-  1.3-    861101 801  1.3+  0.3+
520226 760  1.3+  1.3+    830112 688  1.3-  1.0-    861205 801  0.2-  0.3+
590907 760  1.0+  3.2-    830122 688  1.1-  0.2-    870129 801  0.3-  0.1+
740725 095  0.4+  0.7+    830210 330  0.9-  2.2-

  = 1974 EM = 1976 SB7
  Discovered 1983 Nov. 29 by E. Bowell at the Anderson Mesa Station of
  the Lowell Observatory. The identification 1983 WZ = 1930 KS was suggested
  by W. Landgraf.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  75.65856              (1950.0)            P               Q
n   0.17524699     Peri.  97.80255    -0.59413637    +0.80395936
a  3.1625374      Node 135.71343    -0.75161336   -0.54359200
e  0.1213781     Incl.   2.09464    -0.28649490   -0.24115779
P  5.62           H  11.2           G  0.25
Residuals in seconds of arc
300525 690  2.0+  3.0+    520323 711  2.0-  4.1-    Y 831129 688  2.1-  2.4+
300527 690(12.1-  0.4+)   520323 711  1.1-  0.3+    Y 831129 688  0.9+  1.8+
300529 690 (9.4-  0.2+)   690519 095  0.4+  1.1+    831204 046  0.5+  1.7-
300531 690 (8.0+  0.3+)   700809 095  3.0-  0.6+    831205 046  0.6-  0.7+
300531 690 (9.2+  0.3+)   700829 095  1.1+  1.2-    831205 046  2.2+  1.6+
510109 760  1.7-  1.4+    740315 095  0.8+  0.1-    831208 046  0.6-  0.7+
510109 760  1.8-  2.2+    740725 095  0.2-  0.1-    831208 046  0.8-  1.1-

(3616)* 1984 JJ2 = 1950 HL1 = 1963 KE = 1975 BT1 = 1979 BO1
  Discovered 1984 May 3 by L. V. Zhuravleva at the Crimean Astrophysical
  Observatory.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 265.28859              (1950.0)            P               Q
n   0.23483216     Peri. 118.11789    -0.54386619    +0.81590178
a  2.6019424      Node 117.59972    -0.82645606   -0.48021487
e  0.1210787     Incl. 12.79416    -0.14553336   -0.32202169
P  4.20           H  12.4           G  0.25
Residuals in seconds of arc
500416 760  1.0-  1.3-    750118 330  1.8-  0.8+    840519 095  1.2+  1.5-
500416 760  2.5+  2.2+    750122 330 (2.2+ 10.6-)   840530 095  0.4-  1.5+
630523 760  2.0-  1.4+    790124 095  0.7+  1.2-    861130 801  0.3+  0.5-
630523 760  0.7+  2.0-    840503 095  0.1-  0.5-    861228 801  0.1-  0.3+

(3617)* 1984 LJ = 1950 LM = 1971 FU
  Discovered 1984 June 2 by B. A. Skiff at the Anderson Mesa Station of
  the Lowell Observatory.
Epoch 1987 July 24.0 ET = JDE 2447000.5

M 280.94439  
(1950.0)  
P  
Q  
n 0.23142215  Peri.  34.48423  -0.81351301  +0.58152654  
a 2.6274397  Node  181.10952  -0.57382532  -0.80403692  
e 0.1095052  Incl.  14.48965  -0.09445151  -0.12390121  
P 4.26  
H 12.1  
G 0.25  
Residuals in seconds of arc
500607 760  0.2-  0.4+  840523 095  1.1-  0.8+  870130 801  0.0  0.2-  
500607 760  0.3+  0.5+  840526 095  1.7-  0.1-  870227 801  0.0  0.2-  
710319 095  0.1-  0.2-  840602 688  1.8+  2.5-  870228 801  0.1+  0.1+  
840504 095  0.1-  2.9+  840602 688  1.2+  2.3-  

1986 PG = 1929 UK = 1985 VM

Epoch 1987 July 24.0 ET = JDE 2447000.5  (J-P)

M 152.61860  
(1950.0)  
P  
Q  
n 0.21133953  Peri.  174.61252  +0.96823518  -0.24565609  
a 2.7913637  Node  199.79790  +0.22394814  +0.93491879  
e 0.2299779  Incl.  7.91200  +0.11121092  +0.25608582  
P 4.66  
H 12.0  
G 0.25  
Residuals in seconds of arc
291002 690  0.5+  0.1-  660814 095  2.2-  0.9-  851115 054  0.3-  0.7-  
291026 690  0.3-  1.2+  660913 095  1.0-  0.1+  851115 054  0.1-  0.2-  
291027 690  1.6-  1.0+  660914 095  3.3+  0.1-  
291103 690  0.8+  1.0+  851114 054  0.9+  1.9-  

1986 GK2 = 1986 EE1 = 1986 ES3

Epoch 1987 July 24.0 ET = JDE 2447000.5  (J-P)

M 66.62518  
(1950.0)  
P  
Q  
n 0.29094738  Peri.  167.77123  -0.13314291  +0.99080626  
a 2.2555924  Node  94.57398  -0.91128581  -0.11286547  
e 0.1104312  Incl.  1.37953  -0.38965514  -0.07459449  
P 3.39  
H 13.5  
G 0.25  
Residuals in seconds of arc
760401 095  0.3-  0.0  760502 095  0.4+  0.6+  860305 688  2.2+  1.6-  
760404 095  0.1-  0.8-  860305 688  1.2-  1.2+  860312 809  0.9-  0.7+  


Epoch 1987 July 24.0 ET = JDE 2447000.5  (J-P)

M 299.51895  
(1950.0)  
P  
Q  
n 0.27861010  Peri.  311.45224  -0.11527686  +0.99005793  
a 2.3216977  Node  311.73938  -0.87607619  -0.13957868  
e 0.0916907  Incl.  6.20108  -0.46818986  +0.01740916  
P 3.54  
H 13.0  
G 0.25  
Residuals in seconds of arc
531102 760(32.0- 14.1+)X  781008 095  0.6+  3.7-  800316 095  3.4-  3.0-  
740922 095  0.3-  1.4-  781026 675  0.4-  1.8-  810902 095  0.1+  3.4+  
751204 095  5.4+  6.2+  781027 675  0.5-  1.8-  


The double designations 1980 GF = 1980 FO10 and 1980 DS5 = 1980 FO10 are by B. G. Marsden and by N. S. Chernykh, respectively (MPC 9203, 11332).
The identification 1980 GF = 1984 KD1 was suggested by N. S. Chernykh.
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 340.64814 (1950.0) P Q
n 0.26398658 Peri. 42.22982 -0.99262804 +0.11975446
a 2.4066652 Node 144.63525 -0.11802573 -0.92007288
e 0.0763211 Incl. 1.84821 -0.02755902 -0.37299432
P 3.73 H 13.5 G 0.25
Residuals in seconds of arc
690422 095 1.5- 4.3- 800413 046 0.7- 0.5- 800415 046 0.5+ 0.2+
800221 095 0.3+ 0.6- 800414 046 0.8- 0.5+ 800416 046 2.0- 0.1+
800316 095 0.9- 1.1- 800414 046 1.4+ 1.0+ 840502 095 1.1+ 0.3-
800412 046 1.7+ 1.1+ 800415 046 0.7+ 0.2+ 840525 095 1.1+ 0.3-

1980 RS2 = 1953 TX = 1953 VO
The double designation 1953 TX = 1953 VO was suggested by O. Kippes (NAZ 12, 23).
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 358.98568 (1950.0) P Q
n 0.29174671 Peri. 122.91840 +0.96038266 -0.27147326
a 2.2514706 Node 252.90078 +0.22857703 +0.89662138
e 0.1674602 Incl. 3.77855 +0.15942923 +0.34981762
P 3.38 H 13.0 G 0.25
Residuals in seconds of arc
531007 760 2.0- 3.2+ 531102 760 2.1+ 2.1- 801008 095 0.6+ 0.1+
531007 760 1.3- 2.2+ 800908 095 2.2+ 0.9- 801012 095 1.2- 2.9-

Epoch 1987 July 24.0 ET = JDE 2447000.5

M 190.93950 (1950.0) P Q
n 0.29126341 Peri. 168.94393 -0.95792533 +0.20188028
a 2.2539560 Node 22.75238 -0.25737956 -0.91878501
e 0.1037600 Incl. 7.02436 +0.12702290 -0.33923216
P 3.38 H 12.6 G 0.25
Residuals in seconds of arc
280425 024 2.1- 2.1- 550223 760 0.5+ 3.5+ 730927 095 2.1- 2.6+
280507 024 1.5+ 0.5+ 550223 760 1.9+ 1.1- 801013 095 0.6+ 0.2-
310110 690 (0.2+ 7.0-) 550416 760 0.3- 1.1- 801014 330 2.0+ 0.8+
310111 690 (0.2- 5.4-) 550416 760 0.7- 1.4+ 801028 330 1.6- 0.4-
310112 690 (6.4+ 7.0-) 700930 095 1.0+ 2.7- 801031 330 0.7- 0.7+

1983 BE = 1984 KA1
Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 264.88206 (1950.0) P Q
n 0.20130038 Peri. 76.06043 -0.95792533 +0.20188028
a 2.8834152 Node 115.25816 -0.25737956 -0.91878501
e 0.1294393 Incl. 13.03730 +0.12702290 -0.33923216
P 4.90 H 12.0 G 0.25
Residuals in seconds of arc
830110 675 0.3+ 0.6- 830112 675 1.8+ 1.2+ 830121 688 0.4+ 0.6+
830110 675 1.3+ 0.8+ 830112 675 0.2- 2.1+ 830121 688 0.2- 0.8-
830111 675 2.9- 2.7- 830116 688 0.0 0.2+ 840523 095 1.0+ 0.3+
830111 675 0.9- 0.4- 830116 688 0.4+ 0.3- 840526 095 1.0- 0.3-
1984 SM1 = 1955 QF1 = 1978 RX3 = 1978 SK4

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 195.20017            (1950.0)            P               Q
n   0.17143643  Peri.  350.09326  +0.95694393  +0.28850791
a   3.2092349      Node   352.89047  -0.24549218  +0.74564059
e   0.0652479      Incl.  14.96535  -0.15489319  +0.60065240
P   5.75          H   12.0           G   0.25

Residuals in seconds of arc
550825 760  3.0+  1.7+   840920 046  0.0  2.5-   840929 046  2.3-  1.2+
550825 760  1.7+  1.0+   840920 046  2.3+  1.9-   840930 046  0.6-  1.6+
550825 760  0.3+  0.9+   840927 046  1.6+  1.2-   840930 046  1.7-  1.5+
780928 095 (0.9- 11.2+)  840927 046  1.7+  1.0-
780903 095  0.3+  1.0+   840929 046  0.8-  1.8+
780928 095  0.3+  1.0+   840929 046  0.8-  1.8+

1985 CV = 1983 RZ3

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 285.03184            (1950.0)            P               Q
n   0.23551149  Peri.  269.24539  +0.59490668  -0.79274504
a   2.5969416      Node   143.17895  +0.79702314  +0.56038168
e   0.1955694      Incl.   12.80419  +0.10411602  +0.23984927
P   4.18          H   13.0           G   0.25

Residuals in seconds of arc
830902 688  1.2+  1.4-   850218 809  0.2-  0.1+   850225 809  0.0   0.5-
830902 688  0.9+  1.8-   850219 809  0.1-  0.7-   850225 809  0.3+  0.5-
830902 688  1.0-  1.8+   850219 809  0.0  0.7-   850226 809  0.4+  0.5-
850212 675  1.2+  0.6+   850220 809  0.2+  0.7-   850226 809  0.5-  0.3+
850214 809  0.1-  0.3+   850220 809  0.2+  0.7-   850226 809  0.5-  0.3+
850214 809  0.2+  0.1+   850220 809  0.6+  0.8-   850226 809  0.3-  0.0
850214 809  0.1-  0.3+   850220 046  0.1-  1.1-   850226 809  0.2-  0.3-
850216 809  0.1+  0.8+   850220 046  0.7-  0.5-   850227 809  0.1+  0.9+
850216 809  0.3+  0.9+   850221 809  0.0  0.1+   850227 809  0.1-  0.3+
850216 809  0.7+  0.8+   850221 809  0.1-  0.2+   850227 809  0.4+  0.3+
850216 675  1.0+  0.9+   850221 809  0.2-  0.1+   850227 809  0.1+  0.1+
850216 046  2.4-  0.3+   850224 809  0.1-  0.2-   850227 809  0.0   0.1+
850216 046  2.5-  2.3-   850224 809  0.1-  0.0   850228 809  0.9-  0.6+
850217 809  1.0+  0.5+   850224 809  0.1+  0.1-   850228 809  0.8-  0.5+
850217 809  0.7+  0.5+   850224 809  0.1+  0.2+   850228 809  0.1-  0.4+
850217 809  1.0+  0.5+   850224 809  0.2+  0.4+   850228 809  0.0   0.4+
850218 809  0.6-  0.3-   850224 809  0.2+  0.1+   850228 809  0.1+  0.6+
850218 809  0.5-  0.1-   850225 809  0.1+  0.4-

1985 QG4 = 1932 UD = 1977 DT5

The identification 1985 QG4 = 1977 DT5 was suggested by L. D. Schmadel.

Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 228.14813            (1950.0)            P               Q
n   0.27639559  Peri.  296.37543  +0.06152957  +0.99585155
a   2.3340824      Node   336.85606  -0.84410749  +0.01607759
e   0.2268654      Incl.  9.82015  -0.53263182  +0.08956113
P   3.57          H   14.0           G   0.25
Residuals in seconds of arc (or two decimals in units of degrees)

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<tr>
<th>Date</th>
<th>RA</th>
<th>Declination</th>
<th>Period</th>
<th>Epoch</th>
<th>JDE</th>
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<tr>
<td>1986 EJ1 = 1969 ET1</td>
<td>M 74.30735</td>
<td>(1950.0)</td>
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<td>1987 GC = 1983 LH</td>
<td>M 290.68097</td>
<td>(1950.0)</td>
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<td>P</td>
<td>Q</td>
</tr>
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ORBITAL ELEMENTS BY T. KOBAYASHI, GUNMA, JAPAN.

The identifications are by T. Kobayashi unless otherwise stated.
Epoch 1987 July 24.0 ET = JDE 2447000.5

M 244.77312 (1950.0) P Q
n 0.22571632 Peri. 0.40418 +0.5397167 +0.83563736
a 2.67115342 Node 302.26316 -0.77267954 +0.44359615
e 0.3201173 Incl. 6.93208 -0.33417365 +0.32393311
P 4.37 H 12.5 G 0.25
Residuals in seconds of arc (or two decimals in units of degrees)
360815 094 2.0- 1.9+ 490716 078(23.8+ 8.6-)Y 671004 095 0.3+ 0.5+
360818 094(0.00 0.03+) 581011 760(26.4= 12.1-) 710728 095 2.8+ 1.8-
360820 094 0.4- 1.5+ 581011 760 3.3+ 1.9- 710825 056 1.6- 0.2-
360824 012 2.3+ 1.1+ 581017 760 2.1- 0.2- 710825 056 1.5+ 0.3-
360826 012 1.5- 1.2- 581017 760 0.4- 1.2+
1938 HE = 1971 SH
Epoch 1987 July 24.0 ET = JDE 2447000.5

M 199.46779 (1950.0) P Q
n 0.27624406 Peri. 180.50598 +0.53094860 +0.84290719
a 2.3349312 Node 121.56626 -0.77707979 +0.52533870
e 0.1907018 Incl. 5.87304 -0.33799493 +0.11630443
P 3.57 H 12.5 G 0.25
Residuals in seconds of arc
380419 029 0.9+ 0.3- 380423 029(13.7- 7.0-)Y 710925 808 0.8- 0.9-
380419 029 1.6+ 1.3- 380424 029 3.5- 2.5+ 710925 808 0.6+ 0.7-
380420 029 0.8+ 0.1+ 380426 029 1.9+ 6.1- Y 710926 805 0.0 2.1+
380420 029 0.0 0.2- 380427 029 0.8+ 3.3+ Y 710926 805 0.1- 0.6-
380421 029 1.3- 0.4+ 380427 029 2.0+ 0.1+ Y
380423 029 3.2- 1.5+ 710925 808 0.3+ 0.1+
1949 QL = 1949 QZ = 1969 TV3
The double designation 1949 QL = 1949 QZ is by K. Reinmuth (MPC 383).
Epoch 1987 July 24.0 ET = JDE 2447000.5

M 138.58603 (1950.0) P Q
n 0.29747628 Peri. 25.60748 +0.99877928 -0.01931358
a 2.2224627 Node 335.37064 -0.00525000 +0.87367282
e 0.1968767 Incl. 6.26294 +0.04911599 +0.48613042
P 3.31 H 13.5 G 0.25
Residuals in seconds of arc
490820 690 1.1- 0.4+ 490824 690 0.7+ 1.3- 691014 095 0.4+ 1.4-
490821 024 2.3- 1.5+ 490826 690 1.9+ 1.1-
490822 024 0.9+ 0.3+ 691011 095 0.5- 1.5+
1973 UU5 = 1978 TQ2
Epoch 1987 July 24.0 ET = JDE 2447000.5

M 174.99044 (1950.0) P Q
n 0.19690018 Peri. 296.32627 -0.52527528 -0.85092795
a 2.9262087 Node 185.37064 +0.79076026 -0.48693940
e 0.0246148 Incl. 1.68014 +0.31429937 -0.19700673
P 5.01 H 13.0 G 0.25
Residuals in seconds of arc
731027 033 0.3- 0.1- 731031 033 1.7- 0.7- 781003 095 0.0 0.7-
731027 033 1.0+ 0.6- 731102 033 0.1- 0.0 781007 095 0.1- 1.0+
731028 033 0.5+ 0.1+ 731103 033 0.7+ 1.1+
M. P. C.  11 857                                      1987 MAY 13

1973 UV5 = 1953 VY3 = 1979 OE2
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 330.24647              (1950.0)            P               Q
n   0.29407150     Peri.  257.31861     -0.30887466     -0.95020930
a   2.2395843      Node   210.77058     +0.90086447     -0.27838710
e   0.1312938      Incl.    4.62087     +0.30502401     -0.14001039
P   3.35           H   13.5           G   0.25

Residuals in seconds of arc (or two decimals in units of degrees)
531106 760 (0.06+ 0.01+)X 731031 033  0.5-  0.3-    731103 033  0.3-  0.4-
731027 033  0.3-  0.3-    731101 033  0.3-  0.3+    790724 675  0.7+  0.8+
731028 033  0.6+  0.3+    731102 033  0.8+  0.3+    790725 675  0.7-  0.8-
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 249.76826              (1950.0)            P               Q
n   0.17524337     Peri.  253.28229     +0.68323899     +0.72919055
a   3.1625810      Node    59.87871     -0.65191198     +0.63276898
e   0.1196069      Incl.    2.53675     -0.32893046     +0.26054666
P   5.62           H   11.5           G   0.25

Residuals in seconds of arc
501015 024  0.7+  1.6-    781004 095  0.8-  1.0+    841029 688  2.5+  0.6-
770613 675  0.1-  0.3-    841020 046  1.3-  1.9+    841031 688  0.6-  1.1-
770614 675  0.1+  0.3-    841021 046  2.9-  0.2+    841031 688  0.9+  0.4-
780906 095  0.1-  1.0+    841029 688  1.7+  0.6-
1986 RD1 = 1939 PB
Epoch 1987 July 24.0 ET = JDE 2447000.5
M  47.65143              (1950.0)            P               Q
n   0.21059385     Peri.   52.01176     +0.98101273     -0.16880397
a   2.7979434      Node  317.46409     +0.10140231     +0.86615432
e   0.1998797      Incl.    8.12038     +0.16532267     +0.47040611
P   4.68           H   13.0           G   0.25

Residuals in seconds of arc
390808 020  0.2-  0.7-    860902 046  2.3-  0.7-    860911 046 (6.2+ 3.4-)
390811 020  0.2+  0.8+    860904 046  1.5+  1.8+    860929 010  3.7-  0.2-
390811 020 (2.9+ 10.4+) 860904 046  0.7+  0.7+    860929 010  2.7+  1.1+
860902 046  1.7-  0.2-    860911 046  2.8+  2.5-
9522 P-L = 1974 RB1 = 1987 FB
The key identification 9522 P-L = 1987 FB was found independently by
E. Bowell.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 333.41142              (1950.0)            P               Q
n   0.21056324     Peri.   262.22075     -0.09576280     +0.99539055
a   2.7982146      Node  210.77058     -0.85479222     -0.07951910
e   0.1955672      Incl.    7.44875     -0.51058275     -0.05361319
P   4.68           H   13.0           G   0.25

Residuals in seconds of arc
601017 675  0.2-  0.9+    740911 095  0.1+  0.1-    870327 688  0.8+  2.0-
601022 675  1.2-  0.3+    870326 887  2.0-  2.6+    870331 887  0.4+  0.1+
601024 675  0.7+  0.5-    870326 887  0.6+  1.8+    870331 887  2.5-  0.1+
601026 675  0.5+  0.4-    870327 688  1.8+  2.3-    870404 887  0.9+  0.2-

*    *    *    *    *

ORBITAL ELEMENTS BY K. HURUKAWA, TOKYO ASTRONOMICAL OBSERVATORY.

The identifications are by K. Hurukawa unless otherwise stated.
(3618)* 1979 QP8 = 1962 PA = 1974 WU = 1977 EA5
Discovered 1979 Aug. 20 by N. S. Chernykh at the Crimean Astrophysical Observatory. The key identifications 1979 QP8 = 1962 PA = 1974 WU are by T. Urata (NOC 1308). The identification 1979 QP8 = 1974 WU was also found by L. D. Schmadel (MPC 9681).
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 166.44742
(1950.0) P Q
n 0.17725784 Peri. 94.32418 +0.84702672 +0.53081098
a 3.1385742 Node 233.61804 -0.50043416 +0.77855946
e 0.1938573 Incl. 1.99492 -0.17919648 +0.33479078
P 5.56 H 12.5 G 0.25
Residuals in seconds of arc
620801 760 0.7+ 1.0+ 790820 095 0.5- 0.4- 840702 801 0.5- 0.8-
741118 095 1.2+ 0.2+ 790828 095 1.9+ 0.4+ 840725 801 1.6+ 0.7-
770312 381 0.2+ 0.8+ 790923 095 1.1- 0.1- 770312 381 0.3- 0.9+
801016 095 1.8- 0.0+
(3619)* 1981 EU35 = 1960 SG = 1971 QQ
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 102.29508
(1950.0) P Q
n 0.26711818 Peri. 181.12743 +0.95125116 +0.30755674
a 2.3878136 Node 160.91166 -0.28239941 +0.89858324
e 0.2370066 Incl. 4.03712 -0.12398308 +0.31298086
P 3.69 H 14.0 G 0.25
Residuals in seconds of arc
400926 839 0.1- 0.6+ 810303 413 3.2- 0.3- 810311 413 0.1+ 1.1- 810426 413 0.6+ 0.9-
400926 839 0.4+ 0.2- 810307 413 1.8- 0.7+ 810316 413 0.2- 0.9+ 681002 657 0.8+ 1.1+
400926 839 0.9+ 0.5- 681013 413 2.5+ 1.0- 681030 801 0.0+ 1.0+
610302 413 0.5- 0.2+ 810408 413 1.3- 0.8+ 861005 688 1.5- 0.4+
610302 413 1.8+ 2.4- 810408 413 1.5- 0.2+ 861005 688 1.5- 0.8-
610302 413 1.5- 1.2+ 861020 688 0.5- 1.8-
(3620)* 1981 RU2 = 1955 TG = 1978 EN4
Discovered 1981 Sept. 7 by L. G. Karachkina at the Crimean Astrophysical Observatory. The identifications were found independently by C. M. Bardwell (MPC 10026). The identification 1981 RU2 = 1955 TG was also found by L. D. Schmadel (MPC 10026).
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 28.61396
(1950.0) P Q
n 0.19054589 Peri. 121.74695 +0.81859645 -0.55293709
a 2.9909075 Node 272.26303 +0.46014867 +0.79329880
e 0.1103747 Incl. 8.94914 -0.34374854 +0.25482855
P 5.17 H 12.1 G 0.25
Residuals in seconds of arc
551011 760 0.8- 0.7+ 810003 413 1.2- 1.2- 861011 688 1.1+ 0.0+
551011 760 1.2+ 0.5- 810239 095 1.4+ 4.2+ 861011 054 0.4- 0.4-
551012 760 3.2+ 0.2- 860901 801 0.2- 1.5+ 861029 054 0.2- 0.4-
551012 760 0.5- 1.6- 860905 688 2.7- 1.7+ 861005 688 1.5- 0.4+
680306 095 0.5+ 0.5- 860905 688 0.5+ 0.8- 861005 688 2.3+ 0.0+
810907 095 0.6+ 1.9- 860909 054 1.5+ 0.9+ 861030 801 0.3- 0.5-
810927 095 0.8- 1.6- 861101 688 1.1- 0.5+ 861031 801 0.1- 0.4-
Discovered 1981 Sept. 26 by N. G. Thomas at the Anderson Mesa Station of
the Lowell Observatory. The double designation 1981 SQ1 = 1981 VB1 is by
C. M. Bardwell (MPC 9952). The identifications were also found by L. D.
Schmadel (MPC 10026).
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 41.46318 (1950.0) P Q
n 0.18127669 Peri. 175.65451 +0.98533248 +0.17058634
a 3.0920137 Node 174.15745 -0.15794099 +0.92163306
e 0.1995524 Incl. 2.69708 -0.06641079 +0.34855818
P 5.44 H 12.3 G 0.25
Residuals in seconds of arc
700831 095 0.5- 1.6+ 860825 809 0.2- 0.3+ 860831 809 0.9+ 0.5+
790519 809 0.6- 0.7- 860825 809 0.6+ 0.7+ 860831 809 0.9+ 0.5-
790519 809 0.3- 1.0- 860825 809 0.6- 0.7- 860831 809 0.9+ 0.5-
790521 809 0.0+ 0.6- 860825 809 0.4- 0.5+ 860831 809 0.9+ 0.5-
790523 809 0.2- 1.0- 860825 809 0.4- 0.4+ 860831 809 0.9+ 0.5-
790523 809 0.7- 0.5- 860825 809 0.9- 0.5+ 860831 809 0.9+ 0.5-
790524 809 0.2- 1.0- 860825 809 0.1+ 0.4+ 860831 809 0.9+ 0.5-
810926 688 0.1- 1.1- 860825 809 0.3+ 0.4- 860831 809 0.3+ 0.8-
810926 688 2.5- 2.0- 860825 809 0.7+ 0.5- 860831 809 0.3+ 0.7-
811006 095 1.0+ 3.0+ 860825 809 0.6- 0.0+ 860831 809 0.4+ 0.6-
811021 095 2.2+ 1.1- 860825 809 0.3+ 0.2+ 860831 809 0.2+ 0.8-
811026 095 1.5+ 4.7+ 860825 809 0.3+ 0.4+ 860831 809 0.1+ 0.7-
811027 095 0.5+ 3.1- 860825 809 1.2- 0.6+ 860831 809 1.4- 0.3-
811102 688 1.7+ 3.8- 860825 809 0.7+ 0.5+ 860831 809 0.9+ 0.1-
811102 688 1.2+ 3.1- 860825 809 0.5+ 0.4+ 860831 809 0.3+ 0.4+
860805 801 0.8- 0.3- 860831 809 0.3+ 0.4+

Discovered 1981 Sept. 29 by L. V. Zhuravleva at the Crimean Astrophys-
ical Observatory. The identifications 1981 SX7 = 1975 WO = 1983 CJ2 were
found independently by L. D. Schmadel (MPC 10027).
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 302.11258 (1950.0) P Q
n 0.15717304 Peri. 178.07681 +0.30063247 -0.95017447
a 3.40055619 Node 254.42047 +0.87385029 +0.30903133
e 0.0398210 Incl. 4.90682 +0.38210705 +0.04082423
P 6.27 H 11.5 G 0.25
Residuals in seconds of arc
751128 095 0.2+ 2.6+ 811023 095 0.9+ 1.6+ 860806 801 0.6+ 0.3-
800909 095 0.9- 0.1- 811124 095 0.5- 0.1- 860908 801 0.9+ 1.7-
810929 095 2.2+ 3.1- 830215 688 0.4- 1.4-
811002 095 2.6- 0.4- 830215 688 0.5- 1.7-

(3623)* 1981 TG2 = 1952 VK = 1962 WT1 = 1971 UM4 = 1976 UG1 = 1983 CT1
Discovered 1981 Oct. 4 by L. G. Karachkina at the Crimean Astrophysical
Observatory.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 110.21544 (1950.0) P Q
n 0.20474541 Peri. 233.20742 +0.98700645 +0.15354310
a 2.8509741 Node 117.91616 -0.12498160 +0.91885105
e 0.0862026 Incl. 3.07222 -0.10098448 +0.36350689
P 4.81 H 12.3 G 0.25
Residuals in seconds of arc


Epoch 1987 July 24.0 ET = JDE 2447000.5

M 101.05207 (1950.0) P  Q
n 0.27210473  Peri. 49.20243 +0.57589448 -0.81749258
a 2.3585513  Node 5.64915 +0.72637327 +0.50763936
e 0.1191257  Incl. 4.17806 +0.37513654 +0.27204442
P 3.62 H 13.7 G 0.25

Residuals in seconds of arc

601017 675 0.2+ 0.6- 780808 095 0.1- 0.7+ 821025 095 0.1+ 1.0+
601022 675 1.5- 1.0- 780903 095 0.8- 0.6+ 821109 095 0.5- 1.1+
601024 675 0.9+ 0.1- 800220 095 0.4+ 2.2- 821114 095 0.2+ 0.6+
601026 675 0.7+ 1.1- 821014 095 0.5+ 1.8- 861228 801 0.4- 0.0+
711021 095 2.1+ 1.8- 821020 095 0.6- 2.1+ 870127 801 1.2- 1.0+

(3625)* 1984 HZ1 = 1984 JN1 = 1951 DD = 1952 HX2 = 1953 NE = 1953 PG = 1973 FH1
Discovered 1984 Apr. 27 at the European Southern Observatory. The double designations 1984 HZ1 = 1984 JN1 and 1953 NE = 1953 PG are by F. N. Bowman and A. Lowe (MPC 10610) and by O. Kippes (MPC 1331), respectively.

Epoch 1987 July 24.0 ET = JDE 2447000.5

M 119.42818 (1950.0) P  Q
n 0.18526675  Peri. 103.86353 +0.83093893 +0.55320530
a 3.0474580  Node 222.59202 -0.53823650 +0.77236343
e 0.1231603  Incl. 5.01811 -0.14086152 +0.31211956
P 5.32 H 11.4 G 0.25

Residuals in seconds of arc

510227 760 2.4- 4.9- 730402 095 2.0+ 2.0+ 840505 809 1.2- 0.2-
510227 760 1.4- 0.0+ 840427 809 0.2+ 0.1+ 840505 809 4.9- 3.3-
520426 711 (4.6+ 10.5-) 840427 809 0.1+ 0.4+ 861106 688 0.2+ 0.4-
530714 760 0.8- 1.2+ 840428 809 1.4+ 0.8+ 861106 688 2.4+ 0.0+
530714 760 2.0+ 0.4+ 840428 809 (9.3+ 0.6+) 861205 801 1.3- 1.3-
530809 760 1.4+ 4.0- 840501 809 0.8+ 0.1- 870104 801 1.4- 1.7+
530809 760 0.3+ 0.4+ 840501 809 0.0+ 0.7+
730327 095 4.0+ 1.2+ 840505 809 0.1- 0.5-

* * * * *

ORBITAL ELEMENTS BY H. OISHI, NIIZA, JAPAN.

The following orbital elements are from JAM 2057-2058, 2069 and 2072-2073. The identifications are by H. Oishi unless otherwise stated.
(3626)* 1929 PA = 1929 QJ = 1980 TQ5
Discovered 1929 Aug. 4 by M. Wolf at Heidelberg.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 117.12098 (1950.0) P Q
n 0.17689093 Peri. 38.66609 +0.77950873 +0.62251865
a 3.1429128 Node 282.69159 -0.59094136 +0.69402568
e 0.1647412 Incl. 4.08797 -0.20773646 +0.36166129
P 5.57 H 11.8 G 0.25
Residuals in seconds of arc (or two decimals in units of degrees)
290804 024 1.3- 1.3+ 290814 024 0.0 0.5+ 801010 095 0.7- 1.9+
290806 024 1.7+ 0.4+ 290815 662 0.0 2.4- 801107 675 0.5- 1.4-
290809 662 0.6+ 2.8- 290830 024 2.4- 1.4+ 801125 675 0.4- 0.5+ 861205 801 0.6- 1.6-
290810 024(0.06+ 0.03+)X 801007 675 0.2- 0.7- 861210 801 0.4- 0.3+
290812 024 1.1+ 0.7+ 801008 675 0.7- 1.3- 870129 801 0.4- 0.3+
290813 024 2.9- 0.5+ 801009 675 0.4- 0.4-
290815 662 0.6+ 2.8- 290830 024 2.4- 1.4+ 801107 675 0.4- 0.5+ 861205 801 0.6- 1.6-
290810 024(0.06+ 0.03+)X 801007 675 0.2- 0.7- 861210 801 0.4- 0.3+
290812 024 1.1+ 0.7+ 801008 675 0.7- 1.3- 870129 801 0.4- 0.3+
290813 024 2.9- 0.5+ 801009 675 0.4- 0.4-

Discovered 1973 Feb. 28 by L. Kohoutek at Bergedorf.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 320.61297 (1950.0) P Q
n 0.27393911 Peri. 125.83664 -0.84422911 +0.50898380
a 2.3480104 Node 85.31669 -0.52984675 -0.74524351
e 0.1488291 Incl. 9.70231 -0.08086801 -0.43075236
P 3.60 H 13.4 G 0.25
Residuals in seconds of arc
730228 029 0.7- 0.4+ 821112 095 1.5+ 0.9+ 840430 675 0.1- 1.8-
730228 029 0.4+ 0.5+ 821213 381 0.6- 0.9- 870128 801 0.1- 1.2-
730309 029 0.5- 0.0 821214 381 0.3- 1.9-
730401 095 0.6+ 0.0 821214 381 0.3- 1.9-
730404 095 0.6+ 0.0 840429 675 0.9- 0.6-

Discovered 1979 Nov. 25 by Z. Vavrova at Klet.
Epoch 1987 July 24.0 ET = JDE 2447000.5
M 13.12352 (1950.0) P Q
n 0.24386995 Peri. 187.85124 +0.96208779 +0.2684536
a 2.5372534 Node 156.40504 -0.24322754 +0.92439253
e 0.3027318 Incl. 6.91047 -0.12339958 +0.27098100
P 4.04 H 12.8 G 0.25
Residuals in seconds of arc
300625 690 0.3- 1.4- 850215 809 0.8- 0.0 850220 809 2.1+ 0.3-
300629 690 0.2+ 3.0- 850216 809 0.8- 0.2+ 850221 809 1.7+ 0.5-
620505 760 (8.1+ 37.4+)X 850216 809 1.1- 0.3+ 850221 809 1.4+ 0.4-
751203 095 2.0+ 0.4+ 850216 809 1.1- 0.3+ 850221 809 1.6+ 0.4-
780505 095 0.5+ 0.1- 850217 809 0.3- 0.1+ 850222 809 0.2+ 0.4-
791125 046 1.9+ 0.8- 850217 809 0.6- 0.0 850222 809 0.1+ 0.3-
791125 046 1.5+ 1.0- 850217 809 0.3- 0.1+ 850222 809 0.0 0.3-
791218 095 0.5+ 0.8- 850218 809 0.2+ 0.0 850224 809 2.4- 0.1+
791224 046 2.9- 1.6- 850218 809 0.1+ 0.0 850224 809 2.2- 0.1+
791224 046 2.1- 0.7- 850218 809 0.1+ 0.0 850224 809 2.3- 0.1+
850215 809 0.7- 0.1- 850220 809 2.3+ 0.2-
850215 809 0.7- 0.3- 850220 809 1.8+ 0.1-
Discovered 1982 Nov. 21 by A. Mrkos at Klet. The identifications are by T. Furuta (JAM 1970).

Epoch 1987 July 24.0 ET = JDE 2447000.5

M 108.32220 (1950.0) P Q
n 0.26455063 Peri. 171.95035 +0.68515300 -0.72395052
a 2.4032384 Node 234.75832 +0.66265727 +0.66532213
e 0.1028144 Incl. 5.64807 +0.30240818 +0.18232421
P 3.73 H 12.7 G 0.25

Residuals in seconds of arc
740821 095 0.8+ 2.8+ 821204 046 0.8- 0.9- 870121 046 0.5- 0.1+
740922 095 1.5- 0.8- 821205 046 0.1- 1.2- 870124 046 0.1- 0.7+
821121 046 1.4- 1.2+ 861205 801 0.4+ 0.9+ 870124 809 0.3+ 1.5+
821204 046 0.5- 2.2- 870121 046 0.7+ 0.4- 870228 801 0.9- 1.0+

(3630)* 1984 QN = 1966 TK = 1970 PC1 = 1970 QS1 = 1980 XT1
Discovered 1984 Aug. 28 by A. Mrkos at Klet. The identification 1984 QN = 1980 XT1 was found independently by W. Landgraf (MPC 10517).

Epoch 1987 July 24.0 ET = JDE 2447000.5

M 256.54874 (1950.0) P Q
n 0.21399929 Peri. 321.56178 +0.47472665 +0.87865546
a 2.7681810 Node 336.64662 -0.77231546 +0.38809236
e 0.2063213 Incl. 7.38945 -0.42209411 +0.27811672
P 4.61 H 12.6 G 0.25

Residuals in seconds of arc
661013 095 1.8- 1.7+ 840829 046 1.6+ 0.3+ 840928 688 0.9+ 0.1-
700811 095 0.2- 1.6+ 840829 046 1.5+ 1.1+ 840925 688 1.3- 0.5-
700828 095 1.8+ 4.3- 840831 046 0.8+ 1.1- 870224 046 2.6- 2.7-
801210 095 1.5+ 0.5+ 840831 046 1.9- 1.2- 870224 046 2.5- 2.8-
840828 046 1.8+ 0.9- 840925 688 0.5+ 1.2- 870225 046 1.7- 1.2-
840828 046 1.3- 2.3- 840925 688 0.3+ 0.6- 870225 046 1.5+ 2.7-


Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 98.18851 (1950.0) P Q
n 0.12292089 Peri. 26.68464 +0.56530847 -0.82421463
a 4.0060816 Node 28.92704 +0.74401644 +0.49214564
e 0.1294741 Incl. 3.92563 +0.35618235 +0.28011232
P 8.02 H 10.7 G 0.25

Residuals in seconds of arc
760924 095 0.3+ 0.7- 800404 046 2.3+ 1.7- 870304 888 1.2- 0.6+
800412 046 0.1- 1.6- 800416 046 2.4- 1.9+ 870320 888 0.2+ 0.2-
800412 046 (4.3- 0.5+) 870228 888 0.2+ 1.7- 870320 888 0.1+ 0.2+
800413 046 0.1+ 0.5+ 870228 888 1.5+ 2.0+ 870324 888 1.3+ 1.0-
800413 046 1.6+ 1.8- 870302 888 0.5+ 2.5+ 870324 888 0.9- 0.3-
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800414 046 0.7+ 0.4- 870303 888 (8.2- 1.2+) 870326 888 (1.4- 4.0-) 870329 888 0.5- 0.1+
800415 046 0.1+ 0.3+ 870303 888 0.3+ 1.1+ 870329 888 0.5- 0.1+
800415 046 2.1- 1.8+ 870304 888 1.2- 0.9- 870329 888 0.3- 1.1-


Epoch 1987 July 24.0 ET = JDE 2447000.5 (J-P)

M 26.51295 (1950.0) P Q
n 0.29337414 Peri. 141.90989 -0.99648022 -0.07833521
a 2.2431365 Node 33.63363 +0.05737574 -0.89691576
e 0.0950328 Incl. 3.08888 +0.06111630 -0.43520766
P 3.36 H 13.9 G 0.25
Residuals in seconds of arc

670413 095  1.3+  2.6+    870303 888  1.1+  0.5-    870324 888  0.5-  1.7-
800122 095  0.1-  1.2-    870303 888  0.9-  1.3+    870326 888  0.6-  1.1+
840503 688  1.7-  1.7-    870303 888  0.1+  0.1-    870324 888  0.1-  1.3-
840503 688  1.7-  1.7-    870303 888  0.1+  0.1-    870324 888  0.1-  1.3-
870302 888 (4.1-  2.3-)   870320 888  1.3-  1.8-    870329 888  0.5+  2.0+
870302 888 (6.1-  1.0+)   870320 888  1.7+  2.0-    870329 888  0.9+  2.3+

*    *    *    *    *

EPHEMERIDES.

**Comet Torres (1987j)**

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**Comet Shoemaker (1987o)**

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