



Dezembro de 2002

**GOVERNO DO
ESTADO DO CEARÁ**



SRH Secretaria dos Recursos Hídricos

Programa de Gerenciamento e Integração dos Recursos Hídricos do Estado do Ceará - PROGERIRH

Contrato

Nº 02/ PROGERIRH-PILOTO/CE/SRH 2001

Estudos de Alternativas, EIAS/RIMAS, Projetos Executivos, Levantamentos Cadastrais, Planos de Reassentamento e Avaliação Financeira e Econômica dos Projetos das Barragens João Guerra / Umari, Riacho da Serra, Ceará e Missi, e dos Projetos das Adutoras de Madalena, Lagoa do Mato, Alto Santo e Amontada

BARRAGEM JOÃO GUERRA VOLUME I - ESTUDOS BÁSICOS Tomo 3B - Estudos Cartográficos - Memória de Cálculos



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ÍNDICE



ÍNDICE

| | Páginas |
|---|----------------|
| ÍNDICE | 1 |
| 1. APRESENTAÇÃO | 3 |
| 2. TRANSPORTE DE COORDENADAS | 5 |
| 3. APOIO BÁSICO E SUPLEMENTAR PARA O LEVANTAMENTO AEROFOTOGRAFAMÉTRICO | 26 |



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1. APRESENTAÇÃO



1. APRESENTAÇÃO

O consórcio **Montgomery-Watson / Engesoft** e a **Secretaria dos Recursos Hídricos do Estado do Ceará (SRH-CE)** celebraram o contrato nº 02/PROGERIRH-PILOTO/CE/SRH 2001, que tem como objetivo o Estudo de Alternativas, EIA/RIMAS, Levantamentos Cadastrais, Planos de Reassentamento e Avaliação Financeira e Econômica dos Projetos das Barragens João Guerra / Umari, Riacho da Serra, Ceará e Missi, e dos Projetos das Adutoras de Madalena, Lagoa do Mato, Alto Santo e Amontada.

A ordem de serviço foi emitida em 05 de março de 2001 e imediatamente as equipes do consórcio iniciaram as atividades previstas no cronograma aprovado.

O presente relatório, denominado **Tomo 3B – Estudos Cartográficos – Memória de Cálculo**, é parte integrante do **Volume 1 – Estudos Básicos** e diz respeito à **Barragem João Guerra**, a qual tem por finalidade a criação de um reservatório no riacho Treme, para o abastecimento da população do distrito de Lagoa do Mato no município de Itatira, Ceará.

Este tomo apresenta os anexos referentes à memória de cálculo relativa à transporte de coordenadas e apoio básico e suplementar para o levantamento aerofotogramétrico da bacia hidráulica.



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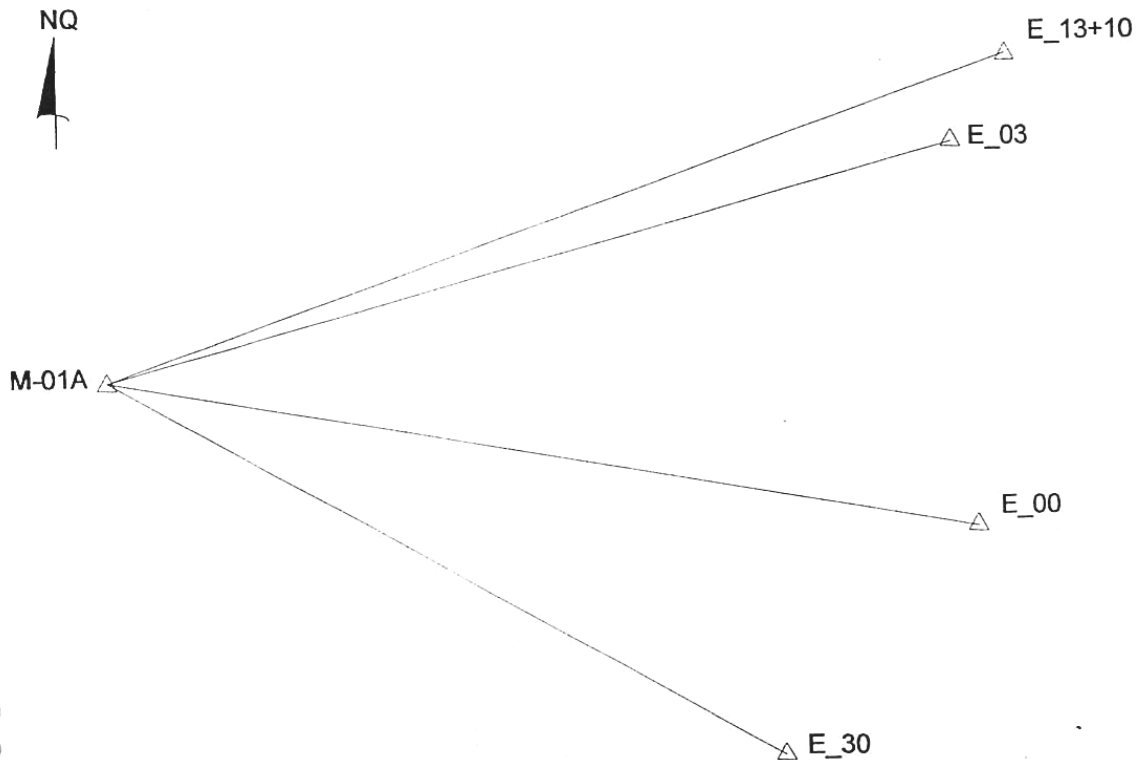
2. TRANSPORTE DE COORDENADAS



ENGESOFTE ENGENHARIA E CONSULTORIA LTDA

| | | |
|--|--|----------------------------------|
| Projeto: João Guerra | Município: Itatira | Estado: Ceará |
| Origem M-01A | Marco Poligonal E_00 | Projeção/Datum UTM/SAD-69 |
| Coordenada NORTE 9.484.943,941m | Coordenada ESTE 428.649,044m | Altitude Ortométrica 387,255m |
| Latitude Geodésica 4°39'34.05693" S | Longitude Geodésica 39°38'35.91339" WGr | |

| | | |
|--|--|----------------------------------|
| Projeto: João Guerra | Município: Itatira | Estado: Ceará |
| Origem M-01A | Marco Poligonal E_30 | Projeção/Datum UTM/SAD-69 |
| Coordenada NORTE 9.484.488,519m | Coordenada ESTE 428.257,460m | Altitude Ortométrica 389,515m |
| Latitude Geodésica 4°39'48.87657" S | Longitude Geodésica 39°38'48.63647" WGr | |





ENGESOFT ENGENHARIA E CONSULTORIA LTDA

| | | |
|--|--|---|
| Vértice: M-01A | Ponto Visado: M-02A | Obra/Ano: O-739/2001 |
| Estado: Ceará | Município: Itaitira | Local: Lagoa do Mato |
| Origem: V. Grosso (IBGE) | MC: 39° W | Datum: SAD-69 |
| Coordenada Geodésica Latitude: 04° 39'24,00013"S | Coordenada Geodésica Longitude: 39° 39'32,49800"W | |
| Coordenada UTM Norte: 9.485.251,148m | Coordenada UTM Este: 426.905,361m | Altura Geométrica: 387,159m Altitude Ortométrica: 387,956m |
| Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: BASE S/A – São Paulo – Protegido Por Lei – Não Destruir – ENGESOFT – 06/2001 – M-01A. | | |
| ITINERARIO | | CROQUIS |
| Partindo-se com 0,0Km da Igreja Nossa Senhora do Carmo em Lagoa do Mato, segue-se na CE-366 em direção a BR-020, com 2,35Km chega-se ao local do marco que está na frente da casa do Sr. Antenor Lobo na margem direita da CE-366. | | |

Aerofotogrametria e Projetos S. L. BASE



Ashtech, Inc. GPPS-L

Program: LINECOMP
Wed Sep 19 20:18:06 2001

Version: 5.2.00

```

Project information
GPS Survey          |25-character project name [ The | is in column 26.
]
2611A              |5-character session name
Project information

```

```

Known-station parameters
00                |Receiver identifier used in "LOGTIMES" file
000000           |Project station number
M-01A           |4-character short name
FIXED STATION    |25-character long name
-----|-----|-----|-----|25-character comment field
0                |Position extraction (0=below,1=U-file,2=proj. file)
S  4 39 25.39032 |Latitude deg-min-sec (g=good;b=bad)
E 320 20 26.22620 |E-Longitude deg-min-sec (g=good;b=bad)
W 39 39 33.77380 |W-Longitude deg-min-sec (g=good;b=bad)
    387.9560      |Ellipsoidal height (m) (g=good;b=bad)
    0.0000        |North antenna offset(m)
    0.0000        |East antenna offset (m)
    1.8490 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
    20.0          |Temperature (degrees C)
    50.0          |Humidity (percent)
    1010.0        |Pressure (millibars)
UBASEA01.261     |Measurement filename (restricted to 24 characters)
Known-station parameters

```

```

Unknown-station parameters
00                |Receiver identifier used in "LOGTIMES" file
000000           |Project station number
E 00            |4-character short name
UNKNOWN STATION  |25-character long name
-----|-----|-----|-----|25-character comment field
0                |Position extraction (0=below,1=U-file,2=proj. file)
S  4 39 35.57526 |Latitude deg-min-sec (g=good;b=bad)
E 320 21 22.69192 |E-Longitude deg-min-sec (g=good;b=bad)
W 39 38 37.30808 |W-Longitude deg-min-sec (g=good;b=bad)
    408.5379      |Ellipsoidal height (m) (g=good;b=bad)
    0.0000        |North antenna offset(m)
    0.0000        |East antenna offset (m)
    1.7330 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
    20.0          |Temperature (degrees C)
    50.0          |Humidity (percent)
    1010.0        |Pressure (millibars)
UESTOA01.261     |Measurement filename (restricted to 24 characters)
Unknown-station parameters

```

```

Run-time parameters
1                |First epoch to process
-1              |Final epoch to process (-1 = last available)
15.0            |Elevation cutoff angle (degrees)
1               |Data to process (0=Wdln;1=L1;2=L2;3=L1c;6=RpdSt)
0.010000       |Convergence criterion (meters)
26 00 00 00 00 00 00 |Omit these satellites (up to 7)
10             |Maximum iterations for tlsq and dlsq
00 00 00 00 00 00 00 |Forbidden reference SVs (up to 7)
yes            |Apply tropo delay correction
Run-time parameters

```

LINECOMP 5.2.00 7-18-94

FIXED U-File from L1 only receiver.
UNKWN U-File from L1 only receiver.

FIXED U-File used BROADCAST orbits.



UNKWN U-File used BROADCAST orbits.

Common start of two UFILES: 2001/09/18 15:18:10.00
Common end of two UFILES: 2001/09/18 15:47: 5.00

Selected first epoch: 1
Selected last epoch: 348
For SV 5 there are 345 triple-difference measurements.
For SV 6 there are 347 triple-difference measurements.
For SV 9 there are 347 triple-difference measurements.
For SV 10 there are 347 triple-difference measurements.
For SV 15 there are 347 triple-difference measurements.
For SV 17 there are 347 triple-difference measurements.
For SV 18 there are 332 triple-difference measurements.
For SV 23 there are 347 triple-difference measurements.
For SV 30 there are 347 triple-difference measurements.
Epoch interval (seconds): 5.000000

THE TRIPLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 8.099731
num_meas = 2759 num_used = 2759 rms_resid = 0.003438 (m)
Post-Fit Chisq = 8892.444 NDF = 6.387

Sigma_x (m): 4.900533
Sigma_y (m): 5.609433
Sigma_z (m): 1.269217
x y z
x 1.00
y 0.41y 1.00
z -0.12z -0.14z 1.00

del_station: -0.000013 0.000052 0.000012
Station1: FIXED STATION Station2: UNKNOWN STATION
M-01A E_00
Latitude: -4.65705287 -4 39 25.39032 -4.65984695 -4 39 35.44901
E-Long : 320.34061839 320 20 26.22620 320.35633635 320 21 22.81088
W-Long : 39.65938161 39 39 33.77380 39.64366365 39 38 37.18912
E-Height: 387.9560 387.2363

Baseline vector: 1093.0526 1359.3080 -307.9135

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 E1 D1 : 100.04728 -0.0312 1771.2405
E1 N1 U1 : 1744.0838 -308.9927 -0.7197
Mark2_xyz : 4895510.5493 -4056206.4891 -514734.1873
Az2 E2 D2 : 280.04601 0.0153 1771.2405
E2 N2 U2 : -1744.0767 308.9927 0.7197

Double-Difference Epochs:
Prn: 5 Start epoch: 2 End epoch: 348
Prn: 6 Start epoch: 2 End epoch: 348
Prn: 9 Start epoch: 2 End epoch: 348
Prn: 10 Start epoch: 2 End epoch: 348
Prn: 15 Start epoch: 2 End epoch: 348
Prn: 17 Start epoch: 2 End epoch: 348
Prn: 18 Start epoch: 17 End epoch: 348
Prn: 23 Start epoch: 2 End epoch: 348
Prn: 30 Start epoch: 2 End epoch: 348

THE FLOAT DOUBLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 0.229954 Wavelength = 0.190294 (m/cycle)
num_meas = 2755 num_used = 2751 rms_resid = 0.022906 (m)
Post-Fit Chisq = 31473.728 NDF = 6.368

Reference SV: 5



```

SV      Ambiguity      FIT      Meas      SV      Ambiguity      FIT      Meas
 6      -1219548.120f  0.117    346      9       -5542020.417f  0.125    346
10      -3453066.642f  0.089    346      15      1424183.283f  0.111    346
17       752201.386f  0.098    346      18      2901320.422f  0.158    329
23      2857624.627f  0.123    346      30      2426627.890f  0.129    346

Sigmax (m):      0.250661
Sigmay (m):      0.287897
Sigmaz (m):      0.132773
SigmaN (cy):     1.154908
SigmaN (cy):     1.054563
SigmaN (cy):     1.040781
SigmaN (cy):     1.974048
SigmaN (cy):     1.677530
SigmaN (cy):     1.503257
SigmaN (cy):     0.932762
SigmaN (cy):     0.684434
x        y        z        N        N        N        N        N        N        N
x 1.00
y 0.48y 1.00
z-0.36z-0.40z 1.00
N-0.93N-0.43N 0.02N 1.00
N-0.78N-0.54N 0.85N 0.53N 1.00
N 0.49N 0.98N-0.54N-0.38N-0.63N 1.00
N-0.91N-0.77N 0.58N 0.78N 0.88N-0.79N 1.00
N-0.88N-0.82N 0.53N 0.78N 0.84N-0.83N 0.99N 1.00
N-0.87N-0.59N 0.76N 0.66N 0.98N-0.66N 0.94N 0.91N 1.00
N-0.75N-0.57N 0.87N 0.49N 0.99N-0.66N 0.88N 0.84N 0.97N 1.00
N-0.87N-0.56N-0.03N 0.96N 0.47N-0.48N 0.78N 0.80N 0.61N 0.44N 1.00

del_station: -0.000206 -0.000045 -0.000026
  Station1: FIXED STATION      Station2: UNKNOWN STATION
           M-01A                      E_00
Latitude: -4.65705287 -4 39 25.39032      -4.65984701 -4 39 35.44925
E-Long   : 320.34061839 320 20 26.22620      320.35633760 320 21 22.81534
W-Long   : 39.65938161 39 39 33.77380      39.64366240 39 38 37.18466
E-Height: 387.9560                          387.2423

Baseline vector:      1093.1446      1359.4106      -307.9214

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 E11 D1 : 100.04675 -0.0310 1771.3774
E1 N1 U1 : 1744.2215 -309.0002 -0.7137
Mark2_xyz : 4895510.6413 -4056206.3864 -514734.1953
Az2 E12 D2 : 280.04547 0.0151 1771.3774
E2 N2 U2 : -1744.2145 309.0002 0.7137

AMBIGUITY RESOLUTION
          1          2          3          4
Abs Contrast  42.708  19.663  4.698  4.047
Contrast      75.237  93.576  94.432
Change Chi2   1349.508  6713.422  14550.209  15296.851
Bias S 5: 6   -1219548 -1219548 -1219548 -1219548
Bias S 5: 9   -5542020 -5542021 -5542021 -5542020
Bias S 5:10  -3453067 -3453066 -3453067 -3453068
Bias S 5:23   2857625  2857624  2857624  2857625
Bias S 5:30   2426628  2426628  2426628  2426628
NDF=76.7750 Chi2=31473.7280
          1          2          3          4
Abs Contrast  43.018  26.892  8.173  4.730
Contrast      67.234  89.183  93.566
Change Chi2   1291.635  4725.471  11723.561  14557.721
Bias S 5: 6   -1219548 -1219548 -1219548 -1219548
Bias S 5:10  -3453067 -3453066 -3453067 -3453068
Bias S 5:23   2857625  2857624  2857624  2857626
Bias S 5:30   2426628  2426628  2426628  2426628

```



```

NDF=76.7750 Chi2=31473.7280
      1          2          3          4
Abs Contrast      43.327      32.025      5.134      2.286
Contrast          61.871      93.076      96.804
Change Chi2      1233.765    3530.436    14183.113    18189.591
Bias S 5: 6      -1219548    -1219548    -1219548    -1219550
Bias S 5:23      2857625      2857624      2857626      2857624
Bias S 5:30      2426628      2426628      2426628      2426627
NDF=76.7750 Chi2=31473.7280
      1          2          3          4
Abs Contrast      48.357      2.500      2.391      0.645
Contrast          97.342      97.458      99.316
Change Chi2      303.362    17810.220    18027.272    24207.798
Bias S 5: 6      -1219548    -1219550    -1219546    -1219549
Bias S 5:30      2426628      2426627      2426629      2426627
NDF=76.7750 Chi2=31473.7280
      1          2          3          4
Abs Contrast      41.483      0.004      0.003      0.001
Contrast          99.993      99.995      99.999
Change Chi2      1576.504    46002.128    47949.517    54546.474
Bias S 5: 9      -5542020    -5542019    -5542020    -5542021
Bias S 5:10      -3453067    -3453068    -3453066    -3453066
Bias S 5:17      752202      752203      752201      752201
Bias S 5:18      2901321    2901322      2901321    2901320
Bias S 5:23      2857625      2857626      2857625      2857624
NDF=78.7750 Chi2=31777.0900
      1          2          3
Abs Contrast      49.663      0.000      0.000
Contrast          100.000      100.000
Change Chi2      64.856    346949.573    366183.473
Bias S 5:15      1424184      1424183      1424185
NDF=83.7750 Chi2=33353.5936

```

```

THE FIXED DOUBLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 0.022372      Wavelength = 0.190294 (m/cycle)
num_meas = 2755      num_used = 2755      rms_resid = 0.023788 (m)
Post-Fit Chisq = 34001.308      NDF = 6.377

```

```

Reference SV: 5      Integer Search Ratio = 97.342
SV      Ambiguity      FIT      Meas      SV      Ambiguity      FIT      Meas
6      -1219548.000X    0.133    346      9      -5542020.000X    0.125    346
10     -3453067.000X    0.097    346      15     1424184.000X    0.113    346
17     752202.000X     0.098    346      18     2901321.000X    0.164    333
23     2857625.000X    0.124    346      30     2426628.000X    0.134    346

```

```

Sigmax (m):      0.026338
Sigmay (m):      0.029352
Sigmaz (m):      0.010613

```

```

x      y      z
x 1.00
y-0.72y 1.00
z-0.06z 0.21z 1.00

```

```

del_station: -0.000000 -0.000000 -0.000000
Station1: FIXED STATION      Station2: UNKNOWN STATION
M-01A      E_00
Latitude: -4.65705287 -4 39 25.39032      -4.65984653 -4 39 35.44750
E-Long : 320.34061839 320 20 26.22620      320.35633660 320 21 22.81174
W-Long : 39.65938161 39 39 33.77380      39.64366340 39 38 37.18826
E-Height: 387.9560      387.2554

```

```

Baseline vector:      1093.0872      1359.3141      -307.8690
Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Azl Ell D1 : 100.04566 -0.0306 1771.2588
El N1 U1 : 1744.1106 -308.9465 -0.7006

```



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Mark xyz : 4895510.5839 -4056206.4830 -514734.1429
Az2 E12 D2 : 280.04439 0.0147 1771.2588
E2 N2 U2 : -1744.1035 308.9465 0.7006
Wed Sep 19 20:18:16 2001



Ashtech, Inc. GPPS-L

Program: LINECOMP
Wed Sep 19 20:16:56 2001

Version: 5.2.00

```

Project information
GPS Survey          |25-character project name [ The | is in column 26.
]
2611A              |5-character session name
Project information

Known-station parameters
00                 |Receiver identifier used in "LOGTIMES" file
000000            |Project station number
M-01A             |4-character short name
FIXED STATION     |25-character long name
-----|-----|-----|25-character comment field
0                 |Position extraction (0=below,1=U-file,2=proj. file)
S  4 39 25.39032  |Latitude deg-min-sec (g=good;b=bad)
E 320 20 26.22620 |E-Longitude deg-min-sec (g=good;b=bad)
W  39 39 33.77380 |W-Longitude deg-min-sec (g=good;b=bad)
      387.9560     |Ellipsoidal height (m) (g=good;b=bad)
      0.0000       |North antenna offset(m)
      0.0000       |East antenna offset (m)
      1.8490 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
      20.0         |Temperature (degrees C)
      50.0         |Humidity (percent)
      1010.0       |Pressure (millibars)
UBASEA01.261     |Measurement filename (restricted to 24 characters)
Known-station parameters

Unknown-station parameters
00                 |Receiver identifier used in "LOGTIMES" file
000000            |Project station number
E_30              |4-character short name
UNKNOWN STATION  |25-character long name
-----|-----|-----|25-character comment field
0                 |Position extraction (0=below,1=U-file,2=proj. file)
S  4 39 50.47022  |Latitude deg-min-sec (g=good;b=bad)
E 320 21 10.10842 |E-Longitude deg-min-sec (g=good;b=bad)
W  39 38 49.89158 |W-Longitude deg-min-sec (g=good;b=bad)
      413.6148     |Ellipsoidal height (m) (g=good;b=bad)
      0.0000       |North antenna offset(m)
      0.0000       |East antenna offset (m)
      1.6610 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
      20.0         |Temperature (degrees C)
      50.0         |Humidity (percent)
      1010.0       |Pressure (millibars)
UES30A01.261    |Measurement filename (restricted to 24 characters)
Unknown-station parameters

Run-time parameters
1                 |First epoch to process
-1                |Final epoch to process (-1 = last available)
15.0             |Elevation cutoff angle (degrees)
1                |Data to process (0=Wdln;1=L1;2=L2;3=L1c;6=RpdSt)
0.010000        |Convergence criterion (meters)
00 00 00 00 00 00 |Omit these satellites (up to 7)
10               |Maximum iterations for tlsq and dlsq
00 00 00 00 00 00 |Forbidden reference SVs (up to 7)
yes              |Apply tropo delay correction
Run-time parameters

LINECOMP 5.2.00 7-18-94

FIXED U-File from L1 only receiver.
UNKWN U-File from L1 only receiver.

FIXED U-File used BROADCAST orbits.

```



UNKWN U-File used BROADCAST orbits.

Common start of two UFILES: 2001/09/18 17:46:40.00

Common end of two UFILES: 2001/09/18 18:13:60.00

Selected first epoch: 1

Selected last epoch: 329

For SV 5 there are 328 triple-difference measurements.
For SV 6 there are 328 triple-difference measurements.
For SV 15 there are 328 triple-difference measurements.
For SV 17 there are 328 triple-difference measurements.
For SV 18 there are 328 triple-difference measurements.
For SV 21 there are 328 triple-difference measurements.
For SV 23 there are 328 triple-difference measurements.
For SV 26 there are 328 triple-difference measurements.
For SV 30 there are 328 triple-difference measurements.
Epoch interval (seconds): 5.000000

THE TRIPLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 8.451448

num_meas = 2624 num_used = 2624 rms_resid = 0.003254 (m)
Post-Fit Chisq = 8086.149 NDF = 6.074

Sigma_x (m): 5.351814
Sigma_y (m): 5.230467
Sigma_z (m): 1.852042

x 1.00
y 0.25y 1.00
z -0.25z -0.47z 1.00

del_station: -0.000034 0.000038 0.000013

Station1: FIXED STATION
M-30

Station2: UNKNOWN STATION
E_30

Latitude: -4.65705287 -4 39 25.39032 -4.66396233 -4 39 50.26440
E-Long : 320.34061839 320 20 26.22620 320.35280200 320 21 10.08719
W-Long : 39.65938161 39 39 33.77380 39.64719800 39 38 49.91281
E-Height: 387.9560 389.4487

Baseline vector: 816.0476 1079.5250 -761.7018

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 El1 D1 : 119.47603 0.0481 1552.8997
E1 N1 U1 : 1351.9073 -764.1067 1.4927
Mark2_xyz : 4895233.5443 -4056486.2721 -515187.9756
Az2 El2 D2 : 299.47504 -0.0621 1552.8997
E2 N2 U2 : -1351.8944 764.1071 -1.4927

Double-Difference Epochs:

Prn: 5 Start epoch: 2 End epoch: 329
Prn: 6 Start epoch: 2 End epoch: 329
Prn: 15 Start epoch: 2 End epoch: 329
Prn: 17 Start epoch: 2 End epoch: 329
Prn: 18 Start epoch: 2 End epoch: 329
Prn: 21 Start epoch: 2 End epoch: 329
Prn: 23 Start epoch: 2 End epoch: 329
Prn: 26 Start epoch: 2 End epoch: 329
Prn: 30 Start epoch: 2 End epoch: 329

THE FLOAT DOUBLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 0.230382 Wavelength = 0.190294 (m/cycle)

num_meas = 2624 num_used = 2624 rms_resid = 0.021664 (m)
Post-Fit Chisq = 28679.308 NDF = 6.074

Reference SV: 18



| SV | Ambiguity | FIT | Meas | SV | Ambiguity | FIT | Meas |
|----|----------------|-------|------|----|----------------|-------|------|
| 5 | -36994988.354f | 0.132 | 328 | 6 | -14637861.975f | 0.118 | 328 |
| 15 | -21073446.129f | 0.099 | 328 | 17 | -28120187.087f | 0.136 | 328 |
| 21 | -21223682.259f | 0.090 | 328 | 23 | -8989535.979f | 0.117 | 328 |
| 26 | -24542031.127f | 0.092 | 328 | 30 | -14683408.163f | 0.118 | 328 |

Sigmax (m) : 0.267037
 Sigmay (m) : 0.261720
 Sigmaz (m) : 0.129694
 SigmaN (cy) : 1.035194
 SigmaN (cy) : 1.074854
 SigmaN (cy) : 0.877003
 SigmaN (cy) : 0.879680
 SigmaN (cy) : 0.917255
 SigmaN (cy) : 0.638592
 SigmaN (cy) : 1.825581
 SigmaN (cy) : 0.478554

x 1.00 y z N N N N N N N
 x 1.00
 y 0.24y 1.00
 z-0.19z-0.32z 1.00
 N 0.03N 0.77N 0.35N 1.00
 N 0.51N 0.93N-0.52N 0.55N 1.00
 N-0.83N 0.10N-0.34N-0.05N-0.07N 1.00
 N-0.37N 0.64N-0.64N 0.26N 0.55N 0.78N 1.00
 N-0.84N-0.52N 0.64N-0.02N-0.77N 0.42N-0.15N 1.00
 N 0.41N 0.88N-0.67N 0.41N 0.96N 0.09N 0.67N-0.75N 1.00
 N 0.36N 0.99N-0.39N 0.70N 0.97N 0.02N 0.60N-0.62N 0.92N 1.00
 N 0.02N 0.28N 0.78N 0.80N 0.08N-0.31N-0.26N 0.29N-0.09N 0.23N 1.00

del_station: 0.000000 -0.000000 -0.000000
 Station1: FIXED STATION Station2: UNKNOWN STATION
 M-01A E_30
 Latitude: -4.65705287 -4 39 25.39032 -4.66396331 -4 39 50.26792
 E-Long : 320.34061839 320 20 26.22620 320.35280257 320 21 10.08927
 W-Long : 39.65938161 39 39 33.77380 39.64719743 39 38 49.91073
 E-Height: 387.9560 389.5898

Baseline vector: 816.1900 1079.4903 -761.8210

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
 Az1 El1 D1 : 119.47834 0.0533 1553.0089
 E1 N1 U1 : 1351.9715 -764.2148 1.6338
 Mark2_xyz : 4895233.6867 -4056486.3067 -515188.0948
 Az2 El2 D2 : 299.47735 -0.0673 1553.0089
 E2 N2 U2 : -1351.9586 764.2152 -1.6338

AMBIGUITY RESOLUTION

| | 1 | 2 | 3 | 4 |
|-----------------------------|-----------|-----------|------------|------------|
| Abs Contrast | 44.198 | 0.278 | 0.056 | 0.012 |
| Contrast | | 99.649 | 99.931 | 99.985 |
| Change Chi2 | 997.220 | 25984.513 | 32710.650 | 38983.916 |
| Bias S18: 6 | -14637862 | -14637862 | -14637860 | -14637864 |
| Bias S18:15 | -21073446 | -21073446 | -21073447 | -21073445 |
| Bias S18:17 | -28120187 | -28120187 | -28120187 | -28120187 |
| Bias S18:21 | -21223682 | -21223683 | -21223684 | -21223681 |
| Bias S18:23 | -8989536 | -8989536 | -8989535 | -8989537 |
| Bias S18:30 | -14683408 | -14683409 | -14683408 | -14683409 |
| NDF=73.6000 Chi2=28679.3076 | | | | |
| Abs Contrast | 49.123 | 0.000 | 0.000 | 0.000 |
| Contrast | | 100.000 | 100.000 | 100.000 |
| Change Chi2 | 152.382 | 94317.654 | 100359.634 | 202236.181 |
| Bias S18: 5 | -36994988 | -36994989 | -36994987 | -36994988 |
| Bias S18:26 | -24542031 | -24542032 | -24542030 | -24542030 |
| NDF=79.6000 Chi2=29676.5278 | | | | |



THE FIXED DOUBLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 0.019355 Wavelength = 0.190294 (m/cycle)
num_meas = 2624 num_used = 2624 rms_resid = 0.022094 (m)
Post-Fit Chisq = 29829.188 NDF = 6.074

Reference SV: 18 Integer Search Ratio = 99.649
Table with columns: SV, Ambiguity, FIT, Meas, SV, Ambiguity, FIT, Meas. Rows include SVs 5, 15, 21, 26 and 6, 17, 23, 30.

Sigmax (m): 0.026628
Sigmay (m): 0.018126
Sigmaz (m): 0.010591
x 1.00
y-0.57y 1.00
z-0.21z 0.17z 1.00

del_station: 0.000084 -0.000117 -0.000112
Station1: FIXED STATION M-01A
Station2: UNKNOWN STATION E_30
Latitude: -4.65705287 -4 39 25.39032 -4.66396305 -4 39 50.26697
E-Long : 320.34061839 320 20 26.22620 320.35280241 320 21 10.08869
W-Long : 39.65938161 39 39 33.77380 39.64719759 39 38 49.91131
E-Height: 387.9560 389.5145

Baseline vector: 816.1226 1079.5229 -761.7857
Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 E11 D1 : 119.47772 0.0505 1552.9788
E1 N1 U1 : 1351.9535 -764.1855 1.5585
Mark2_xyz : 4895233.6193 -4056486.2742 -515188.0595
Az2 E12 D2 : 299.47673 -0.0645 1552.9788
E2 N2 U2 : -1351.9407 764.1859 -1.5585
Wed Sep 19 20:17:05 2001

**ENGESOFT ENGENHARIA E CONSULTORIA LTDA**

| | | |
|---|--|---|
| Projeto: João Guerra | Município: Itatira | Estado: Ceará |
| Origem M-01A | Marco Poligonal E_03 | Projeção/Datum UTM/SAD-69 |
| Coordenada NORTE 9.485.713,722m | Coordenada ESTE 428.604,102m | Altitude Ortométrica 378,429m |
| Latitude Geodésica 4°39'08.98705" S | | Longitude Geodésica 39°38'37.34917" WGr |

| | | |
|--|--|---|
| Projeto: João Guerra | Município: Itatira | Estado: Ceará |
| Origem M-01A | Marco Poligonal E_13+10 | Projeção/Datum UTM/SAD-69 |
| Coordenada NORTE 9.485.889,423m | Coordenada ESTE 428.715,716m | Altitude Ortométrica 379,366m |
| Latitude Geodésica 4°39'03.26843"S | | Longitude Geodésica 39°38'33.72162" WGr |



Ashtech, Inc. GPPS-L

Program: LINECOMP
Wed Sep 19 20:17:06 2001

Version: 5.2.00

```
Project information
GPS Survey          |25-character project name [ The | is in column 26.
]
2611A              |5-character session name
Project information
```

```
Known-station parameters
00                |Receiver identifier used in "LOGTIMES" file
000000           |Project station number
M-01A            |4-character short name
FIXED STATION    |25-character long name
                |25-character comment field
-----
0                |Position extraction (0=below,1=U-file,2=proj. file)
S   4 39 25.39032 |Latitude deg-min-sec (g=good;b=bad)
E 320 20 26.22620 |E-Longitude deg-min-sec (g=good;b=bad)
W  39 39 33.77380 |W-Longitude deg-min-sec (g=good;b=bad)
    387.9560      |Ellipsoidal height (m) (g=good;b=bad)
    0.0000        |North antenna offset (m)
    0.0000        |East antenna offset (m)
    1.8490 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
    20.0          |Temperature (degrees C)
    50.0          |Humidity (percent)
    1010.0        |Pressure (millibars)
UBASEA01.261     |Measurement filename (restricted to 24 characters)
Known-station parameters
```

```
Unknown-station parameters
00                |Receiver identifier used in "LOGTIMES" file
000000           |Project station number
E 03             |4-character short name
UNKNOWN STATION  |25-character long name
                |25-character comment field
-----
0                |Position extraction (0=below,1=U-file,2=proj. file)
S   4 39 10.54746 |Latitude deg-min-sec (g=good;b=bad)
E 320 21 21.24793 |E-Longitude deg-min-sec (g=good;b=bad)
W  39 38 38.75207 |W-Longitude deg-min-sec (g=good;b=bad)
    398.5410      |Ellipsoidal height (m) (g=good;b=bad)
    0.0000        |North antenna offset (m)
    0.0000        |East antenna offset (m)
    1.8380 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
    20.0          |Temperature (degrees C)
    50.0          |Humidity (percent)
    1010.0        |Pressure (millibars)
UEST3A01.261     |Measurement filename (restricted to 24 characters)
Unknown-station parameters
```

```
Run-time parameters
 1                |First epoch to process
-1               |Final epoch to process (-1 = last available)
15.0            |Elevation cutoff angle (degrees)
1               |Data to process (0=Wdln;1=L1;2=L2;3=L1c;6=RpdSt)
0.010000       |Convergence criterion (meters)
00 00 00 00 00 00 00 |Omit these satellites (up to 7)
10             |Maximum iterations for tlsq and dlsq
00 00 00 00 00 00 00 |Forbidden reference SVs (up to 7)
yes            |Apply tropo delay correction
Run-time parameters
```

LINECOMP 5.2.00 7-18-94

FIXED U-File from L1 only receiver.
UNKWN U-File from L1 only receiver.

FIXED U-File used BROADCAST orbits.



UNKWN U-File used BROADCAST orbits.

Common start of two UFILES: 2001/09/18 16:11:10.00
Common end of two UFILES: 2001/09/18 16:43:20.00
Selected first epoch: 1
Selected last epoch: 387

For SV 5 there are 386 triple-difference measurements.
For SV 6 there are 386 triple-difference measurements.
For SV 9 there are 317 triple-difference measurements.
For SV 10 there are 284 triple-difference measurements.
For SV 15 there are 386 triple-difference measurements.
For SV 17 there are 386 triple-difference measurements.
For SV 18 there are 386 triple-difference measurements.
For SV 23 there are 386 triple-difference measurements.
For SV 26 there are 386 triple-difference measurements.
For SV 30 there are 386 triple-difference measurements.
Epoch interval (seconds): 5.000000

THE TRIPLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 7.630612
num_meas = 3303 num_used = 3303 rms_resid = 0.003842 (m)
Post-Fit Chisq = 13329.218 NDF = 7.646

Sigmax (m): 5.250706
Sigmay (m): 5.823459
Sigmaz (m): 1.399877
x y z
x 1.00
y 0.50y 1.00
z 0.10z 0.46z 1.00

del_station: 0.000022 0.000092 0.000009

Station1: FIXED STATION
M-01A

Station2: UNKNOWN STATION

Latitude: -4.65705287 -4 39 25.39032 -4.65288269 -4 39 10.37770
E-Long : 320.34061839 320 20 26.22620 320.35593774 320 21 21.37586
W-Long : 39.65938161 39 39 33.77380 39.64406226 39 38 38.62414
E-Height: 387.9560 378.3800

Baseline vector: 1106.1788 1290.9914 460.4281

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 El1 D1 : 74.82161 -0.3194 1761.3303
E1 N1 U1 : 1699.8530 461.1725 -9.5760
Mark2_xyz : 4895523.6755 -4056274.8057 -513965.8457
Az2 El2 D2 : 254.82037 0.3036 1761.3303
E2 N2 U2 : -1699.8605 -461.1718 9.5760

Double-Difference Epochs:

Prn: 5 Start epoch: 2 End epoch: 387
Prn: 6 Start epoch: 2 End epoch: 387
Prn: 9 Start epoch: 2 End epoch: 318
Prn: 10 Start epoch: 9 End epoch: 292
Prn: 15 Start epoch: 2 End epoch: 387
Prn: 17 Start epoch: 2 End epoch: 387
Prn: 18 Start epoch: 2 End epoch: 387
Prn: 23 Start epoch: 2 End epoch: 387
Prn: 26 Start epoch: 2 End epoch: 387
Prn: 30 Start epoch: 2 End epoch: 387

THE FLOAT DOUBLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 0.209663 Wavelength = 0.190294 (m/cycle)
num_meas = 3304 num_used = 3303 rms_resid = 0.023708 (m)
Post-Fit Chisq = 40609.342 NDF = 7.646



Reference SV: 30

| SV | Ambiguity | FIT | Meas | SV | Ambiguity | FIT | Meas |
|----|----------------|-------|------|----|----------------|-------|------|
| 5 | -9468996.904f | 0.086 | 386 | 6 | -7817650.058f | 0.144 | 386 |
| 9 | -23228899.954f | 0.144 | 317 | 10 | -19691442.821f | 0.170 | 284 |
| 15 | -4572147.214f | 0.119 | 386 | 17 | -7271015.156f | 0.130 | 386 |
| 18 | 3663237.923f | 0.097 | 386 | 23 | 2118556.027f | 0.077 | 386 |
| 26 | -10969273.701f | 0.142 | 386 | | | | |

Sigmax (m): 0.243202
 Sigmay (m): 0.278794
 Sigmaz (m): 0.095128
 SigmaN (cy): 0.682375
 SigmaN (cy): 0.689154
 SigmaN (cy): 0.955520
 SigmaN (cy): 1.469567
 SigmaN (cy): 1.179274
 SigmaN (cy): 0.841030
 SigmaN (cy): 0.539805
 SigmaN (cy): 0.403933
 SigmaN (cy): 1.759730

x y z N N N N N N N N
 x 1.00
 y 0.37y 1.00
 z 0.04z-0.09z 1.00
 N 0.68N 0.78N 0.38N 1.00
 N-0.39N 0.59N-0.53N 0.01N 1.00
 N 0.05N 0.73N 0.53N 0.74N 0.33N 1.00
 N 0.31N 0.98N-0.24N 0.68N 0.69N 0.64N 1.00
 N-0.93N-0.66N 0.07N-0.79N 0.08N-0.26N-0.61N 1.00
 N-0.93N-0.65N-0.06N-0.83N 0.15N-0.33N-0.58N 0.98N 1.00
 N-0.48N-0.19N 0.82N 0.04N-0.16N 0.50N-0.29N 0.53N 0.42N 1.00
 N 0.54N 0.49N 0.70N 0.87N-0.24N 0.73N 0.36N-0.54N-0.62N 0.38N 1.00
 N 0.48N 0.97N 0.11N 0.90N 0.41N 0.80N 0.92N-0.72N-0.73N-0.08N 0.67N 1.00

del_station: -0.000769 -0.000151 -0.000044

Station1: FIXED STATION

Station2: UNKNOWN STATION

M-01A E_03
 Latitude: -4.65705287 -4 39 25.39032 -4.65288255 -4 39 10.37717
 E-Long : 320.34061839 320 20 26.22620 320.35593820 320 21 21.37752
 W-Long : 39.65938161 39 39 33.77380 39.64406180 39 38 38.62248
 E-Height: 387.9560 378.4345

Baseline vector: 1106.2544 1290.9953 460.4398

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
 Az1 El1 D1 : 74.82154 -0.3176 1761.3836
 E1 N1 U1 : 1699.9042 461.1887 -9.5215
 Mark2_xyz : 4895523.7511 -4056274.8018 -513965.8340
 Az2 El2 D2 : 254.82030 0.3018 1761.3836
 E2 N2 U2 : -1699.9117 -461.1880 9.5215

AMBIGUITY RESOLUTION

| | 1 | 2 | 3 | 4 |
|-----------------------------|-----------|-----------|-----------|-----------|
| Abs Contrast | 45.637 | 0.043 | 0.035 | 0.031 |
| Contrast | | 99.950 | 99.960 | 99.964 |
| Change Chi2 | 947.283 | 40938.388 | 41966.297 | 42539.573 |
| Bias S30: 5 | -9468997 | -9468997 | -9468997 | -9468995 |
| Bias S30: 6 | -7817650 | -7817651 | -7817649 | -7817650 |
| Bias S30: 9 | -23228900 | -23228901 | -23228899 | -23228898 |
| Bias S30:17 | -7271015 | -7271015 | -7271015 | -7271017 |
| Bias S30:18 | 3663238 | 3663238 | 3663238 | 3663238 |
| Bias S30:23 | 2118556 | 2118556 | 2118556 | 2118557 |
| NDF=91.5750 Chi2=40609.3416 | | | | |
| | 1 | 2 | 3 | 4 |
| Abs Contrast | 39.885 | 0.000 | 0.000 | 0.000 |



```

Contrast                100.000    100.000    100.000
Change Chi2            2211.705 195848.736 243719.378 244051.674
Bias S30:10           -19691443 -19691442 -19691442 -19691444
Bias S30:15           -4572147  -4572147  -4572147  -4572147
Bias S30:26           -10969274 -10969273 -10969274 -10969274
NDF=97.5750 Chi2=41556.6242

```

```

THE FIXED DOUBLE DIFFERENCE SOLUTION (L1)
Measure of geometry: 0.017038      Wavelength = 0.190294 (m/cycle)
num_meas = 3304      num_used = 3302      rms_resid = 0.024561(m)
Post-Fit Chisq = 43573.190      NDF = 7.644

```

```

Reference SV: 30      Integer Search Ratio = 99.950
SV      Ambiguity      FIT      Meas      SV      Ambiguity      FIT      Meas
5       -9468997.000X  0.090   386       6       -7817650.000X  0.156   386
9       -23228900.000X 0.143   317       10      -19691443.000X 0.168   283
15      -4572147.000X  0.126   386       17      -7271015.000X  0.133   386
18      3663238.000X   0.102   386       23      2118556.000X   0.077   386
26      -10969274.000X 0.151   386

```

```

Sigma_x (m): 0.025131
Sigma_y (m): 0.016423
Sigma_z (m): 0.011533
x      y      z
x 1.00
y-0.58y 1.00
z-0.32z 0.11z 1.00

```

```

del_station: 0.000021 -0.000085 0.000054
Station1: FIXED STATION      Station2: UNKNOWN STATION
           M-01A              E_03
Latitude: -4.65705287 -4 39 25.39032      -4.65288256 -4 39 10.37723
E-Long : 320.34061839 320 20 26.22620      320.35593768 320 21 21.37566
W-Long : 39.65938161 39 39 33.77380      39.64406232 39 38 38.62434
E-Height: 387.9560      378.4291

```

```

Baseline vector:      1106.2135      1290.9547      460.4386

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 El1 D1 : 74.82110 -0.3178 1761.3279
E1 N1 U1 : 1699.8468 461.1871 -9.5269
Mark2_xyz : 4895523.7102 -4056274.8424 -513965.8352
Az2 El2 D2 : 254.81986 0.3020 1761.3279
E2 N2 U2 : -1699.8543 -461.1863 9.5269
Wed Sep 19 20:17:16 2001

```



Ashtech, Inc. GPPS-L

Program: LINECOMP
Wed Sep 19 20:16:42 2001

Version: 5.2.00

```

Project information
GPS Survey          |25-character project name [ The | is in column 26.
]
2611A              |5-character session name
Project information

```

```

Known-station parameters
00                 |Receiver identifier used in "LOGTIMES" file
000000            |Project station number
M-01A             |4-character short name
FIXED STATION     |25-character long name
                  |25-character comment field
0                 |Position extraction (0=below,1=U-file,2=proj. file)
S  4 39 25.39032  |Latitude deg-min-sec (g=good;b=bad)
E 320 20 26.22620 |E-Longitude deg-min-sec (g=good;b=bad)
W  39 39 33.77380 |W-Longitude deg-min-sec (g=good;b=bad)
    387.9560       |Ellipsoidal height (m) (g=good;b=bad)
    0.0000         |North antenna offset(m)
    0.0000         |East antenna offset (m)
    1.8490 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
    20.0           |Temperature (degrees C)
    50.0           |Humidity (percent)
    1010.0         |Pressure (millibars)
UBASEA01.261     |Measurement filename (restricted to 24 characters)

```

```

Known-station parameters
Unknown-station parameters
00                 |Receiver identifier used in "LOGTIMES" file
000000            |Project station number
E_13+10          |4-character short name
UNKNOWN STATION  |25-character long name
                  |25-character comment field
0                 |Position extraction (0=below,1=U-file,2=proj. file)
S  4 39  4.90023  |Latitude deg-min-sec (g=good;b=bad)
E 320 21 24.96170 |E-Longitude deg-min-sec (g=good;b=bad)
W  39 38 35.03830 |W-Longitude deg-min-sec (g=good;b=bad)
    403.8225       |Ellipsoidal height (m) (g=good;b=bad)
    0.0000         |North antenna offset(m)
    0.0000         |East antenna offset (m)
    1.9910 0.1318 0.0000 |Vert antenna offset (m): slant/radius/added_offset
    20.0           |Temperature (degrees C)
    50.0           |Humidity (percent)
    1010.0         |Pressure (millibars)
UES13A01.261    |Measurement filename (restricted to 24 characters)

```

```

Unknown-station parameters
Run-time parameters
1                 |First epoch to process
-1                |Final epoch to process (-1 = last available)
15.0             |Elevation cutoff angle (degrees)
1                |Data to process (0=Wdln;1=L1;2=L2;3=L1c;6=RpdSt)
0.010000        |Convergence criterion (meters)
00 00 00 00 00 00 |Omit these satellites (up to 7)
10              |Maximum iterations for tlsq and dlsq
00 00 00 00 00 00 |Forbidden reference SVs (up to 7)
yes             |Apply tropo delay correction
Run-time parameters

```

LINECOMP 5.2.00 7-18-94

FIXED U-File from L1 only receiver.

UNKWN U-File from L1 only receiver.

FIXED U-File used BROADCAST orbits.



UNKWN U-File used BROADCAST orbits.

Common start of two UFILES: 2001/09/18 16:51:40.00
Common end of two UFILES: 2001/09/18 17:19:30.00

Selected first epoch: 1
Selected last epoch: 335
For SV 5 there are 334 triple-difference measurements.
For SV 6 there are 334 triple-difference measurements.
For SV 15 there are 334 triple-difference measurements.
For SV 17 there are 334 triple-difference measurements.
For SV 18 there are 334 triple-difference measurements.
For SV 21 there are 328 triple-difference measurements.
For SV 23 there are 334 triple-difference measurements.
For SV 26 there are 334 triple-difference measurements.
For SV 30 there are 334 triple-difference measurements.
Epoch interval (seconds): 5.000000

THE TRIPLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 8.895328
num_meas = 2666 num_used = 2654 rms_resid = 0.002953(m)
Post-Fit Chisq = 6041.604 NDF = 6.144

Sigmax (m): 4.754445
Sigmay (m): 4.933051
Sigmaz (m): 1.301595
x y z
x 1.00
y 0.36y 1.00
z-0.23z-0.16z 1.00

del_station: -0.000000 0.000000 -0.000000

Station1: FIXED STATION Station2: UNKNOWN STATION
M-01A E_13+10
Latitude: -4.65705287 -4 39 25.39032 -4.65129511 -4 39 4.66241
E-Long : 320.34061839 320 20 26.22620 320.35694507 320 21 25.00224
W-Long : 39.65938161 39 39 33.77380 39.64305493 39 38 34.99776
E-Height: 387.9560 379.2547

Baseline vector: 1189.1283 1367.4201 635.3464

Mark1 xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 E1 D1 : 70.63547 -0.2683 1920.2940
E1 N1 U1 : 1811.6273 636.7404 -8.7013
Mark2 xyz : 4895606.6250 -4056198.3770 -513790.9275
Az2 E2 D2 : 250.63415 0.2510 1920.2940
E2 N2 U2 : -1811.6395 -636.7394 8.7013

Double-Difference Epochs:

Prn: 5 Start epoch: 2 End epoch: 335
Prn: 6 Start epoch: 2 End epoch: 335
Prn: 15 Start epoch: 2 End epoch: 335
Prn: 17 Start epoch: 2 End epoch: 335
Prn: 18 Start epoch: 2 End epoch: 335
Prn: 21 Start epoch: 8 End epoch: 335
Prn: 23 Start epoch: 2 End epoch: 335
Prn: 26 Start epoch: 2 End epoch: 335
Prn: 30 Start epoch: 2 End epoch: 335

THE FLOAT DOUBLE DIFFERENCE SOLUTION (L1)

Measure of geometry: 0.265177 Wavelength = 0.190294 (m/cycle)
num_meas = 2666 num_used = 2653 rms_resid = 0.014033(m)
Post-Fit Chisq = 10857.431 NDF = 6.141

Reference SV: 23



```

SV      Ambiguity      FIT      Meas      SV      Ambiguity      FIT      Meas
5       -19422182.865f    0.063    334      6       -10755622.077f  0.066    334
15      -10656789.119f    0.076    334      17      -15275333.139f  0.084    334
18      4129272.020f   0.080    334      21      -24195959.924f  0.059    316
26      -16000451.777f  0.100    333      30      -3795679.973f   0.048    334

Sigmax (m):      0.195310
Sigmay (m):      0.186086
Sigmaz (m):      0.070187
SigmaN (cy):     0.358511
SigmaN (cy):     0.484175
SigmaN (cy):     1.064229
SigmaN (cy):     0.774087
SigmaN (cy):     0.396647
SigmaN (cy):     0.931352
SigmaN (cy):     1.060841
SigmaN (cy):     0.205525
x          y          z          N          N          N          N          N          N
x 1.00
y 0.41y 1.00
z 0.03z-0.15z 1.00
N 0.27N 0.72N 0.54N 1.00
N-0.29N 0.58N-0.68N 0.09N 1.00
N-0.96N-0.61N-0.11N-0.49N 0.17N 1.00
N-0.95N-0.48N-0.28N-0.50N 0.35N 0.97N 1.00
N-0.78N-0.73N 0.43N-0.24N-0.31N 0.82N 0.70N 1.00
N-0.93N-0.50N 0.32N-0.12N-0.00N 0.89N 0.81N 0.92N 1.00
N 0.46N 0.99N-0.09N 0.75N 0.52N-0.66N-0.54N-0.73N-0.53N 1.00
N-0.70N-0.78N 0.30N-0.36N-0.31N 0.79N 0.68N 0.92N 0.81N-0.78N 1.00

del_station: -0.002481 0.021344 -0.000460
Station1: FIXED STATION
M-01A
Latitude: -4.65705287 -4 39 25.39032
E-Long : 320.34061839 320 20 26.22620
W-Long : 39.65938161 39 39 33.77380
E-Height: 387.9560
Station2: UNKNOWN STATION
E_13+10
Latitude: -4.65129379 -4 39 4.65764
E-Long : 320.35694572 320 21 25.00459
W-Long : 39.64305428 39 38 34.99541
E-Height: 379.3501

Baseline vector:      1189.2568      1367.4075      635.4848

Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
Az1 E11 D1 : 70.63206 -0.2654 1920.4104
E1 N1 U1 : 1811.6996 636.8871 -8.6059
Mark2_xyz : 4895606.7536 -4056198.3896 -513790.7890
Az2 E12 D2 : 250.63073 0.2481 1920.4104
E2 N2 U2 : -1811.7118 -636.8861 8.6059

AMBIGUITY RESOLUTION
1 2 3 4
Abs Contrast 38.975 0.000 0.000 0.000
Contrast 100.000 100.000 100.000 100.000
Change Chi2 723.980 26069.885 31928.230 32269.333
Bias S23: 5 -19422183 -19422182 -19422183 -19422183
Bias S23: 6 -10755622 -10755622 -10755621 -10755623
Bias S23:15 -10656789 -10656790 -10656788 -10656790
Bias S23:17 -15275333 -15275334 -15275332 -15275334
Bias S23:18 4129272 4129272 4129272 4129272
Bias S23:21 -24195960 -24195960 -24195959 -24195961
Bias S23:30 -3795680 -3795680 -3795680 -3795680
NDF=74.3250 Chi2=10857.4310
1 2 3
Abs Contrast 38.212 0.000 0.000
Contrast 100.000 100.000
Change Chi2 797.935 97210.134 135630.804
Bias S23:26 -16000452 -16000451 -16000453
NDF=81.3250 Chi2=11581.4107

```



THE FIXED DOUBLE DIFFERENCE SOLUTION (L1)
 Measure of geometry: 0.018812 Wavelength = 0.190294 (m/cycle)
 num_meas = 2666 num_used = 2654 rms_resid = 0.014966(m)
 Post-Fit Chisq = 12411.738 NDF = 6.144

Reference SV: 23 Integer Search Ratio = 100.000

| SV | Ambiguity | FIT | Meas | SV | Ambiguity | FIT | Meas |
|----|----------------|-------|------|----|----------------|-------|------|
| 5 | -19422183.000X | 0.061 | 334 | 6 | -10755622.000X | 0.066 | 334 |
| 15 | -10656789.000X | 0.085 | 334 | 17 | -15275333.000X | 0.084 | 334 |
| 18 | 4129272.000X | 0.085 | 334 | 21 | -24195960.000X | 0.058 | 316 |
| 26 | -16000452.000X | 0.112 | 334 | 30 | -3795680.000X | 0.064 | 334 |

Sigma_x (m): 0.014937
 Sigma_y (m): 0.012587
 Sigma_z (m): 0.008081
 x y z
 x 1.00
 y-0.60y 1.00
 z-0.18z 0.07z 1.00

del_station: -0.000060 0.000010 0.000038
 Station1: FIXED STATION Station2: UNKNOWN STATION
 M-01A E_13+10
 Latitude: -4.65705287 -4 39 25.39032 -4.65129403 -4 39 4.65851
 E-Long : 320.34061839 320 20 26.22620 320.35694546 320 21 25.00364
 W-Long : 39.65938161 39 39 33.77380 39.64305454 39 38 34.99636
 E-Height: 387.9560 379.3662

Baseline vector: 1189.2490 1367.3763 635.4567
 Mark1_xyz : 4894417.4967 -4057565.7971 -514426.2738
 Az1 E1 D1 : 70.63253 -0.2649 1920.3740
 E1 N1 U1 : 1811.6705 636.8602 -8.5898
 Mark2_xyz : 4895606.7457 -4056198.4207 -513790.8171
 Az2 E2 D2 : 250.63120 0.2477 1920.3740
 E2 N2 U2 : -1811.6828 -636.8592 8.5898
 Wed Sep 19 20:16:56 2001



MONTGOMERY WATSON



3. APOIO BÁSICO E SUPLEMENTAR PARA O LEVANTAMENTO AEROFOTOGRAMÉTRICO



ENGESOFT ENGENHARIA E CONSULTORIA LTDA

| | | |
|--|---|---|
| Vértice: M-01A | Ponto Visado: M-02A | Obra/Ano: O-739/2001 |
| Estado: Ceará | Município: Itatira | Local: Lagoa do Mato |
| Origem: V. Grosso (IBGE) | MC: 39° W | Datum: SAD-69 |
| Coordenada Geodésica Latitude: 04° 39'24,00013"S | Coordenada Geodésica Longitude: 39° 39'32,49800"W | |
| Coordenada UTM Norte: 9.485.251,148m | Coordenada UTM Este: 426.905,361m | Altura Geométrica: 387,159m Altitude Ortométrica: 387,956m |
| Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: BASE S/A – São Paulo – Protegido Por Lei – Não Destruir – ENGESOFT – 06/2001 – M-01A. | | |
| ITINERÁRIO | | CROQUIS |
| Partindo-se com 0,0Km da Igreja Nossa Senhora do Carmo em Lagoa do Mato, segue-se na CE-366 em direção a BR-020, com 2,35Km chega-se ao local do marco que está na frente da casa do Sr. Antenor Lobo na margem direita da CE-366. | | |



ENGESOFT ENGENHARIA E CONSULTORIA LTDA

| | | | | | |
|--|--|---|---|---|--|
| Vértice: M-02A | | Ponto Visado: M-01A | | Obra/Ano: O-739/2001 | |
| Estado: Ceará | | Município: Itaitira | | Local: Lagoa do Mato | |
| Origem: V. Grosso (IBGE) | | MC: 39° W | | Datum: SAD-69 | |
| Coordenada Geodésica Latitude: 04° 39'35,05575"S | | | Coordenada Geodésica Longitude: 39° 39'13,37932"W | | |
| Coordenada UTM Norte: 9.484.912,212m | | Coordenada UTM Este: 427.494,731m | | Altura Geométrica: 389,313m Altitude Ortométrica: 390,089m | |
| Descrição: Marco de concreto de formato tronco piramidal medindo, (10x12x50) cm, com chapa de bronze no centro do topo, constando: BASE S/A – São Paulo – Protegido Por Lei – Não Destruir – ENGESOFT – 06/2001 – M-02A. | | | | | |
| ITINERÁRIO | | | CROQUIS | | |
| <p>Partindo-se com 0,0Km da Igreja Nossa Senhora do Carmo em Lagoa do Mato, segue-se na CE-366 em direção a BR-020, com 3,1Km chega-se ao local do marco que está no canto da cerca do lado esquerdo da entrada da estrada carroçavel que dá acesso a Fazenda Boqueirão.</p> | | | | | |



ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: UMARÉ e JOÃO GUERRA/CE
Obra: O-739 Operador: WIVEAR Data: 19-Jul-2001

Transformação de Sistemas Geodésicos

Elipsóide de origem: WGS_84 a=6378137.000 b=6356752.314
Elipsóide de destino: SAD_69 a=6378160.000 b=6356774.719
Parâmetros para transformação: dx = 66.870 dy = -4.370 dz = 38.520

Coordenadas referidas ao Sistema WGS_84

| Ponto | Latitude | Longitude | h |
|---------|-----------------|------------------|---------|
| M01 | 4°48'09.36388"S | 39°31'45.60577"W | 299.808 |
| M01A | 4°39'25.39024"S | 39°39'33.77348"W | 359.193 |
| M02 | 4°44'27.82659"S | 39°34'04.95348"W | 318.942 |
| M02A | 4°39'36.44596"S | 39°39'14.65464"W | 361.345 |
| M03 | 4°48'11.07821"S | 39°32'44.85698"W | 296.766 |
| M04 | 4°47'51.55293"S | 39°32'42.12575"W | 283.947 |
| RN1678Z | 4°41'43.53226"S | 39°26'49.48755"W | 331.517 |
| RN515G | 4°44'19.24633"S | 39°34'39.05452"W | 312.509 |
| VBARRA | 4°31'44.57964"S | 39°23'56.35491"W | 538.240 |
| VGROSSO | 4°38'50.10834"S | 39°25'47.92469"W | 453.870 |



ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: UMARÁ e JOÃO GUERRA/CE
Obra: O-739 Operador: WIVEAR Data: 19-Jul-2001

Transformação de Sistemas Geodésicos

Elipsóide de origem: WGS_84 a=6378137.000 b=6356752.314
Elipsóide de destino: SAD_69 a=6378160.000 b=6356774.719
Parâmetros para transformação: dX = 66.870 dY = -4.370 dZ = 38.520

Coordenadas referidas ao Sistema SAD_69

| Ponto | Latitude | Longitude | h |
|---------|-----------------|------------------|---------|
| M01 | 4°48'07.96941"S | 39°31'44.33401"W | 327.755 |
| M01A | 4°39'24.00013"S | 39°39'32.49800"W | 387.159 |
| M02 | 4°44'26.43393"S | 39°34'03.68065"W | 346.909 |
| M02A | 4°39'35.05575"S | 39°39'13.37932"W | 389.313 |
| M03 | 4°48'09.68375"S | 39°32'43.58472"W | 324.701 |
| M04 | 4°47'50.15862"S | 39°32'40.85352"W | 311.887 |
| RN1678Z | 4°41'42.14066"S | 39°26'48.21853"W | 359.600 |
| RN515G | 4°44'17.85375"S | 39°34'37.78140"W | 340.471 |
| VBARRA | 4°31'43.19273"S | 39°23'55.08770"W | 566.480 |
| VGROSSO | 4°38'48.71811"S | 39°25'46.65631"W | 482.000 |



ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAFÉTICO
APOIO BÁSICO

Cliente: ENGESOFT Local: UMARJ e JOÃO GUERRA/CE
Obra: O-739 Operador: WIVEAR Data: 19-Jul-2001

Transformação de Coordenadas Geodésicas em Planoretangulares TM

Elipsóide: SAD_69 a=6378160.000 b=6356774.719
Meridiano Central: 39°00'00.00"W Hemisfério Sul
Coordenadas UTM

| Ponto | N(m) | E(m) | h(m) | Convergência | kapa |
|---------|-------------|------------|---------|--------------|------------|
| M01 | 9469174.135 | 441341.799 | 327.755 | 0°02'39.43" | 0.99964259 |
| M01A | 9485251.148 | 426905.361 | 387.159 | 0°03'12.62" | 0.99966613 |
| M02 | 9475973.281 | 437043.836 | 346.909 | 0°02'48.91" | 0.99964906 |
| M02A | 9484912.212 | 427494.731 | 389.313 | 0°03'11.19" | 0.99966507 |
| M03 | 9469120.061 | 439516.718 | 324.701 | 0°02'44.41" | 0.99964528 |
| M04 | 9469719.675 | 439600.372 | 311.887 | 0°02'43.99" | 0.99964515 |
| RN1678Z | 9481027.870 | 450455.442 | 359.600 | 0°02'11.64" | 0.99963038 |
| RN515G | 9476235.881 | 435993.099 | 340.471 | 0°02'51.64" | 0.99965071 |
| VBARRA | 9499422.163 | 455778.904 | 566.480 | 0°01'53.31" | 0.99962420 |
| VGROSSO | 9486354.135 | 452348.780 | 482.000 | 0°02'05.30" | 0.99962811 |

OBS.: Alturas Geométricas, referidas ao elipsóide.



ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO BÁSICO

Cliente: ENGESOFT Local: UMARI e JOÃO GUERRA/CE
Obra: O-739 Operador: WIVEAR Data: 19-Jul-2001

Coordenadas Geodésicas Planoretangulares - UTM

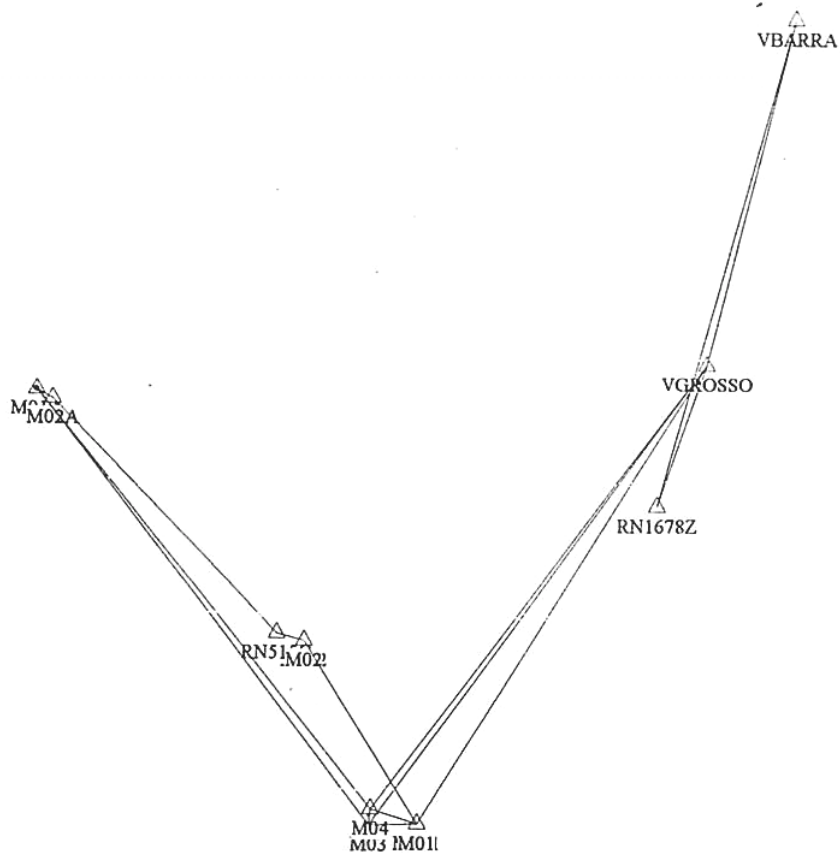
Elipsóide: SAD_69 a=6378160.000 b=6356774.719
Meridiano Central: 39°00'00.00"W Hemisfério Sul

| Ponto | N (m) | E (m) | H (m) |
|---------|-------------|------------|---------|
| M01 | 9469174.135 | 441341.799 | 328.249 |
| M01A | 9485251.148 | 426905.361 | 387.956 |
| M02 | 9475973.281 | 437043.836 | 347.432 |
| M02A | 9484912.212 | 427494.731 | 390.089 |
| M03 | 9469120.061 | 439516.718 | 325.292 |
| M04 | 9469719.675 | 439600.372 | 312.450 |
| RN1678Z | 9481027.870 | 450455.442 | 359.850 |
| RN515G | 9476235.881 | 435993.099 | 340.77 |
| VBARRA | 9499422.163 | 455778.904 | 566.53 |
| VGROSSO | 9486354.135 | 452348.780 | 482.00 |

OBS.: Altitudes Ortométricas, com milímetros, obtidas
por nivelamento geométrico e com centímetros,
obtidas por diferença geoidal.



Network Map: UMJG





COORDINATE ADJUSTMENT SUMMARY
NETWORK = UMJG
TIME = Thu Jul 19 15:38:24 2001

Datum = WGS-84
Coordinate System = Geographic
Zone = Global

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in H

| POINT | NAME | OLD COORDS | ADJUST | NEW COORDS | 1.00σ |
|-------|-----------|--------------------|------------|--------------------|-----------|
| 1 | M01 | | | | |
| | LAT= | 4° 48' 09.363913" | +0.000031" | 4° 48' 09.363882" | 0.009373m |
| | LON= | 39° 31' 45.605882" | +0.000115" | 39° 31' 45.605768" | 0.020653m |
| | ELL HT= | 299.8109m | -0.0026m | 299.8083m | 0.034936m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 2 | M01A | | | | |
| | LAT= | 4° 39' 25.390272" | +0.000033" | 4° 39' 25.390239" | 0.010251m |
| | LON= | 39° 39' 33.773593" | +0.000117" | 39° 39' 33.773476" | 0.021113m |
| | ELL HT= | 359.1957m | -0.0032m | 359.1926m | 0.035471m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 3 | M02 | | | | |
| | LAT= | 4° 44' 27.826623" | +0.000031" | 4° 44' 27.826593" | 0.009990m |
| | LON= | 39° 34' 04.953591" | +0.000116" | 39° 34' 04.953476" | 0.020957m |
| | ELL HT= | 318.9448m | -0.0026m | 318.9422m | 0.035089m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 4 | M02A | | | | |
| | LAT= | 4° 39' 36.445992" | +0.000034" | 4° 39' 36.445958" | 0.010439m |
| | LON= | 39° 39' 14.654749" | +0.000113" | 39° 39' 14.654636" | 0.021198m |
| | ELL HT= | 361.3479m | -0.0032m | 361.3447m | 0.035506m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 5 | M03 | | | | |
| | LAT= | 4° 48' 11.078242" | +0.000034" | 4° 48' 11.078208" | 0.009969m |
| | LON= | 39° 32' 44.857105" | +0.000123" | 39° 32' 44.856982" | 0.020890m |
| | ELL HT= | 296.7669m | -0.0011m | 296.7658m | 0.035378m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 6 | M04 | | | | |
| | LAT= | 4° 47' 51.552962" | +0.000030" | 4° 47' 51.552932" | 0.009961m |
| | LON= | 39° 32' 42.125873" | +0.000123" | 39° 32' 42.125750" | 0.020989m |
| | ELL HT= | 283.9506m | -0.0031m | 283.9474m | 0.035440m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 7 | RN1678Z | | | | |
| | LAT= | 4° 41' 43.532255" | +0.000000" | 4° 41' 43.532255" | 0.003022m |
| | LON= | 39° 26' 49.487551" | +0.000000" | 39° 26' 49.487551" | 0.003022m |
| | ELL HT= | 331.5173m | +0.0000m | 331.5173m | 0.002015m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 8 | RN515G | | | | |



| | | | | |
|------------|--------------------|------------|--------------------|-----------|
| LAT= | 4° 44' 19.246362" | +0.000030" | 4° 44' 19.246332" | 0.010333m |
| LON= | 39° 34' 39.054634" | +0.000120" | 39° 34' 39.054515" | 0.021125m |
| ELL HT= | 312.5116m | -0.0026m | 312.5091m | 0.035188m |
| ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 9 VBARRA | | | | |
| LAT= | 4° 31' 44.579642" | +0.000000" | 4° 31' 44.579642" | 0.003022m |
| LON= | 39° 23' 56.354906" | +0.000000" | 39° 23' 56.354906" | 0.003022m |
| ELL HT= | 538.2401m | +0.0000m | 538.2401m | 0.002016m |
| ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 10 VGROSSO | | | | |
| LAT= | 4° 38' 50.108336" | +0.000000" | 4° 38' 50.108336" | FIXED |
| LON= | 39° 25' 47.924690" | +0.000000" | 39° 25' 47.924690" | FIXED |
| ELL HT= | 453.8700m | +0.0000m | 453.8700m | FIXED |
| ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |



SUMMARY OF COVARIANCES
NETWORK = UMJG
TIME = Thu Jul 19 15:38:27 2001

Definition of precision (E x S)^2 = C^2 + P^2:

Horizontal:

Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted horizontal distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000

3-Dimensional:

Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted slope distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
Using orthometric height errors

Table with 7 columns: FROM/TO, AZIMUTH/DELTA H, 1.00 sigma, DISTANCE/DELTA h, 1.00 sigma, HOR PREC/3-D PREC. Rows include station pairs like M0/M01A, M01/M02, etc.



| | | | | | |
|-----------------|-------------------------|------------------|-------------------|----------------|--------------------------|
| M04 | -75.2451m | 0.0025m | --- | --- | 1: 6036804 |
| M01A RN1678Z | 100°13'14" -27.6753m | 0.11" 0.0355m | 23934.320m --- | 0.0204m --- | 1: 1173165 1: 1173165 |
| M01A RN515G | 134°49'29" -46.6835m | 0.08" 0.0066m | 12805.293m --- | 0.0046m --- | 1: 2757320 1: 2757320 |
| M01A VBARRA | 63°54'41" +179.0475m | 0.07" 0.0355m | 32175.247m --- | 0.0213m --- | 1: 1513011 1: 1513011 |
| M01A VGROSSO | 87°34'16" +94.6774m | 0.08" 0.0355m | 25476.453m --- | 0.0213m --- | 1: 1198400 1: 1198400 |
| M02 M02A | 313°09'22" +42.4025m | 0.07" 0.0065m | 13084.681m --- | 0.0046m --- | 1: 2814194 1: 2814194 |
| M02 M03 | 160°12'22" -22.1764m | 0.14" 0.0066m | 7288.327m --- | 0.0047m --- | 1: 1543098 1: 1543098 |
| M02 M04 | 157°48'43" -34.9948m | 0.14" 0.0063m | 6758.409m --- | 0.0045m --- | 1: 1509515 1: 1509515 |
| M0 RN1678Z | 69°23'46" +12.5751m | 0.14" 0.0351m | 14337.716m --- | 0.0214m --- | 1: 669095 1: 669095 |
| M02 RN515G | 284°04'44" -6.4332m | 0.65" 0.0028m | 1083.439m --- | 0.0034m --- | 1: 314445 1: 314445 |
| M02 VBARRA | 38°40'12" +219.2979m | 0.11" 0.0351m | 30025.277m --- | 0.0179m --- | 1: 1679053 1: 1679053 |
| M02 VGROSSO | 55°53'55" +134.9278m | 0.13" 0.0351m | 18500.113m --- | 0.0202m --- | 1: 916952 1: 916952 |
| M02A M03 | 142°46'24" -64.5789m | 0.06" 0.0083m | 19854.363m --- | 0.0052m --- | 1: 3797519 1: 3797519 |
| M02A M04 | 141°30'20" -77.3973m | 0.05" 0.0036m | 19432.542m --- | 0.0044m --- | 1: 4430049 1: 4430049 |
| M0 RN1678Z | 99°39'19" -29.8274m | 0.11" 0.0356m | 23295.291m --- | 0.0206m --- | 1: 1133459 1: 1133459 |
| M02A RN515G | 135°38'50" -48.8356m | 0.07" 0.0066m | 12149.209m --- | 0.0040m --- | 1: 3022590 1: 3022590 |
| M02A VBARRA | 62°53'40" +176.8954m | 0.07" 0.0356m | 31800.378m --- | 0.0213m --- | 1: 1494351 1: 1494351 |
| M02A VGROSSO | 86°43'58" +92.5253m | 0.08" 0.0355m | 24904.784m --- | 0.0214m --- | 1: 1164521 1: 1164521 |
| M03 M04 | 7°59'16" -12.8184m | 1.44" 0.0080m | 605.639m --- | 0.0038m --- | 1: 158031 1: 158031 |
| M03 RN1678Z | 42°36'59" +34.7515m | 0.19" 0.0354m | 16175.398m --- | 0.0185m --- | 1: 874238 1: 874238 |
| M03 | 333°42'06" | 0.14" | 7943.284m | 0.0052m | 1: 1515776 |



| | | | | | |
|--------------------|-------------------------|------------------|-------------------|----------------|--------------------------|
| RN515G | +15.7433m | 0.0070m | --- | --- | 1: 1515776 |
| M03 VBARRA | 28°15'56" +241.4743m | 0.10" 0.0354m | 34402.797m --- | 0.0158m --- | 1: 2173707 1: 2173707 |
| M03 VGROSSO | 36°42'56" +157.1042m | 0.15" 0.0354m | 21494.539m --- | 0.0172m --- | 1: 1249080 1: 1249080 |
| M04 RN1678Z | 43°52'26" +47.5699m | 0.19" 0.0355m | 15680.823m --- | 0.0188m --- | 1: 835822 1: 835822 |
| M04 RN515G | 331°04'37" +28.5616m | 0.14" 0.0065m | 7450.700m --- | 0.0048m --- | 1: 1551342 1: 1551342 |
| M04 VBARRA | 28°37'15" +254.2927m | 0.11" 0.0355m | 33835.344m --- | 0.0159m --- | 1: 2124198 1: 2124198 |
| M04 VGROSSO | 37°30'39" +169.9226m | 0.15" 0.0354m | 20965.467m --- | 0.0174m --- | 1: 1204843 1: 1204843 |
| RN1678Z RN515G | 251°42'16" -19.0083m | 0.14" 0.0352m | 15241.120m --- | 0.0217m --- | 1: 703184 1: 703184 |
| RN1678Z VBARRA | 16°10'37" +206.7228m | 0.03" 0.0020m | 19156.360m --- | 0.0030m --- | 1: 6339396 1: 6339396 |
| RN1678Z VGROSSO | 19°36'19" +122.3527m | 0.11" 0.0020m | 5654.895m --- | 0.0030m --- | 1: 1871394 1: 1871394 |
| RN515G VBARRA | 40°31'20" +225.7311m | 0.10" 0.0352m | 30492.059m --- | 0.0184m --- | 1: 1657355 1: 1657355 |
| RN515G VGROSSO | 58°18'17" +141.3609m | 0.12" 0.0352m | 19239.491m --- | 0.0206m --- | 1: 934036 1: 934036 |
| VBARRA VGROSSO | 194°44'21" -84.3701m | 0.05" 0.0020m | 13515.817m --- | 0.0030m --- | 1: 4472795 1: 4472795 |



| From Station Short Name | To Station Short Name | Solution Type | Slope | Ratio | Reference Variance | Entered Ant. Ht. (From) | Entered Ant. Ht. (To) |
|----------------------------|--------------------------|------------------|-----------|-------|-----------------------|-------------------------------|-----------------------------|
| M001 | M002 | L1 fixed | 8047.016 | 9.5 | 7.171 | 1.410 | 2.460 |
| M01 | M03 | L1 fixed | 1826.635 | 6.3 | 12.395 | 1.410 | 1.400 |
| M01 | M04 | L1 fixed | 1825.691 | 1.6 | 7.064 | 1.410 | 1.420 |
| M02A | M01A | L1 fixed | 680.155 | 22.3 | 2.067 | 1.410 | 1.390 |
| M03 | M01A | L1 fixed | 20484.150 | 1.6 | 74.197 | 1.390 | 1.410 |
| M03 | M04 | L1 fixed | 605.812 | 2.0 | 5.910 | 1.390 | 1.410 |
| M04 | M01A | L1 fixed | 20067.888 | 1.6 | 70.302 | 1.410 | 1.410 |
| RN1678Z | VBARRA | L1 fixed | 19158.853 | 2.3 | 64.214 | 1.620 | 2.460 |
| RN515G | M02 | L1 fixed | 1083.518 | 26.7 | 3.426 | 1.410 | 1.310 |
| RN515G | M02A | L1 fixed | 12149.997 | 2.5 | 37.329 | 1.410 | 1.410 |
| VGROSSO | M001 | L1 float | 20412.989 | | 29.901 | 2.460 | 1.410 |
| VGROSSO | M03 | L1 fixed | 21496.382 | 2.5 | 23.627 | 1.410 | 1.390 |
| VGROSSO | M04 | L1 fixed | 20967.686 | 1.6 | 46.161 | 1.410 | 1.410 |
| VGROSSO | RN1678Z | L1 fixed | 5656.590 | 28.7 | 9.630 | 2.460 | 1.620 |
| VGROSSO | VBARRA | L1 fixed | 13517.187 | 2.7 | 46.279 | 2.460 | 2.460 |

***** End of Report *****



ENGESOFT Engenharia e Projetos S/A
MAPEAMENTO AEROFOTOGRAMÉTRICO
APOIO SUPLEMENTAR

Cliente: ENGESOFT Local: JOÃO GUERRA/CE
Obra: O-739 Operador: WIVEAR Data: 30-Jun-2001

Coordenadas Geodésicas Planoretangulares - UTM

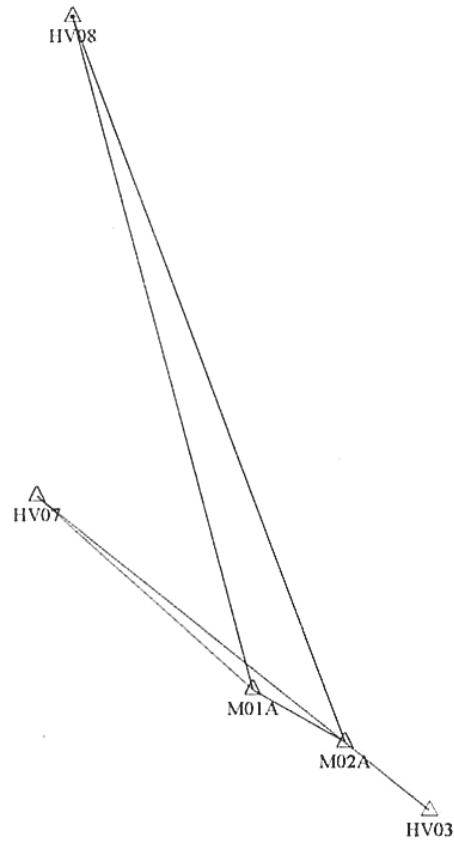
Elipsóide: SAD_69 a=6378160.000 b=6356774.719
Meridiano Central: 39°00'00.00"W Hemisfério Sul

| Ponto | N (m) | E (m) | H (m) |
|-------|-------------|------------|--------|
| HV01 | 9483886.574 | 429876.425 | 373.88 |
| HV02 | 9487009.958 | 430581.695 | 397.68 |
| HV03 | 9484472.405 | 428045.877 | 378.86 |
| HV04 | 9487415.558 | 428143.845 | 399.60 |
| HV05 | 9489601.435 | 428155.999 | 406.06 |
| HV06 | 9484649.401 | 425467.805 | 381.72 |
| HV07 | 9486497.177 | 425516.425 | 406.02 |
| HV08 | 9489580.218 | 425742.902 | 419.00 |
| HV09 | 9485384.608 | 423871.372 | 426.34 |
| HV10 | 9487140.813 | 423634.142 | 432.18 |
| M01A | 9485251.148 | 426905.337 | 387.46 |
| M02A | 9484912.211 | 427494.711 | 389.61 |

OBS.: Altitudes Ortométricas, com milímetros, obtidas por nivelamento geométrico e com centímetros, obtidas por diferença geoidal.



Network Map: JG171





COORDINATE ADJUSTMENT SUMMARY
NETWORK = JG171
TIME = Fri Jun 29 16:02:01 2001

Datum = WGS-84
Coordinate System = Geographic
Zone = Global

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in H

| POINT | NAME | OLD COORDS | ADJUST | NEW COORDS | 1.00σ |
|-------|-----------|--------------------|------------|--------------------|-----------|
| 1 | HV03 | | | | |
| | LAT= | 4° 39' 50.785378" | +0.000000" | 4° 39' 50.785378" | 0.001467m |
| | LON= | 39° 38' 56.779292" | +0.000000" | 39° 38' 56.779292" | 0.001473m |
| | ELL HT= | 350.5958m | +0.0000m | 350.5958m | 0.001076m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| | HV07 | | | | |
| | LAT= | 4° 38' 44.769292" | +0.000000" | 4° 38' 44.769292" | 0.001154m |
| | LON= | 39° 40' 18.815252" | +0.000000" | 39° 40' 18.815252" | 0.001155m |
| | ELL HT= | 377.7566m | +0.0000m | 377.7566m | 0.000776m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 3 | HV08 | | | | |
| | LAT= | 4° 37' 04.373675" | +0.000000" | 4° 37' 04.373674" | 0.001153m |
| | LON= | 39° 40' 11.370237" | +0.000000" | 39° 40' 11.370237" | 0.001153m |
| | ELL HT= | 390.7081m | +0.0000m | 390.7081m | 0.000769m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 4 | M01A | | | | |
| | LAT= | 4° 39' 25.390219" | +0.000000" | 4° 39' 25.390219" | 0.001031m |
| | LON= | 39° 39' 33.774252" | +0.000000" | 39° 39' 33.774252" | 0.001032m |
| | ELL HT= | 359.1930m | +0.0001m | 359.1930m | 0.000690m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| F | M02A | | | | |
| | LAT= | 4° 39' 36.445996" | +0.000000" | 4° 39' 36.445996" | FIXED |
| | LON= | 39° 39' 14.655280" | +0.000000" | 39° 39' 14.655280" | FIXED |
| | ELL HT= | 361.3445m | +0.0000m | 361.3445m | FIXED |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |



SUMMARY OF COVARIANCES
NETWORK = JG171
TIME = Fri Jun 29 16:02:02 2001

Definition of precision $(E \times S)^2 = C^2 + P^2$:

Horizontal:

Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted horizontal distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000

3-Dimensional:

Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted slope distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
Using orthometric height errors

| | FROM/ TO | AZIMUTH/ DELTA H | 1.00σ 1.00σ | DISTANCE/ DELTA h | 1.00σ 1.00σ | HOR PREC/ 3-D PREC |
|------|-------------|---------------------|----------------|----------------------|----------------|-----------------------|
| HV03 | | 308°43'45" | 0.12" | 3241.131m | 0.0019m | 1: 1732326 |
| HV07 | | +27.1608m | 0.0013m | --- | --- | 1: 1732326 |
| HV03 | | 335°46'59" | 0.07" | 5604.881m | 0.0019m | 1: 3001334 |
| HV08 | | +40.1123m | 0.0013m | --- | --- | 1: 3001334 |
| HV03 | | 304°22'39" | 0.27" | 1381.509m | 0.0018m | 1: 768284 |
| M01A | | +8.5972m | 0.0013m | --- | --- | 1: 768284 |
| HV03 | | 308°38'28" | 0.43" | 705.373m | 0.0015m | 1: 479087 |
| M02A | | +10.7487m | 0.0011m | --- | --- | 1: 479087 |
| HV07 | | 4°15'20" | 0.10" | 3092.387m | 0.0015m | 1: 2119589 |
| HV08 | | +12.9515m | 0.0010m | --- | --- | 1: 2119589 |
| HV07 | | 131°57'02" | 0.13" | 1866.551m | 0.0012m | 1: 1616241 |
| M01A | | -18.5636m | 0.0008m | --- | --- | 1: 1616241 |
| HV07 | | 128°45'20" | 0.09" | 2535.759m | 0.0012m | 1: 2196458 |
| M02A | | -16.4121m | 0.0008m | --- | --- | 1: 2196458 |
| HV08 | | 165°01'25" | 0.05" | 4483.933m | 0.0012m | 1: 3888851 |
| M01A | | -31.5151m | 0.0008m | --- | --- | 1: 3888851 |
| HV08 | | 159°29'03" | 0.05" | 4987.578m | 0.0012m | 1: 4325631 |
| M02A | | -29.3636m | 0.0008m | --- | --- | 1: 4325631 |
| M01A | | 119°57'21" | 0.31" | 680.114m | 0.0010m | 1: 659184 |
| M02A | | +2.1515m | 0.0007m | --- | --- | 1: 659184 |

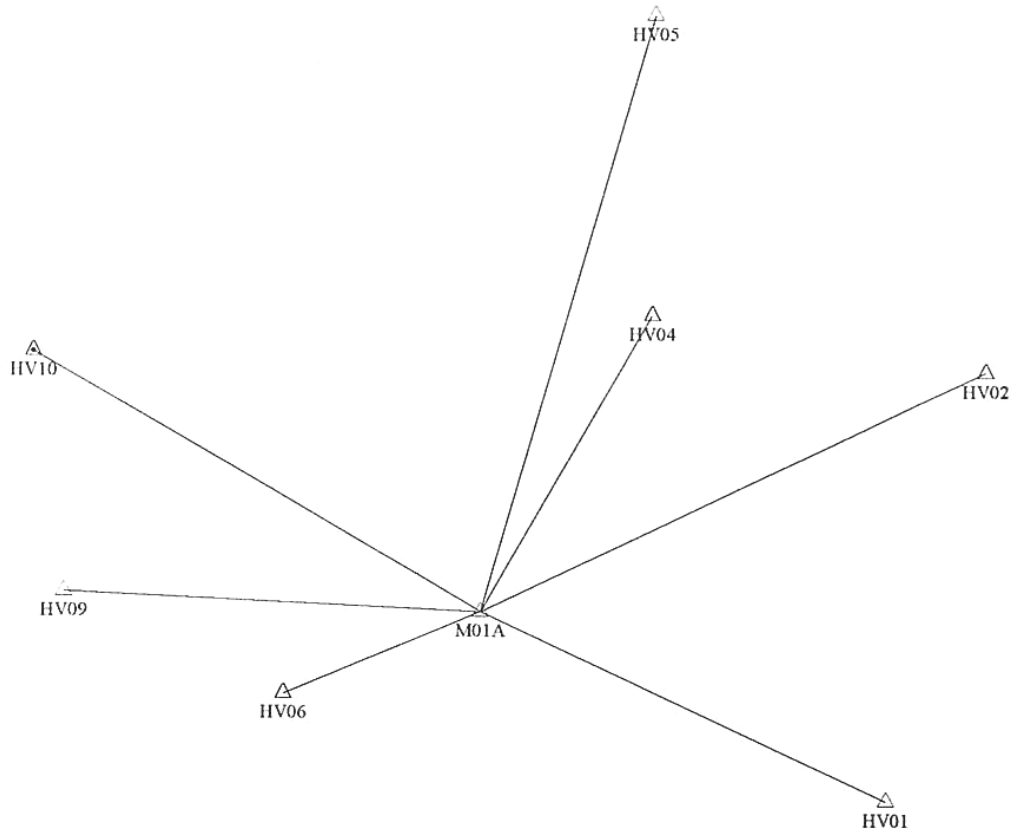


| From Station Short Name | To Station Short Name | Solution Type | Slope | Ratio | Reference Variance | Entered Ant. Ht. (From) | Entered Ant. Ht. (To) |
|----------------------------|--------------------------|------------------|----------|-------|-----------------------|-------------------------------|-----------------------------|
| M01A | HV07 | L1 fixed | 1866.751 | 3.5 | 2.206 | 1.390 | 2.460 |
| M01A | HV08 | L1 fixed | 4484.309 | 5.1 | 4.843 | 1.390 | 2.460 |
| M02A | HV03 | L1 fixed | 705.494 | 19.3 | 1.860 | 1.410 | 1.350 |
| M02A | HV07 | L1 fixed | 2535.960 | 8.2 | 3.326 | 1.410 | 2.460 |
| M02A | HV08 | L1 fixed | 4987.960 | 5.2 | 4.944 | 1.410 | 2.460 |
| M02A | M01A | L1 fixed | 680.155 | 22.3 | 2.067 | 1.410 | 1.390 |

***** End of Report *****



Network Map: JG172





COORDINATE ADJUSTMENT SUMMARY
NETWORK = JG172
TIME = Fri Jun 29 16:31:51 2001

Datum = WGS-84
Coordinate System = Geographic
Zone = Global

Network Adjustment Constraints:
1 fixed coordinates in y
1 fixed coordinates in x
1 fixed coordinates in H

| POINT | NAME | OLD COORDS | ADJUST | NEW COORDS | 1.00σ |
|-------|-----------|--------------------|------------|--------------------|-----------|
| 1 | HV01 | | | | |
| | LAT= | 4° 40' 09.917963" | +0.000000" | 4° 40' 09.917963" | 0.004352m |
| | LON= | 39° 37' 57.381971" | +0.000000" | 39° 37' 57.381971" | 0.004378m |
| | ELL HT= | 345.6035m | +0.0000m | 345.6035m | 0.004007m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| - | HV02 | | | | |
| | LAT= | 4° 38' 28.221220" | +0.000000" | 4° 38' 28.221220" | 0.004371m |
| | LON= | 39° 37' 34.400750" | +0.000000" | 39° 37' 34.400750" | 0.004388m |
| | ELL HT= | 369.3758m | +0.0000m | 369.3758m | 0.004633m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 3 | HV04 | | | | |
| | LAT= | 4° 38' 14.940910" | +0.000000" | 4° 38' 14.940910" | 0.004427m |
| | LON= | 39° 38' 53.511886" | +0.000000" | 39° 38' 53.511886" | 0.004519m |
| | ELL HT= | 371.3106m | +0.0000m | 371.3106m | 0.004921m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 4 | HV05 | | | | |
| | LAT= | 4° 37' 03.755457" | +0.000000" | 4° 37' 03.755457" | 0.010768m |
| | LON= | 39° 38' 53.052687" | +0.000000" | 39° 38' 53.052687" | 0.023012m |
| | ELL HT= | 377.7568m | +0.0000m | 377.7568m | 0.022212m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| - | HV06 | | | | |
| | LAT= | 4° 39' 44.942610" | +0.000000" | 4° 39' 44.942610" | 0.004306m |
| | LON= | 39° 40' 20.450387" | +0.000000" | 39° 40' 20.450387" | 0.004319m |
| | ELL HT= | 353.4713m | +0.0000m | 353.4713m | 0.004018m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 6 | HV09 | | | | |
| | LAT= | 4° 39' 20.949750" | +0.000000" | 4° 39' 20.949750" | 0.004380m |
| | LON= | 39° 41' 12.242300" | +0.000000" | 39° 41' 12.242300" | 0.004470m |
| | ELL HT= | 398.0968m | +0.0000m | 398.0968m | 0.004611m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 7 | HV10 | | | | |
| | LAT= | 4° 38' 23.749729" | +0.000000" | 4° 38' 23.749729" | 0.004543m |
| | LON= | 39° 41' 19.886417" | +0.000000" | 39° 41' 19.886417" | 0.004457m |
| | ELL HT= | 403.9249m | +0.0000m | 403.9249m | 0.005661m |
| | ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |
| 8 | M01A | | | | |



| | | | | |
|-----------|--------------------|------------|--------------------|-----------|
| LAT= | 4° 39' 25.390219" | +0.000000" | 4° 39' 25.390219" | FIXED |
| LON= | 39° 39' 33.774252" | +0.000000" | 39° 39' 33.774252" | FIXED |
| ELL HT= | 359.1930m | +0.0000m | 359.1930m | FIXED |
| ORTHO HT= | 0.0000m | +0.0000m | 0.0000m | NOT KNOWN |



SUMMARY OF COVARIANCES
NETWORK = JG172
TIME = Fri Jun 29 16:31:53 2001

Definition of precision (E x S)^2 = C^2 + P^2:

Horizontal:

Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted horizontal distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000

3-Dimensional:

Precision (P) expressed as: ratio
Propagated linear error (E): U.S.
(standard error of adjusted slope distance)
Scalar (S) on propagated linear error: 1.0000
Constant error term (C): 0.0000
Using orthometric height errors

Table with 7 columns: FROM/TO, AZIMUTH/DELTA H, 1.00 sigma, DISTANCE/DELTA h, 1.00 sigma, HOR PREC/3-D PREC. It lists various station pairs (HV01, HV02, etc.) and their associated measurements and error values.



| | | | | | |
|------|------------|---------|-----------|------------|--------|
| M01A | -10.1828m | 0.0046m | -*- | -*- 1: | 928372 |
| IV04 | 0°22'15" | 2.21" | 2186.655m | 0.0117m 1: | 187412 |
| IVC | +6.4462m | 0.0228m | -*- | -*- 1: | 187412 |
| IV04 | 224°06'14" | 0.33" | 3850.045m | 0.0062m 1: | 622923 |
| IV06 | -17.8393m | 0.0064m | -*- | -*- 1: | 622923 |
| IV04 | 244°37'41" | 0.27" | 4732.215m | 0.0063m 1: | 752084 |
| IV09 | +26.7862m | 0.0067m | -*- | -*- 1: | 752084 |
| HV04 | 266°33'58" | 0.29" | 4519.585m | 0.0063m 1: | 712370 |
| HV10 | +32.6143m | 0.0075m | -*- | -*- 1: | 712370 |
| HV04 | 209°49'53" | 0.38" | 2494.554m | 0.0044m 1: | 565680 |
| M01A | -12.1176m | 0.0049m | -*- | -*- 1: | 565680 |
| HV05 | 208°32'51" | 0.75" | 5636.534m | 0.0163m 1: | 345166 |
| HV06 | -24.2855m | 0.0226m | -*- | -*- 1: | 345166 |
| HV05 | 225°30'34" | 0.59" | 6013.652m | 0.0198m 1: | 304262 |
| HV09 | +20.3400m | 0.0227m | -*- | -*- 1: | 304262 |
| HV05 | 241°29'56" | 0.56" | 5149.728m | 0.0222m 1: | 231893 |
| HV10 | +26.1681m | 0.0229m | -*- | -*- 1: | 231893 |
| HV05 | 196°05'30" | 0.99" | 4528.031m | 0.0131m 1: | 345639 |
| M01A | -18.5638m | 0.0222m | -*- | -*- 1: | 345639 |
| HV06 | 294°46'56" | 0.72" | 1758.179m | 0.0062m 1: | 282812 |
| HV09 | +44.6255m | 0.0061m | -*- | -*- 1: | 282812 |
| HV06 | 323°42'06" | 0.42" | 3094.487m | 0.0062m 1: | 496669 |
| HV10 | +50.4536m | 0.0069m | -*- | -*- 1: | 496669 |
| HV06 | 67°20'26" | 0.57" | 1558.922m | 0.0043m 1: | 360969 |
| M01A | +5.7217m | 0.0040m | -*- | -*- 1: | 360969 |
| HV09 | 352°21'46" | 0.73" | 1772.744m | 0.0063m 1: | 280791 |
| HV10 | +5.8281m | 0.0073m | -*- | -*- 1: | 280791 |
| HV04 | 92°34'28" | 0.30" | 3037.918m | 0.0045m 1: | 679277 |
| M01A | -38.9038m | 0.0046m | -*- | -*- 1: | 679277 |
| HV10 | 120°04'10" | 0.25" | 3779.037m | 0.0045m 1: | 845792 |
| M01A | -44.7319m | 0.0057m | -*- | -*- 1: | 845792 |



| From Station Short Name | To Station Short Name | Solution Type | Slope | Ratio | Reference Variance | Entered Ant. Ht. (From) | Entered Ant. Ht. (To) |
|----------------------------|--------------------------|------------------|----------|-------|-----------------------|-------------------------------|-----------------------------|
| M01A | HV01 | L1 fixed | 3270.793 | 3.4 | 8.317 | 1.350 | 2.460 |
| M01A | HV02 | L1 fixed | 4077.055 | 2.9 | 8.686 | 1.350 | 2.460 |
| M01A | HV04 | L1 fixed | 2494.727 | 4.0 | 13.699 | 1.350 | 2.460 |
| M01A | HV05 | L1 float | 4528.333 | | 6.866 | 1.350 | 3.560 |
| M01A | HV06 | L1 fixed | 1559.019 | 7.8 | 5.084 | 1.350 | 1.410 |
| M01A | HV09 | L1 fixed | 3038.347 | 4.1 | 11.529 | 1.350 | 2.460 |
| M01A | HV10 | L1 fixed | 3779.528 | 2.1 | 12.424 | 1.350 | 2.460 |

***** End of Report *****



| Geométrico ✓ | | | | | | | |
|---|----------|---------|----------------|-----------|-------------------|---------------|----------------|
| Trigonométrico | | | | | | | |
| Altimétrico | | | | | | | |
| Cliente: ENGESOFT ENGENHARIA & PROJETOS S/A | | | | | Folha: _____ | | |
| Local: UMARI e JOÃO GUERRA / CE | | | | | Obra: 0-739 | | |
| Estacas | Desnível | | Desnível Médio | Comp. | Desnível Compens. | Atitudes | Estacas |
| | Ida | Volta | | | | | |
| RN1678P (BGE) | | | | | | 336,8183 | |
| MΦ1 | -8,567 | | | -0,0028 | -8,5698 | 328,2485 | 1.298,77 |
| PSΦ1 | +8,568 | | | -0,0027 | +8,5653 | 336,8138 | 1.289,04 |
| MΦ3 | -11,517 | | | -0,0044 | -11,5214 | 325,2924 | 2.056,46 |
| MΦ4 | -12,841 | | | -0,0013 | -12,8423 | 312,4501 | 6.24,54 |
| PSΦ2 | +7,662 | | | -0,0033 | +7,6587 | 320,1088 | 1.556,07 |
| PSΦ3 | -7,900 | | | -0,0045 | -7,9045 | 312,2043 | 2.110,00 |
| PSΦ4 | +24,662 | | | -0,0050 | +24,6570 | 336,8613 | 2.374,39 |
| PSΦ5 | -1,502 | | | -0,0037 | -1,5057 | 335,3556 | 1.749,02 |
| PSΦ6 | -5,706 | | | -0,0030 | -5,7090 | 329,6466 | 1.410,94 |
| PS21 | +1,255 | | | -0,0022 | +1,2528 | 330,8994 | 1.041,41 |
| MΦ2 | +16,534 | | | -0,0018 | +16,5322 | 347,4316 | 859,38 |
| PS22 | +8,984 | | | -0,0030 | +8,9810 | 356,4126 | 1.405,48 |
| PS23 | +8,335 | | | -0,0037 | +8,3313 | 364,7439 | 1.732,34 |
| PS24 | -35,702 | | | -0,0022 | -35,7042 | 329,0397 | 1.040,14 |
| PS25 | +6,938 | | | -0,0054 | +6,9326 | 335,9723 | 2.530,22 |
| PS26 | -1,187 | | | -0,0045 | -1,1915 | 334,7808 | 2.098,39 |
| PS27 | -6,388 | | | -0,0028 | -6,3908 | 328,3900 | 1.316,12 |
| RN1678U | -1,896 | | | -0,0011 | -1,8971 | 326,4929 | 517,05 |
| (BGE) 201 = | -10,268 | | ef = +0,0574m | P = 11 mm | | dh = -10,3254 | d = 27,009,76m |
| PSΦ6 | | | | | | 329,6466 | |
| PSΦ7 | +10,475 | -10,473 | +10,474 | 1 mm | | 340,1206 | 1.994,42m |
| PSΦ8 | +35,960 | -35,961 | +35,961 | 1 mm | | 376,0816 | 2.989,82m |
| PSΦ9 | +10,973 | -10,965 | +10,969 | 5 mm | | 387,0506 | 2.348,635m |
| PS10 | -24,724 | +24,724 | -24,724 | 0 mm | | 362,3266 | 1.653,215m |
| PS11 | +4,043 | -4,036 | +4,040 | 6 mm | | 366,3666 | 1.268,12m |
| PS12 | +1,349 | -1,348 | +1,349 | 1 mm | | 367,7156 | 1.914,385m |
| MΦ2A | +22,376 | -22,369 | +22,373 | 6 mm | | 390,0886 | 1.437,965m |
| MΦ1A | -2,132 | +2,134 | -2,133 | 2 mm | | 387,9556 | 738,85m |

Calculado por:

Verificado por:

Data: 03/08/2001

Consórcio



MONTGOMERY WATSON

