MASSACHUSETTS

U. S. DEPARTMENT OF COMMERCE

COAST AND GEODETIC SURVEY

PLANE COORDINATE PROJECTION TABLES

MASSACHUSETTS

(LAMBERT)

SPECIAL PUBLICATION NO. 274

U. S. Department of Commerce
Charles Sawyer, *Secretary*

Coast and Geodetic Survey
Robert F. A. Studds, *Director*

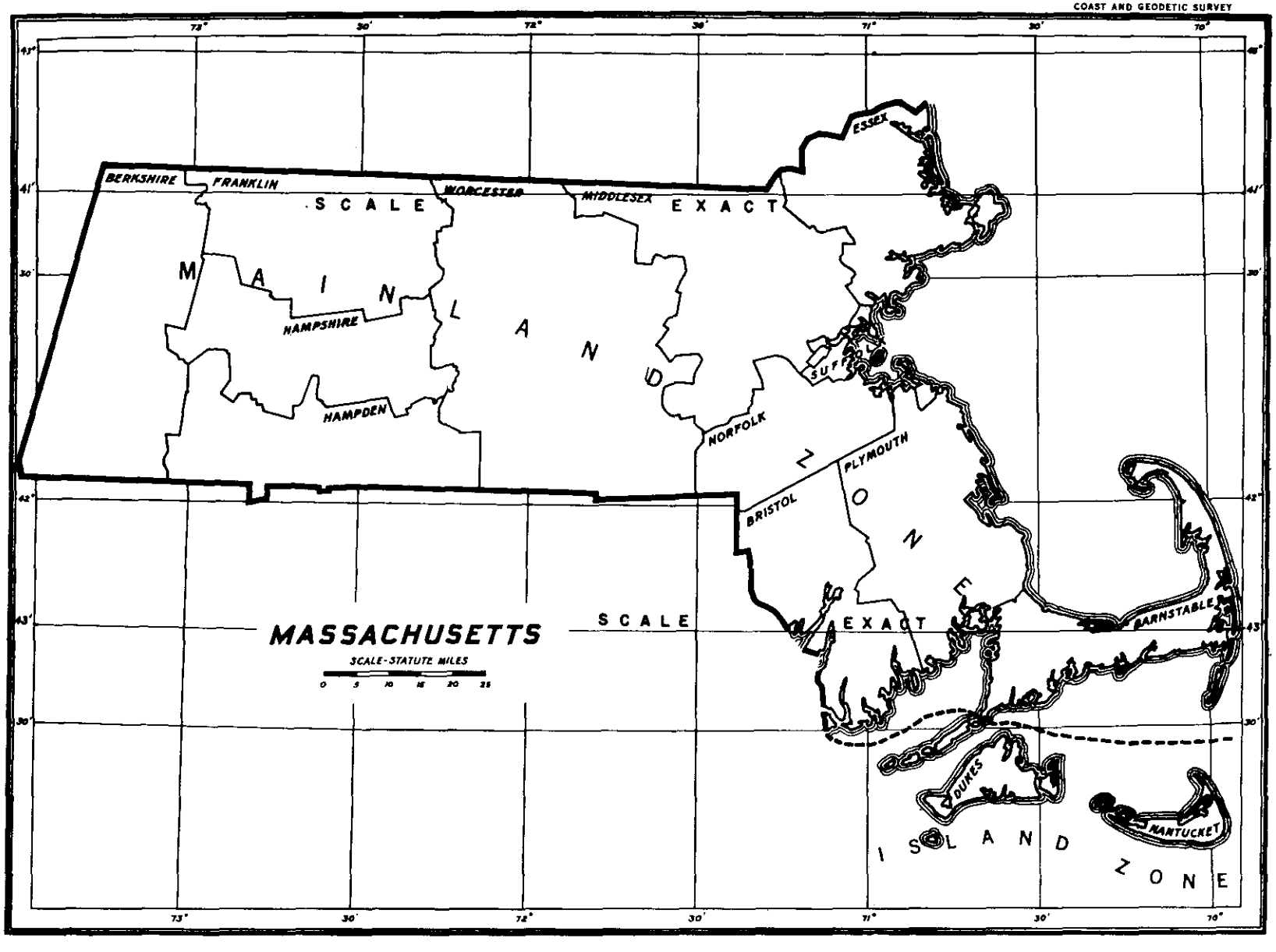
Special Publication No. 274

PLANE COORDINATE PROJECTION TABLES
MASSACHUSETTS

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1952

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 15 cents

U. S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY



STATE PLANE-COORDINATE ZONES

Foreword

The plane coordinate system used in this State is based on the Lambert conformal conic projection with two standard parallels for each zone. The tables in this publication are to be used for the conversion of geographic positions to plane coordinates or plane coordinates to geographic positions. The constants of the projection are listed with the tables.

The methods of computation have been designed for machine calculation, using tables of natural trigonometric functions. A table of these functions has been published by the Coast and Geodetic Survey to ten decimal places with ten-second intervals for 0° to 6° in Special Publication No. 246 and is sold for a nominal sum by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

The formulas and sample computations which follow show the general methods for computing either type of coordinates.

Plane Coordinates from Geographic Positions

$$x = R \sin \theta + C$$

$$y = R_b - R \cos \theta$$

Grid azimuth = geodetic azimuth − θ + second term

where

R is the radius for the latitude of the station,

R_b is a constant for a zone,

θ is the mapping angle for the longitude of the station,

and

C is the value of x assigned to the Central Meridian for a zone.

The second term for the reduction of geodetic to grid azimuths may be neglected for most work. However, for lines five miles or more in length, if the same degree of accuracy is desired as is obtained by geographic computations, this term should be evaluated and used.

$$\text{Second term} = \frac{x_2 - x_1}{2\rho_0^{\,2} \sin 1''} \left(y_1 - y_0 + \frac{y_2 - y_1}{3} \right)$$

Geographic Positions from Plane Coordinates

The formulas show the method of computing R and θ from which the latitude and longitude may be obtained.

$$x' = x - C$$

$$\tan \theta = x' \div (R_b - y)$$

$$R = (R_b - y) \div \cos \theta$$

$$\Delta\lambda = \theta \div \ell$$

$$\lambda = \text{Central Meridian} - \Delta\lambda$$

where

R, R_b, θ, and C are the same as previously defined

and ℓ is a constant for a zone.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
FORM 766 4

PLANE COORDINATES ON LAMBERT PROJECTION

(Condensed form for calculating-machine computation)

$X = R \sin\theta + C$ $\quad$ $Y = R_b - R\cos\theta$ $\quad$ State-Zone Mass - Mainland

$C =$ 600,000.00 $\quad$ $R_b =$ 23,549,477.32 $\quad$ Grid Az. = Geod. Az. $- \theta$

Station	Latitude / Longitude	R / θ	sin θ / cos θ	X / Y
1 Pond, 1934	41 40 15.808	23,304,946.92	+0.01230 74278	886,823.95
	70 27 00.716	+0 42 18.6533	0.99992 42607	246,295.50
	Grid azimuth to azimuth mark			339° 23' 29"
2 Bald Peak, 1836, r.1938	42 06 06.860	23,147,948.59	-0.02266 15283	75,432.11
	73 25 59.173	-1 17 54.6759	0.99974 31946	407,473.25
	Grid azimuth to azimuth mark			9° 33' 11"
3				
	Grid azimuth to azimuth mark			° ' "
4				
	Grid azimuth to azimuth mark			° ' "
5				
	Grid azimuth to azimuth mark			° ' "
6				
	Grid azimuth to azimuth mark			° ' "
7				
	Grid azimuth to azimuth mark			° ' "
8				
	Grid azimuth to azimuth mark			° ' "
9				
	Grid azimuth to azimuth mark			° ' "
10				
	Grid azimuth to azimuth mark			° ' "
11				
	Grid azimuth to azimuth mark			° ' "
12				
	Grid azimuth to azimuth mark			° ' "

M-2524-2

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 742 b

6

GEODETIC POSITIONS FROM LAMBERT COORDINATES

(CALCULATING MACHINE COMPUTATION)

STATE – ZONE Mass. – Mainland ℓ = 0.67172 86561

Station Pond, 1934

C	– 600,000.00	R_b	23,549,477.32
X	886,823.95	Y	– 246,295.50
$X' = X - C$	+ 286,823.95	$R_b - Y$	23,303,181.82
$\tan\theta = X' \div (R_b - Y)$	+0.01230 83600	θ	+ 2538.″6533
θ	+ 0° 42′ 18.″6533	$\Delta\lambda = \theta \div \ell$	+ 3779.″284
$\cos\theta$	0.99992 42607	$\Delta\lambda$	+ 1° 02′ 59.″284
$R = (R_b - Y) \div \cos\theta$	23,304,946.92	Central Meridian	71° 30′ 00.″000
ϕ	41° 40′ 15.″808	λ = C.M. – $\Delta\lambda$	70° 27′ 00.″716

Station Bald Peak, 1836, r. 1938

C	– 600,000.00	R_b	23,549,477.32
X	75,432.11	Y	– 407,473.25
$X' = X - C$	– 524,567.89	$R_b - Y$	23,142,004.07
$\tan\theta = X' \div (R_b - Y)$	-0.02266 73493	θ	-4674.″6759
θ	– 1° 17′ 54.″6759	$\Delta\lambda = \theta \div \ell$	-6959.″173
$\cos\theta$	0.99974 31946	$\Delta\lambda$	– 1° 55′ 59.″173
$R = (R_b - Y) \div \cos\theta$	23,147,948.59	Central Meridian	71° 30′ 00.″000
ϕ	42° 06′ 06.″860	λ = C.M. – $\Delta\lambda$	73° 25′ 59.″173

Station

C	–	R_b	
X		Y	–
$X' = X - C$		$R_b - Y$	
$\tan\theta = X' \div (R_b - Y)$		θ	″
θ	° ′ ″	$\Delta\lambda = \theta \div \ell$	″
$\cos\theta$		$\Delta\lambda$	° ′ ″
$R = (R_b - Y) \div \cos\theta$		Central Meridian	° ′ ″
ϕ	° ′ ″	λ = C.M. – $\Delta\lambda$	° ′ ″

Station

C	–	R_b	
X		Y	–
$X' = X - C$		$R_b - Y$	
$\tan\theta = X' \div (R_b - Y)$		θ	″
θ	° ′ ″	$\Delta\lambda = \theta \div \ell$	″
$\cos\theta$		$\Delta\lambda$	° ′ ″
$R = (R_b - Y) \div \cos\theta$		Central Meridian	° ′ ″
ϕ	° ′ ″	λ = C.M. – $\Delta\lambda$	° ′ ″

M-2545-2

Constants for Massachusetts

Constant	Mainland zone	Island zone
C	600,000.00 ft.	200,000.00 ft.
Central Meridian	71° 30' 00".000	70° 30' 00".000
R_b	23,549,477.32 ft.	23,924,398.02 ft.
y_o	437,502.18 ft.	139,719.58 ft.
ℓ	0.67172 86561	0.66109 53994
$\frac{1}{2\rho_0^2 \sin 1''}$	2.357×10^{-10}	2.357×10^{-10}
$\log \frac{1}{2\rho_0^2 \sin 1''}$	0.372 3226 -10	0.372 4059 -10
$\log \ell$	9.82719 38758 -10	9.82026 41349 -10
log K	7.59994 28232	7.60319 40087

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE I

Lat.	R ft.	y' y value on central meridian ft.	Tabular difference for 1 sec. of Lat. ft.	Scale in units of 7th place of logs	Scale expressed as a ratio
41° 00'	23,549,477.32	0	101.22483	+789.8	1.0001819
01	23,543,403.83	6,073.49	101.22450	+763.9	1.0001759
02	23,537,330.36	12,146.96	101.22417	+738.3	1.0001700
03	23,531,256.91	18,220.41	101.22400	+713.1	1.0001642
04	23,525,183.47	24,293.85	101.22367	+688.2	1.0001585
05	23,519,110.05	30,367.27	101.22333	+663.7	1.0001528
41° 06'	23,513,036.65	36,440.67	101.22317	+639.6	1.0001473
07	23,506,963.26	42,514.06	101.22283	+615.8	1.0001418
08	23,500,889.89	48,587.43	101.22267	+592.4	1.0001364
09	23,494,816.53	54,660.79	101.22233	+569.3	1.0001311
10	23,488,743.19	60,734.13	101.22217	+546.6	1.0001259
41° 11'	23,482,669.86	66,807.46	101.22183	+524.3	1.0001207
12	23,476,596.55	72,880.77	101.22183	+502.3	1.0001157
13	23,470,523.24	78,954.08	101.22150	+480.7	1.0001107
14	23,464,449.95	85,027.37	101.22133	+459.4	1.0001058
15	23,458,376.67	91,100.65	101.22100	+438.5	1.0001010
41° 16'	23,452,303.41	97,173.91	101.22100	+418.0	1.0000962
17	23,446,230.15	103,247.17	101.22083	+397.8	1.0000916
18	23,440,156.90	109,320.42	101.22067	+378.0	1.0000870
19	23,434,083.66	115,393.66	101.22050	+358.5	1.0000825
20	23,428,010.43	121,466.89	101.22033	+339.4	1.0000781
41° 21'	23,421,937.21	127,540.11	101.22017	+320.7	1.0000738
22	23,415,864.00	133,613.32	101.22000	+302.3	1.0000696
23	23,409,790.80	139,686.52	101.22000	+284.3	1.0000655
24	23,403,717.60	145,759.72	101.21983	+266.6	1.0000614
25	23,397,644.41	151,832.91	101.21983	+249.3	1.0000574
41° 26'	23,391,571.22	157,906.10	101.21967	+232.4	1.0000535
27	23,385,498.04	163,979.28	101.21950	+215.8	1.0000497
28	23,379,424.87	170,052.45	101.21950	+199.6	1.0000460
29	23,373,351.70	176,125.62	101.21950	+183.8	1.0000423
30	23,367,278.53	182,198.79	101.21933	+168.3	1.0000388
41° 31'	23,361,205.37	188,271.95	101.21917	+153.2	1.0000353
32	23,355,132.22	194,345.10	101.21933	+138.4	1.0000319
33	23,349,059.06	200,418.26	101.21933	+124.0	1.0000286
34	23,342,985.90	206,491.42	101.21917	+110.0	1.0000253
35	23,336,912.75	212,564.57	101.21917	+ 96.3	1.0000222

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE I (Cont'd)

Lat.	R ft.	y' y value on central meridian ft.	Tabular difference for 1 sec. of Lat. ft.	Scale in units of 7th place of logs	Scale expressed as a ratio
41° 36'	23,330,839.60	218,637.72	101.21917	+ 83.0	1.0000191
37	23,324,766.45	224,710.87	101.21917	+ 70.1	1.0000161
38	23,318,693.30	230,784.02	101.21933	+ 57.5	1.0000132
39	23,312,620.14	236,857.18	101.21917	+ 45.3	1.0000104
40	23,306,546.99	242,930.33	101.21917	+ 33.4	1.0000077
41° 41'	23,300,473.84	249,003.48	101.21933	+ 21.9	1.0000050
42	23,294,400.68	255,076.64	101.21933	+ 10.8	1.0000025
43	23,288,327.52	261,149.80	101.21933	0.0	1.0000000
44	23,282,254.36	267,222.96	101.21950	- 10.4	0.9999976
45	23,276,181.19	273,296.13	101.21950	- 20.4	0.9999953
41° 46'	23,270,108.02	279,369.30	101.21950	- 30.1	0.9999931
47	23,264,034.85	285,442.47	101.21967	- 39.4	0.9999909
48	23,257,961.67	291,515.65	101.21983	- 48.4	0.9999889
49	23,251,888.48	297,588.84	101.21983	- 57.0	0.9999869
50	23,245,815.29	303,662.03	101.22000	- 65.2	0.9999850
41° 51'	23,239,742.09	309,735.23	101.22000	- 73.1	0.9999832
52	23,233,668.89	315,808.43	101.22017	- 80.6	0.9999814
53	23,227,595.68	321,881.64	101.22033	- 87.7	0.9999798
54	23,221,522.46	327,954.86	101.22050	- 94.5	0.9999782
55	23,215,449.23	334,028.09	101.22067	-100.9	0.9999768
41° 56'	23,209,375.99	340,101.33	101.22083	-107.0	0.9999754
57	23,203,302.74	346,174.58	101.22100	-112.7	0.9999740
58	23,197,229.48	352,247.84	101.22117	-118.0	0.9999728
59	23,191,156.21	358,321.11	101.22133	-122.9	0.9999717
42° 00	23,185,082.93	364,394.39	101.22150	-127.5	0.9999706
42° 01'	23,179,009.64	370,467.68	101.22183	-131.7	0.9999697
02	23,172,936.33	376,540.99	101.22200	-135.6	0.9999688
03	23,166,863.01	382,614.31	101.22217	-139.1	0.9999680
04	23,160,789.68	388,687.64	101.22233	-142.2	0.9999673
05	23,154,716.34	394,760.98	101.22267	-144.9	0.9999666
42° 06'	23,148,642.98	400,834.34	101.22283	-147.3	0.9999661
07	23,142,569.61	406,907.71	101.22317	-149.3	0.9999656
08	23,136,496.22	412,981.10	101.22350	-151.0	0.9999652
09	23,130,422.81	419,054.51	101.22367	-152.3	0.9999649
10	23,124,349.39	425,127.93	101.22400	-153.2	0.9999647

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE I (Cont'd)

Lat.	R ft.	y' y value on central meridian ft.	Tabular difference for 1 sec. of Lat. ft.	Scale in units of 7th place of logs	Scale expressed as a ratio
42° 11'	23,118,275.95	431,201.37	101.22417	-153.7	0.9999646
12	23,112,202.50	437,274.82	101.22450	-153.9	0.9999646
13	23,106,129.03	443,348.29	101.22500	-153.8	0.9999646
14	23,100,055.53	449,421.79	101.22517	-153.2	0.9999647
15	23,093,982.02	455,495.30	101.22550	-152.3	0.9999649
42° 16'	23,087,908.49	461,568.83	101.22583	-151.0	0.9999652
17	23,081,834.94	467,642.38	101.22617	-149.4	0.9999656
18	23,075,761.37	473,715.95	101.22650	-147.4	0.9999661
19	23,069,687.78	479,789.54	101.22683	-145.0	0.9999666
20	23,063,614.17	485,863.15	101.22717	-142.3	0.9999672
42° 21'	23,057,540.54	491,936.78	101.22767	-139.2	0.9999679
22	23,051,466.88	498,010.44	101.22800	-135.7	0.9999688
23	23,045,393.20	504,084.12	101.22850	-131.9	0.9999696
24	23,039,319.49	510,157.83	101.22883	-127.7	0.9999706
25	23,033,245.76	516,231.56	101.22917	-123.2	0.9999716
42° 26'	23,027,172.01	522,305.31	101.22950	-118.2	0.9999728
27	23,021,098.24	528,379.08	101.23017	-112.9	0.9999740
28	23,015,024.43	534,452.89	101.23050	-107.2	0.9999753
29	23,008,950.60	540,526.72	101.23083	-101.2	0.9999767
30	23,002,876.75	546,600.57	101.23150	- 94.8	0.9999782
42° 31'	22,996,802.86	552,674.46	101.23183	- 88.0	0.9999797
32	22,990,728.95	558,748.37	101.23233	- 80.9	0.9999814
33	22,984,655.01	564,822.31	101.23267	- 73.4	0.9999831
34	22,978,581.05	570,896.27	101.23333	- 65.5	0.9999849
35	22,972,507.05	576,970.27	101.23367	- 57.3	0.9999868
42° 36'	22,966,433.03	583,044.29	101.23433	- 48.7	0.9999888
37	22,960,358.97	589,118.35	101.23483	- 39.7	0.9999909
38	22,954,284.88	595,192.44	101.23533	- 30.3	0.9999930
39	22,948,210.76	601,266.56	101.23583	- 20.6	0.9999953
40	22,942,136.61	607,340.71	101.23633	- 10.5	0.9999976
42° 41'	22,936,062.43	613,414.89	101.23700	0.0	1.0000000
42	22,929,988.21	619,489.11	101.23750	+ 10.8	1.0000025
43	22,923,913.96	625,563.36	101.23800	+ 22.0	1.0000051
44	22,917,839.68	631,637.64	101.23867	+ 33.6	1.0000077
45	22,911,765.36	637,711.96	101.23917	+ 45.5	1.0000105

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE I (Cont'd)

Lat.	R ft.	y' y value on central meridian ft.	Tabular difference for 1 sec. of Lat. ft.	Scale in units of 7th place of logs	Scale expressed as a ratio
42° 46'	22,905,691.01	643,786.31	101.23983	+ 57.8	1.0000133
47	22,899,616.62	649,860.70	101.24033	+ 70.5	1.0000162
48	22,893,542.20	655,935.12	101.24100	+ 83.6	1.0000192
49	22,887,467.74	662,009.58	101.24167	+ 97.0	1.0000223
50	22,881,393.24	668,084.08	101.24217	+110.8	1.0000255
42° 51'	22,875,318.71	674,158.61	101.24283	+125.0	1.0000288
52	22,869,244.14	680,233.18	101.24350	+139.5	1.0000321
53	22,863,169.53	686,307.79	101.24417	+154.4	1.0000356
54	22,857,094.88	692,382.44	101.24483	+169.6	1.0000391
55	22,851,020.19	698,457.13	101.24550	+185.3	1.0000427
42° 56'	22,844,945.46	704,531.86	101.24617	+201.3	1.0000464
57	22,838,870.69	710,606.63	101.24683	+217.7	1.0000501
58	22,832,795.88	716,681.44	101.24767	+234.4	1.0000540
59	22,826,721.02	722,756.30	101.24817	+251.5	1.0000579
43° 00	22,820,646.13	728,831.19		+269.0	1.0000619

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE II

1" of Long. = 0".67172866 of θ

Long.	θ	Long.	θ	Long.	θ
69° 50'	+1° 07' 10".3729				
51	+1 06 30.0682	70° 26'	+0° 42' 59".4380	71° 01'	+0° 19' 28".8079
52	+1 05 49.7645	27	+0 42 19.1343	02	+0 18 48.5041
53	+1 05 09.4608	28	+0 41 38.8306	03	+0 18 08.2004
54	+1 04 29.1571	29	+0 40 58.5269	04	+0 17 27.8967
55	+1 03 48.8533	30	+0 40 18.2232	05	+0 16 47.5930
69° 56'	+1 03 08.5496	70° 31'	+0 39 37.9194	71° 06'	+0 16 07.2893
57	+1 02 28.2459	32	+0 38 57.6157	07	+0 15 26.9855
58	+1 01 47.9422	33	+0 38 17.3120	08	+0 14 46.6818
59	+1 01 07.6385	34	+0 37 37.0083	09	+0 14 06.3781
70° 00	+1 00 27.3347	35	+0 36 56.7046	10	+0 13 26.0741
70° 01'	+0 59 47.0310	70° 36'	+0 36 16.4008	71° 11'	+0 12 45.7707
02	+0 59 06.7273	37	+0 35 36.0971	12	+0 12 05.4669
03	+0 58 26.4236	38	+0 34 55.7934	13	+0 11 25.1632
04	+0 57 46.1199	39	+0 34 15.4897	14	+0 10 44.8595
05	+0 57 05.8161	40	+0 33 35.1860	15	+0 10 04.5558
70° 06'	+0 56 25.5124	70° 41'	+0 32 54.8823	71° 16'	+0 09 24.2521
07	+0 55 45.2087	42	+0 32 14.5785	17	+0 08 43.9484
08	+0 55 04.9050	43	+0 31 34.2748	18	+0 08 03.6446
09	+0 54 24.6013	44	+0 30 53.9711	19	+0 07 23.3409
10	+0 53 44.2976	45	+0 30 13.6674	20	+0 06 43.0372
70° 11'	+0 53 03.9938	70° 46'	+0 29 33.3637	71° 21'	+0 06 02.7335
12	+0 52 23.6901	47	+0 28 53.0599	22	+0 05 22.4298
13	+0 51 43.3864	48	+0 28 12.7562	23	+0 04 42.1260
14	+0 51 03.0827	49	+0 27 32.4525	24	+0 04 01.8223
15	+0 50 22.7790	50	+0 26 52.1488	25	+0 03 21.5186
70° 16'	+0 49 42.4752	70° 51'	+0 26 11.8451	71° 26'	+0 02 41.2149
17	+0 49 02.1715	52	+0 25 31.5413	27	+0 02 00.9112
18	+0 48 21.8678	53	+0 24 51.2376	28	+0 01 20.6074
19	+0 47 41.5641	54	+0 24 10.9339	29	+0 00 40.3037
20	+0 47 01.2604	55	+0 23 30.6302	30	0 00 00.0000
70° 21'	+0 46 20.9566	70° 56'	+0 22 50.3265	71° 31'	-0 00 40.3037
22	+0 45 40.6529	57	+0 22 10.0227	32	-0 01 20.6074
23	+0 45 00.3492	58	+0 21 29.7190	33	-0 02 00.9112
24	+0 44 20.0455	59	+0 20 49.4153	34	-0 02 41.2149
25	+0 43 39.7418	71° 00	+0 20 09.1116	35	-0 03 21.5186

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE II (Cont'd)

1" of Long. = 0".67172866 of θ

Long.	θ	Long.	θ	Long.	θ
71° 36'	-0° 04' 01".8223	72° 11'	-0° 27' 32".4525	72° 46'	-0° 51' 03".0827
37	-0 04 42.1260	12	-0 28 12.7562	47	-0 51 43.3864
38	-0 05 22.4298	13	-0 28 53.0599	48	-0 52 23.6901
39	-0 06 02.7335	14	-0 29 33.3637	49	-0 53 03.9938
40	-0 06 43.0372	15	-0 30 13.6674	50	-0 53 44.2976
71° 41'	-0 07 23.3409	72° 16'	-0 30 53.9711	72° 51'	-0 54 24.6013
42	-0 08 03.6446	17	-0 31 34.2748	52	-0 55 04.9050
43	-0 08 43.9484	18	-0 32 14.5785	53	-0 55 45.2087
44	-0 09 24.2521	19	-0 32 54.8823	54	-0 56 25.5124
45	-0 10 04.5558	20	-0 33 35.1860	55	-0 57 05.8161
71° 46'	-0 10 44.8595	72° 21'	-0 34 15.4897	72° 56'	-0 57 46.1199
47	-0 11 25.1632	22	-0 34 55.7934	57	-0 58 26.4236
48	-0 12 05.4669	23	-0 35 36.0971	58	-0 59 06.7273
49	-0 12 45.7707	24	-0 36 16.4008	59	-0 59 47.0310
50	-0 13 26.0744	25	-0 36 56.7046	73° 00	-1 00 27.3347
71° 51'	-0 14 06.3781	72° 26'	-0 37 37.0083	73° 01'	-1 01 07.6385
52	-0 14 46.6818	27	-0 38 17.3120	02	-1 01 47.9422
53	-0 15 26.9855	28	-0 38 57.6157	03	-1 02 28.2459
54	-0 16 07.2893	29	-0 39 37.9194	04	-1 03 08.5496
55	-0 16 47.5930	30	-0 40 18.2232	05	-1 03 48.8533
71° 56'	-0 17 27.8967	72° 31'	-0 40 58.5269	73° 06'	-1 04 29.1571
57	-0 18 08.2004	32	-0 41 38.8306	07	-1 05 09.4608
58	-0 18 48.5041	33	-0 42 19.1343	08	-1 05 49.7645
59	-0 19 28.8079	34	-0 42 59.4380	09	-1 06 30.0682
72° 00	-0 20 09.1116	35	-0 43 39.7418	10	-1 07 10.3719
72° 01'	-0 20 49.4153	72° 36'	-0 44 20.0455	73° 11'	-1 07 50.6757
02	-0 21 29.7190	37	-0 45 00.3492	12	-1 08 30.9794
03	-0 22 10.0227	38	-0 45 40.6529	13	-1 09 11.2831
04	-0 22 50.3265	39	-0 46 20.9566	14	-1 09 51.5868
05	-0 23 30.6302	40	-0 47 01.2604	15	-1 10 31.8905
72° 06'	-0 24 10.9339	72° 41'	-0 47 41.5641	73° 16'	-1 11 12.1943
07	-0 24 51.2376	42	-0 48 21.8678	17	-1 11 52.4980
08	-0 25 31.5413	43	-0 49 02.1715	18	-1 12 32.8017
09	-0 26 11.8451	44	-0 49 42.4752	19	-1 13 13.1054
10	-0 26 52.1488	45	-0 50 22.7790	20	-1 13 53.4091

LAMBERT PROJECTION FOR MASSACHUSETTS

MAINLAND ZONE

TABLE II (Cont'd)

1" of Long. = 0".67172866 of θ

Long.	θ
73° 21'	-1° 14' 33".7129
22	-1 15 14.0166
23	-1 15 54.3203
24	-1 16 34.6240
25	-1 17 14.9277
73° 26'	-1 17 55.2315
27	-1 18 35.5352
28	-1 19 15.8389
29	-1 19 56.1426
30	-1 20 36.4463
73° 31'	-1 21 16.7500
32	-1 21 57.0538
33	-1 22 37.3575
34	-1 23 17.6612
35	-1 23 57.9649
73° 36'	-1 24 38.2686
37	-1 25 18.5724
38	-1 25 58.8761
39	-1 26 39.1798
40	-1 27 19.4835

LAMBERT PROJECTION FOR MASSACHUSETTS

ISLAND ZONE

TABLE I

Lat.	R ft.	y' y value on central meridian ft.	Tabular difference for 1 sec. of Lat. ft.	Scale in units of 7th place of logs	Scale expressed as a ratio
41° 00'	23,924,398.02	0	101.20867	+90.1	1.0000207
01	23,918,325.50	6,072.52	101.20883	+81.9	1.0000188
02	23,912,252.97	12,145.05	101.20900	+74.0	1.0000170
03	23,906,180.43	18,217.59	101.20900	+66.5	1.0000153
04	23,900,107.89	24,290.13	101.20933	+59.4	1.0000137
05	23,894,035.33	30,362.69	101.20933	+52.6	1.0000121
41° 06'	23,887,962.77	36,435.25	101.20950	+46.2	1.0000106
07	23,881,890.20	42,507.82	101.20967	+40.2	1.0000093
08	23,875,817.62	48,580.40	101.20967	+34.5	1.0000080
09	23,869,745.04	54,652.98	101.21000	+29.2	1.0000067
10	23,863,672.44	60,725.58	101.21033	+24.3	1.0000056
41° 11'	23,857,599.82	66,798.20	101.21033	+19.7	1.0000045
12	23,851,527.20	72,870.82	101.21050	+15.5	1.0000036
13	23,845,454.57	78,943.45	101.21083	+11.7	1.0000027
14	23,839,381.92	85,016.10	101.21100	+ 8.2	1.0000019
15	23,833,309.26	91,088.76	101.21133	+ 5.1	1.0000012
41° 16'	23,827,236.58	97,161.44	101.21150	+ 2.4	1.0000006
17	23,821,163.89	103,234.13	101.21167	0.0	1.0000000
18	23,815,091.19	109,306.83	101.21200	- 2.0	0.9999995
19	23,809,018.47	115,379.55	101.21233	- 3.6	0.9999992
20	23,802,945.73	121,452.29	101.21250	- 4.9	0.9999989
41° 21'	23,796,872.98	127,525.04	101.21283	- 5.8	0.9999987
22	23,790,800.21	133,597.81	101.21300	- 6.4	0.9999985
23	23,784,727.43	139,670.59	101.21333	- 6.6	0.9999985
24	23,778,654.63	145,743.39	101.21383	- 6.4	0.9999985
25	23,772,581.80	151,816.22	101.21400	- 5.8	0.9999987
41° 26'	23,766,508.96	157,889.06	101.21433	- 4.9	0.9999989
27	23,760,436.10	163,961.92	101.21467	- 3.6	0.9999992
28	23,754,363.22	170,034.80	101.21500	- 2.0	0.9999995
29	23,748,290.32	176,107.70	101.21533	0.0	1.0000000
30	23,742,217.40	182,180.62	101.21567	+ 2.4	1.0000006
41° 31'	23,736,144.46	188,253.56	101.21600	+ 5.1	1.0000012
32	23,730,071.50	194,326.52	101.21650	+ 8.2	1.0000019
33	23,723,998.51	200,399.51	101.21683	+11.7	1.0000027
34	23,717,925.50	206,472.52	101.21717	+15.6	1.0000036
35	23,711,852.47	212,545.55	101.21767	+19.8	1.0000046

LAMBERT PROJECTION FOR MASSACHUSETTS

ISLAND ZONE

TABLE I (Cont'd)

Lat.	R ft.	y' y value on central meridian ft.	Tabular difference for 1 sec. of Lat. ft.	Scale in units of 7th place of logs	Scale expressed as a ratio
41° 36'	23,705,779.41	218,618.61	101.21800	+24.4	1.0000056
37	23,699,706.33	224,691.69	101.21850	+29.3	1.0000067
38	23,693,633.22	230,764.80	101.21883	+34.6	1.0000080
39	23,687,560.09	236,837.93	101.21933	+40.3	1.0000093
40	23,681,486.93	242,911.09		+46.3	1.0000107

LAMBERT PROJECTION FOR MASSACHUSETTS

ISLAND ZONE

TABLE II

1" of Long. = 0".66109540 of θ

Long.	θ	Long.	θ	Long.	θ
69° 50'	+0° 26' 26".6290				
51	+0 25 46.9632	70° 26'	+0° 02' 38.6629	71° 01'	-0° 20' 29.6374
52	+0 25 07.2975	27	+0 01 58.9972	02	-0 21 09.3032
53	+0 24 27.6318	28	+0 01 19.3314	03	-0 21 48.9689
54	+0 23 47.9661	29	+0 00 39.6657	04	-0 22 28.6346
55	+0 23 08.3003	30	0 00 00.0000	05	-0 23 08.3003
69° 56'	+0 22 28.6346	70° 31'	-0 00 39.6657	71° 06'	-0 23 47.9661
57	+0 21 48.9689	32	-0 01 19.3314	07	-0 24 27.6318
58	+0 21 09.3032	33	-0 01 58.9972	08	-0 25 07.2975
59	+0 20 29.6374	34	-0 02 38.6629	09	-0 25 46.9632
70° 00	+0 19 49.9717	35	-0 03 18.3286	10	-0 26 26.6290
70° 01'	+0 19 10.3060	70° 36'	-0 03 57.9943		
02	+0 18 30.6403	37	-0 04 37.6601		
03	+0 17 50.9745	38	-0 05 17.3258		
04	+0 17 11.3088	39	-0 05 56.9915		
05	+0 16 31.6431	40	-0 06 36.6572		
70° 06'	+0 15 51.9774	70° 41'	-0 07 16.3230		
07	+0 15 12.3117	42	-0 07 55.9887		
08	+0 14 32.6459	43	-0 08 35.6544		
09	+0 13 52.9802	44	-0 09 15.3201		
10	+0 13 13.3145	45	-0 09 54.9859		
70° 11'	+0 12 33.6488	70° 46'	-0 10 34.6516		
12	+0 11 53.9830	47	-0 11 14.3173		
13	+0 11 14.3173	48	-0 11 53.9830		
14	+0 10 34.6516	49	-0 12 33.6488		
15	+0 09 54.9859	50	-0 13 13.3145		
70° 16'	+0 09 15.3201	70° 51'	-0 13 52.9802		
17	+0 08 35.6544	52	-0 14 32.6459		
18	+0 07 55.9887	53	-0 15 12.3117		
19	+0 07 16.3230	54	-0 15 51.9774		
20	+0 06 36.6572	55	-0 16 31.6431		
70° 21'	+0 05 56.9915	70° 56'	-0 17 11.3088		
22	+0 05 17.3258	57	-0 17 50.9745		
23	+0 04 37.6601	58	-0 18 30.6403		
24	+0 03 57.9943	59	-0 19 10.3060		
25	+0 03 18.3286	71° 00	-0 19 49.9717		

CORRECTIONS TO NATURAL SCALE RATIOS*
(in units of the 7th decimal place)

For Lambert Projection

Δø' as argument

Δø'	Corr'n (Plus)	Δø'	Corr'n (Plus)
1	0	31	34
2	0	32	36
3	0	33	38
4	1	34	40
5	1	35	43
6	1	36	45
7	2	37	48
8	2	38	51
9	3	39	53
10	4	40	56
11	4	41	59
12	5	42	62
13	6	43	65
14	7	44	68
15	8	45	71
16	9	46	74
17	10	47	77
18	11	48	81
19	13	49	84
20	14	50	88
21	15	51	91
22	17	52	95
23	19	53	98
24	20	54	102
25	22	55	106
26	24	56	110
27	26	57	114
28	27	58	118
29	29	59	122
30	32	60	126

Δø' is the difference in latitude in minutes of the ends of the line.

For Lambert or transverse Mercator Projection

Δy or Δx	Corr'n (Plus)
10,000	0
20,000	0
30,000	1
40,000	2
50,000	2
60,000	3
70,000	5
80,000	6
90,000	8
100,000	10
110,000	11
120,000	14
130,000	16
140,000	19
150,000	21
160,000	24
170,000	27
180,000	31
190,000	34
200,000	38
210,000	42
220,000	46
230,000	50
240,000	55
250,000	59
260,000	64
270,000	69
280,000	74
290,000	80
300,000	86
310,000	91
320,000	97
330,000	103
340,000	110
350,000	116

*Scale ratio interpolated for mean latitude or mean x' of the ends of a line and corrected by the above table is a true mean value accurate to within one in the seventh decimal place.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1952 O - 204408
880-003