

Release of National Ocean Survey Computer Program Software

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NATIONAL GEODETIC SURVEY
HP DESK TOP CALCULATOR PROGRAM #1-41CV
GEODETIC INVERSE

Remarks:

The program is used to compute the azimuth and distance between two geographic positions when the latitude and longitude of the positions are known. The program was translated from the HP 97 geodetic inverse program.

The program can be used on any ellipsoid. The program as written, is for the Clarke 1866 ellipsoid. The parameters used are:

$$e'^2 = (a^2 - b^2)/b^2 \quad \text{Register 16}$$

$$1/b \quad \text{Register 17}$$

$$1 - f \quad \text{Register 18}$$

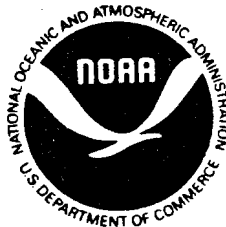
$$f = (a - b)/a \quad \text{Register 19}$$

Latitudes are positive north of the equator, longitudes increase to the west, and azimuths are reckoned clockwise from the south. Since the inverse computation requires the longitude difference between positions, accuracy can be improved by omitting unnecessary digits in the longitudes of the positions.

The formulas used in the program are from a paper by Mr. T. Vincenty in the Survey Review (Vol. XXIII, No. 176).

For technical questions, please call (301)443-8623, or write:

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I001 HP-41CV PROGRAM
GEODETIC INVERSE

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Set printer switch to manual. A SIZE of 026 is needed.			
2.	Insert program cards.			
3.	(XEQ), (ALPHA), INVERSE, (ALPHA)			
4.	Input latitude of station 1.	DEGREES MINUTES SECONDS	(R/S) (R/S) (R/S)	
5.	Repeat step 4 for longitude 1, latitude 2, and longitude 2.			
6.	Computer prints:			
	Length (1-2)			METERS
	Azimuth (1-2)			DEGREES MINUTES SECONDS
	Azimuth (2-1)			DEGREES MINUTES SECONDS
7.	To compute another inverse, touch		(R/S)	

S001 HP-41CV PROGRAM
GEODETIC INVERSE

GEODETIC INV.

LAT. 1

37. ***
59. ***
10.10200 ***

LONG. 1

4. ***
3. ***
3.92100 ***

LAT. 2

36. ***
39. ***
27.94590 ***

LONG. 2

5. ***
11. ***
59.86250 ***

LENGTH METERS

179,171.9427 ***

AZIMUTH 1-2

34. ***
59. ***
3.618 ***

AZIMUTH 2-1

214. ***
17. ***
15.803 ***

P001 HP-41CV PROGRAM
GEODETIC INVERSE

01	ALBL "INVERSE"	51	STOP	101	STO 25
02	"GEODETIC INV."	52	PRX	102	*
03	PRA	53	60	103	RCL 02
04	ADV	54	ST/ Z	104	-
05	.0625	55	X↑2	105	R-P
06	STO 13	56	/	106	STO 22
07	-.375	57	+	107	ST/ 05
08	STO 14	58	D-R	108	RDN
09	1 E-10	59	X<>Y	109	STO 23
10	STO 15	60	D-R	110	R↑
11	6.814784946 E-3	61	+	111	RCL 00
12	STO 16	62	RTN	112	RCL 03
13	1	63	ALBL 10	113	RCL 25
14	ENTER↑	64	RAD	114	*
15	6356583.8	65	RCL 10	115	+
16	/	66	XEQ B	116	STO 06
17	STO 17	67	RCL 12	117	R-P
18	3.390075304 E-3	68	XEQ B	118	RDN
19	STO 19	69	GTO 12	119	STO 07
20	CHS	70	ALBL B	120	RCL 03
21	1	71	TAN	121	ST* 05
22	+	72	RCL 18	122	RCL 06
23	STO 18	73	*	123	RCL 00
24	"LAT. 1"	74	ATAN	124	2
25	PRA	75	1	125	*
26	XEQ A	76	P-R	126	RCL 05
27	STO 10	77	RTN	127	ASIN
28	"LONG. 1"	78	ALBL 12	128	COS
29	PRA	79	STO 04	129	X↑2
30	XEQ A	80	STO 03	130	STO 24
31	STO 20	81	R↑	131	/
32	STO 21	82	STO 00	132	-
33	"LAT. 2"	83	*	133	STO 08
34	PRA	84	STO 01	134	X↑2
35	XEQ A	85	RDN	135	2
36	STO 12	86	ST* 00	136	*
37	"LONG. 2"	87	X<>Y	137	1
38	PRA	88	ST* 03	138	-
39	PSE	89	*	139	STO 09
40	XEQ A	90	STO 02	140	ST* 06
41	ST- 20	91	ALBL C	141	4
42	ST- 21	92	RCL 04	142	RCL 24
43	GTO 10	93	RCL 21	143	3
44	ALBL A	94	SIN	144	*
45	FIX 0	95	STO 05	145	-
46	STOP	96	*	146	RCL 19
47	PRX	97	CHS	147	STO 25
48	STOP	98	RCL 01	148	*
49	PRX	99	RCL 21	149	4
50	FIX 5	100	COS	150	+

P001 HP-41CV PROGRAM
GEODETIC INVERSE

151	RCL 13	201	/	251	ST -07
152	*	202	1	252	RCL 00
153	RCL 24	203	+	253	RCL 07
154	*	204	1	254	*
155	RCL 25	205	RCL 11	255	"LENGTH METERS"
156	ST* 05	206	-	256	PRA
157	*	207	/	257	PRX
158	STO 25	208	RCL 17	258	STO 07
159	RCL 06	209	/	259	360
160	*	210	1	260	RCL 23
161	RCL 08	211	RCL 11	261	R-D
162	+	212	X↑2	262	X<0?
163	RCL 22	213	RCL 14	263	+
164	*	214	*	264	STO 23
165	RCL 25	215	+	265	HMS
166	*	216	RCL 11	266	"AZIMUTH 1-2"
167	RCL 07	217	*	267	PRA
168	+	218	STO 25	268	XEQ a
169	RCL 05	219	RDN	269	"AZIMUTH 2-1"
170	*	220	STO 00	270	PRA
171	1	221	RCL 06	271	5 E4
172	RCL 25	222	RCL 09	272	RCL 07
173	-	223	2	273	X>Y?
174	*	224	*	274	GTO 02
175	RCL 20	225	1	275	GTO 03
176	+	226	-	276	ALBL 02
177	RCL 21	227	RCL 22	277	RCL 03
178	X<>Y	228	X↑2	278	RCL 04
179	STO 21	229	4	279	/
180	-	230	*	280	RCL 21
181	ABS	231	3	281	SIN
182	RCL 15	232	-	282	*
183	X>Y?	233	*	283	RCL 02
184	GTO 14	234	RCL 08	284	RCL 21
185	GTO C	235	*	285	COS
186	ALBL 14	236	RCL 25	286	*
187	RCL 24	237	*	287	RCL 01
188	RCL 16	238	6	288	-
189	*	239	/	289	R-P
190	1	240	-	290	RDN
191	+	241	RCL 25	291	R-D
192	SQRT	242	*	292	360
193	STO 11	243	4	293	X<>Y
194	1	244	/	294	X<0?
195	ST- 11	245	RCL 08	295	+
196	+	246	+	296	HMS
197	ST/ 11	247	RCL 22	297	XEQ a
198	RCL 11	248	*	298	GTO 04
199	X↑2	249	RCL 25	299	ALBL a
200	4	250	*	300	ENTER↑

P001 HP-41CV PROGRAM
GEODETIC INVERSE

301	FIX 0	351	STOP
302	INT	352	GTO "INVERSE"
303	PRX	353	END
304	-		
305	100		
306	*		
307	ENTER↑		
308	INT		
309	PRX		
310	-		
311	100		
312	*		
313	FIX 3		
314	PRX		
315	RTN		
316	▲LBL 03		
317	RCL 10		
318	SIN		
319	RCL 12		
320	SIN		
321	+		
322	RCL 10		
323	RCL 12		
324	-		
325	COS		
326	1		
327	+		
328	/		
329	RCL 20		
330	*		
331	R-D		
332	RCL 23		
333	+		
334	180		
335	+		
336	360		
337	X>Y?		
338	GTO 01		
339	-		
340	ENTER↑		
341	▲LBL 01		
342	RDN		
343	HMS		
344	XEQ a		
345	▲LBL 04		
346	DEG		
347	ADV		
348	ADV		
349	ADV		
350	ADV		

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