00549C

PROGRAM DESCRIPTION I

Program Title ANNUAL GROWTH RATE OF INVESTMENTS (DISCOUNTED CASH FLOW)

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Program Description, Equations, Variables This program finds the true annual growth rate (discounted cash flow rate of return) of an investment portfolio or an unlimited cash flow stream. Inputs are as follows: 1. Evaluation date and market value or initial investment date and amount of initial investment (for cash flow stream). 2. Lump payments and/or withdrawals: date and amount or cash flow outlays and/or revenues: date and amount, and 3. Series payments and/or withdrawals (for investments) and series revenues and/or outlays (for cash flow stream). Thus the "sign" of the entries is reversed for the two as per the table, for inputs 2 and 3.

	Investments	Cash Flow Stream
Funds you receive	Negative	Positive
Funds you give	Positive	Negative

For series, starting date of series is entered as well as months between each payment or withdrawal, amount of each payment/or withdrawal and number of payments or withdrawals. For investment portfolios, a dividend which is not reinvested is treated as a withdrawal. For a cash flow stream, a continuous flow can be approximated by many small series payments. For example, $1000 received continuously over a year can be approximated by 100 revenues, received at intervals of 12/100 months, in the amount of $1000/100 each.

Input data are entered only once even though the program reviews the data three separate times with three separate passes. The program determines its own initial guess for the rate from the first pass review of the data. The initial rate is then used to discount the payments/withdrawals and the resulting ratio of total discounted

Necessary Accessories One memory module minimum; A second memory module is necessary for moderate to large amounts of data. See comments on size and registers on page 10

Operating Limits and Warnings (1) Total payments cannot equal total withdrawals (including market value), i.e. zero growth rate. (2) As in any discounted cash flow analysis, if the year by year cumulative net cash flow (payments minus withdrawals) changes sign more than once, there may not be a unique rate of return. Such a case will be indicated by widely differing values from the three passes and the final rate will be incorrect. (3) The growth rate must be algebraically greater than -100%. (4) In some other rare instances a particular set of data could cause division by zero. If so, the market value (portfolio) or initial investment (cash flow) can be changed by a very small amount and the program rerun.

Reference(s) Users' Library program 00817D-67 by Ken L. Singer has been substantially incorporated into this program, including program description, equations, and sample problems. Where I have varied his text and program the responsibility is of course entirely mine, and certainly if any errors have appeared as a result.

(1) "Changing Times computer service: Find out how your investments are really doing", Changing Times Magazine, March 1970, pgs. 47-49; (2) Wild, N.H., "Return on Investments made easy", Chemical Engineering Magazine, April 12, 1976, pgs. 153-154

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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withdrawals to total discounted payments is used to calculate a refined rate (Pass2). In the same manner data are reviewed automatically a third time and discounted using the refined rate to obtain a further refined rate; then the initial, refined, and further refined rates are combined to obtain a final rate (Pass 3). Accuracy averages 99.999%

Let:

i = initial rate, %	$m = 1 + (i/100)$
i_1 = refined rate, %	$m_1 = 1 + (i_1/100)$
i_2 = further refined rate, %	$m_2 = 1 + (i_2/100)$
i_c = final rate, %	
L = "lump-sum"	S = "series"
W = withdrawal amount	P = payment amount
TW = total withdrawals	TP = total payments
TDW = total discounted withdrawals	TDP = total discounted payments

n' = time (years) series payments/withdrawals start

n = time (years) of payment/withdrawal (relative to evaluation date)

I = interval (months) between series pmt./wdl. $I' = I/12$

N = number of series payments/withdrawals

Pass 1: $\bar{n} = n' + (I'N - I)/2$

$$X_w = \frac{1}{TW}\left[\sum (W_L)(n) + \sum (W_S)(N)(\bar{n})\right]$$

$$X_p = \frac{1}{TP}\left[\sum (P_L)(n) + \sum (P_S)(N)(\bar{n})\right]$$

$$a = X_w - X_p \qquad m = (TW/TP)^{\frac{1}{a}} = 1 + \frac{i}{100}$$

Pass 2:

$$TDW = \sum (W_L)(m^{-n}) + \sum (W_S)\left(\frac{m^{I'N}-1}{m^{I'}-1}\right)\left(m^{-(n'+I'N-I')}\right)$$

$$TDP = \sum (P_L)(m^{-n}) + \sum (P_S)\left(\frac{m^{I'N}-1}{m^{I'}-1}\right)\left(m^{-(n'+I'N-I')}\right)$$

$$1/b = \left(\log \frac{TW}{TP}\right) \Big/ \left(\log \frac{TW/TP}{TDP/TDW}\right) \qquad m_1 = m^{\frac{1}{b}} = 1 + \frac{i_1}{100}$$

Pass 3: TDW_1 = SAME AS PASS 2, EXCEPT m_1 USED INSTEAD OF m

TDP_1 = SAME AS PASS 2, EXCEPT m_1 USED INSTEAD OF m

$$1/b_1 = \left(\log \frac{TW}{TP}\right) \Big/ \left(\log \frac{TW/TP}{TDP_1/TDW_1}\right) \qquad m_2 = m_1^{\frac{1}{b_1}} = 1 + \frac{i_2}{100}$$

$$\text{FINAL RATE (\%)} = i_c = \left(m + \frac{(m_1 - m)^2}{2m_1 - m - m_2} - 1\right)(100)$$

PROGRAM DESCRIPTION II

Sample Problem (Sketch if Desired)

(1) Investment portfolio: $2600 and $3600 were paid into a fund on 3/1/67 and 5/1/70 respectively. $2000 was withdrawn on 4/1/73. Five quarterly dividends of $60 each were paid by the fund (and not reinvested) starting 11/1/68. Additionally, twelve monthly amounts of $100 each were invested in the fund beginning 2/1/74. What was the true annual growth rate of the fund as of 4/1/76, when it had a value of $7000?

(2) Cash flow: (All figures, except those with asterisk, are lump-sum at end of year)

Year	0	1	2	3	4	5	6	7	8
Investment	5	0	8	8	8	7	0	0	0
Revenue	0	3	4	4	4	4	4	9*	9*

* continuously received from start of year to end of year

SOLUTION:

	Input	Function	Display	Comments
(1)	[XEQ][ALPHA] SIZE	[ALPHA] 028		SEE PAGE 10 FOR SIZE REQUIREMENT CALCULATION.
	[XEQ][ALPHA] DCF	[ALPHA]	INVESTMENT PORTFOLIO?	
		[R/S] (YES)	DATE VALUED?	"PORTFOLIO" DISPLAYED TO CONFIRM
	4.1976	[R/S]	MARKET VAL?	
	7000	[R/S]	DATE?	LUMP PAYMENTS DISPLAYED BRIEFLY
	3.1967	[R/S]	AMOUNT?	
	2600	[R/S]	DATE?	
	5.1970	[R/S]	AMOUNT?	
	3600	[R/S]	DATE?	
	4.1973	[R/S]	AMOUNT?	
	2000	[CHS][R/S]	DATE?	
	0	[R/S]	START. DATE?	0 INPUT CHANGES TO SERIES. "SERIES REV." DISPLAYED BRIEFLY
	2.1974	[R/S]	NO. OF PMNTS?	
	12	[R/S]	MONTHS BTWN?	
	1	[R/S]	PMNT. AMOUNT?	
	100	[R/S]	START. DATE?	
	11.1968	[R/S]	NO. OF PMNTS?	
	5	[R/S]	MONTHS BTWN?	
	3	[R/S]	PMNT. AMOUNT?	
	60	[CHS][R/S]	START. DATE?	
	0	[R/S]	TRUE ANNUAL GROWTH RATE = 4.2073%	0 INPUT INDICATES END OF DATA. GROWTH RATE CALCULATED.
(2)	[XEQ][ALPHA] SIZE	[ALPHA] 030		SEE PAGE 10 FOR SIZE REQUIREMENT CALCULATION
	[XEQ][ALPHA] DCF	[ALPHA]	INVESTMENT PORTFOLIO?	
		[ENTER] (NO) [R/S]	CASH FLOW (BRIEFLY)	
			INIT. INV. DATE?	
	.0000	[R/S]	INITIAL INV.?	
	5	[R/S]	REVENUES (BRIEFLY)	
			DATE?	
	.0001	[R/S]	AMOUNT?	
	3	[R/S]	DATE?	
	.0005	[R/S]	AMOUNT?	
	7	[CHS][R/S]	DATE?	
	0	[R/S]	SERIES REV. (BRIEFLY)	
			START. DATE	

(CONTINUATION PAGE)

.0002	[R/S]	NO. OF PMNTS.?
5	[R/S]	MONTHS BTWN.?
12	[R/S]	PMNT. AMOUNT?
4	[R/S]	[START. DATE?
.0006	[R/S]	NO. OF PMNTS.?
200	[R/S]	MONTHS BTWN?
.12	[R/S]	PMNT AMOUNT?
.09	[R/S]	START. DATE?
.0002	[R/S]	NO. OF PMNTS?
3	[R/S]	MONTHS BTWN.?
12	[R/S]	PMNT AMOUNT?
8	[CHS][R/S]	START. DATE?
0	[R/S]	TRUE ANNUAL GROWTH RATE = 6.5280%

USER INSTRUCTIONS

SIZE: SEE PAGE 10
(HP-41C)020 +

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1	LOAD PROGRAM			
2	SET SIZE AND INITIALIZE PROGRAM, SEE PAGE 10 FOR SIZE REQUIREMENT.		[XEQ] DCF	INVESTMENT PORTFOLIO?
3a	IF INVESTMENT PORTFOLIO		[R/S] (YES)	PORTFOLIO
				DATE VALUED?
	ALL DATES ENTERED IN FORM MM.YYYY	DATE	[R/S]	MARKET VAL.?
		VALUE	[R/S]	LUMP PAYMENTS
3b	IF CASH FLOW STREAM		[ENTER] (NO) [R/S]	CASH FLOW
				INIT. INV. DATE?
	AGAIN - ALL DATE ENTERED IN FORM MM.YYYY	DATE	[R/S]	INITIAL INV?
		INIT. INV.	[R/S]	REVENUES
4	ENTER DATES AND AMOUNTS UNTIL			DATE?
	ALL NON SERIES DATA ARE ENTERED	DATE	[R/S]	AMOUNT?
	OBSERVE SIGN CONVENTION PAGE 1	AMOUNT	[R/S]	DATE?
	AND SAMPLE PROBLEMS, CHANGE	DATE	[R/S]	AMOUNT?
	TO SERIES DATA BY ENTERING 0	NEGATIVE AMOUNT	[CHS] [R/S]	DATE?
		0	[R/S]	SERIES REV.
5	ENTER STARTING DATES OF SERIES,			START. DATE?
	NO. OF PAYMENTS, MONTHS BETWEEN	MM.YYYY	[R/S]	NO. OF PMNTS?
	PAYMENT AND PAYMENT AMOUNTS AS	NO. OF PMNTS	[R/S]	MONTHS BTWN?
	PROMPTED. OBSERVE SIGN CONVEN-	MONTHS	[R/S]	PMNT. AMOUNT?
	TION PAGE 1 AND SAMPLE PROBLEMS.	AMOUNT	[R/S]	START DATE?
	REPEAT AS NECESSARY. REQUEST	⋮	⋮	⋮
	TRUE ANNUAL GROWTH RATE WITH 0 ENTRY	0	[R/S]	TRUE ANNUAL
				GROWTH RATE=
6	TO CORRECT ENTRY ERROR, RECALL 09, SUBTRACT 1			___ %
	FROM INTEGER, STORE CORRECT DATA IN	THAT		
	REGISTER & CONTINUE			

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PROGRAM LISTING

☐ 67 ☐ 97 ☑ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
01	♦LBL "DCF"		INITIALIZING ROUTINE
02	SF 00		PREPARES FOR 1ST PASS (LBL E)
03	SF 01		FLAG 02 DIRECT PORTFOLIO ROUTINES
04	CF 02		
05	CLST		PREPARES Y REG. FOR TEST ON LINE 15
06	CLRG		
07	FIX 4		PREPARES REGISTERS FOR DATA
08	12.070		
09	STO 09		INDIRECT ADDRESS FOR STORING ALL TRANSACTION DATA
10	" INVESTMENT"		
11	AVIEW		
12	PSE		
13	" PORTFOLIO?"		IF NO, X & Y ARE SAME & CASH FLOW ROUTINE IS FOLLOWED.
14	PROMPT		
15	X=Y?		
16	GTO 01		PORTFOLIO ROUTINE TO BE FOLLOWED
17	SF 02		
18	" PORTFOLIO"		CONFIRMATION OF PORTFOLIO ROUTINE
19	AVIEW		
20	PSE		
21	GTO 02		
22	♦LBL 01		
23	" CASH FLOW"		CONFIRMATION OF CASH FLOW ROUTINE
24	AVIEW		
25	PSE		
26	"INIT. INV. DATE"		
27	"⊢?"		
28	PROMPT		
29	STO 10		
30	"INITIAL INV.?"		
31	PROMPT		
32	STO 11		
33	" REVENUES"		
34	AVIEW		
35	PSE		
36	GTO 03		
37	♦LBL 02		
38	"DATE VALUED?"		
39	PROMPT		
40	STO 10		
41	"MARKET VAL?"		
42	PROMPT		
43	STO 11		
44	"LUMP PAYMNTS"		
45	AVIEW		
46	PSE		
47	♦LBL 03		BEGINNING OF DATA STORAGE LOOP
48	"DATE?"		
49	PROMPT		DATA STORED IN SUCCESSIVE REGISTERS BEGINNING WITH REG. TEN 12
50	STO IND 09		
51	ISG 09		
52	X=0?		WHEN 0 ENTERED, GOES TO NEXT ROUTINE STORING SERIES DATA
53	GTO 04		
54	"AMOUNT?"		CONTINUATION OF DATA STORAGE ROUTINE
55	PROMPT		
56	STO IND 09		
57	ISG 09		
58	GTO 03		LOOPS BACK FOR NEXT SET OF DATA TO BE STORED
59	♦LBL 04		SERIES DATA STORAGE ROUTINE CONFIRMATION
60	"SERIES REV."		
61	AVIEW		
62	PSE		
63	♦LBL 05		BEGINNING OF DATA STORAGE LOOP FOR SERIES DATA
64	"START. DATE?"		
65	PROMPT		
66	STO IND 09		
67	ISG 09		
68	X=0?		WHEN 0 IS ENTERED, BEGINS CALCULATION ROUTINE
69	GTO E		
70	"NO. OF PMNTS.?"		CONTINUATION OF DATA STORAGE FOR SERIES DATA
71	PROMPT		
72	STO IND 09		
73	ISG 09		

Note: Refer to "HP-41C OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for specific information on keystrokes. The Function Index is found at the very back of the Handbook. Refer to Appendix E in 67 or 97 "OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for exact keystrokes.

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STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
01			
74	"MONTHS BTWN.?"		
75	PROMPT		
76	STO IND 09		
77	ISG 09		
78	"PMNT. AMOUNT?"		
79	PROMPT		
80	STO IND 09		
81	ISG 09		LOOPS BACK FOR NEXT SET OF SERIES DATA
82	GTO 05		
83	♦LBL e		
84	X<>Y		CONVERT DATE TO -N
85	ENTER↑		AMOUNT IN Y; DATE IN X
86	FRC		MM.YYYY IN X & Y REGS.
87	−		.YYYY IN X REG
88	LASTX		MM
89	1 E4		BRING BACK .YYYY
90	*		
91	X<>Y		YYYY.
92	12		MM IN X; YYYY IN Y
93	/		
94	+		FRACTION OF YEAR=MM/12
95	RCL 05		YYYY. FRACTION
96	X<>Y		EVAL DATE (0 IN PASS 1)
97	−		-N=(EVAL.DATE)-DATE
98	RTN		
99	♦LBL A		
100	SF 03		INITIALIZE
101	12.070		LUMP-SUM TRANSACTIONS
102	STO 09		RESET REG. 09
103	RCL 10		TO RECALL DATA IN PROPER
104	RCL 11		SEQUENCE
105	FS? 00		
106	GTO a		TEST FOR PASS, SET=
107	STO 01		PASS 2 OR 3
108	XEQ e		PASS 1., INIT. TW WITH
109	CHS		VALUE ON EVAL DATE.
110	STO 05		CONVERT EVAL.DATE
111	RCL 01		FROM MM.YYYY TO
112	♦LBL B		YY. FRACTION & STORE.
113	RCL IND 09		VALUE ON EVAL DATE
114	ISG 09		LUMP SUM ROUTINE
50			LOOP BEGUN
			DATA RECALL FROM
			SUCCESSIVE REGISTERS

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
51			
115	X=0?		IF 0 FOUND IN REGISTER
116	GTO C		TERMINATES LUMP SUM
117	RCL IND 09		ROUTINE AND GOES TO
118	ISG 09		SERIES ROUTINE
119	FS? 00		TEST FOR PASS
120	GTO b		FLAG 0 SET, PASS 2 OR 3
121	XEQ e		PASS 1. CNVT DATE IN Y
122	X<>Y		TO -N; AMOUNT IN X REG
123	♦LBL 06		COMMON LUMP SUM & SERIES
124	*		(-WDL)(-N) OR (PMT)(-N)
125	LASTX		BRING BACK PMT OR WDL
126	X<0?		PMT OR WDL?
127	GTO 07		WDL; GO TO LBL 07
128	ST+ 02		Σ PMT
129	RDN		(-N)(PMT) TO X REG
130	ST− 04		Σ -(-N)(PMT)
131	FS? 03		LUMP-SUM OR SERIES?
132	GTO B		LUMP SUM
133	GTO C		SERIES
134	♦LBL 07		WDL
135	ST− 01		Σ -(-WDL)
136	RDN		(-N)(-WDL) TO X REG
137	ST+ 03		Σ (-N)(-WDL)
138	FS? 03		LUMP-SUM OR SERIES?
139	GTO B		LUMP-SUM
140	♦LBL C		SERIES
141	CF 03		FOR CL=SERIES
142	RCL IND 09		DATA RECALL ROUTINE
143	ISG 09		
144	X=0?		IF 0 IN REGISTER GO
145	GTO D		TO CALCULATION OF Ic
146	RCL IND 09		OTHERWISE CONTINUE
147	ISG 09		TO RECALL DATA FROM
148	RCL IND 09		SUCCESSIVE REGISTERS
149	ISG 09		
150	RCL IND 09		
151	ISG 09		
152	FS? 00		FLAG 00 SET. PASS 2 OR 3
153	GTO c		
154	STO 06		PASS 1. TEMP. STORE AMOUNT
155	RDN		N IN X REG; I IN Y REG
156	X<>Y		DATE IN Z REG

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157 ST* 06		(N)(PMT) OR (N)(-WDL)
158 CHS		-N
159 X<>Y		I IN X; -N IN Y REG
160 *		(-N)(I)
161 LASTX		BRING BACK I
162 +		I-NI
163 24		$(I-NI)/24=(I'-NI')/2$
164 /		
165 XEQ e		CALCULATE $-n'$
166 +		$\bar{n}=-n'+[(I-nI')/2]$
167 RCL 06		AMNT IN X; $\bar{n}$ IN Y REG
168 GTO 06		COMMON LUMP SUM & SERIES
169♦LBL a		PASS 2 OR 3. INITIALIZE
170 0		INITIALIZE
171 STO 01		TDW & TDP
172 STO 02		
173 X<>Y		0 IN Y; MKT VALUE IN X
174 -		-MKT VALUE IN X
175♦LBL b		PASS 2 OR 3 LUMP SUM
176 0		NOT SERIES
177 STO 03		
178 +		AMNT IN X; DATE IN Y
179♦LBL 08		COMMON LUMP SUM & SERIES
180 XEQ e		CALC. $-n$
181 RCL 03		$(I'N-I')$ OR 0
182 -		$-n'-(I'N-I')$ OR $-n$
183 RCL IND 00		$\pm PV=\pm$ AMOUNT $\times(1+i/100)^{-n}$
184 X<>Y		
185 Y↑X		
186 *		
187 X<0?		PMT OR WDL?
188 GTO 09		WDL; GO TO LBL 09
189 ST+ 02		$\Sigma PV_{PMT}=TDP$
190 FS? 03		LUMP SUM OR SERIES?
191 GTO B		LUMP SUM
192 GTO C		SERIES
193♦LBL 09		WDL
194 ST- 01		$\Sigma-(PV_{WDL})=TDW$
195 FS? 03		LUMP SUM OR SERIES
196 GTO B		LUMP SUM
197 GTO C		SERIES
198♦LBL c		PASS 2 OR 3 SERIES
199 STO 04		TEMO STORE AMOUNT
200 CLX		
201 12		$I'=I/12$
202 /		
203 *		$I'N$
204 STO 03		
205 RCL IND 00		$(1+i/100)$ IN X; $I'N$ IN Y
206 LASTX		BRING BACK I'
207 ST- 03		$(I'N-I')$ IN REG 03
208 Y↑X		
209 1		$A=[1+i/100]^{-I'}-1$
210 -		
211 X<>Y		A IN Y; $I'N$ IN X
212 RCL IND 00		$(1+i/100)$ IN X; $I'N$ IN Y
213 X<>Y		$(1+i/100)$ IN Y; $I'N$ IN X
214 Y↑X		$B=(1+i/100)^{I'N}-1$
215 1		
216 -		
217 X<>Y		B/A
218 /		
219 RCL 04		AMOUNT = AMOUNT $\times(B/A)$
220 *		
221 GTO 08		COMMON LUMP SUM & SERIES
222♦LBL D		CALCULATE RATE
223 FS? 00		TEST FOR PASS
224 GTO d		FLAG00 SET: PASS 2 OR 3
225 RCL 02		PASS 1. CALC. INITIAL
226 RCL 01		RATE
227 /		TP/TW
228 STO 06		STORE TP/TW
229 RCL 04		$x_p=[\Sigma(PMT\times n)]/TP$
230 RCL 02		
231 /		
232 RCL 03		$x_w=[\Sigma(WDL\times n)]/TW$
233 RCL 01		
234 /		
235 -		$a=x_p-x_w$
236 1/X		
237 Y↑X		$(1+i/100)=(TP/TW)^{1/a}$
238 STO 07		STORE $1+(i/100)$
239 GTO E		MAKE NEXT PASS
240♦LBL d		PASS 2 OR 3 RATES
241 RCL IND 00		$(1+i/100)$ OR $(1+i/100)$
242 RCL 06		$A=\log(TW/TP)$
243 LOG		
244 RCL 06		
245 RCL 02		
246 /		

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```
247 RCL 01
248 *
249 LOG
250 /
251 Y↑X
252 FS? 01
253 GTO 10
254 STO 08
255 GTO E
256♦LBL 10
257 STO 03
258 RCL 08
259 RCL 07
260 -
261 ENTER↑
262 *
263 LASTX
264 RCL 03
265 -
266 RCL 08
267 +
268 X≠0?
269 GTO 11
270 CLX
271 1
272♦LBL 11
273 /
274 RCL 07
275 1
276 -
277 +
278 1 E2
279 *
280 BEEP
281 "    TRUE
"
282 AVIEW
283 PSE
284 "ANNUAL
GRWTH"
285 AVIEW
286 PSE
287 "RATE="
288 ARCL X
289 "⊢%"
290 AVIEW
291 STOP
```

$B = \log\left[\frac{TW/TP}{TOP/TDW}\right]$

$1/b = A/B$

$(1+i_1/100) = (1+i/100)^{1/b}$

TEST FOR PASS 3

FLAG 01 SET. PASS 3

PASS 2. STORE $(1+i_1/100)$

START PASS 2

PASS 3. CALC FINAL RATE

STORE $(1+i_2/100)$

$A = \left[(i_1/100) - i/100\right]^2$

$B = (i_1/100$

ARE i, i_1 AND i_2 ALL EQUAL?

NO. PROCEED

YES. SET B=1

A/B

$i_c = \left[(i/100 + (A/B)\right] \times 100$

AUDIBLE SIGNAL CALC. FINISHED. WITH LARGE AMOUNT OF DATA CALC. MAY TAKE SEVERAL MINUTES

RATE DISPLAY ROUTINE

DISPLAY i_c

```
292♦LBL E
293 FS? 00
294 GTO 12
295 SF 00
296 CF 01
297 7
298 STO 00
299 GTO A
300♦LBL 12
301 FS? 01
302 GTO 13
303 SF 01
304 8
305 STO 00
306 GTO A
307♦LBL 13
308 CF 00
309 CF 01
310 GTO A
311 END
```

SET UP NEXT PASS

IS CURRENT PASS 1?

CURRENT PASS IS 2 OR 3

PASS 1. INCREASE TO 2

CLEAR PASS 3 FLAG

SET 00REG TO 7 FOR i_1

START PASS 2

CURRENT PASS IS 2 OR 3?

IS CURRENT PASS 3?

CURRENT PASS IS 3

PASS 2. INCREASE TO 3

SET 00REG TO 8 FOR i_2

START PASS 3

CURRENT FLAGS DIRECT TO PASS 1-FROM PROGRAM INITIALIZING ROUTINE

RESET TO 1. CLEAR PASS 2 OR 3 FLAG

START PASS 1

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REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS

00	T or 8
01	TW or TDW
02	TP or TDP
03	Temp; $1+(i_2/100)$
04	TEMP
05	EVAL DATE
06	TW/TP
07	$1+(i/100)$
08	$1+(i_1/100)$
09	IND. ADDRESS FOR DATA
10	INITIAL INVMNT DATE
11	INIT. INV. OR MKT. VAL.
12	REGISTERS 12 & HIGHER ARE USED FOR STORING DATA AS DIRECTED AND RECALLED BY REGESTER 09. LINES 07 AND 104 OF PROGRAM ALLOW UP TO 58 REGISTERS. IF EVEN MORE STORAGE IS REQUIRED LINES 07 AND 104 CAN BE CHANGED (70 INCREASED BY THE QUANTITY OF ADDITIONAL REGISTERS DESIRED). SEE COMMENTS ABOUT SIZE*

STATUS

SIZE 020* TOT. REG. 119+ USER MODE

ENG ____ FIX ____ SCI ____ ON ____ OFF ✓

DEG ____ RAD ____ GRAD ____

FLAGS

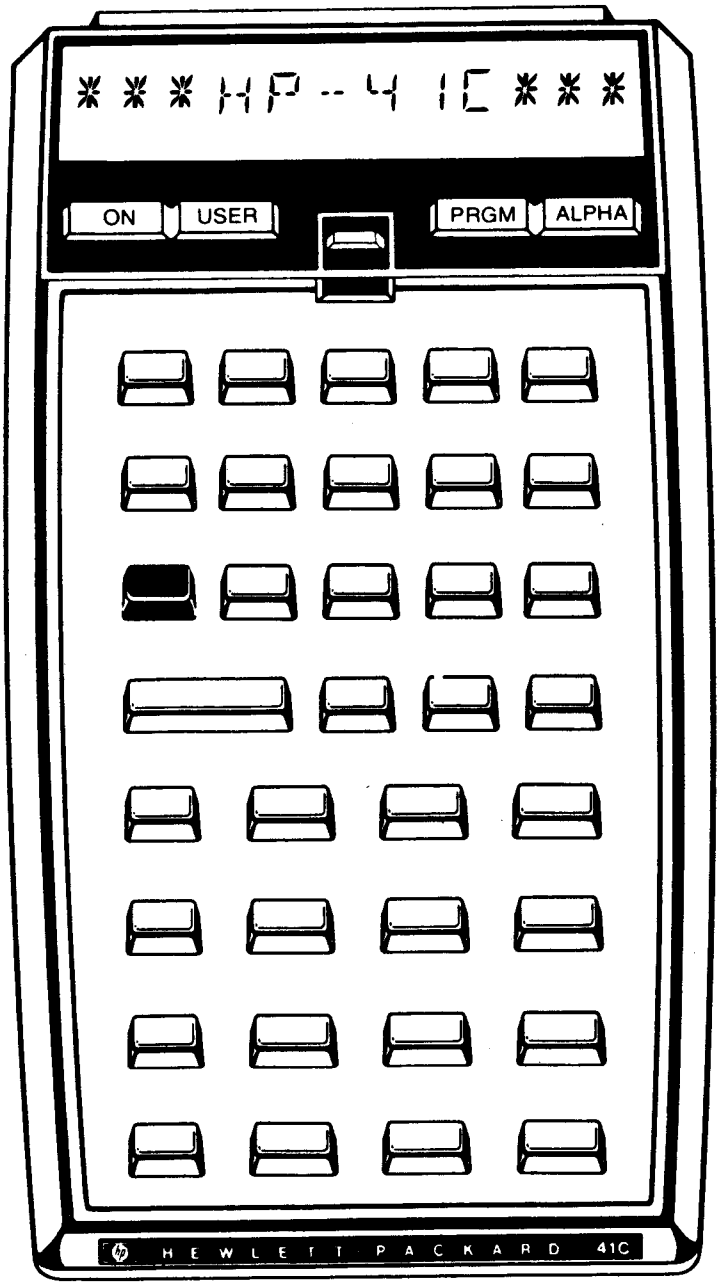
#	INIT S/C	SET INDICATES	CLEAR INDICATES
		* SIZE SHOULD BE SET FOR AT LEAST 020. ACTUAL SIZE REQUIRED IS: 12 PLUS 2 FOR EACH ORDINARY ADDITION OR WITHDRAWAL PLUS 4 FOR EACH SERIES OF REVENUE OR WITHDRAWAL OF INVESTMENT.	
		SIZE = 12 + 2N + 4S	
		WHERE N = NUMBER OF ORDINARY ADDITIONS OR WITHDRAWALS	
		S = NUMBER OF SERIES OF REVENUES OR WITHDRAWALS OF INVESTMENT	
		OF COURSE IF REGISTERS ARE AVAILABLE SIZE 082 OR OTHER GENEROUS AMOUNT WILL TAKE CARE OF ALL BUT THE VERY LARGEST QUANTITIES OF DATA.	

ASSIGNMENTS

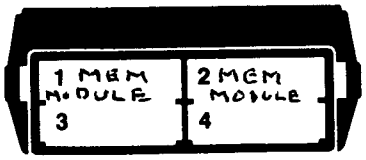
FUNCTION	KEY	FUNCTION	KEY

KEYBOARD CARD LABELING

KEYBOARD

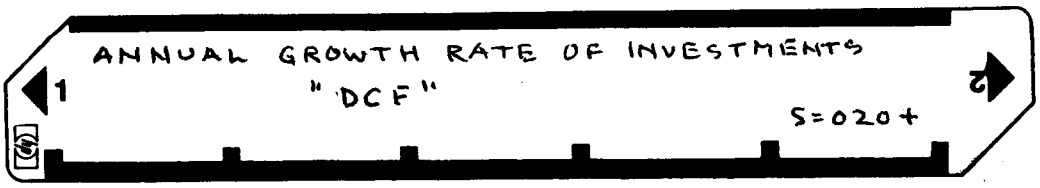


SYSTEM CONFIGURATION



2nd MEM. MODULE ONLY IF QUANTITY OF DATA IS LARGE

CARD



ANNUAL GROWTH RATE OF INVESTMENTS

PROGRAM REGISTERS NEEDED: 98

USERS' LIBRARY
PROGRAM NUMBER: 00549C

ROW 1 (1 : 4)

ROW 2 (5 : 10)

ROW 3 (10 : 13)

ROW 4 (13 : 15)

ROW 5 (16 : 18)

ROW 6 (18 : 23)

ROW 7 (23 : 26)

ROW 8 (26 : 27)

ROW 9 (28 : 30)

ROW 10 (30 : 33)

ROW 11 (33 : 38)

ROW 12 (38 : 41)

ROW 13 (41 : 44)

ROW 14 (44 : 46)

ROW 15 (47 : 52)

ROW 16 (53 : 56)

ROW 17 (57 : 60)

ROW 18 (60 : 64)

ROW 19 (64 : 68)

ROW 20 (69 : 70)

ROW 21 (70 : 74)

ROW 22 (74 : 76)

ROW 23 (76 : 78)

ROW 24 (78 : 83)

ROW 25 (84 : 93)

ROW 26 (94 : 101)

ROW 27 (101 : 108)

ROW 28 (108 : 116)

ROW 29 (116 : 121)

ROW 30 (122 : 131)

ROW 31 (131 : 137)

ROW 32 (138 : 143)

ROW 33 (144 : 150)

ROW 34 (150 : 157)

ROW 35 (158 : 167)

ROW 36 (168 : 177)

ROW 37 (178 : 187)

ROW 38 (188 : 193)

ROW 39 (194 : 199)

ROW 40 (200 : 209)

ROW 41 (210 : 221)

ROW 42 (221 : 229)

ROW 43 (230 : 240)

ROW 44 (240 : 251)

ROW 45 (252 : 260)

ROW 46 (261 : 272)

ROW 47 (273 : 281)

ROW 48 (281 : 284)

ROW 49 (284 : 287)

ROW 50 (287 : 293)

ROW 51 (294 : 301)

ROW 52 (301 : 308)

ROW 53 (309 : 311)